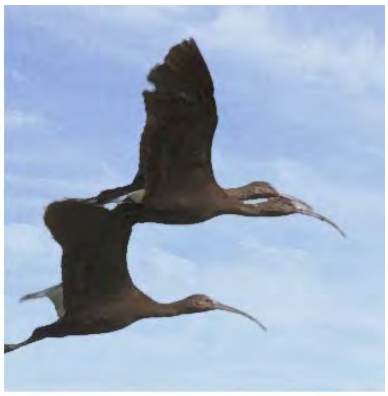
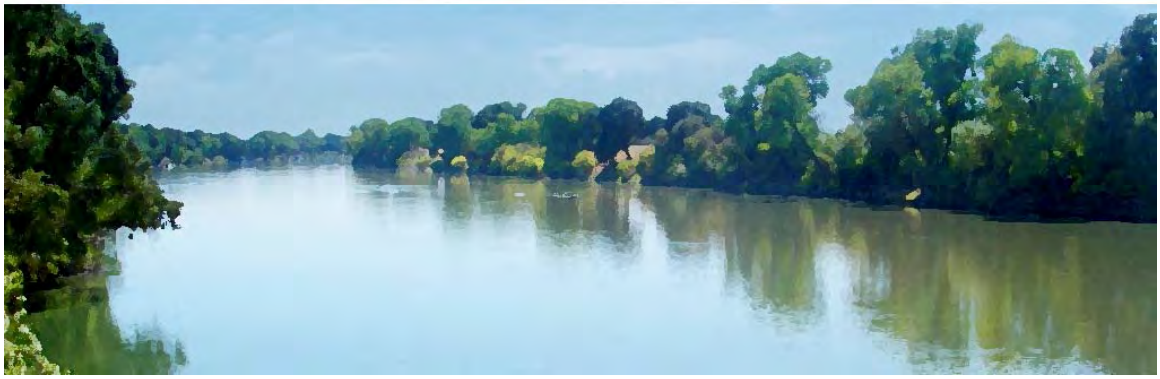
Draft Environmental Impact Statement/Draft Environmental Impact Report on the

Natomas Levee Improvement Program
Phase 3 Landside Improvements Project





State Clearinghouse No. 2008072060

Prepared for:

US Army Corps of Engineers ®
Sacramento District

SAFCA
Sacramento Area Flood Control Agency

February 2009

Draft Environmental Impact Statement/Draft Environmental Impact Report on the

Natomas Levee Improvement Program
Phase 3 Landside Improvements Project

State Clearinghouse No. 2008072060

Prepared for:

U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814

Contact:

Elizabeth Holland
Planning Division
(916) 557-6763

Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Contact:

John Bassett, P.E.
Director of Engineering
(916) 874-7606

Prepared by:

EDAW
2022 J Street
Sacramento, CA 95811

Contact:

Francine Dunn
NEPA/CEQA Project Manager
(916) 414-5800

February 2009

06110058.03
2.11.09

DRAFT ENVIRONMENTAL IMPACT STATEMENT/ DRAFT ENVIRONMENTAL IMPACT REPORT ON THE NATOMAS LEVEE IMPROVEMENT PROGRAM, PHASE 3 LANDSIDE IMPROVEMENTS PROJECT

ABSTRACT

Lead Federal Agency: U.S. Army Corps of Engineers (USACE), Sacramento District

Lead State Agency: Sacramento Area Flood Control Agency (SAFCA)

The Natomas Levee Improvement Program (NLIP), Phase 3 Landside Improvements Project (Phase 3 Project), consists of improvements to the Natomas Basin's perimeter levee system in Sutter and Sacramento Counties, California, and associated landscape and irrigation/drainage infrastructure modifications, as proposed by SAFCA. The overall purpose of the NLIP is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas. This draft environmental impact statement/draft environmental impact report (DEIS/DEIR) has been prepared by USACE and SAFCA in accordance with the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), respectively, and evaluates the significant environmental impacts of the Phase 3 Project.

To implement the Phase 3 Project, SAFCA is requesting permission from USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 United States Code [USC] 408, hereinafter referred to as "Section 408") for alteration of Federal project levees; and Section 404 of the Clean Water Act (33 USC 1344, hereinafter referred to as "Section 404") for the placement of fill in jurisdictional waters of the United States; and Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403, hereinafter referred to as "Section 10") for work performed in, under, or over navigable waters, and excavation of material from or deposition of material into navigable waters. This decision is a major Federal action with the potential to significantly affect the quality of the human environment; therefore, USACE has determined that an EIS is necessary. The Proposed Action also has the potential to cause significant environmental effects under CEQA; therefore, SAFCA has determined that an EIR is necessary.

The DEIS/DEIR describes the flood damage reduction issues and related problems and needs that would be addressed by the Phase 3 Project, identifies the Proposed Action and alternatives to the Proposed Action, and presents an analysis of the environmental impacts and mitigation measures associated with the Proposed Action and alternatives under consideration. The Proposed Action would result in significant and unavoidable adverse impacts on agricultural resources; land use, socioeconomics, and population and housing; special-status terrestrial species; cultural resources; transportation and circulation; air quality; noise; and visual resources.

Public Review and Comment:

The public comment period for the DEIS/DEIR begins on February 13, 2009 and closes on April 6, 2009. SAFCA will hold a public meeting before the SAFCA Board of Directors on Thursday, March 19, 2009 at 3:00 p.m. in the Sacramento County Board of Supervisors Chambers located at 700 H Street, Sacramento, California. For further information regarding the DEIS/DEIR, please contact Elizabeth Holland, USACE Sacramento District, Planning Division, 1325 J Street, Sacramento, CA, 95814, or email Elizabeth.G.Holland@usace.army.mil; or John Bassett, SAFCA Director of Engineering, 1007 7th Street, 7th Floor, Sacramento, CA 95814, or email BassettJ@saccounty.net.

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS

Section **Page**

APPENDICES – VOLUME II ***(If not printed, please see CD on back cover)***

TABLES

Table No. **Page**

TABLES

Table No. **Page**

PLATES

ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
AC	Advisory Circular
ACHP	Advisory Council on Historic Preservation
ADT	average daily traffic
afy	acre-feet per year
AG District	General Agriculture District
AG-20	Agriculture–20 Acre Minimum Parcel Size
AG-80	Agriculture–80 Acre Minimum Parcel Size
AG-RC	Agriculture–Rural Community
Airport	Sacramento International Airport
Airport Master Plan	Sacramento International Airport Master Plan
ALUC	Airport Land Use Commission
ALUCP	Airport Land Use Compatibility Plan
APE	area of potential effects
AQAPs	air quality attainment plans
ARB	California Air Resources Board
ARWI	American River Watershed Investigation
ATCM	Airborne Toxics Control Measure
B.P.	Before Present
BA	Biological Assessment
BACT	Best Available Control Technology
Basin Plan	Water Quality Control Plan for the Sacramento and San Joaquin River Basins
Bay-Delta	San Francisco Bay/Sacramento–San Joaquin Delta
BMPs	best management practices
BO	Biological Opinion
BTEX	ethylbenzene and total xylenes
CAA	Federal Clean Air Act
CAAA	Federal Clean Air Act Amendments of 1990
CAAQS	California ambient air quality standards
Cal/EPA	California Environmental Protection Agency
Cal/OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation

CCAA	California Clean Air Act
CCR	California Code of Regulations
CDF	California Department of Forestry and Fire Protection
CEQ	Council on Environment Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLUPs	comprehensive airport land use plans
cmbs	centimeters below surface
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
Common Features Project	American River Common Features Project
CRHR	California Register of Historical Resources
CTR	California Toxics Rule
CVFPB	Central Valley Flood Protection Board
CWA	Clean Water Act
cy	cubic yards
dB	decibels
dBA	A-weighted decibel
dbh	diameter at breast height
DDE	dichloro-diphenyl-dichloroethylene
DDT	dichloro-diphenyl-trichloroethane
Delta	Sacramento–San Joaquin Delta
DFG	California Department of Fish and Game
DOC	California Department of Conservation
DOGGR	State of California Department of Oil, Gas, and Geothermal Resources
DPFs	diesel particulate filters
DPSs	Distinct Population Segments
DSM	deep soil mixing
DTSC	Department of Toxic Substances Control
DWR	California Department of Water Resources

EFH	essential fish habitat
EIR	environmental impact report
EIS	environmental impact statement
EIS/EIR	environmental impact statement/environmental impact report
Elkhorn Canal	Elkhorn Main Irrigation Canal
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Federal Endangered Species Act
ESU	Evolutionarily Significant Unit
FAA	Federal Aviation Administration
Far Western	Far Western Anthropological Research Group
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FMB	Foothill Metamorphic Belt
FMMP	Farmland Mapping and Monitoring Program
FPP	Federal Farmland Protection Program
FPPA	Federal Farmland Protection Policy Act
FR	Federal Register
FRAQMD	Feather River Air Quality Management District
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
GGS	giant garter snake
GHG	greenhouse gas
GRR	General Re-evaluation Report
H:V	horizontal-to-vertical
HAER	Historic American Engineering Record
hp	horsepower
HPTP	Historic Property Treatment Plan
HTRW	hazardous, toxic, or radioactive waste
HUD	U.S. Department of Housing and Urban Development

I-5	Interstate 5
I-80	Interstate 80
in/sec	inch per second
ISS	Initial Site Survey
ITE	Institute of Transportation Engineers
lb/day	pounds per day
L_{dn}	day-night average noise level
L_{dn}/CNEL	day-night average noise level/community noise equivalent level
LESA	Land Evaluation and Site Assessment
Local Funding EIR	Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area
LOS	level of service
LSCE	Luhdorff & Scalmanini Consulting Engineers
LTMP	Long-Term Management Plan
M	magnitude
MBTA	Migratory Bird Treaty Act
MLD	Most Likely Descendant
mm	millimeter
MMP	Mitigation and Monitoring Plan
MMRP	Mitigation Monitoring and Reporting Program
msl	mean sea level
MTBE	methyl tert-butyl ether
NAAQS	national ambient air quality standards
NAHC	Native American Heritage Commission
NALP	North Area Local Project
NBHCP	Natomas Basin Habitat Conservation Plan
NCC	Natomas Cross Canal
NCIC	North Central Information Center
NCMWC	Natomas Central Mutual Water Company
NEIC	Northeast Information Center
NEMDC	Natomas East Main Drainage Canal
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program

NHPA	National Historic Preservation Act
NLEP	Natomas Levee Evaluation Program
NLIP	Natomas Levee Improvement Program
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOA	naturally occurring asbestos
NOD	notice of determination
NOI	notice of intent
NOP	notice of preparation
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTR	National Toxics Rule
O&M	operations and maintenance
^oC	Celsius
OEDP	Overall Economic Development Plan
OPR	Governor's Office of Planning and Research
PA	Programmatic Agreement
PCBs	polychlorinated biphenyls
PGCC	Pleasant Grove Creek Canal
PG&E	Pacific Gas and Electric Company
Phase 1 Project	NCC South Levee Phase 1 Improvements
Phase 2 Project EIS	Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA
Phase 3 Project	Phase 3 of the NLIP Landside Improvements Project
Phase I ESA	Phase I environmental site assessment
PM	particulate matter
PM_{10}	respirable particulate matter less than 10 microns in diameter
$PM_{2.5}$	fine particulate matter with an aerodynamic diameter of 2.5 micrometers or less
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
PPV	peak particle velocity

PRC	Public Resources Code
Proposed Action	Adjacent Setback Levee Alternative
RBDD	Red Bluff Diversion Dam
RCRA	Resource Conservation and Recovery Act
RD	reclamation district
Reclamation	U.S. Bureau of Reclamation
RECs	recognized environmental conditions
Riverside Canal	Riverside Main Irrigation Canal
RM	river mile
ROD	record of decision
ROG	reactive organic gases
RWQCB	Regional Water Quality Control Board
SACDOT	County of Sacramento, Department of Transportation
SACOG	Sacramento Area Council of Governments
SAFCA	Sacramento Area Flood Control Agency
SB	Senate Bill
SCAS	Sacramento County Airport System
SEIR	supplemental environmental impact report
SGA	Sacramento Groundwater Authority
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SIR	Supplemental Information Report
SMAQMD	Sacramento Metropolitan Air Quality Management District
SMARA	California Surface Mining and Reclamation Act
SMUD	Sacramento Municipal Utility District
SO_2	sulfur dioxide
SR	State Route
SRA	shaded riverine aquatic
SRFCP	Sacramento River Flood Control Project
STPs	shovel test pits
SVAB	Sacramento Valley Air Basin
SVP	Society of Vertebrate Paleontology
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board

TAC	toxic air contaminant
TAME	tert amyl methyl ether
TBA	tert butyl alcohol
T-BACT	toxic best available control technology
TCPs	Traditional Cultural Properties
TDS	total dissolved solids
TNBC	The Natomas Basin Conservancy
TPD	tons per day
TPH	total petroleum hydrocarbons
TPY	tons per year
TRD	trench remixing deep
UCMP	University of California Museum of Paleontology
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
VdB	vibration decibels
WDRs	waste discharge requirements
WHMP	Wildlife Hazard Management Plan
Williamson Act	California Land Conservation Act

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

The Natomas Levee Improvement Program (NLIP), Phase 3 Landside Improvements Project (Phase 3 Project), consists of improvements to a portion of the Natomas Basin's perimeter levee system in Sutter and Sacramento Counties, California, and associated landscape and irrigation/drainage infrastructure modifications, as proposed by the Sacramento Area Flood Control Agency (SAFCA). SAFCA has initiated this effort in cooperation with the California Department of Water Resources and the Central Valley Flood Protection Board (hereinafter referred to together as "State"), and the U.S. Army Corps of Engineers (USACE) Sacramento District, with the aim of incorporating the NLIP into the Natomas components of the Federally authorized American River Common Features Project (Common Features Project).

The overall purpose of the NLIP is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas. The Landside Improvements Project, which is a component of the NLIP, consists of four phases. The Phase 3 Project is one of the four project phases, and includes proposed improvements affecting approximately 13 miles of the levee system. The Phase 1 Project has been completed. The Phase 2 Project has been analyzed in previous environmental documents (see Section ES.5, below) and is scheduled for construction beginning in 2009. The Phase 3 Project is the subject of this environmental impact statement/environmental impact report (EIS/EIR). The Phase 4 Project will be the subject of a future environmental document.

To implement the Phase 3 Project, SAFCA is requesting permission from USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 United States Code [USC] 408, hereinafter referred to as "Section 408") for alteration of Federal project levees; Section 404 of the Clean Water Act (33 USC 1344, hereinafter referred to as "Section 404") for the placement of fill in jurisdictional waters of the United States; and Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403, hereinafter referred to as "Section 10") for work performed in, under, or over navigable waters, and excavation of material from or deposition of material into navigable waters. SAFCA may also need to obtain several state approvals or permits: Central Valley Flood Protection Board encroachment permit, California Surface Mining and Reclamation Act permit, Clean Water Act Section 401 water quality certification, Clean Water Act Section 402 National Pollutant Discharge Elimination System permit, California Fish and Game Code Section 2081 incidental-take authorization, California Fish and Game Code Section 1602 streambed alteration agreement, and permits from the Sacramento Metropolitan Air Quality Management District and the Feather River Air Quality Management District.

ES.2 PURPOSE AND INTENDED USES OF THIS DOCUMENT

This EIS/EIR has been prepared by USACE and SAFCA in accordance with the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), respectively. This EIS/EIR evaluates the potential significant environmental impacts of the Phase 3 Project, and will be used to support the specific USACE decisions on whether to grant permission for the Phase 3 Project proposed by SAFCA pursuant to Section 408, Section 404, and Section 10; and the specific SAFCA decision regarding whether to approve the Phase 3 Project.

This EIS/EIR will also be used by CEQA responsible agencies, such as the Central Valley Flood Protection Board and Central Valley Regional Water Quality Control Board and trustee agencies, such as the California Department of Fish and Game, to ensure that they have met the requirements of CEQA before deciding whether to issue discretionary permits over which they have authority. It may also be used by other state and local agencies, including CEQA trustee agencies, that may have an interest in resources that could be affected by the project.

This EIS/EIR is not intended to be used for future development projects in the Basin.

For NEPA purposes, this EIS is tiered from USACE's *EIS for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA* (Phase 2 Project EIS) (November 2008), which evaluated impacts expected to result from the NLIP at a programmatic level. For CEQA purposes, this EIR is tiered from SAFCA's *EIR on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (Local Funding EIR) (February 2007) and SAFCA's *EIR on the Natomas Levee Improvement Program Landside Improvements Project* (2007 Landside or Phase 2 Project EIR) (November 2007), which also evaluated impacts expected to result from the NLIP.

ES.3 LEAD AGENCIES AND COOPERATING AGENCY

USACE is the Federal lead agency for NEPA, and SAFCA is the California lead agency for CEQA.

The Federal Aviation Administration (FAA) is serving as a cooperating Federal agency for NEPA because if SAFCA and USACE select an alternative that requires the Sacramento International Airport (Airport) to change its Airport Layout Plan or seek a release from Federal Airport Improvement Grant assurances, the FAA would use this EIS/EIR in exercising its decision-making authority under 49 USC 47107 regarding whether to approve those actions.

ES.4 PROJECT LOCATION

The Natomas Basin is located at the confluence of the American and Sacramento Rivers. Encompassing approximately 53,000 acres, the Basin extends northward from the American River and includes portions of the city of Sacramento, Sacramento County, and Sutter County (**Plate 1**). In addition to the American and Sacramento Rivers to the south and west, the Natomas Basin is bordered to the north by the Natomas Cross Canal (NCC) and to the east by the Pleasant Grove Creek Canal (PGCC) and the Natomas East Main Drainage Canal (NEMDC) (**Plate 1**). The NCC diverts the runoff from a large watershed in western Placer and southern Sutter Counties around the Natomas area and is a major contributor to the flows in the upper reach of the Sacramento River channel in SAFCA's jurisdiction. The NEMDC is an engineered channel along the southeastern flank of Natomas. Tributaries to the NEMDC include Dry Creek, Arcade Creek, Rio Linda Creek, Robla Creek, and Magpie Creek Diversion Channel. The Natomas Basin is protected from high flows in these tributaries and in the American and Sacramento Rivers by a Federal perimeter levee system.

The Natomas Basin floodplain is occupied by more than 83,000 residents and over $8.2 billion in damageable property, including the Airport and extensive urban development, primarily in the southern one-third of the Basin. The remaining agricultural lands in the Natomas Basin provide habitat for several important wildlife species. This habitat is protected under Federal and state laws, and expansion of the urban footprint into the remaining agricultural areas is governed by the *Natomas Basin Habitat Conservation Plan* (NBHCP), which is aimed at setting aside and conserving tracts of agricultural land that are needed to sustain the affected species.

ES.5 PROJECT BACKGROUND AND PHASING

As stated above, the overall purpose of the NLIP is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas. The Phase 3 Project is one component of the NLIP Landside Improvements Project, and includes proposed improvements affecting approximately 13 miles of the levee system.

The proposed improvements address identified deficiencies in the Natomas Basin perimeter levee system based on (1) design criteria used to certify levees as providing 100-year flood protection under regulations adopted by the Federal Emergency Management Agency (FEMA), (2) design criteria used by USACE and the State for the levees comprising the American River Common Features Project, and (3) design "200-year" water surface

elevations developed by SAFCA in cooperation with the State using hydrologic modeling data developed by USACE and the State as part of the Sacramento–San Joaquin River Basins Comprehensive Study.

Although SAFCA anticipates that all segments of the Natomas perimeter levee system will eventually be improved to meet all of the above design criteria, SAFCA is partnering with the California Department of Water Resources to implement FloodSafe California using grant funding to initiate early implementation of improvements (early implementation project) for the segments that do not currently meet the 100-year design criteria adopted by FEMA. SAFCA proposes to complete these improvements by the end of 2011. Phases 1–4 of the NLIP Landside Improvements Project constitute the "early implementation project." The remaining segments of the perimeter levee system would be improved by USACE to meet State standards for the "200-year" design water surface elevation. This will require Congressional authorization to expand the scope of the already authorized Common Features Project based on a General Re-evaluation Report (GRR) to be completed by USACE for presentation to Congress in 2010. SAFCA is coordinating with USACE to ensure that the planning and design of the early implementation project are consistent with applicable USACE planning, engineering, and design guidelines. While the GRR will be a separate report with its own environmental documentation, USACE and SAFCA recognize that Federal actions taken in connection with the early implementation project will need to be appropriately reflected in the GRR.

To move forward as quickly as possible to reduce the risk of flooding in the Natomas Basin, SAFCA has identified the broad outlines of the early implementation project at a program level of detail and developed an incremental implementation strategy based on carrying out the project in four phases, with each phase contributing independently and cumulatively to achieving flood risk reduction. Each individual project phase would contribute to increased flood protection for the Natomas Basin, and thus has independent utility. However, no single project phase would achieve the overall project objective of 100-year flood protection to the entire Basin. The NLIP, as a program, has independent utility from the other areas under consideration in the GRR because the NLIP will provide added flood protection to an entire area (similar to a ring levee) and this increased flood protection is not dependent on the outcome of the GRR. The four phases of the project are as follows:

- The Phase 1 Project involved improvements to address underseepage deficiencies affecting a 1.9-mile segment of the NCC south levee. The environmental impacts of these improvements were evaluated in the Local Funding EIR, which the SAFCA Board certified in February 2007. These improvements were constructed in 2007 and 2008.

- The Phase 2 Project focuses on improvements to address remaining underseepage and levee height deficiencies along the entire 5.3-mile length of the NCC south levee as well as underseepage, erosion, encroachment, and levee height deficiencies along the upper 4.5 miles of the Sacramento River east levee. The environmental impacts of these improvements are evaluated in detail in the *EIR on the Natomas Levee Improvement Program, Landside Improvements Project* (Phase 2 Project EIR), which the SAFCA Board certified in November 2007, and the *EIS for 408 Permission and 404 Permit to SAFCA for the Natomas Levee Improvement Project, Sacramento, CA* (Phase 2 Project EIS), for which a record of decision (ROD) was issued in January 2009. USACE also issued the 408 permission and 404 permit for the Phase 2 Project in January 2009. Since the November 2007 certification of the Phase 2 Project EIR, SAFCA has made minor modifications to the design of the Phase 2 Project. A supplemental EIR (Phase 2 Project SEIR) was prepared by SAFCA to evaluate these modifications; the SAFCA Board of Directors certified the SEIR in January 2009, at which time the Board also approved the modifications to the Phase 2 Project. The Phase 2 Project could be constructed on a stand-alone basis, assuming no further action on the balance of the NLIP is taken. Construction is planned to begin in early 2009 and is anticipated to be completed in 2009, assuming receipt of all required environmental clearances and permits.

- The Phase 3 Project, which is the subject of this EIS/EIR, focuses on underseepage, erosion, encroachment, and levee height deficiencies along 4.5 miles of the Sacramento River east levee, 3.2 miles of the PGCC west levee, and 6.2 miles of the NEMDC west levee. If permitted, these improvements could be constructed in

concert with the Phase 2 Project. Construction is planned to begin in 2009 and to be completed in 2010, assuming receipt of all required environmental clearances and permits.

- The Phase 4 Project focuses on underseepage, erosion, encroachment, and levee height deficiencies along 9 miles of the Sacramento River east levee, 7.1 miles of the NEMDC west levee, and 2.1 miles of the American River north levee. The environmental impacts of these improvements were evaluated at a program level in the Local Funding EIR. The project-specific impacts of the Phase 4 Project will be evaluated in a separate EIS/EIR in 2009. Construction is planned to begin in 2010 and be completed in 2011, assuming receipt of all required environmental clearances and permits.

Each of the project phases discussed above also includes associated habitat, drainage, irrigation, and related infrastructure improvements.

ES.6 NEED FOR ACTION

The need for the action is to reduce the flood risk to the Natomas Basin. The need for the NLIP was initially outlined in the *Natomas Levee Evaluation Study Final Report Prepared for SAFCA in Support of the Natomas Basin Components of the American River Common Features* (July 14, 2006), which concluded that segments of the Natomas perimeter levee system have the following problems for both the FEMA 100-year and the "200-year" design water surface elevations:

- inadequate levee height,
- through-levee seepage and foundation underseepage with excessive hydraulic gradients,
- embankment instability, and
- susceptibility to riverbank erosion and scour.

Although not highlighted in the levee evaluation, portions of the perimeter levee system, particularly along the east levee of the Sacramento River, are also subject to vegetative and structural encroachments into the levee prism.

The Natomas Basin floodplain is occupied by over 83,000 residents and $8.2 billion in damageable property. Although previous improvements to the Natomas Basin perimeter levee system, completed as part of the Sacramento Urban Levee Reconstruction Project and the North Area Local Project, have significantly improved flood protection for the area, the Natomas Basin remains vulnerable to flooding in a less than 100-year flood event. Uncontrolled flooding in the Natomas Basin floodplain in a flood exceeding a 100-year event could result in $7.4 billion in damage (this excludes the Airport facilities) (SAFCA 2007b). Resulting damage could hinder community growth, stability, and cohesion. Flooding could also release toxic and hazardous materials, contaminate groundwater, and damage the metropolitan power and transportation grids. The disruption in transportation that could result from a major flood could affect the Airport and interstate and state highways. In addition, displacement of residents, businesses, agriculture, and recreational areas could occur.

In January 2008, FEMA proposed remapping the Natomas Basin as an AE zone. The designation took effect in December 2008. FEMA defines AE zones as areas with a 1% annual chance of flooding. The designation requires the bottom floor of all new buildings be constructed at or above base flood elevation—as little as 3 feet in some areas of the Natomas Basin but up to 20 feet above the ground level in much of the Basin. This designation effectively stopped all development projects that were not issued building permits before the new map took effect.

ES.7 PROJECT PURPOSE/PROJECT OBJECTIVES

SAFCA's project objectives adopted in connection with the NLIP are: (1) provide at least a 100-year level of flood protection to the Natomas Basin as quickly as possible, (2) provide "200-year" protection to the Basin over time, and (3) avoid any substantial increase in expected annual damages as new development occurs in the Basin.

The first two project objectives would reduce the residual risk of flooding sufficiently to meet the minimum requirements of Federal and state law for urban areas like the Natomas Basin. The third project objective is a long-term objective of SAFCA's.

The overall purpose of the project is to develop and select an alternative that would reduce the risk of flood damage in the Natomas Basin. Some residual risk will always remain, however, in any flood damage reduction system. USACE must make decisions on whether or not to grant permission for SAFCA's Phase 3 Project to alter the Natomas Basin levee system (Federal project levees) under Section 408 and issue permits under Section 404 and Section 10. USACE decisions contemplated by this EIS/EIR pertain only to the proposed Phase 3 Project, which is the subject of this EIS/EIR.

Additional project objectives that have informed SAFCA's project design are to:

(1) use flood damage reduction projects in the vicinity of the Airport to facilitate management of Airport lands in accordance with the Airport's *Wildlife Hazard Management Plan*; and

(2) use flood damage reduction projects to increase the extent and connectivity of the lands in the Natomas Basin being managed to provide habitat for giant garter snake, Swainson's hawk, and other special-status species.

SAFCA's approach to defining flood risk reduction accomplishments level of protection (system performance) differs from that of USACE. References in this document to levels of flood protection are based on SAFCA's "best estimate" approach (FEMA's and the state's current method) and should not be taken as USACE concurrence that such levels would be achieved based on USACE's approach of incorporating risk and uncertainty in the estimate of system performance. In any case, flood risk to the Natomas Basin would be considerably reduced by the project.

ES.8 ALTERNATIVES SCREENING

SAFCA formulated a range of action alternatives intended to achieve the specific project objectives through the following steps:

- identification of the deficiencies that must be addressed to provide at least 100-year flood protection as quickly as possible;
- identification of feasible remedial measures to address the deficiencies;
- determination of the likely significant environmental impacts of the remedial measures;
- development of a reasonable range of flood damage reduction alternatives around the remedial measures;
- identification of the deficiencies in the Natomas levee system that must be addressed to provide "200-year" flood protection; and
- addition of measures to ensure that each alternative would improve aviation safety, maintain habitat values, and contribute to the long-term operability of the Natomas Basin's agricultural irrigation and drainage infrastructure.

Alternatives screening for the overall NLIP has been undertaken by SAFCA in a systematic manner through several environmental documents as described in **Appendix I**, "Alternatives Formulation and Screening Details."

ES.9 ALTERNATIVES

ES.9.1 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Numerous alternatives have been considered by SAFCA to provide flood risk reduction to the Natomas Basin. Many alternatives have been evaluated and eliminated from further consideration during completion of the following previous environmental documents:

- *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (SAFCA 2007a), State Clearinghouse Number 2006072098 (Local Funding EIR);

- *Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project* (SAFCA 2007c), State Clearinghouse Number 2007062016 (Phase 2 Project EIR); and

- *Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project* (USACE 2008) (Phase 2 Project EIS).

The following alternatives that could contribute to addressing the Natomas Basin's flood problems and needs were reviewed and eliminated from further consideration in the 2007 Landside EIR and the Phase 2 Project EIS. These eliminated alternatives, which are hereby incorporated by reference, are summarized as follows:

- **Yolo Bypass Improvements.** This measure would involve lengthening the Fremont Weir and widening the Yolo Bypass to increase the amount of flood water conveyed through the bypass and reduce the amount of flood water conveyed through the Sacramento River channel downstream of the weir. This alternative was rejected because (1) it would be too costly for SAFCA to implement; (2) even following implementation of this alternative, some levee height increases and substantial seepage and underseepage and slope stability remediation would still be required for the perimeter levee system, adding to the costs of the bypass alternative; (3) the bypass improvements would lie outside of SAFCA's jurisdiction and would require Federal, state, and local cooperation and funding; and (4) the project objective of restoring 100-year flood protection to the Natomas Basin could not be achieved as quickly as possible using the Proposed Action. (Considered and eliminated in Phase 2 Project EIS.)

- **Reduced Natomas Urban Levee Perimeter.** This measure would involve construction of a cross levee running east to west across the Natomas Basin along an alignment north of Elkhorn Boulevard to protect existing developed areas in the City and County of Sacramento. This alternative was rejected because (1) it is inconsistent with current Federal and state authorizations and would strand Federal, state, and local investments already made in improving the NCC south levee and Sacramento River east levee pursuant to past Congressional authorization; (2) it would result in the need to raise State Route (SR) 99/70 or otherwise protect SR 99/70 from flooding; (3) it would divide Reclamation District 1000 and disrupt several portions of the Natomas Basin irrigation and drainage system and require reconfiguration of these systems; (4) it would present significant barriers to achieving the goals of the NBHCP; (5) it would have substantially greater costs than other alternatives without achieving any additional flood damage reduction benefit; (6) it would not protect existing residential, commercial, and industrial development in the Sutter County portion of the Basin north of the cross levee, and (7) it would leave a portion of the Basin currently planned for development by Sutter County (i.e., *Sutter Pointe Specific Plan* mixed-use development project) outside the urban levee perimeter and likely cause Sutter County to exercise its rights under SAFCA's joint exercise of powers agreement to prevent the expenditure of Consolidated Capital Assessment District funds on this measure. (Considered and eliminated in Phase 2 Project EIS and Local Funding EIR.)

- **Construction of a New Setback Levee.** This alternative would involve construction of a 5-mile-long levee along the northern reaches of the Sacramento River east levee parallel to the existing levee alignment but set

back from the existing alignment by 500–1,000 feet. This alternative was rejected because it is infeasible because of (1) the presence of waterside residences along the existing levee from approximately the southern end of Reach 2 of the Sacramento River east levee (north of Riego Road) in the north to the American River north levee in the south, and the need to maintain access to these residences from Garden Highway; (2) the proximity of the Sacramento River east levee to the Airport, and the need to prevent project features from increasing potential hazards to aviation safety; and (3) the possibility that utility relocations (power poles) and flood damage reduction measures could encroach into surface slopes of Airport runway approach zones. (Considered and eliminated in Phase 2 Project EIS.)

- **Raise Levee in Place with a 1,000-Foot Levee Setback in the Upper 1.4 Miles along the Sacramento River East Levee.** This alternative would have provided a location for a substantial amount of tree planting on the water side of the setback levee, contributing to the offsetting mitigation for the loss of the trees that may need to be removed along the existing levee to meet USACE criteria. This alternative was rejected because it was unlikely that the new setback levee would provide 100-year flood protection per USACE criteria. (Considered and eliminated in Phase 2 Project EIR.)

- **Construct an Adjacent Setback Levee with a 500-Foot Levee Setback in the Upper 1.4 Miles along the Sacramento River East Levee.** This alternative was evaluated because it would provide the opportunity for partially offsetting the loss of landside tree groves through the establishment of new riparian plantings in the levee setback area as well as woodland plantings on the land side of the adjacent setback levee. This alternative was rejected because it would require substantially greater quantities of borrow material with greater impacts on important farmland and transportation and circulation. (Considered and eliminated in Phase 2 Project EIR.)

- **No SAFCA Levee Improvements—Private Levees in Natomas.** This alternative was analyzed assuming that there would be no SAFCA project providing flood protection in the Basin, thus causing private developers to separately fund and implement individual flood protection in the form of private compartment levees that would protect new developments. This alternative was rejected because it would (1) only partially meet the first objective of providing 100-year flood protection, (2) potentially lead to increased fragmentation of habitat for special-status species, and (3) increase projected flood damages without a commensurate reduction in flood risk. (Considered and eliminated in Phase 2 Project EIR and Local Funding EIR.)

- **Natomas 100-Year Protection.** SAFCA analyzed the impacts associated with creation of one new assessment district, which would provide only 100-year flood protection to the Natomas Basin, and which would use funding raised through existing Capital Assessment District Number 3 to provide the local share of the cost of completing improvements to provide 100-year flood protection to the lower American River and South Sacramento Streams Group areas (SAFCA 2007a). This alternative was rejected because it would fail to provide groundwork for the creation of "200-year" protection over time (SAFCA 2007a). (Considered and eliminated in Local Funding EIR.)

The following additional alternatives that could contribute to addressing the Natomas Basin's flood problems and needs were evaluated and eliminated from further consideration either in the Phase 2 EIS (No-Action Alternative-Airport Compartment Levee) or in this EIS/EIR (Cultural Resources Impact Reduction Alternative):

- **No-Action Alternative—Airport Compartment Levee.** The Phase 2 Project EIS evaluated and eliminated from further consideration the No-Action Alternative—Airport Compartment Levee Alternative. The prior discussion of which is hereby incorporated by reference, is summarized as follows (see also **Appendix I**, "Alternatives Formulation and Screening Details**,"** for a summary of the impacts associated with the Airport Compartment Levee). With no authorization of the Phase 3 Project, SAFCA would not be able to provide the Natomas Basin with at least a 100-year level of flood protection by the end of 2010 and would not be able to facilitate achieving a "200-year" level of protection by the end of 2012. Federal and state floodplain regulations would prevent new development in most of the Natomas Basin. The Airport would either be

compelled to operate within its existing footprint, abandoning its current plans for modernization and expansion, or, alternatively, the Airport may construct its own limited flood damage reduction structure (i.e., a ring levee) to protect existing facilities and its expansion area. This alternative is not carried forward for further evaluation in the Phase 3 Project EIS/EIR for the following reasons: (1) construction of a separate levee around the Airport would be under the responsibility and jurisdiction of another agency (Sacramento County Airport System), over which SAFCA would have no jurisdiction, and would require a process that is completely separate from the Proposed Action; (2) the timeline for that process is unknown and there are no design plans that would enable an accurate evaluation of potential environmental impacts; and (3) the action would require a separate CEQA and potentially NEPA environmental process and analysis. (Considered and eliminated in Phase 2 Project EIS/EIR.) In addition to the reasons provided in the Phase 2 EIS, implementation of the Airport Compartment Levee would not meet any of the goals and objectives of the project; the residents, residences, and businesses within the Natomas Basin would not receive flood protection; implementation of the Airport Compartment Levee would only protect the Airport; and SCAS has not proposed such a project and, therefore, it is not considered "reasonably foreseeable."

- **Cultural Resources Impact Reduction Alternative.** The Proposed Action includes construction of deep cutoff walls in the Sacramento River east levee Reaches 5A–9B, which have the potential to result in significant and unavoidable impacts on known prehistoric resources, previously unidentified cultural resources, and human remains, as described in Section 4.10, "Cultural Resources." Construction of a 500-foot berm rather than deep cutoff walls would avoid the deep ground-disturbing work that may adversely affect potential cultural resources while still achieving flood damage reduction objectives. This alternative was rejected because (1) environmental impacts on nine environmental topic areas (hydrology and hydraulics, sensitive aquatic habitats, vegetation and wildlife, special-status terrestrial species, paleontological resources, transportation and circulation, air quality, visual resources, utilities and service systems, and hazards and hazardous materials) would be potentially more substantial than those associated with the Proposed Action; and (2) there would be a net increase in the number, intensity, and severity of environmental impacts relative to the Proposed Action. (Considered and eliminated in Phase 3 Project EIS/EIR.) (See **Appendix I**, "Alternatives Formulation and Screening Details," for analyses of each specific environmental issue area.)

ES.9.2 ALTERNATIVES CARRIED FORWARD FOR EVALUATION IN THIS EIS/EIR

Three alternatives, one no-action and two action alternatives, were carried forward for detailed analysis in the EIS/EIR: the No-Action Alternative (which includes two components: No Construction and Potential Levee Failure), the Adjacent Setback Levee Alternative (Proposed Action), and the Levee Raise-in-Place Alternative. These alternatives are summarized below and described in detail in Chapter 2.0, "Alternatives." The major project elements of the action alternatives are summarized in **Table ES-1**.

The **No-Action Alternative**, under NEPA, is the expected future without-project conditions; under CEQA, it is the existing condition at the time the notice of preparation was published (July 18, 2008), as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved. The No-Action Alternative assumes the Phase 1 and Phase 2 Projects are implemented. This alternative consists of the conditions that would be reasonably expected to occur in the foreseeable future if no additional permissions to alter the existing levees or discharge dredged or fill material into waters of the United States would be granted. Different scenarios are possible under this circumstance. On one hand, no construction would occur and thus, no construction-related impacts would occur, under this alternative (this scenario is referred to in the EIS/EIR as "No Construction"). However, without improvements to the Natomas perimeter levee system (e.g., implementation of one of the action alternatives, described below), the Natomas area would be designated as a special flood hazard area; new development would be effectively precluded in most areas of the Natomas Basin; and existing residential, commercial, and industrial developments in the Natomas Basin would remain subject to a significant risk of flooding. Because a levee failure and subsequent flooding is considered reasonably foreseeable, if the project were not approved, the EIS/EIR includes an analysis of the resulting potential impacts (this scenario is referred to in the EIS/EIR as "Potential Levee Failure").

Table ES-1
Summary of the Major Project Elements of the Proposed Action and the Levee Raise-in-Place Alternative

Major Project Elements	Adjacent Setback Levee Alternative (Proposed Action)	Levee Raise-in-Place Alternative
Sacramento River east levee Reaches 5A–9B: Levee raising and seepage remediation	Construct a raised adjacent setback levee from just north of Elverta Road to just south of Interstate 5 (Reaches 5A–9B) with cutoff walls, seepage berms, and relief wells where required to reduce seepage potential.	Raise the existing levee and flatten the landside slope in Reaches 5A–9B, and construct cutoff walls, seepage berms, and relief wells for seepage remediation as required.
Riverbank erosion control	None	Implement erosion control improvements along approximately 1,260 feet of river bank at the waterside toe of the Sacramento River east levee at River Mile 73.5 (Site G in Reach 6A).
PGCC west levee: Levee raising, slope flattening, and widening; and seepage remediation	Raise the existing levee between Howsley Road and Sankey Road, flatten and widen the levee slopes, and construct cutoff walls or seepage berms to reduce seepage potential.	Same as the Proposed Action
NEMDC west levee from Elkhorn Boulevard to NEMDC Stormwater Pumping Station: Levee widening and flattening and seepage remediation	Widen and flatten the slopes of the existing levee between Elkhorn Boulevard and the NEMDC Stormwater Pumping Station and construct a cutoff wall to reduce seepage potential.	Same as the Proposed Action
NEMDC west levee from NEMDC Stormwater Pumping Station to Northgate Boulevard: Seepage and slope stability remediation	Construct a cutoff wall in the existing levee and/or reconstruct portions of the levee from the NEMDC Stormwater Pumping Station to Northgate Boulevard where required to reduce seepage potential and slope instability.	Same as the Proposed Action
Relocation of approximately 9,400 feet of the Elkhorn Canal (highline irrigation canal) downstream of Elkhorn Reservoir	Pipe the canal between the new adjacent setback levee and Teal Bend Golf Club in Reaches 6B and 7, and in an area adjacent to the landside residential properties in Reach 8; and reconstruct the canal parallel to the adjacent setback levee at a distance of approximately 200 feet from the levee in Reaches 7–9A.	Same as the Proposed Action
Construction of a new GGS/Drainage Canal downstream of Elkhorn Reservoir	Construct a new canal designed to provide drainage and associated giant garter snake habitat (GGS/Drainage Canal) between Elkhorn Reservoir and the West Drainage Canal at I-5.	Same as the Proposed Action
Reconstruction of RD 1000 Pumping Plant No. 2	Reconstruct the existing landside drainage pumping plant with intake structure, a pump station, piping over the adjacent setback levee, and an outfall structure on the waterside of the Sacramento River east levee; and improve the intake channel east of the pumping plant entrance.	Same as the Proposed Action

Table ES-1
Summary of the Major Project Elements of the Proposed Action and the Levee Raise-in-Place Alternative

Major Project Elements	Adjacent Setback Levee Alternative (Proposed Action)	Levee Raise-in-Place Alternative
Habitat creation and management	Establish a new drainage canal to provide connectivity of aquatic habitat; establish perennial native grasses on levee slopes, seepage berms, and operation and maintenance areas; recontour the land and preserve rice and field crop habitat at borrow locations; and establish woodlands consisting of native riparian species at locations along the Sacramento River east levee.	In addition to the elements of the Proposed Action, purchase credits from a local mitigation bank to offset the removal of trees from the water side of the existing levee to meet USACE design criteria.
Infrastructure relocation and realignment	Realign and relocate local irrigation and drainage canals and other infrastructure, such as utility poles, as needed to accommodate the flood damage reduction measures.	Same as the Proposed Action
Landside vegetation removal	In Reaches 10–12A of the Sacramento River east levee, clear vegetation along the landside of the levee in a 670-foot-wide corridor to prepare for future flood damage reduction work.	Same as the Proposed Action
Right-of-way acquisition	Land within the Phase 3 Project footprint would be acquired along the Sacramento River east levee Reaches 5A–9B, the PGCC west levee, the NEMDC west levee between Elkhorn Boulevard and Northgate Boulevard, and at borrow sites associated with the Phase 3 Project.	Same as the Proposed Action, except less land would be needed to accommodate the narrower levee footprint in Reaches 5A–9B.
Encroachment management	Remove encroachments as required to meet USACE, CVFPB, and FEMA criteria.	Remove substantial encroachments from the water side and land side of the Phase 3 Project Sacramento River east levee reaches and land side of the other NLIP project levee segments to ensure that the levees can be certified as meeting the minimum requirements of the National Flood Insurance Program and USACE encroachment guidance.
Borrow site reclamation	Excavate earthen material at the borrow sites and then return the sites to post-construction uses or suitable replacement habitat.	Same as the Proposed Action
Reconfigure Airport West Ditch	Modify irrigation distribution and agricultural drainage systems and infrastructure to allow for dewatering of the Airport West Ditch	Same as the Proposed Action

Notes: PGCC = Pleasant Grove Creek Canal, NEMDC = Natomas East Main Drainage Canal, GGS = giant garter snake, I-5 = Interstate 5, RD = Reclamation District, USACE = U.S. Army Corps of Engineers, CVFPB = Central Valley Flood Protection Board, FEMA= Federal Emergency Management Agency, NLIP = Natomas Levee Improvement Program
Source: Compiled by EDAW in 2008, based on information provided by SAFCA in 2008.

The **Adjacent Setback Levee Alternative (Proposed Action)** focuses on underseepage, erosion, encroachment, and levee height deficiencies along 4.5 miles of the Sacramento River east levee, 3.2 miles of the PGCC west levee, and 6.2 miles of the NEMDC west levee.

The **Levee Raise-in-Place Alternative** would be the same as the Proposed Action, except for levee raising and seepage remediation along the Sacramento River east levee in Reaches 5A–9B and the expected removal of encroachments from these reaches of the Sacramento River east levee.

If permitted, either of the action alternatives could be constructed at the same time as the Phase 2 Project. Construction is planned to begin in 2009, assuming receipt of all required environmental clearances, permits, and approvals for project implementation.

ES.10 MAJOR CONCLUSIONS OF THE ENVIRONMENTAL ANALYSIS

The potential environmental impacts of the Proposed Action and alternatives under consideration, and mitigation measures to avoid, eliminate, minimize, or reduce the significant and potentially significant impacts to less-than-significant levels, are summarized in **Table ES-2** (presented at the end of this executive summary). This table also presents additional information on the impacts, including duration and quantification, where available, to provide a comparison among the alternatives.

ES.10.1 SIGNIFICANT AND UNAVOIDABLE IMPACTS OF THE ACTION ALTERNATIVES

A significant and unavoidable impact is one that would result in a substantial or potentially substantial adverse effect on the environment and that could not be reduced to a less-than-significant level even with implementation of applicable feasible mitigation.

The following impacts of the Proposed Action were found to be significant and unavoidable. Most of these impacts would be temporary and related to construction activities. Where feasible mitigation exists, it has been included to reduce these impacts; however, the mitigation would not be sufficient to reduce the impacts to a less-than-significant level. The following impacts are presented in the order they appear in Chapter 4.0, "Environmental Consequences and Mitigation Measures."

- conversion of Important Farmland to nonagricultural uses;
- conflicts with lands under Williamson Act[1] contracts;
- potential to physically divide or disrupt an established community;
- impacts on Swainson's hawk and other special-status birds;
- potential damage or disturbance to known prehistoric resources from ground-disturbance or other construction-related activities;
- potential damage to or destruction of previously undiscovered cultural resources from ground-disturbance or other construction-related activities;
- potential discovery of human remains during construction;
- temporary increase in traffic on local roadways;

[1] The California Land Conservation Act of 1965 is commonly known as the Williamson Act (California Government Code Section 51200 et seq.).

- temporary emissions of ROG, NO_X, and PM_{10} during construction;
- generation of temporary, short-term construction noise;
- exposure of sensitive receptors to or generation of excessive groundborne vibration;
- temporary, short-term exposure of residents to increased traffic noise levels from hauling activity;
- alteration of scenic vistas, scenic resources, and existing visual character of the project area; and
- new sources of light and glare that adversely affect views.

Significant and unavoidable impacts associated with the Levee Raise-in-Place Alternative would be the same as those for the Proposed Action with six additional significant and unavoidable impacts:

- loss of shaded riverine aquatic habitat associated with levee improvement and encroachment removal activities;
- loss of woodland habitats;
- impacts on wildlife corridors;
- impacts on successful implementation of the NBHCP;
- temporary disruption of emergency service response times and access; and
- temporary changes in recreational opportunities during project construction activities.

Some Garden Highway residents would also be more greatly affected with the Levee Raise-in-Place Alternative than with the Proposed Action because of the potential approximately 8–12-week closure of 1.5- to 2-mile sections of Garden Highway.

ES.10.2 CUMULATIVE IMPACTS OF THE ACTION ALTERNATIVES

Significant cumulative impacts associated with the Proposed Action would be as follows:

- **Agricultural Resources:** Project implementation would involve the permanent conversion of large acreages of Important Farmland (Prime Farmland and Farmland of Statewide Importance), which cannot feasibly be replaced. Historically, agricultural land in the Natomas Basin, much of it Prime Farmland and other categories of Important Farmland, has been converted to residential and commercial development. The project would contribute to this loss.
- **Cultural Resources:** Known or unknown archaeological resources could be disturbed, and cultural resources damaged or destroyed during construction activities. This would contribute to a historical trend in the loss of these resources as artifacts of cultural significance and as objects of research importance.
- **Air Quality:** The Proposed Action, in combination with probable future projects, would contribute to air pollutant emissions in Sutter and Sacramento Counties, and to the nonattainment status of the Feather River Air Quality Management District (FRAQMD) and the Sacramento Metropolitan Air Quality Management District (SMAQMD) for ozone and PM_{10}.

In addition to the significant cumulative impacts listed above for the Proposed Action, implementation of the Levee Raise-in-Place Alternative would also result in the following significant cumulative impacts:

- **Fisheries:** The loss of shaded riverine habitat along the Sacramento River to conform with USACE guidance regarding levee encroachments (particularly vegetation on levees), and reduction in input of woody debris associated with this removal, could contribute to a cumulatively considerable effect; it is unknown whether adequate mitigation could be provided to compensate for this impact because conformance with the USACE guidance is expected to disallow the implementation of any measures that would restore, replace, or rehabilitate any loss of SRA habitat along the Sacramento River in the vicinity of the project. Further, compensation for SRA habitat loss would be limited to the purchase of SRA habitat credits at an authorized mitigation bank; currently, however, there are no known mitigation banks with SRA habitat credits on the Sacramento River.

- **Special-Status Terrestrial Species:** Removal of riparian woodlands from the water side of the Sacramento River east levee would decrease the overall value as habitat for various species; this woodland supports active Swainson's hawk nests, elderberry shrubs, and other important biological resources. While the woodland restoration and preservation proposed for the Levee Raise-in-Place Alternative may be adequate to offset the removal of landside woodlands, these replacement woodlands would not be adequate to compensate for the extensive loss of mature waterside vegetation. Additional woodland mitigation could be provided through the purchase of credits from an authorized woodland mitigation bank; however, there are currently no such banks in operation along the Sacramento River.

ES.11 AREAS OF CONTROVERSY AND ISSUES TO BE RESOLVED

ES.11.1 AREAS OF CONTROVERSY

Comments received from agencies and interested parties during project scoping for this EIS/EIR focused on the following issue areas:

- regional flood damage reduction solutions,
- residual flood risk,
- aircraft-wildlife strike impacts,
- impacts on Native American burial grounds,
- traffic-related impacts,
- encroachment within state levee rights-of-way,
- addition of public pathways on top of levees,
- impacts to open space and recreation areas,
- request for acquisition of land for parks and open space, and
- loss of agricultural lands.

Based on these comments and the history of the NEPA and CEQA processes undertaken by USACE and SAFCA, respectively, the major areas of controversy associated with the project are (1) temporary, construction-related impacts on Garden Highway residents; (2) concerns regarding the hydraulic modeling used to analyze the project's hydraulic impacts; and (3) construction-related impacts on cultural and biological resources. The first two issues were the subject of a lawsuit filed by the Garden Highway Community Association challenging the Phase 2 Project EIR prepared by SAFCA, which was settled. A copy of the settlement agreement is included as **Appendix G**, and applies to all affected Garden Highway residents. SAFCA intends to apply the design and construction provisions in the agreement to all Sacramento River phases of the project. Agreements made by SAFCA in the settlement regarding construction practices are reflected, as appropriate, in the mitigation measures in this EIS/EIR or as part of the project, and the hydraulic modeling approach has been updated for this EIS/EIR. Cultural and biological resource issues are being addressed through the appropriate Federal and state regulatory processes.

ES.11.2 ISSUES TO BE RESOLVED

SAFCA will need to determine whether to approve the Proposed Action. This decision will be based on numerous factors, including the potential environmental impacts addressed in this EIS/EIR, but also the type of financing available, permitting requirements, and implementation schedule.

USACE will consider the Proposed Action and either grant or deny permission for the Phase 3 Project pursuant to Section 408, Section 404, and Section 10.

ES.12 STEPS IN THE NEPA/CEQA PROCESS

On July 18, 2008, USACE and SAFCA issued a notice of intent (NOI) and notice of preparation (NOP), respectively, for preparing this EIS/EIR. A scoping meeting was held on August 6, 2008, to solicit comments on the scope of the EIS/EIR from interested agencies, individuals, and organizations. This DEIS/DEIR is being distributed for public and agency review and comment, in accordance with NEPA and CEQA. The review period begins on February 13, 2009 and closes on April 6, 2009. This distribution ensures that interested parties have an opportunity to express their views regarding the significant environmental impacts of the project, and to ensure that information pertinent to permits and approvals is provided to the decision makers for USACE, SAFCA, FAA, and other Federal and state agencies. This document is available for public review during normal business hours at USACE's office located at 1325 J Street, Sacramento, California, and at SAFCA's office located at 1007 7th Street, 7th Floor, Sacramento, California.

SAFCA will hold a public meeting before the SAFCA Board of Directors on Thursday, March 19, 2009 at 3:00 p.m. in the Sacramento County Board of Supervisors Chambers located at 700 H Street, Sacramento, California , at which it will receive input from agencies and the public on the DEIS/DEIR. USACE may hold one or more public meetings during the comment period. In addition, written comments from the public, reviewing agencies, and stakeholders will be accepted throughout the public comment period. Comments must be received by 5:00 p.m. on April 6, 2009 by USACE or SAFCA at the following address, fax number, or e-mail address:

Elizabeth Holland, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814
Telephone: (916) 557-6763
Fax: (916) 557-7856
E-mail: Elizabeth.G.Holland@usace.army.mil

Or

John Bassett, Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814
Telephone: (916) 874-7606
Fax: (916) 874-8289
E-mail: BassettJ@saccounty.net

Following public review of the DEIS/DEIR, a final EIS (FEIS) and a final EIR (FEIR) will be prepared, in which USACE and SAFCA will provide responses to comments on the DEIS/DEIR. The FEIS will constitute a reprint of the entire DEIS/DEIR, and will include comment letters, responses to comments, and any text changes/clarifications. The FEIR will constitute a response to comments document.

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Agricultural Resources						
Impact 4.1-a: Conversion of Important Farmland to Nonagricultural Uses	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action	Permanent and Temporary	Permanent: 361.5 acres Temporary: 1,657 acres	Significant	Mitigation Measure 4.1-a: Minimize Important Farmland Conversion to the Extent Practicable and Feasible	Significant and Unavoidable
	Levee Raise-in-Place Alternative	Permanent and Temporary	Permanent: 453 acres Temporary: 1,657 acres	Significant	Implement Mitigation Measure 4.1-a	Significant and Unavoidable
Impact 4.1-b: Conflict with Lands under Williamson Act Contracts	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	Proposed Action	Temporary and Permanent	8 acres along the Sacramento River east levee and potentially up to 24 acres along the lower woodlands corridor	Significant	Mitigation Measure 4.1-b: Minimize Impacts on Agricultural Preserve Land and Williamson Act-Contracted Land; Comply with Government Code Sections 51290–51293; and Coordinate with Landowners and Agricultural Operators	Significant and Unavoidable
	Levee Raise-in-Place Alternative	Temporary and Permanent	1 acre along the Sacramento River east levee and potentially up to 24 acres along the lower woodlands corridor	Significant	Implement Mitigation Measure 4.1-b	Significant and Unavoidable

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Land Use, Socioeconomics, and Population and Housing						
Impact 4.2-a: Inconsistency with Airport Master Plan, Airport Land Use Compatibility Plan, and Airport Wildlife Hazard Management Plans	No-Action Alternative: No Construction	Not Applicable	Not Applicable	Consistent	No mitigation is required	Consistent
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Not Applicable	Not Applicable	Consistent	No mitigation is required	Consistent
Impact 4.2-b: Inconsistency with the Natomas Basin Habitat Conservation Plan	No-Action Alternative: No Construction	Not Applicable	Not Applicable	Consistent	No mitigation is required	Consistent
	No-Action Alternative: Potential Levee Failure	Temporary or Permanent	Unquantifiable	Consistent	No mitigation is required	Consistent
	Proposed Action	Permanent	45 acres of rice, 16 acres of canals, 37 acres landside woodland, 1 acre waterside woodland, 115 acres of cropland, and 69 acres of grassland	Potentially Inconsistent	Mitigation Measure 4.2-b: Implement Mitigation Measure 4.9-h, "Ensure that Project Encroachment Does Not Jeopardize Successful Implementation of the NBHCP and Implement Mitigation Measures 4.7-a, 4.8-a, and 4.9-a through 4.9-g"	Consistent
	Levee Raise-in-Place Alternative	Permanent	45 acres of rice, 16 acres of canals, 17.5 acres landside woodland, 22.5 acres waterside woodlands, 12 acres of cropland, and 27 acres of grasslands	Inconsistent	Implement Mitigation Measure 4.2-b	Inconsistent

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.2-c: Potential to Physically Divide or Disrupt an Established Community	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action	Temporary	Intermittent road closures and detours; and, closure of approximately 1,000 feet of Garden Highway at I-5 for approximately 8 to 12 weeks	Significant	Mitigation Measure 4.2-c: Notify Residents and Businesses of Project Construction and Road Closure Schedule; and Implement Mitigation Measure 4.12-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips," and Mitigation Measure 4.12-c, "Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers"	Significant and Unavoidable
	Levee Raise-in-Place Alternative	Temporary	Numerous closures of 1.5 to 2 mile segments for approximately 8 to 12 weeks per segment	Significant	Implement Mitigation Measure 4.2-c	Significant and Unavoidable
Geology and Soils						
Impact 4.3-a: Potential Temporary and Permanent Localized Soil Erosion during Construction and Operation	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Propose Action; Levee-Raise-in-Place Alternative	Temporary and Permanent	Unquantifiable	Potentially Significant	Mitigation Measure 4.3-a(1): Implement Mitigation Measure 4.5-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply With National Pollutant Discharge Elimination System Permit Conditions" Mitigation Measure 4.3-a(2): Secure and Implement the Conditions of the California Surface Mining and Reclamation Act Permit	Less than Significant
Hydrology and Hydraulics						
Impact 4.4-a: Hydraulic Impacts on Other Areas and Exposure to Flood Risk	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary or Permanent	Continued high risk of flooding	Significant	No feasible mitigation is available	Significant and Unavoidable
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	Substantially reduced risk of flooding; no hydraulic impacts	Less than Significant (Beneficial)	No mitigation is required	Less than Significant (Beneficial)
Impact 4.4-b: Alteration of Local Drainage	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Proposed Action and Levee Raise-in-Place Alternative	Temporary or Permanent	Unknown	Potentially Significant	Mitigation Measure 4.4-b: Coordinate with Landowners and Drainage Infrastructure Operators, Prepare Final Drainage Studies as Needed, and Implement Proper Project Design	Less than Significant
Impact 4.4-c: Effects on Groundwater	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	No substantial decrease in groundwater levels or well yields or increase in pumping costs is expected; groundwater levels at the Brookfield borrow site (if used for project borrow) would increase slightly	Less than Significant	No mitigation is required	Less than Significant
Water Quality						
Impact 4.5-a: Temporary Impacts on Water Quality from Stormwater Runoff, Erosion, or Spills	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee-Raise-in-Place	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.5-a: Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
					Comply with National Pollutant Discharge Elimination System Permit Conditions	
Impact 4.5-b: Impacts to Sacramento River Water Quality from Stormwater Runoff from Garden Highway Drainage Outlets	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action	Temporary	Unquantifiable	Significant	Mitigation Measure 4.5-b: Implement Standard Best Management Practices and Comply with NPDES Permit Conditions.	Less than Significant
	Levee Raise-in-Place Alternative	Temporary	Stormwater would drain to land side and water side of Garden Highway; no increased impact to Sacramento River water quality	Less than Significant	No mitigation is required	Less than Significant
Impact 4.5-c: Impacts to Sacramento River Water Quality from RD 1000 Pumping Plant No. 2 Discharges	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary	Unquantifiable	Too Speculative	No feasible mitigation is available	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.5-c: Implement Standard Best Management Practices and Comply with NPDES Permit Conditions for a Point-Source Discharge.	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Fisheries						
Impact 4.6-a: Loss of Fish or Aquatic Habitat through Increased Sedimentation and Turbidity or Releases of Contaminants	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary and Permanent	Unquantifiable	Significant	Mitigation Measure 4.6-a: Implement Mitigation Measure 4.5-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions"; and Mitigation Measure 4.5-c, "Implement Best Management Practices and Comply with NPDES Permit Conditions for a Point-Source Discharge"	Less than Significant
Impact 4.6-b: Loss of Shaded Riverine Aquatic Habitat Associated with Levee Improvement Activities	No-Action Alternative: No Construction	Permanent	Loss of 22.5 acres to conform with USACE guidance regarding levee encroachments	Potentially Significant	No mitigation is required	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action	Permanent	1 acre of individual trees	Potentially Significant	Mitigation Measure 4.6-b: Restore, Replace, or Rehabilitate Degraded SRA Habitat Function and Comply with Section 7 of the Federal Endangered Species Act, Section 1602 of the California Fish and Game Code,	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
					and Section 2081 of the California Endangered Species Act Permit Conditions	
	Levee Raise-in-Place Alternative	Permanent	Removal of several trees along 1,260 feet of riverbank and removal of approximately 22.5 acres of mature woody vegetation	Potentially Significant	Implement Mitigation Measure 4.6-b	Significant and Unavoidable
Impact 4.6-c: Interference with the Migration of Migratory Fish Species through the Creation of Attraction Flows at the RD 1000 Pumping Plant No. 2 Outfall and Drainage Outfalls	No-Action Alternative: No Construction	Temporary or Permanent	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary or Permanent	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
Sensitive Aquatic Habitats						
Impact 4.7-a: Impacts on Jurisdictional Waters of the United States	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Proposed Action	Temporary and Permanent	Temporary impacts: 70.42 to 354.01 acres (if all potential borrow sites are used); permanent impacts: 22.17 to 27.17 acres	Potentially Significant	Mitigation Measure 4.7-a: Minimize Effects on Jurisdictional Waters of the United States, Complete Detailed Design of Habitat Creation Components and Management Agreements to Ensure Compensation of Waters Filled, and Comply with Section 404, Section 401, Section 10, and Section 1602, Permit Processes	Less than Significant (Beneficial)
	Levee Raise-in-Place Alternative	Temporary and Permanent	Temporary impacts: 70.42 to 354.01 acres (if all potential borrow sites are used); permanent impacts: 29.87 to 34.87 acres	Potentially Significant	Implement Mitigation Measure 4.7-a	Less than Significant (Beneficial)
Vegetation and Wildlife						
Impact 4.8-a: Loss of Woodland Habitats	No-Action Alternative: No Construction	Permanent	Loss of 22.5 acres to conform with USACE guidance regarding levee vegetation encroachments	Potentially Significant	No feasible mitigation is available	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action	Permanent	Loss of 37 acres of landside woodlands and 1 acre of waterside woodlands	Significant	Mitigation Measure 4.8-a: Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Loss of Habitat, Implement all Management Agreements, and Comply with the DFG Section 1602 Permit Process	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Levee Raise-in-Place Alternative	Permanent	Loss of approximately 17.5 acres of landside woodlands and 22.5 acres of waterside woodland	Significant	Implement Mitigation Measure 4.8-a	Significant and Unavoidable
Impact 4.8-b: Impacts on Wildlife Corridors	No-Action Alternative: No Construction	Permanent	Loss of 22.5 acres to conform with USACE guidance regarding levee vegetation encroachments	Potentially Significant	No feasible mitigation is available	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action	Permanent	Loss of 16 acres of canals, approximately 37 acres landside woodlands, and <1 acre waterside woodlands	Significant	Mitigation Measure 4.8-b: Implement Mitigation Measure 4.8-a, "Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Loss of Quantity and Quality of Habitat, Implement all Agreements, and Comply with the DFG Section 1602 Permit Process," and Mitigation Measure 4.9-c, "Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Develop Detailed Design of Managed Marsh and New Canals and Management Agreements to Ensure Adequate Compensation for Loss of Habitat, Implement all Management Agreements, and Obtain Incidental Take Authorization"	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Levee Raise-in-Place Alternative	Permanent	Loss of 16 acres of canals, approximately 17.5 acres landside woodlands, and 22.5 acres waterside woodlands	Significant	Implement Mitigation Measure 4.8-b	Significant and Unavoidable
Special-Status Terrestrial Species						
Impact 4.9-a: Impacts on Special-Status Plants Species	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	Approximately 16 acres of habitat	Significant	Mitigation Measure 4.9-a: Conduct Focused Surveys for Special-Status Plants, Minimize Effects, and Develop Detailed Design of Created Habitat and Management Agreements to Ensure Compensation for Loss of Habitat, and Implement all Management Agreements	Less than Significant
Impact 4.9-b: Impacts on Valley Elderberry Longhorn Beetle	No-Action Alternative: No Construction	Permanent	Estimated 4 shrubs and 22.5 acres of waterside woodland	Potentially Significant	No feasible mitigation is available	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not applicable	Unquantifiable	Too Speculative	No mitigation is required	Significant and Unavoidable
	Proposed Action	Permanent	Approximately 63 shrubs, 37 acres of landside woodland, and 1 acre of waterside woodland	Significant	Mitigation Measure 4.9-b: Conduct Focused Surveys for Elderberry Shrubs as Needed, Complete Detailed Design of Woodland/Elderberry Habitat and Management Agreements to Ensure Adequate Compensation	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
					for Loss of Shrubs, Implement all Management Agreements, and Obtain Incidental Take Authorization	
	Levee Raise-in-Place Alternative	Permanent	Approximately 39 shrubs, 22.5 acres of waterside woodlands, and approximately 17.5 acres of landside woodland	Significant	Implement Mitigation Measure 4.9-b	Less than Significant
Impact 4.9-c: Impacts on Giant Garter Snake Related to Construction Activities	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	Approximately 16 acres of canal/ditch and 45 acres of rice	Potentially Significant	Mitigation Measure 4.9-c: Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Develop Detailed Design of Managed Marsh and New Canals and Management Agreements to Ensure Adequate Compensation for Loss of Habitat, Implement all Management Agreements, and Obtain Incidental Take Authorization	Less than Significant
Impact 4.9-d: Impacts on Giant Garter Snake Related to Operational Activities of RD 1000's Pumping Plant No. 2	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Proposed Action and Levee Raise-in-Place Alternative	Not Applicable	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
Impact 4.9-e: Impacts on Northwestern Pond Turtle	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	16 acres of habitat	Potentially Significant	Mitigation Measure 4.9-e: Conduct Focused Surveys for Northwestern Pond Turtles and Relocate Turtles, if Needed	Less than Significant
Impact 4.9-f: Impacts on Swainson's Hawk and Other Special-Status Birds	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action	Permanent	184 foraging acres and 38 potential nesting acres	Significant	Mitigation Measure 4.9-f: Minimize Potential Impacts on Swainson's Hawk and Other Special-Status Birds Foraging and Nesting Habitat, Monitor Active Nests during Construction, Develop and Implement a Management Plan in Consultation with DFG, Obtain Incidental Take Authorization, and Implement Mitigation Measure 4.8-a, "Minimize Effects on Woodland Habitat, Complete Detailed Design of	Significant and Unavoidable

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
					Woodland Creation and Management Agreements to Ensure Compensation for Loss of Quantity and Quality of Habitat, Implement all Agreements, and Comply with the DFG Section 1602 Permit Process"	
	Levee Raise-in-Place Alternative	Permanent	39 foraging acres and 40 nesting acres	Potentially Significant	Implement Mitigation Measure 4.9-f	Significant and Unavoidable
Impact 4.9-g: Impacts on Burrowing Owl	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	Unquantifiable	Potentially Significant	Mitigation Measure 4.9-g: Minimize Potential Impacts on Burrowing Owls and Relocate Owls as Needed	Less than Significant
Impact 4.9-h: Impacts on Successful Implementation of the NBHCP	No-Action Alternative: No Construction	Permanent	Loss of 22.5 acres of nesting habitat for Swainson's hawk (covered by the NBHCP)	Significant	No feasible mitigation is available	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Not Applicable	Less than Significant	No mitigation is required	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Proposed Action	Permanent	45 acres of rice, 16 acres of canals, 37 acres landside woodlands, 1 acre of waterside woodlands, 115 acres of cropland, and 69 acres of grasslands	Significant	Mitigation Measure 4.9-h: Ensure that Project Encroachment Does Not Jeopardize Successful Implementation of the NBHCP and Implement Mitigation Measures 4.7-a, 4.8-a, and 4.9-a through 4.9-g	Less than Significant
	Levee Raise-in-Place Alternative	Permanent	45 acres of rice, 16 acres of canals, 17.5 acres landside woodland, 22.5 acres waterside woodlands, 12 acres of cropland, and 27 acres of grasslands	Significant	Implement Mitigation Measure 4.9-h	Significant and Unavoidable
Cultural Resources						
Impact 4.10-a: Potential Changes to Elements of Reclamation District 1000 and Rural Landscape District	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Permanent	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	Unquantifiable	Potentially Significant	Mitigation Measure 4.10-a: Incorporate Mitigation Measures to Documents Regarding Any Elements Contributing to RD 1000 and Rural Landscape District and Distribute the Information to the Appropriate Repositories	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.10-b: Potential Changes to Other Known Historic-Era Resources from Ground Disturbance or Other Construction-Related Activities	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Permanent	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
Impact 4.10-c: Potential Damage or Disturbance to Known Prehistoric Resources from Ground-Disturbance or Other Construction-Related Activities	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	Unquantifiable	Potentially Significant	Mitigation Measure 4.10-c: Avoid Ground Disturbance Near Eligible and Listed Resources to the Extent Feasible, Prepare a Finding of Effect, and Resolve Any Adverse Effects through Preparation of an HPTP	Significant and Unavoidable
Impact 4.10-d: Potential Damage to or Destruction of Previously Undiscovered Cultural Resources from Ground-Disturbance or Other Construction-Related Activities	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	Unquantifiable	Potentially Significant	Mitigation Measure 4.10-d: Train Construction Workers Before Construction, Monitor Construction Activities, Stop Potentially Damaging Activities, Evaluate Discovery(ies), Resolve Adverse Effects on Eligible Resources, if Encountered, and Conduct Additional Backhoe and Canine Forensic Investigations as Appropriate	Significant and Unavoidable
Impact 4.10-e: Potential Discovery of Human Remains during Construction	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.10-e: Stop Work Within An Appropriate Radius Around the Find, Notify the Applicable County Coroner and Most Likely Descendant, and Treat Remains in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, SAFCA, and the SHPO	Significant and Unavoidable
Paleontological Resources						
Impact 4.11-a: Disturbance of Unknown Unique Paleontological Resources during Earthmoving Activities	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Permanent	Not Applicable	Less than Significant	No mitigation is required	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	Unquantifiable	Potentially Significant	Mitigation Measure 4.11-a: Conduct Construction Personnel Training and, if Paleontological Resources Are Found, Stop Work Near the Find and Implement Mitigation in Coordination with a Professional Paleontologist	Less than Significant
Transportation and Circulation						
Impact 4.12-a: Temporary Increase in Traffic on Local Roadways	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action	Temporary	950-1,000 trips/day for the Sacramento River east levee and 100-200 trips/day for the PGCC; and, closure of approximately 1,000 feet of Garden Highway at I-5 for approximately 8 to 12 weeks.	Significant	Mitigation Measure 4.12-a: Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips	Significant and Unavoidable
	Levee Raise-in-Place Alternative	Temporary	550 haul trips/day for the Sacramento River east levee, 100–200 trips/day for the PGCC, and numerous closures of 1.5 to 2 mile segments of Garden Highway for approximately 8 to 12 weeks per segment	Significant	Implement Mitigation Measure 4.12-a	Significant and Unavoidable

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.12-b: Temporary Increase in Traffic Hazards on Local Roadways	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action	Temporary	Reconstruction of two public roadways and multiple farm road intersections with Garden Highway; and, closure of approximately 1,000 feet of Garden Highway at I-5 for approximately 8 to 12 weeks.	Significant	Mitigation Measure 4.12-b: Implement Mitigation Measure 4.12-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips"	Less than Significant
	Levee Raise-in-Place Alternative	Temporary	Reconstruction of two public roadways and multiple farm road intersections with Garden Highway**,** and numerous closures of 1.5 to 2 mile segments of Garden Highway for approximately 8 to 12 weeks per segment	Significant	Implement Mitigation Measure 4.12-b	Less than Significant
Impact 4.12-c: Temporary Disruption of Emergency Service Response Times and Access	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Proposed Action	Temporary	Numerous temporary road closures and detours; and, closure of approximately 1,000 feet of Garden Highway at I-5 for approximately 8 to 12 weeks.	Potentially Significant	Mitigation Measure 4.12-c: Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers	Less than Significant
	Levee Raise-in-Place Alternative	Temporary	Numerous temporary road closures and detours and closures of 1.5 to 2 mile segments of Garden Highway for approximately 8 to 12 weeks per segment	Potentially Significant	Implement Mitigation Measure 4.12-c	Significant and Unavoidable
Air Quality						
Impact 4.13-a: Temporary Emissions of ROG, NO_X, and PM_{10} during Construction	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action	Temporary	Sacramento County: ROG 75 lb/day NO_X 413 lb/day PM_{10} 971 lb/day Sutter County: ROG 93 lb/day NO_X 499 lb/day PM_{10} 1,283 lb/day	Significant	Mitigation Measure 4.13-a: Implement Applicable District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO_X, and PM_{10} during Construction	Significant and Unavoidable

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Levee Raise-in-Place Alternative	Temporary	Sacramento County: ROG 41 lb/day NO_X 227 lb/day PM_{10} 534 lb/day Sutter County: ROG 51 lb/day NO_X 274 lb/day PM_{10} 706 lb/day	Significant	Implement Mitigation Measure 4.13-a	Significant and Unavoidable
Impact 4.13-b: General Conformity with the Applicable Air Quality Plan	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Mitigation would reduce impacts to the Federal *de minimis* thresholds	Less than Significant	No mitigation is required	Less than Significant
Impact 4.13-c: Long-Term Changes in Emissions of ROG, NO_X, and PM_{10} Associated with Project Implementation	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.13-d: Exposure of Sensitive Receptors to Toxic Air Emissions	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
Noise						
Impact 4.14-a: Generation of Temporary, Short-Term Construction Noise	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary	Unquantifiable	Less than Significant	No feasible mitigation is available	Less than Significant
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	79–101 dBA without feasible noise control(50 feet from nearest noise source); highest noise level would be 89.0 dBA L_{eq} (199 feet from pile driving)	Significant	Mitigation Measure 4.14-a: Implement Noise-Reducing Construction Practices, Prepare a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors	Significant and Unavoidable
Impact 4.14-b: Exposure of Sensitive Receptors to or Generation of Excessive Groundborne Vibration	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary	Unquantifiable	Less than Significant	No feasible mitigation is available	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	0.076 in/sec PPV or 86 VdB (for haul trucks) to as high as 1.518 in/sec PPC or 112 VdB (for pile driving)	Significant	Mitigation Measure 4.14-b: Implement Measures to Minimize Construction-Related Vibration Effects at the Pumping Plant No. 2 Site	Significant and Unavoidable
Impact 4.14-c: Temporary, Short-Term Exposure of Residents to Increased Traffic Noise Levels from Hauling Activity	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	65.0 to 68.8 dBA L_{eq} (50 feet from roadway centerline)	Potentially Significant	Mitigation Measure 4.14-c: Implement Noise-Reduction Measures to Reduce the Temporary, Short-Term Impacts of Haul Truck Traffic Noise	Potentially Significant and Unavoidable
Impact 4.14-d: Long-Term Increases in Project-Generated Noise	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Permanent	78-88 dBA 3-5 feet away; meets compliance standards	Less than Significant	No mitigation is required	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.14-e: Exposure of People Working in the Project Area to Excessive Airport Noise Levels	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Would not exceed Airport noise threshold levels	Less than Significant	No mitigation is required	Less than Significant
Recreation						
Impact 4.15-a: Long-Term Disruption of Recreational Activities and Facilities	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Ueda Parkway closure for approximately 3-6 months	Significant	Mitigation Measure 4.15-a: Prepare and Implement a Bicycle Detour Plan for Ueda Trail, Provide Construction Period Information on Recreational Facility Closures and Detours, Provide Detours for Bicycle Facilities, and Coordinate with Recreation Agencies to Allow Them to Repair Damage to Recreational Facilities	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.15-b: Temporary Changes in Recreational Opportunities during Project Construction Activities	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action	Temporary	Various marinas, boat launches, and Ueda Bicycle Path	Significant	Mitigation Measure 4.15-b: Provide Construction Period Information on Recreational Facility Closures and Detours and Provide Detours for Access Routes to Alternate Boat Launch Ramps and Marinas	Less than Significant
	Levee Raise-in-Place Alternative	Temporary	Various marinas, boat launches, Ueda Bicycle Path, and Teal Bend Golf Club	Significant	Implement Mitigation Measure 4.15-b	Significant and Unavoidable
Visual Resources						
Impact 4.16-a: Alteration of Scenic Vistas, Scenic Resources, and Existing Visual Character of the Project Area	No-Action Alternative: No Construction	Not Applicable	Not Applicable	Potentially Significant	No mitigation is required	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action	Permanent	Removal of approximately 38 acres of woodlands	Significant	No feasible mitigation is available	Significant and Unavoidable
	Levee Raise-in-Place Alternative	Permanent	Removal of 40 acres of woodlands	Significant	Implement Mitigation Measure 4.16-a	Significant and Unavoidable

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.16-b: New Sources of Light and Glare that Adversely Affect Views	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Unquantifiable	Significant	Mitigation Measure 4.16-b: Implement Mitigation Measure 4.19-a, "Coordinate Work in the Critical Zone with Airport Operations and Restrict Night Lighting within and near the Runway Approaches;" and Direct Lighting Away from Adjacent Properties.	Significant and Unavoidable
Utilities and Service Systems						
Impact 4.17-a: Potential Temporary Disruption of Irrigation Water Supply	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.17-a: Coordinate with Irrigation Water Supply Users Before and During All Irrigation Infrastructure Modifications and Minimize Interruptions of Supply	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.17-b: Potential Disruption of Utility Service	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.17-b: Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training with Respect to Accidental Utility Damage	Less than Significant
Impact 4.17-c: Increases in Solid Waste Generation	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Estimated over 100,000 cy solid waste; would not exceed remaining capacity	Less than Significant	No mitigation is required	Less than Significant
Hazards and Hazardous Material						
Impact 4.18-a: Accidental Spills of Hazardous Materials	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Proposed Action and Levee Raise-in-Place Alternative	Temporary or Permanent	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
Impact 4.18-b: Exposure to Hazardous Materials Encountered at Project Sites	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.18-b(1): Complete Recommendations Included in Phase I and/or II ESAs and Implement Required Measures Mitigation Measure 4.18-b(2): Complete Investigations Related to the Extent to Which Soil and/or Groundwater May Have Been Contaminated in Areas Not Covered by the Phase I and II ESAs and Implement Required Measures	Less than Significant
Impact 4.18-c: Interference with an Adopted Emergency Evacuation Plan	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Unquantifiable	Significant	Mitigation Measure 4.18-c: Notify State and Local Emergency Management Agencies about Project Construction and Coordinate Any SR 99/70 Detours with these Agencies to	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
					Ensure That Any Need for Emergency Use Is Not Significantly Impaired	
Impact 4.18-d: Hazardous Emissions or Handling of Hazardous or Acutely Hazardous Materials, Substances, or Waste within One-Quarter Mile of an Existing or Proposed School	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	One existing and one proposed school	Significant	Mitigation Measure 4.18-d: Notify the Twin Rivers Unified School District and Applicable School with Jurisdiction within One-Quarter Mile of Project Construction Activities	Less than Significant
Airport Safety						
Impact 4.19-a: Temporary Aircraft Safety Hazards Resulting from Project Construction Activities within or near the Airport Critical Zone	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Unquantifiable	Significant	Mitigation Measure 4.19-a: Coordinate Work in the Critical Zone with Airport Operations and Restrict Night Lighting within and near the Runway Approaches	Less than Significant
Impact 4.19-b: Potential for Higher Frequency of Collisions between Aircraft	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary and Permanent	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
Wildfire Hazards						
Impact 4.20-a: Potential Exposure to Wildland Fires	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary	Unquantifiable	Significant	Mitigation Measure 4.20-a: Prepare and Implement a Fire Management Plan to Minimize Potential for Wildland Fires	Less than Significant
Environmental Justice						
Impact 4.21-a: Potential to Have a Disproportionate High Adverse Environmental Impact on any Minority or Low-Income Populations	No-Action Alternative: No Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Proposed Action and Levee Raise-in-Place Alternative	Temporary and Permanent	Unquantifiable	Significant	Mitigation Measure 4.21-a: Increase the Direct Benefits of the Project for the Ancestors of the Native American Tribes	Less than Significant

1.0 INTRODUCTION AND STATEMENT OF PURPOSE AND NEED

1.1 INTRODUCTION

This document is a joint environmental impact statement/environmental impact report (EIS/EIR) prepared for the Sacramento Area Flood Control Agency's (SAFCA's) proposed Natomas Levee Improvement Program (NLIP), Phase 3 Landside Improvements Project (Phase 3 Project). This EIS/EIR has been prepared by both the U.S. Army Corps of Engineers (USACE), Sacramento District as Federal lead agency under the National Environmental Policy Act (NEPA) and SAFCA as state lead agency under the California Environmental Quality Act (CEQA). See Code of Federal Regulations (CFR), Title 40, Sections 1502.25, 1506.2, and 1506.4 (authority for combining Federal and state environmental documents) and California Code of Regulations (CCR), Title 14, Division 6, Chapter 3 (State CEQA Guidelines), Section 15222 ("Preparation of Joint Documents"). See also 33 CFR Part 230 (USACE NEPA regulations) and 33 CFR Part 325, Appendix B ("NEPA Implementation Procedures for the [USACE] Regulatory Program").

This draft EIS/draft EIR (DEIS/DEIR) evaluates the potential significant impacts on the environment resulting from implementation of the Phase 3 Project (Proposed Action/Proposed Project), hereinafter referred to as "the project." The EIS/EIR evaluates alternatives and proposes mitigation to reduce, minimize, or avoid any significant adverse impacts. Following public review of the DEIS/DEIR, a final EIS (FEIS) and a final EIR (FEIR) will be prepared, in which USACE and SAFCA will provide responses to comments on the DEIS/DEIR. The FEIS will constitute a reprint of the entire DEIS/DEIR, and will include comment letters, responses to comments, and any text changes/clarifications. The FEIR will constitute a response to comments document.

1.1.1 SCOPE OF ENVIRONMENTAL ANALYSIS

The Phase 3 Project consists of improvements to a portion of the perimeter levee system of the Natomas Basin in Sutter and Sacramento Counties, California, and associated landscape and irrigation/drainage infrastructure modifications, as proposed by SAFCA. SAFCA has initiated this effort in cooperation with the California Department of Water Resources and the California Central Valley Flood Protection Board (formerly called the Reclamation Board) (State) and with USACE with the aim of incorporating the NLIP into the Natomas components of the Federally authorized American River Common Features Project (Common Features Project).

The overall purpose of the NLIP is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas. The Landside Improvements Project, which is a component of the NLIP, consists of four phases. The Phase 3 Project is one of the four project phases, and includes proposed improvements affecting approximately 13 miles of the levee system. The Phase 1 Project has been completed. The Phase 2 Project has been analyzed in previous environmental documents (see Section 1.5.4.2, below) and is scheduled for construction beginning in 2009. The Phase 3 Project is the subject of this EIS/EIR. The Phase 4 Project will be the subject of a future environmental document.

To implement the Phase 3 Project, SAFCA is requesting permission from USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 United States Code [USC] 408, hereinafter referred to as "Section 408") for alteration of Federal project levees; Section 404 of the Clean Water Act (33 USC 1344, hereinafter referred to as "Section 404") for the placement of fill in jurisdictional waters of the United States; and Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403, hereinafter referred to as "Section 10") for work performed in, under, or over navigable waters, and excavation of material from or deposition of material into navigable waters.

NEPA evaluation is required when a major Federal action, including a permit or approval, is under consideration and may have significant impacts on the quality of the human environment. The Proposed Action of the Phase 3 Project has the potential to significantly affect the human environment, and thus an EIS has been prepared.

Compliance with CEQA is required when a state or local public agency proposes to carry out or approve a project that may have a significant direct or indirect effect on the environment. SAFCA has determined that the proposed project may have significant impacts on the environment; and therefore, as the lead agency for CEQA compliance, an EIR has been prepared. SAFCA may also need to obtain several state approvals or permits, including a Central Valley Flood Protection Board encroachment permit, California Surface Mining and Reclamation Act permit, Clean Water Act Section 401 water quality certification, Clean Water Act Section 402 National Pollutant Discharge Elimination System permit, California Fish and Game Code Section 2081 incidental take authorization, California Fish and Game Code Section 1602 Streambed Alteration Agreement, and permits from two local air districts, Sacramento Metropolitan Air Quality Management District and Feather River Air Quality Management District.

This EIS/EIR evaluates the potential environmental impacts of the Phase 3 Project, which supports the USACE decision on whether to grant permission for the Phase 3 Project pursuant to Section 408, Section 404, and Section 10; and the SAFCA decision to approve the Phase 3 Project pursuant to CEQA. For NEPA purposes, this EIS is tiered from USACE's *EIS for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA* (Phase 2 Project EIS) (November 2008), which evaluated impacts expected to result from the NLIP at a programmatic level, which included the Phase 3 Project. For CEQA purposes, this EIR is tiered from SAFCA's *EIR on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (Local Funding EIR) (February 2007) and SAFCA's EIR on the *Natomas Levee Improvement Program Landside Improvements Project* (2007 Landside or Phase 2 Project EIR) (November 2007), which evaluated impacts expected to result from the NLIP at a programmatic level.

1.2 PROJECT LOCATION AND EXISTING FLOOD DAMAGE REDUCTION SYSTEM

The 53,000-acre Natomas Basin in northern Sacramento and southern Sutter Counties, California, including a portion of the city of Sacramento (**Plate 1**), is bounded by a levee system. Originally constructed in the early part of the 20th century, this levee system is bordered by the Natomas Cross Canal (NCC) to the north, the Sacramento River to the west, the American River to the south, and the Pleasant Grove Creek Canal (PGCC) and the Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek to the east.

The above described flood damage reduction system was initially designed to improve navigation and reduce the risk of flooding for the purposes of facilitating agricultural development of the extensive floodplains encompassed by the Sacramento Valley. Levees set closely along the rivers were designed to contain flows generated by common floods and bypasses were constructed to carry overflows generated by large floods. The close-set levees along the rivers ensured that velocities in the river would help scour the river bottom and move sediment through the system, reducing dredging costs for sustaining navigation. Together, the river channels and bypasses were designed to transport a flood of the magnitude of the 1907 and 1909 Sacramento River floods. **Table 1-1** shows the 1907 and 1909 flood flows relative to other historical flood flows.

1.2.1 PERIMETER LEVEE SYSTEM

The perimeter levee system around the Natomas Basin is part of an integrated system of levees, overflow bypass channels, and dams that comprises the Sacramento River Flood Control Project (SRFCP) (**Plate 2**). Over time, the original capacity of the SRFCP was greatly expanded by the construction of five major multipurpose dam-reservoir complexes (Shasta, Black Butte, Oroville, New Bullards Bar, and Folsom Reservoirs) containing 2.7 million acre-feet of dedicated flood storage space. These dams were justified in part by public safety considerations, specifically the need to provide a high level of flood protection to the historical urban settlements at the confluence of the Feather and Yuba Rivers (Yuba City and Marysville) and the American and Sacramento Rivers (Sacramento and West Sacramento). Following are descriptions of flood protection facilities provided by the levee system and the channels that border the Natomas Basin.

Table 1-1
Ranking of Maximum 3-day Unimpaired Flows at Specified Locations

Rank	Sacramento River at Shasta Dam [a]	Sacramento River at Bend Bridge [b]	Feather River at Oroville [c]	Yuba River near Marysville [d]	American River at Fair Oaks [e]
1	1997–168 kcfs	1997–241 kcfs	1997–244 kcfs	1997–124 kcfs	1986–166 kcfs
2	1970–132 kcfs	1974–212 kcfs	1986–187 kcfs	1986–123 kcfs	1997–164 kcfs
3	1974–130 kcfs	1970–206 kcfs	1965–165 kcfs	1965–118 kcfs	1965–140 kcfs
4	1940–125 kcfs	1940–196 kcfs	**1907–150 kcfs**	1956–107 kcfs	1956–127 kcfs
5	1956–120 kcfs	1965–187 kcfs	1956–147 kcfs	**1907–103 kcfs**	1951–108 kcfs
6	1965–117 kcfs	1956–176 kcfs	**1909–129 kcfs**	**1909–87 kcfs**	1928–98 kcfs
7	1986–115 kcfs	1986–175 kcfs			1980–98 kcfs
8	**1907–~95 kcfs**	1983–174 kcfs			1963–94 kcfs
9	**1909–~95 kcfs**	**1909–162 kcfs**			**1907–88 kcfs**
10		**1907–158 kcfs**			**1909–87 kcfs**

Notes: kcfs=1,000 cubic feet per second; bold denotes the flows during the 1907 and 1909 floods.
Period of Record=[a] 1932–1998, [b] 1893–1998, [c] 1902–1997, [d] 1904–1997, and [d] 1905–1997.
Sources: California Reclamation Board and USACE 2002 (for all data except Sacramento River at Shasta Dam 1907 and 1909) and Roos 1997: 2 (Sacramento River at Shasta Dam 1907 and 1909 values were estimated from this source)

1.2.1.1 NATOMAS CROSS CANAL

The NCC carries water from several tributary watersheds in western Placer County and southern Sutter County to the Sacramento River. The 5.3-mile-long channel at the north boundary of the project begins at the PGCC and East Side Canal, and extends southwest to its confluence with the Sacramento River near the Sankey Road/ Garden Highway intersection. Raised water elevations that can affect the NCC levees come during periods of flooding. The Sutter Bypass, Sacramento River, Feather River, and NCC all contribute to flooding of the NCC. For planning purposes, the NCC south levee is divided into seven reaches, as shown in **Plate 3**. Much of the south levee contains an existing stability berm with an internal drainage system that was constructed as part of the North Area Local Project (NALP). Levee slopes are approximately 3:1 horizontal to vertical (3H:1V) on the water side and 2H:1V on the land side. There is an approximately 80- to 100-foot maintenance access area on the land side of the levee through most of the NCC's length. Most of the land along the south levee consists of privately owned farmland and habitat owned and managed by The Natomas Basin Conservancy (TNBC).

1.2.1.2 SACRAMENTO RIVER EAST LEVEE

The east levee of the Sacramento River, referenced in this document as the "Sacramento River east levee," protects the 18-mile west side of the Natomas Basin between the NCC and the American River. For planning purposes, the levee section is divided into 20 reaches, as shown in **Plate 3**. Garden Highway is located on top of the levee crown through all 20 reaches. A 10-foot-wide drained stability berm is present on the landside slope of the levee between the NCC and Powerline Road (Reaches 1–11) and cutoff walls have been constructed through the levee in Reaches 12–20. These improvements were components of the Sacramento Urban Levee Reconstruction Project and the Common Features Project.

Along the land side, Reaches 1–13 are bordered mainly by private agricultural lands containing a few rural residences, the Sacramento International Airport (Airport), and two farmed parcels owned and managed by TNBC. The Airport lands bordering Reaches 1–13 are referred to as the "Airport north bufferlands." Teal Bend

Golf Club is west of the Airport, adjacent to the levee along Reach 6. The parcels bordering Reaches 14–18 contain more residences, several rural estates, and three TNBC parcels. The land side of Reaches 19 and 20 is bordered by residential subdivisions, a business park, and the City of Sacramento's Natomas Oaks Park, undeveloped Costa Park site, and Shorebird Park.

Several marinas and restaurants are located along the water side of the levee in Reaches 1–20 along with more than 150 residences and numerous private boat docks. Many fences, gates, and other appurtenances associated with these properties are located on the levee itself.

1.2.1.3 PLEASANT GROVE CREEK CANAL WEST LEVEE

The PGCC west levee extends southerly for approximately 3.3 miles from the east end of the NCC south levee at Howsley Road to the north end of the NEMDC/Steelhead Creek levee near the Sankey Road crossing (**Plate 3**). The PGCC west levee protects the Natomas Basin from flood flows from the Pleasant Grove Creek, tributary creeks in western Placer County and southern Sutter County, and water backed up in the NCC from high river stages in the Sacramento River.

Levee slopes are generally 2H:1V on both the water side and land side of the levee. Natomas Road is located on top of the levee crown. No berms support this levee. However, as part of implementing the NALP, SAFCA constructed concrete-capped sheetpile walls at Howsley, Fifield, and Sankey Roads to provide hardened sections at these roadway crossings where levee height was inadequate. The Fifield Road/Natomas Road intersection was subsequently raised by Sutter County when it replaced the Fifield Road bridge over the PGCC. Several drainage culverts cross under the PGCC to drain areas to the east into the Reclamation District (RD) 1000 drainage system. A private canal extends parallel to the PGCC west levee for about 1,500 feet at the landside levee toe. The land uses along the PGCC are primarily agricultural uses along with minimal industrial manufacturing and rural residential uses.

1.2.1.4 NATOMAS EAST MAIN DRAINAGE CANAL WEST LEVEE

The NEMDC (also known as Steelhead Creek) extends for approximately 13.3 miles from high ground near Sankey Road to the American River north levee and forms the easterly boundary of the Natomas Basin (**Plate 3**). The west levee of the NEMDC confines the canal through the entire reach. The east side of the canal is unconfined north of SAFCA's NEMDC stormwater pumping station. This facility is connected to the NEMDC west levee and the Dry Creek north levee. It prevents elevated flood waters in Dry Creek and the southern reach of the NEMDC from entering the northern reach of the NEMDC. The pumping facility also collects local flood runoff from the Natomas East Stream Group and from spills (PGCC floodwaters) over the high ground near Sankey Road and discharges this stormwater into the southern reach of the NEMDC. The east side of this southern reach intersects Dry/Robla Creek and Arcade Creek and is confined by the NEMDC east levee, which extends for about 4 miles from the Dry/Robla Creek south levee to the Arcade Creek north levee and from the Arcade Creek south levee to the American River north levee at the mouth of the NEMDC. East Levee Road extends along the crown between Sankey Road and Main Avenue.

As part of the NALP, SAFCA raised the west levee of the NEMDC from 2.0 to 4.5 feet between the NEMDC stormwater pumping station and the American River north levee and raised the east levee of the NEMDC from 1.0 to 3.5 feet between the Dry/Robla south levee and the American River north levee. These improvements were designed to provide a high level of flood protection to the Natomas Basin by providing at least 3 feet of levee height above the "200-year" flood in Dry Creek and Arcade Creek combined with the maximum water surface likely to be produced at the mouth of the NEMDC by a "200-year" or greater flood along the American River.

1.2.1.5 AMERICAN RIVER NORTH LEVEE

The Natomas section of the American River north levee extends for about 2.2 miles from its junction with the Sacramento River east levee at the mouth of the American River to its junction with the NEMDC west levee near the mouth of the NEMDC, as shown in **Plate 3**. This levee was constructed as part of the Natomas perimeter levee system and is designed to prevent flood waters in the American River from entering the Natomas Basin. Built before the construction of Folsom Dam, this levee is set back over 1,000 feet north of the American River main channel and is high enough to provide 3 feet of levee height above the maximum water surface elevation likely to be produced at the mouth of the NEMDC by a "200-year" or greater flood along the American River. For planning purposes, this levee has been divided into four reaches, as shown in **Plate 3**. The general configuration of the levee in these reaches is 3H:1V waterside slopes and 2H:1V landside slopes. Levee crown widths range from 30 to 60 feet. Garden Highway runs along the levee crown for most of these reaches and ranges from two to four lanes.

1.2.2 FLOODFLOW CONDITIONS

The Natomas Basin is subject to flooding from a combination of flows in the Sacramento and American River channels and in the tributary streams east of the Basin. Along the northern and western perimeters of the Basin, the greatest threat is from a large flood in the Sacramento–Feather River basin combined with high runoff in the creeks and streams of southern Sutter and western Placer Counties that drain through the NCC. This threat is somewhat mediated by the operation of the Fremont Weir and Yolo Bypass system, which absorbs approximately 80% of the flood flow reaching the Natomas Basin from the Feather and Sacramento River basins. Along the southern and southeastern perimeters of the Basin, the greatest threat is from a large flood in the American River basin combined with high runoff in the tributary creeks and streams of western Placer and northern Sacramento Counties that drain through the NEMDC/Steelhead Creek.

1.3 PROJECT HISTORY AND PLANNING CONTEXT

SAFCA has developed the NLIP to address identified deficiencies in the levee system protecting the Natomas Basin in Sacramento and Sutter Counties, California. The objectives of the NLIP are to: (1) provide at least a 100-year level of flood protection to the Natomas Basin as quickly as possible; (2) provide "200-year" flood protection to the Basin over time; and (3) avoid any substantial increase in annual flood damages as new development occurs in the Basin.

The Natomas Basin perimeter levee system was originally constructed to promote agricultural development. The historic Sacramento River floods of 1907 and 1909 (see **Table 1-1** for flood flows) triggered the comprehensive, federally financed and managed, flood risk reduction effort that has unfolded over the past 85 years under the leadership of USACE and the State. The product of this effort is the SRFCP, an integrated system of levees, overflow bypass channels, and dams that was designed and constructed by Federal, State, and local interests over several decades to protect farmlands and urban areas in the Sacramento Valley from large floods. The SRFCP has protected the Natomas Basin from significant flooding since construction of the perimeter levee system in 1914.

Today, the Natomas Basin is the location of the Airport and the site of extensive urban development, primarily occupying the southern third of the Basin. The Basin's remaining agricultural lands provide habitat for a number of important wildlife species. This habitat is protected under State and Federal law, and expansion of the urban footprint into the remaining agricultural areas is governed by the *Natomas Basin Habitat Conservation Plan* (NBHCP), which is aimed at setting aside and conserving tracts of agricultural land that are needed to sustain habitat for the affected species. The Natomas Basin's historic floodplain is occupied by more than 83,000 residents and contains $8.2 billion in damageable property. **Table 1-2** presents a brief timeline of major flood-related events in the Natomas Basin.

Table 1-2
History of the Natomas Basin Flood Damage Reduction System

Year/Timeframe	Flood Damage Reduction Project/Event
1911–1915	Natomas Basin reclaimed: levees and interior drainage constructed
1917–1967	Levees authorized as part of the SRFCP; construction on the SRFCP is initiated and completed in stages
1968	National Flood Insurance Program authorized
1978	First NFIP 100-year Flood Maps issued by the Federal Emergency Management Agency (FEMA)
1986	Major floods lead to SRFCP system re-evaluation
1989	FEMA issues new 100-year Flood Maps encompassing most of the city of Sacramento
1990–1993	Congress provides funding for the Sacramento Urban Levee Reconstruction Project
1993–1998	SAFCA carries out the NALP
1996	Congress authorizes raise and strengthening of Sacramento River east levee and strengthening of American River north levee
1997	Major flood in SRFCP
1998	USACE certifies Natomas Basin levees for 100-year FEMA flood protection
1999	Congress authorizes raise and strengthening of the NCC south levee
1999	Post-1997 Flood Assessment recognizes underseepage as a threat
2000	USACE initiates Natomas Basin Common Features Design
2002	USACE conducts public scoping meetings
2003	USACE Levee Task Force completes development of deep underseepage criteria
2004	USACE adopts Standard Operating Procedures for Urban Levee Design
2004–2006	SAFCA evaluates Natomas Basin levees
2004	USACE initiates General Re-Evaluation of the Common Features Project
2006	USACE recommends levee decertification based on new geotechnical information and new standards
2006	SAFCA initiates the NLIP
2006	SAFCA Board of Directors certifies the EIR for the NLIP Phase 1 Project, and USACE adopts a Finding of No Significant Impact and grants permission pursuant to Section 408 for the Phase 1 Project
2007	SAFCA Board of Directors certifies the EIR for NLIP Phase 2 Project (2007 Landside EIR)
2008	USACE issues Draft and Final EIS for NLIP Phase 2 Project
2008	SAFCA completes NLIP Phase 1 Project
2009	USACE issues Phase 2 EIS ROD; granting permission pursuant to Section 408 and Section 404 for Phase 2 Project
2009	SAFCA Board of Directors certifies SEIR for NLIP Phase 2 Project (Phase 2 Supplemental EIR)

Notes: EIR = environmental impact report; EIS = environmental impact statement; FEMA = Federal Emergency Management Agency; NFIP = National Flood Insurance Program; NLIP = Natomas Levee Improvement Program; NLAP = North Area Local Project; NCC = Natomas Cross Canal; SAFCA = Sacramento Area Flood Control Agency; SRFCP = Sacramento River Flood Control Project; USACE = U.S. Army Corps of Engineers; ROD = record of decision; SEIR = Supplemental EIR
Source: Data compiled by EDAW in 2008 and 2009

Although SAFCA anticipates that all segments of the Natomas perimeter levee system will eventually be improved to meet all of the above design criteria, SAFCA is partnering with the California Department of Water Resources to implement FloodSafe California using grant funding to initiate early implementation of improvements ("early implementation project") for the segments that do not currently meet the 100-year design criteria adopted by the Federal Emergency Management Agency (FEMA). SAFCA proposes to complete these improvements by the end of 2011. Phases 1–4 of the NLIP Landside Improvements Project constitute the "early implementation project." The remaining segments of the perimeter levee system would be improved by USACE to meet State standards for the "200-year" design water surface elevation. This will require Congressional authorization to expand the scope of the already authorized Natomas components of the Common Features Project based on a General Re-evaluation Report (GRR) to be completed by USACE for presentation to Congress in 2010. SAFCA is coordinating with USACE to ensure that the planning and design of the early implementation project are consistent with applicable USACE planning, engineering, and design guidelines. While the GRR will be a separate report with its own environmental documentation, USACE and SAFCA recognize that Federal actions taken in connection with the early implementation project will need to be appropriately reflected in the GRR.

To move forward as quickly as possible to reduce the risk of flooding in the Natomas Basin, SAFCA has identified the broad outlines of the early implementation project at a program level of detail and developed an incremental implementation strategy based on carrying out the project in four phases, with each phase contributing independently and cumulatively to achieving flood risk reduction. Each individual project phase would contribute to increased flood protection for the Natomas Basin, and thus has independent utility. However, no single project phase would achieve the overall project objective of 100-year flood protection to the entire Basin. The NLIP, as a program, has independent utility from the other areas under consideration in the GRR because the NLIP will provide added flood protection to an entire area (similar to a ring levee) and this increased flood protection is not dependent on the outcome of the GRR. The four phases of the project are described in Section 1.5.4, "Natomas Levee Improvement Program Environmental Documentation and Relationship of This EIS/EIR to Other Documents," below.

The NLIP Landside Improvements Project and the NLIP as a whole are part of a larger program of improvements to the flood damage reduction system protecting the Sacramento Area that was initiated as part of the American River Watershed Investigation (ARWI) following the record flood of 1986. This section outlines the key events and actions that have shaped the ARWI so as to provide the historical and legislative context within which the NLIP Landside Improvements Project is being pursued.

1.3.1 1986 FLOOD

The record flood of 1986 caused levee failures in many areas of the Sacramento Valley that resulted in millions of dollars of property damage and exposed numerous deficiencies in the SRFCP. In the Sacramento area, these deficiencies included: (1) unstable levees along the east bank of the Sacramento River that were susceptible to failure due to the porous nature of the material used in their construction, (2) inadequate conveyance capacity in the drainage channels around the Natomas Basin that serve to divert runoff from the foothills into the Sacramento and American Rivers, and (3) inadequate reservoir storage capacity for controlling large floods in the American River watershed.

1.3.2 SACRAMENTO URBAN LEVEE RECONSTRUCTION PROJECT

SAFCA was formed in September 1989 to work with USACE and the State to address the deficiencies exposed by the 1986 flood. The initial step in this effort was to quickly implement the Sacramento Urban Levee Reconstruction Project to stabilize the levees along the east bank of the Sacramento River upstream and downstream of the American River. These levees were constructed in the early part of the 20th century using materials dredged from the river channel that contained significant amounts of sand and silt dislodged from the foothills and mountains along the east side of the Sacramento Valley during the hydraulic mining era. These

materials proved to be excessively porous when subjected to the prolonged high flows produced by the 1986 flood, particularly in the Natomas Basin, where levee failure due to seepage through the levee was avoided only through a massive effort to shore up the levee during the height of the flood.

The stabilization effort employed two measures to address this seepage problem. Where space permitted, such as upper Natomas Basin, a drained stability berm was constructed along the landside toe of the levee to intercept any water seeping through the levee and discharge it onto adjacent lands where it is collected by the interior drainage system and then pumped back into the river. Where space was limited, as in the Pocket area and the lower Natomas Basin, a slurry cutoff wall was excavated through the levee and into less permeable ground below. This cutoff wall serves to reduce seepage through the permeable levee embankment soils. Construction of these improvements, covering approximately 33 miles of the Sacramento River east levee, was initiated in 1990 and completed in 1993.

1.3.3 AMERICAN RIVER WATERSHED INVESTIGATION SELECTED PLAN

In addition to levee stabilization, USACE, the State, and SAFCA used the ARWI to develop a broad program of improvements to Sacramento's flood damage reduction system focusing on construction of a flood detention dam along the American River near Auburn combined with raising and strengthening the levees along the tributary streams and drainage canals around the Natomas Basin. The ARWI Selected Plan, which was designed to provide a "200-year" level of flood protection to the Sacramento area, was presented to Congress in 1992. However, in the face of opposition to the detention dam, Congress authorized only the levee improvements around the Natomas Basin and directed that these improvements should proceed while the USACE re-evaluated options for controlling floods along the remainder of the Lower American River. The legislation left open the possibility that the authorized improvements could be constructed by non-Federal interests in exchange for future credits or reimbursements.

1.3.4 NORTH AREA LOCAL PROJECT

Relying on the authorization described above, SAFCA quickly initiated the NALP. This locally funded project was designed to provide a high level of flood protection to the Natomas Basin in a manner that neither depended on nor prejudiced the outcome of the continuing effort to develop a comprehensive plan for protecting the floodplains along the Lower American and Sacramento Rivers outside the Natomas Basin. Toward this end, SAFCA designed the levees along the lower reaches of the NEMDC/Steelhead Creek, Arcade Creek, and Dry/Robla Creek to contain the maximum water surface elevation that could be anticipated in the Lower American River at the mouth of the NEMDC/Steelhead Creek during a "200-year" or greater flood event under any of the alternatives under consideration by the AWRI, including no action. The NALP, which also included levee strengthening measures along the south levee of the NCC and west levee of the PGCC, was completed in 1996.

1.3.5 FOLSOM DAM REOPERATION

In 1995, SAFCA entered into a 5-year agreement with the U.S. Bureau of Reclamation (Reclamation) to initiate a variable space storage operation at Folsom Dam. This would allow for an increase in the available space in three large non-Federal reservoirs located in the American River watershed upstream of Folsom Dam which could be used for flood damage reduction. This effort would result in incidental flood damage reduction benefits without formally incorporating the non-Federal reservoirs into the flood damage reduction system and without creating unacceptable impacts to anadromous fish in the Lower American River water supply, hydropower, and recreational uses dependent on Folsom Dam.

1.3.6 AMERICAN RIVER COMMON FEATURES PROJECT

In 1996, USACE transmitted a Supplemental Information Report (SIR) to Congress that presented the results of the requested re-evaluation of flood risk reduction options for the American River watershed. The SIR concluded that regardless of what measures might be implemented to increase the reservoir storage space available, the levees extending upstream from the mouth of the river should be strengthened to resist seepage. Moreover, the SIR indicated that SAFCA's levee improvements on the northern and eastern levees of the Natomas Basin were sufficient to protect the Basin from very large floods along the American River, and with modifications to the upper 12 miles of the east levee of the Sacramento River, including increased levee height and levee stability improvements and levee stability along the American River north levee adjacent to Natomas, a similarly high level of flood protection could be secured along the Sacramento River. These American River and Natomas Basin improvements were considered "common features" of any long-term effort to provide Sacramento with a high level of flood protection, and Congress directed the Secretary of the Army to design and construct them under the auspices of the Common Features Project. The authorization of the Common Features Project also allowed the non-Federal partners to proceed with the improvements and receive credit for the work. Finally, Congress directed the Secretary of the Interior to continue the variable space storage operation at Folsom Dam and to extend Reclamation's operational agreement with SAFCA pending implementation of a comprehensive flood damage reduction program for the American River watershed.

1.3.7 1997 FLOOD

Shortly after the conclusion of the 1996 Federal legislative session, the Sacramento Valley again experienced a flood of record magnitude. The flood of 1997 produced flows in the Lower Sacramento and American Rivers comparable to those of the flood of 1986. The levees around the Natomas Basin and along the Lower American and Sacramento Rivers, bolstered by the accomplishments of the Sacramento Urban Levee Reconstruction Project and the NALP, and relieved by the additional reservoir storage capacity made available by the Folsom Reoperation Project, passed these flows without the signs of levee stress that occurred in 1986. However, the flood did cause failures of some SRFCP levees along the Feather River and Sutter Bypass upstream of the Natomas Basin. The USACE post-flood assessment concluded that deep underseepage may have contributed to these levee failures. To address this risk, USACE recommended a broader scope for the Common Features Project, including deeper seepage cutoff walls through the levees along the Lower American River. USACE also called for an assessment of the need for similar measures along the east levee of the Sacramento River in the Natomas Basin.

1.3.8 FOLSOM DAM MODIFICATION PROJECT AND EXPANSION OF THE COMMON FEATURES PROJECT

In 1999, Congress approved a plan for increasing flood protection along the American River by modifying Folsom Dam's outlet works to be more efficient. Congress also expanded the scope of the Common Features Project, calling for additional reaches of the levees along the lower American River to be raised and strengthened to ensure safe containment of flows in the river up to 160,000 cubic feet per second (cfs) with at least 3 feet of additional levee height[1], and directing USACE to raise and strengthen the south levee of the NCC to provide the same level of flood protection afforded by the previously authorized improvements of the east levee of the Sacramento River. Lastly, Congress directed the Secretary of the Army to cooperate with the Secretary of the Interior in devising a long-term variable space storage operation plan for Folsom Dam that would take advantage of the operational capabilities created by the modification of the dam's outlet works and improved weather forecasting.

[1] See definition of "levee height" in Section 1.4.2.1, "Flood Problems and Needs."

1.3.9 JOINT FEDERAL PROJECT

In 2005, technical challenges associated with enlarging the existing outlet works at Folsom Dam caused USACE, the State, SAFCA, and Reclamation to embrace a new approach to increasing the dam's low-level discharge capacity. This "Joint Federal Project," which was approved by Congress in 2007, will address both flood damage reduction and dam safety issues through construction of a new auxiliary spillway and control gates. The new facilities will significantly increase Folsom Dam's low-level outlet capacity, enabling the dam to meet applicable Federal dam safety standards while permitting dam operators to safely contain the "200-year" flood in the American River watershed. The new flood damage reduction operation assumes that the variable storage space plan will be continued and that releases from the dam will be increased to 160,000 cfs when inflows to the dam exceed the magnitude of a 100-year flood.

1.3.10 GENERAL RE-EVALUATION OF THE COMMON FEATURES PROJECT

Changes in engineering standards and a better understanding of flood risks in the SRFCP system have caused USACE to initiate a general re-evaluation of the elements included in the Common Features Project. The GRR is expected to be presented to Congress in 2010 with recommendations of scope and cost modifications necessary to ensure that the project can achieve its authorized flood risk reduction objectives.

Initially, the GRR was primarily focused on evaluating the needs of the Natomas Basin. However, a significant similar effort is also under way with respect to the elements of the Common Features Project along the Lower American and Sacramento Rivers outside the Natomas Basin, where scope and cost modifications may also be needed to ensure that the flood risk reduction objectives of the "Joint Federal Project" are achieved. Here, USACE has determined that the Sacramento River east levee between the American River and the town of Freeport may lack adequate levee height, and may be susceptible to underseepage and erosion in a "200-year" flood event. In addition, the levees along the Lower American River may be susceptible to erosion based on the magnitude and duration of the releases from Folsom Dam that occur in such an event. Accordingly, USACE is studying comprehensive alternatives that would consider all the basins in the greater Sacramento area, to ensure that levees protecting the city and county of Sacramento, and the area of Sutter County within the Natomas Basin provide the same level of protection as the Joint Federal Project Folsom Dam improvements, which are already under construction.

SAFCA successfully obtained a grant from the California Department of Water Resources for funding an early implementation project as part of FloodSAFE California. FloodSAFE California is a strategic initiative to maximize Proposition 1E and 84 bond funds to reduce flood risk to Californians, develop a sustainable flood management system for the future, and lessen the consequences of floods when they do occur. As detailed in the Local Funding EIR, SAFCA's cost share requirement was met and the funding awarded. SAFCA's early implementation project is running ahead of the GRR submittal date with the expectation that the perimeter levee improvements that are constructed in advance of any Congressional action on the GRR will be found consistent with the recommendations contained in the GRR. On that basis, SAFCA anticipates that the non-Federal costs incurred in the early implementation project could be credited against the remaining non-Federal share of the cost of the enlarged Common Features Project or Joint Federal Project.

1.4 PROJECT PURPOSE/PROJECT OBJECTIVES AND NEED FOR ACTION

1.4.1 PROJECT PURPOSE/PROJECT OBJECTIVES

USACE and SAFCA each view the project purpose from the purview of their respective responsibilities, as defined below. CEQA also requires the CEQA lead agency to specify project objectives.

1.4.1.1 SACRAMENTO AREA FLOOD CONTROL AGENCY

SAFCA's project objectives adopted in connection with the NLIP are: (1) provide at least a 100-year level of flood protection to the Natomas Basin as quickly as possible, (2) provide "200-year" protection to the Basin over time, and (3) avoid any substantial increase in expected annual damages as new development occurs in the Basin. The first two project objectives would reduce the residual risk of flooding sufficiently to meet the minimum requirements of Federal and state law for urban areas like the Natomas Basin. The third project objective is a long-term objective of SAFCA's.

Additional project objectives that have informed SAFCA's project design are to:

(1) use flood damage reduction projects in the vicinity of the Airport to facilitate management of Airport lands in accordance with the Airport's Wildlife Hazard Management Plan (WHMP); and

(2) use flood damage reduction projects to increase the extent and connectivity of the lands in the Natomas Basin being managed to provide habitat for giant garter snake, Swainson's hawk, and other special-status species.

SAFCA's approach to defining flood risk reduction accomplishments (system performance) differs from that of USACE. References in this document to levels of flood protection are based on SAFCA's "best estimate" approach (FEMA's and the state's current method) and should not be taken as USACE concurrence that such levels would be achieved based on USACE's approach of incorporating risk and uncertainty in the estimate of system performance. In any case, flood risk to the Natomas Basin would be considerably reduced by the project. FEMA and NLIP design criteria for the 1% and 0.5% events is provided in Table I-1 in **Appendix I**.

1.4.1.2 U.S. ARMY CORPS OF ENGINEERS

The overall purpose of the project is to develop and select an alternative that would reduce the risk of flood damage in the Natomas Basin. Some residual risk will always remain, however, in any flood damage reduction system. USACE must make decisions on whether or not to grant permission for SAFCA's Phase 3 Project to alter the Natomas Basin levee system (Federal project levees) under Section 408 and issue permits under Section 404 and Section 10. USACE decisions contemplated by this EIS/EIR pertain only to the proposed Phase 3 Project, which is the subject of this EIS/EIR. USACE's Regulatory Branch has already made decisions under these authorities for the Phase 1 and Phase 2 Projects.

1.4.2 NEED FOR ACTION

The need for the action is to reduce the flood risk to the Natomas Basin.

The Natomas Basin floodplain is occupied by over 83,000 residents and $8.2 billion in damageable property. Although improvements to the Natomas Basin perimeter levee system, completed as part of the Sacramento Urban Levee Reconstruction Project and the NALP, have significantly improved flood protection for the area, the Natomas Basin remains vulnerable to flooding in a less than 100-year flood event. Uncontrolled flooding in the Natomas Basin floodplain in a flood exceeding a 100-year event could result in $7.4 billion in damage (this excludes the Airport facilities) (SAFCA 2007b). Flooding could also release toxic and hazardous materials, contaminate groundwater, and damage the metropolitan power and transportation grids. The disruption in transportation that could result from a major flood could affect the Airport and interstate and state highways. In addition, displacement of residents, businesses, agriculture, and recreational areas could occur.

The NLIP was initially outlined in the Natomas Levee Evaluation Study Final Report Prepared for SAFCA in Support of the Natomas Basin Components of the American River Common Features (July 14, 2006). This evaluation was based on the engineering studies and reports that were included as appendices to the above-referenced report, which are available for review at SAFCA's office at 1007 7th Street, 7th Floor. These studies

and reports indicate that segments of the Natomas perimeter levee system reflect the following problems for both the FEMA 100-year and the "200-year" design water surface elevations:

- inadequate levee height,
- through-levee seepage and foundation underseepage with excessive hydraulic gradients,
- embankment instability, and
- susceptibility to riverbank erosion and scour.

Although not highlighted in the levee evaluation, portions of the perimeter levee system, particularly along the east levee of the Sacramento River, are also subject to vegetative and structural encroachments into the levee prism.

In January 2008, FEMA proposed remapping the Natomas Basin as an AE zone. The designation took effect in December 2008. FEMA defines AE zones as areas with a 1% annual chance of flooding. The designation requires the bottom floor of all new buildings be constructed at or above base flood elevation—as little as 3 feet in some of the Natomas Basin but up to 20 feet above the ground level in much of the Basin. This designation effectively stopped all projects that were not issued building permits before the new map took effect.

The following subsections describe flood damage reduction system problems and other problems and needs related to project implementation.

1.4.2.1 FLOOD PROBLEMS AND NEEDS

Inadequate Levee Height

"Levee height" refers to a measure of the height of a levee above a defined water surface elevation. The NCC south levee and Reaches 1–11 of the Sacramento River east levee provide less than the 3 feet of additional levee height that is required to meet the minimum requirements for 100-year flood protection established by FEMA as part of the National Flood Insurance Program or the minimum requirements for "200-year" flood protection established by the State. Both the FEMA 100-year and the "200-year" design water surface elevations were derived using hydraulic modeling outputs that assume SRFCP levees outside the Natomas Basin do not fail when overtopped. **Plate 3** shows the locations and amounts of levee height deficiency that would be addressed by the NLIP Landside Improvements Project.

Seepage

Seepage beneath and through segments of the Natomas levee system has been identified as a significant risk to the stability and reliability of the system (SAFCA 2006). Underseepage problems occur in locations where levees are constructed on low-permeability foundation soil (silt and clay) underlain by higher-permeability layers (sand and gravel). Excessive underseepage makes the affected levee segment susceptible to failure during periods of high river stage. Under these conditions, seepage travels horizontally under the levee and then is forced vertically upward through the low-permeability foundation layer, often referred to as the "blanket." Failure of the blanket can occur either by uplift, a condition in which the blanket does not have enough weight to resist the confined pressure acting upon the bottom of the blanket, or by piping (internal erosion) caused by water flowing under high vertical gradients through the erodible blanket and carrying fine soil particles out of the foundation materials. Through-seepage is seepage through a levee embankment that can occur during periods of high river stage. Depending on the duration of high water and the permeability of embankment soil, seepage may exit the landside face of the levee. Seepage can also pass directly through pervious layers in the levee if such layers are present. Under these conditions, the stability of the landside levee slope may be reduced. **Plate 4** shows a schematic of these two failure mechanisms. **Plate 3** shows the locations around the Natomas Basin where seepage has been identified as a problem.

Riverbank Erosion

As shown in **Plate 5**, approximately 15 sites along the water side of the Sacramento River east levee are subject to bank erosion in the form of bed or toe scour and wave wash that threatens the stability of the adjacent levee. Risk priorities have been assigned to the affected sites based primarily on the risk of slope failure due to undermining. High-risk sites exhibit one or more of the following characteristics and are considered potentially susceptible to failure in a 100-year flood event:

- the toe of the bank lies inside or very near the levee template and the slope below the waterline is reasonably steep, scour depths are below river bed elevations at the toe, or the local bed has been observed to be lowering;
- the toe of the bank lies outside the levee template but there is risk of cantilever failure based on the estimated stratigraphy of the bank; or
- the bank at the low-water elevation (the contact between the flood basin deposits and the alluvial deposits) lies near the levee template, and there is potential for a failure originating at the contact point to intersect the levee prism. If the failure seems unlikely to intersect the levee prism, the site was ranked as moderate.

Moderate-risk sites exhibit one or more of the following characteristics and may be recommended for treatment as part of any "200-year" flood protection improvement program:

- the toe of the bank lies reasonably close to the levee template, but the slope below the waterline is moderate and general scour elevations are not very far beneath the local bed level;
- the bank at the low-water elevation (the contact between the flood basin deposits and the alluvial deposits) lies inside the levee template, but an individual failure is unlikely to intersect the levee prism; or
- the toe of the bank lies from 20 to 50 feet from the levee template and the risk of slope failure is low to moderate, but erosion appears to be very active or specific site factors, such as lack of vegetation, structures, or fallen trees, suggest that erosion might proceed very quickly during a large flood.

Sites A (River Mile [RM] 78.6), C (RM 78.0), D (RM 77.3), G (RM 73.5), J (RM 69.8), and M (RM 68.8) are considered high-risk sites. Sites B (RM 78.2), I (RM 70.0), K (RM 69.4), and L (RM 69.1) are considered moderate-risk sites.

Treatment of bank erosion is not an element of the Landside Improvements Project but is a part of SAFCA's overall NLIP. The presence of high-risk sites may affect the ability to provide 100-year or "200-year" flood protection to the Natomas Basin. Discussion of erosion sites is relevant to this EIS/EIR, therefore, because the selection and design of improvements along the Sacramento River east levee would influence the extent of the threat that bank erosion sites pose to the integrity of the levee—and, consequently, the need to repair erosion sites.

Encroachment

USACE levee guidance requires the removal of vegetation greater than 2 inches in diameter on the levee slopes and within 15 feet of the waterside and landside levee toes. This guidance also may require removal of encroachments on the levee slopes, including utilities, fences, structures, retaining walls, driveways, and other features that penetrate the levee prism or affect operation and maintenance of the levee system. Substantial encroachments are present on the Sacramento River east levee. **Plates 6a** and **6b** illustrate typical encroachments in the area. Should any of these existing encroachments be determined to threaten the integrity of the levee or otherwise increase flood risk unacceptably, the encroachments would need to be removed. RD 1000 is the entity initially responsible for removing encroachments that have been identified as threatening levee integrity.

1.4.2.2 OTHER PROBLEMS AND NEEDS RELATED TO PROJECT IMPLEMENTATION

Aviation Safety

The Airport is located approximately 1.5 miles east of the Sacramento River east levee and 12 miles north of downtown Sacramento. The Airport includes the Airport Operations Area and adjacent terminals, parking lots, and landscaped areas (**Plate 7**). There are two 8,600-foot parallel runways, oriented roughly north-south, and three airline terminals, as well as additional buildings associated with various airport operations. Approximately half of the 5,900 acres of Sacramento County–owned land at the Airport are located due south and due north of the Airport Operations Area and function as aviation "bufferlands" to prevent encroachment by land uses, such as residential development, that are incompatible with aircraft operations.

The Airport has one of the highest numbers of reported bird strikes of all California airports. The frequency of these strikes is directly related to the Airport's location in the western portion of the Natomas Basin, which is a relatively flat, low-lying area, along the Pacific Flyway, dominated by agricultural crop lands and supporting irrigation and drainage infrastructure. These agricultural uses are the primary wildlife attractants in the area, with rice cultivation, including flooding of the rice fields in winter and summer, considered the most significant attractant.

Since 1996, the Federal Aviation Administration (FAA) has required the Airport to maintain and implement a WHMP. The WHMP relies on a combination of wildlife control and land management strategies and outlines steps for monitoring, documenting, and reporting potential wildlife hazards and bird strikes. In accordance with FAA Advisory Circular (AC) 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports* (FAA 2007), the Airport has been directed by the FAA to reduce wildlife attractants in the Airport Critical Zone, the area within a 10,000-foot radius from the centerline of the two parallel runways for turbine-powered aircraft. The following land management objectives in the WHMP are relevant to the proposed early implementation project:

- maintain grasslands in the Airport Operations Area (the area within the fenced perimeter of the Airport) to discourage use by hazardous wildlife;
- reduce aquatic habitat for hazardous wildlife;
- reduce hazardous wildlife use of ditches in the Airport Operations Area; and
- reduce hazardous wildlife on Sacramento County–owned agricultural land in the 10,000-foot Airport Critical Zone.

Habitat Conservation

The Natomas Basin provides habitat for a variety of wildlife species, ranging from those that use the widely distributed agricultural fields and levee maintenance zones to species that are restricted to remnant patches of native vegetation and the area's historical agricultural irrigation and drainage ditches and canals. Many common wildlife species use the project area, and a number of special-status species also have potential to occur within and adjacent to the levee improvement areas. These special-status species include the following:

- valley elderberry longhorn beetle,
- giant garter snake,
- northwestern pond turtle,
- Swainson's hawk,
- burrowing owl, and
- other nesting birds.

The NBHCP was developed by the City of Sacramento, Sutter County, and TNBC in 2003 to promote conservation of the NBHCP-covered species in conjunction with economic and urban development in the Natomas Basin. The NBHCP establishes a conservation program designed to minimize and mitigate the expected loss of habitat values and incidental take of "covered species" that could result from urban development and operation and maintenance of irrigation and drainage systems. The NBHCP currently authorizes take associated with 17,500 acres of urban development in southern Sutter County and within the city of Sacramento. The U.S. Fish and Wildlife Service (USFWS) approved the NBHCP in 2003 and issued incidental take permits to the City of Sacramento and Sutter County for take of Federally listed species resulting from permitted activities.

The NBHCP's habitat reserve acquisition and management activities are implemented by TNBC, a private, nonprofit organization that began operating in 1998 and whose mission is to serve as "plan operator" of the NBHCP. TNBC receives mitigation fees paid by developers and other NBHCP participants. These funds are used to acquire, establish, enhance, monitor, and manage mitigation lands in perpetuity. As development occurs within the Natomas Basin, and as TNBC acquires mitigation lands, site-specific management plans are implemented by TNBC to ensure that the objectives of the NBHCP are fulfilled. These management plans may include excavation and grading of the acquired lands to create marsh habitats reflective of the floodplain conditions that prevailed in portions of the Natomas Basin before reclamation.

As of January 2006, nearly 4,000 acres of mitigation property had been acquired in the Natomas Basin. As shown in **Plate 8**, this property is concentrated in three areas: north of the Airport and west of State Route 99 in Sutter County, east of the Airport between Elverta Road and the Sacramento/Sutter County border in Sacramento County, and south of the Airport in the vicinity of Fisherman's Lake in Sacramento County. TNBC's goal is to consolidate these three blocks of land through infill acquisitions and to ensure that these lands are reliably served and connected by the Natomas Basin's historical agricultural irrigation and drainage infrastructure.

Agricultural Irrigation and Drainage Infrastructure

Reclamation of the Natomas Basin for agricultural development required construction of two major ditch and canal systems in the Basin: an irrigation system owned and operated by Natomas Central Mutual Water Company (NCMWC) and a drainage system owned and operated by RD 1000. NCMWC pumps water into the Basin to provide irrigation water to its shareholders for agricultural use within the Basin. During winter (October through April), drainage is primarily rainfall runoff; during summer (May through September), drainage water from agricultural fields is typically recirculated for irrigation. Because the Basin is surrounded by levees, all excess drainage within the Basin must be pumped out. In general, water is pumped into the Basin from the Sacramento River and NCC as irrigation water and returned to the perimeter drainage channels via RD 1000's interior drainage system.

Several irrigation canals, pipelines, wells, and pump stations exist along the Sacramento River east levee. These include the Elkhorn Main Irrigation Canal (Elkhorn Canal), which runs parallel to the Sacramento River east levee from the North Drainage Canal to just south of West Elkhorn Boulevard, and the Riverside Main Irrigation Canal (Riverside Canal), which runs parallel to the Sacramento River east levee from approximately 1 mile north of San Juan Road to approximately Orchard Lane. These NCMWC canals are fed by three pumping plants on the Sacramento River (**Plate 9**). These canals are referred to as "highline" canals because they have embankments that allow water levels to be maintained above surrounding ground surfaces so that water can be delivered to agricultural receiving lands by gravity flow. The NCMWC also operates two pumps along the NCC south levee that provide irrigation water to agricultural lands in the northern portion of the Basin. These NCMWC irrigation systems and several other landowner-operated systems along the Sacramento River east levee, NCC south levee, and PGCC west levee would need to be relocated to accommodate improvements to these levees.

RD 1000 operates several drainage pumping plants along the Sacramento River east levee, the NCC south levee, and the NEMDC west levee that could be affected by levee improvement activity. As shown in **Plate 9**, Pumping Plant No. 2, located in Sacramento River Reach 4B, pumps drain water from the lower end of the North Drainage

Canal; Pumping Plant No. 3, located in Sacramento River Reach 13, pumps drain water from the West Drainage Canal; Pumping Plant No. 1, located in Sacramento River Reach 20A, pumps drain water from the Main Drainage Canal; Pumping Plant No. 4, located in NCC Reach 2, pumps drain water from the upper end of the North Drainage Canal; Pumping Plant No. 5, located in Sacramento river Reach 10, pumps drain water from the West Drainage Canal; Pumping Plant No. 8, located on the NEMDC west levee between Del Paso Road and North Market Boulevard, pumps drain water from the C-1 Drain; and Pumping Plant No. 6, located on the NEMDEC west levee between Elverta Road and Elkhorn Boulevard, pumps drain water from the E Drain. These pumping facilities include discharge pipelines that would need to be relocated as part of the levee improvements in these locations. Pumping Plant No. 2 was temporarily removed as part of an emergency levee repair in 2006.

The City of Sacramento operates the Willow Creek stormwater pumping station, which is located in Sacramento River Reach 19B; Pump Station 58, which is located on the American River north levee at Asuza Street; and Pump Station 102, which is located on the NEMDC west levee in Gardenland Park.

1.5 INTENDED USES OF THE EIS/EIR AND RELATIONSHIP TO OTHER DOCUMENTS

1.5.1 NATIONAL ENVIRONMENTAL POLICY ACT

NEPA provides an interdisciplinary framework for Federal agencies to develop information that will help them to take environmental factors into account in their decision-making (42 USC 4321, 40 CFR 1500.1). According to NEPA, an EIS is required whenever a proposed major Federal action (e.g., a proposal for legislation or an activity financed, assisted, conducted, or approved by a Federal agency) would result in significant effects on the quality of the human environment.

Implementation of the project is dependent upon Federal action because it would require Federal approval for one or more of the following activities: (i) alteration of Federal project levees (requires permission from USACE pursuant to Section 408); (ii) placement of fill material into jurisdictional waters of the United States (requires permission from USACE pursuant to Section 404); (iii) work performed in, under, or over navigable waters, and excavation of material from or deposition of material into navigable waters (requires permission from USACE under Section 10); and (iv) activities affecting plant or animal species protected by the Federal Endangered Species Act (ESA) (16 USC 1531[c][1][2]). An EIS is used by Federal agencies in making decisions and is intended to provide full and open disclosure of environmental consequences prior to agency action.

1.5.2 CALIFORNIA ENVIRONMENTAL QUALITY ACT

According to the State CEQA Guidelines (14 CCR Section 15064[f][1]), preparation of an EIR is required whenever a project may result in a significant environmental impact. An EIR is an informational document used to inform public agency decision makers and the general public of the significant environmental effects of a project, identify possible ways to mitigate or avoid the significant effects, and describe a range of reasonable alternatives to the project that could feasibly attain most of the basic objectives of the project while substantially lessening or avoiding any of the significant environmental impacts. Public agencies are required to consider the information presented in the EIR when determining whether to approve a project.

CEQA requires that state and local government agencies consider the environmental effects of projects over which they have discretionary authority before taking action on those projects (Public Resources Code [PRC] Section 21000 et seq.). CEQA also requires that each public agency avoid or mitigate to less-than-significant levels, wherever feasible, the significant environmental effects of projects it approves or implements. If a project would result in significant and unavoidable environmental impacts that cannot be feasibly mitigated to less-than-significant levels, the project can still be approved, but the lead agency's decision makers must issue a "statement

of overriding considerations" explaining in writing the specific economic, social, or other considerations that they believe, based on substantial evidence, make those significant effects acceptable.

1.5.3 PROJECT AUTHORIZATION

SAFCA is authorized to proceed with the early implementation project as approved by the SAFCA Board of Directors in April 2007 and as funded in part by the Consolidated Capital Assessment District that was formed in April 2007 following an affirmative vote of property owners occupying the "200-year" floodplain in Sacramento. In October 2007, the California Legislature approved, and the Governor signed, Senate Bill 276 authorizing the state's participation in the project. The state has the capability to fund its share of the project cost under the authorities created by the passage of Propositions 1E and 84 in November 2006. Federal participation in the project would require additional action by Congress based on the results of the Common Features Project GRR as discussed above.

1.5.4 NATOMAS LEVEE IMPROVEMENT PROGRAM ENVIRONMENTAL DOCUMENTATION AND RELATIONSHIP OF THIS EIS/EIR TO OTHER DOCUMENTS

Summarized below is the relationship of the NLIP Landside Improvement Project phases to one another and their relationship to this EIS/EIR. To provide further context, **Plate 10** shows levee work by phase and borrow sites and **Table 1-3** presents the proposed components and construction timing of the Phase 1, 2, 3, and 4 Projects.

1.5.4.1 PHASE 1 PROJECT

In February 2007, the SAFCA Board of Directors certified the Local Funding EIR (SAFCA 2007a), which examined the physical environmental effects associated with the program of flood damage reduction measures and related mitigation and habitat enhancements that the local funding mechanisms would be used to finance. The Local Funding EIR covered NLIP Phases 1–4 at a program level of detail and Phase 1 (NCC South Levee Phase 1 Improvements [Phase 1 Project]) at a project-specific level of detail. The Phase 1 Project improvements were constructed in 2007 and 2008.

1.5.4.2 PHASE 2 PROJECT

In November 2007, the SAFCA Board of Directors certified the *EIR on the Natomas Levee Improvement Program Landside Improvements Project* (2007 Landside EIR, State Clearinghouse Number 2007062016), which covered the three additional phases of "landside" components of the NLIP that were proposed for construction in 2008 (Phase 2 Project), 2009 (Phase 3 Project), and 2010 (Phase 4 Project). The 2007 Landside EIR was tiered from the analysis in the Local Funding EIR, consistent with Section 15152 of the State CEQA Guidelines. The 2008 construction phase (now referred to as the Phase 2 Project) was analyzed at a project level, and the 2009–2010 construction phases (now referred to as the Phase 3 Project and Phase 4 Project, or the remainder of the Landside Improvements Project) were analyzed at a program level. The Phase 2 Project was approved for implementation by the SAFCA Board of Directors on November 29, 2007.

To implement the Phase 2 Project, SAFCA required permission from USACE pursuant to Section 408 for alteration of a Federal project levee and Section 404 for the discharge of fill into jurisdictional waters of the United States. Therefore, following completion of the 2007 Landside EIR and local approval of the Phase 2 Project, USACE prepared an *EIS for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA* (Phase 2 Project EIS) (USACE 2008). A record of decision (ROD) was issued in January 2009, at which time USACE also issued the 408 permission and 404 permit for the Phase 2 Project.

Table 1-3
Components and Construction Timing of the Phase 1, 2, 3, and 4 Projects

Year	Project Phase	Project Component
2007–2008	Phase 1 Project	Natomas Cross Canal south levee improvements (westernmost 12,500 feet): Through-seepage and underseepage remediation
2009	Phase 2 Project	Natomas Cross Canal south levee improvements: Levee raising and seepage remediation
		Sacramento River east levee (Reaches 1–4B): Levee raising and seepage remediation
		Relocation of the Upper Elkhorn Canal (North Drainage Canal to Elkhorn Reservoir)
		Construction of the Upper GGS/Drainage Canal (North Drainage Canal to just south of Elkhorn Reservoir)
		Removal of a deep culvert at the location of Reclamation District 1000 Pumping Plant No. 2
		Borrow and reclamation at: Airport north bufferlands; Brookfield; Dunmore; RD 1001; and Sutter Pointe
		Habitat creation and management
		Right-of-way acquisition
		Infrastructure relocation and realignment
	Phase 3 Project	Sacramento River east levee (Reaches 5A–9B): levee raising and seepage remediation
		Relocation of the Lower Elkhorn Canal (Elkhorn Reservoir to just south of West Elkhorn Boulevard)
		Construction of the Lower GGS/Drainage Canal (Elkhorn Reservoir to West Drainage Canal at I-5)
		Reconstruction of RD 1000 Pumping Plant No. 2
		Borrow and reclamation at Airport north bufferlands; Dunmore; Pacific Terrace; Private Properties in Reaches 5B, 6A, and 7; South Sutter, LLC; and Sutter Pointe
		Habitat creation and management
2010		Pleasant Grove Creek Canal west levee: Levee raising, slope flattening, and widening; and seepage remediation
		Natomas East Main Drainage Canal west levee (Elkhorn Boulevard to NEMDC Stormwater Pumping Station): Levee widening and flattening and seepage remediation
		Natomas East Main Drainage Canal west levee (NEMDC Stormwater Pumping Station to Northgate Boulevard): Seepage remediation and slope stability remediation
		Infrastructure relocation and realignment
		Encroachment management
		Right-of-way acquisition
		Borrow and reclamation at Brookfield, Elkhorn Borrow Area, Krumenacher, RD 1001, and Twin Rivers Unified School District
		Reconfigure Airport West Ditch
		Landside vegetation removal in Sacramento River east levee Reaches 10–12A
	Phase 4 Project	Sacramento River east levee (Reaches 10–11B): Levee raising and seepage remediation
		Sacramento River east levee (Reaches 12–20): Seepage remediation
		American River north levee (Reaches 1–4): Seepage remediation
		Natomas East Main Drainage Canal west levee (Sankey Road to Elkhorn Boulevard): Levee raising and widening, slope flattening, and seepage remediation
		Relocation of the Riverside Canal and improvements to the West Drainage Canal south of Interstate 5
		Habitat creation and management
		Encroachment management
		Right-of-way acquisition
		Infrastructure relocation and realignment
		Borrow and reclamation at Brookfield, Elkhorn Borrow Area, Fisherman's Lake, Novak, Krumenacher, and RD 1001

Notes: Airport = Sacramento International Airport; GGS = Giant Garter Snake; NEMDC = Natomas East Main Drainage Canal; RD = Reclamation District

Source: Data compiled by EDAW in 2008, based on information provided by SAFCA

The Phase 2 Project as presented in the Phase 2 Project EIS differs from the Phase 2 Project as evaluated in the 2007 Landside EIR for the following reasons. By the time the Phase 2 Project EIS began, SAFCA's engineering consultants had determined that cutoff walls could be used instead of berms along several of the Sacramento River east levee reaches. Thus, the Phase 2 Project EIS includes proposed cutoff walls in some Sacramento River east levee reaches and a discussion of the impacts of the cutoff walls on groundwater recharge. Additionally, it became clear during the EIS process that much of the 2008 construction phase (or Phase 2 Project) would actually have to be conducted in 2009. The Phase 2 Project EIS therefore acknowledges that possibly all of the Phase 2 Project construction could be concurrent with construction of the Phase 3 Project, and discusses the consequences to haul truck traffic, noise, air quality, and other construction-related effects accordingly. These differences have also been considered in the Phase 2 Supplemental EIR, prepared by SAFCA, which was certified by the SAFCA Board of Directors in January 2009, at which time the Board also approved the modifications to the Phase 2 Project.

The Phase 2 Project could be constructed on a stand-alone basis, assuming no further action on the balance of the NLIP is taken. Construction is planned to begin in early 2009 and is anticipated to be completed in 2009, assuming receipt of all required environmental clearances and permits.

1.5.4.3 PHASE 3 PROJECT

This EIS/EIR evaluates the direct, indirect, and cumulative effects of the Phase 3 Project. The EIR is tiered from the SAFCA Local Funding EIR, 2007 Landside EIR, and Phase 2 Project EIS. The Phase 3 Project focuses on underseepage, riverbank erosion, encroachment, and levee height deficiencies along 4.5 miles of the Sacramento River east levee, 3.2 miles of the PGCC west levee, and 6.2 miles of the NEMDC west levee. If permitted, these improvements could be constructed at the same time as the Phase 2 Project. Construction is planned to begin in 2009 and be completed in 2010, assuming receipt of all required environmental clearances and permits.

1.5.4.4 PHASE 4 PROJECT

The Phase 4 Project, and any subsequent phases, will be subject to additional separate, project-specific NEPA and CEQA analysis in the future, prior to approval and implementation. The Phase 4 Project focuses on underseepage, riverbank erosion, encroachment, and levee height deficiencies along 9 miles of the Sacramento River east levee, 7.1 miles of the NEMDC west levee, and 2.1 miles of the American River north levee. The environmental impacts of these improvements were evaluated at a program level in the Local Funding EIR. The project-specific impacts of the Phase 4 Project will be evaluated in a separate, project-specific EIS/EIR in 2009. Construction is planned to begin in 2010 and be completed in 2011, assuming receipt of all required environmental clearances and permits.

1.6 SCOPE AND FOCUS OF THE EIS/EIR

Pursuant to CEQA and the State CEQA Guidelines (Section 15064), the discussion of potential effects on the environment in this EIS/EIR is focused on those impacts that SAFCA has determined may be potentially significant.

To make a preliminary determination of which impacts may be potentially significant, USACE published a notice of intent (NOI) to prepare an EIS in the *Federal Register*, Vol. 73, No. 139, on July 18, 2008; and SAFCA filed a notice of preparation (NOP) of a DEIR with the State Clearinghouse and released the NOP publically on July 18, 2008 (**Appendix A**).

This EIS/EIR includes an evaluation of 21 environmental issue areas and other NEPA- and CEQA-mandated issues (e.g., cumulative impacts and growth-inducing impacts). The 21 environmental issue areas are as follows:

- Agricultural Resources
- Land Use, Socioeconomics, and Population and Housing
- Geology and Soils
- Hydrology and Hydraulics
- Water Quality
- Fisheries
- Sensitive Aquatic Habitats
- Vegetation and Wildlife
- Special-Status Terrestrial Species
- Cultural Resources
- Paleontological Resources
- Transportation and Circulation
- Air Quality
- Noise
- Recreation
- Visual Resources
- Utilities and Services Systems
- Hazards and Hazardous Materials
- Airport Safety
- Wildfire Hazards
- Environmental Justice

CEQA (PRC Section 21002.1) and the State CEQA Guidelines (Section 15143) allow a state lead agency (SAFCA) to focus the discussion in an EIS/EIR on the potential environmental effects of a proposed project that the lead agency has determined may be significant. Lead agencies may limit discussion of other effects to a brief explanation as to why those effects would not be significant. During scoping, and based on review of available information, it was determined that the project would not result in significant environmental effects related to mineral resources. Analyses of effects on mineral resources under CEQA generally focus on whether a project would hinder the extraction and use of known mineral commodities. No known mineral commodities are known to exist in the project area. Therefore, no potentially significant effects on known mineral resources are anticipated as a result of construction activities associated with the project or potential hydraulic changes within the flood conveyance system. For these reasons, this resource topic is not discussed further in this EIS/EIR.

1.7 AGENCY ROLES AND RESPONSIBILITIES

USACE will use this EIS/EIR in exercising its regulatory authority under Section 408, Section 404, and Section 10. It also may be used as an informational document by Federal cooperating agencies, such as the FAA, that could have permitting or approval authority (including partial funding) for aspects of the project.

This EIS/EIR will be used by SAFCA and CEQA responsible and trustee agencies, such as the Central Valley Flood Protection Board (CVFPB), California Department of Water Resources (DWR), Central Valley Regional Water Quality Control Board (RWQCB), and California Department of Fish and Game (DFG), to ensure that they have met the requirements of CEQA before deciding whether to approve or permit project elements over which they have jurisdiction. It may also be used by other state and local agencies, which may have an interest in resources that could be affected by the project, or that have jurisdiction over portions of the project.

1.7.1 LEAD AGENCIES

USACE is the Federal lead agency for NEPA compliance. SAFCA is the state lead agency for CEQA compliance.

1.7.2 COOPERATING, RESPONSIBLE, AND TRUSTEE AGENCIES

Under NEPA, any Federal agency other than the lead agency that has jurisdiction by law or special expertise with respect to any environmental impact involved in an action requiring an EIS is eligible to be a cooperating agency (NEPA Section 1501.6). Cooperating agencies are encouraged to actively participate in the NEPA process of the Federal lead agency, review the NEPA documents of the Federal lead agency, and use the documents when making decisions on the project.

Under CEQA, a responsible agency is a public agency, other than the lead agency, that has responsibility to carry out or approve a project (PRC Section 21069). A trustee agency is a state agency that has jurisdiction by law over natural resources that are held in trust for the people of the State of California (PRC Section 21070).

1.7.2.1 FEDERAL COOPERATING AGENCIES

The FAA is serving as a cooperating agency under NEPA because, if USACE and SAFCA select an alternative that requires the Airport to seek a release from Federal Airport Improvement Grant assurances, the FAA would use this EIS/EIR in exercising its decision-making authority under 49 USC 47107 regarding whether to approve those actions.

1.7.2.2 STATE RESPONSIBLE AND TRUSTEE AGENCIES

The following state agencies may serve as responsible and trustee agencies if they have jurisdiction or regulatory approval over the project or a portion of the project:

- California Air Resources Board
- California Department of Education
- California Department of Fish and Game
- California Department of Health Services
- California Department of Toxic Substances Control
- California Department of Transportation
- California Department of Water Resources
- California State Lands Commission
- California State Office of Historic Preservation
- Central Valley Flood Protection Board (formerly the State Reclamation Board)
- Central Valley Regional Water Quality Control Board (Region 5)
- State Water Resources Control Board

1.7.2.3 REGIONAL AND LOCAL RESPONSIBLE AGENCIES

The following regional and local agencies may serve as responsible agencies if they have jurisdiction or regulatory approval over the project or a portion of the project:

- County of Sacramento
- County of Sutter
- City of Sacramento
- Feather River Air Quality Management District
- Natomas Central Mutual Water Company
- Natomas Unified School District
- Reclamation District 1000
- Reclamation District 1001
- Robla School District
- Sacramento Area Sewer District
- Sacramento County Environmental Management Department
- Sacramento County Local Agency Formation Commission
- Sacramento County Municipal Services Agency
- Sacramento County Water Agency (Zone 41 and 11C Water Districts)
- Sacramento Metropolitan Air Quality Management District
- Sacramento Metropolitan Fire District
- Sacramento Municipal Utility District
- Sacramento Regional County Sanitation District
- Sutter County Environmental Health Services
- Twin Rivers Unified School District

1.7.3 REGULATORY REQUIREMENTS, PERMITS, AND APPROVALS

1.7.3.1 FEDERAL ACTIONS/PERMITS

The Federal actions or permits that would be required for project implementation are listed below.

- **U.S. Environmental Protection Agency:** Reviewing and commenting on the EIS, filing and noticing the EIS, concurrence with Section 404 Clean Water Act permit, and Clean Air Act conformity.
- **U.S. Fish and Wildlife Service:** Federal ESA consultation and incidental-take authorization for the take of, or concurrence with conclusion of no effect for, Federally listed endangered and threatened species.
- **National Marine Fisheries Service:** Federal ESA consultation and incidental-take authorization for the take of, or concurrence with conclusion of no effect for, Federally listed endangered and threatened species.

1.7.3.2 STATE ACTIONS/PERMITS

The state actions or permits that would be required for project implementation are listed below.

- **California Department of Fish and Game, Sacramento Valley:** Compliance with the California Endangered Species Act, streambed alteration (California Fish and Game Code Section 1602), Section 2081 permit, and protection of raptors (California Fish and Game Code Section 3503.5).
- **California State Office of Historic Preservation:** National Historic Preservation Act Section 106 compliance in relation to Federal project authorizations.
- **Central Valley Flood Protection Board (formerly the Reclamation Board) and Reclamation Districts 1000 and 1001:** levee and floodway and other encroachment permits.
- **Central Valley Regional Water Quality Control Board (Region 5):** National Pollutant Discharge Elimination System construction stormwater permit (Notice of Intent to proceed under General Construction Permit) for disturbance of more than 1 acre, discharge permit for stormwater, general order for dewatering, and Clean Water Act Section 401 certification or waste discharge requirements.
- **California Department of Transportation:** Encroachment permit and/or transportation management plan.

1.7.3.3 REGIONAL AND LOCAL ACTIONS/PERMITS

The regional and local actions and permits that would be required for project implementation are listed below.

- **Sutter and Sacramento Counties:** Permits for compliance with the state's Surface Mining and Reclamation Act, and other possible construction authorizations/encroachment permits.
- **City of Sacramento:** Possible construction authorizations/encroachment permits.
- **Feather River Air Quality Management District and Sacramento Metropolitan Air Quality Management District:** Authority to construct (for devices that emit air pollutants), permit to operate, and Air Quality Management Plan consistency determination.

1.8 PUBLIC INVOLVEMENT UNDER NEPA AND CEQA

1.8.1 NOTICE OF INTENT, NOTICE OF PREPARATION, AND SCOPING MEETING

On July 18, 2008, USACE and SAFCA issued an NOI and NOP, respectively, for preparing this EIS/EIR. In addition to the State Clearinghouse's distribution of the NOP to potentially interested state agencies, copies of the NOP were mailed to more than 600 Federal, state, regional, and local agencies, as well as individuals residing within the project area and homeowners associations, to solicit input as to the scope and content of the EIS/EIR. There is no mandated time limit to receive written comments in response to the NOI under NEPA. The NOP was circulated for a 30-day public comment period, in accordance with the State CEQA Guidelines, which closed on August 18, 2008.

A joint public scoping meeting was held on August 6, 2008, to brief interested parties on the proposed project (Proposed Action), and obtain the views of agency representatives and the public on the scope and content of the EIS/EIR (**Appendix A**). Chapter 7.0, "Consultation and Coordination," of this EIS/EIR and **Appendix A** include copies of the comment letters received and a summary listing of the substantive comments on the NOI and NOP, respectively.

1.8.2 ADDITIONAL STEPS IN THE ENVIRONMENTAL PROCESS

This DEIS/DEIR is being distributed for a public and agency review and comment period that begins on February 13, 2009 and closes on April 6, 2009. This distribution ensures that interested parties have an opportunity to express their views regarding the significant environmental impacts of the project, and to ensure that information pertinent to permits and approvals is provided to the decision makers for USACE, SAFCA, the FAA, and other Federal and state agencies. This document is available for public review during normal business hours at USACE, Sacramento District office located at 1325 J Street, Sacramento, California and at the SAFCA office located at 1007 7th Street, 7th Floor, Sacramento, California.

SAFCA will hold a public meeting before the SAFCA Board of Directors on Thursday, March 19, 2009 at 3:00 p.m. in the Sacramento County Board of Supervisors Chambers located at 700 H Street, Sacramento, California, at which it will receive input from agencies and the public on the DEIS/DEIR. USACE may hold one or more public meetings during the comment period. In addition, written comments from the public, reviewing agencies, and stakeholders will be accepted throughout the public comment period. Comments must be received by 5:00 p.m. on April 6, 2009 by USACE or SAFCA at the following addresses, fax numbers, or e-mail addresses:

Elizabeth Holland, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814
Telephone: (916) 557-6763
Fax: (916) 557-7856
E-mail: Elizabeth.G.Holland@usace.army.mil

Or

John Bassett, Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814
Telephone: (916) 874-7606
Fax: (916) 874-8289
E-mail: BassettJ@saccounty.net

Following public review of the DEIS/DEIR, an FEIS and an FEIR will be prepared, in which USACE and SAFCA will provide responses to comments on the DEIS/DEIR. The FEIS will constitute a reprint of the entire DEIS/DEIR, and will include comment letters, responses to comments, and any text changes/clarifications. The FEIR will constitute a response to comments document.

1.9 ORGANIZATION OF THIS EIS/EIR

The content and format of this EIS/EIR are designed to meet the requirements of NEPA, as set forth by the Council on Environmental Quality USACE's NEPA policy and guidance, including Appendix B, "NEPA Implementation Procedures for the Regulatory Program," appended to 33 CFR Part 325, "Processing of Department of Army Permits;" and CEQA and the State CEQA Guidelines. The EIS/EIR is organized as follows:

- The Abstract identifies the project title, lead agencies, an abstract, and comment submission information.
- The Executive Summary presents an overview of the Proposed Action and alternatives under consideration and associated environmental impacts; a listing of environmental impacts and mitigation measures; and impact conclusions regarding growth inducement, irreversible environmental changes, and known areas of controversy and issues to be resolved.
- Chapter 1.0, "Introduction and Statement of Purpose and Need," explains the NEPA and CEQA processes; lists the lead, cooperating, responsible, and trustee agencies that may have discretionary authority over the project; specifies the underlying project purpose/objectives and need for action, to which the lead agencies are responding in considering the proposed project and project alternatives; summarizes required permits, approvals, and authorizations; outlines the organization of the document; and provides information on public participation.
- Chapter 2.0, "Alternatives," presents the Proposed Action and the alternatives to the Proposed Action. This chapter constitutes the project description and describes the project components .This chapter also describes alternatives considered, but rejected from further consideration; and provides a summary matrix that compares the environmental consequences of the Proposed Action and alternatives under consideration.
- Chapter 3.0, "Affected Environment," is divided into 21 sections. Each of the sections is devoted to a particular issue area and describes the baseline or existing conditions.
- Chapter 4.0, "Environmental Consequences and Mitigation Measures," provides an analysis of impacts at an equal level of detail for the Proposed Action and alternatives under consideration and mitigation measures that would avoid or eliminate significant impacts or reduce them to a less-than-significant level, where feasible and available.
- Chapter 5.0, "Cumulative and Growth-Inducing Impacts and Other Statutory Requirements," provides a summary of and incorporates by reference the cumulative impacts contained in the Local Funding EIR, 2007 Landside EIR, and Phase 2 EIS. The "Cumulative Impacts" section also includes any new cumulative impacts, the cumulative impacts of the potential construction of the Phase 2 and Phase 3 projects simultaneously, and the Phase 3 Project contribution to cumulative impacts from implementation of the Phase 4 Project. The "Growth-Inducing" impacts section provides a summary of and incorporates by reference the growth-inducing impacts contained in the Local Funding EIR, 2007 Landside EIR, and Phase 2 EIS. The remainder of this chapter includes the following requirements of NEPA and CEQA that are not addressed elsewhere in this EIS/EIR: relationship between short-term uses of the environment and long-term productivity, significant and unavoidable environmental impacts, and irreversible and irretrievable commitments of resources.
- Chapter 6.0, "Regulatory Setting," summarizes Federal, state, regional, and local laws and regulations that apply to the project and describes the project's compliance with them.
- Chapter 7.0, "Consultation and Coordination," summarizes public and agency involvement activities, agency consultation and coordination, and Native American consultation.

- Chapter 8.0, "References," provides a bibliography of sources cited in the EIS/EIR and identifies the names and affiliations of persons who provided information used in preparing the document.

- Chapter 9.0, "List of Preparers," lists individuals who were involved in preparing this EIS/EIR.

- Chapter 10.0, "List of Recipients," lists the organizations and individuals receiving a copy and/or notice of the EIS/EIR.

- Chapter 11.0, "Index," contains the NEPA-required index for easy reference of topics and issues.

- Chapter 12.0, "Glossary," contains a list of commonly used terms in the EIS/EIR and their definitions.

- Appendices contain the background information that supports the EIS/EIR and can be found on the CD located in the back cover of the EIS/EIR. The appendices are as follows:

    - Appendix A, "Public Outreach"
    - Appendix B, "Hydraulics and Hydrology"
    - Appendix C, "Biological Resources"
    - Appendix D, "Cultural Resources"
    - Appendix E, "Air Quality Modeling Results"
    - Appendix F, "Noise Modeling Results"
    - Appendix G, "SAFCA and Garden Highway Settlement Agreement"
    - Appendix H, "Construction Details"
    - Appendix I, "Alternatives Formulation and Screening Details"
    - Appendix J, "NEPA and/or CEQA Standards and Checklist Applicable to the Elkhorn Borrow Area"
    - Appendix K, "Documents Incorporated By Reference (Cover and Title Pages Only)"

1.10 RELATED NEPA DOCUMENTS AND DOCUMENTS RELIED ON IN PREPARATION OF THIS EIS/EIR

The following NEPA documents, previously prepared by USACE, were reviewed by USACE staff in the analysis of the project:

- April 1991, *Draft American River Watershed Investigation California Feasibility Report: Part I—Main Report* and *Part II—Draft Environmental Impact Statement/Environmental Impact Report*;

- December 1991, *American River Watershed Investigation (AWRI) California Feasibility Report (FR): Part I—Main Report* and *Part II—Environmental Impact Statement/Environmental Impact Report*;

- December 1991, AWRI FR, Volume 2, Appendix G: Section 404 Evaluation;

- March 1996, *Supplemental Information Report, American River Watershed Project, California: Part I—Main Report* and *Part II—Final Supplemental Environmental Impact Statement (FSEIS)/Environmental Impact Report*;

- June 27, 1996, Chief's Report on FSEIS, signed by Acting Chief of Engineers, Major General Pat M. Stevens; and

- July 1, 1997, ROD on FSEIS, signed by Director of Civil Works, Major General Russell L. Furman.

The authors of the EIS/EIR have relied on several background documents in reaching many of the conclusions. These documents provide background information, are sources of technical information, or are part of the

planning context for the overall program. Some of these documents form the foundation of the technical analysis conducted in this EIS/EIR. These documents are as follows:

- *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (Local Funding EIR);
- *Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project* (2007 Landside EIR);
- *Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA* (Phase 2 Project EIS);
- *Sacramento Area Flood Control Agency, Natomas Levee Improvement Program, Summary Report on Hydraulic Impact Analyses* (**Appendix B1**);
- *Draft Evaluation of Potential Groundwater Impacts Due to Proposed Construction for Natomas Levee Improvement Program* (**Appendix B2**);
- Wetland delineation verification letters from USACE (letter numbers 200300332, 200300776, 200300776, 200300795, 200700211) (**Appendix C**);
- *Environmental Site Assessment, Common Features GRR Project, Sacramento, CA*; and
- *Natomas Levee Improvement Program Initial Site Survey and Phase I Environmental Site Assessment*.

Incorporation by reference is encouraged by both NEPA (40 CFR 1500.4, 1502.21) and CEQA (State CEQA Guidelines Section 15150). Both NEPA and CEQA require brief citation (below) and summary of the referenced material, as well as the public availability of this material. CEQA also requires citation of the state identification number of the previous EIRs cited (State CEQA Guidelines Section 15150). Citations (including the state identification number) are provided below; relevant portions of these documents are summarized throughout this EIS/EIR; and printed copies of these documents are available to the public at SAFCA's office at 1007 7th Street, 7th Floor, Sacramento, California, during normal business hours, and are also available on SAFCA's Web site, at http://www.safca.org/Programs_Natomas.html. The following documents are incorporated by reference:

- *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (SAFCA 2007a), State Clearinghouse Number 2006072098;
- *Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project* (SAFCA 2007c), State Clearinghouse Number 2007062016; and
- *Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project* (USACE 2008).

2.0 ALTERNATIVES

2.1 INTRODUCTION

This chapter describes the alternatives that were considered to provide additional flood risk reduction to the Natomas Basin consistent with the objectives in Chapter 1.0, "Introduction and Statement of Purpose and Need." The Natomas Levee Improvement Program (NLIP) Phase 3 Landside Improvements Project (Phase 3 Project) builds upon a program of improvements previously analyzed in the Local Funding EIR, the Landside EIR and Supplemental EIR, and Phase 2 EIS for achieving flood risk reduction for the 53,000-acre Natomas Basin, which is encircled by 42 miles of levees (**Plate 1**). Although they provide contrasting advantages and disadvantages, each of the alternatives is considered feasible for the purpose of analysis based on relevant economic, environmental, social, technological, and legal factors. Three alternatives were evaluated at an equal level of detail:

- No-Action Alternative,
- Proposed Action (Adjacent Setback Levee), and
- Levee Raise-in-Place Alternative.

These alternatives represent a reasonable range of alternatives to the Proposed Action, consistent with the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) and when considered in the context of prior alternatives analyses performed in previous documents from which the current analysis is tiered (see Section 2.1.4 below and Section 3.1.3 in **Appendix I**, "Alternatives Formulation and Screening Process." The action alternatives under consideration have been formulated to feasibly accomplish most of the primary objectives of the project as discussed in Chapter 1.0, "Introduction and Statement of Purpose and Need," of this EIS/EIR. In particular, the action alternatives provide early compliance to meet requirements for certification of 100-year flood protection criteria and are compatible with construction of additional components to meet "200-year" flood protection criteria for urban areas. The action alternatives include components that could avoid or substantially lessen one or more of the significant effects of the preferred alternative.

2.1.1 NEPA/CEQA REQUIREMENTS FOR EVALUATION OF ALTERNATIVES

2.1.1.1 NEPA REQUIREMENTS

The NEPA Council on Environmental Quality Regulations (40 CFR 15012.14) require that an EIS include:

- an objective evaluation of reasonable alternatives;
- identification of the alternatives considered but eliminated from detailed study, along with a brief discussion of the reasons that these alternatives were eliminated;
- information that would allow reviewers to evaluate the comparative merits of the proposed action (i.e., proposed project) and alternatives;
- consideration of the no-action alternative;
- identification of the agency's preferred alternative, if any; and
- appropriate mitigation measures not already included in the proposed action or alternatives.

NEPA requires the analysis of the proposed action and of all alternatives at a substantially similar level of detail. The Council on Environmental Quality Regulations (40 CFR 1502.14) require agencies to rigorously explore and objectively evaluate all reasonable alternatives and to devote substantial treatment to each alternative considered, including the proposed action. All alternatives considered, including the preferred alternative, must be evaluated compared to the No-Action Alternative (future without project).

2.1.1.2 CEQA REQUIREMENTS

Section 15126.6(a) of the State CEQA Guidelines requires that an EIR:

(1) describe a range of reasonable alternatives to a proposed project, or to the location of the project, that would feasibly attain most of the basic project objectives but would avoid or substantially lessen any of the significant effects of the project; and

(2) evaluate the comparative merits of the alternatives.

An EIR need not consider every conceivable alternative to a proposed project but must consider a range of reasonably potentially feasible alternatives that will foster informed decision making and public participation.

The range of alternatives required to be evaluated in an EIR is governed by a "rule of reason" that requires the EIR to set forth only those alternatives necessary to permit a reasoned choice. The EIR need examine in detail only those alternatives that the lead agency determines could feasibly attain most of the basic project objectives, taking into account factors that include site suitability; economic viability; availability of infrastructure; general plan consistency; other plans or regulatory limitations; jurisdictional boundaries; and whether the proponent can reasonably acquire, control, or otherwise have access to the alternative site (State CEQA Guidelines Section 15126.6[f]). CEQA does not require the alternatives to be evaluated at the same level of detail as the proposed project.

The State CEQA Guidelines recommend that an EIR should briefly describe the rationale for selecting the alternatives to be discussed, identify any alternatives that were considered by the lead agency but were eliminated as infeasible, and briefly explain the reasons underlying the lead agency's determination (State CEQA Guidelines Section 15126.6[c]).

An EIR must also evaluate a "no-project" alternative, which represents "what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services." (State CEQA Guidelines Section 15126.6[e][2]). Under CEQA, the no-project alternative like all of the alternatives is compared to the proposed project.

2.1.2 ALTERNATIVES SCREENING

SAFCA formulated the Proposed Action and a reasonable range of project alternatives that are intended to achieve the specific project objectives through the following steps:

- identification of the deficiencies in the Natomas levee system that must be addressed to provide "200-year" flood protection,
- identification of the deficiencies that must be addressed to provide at least 100-year flood protection as quickly as possible,
- identification of feasible remedial measures to address the deficiencies,
- determination of the likely environmental impacts of the remedial measures,

- development of a reasonable range of flood damage reduction alternatives for implementing the remedial measures, and

- addition of measures to ensure that each alternative would improve aviation safety, minimize impacts to significant cultural resource sites, and enhance habitat values.

Alternatives screening for the overall NLIP has been undertaken by SAFCA in a systematic manner through several environmental documents as summarized in this chapter and detailed in **Appendix I**, "Alternatives Formulation and Screening Details." A description of the flood protection measures that SAFCA considered for developing alternatives is provided below.

2.1.3 TYPES OF FLOOD RISK REDUCTION MEASURES CONSIDERED

Plan formulation in water resources is an iterative process that involves identifying, evaluating, and comparing measures and preliminary alternatives to develop a reasonable range of final alternative plans for consideration by decision makers and the general public. For the NLIP Landside Improvements Project, engineering measures were developed and considered that alone or in various combinations would address the project purpose.

The engineering measures that were considered for the Phase 3 Project must meet several criteria. The design selected must adequately improve performance of the levee so that Federal Emergency Management Agency (FEMA) accreditation is possible. Generally, the requirements are to provide enough levee raise so that the levee height is adequate, levee stability meets criteria, and/or reduce seepage to acceptable levels either through or beneath the levee (**Plate 3**).

2.1.3.1 LEVEE RAISE

A levee raise may be necessary only to meet the 200-year protection standard required by the State for urbanized areas, such as the Natomas Basin.

For this Phase 3 Project, a levee raise is possible using either of two engineering design methods to meet flood protection criteria compatible with the engineering design selected for the Phase 2 Project: raising the existing levees in their current alignments (levee raise-in-place) or constructing a new larger levee adjacent to the existing levee (new adjacent levee).

Levee Raise-in-Place

A levee raise-in-place would require the existing levee footprint to be widened at its base on one or both sides. While the levee footprint (its base) size may not be substantially altered, mitigation for loss of habitat would be required by various regulatory agencies. Where the widening results in fill of waters of the United States, including wetlands, mitigation, generally at a 1:1 replacement ratio, would be required. Where the widening occurs on the land side and trees that provide habitat or are otherwise protected exist, the mitigation requirement is to plant replacement woodlands. In some instances, irrigation and drainage ditches and canals exist at the toe of the levee, and would require relocation. Widening of the existing levee may require the purchase of additional easements and/or rights-of-way, including areas for utilities and planting/replacement woodlands and other habitats. Proper construction of the widened levee may require excavation of a keyway trench in the foundation area at the toe of the levee.

New Adjacent Levee

The concept of an adjacent levee is that the levee prism would be shifted landward, such that much of the vegetation on the water side of the existing levee is less likely to need to be cleared for levee operation and maintenance. This design reduces the impact of vegetation removal on the water side, but requires excavation of

additional suitable material to build the adjacent structure. The irrigation and drainage ditches and canals that exist at the toe of the levee may require relocation further to the landside. Construction of an adjacent levee may also require the purchase of additional easements and/or rights of way, including areas for utilities and planting of replacement woodlands and other habitats. Proper construction of the adjacent levee foundation requires excavation of an inspection trench in the foundation soils. Because the Natomas Basin's natural levees have been augmented by human efforts, it is possible to find buried prehistoric features at considerable depth in the landside footprint. Where a levee raise is required, the adjacent levee height would be greater than that of the existing levee. Where a levee raise is not required, the adjacent levee height would be the same as the existing levee.

A trench, usually 6 feet deep and 12 feet wide, is constructed at the base of the levee to allow visible inspection for shallow foundation conditions and the presence of buried utilities. In some instances, relocation of irrigation and drainage ditches and canals may be necessary to construct the inspection trench. In addition to the inspection trench, the landside toe of the existing levee, within the footprint of the new adjacent levee, would be stripped to a depth of approximately one foot to remove vegetative matter and topsoil material from the adjacent levee foundation.

2.1.3.2 SEEPAGE REMEDIATION

Existing seepage remediation in the Natomas Basin has primarily addressed through-seepage. Through-seepage is the movement of water through the levee itself, when high-flow conditions, and/or wind and wave action exist on the water side of the levee. The through-seepage may be addressed by construction of cutoff walls through the levee prism or a drained stability berm on the landside slope. The cutoff walls provide a low permeability barrier to water flow through the levee. Underseepage occurs below the levee prism, and is caused by the buildup of water pressure in the subsurface, when high river stages are present on the water side of the levees. This pressure can be great enough to force water through the earthen foundation layers under the levee. The water finds a pathway of less resistance and exits at the landside ground surface (**Plate 4**). Current construction methods can correct underseepage and be compatible with the methods employed for Phase 2 Project construction.

Cutoff Walls

Cutoff walls use specialized earthen materials (bentonite clay) that are installed into the center of the levee. Successful construction of cutoff walls often requires a 24 hours per day/7 days per week (24/7) construction schedule, so that the cutoff wall material keeps its proper consistency. Specialized equipment allows the cutoff walls to reach deep into the subsurface, to depths of 120 feet (**Plate 11**). Often the levee crown is "degraded" meaning that it is excavated down to a wide platform so that the construction equipment can install the cutoff wall.

Due to the long history of natural and human-enhanced levee buildup in the Natomas Basin, it is not unusual to find conditions of underseepage to depths greater than the maximum depth of a cutoff wall. In those cases, a seepage berm and relief wells may be used to protect against underseepage.

Seepage Berms

Seepage berms are wide, shallow features with relatively flat slopes graded to drain landward. They are typically constructed using material excavated from borrow sites. In some cases, a 1- to 1.5-foot-thick drainage layer consisting of sand or drainrock encapsulated in geotextile fabric is placed on the ground below the seepage berm. Seepage berms may extend up to 500 feet landside of the toe of the levee or the adjacent levee (**Plate 12**). In areas of limited space, seepage berms are constructed with relief wells at the landside toe of the seepage berms.

It is possible to construct a seepage berm using specialized equipment that minimizes vibration and pressure on the immediate subsurface environment. This construction method is often used where sensitive historical features may be expected near the ground surface, and relief wells are omitted. A seepage berm without relief wells

extends the levee footprint farther landside, and depending upon land use, may cause relocation of permanent structures or reduction of farm field size, as well as other environmental impacts.

Relief Wells

Relief wells are controlled artificial springs that relieve the confined water pressures to safe values, thus preventing the removal of soil via piping or internal erosion caused by the uplift pressures beneath elements of the levee or beneath landward soil next to the levee. Relief wells are usually spaced about 50 to 150 feet apart to allow water to flow without pumping during times of high water table. Piezometers are used as a tool to verify relief well performance by measuring the hydrostatic pressure between the wells. Because relief wells may only flow on an intermittent basis sometimes several years apart, it is necessary to conduct regular maintenance of relief wells to ensure that they perform properly (**Plate 13**).

2.1.4 ALTERNATIVES CONSIDERED IN PREVIOUS ENVIRONMENTAL ANALYSES AND INCORPORATED BY REFERENCE

The analysis of alternatives performed in the previous environmental review documents from which the Phase 3 Project EIS/EIR is tiered are summarized in **Appendix I**, "Alternatives Formulation and Screening Details." The alternatives analyses from the documents listed below are incorporated by reference, herein. The material summarized in **Appendix I** is provided to demonstrate the scope of analysis that has already been performed and thus shows which alternatives have been foreclosed by previous analysis.

Incorporation by reference is encouraged by both NEPA (40 CFR 1500.4, 1502.21) and CEQA (Section 15150). Both NEPA and CEQA require brief citation (below) and summary of the referenced material (**Appendix I**) and the public availability of this material. CEQA also requires citation of the state identification number of the previous EIR or EIRs cited (Section 15150). Printed copies of relevant documents are available to the public at USACE's office at 1325 J Street, Sacramento, California and at SAFCA's office at 1007 7th Street, 7th Floor, Sacramento, California.

- *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (SAFCA 2007a), State Clearinghouse Number 2006072098;
- *Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project* (SAFCA 2007b), State Clearinghouse Number 2007062016; and
- *Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project* (USACE 2008).

2.1.5 ALTERNATIVES CONSIDERED, BUT ELIMINATED FROM FURTHER CONSIDERATION

Numerous alternatives have been considered by SAFCA to provide flood risk reduction to the Natomas Basin. These alternatives have been evaluated and eliminated from further consideration during completion of previous environmental documents. This section briefly summarizes alternatives considered but eliminated in these documents to demonstrate the scope of analysis that has already been performed. More detailed information on alternatives considered but eliminated is provided in **Appendix I**, "Alternatives Formulation and Screening Details."

2.1.5.1 ALTERNATIVES EVALUATED AND ELIMINATED IN PREVIOUS SAFCA NATOMAS LEVEE IMPROVEMENT PROGRAM ENVIRONMENTAL DOCUMENTS

The following alternatives that could contribute to addressing the Natomas Basin's flood problems and needs were reviewed and eliminated from further consideration as described below:

- **Yolo Bypass Improvements.** This measure would involve lengthening the Fremont Weir and widening the Yolo Bypass to increase the amount of flood water conveyed through the bypass and reduce the amount of flood water conveyed through the Sacramento River channel downstream of the weir. This alternative was eliminated because (1) it would be too costly for SAFCA to implement; (2) levee height increases and substantial seepage and slope stability remediation would still be required for the perimeter levee system, adding to costs; (3) these improvements lie outside of SAFCA's jurisdiction and would require Federal, state, and local cooperation and funding; and (4) the project objective of restoring 100-year flood protection to the Natomas Basin could not be achieved as quickly as possible. (Considered and eliminated in Phase 2 Project EIS.)

- **Reduced Natomas Urban Levee Perimeter.** This measure would involve construction of a cross levee running east to west across the Natomas Basin along an alignment north of Elkhorn Boulevard to protect existing developed areas in the City and County of Sacramento. This alternative was eliminated because (1) it is inconsistent with current Federal and state authorizations and would strand Federal, state, and local investments already made in improving the NCC south levee and Sacramento River east levee pursuant to past Congressional authorization; (2) it would result in the need to raise State Route (SR) 99/70 or otherwise protect SR 99/70 from flooding; (3) it would divide Reclamation District (RD) 1000 and disrupt several portions of the Natomas Basin irrigation and drainage system and require reconfiguration of these systems; (4) it would present significant barriers to achieving the goals of the Natomas Basin Habitat Conservation Plan (NBHCP); (5) it would have substantially greater costs than other alternatives without achieving any additional flood damage reduction benefit; and (6) it would leave a portion of the Basin currently planned for development by Sutter County (i.e., *Sutter Pointe Specific Plan* mixed-use development project) outside the urban levee perimeter and likely cause Sutter County to exercise its rights under SAFCA's joint exercise of powers agreement to prevent the expenditure of Consolidated Capital Assessment District funds on this measure. (Considered and eliminated in Local Funding EIR and Phase 2 Project EIS.)

- **Construction of a New Setback Levee.** This alternative would involve construction of a 5-mile long levee along the northern reaches of the Sacramento River east levee parallel to the existing levee alignment but set back from the existing alignment by 500–1,000 feet. This alternative was eliminated because it is infeasible because of (1) the presence of waterside residences along the existing levee from the southern end of Reach 2 of the Sacramento River east levee in the north to the American River north levee in the south, and the need to maintain access to these residences from Garden Highway; (2) the proximity of the Sacramento River east levee to Sacramento International Airport (Airport), and the need to prevent project features from increasing potential hazards to aviation safety; and (3) the possibility that utility relocations (power poles) and flood damage reduction measures could encroach into surface slopes of runway approach zones. (Considered and eliminated in Phase 2 Project EIR and Phase 2 Project EIS.)

- **Raise Levee in Place with a 1,000-Foot Levee Setback in the Upper 1.4 Miles along the Sacramento River East Levee.** This alternative would have provided a location for a substantial amount of tree planting on the water side of the setback levee, contributing to the offsetting mitigation for the loss of the trees that may need to be removed along the existing levee to meet USACE criteria. This alternative was eliminated because it was unlikely that the new setback levee would provide 100-year flood protection per USACE criteria. (Considered and eliminated in Phase 2 Project EIR and analyzed, but not selected as the Proposed Action, in Phase 2 Project EIS.)

- **Construct an Adjacent Setback Levee with a 500-Foot Levee Setback in the Upper 1.4 Miles along the Sacramento River East Levee.** This alternative was evaluated because it would provide the opportunity for partially offsetting the loss of landside tree groves through the establishment of new riparian plantings in the levee setback area as well as woodland plantings on the land side of the adjacent setback levee. This alternative was eliminated because: it would require substantially greater quantities of borrow material with greater impacts on important farmland and transportation and circulation. (Considered and eliminated in Phase 2 Project EIR and analyzed, but not selected as the Proposed Action, in Phase 2 Project EIS.)

- **No SAFCA Levee Improvements—Private Levees in Natomas.** This alternative was analyzed assuming that there would be no SAFCA project providing flood protection in the Basin, thus causing private developers to separately fund and implement individual flood protection in the form of private compartment levees that would protect new developments. This alternative was eliminated because it would (1) only partially meet the first objective of providing 100-year flood protection, (2) potentially lead to increased fragmentation of habitat for special-status species, and (3) increase projected flood damages without a commensurate reduction in flood risk. (Considered and eliminated in Local Funding EIR and Phase 2 Project EIR; the effects of this alternative are summarized in **Appendix I**.)

- **Natomas 100-Year Protection.** SAFCA analyzed the impacts associated with creation of one new assessment district, which would provide only 100-year flood protection to the Natomas Basin, and which would use funding raised through existing Capital Assessment District Number 3 to provide the local share of the cost of completing improvements to provide 100-year flood protection to the lower American River and South Sacramento Streams Group areas (SAFCA 2007a). This alternative was eliminated because it would fail to provide groundwork for the creation of "200-year" protection over time (SAFCA 2007a). Because this alternative represents an alternative to the proposed funding mechanisms and not an alternative to the proposed levee improvements, this alternative was not considered to be an alternative to the Phase 2 Project and was not included in the Phase 2 Project EIS. (Considered and eliminated in Local Funding EIR.)

2.1.5.2 ALTERNATIVES EVALUATED AND ELIMINATED IN THIS EIS/EIR

The following additional alternatives that could contribute to addressing the Natomas Basin's flood problems and needs were evaluated and eliminated from further consideration either in the Phase 2 EIS (No-Action Alternative–Airport Compartment Levee) or in this EIS/EIR (Cultural Resources Impact Reduction Alternative):

- **No-Action Alternative–Airport Compartment Levee**. The Phase 2 Project EIS evaluated and eliminated from further consideration the No-Action Alternative–Airport Compartment Levee Alternative. The prior discussion of which is hereby incorporated by reference, is summarized as follows (see also **Appendix I**, "Alternatives Formulation and Screening Details," for a summary of the impacts associated with the Airport Compartment Levee).With no authorization of the Phase 3 Project, SAFCA would not be able to provide the Natomas Basin with at least a 100-year level of flood protection by the end of 2011 and would not be able to facilitate achieving a "200-year" level of protection by the end of 2012. Federal and state floodplain regulations would prevent new development in most of the Natomas Basin. The Airport would either be compelled to operate within its existing footprint, abandoning its current plans for modernization and expansion, or, alternatively, the Airport may construct its own limited flood damage reduction structure (i.e., a ring levee) to protect existing facilities and its expansion area. This alternative is eliminated because: (1) construction of a separate levee around the Airport would be under the responsibility and jurisdiction of another agency (Sacramento County Airport System [SCAS]), over which SAFCA would have no jurisdiction, and would require a lengthy process that is completely separate from the Proposed Action; (2) the timeline for that process is unknown and there are no design plans that would enable an accurate evaluation of potential environmental impacts; and (3) the action would require a separate CEQA and potentially NEPA environmental process and analysis. (Considered and eliminated in Phase 2 Project EIS/EIR.) In addition to the reasons provided in the Phase 2 EIS, implementation of the Airport Compartment Levee would not meet any of the goals and objectives of the project; the residents, residences, and businesses

within the Natomas Basin would not receive flood protection; implementation of the Airport Compartment Levee would only protect the Airport; and SCAS has not proposed such a project and, therefore, it is not considered "reasonably foreseeable."

- **Cultural Resources Impact Reduction Alternative.** The Proposed Action includes construction of deep cutoff walls in the Sacramento River east levee Reaches 5A–9B, which have the potential to result in significant and unavoidable impacts on known prehistoric resources, previously unidentified cultural resources, and human remains, as described in Section 4.10, "Cultural Resources." Construction of a 500-foot-wide seepage berm rather than deep cutoff walls would avoid the deep ground-disturbing work that may adversely affect potential cultural resources while still achieving flood damage reduction objectives. This alternative was eliminated because (1) environmental impacts on nine environmental topic areas (hydrology and hydraulics, sensitive aquatic habitats, vegetation and wildlife, special-status terrestrial species, paleontological resources, transportation and circulation, air quality, visual resources, utilities and service systems, and hazards and hazardous materials) would be potentially more substantial than those associated with the Proposed Action; and (2) there would be a net increase in the number, intensity, and severity of environmental impacts relative to the Proposed Action. (Considered and eliminated in Phase 3 Project EIS/EIR.) (See **Appendix I**, "Alternatives Formulation and Screening Details," for analyses of each specific environmental issue area.)

2.1.6 ALTERNATIVES CARRIED FORWARD FOR EVALUATION IN THIS EIS/EIR

The following alternatives were carried forward for detailed analysis in this EIS/EIR and are described below:

- **No-Action Alternative**—Under NEPA, the expected future without-project conditions; under CEQA, the existing condition at the time the notice of preparation was published (July 18, 2008), as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved.

- **Proposed Action**—Construction of an adjacent setback levee along the Sacramento River east levee improvements to the PGCC west levee and the NEMDC west levee from Elkhorn Boulevard to Northgate Boulevard.

- **Levee Raise-in-Place Alternative**—Raising of the Sacramento River East Levee in place in addition to improvements to the PGCC west levee and the NEMDC west levee from Elkhorn Boulevard to Northgate Boulevard.

The above three alternatives are described in detail in the remaining portions of this chapter. Additional construction details for the Proposed Action and Levee Raise-in-Place Alternative are presented in **Appendix H**, "Construction Details." The Proposed Action and additional action alternative (the Levee Raise-in-Place Alternative) were developed for consideration for the Phase 3 Project with a focus on improvements to the Sacramento River east levee (Reaches 5A–9B). Phase 3 Project improvements to the PGCC west levee, the NEMDC west levee, and landscape and irrigation/drainage system modifications would be similar under the Proposed Action and the Levee Raise-in-Place Alternative.

Development of the Proposed Action and the Levee Raise-in-Place Alternative included substantial planning based on consideration of effects on wetlands and other waters of the United States, woodlands, giant garter snake habitat, and other sensitive habitats. Accordingly, levee improvements were designed to avoid or minimize such effects where practicable and feasible. However, several agricultural canals or portions of canals and small seasonal wetlands exist near the levee toe along the Sacramento River east levee, PGCC west levee, and NEMDC west levee. These would require filling under either the Proposed Action or the Levee Raise-in-Place Alternative because their proximity to the existing levees places them within the expanded landside levee footprint or adjacent maintenance access. Similarly, portions of several woodland groves extend into the footprint of the proposed flood damage reduction features along the land side of the Sacramento River east levee under the

Proposed Action and the Levee Raise-in-Place Alternative and would need to be removed and/or relocated. Consequently, effects on wetlands and other waters of the United States and on other habitats along the land side of the levees are very similar for the Proposed Action and the Levee Raise-in-Place Alternative, and the same compensation strategies are proposed for unavoidable effects.

The Levee Raise-in-Place Alternative differs from the Proposed Action in that it would result in the (1) removal of waterside trees along the Phase 3 Project reaches of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments, and (2) loss of waters of the United States due to the implementation of erosion control improvements along the waterside toe of Sacramento River east levee. These effects would require a different compensation strategy than for the Proposed Action because, under the Proposed Action, these actions would not occur on the waterside of the levee.

In terms of flood reduction system design, the Proposed Action and the Levee Raise-in-Place Alternative differ in terms of how they would achieve the required levee height increases along the Sacramento River east levee. Therefore, the differences between the Proposed Action and the Levee Raise-in-Place Alternative, including effects on habitats, are the result of these Sacramento River east levee design differences.

2.2 NO-ACTION ALTERNATIVE

2.2.1 NO-ACTION ALTERNATIVE—NO FLOOD DAMAGE REDUCTION MEASURES

For the purposes of NEPA compliance, the No-Action Alternative serves as the baseline against which the impacts and benefits of the action alternatives are evaluated. The No-Action Alternative consists of the conditions that would be reasonably expected to occur in the foreseeable future if no additional permissions to alter the existing levees or discharge dredged or fill material into waters of the United States would be granted.

Under the no-action scenario, SAFCA would not be permitted by USACE to undertake the Phase 3 Project improvements under Sections 408, 404, or 10 on the Natomas Basin perimeter levee system. However, given the known deficiencies in these levees and their inclusion as part of the Federal flood damage reduction system, it can be assumed that USACE and/or the State of California would repair the Natomas levee system at some time in the future to meet the Federal and/or State flood risk reduction objectives associated with the Federal flood damage reduction system. As discussed in Section 1.5.10, "General Re-evaluation of the Common Features Project," USACE is preparing a General Re-evaluation Report (GRR) on the Common Features Project, including Natomas Basin levee improvements, that is expected to be presented to Congress in 2010. The earliest that Federal construction under a Congressionally reauthorized USACE project could begin would be 2011 or 2012. Therefore, it is assumed that USACE and/or the State of California would begin repairs on the Natomas Basin levee system in 2011 at the earliest and would complete the improvements providing 100-year flood protection no sooner than 2013. Based on the criteria that SAFCA, in coordination with USACE and the State, has used to select alternatives for detailed analysis, it is reasonable to assume that one of the two action alternatives described below would be implemented by USACE and/or the State and that the environmental effects of project construction would be the same as, or very similar to, those of the action alternatives evaluated in this EIS/EIR. In the period before implementation of flood damage reduction measures for the Natomas Basin, however, there would remain a high potential for a major levee failure and flooding of the Natomas Basin (USACE evaluation of geotechnical information and other data indicate that a future flood event with an approximately 3% or greater probability of occurring in any year could cause a major levee failure).

Therefore, the No-Action Alternative analyzed in this EIS/EIR consists of two components: No Project Construction and Potential Levee Failure. "No Project Construction" refers to the impacts that would result because no flood damage reduction measures would be constructed. "Potential Levee Failure" refers to the impacts that could occur if the Natomas Basin perimeter levee system failed. These two components of the No-Action Alternative are further described below and the analysis contained in Chapter 4.0, "Environmental Consequences and Mitigation Measures," is presented using these subheadings.

2.2.1.1 NO PROJECT CONSTRUCTION

The No-Action Alternative in this analysis consists of the conditions that would likely prevail in the Natomas Basin if no action at all were taken by SAFCA, the State, or USACE to further improve the Basin's perimeter levee system beyond the accomplishments of the Sacramento Urban Levee Reconstruction Project and the North Area Local Project (NALP) and NLIP Phase 1 and Phase 2 Projects. Under this scenario key segments of this system would continue to provide less than 100-year flood protection, and the entire Natomas Basin will be permanently designated as a special flood hazard area subject to development restrictions and mandatory flood insurance requirements pursuant to the regulations of the National Flood Insurance Program (NFIP). SAFCA would not provide the Natomas Basin with at least a 100-year level of flood protection by the end of 2010 and would not be able to facilitate achieving a "200-year" level of protection by the end of 2012.

To meet USACE requirements as described in *Guidelines for Landscape Planting and Vegetation Management at Floodwalls, Levees, and Embankment Dams* (USACE 2000), a substantial number of structural features may need to be removed from the water side of the existing levee. As part of its ongoing operations and maintenance (O&M) activities, RD 1000 would be initially responsible for removal of any encroachments that would threaten levee integrity. Without construction of an adjacent setback levee, approximately 22.5 acres of vegetation would require removal within the Phase 3 Project footprint. Although Chapter 4.0, "Environmental Consequences and Mitigation Measures," discusses the impacts related to the No-Action Alternative, it is not appropriate in this EIS/EIR to propose mitigation measures for the No-Action Alternative because SAFCA as the project proponent, has no authority or jurisdiction over USACE's proposed guidelines, impacts, or timing or implementation of mitigation required to mitigate impacts as a result of implementation of such guidance. Mitigation implementation would be the responsibility of USACE and will be the subject of a future, separate environmental document prepared by USACE. Environmental permits and other regulatory approvals would also be required, which may include: California Fish and Game Code Section 1602 Streambed Alteration Agreement, Clean Water Act Section 401 permit, and/or Clean Water Act Section 404 permit.

Without improvements, Federal and State floodplain regulations would effectively prevent most new development in most of the Natomas Basin. Existing residential, commercial, and industrial development would continue to be concentrated in the southeastern portion of the Basin, south of Elkhorn Boulevard, occupying approximately one-third of the 53,000 acres encompassed by the perimeter levee system. Approximately two-thirds of the Basin, generally north of Elkhorn Boulevard, would remain in some form of agricultural, agricultural support, or open space use along with Airport uses. The Airport may be compelled to operate within its existing footprint, abandoning its current plans for modernization and expansion; alternatively, the Airport may construct its own limited flood damage reduction structure (i.e., a ring levee) to protect existing facilities and its expansion area. As of December 31, 2007, all agricultural leases on Airport property expired and have not been renewed. Some new development could occur along the eastern fringe of the basin where existing high ground could support new structures elevated above the 100-year base flood elevation. The special flood hazard designation in the Natomas Basin would interrupt the regional blueprint for future (2030) growth adopted by the Sacramento Area Council of Governments (SACOG) and Valley Vision in 2006 (**Plate 14**). Up to 60,000 dwelling units and associated commercial and industrial developments that the blueprint anticipates will be located in the Natomas Basin would be need to be redirected to other areas in the region over the next two decades. The Basin's existing residential, commercial, and industrial structures and their contents, with a replacement value of approximately $8.2 billion, or approximately $7.2 billion if the Airport facilities are excluded, would remain subject to a relatively high risk of flooding. The risk of environmental damage resulting from flooding in the urbanized portion of the Basin would remain relatively high.

2.2.1.2 POTENTIAL LEVEE FAILURE

The same conditions with respect to development within the Natomas Basin as described above for the No Project Construction component of the No-Action Alternative would exist for the Potential Levee Failure component. Without additional improvements to the Natomas perimeter levee system, wind and wave run-up or seepage

conditions could cause portions of this system to fail, triggering widespread flooding and extensive damage to the Basin's existing residential, commercial, agricultural, and industrial structures. Extensive damage to utilities, roadways, and other infrastructure systems would also likely occur. The magnitude of the flood damage would depend upon the location of the levee breach, severity of the storm, and river flows at the time of a potential levee failure.

2.2.2 NO-ACTION ALTERNATIVE—NATOMAS LEVEE IMPROVEMENT PROGRAM PHASE 1 AND PHASE 2 PROJECTS IMPLEMENTATION ONLY

Under this alternative, it is assumed that USACE has authorized construction of the Phase 1 and Phase 2 Projects only, which have independent utility from the Phase 3 Project. The Phase 3 Project would not be authorized. Under this alternative, the following Phase 1 Project and Phase 2 Project activities would occur:

- **NCC south levee improvements: Levee raising and seepage remediation**—Raise and realign the NCC south levee to provide additional levee height and more stable waterside and landside slopes and to reduce the need for removal of waterside vegetation. Construct a seepage cutoff walls through the levee crown in Reaches 1–7.

- **Sacramento River east levee Reaches 1–4B: Levee raising and seepage remediation**—Construct an adjacent setback levee from the NCC to the end of Reach 4B, raised where needed to provide adequate levee height, with a combination of cutoff walls, seepage berms, and relief wells for seepage remediation where required.

- **Relocation of the Elkhorn Canal (highline irrigation canal) between the North Drainage Canal and Elkhorn Reservoir**—Approximately 10,500 feet of the Elkhorn Canal would be relocated and constructed several hundred feet east of the landside toe of the Sacramento River east levee in reaches 4B–6A.

- **Construction of new Giant Garter Snake (GGS)/Drainage Canal between the North Drainage Canal and Elkhorn Reservoir**—Construct a new canal designed to provide drainage and associated giant garter snake habitat (referred to as the "GGS/Drainage Canal") from the North Drainage Canal to the slough east of Elkhorn Reservoir in Reaches 4B–6B.

- **Removal of a deep culvert at the location of Pumping Plant No. 2**—Excavate and remove approximately 400 feet of the existing levee section adjacent to the RD 1000 Pumping Plant No. 2 site to expose a deep culvert and possible voids under the levee; remove the deep culvert; reconstruct the levee adjacent to the pumping plant sump with levee embankment fill; and demolish, remove, and relocate the pumping plant remnants within the project footprint.

- **Habitat creation and management**—Establish giant garter snake habitat features in the new GGS/Drainage Canal. Recontour and create managed marsh and grassland on lands used as borrow sources to offset project effects on giant garter snake and Swainson's hawk habitats. Establish grassland on the adjacent setback levee slopes and seepage berms. Install woodland plantings to offset the loss of portions of tree groves within the landside levee footprint.

- **Right-of-way acquisition**—Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites, and to prevent encroachments into the flood damage reduction system.

The environmental impacts of the Phase 1 Project are addressed in detail in the Local Funding EIR. The environmental impacts of the Phase 2 Project are addressed in detail in the Phase 2 Landside EIR, Supplemental EIR, and Phase 2 EIS, and summarized in **Table 2-1**.

Table 2-1
Summary of Phase 2 Project Impacts

Issue Area	Summary of Environmental Impact
Agricultural Resources	Additional land for maintenance activities and encroachment prevention would be associated with widening the landside footprint of the NCC south levee and associated maintenance access corridor, substantially widening the Sacramento River east levee flood damage reduction facilities. Soil borrow sites for the improvements include the Brookfield site and the RD 1001 site. Borrow material for the Sacramento River east levee improvements would come from the Airport north bufferlands sites, the Dunmore site, or potentially the Sutter Pointe site. These borrow sites are in areas classified as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. With the exception of the RD 1001 site, the removal of borrow from all borrow sites would entail the preservation and replacement of the topsoil on these parcels, thus retaining their potential use for agriculture. Therefore, the use of agricultural sites for borrow would not be a permanent conversion to nonagricultural uses. If the RD 1001 borrow site is used, is it assumed that the conversion from agricultural use and the loss of Important Farmland would be permanent.
Land Use and Socioeconomics	The No-Action Alternative—Phase 2 Project Only would be consistent with Policy B.10 of the *City of Sacramento General Plan* because it would allow construction of the Phase 2 Project flood protection components. Without the proposed improvements to provide 100-year flood protection to the Natomas perimeter levee system as proposed for the Phase 3 Project, the risk of a failure in the unimproved portions of the perimeter system would remain.
Geology and Soils	Soil borrow and excavation activities would result in the temporary disturbance of soil and could expose disturbed areas to wind and water erosion. Structures and trees would be removed from a portion of the footprint of the adjacent setback levee and berms along the Sacramento River east levee, and power poles would be removed and relocated. However, Phase 2 Project activities are required to comply with standard best management practices. Without the Phase 3 Project, the risk of a failure in the unimproved portions of the perimeter system would remain.
Hydrology and Hydraulics	The borrow sites that would be used in Phase 2 Project construction would be 3–5 feet lower following the conclusion of borrow operations. These sites would be regraded and either developed as grassland or returned to rice cultivation. Because specific plans have not been finalized to ensure uninterrupted conveyance of drainage, there is the potential for construction activities to temporarily or permanently alter the existing drainage pattern of the project area. Project engineers would coordinate with owners and operators of local drainage systems to evaluate the preproject and postproject drainage needs to remediate any substantial project-related drainage disruption. The presence of cutoff walls could restrict the movement of groundwater in either direction (away from or toward the NCC or Sacramento River). Potential consequences are increases or decreases in the water levels in shallower wells and/or localized near-surface groundwater levels in areas immediately east and west of the cutoff wall.
Water Quality	Levee improvement activities have the potential to result in both short-term and long-term water quality effects from runoff and sedimentation. Extensive ground-disturbing activities near local drainages and waterways could potentially become contaminated by soil or construction substances. These waterways include the NCC, Morrison Canal near the NCC south levee, the North Drainage Canal, the West Drainage Canal, and the Elkhorn Canal. Excavated areas that fill with groundwater or surface drainage during project construction would require dewatering. Effluent from dewatering operations typically contains high levels of suspended sediment and often high levels of petroleum products and other construction-related contaminants. In order to mitigate potential impacts on water quality, SAFCA shall file a Notice of Intent to discharge stormwater associated with construction activity with the Central Valley Regional Water Quality Control Board. Final design and construction specifications shall require the implementation of standard erosion, siltation, and good housekeeping best management practices.
Fish and Aquatic Habitat	Phase 2 Project construction activities could adversely affect migratory habitat for listed adult and juvenile chinook salmon and steelhead that would be susceptible to water quality–related effects. In addition to construction activities, removal of riparian vegetation or woody material along the existing levee or otherwise in the floodplain could result in the loss of important shaded riverine aquatic habitat function. Bank erosion control improvements would need to be implemented along approximately 3,710 feet of riverbank at the waterside toe of the Sacramento River east levee at River Miles 73.5, 69.8, and 68.8 (Sites G, J, and M). Construction of these improvements would require removing approximately 11 trees within Sites G, J, and M, and trimming the canopies of other trees growing on the eroding bank. It is anticipated that any temporary construction losses of overhead shaded riverine aquatic habitat cover would be fully replaced by onsite mitigation planting by the end of the fifth growing season.

Table 2-1
Summary of Phase 2 Project Impacts

Issue Area	Summary of Environmental Impact
	Additionally, the bank protection concept has been designed to fully compensate for impacts on habitat values through the use of suitable types of substrate, vegetation, and instream woody material.
Sensitive Aquatic Habitats	Up to 371.48 acres of jurisdictional wetlands and waters of the United States could be temporarily affected by the proposed project's borrow activities (including the Brookfield borrow site in Sutter County) and up to 36.75 acres of jurisdictional wetlands and waters could be permanently affected.
Vegetation and Wildlife	Levee improvements would require acquiring additional land for maintenance activities and prevention of encroachment along the flood damage reduction facilities. Borrow sites for Phase 2 Project activities are currently cropland; therefore, no impacts on woodlands would result from the utilization of these sites for borrow activities. Beneficial effects would include creation of approximately 30 acres of woodland habitat anticipated to be planted along landside corridors, and approximately 16 acres of existing woodland would be acquired by SAFCA and preserved in public ownership. Existing canals providing aquatic habitat would be adversely affected by the construction of Phase 2. Effects would include temporary disturbance and permanent loss. Adverse effects, however, would be offset by creation of the proposed new canals that would also provide improved movement corridors for aquatic species. A substantial acreage of riparian woodland plantings would be included in the levee setback area under this alternative; however, this vegetation would not mature for several years, and its value as cover would therefore be limited in the near term in comparison with the value of the existing land side woodland corridor along the Sacramento River east levee. After mitigation measures, adverse effects on woodlands and wildlife movement corridors would be reduced to a less-than-significant level.
Special-Status Terrestrial Species	Levee improvement activities could adversely affect habitat for special-status species (rose mallow, special-status birds, Delta tule pea, and Sanford's arrowhead), elderberry, giant garter snake, and the Northwestern pond turtle. However, mitigation measures, such as replacement planting, relocation, and project timing, would reduce these impacts to less-than-significant levels. The NBHCP addresses conservation strategy, such as establishing and managing a habitat reserve system and ensuring connectivity between reserves. Components of the No-Action Alternative—Phase 2 Project Only would support attainment of these goals and objectives by creating and preserving habitat and creating a valuable aquatic corridor linking TNBC reserves in the northern and southern portions of the Natomas Basin. The potential for implementation of the No-Action Alternative—Phase 2 Project Only to threaten the viability of populations of certain covered species, reduce the effectiveness of the NBHCP's conservation strategy, and adversely affect attainment of the goals and objectives of the NBHCP could jeopardize successful implementation of the NBHCP. This would be a significant adverse impact.
Cultural Resources	The No-Action Alternative—Phase 2 Project Only would alter contributing elements of RD 1000 by modifying the NCC south levee, Sacramento River east levee, and realigning Sankey Road at the intersection with Garden Highway. Even though it may be possible to avoid resources or recover and preserve them through a treatment plan if disturbance is unavoidable, physical changes to resources eligible for National Register of Historic Place listing may still alter the significance of the resource. Therefore, if this site (the RD 1000 levee system) is determined to be eligible for listing, implementation of this mitigation may not fully reduce the impact to a less-than-significant level. Historic-era resources shall be formally evaluated for significance in accordance with the stipulations of the Programmatic Agreement between USACE, SAFCA, and the State Historic Preservation Officer (SHPO). Adverse effects shall be treated in accordance with measures stipulated in a Historic Preservation Treatment Plan developed in consultation between USACE, the SHPO, and SAFCA. Modern agricultural cultivation of the Sacramento Valley floodplains and riverbanks has destroyed many prehistoric occupation sites, and the remains of these sites are thus no longer easily visible above ground. In the event that any previously undiscovered cultural resources, including Native American Traditional Cultural Properties, are discovered during project activities, identification of those resources, evaluation of their significance, and determination of project effects on and treatment of historic properties that would be subject to adverse effects shall be conducted in accordance with measures stipulated in a Historic Properties Treatment Plan developed in consultation between USACE, the SHPO, and SAFCA.
Paleontological Resources	There is the potential that unique paleontological resources could be encountered in excavation at depths of 10 feet or more. Deep excavation, mainly associated with cutoff wall construction and borrow activity in Phase 2 Project construction, could destroy unique paleontological resources having potentially significant impacts.

The No-Action Alternative, assuming implementation of the NLIP Phase 1 and Phase 2 Projects only is an unlikely long-term alternative for the Natomas Basin because the Basin would still face elevated risks from lack of 100-year flood protection, which risk would be further reduced by the Phase 3 Project. While the Phase 1 and Phase 2 Projects would provide increased flood protection, the level of protection would still be less than 100-year flood protection. Therefore, the Phase 2 Project, by themselves, would not achieve the overall project purpose and project objectives.

2.3 PROPOSED ACTION

The Phase 3 Project focuses on underseepage, stability, erosion, encroachment, and levee height deficiencies along 4.5 miles of the Sacramento River east levee, 3.2 miles of the PGCC west levee, and 6.2 miles of the NEMDC west levee. If permitted, these improvements could expect to be constructed in concert with the Phase 2 Project. Construction of the Phase 3 Project is scheduled to begin in 2009 and is expected to be completed in 2010, assuming receipt of all required environmental clearances, permits, and approvals for project implementation. **Plates 17a–c** provide an overview of the elements of the Proposed Action.

The Proposed Action has the following major elements:

- **Sacramento River east levee Reaches 5A–9B: Levee raising and seepage remediation**—Construct a raised adjacent setback levee from just north of Elverta Road to just south of I-5 (Reaches 5A–9B) with cutoff walls, seepage berms, and relief wells where required to reduce seepage potential.

- **PGCC west levee: Levee raising, slope flattening, and widening; and seepage remediation**—Raise the existing levee between Howsley Road and Sankey Road, flatten and widen the levee slopes, and construct cutoff walls or seepage berms to reduce seepage potential.

- **NEMDC west levee from Elkhorn Boulevard to NEMDC Stormwater Pumping Station: Levee widening and flattening and seepage remediation**—Widen and flatten the slopes of the existing levee between Elkhorn Boulevard and the NEMDC Stormwater Pumping Station and construct a cutoff wall to reduce seepage potential.

- **NEMDC west levee from NEMDC Stormwater Pumping Station to Northgate Boulevard: Seepage and slope stability remediation**—Construct a cutoff wall in the existing levee and/or reconstruct portions of the levee from the NEMDC Stormwater Pumping Station to Northgate Boulevard where required to reduce seepage potential and slope instability.

- **Relocation of approximately 9,400 feet of the Elkhorn Canal (highline irrigation canal) downstream of Elkhorn Reservoir**—Pipe the canal between the new adjacent setback levee and Teal Bend Golf Club in Reaches 6B and 7, and in an area adjacent to the landside residential properties in Reach 8; and reconstruct the canal parallel to the adjacent setback levee at a distance of approximately 200 feet from the levee in Reaches 7–9A.

- **Construction of a new GGS/Drainage Canal downstream of Elkhorn Reservoir**—Construct a new canal designed to provide drainage and associated giant garter snake habitat (GGS/Drainage Canal) between Elkhorn Reservoir and the West Drainage Canal at I-5.

- **Reconstruction of RD 1000 Pumping Plant No. 2**—Reconstruct the existing landside drainage pumping plant with intake structure, a pump station, piping over the adjacent setback levee, and an outfall structure on the water side of the Sacramento River east levee; and improve the intake channel east of the pumping plant entrance.

- **Habitat creation and management**—Establish the new drainage canal to provide connectivity of aquatic habitat; establish perennial native grasses on levee slopes, seepage berms, and operation and maintenance areas; recontour the land and preserve rice and field crop habitat at borrow locations; and establish woodlands consisting of native riparian species at locations along the Sacramento River east levee.

- **Infrastructure relocation and realignment**—Realign and relocate irrigation and drainage canals and other infrastructure, such as utility poles, as needed to accommodate the flood damage reduction measures.

- **Landside Vegetation removal**—In Reaches 10–12A of the Sacramento River east levee, clear landside vegetation in a 670-foot-wide corridor to prepare for future flood damage reduction work.

- **Right-of-way acquisition**—Land within the Phase 3 Project footprint would be acquired along the Sacramento River east levee Reaches 5A–9B, the PGCC west levee, the NEMDC west levee between Elkhorn Boulevard and Northgate Boulevard, and at borrow sites associated with the Phase 3 Project. The parcels in the Phase 3 Project footprint are shown in **Appendix H**, "Construction Details."

- **Encroachment management**—Remove encroachments as required to meet the criteria of USACE, the Central Valley Flood Protection Board, and FEMA.

- **Borrow sites reclamation**—Excavate earthen material at the borrow sites and then return the sites to post-construction uses or suitable replacement habitat.

- **Reconfiguration of Airport West Ditch**—Modify irrigation distribution and agricultural drainage systems and infrastructure to allow for dewatering of the Airport West Ditch.

Additional construction details for the Proposed Action are contained in **Appendix H** for the following:

- Sacramento River east levee Reaches 5A–9B,
- PGCC west levee,
- NEMDC west levee,
- Relocated Elkhorn Canal,
- New GGS/Drainage Canal,
- Airport West Ditch Reconfiguration,
- RD 1000 Pumping Plant No. 2,
- Prichard and Elkhorn Pumping Plant modifications, and
- Borrow Sites Reclamation.

2.3.1 FLOOD RISK REDUCTION COMPONENTS

Flood risk reduction components of the Proposed Action would consist of levee raises and seepage remediation. Construction of the proposed adjacent levee would reduce the potential for bank erosion to undermine levee stability; therefore, achievement of the project flood risk reduction objectives under this alternative is not expected to require associated repair of bank erosion sites.

2.3.1.1 LEVEE RAISES, WIDENING, AND SLOPE FLATTENING

Many reaches of the Sacramento River east levee need to be raised to meet the desired minimum of 3 feet of levee height above the "200-year" design water surface profile. The levee height increases along the land side of the existing Sacramento River east levee would be accomplished through construction of the raised adjacent setback levee.

Along the PGCC west levee, there are several reaches that do not meet FEMA 100-year levee height requirements and most of the levee does not meet the "200-year" plus 3 feet of levee height design for the top of the levee profile, thus the levee would be raised to meet 100-year FEMA levee height requirements. The levee segment of the PGCC at Sankey Road that lacks adequate levee height would be maintained at its current elevation because the flows through this levee segment into the interior of the Natomas Basin during a FEMA 100-year or "200-year" design event would not damage the levee and are subject to management as part of the Basin's interior drainage system.

The NEMDC west levee between the NEMDC Stormwater Pumping Station and Northgate Boulevard currently meets FEMA 100-year levee height requirements and also meets the "200-year" plus 3 feet of levee height design for the top of the levee profile. Between Elkhorn Boulevard and the NEMDC Stormwater Pumping Station, the NEMDC west levee currently meets FEMA 100-year levee height requirements and the "200-year" plus 3 feet of levee height design for the top of the levee profile.

In all reaches, the final levee configuration would be designed to meet the USACE criteria of a 20-foot-wide minimum crown, a 3H:1V waterside slope, and a 3H:1V (preferred) or 2H:1V (maximum) landside slope.

An adjacent setback levee is proposed in lieu of modifying the existing Sacramento River east levee, which has substantial structural and vegetation encroachments along its water side (**Plates 6a and 6b**). The adjacent levee raise would involve the construction of a new embankment adjoining the Sacramento River east levee (**Plate 15**, lower illustration). The adjacent setback levee would be constructed in Reaches 5A–9B (a distance of approximately 4.5 miles) with a crown elevation at least 3 feet above the "200-year" design water surface profile. In Reaches 5A–11B, where the existing levee has levee height deficiencies, the crown of the adjacent setback levee would be higher than the existing levee and Garden Highway. A minimum 5-foot-wide shoulder would extend from the landside edge of the crown of the existing levee to the water side of the new adjacent setback levee embankment. A 3H:1V slope would extend up to the crown of the adjacent setback levee. The crown would be at least 20 feet wide and would be topped with an aggregate base access road for inspection and maintenance. The adjacent setback levee landside slope would vary from as steep as 3H:1V to as flat as 5H:1V. It would be constructed of compacted earthen fill material obtained from borrow sources.

The PGCC west levee would be expanded to the land side to provide a levee width to encompass, at a minimum, a theoretical 3H:1V waterside slope, a crown width of at least 20 feet, and a landside slope of at least 3H:1V. The intent of the landside expansion is to preserve the existing Natomas Road and East Levee Road, which are county/city-maintained roads located on top of the existing PGCC and NEMDC west levees. Levee widening and slope flattening would also occur along the NEMDC west levee between Elkhorn Boulevard and the NEMDC Stormwater Pumping Station.

2.3.1.2 SEEPAGE REMEDIATION

Excessive underseepage gradients can be corrected through the use of cutoff walls, seepage berms, and relief wells. The choice of seepage remediation is influenced by the depth and continuity of pervious soil layers, adjacent land use, environmental constraints, construction cost, construction schedule, and long-term maintenance considerations. Of the three remediation methods, fully penetrating cutoff walls are generally preferred because they are the least costly (particularly if any soil-bentonite [SB] mix is feasible and the depth of wall is less than 85 feet); are the most reliable under uncertain hydraulic and geotechnical conditions (e.g., water surface elevations above design and variations in foundation soil conditions); and, when combined with an adjacent levee, minimize construction disturbance outside the levee footprint. In reaches where the depth to the impervious soil layer beneath the levee foundation makes the use of a cutoff wall economically infeasible, seepage berms are preferred.

Along the Sacramento River east levee, cutoff walls would be constructed through the adjacent levee in some reaches where seepage remediation is required, and earthen seepage berms would be constructed in others. In the portions of this reach of the Natomas perimeter levee system that are considered susceptible to seismically

induced ground shaking, such a condition would likely not cause deformation of the SB walls in the adjacent levee because of their malleability and location farther away from the river channel, where levee failure is more likely to occur in association with seismically induced collapse of the river bank. Additionally, because an SB seepage cutoff wall is constructed lower in the levee section, it is not likely to be significantly affected by failure of the levee itself if the levee were to collapse. In areas of seismic vulnerability that have a narrow waterside berm, landside seepage berms would be constructed for underseepage remediation.

Within the PGCC west levee, cutoff walls or seepage berms would be constructed to provide seepage remediation. Along the NEMDC west levee between Elkhorn Boulevard and Northgate Boulevard, cutoff walls through the levee embankment would likely be constructed by the deep soil mixing (DSM) or trench remixing deep (TRD) method.

2.3.2 AVIATION SAFETY COMPONENTS

The Airport experiences a high rate of aircraft bird strikes, which pose a substantial hazard to flight safety. In accordance with the Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports* (FAA 2007), the Airport has been directed by the FAA to reduce wildlife attractants in the Airport Critical Zone, the area within a 10,000-foot radius from the centerline of the two parallel runways for turbine-powered aircraft. Additionally, the FAA recommends that no land uses deemed incompatible with safe airport operations be maintained in the General Zone, a radius of five miles from the edge of the Airport Operations Area, if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace. Open water and agricultural crops are recognized as being the greatest wildlife attractants in the Airport vicinity, and rice cultivation is considered the most incompatible agricultural crop because of its flooding regime. The following are aviation safety components associated with the project:

- The Airport West Ditch as currently constructed and operated has the potential to hold water that can attract hazardous wildlife that have the potential to collide with aircraft. Proposed modifications to the irrigation distribution and agricultural drainage systems and infrastructure would allow for dewatering of the Airport West Ditch. This is expected to substantially reduce the attractiveness of the Airport West Ditch to wildlife and reduce the associated potential for bird aircraft strikes. One purpose of the new GGS/Drainage Canal, as described in more detail below, would be to divert irrigation water away from the Airport and provide connectivity of aquatic habitat and improved opportunities for giant garter snake movement within the Basin.

- The grading of Airport lands north of the Airport Operations Area as part of borrow and reclamation operations is expected to improve surface water drainage and facilitate management of these lands in accordance with the Airport's *Wildlife Habitat Management Plan* (WHMP). This would reduce the level of bird attraction to these lands and, therefore, aviation hazards.

2.3.3 HABITAT CONSERVATION COMPONENTS

The NLIP Landside Improvements Project (Phases 1–4) includes a Natomas Basinwide habitat creation, enhancement, and preservation component and associated conservation strategy. This compensatory habitat creation and preservation plan is designed to create a larger contiguous area protected and managed to increase habitat value and function, particularly contributing to giant garter snake and Swainson's hawk recovery in the Basin. To assist USACE and SAFCA in enforcing this plan, a Mitigation and Monitoring Plan (MMP) and a Long-Term Management Plan (LTMP) are scheduled to be completed in spring 2009, based on the following goals:

- the preservation of the abundance and diversity of native species, and particularly special-status species;
- the protection of the habitat features from the effects of indiscriminate land uses that may adversely impact conservation habitat; and
- the restoration of any adverse condition within the conservation habitat areas that may affect or potentially affect these areas.

Compensatory habitat creation that would be implemented as part of the Phase 2 Project in advance of the Phase 3 Project includes the creation of approximately:

- 310 acres of managed grasslands,
- 29 acres of canals,
- 28 acres of associated uplands, and
- 50 acres of landside woodlands.

Additionally, the following would be preserved as part of the Phase 2 Project in advance of the Phase 3 Project:

- 19.5 acres of landside woodlands,
- over 80 acres of field crops, and
- approximately 175 acres of rice fields.

Phase 3 Project habitat creation and conservation are intended to further improve upon actions that would be taken as part of the Phase 2 Project. Sections 2.3.3.1 through 2.3.3.4, below, discuss the habitat creation and conservation components of the Proposed Action.

2.3.3.1 MONITORING OF HABITAT COMPONENTS

Overall, after implementation of mitigation components, the mitigation sites would be monitored throughout the year for 3–8 years depending on the type of habitat and as developed in negotiation with the appropriate resource agencies. SAFCA would be responsible for providing success monitoring, which, as required by the appropriate resource agencies, would be conducted by a qualified ecologist, botanist, or biologist. The monitor would be objective and independent from the installation contractor responsible for maintenance of the site.

All habitat types and mitigation sites would receive quantitative and qualitative monitoring. Quantitative monitoring would be performed in accordance with the performance criteria described in the following sections (e.g., percent cover). Qualitative monitoring would provide an opportunity to document general plant health, overall plant community composition, hydrologic conditions, damage to the site, infestation of weeds, signs of excessive herbivory, signs of wildlife use, erosion problems, and signs of human disturbance and vandalism. These criteria would be assessed and noted for use in adaptive management of the mitigation sites, but they would not be used to determine project success. In addition, a complete list of all wildlife species encountered would be compiled for each mitigation site during each monitoring visit. Particular attention would be given to looking for evidence of giant garter snake, valley elderberry longhorn beetle exit holes, and Swainson's hawk.

SAFCA would prepare an annual report in conjunction with the resource managers that would be submitted to USACE, the U.S. Fish and Wildlife Service (USFWS), the California Department of Fish and Game (DFG), and the Central Valley Regional Water Quality Control Board (RWQCB) by December 31 of each year during the success monitoring period, or until the agencies have verified that final success criteria have been met. The report would assess the attainment of or progress toward meeting the success criteria for the mitigation sites.

More detail regarding the ranges of typical success criteria is provided below.

2.3.3.2 NEW GGS/DRAINAGE CANAL

A new drainage canal would be constructed to provide connectivity of aquatic habitat for giant garter snake between the Fisherman's Lake area south of I-5 and the North Drainage Canal in the northern Natomas Basin. The length of the entire GGS/Drainage Canal is approximately 23,000 linear feet (4.4 miles). A series of water-control structures would be constructed along the length of the canal to maintain consistent water levels in the low-flow channel of the canal during the snake's active season (April–October). Supplemental water would be provided as needed from the Natomas Central Mutual Water Company's (NCMWC's) irrigation system. The low-flow channel would have a top width of approximately 50 feet and a water depth of approximately 4–5 feet (**Plates 16a and 16b**). The canal would be part of the RD 1000 drainage system.

The GGS/Drainage Canal from Elkhorn Reservoir to the West Drainage Canal at I-5 is part of the Phase 3 Project, the majority of which is scheduled for construction in 2009, assuming receipt of all environmental clearances and permits. Details on construction of the GGS/Drainage Canal are provided in **Appendix H**.

A monitoring program with performance criteria would be developed to determine the progress of the GGS/Drainage Canal towards achieving the performance standard of no net loss of aquatic habitat. The criteria for measuring performance would be used to determine if the habitat is trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in mitigation design or maintenance revisions). These criteria must be met for the mitigation site to be declared successful, both during a particular monitoring year and at the end of the establishment period. These performance criteria, which would be developed in consultation with USFWS and DFG, would include, but are not limited to:

- percent total cover (from 85–90%),
- percent relative cover by wetland species (from 85–90%),
- percent relative cover by native species (from 50–85%), and
- water level controlled to within +/- 6 inches of design water level.

Vegetation assessments of the GGS/Drainage Canal would be conducted annually for native perennial grasses (during the appropriate peak flowering period). The presence of giant garter snakes shall be monitored (during the establishment period, but not necessarily in the long-term) and recorded along this canal, consistent with monitoring methods currently conducted for SAFCA and The Natomas Basin Conservancy (TNBC) elsewhere in the Natomas Basin.

2.3.3.3 RICE AND FIELD CROP PRESERVATION

A significant portion of the borrow material needed to construct the Phase 3 Project would be obtained from existing rice or field crop lands. Following removal, stockpiling, and respreading of the topsoil, these lands would be graded, returned to rice or field crop cultivation, and managed to enhance the habitat values associated with these agricultural activities. It is estimated that rice production would be lost for one year, and field crop production would be lost for two years.

Giant garter snakes have adapted successfully to typical rice agricultural practices because rice fields provide sufficient water, cover, and food during the snake's active season. Therefore, the success criterion for the Brookfield rice mitigation site is the continued production of rice using the methodologies developed for the NBHCP. This site would be monitored qualitatively once per month between May 1 and September 30, and through the annual review of water supply and harvest records.

2.3.3.4 MANAGED GRASSLAND ON LEVEE SLOPES AND SEEPAGE BERMS

The levee improvements implemented as part of the Proposed Action would result in landside levee slopes that are less steep than the existing slopes, and several reaches of the Sacramento River east levee would have

adjoining 80- to 500-foot-wide earthen seepage berms with a nearly flat slope (50H:1V or less). Parallel to the landside toe of enlarged levees and seepage berms would be maintenance access roads and seepage relief wells in some locations. With the exception of the crown of the levee, these areas would be managed as grassland. Most grassland would be mowed or grazed throughout the growing season, with an emphasis on mowing procedures and stubble height to optimize these areas for Swainson's hawk foraging habitat. However, the primary purpose and management priority of levees and seepage berms, for which RD 1000 has principal management and maintenance responsibility, would continue to be flood risk reduction, and they would be maintained in accordance with USACE and CVFPB operations and maintenance (O&M) requirements.

The MMP would include a monitoring program with performance criteria that would be developed to determine the progress of the managed grasslands towards achieving its' goals. The MMP would include methods to create the grasslands, including native grass mixes that would be seeded along new levee slopes and seepage berms, staging areas, and adjacent maintenance and utility rights-of-way. Seed material would be purchased from a reputable nursery and must be from local genetic stock within 200 miles of the project site unless otherwise approved by a qualified ecologist. The native grass mix would include, but would not be limited to, the following:

- purple needlegrass (*Nassella pulchra*),
- creeping wildrye (*Leymus triticoides*),
- six weeks grass (*Vulpia microstachys*),
- slender wheatgrass (*Elymus trachycaulus*), and
- meadow barley (*Hordeum brachyantherum*).

An initial baseline assessment of grassland mitigation sites would be conducted following the initial seeding program, and then a monitoring program with performance criteria would be developed to determine the progress of the grassland habitats towards providing adequate mitigation. The criteria for measuring performance would be used to determine how well the mitigation is being established and to assess the need for adaptive management (e.g., changes in mitigation design or maintenance revisions). These criteria must be met for the mitigation site to be declared successful, both during a particular monitoring year and at the end of the establishment period. These performance criteria, which would be developed in consultation with USACE, USFWS, and DFG, would include, but would not be limited to:

- percent cover of invasive species (<1%),
- percent cover of non-native herbaceous plants (<10–25%), and
- percent absolute cover of native species (>50–80%).

2.3.3.5 WOODLANDS

Woodlands consisting of native riparian species would be established at several sites as a component of the Phase 3 Project. Selection of the locations of created woodlands would depend on the availability of suitable parcels as land is acquired for levee improvements and setbacks, relocated canal corridors, and borrow sites. Woodlands would be distributed throughout the project area. Priorities for woodland site selection are sites adjacent to hawk foraging fields but distant from the Airport runways.

In addition, existing woodlands, located outside of the flood damage reduction and canal improvement footprints, but within project acquisition areas adjacent to the new groves, would be preserved. Generally, the size of the woodland mitigation areas would vary somewhat depending on the characteristics of their unique locations. Trees under 10 inches diameter at breast height (dbh) located within the project footprint (mostly valley oaks) that can be feasibly relocated, would be transplanted into woodland sites as a part of the conservation sites. Elderberry shrubs located within the Phase 3 Project footprint that can be feasibly relocated would be transplanted into woodland conservation sites. The botanical species composition of individual clusters and rows would mimic vegetation types commonly found along the Sacramento River, including:

- valley oak woodland,
- mixed riparian forest, cottonwood-dominant,
- shallow scrub (at moist soil sites or depressions),
- sycamore and oak savanna (with native perennial grassland), and
- elderberry shrub/scrub.

A monitoring plan with performance criteria would be developed to determine the progress of the woodland habitats towards providing adequate mitigation. The criteria for measuring performance would be used to determine if the conservation component is trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in design or maintenance revisions). These criteria must be met for the conservation component to be declared successful, both during a particular monitoring year and at the end of the establishment period. These performance criteria, which would be developed in consultation with USFWS and DFG, would include, but are not limited to:

- percent survival of planted trees (from 65–85%),
- percent survival of transplanted trees (from 60–85%), and
- percent relative canopy cover (from 5–35%).

Field assessments of woodland planting areas would be conducted once per year. The timing of these assessments would be adjusted according to annual site-specific conditions, but assessments would generally occur in late summer. To measure percent survival of trees and shrubs, each plant would be inspected and the species of each live plant would be recorded. Qualitative assessments would be recorded to track the health and vigor of each species for adaptive management of the conservation components.

To determine the success of the woodland plantings as a functioning ecosystem, percent canopy would be estimated each fall by recording the extent of woodland habitat on aerial photographs, or using repeat transects or fixed radius plots at ground level. The timing of these assessments would be adjusted according to annual site-specific conditions, but assessments would generally occur in late summer or early fall while trees are still in full foliage. The results of these assessments would also be used to determine where replanting should occur to maintain suitable Swainson's hawk habitat. All monitoring would occur for the full monitoring period or until the performance criteria are met, whichever is longer.

2.3.3.6 LONG-TERM MANAGEMENT OF HABITAT COMPONENTS

A Phase 3 Project LTMP would be implemented by SAFCA in connection with the Phase 3 Project MMP (this may consist of amending previous LTMP and MMP documents prepared for the Phase 2 Project). The LTMP would establish the long-term management practices (post-establishment period success criteria) and land protection mechanisms that would be implemented as each project phase of the NLIP Landside Improvements Project is approved and permitted. Land ownership and management responsibilities would be held by SAFCA, RD 1000, NCMWC, and TNBC.

A description of the land protection and management mechanisms are as follows.

- Private lands acquired in fee title by SAFCA for the creation and/or preservation of woodlands, rice fields, and field crops would be encumbered by easements granted to TNBC to protect the habitat values of these lands in perpetuity. TNBC would manage these lands under a long-term management contract with SAFCA, using similar land management practices as are currently employed by TNBC in connection with the NBHCP.

- Private lands acquired by SAFCA for the new GGS/Drainage Canal would be encumbered by drainage canal easements granted by SAFCA to RD 1000. These easements would require that the easement areas be used exclusively for the GGS/Drainage Canal and would preserve in perpetuity the aquatic and upland habitat values associated with the canal, as well as the secondary drainage and irrigation values. The easements will

identify TNBC as a third party beneficiary (TPB) with the rights necessary to monitor and enforce the terms of the easements.

- RD 1000 would manage the affected flood damage reduction facilities under a long-term operation and maintenance contract with SAFCA and the State.

- Private lands acquired by SAFCA for the new Elkhorn Irrigation Canal would be encumbered by water facilities easements granted by SAFCA to NCMWC.

2.3.4 IRRIGATION AND DRAINAGE COMPONENTS

This section provides general descriptions of the irrigation and drainage components of the Proposed Action, including canals, pumping plants, and private facilities; construction details are provided in **Appendix H**.

2.3.4.1 CANALS

There are two major canal systems in the Natomas Basin: an irrigation system owned and operated by NCMWC and a drainage system owned and operated by RD 1000 (**Plate 9**). NCMWC pumps water into the Basin to provide irrigation water to its shareholders for agriculture use within the Basin. During winter (October through April), drainage is primarily rainfall runoff. During summer (May through September) drainage water from agricultural fields is typically recirculated for irrigation. Because the Basin is surrounded by levees, all excess drainage within the Basin must be pumped out. In general, water is pumped into the Basin from the Sacramento River and NCC as irrigation water and returned to the river and perimeter canals via RD 1000's drainage system. In the southern part of the Natomas Basin, the City of Sacramento also operates several drainage pump stations that serve residential areas.

The project would replace the irrigation canals currently at the toe of the Sacramento River east levee (the Elkhorn Canal) with new irrigation canals set back from and farther to the east of the existing levee. Where constraints exist, certain portions of the highline canals would be piped. The existing and replacement irrigation canals are highline canals, which means that the bottom of the canal is roughly equal to the surrounding ground elevation. The replacement irrigation canals would be constructed high enough to raise canal water levels above the levels of the adjacent fields to allow for gravity flow into the fields. The proposed GGS/Drainage Canal (described above in Section 2.3.3.1, "New GGS/Drainage Canal") would be constructed with the top of bank roughly at existing ground level to facilitate drainage. Material excavated to construct the GGS/Drainage Canal would generally be used to construct the embankments of the highline irrigation canals. Some import of soil materials and export of materials to levee construction would be required to accommodate the phasing of the construction activities.

2.3.4.2 AIRPORT WEST DITCH

As part of the Phase 3 Project, the Airport West Ditch would be reconfigured and redesigned in coordination with construction of the GGS/Drainage Canal. As part of a safety survey conducted by the FAA for the Airport, the FAA expressed concern that the Airport West Ditch provides habitat for wildlife that potentially create a hazard to aircraft. The FAA recommended reconfiguration of the ditch to alleviate the hazard. During storms, the Airport West Ditch receives stormwater runoff from a portion of the impervious surfaces on the west side of the Airport. Depending on the water volume, some of the stormwater is retained in the ditch until it can drain off-site to the RD 1000 drainage system. Therefore, the stormwater detention function of the Airport West Ditch must continue. The NLIP's proposed GGS/Drainage Canal would intercept the year-round irrigation and drainage sources from adjacent private farms, which currently flow into the Airport West Ditch and the Airport Operations Area. Additional irrigation infrastructure (e.g. pipelines, check structures and other canal improvements required to reroute these flows), would be implemented along with the new GGS/Drainage Canal construction.

2.3.4.3 PUMPING PLANTS

The Phase 3 Project includes relocating portions of the RD 1000 Pumping Plant No. 2, which was removed from its original location in response to underseepage observed during severe winter storms in January 2006, and replacing some of its equipment. Relocation of this facility farther landward of the levee is being proposed to resolve levee instability issues. The NCMWC pumping facilities that provide water to the Elkhorn and Central Main Canals (Prichard and Elkhorn Pumping Plants) would need to be modified to accommodate the new height of the Sacramento River east levee during the Phase 3 Project. The discharge piping would be raised above the "200-year" flood level to maintain the design level of flood risk reduction and would be extended to the relocated irrigation canals. Some replacement or modification of pumping equipment may be required to mitigate increased system pumping head and friction losses resulting from raising and extending the piping. The discharge piping for several private irrigation pumping plants would also be raised as described in the next section. Some earthen intake channel reconstruction would be required to improve stability and control seepage infiltration.

2.3.4.4 PRIVATE FACILITIES

The proposed levee improvements would affect private irrigation facilities including agricultural wells, private river pumps, and canals along the Sacramento River east levee Reaches 9B–12 and along the PGCC and NEMDC west levees. These facilities would generally be relocated landward to move them outside of the project footprint and reconstructed in-kind. Discharge piping from river pumps in these reaches would be raised and extended. Private facilities along the Sacramento River east levee Reaches 9B–12 and the PGCC west levee would be relocated as part of the Phase 3 Project. Some pipe raising in the lower reaches of the Sacramento River would be deferred until the new adjacent levee is constructed to allow for pipe raising.

2.3.4.5 GARDEN HIGHWAY DRAINAGE OUTFALLS

Between the Sacramento River adjacent setback levee and Garden Highway in Reaches 5A through 9B, new storm drainage collection facilities would be constructed to convey surface water beneath Garden Highway toward the Sacramento River. A surface collection system (i.e., grassed drainage swale) would convey runoff water to drop inlets, and new pipe laterals would convey the water beneath Garden Highway to new outfalls in the berm along the east bank of the Sacramento River. In most locations, the outfalls would be placed above the ordinary high-water mark generally taken as the 2-year water surface elevation. The location of the laterals would be selected to minimize impacts on existing residential properties and vegetation. These discharge pipes would require minor landscape improvements to control erosion and ensure that applicable water quality standards are met. Excavation of a pipe trench across Garden Highway would be required, and those segments where excavation occurs would require reconstruction. Single-lane traffic controls and through-traffic detours would be required during this phase of construction. This work would be conducted at several work sites simultaneously.

2.3.5 ADDITIONAL ACTIONS TO MEET FEMA, USACE, AND STATE DESIGN REQUIREMENTS: ENCROACHMENT MANAGEMENT

USACE levee guidance requires the removal of vegetation greater than 2 inches in diameter on the levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2000). USACE levee guidance also requires an assessment of encroachments on the levee slopes, including utilities, fences, structures, retaining walls, driveways, and other features that penetrate the levee prism. Substantial encroachments are present on the Sacramento River east levee with a smaller number of encroachments on the other Natomas levees. One of the objectives of constructing an adjacent setback levee along the Sacramento River east levee is to facilitate acceptable management of existing vegetation and structural encroachments along the water side of this levee. By moving the theoretical waterside slope of the levee (the "levee template") landward, the adjacent levee would significantly reduce most of the conflicts between these encroachments and applicable USACE levee operation and maintenance requirements. Should any of these existing encroachments be determined to reduce the integrity of the levee, increase flood risk unacceptably, or impede visibility or access to the waterside levee slope, the

encroachments would need to be removed. Removal of some waterside slope encroachments may be required by the end of 2010 to ensure that the levee system meets Federal criteria for the 100-year level of protection. Along the land side of the proposed adjacent setback levee, encroachment removal would typically be accomplished as part of the landside levee improvements. The relocation of power poles that are on the existing landside slope of the levee in Sacramento River east levee Reaches 1015 would be conducted as part of the Phase 3 Project to prepare for future flood damage reduction work.

2.3.6 LANDS, EASEMENTS, RELOCATIONS, AND RIGHTS-OF-WAY

Several of the project components described above would require substantial land acquisition to accommodate the expanded footprint of the flood damage reduction system. In the context of the Phase 3 Project, the acquired lands would support constructing an adjacent setback levee along the Sacramento River east levee in Reaches 5A–9B and flattening the landside slopes of the PGCC west levee and a portion of the NEMDC west levee. In addition, sufficient land would be acquired to establish a minimum 50-foot-wide access and maintenance corridor at the landside toes of all the improved levees to prevent encroachment into the flood damage reduction system and preserve the land for possible future expansion of flood damage reduction facilities.

In addition, land would be acquired to establish a woodland corridor to replace trees that are removed from the levee footprint, maintenance access areas, and irrigation and drainage canal relocation areas, and to provide habitat compensation (see Section 2.3.4, "Habitat Conservation Components"). Land would also be acquired to establish grasslands to replace Swainson's hawk foraging habitat.

Finally, as discussed previously, the Proposed Action would require relocation of many existing irrigation and drainage facilities, a number of power poles serving residences along the levees, several rural roadway intersections (including West Elverta Road, West Elkhorn Boulevard, and North Bayou with Garden Highway), and several private residential and nonresidential structures.

Privately owned lands would be acquired in fee. Easements would be obtained where the project features would be on Airport land (owned by Sacramento County). Where the SAFCA project footprint would overlie land owned and managed by other agencies (i.e., TNBC), either acquisition of the land in fee or obtaining and securing easements would be required.

Real property acquisition and relocation services would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 USC 4601 *et seq.*) and implementing regulation, 49 CFR Part 24; and California Government Code Section 7267 *et seq*. Refer to Chapter 6.0, "Regulatory Setting," for more details regarding these regulations.

Table H-1 in **Appendix H** and **Plates H-1b–H-1d** identify the parcels within the Phase 3 Project footprint, including those where SAFCA proposes to acquire land through fee title or an easement interest, to implement the Phase 3 Project and preserve adjacent lands.

2.3.7 CONSTRUCTION DETAILS

Table 1-2 in Chapter 1.0, "Introduction and Purpose and Need," summarizes the construction timing of the Phase 3 Project in relation to other project phases. Construction details are described in **Appendix H** for the following elements of the Proposed Action:

- Sacramento River east levee Reaches 5A–9B,
- PGCC west levee,
- NEMDC west levee,
- Major drainage and infrastructure components,
- Relocated Elkhorn Canal,

- New GGS/Drainage Canal,
- Airport West Ditch Reconfiguration,
- RD 1000 Pumping Plant No. 2,
- Prichard and Elkhorn Pumping Plant modifications,
- Private irrigation facilities, and
- Borrow site reclamation.

Following is a summary of the major construction components of the Phase 3 Project.

2.3.7.1 24/7 CONSTRUCTION OF CUTOFF WALLS

The construction contractor may encounter a series of constraints that could frustrate completion of the proposed cutoff walls prior to the start of the flood season (November 1). These constraints could include delays in contract award due to permitting or other issues; conflicts with nesting raptors, including Swainson's hawk; early-season rain; equipment shortages due to regional and national demand for the long-stick excavators that are needed for cutoff wall construction; shortages of construction material, particularly bentonite; and the requirement that the cutoff wall be allowed to cure for at least 4 weeks before backfilling and completing construction of the encapsulating adjacent levee. To manage the risk of delay, the construction contract would allow the construction contractor to construct cutoff walls on a 24-hours-per-day and 7-days-per-week (24/7) work schedule to complete the construction before the flood season. Residents in or near the affected work area would be afforded the opportunity, at SAFCA's expense, to temporarily relocate to a nearby hotel for as long as the 24/7 schedule persists within 500 feet of their residence.

2.3.7.2 SACRAMENTO RIVER EAST LEVEE REACHES 5A–9B

Phase 3 Project construction on the Sacramento River east levee would include improvements in Reaches 5A–9B, a distance of approximately 4.5 miles. This would include:

- construction of an adjacent levee in all reaches;
- construction of a combination of conventional SB cutoff walls and DSM cutoff walls;
- construction of a seepage berm with and without relief wells located at the landside toe of the seepage berms;
- planting of 130-foot-wide woodland groves; and
- reconstruction of the intersections of West Elverta Road, West Elkhorn Boulevard, and North Bayou Road with Garden Highway.

Plate 17a shows these project features in plan view. **Appendix H**, Section 1 provides details of the general construction plan and the construction sequence.

Borrow Quantities and Material Hauling

The imported fill quantity of 1,785,000 cubic yards (cy) includes a 25% shrinkage replacement factor to account for volume loss during placement and compaction. Delivery of the fill material would require as many as 900–1,000 haul trips per day during construction of the Phase 3 Project. These estimates are based on the assumption that the work would be done in a 6-month construction period with 140 out of the 156 working day window being used to haul material. These estimates are based on conservative assumptions of truck capacities of 15 cy and 24 tons and the use of haul trucks for moving all borrow material from the Airport north bufferlands.

Construction Equipment

Appendix H, Section 1, **Table H-3** presents the anticipated construction equipment and duration for the Sacramento River east levee Reaches 5A–9B improvements.

Traffic Control During and After Construction

Single-lane traffic control and detours would be required during reconstruction of Garden Highway at intersections, during reconstruction of pipe and utility crossings and for installation of surface drainage outlets along this roadway. Examples of traffic control measures to be considered include use of flaggers to maintain alternating one-way traffic while work is proceeding on one-half of the intersection, use of advance construction signs and other public notices to alert drivers of activity in the area, and use of "positive guidance" detour signing on alternate access roads to minimize inconvenience to the driving public. Where detours are required for through traffic, local traffic would be allowed, subject to minor delays during critical operations. Road closures would be necessary during the construction of the intersections of West Elkhorn Boulevard, West Elverta Road, and North Bayou Road, and or reconstruction of pipe utility crossings. Detours would be provided so that residents along Garden Highway would have access to their homes. Access to the Teal Bend Golf Club would be maintained with flagger-controlled access and staged construction of the raised levee and approach embankment.

The Elkhorn Boat Launch Facility (a public boat ramp, dock, and picnic area operated by Sacramento County) would require closure for approximately 8 to 12 weeks, likely through the summer months, while cutoff walls are constructed at this location. During this time, Garden Highway would be closed between stations 437+00 to 447+00, 500 feet upstream and 500 feet downstream of the I-5 Bridge. Traffic would be detoured around this road closure, and there would be no access to the public boat launch facility from the east during this time. North of Bayou Road would remain open to provide access to the Garden Highway north of Bayou Road, however, the road surface would be unpaved (gravel).

2.3.7.3 PLEASANT GROVE CREEK CANAL WEST LEVEE

PGCC west levee improvements would include landside widening of the levee to provide a levee width of a minimum, theoretical 3H:1V waterside slope, a crown width of at least 20 feet, and a landside slope of at least 3H:1V. The intent of the landside widening is to preserve the existing Natomas Road, which is a County-maintained road located on top of the existing PGCC west levee. Levee raising, slope flattening, and widening along the PGCC west levee is anticipated to require 475,000 cy of import material (including material to construct a cutoff wall working platform). This material is anticipated to be hauled from the Brookfield borrow site using elevating scrapers for the majority of the PGCC west levee. Where the haul distance exceeds the economical range for elevating scrapers (approximately 1 mile for a one-way trip), hydraulic excavators and off-road dump trucks would be used to load and haul embankment material. This work is expected to involve 15–20 people working a single, 12-hour work shift 6 days a week. Beginning just south of its intersection with Howsley Road and continuing one quarter mile south of Howsley Road, the widened levee would be raised one to two-tenths of a foot to provide 3 feet of levee height above the 100-year design water surface profile. The levee widening would also be conducted to provide a base on which to construct seepage remediation improvements.

Cutoff-wall installation for the PGCC west levee is anticipated to occur using two headings in back-to-back 12-hour work shift, with a total of 22 crew members; with 24-hour-per-day operation to complete the cutoff wall before the flood season (see "24/7 Construction of Cutoff Walls" above). Generally, a 6-day work week (Monday to Saturday) with maintenance on Sunday is expected, with a total of 50 working days to complete cutoff wall installation. An SB cutoff wall would extend through the entire PGCC, totaling approximately 17,400 linear feet. Where the cutoff wall begins at Howsley Road, it would overlap with the cutoff wall scheduled to be constructed as part of the Phase 2 Project. This cutoff wall overlap would be between 100 and 500 feet.

Five existing culverts pass beneath the PGCC west levee and extend to the east side of the PGCC. The sections of these culverts extending under the levee would be replaced with pipe and pipe closure devices meeting USACE standards for levee penetrations.

Plate 17b shows the PGCC west levee construction extent. The construction crew size during its peak is estimated at about 45–55 people.

Work on the water side of the PGCC west levee may require reshaping the waterside levee slope to be flatter than its current 2:1 slope to conform to current USACE criteria. This may be accomplished by trimming back the waterside slope, which would require relocation of Natomas Road, or by placing additional fill material on the water side of the levee slope. This is an issue currently under evaluation by SAFCA's design team.

Current erosion and wind and wave analyses indicate that select areas of the PGCC west levee may require the placement of rock slope protection on the waterside levee slope to provide additional erosion control. Where creeks flow into the PGCC from the east, the waterside slope opposite the creek entrance would be armored with rock slope protection. Some rock slope protection would also be required on the land side of the levee at Howsley Road, where levee overtopping from wave action could affect this section of the levee.

Appendix H, Section 2 provides details of the general construction plan and the construction sequence.

2.3.7.4 NATOMAS EAST MAIN DRAINAGE CANAL WEST LEVEE

NEMDC west levee improvements include cutoff wall installation, levee widening, slope flattening, and reconstruction of portions of the levee that do not meet stability criteria. **Plate 17c** shows the footprint for Phase 3 Project work on the NEMDC in plan view. From Elkhorn Boulevard south to Northgate Boulevard, cutoff walls would be constructed to a depth of up to 80 feet from the levee crown. The existing maintenance area along the NEMDC west levee between the NEMDC Stormwater Pumping Station and Northgate Boulevard would not accommodate levee reshaping or levee degrading beyond what is necessary to provide a minimum working platform for cutoff wall installation. Additionally, structures in close proximity of the landside levee toe make additional maintenance area acquisition impractical. Therefore, this wall is anticipated to be either an SB or a cement-bentonite (CB) wall constructed by the conventional, long reach excavator method, or an SB or soil-cement-bentonite (SCB) cutoff wall constructed by the DSM method.

Construction is anticipated to require three headings working in back-to-back 12-hour shifts per day with 24-hours-per-day operation required to complete the cutoff wall before the flood season. A 6-day work (Monday through Saturday) week is expected (with maintenance on Sunday), with a total of 75 working days to complete cutoff wall installation. If the cutoff wall is constructed with a CB mix, up to 167,000 cy of excess soil from the excavation of the trench would be used to construct the levee improvement between Elkhorn Boulevard and the NEMDC Stormwater Pumping Station. North of the NEMDC Stormwater Pumping Station to Elkhorn Boulevard, levee widening and maintenance area acquisition would occur similar to what is described for the PGCC west levee. **Appendix H**, Section 3 provides details of the general construction plan and the construction sequence.

Total borrow quantity for the NEMDC is estimated to be 225,000 cy. This earthwork estimate contains a 25% shrinkage replacement factor. In addition, regular deliveries of cement and bentonite would be made to the project site.

2.3.7.5 LANDSIDE VEGETATION REMOVAL IN SACRAMENTO RIVER EAST LEVEE REACHES 10–12A

Along the landside of the Sacramento River east levee in Reaches 10–12A, vegetation would be removed during the dormant season as needed from the levee improvement footprint. This 670-foot-wide footprint consists of an adjacent setback levee, an estimated 500-foot-wide seepage berm, 50-foot-wide operations and maintenance corridor, and 20-foot-wide utility (relocation) corridor. Vegetation removal would also occur in the footprint of

the relocated Riverside Canal (Reaches 12A–18B) . This operation would require removal of some trees and relocation/removal of elderberry shrubs, which occur mostly adjacent to existing roads. Large trees would be felled approximately 3 feet above ground level, with stumps temporarily left in place. Logs would be cut into rounds for removal by contractors with lightweight vehicles. Small trees and elderberry shrubs, where feasible, would be relocated to woodland preservation corridors that are part of the Phase 3 Project. A minimal amount of below ground disturbance would occur.

2.3.7.6 RECLAMATION DISTRICT 1000 PUMPING PLANT NO. 2

As part of the Phase 3 Project, a replacement for Pumping Plant No. 2 would be constructed at a distance farther away from the levee than the location of the old site. Pumping Plant No. 2 pumps drainage water from the North Drainage Canal to the Sacramento River for RD 1000 and irrigation water runoff from the North Drainage Canal back into NCMWC's Central Main irrigation canal. Pumping capacity of the proposed RD 1000 Pumping Plant No. 2 replacement would approximately match historical Pumping Plant No. 2 capacity. However, to maintain the equivalent capacity, some additional pumping horsepower would be needed to overcome the losses associated with longer discharge pipes and higher discharge head due to raising the pipes above the "200-year" design water surface elevation.

The replacement Pumping Plant No. 2 would consist of an intake structure in the inlet canal (North Drainage Canal), a pump station and sump, piping over the levee, an outfall structure on the river side of the levee, and a pipe running to the NCMWC Elkhorn Canal distribution box that is part of the Elkhorn Canal improvements component of the Phase 2 Project. The pumping station would have three pumps. Two of the pumps would be approximately 350 horsepower (hp) and the third pump would be approximately 200 hp. The 350-hp pumps would be operated by RD 1000 and the 200-hp pump would be operated by NCMWC. The RD 1000 pumps would be connected to two 36-inch-diameter steel discharge pipes which would run from the pumps to a new concrete outfall structure that would be constructed within the bank along the Sacramento River.

The replacement outfall structure would be constructed close to the location of the original Pumping Plant No. 2 outfall structure. The concrete outfall structure would have a footprint of approximately 21 by 21 feet. A sheet pile cofferdam would be used to isolate and dewater an area of approximately 23 by 23 feet for instream construction. Upon completion of construction, the sheetpile wall would be cutoff at the sediment-water interface. The embedded portion of the sheetpile wall would be left in place for erosion protection. Riprap stone protection would be placed on the water side of the outfall structure extending down the bank to the streambed and approximately 20 feet into the river channel without dewatering. The existing outfall structure, discharge piping, and some abandoned pilings in the river would be removed.

The invert of the discharge pipes would cross over the levee above the "200-year" flood elevation of the Sacramento River to maintain the design level of flood risk reduction. A single 36-inch-diameter steel discharge pipe would connect the NCMWC pump to the Elkhorn Canal. An enclosure building would house the Pumping Plant No. 2 electrical, control, and monitoring equipment. The control system for the pumps would allow operation in a manual or automatic mode. The automatic mode would initiate pump start-up and shut down based on water levels in the North Drainage Canal. A separate electrical metering box would be provided for the NCMWC pump to the Central Main Canal. The pumps, electrical equipment, maintenance platform, pump deck and access road would be elevated above the Natomas Basin interior 100-year flood elevation. Access roads would be provided to the pump deck and intake structure. A concrete box culvert would connect the pump station sump to the intake structure that would be located near the P-6 Drain at the western end of the North Drainage Canal. The intake structure would be provided with a trash rack and automated trash rake system, and a maintenance road located approximately 1 foot above the adjacent land elevation. Based on the loose foundation soils found in the pump station sump, it is anticipated that pipelines and structures would be pile supported or the discharge pipe alignment area would be overexcavated and the foundation soils recompacted. Additional remediation work within the North Drainage Canal for approximately 300 to 400 feet upstream of the plant

entrance would include flattening unstable bank slopes and lining the channel with rock for stability reasons. Additional plant lay-out, construction, and operational details are located in **Appendix H**, Section 7.

2.3.7.7 PRICHARD AND ELKHORN PUMPING PLANT MODIFICATIONS

Because the Basin is surrounded by levees, NCMWC water is pumped into the Basin using NCMWC facilities and returned to the river via RD 1000's drainage system and pumping plants. Because the discharge pipes are required to cross the levee above the new "200-year" design flood elevation, the existing pump house and gate structure for the NCMWC Elkhorn Pumping Plant would need to be removed. The existing manifold structure and the gate structure for the NCMWC Prichard Pumping Plant would also need to be removed. The existing pumps at both pumping plants might require modification or replacement to continue existing design performance after the levee improvements and pipe raising. Detail regarding the anticipated construction equipment and duration, and hauling requirements for Prichard and Elkhorn Pumping Plant modifications are contained in **Appendix H**, Section 7.

2.3.8 BORROW MATERIAL

2.3.8.1 NEED FOR BORROW MATERIAL

Borrow sites are areas from which native materials (i.e., soil and rock) would be removed for use in construction. Construction of the Phase 3 Project would require approximately 2.4 million cy of earthen fill material plus 66,000 tons of aggregate base for levee construction. SAFCA has identified numerous soil borrow sites, within and near to the Natomas Basin, to fulfill the soil borrow requirements. Aggregate base and other materials (e.g., drain rock and rock slope protection) would need to be imported from commercial suppliers located outside the Natomas Basin. Although the soil borrow sites are expected to yield the required soil borrow material, a variety of factors could require additional sources. For instance, discovery of a cultural resource site, paleontological resource, or hazardous materials could halt borrow excavation. In an attempt to ensure that sufficient borrow material is available to complete the Phase 3 Project, a number of potential borrow sites have been identified, as described below.

2.3.8.2 PROCESS FOR OBTAINING BORROW MATERIALS

Borrow material would be excavated from primarily agricultural lands that are either fallow or produce row or field crops. These sites may also contain scattered rural housing, drainage and irrigation features, and woodlands (**Plates 17a-c and 10**). Excavated soils not used for borrow material, such as the organic surface layer or soils considered unsuitable for levee construction, would be stockpiled and respread on-site following excavation. For areas planned to be returned to agricultural use, approximately 1 foot of topsoil would be removed and stockpiled for reuse during reclamation of the site. The borrow site excavation operations would use water for dust control and to maintain proper moisture content in the borrow material. Sites would be reclaimed. For more information, see **Appendix H**, Section 2.

2.3.8.3 POTENTIAL BORROW SITES

The borrow sites shown in **Table 2-2** would provide material for the proposed levee improvements and irrigation infrastructure modifications. Following excavation of the borrow material, these sites would be reclaimed for use and returned to agriculture, or used for habitat mitigation. **Table 2-2** also shows the depth of excavation, depth upon reclamation. **Plate 10** shows the locations of the currently identified borrow sites. **Appendix H**, Section 8 includes construction details for the borrow sites.

Table 2-2
Potential Borrow Sites

Borrow Site/Location	Size of Site (acres)	Amount to be Excavated (acres)[1]	Estimated Average Depth of Excavation Upon Project Completion (feet) [2]	Estimated Average Depth Upon Reclamation (feet) [3]	Current Use	Proposed Post-reclamation Use
Airport North Bufferlands						
Airport Site 3	193	145	4	3	Idle	Idle
Airport Site 5	41	36.5	3.1	2.1	Idle	Idle
Airport Site 6	107	65.4	5.4	4.4	Idle	Idle
Brookfield	195	180	5	4	Rice	Rice
Dunmore	160	160	5	4	Rice	Rice
Elkhorn Borrow Area	625	NA	NA	NA	Agriculture[4]	Agriculture[4]
Lower Woodland Corridor	24	24	2	1	Agriculture	Woodland
Krumenacher	118	NA	NA	NA	Grazing/other	Grazing/other
Novak	94	76	5	4	Field crops	Field crops
Pacific Terrace	276	113	4	3	Field crops	Field crops
Private property in Reach 5A	48	34	3	2	Field crops	Field crops
Private property in Reach 6B	71	20	3	2	Field crops	Field crops
Private property in Reach 7	86	67	5	4	Field crops	Field crops
RD 1001	120	–	–	–	Flood damage reduction improvements by owner	Future flood damage reduction improvements by owner
South Sutter, LLC	97	95	5	4	Field crops	Field crops
Sutter Pointe	817	300	5	4	Rice	Rice
Twin Rivers Unified School District [5]	–	–	–	–	Stockpile	–

Notes:
NA = not available; RD = Reclamation District
[1] Extent of excavation within site
[2] Depth includes topsoil stripping and excavation
[3] Finished depth following finish grading and seeding
[4] The Elkhorn Borrow Area is a large area that supports a variety of current uses. "Agriculture" is used here in a general sense to encompass these many uses.
[5] Twin Rivers Unified School District is a stockpile of soil created from grading; excavation is not required.
Source: Data provided by Mead and Hunt in 2008 and compiled by EDAW in 2008 and 2009

In addition to the above-listed borrow sites, additional borrow sites may be needed in the event that the currently identified sites are not able to supply all of the required earthen fill material. As described above, some sites may have deficiencies as to the quality of fill or have previously unidentified sensitive resources that could make their use infeasible. To ensure that adequate fill material is available for the Phase 3 Project, the Elkhorn Borrow Area (**Plates 17a and 10**) has been identified as an area where additional borrow may be extracted.

Borrow sites would be selected within the Elkhorn Borrow Area consistent with the criteria listed in Section 2.3.8.4, below, and would be developed and reclaimed in the same manner as the identified borrow sites. Those mitigation measures related to impacts associated with borrow sites described in Chapter 4.0, "Environmental Consequences and Mitigation Measures." would apply to any newly developed borrow sites.

2.3.8.4 BORROW SITE PROGRAM

Although it is assumed that several parcels within the Elkhorn Borrow Area would be used (see **Plate 10**), the specific locations are currently unknown because investigations to determine which locations are most suitable are ongoing. This document performs project-level NEPA/CEQA analysis to the extent feasible, and also provides a checklist in **Appendix J** of this EIS/EIR to determine if borrow sites selected after the approval of the Phase 3 Project would be consistent with identified impacts, and thus can be approved as within the Phase 3 Project and under the NLIP. Any borrow site that would be selected within this area will be subject to applicable mitigation and environmental commitments, as identified in this EIS/EIR. The following environmental commitments apply to the selection and use of borrow sites and have been incorporated into the mitigation measures applicable to borrow sites:

- minimize land use fragmentation;
- implement standard best management practices, a stormwater pollution prevention plan, and comply with National Pollutant Discharge Elimination System permit conditions;
- obtain and comply with required permits (e.g., Section 7 of the Federal Endangered Species Act, Section 1602 of the California Fish and Game Code, Section 2081 of the California Endangered Species Act Permit Condition, Section 404 of the Clean Water Act, and California Surface Mining and Reclamation Act permit);
- complete a wetland delineation, and complete detailed design and habitat creation components and management agreements to ensure compensation for fill of waters of the United States;
- conduct focused surveys of special-status species and habitats, develop detailed design to ensure adequate compensation for loss of habitat, and implement all management agreements;
- survey for cultural resources (historic and pre-historic), document alterations made to cultural resources, and distribute the information to the appropriate repositories;
- prepare and implement an Historic Properties Treatment Plan if historic resources are found;
- prepare and implement a traffic safety and control plan for construction-related truck trips and detours;
- implement applicable district-recommended control measures to minimize temporary emissions of reactive organic gases (ROG), oxides of nitrogen (NO_X), and respirable particulate matter with an aerodynamic diameter of 10 micrometers or less (PM_{10})during construction;
- implement noise-reducing construction practices, prepare and implement a noise control plan, implement noise-reduction measures, and monitor and record construction noise near sensitive receptors;

- coordinate with irrigation water supply users before and during all irrigation infrastructure modifications and minimize interruptions of supply;

- verify utility locations, coordinate with utility providers, prepare and implement a response plan, and conduct worker training with respect to accidental utility damage;

- complete Phase I and/or Phase II Environmental Site Assessments and implement required measures;

- coordinate work in the critical zone with Airport operations and restrict night lighting within and near the runway approaches;

- conduct wildlife-aircraft strike analysis and develop and implement mitigation for ground-moving activities within the Sacramento International Airport Critical Zone; and

- prepare and implement a fire management plan to minimize potential for wildland fires.

Appendix J provides a detailed discussion of the criteria that would apply to the selection of borrow sites within the Elkhorn Borrow Area, to determine consistency with the Phase 3 Project and under the NLIP.

2.3.9 OPERATIONS AND MAINTENANCE

Agencies and organizations that would have management responsibility for proposed project features are SAFCA, RD 1000, NCMWC, SCAS, and TNBC, as described below.

- **Sacramento Area Flood Control Agency.** SAFCA would be responsible for the design and construction of all levee improvements, maintenance access, inspection roads, and rights-of-way, replacement canals and associated drainage and irrigation structures, and habitat creation sites. In addition, SAFCA would be responsible for all necessary land acquisitions and easements to construct the project features and achieve the project objectives. However, once these project features are completed, most of the land or land management responsibility would be conferred by SAFCA to the other management entities described below. Memoranda of agreement, land ownership transfers, or management endowments and contracts would be used by SAFCA to transfer land management responsibility to the appropriate public agency or nonprofit land management organization. At the end of the project construction period, all project lands would be in public ownership and/or would be under the permanent control of a natural resource conservation entity.

- **Reclamation District 1000.** The mission and purpose of RD 1000 is to operate and maintain the flood protection levees surrounding the Natomas Basin and operate and maintain the internal drainage system to evacuate agricultural and urban stormwater and incidental runoff. RD 1000 would be responsible for the management of the proposed levee improvements, when complete, the new GGS/Drainage Canal, and reconstructed Pumping Plant No. 2. Typical activities include mowing grassland along levee slopes and berms, canal banks, and rights-of-way; managing canal bank vegetation, including noxious weeds; maintaining relief wells and other drainage features; periodically removing sediment from drainage canals; and maintaining and repairing canal and levee patrol roads.

- **Natomas Central Mutual Water Company.** NCMWC is a nonprofit mutual water company with the primary focus of keeping the water conveyance functioning in order to serve the company shareholders. Intensive maintenance to maximize agricultural irrigation services throughout the basin is generally limited to only 10% annually of the approximately 100 miles in the Natomas Basin canal system operated by NCMWC. NCMWC would be responsible for maintaining and managing the relocated Elkhorn and Riverside Canals and existing irrigation canals. The relocated canals would be maintained in the same manner as the existing canals. Typical maintenance activities include operating and repairing water control structures and barrier gates, periodically removing sediment and noxious aquatic weeds from the canals, repairing canal roads,

managing bank vegetation, and mowing grassland along canal and road rights-of-way. However, compared to the existing Elkhorn and Riverside Canals, the relocated canals would have improved embankments, better water control structures, better vegetation cover, and wider roads and right-of-ways. These improvements are expected to ease annual canal management efforts, allowing for a proportionately greater focus on maintenance and operations and less need for repair and dredging.

- **Sacramento County Airport System.** SCAS manages the Sacramento County–owned bufferlands outside the Airport Operations Area. All project components on land under SCAS management would remain in public ownership (**Plate 7**).

- **The Natomas Basin Conservancy.** TNBC acquires and manages land for the purpose of meeting the objectives of the NBHCP. To meet the mitigation goals of the NBHCP, developers of projects pay a mitigation fee to TNBC when they apply for building permits. TNBC then uses the mitigation fees to acquire, restore, and manage mitigation lands to provide habitat for protected species and maintain agriculture in the Natomas Basin. TNBC owns approximately 30 mitigation properties totaling more than 4,000 acres. Private land acquired by SAFCA and converted to managed marsh or used for woodland establishment may be conveyed to TNBC after creation of permanent habitats as marsh, woodlands, and habitat buffer zones. RD 1000 or SAFCA may also contract with TNBC for management elements of some habitat features (e.g., the GGS/Drainage Canal) (**Plate 8**).

2.4 LEVEE RAISE-IN-PLACE ALTERNATIVE

All elements of the Levee Raise-in-Place Alternative would be the same as described in Section 2.3 for the Proposed Action except for levee raising and seepage remediation with respect to the Sacramento River east levee in Reaches 5A–9B and removal of encroachments from the Sacramento River east levee (differences from the Proposed Action are shown in italicized text). Construction details for this alternative are presented in **Appendix H**.

The Levee Raise-in-Place Alternative includes the following major activities:

- **Sacramento River east levee Reaches 5A-9B: Levee raising and seepage remediation**—*Raise the existing levee and flatten the landside slope from Reach 5A through Reach 9B, and construct cutoff walls, seepage berms, and relief wells for seepage remediation as required.*

- **Riverbank erosion control**—*Implement erosion control improvements along approximately 1,260 feet of river bank at the waterside toe of the Sacramento River east levee at River Mile 73.5 (Site G in Reach 6A).*

- **PGCC west levee: Levee raising, slope flattening, and widening; and seepage remediation**—Same as the Proposed Action.

- **NEMDC west levee from Elkhorn Boulevard to NEMDC Stormwater Pumping Station: Levee widening and flattening and seepage remediation**—Same as the Proposed Action.

- **NEMDC west levee from NEMDC Stormwater Pumping Station to Northgate Boulevard: Seepage and slope stability remediation**—Same as the Proposed Action.

- **Relocation of approximately 9,400 feet of the Elkhorn Canal (highline irrigation canal) downstream of Elkhorn Reservoir**—Same as the Proposed Action.

- **Construction of a new GGS/Drainage Canal downstream of Elkhorn Reservoir**—Same as the Proposed Action.

- **Reconstruction of RD 1000 Pumping Plant No. 2**—Same as the Proposed Action.

- **Habitat creation and management**—Same as the Proposed Action, *except the purchase of credits from a local mitigation bank would be required to offset the removal of trees from the water side of the existing levee to meet USACE design criteria.*

- **Infrastructure relocation and realignment**—Same as the Proposed Action.

- **Landside vegetation removal**—Same as the Proposed Action.

- **Right-of-way acquisition**—Same as the Proposed Action, *except less land would be needed to accommodate the narrower levee footprint in Reaches 5A–9B.*

- **Encroachment management**—*Remove substantial encroachments from the water side and land side of the Phase 3 Project Sacramento River east levee reaches and land side of the other NLIP project levee segments to ensure that the levees can be certified as meeting the minimum requirements of the National Flood Insurance Program and USACE encroachment guidance.*

- **Borrow site reclamation**—Same as the Proposed Action.

- **Reconfiguration of Airport West Ditch**—Same as the Proposed Action.

2.4.1 FLOOD RISK REDUCTION COMPONENTS

This alternative would predominantly involve the same flood risk reduction components as the Proposed Action except that the Sacramento River east levee would be raised in place. These differences are outlined below. In addition, because an adjacent levee would not be constructed along the Sacramento River east levee under this alternative and, instead, the Sacramento River east levee would be raised in place in Reaches 5A–9B, erosion protection would also need to be undertaken at Site G along the water side of this levee. (See **Plate 5** for the locations of erosion sites.) The associated erosion control requirement and methods are described below as well.

2.4.1.1 LEVEE RAISING

The Sacramento River east levee would be raised a distance of approximately 4.5 miles to provide sufficient levee height (3 foot) above the "200-year" design flood. The levee raise would consist of an embankment raise from the landside or waterside toe (or both) upward to the increased crown elevation. This would require partially excavating the levee slope to provide a working platform for equipment, typically 10 feet wide, and rebuilding the levee to the appropriate elevation by benching the new embankment material into the existing embankment material. The landside levee slope would be flattened from 2H:1V to 3H:1V.

2.4.1.2 SEEPAGE REMEDIATION

The seepage remediation components of this alternative would be the same as those of the Proposed Action except along the Sacramento River east levee where it would likely not be feasible to employ SB cutoff walls. In lieu of this measure, a combination of SCB or CB walls, seepage berms, and/or relief wells would be employed.

2.4.1.3 RIVERBANK EROSION CONTROL

Because this alternative would raise the existing levee in place, rather than widening it with an adjacent setback levee as under the Proposed Action, a higher risk would remain for further bank erosion to shorten the seepage path beneath the water side and land side of the levee and destabilize the waterside slope by encroachment into the levee template. Therefore, this alternative includes bank protection improvements to Site G, a high-risk

erosion site at River Mile 73.5 (1,260 linear feet). These improvements would include the measures described below (**Plate 18**).

- Rock riprap would be placed on the existing or restored levee-foundation slope from the channel bed to about the average summer water level on the bank, with toe protection as required to resist and accommodate scour of the channel bed.

- Cobble-covered soil slopes would extend from the riprap up the slope to about the average winter water surface elevation. The maximum slope of the surface of the soil fill would be 3H:1V and the minimum would be 10H:1V. A layer of cobbles and filter material would be placed on the top of the soil to provide protection of the levee foundation from catastrophic scour and erosion protection of the soil surface. Riparian vegetation would be planted through the cobbles, with species varying according to the elevation above the average summer water surface elevation.

- Existing riparian vegetation would be retained above the cobble slope (i.e., above the average winter water level) as a result of limiting the height of the structure up the bank. Providing construction access by barge rather than clearing vegetation on the berm to provide construction access from Garden Highway would further limit the removal of riparian vegetation where this construction method is practical. Where larger-diameter trees are present near where the cobble slope joins the natural upper-bank slope, they would be marked and avoided during construction to the extent feasible. Where trees exist within the area of the proposed cobble slope and the thickness of the soil-cobble layers is less than 2 feet, the existing trees may be retained.

- Instream woody material structures would be included in the design of the bank protection improvements to enhance habitat mitigation. These structures would consist of whole-tree and/or rootwad clusters anchored into the revetment on the lower portion of the cobble-covered soil slope, such that portions of the instream woody material typically would be submerged even during the low-flow season.

2.4.2 Aviation Safety Components

The aviation safety components of this alternative would be the same as for the Proposed Action.

2.4.3 Habitat Conservation Components

The habitat conservation components for this alternative would be the same as for the Proposed Action with one exception: credits would be purchased from a local mitigation bank to offset the removal of trees from the water side of the existing levee to meet USACE design criteria.

2.4.4 Irrigation and Drainage Components

The irrigation and drainage components of this alternative would be the same as for the Proposed Action.

2.4.5 Additional Actions to Meet FEMA, USACE, and State Design Requirements: Encroachment Management and Garden Highway Closures

Encroachment management and road closures associated with raising the Sacramento River east levee would differ from the activities described for the Proposed Action, as specified below.

2.4.5.1 ENCROACHMENT MANAGEMENT

To meet USACE requirements (USACE 2000), a substantial number of structural features may need to be removed from the water side of the existing levee. In addition, implementation of this alternative would require the removal of trees from the water side of the levee, totaling as much as approximately 22.5 acres, in addition to approximately 17.5 acres of trees that would need to be removed from the levee and berm footprint on the land side, for a total loss of 40 acres of woodland. Approximately 157 acres of trees would be planted as replacements at an approximately 6:1 ratio for waterside and 1:1.25 for landside along the land side of the levee.

2.4.5.2 GARDEN HIGHWAY CLOSURES

Raising the existing Sacramento River east levee in place and construction of the cutoff walls would require removal of the top portion of the levee and closure of the Garden Highway for prolonged periods during construction, necessitating an extensive traffic control and detour plan. Closures would affect 1.5- to 2-mile segments of Garden Highway at one time and the duration of closure for each segment could last for approximately 8 to 12 weeks to allow for degrading the levee, installing the cutoff wall, reconstructing the levee, and reconstructing Garden Highway. This would eliminate landside access to residences and businesses along Garden Highway and would require that residents relocate and businesses close until access is restored. Cutoff wall construction would also require demolition and reconstruction of residential driveways along Garden Highway. In addition to the closure of the Elkhorn Boat Launch Facility located along the Sacramento River east levee at the I-5 Bridge, this alternative would also require removal of land-based access to two private marinas and associated restaurants located immediately north of the I-5 boat launch facility. Closure of the marinas would last for approximately 8 to 12 weeks in the summer.

2.4.6 LAND, EASEMENTS, RELOCATIONS, AND RIGHTS-OF-WAY

Right-of-way acquisition would be similar to acquisition for the Proposed Action, except less land would be needed to accommodate the narrower levee footprint in Reaches 5A–9B of the Sacramento River east levee.

2.4.7 CONSTRUCTION DETAILS

The general construction activities for this alternative and the sequence of construction activities would be the same as described for the Proposed Action for the PGCC and NEMDC west levee improvements, improvements to major infrastructure, and habitat creation at borrow sites and in the GGS/Drainage Canal.

Construction of the improvements to the Sacramento River east levee would require a substantially different set of activities. Construction activities for the Levee Raise-in-Place Alternative would include raising in place approximately 24,000 feet of the existing levee and constructing seepage remediation, including cutoff walls at multiple sites and seepage berms at others. The timing of construction of the Levee Raise-in-Place Alternative elements would be the same as for the Proposed Action. **Appendix H** provides construction plan details for cutoff wall construction in the existing Sacramento River east levee, and for levee raising to obtain a minimum of 3 feet of levee height above the “200-year” design water surface,

The crew size for this work is estimated at 45–55 people (i.e., starting from three locations) during two back-to-back 12-hour shifts (24-hour-per-day construction), 7 days per week.

Approximately 900,000 cubic yards of imported soil borrow material would be required for the levee raising and flattening. Hauling of material from the borrow site is anticipated to occur during a single 10-hour shift each day.

If the same overall proportions of construction work would be completed each year as calculated for the Proposed Action, delivery of the 974,750 cy of material would require approximately 500–600 haul trips per day in 2009 (compared to 900–1,100 trips per day under the Proposed Action). As under the Proposed Action, these estimates are based on the assumption that the work would be done in a 6-month construction period with 140 days out of

the 156-working-day window being used to haul material, conservative assumptions of truck capacity of 15 cubic yards and 24 tons, and the use of haul trucks for moving all borrow material from the Airport north bufferlands (rather than a combination of haul trucks and scrapers).

2.4.8 BORROW MATERIAL

Borrow material requirements would be approximately half that of the Proposed Action. Potential borrow sites and selection criteria would be the same as described above for the Proposed Action.

2.4.9 OPERATIONS AND MAINTENANCE

As described in the Proposed Action, RD 1000, TNBC, and SCAS provide O&M services for levees and various lands in the vicinity of flood damage reduction features in the Natomas Basin. O&M activities and requirements would be identical for the Levee Raise-in-Place Alternative because USACE standards for levee maintenance must be met.

2.5 COMPARISON OF THE IMPACTS OF THE ALTERNATIVES

Table 2-3 shows the overall level of significance for each issue area, and provides a comparison of CEQA significance determinations among the No-Action Alternative (No Project Construction and Potential Levee Failure) and the two action alternatives (Proposed Action and Levee Raise-in-Place Alternative) for each of the 21 environmental issues evaluated in this EIS/EIR. As noted in the table, significance conclusions for this alternatives comparison are the result of the combination of all environmental impacts associated with a particular issue area.

As shown in **Table 2-3**, there would be no direct construction-related impacts associated with the No-Action Alternative (No Project Construction component). However, as described in Section 2.2.1, "No-Action Alternative—No Flood Damage Reduction Measures," USACE's evaluation of geotechnical information and other data indicate that without improvements to the Natomas perimeter levee system (i.e., implementation of one of the action alternatives), an approximately 3% per year or greater probability of a flood causing levee failure exists (Potential Levee Failure component). Impacts associated with a potential levee failure are unknown, and would be dependent on the location and extent of flooding, therefore, these potential impacts are considered too speculative for meaningful consideration.

Although a greater number of significant and unavoidable impacts would result from implementation of the Levee Raise-in-Place Alternative compared to the Proposed Action, these impacts would occur as a result of the same type of mechanism (e.g., habitat loss, traffic increases).

To further compare and contrast the significant and unavoidable impacts that would result from implementation of either action alternative, **Table 2-4** provides a comparison of the quantifiable environmental impacts associated with the action alternatives.

Table 2-3
Comparison of the Environmental Impacts (After Mitigation Implementation) of the Phase 3 Project Alternatives[1]

Environmental Issue Area	Phase 3 Project Alternative			
	No-Action Alternative		Proposed Action	Levee Raise-in-Place Alternative
	No Project Construction	Potential Levee Failure		
Agricultural Resources	NI	Too Speculative	**SU**	**SU**
Land Use, Socioeconomics, Population, and Housing	NI	Too Speculative	**SU**	**SU**
Geology and Soils	NI	Too Speculative	LTS	LTS
Hydrology and Hydraulics	NI	**SU**	LTS	
Water Quality	NI	Too Speculative	LTS	LTS
Fisheries	NI	Too Speculative	LTS	LTS
Sensitive Aquatic Habitats	NI	Too Speculative	LTS (B)	LTS (B)
Vegetation and Wildlife	**SU**	Too Speculative	LTS	**SU**
Special-Status Terrestrial Species	NI	Too Speculative	LTS	LTS
Cultural Resources	NI	Too Speculative	**SU**	**SU**
Paleontological Resources	NI	LTS	LTS	LTS
Transportation and Circulation	NI	Too Speculative	LTS	**SU**
Air Quality	NI	Too Speculative	LTS	LTS
Noise	NI	LTS	**SU**	**SU**
Recreation	NI	Too Speculative	LTS	**SU**
Visual Resources	**SU**	Too Speculative	**SU**	**SU**
Utilities and Service Systems	NI	Too Speculative	LTS	LTS
Hazards and Hazardous Materials	NI	Too Speculative	LTS	LTS
Airport Safety	NI	Too Speculative	LTS	LTS
Wildfire Hazards	NI	Too Speculative	LTS	LTS
Environmental Justice	NI	Too Speculative	LTS	LTS

Notes: B = Beneficial, NI = no impact, LTS = less than significant, S = significant, SU = significant and unavoidable

[1] The overall impact conclusion for each issue area for each alternative was determined as follows: Separate tables were created for each issue area, and within each alternative, the number of each of the significance conclusions (LTS, LTS(B), SU) after the implementation of mitigation measures was added up and totaled. The significance conclusion that occurred the greatest number of times within each issue area was determined to be the overall impact conclusion for that alternative. For example, if there were four impacts determined to be LTS and two impacts determined to be SU, the impact conclusion would be LTS. In cases where the numbers were the same (i.e., two impacts determined to be LTS and two impacts determined to be SU), the more severe impact was used; in the case of this example, it would be SU. No Action Alternatives are not subject to mitigation, and often a precise determination of significance is not possible and cannot be made, therefore, the impact is too speculative for meaningful consideration ("Too Speculative").

Source: Data compiled by EDAW in 2009

Table 2-4
Summary of Quantifiable Environmental Impacts of the Action Alternatives[1]

Environmental Impact	Proposed Action	Levee Raise-in-Place Alternative
Permanent Important Farmland Conversion	361.5 acres	**453 acres**
Potential Permanent Habitat Loss		
Rice	45 acres	45 acres
Canals	16 acres	16 acres
Landside Woodlands	**37 acres**	17.5 acres
Waterside Woodlands	1 acre	**22.5 acres**
Cropland	**115 acres**	12 acres
Grasslands	**69 acres**	27 acres
Shaded Riverine Habitat	1 acres	**22.5 acres**
Loss of Elderberry Shrub	**63 shrubs**	39 shrubs
Potential Wetlands Filled		
Temporary	70.42 to 354.01 acres	70.42 to 354.01 acres
Permanent	22.17 to 27.17 acres	**29.87 to 34.87 acres**
Potential Temporary Traffic Increases		
Sacramento River east Levee	**950–1,000 trips/day**	500–600 trips/day
PGCC	100–200 trips/day	100–200 trips/day
Construction-Related Garden Highway Closures	Temporary/Intermittent closure of approximately 1,000 feet of Garden Highway for approximately 8 to 12 weeks	Closure of 1.5- to 2-mile segments of Garden Highway, for approximately 8 to 12 weeks per segment
Potential Temporary Air Pollutant Emissions		
Sacramento County:		
ROG	**75 lb/day**	41 lb/day
NO_X	**413 lb/day**	227 lb/day
PM_{10}	**971 lb/day**	534 lb/day
Sutter County:		
ROG	**93 lb/day**	51 lb/day
NO_X	**499 lb/day**	274 lb/day
PM_{10}	**1,283 lb/day**	706 lb/day

Notes: PGCC = Pleasant Grove Creek Canal, ROG = reactive organic gases, NO_X = oxides of nitrogen, PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less, lb/day = pounds per day

[1] All values are approximate. Refer to Chapter 4.0, "Environmental Consequences and Mitigation Measures," for more detail including significance criteria, mitigation measures, and other aspects of the environmental analysis. Some quantifiable environmental impacts are not presented in this table because there is no significant difference between the impacts, or data are not quantifiable. Values in bold denote the greater impact.

Source: Data compiled by EDAW in 2008 and 2009

2.5.1 RESIDUAL RISK OF FLOODING

Implementation of the Phase 3 Project would substantially lessen the probability of a flood in the Basin due to levee failure. However, the Natomas Basin would remain subject to a residual risk of flooding. All of the action alternatives would have the same residual risk of flooding; with the current risk being reduced from approximately a one-in-three chance under the No-Action Alternative to a one-in-200 chance under either action alternatives for a levee failure in a reach of the Phase 3 Project. As described throughout Chapter 4.0, "Environmental Consequences and Mitigation Measures," the potential environmental impacts of a levee failure, as would occur under the No-Action Alternative, would be significant and unavoidable. Under all action alternatives, SAFCA would be required to maintain an on-going residual risk management program, as described below.

In recognition of the need to incorporate management of this residual risk into local land use planning efforts, as part of the cost sharing agreement between the State of California and SAFCA that will facilitate non-Federal funding of the project, SAFCA will be obligated to provide the state with a safety plan that is consistent with recently adopted requirements of state law. Under these requirements, the safety plan, at a minimum, must include all of the following elements:

- a flood preparedness plan that includes storage of materials that can be used to reinforce or protect a levee when a risk of failure exists;
- a levee patrol plan for high-water situations;
- a flood-fight plan for the period before Federal or state agencies assume control over the flood fight;
- an evacuation plan that includes a system for adequately warning the general public in the event of a levee failure, and a plan for the evacuation of every affected school, residential care facility for the elderly, and long-term health care facility;
- a floodwater removal plan; and
- a requirement, to the extent reasonable, that new buildings in which the inhabitants are expected to be essential service providers is either located outside an area that may be flooded or is designed to be operable shortly after the floodwater is removed.

Moreover, even with these measures in place, SAFCA recognizes that the consequences of an uncontrolled flood would greatly increase over time as planned new development occurs in the Natomas Basin in accordance with SACOG's regional blueprint. If no additional risk reduction measures are implemented, the result would be a steady rise in expected annual damages that would undermine the risk reduction accomplishments of the project.

To address this potential increase in residual risk, SAFCA has implemented a development impact fee program that applies to all new structures placed anywhere in the "200-year" floodplain of SAFCA's capital assessment district, including the Natomas Basin. The objective of this program is to avoid any substantial increase in the expected damage of an uncontrolled flood, as new development proceeds in the floodplain, through a continuing flood risk reduction program for the Natomas Basin and the lower American and Sacramento Rivers that will consist of the measures described below.

- **Waterside Levee Strengthening.** This measure would consist of a long-term program of waterside bank and levee protection improvements along the lower American and Sacramento Rivers, including the Natomas Basin, designed to arrest retreat of the upper bank, preserve waterside berm width, and reduce the potential for destabilization of the adjacent levee foundation due to erosion or ground shaking. In addition, this measure would minimize the long-term loss of mature trees and vegetation located along the affected berms and

provide opportunities for expansion of the Central Valley's remnant riparian forest while enhancing the public safety purposes of the levee system.

- **Landside Levee Strengthening.** This measure would focus on improvements to the crown and landside slope of critical segments of the levee system along the NCC, PGCC, and the lower American and Sacramento Rivers to increase the resistance of these levees to overtopping and extended elevated river stages. In the Natomas Basin, these improvements would involve flattening the landside slope of the NCC south levee, the PGCC west levee, and the Sacramento River east levee to a 5H:1V dimension. Along the lower American River (outside of the Natomas Basin), these improvements would involve hardening the crown and landside slope of portions of the north and south levees between Howe Avenue and Watt Avenue.

- **Acquisition of Agricultural Preconservation Easements.** This measure would focus on acquiring agricultural preconservation easements from willing landowners occupying the levee-protected floodplains upstream and immediately downstream of the Fremont Weir located outside of the Natomas Basin. The purpose of these easements would be to compensate the participating landowners for abandoning the development rights associated with their property. These easements would remove the incentive to improve the levees protecting the property beyond the minimum design requirements of the SRFCP and would thus ensure that these levees are not raised above the "1957 profile" that governs the design of the SRFCP. This would reinforce the "200-year" design of the early implementation project and the NLIP as a whole, which assumes that upstream levees are improved to the 1957 profile and overtop without failing when water surface elevations exceed this profile. It is assumed that SAFCA's development impact fee revenue would constitute only a portion of the revenue devoted to this measure, with the balance coming from the Federal and state governments as part of a comprehensive update of the plan of flood control for the Sacramento Valley (**Plate 2**).

- **Improved System Operations.** This measure would focus on opportunities to improve the operation of the SRFCP to reduce water surface elevations in the lower American and Sacramento Rivers and in the drainage channels around the Natomas Basin. These opportunities would include implementing weather forecast-based operations at Folsom Dam and Reservoir and increasing the conveyance capacity of the Yolo and Sacramento Bypass systems. It is assumed that SAFCA's development impact fee revenue would constitute only a portion of the revenue devoted to this measure, with the balance coming from the Federal and state governments as part of a comprehensive update of the plan of flood control for the Sacramento Valley.

2.6 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

The State CEQA Guidelines require identification of an environmentally superior alternative from among the proposed project (i.e., Proposed Action) and the alternatives evaluated. If the No-Project Alternative (i.e., No-Action Alternative) is environmentally superior, CEQA requires identification of the "environmentally superior alternative" other than the No-Project Alternative and the alternatives evaluated. Federal NEPA guidelines also recommend that an environmentally preferred alternative be identified; however, under NEPA, that alternative does not need to be identified until the final Record of Decision is published. Therefore, the discussion in this section of the environmentally superior alternative is intended to satisfy CEQA requirements.

Under the No-Action Alternative (Potential Levee Failure), without improvements to the Natomas perimeter levee system, the risk of a levee failure would remain high, resulting in the potential for multiple unavoidable significant adverse effects on environmental resources (see **Table 2-3**).

As described in **Appendix I**, development of the action alternatives included consideration of potential effects on environmental resources (e.g., waters of the United States, woodlands, and habitat). Accordingly, levee improvements were designed to avoid or minimize such effects where practicable. However, agricultural canals and seasonal wetlands present near the toe of the levees would require filling under either of the action alternatives because of their proximity to the existing levees. Quantification of these and other impacts is provided

above in **Table 2-4**. Significant impacts to certain environmental issue areas (e.g., noise, cultural resources, visual resources) cannot be quantified, and would result in similar impacts regardless of the action alternative selected.

There are two primary differences between the action alternatives in terms of their potential environmental impacts. The first is that the Levee Raise-in-Place Alternative could result in significant and unavoidable effects on shaded riverine aquatic habitat function associated with the removal of as much as 22.5 acres of riparian vegetation—compared to 1 acre under the Proposed Action—on the water side of the Sacramento River east levee, that would be needed to conform with USACE guidance regarding levee encroachments (USACE 2000). Removal of this vegetation would likely result in the loss of a substantial amount of nesting habitat for Swainson's hawk and adverse impacts to fish. The second difference between the impacts of the action alternatives is that the Levee Raise-in-Place Alternative would require levee degradation (to accommodate installation of the proposed cutoff walls) and reconstruction of the existing Garden Highway in accordance with currently applicable roadway standards. The anticipated closure of Garden Highway would result in severe access and traffic delays. Construction of the adjacent levee under the Proposed Action would preclude the need for this extensive vegetation removal and extensive roadway reconstruction, and thus would avoid these impacts.

Based on the conclusions in **Tables 2-3 and 2-4** and from conclusions presented in the Local Funding EIR, Phase 2 Landside EIR, and Phase 2 EIS incorporated by reference, the Proposed Action would have the fewest overall environmental impacts, as well as the least environmentally damaging impacts, and therefore would be the environmentally superior alternative under CEQA.

3.0 AFFECTED ENVIRONMENT

The baseline environmental conditions assumed in this environmental impact statement/environmental impact report (EIS/EIR) consist of the existing physical environment as of July 18, 2008, the date when SAFCA published the notice of preparation (NOP) to prepare an EIR with the State Clearinghouse and USACE published the notice of intent (NOI) to prepare an EIS in the *Federal Register*, Vol. 73, No. 139. Even though this chapter is titled "Affected Environment" for the purposes of NEPA, it also constitutes the "Environmental Setting" required under CEQA.

3.1 GENERAL SITE CONDITIONS

3.1.1 NATOMAS BASIN

The Natomas Basin (**Plate 1**) is located at the confluence of the American and Sacramento Rivers. Encompassing approximately 53,000 acres, the Basin extends northward from the American River and includes portions of the city of Sacramento, Sacramento County, and Sutter County. In addition to the American and Sacramento Rivers, the Natomas Basin is bordered on the north by the Natomas Cross Canal (NCC) and on the east by the Pleasant Grove Creek Canal (PGCC) and the Natomas East Main Drainage Canal (NEMDC) (also known as Steelhead Creek). The NCC diverts the runoff from a large watershed in western Placer and southern Sutter Counties around the Natomas Basin and is a contributor to the flows in the upper reach of the Sacramento River channel in SAFCA's jurisdiction. The NEMDC is an engineered channel along the southeastern flank of the Natomas Basin. Tributaries to the NEMDC include Dry Creek, Arcade Creek, Rio Linda Creek, Robla Creek, and Magpie Creek Diversion Channel. The Natomas Basin is protected from high flows in these water bodies and in the American and Sacramento Rivers by an interconnected perimeter levee system. This levee system was originally created to promote agricultural development. Today, however, the Natomas Basin contains three major public transportation facilities (Interstate 5 [I-5], Interstate 80 [I-80], and State Route [SR] 99/70) and is the site of the Sacramento International Airport (Airport). Airport lands account for a little over 10% of the total acreage in the Basin. Half of the Airport lands lie outside of the Airport Operations Area and consist of "bufferlands" devoted to agricultural or open space use (see **Plate 7**). About 30% of the Basin consists of developed urban uses mostly located south of Elkhorn Boulevard in the city of Sacramento. The remaining 60% of the Basin is in some form of developed agricultural or open space use in unincorporated areas of Sacramento and Sutter Counties, including 4,000 acres under the management of The Natomas Basin Conservancy (TNBC) (see **Plate 8**).

3.1.2 LEVEE IMPROVEMENT AREAS

The general characteristics of the areas along the Sacramento River east levee, PGCC west levee, and NEMDC west levee are described in the following subsections. See also **Plates 17a–17c**.

3.1.2.1 SACRAMENTO RIVER EAST LEVEE

Table 3.1-1 contains a description of the areas along the Sacramento River east levee. Sacramento River east levee Reaches 1–4B and 10–20B are included in the table below for completeness; however, these reaches are part of the Phase 2 and 4 Projects, respectively, and not the subject of this EIS/EIR.

3.1.2.2 PLEASANT GROVE CREEK CANAL WEST LEVEE

The area along the PGCC west levee contains primarily agricultural uses along with minimal industrial, manufacturing, and rural residential uses.

Table 3.1-1
Description of the Sacramento River East Levee Area by Reach

Reach	Land Side	Water Side
	Phase 2 Project	
1	Sankey Road intersects Garden Highway near the start of Reach 1. Oak woodland and a rural residence are located approximately 3,000 feet south of the start of Reach 1; the rural residence is located within 50 feet of the landside toe of the levee. Rice and field crops border the levee throughout the reach.	Verona Village Resort (a small trailer campground, marina, restaurant, and store) is located on the west side of Garden Highway bordering the start of the reach. Small clusters of woodland are scattered along the highway to the south.
2	A rural residence adjacent to the existing levee is located approximately one-third mile south of the start of Reach 2. Field crops border the levee throughout the reach. The northern part of the TNBC Huffman West Habitat Preserve borders the levee in the southern end of the reach.	Small clusters of woodland are scattered along the highway. Eight residences are located at the end of Reach 2 adjacent to Garden Highway.
3	A field used for row crops, part of the TNBC Huffman West Habitat Preserve, covers the entire reach.	Six residences are located adjacent to Garden Highway.
4A and 4B	Field crops or open space border the levee throughout the reach. Most of the parcels bordering the levee are TNBC land (Huffman West and Atkinson Habitat Preserves) or Airport land. Riego Road intersects Garden Highway approximately 1,500 feet from the start of Reach 4A. Agricultural facilities at the end of a narrow paved road are located approximately 2,000 feet south of Riego Road. The Reclamation District (RD) 1000 Pumping Plant No. 2 is located on the North Drainage Canal. The Elkhorn Canal closely parallels the levee from the North Drainage Canal south. A highline canal perpendicular to the levee is located approximately 2,000 feet south of the North Drainage Canal. A cluster of woodlands is located just south of the canal. A line of trees perpendicular to the levee is located near the southern end of the reach.	Approximately nine residences, interspersed among woodland, are located adjacent to Garden Highway. Several docks and private marinas, including the Rio Ramaza Marina, are located along the bank. The Natomas Central Mutual Water Company's (NCMWC's) Prichard Lake Pumping Plant and pump tender's residence are located at the North Drainage Canal.
	Phase 3 Project	
5A and 5B	Field crops and fallow Airport north bufferlands border the levee throughout the reach on Airport land. A cluster of woodlands is located at the start of the reach. A rural residence with outbuildings and surrounding woodland is located approximately 1,600 feet south of the start of the reach. West Elverta Road intersects Garden Highway approximately 1,500 feet north of the end of the reach. The Elkhorn Canal closely parallels the levee throughout the reach.	Woodland covers the entire reach west of Garden Highway.
6A and 6B	Field crops border the levee throughout the reach. The West Drainage Canal, which borders Teal Bend Golf Club on the north, intersects the levee approximately 1,400 feet south of the orchard. Reservoir Road intersects Garden Highway approximately 1,000 feet south of the West Drainage Canal. The golf course covers the remaining 2,800 feet of the reach. The Elkhorn Canal closely parallels the levee throughout the reach.	Approximately eight residences, interspersed among woodland, are located adjacent to Garden Highway. Several docks are located along the bank. NMCWC's Elkhorn Pumping Plant is located at the start of Reach 6A.

Table 3.1-1
Description of the Sacramento River East Levee Area by Reach

Reach	Land Side	Water Side
7	Teal Bend Golf Club extends approximately 600 feet beyond the start of the reach. Field crops border the levee for the remaining 2,400 feet of the reach. The Elkhorn Canal closely parallels the levee throughout the reach.	Approximately 14 residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
8	Field crops border the levee throughout the reach. A rural residence with outbuildings and surrounding woodland is located at the start of the reach. Another rural residence with outbuildings and surrounding woodland is located approximately 1,200 feet south of the first residence. West Elkhorn Boulevard intersects Garden Highway approximately 800 feet north of the end of the reach. A woodland cluster is located at the end of the reach. The Elkhorn Canal closely parallels the levee throughout the reach, ending approximately 1,200 feet south of Elkhorn Boulevard.	Approximately eight residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
9A and 9B	A woodland cluster is located approximately 1,300 feet south of the start of the reach. Two rural residences are located within 1,000 feet of Bayou Road and the I-5 overpass. A woodland cluster is located on the south side of the I-5 overpass. Another woodland cluster is located approximately 700 feet further south. A woodland cluster is located at the end of Reach 9. Field crops border the levee throughout the reach.	Approximately 10 residences are located adjacent to Garden Highway interspersed among woodland. Several private docks are located along the bank. Two restaurant/ marina facilities are located within 800 feet of the intersection of Bayou Road and Garden Highway. The Elkhorn Boat Launch Facility operated by Sacramento County Regional Parks Department is located adjacent to the marinas.
	Phase 4 Project	
10	A rural residence is located at the start of the reach. A woodland cluster is located approximately 1,100 feet farther south. A large ranch occupies Reach 10 from approximately 1,700 feet south of the start of the reach to the end of the reach. Field crops border the levee throughout the reach. RD 1000's Pumping Plant No. 5 is located in the middle of the reach.	Approximately five residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
11A and 11B	Reach 11 contains the remaining 400 linear feet of the large ranch in Reach 10. Field crops border the levee throughout the reach. A rural residence is located approximately two-thirds mile from the start of Reach 11. Another rural residence is located another 2,000 feet south. Approximately one-half mile farther south, the river bends to the east. A cluster of trees is located approximately 1,600 feet west of the end of the reach. Field crops border the levee throughout the reach. RD 1000's Pumping Plant No. 3 is located within the reach.	Approximately 12 residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
12	An orchard covers much of Reach 12, at which point the river trends south again. A rural residence is located approximately one-half mile south of the start of the reach. A rural residence and the Kimura Ditch are located 500–700 feet north of the end of the reach, followed by two more residences. A highline ditch starts at the Kimura Ditch and closely parallels the levee to the south. Field crops border the levee throughout the reach.	Approximately 14 residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.

Table 3.1-1
Description of the Sacramento River East Levee Area by Reach

Reach	Land Side	Water Side
13	A residence is located at the start of Reach 13. Pumping Plant No. 3 and a large drainage ditch perpendicular to the levee are located 800 feet south of the start of the levee. Another 1,400 feet farther south is a woodland cluster. A highline ditch closely parallels the levee for the length of the reach. Field crops border the levee throughout the reach. The TNBC Cummings preserve includes mitigation plantings for valley elderberry longhorn beetle.	Approximately 13 residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
14	Radio Road intersects Garden Highway approximately 1,600 feet south of the start of Reach 14 at the end of a large field used for row crops. A rural residence is located approximately 800 feet farther south. The southern part of the reach is bordered by the TNBC Alleghany preserve.	Approximately 14 residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank. NCMWC's Riverside Pumping Plant is located in the middle of the reach.
15	Reach 15 starts at the intersection of San Juan Road and Garden Highway. Two residential estates are located 600 and 1,200 feet farther south. Scattered trees are located adjacent to the levee. The northern part of the reach is bordered by the TNBC Alleghany preserve.	Approximately 21 residences, interspersed among woodland, are located adjacent to Garden Highway. More than a dozen private docks are located along the bank.
16	Eight rural residences amid scattered trees are located in the first 1,600 feet of Reach 16. The next 2,000 feet are a mixture of open fields, rural residences, farm buildings, and scattered trees. Dense woodland makes up the remaining 1,200 feet of the reach. The reach contains approximately 20 residences.	Approximately 12 residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
17	A rural residence is located at the start of Reach 17, approximately 600 feet inland from the levee toe. A rural residence with outbuildings is located approximately 800 feet south of the start of the reach.	Approximately seven residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
18	Reach 18 contains four to five rural residences among small orchards north of the I-80 overcrossing. A woodland cluster is located on the east side of the I-80 overcrossing, where the river bends east.	Approximately six residences, interspersed among woodland, are located northwest of the I-80 overcrossing, adjacent to Garden Highway. Several private docks are located along the bank.
19A and 19B	Two rural residences are located within 800 feet of the start of Reach 19, with scattered trees along and adjacent to the levee. The rest of the reach contains a subdivision of several hundred homes, the Swallows Nest Golf Course and condominium complex, and a subdivision of approximately 90 homes. Scattered trees are located on or adjacent to the levee. The City of Sacramento's Willow Creek Pump Station is located in Reach 19B.	Sand Cove Park (37 acres) is located southeast of the I-80 overcrossing. Woodland occupies the first 1,700 feet of Reach 19. The remaining mile to the east is a mixture of homes, private docks, and businesses, including the River View Marina and the City of Sacramento's Willow Creek Pump Station in Reach 19B.
20A and 20B	Reach 20 contains an office park and the 13-acre Natomas Oaks Park. Scattered trees are located on or adjacent to the levee. RD 1000's Pumping Plant No. 1 is located in Reach 20A.	The first two-third mile east of Reach 19 contains a mixture of homes, private docks, and businesses, including the Riverbank Marina. The remaining 2,000 feet contains Discovery Park woodland and RD 1000 Pump Plant No. 1 in Reach 20A.

Notes: I-5 = Interstate 5; I-80 = Interstate 80; NCMWC = Natomas Central Mutual Water Company; RD = Reclamation District; TNBC = The Natomas Basin Conservancy

Source: Data compiled by EDAW in 2008

3.1.2.3 NATOMAS EAST MAIN DRAINAGE CANAL WEST LEVEE

The area west of and adjacent to the NEMDC ranges from agricultural uses to the north to urban uses to the south. The area adjacent to the northern portion of the NEMDC, between Sankey Road and Elkhorn Boulevard, contains primarily agricultural uses with scattered farm residences and associated structures. The area between Elkhorn Boulevard and Del Paso Road contains agricultural uses with scattered large-lot residential. South of Del Paso Road and north of San Juan Road, land uses are more urbanized with a mix of commercial, business parks, and manufacturing uses. The area south of San Juan Road is primarily single-family residential.

3.2 ENVIRONMENTAL RESOURCES NOT CONSIDERED IN DETAIL

CEQA and the State CEQA Guidelines provide for the identification and elimination from detailed study the issues that are not significant or that have been covered by prior environmental review (Public Resources Code [PRC] 21002.1, State CEQA Guidelines Section 15143). The NEPA regulations provide similar provisions (40 Code of Federal Regulations [CFR] 1501.7[a][3]).

3.2.1 MINERAL RESOURCES

No mineral commodities are known to exist in the Phase 3 Project area. The project would not affect any known mineral resources (U.S. Geological Survey [USGS] 2008); therefore, this issue is not addressed further in this EIS/EIR.

3.3 ENVIRONMENTAL RESOURCES EVALUATED IN DETAIL

3.3.1 AGRICULTURAL RESOURCES

Approximately 60% of the Natomas Basin is in some form of developed agricultural or open space use in unincorporated areas of Sacramento and Sutter Counties. Rice is the most common crop and is generally grown over large areas of contiguous land north of Elkhorn Boulevard, although the amount of land in active rice production has greatly diminished in recent years and many former rice fields are now fallow or support grain crops, such as wheat. Agricultural lands in the southern and western portions support other crops (field crops and orchards)(City of Sacramento, Sutter County, and TNBC 2003). **Table 3.8-1** in Section 3.8, "Vegetation and Wildlife," summarizes information compiled for the most recent categorization of land cover types in the Natomas Basin conducted for TNBC.

The *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area*, which was certified by SAFCA in February 2007, anticipates that as part of SAFCA's comprehensive strategy for reducing the risk of flooding along the Sacramento River, SAFCA could acquire agricultural preservation easements from willing sellers in Sutter and Yolo Counties. In October 2007, the Governor signed into law Assembly Bill 930 amending the Sacramento Area Flood Control Agency Act of 1990 to make explicit SAFCA's authority to acquire agricultural preservation easements from willing sellers outside its jurisdiction, provided such acquisition is consistent with applicable county plans and the State Plan of Flood Control.

Pursuant to this authority, SAFCA recently cooperated with Yolo County, the California Department of Water Resources (DWR), the Yolo Land Trust, and the Sacramento Valley Conservancy in acquiring and recording agricultural conservation easements on approximately 1,660 acres of agricultural land in the Elkhorn Basin of Yolo County. The Elkhorn Basin is an agricultural area located directly across the Sacramento River from the Natomas Basin. It is protected from flooding by the Sacramento River west levee and the Yolo Bypass east levee. Preservation of this farmland is consistent with the *Yolo County General Plan* and zoning for this area and with recently enacted state legislation (Senate Bill 5) recognizing that "the level of flood protection afforded rural and

agricultural lands by the original flood damage reduction system would not be adequate to protect those lands if they are developed for urban uses, and that a dichotomous system of flood protection for urban and rural lands has developed through many years of practice." SAFCA will assist in upgrading and maintaining levees at a standard suitable for agriculture.

CALIFORNIA IMPORTANT FARMLAND SYSTEM AND FARMLAND MAPPING AND MONITORING PROGRAM

The California Department of Conservation, Office of Land Conservation, maintains a statewide inventory of farmlands. These lands are mapped by the Division of Land Resource Protection as part of the Farmland Mapping and Monitoring Program (FMMP). The maps are updated every 2 years with the use of aerial photographs, a computer mapping system, public review, and field reconnaissance. Farmlands are divided into the following five categories based on their suitability for agriculture:

- **Prime Farmland**—land that has the best combination of physical and chemical characteristics for crop production. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed.
- **Farmland of Statewide Importance**—land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production.
- **Unique Farmland**—land that does not meet the criteria for Prime Farmland or Farmland of Statewide Importance, but that has been used for the production of specific crops with high economic value.
- **Farmland of Local Importance**—land that is either currently producing crops or has the capability of production, but that does not meet the criteria of the categories above.
- **Grazing Land**—land on which the vegetation is suited to the grazing of livestock.

These categories are sometimes referred to as Important Farmland. Other categories used in the FMMP mapping system are "urban and built-up lands," "lands committed to nonagricultural use," and "other lands" (land that does not meet the criteria of any of the other categories).

Plate 19 shows the designated farmland within the Natomas Basin and the area northeast of the Basin and the location of RD 1001 borrow site, according to the latest data available from FMMP (Farmland Mapping and Monitoring Program 2006). As shown in **Plate 19**, much of the farmland in the Natomas Basin, including the farmland in areas where project features would be located, is designated by the FMMP as Prime Farmland and Farmland of Statewide Importance (California Department of Conservation 2008). The mapping indicates that Important Farmland in the Natomas Basin totaled approximately 40,000 acres in 2006. This represents approximately 6% of the total of approximately 715,000 acres of Important Farmland mapped by the FMMP in Sutter and Sacramento Counties in 2006 (California Department of Conservation 2008).

The Land Evaluation and Site Assessment (LESA) system is a tool used to rank lands for suitability and inclusion in the Federal Farmland Protection Program (FPP) administered by the Natural Resources Conservation Service (NRCS). LESA evaluates several factors, including soil potential for agriculture, location, market access, and adjacent land use. In general, because of the soil qualities, availability of irrigation water, and proximity of markets for agricultural products, agricultural lands in the Phase 3 Project area that are designated by the State of California as Important Farmlands would also receive a high ranking in the LESA system.

WILLIAMSON ACT CONTRACTS

The California Land Conservation Act of 1965, commonly known as the Williamson Act (California Government Code Section 51200 et seq.), is described in Chapter 6.0, "Regulatory Setting and Other NEPA and CEQA Statutory Requirements."

Within the Natomas Basin, a total of approximately 7,586 acres are under Williamson Act Contract with an additional 1,534 acres filed for nonrenewal. In the Sutter County portion of the Basin, all agricultural lands are within an Agricultural Preserve. Properties included in the Phase 3 Project footprint include a number of properties under Williamson Act Contract, including land in the footprint of the proposed Elkhorn Canal alignment and potential borrow site properties (**Plate 20**).

3.3.2 LAND USE, SOCIOECONOMICS, AND POPULATION AND HOUSING

3.3.2.1 LAND USES IN THE PROJECT AREA

As described above, much of the Phase 3 Project area includes rural portions of Sutter and Sacramento Counties. Cultivated lands and scattered rural residences exist in these areas. The Airport, operated by the Sacramento County Airport System (SCAS), is a major feature of the Phase 3 Project area. The rural land use pattern transitions from agricultural to urban where Sacramento County gives way to the city of Sacramento. The portion of the Natomas Basin that is within the city of Sacramento includes the North Natomas Community Plan area and the South Natomas planning area. The North Natomas Community Plan area extends generally between I-80 on the south and Elverta Road on the north, and between the West Drainage Canal, Fisherman's Lake, and SR 99/70 on the west and the NEMDC on the east. The plan area includes more than 9,000 acres, most of which is in the city of the Sacramento, and 1,600 acres of which is in Sacramento County. Approximately 3,500 acres are designated for residential use, the primary use in the plan area. The Employment Center designation has the most remaining vacant land with 890 acres of available land (City of Sacramento Planning Department 2007). The South Natomas planning area consists of more than 5,000 acres bounded by the American River on the South, the Sacramento River and I-80 on the west, I-80 on the north, and the NEMDC/Steelhead Creek on the east. Of the total, 590 acres are vacant. Close to 2,200 acres are designated for residential uses; 200 acres of the residential-designated lands are vacant (City of Sacramento Planning Department 2006).

Within the Phase 3 Project area, land uses located adjacent to the PGCC west levee and the Sacramento River east levee are primarily agricultural. On the lower NEMDC, the west levee forms the eastern boundary of the communities of North and South Natomas with residences and businesses located immediately adjacent to the west levee. Along the Sacramento River east levee, there are approximately 40 residences, a public boat launch facility and 2 private marinas located on the water side of the levee and approximately 7 rural residences located on the land side of the levee in Reaches 5A–9B. The two private marinas and public boat launch facility operated by the Sacramento County Regional Parks Department are located in Reach 9B, close to one another near the I-5 Bridge. Facilities at the marinas consist of parking, shaded picnic areas, boat docks and boat slips, restaurants and bars/taverns, and restrooms. Facilities at the Sacramento County Elkhorn Boat Launch Facility consist of parking, boat ramp, shaded picnic facilities, and restrooms. Within the Elkhorn Borrow Area there are approximately 6 farm residences with associated farm structures and equipment storage yards.

3.3.2.2 RELEVANT LAND USE PLANS AND POLICIES

SAFCA, acting as a Joint Exercise of Power Agency (California Government Code Section 65000), must consider relevant Federal and state land use policies, but is exempt from plans, policies, and regulations adopted by local agencies (California Government Code Section 53090). Nevertheless, this EIS/EIR provides relevant local plans and policies in order to describe the land use planning and policy context in which the project exists and how local agency plans and policies address resource issues in the Phase 3 Project area.

Chapter 6.0, "Regulatory Setting," describes Federal, state, regional, and local regulations and plans that are applicable to the project. The following section focuses on local land use plans and policies that are relevant to the project.

Sacramento International Airport Master Plan

The Sacramento International Airport Master Plan (Sacramento County Airport System 2007a) was adopted by the Sacramento County Board of Supervisors in August 2007. This plan represents the first full-scale master planning effort for the Airport since the mid-1970s. The master plan includes an evaluation of current conditions; definition of objectives, obstacles, and alternatives; an extensive public involvement program; and an implementation plan. The master plan is intended to guide airport development for at least the next 20 years. Phase 1 of the Master Plan (2007–2013) has been permitted. Among the Phase 1 improvements are the following:

- replacement of the existing Terminal B;
- construction of a new concourse from the replacement Terminal B, with a capacity of 23 contiguous gates;
- hotel/parking garage;
- new parallel Taxiway Y;
- new full-length parallel Taxiway A, hold pads, and high-speed taxiway exits for Runway 16R/34L (west runway);
- new airport traffic control tower north and west of Cy Homer Road and airport, airfield, and equipment maintenance buildings;
- general aviation area including corporate hangars, fixed base operator facility, and apron;
- expanded surface rental car parking lot between Airport Boulevard and Earhart Drive;
- expanded rental car terminal facility east of Airport Boulevard and McNair Circle;
- extension of Elkhorn Boulevard from Metro Air Park to Airport Boulevard;
- surface employee parking lot north of I-5 and west of Airport Boulevard to accommodate 1,500 automobile parking spaces;
- new remote economy parking and rental car overflow facility south of I-5 to accommodate 13,800 automobile parking spaces;
- extension of Airport Boulevard to the new parking facility;
- new ground-service equipment maintenance building east of Aviation Drive;
- new community fire station at the northwest corner of Lindbergh Drive and Crossfield Drive; and
- acquisition of two areas (48 acres and 313 acres) north of I-5 for buffers.

Included in future phases of the master plan are the following (Sacramento County Department of Environmental Review and Assessment 2007):

- extension of the east runway (i.e., the runway closest to the Phase 3 Project area) from the current 8,600 feet to 11,000 feet to accommodate nonstop transcontinental flights;
- construction of a new, 8,600-foot-long north-south runway 1,200 feet to the west of the current west runway;

- further expansion of Terminal B and a new Terminal B parking garage;
- extension of Terminal A concourse;
- 2,400-foot extension of Runway 16L/34R (east runway) to provide a total runway length of 11,000 feet;
- addition of a localizer, instrument landing system glide slope, and high-intensity approach lighting system with sequenced flashing lights for new instrument landing system approach to Runway 16L/34R perpendicular taxiway exits for parallel Taxiway A;
- construction of additional taxiways;
- improvement of off-airport roadway access to the airport, including extension of Elkhorn Boulevard to the airport, where it would connect to the airport road system; and
- extension by the Sacramento Regional Transit District of the proposed Downtown-Natomas-Airport light rail line to the airport, with a light rail stop at one of the airport terminals.

Sacramento International Airport Comprehensive Airport Land Use Plan

The 2002 *California Airport Land Use Planning Handbook* (California Department of Transportation [Caltrans] 2002) is the guiding document for establishing, preparing, and modifying local airport land use compatibility plans (ALUCPs) (formerly known as comprehensive airport land use plans [CLUPs]) and their policies and procedures. ALUCP policies are intended to increase the awareness of residents, in any future residential communities that are approved, of their possible exposure to aircraft operations; to limit the potential for conflict between the airport and adjacent communities; and to protect future airport development and aircraft operations. The Sacramento Area Council of Governments (SACOG) serves as the Airport Land Use Commission (ALUC) for Sacramento, Sutter, Yolo, and Yuba Counties. It is responsible for developing and maintaining ALUCPs to protect public health and safety and ensure compatible land uses in the areas around each airport.

The Sacramento International Airport (formerly the Sacramento Metropolitan Airport) CLUP (ALUC 1994) was adopted by the Sacramento County Board of Supervisors in October 1984 and amended in January 1994. The CLUP establishes planning boundaries for the airport and defines compatible types and patterns of future land use. The purpose of the CLUP is to provide the Sacramento International Airport land area with compatibility guidelines for height, noise, and safety. The current Sacramento International Airport CLUP is more than 11 years old; in the time since publication of the CLUP, the level of growth in the region and expansion of operations at the airport has indicated the need for an update to the plan. (ALUC 1994)

The Sacramento International Airport CLUP describes safety compatibility standards for public use airports, which include the Clear Zone, which is near the runway and is the most restrictive; the Approach/Departure Zone, which is located under the takeoff and landing slopes and is less restrictive; and the Overflight Zone, which is the area overflown by aircraft during the normal traffic pattern and is the least restrictive (**Plate 7**). New land uses proposed in any of these zones must comply with the standards identified by the CLUP.

In addition, the CLUP prohibits new residential development and school uses in those areas subject to noise levels of 65 decibels (dB) community noise equivalent level (CNEL) or above. Development in areas between the 60 and 65 CNEL are subject to an aircraft noise evaluation and implementation of recommend noise reduction measures.

Natomas Basin Habitat Conservation Plan

The 2003 *Natomas Basin Habitat Conservation Plan* (NBHCP) was prepared by the City of Sacramento, Sutter County, and TNBC. The NBHCP (City of Sacramento, Sutter County, and TNBC 2003) was developed to

promote biological conservation in conjunction with economic and urban development in the Natomas Basin. The NBHCP establishes a multispecies conservation program to minimize and mitigate the expected loss of habitat values and incidental take of "covered species" that could result from urban development and operation and maintenance of irrigation and drainage systems. The NBHCP authorizes incidental take associated with 17,500 acres of urban development in southern Sutter County and within the City and Sacramento County (i.e., 8,050 acres for the City of Sacramento, 7,467 acres for Sutter County, and 1,983 acres of Metro Air Park in Sacramento County).

Sutter County General Plan

The Land Use Element of the *Sutter County General Plan* (Sutter County 1996a) designates the proposed general distribution, location, and extent of all uses of land, including land for agriculture, and includes the following agricultural resource goal and policy that may be relevant to the project.

- **Goal 6.A.** To preserve high-quality agricultural land for agricultural purposes.
    - **Policy 6.B-3.** The County shall encourage the continued operation and expansion of existing agricultural industries.

Chapter 1500–1410 of the Sutter County zoning code states that the General Agriculture District (AG District) is established to provide areas for general farming, low-density uses, open spaces, and by use permit, limited retail service uses that the planning commission believes will support the local agricultural industry. The AG District classification may be applied to rural communities where the predominant land use is of a general agricultural nature, but the needs of the agricultural community may require the location of retail, commercial, and service establishments. This district is consistent with the Agriculture–20 Acre Minimum Parcel Size (AG-20) or Agriculture–80 Acre Minimum Parcel Size (AG-80) and Agriculture–Rural Community (AG-RC) general plan land use designations.

Sacramento County General Plan

The *Sacramento County General Plan* is currently being updated. The Agricultural Element of the current *Sacramento County General Plan* (Sacramento County 1993a) describes the goals of this element as the challenge of "maintenance of the County's agricultural lands, [and] their agricultural productivity...." The following objective and policies of the current general plan may be relevant to this project.

- **Objective:** Retain agricultural land holdings in units large enough to guarantee future and continued agricultural use.
    - **Policy AG-7:** Agricultural zoning district boundaries shall be rational and shall respect parcel boundaries.
    - **Policy AG-8:** Agricultural land divisions shall not adversely affect the integrity of agricultural pursuits. Agricultural land divisions may be denied if the reviewing authority finds that the division of land is likely to create circumstances inconsistent with this policy.

City of Sacramento General Plan

The *City of Sacramento General Plan 2030 Update* is in the review process (public review period for the draft general plan ended July 31, 2008). The *City of Sacramento General Plan 2006* contains goals and policies related to flood damage reduction and the phased conversion of agricultural properties, as well as the provision of sufficient housing and commercial and economic opportunities (City of Sacramento 1988). The City has a program with SAFCA and USACE in which it works with SAFCA and other responsible agencies to resolve floodplain restrictions. The following policies from the *City of Sacramento General Plan 2006* may be relevant to this project.

- **Conservation and Open Space:**

  - **Policy 10:** To conserve and protect natural resources and planned open space areas and to phase the conversion of agricultural lands to planned urban uses.

    The City will provide open space for recreation. The American and Sacramento River Parkways will be conserved and protected. The City has other open space areas that can also be developed to their recreational use potential. These areas include utility easements, floodways, and floodplains.

- **Resource Protection:**

  - **Policy B.10:** The City shall seek to minimize or avoid adverse impacts to historic and cultural resources from natural disasters. To this end, the City shall promote seismic safety, flood protection, and other building programs that preserve, enhance, and protect these resources.

3.3.2.3 SOCIOECONOMICS AND POPULATION AND HOUSING

According to the 2000 U.S. Census Bureau, Sacramento County had a resident population of 1,223,499 persons. Population projections for Sacramento County are 1,725,710 by 2025, representing a gain of approximately 502,211 new residents by 2025 and an increase of slightly more than 29%. (SACOG 2005.)

Sutter County had a resident population of 78,930 in 2000. By 2025, the population of Sutter County is projected to reach approximately 137,108 persons. This would be approximately 58,178 new residents and an increase of 42%. (SACOG 2005.)

The highest concentration of housing is located within the communities of North and South Natomas, in the southern portion of the Natomas Basin. The area adjacent to the NEMDC west levee has the highest concentration of residences in the Phase 3 Project area. The majority of residences are south of I-80, from San Juan Road south to Garden Highway. U.S. Census Bureau data from the 2000 Census show that this area has a higher percentage of minority and low-income populations than does the city as a whole (U.S. Census Bureau 2000). The largest minority group is of Hispanic ancestry making up approximately 50% of the population in the area, compared to approximately 22% in Sacramento as a whole. The median income for families in this same area was reported by the U.S. Census Bureau to be $27,460 in 2000. The U.S. Department of Housing and Urban Development (HUD) low-income limit[1] for the Sacramento area in 2000 was at $42,300 for a family of four (HUD 2000). This is an indicator that, within the Phase 3 Project area, there are low-income populations located in the area along the southern portion of the NEMDC. Census data for the Census Tract that includes the Sacramento River east levee indicate that minority populations are lower in this area than for the City or County as a whole. The median family income in this area was $66,146 in 2000, indicating the percentage low income populations are lower in this in this area than for the City or County as a whole.

3.3.3 GEOLOGY AND SOILS

The Natomas Basin is relatively flat and open. Flood damage reduction levees provide the only significant topographic relief in and near the Phase 3 Project area.

3.3.3.1 GEOLOGY

The Phase 3 Project area lies in the Sacramento Valley portion of the Great Valley Geomorphic Province. The Great Valley is a large valley trending northwest-southeast that is bounded by the Sierra Nevada to the east

[1] HUD defines "low income" and "very low income" for its many housing assistance programs. Generally, low income is considered to be 80% of the median income for the Metropolitan Statistical Area and adjusted for household size and the specific housing program (HUD 2003).

and south, the Coast Ranges to the west, and the Klamath Mountains to the north. The Great Valley is drained by the Sacramento and San Joaquin Rivers, which join and flow out of the Great Valley province through San Francisco Bay. This geomorphic province is an asymmetric trough approximately 400 miles long and 50 miles wide that is characterized by a relatively flat alluvial plain made up of a deep sequence of sediment deposits from Jurassic (180 million years ago) to recent age. The sediments in the Great Valley vary between 3 and 6 miles in thickness and were derived primarily from erosion of the Sierra Nevada to the east, with lesser material from the Coast Ranges to the west. The eastern edge of the Sacramento Valley is flanked by uplifted and tilted sedimentary strata that overlie rocks of the Foothills Metamorphic Belt and are in turn overlain on the west by younger alluvium.

The Sacramento Valley has been a depositional basin throughout most of the late Mesozoic and Cenozoic time. A vast accumulation of sediments was deposited during cyclic transgressions and regressions of a shallow sea that once inundated the valley. Overlying the thick sequence of sedimentary rock units that form the deeply buried bedrock units in the mid-basin areas of the valley are Late Pleistocene and Holocene (Recent) alluvial deposits, consisting of reworked fan and stream materials that were deposited by streams before the construction of the existing flood damage reduction systems. The youngest geomorphic features in the program study area are low floodplains, which are found primarily along the Sacramento and American Rivers. The natural floodplains of these rivers are very wide in this area because the land is relatively flat. These major drainage ways were originally confined within broad natural levees sloping away from the rivers or streams. The natural levees formed through the deposition of alluvium during periods of flooding. As flood waters lost energy, the coarser materials settled out nearest the rivers and streams, forming the natural levees and sand bars in the vicinity of the river channel. The finer material was carried in suspension farther from the rivers or streams, and settled out in quiet water areas such as swales, abandoned meander channels, and lakes. However, because the streams have meandered and reworked the previously deposited sediments, extreme variations in material types may be found over a limited distance or depth.

Flanking the Recent alluvial deposits in the Phase 3 Project area are late Pleistocene alluvial fan and terrace deposits of the Modesto and Riverbank Formations (Helley and Harwood 1985). Stream terrace deposits, mapped as the Modesto Formation, are higher in elevation and older than floodplain sediments. Before the construction of the existing levees, these stream terraces were occasionally flooded, but only small amounts of sediment were deposited during flood events. The lower fan terraces of the Riverbank Formation are higher in elevation and older than stream terraces, and were only rarely flooded.

The major source of sediments deposited in the Natomas Basin is from the erosion of the Sierra Nevada mountain range and foothills to the east of the Sacramento Valley. Naturally occurring asbestos (NOA) is known to occur in the foothill metamorphic belt. Therefore, NOA may be present in the Phase 3 Project area; however, the likelihood of the Phase 3 Project area soils containing significant concentrations of NOA is low due to the long distance from the source rock (Anderson 2008).

3.3.3.2 SEISMICITY

The Phase 3 Project area has experienced relatively low seismic activity in the past and does not contain any Alquist-Priolo Earthquake Fault Zones (California Geological Survey 1999, Hart and Bryant 1999). Numerous earthquakes of magnitude (M) 5.0 or greater have occurred on regional faults, primarily those within the San Andreas Fault System. The west side of the Central Valley is a seismically active region. The nearest known active (Holocene or Historic) fault trace to the Phase 3 Project area is the Dunnigan Hills fault, approximately 30 miles northwest of downtown Sacramento and 15 miles from the Natomas Basin (Jennings 1994).

The closest active faults to the Phase 3 Project area are listed in **Table 3.3-1**. In addition, the approximate distance from the Phase 3 Project area, maximum moment magnitude, and fault class are identified.

Table 3.3-1
Active Faults in the Project Area

Fault Name	Approximate Distance from Project Site (Miles)	Fault Class[1]	Maximum Moment Magnitude[2]
Dunnigan Hills	15	NA	NA
Great Valley 3	23	B	6.9
Great Valley 4	26	B	6.6
Great Valley 5	35	B	6.5
Hunting Creek-Berryessa	38	B	7.1
Concord-Green Valley	41	B	6.7
Great Valley 2	44	B	6.4
West Napa	48	B	6.5
Bartlett Springs	50	B	7.6
Great Valley 1	52	B	6.7
Collayomi	58	B	6.5
Mount Diablo Thrust	59	B	6.6
Maacama-Garberville	60	B	7.5
Greenville	61	B	6.9
Hayward–Rodgers Creek	62	A	7.2

Notes: NA = not available

[1] Faults with an "A" classification are capable of producing large magnitude (M) events (M greater than 7.0), have a high rate of seismic activity (e.g., slip rates greater than 5 millimeters per year), and have well-constrained paleoseismic data (e.g., evidence of displacement within the last 700,000 years). Class B faults are those that lack paleoseismic data necessary to constrain the recurrence intervals of large-scale events. Faults with a "B" classification are capable of producing an event of M 6.5 or greater.

[2] The moment magnitude scale is used by seismologists to compare the energy released by earthquakes. Unlike other magnitude scales, it does not saturate at the upper end, meaning that there is no particular value beyond which all earthquakes have about the same magnitude, which makes it a particularly valuable tool for assessing large earthquakes.

Sources: Jennings 1994, Petersen et al. 1996, Kleinfelder 2008

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is fault ground rupture, also called surface faulting. Because there are no active faults mapped in the Phase 3 Project area by the California Geological Survey or the U.S. Geological Survey, and the area is not located within an Alquist-Priolo Earthquake Fault Zone, fault ground rupture is unlikely. Common secondary seismic hazards include ground shaking, liquefaction, subsidence, and seiches. These hazards are discussed briefly below:

- **Ground shaking.** Seismic ground shaking refers to ground motion that results from the release of stored energy during an earthquake. The intensity of ground shaking depends on the distance from the earthquake epicenter to the site, the magnitude of the earthquake, site soil conditions, and the characteristic of the source.

- **Ground failure/liquefaction.** Liquefaction is a process by which water-saturated materials (including soil, sediment, and certain types of volcanic deposits) lose strength and may fail during strong ground shaking, when granular materials are transformed from a solid state into a liquefied state as a result of increased pore-water pressure. Structures on ground that undergoes liquefaction may settle or suffer major structural damage. Liquefaction is most likely to occur in low-lying areas where the substrate consists of poorly consolidated to

unconsolidated water-saturated sediments or similar deposits of artificial fill. Liquefaction during an earthquake requires strong shaking continuing for a long period and loose, clean granular materials (particularly sands) that may settle and compact because of the shaking. Evidence of liquefaction may be observed in "sand boils," which are expulsions of sand and water from below the surface due to increased pore-water pressure below the surface. Areas paralleling the Sacramento River that contain clean sand layers with low relative densities coinciding with a relatively high water table have generally high liquefaction potential.

- **Subsidence and settlement.** Subsidence is the gradual settling or sudden sinking of the ground surface resulting from subsurface movement of earth materials. Seismically induced settlement refers to the compaction of soils and alluvium caused by ground shaking. Fine-grained soils are subject to seismic settlement and differential settlement. Areas underlain by low-density silts and clays associated with fluvial depositional environments are susceptible to seismically induced settlement. These environments include old lakes, sloughs, swamps, and streambeds. The amount of settlement may range from a few inches to several feet. The potential for differential settlement is highest and occurs over the largest areas during great earthquakes. A potential for differential settlement exists where low-density and unconsolidated material is encountered, such as overbank river deposits (present day and historical) common along the Sacramento River. Subsidence and settlement may also occur from construction of the adjacent levee separate from liquefaction or densification due to both immediate settlements in granular soils and the consolidation of fine grained soils.

- **Seismic seiches.** A seiche is an earthquake-induced wave within an enclosed or restricted body of water, such as a lake, reservoir, or channel. Seiches can cause a body of water to overtop and damage levees and dams and may lead to inundation of surrounding areas.

3.3.3.3 SOILS

The Sutter and Sacramento County soil surveys (NRCS 1988, 1993) identify a variety of soil map units in the Phase 3 Project area. Most of the soils in the Phase 3 Project area are shallow to moderately deep, sloping, well-drained soils with very slowly permeable subsoils underlain with hardpan. These soils have good natural drainage, slow subsoil permeability, and slow runoff (NRCS 1988, 1993).

The Natomas Basin generally consists of deep soils derived from alluvial sources, which range from low to high permeability rates and low to high shrink-swell potential. Soils range from low to high hazard ratings for construction of roads, buildings, and other structures related to soil bearing strength, shrink-swell potential, and the potential for cave-ins during excavation. Soils immediately adjacent to the Sacramento River are dominated by deep, nearly level, well-drained loamy and sandy soils. The natural drainage is good, and the soils have slow to moderate subsoil permeability. The river terraces consist of very deep, well-drained alluvial soils. (NRCS 1988, 1993.) The porous nature of the soils underneath the existing levee system is an important consideration for the Phase 3 Project.

3.3.4 HYDROLOGY AND HYDRAULICS

3.3.4.1 SURFACE WATER HYDROLOGY

The Phase 3 Project area lies just north of the confluence of the Sacramento and American Rivers. The Sacramento River drainage basin covers approximately 26,150 square miles and includes the Feather River drainage basin, which totals approximately 5,500 square miles. Despite its relatively small size, the Feather River has the potential to generate very high peak floods. **Table 3.4-1** compares the runoff characteristics of these drainage basins.

Table 3.4-1 Basin Runoff Characteristics				
Basin	Watershed Area (square miles)	Flood of Record (year)	Unregulated Flow Record 1-Day Flow (cfs)	Flow per Square Mile (cfs)
Sacramento River at Latitude of Verona	21,251	1997	624,000	29
Feather River at Shanghai Bend	5,313	1997	534,000	101
Sacramento River at Latitude of Sacramento	26,150	1997	840,000	32
Note: cfs = cubic feet per second Source: SAFCA 2007 (data provided by MBK Engineers)				

Total annual precipitation within the Sacramento River watershed falls as both rain and snow. Precipitation in winter falls primarily as snow in the higher elevations. Annual, monthly, and daily precipitation varies widely within the watershed, with the highest precipitation totals generally falling in the winter, in the Sierra Nevada, and in the northern part of the watershed. The high variability in precipitation, snowfall, and snowmelt results in highly variable runoff patterns each year and month during the late fall, winter, and spring. The number of high-water events in the waterways surrounding the Natomas Basin each year varies widely as well, and ranges from no events to five or more events.

The American and Feather Rivers produce about 90% of the flood flows approaching Sacramento from the north and the east. Both historically and as part of the design of the Sacramento River Flood Control Project (SRFCP), flood flows approaching from the north are split between the Sacramento River and the Yolo Basin (Bypass). Under the current design of the SRFCP, the Yolo Bypass absorbs about 70% of this flow at the latitude of Verona and 80% at the latitude of Sacramento. To the east, the entire flow of the American River must be passed through the urban core of Sacramento. Improved flood protection for the Sacramento area is thus dependent on the strength of the levee system along the lower Sacramento and American Rivers and on the capability of Folsom Dam to limit American River flows to the design capacity of the American River levee system.

The SRFCP was designed based on the flows and water surface elevations produced by the great floods of 1907 and 1909. The project design considered that areas inundated by these floods would be protected by levees, thus increasing flood flows downstream due to the elimination of floodplain storage. Because the 1907 and 1909 floods were the largest to occur since 1862, it was assumed that floods of this magnitude would recur very infrequently throughout the watershed. In fact, based on the continuous record of streamflow data since the SRFCP was approved, it appears that the 1907 and 1909 floods are approximately equal to a 10-year flood (10% annual exceedance probability) along the American and Feather Rivers. Consequently, the original plan of flood damage reduction has been modified numerous times to account for changes in the SRFCP design flood and the flood risk associated with the urban areas in the American and Feather River basins. The most recent modifications have involved the construction of Folsom Dam and the extension of the levee along the north side of the American River (completed 1955) and the construction of Oroville Dam and New Bullards Bar Dam in the Feather River basin (completed 1969).

3.3.4.2 LEVEE DESIGN

When the SRFCP was conceived, river navigation was an important element of the Sacramento Valley's transportation infrastructure. Hydraulic mining debris (sand, gravel, and cobbles) had clogged river channels and added significant uncertainty and cost to navigation. The SRFCP was designed in part to address this problem. Thus, the mainstem river levees were placed close to the channel to confine river flows in flood stage and use the energy of the river to drive hydraulic mining sediments out of the system. This design also reduced the cost of levee construction by taking advantage of the high ground built up by the river over time along its banks and by making it possible for existing technology (the clam shell dredge and hydraulic suction dredge) to efficiently use the sediment in the channel as a borrow source for the levees.

This design, although well suited to address the technical and financial challenges of a previous era, has left a succeeding generation of flood managers with two systemic problems and levee risk factors: chronic erosion and seepage. Because of the use of relatively porous hydraulic mining sediments in many parts of the mainstem levee system, the levees have a propensity to seep when subjected to prolonged high water surface elevations such as occurred during the floods of 1986 and 1997. Through-seepage was deemed a levee system design deficiency in the aftermath of the 1986 flood, and a substantial capital improvement program has been under way since the early 1990s to address this deficiency. Additionally, because the mainstem levees are constructed on high berms relatively close to the river channel, the same energy that was harnessed to drive hydraulic mining sediment from the system also exerts itself against the sandy alluvial soil layers that lie beneath the levees. In high river stage conditions, this energy is strong enough to push water through these layers in volumes great enough to exert an uplift force capable of fracturing the soil mantel on the land side of the levee. This "underseepage" can occur where levees are constructed on low-permeability foundation soil (silt and clay) underlain by a higher-permeability layer (sand and gravel), and makes the levee susceptible to failure during periods of high river stage.

3.3.4.3 FREQUENCY OF FLOODING

The Natomas Basin is subject to flooding from a combination of flows in the Sacramento and American River channels and in the tributary streams east of the Basin. Along the northern and western perimeters of the Basin, the greatest threat is from a large flood in the Sacramento/Feather River basin combined with high runoff in the creeks and streams of southern Sutter and western Placer Counties that drain through the NCC. The probability (or frequency) of an uncontrolled flood in the Natomas Basin is linked to the hydrology of the lower Sacramento Valley and the performance of the levees comprising the SRFCP, including the levees upstream of the Natomas Basin. The hydrology of the lower Sacramento Valley was extensively analyzed by USACE and the State of California Reclamation Board (now the Central Valley Flood Protection Board) as part of the Sacramento and San Joaquin River Basins California Comprehensive Study. These data have been used to create hydraulic models that route the estimated runoff for various flood events through the river and stream channels comprising the SRFCP and estimate the resulting water surface elevations. In very large floods that exceed the design capacity of the SRFCP, these calculated water surface elevations are highly sensitive to assumptions about the performance of upstream SRFCP levees. If the SRFCP levees upstream of the Natomas Basin are assumed to fail when overtopped, these very large floods produce much lower water surface elevation in the channels around the Natomas Basin (by 1 to 2 feet) than if it is assumed the upstream levees will not fail when overtopped.

3.3.4.4 IRRIGATION AND DRAINAGE FACILITIES

Reclamation of the Natomas Basin for agricultural development required construction of two major ditch and canal systems in the Natomas Basin: an irrigation system owned and operated by NCMWC and a drainage system owned and operated by RD 1000. NCMWC pumps water into the Basin to provide irrigation water to its shareholders for agricultural use within the Basin. During winter (October through April), drainage is primarily rainfall runoff; during summer (May through September), drainage water from agricultural fields is typically recirculated for irrigation. Because the Basin is surrounded by levees, all excess drainage within the Basin must be pumped out. In general, water is pumped into the Basin from the Sacramento River and NCC as irrigation water and returned to the perimeter drainage channels via RD 1000's interior drainage system.

Several irrigation canals, pipelines, wells, and pump stations exist along the Sacramento River east levee. These include the Elkhorn Main Irrigation Canal (Elkhorn Canal), which runs parallel to the Sacramento River east levee from the North Drainage Canal to just south of West Elkhorn Boulevard, and the Riverside Main Irrigation Canal (Riverside Canal), which runs parallel to the east levee from approximately 1 mile north of San Juan Road to approximately Orchard Lane. These NCMWC canals are fed by three pumping plants on the Sacramento River (**Plate 9**). They have earthen embankments that allow water levels to be maintained above surrounding ground surfaces so that water can be delivered to agricultural receiving lands by gravity flow. The NCMWC also operates two pumps along the NCC south levee that provide irrigation water to agricultural lands in the northern portion of the Basin. NCMWC irrigation systems and several other landowner-operated systems along the Sacramento River east levee, the PGCC west levee, and the NEMDC west levee will need to be relocated to accommodate

improvements to these levees. The new facilities along the Sacramento River east levee could provide a sustainable long-term source of agricultural irrigation water in the western and northern portions of the Basin that are expected to remain in some form of agriculture or open space use to accommodate the Airport and two of the three major blocks of habitat being assembled by TNBC. Currently, the Brookfield borrow site is irrigated from on-site wells. In order to provide irrigation to the site following the excavation of borrow material, the irrigation canal along the south side of the site would need to be restored westward to the culvert under SR 99. In addition, a field irrigation ditch would need to be constructed within the Brookfield site to provide irrigation water from the adjacent highline canal to the fields.

RD 1000 operates several drainage pumping plants along the Sacramento River east levee that could be affected by levee improvement activity. Pumping Plant No. 2, located in Sacramento River Reach 4B, pumps drain water from the lower end of the North Drainage Canal; Pumping Plant No. 5, located in Sacramento River Reach 10, pumps water from the West Drainage Canal; Pumping Plant No. 3, located in Sacramento River Reach 13, pumps drain water from the West Drainage Canal; Pumping Plant No. 1, located in Reach 20A, pumps drain water from the Main Drainage Canal; and Pumping Plant No. 4, located in NCC Reach 2, pumps drain water from the upper end of the North Drainage Canal; Pumping Plant No. 5, located in Sacramento river Reach 10, pumps drain water from the West Drainage Canal; Pumping Plant No. 8, located on the NEMDC west levee between Del Paso Road and North Market Boulevard, pumps drain water from the C-1 Drain; and Pumping Plant No. 6, located on the NEMDEC west levee between Elverta Road and Elkhorn Boulevard, pumps drain water from the E Drain. These pumping facilities include discharge pipelines that would need to be relocated as part of the levee improvements in these locations. Pumping Plant No. 2 was temporarily removed as part of an emergency levee repair in 2006 and would be replaced as an element of the Phase 3 Project.

The City of Sacramento operates the Willow Creek drainage pumping station that is located in Sacramento River Reach 19B; Pump Station 58, which is located on the American River north levee at Asuza Street; and Pump Station 102, which is located on the NEMDC west levee in Gardenland Park.

The major irrigation and drainage facilities that would be affected by the project are discussed in Section 2.3.4, "Irrigation and Drainage Components."

3.3.4.5 GROUNDWATER HYDROLOGY

Basin and Aquifer Description

The Natomas Basin lies in the North American Subbasin within the Sacramento Groundwater Basin. The North American Subbasin is bounded on the north by the Bear River, on the west by the Feather and Sacramento Rivers, and on the south by the Sacramento River in the west and the American River in the east. The eastern boundary is a north-south line extending from the Bear River south to Folsom Lake, which passes about 2 miles east of the town of Lincoln (see **Plate 2** for general locations). The eastern boundary represents the approximate edge of the alluvial basin, where little or no groundwater flows into or out of the groundwater basin from the rock of the Sierra Nevada (DWR 1997a). The eastern portion of the subbasin is characterized by low, rolling dissected uplands. The western portion is nearly a flat flood basin for the Bear, Feather, Sacramento and American Rivers, and several small east side tributaries. The general direction of drainage is west-southwest at an average grade of about 5% (DWR 2003).

DWR Bulletin 118 (DWR 2003) describes the aquifer system in the subbasin as heterogeneous and consisting of many discontinuous beds of clay, silt, sand and gravel. The water-bearing materials of the subbasin are dominated by unconsolidated continental deposits of Late Tertiary and Quaternary age deposits that include Miocene/ Pliocene volcanics, older alluvium, and younger alluvium. Younger alluvium consisting of alluvial flood basin and stream channel deposits is present in the upper 100 feet in areas along and adjacent to the Sacramento and American Rivers. Sand and gravel zones, along with dredger tailings that are found sporadically along the American River, are highly permeable and yield significant quantities of water to wells. Older alluvium, deposited during Pliocene and Pleistocene times and occurring over the area between the Sierra foothills and the valley axis,

consists of loosely to moderately compacted sand, silt and gravel. Permeability varies considerably in these alluvial deposits (Valley Springs, Laguna, and Fair Oaks formations), which occupy the upper 200 to 300 feet of the aquifer system. Groundwater in the older alluvium is typically unconfined, although semiconfined conditions exist on localized levels. The Mehrten and older geologic units can be characterized as composing the lower aquifer system, which is generally deeper than 300 feet toward the west side of the subbasin. Typically, the level of confinement increases with depth. The cumulative thickness of these deposits increases from a few hundred feet near the Sierra Nevada foothills on the east to over 2,000 feet along the western margin of the subbasin. Most of the groundwater is produced in the northern portion of the subbasin. (DWR 2003.)

Groundwater Recharge and Local Levels

Major recharge to the local aquifer system generally occurs along active river and stream channels where extensive sand and gravel deposits exist, particularly in the American River and Sacramento River channels (Sacramento Groundwater Authority [SGA] 2002). Where surface water is hydrologically disconnected from groundwater, it percolates through the unsaturated zone beneath the streambed to the groundwater and is a function of the underlying aquifer materials and water levels in the stream. Some evidence suggests this occurs in parts of the Sacramento River in northern Sacramento County (SGA 2003). In Western Placer County (northeast section of the subbasin), the rivers adjacent to the subbasin, including the Sacramento and Bear Rivers, and the major streams, ravines, and creeks that cross the valley floor are the main sources of recharge (Placer County Water Agency 2003). Other sources of recharge within the system include inflow of groundwater generally from the northeast; subsurface recharge from fractured geologic formations to the east; and deep percolation from applied surface water, precipitation, and small streams. The extensive agricultural operations in the Natomas Basin have also contributed to recharge there, with the portion of applied irrigation water in excess of crop demands becoming recharge water through deep percolation (SGA 2003).

Groundwater levels average 10 to 25 feet below ground surface in the Natomas Basin (MWH 2001). According to the Sacramento Groundwater Authority, hydrographs for wells in the western part of the North American Subbasin show groundwater levels varying between -5 and 20 feet mean spring groundwater level between wells.

Groundwater Storage

DWR's Bulletin 118 assumed a specific yield of 7% and an aquifer thickness of 200 feet for 200,000 acres within the North American Subbasin. Storage capacity can be estimated for the North American Subbasin by applying the same assumptions as previous DWR studies (DWR 1997a), which indicated a specific yield of 7% and an assumed thickness of 200 feet over the entire 351,000-acre subbasin. The result is an estimated storage capacity of approximately 4.9 million acre-feet (DWR 2003).

Groundwater Budget

Luhdorff & Scalmanini Consulting Engineers (LSCE) prepared a report in November 2008 evaluating the potential groundwater impacts of the NLIP (see **Appendix B2**) (LSCE 2008). The report includes a groundwater budget for existing conditions (without SAFCA construction activities) in the Natomas Basin based on the final water year of the 1970–2004 calibration period for the Sacramento County Integrated Groundwater and Surface Water Model. The model results for 2004, shown in **Table 3.4-2**, are grouped into inflow and outflow components, with the change in storage representing the difference between the inflow and the outflow. The simulated change in storage shows a decline of almost 5,000 AFY. Divided by the area of the Natomas Basin, this represents a small decrease in storage on a per acre basis of less than 0.1 acre-foot per acre per year.

Table 3.4-2
Simulated Groundwater Budget for Natomas Basin—Existing Conditions

	Water Budget Component	2004 Simulation (AFY)
Inflow	Deep Percolation (including Canal Seepage)	31,429
	Recharge from Sacramento River	6,469
	Recharge from American River	1,086
	Boundary Inflow from West	10,365
	Subsurface Inflow from North and South	2,955
	Total Inflow	**52,304**
Outflow	Groundwater Pumping	35,537
	Subsurface Outflow to East	21,738
	Subsurface Outflow to South	0
	Total Outflow	57,275
Inflow minus Outflow	**Change in Storage**	**-4,971**

Note: AFY = acre-feet per year
Source: Data adapted from LSCE 2008

3.3.5 WATER QUALITY

The East Drainage Canal and the West Drainage Canal drain the Natomas Basin. Currently, seven pumping sites remove stormwater from the Natomas Basin. Five sites pump into the Sacramento River, one pumps into the NCC, and four RD 1000 Pumping Plant No. 6 and Pumping Plant No. 8 and City of Sacramento Gardenland and Azuza Pump Stations) pump into the NEMDC.

3.3.5.1 SURFACE WATER QUALITY

Surface water quality in the hydrologic region is generally good. Possible types of contamination that can affect water quality include turbidity; pesticides and fertilizers from agricultural runoff; water temperature exceedances; and toxic heavy metals, such as mercury, copper, zinc, and cadmium from acid mine drainage (USGS 2000, DWR 2005). The portion of the Sacramento River forming the western boundary of the Phase 3 Project area is part of a 16-mile segment from Knights Landing to the Sacramento–San Joaquin Delta that is on the Section 303(d) list for diazinon from agricultural sources, mercury from abandoned mines, and toxicity from unknown sources (Central Valley Regional Water Quality Control Board [RWQCB] 2002).

As defined by the Basin Plan (Central Valley RWQCB 2007), the following are the designated beneficial uses for the Sacramento River and all tributaries from the Colusa Basin Drain, upstream of the Phase 3 Project area, to the I Street Bridge in Sacramento:

- municipal, industrial, and agricultural supply;
- irrigation;
- contact and noncontact recreation;
- coldwater fish habitat, migration, and spawning;
- warm water fish habitat, migration, and spawning;
- wildlife habitat;
- power generation; and
- navigation.

3.3.5.2 GROUNDWATER QUALITY

The Phase 3 Project area is in the North American Groundwater Subbasin, which lies in the eastern central portion of the Sacramento Valley Groundwater basin (see description in Section 3.3.4.5, "Groundwater Hydrology").

Although there are many areas of good quality groundwater in the North American Subbasin, some areas within the subbasin have shown elevated levels of total dissolved solids (TDS), chloride, sodium, bicarbonate, boron, fluoride, nitrate, iron manganese, and arsenic, based on applicable water quality standards and guidelines for domestic and irrigation uses. An area between the Airport and the Bear River to the north has high levels of TDS, chloride, sodium, bicarbonate, manganese, and arsenic (DWR 2006).

3.3.6 FISHERIES

The NEMDC is a tributary to the lower Sacramento River just upstream of its confluence with the lower American River, and the PGCC is a tributary to the NCC. These waterways are indirectly connected to the irrigation and drainage canals and ditches in the Phase 3 Project area by a number of pumping facilities. The aquatic resources in these waterways provide important habitat for native anadromous and resident Central Valley fishes, including species that are listed under the Federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA), which are described in this section, and perform other important ecological functions, as described in Section 3.3.7, "Sensitive Aquatic Habitats." Water quality and hydrology are discussed in Section 3.3.5, "Hydrology and Water Quality." The NCC is not discussed further as it is not affected by the Phase 3 Project.

3.3.6.1 FISH SPECIES FOUND IN THE LOWER SACRAMENTO RIVER, PLEASANT GROVE CREEK CANAL, AND NATOMAS EAST MAIN DRAINAGE CANAL

The lower Sacramento River, PGCC, and NEMDC provide fish spawning, rearing, and/or migratory habitat for a diverse assemblage of native and nonnative species (**Table 3.6-1**). The use of different areas of these waterways by fish species is influenced by variations in habitat conditions, each species' habitat requirements, life history timing, and daily and seasonal movements and behavior.

Altered flow regimes, flood damage reduction, and bank protection efforts along these channels have reduced available shaded riverine aquatic (SRA)[2] habitat, sediment transport, channel migration and avulsion, and large woody debris recruitment, and have isolated the channels from their floodplains. Altered flow regimes have resulted in reduced physical processes (sediment transport and deposition) and artificial seasonal flows (i.e., generally decreased water in winter and increased water in summer) relative to natural conditions. Past modifications of channels for agricultural water conveyance and flood damage reduction purposes have resulted homogenous, trapezoidal channels lacking in-stream structure with narrow and sparse bands of riparian vegetation that provide only limited SRA habitat functions. Combined, these alterations have resulted in marginal conditions that provide only limited habitat functions for most native fish species.

[2] SRA habitat is defined as the nearshore aquatic habitat occurring at the interface between a river and adjacent woody riparian habitat. The principal attributes of this cover type are: (1) an adjacent bank composed of natural, eroding substrates supporting riparian vegetation that either overhangs or protrudes into the water; and (2) water that contains variable amounts of woody debris, such as leaves, logs, branches, and roots and has variable depths, velocities, and currents. Riparian habitat provides structure (through SRA habitat) and food for fish species. Shade decreases water temperatures, while low overhanging branches can provide sources of food by attracting terrestrial insects. As riparian areas mature, the vegetation sloughs off into the rivers, creating structurally complex habitat consisting of large woody debris that furnishes refugia from predators, creates higher water velocities, and provides habitat for aquatic invertebrates.

Table 3.6-1
Fishes Present in the Lower Sacramento River, PGCC, and/or NEMDC

Common Name	Scientific Name	Native (N) or Introduced (I)
Sacramento River winter-run chinook salmon	*Oncorhynchus tshawytscha*	N
Central Valley spring-run chinook salmon	*Oncorhynchus tshawytscha*	N
Central Valley fall-/late fall–run chinook salmon	*Oncorhynchus tshawytscha*	N
Central Valley steelhead/rainbow trout	*Oncorhynchus mykiss*	N
Green sturgeon	*Acipenser medirostris*	N
White sturgeon	*Acipenser transmontanus*	N
Pacific lamprey	*Lampetra tridentate*	N
Sacramento pikeminnow	*Ptychocheilus grandis*	N
Sacramento splittail	*Pogonichthys macrolepidotus*	N
Sacramento sucker	*Catostomus occidentalis*	N
Hardhead	*Mylopharodon conocephalus*	N
California roach	*Lavinia symmetricus*	N
Striped bass	*Morone saxatilus*	I
American shad	*Alosa sapidissima*	I
Largemouth bass	*Micropterus salmoides*	I
Smallmouth bass	*Micropterus dolomieui*	I
White crappie	*Pomoxis annularis*	I
Black crappie	*Pomoxis nigromaculatus*	I
Channel catfish	*Ictalurus punctatus*	I
White catfish	*Ameiurus catus*	I
Brown bullhead	*Ictalurus nebulosus*	I
Bluegill	*Lepomis macrochirus*	I
Green sunfish	*Lepomis cyanellus*	I
Golden shiner	*Notemigonus crysaleucas*	I

Source: Moyle 2002

Native species present in the lower Sacramento River can be separated into anadromous species (i.e., species that spawn in fresh water after migrating as adults from marine habitat) and resident species. Native anadromous species include four runs of chinook salmon (*Oncorhynchus tshawytscha*), steelhead trout (*O. mykiss*), green and white sturgeon (*Acipenser medirostris* and *A. transmontanus*), and Pacific lamprey (*Lampetra tridentata*). Of these species, relatively low numbers of chinook salmon and steelhead seasonally use channels bordering the Natomas Basin during adult upstream and juvenile downstream migrations. The channels also may provide limited rearing habitat functions for juvenile salmon and steelhead during these seasonal outmigration periods. Green and white sturgeon and Pacific lamprey are only expected to utilize habitats in the lower Sacramento River.

Native resident species include Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento splittail (*Pogonichthys macrolepidotus*), Sacramento sucker (*Catostomus occidentalis*), hardhead (*Mylopharodon conocephalus*), California roach (*Lavinia symmetricus*), and rainbow trout (*O. mykiss*). Pikeminnow, splittail,

sucker, hardhead, and roach may be present in relatively low numbers in all channels year-round, while resident rainbow trout is generally expected to be found only in the lower Sacramento River.

Nonnative anadromous species include striped bass (*Morone saxatilis*) and American shad (*Alosa sapidissima*). Striped bass and American shad are not known to use any of the channels in the Phase 3 Project area with the exception of the lower Sacramento River. Nonnative resident species include largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), white and black crappie (*Pomoxis annularis* and *P. nigromaculatus*), channel catfish (*Ictalurus punctatus*), white catfish (*Ameiurus catus*), brown bullhead (*Ictalurus nebulosus*), bluegill (*Lepomis macrochirus*), green sunfish (*L. cyanellus*), and golden shiner (*Notemigonus crysaleucas*). With the exception of the lower Sacramento River, habitat conditions in channels bordering the Natomas Basin are most favorable for nonnative warm water resident species; therefore, these species are anticipated to be the most abundant in these channels.

3.3.6.2 SPECIAL-STATUS FISH SPECIES

Seven special-status fish species have the potential to occur in the lower Sacramento River, PGCC, and NEMDC, as described below (**Table 3.6-2**). Of the seven species, green sturgeon, Central Valley steelhead Evolutionarily Significant Unit (ESU), Sacramento River winter-run chinook salmon ESU, and Central Valley spring-run chinook salmon ESU are Federally listed as endangered or threatened species. Sacramento River winter-run chinook salmon ESU (endangered) and Central Valley spring-run chinook salmon ESU (threatened) are also listed under CESA. The National Marine Fisheries Service (NMFS) determined that listing is not warranted for Central Valley fall-/late fall–run chinook salmon. However, this species is still designated a species of concern by NMFS and a species of special concern by the California Department of Fish and Game (DFG) because of concerns about specific risk factors. The remaining two species, hardhead and Sacramento splittail, are considered species of special concern by DFG. Delta smelt, which is Federally and state listed as threatened, is found in the Sacramento River but downstream of the confluence with the American River, and therefore is not expected to be found in the Sacramento River near the Phase 3 Project area. Delta smelt are not found in the PGCC or NEMDC. Summary descriptions for those species that have the potential to occur in the Phase 3 Project area are provided below.

- **Fall-Run Chinook Salmon.** Adult fall-run chinook salmon enter the Sacramento and San Joaquin River systems from July through April and spawn from October through February. During spawning, the female digs a redd (gravel nest) in which she deposits her eggs, which are then fertilized by the male. Optimal water temperatures for egg incubation are 6.7 degrees Celsius (ºC) to 12.2ºC Newly emerged fry remain in shallow, lower-velocity edgewaters, particularly where debris congregates and makes the fish less visible to predators (DFG 1998). The duration of egg incubation and time of fry emergence depends largely on water temperature. In general, eggs hatch after a 3- to 5-month incubation period, and alevins (yolk-sac fry) remain in the gravel until their yolk-sacs are absorbed (2–3 weeks).

  Juveniles typically rear in freshwater (in their natal streams, the Sacramento River system, and the Sacramento–San Joaquin Delta [Delta]) for up to 5 months before entering the ocean. Juveniles migrate downstream from January through June. Juvenile chinook salmon prefer water depths of 0.5–3.3 feet and velocities of 0.26–1.64 feet per second (Raleigh, Miller, and Nelson 1986). Important winter habitat for juvenile chinook salmon includes flooded bars, side channels, and overbank areas with relatively low water velocities. Juvenile chinook salmon have been found to rear successfully in floodplain habitat, which routinely floods but is dry at other times. Growth rates appear to be enhanced by the conditions found in floodplain habitat.

Table 3.6-2
Special-Status Fish Species Potentially Occurring in the Lower Sacramento River, PGCC, and/or NEMDC

Species	Status[1]		Habitat	Potential to Occur
	USFWS/ NMFS	DFG		
Central Valley fall-/late fall–run chinook salmon *Oncorhynchus tshawytscha*	SC	SSC	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Delta	Occurs in the lower Sacramento River and NEMDC; unlikely to occur in the PGCC
Sacramento River winter-run chinook salmon ESU *Oncorhynchus tshawytscha*	E	E	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Delta	Occurs in the Sacramento River
Central Valley spring-run chinook salmon ESU *Oncorhynchus tshawytscha*	T	T	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Delta	Occurs in the Sacramento River and certain tributaries
Central Valley steelhead ESU *Oncorhynchus mykiss*	T	–	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Delta	Occurs in the lower Sacramento River and NEMDC; unlikely to occur in the PGCC
Green sturgeon *Acipenser medirostris*	T	–	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, tributaries, and Delta	Occurs in the lower Sacramento River; unlikely to stray into the PGCC or NEMDC
Sacramento splittail *Pogonichthys macrolepidotus*	–	SSC	Spawning and juvenile rearing from winter to early summer in shallow weedy areas inundated during seasonal flooding in the lower reaches and flood bypasses of the Sacramento River, including the Yolo Bypass	Occurs in the lower Sacramento River
Hardhead *Mylopharodon conocephalus*	–	SSC	Spawning occurs in pools and side pools of rivers and creeks; juveniles rear in pools of rivers and creeks, and in shallow to deeper water of lakes and reservoirs	Occurs in the lower Sacramento River; likely to occur in the PGCC and NEMDC

Notes: Delta = Sacramento–San Joaquin Delta; DFG = California Department of Fish and Game; ESU = Evolutionarily Significant Unit; NEMDC = Natomas East Main Drainage Canal; NMFS = National Marine Fisheries Service; PGCC = Pleasant Grove Creek Canal; USFWS = U.S. Fish and Wildlife Service

[1] Legal Status Definitions

Federal Listing Categories (USFWS and NMFS)
- E Endangered (legally protected)
- T Threatened (legally protected)
- SC Species of Concern

State Listing Categories (DFG)
- E Endangered (legally protected)
- T Threatened (legally protected)
- SSC Species of Special Concern (no formal protection)

Source: Data compiled by EDAW in 2008

Cover structures, space, and food are necessary components for chinook salmon rearing habitat. Suitable habitat includes areas with instream and overhead cover in the form of undercut banks; downed trees; and large, overhanging tree branches. The organic materials forming fish cover also help provide sources of food, in the form of both aquatic and terrestrial insects. Growth of juvenile chinook salmon in floodplain habitat is fast relative to growth in river habitat. Juvenile salmon have been found to have growth rates in excess of 1 millimeter (mm) per day when they rear in flooded habitat and as much as 20 mm in 2–3 weeks (Jones & Stokes 2001). The water temperature in floodplain habitat is typically higher than that in main channel habitats. Although increased temperature increases metabolic requirements, the productivity in flooded habitat is also increased, resulting in higher growth rates (Sommer et al. 2001). The production of drift invertebrates in the Yolo Bypass has been found to be one to two times greater than production in the river (Sommer et al. 2001). Also, grasses that are flooded support invertebrates that are also a substantial source of food for rearing juveniles. Increased areas resulting from flooded habitat can also reduce the competition for food and space and potentially decrease the possible encounters with predators (Sommer et al. 2001). Juvenile chinook salmon that grow faster are likely to migrate downstream sooner, which helps to reduce the risks of predation and competition in freshwater systems.

Juvenile chinook salmon in the Sacramento River system move out of upstream spawning areas into downstream habitats in response to many factors, including inherited behavior, habitat availability, flow, competition for space and food, and water temperature. The number of juveniles that move and the timing of movement are highly variable. Storm events and the resulting high flows appear to trigger movement of substantial numbers of juvenile chinook salmon to downstream habitats. In general, juvenile abundance in the Delta increases as flow increases (USFWS 1993).

Fall-run chinook salmon emigrate as fry and subyearlings and remain off the California coast during their ocean migration (63 *Federal Register* [FR] 11481, March 9, 1998). Fall-run chinook salmon occur in the lower Sacramento River, are likely to occur in the NEMDC, and are unlikely to occur in the PGCC.

- **Winter-Run Chinook Salmon.** Adult winter-run chinook salmon leave the ocean and migrate through the Delta into the Sacramento River system from November through July. Salmon migrate upstream past the Red Bluff Diversion Dam (RBDD) on the Sacramento River from mid-December through July, and most of the spawning population has passed RBDD by late June.

  Winter-run chinook salmon spawn from mid-April through August, and incubation continues through October. The primary spawning grounds in the Sacramento River are above RBDD. Adult winter-run chinook salmon generally do not enter the American River.

  Juvenile winter-run chinook salmon rear and emigrate in the Sacramento River from July through March (Hallock and Fisher 1985). Juveniles descending the Sacramento River above RBDD from August through October and possibly November are mostly pre-smolts (smolts are juveniles that are physiologically ready to enter seawater) and probably rear in the Sacramento River below RBDD. Juveniles have been observed in the Delta between October and December, especially during high Sacramento River discharge caused by fall and early-winter storms.

  Triggers for downstream movement are similar to those described above for fall-run chinook salmon. Winter-run salmon smolts may migrate through the Delta and bay to the ocean from December through as late as May (Stevens 1989). The Sacramento River channel is the main migration route through the Delta. Adult winter-run chinook salmon spend 1–4 years in the ocean. About 67% of the adult escapement that leaves the ocean to spawn in the Sacramento River consists of 3-year-olds, 25% consists of 2-year-olds, and 8% consists of 4-year-olds (Hallock and Fisher 1985). Winter-run chinook salmon occur in the lower Sacramento River adjacent to the Phase 3 Project area.

- **Spring-Run Chinook Salmon.** Spring-run chinook salmon historically were the second most abundant run of Central Valley chinook salmon (Fisher 1994). They occupied the headwaters of all major river systems in the Central Valley where there were no natural barriers. Adults returning to spawn ascended the tributaries to the upper Sacramento River, including the Pit, McCloud, and Little Sacramento Rivers. They also occupied Cottonwood, Battle, Antelope, Mill, Deer, Stony, Big Chico, and Butte Creeks and the Feather, Yuba, American, Mokelumne, Stanislaus, Tuolumne, Merced, San Joaquin, and Kings Rivers. Spring-run chinook salmon migrated farther into headwater streams where cool, well-oxygenated water is available year round.

  Current surveys indicate that remnant, nonsustaining spring-run chinook salmon populations may be found in Cottonwood, Battle, Antelope, and Big Chico Creeks (DWR 1997b). More sizable, consistent runs of naturally produced fish are found only in Mill and Deer Creeks. The Feather River Fish Hatchery sustains the spring-run population on the Feather River, but the genetic integrity of that run is questionable (DWR 1997b). Estimates since 1953 on the Feather River indicate that numbers returning to the hatchery average around 2,115, although the estimates have increased dramatically since 1990 (DFG 2006).

  Historical records indicate that adult spring-run chinook salmon enter the mainstem Sacramento River in February and March and continue to their spawning streams, where they then hold in deep, cold pools until they spawn. Spring-run chinook salmon are sexually immature during their spawning migration. Some adult spring-run chinook salmon start arriving in the Feather River below the Fish Barrier Dam in June. They remain there until the fish ladder is opened in early September. Spawning and rearing requirements for the species are similar to those identified above for fall-run chinook salmon.

  Spawning occurs in gravel beds from late August through October, and emergence takes place in March and April. Spring-run chinook salmon appear to emigrate at two different life stages: fry and yearlings. Fry move between February and June, while the yearling spring-run emigrate October to March, peaking in November (Cramer and Demko 1997).

  Juveniles display considerable variation in stream residence and migratory behavior. Juvenile spring-run chinook salmon may leave their natal streams as fry soon after emergence or rear for several months to a year before migrating as smolts or yearlings (Yoshiyama, Fisher, and Moyle 1998). Triggers for downstream movement are similar to those described above for fall-run chinook salmon.

  On March 9, 1998 (63 FR 11481), NMFS issued a proposed rule to list Central Valley spring-run chinook salmon ESU as endangered. NMFS designated the species as threatened on September 16, 1999 (64 FR 50393). On February 5, 1999, the California Fish and Game Commission listed it as threatened under CESA. Critical habitat originally had been designated for Central Valley spring-run chinook salmon by NMFS (65 FR 7764, February 16, 2000). However, following a lawsuit (*National Association of Home Builders et al. v. Donald L. Evans, Secretary of Commerce, et al.*), NMFS rescinded the listing. After further review, critical habitat for the Central Valley spring-run chinook salmon ESU was designated on August 12, 2005. Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins. Spring-run chinook salmon occur in the lower Sacramento River adjacent to the Phase 3 Project area.

- **Central Valley Steelhead.** Historically, steelhead spawned and reared in most of the accessible upstream reaches of Central Valley rivers, including the Sacramento and American Rivers and many of their tributaries. Compared with chinook salmon, steelhead generally migrated farther into tributaries and headwater streams where cool, well-oxygenated water is available year-round.

  In the Central Valley, steelhead are now restricted to the upper Sacramento River downstream of Keswick Reservoir; the lower reaches of large tributaries downstream of impassable dams; small, perennial tributaries of the Sacramento River mainstem; and the San Francisco Bay/Sacramento–San Joaquin Delta (Bay-Delta) system.

The upstream migration of adult steelhead in the mainstem Sacramento River historically started in July, peaked in September, and continued through February or March. Central Valley steelhead spawn mainly from January through March, but spawning has been reported from late December through April (McEwan and Jackson 1996). During spawning, the female digs a redd (gravel nest) in which she deposits her eggs, which are then fertilized by the male. Egg incubation time in the gravel is determined by water temperature, varying from approximately 19 days at an average water temperature of 15.5ºC to approximately 80 days at an average temperature of 14.5ºC (McEwan and Jackson 1996).

Steelhead fry usually emerge from the gravel 2–8 weeks after hatching, between February and May, sometimes extending into June (Barnhart 1986, Reynolds et al. 1993). Newly emerged steelhead fry move to shallow, protected areas along streambanks but move to faster, deeper areas of the river as they grow. Juvenile steelhead feed on a variety of aquatic and terrestrial insects and other small invertebrates.

Juvenile steelhead rear throughout the year and may spend 1–3 years in freshwater before emigrating to the ocean. Smoltification, the physiological adaptation that juvenile salmonids undergo to tolerate saline waters, occurs in juveniles as they begin their downstream migration. Smolting steelhead generally emigrate from March to June (Barnhart 1986, Reynolds et al. 1993).

NMFS completed a status review of steelhead populations in Washington, Oregon, Idaho, and California and identified 15 Distinct Population Segments (DPSs) in this range. On August 9, 1996, NMFS issued a proposed rule to list five of these DPSs (including the Central Valley steelhead) as endangered and five as threatened under the ESA (61 FR 155). The Central Valley steelhead DPS was later listed as threatened (downgraded from its proposed status of endangered) (63 FR 13347, March 19, 1998), and critical habitat (which included the lower Feather and Yuba Rivers) was designated for this DPS (65 FR 7764, February 16, 2000). However, after the lawsuit referenced above (*National Association of Home Builders et al. v. Donald L. Evans, Secretary of Commerce, et al.*), NMFS rescinded the listing. After further review, critical habitat for the Central Valley steelhead DPS was designated on August 12, 2005. This habitat includes select waters in the Sacramento and San Joaquin River basins. Steelhead occur in the lower Sacramento River, are likely to occur in the NEMDC, and are unlikely to occur in the PGCC.

- **Green Sturgeon.** Green sturgeon has recently has been listed as threatened by NMFS (71 FR 17757, April 7, 2006). Green sturgeon are found in the lower reaches of large rivers, including the Sacramento–San Joaquin River basin, and in the Eel, Mad, Klamath, and Smith Rivers. Green sturgeon adults and juveniles are found throughout the upper Sacramento River, as indicated by observations incidental to winter-run chinook monitoring at RBDD in Tehama County (NMFS 2005). Green sturgeon spawn predominantly in the upper Sacramento River. They are thought to spawn every 3–5 years (Tracy 1990). Their spawning period is March to July, with a peak in mid-April to mid-June (Moyle, Foley, and Yoshiyama 1992). Juveniles inhabit the estuary until they are approximately 4–6 years old, when they migrate to the ocean (Kohlhorst et al. 1991). Green sturgeon is found primarily in the Sacramento River and occasionally in the Feather River.

- **Sacramento Splittail.** Recent data indicate that Sacramento splittail occur in the Sacramento River as far upstream as RBDD (Sommer et al. 1997) and that some adults spend the summer in the mainstem Sacramento River rather than returning to the estuary (Baxter 1999). The distribution and extent of spawning and rearing along the mainstem Sacramento River is unknown.

  Sacramento splittail spawn over flooded terrestrial or aquatic vegetation (Moyle 2002, Wang 1986). Sacramento splittail spawn in early March and May in lower reaches of the Sacramento River (Moyle et al. 1995). Spawning has been observed to occur as early as January and to continue through July (Wang 1986). Larval splittail are commonly found in the shallow, vegetated areas where spawning occurs. Larvae eventually move into deeper, open water habitats as they grow and become juvenile. During late winter and spring, young-of-year juvenile splittail (i.e., those less than 1 year old) are found in floodplain habitat, sloughs, rivers, and Delta channels near spawning habitat. Juvenile splittail gradually move from shallow,

nearshore habitats to the deeper, open water habitats of Suisun and San Pablo Bays (Wang 1986). In areas upstream of the Delta, juvenile splittail can be expected to be present in the flood basins (i.e., Sutter and Yolo Bypasses and the Sacramento River) when these areas are flooded during winter and spring.

In 1999, after 4 years of candidate status, the splittail was listed as threatened under the ESA (64 FR 25, March 10, 1999). Fall midwater trawl surveys indicate that juvenile splittail abundance has been highly variable from year to year, with peaks and declines coinciding with wet and dry periods, respectively, and correlated with the availability of flooded shallow-water habitat. After the listing, the State Water Contractors, the San Luis and Delta-Mendota Water Authority, and others challenged the listing, contending that it violated the ESA and the Administrative Procedures Act. On June 23, 2000, the U.S. District Court in Fresno ruled in favor of the plaintiffs and found the listing unlawful. On September 22, 2003, the U.S. Fish and Wildlife Service (USFWS) withdrew splittail from the list of threatened species, indicating that habitat restoration actions implemented through the CALFED Bay-Delta Program and the Central Valley Project Improvement Act are likely to keep the splittail from becoming endangered in the foreseeable future (68 FR 55139, September 22, 2003).

- **Hardhead.** Hardhead are widely distributed throughout the low- to mid-elevation streams in the main Sacramento–San Joaquin drainage, including the Sacramento River system. Undisturbed portions of larger streams at low to middle elevations are preferred by hardhead. Hardhead are able to withstand summer water temperatures above 20ºC; however, they will select lower temperatures when they are available. Hardhead are fairly intolerant of low-oxygenated waters, particularly at higher water temperatures. Pools with sand-gravel substrates and slow water velocities are the preferred habitat; adult fish inhabit the lower half of the water column, while the juvenile fish remain in the shallow water closer to the stream edges. Hardhead typically feed on small invertebrates and aquatic plants at the bottom of quiet water (Moyle 2002). Hardhead is a Federal species of concern and a state species of special concern.

3.3.6.3 Other Important Native Fish Species Supported by the Lower Sacramento River, Pleasant Grove Creek Canal, and Natomas East Main Drainage Canal

Summary descriptions for those species that have the potential to occur in the Phase 3 Project area are provided below.

- **Sacramento Sucker.** The Sacramento sucker is widely distributed throughout the Sacramento River system. Sacramento sucker occupy waters from cold, high-velocity streams to warm, nearly stagnant sloughs. They are common at moderate elevations (600–2,000 feet). Sacramento sucker feed on algae, detritus, and benthic invertebrates. They usually spawn for the first time in their fourth or fifth years. When they cannot move upstream and end up spawning in lake habitat, they typically orient themselves near areas where spring freshets flow into the lake. They typically spawn in stream habitat on gravel riffles from late February to early June. The eggs hatch in 3–4 weeks, and the young typically live in the natal stream for a couple of years before moving downstream to a reservoir or large river (Moyle 2002).

- **Sacramento Pikeminnow.** Sacramento pikeminnow occupy rivers and streams throughout the Sacramento–San Joaquin River system, mainly at elevations between 300 and 2,000 feet. Sacramento pikeminnow spawn in April and May, with eggs hatching in less than a week. Within a week of hatching, the fry are free-swimming and schooling. Adult pikeminnow may feed on other fish, including juvenile pikeminnow, chinook salmon, and steelhead, but, according to Moyle (2002), are overrated as predators on salmonid species in natural environments. They can, however, be major predators on juvenile salmon and steelhead in riverine environments modified by dams and fish ladders. Pikeminnow tend to remain in well-shaded, deep pools with sand or rock substrate and are less likely to be found in areas where there are higher numbers of introduced predator species, such as largemouth bass and other centrarchid species.

3.3.6.4 IMPORTANT NONNATIVE FISH SPECIES SUPPORTED BY THE LOWER SACRAMENTO RIVER, PLEASANT GROVE CREEK CANAL, AND NATOMAS EAST MAIN DRAINAGE CANAL

Summary descriptions for those species that have the potential to occur in the Phase 3 Project area are provided below.

- **Striped Bass.** Striped bass are anadromous fish that have been an important part of the sport-fishing industry in the Delta. They were introduced into the Sacramento–San Joaquin estuary between 1879 and 1882 (Moyle 2002). Striped bass may move into the lower reaches of the rivers year-round but probably most often between April and June, when they spawn. The species tends to remain in deep, slow-moving water, where it has access to prey without having to expend a great deal of energy.

- **American Shad.** American shad are an anadromous fish that have been introduced into the Central Valley and have become established as a popular sport fish. American shad enter the American River to spawn during the spring (primarily May and June) and support a seasonal fishery downstream of the dams during these months.

3.3.6.5 DESIGNATED ESSENTIAL FISH HABITAT

The Sacramento River and the lowermost segment of the NEMDC have been designated as Essential Fish Habitat by the Pacific Fishery Management Council to protect and enhance habitat for coastal marine fish and macroinvertebrate species that support commercial fisheries. Essential Fish Habitat is defined as waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. Under *the Pacific Coast Salmon Fisheries Management Plan* (Pacific Fishery Management Council 2003), the lower portion of the NEMDC (i.e., portion below confluence with Dry Creek) have been designated as Essential Fish Habitat for fall-run chinook salmon, and the Sacramento River has been designated as Essential Fish Habitat for spring-, fall-, late fall-, and winter-run chinook salmon.

3.3.7 SENSITIVE AQUATIC HABITATS

Sensitive aquatic habitats include those that are of special concern to resource agencies or that are afforded specific consideration through ESA, CEQA, Section 1602 of the California Fish and Game Code, Section 404 and 401 of the Clean Water Act (CWA), or the Sustainable Fisheries Act (as amended). These habitats are of special concern because they may be of high value to plants, wildlife, and fish species and may have a higher potential to support special-status species. They also provide other important ecological functions, such as enhancing flood and erosion control and maintaining water quality. Essential Fish Habitat is described in Section 3.3.6.5, "Designated Essential Fish Habitat," above; other sensitive aquatic habitats are described below.

Irrigation/drainage canals and ditches in the Phase 3 Project area are anticipated to be considered waters of the United States and subject to regulation under CWA Section 404. Other permanently and/or seasonally wet habitats, such as freshwater marsh and seasonal wetland, could qualify as jurisdictional waters of the United States subject to Section 404 regulation if they are adjacent or abutting other jurisdictional waters of the United States.

A wetland delineation was completed for the PGCC, NEMDC, and Sutter Pointe and Dunmore borrow areas. The preliminary wetland delineation report concluded that the PGCC, NEMDC, irrigation/drainage ditches, and small areas of seasonal wetlands and irrigated wetlands at the toe of the existing levees within the project footprint are subject to CWA Section 404 jurisdiction. Irrigated wetlands and irrigation/drainage ditches on the Sutter Pointe and Dunmore potential borrow sites are also subject to CWA jurisdiction. USACE issued a preliminary jurisdictional determination form in November 2008 that concurred with the estimate of jurisdictional waters of the United States within the project footprint presented in the wetland delineation report.

Previous delineation reports verified by USACE (Cavanaugh pers. comm., 2005, 2006a, 2006b; Finan 2008; Roukey 2006; **Appendix C**), which covered other elements of the anticipated footprint for the Phase 2 and Phase 3 Projects (Sacramento River east levee improvements, canal relocations, the NCC, and borrow operations at the Airport north bufferlands and Brookfield sites), identify the following features as jurisdictional: irrigation/ drainage ditches and canals along the toe of the levee that connect with these, seasonal wetlands within the Airport north bufferlands borrow area, freshwater marsh habitat, irrigated wetlands in rice fields, and the slough north of the Teal Bend Golf Club. In addition, the riverbank erosion control element of the Levee Raise-in-Place Alternative at erosion sites along the Sacramento River east levee would be within USACE jurisdictional areas, and some of the discharge pipes conveying filtered stormwater drainage from the east levee to the east bank of the Sacramento River under the Proposed Action might extend to areas within CWA Section 404 and/or Section 10 of the Rivers and Harbors Act jurisdiction. A previously verified delineation report was conducted in the "panhandle" area south of Elkhorn Boulevard (SPK-2005-01087) which found jurisdictional vernal pools along the NEMDC west levee.

The functional quality of an aquatic resource is considered by USACE as part of the CWA Section 404 regulatory process. Habitat quality may be generally categorized as low, moderate, or high, defined herein as follows:

- **Low:** High levels of disturbance (e.g., vegetation disking for fire clearance purposes, dominance of monotypic stands of nonnative vegetation, presence of human-made structures)

- **Moderate:** Moderate levels of disturbance (e.g., natural plant communities intact with some evidence of nonnative vegetation, low-intensity developments such as trails, selective vegetation management for flood damage reduction purposes)

- **High:** Natural structure and function of biotic community exists, with minimal changes in structure or function evident—i.e., zero to low levels of human disturbance (e.g., natural plant communities intact, no artificial structures present, sensitive plant and/or wildlife species utilization)

The relative functional quality of the features identified above that would fall within the project footprint is generally as follows: irrigation canals and irrigation/drainage ditches—low; seasonal wetlands in the Airport north bufferlands area and in the footprint of the proposed adjacent setback levee along the Sacramento River east levee and Giant Garter Snake (GGS)/Drainage and Elkhorn Canals, irrigated wetlands in the Brookfield, Sutter Pointe, and Dunmore potential borrow sites—moderate; and slough, freshwater marsh, and Sacramento River bank—moderate to high.

All of the aquatic habitats described above are also anticipated to qualify as waters of the state and be regulated under the Porter-Cologne Water Quality Control Act. In addition, waterways and associated riparian habitats are likely subject to regulation under Section 1600 et seq. of the California Fish and Game Code. Within the footprint of the Phase 3 Project, riparian habitat occurs in scattered patches along the waterside of the Sacramento River east levee and near the historic Jacobs Slough.

Other habitats considered sensitive by DFG include those identified as "rare and worthy of consideration" in natural communities recognized by the California Natural Diversity Database (CNDDB). These sensitive communities provide essential habitat to special-status species that are often restricted in distribution or decreasing throughout their range. Some woodland patches within the Phase 3 Project area could be categorized as Great Valley cottonwood riparian forest, which is a natural community documented in the CNDDB.

3.3.8 VEGETATION AND WILDLIFE

3.3.8.1 LAND USE AND VEGETATION

Before 1850, vegetation in the Natomas Basin and the remainder of the Sacramento Valley bore little resemblance to its current state. The Sacramento River dominated the area, its banks lined by a riverine growth of oak, western sycamore, Fremont cottonwood, willow, and Oregon ash, up to a mile in width. Drainage from the western slopes of the Sierra Nevada resulted in regular flooding of the Sacramento Valley, rendering the Natomas Basin an area of highly fertile, alluvial soils. The southern portion of the Basin was part of the overlapping American and Sacramento River floodplains. This large floodplain supported large tracts of riparian woodland and scrub, permanent freshwater marsh, and seasonal wetland. It is likely that vernal pools also existed historically in the Natomas Basin, particularly in upland areas in the eastern portion (USFWS, City of Sacramento, and Sutter County 2003).

Currently, the Natomas Basin supports a wide array of land uses and habitat types, including urban, suburban, and rural development; agricultural fields; and remnant and restored native habitat. **Table 3.8-1** summarizes information compiled for the most recent categorization of land cover types in the Natomas Basin conducted for TNBC.

Table 3.8-1
Land Cover Types in the Natomas Basin

Habitat Type	Acres
Alfalfa	1,189
Fallow rice	7,970
Fallow row and grain crops	2,065
Fresh emergent marsh	154
Fresh emergent marsh (created)	674
Grass hay	2,212
Grassland (created)	68
Irrigated grassland	451
Nonhabitat land uses (developed, disturbed/bare, ruderal)	14,226
Nonnative annual grassland	5,192
Nonriparian woodland	51
Open water	340
Orchard	184
Rice	14,590
Riparian scrub	114
Riparian woodland	357
Row and grain crops (milo, tomatoes, sunflower, wheat)	4,067
Seasonal wetland	108
Valley oak woodland	192
Total	**54,207**

Source: Habitat mapping by Jones & Stokes in 2007; data compiled by EDAW in 2008

The southern portion of the Natomas Basin is largely developed, particularly south of Elkhorn Boulevard and east of El Centro Road. The western and northern portions, in contrast, are dominated by agricultural lands. The primary crops produced in the Natomas Basin are rice, corn, grain, and tomatoes. Rice, the most common crop, is generally grown over large areas of contiguous land north of Elkhorn Boulevard, although the amount of land in active rice production has greatly diminished in recent years and many former rice fields are now fallow or support grain crops, such as wheat. Agricultural lands in the southern and western portions support other crops and urban land uses (City of Sacramento, Sutter County, and TNBC 2003).

Only small fragments of native habitat persist in the Natomas Basin. Riparian habitat is primarily restricted to a narrow strip along the levees of the Sacramento River and NEMDC. Small patches of woodland, scrub, and wetland habitats dominated by native species are scattered throughout the Natomas Basin, most relatively close to the Sacramento River or adjacent to other features that support surface water. An extensive network of irrigation and drainage ditches also traverses the Natomas Basin and a growing number of restored marsh habitat patches are being created, primarily in the north. Most of these are owned and managed by TNBC; others are separately managed as Airport mitigation sites.

The Phase 3 Project area is largely undeveloped, except for residences widely scattered along the northern and middle reaches of the Sacramento River, the southern portion of PGCC, and the southern portion of the NEMDC. Residences are more densely spaced in the southern reaches of the Sacramento River and NEMDC. Levee slope maintenance zones along the landside toe are dominated by weedy ruderal vegetation that is regularly maintained via mowing and/or burning. Irrigation/drainage ditches and canals are present along many of the levee reaches, landward of the maintenance zones. These ditches generally support little native vegetation and are regularly maintained. Lateral ditches and canals also extend into the Phase 3 Project area. The relatively limited amount of native vegetation within the Phase 3 Project area is associated with these lateral ditches, which are concentrated in the upper reaches of the Sacramento River east levee, and remnant woodland and scrub patches scattered along the land side of the Sacramento River east levee. The dominant habitat landward of levee maintenance zones and irrigation/drainage features is agricultural. Aside from the urbanized areas, along the southern reaches of the Sacramento River and NEMDC, areas along the Sacramento River and NEMDC are predominantly row and field crops. Land adjacent to the PGCC and at the potential borrow sites are a mix of rice and row/field crops.

3.3.8.2 WILDLIFE

Before European settlement, the Sacramento area floodplains supported a wide variety and large numbers of wildlife species associated with its riparian habitats, permanent and seasonal wetlands, and oak woodlands and savannas. Much of this habitat has been lost, locally and regionally. Initially, land within the Natomas Basin was converted to agriculture, though more recent land use conversions have been to urban development. As a result, there have been shifts in wildlife use as land uses and habitats have changed. With the conversion to agriculture, the abundance of species restricted to natural habitats likely decreased, and in some cases particular species ceased to occur (City of Sacramento, Sutter County, and TNBC 2003). However, remnant native habitat patches and created habitat associated with drainage and agricultural supply ditches and habitat reserves have allowed remnant wildlife populations to persist within the Natomas Basin, most notable of which are giant garter snake and the Swainson's hawk populations. The presence of ditches among the mosaic of agricultural fields and remnant riparian and wetland patches provides important nesting, feeding, and migration corridor habitat for a variety of wildlife species that inhabit the Natomas Basin. Many of these are special-status species, which are described in Section 3.3.9, "Special-Status Terrestrial Species."

Wildlife use is also linked to the Natomas Basin's position in the Pacific Flyway, the westernmost of North America's four flyways, or migration routes. These flyways are defined as geographic regions with breeding grounds in the north, wintering grounds in the south, and a system of migration routes in between. The Central Valley lies at the southerly end of the Pacific Flyway migratory route. Historically, the Central Valley contained approximately 4 million acres of wetlands, including permanent marshes and seasonal wetlands created by winter rains and spring snowmelt from the Sierra Nevada. Today, approximately 300,000 acres remain, providing

wintering habitat for 60% of the Pacific Flyway's current waterfowl population and migration habitat for an additional 20% of the population. All together, approximately 10–12 million ducks and geese, along with millions of other water birds, winter in or pass through the Central Valley each year (City of Sacramento, Sutter County, and TNBC 2003). Although most marshes and seasonal wetlands in the Natomas Basin have been converted to agricultural and urban uses, flooded rice fields continue to attract and support migrant waterfowl. Some species also utilize pasture, harvested rice, and other croplands for foraging (USFWS, City of Sacramento, and Sutter County 2003).

The Phase 3 Project area provides habitat for a variety of wildlife species, ranging from those that utilize the widely distributed agricultural fields and levee maintenance zones to species that are restricted to remnant patches of native vegetation and the system of irrigation/drainage ditches and canals. Many common wildlife species utilize the Phase 3 Project area, and a number of sensitive species also have potential to occur within and adjacent to the levee improvement areas. These sensitive species are discussed further in Section 3.3.9, "Special-Status Terrestrial Species."

3.3.9 SPECIAL-STATUS TERRESTRIAL SPECIES

A programmatic Biological Opinion (BO) was issued by USFWS for the NLIP in October 2008.

3.3.9.1 SPECIAL-STATUS PLANT SPECIES

Nine special-status plant species were evaluated for their potential to occur in the Phase 3 Project area. These are species that are covered under the NBHCP and/or are considered by the California Native Plant Society (CNPS) to be rare, endangered, or threatened and are considered to have suitable habitat in the project region. **Table 3.9-1** summarizes for each species the regulatory or CNPS listing status, including coverage in the NBHCP; habitat association; and potential for occurrence in the Phase 3 Project area.

Three of the nine species were determined to have potential to occur in the Phase 3 Project area: rose mallow, Delta tule pea, and Sanford's arrowhead. All of these species occur in freshwater habitats, including marshes, swamps, sloughs, and ditches. Potentially suitable habitat for them within the Phase 3 Project area is provided by the irrigation and drainage canals throughout the Phase 3 Project area. In general, these areas provide low-quality habitat and are unlikely to support these three special-status plants. Rose mallow and Delta tule pea are not known to occur in the Phase 3 Project area (CNDDB 2008). Surveys conducted in 2008 did not detect Sanford's arrowhead in potentially suitable habitat that could be disturbed during construction of the Phase 3 Project.

The remaining six species included in **Table 3.9-1** are not addressed further in this section, because the Phase 3 Project area does not support the vernal pool and seasonal wetland habitats in which they occur. Potential habitat for these species is generally concentrated in the eastern portion of the Natomas Basin, between Del Paso Road and Riego Road, along the northern portion of the NEMDC, where construction is not proposed under the Phase 3 Project.

3.3.9.2 SPECIAL-STATUS WILDLIFE SPECIES

Twenty special-status wildlife species, including all species covered by the NBHCP, were evaluated for their potential to occur in the Phase 3 Project area. **Table 3.9-2** summarizes for each species the regulatory status, including coverage in the NBHCP; habitat association; and potential for occurrence in the Phase 3 Project area. Six of these species (four invertebrate species and two amphibian species) are not addressed further in this section because the Phase 3 Project area does not support the habitats in which they occur. Three of the bird species listed in **Table 3.9-2** have been documented in the area in the past but are not known to nest in the Phase 3 Project area and are not discussed further. The remaining eleven species were determined to have potential to occur in the Phase 3 Project area during at least part of the year and are discussed below.

Table 3.9-1
Special-Status Plant Species Evaluated for Potential to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Dwarf downingia	*Downingia pusilla*	CNPS: 2	Vernal pools and lakes	No suitable habitat is present within the project area
Bogg's Lake hedge-hyssop	*Gratiola heterosepala*	CA: endangered CNPS: 1B NBHCP: covered	Vernal pools and lake margins	No suitable habitat is present within the project area
Rose mallow	*Hibiscus lasiocarpus*	CNPS: 2	Freshwater marshes and swamps	Low potential to occur in ditches and ponds in the project area
Delta tule pea	*Lathyrus jepsonii jepsonii*	CNPS: 1B NBHCP: covered	Freshwater and brackish marshes and sloughs	Low potential to occur in ditches and ponds in the project area
Legenere	*Legenere limosa*	CNPS: 1B NBHCP: covered	Vernal pools	No suitable habitat is present within the project area
Colusa grass	*Neostapfia colusana*	Federal: threatened CA: endangered CNPS: 1B NBHCP: covered	Vernal pools	No suitable habitat is present within the project area
Slender orcutt grass	*Orcuttia tenuis*	Federal: threatened CA: endangered CNPS: 1B NBHCP: covered	Vernal pools	No suitable habitat is present within the project area
Sacramento orcutt grass	*Orcuttia viscida*	Federal: endangered CA: endangered CNPS: 1B NBHCP: covered	Vernal pools	No suitable habitat is present within the project area
Sanford's arrowhead	*Sagittaria sanfordii*	CNPS: 1B NBHCP: covered	Freshwater ponds, marshes and ditches	Low potential to occur in ditches and ponds in the project area

Notes: CA = California; CNPS = California Native Plant Society; NBHCP = Natomas Basin Habitat Conservation Plan
California Native Plant Society Listing Categories:
1B Plants considered rare, threatened, or endangered in California and elsewhere
2 Plants considered rare, threatened, or endangered in California but more common elsewhere
Sources: CNPS 2007; CNDDB 2007; City of Sacramento, Sutter County, and TNBC 2003; USFWS 2005

Table 3.9-2
Special-Status Wildlife Species Evaluated for Potential to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Invertebrates				
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	Federal: threatened NBHCP: covered	Elderberry shrubs, typically in riparian habitats	Elderberry shrubs are present within and adjacent to the Sacramento River east levee improvement area
California linderiella	*Linderiella occidentalis*	Federal: endangered NBHCP: covered	Vernal pools and other seasonal wetlands	No suitable habitat is present within the project area
Vernal pool tadpole shrimp	*Lepidurus packardi*	Federal: endangered NBHCP: covered	Vernal pools and swales	No suitable habitat is present within the project area
Midvalley fairy shrimp	*Branchinecta mesovallensis*	NBHCP: covered	Vernal pools	No suitable habitat is present within the project area
Vernal pool fairy shrimp	*Branchinecta lynchi*	Federal: threatened NBHCP: covered	Vernal pools and other seasonal wetlands	No suitable habitat is present within the project area
Amphibians				
California tiger salamander	*Ambystoma californiense*	Federal: threatened CA: species of special concern NBHCP: covered	Vernal pools and seasonal wetlands in upland with burrows and other belowground refuge	No suitable habitat is present within the project area
Western spadefoot	*Spea hammondii*	CA: species of special concern NBHCP: covered	Vernal pools and seasonal wetlands in upland with burrows and other belowground refuge	No suitable habitat is present within the project area
Reptiles				
Giant garter snake	*Thamnophis gigas*	Federal: threatened CA: threatened NBHCP: covered	Streams, sloughs, ponds, and irrigation/ drainage ditches; also require upland refugia not subject to flooding during the snake's inactive season	The Natomas Basin supports a key population; rice fields, ditches, and ponds in the project area provide potentially suitable habitat
Northwestern pond turtle	*Actinemys marmorata marmorata*	CA: species of special concern NBHCP: covered	Ponds, marshes, rivers, streams, sloughs; nest in nearby uplands with suitable soils	Ditches and ponds in the project area provide potentially suitable habitat
Birds				
White-faced ibis	*Plegadis chihi*	CA: species of special concern NBHCP: covered	Forage and roost in shallow water and flooded fields; nest in freshwater marshes	Rice fields in project area provide foraging habitat; the only nesting colony in the Natomas Basin is approximately 3 miles from the nearest levee improvement area

Table 3.9-2
Special-Status Wildlife Species Evaluated for Potential to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Aleutian Canada goose	*Branta canadensis leucopareia*	NBHCP: covered	Forage in agricultural fields and roost in aquatic habitats	Could be a winter visitor to the project area, but no recent documented occurrences
White-tailed kite	*Elanus leucurus*	CA: fully protected	Forage in grasslands and agricultural fields; nest in isolated trees or small woodland patches	Known to nest and forage in the project area
Northern harrier	*Circus cyaneus*	CA: species of special concern	Forage and nest in grassland, agricultural fields, and marshes	Known to nest and forage in the project area
Cooper's hawk	*Accipiter cooperii*	CA: species of special concern	Forage and nest in open woodlands and woodland margins	Known to nest and forage in the project area
Swainson's hawk	*Buteo swainsoni*	CA: threatened NBHCP: covered	Forage in grasslands and agricultural fields; nest in open woodland or scattered trees	Known to nest and forage in the project area
American peregrine falcon	*Falco peregrinus anatum*	CA: endangered and fully protected NBHCP: covered	Forage in a variety of open habitats, particularly marshes and other wetlands	Likely to occasionally forage in the project area, but no suitable nesting habitat is present
Burrowing owl	*Athene cunicularia*	CA: species of special concern NBHCP: covered	Grasslands and agricultural fields	Known to occur along the PGCC
Bank swallow	*Riparia riparia*	CA: threatened NBHCP: covered	Forage in various habitats; nest in banks or bluffs, typically adjacent to water	Could forage in the project area, but no colonies have been documented nearby within the past 10 years
Loggerhead shrike	*Lanius ludovidianus*	CA: species of special concern NBHCP: covered	Forage in grasslands and agricultural fields; nest in scattered shrubs and trees	Known to nest and forage in the project area
Tricolored blackbird	*Agelaius tricolor*	CA: species of special concern NBHCP: covered	Forage in grasslands and agricultural fields; nest in freshwater marsh, riparian scrub, and other dense shrubs and herbs	Known to nest and forage in the project area

Notes:
CA = California; NBHCP = Natomas Basin Habitat Conservation Plan ; PGCC = Pleasant Grove Creek Canal
Sources: CNDDB 2007; City of Sacramento, Sutter County, and TNBC 2003; USFWS 2005; USFWS 2006a

- **Valley Elderberry Longhorn Beetle.** The valley elderberry longhorn beetle is Federally listed as threatened and is covered under the NBHCP. These beetles are patchily distributed throughout the remaining riparian forests of the Central Valley, from Redding to Bakersfield, and appear to be only locally common (i.e., found in population clusters that are not evenly distributed across the Central Valley). Valley elderberry longhorn beetles require elderberry shrubs (*Sambucus* sp.) for reproduction and survival, and are rarely seen because they spend most of their life cycle as larvae within the stems of the shrubs. It appears that in order to function as habitat for the valley elderberry longhorn beetle, host elderberry shrubs must have stems that are 1.0 inch or greater in diameter at ground level. Use of the shrubs by the beetle is rarely apparent; often the only exterior evidence is an exit hole created by the larva just before the pupal stage.

  USFWS released a 5-year status review for the valley elderberry longhorn beetle on October 2, 2006 (USFWS 2006b). This review reported an increase in known beetle locations from 10 at the time of listing in 1980 to 190 in 2006. Because of the presumed increase in the estimated population and the concurrent protection and restoration of several thousand acres of riparian habitat suitable for valley elderberry longhorn beetles, the USFWS status review determined that this species is no longer in danger of extinction, and recommended that the species no longer be listed under ESA. This recommendation is not a guarantee that the species will be delisted, however, because formal changes in the classification of listed species require a separate USFWS rulemaking process distinct from the 5-year review. If valley elderberry longhorn beetles are removed from the ESA list, it will likely be more than a year before this decision is finalized.

  There are no known documented occurrences of the beetle in the Phase 3 Project area, but the species is known to occur in the nearby American River Parkway. Elderberry shrubs that could support beetles are relatively sparsely scattered throughout the Phase 3 Project area, primarily in riparian vegetation on the water side of the Sacramento River east levee. Elderberry shrubs are also scattered in some remnant riparian and oak woodland clumps on the land side of the levee, but they are relatively uncommon in these locations.

- **Giant Garter Snake.** The giant garter snake is Federally and state listed as threatened and is a primary covered species under the NBHCP. This species formerly ranged throughout the wetlands of California's Central Valley but appears to have been extirpated from the southern San Joaquin Valley (Hansen and Brode 1980, USFWS 1999) and has suffered serious declines in other parts of its former range. The primary cause of decline, loss or degradation of aquatic habitat caused by agricultural development, has been compounded by the loss of upland refugia and bankside vegetation cover (Thelander 1994).

  Giant garter snakes inhabit agricultural wetlands and other waterways, such as irrigation and drainage canals, rice fields, marshes, sloughs, ponds, small lakes, low-gradient streams, and adjacent uplands in the Central Valley (USFWS 1999). Rice fields and their adjacent irrigation and drainage canals serve an important role as aquatic habitat for giant garter snake. During the summer, giant garter snakes use the flooded rice fields as long as their prey is present in sufficient densities. In late summer, rice fields provide important nursery areas for newborns. In late summer/fall, water is drained from the rice fields and giant garter snake prey items become concentrated in the remaining pockets of standing water, which allows the snakes to gorge before their period of winter inactivity (USFWS 1999). It appears that the majority of giant garter snakes move back into the canals and ditches as the rice fields are drained, although a few may overwinter in the fallow fields, where they hibernate within burrows in the small berms separating the rice checks (Hansen 1998).

  Managed marsh in TNBC reserves also provides important habitat for giant garter snake. In contrast to rice, managed marsh provides year-round habitat, and habitat elements to meet all of the giant garter snake's daily and seasonal needs, such as dense cover, basking sites, and refugia. TNBC reserves have been designed to provide habitat elements throughout the marsh; by contrast, the limited availability of the same elements in rice fields contributes to giant garter snake use occurring primarily around the perimeter of the rice fields. Approximately 674 acres of created marsh habitat are present in the Natomas Basin, as shown in **Table 3.8-1**.

The width of uplands used by giant garter snake varies considerably. Many summer basking and refuge areas used by this snake are immediately adjacent to canals and other aquatic habitats, and may even be located in the upper canal banks. Giant garter snakes have also been found hibernating as far as 820 feet (250 meters) from water, however, and any land within this distance may be important for snake survival in some cases (Hansen 1988). USFWS considers 200 feet to be the width of upland vegetation needed to provide adequate habitat for giant garter snake along the borders of aquatic habitat (USFWS 1997).

The Natomas Basin supports one of the most significant of the remaining giant garter snake populations. Recent occurrences of the species have generally been concentrated in the central and northern portions of the Basin, with giant garter snakes becoming increasingly uncommon at Fisherman's Lake in the south (TNBC 2008). Irrigation and drainage ditches and canals throughout the Phase 3 Project area provide habitat of varying quality for giant garter snake, depending on the location. In general, irrigation ditches on the far western side of the Basin are of poor habitat quality, while rice fields and canals in the north and TNBC lands within and adjacent to the Phase 3 Project area provide high-quality habitat and support a known population. **Table 3.8-1** lists the overall acreages of habitat types in the Natomas Basin; ditches and canals are included in the "Open water" designation.

Large waterways, such as the Sacramento and American Rivers, do not provide suitable habitat for giant garter snake. The PGCC and NEMDC provide habitat of limited value for giant garter snake, and there is little evidence to suggest the species regularly occurs in these channels.

- **Northwestern Pond Turtle.** Northwestern pond turtle is a DFG species of special concern and is covered under the NBHCP. This species is generally associated with permanent or near-permanent aquatic habitats, such as lakes, ponds, streams, freshwater marshes, and agricultural ditches. They require still or slow-moving water with instream emergent woody debris, rocks, or similar features for basking sites. Pond turtles are highly aquatic but can venture far from water for egg laying. Nests are typically located on unshaded upland slopes in dry substrates with clay or silt soils (Jennings and Hayes 1994).

  Ditches, ponds, and marshes throughout the Natomas Basin provide potential habitat for northwestern pond turtle. Basinwide acreages of these habitats are shown in **Table 3.8-1** in the categories "Open water" and "Fresh emergent marsh." Potential breeding habitat is very limited because of the predominance of agriculture and development, but turtles could occur along ditches and margins of other aquatic habitat. Limited information is available on the status and distribution of the northwestern pond turtle in the Basin. Surveys conducted in 2004–2007 for TNBC documented only 17 occurrences of northwestern pond turtle in the Natomas Basin (TNBC 2008). Although there have been few documented occurrences, several of them have been within or near the Phase 3 Project area.

- **Swainson's Hawk.** Swainson's hawk is state listed as threatened and is a primary covered species under the NBHCP. As many as 17,000 Swainson's hawk pairs may have nested in California at one time (DFG 1994). Currently, there are 700–1,000 breeding pairs in California, of which 600–900 are in the Central Valley (Estep 2003). Swainson's hawks typically occur in California only during the breeding season (March–September) and winter in Mexico and South America. The Central Valley population migrates only as far south as central Mexico. Swainson's hawks begin to arrive in the Central Valley in March; nesting territories are usually established by April, with incubation and rearing of young occurring through June (Estep 2003).

  Swainson's hawks are found most commonly in grasslands, low shrublands, and agricultural habitats that include larges trees for nesting. Nests are found in riparian woodlands, roadside trees, trees along field borders, and isolated trees. Corridors of remnant riparian forest along drainages contain the majority of known nests in the Central Valley (England, Bechard, and Houston 1997; Estep 1984; Schlorff and Bloom 1984). Nesting pairs frequently return to the same nest site for multiple years and decades.

Prey abundance and accessibility are the most important features determining the suitability of Swainson's hawk foraging habitat. In addition, agricultural operations (e.g., mowing, flood irrigation) have a substantial influence on the accessibility of prey and thus create important foraging opportunities for Swainson's hawk. Crops that are tall and dense enough to preclude the capture of prey do not provide suitable habitat except around field margins, but prey animals in these habitats are accessible during and soon after harvest. Swainson's hawks feed primarily on small rodents but also consume insects and birds. Although the most important foraging habitat for Swainson's hawks lies within a 1-mile radius of each nest (City of Sacramento, Sutter County, and TNBC 2003), Swainson's hawks have been recorded foraging up to 18.6 miles from nest sites (Estep 1989). Any habitat within the foraging distance may provide food at some time in the breeding season that is necessary for reproductive success. In a dynamic agricultural environment such as the Natomas Basin, the area required for Swainson's hawk foraging habitat depends on time of season, crop cycle, crop type, and disking/harvesting schedule, as these factors affect the abundance and availability of prey (City of Sacramento, Sutter County, and TNBC 2003).

The most recent survey published by TNBC (2008) documented that 44 of the 103 known nesting territories in the Natomas Basin and along adjacent waterways were active in 2007. Most nest sites are located in the western portion of the Basin along the Sacramento River. Along the Sacramento River, the majority of nest sites are located on the water side of the levees, and the relatively few nest sites on the land side of the Sacramento River east levee are typically located at least several hundred feet or more from the levee. In addition to the scattered nest sites adjacent to the Phase 3 Project area, agricultural fields and levee maintenance zones throughout the Phase 3 Project area provide suitable foraging habitat for Swainson's hawk. Basinwide acreages of grasslands and alfalfa, row, and grain crops that may provide foraging habitat for Swainson's hawks are shown in **Table 3.8-1**.

The Phase 3 Project area is within a densely populated and important component of the Central Valley Swainson's hawk population. Nesting pairs in the Natomas Basin may represent as much as 10% of the Swainson's hawks that are found in the Central Valley. Most nest sites are located in the western portion of the Basin along the Sacramento River; several nests are also typically scattered along the NCC and PGCC. Nesting habitat includes riparian and non-riparian woodlands. In addition to nest sites that are adjacent to the Phase 3 Project area, there are agricultural fields and grassland habitats (including levee and canal maintenance zones) throughout the Phase 3 Project area that provide suitable foraging habitat for Swainson's hawk.

Alfalfa and other irrigated field crops can generally provide higher quality foraging habitat than uncultivated annual grasslands and ruderal areas due to prey abundance and availability. The crops can provide abundant cover and food for prey populations. Periodic disturbances such as harvesting, tilling, and flooding can increase prey availability. Certain crops provide better foraging than others due to crop height and the frequency of the disturbance regime. Generally, alfalfa crops are considered the highest value foraging habitat for Swainson's hawk. Next in order of preference is grass hay, fallow crops, row and grain crops, and finally annual grasslands (Estep 2007, Woodbridge 1998).

- **Burrowing Owl.** Burrowing owl is a DFG species of special concern and is covered under the NBHCP. Burrowing owls and their nests are also protected under Section 3503.5 of the California Fish and Game Code, which states that it is unlawful to take, possess, or destroy any raptors, including their nests or eggs. Burrowing owls typically inhabit grasslands and other open habitats with low-lying vegetation. They are also known to nest and forage in idle agricultural fields, ruderal fields, and the edges of cultivated fields, although these areas provide lower-quality habitat than native grasslands. Burrow availability is an essential component of suitable habitat. Burrowing owls are capable of digging their own burrows in areas with soft soil, but they generally prefer to adopt those excavated by other animals, typically ground squirrels. In areas where burrows are scarce, they can use pipes, culverts, debris piles, and other artificial features.

Burrowing owl sightings are generally in the eastern half of the Natomas Basin, with the highest concentration along the far eastern edge (TNBC 2008). No burrowing owls have been observed during the many general and focused biological surveys conducted in project surveys in 2005–2007 along the Sacramento River east levee. However, there have been observations along the PGCC, just north of Sankey Road, including an observation of a pair of burrowing owls by a project biologist in August 2007, and along the southern portion of the NEMDC near I-80.

- **Other Nesting Birds.** Several bird species identified in **Table 3.9-2** have the potential to nest in or adjacent to the Phase 3 Project area. Species associated with riparian and other woodland habitats, such as Cooper's hawk and white-tailed kite, are most likely to nest along the Sacramento River (Cooper's hawk) and in remnant woodland and suitable trees on the land side of the levees (white-tailed kite). In general, these two raptor species are relatively uncommon in the Phase 3 Project area, but several active nests have been documented adjacent to the Phase 3 Project area in recent years, including white-tailed kite nests found near Prichard Lake during project studies in 2007 and along the southern portion of the NEMDC in 2008. Northern harriers are likely to nest in grain crops and fallow agricultural fields in and adjacent to the Phase 3 Project area. Three harrier nests were documented by a project biologist in 2007 in fallow fields and upland adjacent to Prichard Lake. Loggerhead shrikes are known to nest at several TNBC reserves and elsewhere in the Natomas Basin (TNBC 2008) and are likely to nest in small trees and shrubs within the Phase 3 Project area, particularly on the land side of the Sacramento River east levee and the PGCC.

  Tricolored blackbirds have been known to nest on a preserve in TNBC's Central Basin Reserve Area and in the extreme northeast corner of the Basin (TNBC 2008). There is also potential for this species to nest in areas of suitable habitat elsewhere adjacent to the Phase 3 Project area, including several TNBC reserves and other lands north of the airport. Similarly, white-faced ibis were not known to nest anywhere in the Natomas Basin until 2007, when a new nesting colony became established at a preserve in TNBC's Central Basin Reserve Area.

3.3.10 CULTURAL RESOURCES

This section describes the prehistoric, ethnographic, and historic setting for the Phase 3 Project area. Known cultural resources identified in previous studies are also described. Section 4.10, "Cultural Resources," describes the regulatory setting for the project, as well as identified resources that may be affected by the Phase 3 Project.

3.3.10.1 PREHISTORIC AND ETHNOGRAPHIC SETTING

The Phase 3 Project area is situated within the lands traditionally occupied by the Nisenan, or Southern Maidu. The language of the Nisenan, which includes several dialects, is classified within the Maiduan family of the Penutian linguistic stock (Kroeber 1925). The western boundary of Nisenan territory was the western bank of the Sacramento River and the area between present-day Sacramento and Marysville. In the Sacramento Valley, the tribelet, consisting of a primary village and a few satellite villages, served as the basic political unit (Moratto 1984). Valley Nisenan territory was divided into three tribelet areas, each populated with several large villages (Wilson and Towne 1978), generally located on low, natural rises along streams and rivers or on slopes with a southern exposure. One important village, Pusune, near Discovery Park, appears to have been recorded as CA-SAC-26. Other villages—Wollok, Leuchi, Wishuna, Totola, and Nawrean—were located east of the confluence of the Feather and Sacramento Rivers, near the northwestern portion of the Natomas Basin.

Euro-American contact with the Nisenan began with infrequent excursions by Spanish explorers and Hudson Bay Company trappers traveling through the Sacramento and San Joaquin Valleys in the early 1800s. In general, Nisenan lifeways remained stable for centuries until the early to middle decades of the 19th century. With the coming of Russian trappers and Spanish missionaries, cultural patterns began to be disrupted as social structures were stressed. An estimated 75% of the Valley Nisenan population died in the malaria epidemic of 1833. With the influx of Europeans during the Gold Rush era, the population was further reduced by disease and violent relations

with the miners. However, today the Maidu are reinvesting in their traditional culture and, through newfound political, economic, and social influence, now constitute a growing and thriving native community in California.

3.3.10.2 HISTORIC SETTING

In what is now known as the Sacramento and Sutter County region, agriculture and ranching were the primary industries during the historic period. Regional ranching originated on the New Helvetia rancho in the early 1840s. The Gold Rush precipitated growth in agriculture and ranching, as ranchers and farmers realized handsome returns from supplying food and other goods to miners.

In the early part of the 20th century, the California Legislature established The Reclamation Board to exercise jurisdiction over reclamation districts and levee plans. That year, the state approved and began implementation of the SRFCP. The ambitious project included the construction of levees, weirs, and bypasses along the river to channel floodwaters away from population centers. Under the SRFCP, new reclamation districts were created, including RD 1000, consisting of approximately 55,000 acres in the Natomas Basin. RD 1000 was largely controlled by the Natomas Company, which had access to more money than any individual landowner. The infrastructure of RD 1000 was completed in the 1920s. It includes levees, drainage canals, pumps, irrigation systems, agricultural fields, roads, and remnant natural features. The originally constructed features included levees and exterior drainage canals, an interior drainage canal system, nine pumping plants, a series of levee and interior roads, and unpaved rights-of-way between the farm fields.

RD 1000 has been previously evaluated as a Rural Historic Landscape District on behalf of USACE and was found eligible for National Register of Historic Places (NRHP) and California Register of Historical Resources (CRHR) listing (Dames & Moore 1994a). Dames & Moore determined that RD 1000 appears to be eligible for listing as a Rural Historic Landscape District at the state level of significance for the period from 1911 to 1939 under Criterion A of the NRHP. The area of significance is reclamation and the historical context is flood damage reduction and reclamation of the Sacramento River basin within the SRFCP as an important part of the history of reclamation and flood damage reduction. The district retains much of its historic integrity, including location design, setting, materials, workmanship, feeling, and association. The contributing and noncontributing elements of the district were defined as part of this effort. Contributing elements were described as follows:

- **Drainage System:** East Levee, River Levee, Cross Canal Levee; Natomas East Main Drainage Canal; Cross Canal; Pleasant Grove Canal; Pumping Plant No. 1-A, 2, and 3; and the drainage ditches within the areas of contributing large scale land patterns.

- **Road System:** Garden Highway from Orchard Lane north to the Cross Canal; East Levee/Natomas Road; Sankey Road; Riego Road; Elverta Road; Elkhorn Boulevard from Garden Highway to the western boundary of the Sacramento Airport; Del Paso Road from Powerline Road to its intersection with I-5; San Juan Road from Garden Highway to its intersection with I-5; Powerline Road; El Centro Road from north of I-80 to its intersection with Bayou Way; and the right-of-way roads within fields in the areas of contributing large scale land patterns.

- **Large-Scale Land Patterns:** Land area that is comprised of open fields formed by the intersection of the canals and roads in the area bounded as follows: west of the East Levee; west of Sorrento Road; north of Del Paso Road between the East Levee and I-5, west of I-5 from its intersection with Del Paso Road to its intersection with I-80; north of I-80 from its intersection with I-5 to the River Levee; east of the River Levee; and south of the Cross Canal Levee.

3.3.10.3 RECORDS SEARCH RESULTS

Records searches for recorded cultural resources and studies were conducted in 2006 and 2007. Most of the searches were conducted at the North Central Information Center (NCIC) of the California Historical Resources

Information System, located at California State University, Sacramento. The NCIC records search covered portions of the project area in Sacramento County. Records searches were also conducted at the Northeast Information Center (NEIC), which maintains cultural resource records for Sutter County. The records searches included the levee ring around the Basin as well as all the lands inside the Natomas Basin so that changing project needs (e.g., the identification of alternate borrow sites) would be covered by the records searches.

The NEIC and NCIC reported that several cultural resource inventories have been conducted within the project area. These are listed in **Tables 3.10-1** and **3.10-2**, respectively.

Table 3.10-1
Previous Cultural Resources Surveys Conducted in the NLIP Project Area in Sutter County

NEIC Report No.	Author(s)	Title	Date
1135	Bass, H. O.	*Department of Transportation Negative Archaeological Survey Report: State Route 99*	1983
7173	Cultural Resources Unlimited	*A Cultural Resources Study for Sutter Bay Project, Sutter County, California*	1992
7175	Cultural Resources Unlimited	*A Cultural Resources Study for Sutter Bay Project Highway 99/70 Interchange/Crossroad Improvements Sutter County, California*	1992
3469B	Dames & Moore	*Rural Historic Landscape Report for Reclamation District 1000 for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1996
5777	Dames & Moore	*Historic Property Treatment Plan for Reclamation District 1000 Rural Historic Landscape District for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1994
4197	Dames & Moore	*Archaeological Inventory Report, Natomas Locality, Cultural Resources Inventory and Evaluation, American River Watershed Investigation, El Dorado, Placer, Sacramento, and Sutter Counties, California*	1994
6892	Derr, E. H.	*American Basin Fish Screen and Habitat Improvement Project, Feasibility Study: Alternative 1C, 2C, 3, Sacramento and Sutter Counties, California*	2002
6944	Ebasco Environmental	*Cultural Resources Survey of the Sacramento Energy Project Sacramento County, California*	1992
5655	Egherman, R., and B. Hatoff	*Roseville Energy Facility Cultural Resources Appendix J-1 of Application for Certification*	2002
6945	Foster, J. W., and D. G. Foster	*An Archaeological Survey of the South Sutter Industrial Center Property, Sutter County, California*	1992
2987	Jensen, P.	*Historic Properties Survey Report for the Proposed Fifield Road at Pleasant Grove Creek Canal, Caltrans District 3, Sutter County, California*	1999
6893	Kaptain, N.	*Historic Property Survey Report for the State Route 99/Riego Road Interchange Project Sutter and Sacramento Counties*	2005
4658	Nelson, W. J., M. Carpenter, and K. L. Holanda	*Cultural Resources Survey for the Level (3) Communications Long Haul Fiber Optics Project. Segment WPO4: Sacramento to Redding*	2000
3469A	Peak & Associates	*Historic American Engineering Record Reclamation District 1000 HAER No. CA-187*	1997
1141	Wilson, K. L.	*Sacramento River Bank Protection Unit 34 Cultural Resources Survey Final Report*	1978

Note: NEIC = Northeast Information Center
Source: Data provided by the Northeast Information Center in 2007

Table 3.10-2
Previous Cultural Resources Surveys Conducted in the NLIP Project Area in Sacramento County

NCIC Report No.	Author(s)	Title	Date
–	Banek, B.	*An Archaeological Reconnaissance of the South Natomas Area for the River Bank Holding Company, Sacramento County, California*	1982
4188	Billat, L. B.	*Nextel Communications Wireless Telecommunications Service Facility—Sacramento County*	2001
–	Bouey, P. D.	*Cultural Resources Inventory and Evaluation: Sacramento River Bank Protection (Unit 44) Project*	1989
4206, part 1	Bouey, P. D., and R. Herbert	*Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project*	1990
6519	Bouey, P., J. Berg, J., and C. A. Hunter	*Cultural Resources Test Excavations, Sacramento Urban Area Flood Control Project, Sacramento County, California*	1991
4457	California Department of Transportation	*Negative Historic Property Survey Report for the Proposed Installation of Automatic Vehicle Census Systems on Interstate 80 East of the West El Camino Over-Crossing and on Highway 51 East of the "E" Street Ramps, Sacramento County, California*	2003
4194	Chavez, D., L. H. Shoup, C. Desgrandchamp, and W. G. Slater	*Cultural Resources Evaluations for the North Natomas Community Plan Study Area, Sacramento, California*	1984
4193	County of Sacramento Department of Environmental Review and Assessment	*Draft Environmental Impact Report for Teal Bend Golf Course Use Permit*	1995
4190	CRS Archaeological Consulting and Research Services	*Sacramento Metro Airport Airmail Facility*—letter report	1988
3409	Cultural Resources Unlimited	*A Cultural Resources Study for Sacramento Area Flood Control Agency Borrow Sites Project Sacramento County*	1993
4463	Cultural Resources Unlimited	*A Cultural Resources Survey and Archival Review for the Arden-Garden Connector Project Sacramento County, California*	1992
3469B	Dames & Moore	*Rural Historic Landscape Report for Reclamation District 1000 for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1996
4197	Dames & Moore	*Archaeological Inventory Report, Natomas Locality, Cultural Resources Inventory and Evaluation, American River Watershed Investigation, El Dorado, Placer, Sacramento, and Sutter Counties, California*	1994
5777	Dames & Moore	*Historic Property Treatment Plan for Reclamation District 1000 Rural Historic Landscape District for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1996
4195	Derr, E.	*Cultural Resources Report: North Natomas Comprehensive Drainage Plan; Levee Improvements, Canal Widening and Additional Pumping Capacity*	1997
4466	Derr, E.	*Historic Resource Evaluation Report for the Arden-Garden Connector Project CT-03-30274.B1 Sacramento County, California*	1983
6892	Derr, E. H.	*American Basin Fish Screen and Habitat Improvement Project, Feasibility Study: Alternative 1C, 2C, 3, Sacramento and Sutter Counties, California*	2002

Table 3.10-2
Previous Cultural Resources Surveys Conducted in the NLIP Project Area in Sacramento County

NCIC Report No.	Author(s)	Title	Date
6944	Ebasco Environmental	*Cultural Resources Survey of the Sacramento Energy Project Sacramento County, California*	1992
5655	Egherman, R., and B. Hatoff	*Roseville Energy Facility Cultural Resources Appendix J-1 of Application for Certification*	2002
3489A	Far Western Anthropological Research Group	*Report on the First Phase of Archaeological Survey for the Proposed SMUD Gas Pipeline Between Winters and Sacramento Yolo and Sacramento Counties, California*	1993
3489B	Far Western Anthropological Research Group	*Addendum to the Report on the First Phase of Archaeological Survey for the Proposed SMUD Gas Pipeline Between Winters and Sacramento Yolo and Sacramento Counties, California*	1993
4206, part 2	Far Western Anthropological Research Group	*Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project*—letter report to SHPO	2005
–	Foster, J. W.	*A Cultural Resource Investigation of the Blue Oaks Skilled Nursing Facility Site Auburn, California*	1995
–	Glover, L. C., and P. D. Bouey	*Sacramento River Flood Control System Evaluation, Mid-Valley Area Cultural Resources Survey, Colusa, Sacramento, Sutter, Yolo, and Yuba Counties, California*	1990
4449	Herbert, R. F.	*Report on the National Register Eligibility of the Sacramento River Docks Building 37 McClellan Air Force Base, Sacramento, California*	1995
5803	Herbert, R. F.	*Report on the National Register Eligibility of the Sacramento River Dock Complex including Building 4635 (Dock) and Building 4637 (Warehouse) McClellan Air Force Base, Sacramento, California*	1995
4202	Humphreys, S., and L. McBride	*A Review of the Work Carried Out at Sacramento 16, the Bennett Mound*	1966
4178	Jones & Stokes	*Archaeological Survey Report for the North Natomas Drainage System's San Juan Pump Station*	1992
2956	Nadolski, J. A.	*Archaeological Survey Report for the Jibboom Street Bridge Project Sacramento, California*	2001
4435	Nadolski, J. A.	*Archaeological Investigations for the Sacramento-KOVR Diverse Lateral Overbuild in Sacramento and Yolo Counties*	2001
5810	PAR Environmental Services, Inc.	*Northgate Boulevard/Arden-Garden Intersection Cultural Resources Investigation, City of Sacramento, Sacramento County, California*	n.d.
4187	Pastron, A. G., and R. K. Brown	*Historical and Cultural Resource Assessment Proposed Telecommunications Facility Natomas Park, Site No. SA-750-01 2450 Del Paso Road, Sacramento County, California*	2001
173	Peak, A. S.	*American River Parkway An Archaeological Perspective*	1973
2764	Peak & Associates	*Historic Property Survey Report and Finding of No Adverse Effect for the Proposed American River Parkway Bike Trail Improvement Project, City and County of Sacramento, California*	2001
2765	Peak & Associates	*Archaeological Survey Report for the Proposed American River Parkway Bike Trail Improvement Project, City and County of Sacramento, California*	2001
3469A	Peak & Associates	*Historic American Engineering Record Reclamation District 1000 HAER No. CA-187*	1997
4173	Peak & Associates	*Report on the Archaeological Testing Within the Riverbend Classics Project Area, City of Sacramento, California*	1999

Table 3.10-2
Previous Cultural Resources Surveys Conducted in the NLIP Project Area in Sacramento County

NCIC Report No.	Author(s)	Title	Date
4181	Peak & Associates	*Cultural Resources Overview for the North Natomas Long-Term Planning Area, Sacramento County, California*	2000
6830	Peak & Associates	*Determination of Eligibility and Effect for the Natomas Panhandle Annexation Project Area Sacramento County, California*	2005
4201	Peak, A. S., H. L. Crew, and R. Gerry	*The 1971 Archaeological Salvage of the Bennett Mound, CA-SAC-16, Sacramento, CA*	1984
4456	Ritchie, M.	*Finding of Effect for the Proposed Safety Improvements and Rehabilitation of the Jibboom Street Bridge on Jibboom Street, Bridge No. 24C-022, Sacramento, Sacramento County, California*	2001
–	Snyder, J. W.	*Historic Property Survey Report (Positive) for the Jibboom Street Bridge Safety Improvements and Rehabilitation Project Jibboom Street, Sacramento County, California*	2003
4441	Sonoma State Anthropological Studies Center	*Archaeological Surface Reconnaissance and Backhoe Testing for the South Natomas Projects (P92-122, P92-160) Sacramento County, California*	1992
3408	Theodoratus Cultural Research	*Discovery Park Construction Site Examination for Archaeological Resources in the Area of CA-Sac-26*—letter report	1981
4458	True, D. L.	*8-Acre Survey at 1801 Garden Highway, Sacramento, California*	1983
1141	Wilson, K. L.	*Sacramento River Bank Protection Unit 34 Cultural Resources Survey Final Report*	1978

Note: NCIC = North Central Information Center; SHPO = State Historic Preservation Officer
Source: Data provided by the North Central Information Center and compiled by EDAW in 2007

Numerous archaeological investigations have covered portions of the Natomas Basin. These have generally focused on areas closest to the rivers and levees. There has been very little archaeological inventory of lands more than 100 feet from the levee toes, and ground surface visibility has frequently been poor even in surveyed areas.

The most comprehensive of these investigations were completed by Dames & Moore and Far Western Anthropological Research Group (Far Western). In 1994, Dames & Moore (1994b) conducted a broad survey in the Natomas Basin as part of the American River Watershed Investigation. A survey of selected parcels along the Sacramento River identified 17 primarily historic sites. During the same effort, Dames & Moore visited an additional 10 previously identified cultural resources to update site records for those locations. At the same time, Dames & Moore (1994a) prepared a draft historic property treatment plan that explored the history and elements of RD 1000. In 1996, Dames & Moore completed its evaluation of RD 1000, concluding that it appeared to be eligible for listing on the NRHP under Criterion A at a state level of significance as an example of reclamation and flood damage reduction in the Sacramento River basin during the period 1911–1939 (see Section 3.3.10.2). This report extensively documents both the contributing and noncontributing resources of RD 1000. Previously, in 1990, Far Western had conducted surveys of areas along the same route surveyed by Dames & Moore in 1994 (Dames & Moore 1994b), as well as of additional areas (Bouey and Herbert 1990). Far Western (Bouey, Berg, and Hunter 1991) followed up with limited test excavations of two sites south of the Airport.

Numerous cultural resources were identified in the course of previous survey efforts, including ranches and farms; agricultural, transportation, and reclamation features; and debris scatters, as well as prehistoric occupation and burial sites, frequently seen as mounds or the disturbed remnants of mounds.

3.3.10.4 Previously Recorded Cultural Resource Sites in the Sutter County Portion of the Natomas Levee Improvement Program Project Area (As of September 2006)

This section describes cultural resources identified in previous studies on file at the NEIC. The known cultural resource sites in or near the Sutter County portion of the project area are listed in **Table 3.10-3** and described below.

Table 3.10-3
Cultural Resources in the Sutter County Portion of the NLIP Project Area

Trinomial or Temporary Designation	P-No.	Historic/ Prehistoric	Description	Date Recorded	Quadrangle
CA-Sut-84H	51-000084	Historic	NCC/PGCC levees	1994	Pleasant Grove, Verona
	51-000096H	Historic	1950s-era ranch	2002	Taylor Monument

Notes: NCC = Natomas Cross Canal; PGCC = Pleasant Grove Creek Canal
Source: Data provided by the North Central Information Center and compiled by EDAW in 2007

- **CA-Sut-84H (P-51-000084).** This trinomial includes both the NCC south levee and the PGCC west levee, the northernmost contributing resources to RD 1000. The NCC levee measures approximately 25 feet wide at the top and 75 feet wide at the base, and is 15 feet high. The top has been graded and graveled for vehicle traffic. The PGCC levee is smaller, measuring approximately 20 feet wide at the top, 60 feet wide at the base, and 10 feet high. There is also an associated retention basin, constructed of concrete and measuring 50 feet by 35 feet across and 15 feet deep. A concrete and steel pump foundation is located within the basin. Concrete footings running from a hole in the side of the basin to the top of the NCC levee indicate that a large pipe once connected the two features.

  Archaeologists reported that the one of the levees was raised and strengthened twice, after flooding during 1938–1939 and after flooding in RD 1001 during 1955. However, records fail to specify if the changes were made to the NCC or the PGCC. RD 1000 modified the NCC south levee and its adjacent canals in 1987 and SAFCA modified them in 1996. SAFCA completed cutoff wall construction in the western portion of the NCC south levee in fall 2007.

- **P-51-000096H.** Located on the Sacramento/Sutter County line and at the edge of a proposed borrow area, this resource consists of a historic ranch complex that includes two residences, four sheds or barns, and a trailer. The archaeological survey crew was not allowed on the property to record updates to the existing records.

3.3.10.5 Previously Recorded Cultural Resource Sites in the Sacramento County Portion of the Natomas Levee Improvement Program Project Area (As of May 2008)

This section describes cultural resource sites identified in previous studies on file at the NCIC in the Sacramento County portion of the project area (listed in **Table 3.10-4** and described below). The listing does not include several known sites in the southeastern portion of the Natomas Basin (located mainly along the NEMDC) because there are no proposed project elements in that part of the Natomas Basin.

Table 3.10-4
Cultural Resources in the Sacramento County Portion of the NLIP Project Area

Trinomial	P-No.	Historic/ Prehistoric	Description	Date Recorded	Quadrangle
CA-Sac-15/H	34-000042	Both	Occupation mound with historic debris	1934, 1990, 1993	Taylor Monument
CA-Sac-16/H	34-000043	Both	Occupation/burial mound with historic debris and foundations	1934, 1966, 1984, 1987, 1990, 1993	Taylor Monument
CA-Sac-17	34-000044	Prehistoric	May have been destroyed	1934, 1990	Taylor Monument
CA-Sac-18	34-000045	Prehistoric	Lithic scatter	1934, 1994	Taylor Monument
CA-Sac-160/H	34-000187	Both	Occupation/burial mound with historic farm	1947, 1949, 1994	Taylor Monument
CA-Sac-164	34-000191	Prehistoric	Occupation/burial site nominated to NRHP	1972, 1982, 1988, 1989, 1990, 1991, 2001–2007	Sacramento West
CA-Sac-430H	34-000457	Historic	West drainage canal	1991, 1993, 1997	Taylor Monument
CA-Sac-483/H	34-000510	Historic	Krumenacher Ranch complex and relocated prehistoric artifacts	1994	Rio Linda
CA-Sac-484H	34-000511	Historic	Historic debris	1994	Rio Linda
CA-Sac-485/H	34-000512	Both	Occupation/burial mound and historic home site	1994	Taylor Monument
CA-Sac-486H	34-000513	Historic	Historic home site	1994	Taylor Monument
CA-Sac-487H	34-000514	Historic	Historic debris and vegetation	1994	Taylor Monument
CA-Sac-488H	34-000515	Historic	Historic debris and vegetation	1994	Taylor Monument
CA-Sac-489H	34-000516	Historic	Historic debris and vegetation	1994	Taylor Monument
CA-Sac-490H	34-000517	Historic	Historic debris and vegetation	1994	Taylor Monument
CA-Sac-491H	34-000518	Historic	Historic debris and vegetation	1994	Taylor Monument
CA-Sac-492H	34-000519	Historic	Historic well, pipes and vegetation	1994	Taylor Monument
CA-Sac-493H	34-000520	Historic	Historic debris	1994	Taylor Monument
CA-Sac-494H	34-000521	Historic	Historic debris	1994	Taylor Monument
CA-Sac-517H	34-000641	Historic	Historic debris	2001	Rio Linda
CA-Sac-518H	34-000647	Historic	Concrete bridge abutment	2001	Rio Linda
CA-Sac-569H	34-000741	Historic	Paved road	1994, 1998	Taylor Monument, Rio Linda
CA-Sac-836H	34-001354	Historic	Farm Complex	2005	Taylor Monument
	34-000883	Historic	Paved road	1998	Taylor Monument
	34-000884	Historic	Paved road	1998	Taylor Monument
	34-000886	Historic	Paved road	1998	Rio Linda, Taylor Monument
	34-001552	Historic	House	2002	Taylor Monument
	34-001557	Historic	Pumping plant	2006	Taylor Monument
	34-001558	Historic	Pumping plant	2006	Taylor Monument
	34-001559	Historic	Pumping plant	2006	Taylor Monument

Note: NRHP = National Register of Historic Places

Source: Data provided by the North Central Information Center and compiled by EDAW in 2007 and 2008

- **CA-Sac-15/H.** This site, near the Sacramento River east levee south of I-5, consists of a prehistoric occupation midden mound with a concentration of debitage, flaked stone tools, shell artifacts, faunal remains, fire-cracked rock, and baked clay objects. The mound has been heavily affected by farming and ranching activities. There is a ranch complex including a bunkhouse, garden, shed, chicken coop, water tower, garage, and driveway on the mound; historic debris on the site includes glass and broken ceramic fragments.

  A limited auger testing program was carried out west of the mound along the Sacramento River east levee and found no cultural materials along that transect (Bouey and Herbert 1990).

- **CA-Sac-16/H (P-34-000043).** CA-Sac-16/H is in the Airport north bufferlands south of the Airport Operations Area. This site has been variously called the Bennett Mound, Mound Ranch, Willey Mound, and S-16. It includes the remains of a prehistoric occupation mound, possibly the largest in the Sacramento Valley, but has been leveled in stages by agricultural activities. The site location corresponds to the ethnographic village of Nawrean. What remains today consists of dark midden soils in plowed fields with fragments of human remains, shell, fire-cracked rock, baked clay objects, ground stone, faunal bone, flaked stone artifacts, and debitage. A few historic artifacts, such as brick and ceramic fragments, are also on this site. Today, two separate loci have been identified and recorded as CA-Sac-16/H; the larger, Locus 1, represents the approximate original location of the mound. Locus 2 is an area of redeposited soil taken from the mound in the past. There is also a historic-era component of the site from the remnants of a slaughterhouse and brick factory present before the 1930s. Historic artifacts noted include bricks, sawed mammal bone, a filled-in privy, bottles, ceramic and metal fragments, and glass.

  The site was originally described as very large, up to 7 acres in area, and 20 feet high. The earliest investigations were conducted in 1923 by Zallio, who excavated at the site a number of times and recovered projectile points, bone tools, Haliotis ornaments, and other artifacts (Bouey, Berg, and Hunter 1991). It was first formally recorded in 1934 by Heizer, who identified it as a large mound with stone artifacts and freshwater shell on the surface. Sacramento Junior College excavated pits and trenches up to 18 feet deep in 1936–1937. The main focus of this effort was on recovery of mortuary remains; however, considerable quantities of nonburial associated artifacts were also documented. More excavations were conducted by Sacramento State College in 1953 and by American River College between 1966 and 1971, and more artifacts and burials were salvaged by Peak, Crew, and Gerry (1984) when what was left of the mound was leveled. At that time, Peak, Crew, and Gerry estimated that as much as 13 feet of the mound might still be present below the plowed surface. As an interesting side note—and as an indication of the original CA-Sac-16/H mound's prominence—Peak, Crew, and Gerry mention that Heinrich Schliemann (an amateur archaeologist and later the discoverer of Troy) visited the site in 1851–1852.

  More recently, Bouey and Herbert (1990) completed a surface survey and excavated two auger holes at the toe of the levee that forms the western boundary of the site; they reported evidence of subsurface cultural deposits, including shell midden. Larger-scale excavations (Bouey, Berg, and Hunter 1991), dug within 100 feet of the levee toe and the ramp leading up to Garden Highway, confirmed that midden deposits still exist; however, agricultural activity seems to have destroyed any stratigraphic integrity the deposits might have had that close to the levee. It may be that Bouey and Herbert were looking strictly at redistributed mound soils.

  The summary of the research done by 1991 (Bouey, Berg, and Hunter 1991) agreed with the conclusions of Derr (1983) that the site was a large, permanent habitation locus occupied from the Upper Archaic (ca. 1000 B.C.) to just after the beginning of European contact. Derr found that the upper 20–60 centimeters of soil (in the areas he examined near the levee) consisted of redistributed midden with artifacts and isolated human remains. What appears to be missing from any of these analyses is an attempt to define the original mound or to find intact elements of the site that may have been located beyond the original mound. If there are intact subsurface deposits associated with CA-Sac-16/H, then the site may be eligible for listing on the CRHR or NRHP because of the potential information contained in those deposits.

The earliest documentation, Heizer's site record form from 1934, does not give dimensions for the mound and does not contain specific enough information to provide for relocation of the original boundaries of the mound. It is presumed that the dispersed midden from the mound now covers a larger surface area than the mound used to occupy. However, it is unclear exactly how large an area that is because various investigations have reported Locus 1 (the larger site deposit) as measuring 110 meters by 185 meters (Bouey and Herbert 1990), 250 meters by 250 meters (Kauffman and Kauffman 1987), and 450 meters by 850 meters (Dames & Moore 1993). The Dames & Moore site record form appears to be the only one that maps out the secondary Locus 2 area, northeast of the main deposit and east of a drainage ditch (as of 1993).

- **CA-Sac-17 (P-34-000044).** This is the location of a mound site reported by Heizer in 1934 west of Fisherman's Lake; however, none of the mound remains. In 1990, Bouey and Herbert attempted to locate any cultural remains but could not find any evidence of cultural deposits on the surface or in auger holes.

- **CA-Sac-18 (P-34-000045).** This site, landward of the Sacramento River east levee located north of San Juan Road, consists of a sparse scatter of basalt debitage, one cryptocrystalline biface fragment, a polished stone, and possible fire-cracked rock. It was originally described by Heizer as a mound 30 yards in diameter and 5 feet high; however, Heizer may have misinterpreted a natural rise in the landscape as a mound. CA-Sac-18 appears to be lacking the intensive cultural deposits that are the hallmark other nearby known mound sites (Dames & Moore 1994b).

- **CA-Sac-160/H (P-34-000187).** This is a multicomponent site near the Sacramento River east levee located north of San Juan Road. It includes a prehistoric occupation mound with a farm complex situated on top. Excavations in the 1940s removed numerous burials and artifacts, including ground stone, flaked stone tools, shell beads and ornaments, fire-cracked rock, baked clay objects, stone beads, faunal remains, bone awls, bird bone tubes and whistles, obsidian drills, quartz crystals, charmstones, and historic glass trade beads, as well as historic debris related to farming and occupation of the top of the mound.

- **CA-Sac-164 (P-34-000191).** CA-Sac-164 is a very large, deeply stratified prehistoric occupation and burial mound near Sand Cove Park on the Sacramento River that has been explored a number of times using archaeological techniques; however, in spite of these efforts, the true boundaries of the site remain unknown. The site includes shell midden with abundant cultural materials including fire-cracked rock, flaked and ground stone tools, charmstones, polished bone implements, debitage, quartz crystals, bone and shell beads, baked clay objects, and plentiful faunal remains. Large fire-cracked rock features and hearths have also been noted. Because of its significant scientific value and the integrity, CA-Sac-164 was nominated for NRHP listing in 2001.

  The site was first recorded in 1951, after a newspaper article reported that human remains and stone tools were eroding out of the cutbank and into the Sacramento River. Observers who walked along the edge of the cutbank in summer and fall when the river was at its lowest noted that site deposits, interspersed with flood-deposited silt, extended at least 4 meters below the current-day surface. Excavations in the 1970s, 1980s, and 1990s confirmed the depth of intact and resource-bearing cultural strata at the site. Work on the land side of the Sacramento River levee indicated that downward-trending cultural strata might be found there as well, beginning well over a meter below the ground surface.

  Annual river height fluctuation, wave action resulting from boat wakes, and looting combined to cause continual erosion and collapse of the cutbank. This resulted in artifacts and remains falling onto the beach area below, where they either washed into the river or collected by the public. To address this issue, a site stabilization program was implemented in 2005 that included placing dirt and plantings over the cutbank and creating a wave break near the river's edge of the site.

- **CA-Sac-430H (P-34-000457).** This feature is the West Drainage Canal, a relatively unmodified canal that originates at Fisherman's Lake and flows southeast to the NEMDC.

- **CA-Sac-483H (P-34-000510).** This site consists of two loci containing a historic ranch complex with a small prehistoric component. The ranch complex (Locus 1) includes barns, sheds, shops and residences, farm equipment, and glass, ceramic, and metal debris. The prehistoric component consists of a relocated collection of mortars, pestles, and a mano located in a flower garden. The property owner reported that the prehistoric artifacts may have been collected from an eroding knoll near Locus 2.

- **CA-Sac-484H (P-34-000511).** This site comprises a light scatter of historic debris located along the north side of a small knoll. The debris is associated with a house that was built for a security guard; the house has been demolished. The debris includes fragments of water pipe, concrete, milled lumber, metal, and glass.

- **CA-Sac-485/H (P-34-000512).** This site, between the Sacramento River's east levee and the proposed location of the relocated Elkhorn Canal, was once a prehistoric occupation and burial mound that has been leveled by agricultural activities and was documented by Dames & Moore in 1994. The remains of a historic-era homestead, consisting mainly of ornamental vegetation, driveway, and historic debris, were noted on top of the prehistoric site. Dames & Moore archaeologists noted that the prehistoric component was large, measuring 220 meters by 160 meters with two depositional loci—a larger area near Garden Highway and a smaller deposit to the east. Prehistoric artifacts noted at the time included obsidian and basalt flakes and tools, shell beads and ornaments, faunal remains, ground-stone fragments, charmstones, baked clay, imported exotic tool stone, and shell.

  In August 2007, archaeologists undertook a limited shovel testing program at CA-Sac-485/H to determine whether there was an undisturbed subsurface deposit that could be affected by the proposed canal construction near this site. The 2007 investigation began with a survey of the site area where a sparse assortment of artifacts was visible; because no concentrations of artifacts were identified on the surface, the Dames & Moore archaeological site map was used to guide the placement of shovel test pits (STPs). Brian Padilla, of the El Dorado Miwok, was present while the STPs were excavated.

  During the course of excavations, archaeologists uncovered artifacts including obsidian and basalt flakes; clamshell disk beads; burned earth; faunal remains, including freshwater mussel shell; and fire-cracked rock. Human remains were uncovered in three of the STPs; the Sacramento County coroner and Native American Heritage Commission were contacted, excavation of each of those three STPs was halted immediately, and the remains were reburied where they were found. None appeared to be part of a larger, intact burial and all were found in the upper 50 centimeters of soil. (SAFCA 2007.)

  In general, site soils consisted of dry compact silts with a small sand and clay content; excavation and screening were difficult because the soils were very dry and hard. If artifacts were recovered, excavation generally proceeded to 100 centimeters below surface (cmbs); where no artifacts were found, excavations terminated around 80 cmbs. A deeply buried midden layer was identified in each of the four STPs (Numbers 4, 6, 21, and 24) closest to the levee, beginning anywhere from 55 cmbs to 80 cmbs. Excavation halted at approximately 100 cmbs in these STPs without reaching the bottom of the midden deposit; a split-spoon probe was used in STP No. 21 to find the bottom of the deposit, which was reached at approximately 160 cmbs. Although the northern and southern edges of the midden deposit were not located, the STP program was halted on the assumption that a more formal testing program, using a combination of test units and additional STPs, would be implemented as part of more detailed design of the proposed project.

- **CA-Sac-486H (P-34-000513).** This site near the Sacramento River east levee located south of the North Drainage Canal consists of the remains of a historic-era homestead. The structure that once stood on the site has been demolished. Remnant landscape plantings and debris consisting of ceramic fragments, bottle glass, ceramic, bricks, mortar, and metal fragments were noted. The structures were visible in a 1937 aerial photograph and were depicted on the 1967 U.S. Geological Survey topographic quadrangle map. The archaeologists who identified the site in 1994 noted that some of the trees appeared to be less than 30 years old, although a fragment of amethyst glass (generally associated with the turn of the century) was noted.

- **CA-Sac-487H (P-34-000514).** Like CA-Sac-486H, this location near the Sacramento River east levee located south of the North Drainage Canal includes historic debris, such as concrete fragments, milled lumber, metal fence posts, wire, farm machinery parts, clear and green glass, window glass, and ornamental plantings, all of which indicate that a structure existed at the site at one point but has since been demolished. Also like the previous site, a structure was visible in this location in a 1937 aerial photograph; several structures were indicated on the 1950 and 1975 topographic quadrangle maps for the area.

- **CA-Sac-488H (P-34-000515).** This is another site near the Sacramento River east levee located south of the North Drainage Canal where a structure appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is on the site today. Historic debris, ornamental vegetation, and a fence line remain. The debris included various concrete fragments, corrugated metal, wire, culvert pipe, and a large section of iron pipe.

- **CA-Sac-489H (P-34-000516).** This is another site near the Sacramento River east levee located south of the North Drainage Canal where a structure appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is on the site today. The associated debris includes a fenced-off well head, concrete fragments, lumber, window glass, wooden posts, galvanized pipes, old fencing overgrown by an oak tree, an enamelware bucket, tires, ceramic fragments, bottle glass, and a metal bucket. Ornamental landscaping plants were also noted.

- **CA-Sac-490H (P-34-000517).** This site, near the south end of Powerline Road, had three structures that appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is on the site today. The historic debris is similar to the debris found at sites CA-Sac-486H through CA-Sac-489H, including concrete, brick, iron piping, a fence post, bottle glass, ceramic fragments, and galvanized metal pipe, as well as remnant ornamental vegetation.

- **CA-Sac-491H (P-34-000518).** This site, near the south end of Powerline Road, was likely used in association with four structures that appeared on the 1950 topographic quadrangle map. The 1937 aerial photograph associated with other sites listed here includes coverage of this property; however, only trees are clearly visible in the photograph. The artifacts consist of a sparse scatter, including a wood fence, concrete fragments, bricks, and metal fence posts. Ornamental vegetation was noted nearby.

- **CA-Sac-492H (P-34-000519).** This site, near the south end of Powerline Road, consists of a concrete-capped well, associated water pipes, and remnant ornamental vegetation and fruit trees that were likely associated with a structure visible on the 1950 topographic quadrangle map of the area. A cluster of trees is visible in the 1937 aerial photograph, but no structures are clearly visible. The site is now used to keep honeybees.

- **CA-Sac-493H (P-34-000520).** The 1950 topographic quadrangle map and 1937 aerial photograph of the region indicate that there was once a large barn and associated structure at this location near the Sacramento River east levee located south of I-5. Today, scattered historic debris—clear and colored glass, porcelain and earthenware, iron pipe, bone fragments, brick, and a white ceramic insulator—is all that remains.

- **CA-Sac-494H (P-34-000521).** This is another site, west of Fisherman's Lake, where a structure appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is present today. Associated debris documented by an archaeological team in 1994 included concrete and brick fragments, an iron water pipe, white ceramic insulators, and clear bottle glass. In addition, the archaeologists noted abundant modern debris on the site, making it difficult to distinguish between modern and historic artifacts.

- **CA-Sac-517H (P-34-000641).** This is an historic trash scatter exposed on both the east and west sides of the NEMDC. Components include milk glass fragments, electric insulator fragments, and candy dish fragments.

- **CA-Sac-518H (P-34-000647).** This is a concrete bridge abutment located just north of the Silver Eagle Road crossing of the NEMDC. The abutments have cobblestone facing over concrete.

- **CA-Sac-569H (P-34-000741).** This is a segment of Del Paso Road, a two-lane paved road that extends from Powerline Road to East Levee Road. Del Paso Road likely originated as a dirt farm road and has subsequently been modernized, paved, and widened.

- **CA-Sac-836H (P-34-001354).** This resource, located near the Sacramento River east levee located south of West Elverta Road, consists of the Yuki Pear Farm complex with a relocated ranch house, a 1930s barn, a 1940s bunkhouse/workshop/garage, a 1960s bunkhouse, a 1974 residence, and a mid-1970s barn. A 1903 map shows the Farmers and Merchants Bank as the property owners; no improvements were listed on any maps in the next several years. By 1939, the property belonged to the California Trust and Savings Band; it later was owned by Thomas and Nancy McDermott. The McDermotts sold the land to A. R. Galloway, who never lived on the property but rented it to Masami Yuki as a tenant farmer. The Yuki family originally grew asparagus at the farm but switched to tomatoes in 1968 and planted the pear orchard in 1969.

- **P-34-000883H.** This is El Centro Road, a north-south, paved two-lane road that dates to the period before 1921. It runs between I-80 to the south and Bayou Road to the north. It is likely that this was originally a dirt farm road that has been paved a number of times.

- **P-34-000884H.** This is San Juan Road, an east-west, paved two-lane road that dates to the period before 1921. It runs between I-80 and the Sacramento River east levee. It is likely that this was originally a dirt farm road that has been paved a number of times in the past.

- **P-34-000886H.** This is Elkhorn Boulevard, an east-west, paved two-lane road that dates to the period before 1921. It runs between the Sacramento River east levee and the NEMDC. It is likely that this was originally a dirt farm road that has been paved a number of times in the past.

- **P-34-001552H.** This site includes a 1950s-era house and shed, surrounded by a chain link fence. The house is located along Garden Highway, near the northern Sacramento County line.

- **P-34-001557H.** This structure is a concrete valve tank associated with the Prichard Lake Pumping Plant at the end of the North Drainage Canal.

- **P-34-001558H.** This resource consists of a concrete-lined sump 50 feet long and 25 feet wide associated with the Prichard Lake Pumping Plant.

- **P-34-001559H.** This is a concrete pad near the P-34-001558H sump. It is also associated with the Prichard Lake Pumping Plant.

3.3.11 PALEONTOLOGICAL RESOURCES

Paleontological resources (fossils) are the remains or traces of prehistoric animals and plants that are 10,000 years old or older.

3.3.11.1 PALEONTOLOGICAL RESOURCE INVENTORY

Stratigraphic Inventory

Geologic maps and reports covering the geology of the project site and surrounding study area were reviewed to determine the exposed rock units and to delineate their respective aerial distributions in the project area. Regional and local surficial geologic mapping and correlation of the various geologic units in the vicinity of the project area has been provided at a scale of 1:62,500 by Helley and Harwood (1985); and 1:250,000 by Wagner et al. (1987). The rock formations of the project area are shown in **Plate 21** and described below.

- **Holocene Alluvium.** Sediments adjacent to the Sacramento and American Rivers are composed of Recent (Holocene) alluvial floodplain deposits (Wagner et al. 1987). In general, these deposits consist primarily of unconsolidated sand and silt. Holocene alluvial deposits overlay an older alluvial fan system composed of Pleistocene-age sediments. Construction activities that would occur within alluvial floodplain or basin deposits would be located within Holocene sediments. By definition, sediments associated with Holocene-age alluvium are too young to contain paleontologically sensitive resources.

- **Riverbank and Modesto Formations.** Piper et al. (1939) were the first to publish detailed geologic maps in the southern Sacramento and northern San Joaquin Valley areas, and they designated the older alluvial Pleistocene deposits as the Victor Formation. However, Davis and Hall (1959) proposed a subdivision of the Victor Formation into the Turlock Lake (oldest), Riverbank (middle), and Modesto (youngest) formations. Marchand and Allwardt (1981) proposed that the name Victor Formation be abandoned and that the Turlock Lake, Riverbank, and Modesto Formations be adopted as formal nomenclature for Quaternary deposits in the Sacramento and San Joaquin Valleys. Most researchers have followed this recommendation.

  In the Sacramento Valley, the Modesto Formation consists of alluvial terraces, some alluvial fans, and some abandoned channel ridges of the Sacramento River. The Modesto Formation can be divided into upper and lower members. The upper member consists primarily of unconsolidated, unweathered, coarse sand and sandy silt. The age of this member has been placed at approximately 12,000–26,000 years Before Present (B.P.) (Atwater cited in Helley and Harwood 1985). The lower member of the Modesto Formation consists of consolidated, slightly weathered, well-sorted silt and fine sand, silty sand, and sandy silt. Age estimates for the lower member range from 29,000 to 42,000 years B.P. (Marchand and Allwardt 1981, cited in Helley and Harwood 1985).

  Sediments in the Riverbank Formation consist of weathered reddish gravel, sand, and silt that form alluvial terraces and fans. In the Sacramento Valley, this formation tends toward soil-profile developments that are more easily distinguishable from the Modesto Formation (Helley and Harwood 1985). The Riverbank Formation is Pleistocene in age (Wagner et al. 1987), but it is considerably older than the Modesto Formation; estimates place the age of the Riverbank between 130,000 and 450,000 years B.P. (Helley and Harwood 1985). The Riverbank Formation forms alluvial fans and terraces of the Sacramento River. The Riverbank's fans and terraces are higher in elevation and generally have a more striking topography than those formed by the Modesto Formation.

Field Survey

A field reconnaissance was conducted by EDAW in July and August 2006, on April 26–28, 2007, and in February 2008 to document the presence of any previously unrecorded fossil sites and of strata that might contain fossil remains. The surface topography was nearly flat, and no exposed road cuts or other escarpments were noted where fossils in the Riverbank or Modesto Formation could be exposed. No fossils were observed at the project site.

3.3.11.2 PALEONTOLOGICAL RESOURCE ASSESSMENT

Holocene Alluvium

By definition, to be considered a fossil, an object must be more than 10,000 years old; therefore, project-related activities in this rock formation would have no effect on paleontological resources.

Modesto and Riverbank Formations

Surveys of late Cenozoic land mammal fossils in northern California have been provided by Hay (1927), Lundelius et al. (1983), Jefferson (1991a, 1991b), Savage (1951), and Stirton (1939). On the basis of his survey of vertebrate fauna from the nonmarine late Cenozoic deposits of the San Francisco Bay region, Savage (1951)

concluded that two major divisions of Pleistocene-age fossils could be recognized: the Irvingtonian (older Pleistocene fauna) and the Rancholabrean (younger Pleistocene and Holocene fauna). These two divisions of Quaternary Cenozoic vertebrate fossils are widely recognized today in the field of paleontology. The age of the later Pleistocene, Rancholabrean fauna was based on the presence of bison and on the presence of many mammalian species that are inhabitants of the same area today. In addition to bison, larger land mammals identified as part of the Rancholabrean fauna include mammoths, mastodons, camels, horses, and ground sloths.

The closest vertebrate fossils to the project area were recovered from Arco Arena (Hilton et al. 2000), approximately 12 miles to the south, in sediments of the Riverbank Formation. Fossils recovered from this site include Harlan's ground sloth, bison, coyote, horse, camel, squirrel, antelope, mammoth, and several plant specimens.

University of California Museum of Paleontology (UCMP) locality V-6426, approximately 16 miles north of the project area near Gilsizer Slough, is located in sediments referable to the Modesto Formation. This site yielded a vertebra from a Pleistocene (Irvingtonian) age Proboscidea, an order that includes mammoths, mastodons, and elephants. UCMP locality V-3915 on Oswald Road, approximately 18 miles northwest of the project site, yielded remains from a Pleistocene-age bison in sediments referable to the Modesto Formation. UCMP locality V-4043 in the Sutter Buttes, approximately 22 miles north of the levee, yielded remains from a Pleistocene-age horse in sediments referable to the Riverbank Formation.

Fossil specimens from the Modesto Formation have been reported by Marchand and Allwardt (1981) near the type locality in the city of Modesto. These authors also reported fossil specimens from the Riverbank Formation near its type locality in the city of Riverbank. Other locations are also known throughout the northern and Central Valley (UCMP 2006). For example, there are several sites approximately 10–20 miles away in Yolo County, near the cities of Davis and Woodland, which have yielded Rancholabrean-age rodents, snakes, horses, antelope, Harlan's ground sloth, mammoth, and saber-toothed tiger from sediments referable to both the Modesto and Riverbank Formations (Hay 1927, UCMP 2006).

There are at least seven additional recorded Rancholabrean-age vertebrate fossils sites from the Riverbank Formation in the city of Sacramento, southeast of the levee (UCMP 2006, Kolber 2004). These sites have yielded remains of mammoth, bison, horse, and several types of reptiles.

Results of a paleontological records search at the UCMP indicated no fossil remains within the project area, and no fossils were observed during a cursory field visit. However, the occurrence of Pleistocene vertebrate fossil remains in sediments referable to the Modesto and Riverbank Formations from Sacramento; Yuba City and the town of Sutter in Sutter County; as well as Davis, Woodland, and numerous other areas throughout the northern and central valleys, suggests there is a potential for uncovering additional similar fossil remains during construction-related earthmoving activities within the Phase 3 Project area and the RD 1001 borrow site.

3.3.12 TRANSPORTATION AND CIRCULATION

The roadways in the Phase 3 Project area and surrounding area are described in **Table 3.12-1** and shown in **Plate 10**.

All the roadways north of I-5 in the vicinity of the levee improvement sites and borrow areas are rural two-lane roads with low traffic volumes. Below I-5, nearer to and within the city of Sacramento, the roads are also two-lane roadways but have higher traffic volumes. Data on traffic volumes are available for only a few of the roadways listed in **Table 3.12-1**. The use of some of these roadways can also be characterized in terms of level of service (LOS). LOS is a qualitative description of operation of a roadway segment based on delay and maneuverability. LOS is often calculated by counties' agencies that manage congestion. LOS can range from "A," representing free-flow conditions, to "F," representing gridlock (**Table 3.12-2**).

Table 3.12-1
Project Area Roadway Network

Roadways	Description
SR 99/70	SR 99/70 is a primary regional transportation corridor within Sutter County and supports north-south regional travel. SR 99 extends from I-5 in the project area north through Sacramento and Sutter Counties to the Butte County line. The roadway has two to four lanes over its length and provides regional access to the Sacramento metropolitan area in the south and the cities of Gridley and Chico in the north. SR 70 serves as the north-south regional travel corridor providing connection to Butte County to the north and Sacramento County to the south. SR 70 is a two-lane roadway that extends from the Yuba County line in the north, south to a junction with SR 99. At the junction with SR 99, SR 70 continues south as SR 99/70 to the Sacramento County line. The roadway provides regional access to the cities of Sacramento and Marysville.
I-5	I-5 is a primary regional transportation corridor within Sacramento County, providing connection between the city and county of Sacramento and Yolo County. It provides primary access to the Airport just west of Powerline Road.
I-80	I-80 is a primary regional transportation corridor within the city and county of Sacramento, intersecting I-5 just south of San Juan Road.
Garden Highway	Garden Highway is a north/south two-lane roadway that extends north from the Sacramento city limits along the Sacramento River to Yuba City. Garden Highway serves as an alternative north/south route to SR 99. It provides primary access for residences along the water side of the Sacramento River east levee.
Howsley Road	Howsley Road is an east/west two-lane roadway that intersects SR 99/70 at the NCC. It crosses the PGCC and connects with Pleasant Grove Road just west of the Sutter/Placer County line.
Natomas Road	Natomas Road is a north/south two-lane roadway on top of the west levee of the PGCC in Sutter County. It extends south from Howsley Road and becomes East Levee Road between Riego Road and West Elverta Road.
Pacific Avenue	Pacific Avenue is a north/south two-lane roadway that extends from Striplin Road to Howsley Road in Sutter County.
Powerline Road	Powerline Road is a north/south two-lane roadway that parallels SR 99/70, providing an alternate north/south route to Garden Highway and SR 99/70 from Sankey Road in Sutter County to Garden Highway in Sacramento County.
Riego Road	Riego Road is an east/west two-lane roadway extending from Garden Highway in Sutter County to Base Line Road in Placer County.
Sankey Road	Sankey Road is an east/west two-lane roadway in Sutter County that extends from Garden Highway east across SR 99/70.
Striplin Road	Striplin Road is an east/west two-lane roadway that extends from Garwood Road to Pacific Avenue in Sutter County.
West Elverta Road	West Elverta Road is an east/west two-lane roadway in Sacramento County at the north/south midpoint of the Natomas Basin that extends from Garden Highway east across SR 99/70.
Elkhorn Boulevard	Elkhorn Boulevard is an east/west two-lane roadway in Sacramento County between Powerline Road and SR 99/70 and extending into the city of Sacramento to the East Levee Road on the NEMDC.
West Elkhorn Boulevard	West Elkhorn Boulevard is an east/west two-lane roadway in Sacramento County that extends from Garden Highway to west of the Airport.
Del Paso Road	Del Paso Road is an east/west two- to four-lane roadway that extends eastward across the Basin from Powerline Road in Sacramento County across I-5 to the NEMDC in the city of Sacramento.
San Juan Road	San Juan Road is an east/west two-lane roadway that connects the Garden Highway in Sacramento County to I-5 and the city of Sacramento.
El Centro Road	El Centro Road is a north/south two- to four-lane roadway in Sacramento County and the city of Sacramento that extends south from Del Paso Road to West El Camino Avenue.
West El Camino Avenue	West El Camino Avenue is an east/west four-lane roadway in the city of Sacramento that connects I-5 with El Centro Road. Continuing to the east, it intersects with Northgate Boulevard and continues to the east to cross the NEMDC.
Northgate Boulevard	Northgate Boulevard is a north/south four-lane road in the city of Sacramento connecting the Garden Highway in South Natomas to Del Paso Road in North Natomas.

Notes: I-5 = Interstate 5; I-80 = Interstate 80; NCC = Natomas Cross Canal; NEMDC = Natomas East Main Drainage Canal; PGCC = Pleasant Grove Creek Canal; SR = State Route

Source: Data compiled by EDAW in 2008

Table 3.12-2
Level of Service Descriptions

LOS	Description
A	Free-flow travel with an excellent level of comfort and convenience and the freedom to maneuver.
B	Stable operating conditions, but the presence of other road users causes a noticeable, though slight, reduction in comfort, convenience, and maneuvering freedom.
C	Stable operating conditions, but the operation of individual users is substantially affected by the interaction with others in the traffic stream.
D	High-density but stable flow.
E	Operating conditions at or near capacity. Speeds are reduced to a low but relatively uniform value. Freedom to maneuver is difficult with users experiencing frustration and poor comfort and convenience. Unstable operation is frequent, and minor disturbances in traffic flow can cause breakdown conditions. Severe restriction in speed and freedom to maneuver, with poor levels of comfort and convenience.
F	Breakdown conditions. These conditions exist wherever the volume of traffic exceeds the capacity of the roadway. Long queues can form behind these bottleneck points with queued traffic traveling in a stop-and-go fashion.

Source: City of Sacramento 2005

The *Sutter County General Plan Background Report* (Sutter County 1996b) contains the most recent traffic count and LOS data for roadways in the northern part of the Natomas Basin. In the general plan background report, Garden Highway between Sankey Road and Riego Road was rated LOS A, with an average daily traffic (ADT) volume of 340. SR 99/70 was rated LOS C with an ADT volume of 22,000. Riego Road was rated at LOS A with an ADT volume of 540, and Sankey Road was rated LOS A with an ADT volume of 440. LOS data were not available for the Natomas Basin portion of unincorporated Sacramento County. However, given that similar land uses exist south of the Sutter County line and west of SR 99/70, traffic volumes and conditions are expected to be similar.

The most recent annual traffic counts performed for select roadways by Sacramento County Department of Transportation (August 17 and 18, 2006) show the daily traffic volume on Powerline Road north of Elverta Road to be between 250 and 270 in each direction (Sacramento County 2007a). Data on other Sacramento County roads in the Phase 3 Project area are not available.

City of Sacramento traffic count data (City of Sacramento 2005) indicate an average one-way ADT of 381 on San Juan Road between El Centro Road and Garden Highway (April 2003 data). The *City of Sacramento General Plan Background Report* (City of Sacramento 2005) and the July 2006 draft environmental impact report for the Greenbriar Development Project (City of Sacramento and Sacramento Local Agency Formation Commission [LAFCo] 2006) contain LOS data for roadways for the portions of the southern Natomas Basin that are within Sacramento's city limits and sphere of influence. The City of Sacramento regards LOS C as unacceptable. Elkhorn Boulevard west of the SR 99/70 interchange operates at LOS A and east of SR 99/70 operates at LOS D. San Juan Road, West El Camino Avenue, and Garden Highway west of I-5 are shown as operating at LOS A through LOS C, depending on time of day. East of Truxel Road (which becomes Natomas Boulevard), West El Camino Avenue operates at LOS E and San Juan Road operates at LOS D. Northgate Boulevard in South Natomas operates at LOS A through C. North Natomas segments located north of North Market Boulevard operate at LOS E. Segments of I-80, I-5, and SR 99/70 operate at LOS D or below during commute hours, with heavy traffic occurring during the morning hours in the direction of job centers (e.g., downtown Sacramento) and in the afternoon/evening hours in the opposite direction. According to the *Draft Environmental Impact Report for the Sacramento International Airport Master Plan* (Sacramento County 2007b), I-5 between Airport Boulevard in Sacramento County and County Road 22 on the Yolo County side of the Sacramento River operates at LOS B or C in both directions during peak hours.

3.3.13 AIR QUALITY

3.3.13.1 OVERVIEW

The Phase 3 Project area is located within the southern portion of the Sacramento Valley Air Basin, which comprises all of Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba Counties; the western portion of Placer County; and the eastern portion of Solano County. Air quality within the Phase 3 Project area and the remainder of the Natomas Basin is regulated by the U.S. Environmental Protection Agency (EPA), California Air Resources Board (ARB), the Feather River Air Quality Management District (Sutter County portion of the Natomas Basin), and the Sacramento Metropolitan Air Quality Management District (Sacramento County portion of the Natomas Basin). Each of these agencies develops rules, regulations, policies, and/or goals to comply with applicable legislation. Although EPA regulations may not be superseded, both state and local regulations may be more stringent than EPA regulations.

3.3.13.2 CRITERIA AIR POLLUTANTS

Ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM), and lead are the most prevalent air pollutants known to be deleterious to human health. These pollutants are commonly referred to as "criteria air pollutants." Ozone, typically associated with poor air quality, is not emitted directly into the air, but is formed through a series of chemical reactions between reactive organic gases (ROG) and oxides of nitrogen (NO_X) in the presence of sunlight. Motor vehicles and stationary industrial sources are major sources of emissions of both ROG and NO_X, which are also referred to as ozone precursors.

Air pollutant concentrations are measured at several monitoring stations in the Sacramento Valley Air Basin. The Sacramento–3801 Airport Road station is the closest monitoring station to the levee improvement sites with data to meet EPA and ARB criteria for quality assurance for all criteria pollutants, except for fine particulate matter ($PM_{2.5}$). The Yuba City air quality monitoring station on Almond Street is the closest monitoring station with $PM_{2.5}$ data. In general, the ambient air quality measurements from these monitoring stations are representative of the air quality in the Phase 3 Project area.

Table 3.13-1 summarizes the air quality data from this monitoring station for the latest 3 years for which data are available, 2005–2007. Both ARB and EPA use the type of monitoring data provided in **Table 3.13-1** to designate areas according to attainment status for criteria air pollutants established by the agencies. The purpose of these designations is to identify those areas with air quality problems and thereby initiate planning efforts for improvement. The three basic designation categories are "nonattainment," "attainment," and "unclassified." The "unclassified" designation is used in an area that cannot be classified on the basis of available information as meeting or not meeting the standards. In addition, the California designations include a subcategory of the nonattainment designation, called "nonattainment-transitional." The nonattainment-transitional designation is given to nonattainment areas that are progressing and nearing attainment. **Table 3.13-2** summarizes the attainment status for criteria air pollutants for Sutter and Sacramento Counties.

3.3.13.3 NATURALLY OCCURRING ASBESTOS

In addition, naturally occurring asbestos (NOA), which was identified as a toxic air contaminant in 1986 by the California Air Resources Board, is located in many parts of California and is commonly associated with ultramafic rocks (Clinkenbeard et al. 2002). Asbestos is the common name for a group of naturally occurring fibrous silicate minerals that can separate into thin but strong and durable fibers. Ultramafic rocks form in high-temperature environments well below the surface of the earth. By the time they are exposed at the surface by uplift and erosion, ultramafic rocks may be partially to completely altered to serpentinite, a type of metamorphic rock. Sometimes the metamorphic conditions are right for the formation of chrysotile asbestos or tremolite-actinolite asbestos in the bodies of these rocks or along their boundaries (Churchill and Hill 2000).

Table 3.13-1
Summary of Annual Air Quality Data

	2005	2006	2007
Sacramento–3801 Airport Road			
Ozone			
State standard (1-hour/8-hour avg., 0.09/0.07 ppm)			
National standard (8-hour avg., 0.08 ppm)			
Maximum concentration (1-hour/8-hour avg., ppm)	0.100/0.087	0.105/0.086	0.119/0.102
Number of days state standard exceeded	4/8	5/13	2/8
Number of days national 8-hour standard exceeded	1	1	4
Respirable Particulate Matter (PM_{10})			
State standard (24-hour avg., 50 µg/m^3)			
National standard (24-hour avg., 150 µg/m^3)			
Maximum concentration (µg/m^3)	99.8	84.0	98.0
Number of days state standard exceeded	25	4	6
Number of days national standard exceeded	0	0	0
Nitrogen Dioxide (NO_2)			
State standard (1-hour avg., 0.18 ppm)			
National standard (annual, 0.053 ppm)			
Maximum concentration (µg/m^3) (1-hour avg., ppm)	0.074	0.072	0.064
Number of days state standard exceeded	0	0	0
Carbon Monoxide (CO)			
State standard (1-hour/8-hour avg., 20/9.1 ppm)			
National standard (1-hour/8-hour avg., 35/9.5 ppm)			
Maximum concentration (1-hour/8-hour avg., ppm)	3.90/2.97	4.70/3.15	6.30/5.58
Number of days state standard exceeded	0	0	0
Number of days national 1-hour/8-hour standard exceeded	0/0	0/0	0/0
Yuba City–Almond Street Monitoring Station			
Fine Particulate Matter ($PM_{2.5}$)			
No separate state standard			
National standard (24-hour avg., 35 µg/m^3)			
Maximum concentration (µg/m^3)	47.2	51.6	55.8
Number of days national standard exceeded	0	0	0

Notes: µg/m^3 = micrograms per cubic meter; NA = not available; ppm = parts per million by volume
Sources: ARB 2008a, EPA 2008

Table 3.13-2
Ambient Air Quality Standards and Attainment Status Designations for Sutter and Sacramento Counties

Pollutant	Averaging Time	California		National Standards [1]		
		Standards [2,3]	Attainment Status [4]	Primary [3,5]	Secondary [3,6]	Attainment Status [7]
Ozone	1-hour	0.09 ppm (180 µg/m^3)	N (Serious)	–	–	–
	8-hour	0.07 ppm[8] (137 µg/m^3)	Sutter: N Sacramento: N (Serious)	0.075 ppm (157 µg/m^3)	Same as Primary Standard	Sutter: N (Severe) Sacramento: N (Serious)
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m^3)	A	35 ppm (40 mg/m^3)	–	U/A
	8-hour	9 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)		
Nitrogen Dioxide (NO_2)[9]	Annual Arithmetic Mean	0.030 ppm (56 µg/m^3)	A	0.053 ppm (100 µg/m^3)	Same as Primary Standard	U/A
	1-hour	0.18 ppm (338 µg/m^3)		–		
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	–	–	0.030 ppm (80 µg/m^3)	–	U
	24-hour	0.04 ppm (105 µg/m^3)	A	0.14 ppm (365 µg/m^3)	–	
	3-hour	–	–	–	0.5 ppm (1300 µg/m^3)	
	1-hour	0.25 ppm (655 µg/m^3)	A	–	–	–
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 µg/m^3	N	– [10]	Same as Primary Standard	Sutter: U Sacramento: N (Moderate)
	24-hour	50 µg/m^3		150 µg/m^3		
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 µg/m^3	Sutter: U Sacramento: N	15 µg/m^3	Same as Primary Standard	Sutter: N (Proposed) Sacramento: U/A
	24-hour	–		35 µg/m^3		
Lead	30-day Average	1.5 µg/m^3	A	–	–	A
	Calendar Quarter	–	–	1.5 µg/m^3	Same as Primary Standard	
Sulfates	24-hour	25 µg/m^3	A	**No National Standards**		
Hydrogen Sulfide	1-hour	0.03 ppm (42 µg/m^3)	U			
Visibility-Reducing Particle Matter	8-hour	Extinction coefficient of 0.23 per kilometer—visibility of 10 miles or more (0.07—30 miles or more for Lake Tahoe) because of particles when the relative humidity is less than 70%.	U			

[1] National standards (other than ozone, PM, and those based on annual averages or annual arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. The PM_{10} 24-hour standard is attained when 99% of the daily concentrations, averaged over 3 years, are equal to or less than the standard. The $PM_{2.5}$ 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact the EPA for further clarification and current Federal policies.

[2] California standards for ozone, CO (except Lake Tahoe), SO_2 (1- and 24-hour), NO_2, PM, and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded. California Ambient Air Quality Standards (CAAQS) are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

[3] Concentration expressed first in units in which it was promulgated (i.e., parts per million [ppm] or micrograms per cubic meter [$\mu g/m^3$]). Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[4] Unclassified (U): a pollutant is designated unclassified if the data are incomplete and do not support a designation of attainment or nonattainment.
Attainment (A): a pollutant is designated attainment if the state standard for that pollutant was not violated at any site in the area during a 3-year period.
Nonattainment (N): a pollutant is designated nonattainment if there was a least one violation of a state standard for that pollutant in the area.
Nonattainment/Transitional (NT): is a subcategory of the nonattainment designation. An area is designated nonattainment/transitional to signify that the area is close to attaining the standard for that pollutant.

[5] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[6] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[7] Nonattainment (N): any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.
Attainment (A): any area that meets the national primary or secondary ambient air quality standard for the pollutant.
Unclassifiable (U): any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

[8] This concentration effective May 17, 2006.

[9] The CAAQS were amended on February 22, 2007, to lower the 1-hour standard to 0.18 ppm and establish a new annual standard of 0.03 ppm. These changes become effective after regulatory changes are submitted and approved by the Office of Administrative Law, expected later this year.

[10] Because of a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM_{10} standard on September 21, 2006.

Source: ARB 2008b

For individuals in the vicinity of NOA, there are many potential pathways for airborne exposure. Exposures to soil dust containing asbestos can occur under a variety of scenarios, including dust raised from unpaved roads and driveways covered with crushed serpentine, uncontrolled quarry emissions, grading and construction, and other activities. People exposed to low levels of asbestos may be at elevated risk (e.g., above background rates) of lung cancer and mesothelioma. The risk is proportional to the cumulative inhaled dose (number of fibers), and also increases with the time since first exposure. Although there are a number of factors that influence the disease-causing potency of any given asbestos (such as fiber length and width, fiber type, and fiber chemistry), all forms are carcinogens.

The California Geological Survey (formerly the California Division of Mines and Geology) has prepared the *General Location Guide for Ultramafic Rocks in California—Areas More Likely to Contain Naturally Occurring Asbestos* (Churchill and Hill 2000). Although geologic conditions are more likely for asbestos formation in or near these areas, the presence thereof is not certain. According to this guide, and the report *Relative Likelihood for the Presence of Naturally Occurring Asbestos in Eastern Sacramento County, California* (Higgins 2006), the project site is located in an area that is least likely to contain NOA. Based on the distant locations of NOA locations from the project site, the potential for NOA at concentration levels above acceptable limits is low in the NLIP project area.

In July 2001, ARB adopted an Airborne Toxics Control Measure (ATCM) for construction, grading, quarrying, and surface mining operations that regulates grading and excavation activities in areas of serpentine or ultramafic rocks. The probability for encountering NOA in the Phase 3 Project area is low, and if NOA were encountered, it would be handled in accordance with state regulations. Thus, the issue will not be discussed further in this EIS/EIR.

3.3.13.4 AMBIENT AIR QUALITY STANDARDS

At the Federal level, EPA has been charged with implementing national air quality programs. EPA's air quality mandates are drawn primarily from the Federal Clean Air Act (CAA), which was enacted in 1970. The most recent major amendments made by Congress were in 1990.

The CAA required EPA to establish national ambient air quality standards (NAAQS). As shown in **Table 3.13-2**, EPA has established primary and secondary NAAQS for the following criteria air pollutants: ozone, respirable particulate matter (PM_{10}), $PM_{2.5}$, CO, NO_2, SO_2, and lead. The primary standards protect the public health and the secondary standards protect public welfare. The CAA also required each state to prepare an air quality control plan referred to as a State Implementation Plan (SIP). The Federal Clean Air Act Amendments of 1990 (CAAA) added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is modified periodically to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. EPA reviews all SIPs to determine conformation to the mandates of the CAA and its amendments and to determine whether implementation of the SIPs will achieve air quality goals. If EPA determines that a SIP is inadequate, a Federal Implementation Plan that imposes additional control measures may be prepared for the nonattainment area. Failure to submit an approvable SIP or to implement the plan within the mandated time frame may result in application of sanctions to transportation funding and stationary air pollution sources in the air basin.

3.3.14 NOISE

3.3.14.1 SOUND AND THE HUMAN EAR

Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound, as described in more detail below, is mechanical energy transmitted in the form of a wave caused by a disturbance or vibration. Because of the ability of the human ear to detect a wide range of sound pressure fluctuations, sound pressure levels are expressed in logarithmic units called decibels (dB). The sound pressure level in decibels is calculated by taking

the log of the ratio between the actual sound pressure and the reference sound pressure squared. The reference sound pressure is considered the absolute hearing threshold (Caltrans 1998: N-9).

Because the human ear is not equally sensitive to all sound frequencies, a specific frequency-dependent rating scale was devised to relate noise to human sensitivity. An "A-weighted" decibel (dBA) scale performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. The basis for compensation is the faintest sound audible to the average ear at the frequency of maximum sensitivity. This dBA scale has been adopted by most authorities for the purpose of regulating environmental noise. Typical indoor and outdoor noise levels are presented in **Plate 22**.

Because the decibel scale is logarithmic, sound levels measured in decibels are not additive. For example, a 65-dBA source of sound, such as a truck, when joined by another 65-dBA source results in sound amplitude of 68 dBA, not 130 dBA (i.e., doubling the source strength increases the sound pressure by 3 dBA). Amplitude is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 10-dBA increase in amplitude with a perceived doubling of loudness and establish a 3-dBA change in amplitude as the minimum difference perceptible to the average person (Caltrans 1998: N-42).

3.3.14.2 SOUND PROPAGATION

As sound (or noise) propagates from the source to the receptor, the attenuation, or manner of noise reduction in relation to distance, depends on surface characteristics, atmospheric conditions, and the presence of physical barriers. The inverse square law describes the attenuation caused by the pattern of sound traveling from the source to the receptor. Sound travels uniformly outward from a point source in a spherical pattern with an attenuation rate of 6 dBA per doubling of distance. However, from a line source (e.g., a road), sound travels uniformly outward in a cylindrical pattern with an attenuation rate of 3 dBA per doubling of distance. The surface characteristics between the source and the receptor may result in additional sound absorption and/or reflection. Atmospheric conditions such as wind speed, temperature, and humidity may affect noise levels.

Furthermore, the presence of a barrier between the source and the receptor may also attenuate noise levels. The actual amount of attenuation depends on the barrier size and frequency of the noise. A noise barrier may be any natural or human-made feature such as a hill, tree, building, wall, or berm (Caltrans 1998: N-33).

3.3.14.3 NOISE DESCRIPTORS

The selection of a proper noise descriptor for a specific source depends on the spatial and temporal distribution, duration, and fluctuation of the noise. The noise descriptors most often encountered when dealing with traffic, community, and environmental noise are defined below (Caltrans 1998: N-44 through N-45, Lipscomb and Taylor 1978: 65–68).

- **L_{max} (Maximum Noise Level):** The maximum instantaneous noise level during a specific period of time. The $_{max}$ may also be referred to as the "peak (noise) level."
- **L_{min} (Minimum Noise Level):** The minimum instantaneous noise level during a specific period of time.
- **L_X (Statistical Descriptor):** The noise level exceeded X% of a specific period of time. The L_{50} is the noise level exceeded 50% of the time, for example.
- **L_{eq} (Equivalent Noise Level):** The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value is calculated, which is then converted back to dBA to determine the L_{eq}.
- **L_{dn} (Day-Night Noise Level):** The 24-hour L_{eq} with a 10-dBA "penalty" for the noise-sensitive hours between 10:00 p.m. and 7:00 a.m. In calculating the L_{dn}, 10 dBA is added to each noise event occurring in the

nighttime hours, resulting in a higher reported sound level than would occur without the penalty. The L_{dn} is intended to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.

- **CNEL (Community Noise Equivalent Level):** Similar to the L_{dn} described above, but with an additional 5-dBA "penalty" for the noise-sensitive hours between 7:00 p.m. and 10:00 p.m., which are typically reserved for relaxation, conversation, reading, and television. If the same 24-hour noise data are used, the CNEL is typically approximately 0.5 dBA higher than the L_{dn}.

3.3.14.4 EXISTING NOISE CONDITIONS AND NOISE-SENSITIVE LAND USES IN THE PROJECT VICINITY

Noise-sensitive land uses in the vicinity of the Phase 3 Project footprint consist of waterside residential uses, landside rural residential/agricultural uses, and the Teal Bend Golf Club (**Plate 17a**). Some waterside and landside residences are located within 150 feet of construction areas. Several landside residences situated between the Sacramento River east levee and the GGS/Drainage and Elkhorn Canals would be removed or relocated farther from the levee system before construction would take place in these areas. A few noise-sensitive rural residential/agriculture land uses are in the vicinity of the PGCC, and an Arabian horse training ranch is located along Howsley Road east of SR 99/70 adjacent to, and west of, the PGCC construction area (**Plate 17b**). A large number of noise-sensitive land uses are located in the vicinity of the NEMDC (**Plate 17c**): rural residential/ agricultural, medium-density residential, places of worship, schools, and park land. The most sensitive land uses include the following:

- Harmon Johnson Elementary School,
- Garden Valley Elementary School,
- A Present Truth SDA Church,
- St. Paul Church of God Christ,
- Ueda Parkway,
- Hansen Ranch Park,
- American River Parkway,
- Gardenland Park,
- Johnston Park, and
- Redwood Park.

The primary noise sources in the area include vehicle traffic, Airport operations, agricultural activities, railroad operations, machinery and activities associated with commercial and industrial uses, miscellaneous sources within residential communities, and boating operations on the Sacramento River. The major highways/roadways in the area are I-5, I-80, SR 99/70, Garden Highway, Powerline Road, Riego Road, and Elverta Road. The most substantial roadway traffic source within the area is vehicle traffic along the highways. Arterial roadways and stationary sources have a localized influence on the noise environment.

3.3.15 RECREATION

The width and depth of the PGCC channel does not accommodate water-based recreation, and is therefore not considered a recreational resource. The PGCC west levee, which is owned by RD 1000, is used by the public for passive recreational activities such as walking and jogging. No recreational facilities are adjacent to the levee.

The Ueda Parkway is located on the NEMDC west levee, in the Phase 3 Project area extending north from the vicinity of the Arden Garden Connector to Elkhorn Boulevard. The parkway integrates recreational trails within creek corridors in the northern area of Sacramento, including providing connections to the American River Parkway and the Dry Creek Parkway to the east of the NEMDC. The Ueda Parkway allows access to the natural habitat areas of Steelhead (NEMDC), Arcade, Dry, and Robla Creeks. A paved bike path exists on the levee crown of the NEMDC from Garden Highway to Sotnip Road, just north of Main Avenue. Gardenland Park, a 6-acre neighborhood park, is located off of Bowman Avenue immediately adjacent to the NEMDC west levee and

Ueda Parkway in South Natomas. An on and off-street bicycle trail is located adjacent to Garden Highway on the American River north levee and Sacramento River east levee, between Northgate Boulevard and Gateway Oaks Drive in South Natomas.

The Sacramento River is a popular location for both water-related and land-based recreation. Recreational boating is one of the primary uses of the Sacramento River in the vicinity of the Phase 3 Project area. The only access to marinas and boat launches from the landside of the levee in the project area is from Garden Highway. People camp, picnic, and fish from the shoreline in limited areas along the Sacramento River in and near the Phase 3 Project area. A number of public parks and two golf courses are located in the Phase 3 Project area and in the surrounding area. **Table 3.15-1** lists private and public marinas/boat launches, city and county parks, and golf courses; **Plate 23** shows their locations.

Table 3.15-1
Recreational Facilities In or Near the NLIP Project Area

Facility	Location	Features
Gardenland Park	3010 Bowman Avenue in South Natomas, adjacent to the NEMDC and Ueda Parkway	6-acre park with picnic facilities, ball field, volleyball and basketball courts, play areas, restroom
Verona Marina	6955 Garden Highway, north of the NCC	Boat ramp, marina
Verona Village Resort	6995 Garden Highway	Boat ramp, picnic area, RV campground
Rio Ramaza	10000 Garden Highway	Boat ramp, marina, picnic area
Teal Bend Golf Club	7200 Garden Highway	18-hole golf course, bar and grill
The Alamar Marina	5999 Garden Highway	Boat ramp, marina, picnic area, restaurant, pub
Swabbie's at Metro Marina	5871 Garden Highway	Marina, picnic area, bar and grill
Elkhorn Boat Launch (Sacramento County)	Garden Highway at North Bayou Road	Boat ramp and dock, picnic area
Costa Park Site (City of Sacramento)	Garden Highway and I-5	Undeveloped; planned neighborhood-serving park
Sand Cove Park (City of Sacramento)	2005 Garden Highway	Boat dock/landing, paved walkways, trails, picnic facilities
Swallows Nest Country Club	2245 Orchard Lane	Nine-hole golf course, community facility
Shorebird Park (City of Sacramento)	Kittiwake Drive and Swainson's Way	Play equipment, picnic area with shelter, lawn volleyball court
River View Marina	1801 Garden Highway	Boat ramp, marina, restaurant
Riverbank Marina	1371 Garden Highway #200	Marina, boat dock/landing, restaurant, pub
Natomas Oaks Park (City of Sacramento)	2101 Gateway Oaks Drive	Picnic area, oak preserve and interpretative center
Discovery Park (Sacramento County)	Confluence of American and Sacramento Rivers	Boat ramp, picnic area, hiking and biking trails
Ueda Parkway (City of Sacramento)	NEMDC West Levee between Arden Garden Connector and Elkhorn Boulevard, Dry Creek, and Robla Creek	Paved bicycle trail; links with American River Parkway and downtown Sacramento; access points at various locations
Hansen Park	350 Kelton Way (east side of NEMDC)	Nature area, bicycle trail
Redwood Park	2415 Western Avenue (east side of NEMDC)	Lighted park
Bannon Creek Nature Preserve	South of West El Camino Avenue, near American River north levee	Nature preserve

Note: I-5 = Interstate 5; NCC = Natomas Cross Canal; NEMDC = Natomas East Main Drainage Canal; RV = recreational vehicle

Sources: City of Sacramento Department of Parks and Recreation 2007; Sacramento County Regional Parks 2007; Geographical Information Center at California State University, Chico 2007; Haenggi, pers. comm., 2007

3.3.16 VISUAL RESOURCES

3.3.16.1 SACRAMENTO RIVER EAST LEVEE

Land uses along the Sacramento River east levee within the Phase 3 Project area (Reaches 5A–9B) are predominantly rural; however, the Sacramento International Airport in the southern portion of the Phase 3 Project area is an urbanized feature in the landscape. The landscape of the western portion of the Phase 3 Project area is almost entirely flat, the only topographic variation consisting of the levees and a few low rises where residences and agricultural buildings are located.

In Reaches 5A–9B, the area from the landside toe of the Sacramento River east levee to the Airport is largely rural and agricultural. Houses and agricultural structures are in scattered locations along the levee system. Rows of mature trees, mainly oaks, cross the landscape in lines along parcel boundaries, and numerous individual mature trees and groves of various sizes grow along the landside levee toe and are scattered throughout the Phase 3 Project area. Where very large, mature oaks grow near Garden Highway, they often tower above all surrounding elements of the viewscape and are striking natural features both individually and as parts of overall views.

Airport facilities and arriving and departing aircraft are prominent features in the Phase 3 Project area and in broader views of the overall landscape, and these Airport-related features contrast with the otherwise rural character of the northern and middle portion of the Natomas Basin. I-5, which rises from about 2,000 feet east of the levee to cross the Sacramento River to the west, is also a dominant feature in views of the levee area in Reaches 8–10.

The main viewer groups in the Phase 3 Project area are local residents and travelers on Garden Highway, which is on the crown of the Sacramento River east levee and, therefore, elevated above the Basin. Much of the viewscape is typical of local rural areas, consisting mainly of scattered agricultural outbuildings, rural roads, disturbed areas of ruderal vegetation bordering roadways, utility poles and overhead utility lines, and the existing levees. Approximately 25 feet high on average, the existing levee blocks views of the Sacramento River from the east. The existing levee and adjacent berms are an integral part of the visual setting to regular viewers, including area farmers, recreationists, and other travelers on local county roads. The portion of the levee in the Phase 3 Project area is generally not visible from SR 70/99, which runs in a north-south direction and is 3–5 miles east of the Sacramento River east levee. When looking toward the Sacramento River from the east, trees in the riparian area along the Sacramento River's west levee are visible above the top of the levee.

Garden Highway is used by local residents, agricultural workers and by recreationists traveling to private marinas, the public boat launch ramp, and Teal Bend Golf Club. Recreationists are considered a sensitive viewer group; however, overall numbers of recreationists using the land side of the levee in this area are low.

In addition, sweeping views of the Basin are afforded to travelers on I-5 where the roadway is elevated, but these views are of short duration, and freeway travelers are not considered a sensitive viewer group. Overall views of the Basin in Phase 3 Project area lack vividness and are neither striking nor distinctive. Where Airport facilities are part of the viewshed, the viewscape lacks unity and intactness. However, outside the Airport Operations Area north of I-5, the rural reclamation features of the western Basin (levees and berms, irrigation and drainage canals, and well-established agricultural elements) form a cohesive whole, and the area therefore has moderate intactness and unity of visual aesthetic features.

Within the Phase 3 Project area, the water side of the Sacramento River east levee is lined with residences and marinas among remnants of mature riparian woodland. The woodland consists mainly of oaks, cottonwoods, and ornamental trees associated with the houses there. Travelers along the length of Garden Highway, which is located on top of the Sacramento River east levee, have intermittent views of the Sacramento River through the trees on the water side of the levee.

The water side of the Sacramento River east levee is visible to boaters and other recreationists along the Sacramento River. However, all views of the interior of the Basin from the Sacramento River channel are blocked by the levee, waterside structures, and waterside trees. Views of the river corridor itself are distinctive and moderately vivid, with the meandering river channel and dense riparian growth forming striking and harmonious visual elements. However, the riparian growth is interrupted throughout the length of the Phase 3 Project area by residences and adjacent clearings and by waterside commercial establishments. These features and the east levee limit the extent of the riparian growth and detract from the natural appearance of the corridor, reminding viewers of the presence of nearby urban and agricultural areas. The views have a moderate degree of both intactness and unity. Recreationists are generally considered a sensitive viewer group, but because the number of recreationists in this area is only moderate, the sensitivity of views is moderate. Overall, area views are of moderate aesthetic value.

3.3.16.2 Pleasant Grove Creek Canal West Levee and Natomas East Main Drainage Canal West Levee

The areas along the PGCC west levee and northern section of the NEMDC west levee are rural and agricultural. The surrounding lands are almost entirely flat, and few trees grow on the landscape except those along the channels (i.e., on the water side of the levees), in widely spaced woodland areas along the land side of the levee, and near rural residences. Views of these areas lack vividness, but the visual components of the agricultural landscape are largely uninterrupted by built features. Views of the PGCC west levee and NEMDC west levee areas are therefore intact and unified. No major roadways are along these facilities, only a few residences exist from which viewers have near-distance views of the levee improvement sites, and these are not areas of recreational use or tourism. Views of these sites are therefore of low sensitivity, and the quality of the views is low to moderate.

3.3.16.3 Borrow Sites

As noted above, the topography of the Natomas Basin is flat, with the only topographic relief provided by the Sacramento River and drainage canal levees. Views of the potential borrow sites are typical of the Natomas Basin, flat topography and uninterrupted by human-made features. The potential borrow sites are in active agricultural use or are fallowed fields and are generally adjacent to similar cover types. The Brookfield, Dunmore, and Sutter Pointe properties are located in the northern portion of the Basin and are in an area dominated by rice cultivation. The Novak property; private properties within Reaches 5B, 6A, and 7; South Sutter LLC; and Pacific Terrace properties are in active agricultural use and are located near the Sacramento River east levee, and adjacent to TNBC lands, some of which are managed for habitat. The Lower Woodlands site is grassland adjacent to the Sacramento River east levee. The Krumenacher site is grassland adjacent to the NEMDC in an area that is undergoing urbanization. The Twin Rivers property is a soil stockpile adjacent to the Krumenacher property. The Airport north bufferlands consist of idle fields managed for the purposes of operational land use compatibility (i.e., to prevent encroachment by land uses, such as residential development, or the attraction of wildlife that are incompatible with aircraft operations). The Elkhorn Borrow Area consists predominantly of agricultural land, with scattered rural structures, trees, and canals. Views of these areas lack vividness, but the visual components of the agricultural or open space landscapes are largely uninterrupted by built features.

Residences are sparse near these sites, viewers are few, and no sensitive viewer groups are immediately adjacent to them.

3.3.17 Utilities and Service Systems

This section addresses the following public utilities and service systems: water and wastewater, solid waste, electrical and natural gas, telephone and cable, and fire and police protection services. Drainage systems are described in Section 3.3.4, “Hydrology and Hydraulics.”

3.3.17.1 WATER SUPPLY

Agricultural irrigation water is provided in the Natomas Basin in Sutter and Sacramento Counties by NCMWC, a private purveyor of irrigation water to farmlands, and through on-site wells and private river pumps. NCMWC provides water to more than 33,000 acres of land through pipelines, pumps, and more than 50 miles of canals.

The Sacramento County Water Agency provides municipal and industrial water service within Sacramento County, although much of the Natomas Basin receives only agricultural and irrigation water service supplied by NCMWC. The City of Sacramento provides domestic water service within the city limits. Domestic water is provided by a combination of surface water and groundwater sources.

3.3.17.2 WASTEWATER

The Sacramento Regional County Sanitation District provides regional sewage services in the unincorporated areas of Sacramento County. The Sacramento Area Sewer District is responsible for providing and maintaining sewer services in incorporated Sacramento County.

Septic systems within the Phase 3 Project area are under the jurisdiction of the Sacramento County Environmental Management Department in Sacramento County and the Sutter County Environmental Health Services in Sutter County.

3.3.17.3 SOLID WASTE

The nearest landfills in the project region that could be used for waste disposal during project construction are listed in **Table 3.17-1**. No landfills are located in Sutter County.

Table 3.17-1
Major Landfills in the Project Region

Facility (County)	Location	Capacity
Kiefer Landfill (Sacramento County)	12701 Kiefer Boulevard Sloughhouse, CA 95683	Maximum permitted capacity: 117,400,000 cubic yards Remaining capacity (as of September 12, 2005): 112,900,000 cubic yards
Union Mine Disposal Site (El Dorado County)	5700 Union Mine Road El Dorado, CA 95623	Maximum permitted capacity: 195,000 cubic yards Remaining capacity (as of November 25, 2001): 140,000 cubic yards
Western Regional Landfill (Placer County)	3195 Athens Road Lincoln, CA 95648	Maximum permitted capacity: 36,350,000 cubic yards Remaining capacity (as of June 30, 2005): 29,093,819 cubic yards

Source: California Integrated Waste Management Board 2007

3.3.17.4 ELECTRICAL AND NATURAL GAS SERVICE

The Sacramento Municipal Utility District provides electrical service to customers in the city of Sacramento and the Sacramento County portion of the Natomas Basin (Sacramento LAFCo 2007). The Pacific Gas and Electric Company provides electrical and natural gas services in Sutter County. Standard 12-kilovolt electrical distribution lines supported overhead by wooden poles are located roughly parallel to the Sacramento River east levee.

3.3.17.5 TELEPHONE AND CABLE

Communications service in the Phase 3 Project area is provided by multiple providers, including AT&T, Sprint, Comcast, SBC Communications, and SureWest.

3.3.17.6 FIRE AND POLICE PROTECTION

The Sutter County Fire Department and the Sutter County Sheriff's Department provide fire and police protection, respectively, for Sutter County. The Natomas Fire Protection District of the City of Sacramento provides fire protection services for the portion of the Natomas Basin south of Sutter County by contract between the City and County of Sacramento (Sacramento LAFCo 2007). The unincorporated areas of Sacramento County are under the jurisdiction of the Sacramento County Sheriff's Department, and the City of Sacramento Police Department provides police protection services within the Sacramento city limits.

3.3.17.6 UTILITY ENCROACHMENTS

The project would encroach upon multiple types of utility equipment. Along the Sacramento River between Reaches 5A and 9B, project implementation would infringe upon electric conduits, telephone conduits, conductors, irrigation pipes, and at least one gas line (Dosanjh, pers. comm., 2008). Pump, irrigation appurtenances, utility poles, and pipe crossings would be affected along the PGCC (Contreras, pers. comm., 2008). The Upper Northwest Interceptor Sections 3 & 4 construction is expected to be completed in early 2009. It will enter the Natomas Basin from the east, crossing East Levee Road north of Elkhorn Boulevard.

3.3.18 HAZARDS AND HAZARDOUS MATERIALS

For purposes of this section, the term "hazardous materials" refers to both hazardous substances and hazardous wastes. A "hazardous material" is defined in the Code of Federal Regulations as "a substance or material that…is capable of posing an unreasonable risk to health, safety, and property when transported in commerce" (49 CFR 171.8). California Health and Safety Code Section 25501 defines a hazardous material as follows:

> "Hazardous material" means any material that, because of its quantity, concentration, or physical, or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. "Hazardous materials" include, but are not limited to, hazardous substances, hazardous waste, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.

"Hazardous wastes" are defined in California Health and Safety Code Section 25141(b) as wastes that:

> because of their quantity, concentration, or physical, chemical, or infectious characteristics, [may either] cause, or significantly contribute to an increase in mortality or an increase in serious illness[, or] pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

3.3.18.1 POTENTIAL SOURCES OF HAZARDOUS MATERIALS

The sites of proposed construction activity are located in rural, suburban, and urban areas. Potential sources of hazardous materials and waste may exist in both the agricultural and urbanized portions of the Phase 3 Project area. Hazardous materials may have been used in the past at the proposed construction or borrow sites that could have resulted in soil contamination. Sites where borrow material would be excavated are of particular interest. All of the potential borrow sites have been or currently are in agricultural use.

USACE prepared a draft Phase I environmental site assessment (Phase I ESA) for the proposed Natomas General Re-evaluation Report (GRR) project, which includes the entire Natomas Basin. The Phase I ESA, performed in accordance with NEPA, CEQA, and USACE regulations, was designed to identify hazardous, toxic, or radioactive waste (HTRW). The report consisted of reviewing regulatory lists of HTRW sites, historical literatures, aerial photographs, Web sites, interviews, and a site reconnaissance. Relevant database searches were performed by Environmental Data Resources, Inc.

Site reconnaissance consisted of site inspections at approximately 2-mile intervals along the land side and water side of the levee system surrounding the Natomas Basin. Notes and photographs were taken of relevant observations, including site characteristics and potential hazards. Recorded sites of potential contamination within the Phase 3 Project area exhibited the following issues:

- petroleum stains on soil, pavement, and directly into a waterway;
- illegal dumping of trash, including major appliances;
- recent evidence of burning;
- contamination from maintenance of agricultural equipment and facilities;
- high-voltage lines that cross the levee; and
- transformers that do not display labels ensuring they are not a source of polychlorinated biphenyls (USACE in prep).

Kleinfelder evaluated properties along the NCC and Sacramento River east levee between Reach 1 and 6A for the NLIP. Parcels were evaluated based on site reconnaissance from existing right-of-way, a review of regulatory agency data bases, historical aerial photographs and topographic maps, title records, and zoning/land use documents. Phase I ESAs were conducted on parcels that were found to have potential recognized environmental conditions (RECs). According to ASTM Standard E1527-05, a REC is defined as the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property (ASTM, E1527-05). The following sites were found to contain RECs:

- **The Yuki Pear Farm (Assessor's Parcel Number [APN] 201-0150-033):** This property contains one domestic well and two wells that are used to monitor a known gasoline spill. The former presence of structures on the parcel indicates that subsurface utility systems (i.e., septic tanks, cistern, and heating oil tanks) that may represent an environmental hazard may be present. Additional detail is provided below.
- **APN 201-0280-037:** An application to install an underground storage tank (UST) was submitted, however, it is unknown by Kleinfelder and the property owner where or if an UST exists on site. Proper installation and abandonment is unknown.
- **APN 201-0270-048:** A damaged automotive battery is located on site. Although there is no apparent soil staining in relation, contamination is unknown.
- **APN 201-0270-028:** This property contains pieces of heavy equipment leaking engine oil and hydraulic fluid and numerous locations with discolored soil. A database search reported that USTs are located on site; however, there are none registered so if is not known if proper abandonment and removal practices were followed. There are also multiple above ground storage tanks that may have contained lead-based petroleum products. Additionally, solid waste including tires, automobile batteries, and electrical equipment was found on site.

In October 1997, approximately 2,000 gallons of gasoline were released from an aboveground storage tank at Yuki Pear Farms. Analysis at the Yuki Pear Farm included orchard soil sampling, domestic and monitoring well sampling, and geoprobe soil and groundwater sampling. The presence of dichloro-diphenyl-dichloroethylene (DDE) and dichloro-diphenyl-trichloroethane (DDT) was found during orchard soil sampling. Additional sampling for these organochlorine pesticides was performed. Soil and groundwater samples taken from the site in 1999 detected total petroleum hydrocarbons (TPH) as gasoline, benzene, ethylbenzene, xylenes, methyl tert-butyl ether (MTBE), tert amyl methyl ether (TAME) in the soil, and TPH as gasoline, benzene, toluene, ethylbenzene and total xylenes (BTEX), MTBE, TAME, and tert butyl alcohol (TBA) in the groundwater. Additional samples collected in 2000 found the same type of contamination, although at a lower concentration.

The Yuki Pear Farm Phase I ESA noted one domestic and two monitoring wells as issues of environmental concerns, but not designated as RECs. The former presence of structures on the parcel indicates that subsurface utilities systems (i.e., septic tanks, cistern, and heating oil tanks) may be present. Residual amounts of pesticides and herbicides may be present in the soil and groundwater as a result of historical agricultural use.

Recommendations include:

- further investigation or remediation depending on future use of the site,
- consultation with Sacramento County Environmental Management Department regarding future use of the site,
- continued sampling from monitoring wells on a quarterly basis, and
- stockpiling and sampling soil for DDT and DDE prior to removal.

No RECs were revealed on the remaining sites. The sites listed below may contain persistent pesticide and herbicide residue from agricultural use. Kleinfelder considers risk of exposure to pesticide and herbicide residue to be low; however, the concentrations are unknown. Additional environmental concerns that could affect the NLIP are listed below:

- **Dunmore Borrow Site (APN 201-0120-031):** The State of California Department of Oil, Gas, and Geothermal Resources (DOGGR) listed an abandoned gas well within the site; however, Kleinfelder did not find evidence of this on-site or on aerial photographs or historical topographic maps. Proper abandonment of wells are recommended, in accordance with applicable requirements, if found within the site.
- **Brookfield Borrow Site (APN 35-080-021):** Water pumps with two associated aboveground storage tanks containing diesel fuel were noted on the northeastern and central portion of the site, as well as two 5-gallon buckets, containing small amounts of unknown oil, that were not properly stored. Proper disposal of the 5-gallon buckets is recommended.
- **APNs 201-0150-040, 201-0150-041, 201-0150-042:** Records for DOGGR indicate that one plugged and abandoned dry hole exists on site. Title reports detail an easement granted to Shell Oil Company. Kleinfelder recommends that SAFCA contact the Division of Oil and Gas to obtain requirements for construction activities near the dry hole and investigate the presence of an underground conveyance pipeline.
- **APNs 201-0150-055, 201-0140-059:** A topographic map from 1967 indicates the presence of an unimproved landing strip that may have been used for crop dusting activities. Structures on the site have been removed and Kleinfelder reported no indication of historical impact. The existence of former farm buildings on-site indicates that domestic wells and septic systems may exist within the site, although no record of abandonment in the Sacramento County Building Department records exists. An idle gas well is located east of the western irrigation canal and south of the former building site on APN 201-0150-055. Recommendations include consultation with DOGGR and the gas well lease holder if the idle gas well would be disturbed during

construction activities and confirmation of the presence of water wells, followed by possible abandonment in accordance with state and local requirements.

- **APN 201-0280-044:** Proximity of the site to I-5 and Bayou Way, both well-travelled roads, may have resulted in lead contamination from leaded gasoline. In addition to pesticide and herbicide residue, underground irrigation pipelines that contain asbestos may exist on site due to past agricultural use.

    - **Underground Storage Tank:** An underground storage tank containing diesel is located at 5870 Garden Highway.

    - **Domestic wells and septic tanks:** Domestic wells and septic tanks may also exist within parcels along the Sacramento River. Their proximity to Phase 3 Project activities is unknown.

A limited sampling program that encompasses the entire project is recommended. Chemicals that may exist within the NLIP include organochlorine pesticides, organophosphorous pesticides, chlorinated herbicides, and selected metals.

The occurrence of naturally occurring asbestos is recognized as a potential hazard if it is disrupted or agitated during activities such as quarrying, earthwork, and use for unpaved access roads. Generally, NOA occurs in the Foothill Metamorphic Belt (FMB) in eastern Sacramento, Placer, and El Dorado Counties. The presence of NOA is unlikely to exist within the Natomas Basin above the California Environmental Protection Agency's regulatory limit of 0.25%. NOA may not be ruled out, however, because the existing levees and materials from borrow sites planned to be used in construction are derived from erosion of the FMB and Sierra Nevada. The preliminary evaluation of naturally occurring asbestos recommends testing for the presence of NOA before earth disturbance.

3.3.18.2 SCHOOLS WITHIN ONE-QUARTER MILE OF THE PROJECT FOOTPRINT

The State CEQA Guidelines require EIRs to assess whether a project will emit hazardous emissions or involve the handling of hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school (see Appendix G of the State CEQA Guidelines). The project footprint is located within one-quarter mile of the boundaries of three school districts in the Sacramento area: the Robla School District, the Natomas Unified School District, and the Twin Rivers Unified School District (formerly North Sacramento and Del Paso Heights School Districts). The Twin Rivers Unified School District is planning construction of schools within the Twin Rivers potential borrow site. Completion is expected in 2010. One school currently exists within one-quarter mile: Garden Valley Elementary School located at 3601 Larchwood Drive in Sacramento.

3.3.19 AIRPORT SAFETY

The Airport is approximately 1.5 miles east of the Sacramento River east levee and 12 miles north of downtown Sacramento. The Airport includes the Airport Operations Area and adjacent terminals, parking lots, and landscaped areas. Two 8,600-foot parallel runways are oriented roughly north–south. Three airline terminals and additional buildings are also associated with various airport operations. Approximately half of the 5,900 acres of Sacramento County–owned land at the Airport is located due south and due north of the Airport Operations Area. Sacramento County–owned property outside of the Airport Operations Area functions as aviation "bufferlands" for the purposes of operational land use compatibility (i.e., to prevent encroachment by land uses, such as residential development, that are incompatible with aircraft operations). Agricultural leases on these bufferlands expired December 31, 2007, and they are currently managed as grassland open space.

The Airport has one of the highest numbers of reported wildlife strikes of all California airports (SCAS 2007). According to the FAA Bird Strike Database (FAA 2005), 964 wildlife strikes were recorded at the Airport between 1990 and 2004. Birds with flocking tendencies and birds of relatively large size, such as waterfowl, gulls, herons, egrets, pigeons, blackbirds, and raptors, present the greatest threat to aviation at the Airport (SCAS 2007).

The frequency of wildlife strikes at the Airport is directly related to the Airport's location. The Airport is situated in the western portion of the Natomas Basin, which is a relatively flat, low-lying area that was historically part of the Sacramento/American River floodplain. Historically, wetlands in the Basin attracted tremendous numbers of migratory waterfowl. Land reclamation and the extensive construction of canals, levees, and pumping stations have allowed more than 80% of the Natomas Basin to be converted to agricultural production (City of Sacramento, Sutter County, and TNBC 2003). Agricultural crops and open water are the primary wildlife attractants with the Airport's Critical Zone. Rice, wheat, safflower, corn, and alfalfa are all grown in the Critical Zone. However, the FAA considers rice cultivation, along with flooding of the rice fields in winter and summer, as the most incompatible current land use in the Critical Zone (SCAS 2007).

Since 1996, the FAA has required SCAS to maintain and implement a *Wildlife Hazards Management Plan* (WHMP) because of the significant number of wildlife strikes that occur at the Airport. The plan emphasizes the identification and abatement of wildlife hazards and outlines steps for monitoring, documenting, and reporting potential wildlife hazards and birds strikes. Implementation of the WHMP involves an integrated approach that relies on a combination of wildlife control and land management strategies (SCAS 2007). The following land management objectives in the WHMP are relevant to the project:

- maintain grasslands in the Airport Operations Area to discourage use by hazardous wildlife,
- reduce aquatic habitat for hazardous wildlife,
- reduce hazardous wildlife use of ditches in the Airport Operations Area, and
- reduce hazardous wildlife on Sacramento County–owned agricultural land in the 10,000-foot Critical Zone.

The FAA has identified two potentially hazardous wildlife attractants on Airport land within the Critical Zone: the Airport West Ditch and the rice fields north of the Airport Operations Area. The Airport West Ditch is an open ditch that conveys irrigation and drainage water through the western portion of the Airport Operations Area. Because of its proximity to the runway, the Airport West Ditch is not only a potentially hazardous wildlife attractant; it is also a potential hazard for aircraft that may leave the runway under difficult conditions. The former rice fields occupy approximately 500 acres north of the Airport Operations Area. These fields were leveled and diked to hold water for rice production. Accordingly, they became a potentially hazardous wildlife attractants as a result of irrigation during the growing season and rainfall during the non-growing season. To reduce this extent of this hazard, SCAS has chosen not to renew the leases on these rice lands that expired December 31, 2007, as noted above.

3.3.20 WILDFIRE HAZARDS

In addition to hazardous materials, wildfires also pose a hazard to both persons and property in many areas of California. Wildland fires are a particularly dangerous threat to development located in forest and shrub areas. The severity of wildland fires is primarily influenced by vegetation, topography, and weather (temperature, humidity, and wind). The California Department of Forestry and Fire Protection (CDF) has developed a fire hazard severity scale that considers vegetation, climate, and slope to evaluate the level of wildfire hazard in all State Responsibility Area lands. A State Responsibility Area is defined as part of the state where CDF is primarily responsible for providing basic wildland fire protection assistance. CDF designates three levels of Fire Hazard Severity Zones (Moderate, High, and Very High) to indicate the severity of fire hazard in a particular geographical area (CDF 2007e). According to CDF's Fire Resource Assessment Program, the majority of the land in Sacramento and Sutter Counties is located in either a "nonflammable" or "moderate" zone for wildland fires (CDF 2007a). No Very High Fire Hazard Severity Zones are located in the Phase 3 Project area within either Sacramento County or Sutter County (CDF 2007b). In addition, Sutter and Sacramento Counties are not located in a State Responsibility Area (CDF 2007c, 2007d).

3.3.21 ENVIRONMENTAL JUSTICE

Environmental justice is defined by the EPA's Office of Environmental Justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." Fair treatment means that "no group of people, including racial, ethnic, or socioeconomic group, shall bear a disproportionate share of negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and policies."

Chapter 6.0, "Regulatory Setting," describes the Federal and state regulations that are applicable to the project, including Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"; Senate Bills 115, 89, and 828; and Assembly Bill 1553.

As discussed in Section 3.3.2.3, "Socioeconomics and Population and Housing," above, the area adjacent to the NEMDC west levee has the highest concentration of residences, the majority of which are south of I-80 from San Juan Road south to Garden Highway, in the Phase 3 Project area. Data from the 2000 Census show that this area has a higher percentage of minority and low-income populations than does the city as a whole (U.S. Census Bureau 2000). The largest minority group is of Hispanic ancestry, making up approximately 50% of the population in the area, compared to approximately 22% in Sacramento as a whole. The median income for families in this same area was reported by the U.S. Census Bureau to be $27,460 in 2000. HUD low-income limit for the Sacramento area in 2000 was at $42,300 for a family of four (HUD 2000). This is an indicator that low-income populations are concentrated in the area along the southern portion of the NEMDC.

While not currently residing in the local project vicinity as a distinct population group, Native American tribes are known to have lived in the project study area in the past. Evidence of their occupation of the project study area includes known villages, midden sites, burial sites, and other artifacts as described in Section 3.3.10.5, "Previously Recorded Cultural Resources Site in the Sacramento County Portion of the Natomas Levee Improvement Program Project Area (as of May 30, 2008)," above. The sites of occupation by Native American tribes are considered culturally significant.

4.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

This chapter begins with a description of the general approach to the environmental analysis, followed by the analysis of the significant environmental impacts of the Proposed Action and alternatives under consideration, organized by issue area.

4.0.1 APPROACH TO THE ENVIRONMENTAL ANALYSIS

An environmental document prepared to comply with the National Environmental Policy Act (NEPA) must consider the context and intensity of the environmental effects that would be caused by, or result from, the Proposed Action and other alternatives under evaluation. Under NEPA, the significance of an effect is used to determine whether an environmental impact statement must be prepared. An environmental document prepared to comply with the California Environmental Quality Act (CEQA) must identify the significance of the environmental effects of a proposed project. A "[s]ignificant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project" (State CEQA Guidelines, Section 15382).

4.0.1.1 SECTION CONTENTS

Sections 4.1 through 4.21 of this EIS/EIR follow the same general format and are each organized into the following major components:

- **Methodology and Thresholds of Significance:** This subsection describes the methods, process, procedures, and/or assumptions used to formulate and conduct the impact analysis. It also presents the significance criteria (or "thresholds of significance") used to define the level at which an impact would be considered significant in accordance with CEQA. Thresholds may be quantitative or qualitative; they may be based on agency or professional standards or on legislative or regulatory requirements that are relevant to the impact analysis. Generally, however, thresholds of significance are derived from Appendix G of the State CEQA Guidelines, as amended, and NEPA, where defined. Significance criteria used in this EIS/EIR are based on the checklist presented in Appendix G of the State CEQA Guidelines; factual or scientific information and data; and regulatory standards of Federal, state, regional, and local agencies. These thresholds also include the factors taken into account under NEPA to determine the significance of the action in terms of the context and the intensity of its effects.

- **Environmental Impacts and Mitigation Measures:** This analysis examines the impacts that would occur with implementation of the Proposed Action and alternatives under consideration. Impacts and mitigation measures are numbered sequentially in each section, with mitigation measures corresponding to the impact being addressed. For instance, impacts in Section 4.1, "Agricultural Resources," are numbered Impact 4.1-a, and Mitigation Measure 4.1-a corresponds with Impact 4.1-a. An impact statement precedes the discussion of each impact. The discussion that follows the impact statement includes substantial evidence to support the stated conclusion.

  Many of the potential impacts that may result from implementation of the action alternatives discussed in this document would be temporary and short-term effects resulting from construction activities, including hauling of borrow material and the movement of heavy construction equipment. However, many effects related to agricultural land conversion; modification and loss of habitats, including fill of waters of the United States; and disturbance of cultural resources would be permanent.

  The impacts of each alternative are compared to the impacts of the Proposed Action at the end of each impact discussion in this chapter as "similar," "greater," "lesser," or "currently unknown."

Following each discussion of a significant or potentially significant impact, mitigation measures are provided to avoid, minimize, or reduce the significant or potentially significant impacts of the Proposed Action or Levee Raise-in-Place Alternative to a less-than-significant level, where feasible. In accordance with Section 15126.4(a)(2)(4) of the State CEQA Guidelines, mitigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments. Section 15370 of the State CEQA Guidelines defines mitigation as:

- avoiding the impact altogether by not taking a certain action or parts of an action;
- minimizing impacts by limiting the degree of magnitude of the action and its implementation;
- rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the impact over time by preservation and maintenance operation during the life of the action; or
- compensating for the impacts by replacing or providing substitute resources or environments.

Mitigation measures are not required for impacts identified under the No-Action Alternative because the approving agency (in this case, SAFCA) would not be required to obtain permits or agreements if the agency chose not to approve the project. Additionally, USACE would not issue permission, permits, or authorizations for the No-Action Alternative. For these reasons, mitigation measures are not provided for the No-Action Alternative in Sections 4.1 through 4.21.

- **Residual Impacts:** This subsection describes which impacts would remain significant following implementation of mitigation measures. For each impact, either the impact would be reduced to a level below the significance threshold (reduced to a less-than-significant level) or it is concluded that feasible mitigation is not available or is insufficient to reduce the impact to a less-than-significant level. When an impact cannot be reduced to less than significant, it is called a "significant and unavoidable" impact on the environment. Under CEQA, if significant and unavoidable impacts remain, an agency may approve a project if it finds, pursuant to Section 21081 of the Public Resources Code (PRC), (i) that the agency has considered and approved all feasible mitigation measures; (ii) that any alternative that would reduce the severity of the significant unavoidable impacts is infeasible; and (iii) that the overriding economic, social, or other benefits of the project outweigh the significant impacts.

4.0.1.2 TERMINOLOGY USED TO DESCRIBE IMPACTS

IMPACT LEVELS

The EIS/EIR uses the following CEQA terminology to denote the significance of environmental impacts of the Proposed Action and alternatives under consideration:

- **No impact** indicates that the construction, operation, and maintenance of the Proposed Action and action alternatives would not have any direct or indirect impacts on the environment. It means that no change from existing conditions would result. This impact level does not require mitigation.
- A **less-than-significant impact** is one that would not result in a substantial or potentially substantial adverse change in the physical environment. This impact level does not require mitigation, even if applicable measures are available, under CEQA.
- A **significant impact** is defined by CEQA Section 21068 as one that would cause "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the

project." Levels of significance can vary by project alternative, based on the setting and the nature of the change in the existing physical condition. Under CEQA, mitigation measures or alternatives to the Proposed Action must be provided, where applicable, to avoid or reduce the magnitude of significant impacts.

- A **potentially significant impact** is one that, if it were to occur, would be considered a significant impact as described above; however, the occurrence of the impact cannot be immediately determined with certainty. For CEQA purposes, a potentially significant impact is treated as if it were a significant impact. Therefore, under CEQA, mitigation measures or alternatives to the Proposed Action must be provided, where necessary and applicable, to avoid or reduce the magnitude of significant impacts.

- A **significant and unavoidable impact** is one that would result in a substantial or potentially substantial adverse effect on the environment and that could not be reduced to a less-than-significant level even with implementation of any applicable feasible mitigation. Under CEQA, a project with significant and unavoidable impacts could proceed, but the CEQA lead agency would be required (i) to conclude in findings that there are no feasible means of substantially lessening or avoiding the significant impact in accordance with State CEQA Guidelines Section 15091(a)(3) and (ii) to prepare a statement of overriding considerations, in accordance with State CEQA Guidelines Section 15093, explaining why the CEQA lead agency would proceed with the project in spite of the potential for significant impacts.

- An impact may have a level of significance that is too uncertain to be reasonably determined, which would be designated **too speculative for meaningful consideration**, in accordance with State CEQA Guidelines Section 15145. Where some degree of evidence points to the reasonable potential for a significant effect, the EIS/EIR may explain that a determination of significance is uncertain, but is still assumed to be "potentially significant," as described above. In other circumstances, after thorough investigation, the determination of significance may still be too speculative to be meaningful. This is an effect for which the degree of significance cannot be determined for specific reasons, such as because aspects of the impact itself are either unpredictable or the severity of consequences cannot be known at this time.

It is important to note that under NEPA, there are no specific thresholds of significance and that environmental effects are analyzed based on their intensity and duration. Because this EIS/EIR is a joint NEPA/CEQA document, the CEQA thresholds have been applied because they are more stringent.

IMPACT MECHANISMS

Mechanisms that could cause impacts are discussed for each issue area. General categories of impact mechanisms are construction of the project and activities related to future operations and maintenance, as described in Chapter 2.0, "Alternatives."

Under CEQA, the environmental analysis compares the Proposed Action and alternatives under consideration, including the No-Project Alternative (referred to in this EIS/EIR as the No-Action Alternative), to existing conditions, defined at the time when the notice of preparation was published (July 18, 2008). Under NEPA, the effects of the Proposed Action and alternatives under consideration, including the No-Action Alternative, are determined by comparing effects between alternatives and against effects from the No-Action Alternative. Consequently, baseline conditions differ between NEPA and CEQA. Under NEPA, the No-Action Alternative (i.e., expected future conditions without the project) is the baseline to which the action alternatives are compared, and the No-Action Alternative is compared to existing conditions. Under CEQA, existing conditions are the baseline to which all alternatives are compared.

Project impacts are effects that are categorized, pursuant to NEPA and CEQA, to describe the intensity or duration of the impact. Project effects fall into the following categories:

- A **temporary impact** would occur only during construction. The environmental analysis addresses potentially significant impacts from the direct impact of construction at the project site, direct impact associated with site development, and indirect construction impacts associated with fill and wetland construction activities and construction traffic.

- A **short-term impact** would last from the time construction ceases to within 3 years following construction.

- A **long-term impact** would last longer than 3 years following construction. In some cases, a long-term impact could be considered a permanent impact.

- A **direct impact** is an impact that would be caused by an action and would occur at the same time and place as the action.

- An **indirect impact** is an impact that would be caused by an action but would occur later in time, or at a distance that is removed from the project area, such as growth-inducing effects and other changes related to changes in land use patterns, and related effects on the physical environment, yet is reasonably foreseeable in the future.

- A **residual impact** is an impact that would remain after the application of mitigation.

- A **cumulative impact** is an impact taken together with other past, present, and probable future projects producing related impacts, or when two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. A cumulative impact occurs from the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.

In accordance with PRC Section 21081.6(a), the SAFCA Board of Directors, if it approves the Proposed Action, will adopt a mitigation monitoring and reporting program (MMRP) at the time that it certifies the EIR. The purpose of the MMRP prepared under CEQA is to ensure that the mitigation measures adopted as part of project approval will be complied with during construction and implementation of the project. The MMRP will identify each of the mitigation measures and describe the party responsible for monitoring, the timeframe for implementation, and the program for monitoring compliance.

The SAFCA Board of Directors will also be required to adopt findings identifying each significant impact of the project and the extent to which feasible mitigation measures have been adopted (PRC Section 21081).

4.1 AGRICULTURAL RESOURCES

4.1.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.1.1.1 METHODOLOGY

Evaluation of the project's potential impacts on agricultural resources was based on a review of the planning documents pertaining to the project study area, including goals and policies from the *Sutter County General Plan* (1996), the *Sacramento County General Plan* (1993a), the *City of Sacramento General Plan 2006*, Federal plans and regulations relating to the Sacramento County Airport System (SCAS) and Federal Emergency Management Agency, the soil surveys of Sutter and Sacramento Counties (NRCS 1988, 1993), and consultation with appropriate agencies. In addition, the California Department of Conservation (DOC) Important Farmland maps and California Land Conservation Act (commonly known as the Williamson Act [California Government Code Section 51200 et seq.]) maps for Sutter and Sacramento Counties were used to determine the agricultural significance of the lands on the project area. For purposes of this analysis, it was assumed that reclamation of borrow sites by returning the topsoil layer to the site would not adversely affect a site's long-term agricultural productivity and therefore, its status as Important Farmland under the Important Farmland Mapping and Monitoring Program (FMMP) would not be changed permanently.

4.1.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to agricultural resources if they would do any of the following:

- convert Important Farmland (i.e., Prime Farmland, Unique Farmland, or Farmland of Statewide Importance) as shown on the maps prepared pursuant to the FMMP of the California Resources Agency, to nonagricultural use;
- conflict with existing zoning for agricultural use or a Williamson Act contract; or
- involve other changes in the existing environment which, due to their location or nature, could result in conversion of Important Farmland to nonagricultural use.

4.1.2 IMPACTS AND MITIGATION MEASURES

Impact 4.1-a: Conversion of Important Farmland to Nonagricultural Uses

Table 4.1-1 summarizes and compares the project's potential impacts to Important Farmlands. Loss and conversion of agricultural lands on a cumulative basis is addressed in Chapter 5.0, "Cumulative and Growth-Inducing Impacts, and Other Statutory Requirements."

Impact 4.1-a: Conversion of Important Farmland to Nonagricultural Uses

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, the project would not convert any Important Farmland. There would be **no impact**. ***(Lesser)***

Table 4.1-1
Conversion of Important Farmland: Comparison of Proposed Action and Raise-in-Place Alternative

Project Component/Location	No Action Alternative	Proposed Action (Acres)	Levee Raise-in-Place Alternative (Acres)
Permanent Conversion			
Sacramento River east levee	-	86	56
Canal relocations	-	60	60
PGCC west levee	-	60	60
Woodland plantings (includes Lower Woodlands)	-	35.5	157
RD 1001 Borrow Site	-	120	120
Total	-	**361.5**	**453**
Temporary Conversion			
Brookfield Borrow Site	-	180	180
Dunmore Borrow Site	-	160	160
Novak Borrow Site	-	76	76
Pacific Terrace Borrow Site	-	113	113
Private Property Reach 5A Borrow Site	-	34	34
Private Property Reach 6B Borrow Site	-	20	20
Private Property Reach 7 Borrow Site	-	67	67
South Sutter, LLC Borrow Site	-	95	95
Sutter Pointe Borrow Site	-	300	300
Elkhorn Borrow Area[1]	-	612	612
Total[2]	-	**1,657**	**1,657**

[1] Area of potential conversion because specific parcels have not yet been identified within the Elkhorn Borrow Area.
[2] Potential maximum if all borrow sites, including the Elkhorn Borrow Area, are excavated over entire acreage available.
Source: Data compiled by EDAW in 2008 and 2009

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of a levee failure would remain high. A levee failure along the NCC, the PGCC, or the northern reaches of the Sacramento River east levee could result in scouring of agricultural land and the long-term loss of topsoil in areas near a levee breach. This could result in a long-term loss of Important Farmland in those areas. Such a loss is evident at the locations of past levee failures, for example on the Feather River above Star Bend in Yuba County, where a large dense stand of willow riparian scrub grows in sediments deposited by floodwaters following the scouring of the agricultural soil by the force of in-rushing water. Such losses are typically limited to localized areas within several hundred feet of a levee breach. (The indirect effects of lack of flood protection on urban development and Important Farmland conversion have been addressed as part of the NLIP cumulative and growth-inducing impact analyses (see Chapter 5.0, "Cumulative and Growth-Inducing Impacts, and Other Statutory Requirements") The effects of a single or isolated levee failure on the permanent loss of Important Farmland would be localized at the point of the levee breech and would be less-than-significant. Simultaneous levee failures in more than one location in the perimeter levee system would have a more widespread effect. A precise determination of significance is not possible and

cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

Important Farmland mapping for the Natomas Basin is shown on **Plate 19** and Important Farmland classifications are described in detail in Chapter 3.0, "Affected Environment," in Section 3.3.1, "Agricultural Resources."

Nearly all of the areas within the footprint of flood damage reduction facilities (except for the area of the NEMDC south of the stormwater pumping station) are classified as Prime Farmland, Farmland of Statewide Importance, or Farmland of Local Importance. For the Proposed Action, a total of approximately 361.5 acres of Important Farmland would be permanently converted to nonagricultural use within the footprint of flood damage reduction facilities and on adjacent land required for maintenance access and prevention of encroachment into the flood damage reduction system. These lands include approximately 60 acres in the footprint of the relocated Elkhorn Canal and the new Giant Garter Snake (GGS)/Drainage Canal, 60 acres in the footprint of the levee improvements along the PGCC, and 86 acres in the footprint of the Sacramento River levee improvements. A total of 35.5 acres of Important Farmland would be converted for woodland plantings to compensate for loss of woodlands primarily on the land side of the levee. The conversion of these areas to nonagricultural uses would be permanent, and therefore is considered a **significant** impact.

Soil borrow for construction would be obtained from the proposed borrow sites described in Section 2.3.8, "Borrow Material," and shown in **Plate 10**. **Table 2-2** lists the potential borrow sites, excavation area and depth, postborrow depth, and proposed postborrow (reclaimed) use. Properties identified as potential borrow areas total approximately 3,072 acres. However, only portions of each property and not all of the properties identified would ultimately be used for borrow. The decision as to which borrow sites would be used and for which construction phase has not yet been made by SAFCA. The decision would depend on the availability of material at each site, the proximity of the borrow site to the project component (length of haul route), the quality of borrow material, and avoidance and/or minimization of significant environmental effects, such as the conversion of Important Farmlands. The lands in the potential borrow sites located in Sutter County are classified as Prime Farmland, Farmland of Statewide Importance, or Grazing. The lands in the potential borrow sites in Sacramento County are classified as Prime Farmland, Farmland of Statewide Importance, Farmland of Local Importance, Unique Farmland, and Grazing Land. Reclamation of all borrow sites would be performed in compliance with the California Surface Mining and Reclamation Act and would entail preservation and replacement of the topsoil on these parcels, thus retaining their potential use for agriculture. The majority of sites would be returned to agricultural uses; however, a few sites would be converted to managed habitat (see **Table 2-2**). The County of Sacramento allowed all agricultural leases on Sacramento International Airport property to expire on December 31, 2007 in order to comply with FAA policy guidelines, which recommend that all agricultural practices be excluded on or near airports to discourage the presence of hazardous wildlife. SAFCA proposes to obtain borrow material from properties within the Airport north bufferlands area. Following borrow removal, these lands would be reclaimed and would be returned to their current idle state. SCAS would continue to manage these lands to minimize the attraction of hazardous wildlife (i.e., bird strike) in the Airport Operations Area. The Proposed Action would not affect the status of these SCAS lands as Important Farmland.

Sites that SAFCA intends to reclaim and return to agricultural use are listed in **Table 4.1-1** under "Temporary Conversion." These sites include the Brookfield and Sutter Pointe properties in Sutter County, which would be returned to rice cultivation following the completion of soil borrow removal. The Elkhorn Borrow Area (**Plate 10**) has been identified as an area where additional borrow sites could be used, if needed. Within the Elkhorn Borrow Area, approximately 612 acres are classified as Important Farmland. Any borrow site developed in the Elkhorn Borrow Area would be returned to agricultural use upon reclamation. All of the borrow sites in Sacramento County, with the exception of those discussed below, would be returned to agricultural use (either rice or field crops) upon completion of soil borrow removal. Therefore, the use of these sites for borrow would not represent a permanent conversion to nonagricultural uses. For the Proposed Action, the only currently identified borrow sites

where Important Farmland would be permanently converted to habitat are the Lower Woodlands site (24 acres) in Sacramento County and the RD 1001 site (120 acres) in Sutter County. The Lower Woodlands site would be converted to upland habitat even if it is not used as a borrow site. However, the RD 1001 site would be converted to marsh habitat only if it is used as a borrow site.

The permanent conversion of Important Farmlands would total 361.5 acres and would be a **significant**, long-term impact. The temporary and short-term conversion of Important Farmland in borrow sites would total 1,657 acres if all the sites listed in **Table 4.1-1** were used. The temporary conversion of these potential borrow areas to nonagricultural uses is considered a **significant**, short-term impact.

SAFCA could enter into an agreement with the Airport to swap lands. The ultimate goal would be to improve land uses on Airport land according to the Airport's draft *Wildlife Hazard Management Plan* (WHMP). The lands and agreement in question, while not finalized, are anticipated to consist of approximately 50–100 acres within the Airport's Critical Zone that is currently owned by SAFCA, which would be swapped with lands in Sutter County outside the Airport's Critical Zone currently owned by the Airport/Sacramento County. The proposed land swap could result in an incremental decrease (approximately 50–100 acres) in the amount of agriculture production in the Natomas Basin (Sacramento and Sutter Counties) if the agreement is reached as planned. The land swap is currently anticipated to take place concurrent with construction of the Phase 4 Project; however, it is not dependent on the Phase 4 Project construction schedule, and would be analyzed in separate environmental documentation and permitted separately when the agreement between the SAFCA and the Airport is finalized.

Levee Raise-in-Place Alternative

The raised portion of the Sacramento River east levee under the Levee Raise-in-Place Alternative would have a smaller footprint than the adjacent setback levee in Reaches 5–9B under the Proposed Action, and therefore, would have slightly less impact on Important Farmlands than would the Proposed Action. Approximately 56 acres of Important Farmland would be permanently converted in the footprint of the Sacramento River east levee flood damage reduction facilities footprint under this alternative, compared with 86 acres under the Proposed Action. This alternative would include the same conversion of Important Farmland as the Proposed Action in the footprint of the relocated Elkhorn Canal and the new GGS/Drainage Canal (approximately 60 acres), and the PGCC (approximately 60 acres). Because greater impacts to waterside riparian woodlands would require a higher replacement ratio than for landside woodlands, approximately 157 acres of Important Farmland could be converted for habitat creation. The 24-acre Lower Woodlands site would be part of this conversion; the location of the remaining planting sites has not been determined (see Impact 4.8-a).

Important Farmlands permanently converted at borrow sites would be the same as under the Proposed Action (potentially 120 acres at the RD 1001 site). As stated above, the Lower Woodlands site would be used for borrow, reclaimed, and then converted to woodland habitat (24 acres). As described for the Proposed Action, additional borrow areas may also be required for this alternative that would result in conversion of Important Farmlands to nonagricultural uses. With the Levee Raise-in-Place Alternative, temporary conversion of Important Farmland for borrow sites would be the same as described above for the Proposed Action. SAFCA intends to reclaim and return these sites to agricultural use.

Permanent conversion of Important Farmland to nonagricultural use under the Levee Raise-in-Place Alternative would total 453 acres and would be a **significant**, long-term impact ***(Greater)***. The temporary and short-term conversion of Important Farmland in borrow sites would total 1,657 acres if all the sites listed in **Table 4.1-1** were used. The temporary conversion of these potential borrow areas to nonagricultural uses is considered a **significant**, short-term impact. ***(Similar)***

Mitigation Measure 4.1-a: Minimize Important Farmland Conversion to the Extent Practicable and Feasible

Proposed Action and Levee Raise-in-Place Alternative

SAFCA shall implement the measures listed below with regard to Prime Farmland, Unique Farmland, and Farmland of Statewide Importance to minimize impacts on these lands.

(a) Borrow sites shall be configured to minimize the fragmentation of lands that are to remain in agricultural use. Contiguous parcels of agricultural land of sufficient size to support their efficient use for continued agricultural production shall be retained to the extent practicable and feasible.

(b) To the extent practicable and feasible, when expanding the footprint of a flood damage reduction facility (e.g., levee or berm) onto agricultural land, the most productive topsoil from the construction footprint shall be salvaged and redistributed to less-productive agricultural lands in the vicinity of the construction area that could benefit from the introduction of good-quality soil. By agreement between the implementing agencies or landowners of affected properties and the recipient(s) of the topsoil, the recipient(s) shall be required to use the topsoil for agricultural purposes. SAFCA shall implement all terms and conditions of agreements.

(c) During project construction, use of utilities that are needed for agricultural purposes (including wells, pipelines, and power lines) and of agricultural drainage systems shall be minimized so that agricultural uses are not substantially disrupted.

(d) Disturbance of agricultural land and agricultural operations during construction shall be minimized by locating construction staging areas on sites that are fallow, that are already developed or disturbed, or that are to be discontinued for use as agricultural land, and by using existing roads to access construction areas to the extent possible.

(e) To the extent feasible, lands acquired for flood damage reduction purposes shall also be used as mitigation land for NBHCP programs so that agricultural land conversion is minimized.

Implementation of this mitigation measure would reduce the impact of permanent conversion of Important Farmland under the Proposed Action and the Levee Raise-in-Place Alternative, but not to a less-than-significant level because no new farmland would be made available, and the productivity of existing farmland would not be improved. Because no feasible mitigation is available to fully reduce the impact of permanent conversion of Important Farmland, this impact would remain **significant and unavoidable** for the Proposed Action and the Levee Raise-in-Place Alternative. ***(Greater)***

Implementation of these measures for borrow sites that are returned to agricultural use would reduce the impacts of temporary conversion of Important Farmland under the Proposed Action and the Levee Raise-in-Place Alternative, but not to a less-than-significant level. Temporary conversion of Important Farmland for borrow sites is considered a **significant and unavoidable** impact in the short term, but a **less-than-significant** impact in the long term. ***(Similar)***

Impact 4.1-b: Conflict with Lands under Williamson Act Contracts

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, the project would not cause Williamson Act contracts to be terminated as a result of levee construction or borrow activities. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Flooding in the Basin, resulting in destruction of agricultural land, would have **no impact** related to cancellation of Williamson Act contracts. ***(Lesser)***

Proposed Action

The Proposed Action would affect properties in Agricultural Preserve in Sutter County, including properties adjacent to the PGCC and in the Sutter Pointe, Brookfield, and RD 1001 borrow sites. None of the affected properties in Sutter County are under Williamson Act contract. In Sacramento County, the Proposed Action would affect properties under Williamson Act contract along the Sacramento River east levee in Reach 9B, and the proposed Elkhorn Canal alignment.

If the Proposed Action does not require acquisition of an entire property, the contract on the portion of the property required for levee improvements would be terminated, and the remainder of the property unaffected by the Proposed Action would remain under contract. Approximately 8 acres of land would be removed permanently from Williamson Act contract for construction of the adjacent levee on the Sacramento River east levee under the Proposed Action.

The potential use of borrow sites (Pacific Terrace, South Sutter LLC, Novak, Dunmore, and Lower Woodlands) would require termination of Williamson Act contracts, affecting more than 580 acres. Within the Elkhorn Borrow Area, approximately 172 acres are under Williamson Act contract, which coincides with the land that is also in an agricultural preserves designated under the Act. For lands that would be permanently converted to nonagricultural uses or acquired in fee by SAFCA, notice to the California Department of Conservation is required under the Act, as described under Mitigation Measure 4.1-b, below. The Dunmore, Pacific Terrace, Novak, and South Sutter LLC properties, as well as any lands within the Elkhorn Borrow Area would be returned to agricultural use and could potentially be reenrolled; therefore, this impact is considered a significant impact in the short term, but a less-than-significant impact in the long term. The Lower Woodlands properties would be converted to managed habitat, and therefore would not be eligible for Williamson Act contracting. The impact from permanent conversion of as much as 8 acres of contracted lands along the Sacramento River east levee and 24 acres in the Lower Woodlands properties is considered **significant**.

Levee Raise-in-Place Alternative

The Levee Raise-in-Place Alternative would have the same impacts on Agricultural Preserves and Williamson Act contracted lands as the Proposed Action with respect to borrow sites and the canal alignments. However, it would not have as great an impact on Williamson Act–contracted lands adjacent to the Sacramento River east levee, because the levee footprint would not be expanded onto adjacent properties to the same extent as the Proposed Action. Approximately 1 acre of land under Williamson Act contract would be permanently affected along the Sacramento River east levee by this alternative. Impacts from permanent conversion of Williamson Act contracted lands under the Levee Raise-in-Place Alternative are considered **significant**. ***(Lesser)***

Mitigation Measure 4.1-b: Minimize Impacts on Agricultural Preserve Land and Williamson Act–Contracted Land; Comply with Government Code Sections 51290–51293; and Coordinate with Landowners and Agricultural Operators

Proposed Action and Levee Raise-in-Place Alternative

To reduce impacts on Agricultural Preserve land and on lands under Williamson Act contracts, SAFCA shall implement the measures described below.

(a) SAFCA shall comply with California Government Code Sections 51290–51295 with regard to acquisition of Williamson Act contracted lands as follows:

- The policy of the state, consistent with the purpose of the Williamson Act to preserve and protect agricultural land, is to avoid, whenever practicable, locating public improvements and any public utilities improvements in agricultural preserves. If it is necessary to locate within a preserve, it shall be on land that is not under contract (Government Code Section 51290[a][b]). More specifically, the basic requirements are:
  - Whenever it appears that land within a preserve or under contract may be required for a public improvement, the public agency or person shall notify the DOC and the city or county responsible for administering the preserve (Government Code Section 51291[b]).
  - Within 30 days of being notified, DOC and the city or county shall forward comments, which shall be considered by the public agency or person (Section 51291[b]).
- The contract shall be terminated when land is acquired by eminent domain or in lieu of eminent domain (Government Code Section 51295).
- DOC and the city or county shall be notified before project completion of any proposed substantial changes to the public improvement (Government Code Section 51291[d]).
- DOC shall be notified within 10 working days upon completion of the acquisition (Section 51291[c]).
- If, after acquisition, the acquiring public agency determines that the property will not be used for the proposed public improvement, before returning the land to private ownership, DOC and the city or county administering the involved preserve shall be notified. The land shall be reenrolled in a new contract or encumbered by an enforceable restriction at least as restrictive as that provided by the Williamson Act (Government Code Section 51295).

(b) SAFCA shall coordinate with landowners and agricultural operators to sustain existing agricultural operations, at the landowners' discretion, within the project area until the individual agricultural parcels are needed for project construction.

Implementation of this mitigation measure would reduce the impacts from loss of Williamson Act–contracted lands under the Proposed Action and the Levee Raise-in-Place Alternative, but not to a less-than-significant level. Because no feasible mitigation is available to fully compensate for the loss of land under Williamson Act contracts and its conversion to nonagricultural use, this impact would remain **significant and unavoidable**. ***(Similar)***

4.1.3 RESIDUAL SIGNIFICANT IMPACTS

Under the No-Action Alternative; impacts of permanent agricultural land loss due to levee failure would remain uncertain, depending on the location and number of levee breeches. Because of this uncertainty, these potential impacts are considered too speculative for meaningful consideration.

The implementation of mitigation measures required in this section would partially reduce the impacts of permanent conversion of Important Farmland to nonagricultural uses and loss of lands in Agricultural Preserves and under Williamson Act contracts. However, there is no feasible mitigation available that would fully compensate for these losses; therefore, residual significant and unavoidable impacts would occur under both the Proposed Action and the Levee Raise-in-Place Alternative.

The implementation of mitigation measures in this section would partially reduce the impacts of temporary conversion of Important Farmland to nonagricultural uses and temporary conversion of lands in Agricultural Preserves and under Williamson Act contracts. However, there are no feasible mitigation measures that would fully compensate for these temporary effects, therefore residual significant and unavoidable temporary impacts would remain under both the Proposed Action and the Levee Raise-in-Place Alternative.

4.10 CULTURAL RESOURCES

This section evaluates the Phase 3 Project's potential effects on cultural resources, and provides an update on management efforts for CA-Sac-485/H, a significant cultural resource in the Phase 2 Project. Cultural resources include prehistoric archaeological sites and artifacts, historic-era buildings and structures, and places used for traditional Native American practices or other properties with special cultural significance to Native Americans (Traditional Cultural Properties [TCPs]). This section also revises the analysis for impacts on previously unidentified cultural resources for the overall NLIP, as discussed in the 2007 Landside EIR (SAFCA 2007c).

This project is subject to both CEQA and Section 106 of the National Historic Preservation Act (NHPA); each has specific cultural resources mitigation requirements. This section describes the relevant regulatory framework that sets thresholds of significance for impacts under both CEQA and Section 106, and the methods used to identify cultural resources. This section also identifies potential impacts associated with the project and mitigation measures to avoid or reduce those impacts, where feasible.

4.10.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.10.1.1 METHODOLOGY

This section describes the methods used to identify and evaluate cultural resources that may be affected by the project.

Native American Tribal Consultation

USACE, SAFCA, and the State Historic Preservation Officer (SHPO) became signatories to a Programmatic Agreement (PA), concluding compliance with Section 106 in May 2008 (**Appendix D1**). Native American tribes who were consulted by USACE were the Ione Band of Miwok Indians, the Shingle Springs Band of Miwok Indians, and the United Auburn Community, and all were invited to participate in the PA. Native American monitors worked with SAFCA to assist in the treatment of Native American human remains and items associated with Native American burials discovered during the project inventory process, as required by the PA (Section VI).

EDAW sent a letter of inquiry to the Native American Heritage Commission (NAHC) on June 12, 2007, asking for information or concerns regarding the project area, as well as a list of individuals or organizations that might have information or concerns regarding the project area. On June 19, 2007, Debbie Pilas-Treadway of the NAHC responded and indicated that no known sites were found in the Sacred Lands File that were located within the project area or in the immediate vicinity. Ms. Pilas-Treadway also provided EDAW with a list of individuals who could be contacted concerning cultural resources in the project area. These individuals were sent contact letters on June 21, 2007, with information regarding the project and a request for any information they might provide or concerns that they might have about the project. This program of correspondence did not reveal new resources. The complete results of this program of investigation are described in the Phase 2 Project EIR (DEIR at p. 3.8-11, SAFCA 2007).

Information Center Records Searches

Records searches were begun in 2006 and 2007 for the entire NLIP footprint, which includes the Phase 3 Project footprint. Most of the searches were conducted at the North Central Information Center (NCIC) of the California Historical Resources Information System, located at California State University, Sacramento. The NCIC records search covered portions of the project area in Sacramento County. Records searches were also conducted at the Northeast Information Center (NEIC), which maintains cultural resource records for Sutter County. The searches at both facilities included, but were not necessarily restricted to, an examination of the following resources:

- the State Office of Historic Preservation's *Historic Property Directory and Determination of Eligibility* (2006),
- the National Register of Historic Places and California Registers of Historical Resources (2006),
- *California Inventory of Historic Resources* (1976 and updates),
- *Historic Properties Directory* (2006),
- *California Historical Landmarks* (1996 and updates),
- *California Points of Historical Interest* (1992 and updates),
- *Caltrans Local Bridge Survey* (1987), and
- various historic maps.

The record search results are described in detail in Section 3.3.10.3, "Records Search Results."

Inventory of the Phase 3 Project Area of Potential Effects

SAFCA is required to perform an inventory, evaluation, and finding of effect for identified resources for the area of potential effects (APE) for each project phase, under the executed PA, as described below (Stipulations IV[A]). Inventory and evaluation typically consists of the following steps:

- pedestrian survey of the project footprint;
- limited shovel testing or probing where ground cover impairs surface visibility;
- documentation of identified resources; and
- evaluation of identified resources by application of eligibility criteria, and where necessary, limited test excavation to assist in resource evaluation.

SAFCA has completed a pedestrian survey for the majority of the Phase 3 Project footprint. However, several possible borrow locations remain that require pedestrian inventory or additional subsurface investigation, including the Elkhorn Borrow Area (**Plate 10**), which contains most of the properties listed in Section 2.3.8.3, "Potential Borrow Sites." To date, the Brookfield and Airport north bufferlands borrow sites have been subject to pedestrian surveys, with some limited subsurface inventory at the Airport north bufferlands. SAFCA will complete an inventory of all borrow locations as well as an evaluation, findings of effect, and treatment of identified resources where required. Within the portion of the Phase 3 Project footprint that has been surveyed, several identified resources require evaluation to determine if they are historic properties or historical resources. If they are eligible for listing on the National Register of Historic Places (NRHP) or the California Register of Historical Resources (CRHR), SAFCA will make a finding of effect and make recommendations for further management in an Historic Property Treatment Plan (HPTP), as required under the PA.

4.10.1.2 Regulatory Framework and Thresholds of Significance

This subsection describes the regulatory framework that governs management of cultural resources for this project. Because the regulatory framework and the PA adopted for the project determine the methods and management milestones required, this section precedes discussion of methodology and impacts. The thresholds for determining the significance of impacts of the Proposed Action or alternatives under consideration for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines and Section 106, as well as the stipulations in the executed PA.

California Environmental Quality Act

CEQA requires consideration of impacts on historical resources, unique archaeological resources, and interred human remains. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to cultural resources if they would do any of the following:

- cause a substantial adverse change in the significance of a unique archaeological resource as defined in PRC Section 21083.2(g) or a historical resource as defined in PRC Section 21084.1 (see also Section 15064.5 of the State CEQA Guidelines), or

- disturb any human remains, including those interred outside of formal cemeteries.

A unique archaeological resource, as defined in PRC Section 21083.2(g), is an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it:

(1) contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information,

(2) has a special and particular quality such as being the oldest of its type or the best available example of its type, or

(3) is directly associated with a scientifically recognized important prehistoric or historic event or person.

Section 15064.5(a) of the State CEQA Guidelines defines an historic resource as:

(1) a resource listed in, or determined to be eligible by the State Historical Resources Commission for listing in, the CRHR;

(2) a resource included in a local register of historical resources or identified as significant in a historical resource survey; and

(3) any other object, building, structure, site, area, place, record, or manuscript that a CEQA lead agency determines to be historically significant, provided that the lead agency's determination is supported by substantial evidence.

A substantial adverse change in the significance of a historical resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the historical resource would be materially impaired.

Section 106 of the National Historic Preservation Act

Section 106 requires Federal agencies to consider the effects of their undertakings on historic properties (those cultural resources presently listed or determined to be eligible for listing on the NRHP) and to allow the Advisory Council on Historic Preservation (ACHP) reasonable opportunity to comment on their actions (16 U.S. Code Section 470[f]). An historic property is a resource that is eligible for or listed on the NRHP. Adverse effects on historic properties, as explained in this section, are significant impacts. Identification of adverse effects is a two-step process: first, cultural resources must be assessed to determine if they are eligible for or listed on the NRHP, and then effects must be analyzed to determine if they are adverse within the meaning of Section 106.

To be eligible, a property must possess significance and integrity, as defined at 36 CFR, Section 60.4:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and,
>
> (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or

(b) that are associated with the lives of persons significant in our past; or

(c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) that have yielded, or may be likely to yield, information important in prehistory or history.

Ordinarily, cemeteries, birthplaces, or graves of historical figures; properties owned by religious institutions or used for religious purposes; structures that have been moved from their original locations; reconstructed historic buildings; properties primarily commemorative in nature; and properties that have achieved significance within the past 50 years shall not be considered eligible for the NRHP. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:

(a) a religious property deriving primary significance from architectural or artistic distinction or historical importance; or

(b) a building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event; or

(c) a birthplace or grave of a historical figure of outstanding importance if there is no appropriate site or building directly associated with his productive life; or

(d) a cemetery which derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events; or

(e) a reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived; or

(f) a property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or

(g) a property achieving significance within the past 50 years if it is of exceptional importance.

TCPs can also be historic properties under Section 106. These resources are properties whose significance, is "derived from the role the property plays in a [particular] community's historically rooted beliefs, customs, and practices" (National Park Service 1998:1). These resources thus may include a geographic location used for traditional plant gathering activities, or a community center associated with a particular ethnic neighborhood that has a long standing history of use. TCPs are evaluated in the same manner as other resources, by application of the NRHP eligibility criteria, and criteria considerations (National Park Service 1998:11–18).

The evaluation process thus provides a filter that limits consideration of effects of Federal actions to NRHP eligible or listed cultural resources (historic properties). Adverse effects are effects that must be managed and resolved (36 CFR Part 800.6). Adverse effects on historic properties are defined as effects that would:

> …alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's

eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative.

Thus adverse effects are effects that damage the qualities that make an historic property eligible for the NRHP, or the ability of that property to convey the significance that makes it eligible.

Management Framework for Historic Properties: The Programmatic Agreement

Normally, the Section 106 process is performed as four sequential steps. In this process, the Federal agency responsible for satisfying Section 106 initiates consultation with the SHPO, identifies historic properties, assesses effects, and then resolves adverse effects, if any. These steps are defined at 36 CFR Part 800 et seq. However, because the Proposed Action and alternatives under consideration involve large areas of land that require inventory and evaluation of historic properties in phases, USACE and SAFCA, in consultation with the SHPO and other consulting parties, developed and executed a PA that lays out a parallel process that replaces the process provided in Part 800, while incorporating relevant standards and definitions from Part 800 by reference.

The PA requires SAFCA to define the APE and complete an inventory of cultural resources prior to each project phase of construction (Stipulations III[C] and IV[A]). The inventory will include a map of the APE for each project phase (Stipulation III[C]). Identified resources will be evaluated for NRHP eligibility, and SAFCA will make a finding of effect, in consultation with USACE and the SHPO (Stipulation IV[A]). If adverse effects on historic properties are identified, SAFCA must prepare an HPTP per Stipulation V(A) of the PA. The HPTP specifies actions SAFCA will take to resolve adverse effects on an historic property or a set of historic properties (Stipulation V[A]). The PA also requires SAFCA to prepare and submit a plan to respond to inadvertent discoveries prior to construction (Stipulation V[B][1]). EDAW has prepared a Construction Monitoring and Inadvertent Discovery Plan, and SAFCA has submitted this document to USACE as part of the Phase 2 Project Inventory Report. The plan describes the protocols and methods for monitoring of construction and protection of cultural resources discovered during construction. Together, the PA and the Monitoring and Inadvertent Discovery Plan provide part of the management framework for historic properties that may be affected by the project. However, SAFCA cannot proceed with subsequent project phases without implementing and complying with the stipulations outlined in the PA.

While SAFCA is a signatory to the PA, Section 106 requires consultation between the Federal signatory to the PA and other consulting parties. USACE and the SHPO must concur on major management decisions such as how adverse effects will be resolved (Stipulation V), and USACE has the ultimate responsibility for satisfying Section 106 (36 CFR Part 800.1[a]). Therefore while this EIS/EIR describes what SAFCA believes are all feasible methods under CEQA of mitigating impacts to cultural resources, USACE and the other consulting parties under Section 106 must agree to SAFCA's proposed mitigation plan, including the selection of any particular improvement at the location of identified and eligible resources that would be adversely affected.

4.10.2 IDENTIFIED RESOURCES

Table 4.10-1 contains all identified resources, other than elements of RD 1000 (which is discussed separately under Impact 4.10-a, below) in the Phase 3 Project footprint. For all resources that are recommended ineligible, no further management is required provided that USACE and the SHPO concur in the eligibility recommendation. Management of resources that are NRHP listed, recommended eligible, or require further investigation is discussed below. This section thus describes the management steps taken or required for resources described in Chapter 3.0, "Affected Environment," and newly identified sites, which occur in the Phase 3 Project footprint.

Table 4.10-1 Identified Cultural Resources in the Phase 3 Project Footprint				
Trinomial or P-Number	Temporary Designation	Resource Type	Project Phase	Eligibility Recommendation
	NLIP-18	Prehistoric site[1]	3	**Requires testing/evaluation**
CA-Sac-485/H		Prehistoric site[1]	2	Recommended eligible
CA-Sac-487-H		Historic debris	2/3	Determined ineligible[2]
CA-Sac-486-H		Historic structure	2/3	Determined ineligible[2]
CA-Sac-836-H		Historic	3	Determined ineligible[2]
CA-Sac-489-H		Historic debris	3	Determined ineligible[2]
	NLIP-2	Historic debris	3	Determined ineligible[2]
CA-Sac-488-H		Historic debris	3	Determined ineligible[2]
	NLIP-12	Prehistoric site[1]	3	**Requires testing/evaluation**
	NLIP-26	Prehistoric site	3	**Requires testing/evaluation**
	NLIP-24	Historic farm complex	3	**Recommended ineligible**
	NLIP-13	Prehistoric site	3	**Requires testing/evaluation**
	NLIP-16	Prehistoric site	3	**Requires testing/evaluation**
	NLIP-23	Historic farm complex	3	**Recommended ineligible**
	NLIP-17	Prehistoric site	3	**Requires testing/evaluation**
	NLIP-14	Prehistoric site	3	**Requires testing/evaluation**
	NLIP-15	Prehistoric site	3	**Requires testing/evaluation**
	NLIP-18	Prehistoric site	3	**Requires testing/evaluation**
	NLIP-19	Prehistoric site	3	**Requires testing/evaluation**
	NLIP-20	Prehistoric site	3	**Requires testing/evaluation**
CA-Sac-484-H		Historic debris	3	Determined ineligible[2]
CA-Sac-483-H		Historic ranch	3	Determined ineligible[2]

NLIP = Natomas Levee Improvement Program; NRHP = National Register of Historic Places

Resources organized approximately north to south, eligibility recommendations are subject to USACE and SHPO concurrence. For all eligible or listed resources, SAFCA will determine the effect of the undertaking, subject to USACE and SHPO concurrence. If adverse effects are found, SAFCA would prepare and implement an HPTP in consultation with USACE and the SHPO.

[1] Resource contains a mortuary component

[2] SHPO and USACE concurrence received November 24, 2008 on eligibility recommendation

Source: Data compiled by EDAW in 2008 and 2009

4.10.2.1 HISTORIC RESOURCES

Sites CA-Sac-483-H, CA-Sac-484-H, CA-Sac-486-H, CA-Sac-487-H, CA-Sac-488-H, CA-Sac-489-H, CA-Sac-836-H, and NLIP-2 have been evaluated and recommended ineligible by SAFCA (USACE and SAFCA 2008). This report was submitted to USACE and the SHPO. USACE and SHPO have concurred in this recommendation, therefore no further management is required.

NLIP-23 and NLIP-24 consist of historic-era farm complexes; these resources have been evaluated and recommended ineligible in a report submitted to USACE. No further management of these resources will be required if USACE and the SHPO concur in these recommendations.

4.10.2.2 PREHISTORIC RESOURCES

The following sites are new discoveries: NLIP-12, NLIP-13, NLIP-14, NLIP-15, NLIP-16, NLIP-17, NLIP-18, NLIP-19, NLIP-20, and NLIP-26 (see **Table 4.10-1**). These resources are all prehistoric deposits discovered through shovel testing of the Phase 3 Project footprint in 2007 and 2008. Most of these resources manifest as ephemeral and light deposits with various combinations of prehistoric debris, charcoal, and burnt clay that require further investigation to determine if they are cultural deposits, isolated finds, or naturally occurring non-cultural debris. One site, NLIP-12, has a mortuary component. SAFCA will make a recommendation of eligibility for these resources to USACE and the SHPO. If any of these resources are eligible, SAFCA will consult with USACE and the SHPO to make a finding of effects. If any of the eligible resources are subject to adverse effects, SAFCA will consult with USACE, the SHPO, and Native American individuals and organizations to identify ways to avoid, minimize, or mitigate adverse effects as stipulated in the PA.

The prehistoric site CA-Sac-485/H was identified in record searches conducted for the Phase 2 Project, as described in Chapter 3.0, "Affected Environment." The following discussion describes management efforts for this resource to provide an update on Phase 2 Project cultural resource impacts.

- **CA-Sac-485/H (P-34-000512).** Further investigations during summer 2008 focused on more precisely characterizing the boundaries and nature of the deposit at CA-Sac-485/H. This investigation was conducted through excavation of control units with limited use of a backhoe at the edges of the site and beyond the site boundaries (to confirm the nature of the sterile deposits that surround the site). Based on the records and investigation to date, it appears that CA-Sac-485/H was a habitation site with structures and numerous interments. The assemblage on-site contains a rich deposit of flakes stone, faunal bone, skeletal remains and grave goods, hearth features, and utilitarian artifacts.

  This site will be recommended eligible in an inventory report prepared by SAFCA and submitted to USACE and the SHPO. This report will also make a finding of effect, which is anticipated to be adverse (subject to treatment to minimize impacts). Further consultation with SAFCA, USACE, the SHPO, and Native American individuals and organizations is required to define appropriate treatment as stipulated in the PA. Through this consultation process, SAFCA will prepare an HPTP that defines how impacts on the site will be minimized. SAFCA is currently consulting with these entities to determine if placement of a wide seepage berm over the site will meet the combined goals of reducing flood risks and minimizing adverse effects.

4.10.3 IMPACTS AND MITIGATION MEASURES

This section describes the impacts of the Proposed Action and alternatives under consideration on cultural resources and outlines treatment measures that may avoid or reduce the predicted impacts. These measures would be implemented by USACE and SAFCA, in consultation with the SHPO. The specific documents that will further define and describe monitoring and mitigation measures include HPTPs that SAFCA will prepare and the Construction Monitoring and Inadvertent Discovery Plan, in compliance with the PA.

Impacts that are significant under CEQA are also considered adverse effects under the NHPA.

Impact 4.10-a: Potential Changes to Elements of Reclamation District 1000 and Rural Landscape District

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to directly disturb elements of Reclamation District 1000 and Rural Landscape District. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in flooding that could alter elements of RD 1000. However, the major elements and overall character of RD 1000 are unlikely to be significantly adversely affected because levee systems by their nature are subject to ongoing repair and upgrades. Repairs would thus be consistent with the character-defining elements of the landscape. This potential impact is considered **less than significant**. ***(Lesser)***

Proposed Action and Levee Raise-in-Place Alternative

As described in Section 3.3.10.2, "Historic Setting," RD 1000 is a rural historic landscape district that contains numerous elements associated with flood damage reduction and drainage infrastructure. An evaluation of RD 1000 was conducted both to determine the NRHP eligibility of the district and to evaluate whether the district would be significantly affected by flood damage reduction projects (levee modifications) planned and subsequently implemented by USACE as part of the American River Watershed Project. RD 1000 was identified as eligible for inclusion in the NRHP as a Rural Historic Landscape District. The finding of effect statement concluded that USACE projects would adversely affect both contributing and noncontributing elements of RD 1000 by allowing for greater development to occur in the region. As a result, mitigation measures were adopted and incorporated into USACE's project. These consisted of Historic American Engineering Record (HAER) documentation, which was prepared by Peak & Associates (1997), videotapes of historic properties, and a list of repositories where copies of the information would be made available to the public.

Work associated with the Phase 3 Project under both the Proposed Action and the Levee Raise-in-Place Alternative may alter contributing elements of RD 1000. These changes include construction of new features such as a new RD 1000 Pumping Plant No. 2, which may affect the setting by introducing inconsistent elements and thus the integrity of RD 1000. These changes may be consistent with the character-defining elements of RD 1000 because flood damage reduction infrastructure, by its nature, requires ongoing maintenance and alteration. However, such changes could instead diminish the significance or integrity of contributing elements of the district, under both the Proposed Action and the Levee Raise-in-Place Alternative. This impact is considered **potentially significant** pending identification and evaluation of effects on contributing elements of RD 1000. ***(Similar)***

Mitigation Measure 4.10-a: Incorporate Mitigation Measures to Documents Regarding Any Elements Contributing to RD 1000 and Rural Landscape District and Distribute the Information to the Appropriate Repositories

Proposed Action and Levee Raise-in-Place Alternative

The management of the cultural resources that constitute the contributing elements of RD 1000 is governed by the PA (**Appendix D**). Because the elements of the RD 1000 historic landscape district have already been recorded, a new inventory of these resources is not required under Stipulation IV(A) of the PA. After an APE has been determined per Stipulation III(C), a qualified architectural historian shall determine if contributing elements of the district are present in the APE. If contributing elements are present, the architectural historian shall update records for these resources and evaluate those elements to determine if

they still retain integrity. Because much of the Natomas Basin has been developed, it is possible that changes to the setting have diminished the integrity and thus eligibility of contributing elements in the APE. If the elements in the APE retain eligibility, the architectural historian shall make a finding of effect.

If there is an adverse effect to a contributing element (under Section 106) or a significant impact on the resource's integrity as an historical resource (under CEQA), the architectural historian shall review existing HAER documentation and determine whether any augmentation of this documentation is needed. The original documentation for the American River Watershed Project (completed in 1997) contemplated changes to the setting of the district and thus provided comprehensive documentation to record the district before urbanization (Peak & Associates 1997). It is possible that this original documentation adequately recorded and preserved records of the elements that may be affected. If this documentation is not sufficient for adversely affected and contributing elements, SAFCA shall prepare an HPTP stipulating additional HAER documentation, or other similar treatment as required under Stipulation V(A). After consultation with USACE and the SHPO, SAFCA shall implement the required documentation. Any additional documentation that is needed shall be prepared and distributed to appropriate public repositories.

Implementing this mitigation and treatment measure would reduce the impacts of potential changes to elements of RD 1000 under both the Proposed Action and the Levee Raise-in-Place Alternative to a **less-than-significant** level. This treatment measure would be incorporated into an HPTP developed through consultation with USACE and the SHPO. ***(Similar)***

Impact 4.10-b: Potential Changes to Other Known Historic-Era Resources from Ground Disturbance or Other Construction-Related Activities

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to directly disturb any known historic-era resources. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Substantial flooding could result in inundation, or scour at the location of a levee break, of known subsurface historic-era resources. These resources are recommended to be ineligible for listing on the CRHR and the NRHP. The flooding of these resources would not cause adverse effects on historical resources within the meaning of CEQA or historic properties under Section 106. Further, these resources have been subject to potential past impacts. This potential impact is considered **less than significant**. ***(Similar)***

Proposed Action and Levee Raise-in-Place Alternative

Previous investigations, as well as the SAFCA project efforts in 2007 and 2008, identified a number of historic-era structures and debris scatters. The following historic-era resources are located within the footprint of the Phase 3 Project **(**see **Table 4.10-1**), under both the Proposed Action and the Levee Raise-in-Place Alternative: NLIP-23, NLIP-24, CA-Sac-487-H, CA-Sac-486-H, CA-Sac-836-H, CA-Sac-489H, NLIP-2, CA-Sac-488H, CA-Sac-484-H, and CA-Sac-483H. Construction-related activities could alter these sites, including the planned demolition of the historic structures NLIP-23 and NLIP-24Although they date to the historic era, these resources all appear to lack association with important historic themes, stylistic values, and data potential. Because these resources lack

significance that might make them eligible for listing on the NRHP or the CRHR, they are recommended ineligible for listing on both registers. USACE and SHPO have concurred in this recommendation for the majority of these resources. Concurrence for NLIP-23 and NLIP-24 is pending; therefore, no further management is anticipated to be required. This impact is considered **less than significant**. ***(Similar)***

Mitigation Measure: No mitigation is required.

Impact 4.10-c: Potential Damage or Disturbance to Known Prehistoric Resources from Ground-Disturbance or Other Construction-Related Activities

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to directly damage or destroy any known prehistoric resources along the Natomas perimeter levee system as part of this project. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Substantial flooding could result in inundation, or scour at the location of a levee break, of known subsurface prehistoric resources. Before construction of the levee system, these resources were subject to the effects of periodic flooding over several centuries and are unlikely to be adversely affected by additional episodes of inundation. Should a levee break occur at the location of a prehistoric resource site, the resource would likely be obliterated by the scourhole (potentially 1,000 feet wide and 80 feet deep) that would be created by the levee break. The magnitude of the impacts would depend upon the location of the levee breach, severity of the storm, and river flows at the time. Therefore, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Construction of levee improvements may affect several prehistoric sites in the Phase 3 Project footprint (see **Table 4.10-1**) under both the Proposed Action and the Levee Raise-in-Place Alternative: NLIP-21, NLIP-18, NLIP-12, NLIP-13, NLIP-16, NLIP-17, NLIP-14, CA-Sac-485/H, NLIP-19, NLIP 15, NLIP-26, and NLIP-20. Some of these sites have mortuary components as indicated above in **Table 4.10-1**. The remaining resources require evaluation to determine if they are eligible for the NRHP. While CA-Sac-485/H has not been formally evaluated in an inventory report, it is a large habitation site with a mortuary component. It is anticipated that it will be recommended eligible for listing on the NRHP and CRHR. The evaluation of eligibility and determination of effects on all eligible and listed sites will be made in consultation with USACE and the SHPO. The sites that require evaluation may be significant both for their data potential, and their importance to local Native American groups, and may have the integrity to convey this significance. Such resources would be eligible for listing on the CRHR and the NRHP. It is possible that ground-disturbing work associated with the Phase 3 Project may, absent mitigation or treatment, result in significant impacts on both listed and eligible resources. Significant impacts may occur by conducting ground-disturbing construction that diminishes the data these resources contain, or disturbing interred human skeletal remains and associated grave goods, under both the Proposed Action and the Levee Raise-in-Place Alternative. This impact is considered **potentially significant**. ***(Similar)***

Mitigation Measure 4.10-c: Avoid Ground Disturbance Near Eligible and Listed Resources to the Extent Feasible, Prepare a Finding of Effect, and Resolve Any Adverse Effects through Preparation of an HPTP

Proposed Action and Levee Raise-in-Place Alternative

Under either the Proposed Action or the Levee Raise-in-Place Alternative, SAFCA shall implement the following measures.

- Complete an evaluation of identified resources, and determine the effect of each phase of work on all eligible or listed resources in accordance with Stipulation IV(A) of the PA.
- Consult with USACE, the SHPO, and other consulting parties such as Native American individuals and organizations, to develop appropriate treatment or mitigation in an HPTP, per Stipulation V(A) of the PA if the project would result in adverse effects on eligible resources.
- Document the site and avoid further effects by protecting the resource through capping per management under an HPTP or other avoidance measures where feasible. Where physical impacts cannot be avoided and such physical impacts could damage the data these sites contain, including mortuary components, further mitigation may required. Such mitigation may consist of data recovery excavations to retrieve those values and mortuary assemblages that contain significance for archaeology after consultation with and the agreement of the Native American most likely descendent (MLD) tribe.
- Monitor all construction in the vicinity of documented resources, as required under the Construction Monitoring and Inadvertent Discovery Plan.

Project implementation involves ground-disturbing work that both covers large areas of land, and includes deep excavation within the existing and new levee footprint to provide necessary repairs to the flood damage reduction infrastructure in the Basin. Flood damage reduction measures that only involve capping of sites with minimization of vibratory and compaction impacts may reduce significant impacts to less-than-significant levels. The complex and stratified geomorphology of the Basin as well as the magnitude of the construction are such that implementation of all treatment and mitigation may not fully reduce all impacts to known prehistoric resources under either the Proposed Action or the Levee Raise-in-Place Alternative to a less-than-significant level. For example, identified sites may have buried components that cannot be adequately documented prior to intrusive work. Therefore, these impacts would remain **significant and unavoidable**. ***(Similar)***

Impact 4.10-d: Potential Damage to or Destruction of Previously Undiscovered Cultural Resources from Ground-Disturbance or Other Construction-Related Activities

No-Action Alternative

No Project Construction

Under the No-Action Alterative, no construction activities would occur; therefore, no potential exists for the project to directly damage or destroy previously undiscovered cultural resources. There would be **no impact.** ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Substantial flooding could occur and result in inundation, or scour at the location of a levee break, of unknown subsurface prehistoric resources. However, before construction of the levee system, these resources would have

been subject to the effects of periodic flooding over several centuries and are unlikely to be significantly adversely affected by additional episodes of inundation. However, should a levee break occur at the location of a previously unidentified and significant prehistoric resource site, the resource would likely be obliterated by the scourhole (potentially 1,000 feet wide and 80 feet deep) that would be created by the levee break. The magnitude of the impacts would depend upon the location of the levee breach, severity of the storm, and river flows at the time. Therefore, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Sacramento Valley floodplains and riverbanks were extensively occupied and used by prehistoric populations. Prehistoric occupation sites frequently took the form of mounds constructed above the natural ground surface by prehistoric human populations, but the upper portions of many of these sites have been destroyed by modern agricultural cultivation and leveling of fields, and the remains of these sites are thus no longer easily visible above ground. Additionally, intermittent flooding deposited layers of alluvium over prehistoric deposits, leaving these resources intact below grade with no surface manifestations. These conditions may obscure both prehistoric and historic archaeological deposits.

Because technical work necessary to identify all resources in the Phase 3 Project and overall NLIP footprint is ongoing, significant resources may be identified after certification of this EIS/EIR that would be adversely affected by construction-related activities. Furthermore because of the scale of the Phase 3 Project and the lack of complete rights of entry to all parcels within the footprint, it is anticipated that additional resources may be identified after completion of this EIS/EIR, as well as subsequent NEPA/CEQA documents for future project phases. It is possible that impacts on yet unidentified resources cannot be avoided through changes in project design or configuration of borrow sites identified in **Table 2-2**. This impact is considered **potentially significant**. ***(Similar)***

Where cultural resources are buried below sterile soils or truncated with no surface manifestation, discovery prior to construction or other ground-disturbing activities is not always possible. Furthermore, proposed improvements such as cutoff walls would occur under the footprint of the existing Sacramento River east levee. The levee would only be degraded prior to construction thus there are few feasible methods of conducting a cultural resources inventory within the footprint of these activities. Degrading the levee prior to construction for cultural resource investigations would not be feasible because it would require demolishing the levee for cultural investigations during the summer in advance of construction, and rebuilding the levee for the flood season, at substantial expense and project delay.

Excavation, grading, and other ground-disturbing activities required during construction of improvements and excavation of borrow from sites identified in **Table 2-2** could encounter and damage previously unknown cultural resources that may be eligible for listing on the NRHP, CRHR, or both, under both the Proposed Action and the Levee Raise-in-Place Alternative. This impact is considered **potentially significant**. ***(Similar)***

Mitigation Measure 4.10-d: Train Construction Workers Before Construction, Monitor Construction Activities, Stop Potentially Damaging Activities, Evaluate Discovery(ies), Resolve Adverse Effects on Eligible Resources, if Encountered, and Conduct Additional Backhoe and Canine Forensic Investigations as Appropriate

Proposed Action and Levee Raise-in-Place Alternative

Under either the Proposed Action or the Levee Raise-in-Place Alternative, SAFCA shall implement the following measures.

- SAFCA shall complete surveys to identify cultural resources in the Phase 3 Project footprint, as identified in the 2007 Landside EIR (p. 3.8-31) at the program level.

- Mitigation Measure 3.4-d from the supplemental environmental impact report (SEIR) prepared for the Phase 2 Project is copied below and shall be implemented, as appropriate within the footprint of the Proposed Action (SAFCA 2008: 3.4-10).

  Mitigation Measure 3.4-d: Conduct Additional Backhoe and Canine Forensic Investigations As Appropriate

  To increase the data set for identifying buried sites under the existing levee, SAFCA shall recommend that the following additional mitigation measures be adopted by USACE during Section 106 consultation:

  - Additional inventory should be conducted at appropriate intervals along the Sacramento River east levee for the Phase 2 Project, using a backhoe excavator, to increase the sample of information at depths below six feet, which cannot be reached with conventional shovel test methods.

  - Where this process or additional inventory efforts reveal other resources, SAFCA recommends the use of canine forensic investigations as a way of identifying interred human remains with minimal disturbance, and for further refinement of and understanding of the constituents of identified resources.

- Before construction begins, a qualified professional archaeologist retained by SAFCA shall give a presentation and training session to all construction personnel so that they can assist with identification of undiscovered cultural resource materials and avoid them where possible.

- A qualified archaeologist and a Native American monitor where appropriate, retained by SAFCA, shall monitor all ground-disturbing construction activities along the Sacramento River east levee and at other locations determined by the archaeologist to be sensitive for subsurface cultural resource deposits. If a previously unidentified archaeological resource is uncovered during construction, construction activities shall be halted in the vicinity of the find and the construction contractor, SAFCA, USACE, and other appropriate parties shall be notified regarding the discovery. Where construction would consist of cutoff walls excavated in a bentonite slurry, SAFCA and USACE anticipate that it will not be possible to identify the precise location of any materials found in spoils or at soil mixing stations, thus construction cannot stop during excavation of cutoff walls if resources are discovered in spoils.

- SAFCA shall then consult with USACE and the SHPO to determine the eligibility of the resource. If SAFCA and USACE, in consultation with the SHPO, concur that the resource is eligible and the project may result in adverse effects on the resource, SAFCA shall prepare and implement an HPTP as required under the PA, Stipulation V(A). The HPTP shall be prepared in consultation with USACE, the SHPO, and other appropriate consulting parties such as Native American individuals or organizations.

- Work may only resume when either all necessary treatment has been performed under the HPTP, or construction in the vicinity will not result in adverse effects, and that work does not encroach within 30 meters of the known boundaries of the resource, or the boundaries designated by the SHPO, per the PA, Stipulation V(B)(2). All treatment stipulated in the HPTP shall be performed by SAFCA, in consultation with USACE.

It may be possible to avoid resources or recover and preserve them through measures stipulated in an HPTP.

However, as with all ground-disturbing construction impacts, there is always the possibility of disturbing and adversely affecting resources before they can be discovered and appropriately protected. There is also the possibility that design constraints for proposed improvements and borrow sites will preclude the ability of SAFCA and USACE to avoid impacts on significant resources identified during inventory efforts. Therefore, implementation of these mitigation measures may not fully reduce all impacts under the Proposed Action, or the Levee Raise-in-Place Alternative, or under the NLIP to a less-than-significant level. Thus, this impact would remain **significant and unavoidable**. ***(Similar)***

Impact 4.10-e: Potential Discovery of Human Remains during Construction

No-Action Alternative

No Project Construction

Under the No-Action Alterative, no construction activities would occur; therefore, no potential exists for the project to result in the discovery of human remains. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Substantial flooding could occur and result in inundation, or scour at the location of a levee break, of unknown human remains. However, before construction of the levee system, these resources would have been subject to the effects of periodic flooding over several centuries. Should a levee break occur at the location of the prehistoric resource site, any interred and previously unidentified burials would be obliterated by the scourhole (potentially 1,000 feet wide and 80 feet deep) that would be created by the levee break. However, a precise determination of significance is not possible and cannot be made because it is unknown where such an event would occur and whether any resources would be affected. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Prehistoric human remains have been found at several prehistoric sites in the project area. Previously unknown buried human remains may be unearthed, damaged, or destroyed during excavation activities associated with project construction and excavation of borrow from the sites identified in **Table 2-2**. This impact was previously analyzed by SAFCA in the 2007 Landside EIR, which is hereby incorporated by reference, as Impact 3.8-e (DEIR, p. 3.8-32). Mitigation Measure 3.8-e was adopted by the SAFCA Board of Directors and incorporated into the project, and the significance conclusion is unchanged under CEQA. USACE concludes that the possibility exists of inadvertently disturbing interred human remains under both the Proposed Action and the Levee Raise-in-Place Alternative. In particular, the Proposed Action has a high risk of impacting previously undiscovered human remains because of the nature of the construction methods and procedures involved in the levee improvements. Under the Proposed Action, the existing stability berm along the land side of the levee would be removed and an earthen platform would be constructed to serve as the working area for construction of the cutoff wall. The existing level of flood protection would be reduced temporarily by removal of the stability berm and the levee would need to be reconstructed to at least the same level of flood protection for the following flood season. Under the Levee Raise-in-Place Alternative, deep cutoff walls would be constructed through the levee crown, and penetrate strata that are underneath the existing levee prism.

Because there is no feasible way to conduct cultural resource investigations in advance of cutoff wall construction, there is no way to completely investigate the exact footprint of the deep cutoff wall for human remains and other cultural features. In areas where seepage berms are proposed, the excavation of the inspection trench that would be constructed prior to placement of the berm could not be accomplished without prior removal

of the existing stability berm. This excavation could not be conducted during the flood season because the open trench would aggravate existing underseepage concerns. This impact is considered **potentially significant**. ***(Similar)***

Mitigation Measure 4.10-e: Stop Work Within An Appropriate Radius Around the Find, Notify the Applicable County Coroner and Most Likely Descendant, and Treat Remains in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, SAFCA, and the SHPO

Proposed Action and Levee Raise-in-Place Alternative

If human remains are uncovered during ground-disturbing activities, under either the Proposed Action or the Levee Raise-in-Place Alternative, all ground-disturbing activities shall cease within the vicinity of the find, if known. If the discovery occurs in spoils removed from construction of cutoff walls, the remains will be treated in accordance with state law. However, because cutoff walls are constructed at great depth within a slurry of soil and bentonite, SAFCA and USACE anticipate that it will not be possible to pinpoint the location of human remains that may be disinterred during construction of these features, it will not be feasible or useful to stop construction. Discovered remains removed from cutoff wall spoils will be treated per state law, as follows. SAFCA's archaeological monitors and/or the contractor shall notify the relevant county coroner and a SAFCA-retained senior archaeologist skilled in osteological analysis to determine the nature of the remains. If the coroner determines that the remains are those of a Native American, he or she must contact the NAHC by phone within 24 hours of making that determination (Health and Safety Code Section 7050[c]). The NAHC will designate an MLD who may decide how to reinter the remains with appropriate dignity in an appropriate location.

Prehistoric remains are usually found in the context of an archaeological site. The treatment of any associated site shall be resolved per Mitigation Measure 4.10-d(1), in consultation with the MLD, as required under the PA. It is unlikely, but also possible, that ground-disturbing work may disinter human remains associated with an historic burial, not subject to the jurisdiction of the NAHC. Such a resource shall be treated as an archaeological discovery per Mitigation Measure 4.10-d(1).

The implementation of Mitigation Measure 3.4-d from the SEIR, described under Mitigation Measure 4.10-d, above, will increase the probability of identifying interred remains prior to construction; however, it is possible that despite monitoring of construction and implementation of this mitigation measure, ground-disturbing work would disinter and damage human remains, under either the Proposed Action or the Levee Raise-in-Place Alternative. Therefore, implementation of this mitigation measure may not fully reduce the impact to potential interred human remains under the Proposed Action or the Levee Raise-in-Place Alternative to a less-than-significant level. Thus, this impact would remain **significant and unavoidable**. ***(Similar)***

4.10.4 RESIDUAL SIGNIFICANT IMPACTS

Under the No-Action Alternative, the significance determinations for potential impacts to known and undiscovered prehistoric resources and to undiscovered human remains due to levee failure are uncertain. Because of this uncertainty these impacts are considered too speculative for meaningful consideration. Additionally, mitigation measures cannot be required for the No-Action Alternative; therefore impacts that result from the No-Action Alternative would not be mitigated.

As described under Mitigation Measures 4.10-c, 4.10-d, and 4.10-e, potential construction impacts on known prehistoric resources, previously unidentified cultural resources, and interred human remains are potentially significant and unavoidable under the Proposed Action and the Levee Raise-in-Place Alternative, despite the

implementation of all feasible mitigation measures, because there is a potential that resources could still be adversely affected. Therefore, significant and unavoidable impacts would likely remain even with implementation of the recommended mitigation measures.

4.11 PALEONTOLOGICAL RESOURCES

4.11.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

Paleontological resources (fossils) are the remains or traces of prehistoric animals and plants that are 10,000 years old or older. This section assesses the potential for earthmoving activities associated with the Proposed Action and alternatives under consideration to affect scientifically important fossil remains. **Plate 21** shows the geologic formations in the project area.

4.11.1.1 METHODOLOGY

The potential paleontological importance of the project area can be assessed by identifying the paleontological importance of exposed rock units within the project site. Because the aerial distribution of a rock unit can be easily delineated on a topographic map, this method is conducive to delineating parts of the project area that are of higher and lower sensitivity for paleontological resources and to delineating parts of the project area that may require monitoring during construction.

A paleontologically important rock unit is one that (1) has a high potential paleontological productivity rating and (2) is known to have produced unique, scientifically important fossils. The potential paleontological productivity rating of a rock unit exposed in the project area refers to the abundance/densities of fossil specimens and/or previously recorded fossil sites in exposures of the unit in and near the project area. Exposures of a specific rock unit at the project site are most likely to yield fossil remains representing particular species in quantities or densities similar to those previously recorded from the unit in and near the project area.

The following tasks were completed to establish the paleontological importance of each rock unit exposed at or near the project area:

- the potential paleontological productivity of each rock unit was assessed, based on the density of fossil remains previously documented within the rock unit; and
- the potential for a rock unit exposed in the project area to contain a unique paleontological resource was considered.

In its standard guidelines for assessment and mitigation of adverse impacts on paleontological resources, the Society of Vertebrate Paleontology (SVP) (1995) established three categories of sensitivity for paleontological resources: high, low, and undetermined. Areas where fossils have been previously found are considered to have a high sensitivity and a high potential to produce fossils. Areas that are not sedimentary in origin and that have not been known to produce fossils in the past typically are considered to have low sensitivity. Areas that have not had any previous paleontological resource surveys or fossil finds are considered to be of undetermined sensitivity until surveys and mapping are performed to determine their sensitivity. After reconnaissance surveys, observation of exposed cuts, and possibly subsurface testing, a qualified paleontologist can determine whether the area should be categorized as having high or low sensitivity. In keeping with the significance criteria of the SVP (1995), all vertebrate fossils are generally categorized as being of potentially significant scientific value.

4.11.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to paleontological resources if they would do any of the following:

- directly or indirectly destroy a unique paleontological resource or site.

For the purposes of this analysis, an individual vertebrate fossil specimen may be considered unique or significant if it is identifiable and well preserved, and it meets one of the following criteria:

- a type specimen (i.e., the individual from which a species or subspecies has been described);
- a member of a rare species;
- a species that is part of a diverse assemblage (i.e., a site where more than one fossil has been discovered) wherein other species are also identifiable, and important information regarding life history of individuals can be drawn;
- a skeletal element different from, or a specimen more complete than, those now available for its species; or
- a complete specimen (i.e., all or substantially all of the entire skeleton is present).

For example, identifiable vertebrate marine and terrestrial fossils are generally considered scientifically important because they are relatively rare. The value or importance of different fossil groups varies, depending on the age and depositional environment of the rock unit that contains the fossils, their rarity, the extent to which they have already been identified and documented, and the ability to recover similar materials under more controlled conditions such as part of a research project. Marine invertebrates are generally common, well developed, and well documented. They would generally not be considered a unique paleontological resource.

4.11.2 IMPACTS AND MITIGATION MEASURES

Impact 4.11-a: Disturbance of Unknown Unique Paleontological Resources during Earthmoving Activities

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no excavation activities would occur along the Natomas perimeter levee system or at the proposed borrow sites; therefore, no potential exists for the project to directly disturb any paleontological resources that may be present in those areas. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Because any paleontological resources in the Basin would be relatively deep within the ground and would have existed through numerous past flooding episodes, they would be unlikely to sustain damage in the event of flooding in the absence of improvements to the perimeter levee system. This potential impact is considered **less than significant**. ***(Lesser)***

Proposed Action and Levee Raise-in-Place Alternative

Areas along the Sacramento River east levee, including the Elkhorn Borrow Area, are associated with Holocene-age alluvium. By definition, sediments associated with Holocene-age alluvium are too young to contain paleontologically sensitive resources. Therefore, earthmoving activities in any of these sediments would result in no impacts on paleontological resources.

However, because of the number of recorded fossil sites in the Riverbank and Modesto Formations within the Central Valley, they are both considered paleontologically sensitive rock formations under SVP criteria. The discovery of Pleistocene vertebrate fossil remains in sediments referable to the Riverbank and Modesto

Formations from Sutter and Sacramento Counties, as well as from Davis, Woodland, and numerous other areas throughout the Central Valley, suggests the potential exists for uncovering additional similar fossil remains during construction-related deep excavation within portions of the project area.

Certain construction-related activities in the Riverbank or Modesto Formations, such as enhancing levee embankments or forming berms on top of the existing ground surface, would not cause significant adverse impacts on paleontological resources because Pleistocene-age fossils would not be encountered until approximately 10 feet below the surface. However, excavations deeper than 10 feet (e.g., for borrow excavation, installation of cutoff walls, installation of relief wells) in the Riverbank Formation or the Modesto Formation could encounter and possibly damage unique paleontological resources.

Of the areas potentially excavated as part of the project, all of the PGCC and portions of the south NEMDC, and the Brookfield and Airport north bufferlands borrow sites (and potentially other borrow sites) overlie paleontologically sensitive rock units. A cutoff wall would be constructed through the entire length of the PGCC up to a depth of 80 feet from the existing levee crown. Along the NEMDC, cutoff walls would be constructed to depths of 60–80 feet. Borrow excavation on some properties could be deep enough to encounter fossils, should they be present. Because construction-related activities have the potential to encounter and damage or destroy unique paleontological resources, this impact is considered **potentially significant**. ***(Similar)***

Mitigation Measure 4.11-a: Conduct Construction Personnel Training and, if Paleontological Resources Are Found, Stop Work Near the Find and Implement Mitigation in Coordination with a Professional Paleontologist

Proposed Action and Levee Raise-in-Place Alternative

Before the start of construction and/or borrow activities in the Riverbank Formation or the Modesto Formation, construction personnel involved with earthmoving activities shall be informed by SAFCA of the possibility of encountering fossils, the appearance and types of fossils likely to be seen during construction activities, and the proper notification procedures should fossils be encountered. This worker training may be either (1) prepared and presented by an experienced field archaeologist at the same time as construction worker education on cultural resources, or (2) prepared and presented separately by a qualified paleontologist.

If paleontological resources are discovered during earthmoving activities, the construction crew shall immediately stop work in the vicinity of the find. SAFCA shall retain a qualified paleontologist to evaluate the resource and prepare a mitigation plan in accordance with SVP guidelines (1995). The mitigation plan may include a field survey, construction monitoring, sampling and data recovery procedures, museum storage coordination for any specimen recovered, and a report of findings. Recommendations made by the paleontologist, in consultation with SAFCA, shall be implemented before construction activities can resume at the site where the paleontological resources were discovered.

Implementing this mitigation measure would reduce the impact to unique, scientifically-important paleontological resources discovered during construction or other earthmoving activities to a **less-than-significant** level. ***(Similar)***

4.11.3 RESIDUAL SIGNIFICANT IMPACTS

Under the No-Action Alternative no impacts would occur to paleontological resources. In the event of a levee failure, under the No-Action Alternative impacts would be less than significant.

With implementation of the mitigation measures described in this section, project implementation would not result in any residual significant impacts related to paleontological resources under the Proposed Action and the Levee Raise-in-Place Alternative.

4.12 TRANSPORTATION AND CIRCULATION

4.12.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.12.1.1 METHODOLOGY

This section analyzes the potential impacts of the Proposed Action and alternatives under consideration on traffic circulation and transportation systems and potential impacts related to emergency vehicle access and construction traffic hazards. Impacts on flight safety related to operation of the Airport are addressed in Section 4.19, "Airport Safety."

Because project operation would not generate and increase in vehicle trips, long-term project operation would have no impacts on transportation and circulation. Therefore, this analysis is focused on temporary and short-term construction-related traffic impacts.

Instead of a traffic analysis focused on level of service, which is appropriate for projects that are focused within a specific, discrete area and when the exact project-related traffic routes are known, this analysis for this project uses the traffic analysis methodology from the Institute of Transportation Engineers (ITE) (1989). This methodology is appropriate for this EIS/EIR because the exact traffic routes are not known and construction activities would be dispersed over a wide area. ITE recommends using the following screening criterion for assessing the impacts of development projects that create permanent traffic increases: "In lieu of other locally preferred thresholds, a traffic access/impact study should be conducted whenever a proposed development will generate 100 or more added (new) peak-direction trips to or from the site during the adjacent roadway's peak hours or the development's peak hours." For construction projects that create temporary traffic increases, this criterion is considered conservative by ITE (1989).

4.12.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action and alternatives under consideration were determined to result in a significant impact related to transportation and circulation if they would do any of the following:

- cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system;
- result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;
- substantially increase hazards due to a design feature or incompatible uses;
- result in inadequate emergency access;
- result in inadequate parking capacity; or
- conflict with adopted policies, plans, or programs supporting alternative transportation.

To account for the large percentage of heavy trucks associated with a large construction project, ITE recommends that the threshold level (see Section 4.12.1.1, "Methodology," above) be reduced to 50 or more new peak-direction trips. Consequently, the Proposed Action and alternatives under consideration were determined to result in a significant impact on traffic (i.e., would be considered to cause an increase in traffic that is substantial in

relation to the existing traffic load and capacity of the street system) if the project would result in 50 or more new truck trips during the a.m. or p.m. peak hour.

The project does not involve changes to air traffic patterns or other airport operations that would affect air traffic patterns, and therefore this issue is not discussed further in this EIS/EIR.

All construction-related vehicles (i.e., equipment and worker vehicles) would be parked at construction staging areas, which would be located away from any public roadways. No public parking facilities would be affected by the parking of project-related construction-related equipment and worker vehicles, and therefore this issue is not discussed further in this EIS/EIR.

The project would not permanently eliminate alternative transportation corridors or facilities (e.g., bike paths, lanes, bus turnouts). Temporary, short-term impacts related to use of bicycle paths are addressed in Section 4.15, "Recreation." In addition, the project would not include changes in policies or programs that support alternative transportation. Therefore, the project would not conflict with adopted policies, plans, or programs supporting alternative transportation. These issues are not discussed further in this EIS/EIR.

4.12.2 IMPACTS AND MITIGATION MEASURES

Impact 4.12-a: Temporary Increase in Traffic on Local Roadways

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to adversely affect traffic on local roadways. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Flooding of Natomas Basin roadways—Sacramento and Sutter County roadways, SR 99/70, and Interstates 5 and 80—could be minor to extensive depending on the location and severity of the failure and the duration of flooding. Traffic rerouting could lead to minor to substantial traffic congestion on alternate roadways. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

Project construction would result in a temporary, but substantial, increase in traffic on local roadways. Construction-related traffic would consist of daily commute trips by construction workers and truck trips to haul materials (especially borrow) and supplies from outside the project vicinity, as well as truck trips to haul waste materials off-site for disposal. Section 3.3.12, "Transportation and Circulation," identifies the roadways in the project area (see **Table 3.12-1**) and includes the traffic count and level of service (LOS) data for these roadways, where available. **Plate 10** shows the anticipated haul routes that would be used during construction.

Construction of the Sacramento River east levee improvements and irrigation canal would require borrow from the following locations: the Airport north bufferlands; the Dunmore borrow site; properties near the levee canal work in Reaches 5B, 6A, and 7; South Sutter LLC; and the Pacific Terrace and Novak borrow sites. Hauling from the Pacific Terrace borrow site would likely take place on West Elkhorn Boulevard. The improvements to the Sacramento River east levee would involve haul trucks carrying borrow material to construction areas along

unpaved access roads that would be constructed parallel to the Sacramento River east levee to allow equipment to move up and down the levee during construction. Personnel, equipment, and other imported construction materials would reach the construction areas and Garden Highway via a combination of roadways that may include State Route (SR) 99/70, Elverta Road, Powerline Road, Natomas Road, East Levee Road, Elkhorn Boulevard, Del Paso Road, San Juan Road, El Centro Road, and West El Camino Avenue. Borrow material would be hauled to the PGCC west levee either along the levee toe from the adjacent Brookfield borrow site or from the RD 1001 borrow site via Striplin Road, SR 99/70, and Howsley Road. Personnel, equipment, and other imported construction materials would reach the PGCC west levee mainly via SR 99/70, Howsley Road, and Sankey Road.

In addition to the borrow sites listed above, the Elkhorn Borrow Area (**Plate 10**) has been identified as an area where additional borrow sites could be used, if needed. Roadways nearby that could potentially be used as haul routes include West Elkhorn Boulevard, School House Road, and Walnut Road.

The total of the crew size would reach up to 175 workers. Construction crew members would travel to different project sites from different directions and by way of different sets of roadways and intersections. It is also likely that some ridesharing would take place and that trips would occur before and after peak hours. Therefore, traffic from construction crew commutes is unlikely to substantially affect local roadways, even during the peak a.m. and p.m. hours.

Haul trips for borrow material are anticipated to average 950–1,100 trips per day for the Sacramento River east levee improvements (Reaches 5A–9B) and 100–200 trips per day for the PGCC west levee improvements. Hauling on Elkhorn Boulevard could exceed the ITE threshold during the a.m. or p.m. peak hour for use of the Pacific Terrace borrow site. Construction on the NEMDC west levee would use off-road haul routes from the East Side and Twin Rivers borrow sources.

Implementation of the Proposed Action would result in a substantial increase in traffic on local roadways associated with truck haul trips during construction activities. In addition, temporary, short-term road closures would be required to accommodate construction activities on the levee. Garden Highway at the I-5 Bridge would be closed for approximately 8–12 weeks to allow for cutoff wall construction at that location. These road closures would cause or contribute to temporary substantial increases in traffic levels as traffic is detoured or slowed on some local roadways and SR 99/70. This temporary impact is considered **significant**.

Levee Raise-in-Place Alternative

Under the Levee Raise-in-Place Alternative, construction-related trips would be the same as for all elements described for the Proposed Action, except for haul trips associated with the Sacramento River east levee improvements (off of public roadways). These trips would be approximately 40% lower: 550 haul trips per day under this alterative compared to 950 trips per day under the Proposed Action. However, raising the existing Sacramento River east levee in place would require lane or road closures along portions of Garden Highway for prolonged periods during construction, causing traffic and access delays on local roadways. Closures would affect 1.5 to 2-mile segments of Garden Highway at any one time with the duration of closure for each segment lasting approximately 8–12 weeks to allow for levee degradation, installation of the cutoff wall, reconstruction of the levee, and reconstruction of Garden Highway and connecting roadway intersections. Access to some residences located on the water side of the levee would be temporarily prevented by construction of the cutoff walls, requiring some residents to relocate temporarily for approximately 8 to 12 weeks during construction. Compared to other local roads in the Natomas Basin, Garden Highway is a primary route for residents traveling to and from their homes on the west side of the Basin. The prolonged closures that would be required to raise the levee in place and construct cutoff walls would result in substantial traffic and access delays that, although temporary, would be greater than for the Proposed Action. This impact is considered **significant**. ***(Greater)***

Mitigation Measure 4.12-a: Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips

Proposed Action

Before the start of construction in each construction season, SAFCA and its primary contractors for engineering and construction shall develop a coordinated construction traffic safety and control plan to minimize the simultaneous use of roadways by different construction contractors for material hauling and equipment delivery to the extent feasible and to avoid and minimize potential traffic hazards on local roadways during construction. Upon selection of borrow sites within the Elkhorn Borrow Area, the traffic safety and control plan shall reflect affected roadways. Items (a) through (e) of this mitigation measure, as listed below shall be integrated as terms of the construction contracts.

(a) The plan shall outline phasing of activities and the use of multiple routes to and from off-site locations to minimize the daily amount of traffic on individual roadways. SAFCA shall ensure that the construction contractors enforce the plans throughout the construction periods.

(b) The construction contractors shall develop traffic safety and control plans for the local roadways that would be affected by construction traffic. Before the initiation of construction-related activity involving high volumes of traffic, the plan shall be submitted for review by Caltrans and the agencies of the local jurisdictions (Sutter County, Sacramento County, and/or City of Sacramento) having responsibility for roadway safety at and between project sites. The plan shall call for the following elements:

- posting warnings about the potential presence of slow-moving vehicles;
- using traffic control personnel when appropriate; and
- placing and maintaining barriers and installing traffic control devices necessary for safety, as specified in Caltrans's *Manual of Traffic Controls for Construction and Maintenance Works Zones* and in accordance with city/county requirements.

The contractor shall train construction personnel in appropriate safety measures as described in the plan and shall implement the plan. The plan shall include the prescribed locations for staging equipment and parking trucks and vehicles. Provisions shall be made for overnight parking of haul trucks to avoid causing traffic or circulation congestion.

(c) All operations shall limit and expeditiously remove, as necessary, the accumulation of project-generated mud or dirt from adjacent public streets at least once every 24 hours if substantial volumes of soil have been carried onto adjacent paved public roadways during project construction.

(d) Construction of project features along the Sacramento River east levee shall be accommodated through the creation of temporary haul roads along the landside of the adjacent levee and berm footprint. Garden Highway shall not be used for earthen materials hauling activities.

(e) A Transportation Management Plan shall be prepared and submitted to Caltrans District 3 to cover any points of access from the state highway system for haul trucks and other construction equipment.

(f) Before the start of the first construction season, SAFCA shall coordinate with Sacramento and Sutter Counties to address maintenance and repair of affected roadways resulting from increased truck traffic.

(g) Before project construction begins, SAFCA shall provide notification of project construction to all appropriate emergency service providers in Sutter County, Sacramento County, and/or the City of Sacramento and shall coordinate with providers throughout the construction period to ensure that emergency access through construction areas is maintained.

Implementation of this mitigation measure would reduce the level of impact, but not to a less-than-significant level. However, given the high amount of hauling required for the Proposed Project and the Levee Raise-in-Place Alternative, and the limited number of roadways in the project vicinity that would be suitable for hauling between borrow sites and project construction sites, it is possible that the volume of traffic during some periods may still exceed ITE thresholds despite the implementation of this measure. Because no other feasible mitigation measures are available to fully reduce this impact to a less-than-significant level, this impact would remain **significant and unavoidable**.

Levee Raise-in-Place Alternative

The same mitigation described above for the Proposed Action would also apply to the Levee Raise-in-Place Alternative. Despite mitigation implementation, however, impacts under the Levee Raise-in-Place Alternative would be temporarily **significant and unavoidable** due to the requirements for temporary closure of 1.5- to 2-mile segments of Garden Highway (for approximately 8 to 12 weeks in each segment) needed to accommodate the construction of cutoff walls. ***(Greater)***

Impact 4.12-b: Temporary Increase in Traffic Hazards on Local Roadways

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to temporarily increase traffic hazards. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. If any part of the levee system were to fail, flooding of Natomas Basin roadways—Sacramento and Sutter County roadways, SR 99/70, and Interstates 5 and 80—could be minor to extensive depending on the location and severity of the failure and the duration of flooding and associated traffic hazards could be minor to severe. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered to **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

During project construction along the Sacramento River east levee (Reaches 5A–9B), two public roadways—West Elverta Road and West Elkhorn Boulevard—and intersections of farm roads with Garden Highway would be reconstructed across the adjacent setback levee to Garden Highway. As described under Impact 4.12-a, high volumes of slow-moving truck traffic could be associated with the construction activities on some rural roadways.

Pavement sections on the rural Sacramento and Sutter County roadways in the project area were designed to carry low-volume traffic. The high-volume truck traffic during construction would accelerate wear and tear on West Elverta Road between the Dunmore borrow site and the Sacramento River east levee and on West Elkhorn Boulevard between the Pacific Terrace borrow site and the Sacramento River east levee. Similarly, haul routes that would be used to access selected borrow sites within the Elkhorn Borrow Area could potentially affect West Elkhorn Boulevard, School House Road, and/or Walnut Road. Besides shortening the life of pavement sections, high-volume truck traffic could cause road damage, such as cracks and potholes, which could create road hazards for other motorists.

The combination of the high volume of slow-moving truck traffic, potentially tracking mud and debris onto roadways; workers entering and exiting construction sites; periodic road and lane closures associated with levee improvements; and potential damage to pavement would increase traffic hazards on local roadways during the construction period. This impact is considered **significant**.

Levee Raise-in-Place Alternative

Under the Levee Raise-in-Place Alternative, construction-related traffic hazards would be similar to but greater in magnitude than those described above for the Proposed Action. Construction of the Levee Raise-in-Place Alternative would include raising the existing Sacramento River east levee in place in Reaches 5A–9B, which would require closure of Garden Highway for prolonged periods during construction, causing traffic and access delays on local roadways. Additionally, the Garden Highway intersections at West Elverta Road and West Elkhorn Boulevard would be reconstructed to match the elevated profile of the raised existing levee.

Construction workers entering and exiting construction areas at the beginning and end of work shift could also increase traffic hazards. In addition, trucks and other vehicles could track mud and gravel onto the local roadways, potentially posing driving hazards.

Under the Levee Raise-in-Place Alternative, the high-volume truck traffic during construction would accelerate wear and tear on West Elverta Road between the Dunmore borrow site and the Sacramento River east levee and on West Elkhorn Boulevard between the Pacific Terrace borrow site and the Sacramento River east levee, including the Elkhorn Borrow Area. Besides shortening the life of pavement sections, high-volume truck traffic could cause road damage such as cracks and potholes, which could create road hazards for other motorists.

The potential increase in traffic hazards under the Levee Raise-in-Place Alternative is considered a **significant** impact. ***(Similar)***

Mitigation Measure 4.12-b: Implement Mitigation Measure 4.12-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips"

Proposed Action and Levee Raise-in-Place Alternative

SAFCA and its primary contractors for engineering design and construction shall implement Mitigation Measure 4.12-a, above.

Implementing this mitigation measure would reduce the impact to a **less-than-significant** level because a traffic safety plan would be prepared and SAFCA would coordinate with the construction contractors and local and regional agencies regarding the distribution of traffic along haul routes and establishing alternative traffic routes. ***(Similar)***

Impact 4.12-c: Temporary Disruption of Emergency Service Response Times and Access

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to directly disturb emergency service response times and access. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure along the NCC, the PGCC, or the Sacramento River east levee could result in minor to substantial flooding of the Natomas Basin, including the Airport, Interstates 5 and 80, and SR 99/70, as well as local roadways, which would result in a minor to substantial disruption of emergency service and response times. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related effect on traffic and circulation and emergency service response cannot be estimated. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered to **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

Implementation of the Proposed Action could result in delays in emergency service response times because of the difficulty of emergency vehicles needing to pass through or near construction areas as discussed under Impacts 4.12-a and 4.12-b, above.

The Proposed Action would result in increased traffic on local roadways associated with construction trips. In addition, temporary road closures associated with levee improvements could cause or contribute to temporary increases in traffic levels as traffic is detoured or slowed on some local roadways and SR 99/70. Increased traffic congestion could interfere with the use of main roadways for emergency evacuation routes. Garden Highway is the primary access for homes and businesses located on the water side of the levee. Temporary construction closures, including an approximately 8–12-week closure of Garden Highway at the I-5 Bridge, would interfere with emergency access to these residences and businesses (see also Section 4.2, “Land Use, Socioeconomics, and Population and Housing”). Because the Proposed Action could result in delays in emergency service response times, this impact is considered **potentially significant**.

Levee Raise-in-Place Alternative

As with the Proposed Action, the Levee Raise-in-Place Alternative would result in increased traffic on local roadways due to construction trips and traffic detours. Additionally, this alternative would require long-term closure of Garden Highway to accommodate construction of cutoff walls in the existing levee. Closures would affect 1.5- to 2-mile segments of Garden Highway at any one time with the duration of closure for each segment lasting approximately 8 to 12 weeks to allow for levee degradation, installation of the cutoff wall, reconstruction of the levee, and reconstruction of Garden Highway and connecting roadway intersections. This would eliminate landside access to residences and businesses along Garden Highway in these sections; therefore, emergency access to residences and businesses would be severely limited during construction in this area (see also Section 4.1, “Land Use, Socioeconomics, and Population and Housing”). Because the Levee Raise-in-Place Alternative could restrict emergency service response in the project area, this impact is considered **potentially significant**. ***(Greater)***

Mitigation Measure 4.12-c: Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers

Proposed Action

SAFCA and its primary contractors for engineering design and construction shall implement Mitigation Measure 4.12-a, above.

Implementing this mitigation measure would reduce the temporary impact on emergency service response times and access to a **less-than-significant** level because before project construction begins, SAFCA would provide notification of project construction to all appropriate emergency service providers in Sutter County, Sacramento County, and/or the City of Sacramento and would coordinate with providers throughout the construction period to ensure that emergency access through construction areas is maintained.

Levee Raise-in-Place Alternative

SAFCA and its primary contractors for engineering design and construction shall implement Mitigation Measure 4.12-a, above. Despite implementing this mitigation measure, the temporary impact on emergency service response time and access would be **significant and unavoidable** under the Levee Raise-in-Place Alternative due to the requirements for road closures of 1.5 to 2-mile segments of Garden Highway (for approximately 8–12 weeks in each segment) needed to accommodate construction of cutoff walls. ***(Greater)***

4.12.3 RESIDUAL SIGNIFICANT IMPACTS

Under the No-Action Alternative, impacts due to disruption of traffic circulation, traffic hazards, and emergency service response times and access in the event of levee failure are uncertain. Because of this uncertainty, this potential impact is considered too speculative for meaningful consideration. Additionally, mitigation measures cannot be required for the No-Action Alternative; therefore impacts that result from the No-Action Alternative would not be mitigated.

Implementation of Mitigation Measure 4.12-a under the Proposed Action and Levee Raise-in-Place Alternative would not reduce the temporary increase in traffic levels from haul trucks during construction to a less-than-significant level; therefore, a residual significant impact would occur. While impacts related to the temporary disruption of emergency service response times and access would be reduced to a less-than-significant level under the Proposed Action, this impact would remain significant and unavoidable on a short-term basis for the Levee Raise-in-Place Alternative as a result of the closures of 1.5- to 2-mile segments of Garden Highway for approximately 8 to 12 weeks in each segment.

4.13 AIR QUALITY

4.13.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.13.1.1 METHODOLOGY

Almost all increased pollutant emissions that would be associated with the proposed levee improvements would be generated by construction-related activities. Construction emissions are described as "short-term" or temporary in duration. These temporary and short-term emissions, especially emissions of criteria air pollutants (i.e., respirable particulate matter less than 10 microns in diameter [PM_{10}]) and ozone precursors (e.g., reactive organic gases [ROG] and oxides of nitrogen [NO_X]), have the potential to represent a significant air quality impact.

Fugitive dust emissions are associated primarily with site preparation and excavation and vary as a function of such parameters as soil silt content, soil moisture, wind speed, acreage of disturbance area, and vehicle miles traveled on-site and off-site. Emissions of ROG and NO_X are associated primarily with gas and diesel equipment and asphalt paving.

The method of analysis for temporary, short-term construction-long-term operation-related (regional); local mobile-source; and toxic air contaminant (TAC) emissions is consistent with the recommendations of the Sacramento Metropolitan Air Quality Management District (SMAQMD) and the Feather River Air Quality Management District (FRAQMD).

4.13.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to air quality if they would do any of the following:

- conflict with or obstruct implementation of the applicable air quality plan,
- violate any air quality standard or contribute substantially to an existing or projected air quality violation,
- result in a cumulatively considerable net increase of a criteria air pollutant for which the project region is nonattainment under any applicable Federal or state ambient air quality standards (including releasing emissions that exceed quantitative thresholds for ozone precursors),
- result in exposure of sensitive receptors to substantial concentrations of toxic air emissions or criteria air pollutants, or
- create objectionable odors affecting a substantial number of people.

As stated in Appendix G of the State CEQA Guidelines, the significance criteria established by the applicable air quality management districts or air pollution control district may be relied upon to make the above determinations. Thus, the appropriate district-recommended emission thresholds as published in their respective CEQA guidance documents also applies to individual projects under their jurisdiction. For portions of the project that would occur in Sacramento County, based on SMAQMD's *Guide to Air Quality Assessment in Sacramento County* (SMAQMD 2004), an air quality impact was considered significant if implementation of the Proposed Action or alternatives under consideration would do any of the following:

- generate construction-related emissions of criteria air pollutants or precursors that exceed the SMAQMD-recommended threshold of 85 pounds per day (lb/day) for NO_X, or result in or substantially contribute (at a level equal to or greater than 5%) to emissions concentrations that exceed the national ambient air quality standards (NAAQS) or California ambient air quality standards (CAAQS) (e.g., 50 micrograms per cubic meter [$\mu g/m^3$] and 2.5 $\mu g/m^3$, respectively, for PM_{10}); or

- generate long-term regional criteria air pollutant or precursor emissions that exceed the SMAQMD-recommended threshold of 65 lb/day for ROG and NO_X, or result in or substantially contribute (at a level equal to or greater than 5%) to emissions concentrations that exceed the NAAQS or CAAQS (e.g., 50 $\mu g/m^3$ and 2.5 $\mu g/m^3$, respectively, for PM_{10}).

For levee improvements conducted in Sutter County, the FRAQMD *Indirect Source Review Guidelines* and CEQA planning guidance (FRAQMD 1998, 2007) provide recommended thresholds of significance for project-generated emissions of ozone precursors and PM_{10}. An air quality impact was considered significant if implementation of the Proposed Action or alternatives under consideration would result in project construction emissions that exceed:

- 25 lb/day of ROG,
- 25 lb/day of NO_X, or
- 80 lb/day of PM_{10}.

Project construction would conflict with applicable air quality planning efforts as specified under the Clean Air Act, and a conformity determination would be needed, if the following emissions thresholds were exceeded:

- For construction-related emissions in Sacramento County:
  - 25 tons per year (TPY) of ROG,
  - 25 TPY of NO_X, or
  - 100 TPY of PM_{10}.

- For construction-related emissions in Sutter County:
  - 25 TPY of ROG, or
  - 25 TPY of NO_X.

Project implementation would not result in any major sources of odor, and the project would not involve operation of any of the common types of facilities that are known to produce odors (e.g., landfill, coffee roaster, wastewater treatment facility). Diesel exhaust, which is sometimes considered an objectionable odor source, would be associated with the use of on-site construction equipment, but it would be intermittent and temporary and would dissipate rapidly from the source with an increase in distance. Thus, project implementation would not expose sensitive receptors to odorous emissions, and this issue is not discussed further in this EIS/EIR.

4.13.2 IMPACTS AND MITIGATION MEASURES

Impact 4.13-a: Temporary Emissions of ROG, NO_X, and PM_{10} during Construction

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for project-related construction emissions. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Cleanup actions in the event of levee failure would likely require the use of construction equipment that would emit air quality pollutants. The amount and types of pollutants cannot be predicted and would depend on the magnitude of cleanup operations. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered to **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

The Proposed Action would result in the temporary generation of ROG, NO_X, and PM_{10} emissions from excavation, material handling, vegetation clearing, grading, cut-fill, concrete placement, asphalt paving, motor vehicle exhaust associated with construction equipment, construction employee commute trips, material transport (especially on unpaved surfaces), and other construction activities associated with construction in Reaches 5A–9B of the Sacramento River east levee, the PGCC, and the NEMDC from Elkhorn Boulevard to Northgate Boulevard, in addition to the canal work south of Elkhorn Reservoir.

To ensure that worst case air quality impacts were captured, emissions were estimated assuming that all of the Phase 3 Project is constructed in 2009 (simultaneous with construction of the Phase 2 Project, evaluated in previous CEQA/NEPA certified/approved documents), which includes the NCC south levee, Reaches 1–4B of the Sacramento River east levee, and canal work. It should be noted that emissions are estimated within the air districts that regulate them.

Improvements to Reaches 1–3 and the majority of Reach 4A of the Sacramento River east levee portion of the project would also be located in Sutter County, and under FRAQMD's jurisdiction. Improvements to a portion of Reach 4A and all of Reaches 4B–9 would be located in Sacramento County and under the jurisdiction of SMAQMD. Various sources of soil borrow material within Sacramento and Sutter Counties would be used for levee and canal improvements over the course of the Phase 3 Project.

The PGCC and NCC sites would also be constructed in Sutter County under FRAQMD's jurisdiction. Improvement of the NCC south levee (located entirely within Sutter County and under FRAQMD's jurisdiction) would involve cutoff wall construction and levee raise work that would occur during the construction season (April through November).

Construction of the NEMDC, the new GGS/Drainage Canal, and the relocated Elkhorn Canal between the North Drainage Canal and Elkhorn Reservoir would occur in Sacramento County under the jurisdiction of SMAQMD.

Borrow sites for both phases are located in both jurisdictions. The Brookfield and Sutter Pointe borrow sites are located in Sutter County (FRAQMD's jurisdiction). The Brookfield borrow site, in Sutter County, is the assumed source of soil borrow material for improvements to the NCC and the PGCC. The Airport north bufferlands borrow sites in Reaches 5B, 6A, and 7; South Sutter LLC; Pacific Terrace; and Dunmore borrow sites are located in Sacramento County (SMAQMD jurisdiction). All other potential Phase 3 Project borrow sites are located in Sacramento County, including the Elkhorn Borrow Area (**Plate 10**).

For modeling purposes, it was assumed that borrow material would be transported an average of approximately 6 miles round trip on 50% paved and 50% unpaved haul routes.

Worst-case daily and annual construction emissions were calculated for completion of the 2009 construction season using AP-42 emission factors recommended by the U.S. Environmental Protection Agency (EPA) for fugitive dust, and OFFROAD and EMFAC 2007 emission factors for mobile-equipment, as contained in the Road Construction Emissions Model version 6, as recommended by FRAQMD and SMAQMD. The results of the calculations are shown in **Table 4.13-1**.

Table 4.13-1
Summary of Maximum Daily Emissions during the 2009 Construction Season (Combined Phase 2 and Phase 3 Projects) for the Proposed Action[1]

	Pollutant		
	ROG	NO_X	PM_{10}
Worst-Case Emissions within Sutter County—FRAQMD Emissions (lb/day)			
Natomas Cross Canal			
Total unmitigated NCC emissions	20	106	184
Sacramento River East Levee			
Total unmitigated Sacramento River east levee emissions—Reaches 1–4A	42	252	3,361
Pleasant Grove Creek Canal			
Total unmitigated PGCC emissions	17	159	341
Total unmitigated emissions (lb/day)	79	517	3,885
FRAQMD Threshold (lb/day)	**25**	**25**	**80**
Significant?	**Yes**	**Yes**	**Yes**
Total mitigated emissions (lb/day)[2]	75	413	971
Significant with Mitigation Incorporated?	**Yes**	**Yes[4]**	**Yes**
Worst-Case Emissions within Sacramento County—SMAQMD Emissions (lb/day)			
Sacramento River East Levee			
Total unmitigated Sacramento River east levee emissions—Reaches 4A–9	58	354	4,714
GGS/Elkhorn Canal Relocation			
Total unmitigated GGS/Elkhorn Canal emissions	9	75	113
Natomas East Main Drainage Canal			
Total unmitigated NEMDC emissions	31	195	306
Total unmitigated emissions (lb/day)	98	623	5,133
SMAQMD Threshold	**–**	**85**	**-[3]**
Significant?	**–**	**Yes**	**Yes[3]**
Total mitigated emissions (lb/day)[2]	93	499	1,283
Significant with Mitigation Incorporated?	–	No[4]	**Yes[3]**

Notes: FRAQMD = Feather River Air Quality Management District; GGS = Giant Garter Snake; lb/day = pounds per day; $\mu g/m^3$ = micrograms per cubic meter; NCC = Natomas Cross Canal; NEMDC = Natomas East Main Drainage Canal; NO_X = oxides of nitrogen; PGCC = Pleasant Grove Creek Canal; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; ROG = reactive organic gases; SMAQMD = Sacramento Metropolitan Air Quality Management District

[1] 2009 construction season refers to improvements to the NCC south levee, Sacramento River east levee Reaches 1-9, Elkhorn Canal and GGS/Drainage Canal between the North Drainage Canal and Elkhorn Reservoir, NEMDC, and PGCC.

[2] Implementation of all recommended standard mitigation measures listed under Mitigation Measure 4.13-a would result in reductions of ROG, NO_X, and PM_{10} emissions by approximately 5%, 20%, 75%–85% for fugitive PM_{10} emissions, and 45% for mobile-source PM_{10} emissions, respectively.

[3] SMAQMD does not have an adopted mass emission-based threshold for PM_{10}.

[4] Payment into SMAQMD's Off-site Construction Mitigation Fee Program to offset NO_X emissions in excess of SMAQMD's significance threshold would reduce impacts for this pollutant in SMAQMD's jurisdiction to a less-than-significant level. Coordination of an emissions reduction agreement with the FRAQMD for calculation and fee payment by SAFCA to FRAQMD prior to project approval would be used to offset an equivalent mass of NO_X emissions in excess of EPA's applicable threshold for general conformity purposes. Successful implementation of this measure would reduce NO_X emissions in FRAQMD's jurisdiction, but not to a less-than-significant level for this impact.

See **Appendix E** of this EIS/EIR for assumptions and modeling results for each activity and subphase.

Source: Calculations performed by EDAW based on data provided by HDR, Wood Rodgers, and Mead & Hunt in 2008

Conservative assumptions were made for construction activities associated with all improvements that would occur under the Phase 3 Project. Therefore, emissions calculations summarized in **Table 4.13-1** represent worst-case daily emissions that could occur associated with construction for the Phase 2 and Phase 3 Projects potentially overlapping during 2009. See **Appendix E** of this EIS/EIR for detailed emission sources and assumptions. Based on the project information presented in **Appendix H**, construction of the Proposed Action in 2009 would result in maximum unmitigated daily emissions in excess of applicable FRAQMD thresholds for ROG, NO_X, and PM_{10} and SMAQMD thresholds for NO_X and PM_{10}. Because of the large size of the project, large extent, and high intensity of construction activities to be conducted concurrently, as well as the existing nonattainment status of the project area, and based on the modeling conducted, it is foreseeable that unmitigated construction-generated emissions could result in or substantially contribute to a violation of air quality standards.

SMAQMD does not have an adopted mass emission-based threshold for $PM_{10.}$ Instead, SMAQMD relies on a concentration-based threshold equivalent to the ambient air quality standard for PM_{10}. If construction activities would result in or substantially contribute to a violation of the standard at or beyond the project boundary, then construction-generated emissions of PM_{10} would be significant. Because of the intensity of earthmoving activities that would be involved during the construction of the Sacramento River east levee improvements, it is likely that a substantial contribution to a violation of the applicable air quality standard would occur. If the proposed construction schedule for the Phase 3 Project were to experience a delay (i.e., construction of part or all of the Phase 3 Project in 2010 instead of in 2009) as a result of permitting issues or other environmental constraints, worst-case daily emissions would be similar to those presented below in **Table 4.13-2**. This is because the nature and intensity of construction activities and the construction equipment fleet would be similar, but would occur during the subsequent calendar year. If construction of the Phase 3 Project were to begin in 2009 and extend into 2010, worst-case daily emissions would be similar to, or slightly less than, those presented in **Table 4.13-2**, because the same extent of construction activities would be spread out over a longer duration, potentially resulting in less intense construction and earth movement on any single active day.

The Proposed Action would result in construction-related emissions that could expose nearby existing sensitive receptors to substantial pollutant concentrations and/or substantially contribute to a violation of an air quality standard. As a result, the Proposed Action would have a direct, adverse effect on air quality. This impact is considered **significant**.

Levee Raise-in-Place Alternative

Worst-case daily and annual construction emissions associated with this alternative would occur during the levee construction phase during which most earthmoving activities would occur. Emissions associated with the Levee Raise-in-Place Alternative were calculated based on the percent difference in earth movement relative to the Proposed Action. As under the Proposed Action, modeling for this alternative was based on the scenario in which construction of both the Phase 2 and Phase 3 Projects would be constructed and completed in 2009. The difference in ROG, NO_X, and PM_{10} emissions are assumed to vary as a function of change in the number of haul trips and in the total amount of borrow material relative to the Proposed Action.

Total unmitigated worst-case emissions under the Levee Raise-in-Place Alternative would be 45% less than those under the Proposed Action for the 2009 construction season. These estimates assume all construction activity would take place in a 6-month construction season. Emissions associated with the Levee Raise-in-Place Alternative would be anticipated to expose nearby existing sensitive receptors to substantial pollutant concentrations and/or substantially contribute to an air quality violation. The Levee Raise-in-Place Alternative would have a direct, adverse impact on air quality. This impact is considered **significant**. ***(Similar)***

Table 4.13-2
Summary of Maximum Daily Emissions during the 2009 Construction Season (Combined Phase 2 and Phase 3 Projects) for the Levee Raise-in-Place Alternative[1]

	Pollutant		
	ROG	NO_X	PM_{10}
Worst-Case Emissions within Sutter County—FRAQMD Emissions (lb/day)			
Total unmitigated emissions (lb/day)	43	284	2,137
FRAQMD Threshold (lb/day)	**25**	**25**	**80**
Significant?	**Yes**	**Yes**	**Yes**
Total mitigated emissions (lb/day)[2]	41	227	534
Significant with mitigation incorporated?	**Yes**	**Yes[4]**	**Yes**
Worst-Case Emissions within Sacramento County—SMAQMD Emissions (lb/day)			
Total unmitigated emissions (lb/day)	54	343	2,823
SMAQMD Threshold	**–**	**85**	**–[3]**
Significant?	**–**	**Yes**	**Yes[3]**
Total mitigated emissions (lb/day)[2]	51	274	706
Significant with Mitigation Incorporated?	**–**	No[4]	**Yes[3]**

Notes: FRAQMD = Feather River Air Quality Management District; lb/day = pounds per day; $\mu g/m^3$ = micrograms per cubic meter; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; ROG = reactive organic gases; SMAQMD = Sacramento Metropolitan Air Quality Management District

[1] 2009 construction season refers to improvements to the NCC south levee, Sacramento River east levee Reaches 1–9, Elkhorn Canal and Giant Garter Snake (GGS)/Drainage Canal between the North Drainage Canal and Elkhorn Reservoir, Natomas East Main Drainage Canal, and Pleasant Grove Creek Canal.

[2] Implementation of all recommended standard mitigation measures listed under Mitigation Measure 4.13-a would result in reductions of ROG, NO_X, and PM_{10} emissions by approximately 5%, 20%, and 75%–85% for fugitive PM_{10} emissions, and 45% for mobile-source PM_{10} emissions, respectively.

[3] SMAQMD does not have an adopted mass emission-based threshold for PM_{10}.

[4] Payment into SMAQMD's Off-site Construction Mitigation Fee Program to offset NO_X emissions in excess of SMAQMD's significance threshold would reduce impacts for this pollutant in SMAQMD's jurisdiction to a less-than-significant level. Coordination of an emissions reduction agreement with the FRAQMD for calculation and fee payment by SAFCA to FRAQMD prior to project approval would be used to offset an equivalent mass of NO_X emissions in excess of EPA's applicable threshold for general conformity purposes. Successful implementation of this measure would reduce NO_X emissions in FRAQMD's jurisdiction, but not to a less-than-significant level for this impact.

See **Appendix E** of this EIS/EIR for assumptions and modeling results for each activity and subphase.

Source: Calculations performed by EDAW based on data provided by HDR, Wood Rodgers, and Mead & Hunt in 2008

Mitigation Measure 4.13-a: Implement Applicable District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO_X, and PM_{10} during Construction

Proposed Action and Levee Raise-in-Place Alternative

SAFCA shall implement mitigation measures as recommended by FRAQMD or SMAQMD, as applicable, and shall comply with all applicable rules and regulations of FRAQMD or SMAQMD, as described below.

Construction in Sutter County (FRAQMD)

For portions of the project occurring in Sutter County, FRAQMD's *Indirect Source Review Guidelines* and online CEQA guidance provide mitigation measures for reducing short-term air quality impacts. As recommended by FRAQMD, SAFCA shall ensure that the following mitigation measures are implemented during all project construction activities to the extent practicable. In addition, construction of the proposed levee improvements are required to comply with all applicable FRAQMD rules and regulations, in particular Rule 3.0 (Visible Emissions), Rule 3.16 (Fugitive Dust Emissions), and Rule 3.15 (Architectural Coatings).

1. SAFCA shall implement a Fugitive Dust Control Plan that includes the following measures:

    - All earthmoving operations should be suspended when winds exceed 20 miles per hour or when winds carry dust beyond the property line despite implementation of all feasible dust control measures.
    - Construction sites shall be watered as directed by the Sutter County Department of Public Works or FRAQMD and as necessary to prevent fugitive dust violations.
    - An operational water truck shall be on-site at all times. Apply water to control dust as needed to prevent visible emissions violations and off-site dust impacts.
    - On-site dirt piles or other stockpiled particulate matter shall be covered, wind breaks installed, and water and/or soil stabilizers employed to reduce wind blown dust emissions. Incorporate the use of approved nontoxic soil stabilizers to all inactive construction areas according to manufacturers' specifications.
    - All transfer processes involving a free fall of soil or other particulate matter shall be operated in such a manner as to minimize the free-fall distance and fugitive dust emissions.
    - Apply approved chemical soil stabilizers to all inactive construction areas (previously graded areas that remain inactive for 96 hours), including unpaved roads and employee/equipment parking areas, according to the manufacturers' specifications.
    - To prevent track-out, wheel washers shall be installed where project vehicles and/or equipment exit onto paved streets from unpaved roads. Vehicles and/or equipment shall be washed before each trip. Alternatively, a gravel bed or rumble strip may be installed as appropriate at vehicle/equipment site exit points to effectively remove soil buildup on tires and tracks to prevent/diminish track-out.
    - Paved streets shall be swept frequently (at least once per day by water sweeper with reclaimed water recommended; wet broom) if soil material has been carried onto adjacent paved, public thoroughfares from the project site.
    - Provide temporary traffic control as needed during all phases of construction to improve traffic flow, as deemed appropriate by the Sutter County Department of Public Works and/or Caltrans and to reduce vehicle dust emissions. An effective measure is to enforce vehicle traffic speeds at or below 15 miles per hour on unpaved roads.

- Reduce traffic speeds on all unpaved surfaces to 15 miles per hour, where feasible, and reduce unnecessary vehicle traffic by restricting access. Provide appropriate training, on-site enforcement, and signage. Where restricting vehicle speeds on unpaved surfaces to 15 miles per hour would make timely completion of the project infeasible, SAFCA shall cooperate with FRAQMD to implement alternative dust control measures that would be at least as effective in reducing fugitive dust emissions. Such measures may include increased frequency in applying water to the unpaved roads in the vicinity of sensitive receptors and reducing speeds in the vicinity of sensitive receptors.

- Reestablish ground cover on the construction site as soon as possible, through seeding and watering.

- Open burning is yet another source of fugitive gas and particulate emissions, and it shall be prohibited at the project site. No open burning of vegetative waste (natural plant growth wastes) or other legal or illegal burn materials (trash, demolition debris, etc.) may be conducted at the project site. Vegetative wastes should be chipped or delivered to waste to energy facilities (permitted biomass facilities), mulched, composted, or used for firewood. It is unlawful to haul waste materials off-site for disposal by open burning.

2. Construction equipment exhaust emissions shall not exceed FRAQMD Regulation III, Rule 3.0, Visible Emissions Limitations (40% opacity or Ringelmann 2.0). Operators of vehicles and equipment found to exceed opacity limits shall take action to repair the equipment within 72 hours or remove the equipment from service. Failure to comply may result in a notice of violation.

3. SAFCA shall be responsible for ensuring that all construction equipment is properly tuned and maintained before and during on-site operation.

4. Minimize idling time to 10 minutes, to conserve fuel and minimize emissions.

5. Use existing power sources (e.g., power poles) or clean fuel generators rather than temporary diesel-powered generators.

6. Portable engines and portable engine-driven equipment units used at the project work site, with the exception of on-road and off-road motor vehicles, may require California Air Resources Board (ARB) Portable Equipment Registration with the state or a local district permit. The owner/operator shall be responsible for arranging appropriate consultations with ARB or FRAQMD to determine registration and permitting requirements before equipment is operated at the site.

7. SAFCA shall assemble a comprehensive inventory list (i.e., make, model, engine year, horsepower, and emission rates) of all heavy-duty off-road (portable and mobile) equipment (50 horsepower [hp] and greater) that will be used an aggregate of 40 or more hours for the construction project and apply the following mitigation measure:

   - Reduce NO_X emissions from off-road diesel-powered equipment: SAFCA shall provide a plan for approval by FRAQMD demonstrating that the heavy-duty (equal to or greater than 50 hp) off-road equipment to be used in the construction project, including owned, leased and subcontractor vehicles, shall achieve a project wide

fleet-average 20% NO_X reduction and 45% particulate reduction[1] compared to the most recent ARB fleet average at time of construction.

Implementing the FRAQMD-recommended measures is expected to achieve at least a 75% reduction in fugitive dust emissions, 5% reduction in ROG emissions from construction equipment, 20% reduction in NO_X emissions from construction equipment, and 45% reduction in PM_{10} emissions from construction equipment (SMAQMD 2004). The resulting maximum average daily construction-generated emissions in Sutter County, with mitigation incorporated, are conservatively calculated to be as high as 75 lb/day of ROG, 413 lb/day of NO_X, and 971 lb/day of PM_{10} for the Proposed Action, and 41 lb/day of ROG, 227 lb/day of NO_X, and 534 lb/day of PM_{10} for the Levee Raise-in-Place Alternative.

SAFCA shall implement the following measure to further mitigate NO_X emissions through off-site reductions:

8. SAFCA shall enter into a voluntary emissions reduction agreement with the FRAQMD to mitigate the portion of construction-generated emissions of NO_X that exceeds FRAQMD's emission threshold of 25 lb/day. The calculation of the fee shall be determined in coordination with the FRAQMD and paid prior to the occurrence of any construction-related activities within areas under the jurisdiction of the FRAQMD.

Implementation of the mitigation measures described above would reduce project-generated construction-related emissions, but emissions would remain in excess of the FRAQMD-recommended thresholds of 25 lb/day for ROG and NO_X and 80 lb/day for PM_{10}. Therefore, although the impact would be reduced, implementing the mitigation measures described above would not reduce project-generated construction-related emissions of ROG and PM_{10} in Sutter County to levels less than FRAQMD's significance thresholds. It should be noted that not meeting FRAQMD-suggested impact criteria, postmitigation, is not a violation of any FRAQMD rules or guidelines, and authorization to construct would be provided by FRAQMD if the listed mitigation measures are implemented. Nevertheless, because this mitigation would not reduce temporary construction-related impacts in Sutter County below the FRAQMD-recommended thresholds, this impact is considered **significant and unavoidable**. **(*Similar*)**

Construction in Sacramento County (SMAQMD)

For portions of the project occurring in Sacramento County, SMAQMD's *Guide to Air Quality Assessment in Sacramento County* (SMAQMD 2004) provides mitigation measures for reducing short-term air quality impacts. As recommended by SMAQMD, SAFCA shall ensure that the following mitigation measures are implemented during all project construction activities to the extent practicable and feasible.

- SAFCA shall submit a construction emissions dust control plan(s) to SMAQMD that reduces fugitive dust emissions by at least 85% (or shall provide calculations based on SMAQMD-approved methodologies showing that emissions would be reduced to less than 100 tons per year assuming a conservative reduction of 75% with typical mitigation) and shall receive approval of the plan(s) (or revised calculations) before groundbreaking. All grading operations shall be suspended when fugitive dust levels exceed levels specified by SMAQMD rules. SAFCA and its primary construction contractors shall

[1] Acceptable options for reducing emissions may include use of late-model engines, low-emission diesel products, alternative fuels, engine retrofit technology (Carl Moyer Guidelines), and after-treatment products; voluntary off-site mitigation projects; providing funds for air district off-site mitigation projects; and/or other options as they become available. FRAQMD should be contacted to discuss alternative measures.

ensure that dust is not causing a nuisance beyond the property line of the construction site.

- SAFCA shall develop a plan, in consultation with SMAQMD, demonstrating that the heavy-duty (>50 hp), off-road vehicles to be used in the construction project (including owned, leased, and subcontractor vehicles) shall achieve a project-wide fleet-average 20% NO_X reduction and 45% particulate reduction compared to the most recent ARB fleet average at the time of construction.[2]

- A comprehensive inventory of all off-road construction equipment equal to or greater than 50 hp that will be used for an aggregate of 40 or more hours during any portion of project construction shall be submitted to SMAQMD. The inventory shall be updated and submitted monthly throughout the duration of the project, except that an inventory shall not be required for any 30-day period in which no construction operations occur. At least 48 hours before heavy-duty off-road equipment is used, SAFCA shall provide SMAQMD with the anticipated construction timeline, including the start date, and the name and phone number of the contractor's project manager and on-site foreman.

- Emissions from off-road, diesel-powered equipment used on the project site shall not exceed 40% opacity for more than 3 minutes in any 1 hour. Any equipment found to exceed 40% opacity (or Ringelmann 2.0) shall be repaired immediately, and SMAQMD shall be notified of noncompliant equipment within 48 hours of identification. A visual survey of all in-operation equipment shall be made at least weekly. A monthly summary of visual survey results shall be submitted to SMAQMD throughout the construction period, except that the monthly summary shall not be required for any 30-day period in which no construction operations occur. The monthly summary shall include the quantity and type of vehicles surveyed, as well as the dates of each survey. SMAQMD and/or other officials may conduct periodic site inspections to determine compliance.

- SAFCA shall pay SMAQMD an off-site mitigation fee for implementation of any proposed alternatives for the purpose of reducing impacts to a less-than-significant level. Based on the construction information presented in **Appendix H** and the emissions calculations shown in **Appendix E** of this EIS/EIR, if the Proposed Action is implemented, the specific fee amount to offset NO_X emissions for elements of the 2009 construction phase that would occur in Sacramento County would be $264,139 (see **Appendix E** of this EIS/EIR for fee calculations) plus a 5% administrative fee of $13,207. Thus, the total mitigation fee for project-related work conducted in Sacramento County during the 2009 construction season is currently estimated to be $277,346 for the Proposed Action. Calculation of fees associated with subsequent improvement plans/project phases shall be conducted at the time of project approval. The applicable fee rate shall be determined and the total fee shall be calculated based on the fee rate in effect at the time that subsequent environmental documents are prepared. The fee for subsequent construction projects shall be remitted to SMAQMD before groundbreaking.

SAFCA shall pay into SMAQMD's off-site construction mitigation fund to further mitigate construction-generated emissions of NO_X that exceed SMAQMD's daily emission threshold of 85 lb/day. The calculation of daily NO_X emissions is based on the cost to reduce 1 ton of NO_X at the time when the document is prepared (currently $16,000 per ton). The determination of the final mitigation fee shall be conducted in coordination with SMAQMD before any demolition or ground disturbance occurs for any project phase.

[2] Acceptable options for reducing emissions include the use of late-model engines, low-emission diesel products, alternative fuels, particulate-matter traps, engine retrofit technology, after-treatment products, and/or such other options as become available.

Calculation of and payment of the fee for all subsequent project phases shall also be included in the CEQA MMRP for the project.

Implementing the SMAQMD-recommended measures is expected to achieve at least a 75–85% reduction in fugitive dust emissions, 5% reduction in ROG emissions from construction equipment, 20% reduction in NO_X emissions from construction equipment, and 45% reduction in PM_{10} emissions from construction equipment (SMAQMD 2004). The resulting maximum average daily construction-generated emissions with mitigation incorporated are shown in **Table 4.13-1**.

Implementation of the mitigation measures described above would reduce project-generated construction-related emissions in Sacramento County to a **less-than-significant** level for NO_X. However, it is anticipated that the project could still result in emissions that substantially contribute to a violation of the ambient air quality standard for PM_{10}. Therefore, although the impact would be reduced, implementing the mitigation measures described above would not fully reduce project-generated construction-related emissions of PM_{10} in Sacramento County to a less-than-significant level. Therefore, construction-related emissions for PM_{10} would remain **significant and unavoidable**. **(*Similar*)**

All Project Construction

SAFCA shall implement the following additional measures to reduce construction emissions of PM_{10} comprising fugitive dust and mobile-exhaust and ozone precursors throughout the project area:

- Open burning of removed vegetation shall be prohibited. Vegetation material shall be chipped on-site or delivered to waste-to-energy facilities to the extent feasible.
- An operational water truck shall be on-site at all times. Water shall be applied to control dust as needed to prevent dust impacts off-site. Unpaved areas subject to vehicle traffic, including employee parking areas and equipment staging areas, shall be stabilized by being kept wet, treated with a chemical dust suppressant or soil binders, or covered.
- The track-out of bulk material onto public paved roadways as a result of operations, or erosion, shall be minimized by the use of track-out and erosion control, minimization, and preventive measures, and removed within 1 hour from adjacent streets such material anytime track-out extends for a cumulative distance of greater than 50 feet onto any paved public road during active operations. All visible roadway dust tracked out upon public paved roadways as a result of active operations shall be removed at the conclusion of each work day when active operations cease, or every 24 hours for continuous operations. Wet sweeping or a HEPA filter equipped vacuum device shall be used for roadway dust removal.
- Low-sulfur fuel shall be used for stationary construction equipment.
- Existing power sources or clean fuel generators shall be used rather than temporary power generators to the extent feasible.
- Low-emission on-site stationary equipment shall be used.
- Vehicle speeds on unpaved roadways shall be limited to 15 miles per hour.
- Idling time for all heavy-duty equipment shall be limited to 10 minutes.

- Diesel-fueled construction equipment that will operate on the project site for more than 40 hours shall be equipped with diesel particulate filters (DPFs) that meet ARB "Level 3" verification standards. A list of currently verified DPF technologies can be found at http://arb.ca.gov/diesel/verdev/vt/cvt.htm.

Implementing this mitigation measure would reduce the impact under the Proposed Action and the Levee Raise-in-Place Alternative, but not to a less-than-significant level. This impact would remain **significant and unavoidable**. ***(Similar)***

Impact 4.13-b: General Conformity with the Applicable Air Quality Plan

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no construction emissions associated with such construction would result. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in flooding, necessitating emergency procedures. Extensive construction required to repair infrastructure damages would result in ozone precursor emissions and PM_{10}. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered to **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

The General Conformity Rule, which addresses whether a project conforms to the State Implementation Plan (SIP) approved and promulgated under Section 110 of the Federal Clean Air Act (CAA), applies to Federal actions that would generate emissions of criteria air pollutant or precursor emissions in nonattainment or maintenance areas. The Sacramento and Sutter County portions of the Sacramento Valley Air Basin (SVAB) are currently designated as serious nonattainment areas with respect to the national 8-hour ozone standard. In addition, the Sacramento County portion of the SVAB is designated as moderate nonattainment for the national PM_{10} standard, while Sutter County is unclassified for PM_{10}. General conformity requirements would apply to actions where the total project-generated direct or indirect emissions would be equal to or exceed the applicable emissions levels, known as the *de minimis* thresholds, or would be greater than 10% of the area's annual emissions budget, known as regionally significant thresholds. If either of the thresholds is exceeded, a conformity determination would be needed prior to project approval. The *de minimis* thresholds applicable to Sacramento and Sutter Counties are provided in Section 4.13.1.2, "Thresholds of Significance," above.

As discussed above, ozone precursor emissions of ROG and NO_X would occur associated primarily with construction equipment exhaust and asphalt paving. Fugitive PM_{10} emissions are associated primarily with site preparation and earthmoving activities. Because general conformity is determined by calendar year, total emissions were calculated for the 2009 calendar year using a worst-case assumption (i.e., that all of the levee improvements for the Phase 2 and Phase 3 Projects would occur simultaneously with all activities in the 2009 calendar year at a minimum). To assume the worst-case scenario, it was assumed that construction of the Sacramento River east levee Reaches 1–9, NCC, PGCC, Elkhorn and GGS/Drainage Canals, and the southern portion of the NEMDC would all be constructed concurrently during 2009.

Construction-generated emissions that would occur during calendar year 2009 under worst-case assumptions for air quality analysis are shown in **Table 4.13-3**, and are categorized by the respective jurisdiction in which they would occur. Total worst-case emissions for Sutter and Sacramento Counties combined, with mitigation proposed under Mitigation Measure 4.13-a implemented, were calculated to be 23 TPY of ROG, 104 TPY of NO_X, and 209 TPY of PM_{10}. See **Table 4.13-3** for detailed emissions that would occur in each jurisdiction. See **Appendix E** of this EIS/EIR for detailed emission sources and assumptions.

Based on the project information presented in Chapter 2.0, "Alternatives," and in **Appendix H**, construction of the Phase 3 Project would result in maximum unmitigated and mitigated annual emissions in excess of the *de minimis* threshold for NO_X in the Sutter County portion of the SVAB, as summarized in **Table 4.13-3**. Based on the modeling conducted, it is foreseeable that unmitigated construction-generated emissions would result in or substantially conflict with applicable air quality planning efforts. However, with implementation of mitigation identified under Impact 4.13-a, emissions would be reduced below the Federal *de minimis* thresholds.

If the Phases 2 and 3 Projects would not be constructed during the same calendar year, then emissions would be less than those presented in **Table 4.13-3**, and would also be below the Federal *de minimis* thresholds.

Finally, project operation (discussed under Impact 4.13-c, below) would result in minimal emissions of pollutants for which the region is in nonattainment. Construction under the Proposed Action is not anticipated to conflict with implementation of the SIP, and a conformity determination would not be required prior to project approval. For this reason, this impact is considered **less than significant**.

Levee Raise-in-Place Alternative

According to current Federal standards, a conformity determination is required only for the Proposed Action. However, for purposes of this analysis, the emissions of criteria air pollutant or precursor emissions under the Levee Raise-in-Place Alternative were calculated and are shown in **Table 4.13-3**. Because the emissions under this alternative would fall below the Federal *de minimis* threshold, implementation of the Levee Raise-in-Place Alternative would not conflict with implementation of the SIP, and therefore if selected in place of the Proposed Action, a conformity determination would not be required. Therefore, this impact is considered **less than significant**. ***(Similar)***

Mitigation Measure: No mitigation is required.

Impact 4.13-c: Long-Term Changes in Emissions of ROG, NO_X, and PM_{10} Associated with Project Implementation

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no long-term changes in emissions related to the project would occur. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Efforts to reconstruct the levee would depend on the extent and location of damage. Equipment such as pumping plants would likely be used, generating short-term emissions of air quality pollutants. Upon completion of levee repairs, generation of these emissions would not be substantially greater than in a no-action, no-flood scenario. However, a precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Table 4.13-3
Summary of Maximum Annual Construction Emissions during the 2009 Calendar Year Associated with the Combined Phase 2 and Phase 3 Projects

	Pollutant		
	ROG	NO_X	PM_{10}
Worst-Case Emissions within Sutter County—FRAQMD Emissions (tons/year)			
Natomas Cross Canal			
Total unmitigated NCC emissions	4	25	117
Pleasant Grove Creek Canal West Levee			
Total unmitigated PGCC emissions	1	11	16
Sacramento River East Levee			
Total unmitigated Sacramento River east levee emissions—Reach 1–4A	3	18	244
Total unmitigated emissions (TPY)	8	55	377
General Conformity Thresholds: De minimis/ Regional Significance (TPY)	25/377	25/740	-
Significant?	No	**Yes**	-
Total mitigated emissions (TPY)[1]	7	44	
Significant with mitigation incorporated?	No	No [2]	-
Worst-Case Emissions within Sacramento County—SMAQMD Emissions (lb/day)			
Sacramento River East Levee			
Total unmitigated Sacramento River east levee emissions—50% of Reaches 4A–20A	4	26	342
GGS/Elkhorn Canal Relocation			
Total unmitigated GGS/Elkhorn Canal emissions	1	6	1
Natomas East Main Drainage Canal			
Total unmitigated NEMDC emissions	1	8	13
Total unmitigated emissions (TPY)	6	40	356
General Conformity Thresholds: De minimis/Regional Significance (TPY)	**25/2,351**	**25/2,985**	**100/1,622**
Significant?	No	No	**Yes**
Total mitigated emissions (TPY)[1]	6	32	89
Significant with Mitigation Incorporated?	No	No[2]	No[1]

Notes: FRAQMD = Feather River Air Quality Management District; lb/day = pounds per day; $\mu g/m^3$ = micrograms per cubic meter; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; ROG = reactive organic gases; SMAQMD = Sacramento Metropolitan Air Quality Management District

[1] Implementation of all recommended standard mitigation measures listed under Mitigation Measure 4.13-a would result in reductions of ROG, NO_X, and PM_{10} emissions by approximately 5%, 20%, 75–85% for fugitive PM_{10} emissions, and 45% for mobile-source PM_{10} emissions, respectively.

[2] Payment into SMAQMD's Off-site Construction Mitigation Fee Program to offset NO_X emissions in excess of SMAQMD's significance threshold would reduce impacts for this pollutant in SMAQMD's jurisdiction to a less-than-significant level. Coordination of an emissions reduction agreement with the FRAQMD for calculation and fee payment by SAFCA to FRAQMD prior to project approval would be used to offset an equivalent mass of NO_X emissions in excess of EPA's applicable threshold for general conformity purposes. Successful implementation of this measure would reduce NO_X emissions in FRAQMD's jurisdiction, but not to a less-than-significant level for this impact.

See **Appendix E** of this EIS/EIR for assumptions and modeling results for each activity and subphase.

Source: Calculations performed by EDAW based on data provided by HDR, Wood Rodgers, and Mead & Hunt in 2008

Proposed Action and Levee Raise-in-Place Alternative

Long-term project operation would not result in increased regional emissions of ROG, NO_X, and PM_{10} from mobile-, stationary-, or area-source emissions. Project implementation would require a negligible increase in operational maintenance activities at the proposed facilities, and associated vehicle trips. In addition, the levee system would not require extensive landscape maintenance or other activities that would result in a substantial net increase in emissions in comparison with existing conditions.

Furthermore, project implementation would not result in the operation of any new major stationary emission sources. Replacement of Reclamation District 1000 Pump Station No. 2 would be constructed at the end of the North Drainage Canal, and would include a backup power generator and, therefore, would be a minor stationary source of emissions, located in Sacramento County. The pump station would consist of two 350-hp pumps and one 200-hp pump that would be operated by electricity. A diesel-powered backup generator would be used in emergency situations and would be tested monthly. Stationary equipment such as diesel-powered generators would be subject to the respective air district's permitting process and Best Available Control Technology (BACT) and offset requirements. The applicable air district's permitting process would ensure that emissions from equipment are within acceptable limits. Emissions of ozone precursors and PM_{10} associated with pump station operation would be negligible. No other stationary sources of emissions would be associated with the action alternatives. Thus, long-term operational emissions of criteria air pollutants or precursors would not result in or substantially contribute to a violation of the applicable air quality standards. Thus, project operation would not result in a direct, adverse impact on air quality, and this impact is considered **less than significant**. ***(Similar)***

Mitigation Measure: No mitigation is required.

Impact 4.13-d: Exposure of Sensitive Receptors to Toxic Air Emissions

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for direct exposure of sensitive receptors to project-related toxic air emissions. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the perimeter levee system, the risk of levee failure would remain high. In the event of a flood, toxic air emissions could be associated with the use of equipment during cleanup operations. However, effects on sensitive receptors would depend on many factors (e.g., magnitude and duration of emissions, proximity to sensitive receptors), and therefore the magnitude of the impact cannot be predicted. For these reasons, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Project construction and operation would generate emissions of diesel PM, which is identified by ARB as a TAC. TAC emission sources are discussed separately below. Neither FRAQMD nor SMAQMD has any current guidance on TAC emissions from mobile equipment, and neither has a threshold of significance for exposure to emissions from this equipment.

Project construction would result in the temporary and short-term generation of diesel exhaust emissions from the use of off-road diesel equipment required for site grading and excavation, paving, and other construction activities, in addition to diesel-fueled on-road haul trucks used for hauling borrow material. The dose to which the

receptors are exposed (a function of concentration and duration of exposure) is the primary factor used to determine health risk (i.e., potential exposure to TAC emission levels that exceed applicable standards). According to the Office of Environmental Health Hazard Assessment, health risk assessments (HRAs), which determine the exposure of sensitive receptors to TAC emissions, should be based on a 70-year exposure period; however, such assessments should be limited to the period/duration of activities associated with the project (Salinas, pers. comm., 2004).

The duration of mobilized equipment used near sensitive receptors located along the levee system and borrow sites would be short (less than 2 full years for the Phase 3 Project). Each construction season would last approximately 6 months. In addition, as improvements are completed, mobile equipment would progress along the levees and canal alignments and would not operate near (within approximately 500 feet of) any one sensitive receptor for more than a maximum of a few weeks at a time. Sensitive receptors located near (within 500 feet of) the borrow areas would likely experience longer exposure periods than receptors located along the levee alignments but would be located a greater distance from most of the borrow activities (see **Plates 17a–17c** for a depiction of the project area). The project would represent less than 0.1% of the 70-year exposure period for any nearby sensitive receptor in the area. Because the exposure period for receptors in the vicinity of the project would be minimal, and because the local air districts do not have guidance for preparation of HRAs for construction equipment, an HRA is not recommended for the action alternatives' construction activities.

As discussed under Impact 4.13-c, above, a replacement pump station would be constructed at the west end of the North Drainage Canal and would be a minor stationary source of TAC emissions, located in Sacramento County. A diesel-powered backup generator would be used in emergency situations and would be tested monthly. Consequently, diesel PM emissions associated with the pump station would be infrequent. Furthermore, this category of stationary source (i.e., portable equipment), in addition to any other stationary sources that may emit TACs, would be subject to SMAQMD permitting and toxic best available control technology (T-BACT) requirements. If the implementation of T-BACT would not reduce emissions to an acceptable level, then SMAQMD would deny the required permit for this piece of equipment. Therefore, operation of this stationary source would not result in the exposure of sensitive receptors to substantial concentrations of TACs. No other stationary sources of emissions would be associated with any of the action alternatives. Thus, this impact is considered to be **less than significant**. ***(Similar)***

Mitigation Measure: No mitigation is required.

4.13.3 RESIDUAL SIGNIFICANT IMPACTS

In the event of a levee failure under the No-Action Alternative, impacts due to temporary construction emissions, lack of general conformity with the Air Quality Plan, long-term emissions, and exposure of sensitive receptors to toxic air emissions are uncertain. Because of this uncertainty, these potential impacts are considered too speculative for meaningful consideration. Additionally, mitigation measures cannot be required for the No-Action Alternative; therefore impacts that result from the No-Action Alternative would not be mitigated.

Because of the intensity of construction operations, time constraints to which it is assumed all action alternatives must adhere to avoid other environmental impacts and adverse weather conditions, and the nonattainment status of the project area, Mitigation Measure 4.13-a is not expected to be sufficient to reduce the Phase 3 Project emissions of ROG or PM_{10} associated with the Proposed Action or the Levee Raise-in-Place Alternative below the applicable threshold. As described under Impact 4.13-a and summarized in **Tables 4.13-1** and **4.13-2**, emissions of ROG and PM_{10} that would occur in Sutter County would still exceed the applicable FRAQMD significance criteria of 25 and 80 lb/day, respectively. Similarly, mitigated emissions of PM from earth movement activities in Sacramento County would still be expected to result in or substantially contribute to a violation of applicable air quality standards. Because the impacts cannot be fully mitigated, this impact would be significant and unavoidable for the Proposed Action and the Levee Raise-in-Place Alternative.

4.14 NOISE

4.14.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.14.1.1 METHODOLOGY

Construction-noise and stationary-source noise impacts were calculated based on the Federal Transit Noise and Vibration Impact Assessment methodology (FTA 2006). Reference emission noise levels and usage factors are based on the Federal Highway Administration (FHWA) Roadway Construction Noise Model. The FHWA Roadway Noise Prediction Model (FHWA-RD-77-108) was used to calculate traffic noise levels along haul routes, based on estimates described in **Appendix H**.

4.14.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to noise if they would do any of the following:

- result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- expose people residing or working in the project area to excessive noise levels;
- expose persons to or generate excessive groundborne vibration or groundborne noise levels;
- for a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels; or
- for a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.

The following considerations apply to the first three significance thresholds:

- **Temporary, short-term construction noise impacts:** Temporary, short-term construction noise impacts are considered significant if construction-generated noise levels exceed the applicable standards at nearby noise-sensitive land uses.
- **Noise impacts from haul truck traffic:** For all affected residential land uses, noise that would be generated by haul truck traffic is considered significant if it would cause the overall exterior noise level to exceed the "normally acceptable" exterior land use compatibility noise standard of 60 A-weighted decibels (dBA) day-night average noise level/community noise equivalent level (L_{dn}/CNEL) for residential land uses or would exceed the interior noise standard of 45 dBA L_{dn}/CNEL in any inhabitable residence.
- **Exposure of sensitive receptors to, or generation of, excessive vibration levels:** Temporary and short- and long-term vibration impacts would be significant if construction or operation of the project would result in the exposure of sensitive receptors to, or would generate, vibration levels that exceed the California Department of Transportation's (Caltrans') recommended standard of 0.2 inch per second (in/sec) peak particle velocity (PPV) with respect to the prevention of structural damage for normal buildings (Caltrans 2002) or the Federal Transit Administration's (FTA's) maximum acceptable vibration standard of 80 vibration decibels (VdB)

with respect to human response for residential uses (i.e., annoyance) (FTA 2006) at any nearby existing sensitive land uses.

Portions of the project activities would be located inside the Airport land use plan area. In some areas, construction would occur as close as 3,000 feet to the Airport.

There are no private airstrips in the vicinity of the project area. Therefore, this issue is not discussed further in this EIS/EIR.

Local Noise Standards

City of Sacramento

The *City of Sacramento General Plan* Noise Element establishes an exterior noise level of 60 dBA L_{dn} and an interior noise level of 45 dBA L_{dn} as acceptable.

The City's exterior noise standard, as stated in the City's noise ordinance, is 55 dBA during the hours of 7:00 a.m. to 10:00 p.m. for residential and agricultural uses. The standard then adjusts to 50 dBA between 10:00 p.m. and 7:00 a.m. for residential and agricultural uses. The noise ordinance also exempts construction noise during the hours of 7:00 a.m. and 6:00 p.m. Monday through Saturday and from 9:00 a.m. to 6:00 p.m. on Sundays. The ordinance further states that the operation of an internal combustion engine is not exempt if the engine is not equipped with suitable exhaust and intake silencers in good working order (8.68.080 Exemptions, Noise Control Standards, City of Sacramento Municipal Code).

Sacramento County

The *Sacramento County General Plan* Noise Element states that noise created by new nontransportation noise sources may not exceed the standards outlined in **Table 4.14-1** when measured at the property line of the noise-sensitive land use.

Table 4.14-1
Local Government Non-transportation Noise Standards (dBA)

Noise Element Jurisdiction/ Land Use Category	Maximum Allowable Exterior Noise Levels					
	Daytime 7:00 a.m.–7:00 p.m.		Evening 7:00 p.m.–10:00 p.m.		Nighttime 10:00 p.m.–7:00 a.m.	
Sutter County	Daytime Hourly		Evening Hourly		Nighttime Hourly	
	L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
	50	70	50	70	45	65
	Construction noise is not exempt from Sutter County noise standards during any hours of the day.					
Sacramento County Residential Areas	**Hourly**		**Hourly**		**Hourly**	
	L_{50}	**L_{max}**	**L_{50}**	**L_{max}**	**L_{50}**	**L_{max}**
	50	70	50	70	45	65
	Construction noise is exempt from the Sacramento County noise regulations provided that construction does not take place before 6:00 a.m. or after 8:00 p.m. Monday through Friday, and before 7:00 a.m. or after 8:00 p.m. on Saturday and Sunday.					
City of Sacramento Residential Areas	Exterior L_{dn}/CNEL			Interior L_{dn}/CNEL		
	60			45		
	Construction noise is exempt from the City of Sacramento noise regulations provided that construction does not take place before 7:00 a.m. or after 6:00 p.m. Monday through Saturday, and before 9:00 a.m. or after 6:00 p.m. on Sunday.					

Notes: CNEL = community noise equivalent level; dBA = A-weighted decibel; L_{50} = noise level exceeded 50% of the time; L_{dn} = day-night average noise level; L_{eq} = energy-equivalent noise level; L_{max} = maximum noise level
Sources: City of Sacramento 1988, Sacramento County 1993b, Sutter County 1996a

The Sacramento County noise ordinance states that a standard of 55 dBA is applied during the hours of 7:00 a.m. and 10:00 p.m. and standard of 50 dBA is applied during the hours of 10:00 p.m. and 7:00 a.m. for residential and agricultural uses. The noise ordinance also states that construction activities are exempt during the hours of 6:00 a.m. and 8:00 p.m. Monday through Friday and from 7:00 a.m. and 8:00 p.m. on Saturdays and Sundays (Chapter 6.68 Noise Control, County of Sacramento Code).

Sutter County

The *Sutter County General Plan* Noise Element has established noise standards for noise-sensitive land uses. The County has established an exterior noise level of 60 dBA L_{dn} and an interior noise level of 45 dBA L_{dn}. For nontransportation noise sources, the standards outlined in **Table 4.14-1** would apply. Sutter County does not contain any provisions that would exempt construction noise within the county; therefore, the standards shown in **Table 4.14-1** would also apply to construction noise.

General

Construction noise may affect sensitive receptors in unincorporated areas of Sutter and Sacramento Counties and in the city of Sacramento. These jurisdictions either have nontransportation noise standards based on time of day and land use sensitivity or provide exemptions for construction as long as those activities occur during the daytime. Residential areas are considered the most noise-sensitive land use, and the most restrictive noise standards apply.

Noise generated by a transportation source is also regulated according to land use. All the jurisdictions with standards for transportation noise impacts have adopted a normally acceptable L_{dn}/CNEL noise standard of 60 dBA for residential land uses and a conditionally acceptable L_{dn}/CNEL noise standard of 65 dBA, provided that the best available noise reduction measures have been applied. Many of the jurisdictions have adopted a maximum L_{dn}/CNEL noise limit of 70 dBA for playgrounds, parks, and riding stables.

For the purposes of this analysis, the local noise level standards presented above are applied to evaluate the impacts of noise generated by construction equipment and construction-related truck trips.

4.14.2 IMPACTS AND MITIGATION MEASURES

Impact 4.14-a: Generation of Temporary, Short-Term Construction Noise

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to generate temporary, short-term construction noise. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Noise-sensitive land uses (in this case, primarily residential uses) are scattered throughout the area in which repair-related construction would occur. However, levee failure would likely result in evacuation of people (i.e., sensitive receptors) from damaged levee locations. Without sensitive receptors, potential impacts related to temporary, short-term construction noise would be **less than significant**. ***(Lesser)***

General construction activities under the Proposed Action that would apply to levee improvements and drainage and irrigation infrastructure construction would generate temporary, short-term, and intermittent noise at or near the individual noise-sensitive locations. Much of the construction activity would proceed in a linear manner along the levee and canal alignments and would have the maximum noise impact on individual residences for approximately 2–3 weeks in most locations. Noise levels would fluctuate depending on the particular type, number, duration of use of various pieces of construction equipment, and physical location of construction activities. On-site equipment required for levee improvement and canal construction activities is anticipated to include excavators, backhoes, bulldozers, scrapers, rollers, graders, loaders, compactors, and various trucks. Individual equipment maximum noise levels produced by these operations could range from 79 to 101 dBA without the implementation of feasible noise control, and from 75 to 95 dBA with implementation of feasible noise control at a distance of 50 feet from the nearest noise source, as indicated in **Table 4.14-2**.

Table 4.14-2
Construction Equipment Noise Emission Levels[1]

Equipment Type	Typical Noise Level (dB) at 50 feet	Equipment Type	Typical Noise Level (dB) at 50 feet
Air Compressor	78	Generator	81
Asphalt Paver	77	Grader	85
Backhoe	78	Hoe Ram Extension	90
Compactor	83	Jack Hammer	89
Concrete Breaker	82	Pneumatic Tools	85
Concrete Pump	81	Pile Driver	101
Concrete Saw	90	Rock Drill	81
Crane, Mobile	81	Scraper	84
Dozer	82	Trucks	74–81
Front-end Loader	79	Water Pump	81

Notes:
[1] All equipment fitted with properly maintained and operational noise control device, per manufacturer specifications. Noise levels listed are the actual measured noise levels for each piece of heavy construction equipment.
dB = A-weighted decibels (dBA).
Sources: Bolt, Beranek and Newman 1981, FTA 2006.

Noise-sensitive land uses (in this case, primarily residential uses) are scattered throughout the areas in which construction would occur. Water side residences, Teal Bend Golf Club, and a few landside residences are located along the Sacramento River east levee in Reaches 5–9A (see **Plate 17a**); some of the landside residences would be removed before construction of levee improvements would take place in this area. Scattered rural residential/agricultural uses and an Arabian horse training ranch are present along the PGCC. Noise-sensitive land uses located along the NEMDC west levee from the NEMDC Stormwater Pumping Station to Northgate Boulevard are most numerous south of the Twin Rivers Unified School District borrow site; these uses consist of residential, parks, schools, and places of worship (see **Plate 17c**). Three residences are present in close proximity to the GGS/Drainage Canal and Elkhorn Canal construction areas. Other scattered residences are present in the general area but are more than one-half mile from the levee. Residential uses abut the Airport north bufferlands; the private properties in Reaches 5A, 6B, and 7; Krumenacher; South Sutter, LLC; Twin Rivers Unified School District; and Brookfield borrow areas (see **Plates 17a–c**). Several residences are as close as 50–100 feet from canal, levee, and borrow areas where construction activity would occur. Residences are present along the water

side of the Sacramento River east levee from the lower part of Reaches 5A–9B, where improvements would be constructed as part of the Phase 3 Project. The density of residences increases in the lower levee reaches.

Any borrow site developed in the Elkhorn Borrow Area would potentially affect noise sensitive land uses. Borrow activities within the Elkhorn Borrow Area would only occur during daylight hours, as discussed in Mitigation Measure 4.19-a, "Coordinate Work in the Critical Zone with Airport Operations and Restrict Night Lighting within and near the Runway Approaches." SAFCA would additionally be required to implement noise-reducing construction practices, prepare a noise control plan, implement noise-reduction measures, and monitor and record construction noise near sensitive receptors, as described below in Mitigation Measure 4.14-a, "Implement Noise-Reducing Construction Practices, Prepare a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors."

Construction noise attributable to the project was estimated using the FTA noise methodology for the prediction of stationary noise sources (FTA 2006). **Table 4.14-3** shows the results for the various stages of construction activities associated with the proposed levee and canal improvements, based on the equipment requirements for construction shown in **Appendix H** and the distances to the 45-dBA and 50-dBA noise contours assuming no intervening barriers. **Appendix F** of this EIS/EIR shows the complete listing of inputs and the methodology for predicting noise levels from construction.

Table 4.14-3
Predicted Noise Levels Attributable to Major Construction Activities

Action	Project Improvement Type	Resulting Noise Level in dBA L_{eq} at 100 Feet	Distance to Noise Contour (Feet)	
			50 dBA[1]	45 dBA[1]
Clearing and grubbing/stripping	Levee, canal	74.6	1,698.8	3,021.0
Levee degrading	Levee	76.7	2,172.6	3,863.4
Demolition of canal and removal of trees	Levee	76.3	2,073.9	3,687.9
Cutoff wall construction	Levee	76.1	2,029.8	3,609.5
Borrow site excavation	Levee, canal	76.3	2,073.9	3,687.9
Levee raising	Levee	75.7	1,923.8	3,421.1
Dewatering	Canal	80.9	3,504.4	6,231.8
Excavation	Canal	76.3	2,073.9	3,687.9
Foundation construction	Canal	80.9	3,504.4	6,231.8
Concrete construction	Canal	75.8	1,955.8	3,478.0
Pipeline construction	Canal	75.0	1,781.9	3,168.7
Backfill and finish grading	Canal	76.7	2,172.6	3,863.4
Electrical and mechanical equipment installation	Canal	73.2	1,447.0	2,573.2
Pile driving	Canal	89.0	2,500+	2,500+
Erosion control	Levee, canal	74.4	1,651.2	2,936.4
Demobilization and cleanup	Levee, canal	73.6	1,505.0	2,676.4

Notes: dBA = A-weighted decibel; L_{eq} = energy-equivalent noise level

[1] Distances to noise contours do not take into account intervening topography or existing structure facades.

The equation: $L_{eq}(equip) = E.L.+10*\log (U.F.) - 20*\log (D/50) - 10*G*\log (D/50)$

Sources: FTA 2006, data modeled for SAFCA by EDAW in 2008

As shown in **Table 4.14-3**, the predicted highest noise level during construction would be 89.0 dBA L_{eq} at a distance of 100 feet from pile driving activities. Pile driving would be used only in the reconstruction of RD 1000 Pumping Plant No. 2 at the north end of the Elkhorn Canal, a location that is approximately 200 feet from a single residence. The next predicted highest noise level associated with construction activities would be 80.9 dBA L_{eq} at 100 feet from construction activities without noise control device outfitting for heavy construction equipment, for both the levee improvement and canal improvement construction activities. In some work locations, construction noise would be short term, and impacts would generally not result in sleep disruption or annoyance. In other instances, the levee itself may serve as a sound barrier that provides some protection to sensitive land uses. For instance, this may occur when construction activity takes place at the land side toe of the Sacramento River east levee in reaches where there are waterside residences.

Assuming a standard exterior-to-interior attenuation rate of 25 dBA for typical residential buildings with doors and windows closed, noise generated by construction equipment could result in interior noise levels that exceed the interior noise standard of 45 dBA L_{dn}/CNEL for residential land uses established by the City of Sacramento, Sacramento County, and Sutter County. Although construction activity is expected to take place during daytime hours in Sacramento County, Sutter County, and the city of Sacramento, because of the need to complete levee improvements outside of the flood season and because of other environmental and engineering constraints on project schedule, it is possible that construction may need to be conducted on a 24-hours-per-day and 7-days-per-week (24/7) work schedule basis. Therefore, noise may be generated by construction equipment operating near homes during the more noise-sensitive early morning and nighttime hours (i.e., during hours that are not exempted by the applicable local ordinances in the City of Sacramento and Sacramento County) and could result in sleep disturbance at nearby residences.

Construction of the proposed levee and canal improvements could result in temporary, short-term noise levels that exceed the applicable daytime and nighttime standards for nontransportation sources (**Table 4.14-3**), resulting in increased annoyance and/or sleep disruption to occupants of residential dwellings and other sensitive receptors. This temporary, short-term impact is considered **significant**.

Levee Raise-in-Place Alternative

Under the Levee Raise-in-Place Alternative, more noise-sensitive uses along the Sacramento River east levee would be exposed to the highest noise levels shown in **Table 4.14-3** without the benefit of the shielding that would be provided by the levee itself. As a result, this alternative would likely cause noise disturbance to residents along the Sacramento River east levee. This temporary, short-term impact is considered **significant**. ***(Similar)***

Mitigation Measure 4.14-a: Implement Noise-Reducing Construction Practices, Prepare a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors

Proposed Action and Levee Raise-in-Place Alternative

SAFCA and its primary contractors for engineering design and construction shall ensure that the following measures are implemented at each work site in any year of project construction to avoid and minimize construction noise effects on sensitive receptors. These measures are consistent with SAFCA's standard contract specifications for noise control.

The primary construction contractors shall employ noise-reducing construction practices. Measures that shall be used to limit noise shall include the measures listed below.

- Equipment shall be used as far away as practical from noise-sensitive uses.
- All construction equipment shall be equipped with noise-reduction devices such as mufflers to minimize construction noise and all internal combustion engines shall be equipped with exhaust and intake silencers in accordance with manufacturers' specifications.

- Equipment that is quieter than standard equipment shall be used, including electrically powered equipment instead of internal combustion equipment where use of such equipment is a readily available substitute that accomplishes project tasks in the same manner as internal combustion equipment.
- Construction site and haul road speed limits shall be established and enforced.
- The use of bells, whistles, alarms, and horns shall be restricted to safety warning purposes only.
- Noise-reducing enclosures shall be used around stationary noise-generating equipment (e.g., compressors and generators).
- Fixed construction equipment (e.g., compressors and generators), construction staging and stockpiling areas, and construction vehicle routes shall be located at the most distant point feasible from noise-sensitive receptors.
- When noise-sensitive uses are within close proximity and subject to prolonged construction noise, noise-attenuating buffers such as structures, truck trailers, or soil piles shall be located between noise generation sources and sensitive receptors.
- Before construction activity begins within 500 feet of one or more residences or businesses, written notification shall be provided to the potentially affected residents or business owners, identifying the type, duration, and frequency of construction activities. Notification materials shall also identify a mechanism for residents or business owners to register complaints with the appropriate jurisdiction if construction noise levels are overly intrusive. The distance of 500 feet is based on the 60-dBA contour of the loudest anticipated construction activity other than pile driving.
- When construction of cutoff walls takes place during nighttime hours (between 10:00 p.m. and 6:00 a.m.), SAFCA shall honor requests from affected residents to provide reasonable reimbursement of local hotel or short-term rental stays for the period of time that cutoff wall construction takes place within 500 feet of the residents requesting reimbursement.
- If noise-generating activities are conducted within 100 feet of noise-sensitive receptors (the 70-dBA noise contour of construction noise), the primary contractor shall continuously measure and record noise levels generated as a result of the proposed work activities. Sound monitoring equipment shall be calibrated before taking measurements and shall have a resolution within 2 dBA. Monitoring shall take place at each activity operation adjacent to sensitive receptors. The recorded noise monitoring results shall be furnished weekly to SAFCA.
- The primary contractor shall prepare a detailed noise control plan based on the construction methods proposed. This plan shall identify specific measures to ensure compliance with the noise control measures specified above. The noise control plan shall be submitted to and approved by SAFCA before any noise-generating construction activity begins.

Implementing this mitigation would reduce the level of impact but may not reduce noise levels at all times to a less-than-significant level because of the close proximity of noise-sensitive receptors to construction activities and the limited feasibility of mitigating construction noise to acceptable levels. Therefore, this impact would remain **significant and unavoidable**. ***(Similar)***

Impact 4.14-b: Exposure of Sensitive Receptors to or Generation of Excessive Groundborne Vibration

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to directly expose sensitive receptors to or generation of excessive groundborne vibration. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Noise-sensitive land uses (in this case, primarily residential uses) are scattered throughout the areas in which repair-related construction would occur. However, levee failure would likely result in evacuation of people (i.e., sensitive receptors) from damaged levee locations. Without sensitive receptors, potential impacts related to the generation of excessive groundborne vibration would be **less than significant**. ***(Lesser)***

Proposed Action and Levee Raise-in-Place Alternative

Project construction activities have the potential to result in varying degrees of temporary ground vibration, depending on the specific construction equipment used and operations involved. Vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. **Table 4.14-4** displays vibration levels for typical construction equipment.

Table 4.14-4
Typical Construction Equipment Vibration Levels

Equipment		PPV at 25 feet (in/sec)[1]	Approximate L_v at 25 feet[2]
Pile driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile driver (sonic)	Upper range	0.734	105
	Typical	0.170	93
Large bulldozer		0.089	87
Trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

[1] Where PPV is the peak particle velocity.

[2] Where L_v is the velocity level in decibels and based on the root mean square velocity amplitude.

Source: FTA 2006

On-site construction equipment would include pile drivers (only for the reconstruction of RD 1000 Pumping Plant No. 2), excavators, backhoes, bulldozers, scrapers, rollers, graders, loaders, compactors, and various trucks. With the exception of pile driving, the most intense generation of ground vibration would be associated with large bulldozers that generate levels of 0.089 in/sec PPV and 87 VdB. These levels would attenuate to 0.031 in/sec PPV or 78 VdB at a distance of 50 feet. Because there are no residential buildings closer than 50 feet to the construction areas, vibration generated by other off-road construction equipment would not exceed the Caltrans (0.2 in/sec PPV) or FTA (80 Vdb) standards. Ground vibration would also be generated by haul trucks operating

on area haul routes. As shown in **Table 4.14-4**, vibration levels generated by trucks could reach as high as 0.076 in/sec PPV or 86 VdB at a distance of 25 feet. At a distance of 50 feet, these levels would attenuate to 0.027 in/sec PPV and 77 VdB. Because levels would be less than Caltrans' and FTA's standards, this temporary, short-term impact related to vibration from other construction equipment is considered **less than significant**. ***(Similar)***

Vibration levels associated with pile driving could be as high as 1.518 in/sec PPV or 112 VdB (referenced to 1 microinch per second and based on the root mean square velocity amplitude) at a distance of 25 feet. Using FTA's recommended procedure for applying a propagation adjustment to these reference levels, predicted worst-case vibration levels would not exceed Caltrans' recommended standard of 0.2 in/sec PPV with respect to the prevention of structural damage for normal buildings and FTA maximum acceptable vibration standard of 80 VdB with respect to human annoyance for residential uses greater than 300 feet from pile-driving activities. However, there is one existing residence located approximately 200 feet from the site where pile driving would be performed for the reconstruction of the RD 1000 Pumping Plant No. 2 at the north end of the Elkhorn Canal. While the structure is not considered to be historically significant or particularly vulnerable to groundborne vibration, the resulting vibration levels would exceed the FTA's human disturbance-based standard. Therefore, this temporary, short-term impact related to vibration from pile driving is considered **significant**. ***(Similar)***

Mitigation Measure 4.14-b: Implement Measures to Minimize Construction-Related Vibration Effects at the Pumping Plant No. 2 Site

Proposed Action and Levee Raise-in-Place Alternative

SAFCA and its primary contractors for engineering design and construction shall ensure that the measures listed below are implemented to avoid and minimize construction vibration effects on sensitive receptors and the structure near the Pumping Plant No. 2 site.

- Pile driving shall be conducted as far as practicable from the residential structure.
- Vibration monitoring equipment shall be placed at the property line adjacent to large equipment and, with owner approval, at the back of the residential structure adjacent to the large equipment.
- A preconstruction and postconstruction survey shall be conducted to assess potential architectural damage from pile driving at the residence near the RD 1000 Pumping Plant No. 2 site which is owned by RD 1000 and/or NCMWC. The survey shall include visual inspection of the structure and documentation of the structure by means of photographs and video. This documentation shall be reviewed with the individual owner prior to any construction activity. Postconstruction monitoring of the structure shall be performed to identify (and repair, if necessary) damage, if any, from construction vibrations. Any damage shall be documented with photographs and video.

Performing pile driving as far as feasibly possible from residential structures would reduce the probability of generating structural damage and/or human disturbance. However, these measures would not necessarily reduce ground vibration to levels below Caltrans recommended standard of 0.2 in/sec PPV with respect to the prevention of structural damage for normal buildings or the FTA maximum acceptable vibration standard of 80 VdB with respect to human response for residential uses. Therefore, implementing this mitigation measure would partially reduce the temporary, short-term impact of construction-related vibration from pile driving under the Proposed Action and the Levee Raise-in-Place Alternative, but would not fully reduce the impact to a less-than-significant level. Therefore, this temporary, short-term impact would remain **significant and unavoidable**. **(*Similar*)**

Impact 4.14-c: Temporary, Short-term Exposure of Residents to Increased Traffic Noise Levels from Hauling Activity

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for hauling activity caused by the project to directly increase traffic noise levels. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Repairs would result in a substantial increase in vehicle trips. It is unknown how a flood would affect roadways within the Natomas Basin, or if borrow material sites would be the same or in close proximity to those examined for the Phase 3 Project. Traffic noise levels, as a result of flooding in Natomas during a catastrophic flood, are unpredictable, therefore, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Project construction would generate high volumes of haul truck trips on area roads, as described in Section 4.12, "Transportation and Circulation." Associated traffic noise levels were estimated using the FHWA Federal Highway Traffic Noise Prediction Model (FHWA 1978) and are displayed in **Table 4.14-5**. These estimates are based on the amount of material to be hauled, number of days of construction, and the hours per day in which hauling would occur.

As shown in **Table 4.14-5**, noise levels attributable to project haul truck traffic would range from 61.7 to 67.6 dBA L_{eq} at a distance of 50 feet from the roadway centerline.

Table 4.14-5
Summary of Modeled Haul Truck Noise Levels [1]

Construction Site	Number of One-Way Trips Required per Hour	Resulting Noise Level (dBA L_{eq} 50 Feet from Haul Route Centerline)
Sutter Pointe Borrow Site	213	67.2
Dunmore Borrow Site	133	65.1
East Side Borrow Site [2]	60	61.7
Pacific Terrace Borrow Site	236	67.6
Elkhorn Borrow Area	90	63.4

Notes: dBA = A-weighted decibels; L_{eq} = energy-equivalent noise level

[1] Traffic noise levels were modeled using the Federal Highway Traffic Noise Prediction Model (FHWA 1978). Calculated noise levels do not consider any shielding or reflection of noise by existing structures or terrain features or noise contribution from other sources. Estimates are based on the amount of material to be hauled, number of days of construction, and the number of hauling hours per day as provided in Chapter 2.0, "Alternatives," and assuming a speed of 25 mph. See modeling results in **Appendix F** of this EIS/EIR for further detail.

[2] Haul truck traffic would use East Levee Road in the event that soil excavated from the cutoff wall trench must be hauled to a stockpile site at the East Side borrow site.

Source: Data compiled by EDAW in 2008

Because most of the project area roadways currently serve a limited volume of residential and agricultural traffic, it is assumed that the modeled noise levels represent substantial increases compared to existing traffic noise levels. Not only would the project result in substantially more vehicle trips on some roads in Sutter County and along the toe of the Sacramento River east levee near residences, but the vehicles would be predominantly haul trucks, which generate considerably more noise than passenger vehicles. Predicted traffic noise levels along haul routes would exceed local exterior noise standards at residential land uses located along designated haul routes. Specifically, residences located along Riego Road, West Elverta Road, and West Elkhorn Boulevard would experience an increase in traffic noise levels due to hauling activities. The nearest residential land uses situated along West Elkhorn Boulevard are located 50 feet from centerline and are expected to experience haul truck traffic noise levels from work associated with the Pacific Terrace Borrow Site of 67.6 dB.

Any borrow site developed in the Elkhorn Borrow Area would require an associated haul route that would contribute to traffic noise levels associated with this impact. As described in Section 2.3.8, "Borrow Material," in selecting borrow sites, consideration would be given to ensure that activities result in minimal adverse impacts to the environment. SAFCA would be required to evaluate haul truck traffic noise levels and implement Mitigation Measure 4.14-c, described below.

Assuming a standard exterior-to-interior attenuation rate of 25 dBA for residential buildings, noise generated by haul trucks supplying material for the Sacramento River east levee improvements could result in interior noise levels of 42.6 dBA L_{eq}. Assuming haul trucks would be operational for 10 daytime hours, average interior noise levels associated with daily haul truck trips would be 38.9 dB L_{dn}. Based on these results, haul truck noise levels are not expected to result in an exceedance of the interior noise standard of 45 dBA L_{dn}/CNEL for residential land uses established by Sutter County, Sacramento County, and the City of Sacramento for transportation noise sources, although they would exceed local exterior noise standards at residential land uses, as noted above. In addition, although hauling activity is expected to take place during daytime hours, because of the need to complete levee improvements outside of the flood season and because of other environmental constraints on project schedule, it may be necessary to conduct some hauling activity during some noise-sensitive early morning and nighttime hours, potentially resulting in sleep disturbance at nearby residences. This temporary, short-term impact is considered **potentially significant**. ***(Similar)***

Mitigation Measure 4.14-c: Implement Noise-Reduction Measures to Reduce the Temporary, Short-term Impacts of Haul Truck Traffic Noise

Proposed Action and Levee Raise-in-Place Alternative

SAFCA and its primary contractors for engineering design and construction shall ensure that the measures listed below are implemented at each work site in any year of project construction to minimize temporary, short-term construction traffic noise effects on sensitive receptors.

- All heavy trucks shall be equipped with noise control (e.g., muffler) devices in accordance with manufacturers' specifications.
- All haul trucks shall be inspected before use and a minimum of once per year to ensure proper maintenance and presence of noise-control devices (e.g., lubrication, nonleaking mufflers, and shrouding).
- Before haul truck trips are initiated during a construction season on roads within 160 feet of residences (the 60-dBA noise contour of haul truck traffic), written notification shall be provided to the potentially affected residents identifying the hours and frequency of haul truck trips. Notification materials shall also identify a mechanism for residents to register complaints with the appropriate jurisdiction if haul truck noise levels are overly intrusive or occur outside the exempt daytime hours for the applicable jurisdiction.

These measures would reduce interior and exterior noise levels generated by haul truck traffic that passes noise-sensitive receptors. However, the mitigated noise levels may not meet the applicable standards for local exterior noises for residential land uses. Therefore, implementing this mitigation measure would partially reduce the temporary traffic noise impact from hauling activities, but not to a less-than-significant level. Thus, this temporary, short-term impact would remain **potentially significant and unavoidable**. **(*Similar*)**

Impact 4.14-d: Long-Term Increases in Project-Generated Noise

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for long-term increases in project-generated noise. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without the Natomas perimeter levee system, the risk of levee failure would remain high. Efforts to reconstruct the levee would depend on the extent and location of damage. Equipment such as pumping plants would likely be used, generating short-term noise. Upon completion of levee repairs, noise generation would not be substantially greater than in a no-action, no-flood scenario. However, a precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

The proposed replacement of RD 1000 Pumping Plant No. 2 would be located east of the Sacramento east levee near the west end of the North Drainage Canal and would involve the long-term operation of noise-generating stationary equipment. The pumping station would contain two 350-hp and one 200-hp electric-motor-driven pump and a backup generator. Without proper noise control or enclosure, such equipment could result in noise levels in the range of 78–88 dBA at 3–5 feet from the source depending on the exact type and size (EPA 1971).

The two pumps would replace similarly sized pumps that existed at the RD 1000 Pumping Plant No. 2 site prior to removal of the pump station. The only increase in stationary and area source noise associated with the proposed replacement pump station would be mechanical equipment, such as an emergency standby generator. The generator would be used only during emergency situations and during monthly testing. Operational noise levels associated with proposed pumping station improvements would be in compliance with applicable performance standards at nearby receptors. Therefore, this impact related to long-term operational noise is considered **less than significant**. ***(Similar)***

Mitigation Measure: No mitigation is required.

Impact 4.14-e: Exposure of People Working in the Project Area to Excessive Airport Noise Levels

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, people would not be working in the project area and workers would not be exposed to excessive Airport noise levels. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. If a flood were to occur, the location of workers reconstructing the levee would depend on the location of damage. Provided that repair locations are in close proximity to the Airport, it is considered highly unlikely for aircraft operations to be occurring post-flood event. This potential impact would be **less than significant**. ***(Similar)***

Proposed Action and Levee Raise-in-Place Alternative

Project construction activities would expose people working in the project area to excessive Airport noise levels. Portions of the Sacramento River east levee construction area would be located within the 65-dB, 70-dB, and 75-dB L_{dn}/CNEL Airport noise level contours, specifically, Reaches 4A–5A and Reaches 10–11B. The *County of Sacramento General Plan* Land Use Compatibility for Airport Noise chart (pages 21–23 of the *County of Sacramento General Plan*) lists a variety of land uses and the acceptable Airport noise levels applicable for each land use. Construction areas are not specifically stated in this list; however, they are assumed to fall in the category of industrial and manufacturing, which allows an acceptable Airport noise level of up to 85 dB L_{dn}/CNEL. As stated above, construction areas would only be exposed to Airport noise levels of up to 75 dB L_{dn}/CNEL. Therefore, construction areas would not exceed the recommended land use compatibility for Airport noise, this impact is considered **less than significant**. ***(Similar)***

Mitigation Measure: No mitigation is required.

4.14.3 RESIDUAL SIGNIFICANT IMPACTS

In the event of levee failure under the No-Action Alternative, potential impacts related to generation of temporary, short-term construction noise, exposure of sensitive receptors to or generation of excessive temporary, short-term groundborne vibration, exposure of people working in the project area to excessive Airport noise levels would be less-than-significant. Impacts related to exposure of residents to temporary, short-term increased traffic noise levels from hauling activity and long-term increases in project-generated noise are uncertain. Because of this uncertainty, this potential impact is considered too speculative for meaningful consideration. Additionally mitigation measures cannot be required for the No-Action Alternative; therefore impacts that result from the No-Action Alternative would not be mitigated.

Under the Proposed Action and the Levee Raise-in-Place Alternative, the adverse impacts of both exposure of sensitive receptors to or generation of excessive groundborne vibration and exposure of residents to increased traffic noise levels from hauling activity would be significant. Implementing Mitigation Measures 4.14-b and 4.14-b would reduce these temporary, short-term impacts, but not to a less-than-significant level, because the recommended mitigation would not fully reduce groundborne vibration and exterior noise to levels that are below established standards. Therefore, the Proposed Action and the Levee Raise-in-Place Alternative would result in a significant and unavoidable temporary, short-term impact on noise-sensitive receptors (e.g., nearby residents).

4.15 RECREATION

4.15.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.15.1.1 METHODOLOGY

No recreational facilities exist along the PGCC and no institutionally recognized recreational activities or substantial recreational uses take place there. Therefore, the impact analysis is limited to the NEMDC, the Sacramento River east levee, and associated construction areas.

4.15.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to recreation if they would do any of the following:

- increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated;
- include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment;
- substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity; or
- implement operational or construction-related activities related to the placement of project facilities that would cause a substantial long-term disruption of any institutionally recognized recreational activities.

The project would not increase the use of existing recreational facilities such that substantial physical deterioration would occur or involve the construction of additional recreational facilities or expansion of existing facilities. Therefore, the first two significance thresholds do not apply and are not discussed further in this EIS/EIR.

4.15.2 IMPACTS AND MITIGATION MEASURES

Impact 4.15-a: Long-Term Disruption of Recreational Activities and Facilities

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to directly disturb recreational facilities. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Recreational facilities, including boat ramps, a golf course, and neighborhood park could face temporary closure as a result of flooding. A precise determination of significance is not possible and cannot be made because the

extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

No parks are located near the proposed borrow sites; therefore, no recreational facilities would be directly or indirectly affected by borrow site activities. A portion of the proposed Krumenacher borrow site, adjacent to the NEMDC west levee, has been identified by the City of Sacramento Department of Parks and Recreation as a potential park site (Allen, pers. comm., 2008). Reclamation of the proposed Krumenacher borrow site entails returning it to agricultural use (grazing). Thus, such reclamation would not interfere with the future use of the site as a park. Therefore, long-term impacts on recreational opportunities related to the proposed borrow sites are considered less than significant.

The NEMDC west levee itself is contained within the Ueda Parkway, which includes a paved bike trail on the levee crown between Garden Highway and Del Paso Road. The trail is a permitted encroachment on the NEMDC west levee and its continued presence is subject to the needs of the operation and maintenance of the levee system. Gardenland Park is immediately adjacent to the NEMDC west levee. Construction activities would require demolition of the paved trail and closure of the bicycle trail for approximately 3–6 months. The Ueda Parkway Bicycle Trail provides a north-south connection between North Natomas, South Natomas, and the American River Parkway bicycle trails and is used by recreational and commuter bicyclists. The trail also provides bicycle access to downtown Sacramento.

Construction of a cutoff wall in the Sacramento River east levee adjacent to the I-5 Bridge would require closure of Garden Highway south of North Bayou Road for approximately 8–12 weeks during the summer season, preventing access to Sacramento County's Elkhorn Boat Launching Facility at this location (Reach 9B).Temporary impacts on bicycle facilities and the public boat launch ramp are considered significant.

Overall, temporary disruption to recreational facilities during project construction activities would be a **significant** impact. ***(Similar)***

Mitigation Measure 4.15-a: Prepare and Implement a Bicycle Detour Plan for Ueda Trail, Provide Construction Period Information on Recreational Facility Closures and Detours, Provide Detours for Bicycle Facilities, and Coordinate with Recreation Agencies to Allow Them to Repair Damage to Recreational Facilities

Proposed Action and Levee Raise-in-Place Alternative

SAFCA shall implement the following measures to reduce temporary, short-term construction impacts on recreational opportunities in the project area:

- Before the start of construction, prepare a bicycle detour plan for the Ueda Parkway Bicycle Trail in consultation with the City of Sacramento Bicycle and Pedestrian Coordinator. The detour plan shall include posted signs clearly indicating detour routes, roadway markings to designate temporary bike lanes, and informational signs to notify motorists to share the roads with bicyclists. The detour plan shall be in place before the start of construction and shall be maintained and implemented throughout the construction period.
- Provide construction period information on recreational facility closures and detours.
- Upon completion of the levee improvements, coordinate with the City and/or County (where applicable) for the City and/or County (where applicable) to restore access and repair any construction related damage to recreational facilities, including the Ueda Parkway bicycle trail.

Implementing this mitigation measure would reduce the temporary impact from construction-related disruption to bicycle trails and the boat launch facility under the Proposed Action and the Levee Raise-in-Place Alternative to a **less-than-significant** level because construction-related damage would be repaired, access restored, and detour routes, roadway markings to designate temporary bike lanes, and informational signs would be provided. ***(Similar)***

Impact 4.15-b: Temporary Changes in Recreational Opportunities during Project Construction Activities

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, the No-Action Alternative would not directly affect recreational opportunities in the project area. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Recreational facilities, including boat ramps, a golf course, and neighborhood parks could face permanent closure as a result of flooding. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

Construction of the adjacent levee and cutoff wall would temporarily restrict access to some recreational facilities located along the Sacramento River east levee. Construction activities would result in traffic delays and/or lane closures along Garden Highway, which is a primary travel route to marinas and boat launch ramps along the Sacramento River. Construction of a cutoff wall in the Sacramento River east levee adjacent to the I-5 Bridge would require closure of a section of Garden Highway for approximately 8–12 weeks during the summer season, preventing access to Sacramento County's Elkhorn Boat Launching Facility at this location (Reach 9B). Access would be maintained to the two nearby marinas, located north of the boat launch ramp. Access to Teal Bend Golf Club on the land side of the levee may be affected to varying degrees depending on the haul route selected. A haul route at the landside of the levee along Garden Highway would require rerouting access to the golf course from Garden Highway during the construction of levee improvements in Reach 6B. If an alternative haul route were selected, following the GGS/Drainage Canal alignment, disturbance of access to the golf course from Garden Highway would be limited primarily to levee raise and cutoff wall construction activities.

The quality of recreational opportunities is also likely to be somewhat reduced, temporarily, in the project vicinity as a result of noise, dust, and visual disturbance from construction activities associated with levee improvement activities. Gardenland Park, a neighborhood park located adjacent to the NEMDC west levee in South Natomas, parks located adjacent to the NEMDC east levee, including Hansen Ranch Park and Redwood Park, and two private marinas located near the I-5 Bridge may be adversely affected by noise and dust from construction activities.

Construction activities associated with the proposed relocation of the Elkhorn Canal and the new GGS/Drainage Canal could disturb recreational uses at the Teal Bend Golf Club, depending on the alignment of these canals. Use of the golf course may be disrupted by excavation activities within the Elkhorn Borrow Area located immediately to the south of the Teal Bend Golf Club. The Gardenland Park, located adjacent to the NEMDC west levee on Bowman Avenue, would not be in the construction footprint, but use of the park would be affected by temporary construction-generated noise, dust, and visual disturbance. Construction of the seepage cut-off wall would occur 24 hours-per-day, 7 days-per-week at times, as described in Section 2.1.3.2, "Seepage Remediation."

Temporary closure of the Sacramento River levee sections of Garden Highway would be an inconvenience for recreationists. Recreationists would need to use other travel routes to access recreational facilities and would need to use alternative facilities along the unaffected portions of the levee during the construction period. For example, Powerline Road could be used as an alternative route to Garden Highway. Powerline Road allows for north-south travel between Sankey Road in the north to south of I-5 in the south. Boat launch ramps at Discovery Park, Miller Park, and Verona outside of the construction area, could be used when the Elkhorn Boat Launch facility is temporarily closed.

Disturbance of recreational facilities in any part of the project area would temporarily affect recreational uses. Residents would need to use nearby recreational facilities in South Natomas or in adjacent areas. Off-street bicycle facilities in the area are limited; the Ueda Parkway Bicycle Trail is the only off-street bicycle path connecting North and South Natomas and provides an important connection to the American River Parkway and downtown Sacramento. Bicyclists would have to find alternative on-street routes through the area.

Overall, temporary changes in recreational opportunities during project construction activities would be a **significant** impact.

Levee Raise-in-Place Alternative

Impacts related to effects to recreational opportunities under the Raise-in-Place Alternative would be the same as the Proposed Action, except that Sacramento River levee improvements, including construction of the cutoff wall would take place on the existing levee, requiring full closure of 1.5- to 2-mile sections of Garden Highway for approximately 8–12 weeks at a time. This would result in loss of access to boat launch ramp near the I-5 Bridge, as would occur with the Proposed Action; however the two marinas located immediately north of the boat launch ramp would also lose access for approximately 8–12 weeks during the summer season. Additionally reconstruction of the existing levee would cut off access to the Teal Bend Golf Club for the duration of the construction period.

Overall, temporary changes in recreational opportunities during project construction activities would be a **significant** impact. ***(Greater)***

Mitigation Measure 4.15-b: Provide Construction Period Information on Recreational Facility Closures and Detours and Provide Detours for Access Routes to Alternate Boat Launch Ramps and Marinas

Proposed Action

SAFCA shall implement Mitigation Measure 4.15-a and the following measure to reduce construction impacts on recreational opportunities in the project area:

- Provide public information through the media and on SAFCA's Web site regarding detours and alternative access routes to public and private recreational facilities affected by project construction. SAFCA shall coordinate with the City of Sacramento Recreation and Parks Department to make available information to the public regarding closure of public recreational facilities, detours and alternate sites available.

Implementing this mitigation measure would reduce the temporary impact from construction-related disruption recreational opportunities under the Proposed Action to a **less-than-significant** level.

Levee Raise-in-Place Alternative

In addition the mitigation measure described above for the Proposed Action, SAFCA shall provide alternative access with posted detours, as feasible, for recreational facilities affected by the anticipated road closures on Garden Highway.

Implementing this mitigation measure would reduce the temporary impact from construction-related disruption recreational opportunities under the Levee Raise-in-Place

Alternative, but not to a less-than-significant level because providing alternate access may not be feasible. Therefore, the temporary (lasting approximately 8–12 weeks per closed section) impact on recreational opportunities would be **significant and unavoidable**. **(*Greater*)**

4.15.3 RESIDUAL SIGNIFICANT IMPACTS

Impacts related to long-term disruption of recreational activities and facilities and temporary changes in recreational opportunities in the event of levee failure are uncertain. Because of this uncertainty, these potential impacts are considered too speculative for meaningful consideration. Additionally, mitigation measures cannot be required for the No-Action Alternative; therefore impacts that result from the No-Action Alternative would not be mitigated.

With implementation of the mitigation measures described above, no residual significant impacts related to recreation would occur under the Proposed Action and Levee Raise-in-Place Alternative. However, in the event SAFCA cannot provide a feasible alternative access/detour route for those recreational facilities affected by construction-related activities, the temporary, construction-related impact would remain significant and unavoidable in the short-term.

4.16 VISUAL RESOURCES

4.16.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.16.1.1 METHODOLOGY

Evaluation of the project's potential impacts on visual resources was based on a review of scenic vistas and landscapes that could be affected by project-related activities. Visual contrasts were examined, which included evaluations of changes in form, size, colors, project dominance, view blockage, and duration of impacts. Other elements such as natural screening by vegetation or landforms and placement of the project in relation to existing structures were also considered.

4.16.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to visual resources if they would do any of the following:

- have a substantial adverse effect on a scenic vista;
- substantially damage scenic resources, including but not limited to trees, rock outcrops, and historic buildings, within a state scenic highway;
- substantially degrade the existing visual character or quality of the site and its surroundings; or
- create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

There are no designated state scenic highways in the project area (Caltrans 2007); therefore, this issue is not discussed further in this EIS/EIR.

4.16.2 IMPACTS AND MITIGATION MEASURES

Impact 4.16-a: Alteration of Scenic Vistas, Scenic Resources, and Existing Visual Character of the Project Area

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for impacts on adjacent trees on the land side of the Sacramento River east levee. On the water side of the levee, trees and vegetation would continue to be removed in compliance with USACE guidance regarding levee encroachments. The quality of the views of the waterside of the levee would be degraded for recreational users of the river as a result of these actions. Therefore, this is considered a **potentially significant** impact. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Damage caused by flooding could result in damage to structures, vegetation, and woodlands. Sensitive viewers, such as residents and recreational users, could lose aspects of visual coherence, vividness, and unity. However, if a levee failure were to occur, damage to visual resources would depend on extent and duration of a flood event and subsequent repair. Because the effects of a levee failure are unpredictable, a precise determination of

significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

Along the land side of the Sacramento River east levee and the PGCC, construction activities would not take place in areas of high aesthetic qualities or viewer sensitivity; would be temporary; would be distant from most residences; and would not be visible for prolonged periods to any recreationists, who would generally be on the water side of the Sacramento River east levee. For these reasons, the presence of construction equipment and crews would not substantially affect scenic vistas or substantially degrade the visual character or quality near the Sacramento River east levee and the PGCC for a prolonged period of time. However, adjacent land uses in the portion of the NEMDC located generally south of Interstate 80 (I-80) consist of offices and residential neighborhoods. While aesthetic values are moderate in this area, residents are generally more sensitive to visual change because of the prolonged exposure and higher degree of concern regarding their surroundings. Construction equipment and crews would be present and would be visible for temporary but prolonged periods to residents during construction.

The Sacramento River east levee improvements would entail constructing an adjacent levee with a 3:1 horizontal-to-vertical (H:V) landside slope along the existing levee, which would widen the levee embankment by approximately 50 feet and flatten its landside slope. The PGCC west levee would be widened and strengthened through the construction of seepage berms approximately 100 feet wide along the land side of the levee. These alterations to the existing levee would result in views similar to existing conditions at the conclusion of construction activities. The temporary presence of construction equipment would substantially degrade the visual character or quality along the land side of the Sacramento River east levee. Upon completion of project construction, visual resource qualities and character would return to preexisting conditions.

The NEMDC levee improvements would widen the west levee from Elkhorn Boulevard to the NEMDC stormwater pumping station. A cutoff wall would be constructed where needed to reduce seepage potential in the section from Elkhorn Boulevard to Northgate Boulevard. **Plate 11** illustrates a typical cutoff wall through a levee centerline. Construction of a cutoff wall through the center of the levee typically requires that the existing levee be degraded as much as one-third of the levee height. After the cutoff wall installation is complete, select fill would be used to rebuild the levee. There would be no noticeable visual change in the levee structure at the conclusion of construction activities. The temporary presence of construction equipment would temporarily degrade the visual character or quality along the NEMDC west levee. Upon completion of project construction, visual resource qualities and character would return to preexisting conditions.

The Proposed Action would require the removal of numerous large, mature trees in scattered locations in the Phase 3 Project footprint, but primarily along the landside toe of the Sacramento River east levee in Reaches 5A–9B and in Reaches 10–12A. In some locations, these trees are portions of larger groves, the majority of which would not be affected by the project. However, many of these trees tower above the surrounding features and are striking, distinctive elements in local settings along the levee system, visible to residents on both sides of the levee and travelers along Garden Highway and other local roadways, Interstate 5 (I-5), and I-80. As reminders of the oak woodlands that formerly occupied much of the region and sometimes the only remnants of farmsteads that once stood in locations along the levee toe, these trees have a high aesthetic value. Additionally, the Proposed Action would include tree removal within the footprint of the Elkhorn and GGS/Drainage canals and the RD 1000 Pumping Plant No. 2 and along the alignment of the Replacement Riverside Canal. In total, the Proposed Action would remove approximately 38 acres of trees. As described in Chapter 2.0, “Alternatives,” the Proposed Action includes offsetting the removal of the trees with new woodland plantings, consisting largely of oaks and faster-growing cottonwoods, spread throughout the western portion of the Basin. The location of the plantings includes the Lower Woodlands borrow site. In time, these new trees would enhance the visual qualities of the landscape; however, it would take many years for the new plantings to reach the size of the existing trees that are proposed to be removed, which in some cases are likely 100 years old or older. The removal of the existing trees would

substantially degrade the quality of scenic resources and the existing visual character and quality of local sites and their surroundings.

The raised and widened Sacramento River east levee would be noticeable to travelers on Garden Highway, but variations in the height and width of flood damage reduction features are common throughout the flood damage reduction system, and the levees themselves are not distinctive scenic resources. For this reason and the reasons stated with regard to changes in views from the land side of the levees, these changes in the appearance of the flood damage reduction system would not represent a substantial change in scenic vistas or the character or quality of views.

The proposed borrow operations would lower the elevation of borrow sites by about 5 feet over very large areas. The majority of the sites would be returned to pre-project conditions (field crops, fallow fields, rice, or grazing). However, the 24-acre Lower Woodlands borrow site would be converted from grassland to woodlands (see **Table 2-2** for details regarding borrow pit depth, area of excavation and postreclamation uses). The proposed elevation changes would not be discernible at the scale at which they would be implemented (hundreds of acres), and the proposed land cover types would be consistent with adjacent land uses and overall land cover types in the surrounding portions of the Natomas Basin. The change from grassland to woodlands would be comparable in terms of visual quality, and because the other borrow sites would be returned to preproject conditions, the long-term impacts at the borrow sites are considered less than significant. However, in the short term, the presence of construction equipment and the loss of vegetative cover would temporarily degrade the visual character of the borrow sites. Additionally, any borrow sites developed in the Elkhorn Borrow Area would potentially contain irrigation and drainage pipeline penetrations, which would introduce new intrusive visual features into the landscape.

Overall, alteration of scenic vistas, scenic resources, and existing visual character of the project area would be a **significant** impact.

Levee Raise-in-Place Alternative

The Levee Raise-in-Place Alternative is similar to the Proposed Action except that no adjacent setback levee would be constructed along the Sacramento River east levee, thus the Levee Raise-in-Place Alternative would require removal of riparian woodlands on the water side of these levee reaches to construct cutoff walls and conform with USACE guidance regarding levee encroachments.

Under this alternative, in addition to the removal of trees on the landside of the Sacramento River east levee, as much as 22.5 acres of riparian woodland on the water side of the Sacramento River east levee would likely be removed to construct cutoff walls and conform with USACE guidance regarding levee encroachments. Tree removal for the RD 1000 Pumping Plant No. 2, alignment of the replacement Elkhorn Canal, new GGS/Drainage Canal, and replacement Riverside Canal would be the same as under the Proposed Action. The total amount of tree loss for this alternative would amount to approximately 40 acres. Viewer sensitivity would be high for Sacramento River recreational users, and for residents living on the water side of the levee. This alternative would include offsetting the removal of trees with approximately 41 acres of woodland planting as described under the Proposed Action. As noted above, replacement plantings would require many years to achieve the same size and aesthetic value as the existing mature vegetation that would be removed. The loss of high aesthetic qualities due to removal of mature waterside vegetation combined with high viewer sensitivity of recreational users of the Sacramento River and residents on the water side of the levee would be a **significant** impact. ***(Similar)***

Mitigation Measure: No feasible mitigation is available.

Impact 4.16-b: New Sources of Light and Glare that Adversely Affect Views

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to change light and glare along the perimeter levee system. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Damage to the infrastructure in the Natomas Basin could result in a short-term decrease in nighttime lighting due to power outages. However, depending on the extent and location of levee failure and subsequent flood damage, emergency lighting could be required for nighttime security and construction. Because the effects of a levee failure are unpredictable, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered to be **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

No new permanent sources of light or glare would be associated with the Proposed Action or the Levee Raise-in-Place Alternative. However, equipment staging areas would be lit as necessary for security reasons during construction. With the exception of construction of the seepage cutoff walls (e.g., 24/7 construction), construction is not generally anticipated to be conducted after 8:00 p.m.; however, it is possible that occasional construction activities may be required during nighttime hours (except for borrow areas in the Airport Critical Zone), in which case additional construction areas may require temporary nighttime lighting. Construction of the seepage cutoff walls may require construction 24 hours per day, 7 days per week, in which case security and construction night lighting would be used.

Residences are located on the land side of the Sacramento River east levee close to the proposed levee improvement sites in the Phase 3 Project area; however, the landside construction areas could often be screened from direct views of the construction area by trees, depending on tree height and proximity to the construction areas, and proximity of residences to the construction area. Where many residences are present on the water side of the levee, the existing levee itself, trees, and other vegetation could partially shield residences from lighting used on the land side of the levee, where the work would be performed. Security night lighting also would be provided at the replacement of RD 1000 Pumping Plant No. 2, although it would be situated such that no residences would be affected by this source of night light.

Along the NEMDC, primarily south of I-80, there are residential areas immediately adjacent to the levee. The seepage cutoff wall would be constructed in this section of the NEMDC; therefore, exposure of residents to light and glare from nighttime construction would occur with installation of the seepage cutoff walls using 24/7 construction.

Construction work would typically move in a linear fashion along the levees, and construction activities generally would not take place in any one location for more than a few weeks. Therefore, where nighttime construction lighting (if needed) would be clearly visible from nearby residences, the activity would be short-term and temporary and therefore would not constitute a substantial source of light or glare. However, nighttime lighting related to project construction with a 24/7 construction schedule in particular could create a new source of

substantial light or glare that would adversely affect nighttime views in the area. The introduction of new light and glare, primarily with 24/7 construction, would be a temporary but **significant** impact. ***(Similar)***

Mitigation Measure 4.16-b: Implement Mitigation Measure 4.19-a, "Coordinate Work in the Critical Zone with Airport Operations and Restrict Night Lighting within and near the Runway Approaches;" and Direct Lighting Away from Adjacent Properties

Proposed Action and Levee Raise-in-Place Alternative

SAFCA shall implement the following measures to reduce the impacts of light and glare associated with project construction activities.

SAFCA shall implement Mitigation Measure 4.19-a, "Coordinate Work in the Critical Zone with Airport Operations and Restrict Night Lighting within and near the Runway Approaches," contained in Section 4.19, "Airport Safety," which requires that no borrow activities shall be conducted within the Airport Critical Zone during nighttime hours; and, that all project-related nighttime lighting that is in, or is aligned with, the Airport runway approach zone (Sacramento River east levee Reaches 5A–9B) shall be directed downward to avoid potential interference within nighttime aircraft operations. As discussed in Section 4.19, "Airport Safety," implementation of Mitigation Measure 4.19-a would reduce lighting impacts associated with the Airport to a less-than-significant level. **(*Similar*)**

Additionally, SAFCA shall implement the following measures:

(a) SAFCA shall require that nearby residents be notified in advance of nighttime construction activities.

(b) SAFCA shall require that construction and security lighting be shielded and directed downward to minimize the spill of light onto adjacent properties.

Implementing these measures would reduce the impacts of light and glare for nearby residents, but not to a less-than-significant level; therefore, this impact would remain **significant and unavoidable**. ***(Similar)***

4.16.3 RESIDUAL SIGNIFICANT IMPACTS

Impacts related to degradation of visual resources in the project area in the event of levee failure are uncertain. Because of this uncertainty, these potential impacts are considered too speculative for meaningful consideration. Additionally, mitigation measures cannot be required for the No-Action Alternative; therefore impacts that result from the No-Action Alternative would not be mitigated.

Under the Proposed Action and the Levee Raise-in-Place Alternative, adverse impacts on visual resources due to construction activities and equipment on the levees would be significant. Measures to screen residences from construction sites and equipment staging and storage areas would reduce these impacts, but screening may not be feasible at all construction locations; therefore, the impact would remain significant and unavoidable. Similarly for visual degradation due to light and glare, screening and directing lighting away from adjacent properties would reduce the impacts of light and glare for nearby residents, but not to a less-than-significant level; therefore, this impact would remain significant and unavoidable.

Under the Proposed Action and the Levee Raise-in-Place Alternative, adverse effects on scenic resources and visual character of the Sacramento River east levee area from the removal of a substantial number of trees along the waterside of this levee would be significant. The Proposed Action and the Levee Raise-in-Place Alternative include measures to limit the extent of impacts on visual resources caused by the short-term loss of woodland areas (e.g., transplanting existing trees outside the project footprint where feasible) and to offset them over the

longer term (through substantial woodland planting). However, no feasible mitigation is available to reduce the short-term impacts from Impact 4.16-a to a less-than-significant level; thus, this impact would be significant and unavoidable in the short term. However, over the long term with the new acres of woodland plantings that would be installed under the Proposed Action and the Levee Raise-in-Place Alternative, the impact would be reduced to a less-than-significant level.

4.17 UTILITIES AND SERVICE SYSTEMS

4.17.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.17.1.1 METHODOLOGY

Impacts on utilities and service systems that would result from project implementation were identified by comparing existing service capacity and facilities against project implementation. Evaluation of potential utility and service systems impacts was based on a review of documents pertaining to the Natomas Basin. Additional information was obtained through consultation with appropriate agencies, such as Sacramento Regional County Sanitation District, Sacramento Municipal Utility District, Pacific Gas and Electric Company, and NCMWC.

4.17.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to utilities and service systems if they would do any of the following:

- exceed wastewater treatment requirements of the applicable regional water quality control board;
- require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- exceed water supplies available to service the project from existing entitlements and resources, such that new or expanded entitlements would be needed;
- result in a determination by the wastewater treatment provider that serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments;
- generate waste materials that would exceed the permitted capacity of local landfills or fail to comply with federal, state, and local statutes and regulations related to solid waste; or
- result in substantial adverse physical impact associated with the provision of new or altered governmental facilities in order to maintain acceptable service ratios, response times, or other performance objectives for public services such as fire protection, police protection, schools, or parks.

The project would not involve any changes in land use that would increase short-term or long-term demand for public services, including fire and police protection, schools, parks, and other public facilities, thus necessitating the construction of new or altered government service facilities. Similarly, the project would not result in demand for increased natural gas facilities, electrical transmission lines, communication systems, water infrastructure, sewer lines, or solid-waste services beyond their current capacity. Additional related information is presented in Section 4.2, "Land Use, Socioeconomics, and Population and Housing," and Chapter 5.0, "Cumulative and Growth-Inducing Impacts and Other Statutory Requirements."

4.17.2 IMPACTS AND MITIGATION MEASURES

Impact 4.17-a: Potential Temporary Disruption of Irrigation Water Supply

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to cause construction-related disruption to irrigation water supply. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could cause flooding that would damage canals, potentially disrupting irrigation of cropland. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related effect on these services cannot be predicted. Because the effects of a levee failure are unpredictable, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Irrigation and drainage pipeline penetrations of the Sacramento River east levee Reaches 5A–9B, the PGCC west levee, and the NEMDC west levee (south of Elkhorn Boulevard) would be raised as part of the project to meet current USACE regulations. Wells and pumps in the footprint of the proposed flood damage reduction facilities would be removed and replaced in locations farther from the project footprint. The Elkhorn and Riverside Canals, which are constructed above the surrounding terrain, would be relocated away from the toe of the Sacramento River east levee, and the replacement canals would need to be operable and lateral irrigation canals connected to them before the existing canals are demolished. Additional buried irrigation lines may exist that would need to be removed or reconnected. Further, much of the land within the Elkhorn Borrow Area relies on irrigation for agricultural purposes. Any borrow site developed in the Elkhorn Borrow Area would potentially contain irrigation and drainage pipeline facilities.

Substantial temporary interruptions of irrigation supply could occur if irrigation infrastructure is damaged or otherwise rendered inoperable at a time when it is needed (e.g., reconnections to water supply sources are not completed by the time crop irrigation must begin). Given the extent and intensity of project construction activities, it is possible that these activities could impede the repair of damaged infrastructure or cause a delay in the provision of irrigation supply. This temporary impact is considered **potentially significant**. ***(Similar)***

Mitigation Measure 4.17-a: Coordinate with Irrigation Water Supply Users Before and During All Irrigation Infrastructure Modifications and Minimize Interruptions of Supply

Proposed Action and Levee Raise-in-Place Alternative

SAFCA and its primary contractors for engineering design and construction shall ensure that the measures listed below are implemented to minimize the potential for irrigation water supply interruptions during construction activities. Upon selection of borrow sites within the Elkhorn Borrow Area, coordination similar to that listed below shall be required before irrigation interruption.

- Coordinate the timing of all modifications to irrigation supply infrastructure with the affected infrastructure owners and water supply users, either directly or through NCMWC.

- Include detailed scheduling of the phases of modifications/replacement of existing irrigation infrastructure components in project design and in construction plans and specifications.
- Plan and complete modifications of irrigation infrastructure for the nonirrigation season to the extent feasible.
- Provide for alternative water supply, if necessary, when modification/replacement of irrigation infrastructure must be conducted during a period when it would otherwise be in normal use by an irrigator.
- Ensure either that (1) users of irrigation water supply do not, as a result of physical interference associated with the project, experience a substantial interruption in irrigation supply when such supply is needed for normal, planned farming operations (i.e., a decrease in level of service in comparison with the existing level of service), or (2) users of irrigation water supply that experience a substantial decrease in an existing level of service that meets the established standards for the project area are compensated in kind for losses associated with the reduction in level of service.

Implementing this mitigation measure would reduce the potential temporary impact of disruptions to irrigation supply to a **less-than-significant** level because SAFCA would coordinate with water supply providers and consumers to minimize interruptions, would conduct work during the nonirrigation season whenever feasible, and would ensure that essential water supply necessary during the irrigation season is provided by an alternative supply if an interruption is unavoidable. ***(Similar)***

Impact 4.17-b: Potential Disruption of Utility Service

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to disrupt utility service. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in minor to substantial flooding that could substantially interrupt utilities and public services. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related impact on these services cannot be predicted. Therefore, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Project implementation would encroach upon multiple types of utility equipment and facilities. Along the Sacramento River east levee Reaches 5A–9B, project implementation would infringe upon electric conduits, telephone conduits, conductors, irrigation pipes and at least one gas line, as well as other pipelines and underground utilities (Dosanjh, pers. comm., 2008). Pumps, irrigation appurtenances, utility poles, and pipe crossings would be affected along the PGCC and NEMDC (Contreras, pers. comm., 2008). Project construction activities, including grading and excavation, could damage identified and unidentified utility equipment and facilities. In addition, required relocation of existing electrical and telephone lines and gas pipelines, could result

in interruptions in service. Similarly, much of the land within the Elkhorn Borrow Area contains utilities equipment and facilities that could be temporarily disrupted during borrow activities.

Detailed project design would include consultation with all known service providers to identify infrastructure locations and appropriate protection measures, and consultation would continue during construction to ensure avoidance/protection of facilities as construction proceeds to minimize service disruptions. The extent and intensity of project construction activities, however, may affect service providers' abilities to quickly repair damage and/or restore interrupted service. This impact is considered **potentially significant**. ***(Similar)***

Mitigation Measure 4.17-b: Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training with Respect to Accidental Utility Damage

Proposed Action and Levee Raise-in-Place Alternative

Before construction begins, SAFCA and its primary contractors shall coordinate with USACE, the CVFPB, and applicable utility providers to implement orderly relocation of utilities that need to be removed or relocated. Existing main electrical power transmission lines and poles on the water side of the existing Garden Highway levee that do not need to be relocated or replaced to accommodate the project may be left in place. No new main electrical power transmission lines and poles shall be installed on the water side of Garden Highway. Consistent with sound engineering practices that prioritize the following, individual service lines shall: (1) use existing configurations and facilities, and (2) any new poles shall be placed on the land side of Garden Highway, subject to the approval of USACE, the CVFPB, and any other regulatory public agencies and utility companies.

Notification of any potential interruptions in service shall be provided to the appropriate agencies and affected landowners.

Before the start of construction, utility locations shall be verified through field surveys and the use of the Underground Service Alert services. Any buried utility lines shall be clearly marked in the area of construction on the construction specifications in advance of any earthmoving activities.

Before the start of construction, a response plan shall be prepared to address potential accidental damage to a utility line. The plan shall identify chain of command rules for notification of authorities and appropriate actions and responsibilities to ensure the safety of the public and workers. Worker education training in response to such situations shall be conducted by the contractor. The response plan shall be implemented by SAFCA and its contractors during construction activities.

Utility relocations shall be staged to minimize interruptions in service.

Additionally, upon borrow site selection within the Elkhorn Borrow Area, further verification of utility locations, coordination with utility providers, preparation and implementation of a response plan, and any required construction worker training with respect to accidental utility damage shall be completed before any earth-moving activities take place.

Implementing this mitigation measure would reduce the impact from disruption of utility services to a **less-than-significant** level because SAFCA would coordinate with utility service providers and consumers to minimize interruptions to the maximum extent feasible and a response plan to address service interruptions would be prepared and implemented. ***(Similar)***

Impact 4.17-c: Increases in Solid Waste Generation

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no increase in solid waste generation related to project implementation. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Cleanup operations following flooding are likely to generate very high levels of solid waste; the amount of waste would depend on the extent, depth, and duration of flooding and the types of property damaged. Waste materials could exceed the permitted capacity of local landfills or fail to comply with federal, state, and local statutes and regulations related to solid waste. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

There would be no long-term generation of solid waste associated with project operation. Temporary, short-term project construction activities would generate over 100,000 cy of solid waste during the Phase 3 Project. Some residences, agricultural structures, and appurtenances in or near the footprint of the proposed flood damage reduction facilities on the land side of the Sacramento River east levee Reaches 5A–9B, the PGCC west levee, and the NEMDC west levee (south of Elkhorn Boulevard) would be relocated if feasible and in accordance with landowner preferences, but others would be demolished. Other materials, such as asphalt, concrete, pipes, and gravel, would need to be removed from the footprint of the proposed flood damage reduction facilities.

Waste materials (including cleared vegetation) would be hauled off-site to a suitable disposal location. Excess earth materials (organic soils, roots, and grass from borrow sites, including any borrow sites selected within the Elkhorn Borrow Area, and the adjacent levee foundation; and excavated materials that do not meet levee embankment criteria) would be used in the reclamation of borrow sites or hauled off-site to a suitable disposal location. Hazardous materials (e.g., building materials containing lead paint or asbestos) encountered during the removal of residences and other structures would be disposed of in accordance with regulatory standards (see Mitigation Measures 4.18-b[1] and 4.18-b[2] in Section 4.18, "Hazards and Hazardous Materials"). The location of the landfill used for disposal of spoil material and other construction-related waste would be determined by the construction contractor at the time of construction activity based on capacity, type of waste, and other factors. Only those landfills determined to have the ability to accommodate the construction disposal needs of the alternatives would be used. It is likely that Kiefer Landfill, owned and operated by Sacramento County, would be used for all or a part of the construction waste. Kiefer Landfill, which accepts 10,815 tons per day (TPD) of solid waste, is located about 15 miles southeast of the city of Sacramento (approximately 40 miles southeast of the Natomas Cross Canal south levee). With a permitted capacity of more than 117 million cubic yards through 2035 and a remaining capacity of nearly 113 million cubic yards as of 2005 (California Integrated Waste Management Board 2008), Kiefer Landfill would be able to accommodate the project's construction disposal needs. Similarly, the Western Regional Landfill in Placer County, approximately 15 miles from the NCC, would be able to accommodate the project disposal requirements, accepting 1,900 TPD with a maximum permitted capacity of more than 36 million cy and a remaining capacity of more than 29 million cy (California Integrated Waste Management Board 2008). Project construction and operation would not cause existing regional landfill capacity to be exceeded; therefore, this temporary, short-term impact is considered **less than significant**. ***(Similar)***

Mitigation Measure: No mitigation is required.

4.17.3 RESIDUAL SIGNIFICANT IMPACTS

Impacts associated with disruption to irrigation supply and utility services, and increases in solid waste generation are uncertain. Because of this uncertainty, these potential impacts are considered too speculative for meaningful consideration. Additionally, mitigation measures cannot be required for the No-Action Alternative; therefore impacts that result from the No-Action Alternative would not be mitigated.

Implementation of the mitigation measures described in this section for the Proposed Action and the Levee Raise-in-Place Alternative would reduce the impacts of a potential temporary, short-term disruption of the irrigation supply and the provision of other utility services to less-than-significant levels; therefore, there would be no residual significant impacts.

4.18 HAZARDS AND HAZARDOUS MATERIALS

4.18.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.18.1.1 METHODOLOGY

This section addresses potential sources of hazards and risks associated with hazardous materials that may be associated with implementation of the Proposed Action and alternatives under consideration. This analysis is based on a review of the following documents:

- *Environmental Site Assessment, Common Features GRR Project, Sacramento, CA*, USACE Sacramento District, Environmental Chemistry Section, Sacramento, California, in preparation; and
- *Natomas Levee Improvement Program (NLIP) Initial Site Survey (ISS) and Phase I Environmental Site Assessment (ESA)*, SAFCA, Sacramento, CA, prepared by Kleinfelder, July 15, 2008.

4.18.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to hazards and hazardous materials if they would do any of the following:

- create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- emit hazardous emissions or involve the handling of hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;
- be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment; or
- impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

4.18.2 IMPACTS AND MITIGATION MEASURES

Impact 4.18-a: Accidental Spills of Hazardous Materials

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities and thus, no accidental spills of hazardous materials related to this project would occur. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in flooding that could upset stored hazardous materials and spread

agricultural pesticides, oil, gasoline, and other hazardous materials in flood waters, creating hazardous conditions for the public and the environment. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related risks cannot be predicted. Because the effects of a levee failure are unpredictable, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Project-related construction and maintenance activities would involve the use of potentially hazardous materials, such as fuels (gasoline and diesel), oils and lubricants, and cleaners (which could include solvents and corrosives in addition to soaps and detergents), that are commonly used in construction projects. Bentonite (a nonhazardous material) and/or cement would be used where cutoff walls are being constructed to remediate levee seepage conditions. Construction contractors would be required to use, store, and transport hazardous materials in compliance with Federal, state, and local regulations during project construction and operation. Risks to water quality associated with incidental releases of these materials on project sites are addressed in Section 4.5, "Water Quality."

Compliance with the applicable regulations would reduce the potential for accidental release of hazardous materials during their transport and during project construction activities. Consequently, the risk of significant hazards associated with the transport, use, and disposal of these materials is low. This impact is considered **less than significant**. ***(Similar)***

Mitigation Measure: No mitigation is required.

Impact 4.18-b: Exposure to Hazardous Materials Encountered at Project Sites

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to expose people to hazardous materials encountered at project sites. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in flooding known sites of hazardous materials and potentially exposing the public and the environment to both the known hazardous conditions discussed above and potentially unknown hazardous conditions at those portions of the project site that have not been evaluated under a Phase I ESA. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related risks cannot be predicted. Because the effects of a levee failure are unpredictable, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

As described in Section 3.3.18, Kleinfelder has completed a Phase I ESA for areas within the NCC and Sacramento River east levee, between Reaches 1 and 9B. USACE is simultaneously performing a Phase I ESA on the Common Features Project, which includes the levee system surrounding the Natomas Basin (Esparza, pers. comm., 2008). Kleinfelder noted the possibility of residual pesticides, herbicides, and irrigation pipelines that contain asbestos at all sites used historically for agriculture. Four Recognized Environmental Conditions (RECs), which indicate the existence or likely existence of a hazardous substance impacting a property, were found within the project footprint:

- **The Yuki Pear Farm (Assessor's Parcel Number [APN] 201-0150-033):** This property contains one domestic well and two wells that are used to monitor a known gasoline spill. The existence of structures on the parcel indicates that subsurface utility systems (i.e., septic tanks, cistern, and heating oil tanks) that may represent an environmental hazard may be present.
- **APN 201-0280-037:** An application to install an underground storage tank (UST) was submitted; however, it is unknown by Kleinfelder and the property owner where or if a UST exists on site. Proper installation and abandonment is unknown.
- **APN 201-0270-048:** A damaged automotive battery is located on site. Although there is no apparent soil staining in relation, contamination is unknown.
- **APN 201-0270-028:** This property contains pieces of heavy equipment leaking engine oil and hydraulic fluid and numerous locations with discolored soil. A database search reported that USTs are located on site; however, there are none registered so if is not known if proper abandonment and removal practices were followed. There are also multiple above ground storage tanks that may have contained lead-based petroleum products. Additionally, solid waste including tires, automobile batteries, and electrical equipment was found on site.

The following sites do not contain RECs; however, there are environmental concerns:

- **Dunmore Borrow Site (APN 201-0120-031):** The State of California Department of Oil, Gas, and Geothermal Resources (DOGGR) listed an abandoned gas well within the site; however, Kleinfelder did not find evidence of this on-site or on aerial photographs or historical topographic maps.
- **Brookfield Borrow Site (APN 35-080-021):** Water pumps with two associated aboveground storage tanks containing diesel fuel were noted on the northeastern and central portion of the site, as well as two 5-gallon buckets containing small amounts of unknown oil that were not properly stored.
- **APNs 201-0150-040, 201-0150-041, 201-0150-042:** Records for DOGGR indicate that one plugged and abandoned dry hole exists on site. Title reports detail an easement granted to Shell Oil Company.
- **APNs 201-0150-055, 201-0140-059:** A topographic map from 1967 indicates the presence of an unimproved landing strip that may have been used for crop dusting activities. Structures on the site have been removed and Kleinfelder reported no indication of historical effect. Historic farm site domestic wells and septic systems may exist within the site, although no record of abandonment in the Sacramento County Building Department records exists. An idle gas well is located east of the western irrigation canal and south of the former building site on APN 201-0150-055.
- **Underground Storage Tank:** An underground storage tank containing diesel is located at 5870 Garden Highway.
- **Domestic Wells and Septic Tanks:** Domestic wells and septic tanks may also exist within parcels along the Sacramento River. Their proximity to Phase 3 Project activities is unknown.
- **APN 201-0280-044:** Proximity of the site to I-5 and Bayou Way, both well-travelled roads, may have resulted in lead contamination from leaded gasoline. In addition to pesticide and herbicide residue, underground irrigation pipelines that contain asbestos may exist on site due to past agricultural use.

Construction activities in the vicinity of these known on-site RECs and environmental concerns could result in public health hazards. In addition, the Elkhorn Borrow Area could contain herbicide and pesticide residue or other hazardous materials. Because the potential exists for exposure to known RECs and potentially unknown hazardous materials during construction activities that could adversely affect public health and the environment, this impact is considered **potentially significant**. ***(Similar)***

Mitigation Measure 4.18-b(1): Complete Recommendations Included in Phase I and/or II ESAs and Implement Required Measures

Proposed Action and Levee Raise-in-Place Alternative

Before the start of any construction activities, SAFCA shall ensure that all recommendations from the Kleinfelder Phase I ESA, listed below, are implemented by the property owner in compliance with applicable rules and regulations:

The Yuki Pear Farm (APN 201-0150-033):

- Conduct further investigation and implement all feasible remedial actions recommended in the Phase II ESA.
- Consult with the Sacramento County Environmental Management Department regarding any hazardous materials actions that may be necessary during future use of the site.
- Continue sampling from monitoring wells on a quarterly basis.
- Stockpile and sample soil for dichloro-diphenyl-trichloroethane (DDT) and dichlorodiphenyldichloroethylene (DDE) before removal.

Dunmore Borrow Site (APN 201-0120-031):

- Properly abandon wells, in accordance with applicable Federal, state, and local requirements, if found within the site and determined to be no longer needed.

Brookfield Borrow Site (APN 35-080-021):

- Properly dispose of buckets containing waste found on-site at a licensed disposal facility.

APNs 201-0150-040, 201-0150-041, 201-0150-042:

- Obtain requirements from DOGGR for construction activities near the dry hole.
- Investigate the presence of an underground conveyance pipeline that may be present on the Shell Oil easement and if found, coordinate with the owner to avoid or minimize impacts on said pipeline during construction activities, or relocate the pipeline if it is determined to be necessary.

APNs 201-0150-055, 201-0140-059:

- Consult with DOGGR and the gas well lease holder if the idle gas well would be disturbed during construction activities; if so, then implement all recommendations for safe project operations as provided by DOGGR following the initial consultation.
- Confirm the presence of water wells and septic systems and perform appropriate actions to abandon them in accordance with state and local requirements.

APN 201-0270-028:

- Complete a Phase II ESA to determine the presence of lead contamination associated with petroleum products.
- Determine if the former USTs are located on site, and if they have been properly abandoned and/or removed.

APN 201-0270-048:

- Complete a Phase II ESA to determine if the damaged automotive battery observed on site has contaminated soil.

APN 201-0280-037:

- Determine if a 100-gallon UST is located on site. If it exists, confirm proper abandonment practices.

APN 201-0280-044:

- Complete a Phase II ESA to determine elevated concentrations of chemicals remain on site.

Sites with Historical Agricultural Use:

- Conduct a limited sampling program (Phase II ESA) to analyze concentrations of organochlorine pesticides, organophosphorous pesticides, chlorinated herbicides, and selected metals residues.
- Investigate presence and location of asbestos-containing irrigation pipes.
- Implement all feasible remedial action recommendations contained in the Phase II ESA.

Implementing this mitigation measure would reduce the potentially significant impact from exposure of people to hazardous materials at project sites under the Proposed Action and the Levee Raise-in-Place Alternative to a **less-than-significant** level because RECs known to exist within the project area would be addressed; consultation with appropriate Federal, state, and local agencies would occur; and on-site contamination would be removed and properly disposed of by a licensed contractor in accordance with Federal, state, and local regulations. ***(Similar)***

Mitigation Measure 4.18-b(2): Complete Investigations Related to the Extent to Which Soil and/or Groundwater May Have Been Contaminated in Areas Not Covered by the Phase I and II ESAs and Implement Required Measures

Proposed Action and Levee Raise-in-Place Alternative

SAFCA shall implement the measures described below in coordination with the property owner.

- Conduct Phase I ESAs, and if necessary, Phase II ESAs, and/or other appropriate testing and include, as necessary, analysis of soil and/or groundwater samples for the potential contamination sites that have not yet been covered by previous investigations before construction activities begin. Similar appropriate testing for borrow sites selected within the Elkhorn Borrow Area shall be completed before any earth-moving activities. Recommendations in the Phase I and II ESAs to address any contamination that is found shall be implemented before initiating ground-disturbing activities in these areas.
- Implement the following measures before ground-disturbing or demolition activities begin within each project phase to reduce health hazards associated with potential exposure to hazardous substances:
    - Prepare a site plan that identifies any necessary remediation activities appropriate for proposed land uses, including excavation and removal of on-site contaminated soils, and redistribution of clean fill material on the project site. The plan shall include

measures that ensure the safe transport, use, and disposal of contaminated soil and building debris removed from the site. In the event that contaminated groundwater is encountered during site excavation activities, the contractor shall report the contamination to the appropriate regulatory agencies, dewater the excavated area, and treat the contaminated groundwater to remove contaminants before discharge into the sanitary sewer system. The contractor shall be required to comply with the plan and applicable Federal, state, and local laws. The plan shall outline measures for specific handling and reporting procedures for hazardous materials and disposal of hazardous materials removed from the site at an appropriate off-site disposal facility.

- Retain a licensed contractor to remove all underground storage tanks and stained soils associated with debris piles, in accordance with applicable Federal, state, and local regulations.

- Retain a licensed contractor to remove and dispose of all asbestos cement pipe found within the project area in accordance with applicable Federal, state, and local regulations.

- Retain a licensed contractor to remove all septic systems in accordance with applicable Federal, state, and local regulations.

- Retain an asbestos consultant who is certified by the California Occupational Safety and Health Administration (Cal/OSHA). The asbestos consultant shall investigate whether any asbestos-containing materials or lead-based paints are present before demolition of any on-site buildings. If any materials containing asbestos or lead are found, they shall be removed by an accredited contractor in accordance with U.S. Environmental Protection Agency and Cal/OSHA standards. In addition, all activities (construction or demolition) in the vicinity of these materials shall comply with Cal/OSHA asbestos and lead worker construction standards. The materials containing asbestos and lead shall be disposed of properly at an appropriate off-site disposal facility.

- Obtain an assessment conducted by the Pacific Gas and Electric Company pertaining to the contents of the existing pole-mounted transformers located within the project area. The assessment shall determine whether existing on-site electrical transformers contain polychlorinated biphenyls (PCBs) and whether there are any records of spills from such equipment. If equipment containing PCB is identified, the maintenance and/or disposal of the transformer shall be subject to the regulations of the Toxic Substances Control Act under the authority of the Sutter County Environmental Health Division and Sacramento County Environmental Management Department.

- Notify the appropriate Federal, state, and local agencies if evidence of previously undiscovered soil or groundwater contamination (e.g., stained soil, odorous groundwater) is encountered during construction activities. Any contaminated areas shall be cleaned up in accordance with recommendations made by the Sutter County Environmental Health Division, Sacramento Environmental Management Department, Central Valley Regional Water Quality Control Board, California Department of Toxic Substances Control, or other appropriate Federal, state, or local regulatory agencies as generally described above.

Implementing this mitigation measure would reduce the significant impact from exposure of unknown hazardous materials at the project site under the Proposed Action and the Levee Raise-in-Place Alternative to a **less-than-significant** level because a site plan identifying

remediation activities and setting forth procedures to appropriately handle hazardous materials would be prepared, and hazardous substances that are encountered would be removed and properly disposed of by a licensed contractor in accordance with Federal, state, and local regulations. ***(Similar)***

Impact 4.18-c: Interference with an Adopted Emergency Evacuation Plan

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to interfere with adopted emergency evacuation plans. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in flooding that could damage roadways. Road closures could create increases in traffic levels that could interfere with the use of main roadways for emergency evacuation routes. Because the effects of a levee failure are unpredictable, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

The Proposed Action and the Levee Raise-in-Place Alternative would increase traffic on local roadways associated with construction trips. In addition, temporary road closures associated with levee improvements could cause or contribute to temporary increases in traffic levels as traffic is detoured or slowed on some local roadways and SR 99/70. Increased traffic congestion could interfere with the use of main roadways for emergency evacuation routes. This impact is considered **significant**. ***(Similar)***

Mitigation Measure 4.18-c: Notify State and Local Emergency Management Agencies about Project Construction and Coordinate Any SR 99/70 Detours with these Agencies to Ensure That Any Need for Emergency Use Is Not Significantly Impaired

Proposed Action and Levee Raise-in-Place Alternative

SAFCA shall implement Mitigation Measure 4.12-a to avoid impairment of the use of SR 99/70 as an emergency evacuation route.

Implementing this mitigation measure would reduce the impact from the potential interference with an adopted emergency evacuation plan under the Proposed Action and the Levee Raise-in-Place Alternative to a **less-than-significant** level because the appropriate state and local agencies would be involved in implementing detours to ensure acceptable traffic flow and reduce the risk of impairment to emergency evacuation routes. ***(Similar)***

Impact 4.18-d: Hazardous Emissions or Handling of Hazardous or Acutely Hazardous Materials, Substances, or Waste within One-Quarter Mile of an Existing or Proposed School

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to release hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in flooding that could damage the Natomas Basin in such a way that hazardous substances could be emitted or handled within one-quarter mile of an existing or proposed school. Because the effects of a levee failure are unpredictable, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Garden Valley Elementary School, located at 3601 Larchwood Drive, is located within one-quarter mile of proposed construction and alteration of the NEMDC levee. In addition, the Twin Rivers Unified School District is planning to open a high school to be located on parcels located adjacent to the NEMDC. Construction and maintenance activities and borrow excavation in the Phase 3 Project would involve the use of potentially hazardous materials, such as fuels (gasoline and diesel), oils and lubricants, and cleaners (which could include solvents and corrosives in addition to soaps and detergents), that are commonly used in construction projects. Additionally, undocumented contaminated soil or water may be found during construction. Because the potential exists for exposure to both known and previously unknown hazardous materials within one-quarter mile of a school during construction activities, this impact is considered **significant**. ***(Similar)***

Mitigation Measure 4.18-d: Notify the Twin Rivers Unified School District and Applicable Schools with Jurisdiction within One-Quarter Mile of Project Construction Activities

Proposed Action and Levee Raise-in-Place Alternative

SAFCA shall provide written notification of the project to each of the affected schools and the Twin Rivers Unified School District within 30 days prior to certification of the EIS/EIR and shall consult with the Twin Rivers Unified School District regarding the potential impacts on schoolchildren from hazards associated with project implementation.

Implementation of this mitigation measure would reduce impacts associated with hazardous materials emissions related to schools within one-quarter mile of the project area to a **less-than-significant** level because under CEQA, the notification process is considered to satisfy the requirements of CEQA Public Resources Code Section 21151.4. ***(Similar)***

4.18.3 RESIDUAL SIGNIFICANT IMPACTS

Impacts associated with spills of hazardous materials, exposure to hazardous materials or interference with emergency evacuation plans are uncertain. Because of this uncertainty, these potential impacts are considered too speculative for meaningful consideration. Additionally, mitigation measures cannot be required for the No-Action Alternative; therefore impacts that result from the No-Action Alternative would not be mitigated.

Implementation of the mitigation measures described in this section for the Proposed Action and the Levee Raise-in-Place Alternative would reduce all potential impacts to less-than-significant levels.

4.19 AIRPORT SAFETY

4.19.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.19.1.1 METHODOLOGY

Evaluation of the project's potential impacts on airport safety was based on a review of the regulations pertaining to the project area, including the Airport's WHMP (SCAS 2007) and the FAA's Advisory Circular (AC) 150/5200-33B on hazardous wildlife attractants on or near airports (FAA 2007).

4.19.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to airport safety if they would result in a safety hazard for people residing or working in a project area that is located within 2 miles of a public airport or public-use airport.

There are no established thresholds for wildlife strikes. For this analysis, airport safety was analyzed within the Airport Critical Zone and the Airport Operations Area. The FAA recommends a separation distance of 10,000 feet between the Airport Operations Area and hazardous wildlife attractants (FAA 2007); this area is identified as the Critical Zone. Additionally, the FAA recommends a distance of 5 statute miles between the farthest edge of the Airport Operations Area and hazardous wildlife attractants (FAA 2007).

4.19.2 IMPACTS AND MITIGATION MEASURES

Impact 4.19-a: Temporary Aircraft Safety Hazards Resulting from Project Construction Activities within or near the Airport Critical Zone

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to introduce a safety hazard within or near the Airport Critical Zone. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Extensive night lighting may be necessary near or within the Airport Critical Zone for emergency operations, which could pose a potential safety hazard. Because the effects of a levee failure are unpredictable, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Portions of the project footprint, including the Sacramento River east levee, Elkhorn Canal relocation, GGS/ Drainage Canal, and most of the Airport north bufferlands, private property (Reaches 5B, 6A, and 7), South Sutter LLC, Pacific Terrace, Dunmore borrow sites, and the Elkhorn Borrow Area, are within the Airport Critical Zone (**Plates 17a and 17c**). Extensive night lighting of construction work and security lighting of construction staging

areas at night within these areas could interfere with nighttime aircraft landing operations and create a safety hazard related to aircraft landings. This impact is considered **significant**. ***(Similar)***

Mitigation Measure 4.19-a: Coordinate Work in the Critical Zone with Airport Operations and Restrict Night Lighting within and near the Runway Approaches

Proposed Action and Levee Raise-in-Place Alternative

SAFCA and its primary construction contractors shall ensure that the following mitigation is implemented to avoid interference of construction activities with Airport operations.

- No borrow activities shall be conducted within the Airport Critical Zone during nighttime hours.
- All project-related nighttime lighting that is in, or is aligned with, the Airport runway approach zones (Sacramento River east levee Reaches 5A–9B) shall be directed downward to avoid potential interference with nighttime aircraft operations.
- SAFCA shall ensure that the SCAS is informed in advance of the timing and nature of all construction activities within the Airport Critical Zone, and shall coordinate with SCAS during final project design to ensure that all appropriate safety precautions within the Critical Zone are incorporated into the construction plans. Additionally, requirements provided by the FAA, not incorporated into this document, shall be followed.
- SAFCA shall submit the FAA form 7460-1, Notice of Proposed Construction or Alteration, which notifies the FAA of construction or alteration that might affect navigable airspace. This form must be submitted to the FAA at least 30 days before the earlier of the following dates: (1) the date the proposed construction or alteration is proposed to begin, or (2) the date an application for a construction permit is to be filed.

Implementing this mitigation measure would reduce the temporary aircraft safety hazard impact from project construction activities within or near the Airport Critical Zone under the Proposed Action and the Levee Raise-in-Place Alternative to a **less-than-significant** level, because all nighttime lighting would be directed downward and SAFCA would coordinate with SCAS to ensure that all appropriate safety precautions are taken within the Critical Zone. ***(Similar)***

Impact 4.19-b: Potential for Higher Frequency of Collisions between Aircraft and Wildlife at Sacramento International Airport

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to increase the number of wildlife at the Airport. None of the proposed borrow site activities, dewatering, filling, canal replacement, removal and replacement of trees, or creation of habitat described for the Proposed Action and the Levee Raise-in-Place Alternative would occur. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Flooding is likely to result in changes in land surface in some areas, and areas retaining water for long periods even after floodwaters have receded. These conditions could result in high numbers of birds being attracted to the lands around the Airport (which is in a low-elevation area in the Basin) in the months following flooding and the

resumption of Airport operations, increasing the potential for collisions between aircraft and wildlife. Because the effects of a levee failure are unpredictable, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

The Airport has one of the highest numbers of reported wildlife strikes with aircraft of all California airports (SCAS 2007). Collisions between aircraft and wildlife compromise the safety of aircraft passengers and flight crews. In an attempt to reduce wildlife collisions with aircraft, SCAS has maintained and implemented the WHMP for more than 10 years at the Airport. The plan identifies routine maintenance, hazardous wildlife habitat manipulation, and other land management activities as the most effective long-term preemptive measures for reducing wildlife hazards.

As described in FAA's AC 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*, the FAA recommends a separation distance of 10,000 feet between the Airport Operations Area and hazardous wildlife attractants (FAA 2007); this area is identified as the Airport Critical Zone. Additionally, the FAA recommends a distance of 5 statute miles between the farthest edge of the Airport Operations Area and hazardous wildlife attractants (FAA 2007). Open water and agricultural crops are recognized as being the greatest wildlife attractants in the Airport vicinity, and rice cultivation is considered the most incompatible agricultural crop because of its flooding regime. Wildlife attractants near the runways are of greatest concern because, nationally, 74% of bird-aircraft strikes occurred at or below 500 feet above ground level (Cleary, Dolbeer, and Wright 2004). The area within a 10,000-foot radius of the Airport Operations Area is where arriving and departing aircraft are typically operating at or below 2,000 feet, an altitude that also corresponds with most bird activity (SCAS 2007).

The project would reduce the risk of a levee failure along the perimeter of the Natomas Basin that could cause the Airport to be flooded and out of commission for several months. Moreover, the project includes features designed to further reduce potentially hazardous wildlife attractants within the Airport Critical Zone by reducing open water and agricultural crops in this area. First, construction of the new GGS/Drainage Canal across Airport land just east of the Sacramento River east levee would allow agricultural irrigation water to be diverted into the new GGS/Drainage Canal and out of the Airport West Ditch. Second, borrow operations on the Airport north bufferlands would improve drainage on the former rice fields north of the Airport Operations Area and reduce the potential for standing water to accumulate on these fields and serve as a potentially hazardous wildlife attractant. This would be accomplished by grading these level fields to create a series of slopes and receiving swales capable of moving stormwater more efficiently to surrounding drainage canals. The graded land surface would be about 3 to 4 feet lower than the current land surface in most locations, but at least 2 to 3 feet above the elevation of the groundwater basin in this portion of the Natomas Basin and 1 to 2 feet above the receiving water in the drainage canals surrounding the Airport during a 10-year flood. The new surface area would be reclaimed as managed grassland. Grasslands, while used by wildlife, would be expected to drain more quickly and would be less attractive to hazardous wildlife, such as waterfowl, than would emergent wetlands, open water, and agricultural crops.

Finally, the project would also include removal of trees on Airport land along the landside toe of the Sacramento River east levee to construct levee improvements, and planting of trees on Airport land in Sutter County outside the Airport Critical Zone. As described above, the FAA recommends a separation distance of 10,000 feet between the Airport Operations Area and hazardous wildlife attractants in the Airport Critical Zone (FAA 2007). Because woodlands are known to support hazardous wildlife species, planting trees outside of the Airport Critical Zone would reduce wildlife attractants in that area. The new tree plantings would eventually result in an increase in the acreage of woodlands in the vicinity of the Airport; however, there would be a net reduction in the number of trees within the Airport Critical Zone and a net reduction in the attractiveness of the zone to hazardous wildlife.

Implementation of the project would involve construction of habitat enhancement features that could serve as attractants to birds within the Airport Critical Zone. Within this zone, the project entails relocating, creating, or redesigning a substantial length of irrigation and drainage canals, including 45 acres of new drainage canal designed as giant garter snake habitat.

Although these habitat features could serve as wildlife attractants, the project would actually result in a reduction of potential for wildlife collisions with aircraft at the Airport because it has been designed to replace existing hazardous wildlife attractants in the Critical Zone with land uses considered more compatible by the FAA and SCAS.

Construction of the GGS/Drainage Canal would allow approximately 5 acres of the Airport's West Ditch to be dewatered during summer. A significant portion of the West Ditch, which parallels the Airport's west runway, is located within the Airport Operations Area. This facility currently serves as an irrigation canal in the summer and a stormwater drainage canal in the winter. The aquatic habitat associated with the West Ditch has been identified by SCAS and the FAA as a hazardous wildlife attractant. As part of the Phase 3 Project, the irrigation function of the West Ditch and most of its drainage function, would be transferred to the lower portion of the new GGS/ Drainage Canal south of the Teal Bend Golf Club while the upper portion of the new canal north of the Golf Club would provide new canal habitat that would offset the impacts of the Airport West Grading ditch into a swale. This new configuration would help SCAS to achieve two objectives specified in the Airport's WHMP: (1) reducing aquatic habitat for hazardous wildlife, and (2) reducing hazardous wildlife use of ditches in the Airport Operations Area (SCAS 2007).

SCAS allowed all agricultural leases on Airport property, including the Airport north bufferlands, to expire on December 31, 2007 in order to comply with FAA policy guidelines, which recommend that all agricultural practices be excluded on or near airports to discourage the presence of hazardous wildlife. SAFCA would implement landscape changes on Airport north bufferlands used as borrow sources, through subsequent land reclamation, that would result in an improved pattern of surface water drainage and a corresponding reduction in the attractiveness of those parcels to hazardous wildlife. Borrow sites within the Airport Critical Zone and borrow sites that are selected within the Elkhorn Borrow Area would be returned to agricultural use following excavation and would not increase or decrease hazardous wildlife attractants.

SAFCA would also remove several acres of woodland from Airport land in the Critical Zone. Most species of birds dependent on woodland habitats forage and nest within these habitats. This behavior trait can put many woodland species at risk of collisions with aircraft depending on the location of the woodlands in relation to the Airport Operations Area. Since most of the trees to be removed from Airport lands by SAFCA are located in the vicinity of the north and south runway approaches, removal of these trees could lessen the risk of woodland species colliding with aircraft.

In summary, the project elements as a whole are expected to reduce the overall attractiveness of the project area to hazardous wildlife. As a result, wildlife collisions with aircraft arriving and departing from the Airport are not expected to increase, and could decrease. In addition, SAFCA would be responsible for securing all necessary permits and environmental clearances associated with the project, which would provide SCAS with more flexibility than it currently has to reduce the wildlife hazards associated with the Airport West Ditch.

USACE, SAFCA, the FAA, and SCAS have met several times to discuss how project design and Airport safety relate. In particular, plans for improving the Airport West Ditch, regrading the Airport north bufferlands to improve surface water drainage, and removing woodlands from Airport lands in the Critical Zone have been refined. Because these features have been included in the project for the reasons detailed above, both the Proposed Action and the Levee Raise-in-Place Alternative would result in a **less-than-significant** impact related to Airport and wildlife collisions. ***(Similar)***

Mitigation Measure: No mitigation is required.

4.19.3 RESIDUAL SIGNIFICANT IMPACTS

In the event of levee failure under the No-Action Alternative, impacts associated with increased hazards in the vicinity of the Airport due to construction or increased frequency of wildlife airstrikes is uncertain. Because of this uncertainty, these potential impacts are considered too speculative for meaningful consideration. Additionally, mitigation measures cannot be required for the No-Action Alternative; therefore impacts that result from the No-Action Alternative would not be mitigated.

Under the Proposed Action and the Levee Raise-in-Place Alternative no significant impacts are identified associated with the potential for higher frequency of collisions between aircraft and wildlife. Implementation of mitigation measures would reduce impact due to temporary aircraft safety hazards associated with project construction activities to a less-than-significant level; therefore no residual impacts would occur.

4.2 LAND USE, SOCIOECONOMICS, AND POPULATION AND HOUSING

4.2.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.2.1.1 METHODOLOGY

The Proposed Action and alternatives under consideration were evaluated in the context of adopted land use plans and policies. State, regional, and local land use plans and policies contained in adopted planning documents pertaining to the project site were reviewed, including the Sutter County General Plan (Sutter County 1996) and zoning code, Sacramento County General Plan (Sacramento County 1993a) and zoning code, the City of Sacramento General Plan (City of Sacramento 1988) and zoning code, the Sacramento International Airport Master Plan (Airport Master Plan) (Sacramento County Airport System 2007a), the Sacramento International Airport Land Use Compatibility Plan (ALUCP), the Natomas Basin Habitat Conservation Plan (NBHCP), and field review and consultation with appropriate agencies. There are no Federal land use plans or policies that would apply to the project. SAFCA, acting as a Joint Exercise of Power Agency (California Government Code 65000), must consider relevant Federal and state land use policies, but is exempt from compliance with plans, policies, and regulations adopted by local agencies (California Government Code 53090).

4.2.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to land use, socioeconomics, and population and housing if they would do any of the following:

- conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental impact;
- conflict with any applicable habitat conservation plan or natural community conservation plan;
- physically divide or disrupt an established community;
- displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere; or
- displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

As stated in Section 2.3.6, “Lands, Easements, Relocations, and Rights-of-Way,” several residences would be removed from the land side of the Sacramento River east levee during implementation of the Phase 3 Project. All relocations of residents would be conducted in compliance with Federal and state relocation law. Acquisition and relocation services would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 USC 4601 *et seq.*) and implementing regulation, 49 CFR Part 24; and California Government Code Section 7267 *et seq*. These laws require that appropriate compensation be provided to displaced landowners and tenants, and residents would be relocated to comparable replacement housing. Refer to Chapter 6.0, “Regulatory Setting,” for more details regarding these regulations. The existing housing stock in the project vicinity has sufficient available housing for rent and purchase to accommodate displaced residents from these residences. Therefore, no new construction would be required to achieve the relocation of residences and no further discussion of this issue is necessary in this EIS/EIR.

4.2.2 IMPACTS AND MITIGATION MEASURES

Impact 4.2-a: Inconsistency with Airport Master Plan, Airport Land Use Compatibility Plan, and Airport Wildlife Hazard Management Plans

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to directly conflict with adopted Airport plans. This would be **consistent**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. In the event that a major flood event affects operations at the Airport, the Sacramento County Board of Supervisors has approved a *Continuity of Airport Operations Flood Contingency Plan* that would transfer limited commercial transport operations to Mather Field (Sacramento County Board of Supervisors 2008). Consistency of the No-Action Alternative with the continued implementation of Airport plans would depend on the location of any future levee failure and the extent of subsequent flooding. Assuming that the Airport is still operational after levee failure, Airport bufferlands could be temporarily altered from managed grassland and idle fields to marsh conditions, a land use considered to be incompatible near airports. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential inconsistency is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

The Phase 3 Project levee footprint would overlap parts of the Airport's Critical Zone. The flood damage reduction improvements would not modify intended land uses within those areas or include components such as the creation of water features that could attract waterfowl and thereby introduce hazards into the Critical Zone. The use of Airport north bufferlands parcels for soil borrow and their subsequent return to managed grassland is being coordinated with SCAS to enhance SCAS's ability to minimize the flight safety hazards associated with wildlife attraction to these lands and, therefore, supports plans and policies intended to enhance public safety associated with Airport operations (see Section 4.18, "Hazards and Hazardous Materials"). Additionally, borrow sites within the Airport Critical Zone and those selected within the Elkhorn Borrow Area would be returned to agricultural purposes following excavation activities. Therefore, the Proposed Action and Levee Raise-in-Place Alternative would not conflict with implementation of the adopted Airport Master Plan, ALUCP, or Airport Wildlife Hazard Management Plans. This would be **consistent**. ***(Similar)***

Mitigation Measure: No mitigation is required.

Impact 4.2-b: Inconsistency with the Natomas Basin Habitat Conservation Plan

Consistency of the Proposed Action and the Levee Raise-in-Place Alternative with the NBHCP is summarized below. Refer to Impact 4.9-h in Section 4.9, "Special-Status Terrestrial Species," for a detailed discussion of the project's potential impacts to biological resources related to implementation of the NBHCP.

No Project Construction

Under the No-Action Alternative, without levee improvements, vegetation removal from the water side of the levee would be required to conform with USACE guidance regarding levee encroachments, eliminating habitat for several species covered by the NBHCP, including Swainson's hawk. This habitat supports the majority of Swainson's hawk nest sites in the Natomas Basin. However, the NBHCP was put in place to promote biological conservation to compensate for habitat loss largely brought about by urban development in the Natomas Basin. Without flood risk reduction provided by the project, restrictions would be placed on new urban development and remaining habitat would not be at risk for conversion due to development. For these reasons, the No-Action Alternative would not directly conflict with implementation of the NBHCP. This alternative would be generally **consistent** with the NBHCP. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee, the risk of levee failure would remain high. The Natomas Basin Conservancy's (TNBC's) reserve infrastructure would be subject to damage in the event of levee failure; however the extent of such damage is uncertain. Without flood protection provided by the levee improvements, restrictions would be placed on new urban development and remaining habitat would not be at risk for conversion due to development. Because there would be no habitat loss due to urban development, implementation of this alternative would not directly conflict with the implementation of the NBHCP. Impacts of the No-Action Alternative on biological resources are addressed in Section 4.9, "Special-Status Terrestrial Species" (Impact 4.9-h and Mitigation Measure 4.9-h). This alternative would be generally **consistent** with the NBHCP. ***(Lesser)***

Proposed Action

While the Proposed Action would not encroach upon TNBC reserves, as described in Impact 4.9-h, conversion of habitat for NBHCP-covered species provided by existing canals, croplands, and woodlands would be a result of project implementation. No documented Swainson's hawk nesting trees would be removed as part of the Proposed Action. As compensation for habitat loss, the project would preserve croplands with high Swainson's hawk foraging value, create new higher-quality canal habitat and landside woodland habitat, and retain extensive mature waterside riparian vegetation. The goal of the habitat compensation is an increase in overall habitat quality. However, without proper implementation of habitat creation/preservation and creation of a management plan in consultation with USFWS and DFG, the Proposed Action would have the potential to reduce the effectiveness of the NBHCP conservation strategy and adversely affect attainment of its goals and objectives. The Proposed Action would be **potentially inconsistent** with the NBHCP.

Levee Raise-in-Place Alternative

The Levee Raise-in-Place Alternative would result in similar impacts as described above for the Proposed Action, except that under this alternative, there would also be extensive removal of riparian vegetation on the water side of the Sacramento River east levee to conform to USACE guidance regarding levee encroachments. A total of 15 Swainson's hawks nests have been documented within waterside riparian habitat along the Sacramento River east levee in Reaches 5A–9B from 2003 to 2007. Adverse impacts on nesting habitat for Swainson's hawks in the near term (i.e., before compensation woodland plantings have developed sufficiently to provide replacement nesting habitat) would conflict with the successful implementation of the NBHCP to a greater extent under this alternative because of these waterside riparian impacts than under the Proposed Action. Impacts of the Levee Raise-in-Place Alternative on biological resources, and mitigation measures needed to reduce those impacts, are addressed in Section 4.9, "Special-Status Terrestrial Species" (Impact 4.9-h and Mitigation Measure 4.9-h). The Levee Raise-in-Place Alternative would be **inconsistent** with the NBHCP. ***(Greater)***

Mitigation Measure 4.2-b: Implement Mitigation Measure 4.9-h, "Ensure that Project Encroachment Does Not Jeopardize Successful Implementation of the NBHCP and Implement Mitigation Measures 4.7-a, 4.8-a, and 4.9-a through 4.9-g"

Proposed Action and Levee Raise-in-Place Alternative

SAFCA shall implement Mitigation Measure 4.9-h, "Ensure that Project Encroachment Does Not Jeopardize Successful Implementation of the NBHCP and Implement Mitigation Measures 4.7-a, 4.8-a and 4.9-a through 4.9-g," contained in Section 4.9, "Special-Status Terrestrial Species." This mitigation measure requires SAFCA to coordinate with TNBC, USFWS, and DFG to identify and implement actions to ensure that the project's small encroachment onto TNBC reserves does not jeopardize successful implementation of the NBHCP. With implementation of this mitigation measure, the Proposed Action would be **consistent** with the NBHCP.

Under the Levee Raise-in-Place Alternative, because of the likely loss of a substantial amount of nesting habitat for Swainson's hawk, the mitigation measures described above could be insufficient to ensure that the project would not jeopardize the successful implementation of the NBHCP. This Alternative would remain **inconsistent** with the NBHCP. ***(Greater)***

Impact 4.2-c: Potential to Physically Divide or Disrupt an Established Community

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to divide or disrupt an established community. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Levee failure would have the potential to destroy houses located on or adjacent to the levee, and to isolate residents from nearby communities. The magnitude of the impact cannot be predicted and would depend upon the location of the levee breach, severity of the storm, and river flows at the time. Therefore, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

Within the project area, the main concentration of urban development is along the west levee of the NEMDC in the city of Sacramento communities of North and South Natomas. Land uses along the west levee of the PGCC are primarily agricultural. Land uses along the land side of the Sacramento River east levee are primarily agricultural, with the exception of the Teal Bend Golf Club in Reach 6B, and approximately 5 rural residences at various locations along the land side of the levee. Along the water side of the Sacramento River east levee, there are two marinas and a public boat launch facility in Reach 9B and approximately 40 residences situated within Reaches 5A–9B. Approximately 6 residences with associated farm structures are located within the Elkhorn Borrow Area.

With respect to the physical division or disruption of an established community, the Proposed Action would not divide or disrupt the communities located adjacent to the lower NEMDC because construction would be restricted to the adjacent setback levee area, and would not require full closure or demolition of Garden Highway. No established communities are present along the land side of the Sacramento River east levee or within the Elkhorn

Borrow Area. Because the residences and businesses located along the water side of the Sacramento River east levee are widely spaced and are not near to a broader community on the land side of the levee, the project would not divide an established community. However, because Garden Highway provides the only access to residences and businesses on the water side of the levee, intermittent road closures and detours would be a disruption for residents and business operators (refer to Section 4.12, "Transportation and Circulation"). Additionally, construction of a cutoff wall would be required along the Sacramento River east levee adjacent to the I-5 Bridge. This would require closure of approximately 1,000 feet of the Garden Highway in this location (about 500 feet upstream and downstream of the I-5 Bridge) for approximately 8 to 12 weeks during the summer season, preventing landside access to the Sacramento County public boat launch facility. Access would be maintained to two nearby marinas, located to the north of the boat launch ramp. North Bayou Road would also remain open; however, it would have a gravel surface at this location during construction. Temporary disruptions to access for residents and businesses would be a **significant** impact.

Levee Raise-in-Place Alternative

As with the Proposed Action, this alternative would have no impacts related to the established communities adjacent to the NEMDC in North and South Natomas.

The Levee Raise-in-Place Alternative would not divide an established community; however, construction of cutoff walls in the existing levee would require full closure and demolition of Garden Highway, which provides primary access to the waterside residences and businesses in Reaches 5A–9B. Closures would affect 1.5- to 2-mile segments of Garden Highway at any one time and the duration of closure for each segment would be approximately 8 to 12 weeks to allow for degrading the levee, installing the cutoff wall, reconstructing the levee, and reconstructing Garden Highway. This would eliminate landside access to residences and businesses along Garden Highway in this area and would require that residents relocate and businesses close until access is restored. Residents and businesses with docks may be able to maintain access from the water side of the levee. Construction of the cutoff wall in the vicinity of the I-5 Bridge would prevent land side access to the two marinas and Sacramento County's public boat launch facility for approximately 8 to 12 weeks, during the summer. This would require temporary closure of the businesses associated with the marinas (restaurants, bars, boat rentals) and the boat launch facility. This would be a **significant** impact. ***(Greater)***

Mitigation Measure 4.2-c: Notify Residents and Businesses of Project Construction and Road Closure Schedule; and Implement Mitigation Measure 4.12-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips," and Mitigation Measure 4.12-c, "Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers"

Proposed Action

SAFCA and its primary contractors for engineering design and construction shall implement Mitigation Measures 4.12-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips," and 4.12-c, "Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers," contained in Section 4.12, "Transportation and Circulation." Additionally, the following measures shall be implemented:

a) SAFCA shall provide residents and business owners located adjacent to the construction areas with a construction timeline and shall post its construction schedule on the SAFCA Web site. Information shall include road closures and detour information. The schedule shall be updated on a monthly basis.

b) SAFCA shall provide notice as feasible for emergency construction or remedial construction.

Implementation of these mitigation measures would reduce the level of impact, but not to a less-than-significant level. Because no other feasible mitigation measures are available to

fully reduce this impact to a less-than-significant level, this impact would remain **significant and unavoidable** under the Proposed Action.

Levee Raise-in-Place Alternative

SAFCA and its primary contractors for engineering design and construction shall implement Mitigation Measures 4.12-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips," and 4.12-c, "Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers," contained in Section 4.12, "Transportation and Circulation."

In addition to measures (a), and (b), listed under the Proposed Action, above, the following measures shall be implemented:

c) SAFCA shall provide assistance for residents who are required to relocate during the construction period. SAFCA shall compensate residents for reasonable rent and living expenses incurred due to relocation. Residents will have the right to decent, safe and sanitary housing in accordance with the Uniform Relocation Assistance and Real Property Acquisition Act.

d) SAFCA shall provide 24-hour security patrols for residences and businesses that must be vacated during the construction period.

e) SAFCA shall negotiate an agreement, consistent with the terms of existing leases, with any business required to suspend operations during levee/cutoff wall construction in order to reimburse them for loss of revenue during the time that they will be closed, based on actual income for that time of year.

Implementation of these mitigation measures would reduce the level of impact, but not to a less-than-significant level due to the potential for temporary dislocation of residents and business closures as a result of road closures of approximately 8 to 12 weeks. Therefore, this impact would remain **significant and unavoidable** under the Levee Raise-in-Place Alternative because no other feasible mitigation measures are available. ***(Greater)***

4.2.3 RESIDUAL SIGNIFICANT IMPACTS

Under the No-Action Alternative, significance determinations for potential impacts due to community disruption are considered too speculative for meaningful consideration, given the uncertainties involved in consequences of a levee failure. Under the Levee Raise-in-Place Alternative, because of the likely loss of a substantial amount of nesting habitat for Swainson's hawk, this alternative would remain potentially inconsistent with the NBHCP.

With respect to disruption of communities and residences located along the Sacramento River east levee, significant and unavoidable impacts would remain related to short-term and temporary access restrictions and construction disturbance under the Proposed Action and the Levee Raise-in-Place Alternative.

4.20 WILDFIRE HAZARDS

4.20.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.20.1.1 METHODOLOGY

This section addresses potential sources of wildfire hazards and risks associated with implementation of the Proposed Action and alternatives under consideration. This evaluation was based on a review of historic local weather conditions, historic ignition sources, topography, vegetation, and fire history. Fire hazard severity zones, which are established by the California Department of Forestry and Fire Protection, were identified and compared to the project area.

4.20.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to wildfire hazards if they would expose people or structures to a significant risk of loss, injury, or death from wildland fires.

4.20.2 IMPACTS AND MITIGATION MEASURES

Impact 4.20-a: Potential Exposure to Wildland Fires

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to expose people or structures to wildland fires. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A recently flooded area is not likely to be dry enough to sustain a fire that would pose significant risk of loss, injury, or death. However, if accumulated debris from uprooted vegetation or structures remained in place long enough to dry out, there would be a potential for increased fire hazard. However, the potential for such an occurrence is uncertain, and the magnitude of the effect cannot be predicted, therefore, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Although no "Very High Fire Hazard Severity Zones" are located in the project area, and the majority of Sutter and Sacramento Counties is located in either a "nonflammable" or "moderate" zone for wildland fires, the project components would be constructed in locations where physical and weather conditions may combine to lead to a high risk of fire hazard. Construction equipment or construction practices could ignite fires that may result in wildland fires and expose people or structures to a significant risk of loss, injury, or death under some circumstances. This potential impact is considered **significant**. ***(Similar)***

Mitigation Measure 4.20-a: Prepare and Implement a Fire Management Plan to Minimize Potential for Wildland Fires

Proposed Action and Levee Raise-in-Place Alternative

SAFCA and its primary contractors for engineering design and construction shall prepare and implement a fire management plan in coordination with the appropriate emergency service and/or fire-suppression agencies of the applicable local jurisdictions before beginning project construction. The plan shall describe fire prevention and response methods, including fire precaution, presuppression, and suppression measures that are consistent with the policies and standards of the affected jurisdictions. All materials and equipment required for implementation of the plan shall be maintained on-site. All construction personnel shall be made familiar with the contents of the plan before construction activities begin. The plan shall be amended, as appropriate, upon selection of borrow sites within the Elkhorn Borrow Area.

Implementing this mitigation measure would reduce the potential impact from exposure to wildland fires under the Proposed Action and the Levee Raise-in-Place Alternative to a **less-than-significant** level, because a plan to provide project-specific fire prevention and response would be implemented. ***(Similar)***

4.20.3 RESIDUAL SIGNIFICANT IMPACTS

Under the No-Action Alternative, the impacts related to increased wildfire hazard are uncertain. Because of this uncertainty the impact remains too speculative for meaningful consideration. Additionally, mitigation cannot be required under the No-Action Alternative; therefore impacts would not be mitigated.

There would be no impact to wildfire hazards under the No-Action Alternative, therefore, there would be no residual impacts. With implementation of Mitigation Measure 4.20-a, project implementation would reduce impacts to a less-than-significant level and would not result in any residual significant impacts related to wildland fires.

4.21 ENVIRONMENTAL JUSTICE

Environmental justice is defined by the U.S. Environmental Protection Agency (EPA) Office of Environmental Justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." Fair treatment means that "no group of people, including racial, ethnic, or socioeconomic group, shall bear a disproportionate share of negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and policies." Analysis of project effects on environmental justice is required by NEPA.

4.21.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.21.1.1 METHODOLOGY

The following analysis is based on *Environmental Justice, Guidance Under the National Environmental Policy Act*, prepared by the Council of Environmental Quality (CEQ) and the Executive Office of the President (December 2007). Although none of the published guidelines define the term "disproportionately high and adverse," CEQ includes a non-quantitative definition stating that an effect is disproportionate if it appreciably exceeds the risk or benefit rate to the general population.

4.21.1.2 THRESHOLDS OF SIGNIFICANCE

To prove a violation of Federal environmental justice principles, low-income populations, individuals belonging to minority populations, and/or minority populations (i.e., Native American or Alaskan Native, Asian or Pacific Islander, black, not of Hispanic origin, or Hispanic) must be affected by the project. According to CEQ, two types of environmental justice impacts may exist: disproportionately high and adverse human health effects and disproportionately high and adverse environmental effects. Determination of disproportionately high and adverse human health effects considers whether any of the following, described below, would exist.

- The health effects, which may be measured in risks and rates, are significant (as employed by NEPA), or above the generally accepted norm. Adverse health effects may include bodily impairment, infirmity, illness, or death.

- The risk or rate of hazard exposure by a minority population, low-income population, or Native American tribe to an environmental hazard is significant (as employed by NEPA) and appreciably exceed the risk or rate to the general population or other appropriate comparison group.

- The health effects occur in a minority population, low-income population, or Native American tribe affected by cumulative or multiple adverse exposures from environmental hazards.

Determination of a disproportionately high and adverse environmental effect considers whether any of the following, described below, would exist.

- There is or would be an impact on the natural or physical environment that significantly (as employed by NEPA) and adversely affects a minority population, low-income population, or Native American tribe. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Native American tribes when those impacts are interrelated to impacts on the natural or physical environment.

- The environmental effects are significant (as employed by NEPA) and are or may be having an adverse impact on minority populations, low-income populations, or Native American tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group.

- The environmental effects occur or would occur in a minority population, low-income population, or Native American tribe affected by cumulative or multiple adverse exposures from environmental hazards.

4.21.2 IMPACTS AND MITIGATION MEASURES

Impact 4.21-a: Potential to Have a Disproportionate High and Adverse Environmental Impact On Any Minority Or Low-Income Populations

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no improvements would be made to the Natomas perimeter levee system and there would be no potential to have disproportionately high and adverse environmental impacts on any minority or low-income populations. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Flooding could cause disproportionately high and adverse environmental impact to minority or low-income populations. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered to **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

The Phase 3 Project would reduce the risk of flooding to existing residential, commercial, and industrial development in the Natomas Basin. While there are low-income and minority populations present in a portion of the project area, as discussed in Section 3.3.21, "Environmental Justice," the flood protection benefits of the project would accrue to all segments of the population in the Natomas Basin. Any potential environmental impacts on low-income and minority neighborhoods would be the same types of impacts experienced throughout the project area (e.g., primarily temporary exposure to construction noise, dust, and light and glare during construction), and no permanent residential relocations would occur in low-income areas or areas with high minority populations. Therefore, the project would have no disproportionately high and adverse environmental impact on any minority or low-income populations.

Executive Order 12898, which is described more fully in Chapter 6.0, "Regulatory Setting," requires that the lead Federal agency consider the effects of an action on Native American tribes and determine if the adverse effects are disproportionate to the beneficial aspects of the action. As described in Section 4.10, "Cultural Resources," many elements of the project have the potential to adversely affect cultural resources that possess particular cultural significance and value to Native American individuals and organizations that are culturally affiliated with the prehistoric inhabitants of the Natomas Basin. Construction of improvements such as seepage berms and cutoff walls, as well as the excavation of large quantities of borrow from a range of possible sites, has the potential to damage prehistoric archaeological assemblages, including interred skeletal remains. (See **Table 2-2** in Chapter 2.0, "Alternatives," for a list of potential borrow sites.) The ancestors of the Native American tribes that dwelled on the project site in the past may not necessarily experience the direct beneficial aspect of flood damage reduction in the Natomas region. This raises an environmental justice concern because the project could result in disturbance to and/or damage of cultural resources of importance to the Native American community, while the

Native American community would not receive a proportionate benefit from flood damage reduction because they live in dispersed locations, largely outside of the Natomas Basin. This is a **significant** impact with respect to environmental justice. ***(Similar)***

Mitigation Measure 4.21-a: Increase the Direct Benefits of the Project for the Ancestors of the Native American Tribes

Proposed Action and Levee Raise-in-Place Alternative

As part of the Phase 3 Project, SAFCA proposes to acquire various properties in the Natomas Basin as compensation for the project's potential impacts, as required under Federal and state laws. As part of the process for restoring these lands, SAFCA shall implement the following measures to address environmental justice and increase the direct benefits to the ancestors of the Native American tribes that would bear disproportionate adverse effects:

- consult with appropriate Native American representatives to identify plant species of value for traditional cultural uses;
- consult with Native American representatives to identify traditional cultural activities that could occur on these lands, consistent with habitat conservation and safety objectives;
- to the extent feasible, include identified plant species in the planting palettes developed for habitat conservation;
- to the extent feasible, establish easements or other protective measures on these properties that include access for appropriate Native American representatives for plant gathering and other traditional cultural activities; and
- where feasible, also provide access to appropriate Native American representatives to the river front on acquired parcels that have access to the Sacramento River, provided that access does not permit the construction of physical structures on the levee, beaches, or in the river without prior approval from the appropriate regulatory agency.

Implementation of these measures would reduce the impact to a **less-than-significant** level because it would provide the ancestors of the Native American tribes with a benefit that would offset the disproportionate burden created by impacts to cultural resources of concern, and of great value to the Native American community, caused by the Proposed Action and the Levee Raise-in-Place Alternative. ***(Similar)***

4.21.3 RESIDUAL SIGNIFICANT IMPACTS

In the event of a levee failure under the No-Action Alternative, impacts to minority or low-income populations or Native American tribes are uncertain. Because of this uncertainty, these potential impacts are considered too speculative for meaningful consideration. Additionally, mitigation measures cannot be required for the No-Action Alternative; therefore impacts that result from the No-Action Alternative would not be mitigated.

With implementation of the mitigation measures described in this section, project implementation would not result in any residual significant impacts related to environmental justice.

4.3 GEOLOGY AND SOILS

4.3.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.3.1.1 METHODOLOGY

This section addresses issues related to geologic hazards, specifically seismicity and soil erosion. Impacts associated with geology and soils that could result from project-related activities were evaluated based on expected construction practices, materials used to construct the proposed improvements, general locations, and the nature of proposed operations.

This analysis relies on review of the *Soil Survey of Sutter County, California* (National Resources Conservation Service 1988), the *Soil Survey of Sacramento County* (National Resources Conservation Service 1993), as well as published geologic maps and literature.

4.3.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to geology and soils if they would do any of the following:

- expose people or structures to potential substantial adverse impacts, including risk of loss, injury, or death through the rupture of a known earthquake fault, strong seismic shaking, seismic-related ground failure, soil liquefaction, or landslides;
- result in substantial soil erosion or the loss of topsoil;
- locate project facilities on a geologic unit or soil that is unstable, or that would become unstable as a result of the proposed action, and potentially result in on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
- locate project facilities on expansive soil, creating substantial risks to property;
- have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater;
- create a substantial flooding risk as a result of a seismic seiche; or
- destroy a unique geologic feature.

Because the project area is not located within an Alquist-Priolo Earthquake Fault Zone, fault ground rupture is highly unlikely, and therefore this issue is not addressed further in this EIS/EIR.

All levee improvements, including the RD 1000 Pumping Plant No. 2 replacement facilities, would be designed based on the results of detailed geotechnical engineering studies performed previously (summarized in Kleinfelder 2008) and would be required to comply with standard engineering practices for levee design. The Central Valley Flood Protection Board's standards are the primary state standards applicable to the proposed levee improvements; these are stated in Title 23, Division 1, Article 8, Sections 111–137 of the California Code of Regulations. The Board's standards direct that levee design and construction be in accordance with USACE's *Engineering Design and Construction of Levees* (USACE 2000), the primary Federal standards applicable to

levee improvements. Because the design, construction, and maintenance of levee improvements must comply with the regulatory standards of USACE and the Central Valley Flood Protection Board, it is assumed that the design and construction of all levee modifications under the Proposed Action or Levee Raise-in-Place Alternative would meet or exceed applicable design standards for static and dynamic stability, seismic ground shaking, liquefaction, subsidence, and seepage.

Because the project area is relatively flat, there would be no adverse impacts related to landslides, this issue is not addressed further in this EIS/EIR.

Because the project would not involve the use of wastewater disposal systems of any kind, there would be no impact related to the ability of project area soils to support the use of septic systems. Therefore, this issue is not addressed further in this EIS/EIR.

While a seiche in the project area could be damaging, the risk of seiches is low, given the distance from active faults and the anticipated short duration of any seismic ground shaking in the area. Therefore, this issue is not addressed further in this EIS/EIR.

There are no unique geologic features in the project area. Therefore, the project would not destroy such features and this issue is not discussed further in this EIS/EIR.

4.3.2 IMPACTS AND MITIGATION MEASURES

Impact 4.3-a: Potential Temporary and Permanent Localized Soil Erosion during Construction and Operation

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for construction-related soil erosion. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

However, without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Any levee failures would likely result in soil scouring and permanent loss of topsoil in localized areas within several hundred feet of a levee breach; simultaneous levee failures in more than one location in the perimeter levee system would have an even more widespread impact. The magnitude of the impacts would depend upon the location of the levee breach, severity of the storm, and river flows at the time. Therefore, a precise determination of significance is not possible and cannot be made. This impact could be offset by soil deposition resulting from inundation of the Natomas Basin by sediment laden flood waters. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Implementation of the Proposed Action and the Levee Raise-in-Place Alternative would include a substantial amount of construction activity over large areas, particularly along the Sacramento River east levee, the PGCC west levee, the NEMDC west levee, and at proposed borrow sites. Construction activities would be conducted continuously, to the extent feasible, between April and November.

Borrow activity is subject to regulation under the California Surface Mining and Reclamation Act (SMARA), which is administered by the county in which the borrow site is located (see Chapter 6.0, “Regulatory Setting”). SAFCA proposes using borrow sites in both Sutter and Sacramento Counties. The excavation of soil from borrow

sites would entail the preservation and replacement of the topsoil on these parcels, so that they could continue to be used for agriculture or otherwise returned to their preproject condition as in the case of the Airport north bufferlands. The Lower Woodlands sites would be converted to upland habitat and the RD 1001 site would be converted to marsh habitat, if it is used as a borrow site.

Table 2-2 lists the borrow sites that would potentially be used for the Phase 3 Project and shows the depth of excavation, depth upon reclamation, and final postreclamation use. As part of the borrow operations, the upper 6–12 inches of topsoil from the borrow sites would be set aside and replaced on-site after project construction in each construction season. After the project is complete, the borrow sites would be recontoured and reclaimed. These borrow operations would support levee improvements activity involving soil stripping and site grading in:

- the footprint of the adjacent setback levee along the Sacramento River east levee under the Proposed Action and in areas where seepage berms would be constructed,
- the expanded toe of the PGCC west levee and adjacent seepage berms under the Proposed Action and Levee Raise-in-Place Alternative, and
- the NEMDC west levee south of the NEMDC stormwater pumping station under the Proposed Action and Levee Raise-in-Place Alternative.

Structures and trees would need to be removed from a portion of the footprint of the adjacent setback levee and berms along the Sacramento River east levee, and power poles would need to be removed and relocated.

Borrow activities, including at borrow sites selected within the Elkhorn Borrow Area, and levee improvement activities would result in the temporary disturbance of soil and could expose disturbed areas to erosion due to wind or winter or early-season rainfall events. Wind or rainfall of sufficient intensity could dislodge soil particles from the soil surface. Once particles are dislodged, substantial localized erosion could occur.

The potential for substantial erosion or loss of topsoil during construction of the Proposed Action and Levee Raise-in-Place Alternative is considered a **potentially significant** impact. ***(Similar)***

Mitigation Measure 4.3-a(1): Implement Mitigation Measure 4.5-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions"

Proposed Action and Levee Raise-in-Place Alternative

SAFCA shall implement Mitigation Measure 4.5-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions," contained in Section 4.5, "Water Quality." SAFCA's final design and construction specifications for all project components, including borrow sites, shall include implementation of standard erosion, siltation, and soil stabilization Best Management Practices (BMPs). This mitigation measure requires filing a Notice of Intent (NOI) with the Central Valley Regional Water Quality Control Board (RWQCB); implementing standard erosion, siltation, and BMP measures; preparing and implementing a Stormwater Pollution Prevention Plan (SWPPP); and complying with the conditions of the National Pollutant Discharge Elimination System (NPDES) general stormwater permit for construction activity. Upon selection of borrow sites within the Elkhorn Borrow Area, specific details within the BMPs, SWPPP, and NPDES permit shall reflect potential impacts. Implementing this mitigation measure would reduce the impacts related to erosion from construction activities to a **less-than-significant** level because a SWPPP and BMPs to prevent erosion and siltation would be implemented. ***(Similar)***

Mitigation Measure 4.3-a(2): Secure and Implement the Conditions of the California Surface Mining and Reclamation Act Permit

Proposed Action and Levee Raise-in-Place Alternative

In the event that any borrow site activity is determined to be subject to SMARA, SAFCA shall secure and implement the conditions contained in the SMARA permit as administered and issued by the local agency (applicable county). Implementing this mitigation measure would reduce the impacts related to erosion from construction activities on borrow sites to a **less-than-significant** level because SAFCA would secure a SMARA permit (if required) and implement its conditions.

4.3.3 RESIDUAL SIGNIFICANT IMPACTS

In the event of levee failure under the No-Action Alternative, the magnitude of impacts due to temporary and permanent soil erosion is uncertain. Because of this uncertainty, these potential impacts are considered too speculative for meaningful consideration. Additionally, mitigation measures cannot be required for the No-Action Alternative; therefore impacts that result from the No-Action Alternative would not be mitigated.

Implementation of Mitigation Measures 4.3-a(1) and 4.3-a(2) would reduce the temporary potentially significant impacts associated with soil erosion due to construction activities under the Proposed Action and the Levee Raise-in-Place Alternative to a less-than-significant level.

4.4 HYDROLOGY AND HYDRAULICS

4.4.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.4.1.1 METHODOLOGY

This analysis relies on information provided by various public agencies, as well as the following site-specific technical planning studies generated to support the Proposed Action and alternatives under consideration in this EIS/EIR:

- *Sacramento Area Flood Control Agency, Natomas Levee Improvement Program, Summary Report on Hydraulic Impact Analyses,* MBK Engineers 2008 (**Appendix B1**);
- *Draft Evaluation of Potential Groundwater Impacts Due to Proposed Construction for Natomas Levee Improvement Program,* Luhdorff & Scalmanini Consulting Engineers 2008 (**Appendix B2**); and
- *Evaluation of Cutoff Walls Impacts on Groundwater Recharge, Sacramento East Levee, Natomas Levee Improvement Program,* Kleinfelder 2007 (**Appendix B3**).

This section addresses seasonal flooding and flood management as defining elements of the physical environment in the project area and evaluates the potential hydraulic impacts of the Proposed Action and alternatives under consideration on the operations of the Sacramento River Flood Control Project (SRFCP) and interior drainage within the Natomas Basin. It also evaluates the potential impact of seepage cutoff walls on groundwater recharge.

Impacts associated with hydrology and hydraulics that could result from construction and operation activities related to the project site were evaluated based on expected construction practice, on the materials to be used, and on the locations and duration of the activities. A review of published literature included maps, books, and primary-source documents cited above.

The surface hydrology analysis evaluated the potential flood-related impacts of the action alternatives on water surface elevations in the stream and river channels in the project area and in the larger watershed within which the project is situated. Specifically, a UNET hydraulic computer model was used to compare existing conditions in the waterways surrounding the Natomas Basin and in the larger SRFCP with and without the Proposed Action (With Project and Without Project [i.e., No-Action Alterative], respectively) and other reasonably foreseeable improvements to Folsom Dam and the urban levees outside the Natomas Basin.

Table 4.4-1 summarizes the conditions and assumptions associated with each of the model runs. The modeling outputs generated by these conditions under the targeted flood scenarios are displayed in **Tables 4.4-2 through 4.4-8**. A description of these conditions is provided below in **Table 4.4-1**.

The existing conditions analysis provided an evaluation of the levee and reservoir system as it existed in April 2008. The No-Action condition assumed implementation of Federally authorized improvements to Folsom Dam and anticipated "early implementation" improvements to the levees protecting existing urban areas outside the Natomas Basin (i.e., American River Basin, West Sacramento, Yuba Basin, and Sutter Basin) so as to provide these areas with "200-year" flood protection. The With-Project condition added the improvements proposed as part of the entire Natomas Levee Improvement Program (NLIP) to the No-Action condition to display the individual and cumulative impacts of the Proposed Action when added to the other reasonably foreseeable urban levee improvement projects in the Sacramento Valley. The NLIP includes additional levee raising already evaluated in the Phase 2 EIS as well as levee raising that will be evaluated at a project-level in a future environmental document for the Phase 4 Project.

Table 4.4-1
Definition of Model Assumptions for Various Conditions

Condition	Top of Levee Assumption	Levee Failure Assumption	Reservoir Operations Assumption
Existing	Existing top of levee grade April 2008	Levees fail when water reaches the top of the levee	Existing reservoirs and current (2008) operation criteria
Without Project	Same as Existing with the following changes. Federally authorized improvements to Folsom Dam are implemented and urban area levees outside the Natomas Basin are assumed to have levees at 200-year water surface + 3 feet of freeboard. NLIP levees same as Existing Condition.	Levees fail when water reaches the top of levee.	Same as Existing except Folsom Dam will be operated in accordance with the Joint Federal Project currently under construction
With Project	Same as Without Project except NLIP levees raised to design level	Same as Without Project	Same as Without Project
Without Project Sensitivity Analysis	Same as Without Project except that SRFCP levees with top elevations below SRFCP design standard are assumed to be raised to meet this standard	No levee failures	Same as Without Project
With Project Sensitivity Analysis	Same as With Project except that SRFCP levees with top elevations below SRFCP design standard are assumed to be raised to meet this standard	No levee failures	Same as Without Project

Notes: NLIP = Natomas Levee Improvement Program; NCC = Natomas Cross Canal, PGCC = Pleasant Grove Creek Canal, NEMDC = Natomas East Main Drainage Canal, SRFCP = Sacramento River Flood Control Project

[1] With-Project condition adds the improvements proposed as part of the NLIP to the Without Project condition, including levee raises on the Sacramento River, NCC, PGCC, and NEMDC in the locations shown in Figure 3 of **Appendix B1** of this EIS/EIR.

Source: **Appendix B1** of this EIS/EIR

Table 4.4-2
Levee Failure Summary in the Sacramento River Flood Control Project
(Predicted Number of Levee Failures)

Condition	Design Flood			
	SRFCP (1957)	100-Year 1% Annual Exceedance Probability (AEP)	"200-Year" (0.5% AEP)	"500-Year" (0.2% AEP)
Existing	0	3	26	62
Without Project	0	3	18	80
With Project	0	3	18	77

Note: USACE = U.S. Army Corps of Engineers

Source: **Appendix B1** of this EIS/EIR

Table 4.4-3
100-Year (1% AEP) Maximum Water Surface Elevation Summary
(Levees Fail When Water Reaches Top of Levee)

Location (Comprehensive Study River Mile)	Maximum Water Surface Elevation (Feet NGVD 29)			Change (Feet)	
	Existing	Without-Project	With-Project	Existing to Without-Project	Without-Project to With-Project
Sacramento River					
at Knight's Landing (90.22)	41.49	41.47	41.47	-0.02	0
at Fremont Weir, west end (84.75)	40.18	40.17	40.17	-0.01	0
at Natomas Cross Canal (79.21)	40.24	40.20	40.21	-0.04	+0.01
at I-5 (71.00)	35.82	35.73	35.73	-0.09	0
at Sacramento Bypass (63.82)	31.18	30.81	30.81	-0.37	0
at NEMDC (61.0)	31.68	31.30	31.30	-0.38	0
at I Street (59.695)	31.40	31.03	31.03	-0.37	0
at Freeport Bridge (46.432)	25.03	24.91	24.91	-0.12	0
Natomas Cross Canal					
At SR 99/70 (4.82)	40.36	40.38	40.39	+0.02	+0.01
Pleasant Grove Creek Canal					
at Sankey Road (3.65)	40.36	40.38	40.39	+0.02	+0.01
at Fifield Road (1.49)	40.44	40.46	40.47	+0.02	+0.01
at Howsley Road (0.40)	40.43	40.45	40.46	+0.02	+0.01
Natomas East Main Drainage Canal					
at Elverta Road (10.35)	28.24	28.24	28.24	0	0
at Elkhorn Boulevard (8.35)	28.02	28.02	28.02	0	0
at Main Avenue (6.09)	36.47	35.93	35.93	-0.54	0
at West El Camino Avenue (2.96)	34.65	33.80	33.80	-0.85	0
Feather River					
at Nicolaus Gage (8.00)	48.54	48.53	48.53	-0.01	0
Yolo Bypass					
at Woodland Gage (51.10)	32.62	32.60	32.60	-0.02	0
American River					
at H Street (6.471)	42.99	40.71	40.71	-2.28	0

Notes: I-5 = Interstate 5; NEMDC = Natomas East Main Drainage Canal; NGVD = National Geodetic Vertical Datum of 1929; SR = State Route

Source: **Appendix B1** of this EIS/EIR

Table 4.4-4
200-Year (0.5% AEP) Maximum Water Surface Elevation Summary
(Levees Fail When Water Reaches Top of Levee)

Location (Comprehensive Study River Mile)	Maximum Water Surface Elevation (Feet NGVD 29)			Change (Feet)	
	Existing	Without-Project	With-Project	Existing to Without-Project	Without-Project to With-Project
Sacramento River					
at Knight's Landing (90.22)	41.69	41.69	41.69	0	0
at Fremont Weir, west end (84.75)	40.94	40.95	40.96	+0.01	+0.01
at Natomas Cross Canal (79.21)	41.00	41.00	41.00	0	0
at I-5 (71.00)	36.72	36.19	36.19	-0.53	0
at Sacramento Bypass (63.82)	34.42	32.30	32.30	-2.12	0
at NEMDC (61.0)	35.40	32.85	32.85	-2.55	0
at I Street (59.695)	35.13	32.57	32.57	-2.56	0
at Freeport Bridge (46.432)	28.01	26.03	26.03	-1.98	0
Natomas Cross Canal					
at SR 99/70 (4.82)	41.04	41.04	41.04	0	0
Pleasant Grove Creek Canal					
at Sankey Road (3.65)	41.03	41.04	41.05	+0.01	+0.01
at Fifield Road (1.49)	41.10	41.12	41.13	+0.02	+0.01
at Howsley Road (0.40)	41.07	41.07	41.08	0	+0.01
Natomas East Main Drainage Canal					
at Elverta Road (10.35)	30.21	30.25	30.29	+0.04	+0.04
at Elkhorn Boulevard (8.35)	29.50	29.56	29.62	+0.06	+0.06
at Main Avenue (6.09)	40.00	37.72	37.72	-2.28	0
at West El Camino Avenue (2.96)	39.03	36.05	36.05	-2.98	0
Feather River					
at Nicolaus Gage (8.00)	50.16	50.16	50.16	0	0
Yolo Bypass					
at Woodland Gage (51.10)	33.48	33.47	33.47	-0.01	0
American River					
at H Street (6.471)	46.51	44.25	44.25	-2.26	0

Notes: I-5 = Interstate 5; NEMDC = Natomas East Main Drainage Canal; NGVD = National Geodetic Vertical Datum of 1929; SR = State Route

Source: **Appendix B1** of this EIS/EIR

Table 4.4-5
500-Year (0.2% AEP) Maximum Water Surface Elevation Summary
(Levees Fail When Water Reaches Top of Levee)

Location (Comprehensive Study River Mile)	Maximum Water Surface Elevation (Feet NGVD 29)			Change (Feet)	
	Existing	Without-Project	With-Project	Existing to Without-Project	Without-Project to With-Project
Sacramento River					
at Knight's Landing (90.22)	41.60	41.64	41.64	+0.04	0
at Fremont Weir, west end (84.75)	40.79	40.85	40.85	+0.06	0
at Natomas Cross Canal (79.21)	40.86	40.86	40.86	0	0
at I-5 (71.00)	37.30	37.12	37.12	-0.18	0
at Sacramento Bypass (63.82)	35.30	35.06	35.06	-0.24	0
at NEMDC (61.0)	36.45	36.22	36.22	-0.23	0
at I Street (59.695)	36.16	35.93	35.93	-0.23	0
at Freeport Bridge (46.432)	28.55	28.40	28.40	-0.15	0
Natomas Cross Canal					
at SR 99/70 (4.82)	41.25	41.37	41.38	+0.12	+0.01
Pleasant Grove Creek Canal					
at Sankey Road (3.65)	41.75	41.80	41.82	+0.05	+0.02
at Fifield Road (1.49)	41.77	41.85	41.86	+0.08	+0.01
at Howsley Road (0.40)	41.49	41.65	41.66	+0.16	+0.01
Natomas East Main Drainage Canal					
at Elverta Road (10.35)	32.30	32.23	33.05	-0.07	+0.82
at Elkhorn Boulevard (8.35)	31.78	31.76	32.40	-0.02	+0.64
at Main Avenue (6.09)	41.04	41.12	41.12	+0.08	0
at West El Camino Avenue (2.96)	40.37	40.29	40.29	-0.08	0
Feather River					
at Nicolaus Gage (8.00)	50.12	50.12	50.12	0	0
Yolo Bypass					
at Woodland Gage (51.10)	33.25	33.53	33.53	+0.28	0
American River					
at H Street (6.471)	46.56	47.66	47.66	+1.10	0

Notes: I-5 = Interstate 5; NEMDC = Natomas East Main Drainage Canal; NGVD = National Geodetic Vertical Datum of 1929; SR = State Route

Source: **Appendix B1** of this EIS/EIR

Table 4.4-6
100-Year (1% AEP) Maximum Water Surface Elevation Summary
(No Levee Failures—Sensitivity Analysis)

Location (Comprehensive Study River Mile)	Maximum Water Surface Elevation (Feet NGVD 29)		Change (Feet)
	Without-Project	With-Project	Without-Project to With-Project
Sacramento River			
at Knight's Landing (90.22)	42.10	42.10	0
at Fremont Weir, west end (84.75)	40.90	40.90	0
at Natomas Cross Canal (79.21)	41.45	41.45	0
at I-5 (71.00)	36.90	36.90	0
at Sacramento Bypass (63.82)	31.45	31.45	0
at NEMDC (61.0)	32.02	32.02	0
at I Street (59.695)	31.74	31.74	0
at Freeport Bridge (46.432)	25.54	25.54	0
Natomas Cross Canal			
at SR 99/70 (4.82)	41.50	41.50	0
Pleasant Grove Creek Canal			
at Sankey Road (3.65)	41.37	41.37	0
at Fifield Road (1.49)	41.50	41.50	0
at Howsley Road (0.40)	41.51	41.51	0
Natomas East Main Drainage Canal			
at Elverta Road (10.35)	31.20	31.21	+0.01
at Elkhorn Boulevard (8.35)	30.29	30.30	+0.01
at Main Avenue (6.09)	35.85	35.85	0
at West El Camino Avenue (2.96)	33.70	33.70	0
Feather River			
at Nicolaus Gage (8.00)	48.90	48.90	0
Yolo Bypass			
at Woodland Gage (51.10)	33.21	33.21	0
American River			
at H Street (6.471)	40.81	40.81	0

Notes: I-5 = Interstate 5; NEMDC = Natomas East Main Drainage Canal; NGVD = National Geodetic Vertical Datum of 1929; SR = State Route

Source: **Appendix B1** of this EIS/EIR

Table 4.4-7
200-Year (0.5% AEP) Maximum Water Surface Elevation Summary
(No Levee Failures—Sensitivity Analysis)

Location (Comprehensive Study River Mile)	Maximum Water Surface Elevation (Feet NGVD 29)		Change (Feet)
	Without-Project	With-Project	Without-Project to With-Project
Sacramento River			
at Knight's Landing (90.22)	43.39	43.39	0
at Fremont Weir, west end (84.75)	42.47	42.48	+0.01
at Natomas Cross Canal (79.21)	42.90	42.92	+0.02
at I-5 (71.00)	38.24	38.24	0
at Sacramento Bypass (63.82)	33.48	33.48	0
at NEMDC (61.0)	34.06	34.07	+0.01
at I Street (59.695)	33.78	33.78	0
at Freeport Bridge (46.432)	27.40	27.41	+0.01
Natomas Cross Canal			
at SR 99/70 (4.82)	42.92	42.94	+0.02
Pleasant Grove Creek Canal			
at Sankey Road (3.65)	42.65	42.67	+0.02
at Fifield Road (1.49)	42.90	42.91	+0.01
at Howsley Road (0.40)	42.92	42.94	+0.02
Natomas East Main Drainage Canal			
at Elverta Road (10.35)	35.10	35.49	+0.39
at Elkhorn Boulevard (8.35)	34.89	35.30	+0.41
at Main Avenue (6.09)	36.59	36.59	0
at West El Camino Avenue (2.96)	35.85	35.85	0
Feather River			
at Nicolaus Gauge (8.00)	51.19	51.20	+0.01
Yolo Bypass			
at Woodland Gauge (51.10)	34.56	34.57	+0.01
American River			
at H Street (6.471)	44.40	44.40	0

Notes: I-5 = Interstate 5; NEMDC = Natomas East Main Drainage Canal; NGVD = National Geodetic Vertical Datum of 1929; SR = State Route

Source: **Appendix B1** of this EIS/EIR

Table 4.4-8
500-Year (0.2% AEP) Maximum Water Surface Elevation Summary
(No Levee Failures—Sensitivity Analysis)

Location (Comprehensive Study River Mile)	Maximum Water Surface Elevation (Feet NGVD 29)		Change (Feet)
	Without-Project	With-Project	Without-Project to With-Project
Sacramento River			
at Knight's Landing (90.22)	44.27	44.31	+0.04
at Fremont Weir, west end (84.75)	43.79	43.85	+0.06
at Natomas Cross Canal (79.21)	43.68	43.85	+0.17
at I-5 (71.00)	39.76	39.85	+0.09
at Sacramento Bypass (63.82)	37.97	38.00	+0.03
at NEMDC (61.0)	37.97	38.00	+0.03
at I Street (59.695)	37.67	37.69	+0.02
at Freeport Bridge (46.432)	30.28	30.30	+0.02
Natomas Cross Canal			
at SR 99/70 (4.82)	43.45	43.71	+0.26
Pleasant Grove Creek Canal			
at Sankey Road (3.65)	43.25	43.42	+0.17
at Fifield Road (1.49)	43.50	43.71	+0.21
at Howsley Road (0.40)	43.48	43.73	+0.25
Natomas East Main Drainage Canal			
at Elverta Road (10.35)	40.36	41.72	+1.36
at Elkhorn Boulevard (8.35)	40.35	41.71	+1.36
at Main Avenue (6.09)	43.76	43.77	+0.01
at West El Camino Avenue (2.96)	42.71	42.72	+0.01
Feather River			
at Nicolaus Gage (8.00)	53.45	53.47	+0.02
Yolo Bypass			
at Woodland Gage (51.10)	35.96	36.01	+0.05
American River			
at H Street (6.471)	49.16	49.17	+0.01

Notes: I-5 = Interstate 5; NEMDC = Natomas East Main Drainage Canal; NGVD = National Geodetic Vertical Datum of 1929; SR = State Route
Source: **Appendix B1** of this EIS/EIR

The analysis consisted of calibrating the hydraulic model to historic flood events using high-water marks and stream gauge data gathered in connection with the 1997 flood, and modeling the existing Proposed Action and No-Action conditions under the following flood scenarios: (1) the 1957 water surface profiles that serve as the minimum design standard for the SRFCP; (2) the 100-year (1% AEP) flood that affects management of SRFCP-protected floodplains under the National Flood Insurance Program (33 Code of Federal Regulations [CFR] 65.10); (3) the "200-year" (0.5% AEP) flood that is likely to affect implementation of the floodplain management standards recently adopted by the California Legislature (Chapter 364, Statutes of 2008 [adding Water Code

Section 9602(i)]); and (4) the "500-year" (0.2% AEP) flood that represents a worst-case scenario for analyzing project impacts. Each of these scenarios was modeled assuming that levees outside the project area would fail when overtopped. However, to test how sensitive the water surface elevations predicted by the model are to different levee failure scenarios, each scenario was also modeled assuming that nonurban levees that currently do not meet the SRFCP's minimum levee height requirements would be repaired and that no levees would fail even under the most extreme overtopping condition. The "500-year" (0.2% AEP) flood scenario represents the worst case because it is the largest hydrologic event modeled for the SRFCP and would produce the highest water surface elevations among the model results. See **Appendix B1** of this EIS/EIR for additional information about the background, approach, and results of the NLIP hydrologic and hydraulic modeling analyses, including a summary description of the legislative support for the NLIP impact methodology.

4.4.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to hydrology and hydraulics if they would do any of the following:

- substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level;
- create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- place housing within a 100-year flood hazard area or place within a 100-year flood hazard area structures that would impede or redirect flood flows;
- expose people or structures to a significant risk of loss, injury, or death involving flooding; or
- substantially alter the existing drainage pattern of a site or an area, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site.

The project would not cause substantial increases in amounts of runoff or place housing or other inhabitated structures in a 100-year flood hazard area. Therefore, this issue is not discussed further in this EIS/EIR.

In determining whether a project would expose people or structures to a significant risk as a result of flooding, SAFCA uses the following thresholds:

- whether the project would cause encroachment on SRFCP design levee height for the SRFCP design flow for a project levee outside the project area, or
- whether the project would cause a significant increase in flooding in an area that is outside the protection of the SRFCP.

For purposes of these thresholds, "flood hazard area" means an area that does not meet the minimum level of flood protection required by Federal or state law, whichever is more stringent. The 100-year (1% AEP) level of flood protection will be the standard applicable until 2015, or perhaps earlier, depending on when the Central Valley Flood Protection Plan takes effect. At that point, the applicable standard would be governed by Senate Bill 5, namely, either "200-year" (0.5% AEP) protection or "adequate progress" towards meeting the "200-year" (0.2% AEP) protection standard by 2025.

4.4.2 IMPACTS AND MITIGATION MEASURES

Impact 4.4-a: Hydraulic Impacts on Other Areas and Exposure to Flood Risk

Table 4.4-2 and **Appendix B1** indicate the levee failures that would occur throughout the SRFCP area under each of the targeted flood conditions assuming levees fail when overtopped. These failures would generally affect nonurban levees. However, the urban levees along the Lower American River would fail under the existing condition "200-year" (0.5% AEP) flood (flooding that has a 1-in-200 chance of occurring in any given year), and urban levees along the Feather and Lower American Rivers would fail in the existing condition "500-year" (0.2% AEP) flood (flooding that has a 1-in-500 chance of occurring in any given year).

Tables 4.4-3, 4.4-4, and **4.4-5** display the comparative water surface elevations that would occur under each of the targeted flood scenarios with levee failures caused by overtopping. These data indicate no significant increase in water surface elevations for the Phase 3 Project when the Proposed Action conditions are compared to the existing and No-Action conditions. The sensitivity analysis does show an increase in water surface elevations on the NEMDC at Elverta Road for "500-year" (0.2% AEP) analyses. It should be noted that this potential increase in flood stage is a result of raising the NEMDC levee between Sankey Road and Elkhorn Boulevard. This reach of the NEMDC (Sankey Road to Elkhorn Boulevard) is part of the Phase 4 Project and will be evaluated at a project-level in a future environmental compliance document.

In addition, as shown in **Table 4.4-2**, the same number of levee failures would occur in the 100-year (1% AEP) flood event under both the Proposed Action and No-Action Alternative.

Tables 4.4-6, 4.4-7, and **4.4-8** display the comparative water surface elevations that would occur under the sensitivity analysis, which assumes no levee failures. The sensitivity analysis does show an increase in water surface elevations on the NEMDC at Elverta Road for the "200-year" (0.5% AEP) and "500-year" (0.2% AEP) analyses. It should be noted that this potential increase in flood stage is a result of raising the NEMDC levee between Sankey Road and Elkhorn Boulevard. This reach of the NEMDC (Sankey Road to Elkhorn Boulevard) is part of the Phase 4 Project and will be evaluated at a project-level in a future environmental compliance document. This EIS/EIR evaluates the NEMDC levee improvements that are part of the Phase 3 Project, which include seepage remediation between Elkhorn Boulevard and Northgate Boulevard but do not include levee raising because this section of the NEMDC west levee has been determined to have adequate levee height.

These modeling results are more fully discussed in **Appendix B1** of this EIS/EIR.

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore hydrology or hydraulics would not be altered. There would be **no impact**. ***(Greater)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Wind and wave run-up or seepage conditions could cause portions of this system to fail, triggering widespread flooding and extensive damage to property within the Basin. Residences on the water side of the Sacramento River levee in the vicinity of a levee breach could be engulfed, access to residences on the water side of the levee and within the Basin could be cut off, and interior roadways and other infrastructure damaged. The magnitude of the impacts would depend upon the location of the levee breach, severity of the storm, and river flows at the time. While a precise determination of significance is uncertain, due to the uncontrolled consequences of levee failure, this

impact is still assumed to be **significant**. As discussed in Section 4.0.1, "Approach to the Environmental Analysis," no mitigation is required. This impact would remain **significant and unavoidable**. ***(Greater)***

Proposed Action and Levee Raise-in-Place Alternative

The hydraulic impacts of the Proposed Action and the Levee Raise-in-Place Alternative would be the same, as described in further detail below.

The Proposed Action includes an adjacent setback levee along the Sacramento River east levee in Reaches 5A–9B, widening and flattening of the PGCC west levee, widening and flattening of the NEMDC west levee from Elkhorn Boulevard to the NEMDC stormwater pumping station, and seepage and slope stability remediation from the NEMDC stormwater pumping station to Northgate Boulevard. The Levee Raise-in-Place Alternative is the same as under the Proposed Action for construction on the PGCC and NEMDC, but this alternative would raise the existing Sacramento River east levee in place instead of constructing an adjacent levee.

Under both action alternatives, levee raises would occur on the Sacramento River east levee (Reaches 5A–9B) and portions of the PGCC to provide the required 3 feet of levee height above the "200-year" (0.5% AEP) design water surface profile. This levee height requirement originates in Federal Emergency Management Agency regulations and the engineering practice of the California Department of Water Resources, which has been mandated to develop design standards for providing a "200-year" (0.5% AEP) level of flood protection for urban areas protected by levees in the Central Valley.

As indicated in **Tables 4.4-1** through **4.4-8** above, this analysis shows that the levees around the Natomas Basin are currently high enough to contain the 1957 profile and the 100-year (1% AEP) flood profile under both the levee failure scenario and the sensitivity (no levee failure) analysis. Accordingly, the improvements that would be constructed as part of the Proposed Action would not measurably alter these water surface elevations. However, it should be noted that some of these levees do not meet FEMA's requirement of 3 feet of levee height above the 100-year design water surface profile (see Chapter 2.0, "Alternatives," Section 2.3.1.1, "Levee Raises, Widening, and Slope Flattening"); meeting this requirement is one of the project objectives.

With respect to the "200-year" (0.5% AEP) design flood, the hydraulic models show that nonurban levees outside of the Natomas Basin would overtop in multiple locations by 6 inches to 1 foot. At these locations, the UNET model assumes that the overtopping would produce a 500-foot breach over a 2-hour period. The model allows water to leave the system by flowing through the breach. The water remaining in the adjacent channel is routed downstream and thus contributes to the resulting water surface elevations in the channels surrounding the Natomas Basin. The Phase 3 Project would increase flood stages for the "200-year" (0.5% AEP) flood profile by a maximum of 0.06 foot; therefore, this impact is less than significant.

With respect to the "500-year" (0.2% AEP) flood, the hydraulic modeling results show that approximately 100 miles of the SRFCP levee system would be subject to overtopping by up to 2 feet in some locations. The affected levees would perform as described above for the "200-year" (0.5% AEP) levee failure.

As part of the sensitivity analysis, the "200-year" (0.5% AEP) and "500-year" (0.2% AEP) flood analyses were performed without any levee failures being allowed. Under these conditions, the UNET model assumes that the affected levees would function as weirs, allowing water to leave the system by flowing over the top of the affected levee, but without triggering a breach. As in the levee failure scenarios, the water remaining in the adjacent channel is routed downstream and thus contributes to the resulting water surface elevations in the channels surrounding the Natomas Basin. These no levee failure routings indicate that the "200-year" (0.5% AEP) flood would slightly overtop portions of the existing Sacramento River east levee, the existing NCC south levee, and the existing NEMDC west levee, but would otherwise be contained. Raising these levees under either action alternative would prevent this overtopping and increase the "200-year" (0.5% AEP) design water surface elevation in the project area by 0.02 foot in the Sacramento River channel, 0.02 foot in the NCC, 0.02 foot in the

PGCC, and 0.41 foot in the NEMDC. The "500-year" (0.2% AEP) flood with no upstream levee failures would cause more substantial overtopping in these reaches of the Natomas Basin levee system. The proposed improvements would contain these overflows and cause the "500-year" (0.2% AEP) design water surface elevation to potentially increase by up to 0.17 foot in the Sacramento River channel, up to 0.26 foot in the NCC, up to 0.25 foot in the PGCC, and up to 1.36 feet in the NEMDC. It should be noted that raising of the NEMDC levee would be conducted as part of the Phase 4 Project that will be evaluated at a project-levee in a future environmental document.

In summary, implementation of the Proposed Action or the Levee Raise-in-Place Alternative would not measurably alter water surface elevations in the project area except in the most extreme circumstances (i.e., a "200-year" (0.5% AEP) or a "500-year" (0.2% AEP) flood with no levee failures despite 100 miles of levee overtopping in areas upstream of the Natomas Basin). The action alternatives would not change the existing geometry of the channels surrounding the Natomas Basin and therefore would not cause significant changes to water flow in these channels, or cause adverse hydraulic effects upstream or downstream of the project area during peak flows. The details of this analysis are included in **Appendix B1** of this EIS/EIR.

A number of residents of homes on the water side of the Sacramento River east levee have expressed concerns to SAFCA and USACE that the proposed levee height increases would increase the risk of flooding of their residences. As described above, implementation of either action alternative would not cause the SRFCP operations to be altered; therefore, the principal risks of flood damage to these existing waterside Garden Highway residences would continue to be either inundation by the water surface elevations that would remain unchanged by the Proposed Action or damage by the wind and wave run-up generated from these water surface elevations. In either event, neither action alternative would alter the existing risk of damage associated with living along the edge of the Sacramento River channel. Moreover, this risk would be alleviated by the project because the levee height added to the Sacramento River east levee would significantly reduce a potential wind- and wave-induced levee failure and the improvements to address seepage potential would greatly reduce the potential for a seepage-induced failure.

For these reasons, the Proposed Action and the Levee Raise-in-Place Alternative would not have a significant adverse hydraulic impact on the SRFCP. In addition, these alternatives would not expose people or structures to a significant risk of flooding. Rather, this risk would be alleviated because the levee height added to the Sacramento River east levee would reduce the risk of wind- and wave-induced levee failure, and the seepage remediation measures would reduce the potential for seepage-induced failure. Because the action alternatives would replace or upgrade existing levees using up-to-date design and construction standards, implementation of either of these alternatives would substantially reduce the risk of flooding of the Natomas Basin, which would be a **less-than-significant (beneficial)** impact. ***(Similar)***

Mitigation Measure: No mitigation is required.

Impact 4.4-b: Alteration of Local Drainage

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore construction activities related to the project would not alter the local drainage systems described in Chapter 2.0, "Alternatives." There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in flooding that could alter local drainage systems. However,

the potential for such an occurrence is uncertain, and the magnitude and duration of any related effects on local drainage systems cannot be predicted. Therefore, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

As part of the planning process for the project and in coordination with SAFCA, Sacramento County Airport System, and Reclamation District 1000, Mead & Hunt has conducted preliminary evaluations of local drainage patterns and needs in relation to proposed features of the alternatives.

The borrow sites that would likely be used in the Phase 3 Project, (i.e., the Airport north bufferlands, the Brookfield borrow site, and the Krumenacher and Twin Rivers Unified School District borrow sites), the borrow sites that could be used (i.e., the Dunmore and Sutter Pointe borrow sites and selected sites within the Elkhorn Borrow Area), and the properties adjacent to the Sacramento River east levee south of the Teal Bend Golf Club, would be 3–5 feet lower following the conclusion of borrow operations. These sites would be regraded and returned to their pre-project uses. Drainage from these sites would be routed to the existing drainage system for these lands.

Other Phase 3 Project elements include construction of the adjacent setback levee in Reaches 5A–9B of the Sacramento River east levee under the Proposed Action and levee raising and backslope flattening under the Levee Raise-in-Place Alternative and the associated relocation of the existing Elkhorn Canal south of Elkhorn Reservoir and the Riverside Canal. Portions of privately maintained local canals, some of which may provide a drainage function, would be overlapped by the footprint of the adjacent setback levee along the Sacramento River east levee, the widened PGCC west levee, and/or berms associated with both levees. Drainage would need to be rerouted to new replacement canals before the existing canals are decommissioned to ensure that local drainage and ponding areas would not be adversely affected as a result of project construction. Detailed plans for these replacements are still under development. The new GGS/Drainage Canal would become part of the local drainage system and would be designed to intercept and convey runoff from much of the area currently drained by the Airport West Ditch. Construction of the new GGS/Drainage Canal, and the repairs to infrastructure associated with the Airport West Ditch, would substantially alter drainage collection west of the Airport operations area by improving drainage in the Airport Critical Zone.

Because specific plans have not been finalized to ensure uninterrupted conveyance of drainage from agricultural lands along the Sacramento River east levee and the PGCC west levee, and grading plans have not yet been finalized for borrow areas, the alternatives may temporarily or even permanently alter the existing drainage pattern of the project area as a result of the Phase 3 Project, causing localized flooding, resulting in a **potentially significant** impact. ***(Similar)***

Mitigation Measure 4.4-b: Coordinate with Landowners and Drainage Infrastructure Operators, Prepare Final Drainage Studies as Needed, and Implement Proper Project Design

Proposed Action and Levee Raise-in-Place Alternative

During project design, the project engineers shall coordinate with owners and operators of local drainage systems and landowners served by the systems. This coordination shall enable the project engineers to evaluate the preproject and postproject drainage needs and the design features to consider in project design any project-related substantial drainage disruption or alteration in runoff that would increase the potential for local flooding. If substantial alteration of runoff patterns or disruption of a local drainage system could result from a project feature, a final drainage study shall be prepared and implemented as part of project design. The study shall consider the design flows of any existing facilities that would be crossed by project features and shall develop appropriate plans for relocation or other modification of these facilities and construction of new facilities, as needed, to ensure that

the altered systems provide drainage services during and after construction that are equivalent to the drainage services that were provided prior to construction. If no drainage facilities (e.g., ditches, canals) would be affected, but project features would have a substantial adverse impact on runoff amounts and/or patterns, then new drainage systems shall be included in the design of project improvements to ensure that the project would not result in new or increased local flooding. Any necessary features to remediate project-induced drainage problems shall be constructed before the project is completed or as part of the project, depending on site-specific conditions. Any additional coordination with landowners and drainage infrastructure operators related to future selection of borrow sites within the Elkhorn Borrow Area shall be completed before any earth-moving activities. Implementing this mitigation would reduce adverse impacts to local drainage to a **less-than-significant** level. ***(Similar)***

Impact 4.4-c: Effects on Groundwater

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to directly disturb groundwater recharge or flow. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Flooding of the Basin, should it occur in the absence of improvements to the perimeter levee system, would not inhibit groundwater recharge. Therefore, there would be **no impact**. ***(Lesser)***

Proposed Action and Levee Raise-in-Place Alternative

Construction of the adjacent setback levee in Reaches 5A–9B under the Phase 3 Project includes installation of conventional soil-bentonite cutoff walls from Station 228+70 to Station 262+50 (Reach 5A) and from Station 338+00 to Station 455+00 (Reaches 7–9B), and installation of deep soil mix cutoff walls from Station 293+50 to Station 338+00 (Reaches 6A–7) and from Station 455+00 to Station 468+00 (Reach 9B) of the proposed adjacent levee. The Phase 3 Project would also include installation of cutoff walls in the west levee of the PGCC where required and in the west levee of the NEMDC between Elkhorn Boulevard and Northgate Boulevard. The depth of these cutoff walls from the levee crown would range from 60 to 80 feet.

The presence of cutoff walls could restrict the movement of groundwater in either direction (away from or toward the Sacramento River, the PGCC, or the NEMDC), potentially increasing or decreasing localized near-surface groundwater levels in areas immediately east and west of the cutoff wall. A significant drop in groundwater levels could decrease the yields of nearby wells or increase the pumping costs of those wells. The combined effect of all of SAFCA's proposed construction activities under the NLIP (including the contribution of the Phase 3 Project) on the overall groundwater budget for the Natomas Basin under both existing and future conditions is discussed in Chapter 5.0, "Cumulative and Growth-Inducing Impacts, and Other Statutory Requirements."

The evaluation of potential groundwater impacts prepared by Luhdorff & Scalmanini Consulting Engineers (LSCE) (**Appendix B2**) estimated the water-level changes caused by the cutoff walls along the Sacramento River east levee. These estimates were based on simulations using the SEEP/W groundwater model analysis developed by Kleinfelder in its report, *Evaluation of Cutoff Walls Impact on Groundwater Recharge Sacramento River East Levee* (**Appendix B3**). On the water side of the levee, the predicted effect of the cutoff wall is negligible (less than an inch) at low stage, and there would be a slight increase in groundwater levels (less than 1 foot) at high

stage (see Figure 8-2 in **Appendix B2**). On the land side of the levee, the simulated groundwater levels are slightly lower because of the cutoff wall (typically 0.25 to 0.5 foot). In both cases, impacts, if any, would be small enough to be considered negligible even for the shallowest domestic wells (less than 100 feet deep). As a result, no substantial decrease in groundwater levels or well yields or increase in pumping costs is expected to be caused by the cutoff walls; therefore, this impact is considered **less than significant**.

The evaluation of potential groundwater impacts prepared by LSCE also investigated the effects on groundwater of excavation of the proposed borrow sites (see **Appendix B2**). Excavation and reclamation of the Brookfield borrow site would have an indirect effect on groundwater conditions because of the proposed delivery of surface water to the site. Approximately 325 acres are planted with rice. SAFCA plans to restore any portion of the site that is used for borrow operations to rice cultivation after construction activities are complete. The Brookfield site is currently irrigated entirely with groundwater, but SAFCA has proposed to provide the infrastructure necessary to irrigate up to 80% of the site with surface water after reclamation. This transition would reduce groundwater pumping by about 1,625 afy. Groundwater levels would increase because of the reduced pumping, which is expected to increase subsurface outflow beneath the PGCC by about 76 afy. Groundwater would not decrease as a result of using Brookfield as a borrow site, and groundwater levels there would increase slightly. This impact is considered **less-than-significant** (but beneficial from the aspect of the overall increase to groundwater levels). ***(Similar)***

Mitigation Measure: No mitigation is required.

4.4.3 RESIDUAL SIGNIFICANT IMPACTS

Because mitigation would not be required for the No-Action Alternative, impacts related to the continued exposure of the Natomas Basin to a significant residual risk of flooding under the No-Action Alternative are assumed to be significant and unavoidable. Under the No-Action Alternative, impacts to local drainage systems are uncertain. Because of this uncertainty, this potential impact is considered too speculative for meaningful consideration.

Implementation of the mitigation measures described in this section for the Proposed Action and the Levee Raise-in-Place Alternative would reduce residual hydraulic impacts to a less-than-significant level.

As noted in Chapter 2.0, “Alternatives,” Section 2.5.1, “Residual Risk of Flooding,” implementation of the Phase 3 Project would substantially lessen the probability of a flood in the Natomas Basin due to levee failure. However, the Basin would remain subject to a residual risk of flooding, which would be the same under both the Proposed Action and the Levee Raise-in-Place Alternative. SAFCA would be required to maintain an ongoing residual risk management program, as detailed in Section 2.5.1.

4.5 WATER QUALITY

4.5.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.5.1.1 METHODOLOGY

Water quality impacts that could result from project construction activities were evaluated based on the construction practices and materials used, the location and duration of the activities, and the potential for degradation of water quality or beneficial uses of project area waterways.

4.5.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to water quality if they would violate any water quality standards or waste discharge requirements or otherwise substantially degrade water quality.

4.5.2 IMPACTS AND MITIGATION MEASURES

Impact 4.5-a: Temporary Impacts on Water Quality from Stormwater Runoff, Erosion, or Spills

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to directly disturb water quality from stormwater runoff. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system the risk of levee failure would remain high. Potential flooding and inundation of the Natomas Basin could introduce large quantities of agricultural pesticides, oil, gasoline, and other hazardous materials into waters and subsequently into stream channels and groundwater. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related impacts on water quality cannot be predicted. A precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Project implementation would include extensive ground-disturbing activities during construction, many of them near local drainages and waterways that could become contaminated by soil or construction substances. These waterways include the PGCC, the NEMDC, the West Drainage Canal, and the Elkhorn and Riverside Canals. Construction would include landside widening of the PGCC and NEMDC west levees with installation of a cutoff wall through the entire PGCC and NEMDC. Irrigation ditches south of Howsley Road may be filled as a result of landside widening of the west levee. Work on the PGCC may also require placement of additional fill material on the waterside of the west levee to flatten the levee slope. Under the Proposed Action, an adjacent levee would be constructed adjoining the Sacramento River east levee in Reaches 5A–9B, with a combination of cutoff walls and seepage berms. Under the Levee Raise-in-Place Alternative, the existing levee would be raised in place with the

inclusion of seepage remediation as required. Under both of these alternatives, the relocated Elkhorn Canal and the new GGS/Drainage Canal would be constructed south of the Elkhorn Reservoir.

Fill material for levee and berm construction would be excavated from the borrow sites shown on **Plate 10**. Following excavation, these borrow sites would either be returned to their preproject use or converted to marsh or upland habitat (see **Table 2-2**). Some of these lands are bordered by agricultural canals or ditches.

Planned construction activities would coincide with part of the rainy season. These activities have the potential to temporarily impair water quality if disturbed and eroded soil, petroleum products, or construction-related wastes (e.g., cement and solvents) are discharged into receiving waters or onto the ground where they can be carried into receiving waters. Soil and associated contaminants that enter receiving waters through stormwater runoff and erosion can increase turbidity, stimulate algae growth, increase sedimentation of aquatic habitat, and introduce compounds that are toxic to aquatic organisms. Accidental spills of construction-related substances such as oils and fuels can contaminate both surface water and groundwater. The extent of potential impacts on water quality would depend on the following factors: tendency for erosion of soil types encountered, types of construction practices, extent of the disturbed area, duration of construction activities, timing of particular construction activities relative to the rainy season, proximity to receiving water bodies, and sensitivity of those water bodies to construction-related contaminants.

Slurry that would be used for construction of the new cutoff walls (in the PGCC and NEMDC west levees and in the adjacent levee along Reaches 5A–9B of the Sacramento River east levee under the Proposed Action or in the existing Sacramento River east levee under the Levee Raise-in-Place Alternative) has a fluid consistency when being placed. Improper handling or storage could result in releases to nearby surface water, thereby degrading water quality.

Excavated areas that fill with surface or groundwater during project construction would require dewatering. Effluent from dewatering operations typically contains high levels of suspended sediment and often high levels of petroleum products and other construction-related contaminants. This effluent could be directly released to local receiving waters, thereby degrading water quality.

Because the potential for release of soil or construction-related materials into the PGCC, NEMDC, local drainages, and ultimately the American or Sacramento River could adversely affect river water quality, this temporary, construction-related impact is considered **potentially significant**. **(*Similar*)**

Mitigation Measure 4.5-a: Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions

Proposed Action and Levee Raise-in-Place Alternative

SAFCA shall file a Notice of Intent (NOI) to discharge stormwater associated with construction activity with the Central Valley RWQCB. Final design and construction specifications shall require the implementation of standard erosion, siltation, and good housekeeping BMPs. Construction contractors shall be required to prepare and implement a SWPPP and comply with the conditions of the NPDES general stormwater permit for construction activity. The SWPPP shall describe the construction activities to be conducted, BMPs that will be implemented to prevent discharges of contaminated stormwater into waterways, and inspection and monitoring activities that shall be conducted.

The SWPPP shall include the following:

- pollution prevention measures (erosion and sediment control measures and measures to control nonstormwater discharges and hazardous spills),

- demonstration of compliance with all applicable Central Valley RWQCB standards and other applicable water quality standards,
- demonstration of compliance with regional and local standards for erosion and sediment control,
- identification of responsible parties,
- detailed construction timelines, and
- a BMP monitoring and maintenance schedule.

BMPs shall include the following:

- conduct all work according to site-specific construction plans that identify areas for clearing, grading, and revegetation so that ground disturbance is minimized;
- install silt fences near riparian areas or streams to control erosion and trap sediment, and reseed cleared areas with native vegetation;
- stabilize disturbed soils of the new or raised levees, existing levee removal areas, and borrow sites before the onset of the winter rainfall season; and
- stabilize and protect stockpiles from exposure to rain and potential erosion.

The SWPPP also shall specify appropriate hazardous materials handling, storage, and spill response practices to reduce the possibility of adverse impacts from use or accidental spills or releases of contaminants. Specific measures applicable to the project include, but are not limited to, the following:

- develop and implement strict on-site handling rules to keep potentially contaminating construction and maintenance materials out of drainages and other waterways;
- conduct all refueling and servicing of equipment with absorbent material or drip pans underneath to contain spilled fuel, and collect any fluid drained from machinery during servicing in leak-proof containers and deliver to an appropriate disposal or recycling facility;
- maintain controlled construction staging and fueling areas at least 100 feet away from channels or wetlands to minimize accidental spills and runoff of contaminants in stormwater;
- prevent substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses; and
- maintain spill cleanup equipment in proper working condition. Clean up all spills immediately according to the spill prevention and response plan, and immediately notify California Department of Fish and Game (DFG) and the Central Valley RWQCB of any spills and cleanup procedures.

BMPs shall be applied to meet the “maximum extent practicable” and “best conventional technology/best available technology” requirements and to address compliance with water quality standards. A monitoring program shall be implemented during and after construction to ensure that the project is in compliance with all applicable standards and that the BMPs are effective.

Several technical studies have been conducted regarding water-quality control feature impacts on groundwater (e.g., City of Fresno Nationwide Urban Runoff Project and *California Storm Water Best Management Practices Handbook* prepared by the Stormwater Quality Task Force) and surface water (e.g., *Cumulative Water Quality Analysis Report for the Lahontan Development 1996–2002* [Huffman & Carpenter 2003]). These studies have determined that water-quality control features such as revegetation, erosion control measures, and detention and infiltration basins have been successful in avoiding water quality impacts (metals and organic compounds associated with stormwater are typically lost within the first few feet of the soil of the retention basins associated with groundwater). Technical studies associated with the Lahontan Development (residential and golf course development) demonstrated that the use of a variety of BMPs (e.g., source control, detention basins, revegetation, and erosion control) have been able to maintain surface water quality conditions in adjacent receiving waters (Martis Creek).

Implementation of Mitigation Measure 4.5-a would reduce water quality impacts from temporary construction activities under the Proposed Action and Levee Raise-in-Place Alternative because SAFCA would conform with applicable local and state regulations regulating construction discharges, which would reduce temporary potentially significant impacts to a **less-than-significant** level. **(*Similar*)**

Impact 4.5-b: Impacts to Sacramento River Water Quality from Stormwater Runoff from Garden Highway Drainage Outlets

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for the project to directly disturb water quality from stormwater runoff. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Impacts to water quality as a result of levee failure would be the same as described in Impact 4.5-a under the No-Action Alternative (Potential Levee Failure). The potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

Implementation of the Proposed Action would involve construction of a new drainage system along Garden Highway in Reaches 5A–9B of the Sacramento River to collect surface water from the drainage area between the existing highway and the new adjacent levee and convey it beneath Garden Highway to the Sacramento River. The surface water would collect in drainage swales between Garden Highway and the adjacent setback levee and drain through pipe laterals under Garden Highway to outfalls in the berm along the east bank of the Sacramento River. Without treatment, stormwater runoff from Garden Highway could degrade the water quality of the Sacramento River by discharging water containing metals (e.g., break-lining dust), oil and grease, solvents, phosphates, hydrocarbons, and suspended solids through the proposed drainage outlets. This impact would be **significant**.

Levee Raise-in-Place Alternative

Under the Levee Raise-in-Place Alternative, the existing drainage patterns on Garden Highway would remain in place. Because the existing drainage would not be altered, there would be no increased impact to water quality in the Sacramento River. This impact would be **less than significant**. **(*Lesser*)**

Mitigation Measure 4.5-b: Implement Standard Best Management Practices and Comply with NPDES Permit Conditions

Proposed Action

SAFCA and its engineering consultants shall implement a suite of stormwater quality BMPs designed to remove contaminants from water discharging through the Garden Highway outlets. These BMPs shall be based on the Stormwater Quality Design Manual for Sacramento and South Placer Regions (May 2007), meet "maximum extent practicable" and "best conventional technology/best available technology" requirements, and comply with NPDES permit conditions.

Implementing this mitigation measure would reduce the potential impact on water quality from stormwater runoff associated with drainage from Garden Highway to a **less-than-significant** level.

Levee Raise-in-Place Alternative

No mitigation is required.

Impact 4.5-c: Impacts to Sacramento River Water Quality from RD 1000 Pumping Plant No. 2 Discharges

No-Action Alternative

No Project Construction

Under the No-Action Alternative, RD 1000 Pumping Plant No. 2 would not be constructed and operated; therefore, no potential exists for the project to directly disturb water quality from agricultural tailwater runoff. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system the risk of levee failure would remain high. Impacts to water quality as a result of levee failure would be the same as described in Impact 4.5-a under the No-Action Alternative (Potential Levee Failure). The potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Implementation of the Proposed Action and the Levee Raise-in-Place Alternative would involve reconstruction of RD 1000 Pumping Plant No. 2 to replace the original pumping plant, which was taken out of service in January 2006. The original plant was constructed in the 1920s and has been upgraded over time. The original plant was never regulated by the Central Valley RWQCB as a point-source discharge under the Porter-Cologne Water Quality Control Act and the Clean Water Action (CWA), Section 402. The proposed plant is designed to pump water from the North Drainage Canal in the Natomas Basin into the Sacramento River for RD 1000 and also to recycle agricultural tailwater runoff back into the Natomas Central Mutual Water Company's Elkhorn irrigation canal. Debris from the North Drainage Canal would be prevented from entering the pump by a trashrack and trash rake system. The water would be pumped into the Sacramento River through three 36-inch diameter pipes. The

pipes would equipped with flap gates to prevent backflow. The outfall structure would be designed to minimize bank erosion from either discharge or river action.

Depending upon the time of year, water that would be pumped from the North Drainage Canal would be either agricultural tailwater or runoff from winter storms. These waters may contain excessive concentrations of pesticides, herbicides, nutrients, disease-carrying microorganisms, or salts. Without treatment, discharges from the plant could degrade the water quality of the Sacramento River. This impact would be **potentially significant**. ***(Similar)***

Mitigation Measure 4.5-c: Implement Best Management Practices and Comply with NPDES Permit Conditions for a Point-Source Discharge

Proposed Action and Levee Raise-in-Place Alternative

Prior to operation of Pumping Plant No. 2 for discharge of water into the Sacramento River, SAFCA and RD 1000 shall file a report of waste discharge with RWQCB and comply with NPDES permit conditions (See Mitigation Measure 4.5-a for more information on BMPs and the SWPPP). Implementing this mitigation measure would reduce the potential impact on water quality in the Sacramento River from plant discharges to a **less-than-significant** level. ***(Similar)***

4.5.3 RESIDUAL SIGNIFICANT IMPACTS

Because mitigation cannot be required for the No-Action Alternative, water quality impacts related to the continued exposure of the Natomas Basin to a significant residual risk of flooding under the No-Action Alternative are uncertain. Because of this uncertainty, the potential impacts remain too speculative for meaningful consideration.

With implementation of Mitigation Measures 4.5-a, 4.5-b, and 4.5-c, no residual significant impacts related to water quality impacts from long-term urban runoff, short-term alteration of drainages and associated surface water quality and sedimentation, groundwater recharge, or groundwater quality would be associated with the Proposed Action or the Levee Raise-in-Place Alternative.

4.6 FISHERIES

4.6.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.6.1.1 METHODOLOGY

This section addresses the potential impacts of the Proposed Action and alternatives under consideration on common and sensitive fisheries resources found in the lower Sacramento River, the PGCC, and the NEMDC.

Fisheries impacts that could result from project construction and operational activities were qualitatively evaluated based on the construction practices and materials to be used, the location and duration of the activities, and the potential for adverse impacts on aquatic habitats adjacent to the project area and/or the fish community that may be occupying these habitats.

4.6.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or alternatives under consideration were determined to result in a significant impact related to fisheries if they would do any of the following:

- interfere substantially with the movement of any native resident or migratory fish species,
- substantially reduce the habitat of a fish species, or
- cause a fish species to drop below self-sustaining levels.

4.6.2 IMPACTS AND MITIGATION MEASURES

Impact 4.6-a: Loss of Fish or Aquatic Habitat through Increased Sedimentation and Turbidity or Releases of Contaminants

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no improvements would be made to the Natomas perimeter levee system and there would be no potential for release of contaminants or increased sedimentation or turbidity from perimeter levee improvements from project-related activities. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in flooding that could introduce large quantities of agricultural pesticides, oil, gasoline, and other hazardous materials into stream channels, irrigation and drainage canals, and the Sacramento and American Rivers, potentially resulting in the loss of fish or aquatic habitat. Because the extent and location of a levee failure and subsequent flooding is unknown, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Project construction activities would include the following:

- clearing and grubbing/stripping, degrading, and subsequent reconstruction of portions of the upper half of the PGCC west levee and NEMDC west levee;
- construction of cutoff walls along the entire PGCC west levee and NEMDC west levee;
- extensive soil borrow excavation and placement for all levee improvements;
- construction of the adjacent setback levee along a portion of the Sacramento River east levee, finish grading, and relocation and construction of canals; and
- reconstruction of RD 1000 Pumping Plant No. 2, and demobilization/cleanup.

These activities may temporarily impair water quality if disturbed and eroded soil is discharged into receiving waters. Soil and associated contaminants that enter receiving waters through stormwater runoff and erosion can increase turbidity, stimulate algae growth, increase sedimentation of aquatic habitat, and introduce compounds that are toxic to aquatic organisms. Impaired water quality would affect habitats and the physical health of individual fish and species populations within the Sacramento River, PGCC, and NEMDC. These waterways provide (or are hydrologically connected to waterways that provide) migratory habitat for special-status adult and juvenile chinook salmon and steelhead and spawning habitat for special-status green sturgeon, as well as striped bass and American shad.

Fish population levels and survival have been linked to levels of turbidity and siltation in a watershed. Prolonged exposure to high levels of suspended sediment could create a loss of visual capability in fish, leading to a reduction in feeding and growth rates; a thickening of the gill epithelia, potentially causing the decrease of respiratory function; clogging and abrasion of gill filaments; and increases in stress levels, reducing the tolerance of fish to disease and toxicants (Waters 1995).

Also, high levels of suspended sediments would cause the movement and redistribution of fish populations and could affect habitat. Once sediment is deposited, it could reduce water depths in pools, decreasing the water's carrying capacity for juvenile and adult fish (Waters 1995). Sediment resulting from construction may become embedded in the substrate (fish habitat), although natural flushing action is likely to clean the substrate within a few years after construction ceases. Increased sediment loading could adversely affect prey species downstream of the project area as well. Sediment loading could interfere with photosynthesis of aquatic flora and displace aquatic fauna. Many fish are sight feeders, and turbid waters reduce the ability of these fish to locate and feed on prey. Some fish, particularly juveniles, could become disoriented and leave areas where their main food sources are located, ultimately reducing their growth rates.

Avoidance is the most common result of increases in turbidity and sedimentation. Fish will not occupy areas unsuitable for survival unless they have no other option. Some fish, such as bass, will not spawn in excessively turbid water (Bell 1991). Therefore, project construction could cause fish habitat to become limited if high turbidity resulting from construction-related erosion were to preclude a species from occupying habitat required for successful completion of one or more life stages.

In addition, contaminants such as fuels, oils, and other petroleum products used in construction activities could be introduced into waters directly or through surface runoff. Contaminants may be toxic to fish or may alter oxygen diffusion rates and cause acute and/or chronic toxicity to aquatic organisms, thereby reducing growth and/or survival.

For the reasons described above, sedimentation and increased turbidity or other contamination could degrade water quality and adversely affect fish habitats and fish populations. This potential impact is considered **significant**. ***(Similar)***

Mitigation Measure 4.6-a: Implement Mitigation Measure 4.5-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions"; and Mitigation Measure 4.5-c, "Implement Best Management Practices and Comply with NPDES Permit Conditions for a Point-Source Discharge"

Proposed Action and Levee Raise-in-Place Alternative

SAFCA shall implement Mitigation Measure 4.5-a, as described in Section 4.5, "Water Quality." This measure requires filing an Notice of Intent (NOI) with the Central Valley RWQCB; implementing standard erosion and siltation measures and best management practices (BMPs); preparing and implementing a storm water pollution prevention plan (SWPPP); and complying with the conditions of the National Pollutant Discharge Elimination System (NPDES) general stormwater permit for construction activity.

Additionally, SAFCA shall implement Mitigation Measure 4.5-c, as described in Section 4.5, "Water Quality," which requires filing a report of waste discharge with the Central Valley RWQCB and complying with the NPDES permit conditions prior to operation of RD 1000's Pumping Plant No. 2.

Implementing this mitigation measure would reduce the potential impacts of increased sedimentation and turbidity on fish to a **less-than-significant** level because the use of BMPs (e.g., source control, detention basins, revegetation, and erosion control) would maintain surface water quality conditions in adjacent receiving waters. ***(Similar)***

Impact 4.6-b: Loss of Shaded Riverine Aquatic Habitat Associated with Levee Improvement Activities

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no loss of shaded riverine aquatic (SRA) habitat would occur related to the project. Conformance with USACE guidance regarding levee encroachments, however, could require removal of approximately 22.5 acres of riparian vegetation along Reaches 5A–9B on the water side of the Sacramento River east levee. Much of this vegetation contributes to SRA habitat, and its removal would adversely affect important SRA habitat, including moderation of water temperatures, recruitment of woody debris, and introduction of insects that provide food for fish. These effects would be similar to those of the Levee Raise-in-Place Alternative and greater than those of the Proposed Action. This impact is considered **potentially significant**. ***(Greater)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Absence of improvements could have adverse or beneficial impacts on SRA habitat, depending on timing, location, magnitude, and duration of flooding. A precise significance determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown and whether it would be adverse or beneficial. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

Small amounts of riparian vegetation (i.e., approximately 0.16 acre of individual trees), potentially providing SRA habitat (e.g., overhead cover for fish or contributing instream woody material to the NCC and Sacramento River [downstream] channels), may need to be removed from the Sacramento River east levee at the RD 1000 Pumping Plant No. 2 site to accommodate construction of a new outfall structure. In addition, drainage outfall structures on the water side of the Sacramento River east levee to drain stormwater would necessitate the removal of less than 1 acre of riparian vegetation that could be potential SRA habitat.

The removal of small amounts of riparian vegetation or woody material along the existing levee or otherwise in the floodplain could result in the loss of individual trees that may provide SRA habitat function. The potential loss of trees (and associated potential SRA habitat) could result in reduced quality and quantity of important habitat for fish species and/or their prey species. Therefore, implementation of the Proposed Action would result in a **potentially significant** impact on SRA habitat.

Levee Raise-in-Place Alternative

Under the Levee Raise-in-Place Alternative, in addition to the removal of SRA described for the Proposed Action, erosion control improvements would need to be implemented along approximately 1,260 feet of riverbank at the waterside toe of the Sacramento River east levee at River Mile 73.5 (Site G). Construction of these improvements would require the removal of several trees within Site G and trimming of canopies of other trees growing on the eroding bank. Branches that extend over the proposed cobble surfaces would be required to be trimmed. Additionally, the bank protection activities have been designed to fully compensate for impacts on habitat values through the use of suitable types of substrate, vegetation, and instream woody material.

In addition to the tree removal and trimming within the erosion control sites as described above, implementation of the Levee Raise-in-Place Alternative would also require the removal of approximately 22.5 acres of mature woody vegetation along Reaches 5A–9B on the waterside of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments.

This extensive riparian vegetation removal could substantially and adversely affect the function of SRA habitat, including moderation of water temperatures, recruitment of woody debris, and introduction of insects that provide food for fish. This impact is considered **potentially significant**. ***(Greater)***

Mitigation Measure 4.6-b: Restore, Replace, or Rehabilitate Degraded SRA Habitat Function and Comply with Section 7 of the Federal Endangered Species Act, Section 1602 of the California Fish and Game Code, and Section 2081 of the California Endangered Species Act Permit Conditions

Proposed Action

To restore, replace, or rehabilitate SRA habitat along the Sacramento River east levee at the location of the RD 1000 Pumping Plant No. 2 and in the footprint of the drainage outfall structures, SAFCA shall implement the measures described below.

- SAFCA shall consult with DFG regarding potential disturbance to fish habitat, including SRA, and shall obtain a streambed alteration agreement, pursuant to Section 1602 of the California Fish and Game Code, for construction work associated with levee improvements made on the waterside of a levee. SAFCA shall comply with all permit conditions of the streambed alteration agreement to protect fish habitat or to restore, replace, or rehabilitate any SRA habitat on a no-net-loss basis.
- USACE shall initiate Section 7 consultation with the National Marine Fisheries Service (NMFS) under Section 7 of the Federal Endangered Species Act (ESA), and SAFCA shall consult with DFG under the California Endangered Species Act (CESA) regarding potential impacts of the loss of SRA habitat on Federally listed fish species and state-

listed fish species, respectively. SAFCA shall implement any additional measures developed through the ESA Section 7 and CESA consultation processes, including Section 2081 permit conditions to ensure no net loss of habitat function.

Implementing this mitigation measure would reduce the impact to a **less-than-significant** level for the Proposed Action because SAFCA would ensure that any loss of SRA habitat for fish would be restored, replaced, and/or rehabilitated in consultation with USFWS, NMFS, and DFG and appropriate permits would be obtained.

Levee Raise-in-Place Alternative

To conform with USACE guidance regarding levee encroachments, the Levee Raise-in-Place Alternative would not allow measures to be implemented that would restore, replace, or rehabilitate any loss of SRA habitat along the Sacramento River in the vicinity of the proposed project. Compensation for SRA habitat loss would be limited to the purchase of SRA habitat credits at an authorized mitigation bank; currently, however, there are no known mitigation banks with SRA habitat credits on the Sacramento River. Therefore, this impact would remain **significant and unavoidable** because no feasible additional mitigation is available that would adequately and fully compensate for the loss of SRA habitat. ***(Greater)***

Impact 4.6-c: Interference with the Migration of Migratory Fish Species through the Creation of Attraction Flows at the RD 1000 Pumping Plant No. 2 Outfall and Drainage Outfalls

No-Action Alternative

No Project Construction

Under the No-Action Alternative, the reconstruction of the RD 1000 Pumping Plant No. 2 and associated outfall and drainage outfalls would not occur. As a result, there would be no potential for influencing the movement of native resident or migratory fish species because no potential attraction flows would be created. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Levee failure would cause flows into, and possibly out of the Natomas Basin. Fish washed through a levee breach at the time flooding initially occurs would result in some fish mortality through physical injuries or through stranding when waters recede in the Basin. Depending on specific hydraulic conditions at the levee break, additional fish could be washed into the Basin after the levee break. Because migratory fish species would be attracted to flows specific to imprinted olfactory cues, it is not expected that fish would actively migrate into the Natomas Basin through a levee breach. However, the hydraulic conditions could result in numerous fish of all species present being conveyed through the levee breach into the Natomas Basin, where mortality would be expected to be high over time. A precise significance determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown and whether it would be adverse or beneficial. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

The Phase 3 Project includes relocating and replacing RD 1000 Pumping Plant No. 2 and constructing several drainage outfalls.

Pumping Plant No. 2 was removed in response to underseepage observed during severe winter storms in January 2006 and must be relocated farther landward of the levee to resolve levee instability issues. Once the new pumping plant is built, the water would be carried from the pump to the outfall by three 36-inch pipes. The

replacement discharge piping would be raised such that it would cross the levee above the "200-year" flood level. The piping would then angle down towards the river and discharge at a roughly horizontal angle. The Pumping Plant No. 2 outfall is anticipated to be roughly 2–3 feet above the "normal" water level and would be constructed of reinforced concrete. Flap gates would be provided for each of the discharge pipes to prevent backflow and entry.

Several drainage outfalls are proposed to be constructed along the Sacramento River east levee. Each drain is designed to accommodate flows generated from runoff in the areas between the existing levee and proposed adjacent levee during a 10-year storm event. No additional surface runoff would be directed to or conveyed through the drains under future project phases. Drainage pipes are anticipated to vary in size from 12 to 15 inches in diameter. All of the drainage outfalls are anticipated to be located above the ordinary high-water mark of the river.

Anadromous salmonids, during their spawning migrations in the Sacramento River, use primarily olfactory cues to home to their natal streams once they reach the freshwater environment. There is the potential that the flows from Pumping Plant No. 2 and/or drainage outfalls would have olfactory cues and create velocity gradients that could attract these fish to attempt to swim up the water discharge. During fall and winter, adult chinook and steelhead are in the river migrating upstream to spawning grounds. If these fish become attracted to the flows from the outfall pipes, there is a potential to cause migration delays. With high river levels, the pump and drainage outfalls could create a condition where fish could enter the pipes. However, because salmonids imprint on olfactory cues particular to their stream of origin, the probability of flows from the pump or drainage outfalls interfering with migrations is low. Therefore, implementation of the Phase 3 Project would likely not result in substantial interference with the movement of native resident or migratory fish species. Therefore, this is considered a **less-than-significant** impact. ***(Similar)***

Mitigation Measure: No mitigation is required.

4.6.3 RESIDUAL SIGNIFICANT IMPACTS

Under the No-Action Alternative, there would be no impacts related to fish attraction at drainage outfalls and Pumping Plant No. 2. In the event of levee failure under the No-Action Alternative, impacts of degraded water quality on fish habitat due to levee failure are uncertain, but there would be some unknown fish mortality through physical injury and stranding of fish entering Natomas Basin through a levee breach. Because the severity of flood conditions can vary substantially, and the specific effects on fish cannot be reasonably predicted, this potential impact is considered too speculative for meaningful consideration. Under the No-Action Alternative, impacts to SRA habitat from removal of riparian vegetation would remain significant and unavoidable; however, in the event of levee failure, impacts are uncertain and too speculative for meaningful consideration. Additionally mitigation measures cannot be required for the No-Action Alternative; therefore, impacts that result from the No-Action Alternative would not be mitigated.

Under the Levee Raise-in-Place Alternatives, there are no feasible mitigation measures that could be implemented to compensate for the loss of riparian vegetation on the waterside of the Sacramento River east levee, and therefore the impacts under these alternatives would be significant and unavoidable. Implementation of the Proposed Action would not result in any residual significant impacts related to fisheries, as all impacts would be less than significant.

4.7 SENSITIVE AQUATIC HABITATS

4.7.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.7.1.1 METHODOLOGY

The following analysis is based on the results of field surveys and review of existing documentation. Biologists conducted multiple reconnaissance-level and focused biological surveys of the project area during 2004–2008, as part of project-related studies and planning efforts. Specific documents reviewed to support the analysis in this section include multiple wetland delineation reports (some of which are in the process of verification by USACE) that cover portions of the Phase 3 Project area, including areas along the Sacramento River east levee (USACE Reference ID #200700211), the Airport north bufferlands (USACE Reference ID #200300776 and #20060032), the Brookfield borrow site (USACE Reference ID #200700211 and #20081039), the Krumenacher borrow site and Twin Rivers stock pile (USACE Reference ID #200501087), and the Sutter Pointe and Dunmore borrow sites, the PGCC (Howsely Road to Sankey Road), and the NEMDC (Elkhorn Boulevard south to Northgate Boulevard) (Preliminary Jurisdictional Determination, USACE Reference ID #20081039). The USACE verification letters for those sites already verified are included in **Appendix C**. Methodology used to preliminarily identify irrigated wetlands within the Sutter Pointe and Dunmore borrow sites is consistent with the USACE-approved delineation methodology in the verified Phase 2 Project delineation (see **Appendix C**).

Consistent with the overall approach to this document and for purposes of NEPA and CEQA compliance, the analysis presented below encompasses all potential borrow sites for the Phase 3 Project, including some which may not be used for the project. In addition to the potential impacts at the Brookfield and Airport north bufferlands borrow sites included in the Phase 2 Project 404 permit (issued in January 2009), which could be used for the Phase 3 Project, potential impacts to wetlands at the Sutter Pointe and Dunmore borrow sites are also analyzed as part of the Phase 3 Project, although these sites may be used at a later time; SAFCA would be required to submit a permit modification or a new permit application if these sites are used at a later time.

Effects on nonjurisdictional riparian habitats are addressed with other woodland effects in Section 4.8, "Vegetation and Wildlife."

4.7.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or the alternatives under consideration were determined to result in a significant impact related to sensitive aquatic habitats if they would have a substantial adverse effect on waters of the United States, including wetlands.

4.7.2 IMPACTS AND MITIGATION MEASURES

Impact 4.7-a: Impacts on Jurisdictional Waters of the United States

Potential temporary and permanent impacts on waters of the United States resulting from the Phase 3 Project are identified in **Table 4.7-1**.

Table 4.7-1
Estimated Impacts on Jurisdictional Waters of the United States for the Phase 3 Project

Feature	Functional Value[1]	Proposed Action		Levee Raise-in-Place Alternative	
		Temporary Impact (Acres)	Permanent Impact (Acres)	Temporary Impact (Acres)	Permanent Impact (Acres)
Construction of Sacramento River East Levee Improvements					
Irrigation Ditches (Fill)	Low		2.23		2.23
Field Drain (Fill)	Low		0.94		0.94
Airport West Ditch (Fill)	Moderate		9.0		9.0
Open Water (Fill)	Low		0.30		0.30
Seasonal Wetland (Fill)	Moderate		0.14		0.14
Freshwater Marsh (Fill)	High		0.58		0.58
Sacramento River Waterside[2] Erosion Site G (Fill)	High		-		7.8
Raising and Flattening of Pleasant Grove Creek Canal West Levee					
Irrigated Wetland (Fill)	Moderate	2.06		2.06	
Irrigation Ditch (Fill)	Low		0.88		0.88
PGCC Waterside Erosion Control Rock Blanket (Fill)	High		<1.0		<1.0
Landside Rock Blanket into Existing Drainage Ditches (Fill)	Low		<0.25		<0.25
Natomas East Main Drainage Canal West Levee					
Seasonal Wetland (Fill)	Moderate		0.03		0.03
Vernal Pools (Fill)[3]	High		<1		<1
Construction of New Elkhorn Canal and GGS/Drainage Canal					
Irrigation and Drainage Ditches (Fill)	Low		3.01		3.01
Seasonal Wetland (Fill)	Moderate		0.45		0.45
Freshwater Marsh (Fill)	High		0.17		0.17
Reconstruction of RD 1000's Pumping Plant No. 2					
Irrigation and Drainage Ditches (Fill)	Low		0.61		0.61
Sacramento River Waterside Erosion Control Rip Rap (Fill)	High		<0.25 acre		<0.25 acre
Drainage Outfalls in Sacramento River (Fill)	High		<0.1 acre		-
Borrow Site and Haul Road Construction					
Drainage Ditches and Canals (Fill/Dewater)	Low	8.26	0.78	8.26	0.78
Seasonal Wetland (Fill/Dewater)	Moderate	0.82		0.82	
Irrigated Wetland (Fill of Brookfield Borrow Site)	Moderate	59.28	0.20	59.28	0.20
Potential Irrigated Wetland (Fill of Sutter Pointe and Dunmore Potential Borrow Sites)	Moderate	(283.59)[4]		(283.59)[4]	
Elkhorn Borrow Area Drainage, Irrigation, and Field Ditches (Fill)	Low		<5.0		<5.0
P-6 Drain Stabilization Protection (Fill)	Low		<0.25		<0.25
Total Potential Impacts on Waters of the United States	Minimum Maximum	**70.42** **(354.01)[4]**	**22.17** **27.17[5]**	**70.42** **(354.01)[4]**	**29.87** **34.87[5]**

Notes: PGCC = Pleasant Grove Creek Canal; GGS = Giant Garter Snake; RD = Reclamation District

[1] Functional value definitions: High = Natural structure and function of biotic community maintained, with minimal changes evident. Moderate = Moderate changes in structure and function of biotic community—i.e., moderate level of disturbance. Low = Severe changes in structure and/or function of biotic community evident—i.e., high level of disturbance. See Section 3.3.7 in Chapter 3.0, "Affected Environment," for additional information.

[2] Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act authorizations are required for work on the waterside of the levee.

[3] Assessment based on Panhandle Delineation (SPK-2005-01087).

[4] Maximum potential temporary impact at Sutter Pointe and Dunmore sites based on preliminary fieldwork and review of aerials. Wetland delineations have not all been verified by USACE.

[5] Includes all Elkhorn Borrow Area Drainage, Irrigation, and Field Ditches.

Sources: Data provided by Wood Rodgers in 2008, Mead & Hunt in 2008, and HDR, Inc. in 2008, and compiled by EDAW in 2008 and 2009

No-Action Alternative

No Project Construction

Under the No-Action Alternative, the Natomas perimeter levee system would not be improved and the proposed landscape and irrigation/drainage system modifications would not be implemented. There would be **no impact** on waters of the United States under USACE jurisdiction. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in flooding that could adversely or beneficially affect waters of the United States that occupy approximately 930 acres, or 1.7%, of the Basin (TNBC 2007). Because the exact level of impact would be dependent on the flooding duration, depth, rate, timing, and location, this impact is considered uncertain and a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

The Proposed Action, which includes a number of potential borrow sites, would, if all the borrow sites were affected, result in temporary impacts to 354.01 acres and permanent impacts to 27.17 acres of waters of the United States, including wetlands (**Table 4.7-1**). These impacts would result from construction along the Sacramento River east levee, PGCC west levee, NEMDC west levee, new Elkhorn Canal and GGS/Drainage Canal, and construction activities at the borrow sites and along haul roads.

Potential impacts to waters of the United States resulting from the Proposed Action would include fill of approximately 2.23 acres of irrigation ditches along or near the landside toe of the levee in Reaches 5A–9B of the Sacramento River east levee. Relocation of the Elkhorn Canal and construction of the new GGS/Drainage Canal in Reaches 5A–9B of the Sacramento River would result in permanent fill of 0.45 acre of seasonal wetland in the canal alignments and approximately 3.01 acres of irrigation ditches, field drains, and drainage ditches.

Under the Proposed Action, in reaches where the adjacent levee would be constructed and would be higher than the existing levee (Reaches 5A–9B), filtered runoff (via the grassed swale) would be conveyed in pipes from the swale between the existing levee and the new adjacent levee to new drainage outfalls in the berm along the east bank of the Sacramento River. Most of the outfalls would be placed above the ordinary high-water mark (OHWM) and are not expected to qualify as fill of waters of the United States under Section 404 of the CWA. However, because this work would be occurring over a navigable water of the United States, authorization under Section 10 of the River and Harbors Act of 1899 would be required. Up to 15 outfalls are anticipated under the Proposed Action. The installation of these outfalls would result in no more than 0.1 acre of fill of waters of the United States and the removal of some minor amounts of riparian vegetation.

Reconstruction of RD 1000's Pumping Plant No. 2 would consist of an intake structure, a pump station, piping over the adjacent setback levee, and an outfall structure on the water side of the Sacramento River east levee. Grading and placement of these structures would result in the fill of approximately 0.6 acre of drainage ditches, and 0.01 acre of irrigation ditch. Although design of the waterside outfall structure is not yet complete, it is estimated that less than 0.25 acre would be filled by erosion control rip rap placed below the outfall, which would be located within the OHWM of the Sacramento River.

Along the PGCC, irrigation and drainage ditches (other waters) totaling approximately 0.88 acre within the maintenance zone at the landside toe of the PGCC west levee would be permanently filled to accommodate the levee expansion, eliminate depressions near the levee toe, and facilitate use of the area for maintenance. Near the intersection of Howsley Road and Natomas Road, a landside rock blanket would be installed which would fill less

than 0.1 acre of drainage and irrigation ditches. A total of approximately 2.06 acres of irrigated wetland landward of the landside levee toe would be filled temporarily as a result of landside flattening of the levee slope. Construction of a waterside rock blanket to combat erosion adjacent to historic creek beds would result in less than 1.0 acre of fill within the PGCC channel below the OHWM.

Impacts associated with construction along the NEMDC would include fill of 0.03 acre of seasonal wetlands within the levee berm footprint south of Elkhorn Boulevard and fill of less than 1 acre of vernal pools in the "panhandle" area, also south of Elkhorn Boulevard.

Use of material from the Brookfield, Sutter Pointe, and Dunmore borrow sites would require the permanent fill of 0.20 acre of irrigated wetlands and 0.78 acre of a drainage ditch, and a maximum potential temporary fill of 342.87 acres of irrigated wetlands and temporary fill of 8.26 acres of drainage ditches and canals. The P-6 drain in the proximity of the Airport north bufferlands, would require permanent fill of approximately 0.25 acre. Use of the Elkhorn Borrow Area would also potentially require the fill of approximately 5.0 acres of permanent fill of drainage, field, and irrigation ditches surrounding the agricultural fields (irrigation function would be restored post-project). The exact amount is not known at this time. The total acreage for temporary impacts noted in **Table 4.7-1** is the potential acreage of temporary impacts if all borrow sites are completely disturbed within their excavation footprints. It is not expected that all the borrow sites, however, would be used.

For the Proposed Action, impacts on jurisdictional wetlands within irrigated rice fields at the Sutter Pointe, Dunmore, and Brookfield borrow sites would be temporary, with reestablishment of irrigated rice fields after project completion. Consequently, there would be no permanent loss of aquatic resource functions. Likewise, impacts associated with haul road construction across various drainage canals and irrigated wetlands would be temporary, and these resources would be restored to preproject conditions after project completion. However, approximately 9 acres of open water in the Airport West Ditch would be permanently lost due to the reconfiguration and redesign of this facility. Irrigation and drainage flows that currently enter the ditch would be rerouted and the existing ditch would be re-graded to a grassy swale.

A detailed design of aquatic habitats will be developed and protective mechanisms and specific management protocols are currently being prepared by SAFCA in coordination with USACE, the U.S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (DFG). These aquatic habitats must be created and managed in a manner that provides the essential functions of the habitats that would be lost, for the created habitat to provide adequate compensation. Therefore, an overall adverse impact on waters of the United States could occur if habitat creation and management are not properly implemented. This impact is considered **potentially significant**.

Levee Raise-in-Place Alternative

As shown in **Table 4.7-1**, impacts on waters of the United States under the Levee Raise-in-Place Alternative would be similar to the Proposed Action except that (1) there would be no drainage outfalls constructed along the east bank of the Sacramento River levee and, therefore, no potential for impacts to navigable waters of the United States from those features; and (2) erosion control improvements would be implemented along approximately 1,260 linear feet of river bank at the waterside toe of the Sacramento River east levee at River Mile 73.5 (Site G in Reach 6A).

The proposed erosion control improvements would involve the permanent placement of cobble, riprap, and soil at Site G to provide protection of the levee foundation from catastrophic scour and erosion protection of the soil surface (**Plate 5**). The majority of riprap would be placed on the submerged toe of the eroding bank (where it meets the channel bottom) to arrest retreat of the emergent upper bank and stop the reduction in berm width, thereby reducing the potential for loss of extensive mature riparian vegetation, destabilization of the levee foundation, and shortening of seepage pathways. Approximately 7.8 acres of waters of the United States would be permanently filled at Site G under the Levee Raise-in-Place Alternative. While the placement of fill in the

Sacramento River would alter the cross section and the type of substrate present at the bank protection sites, it would not alter the ability of the Sacramento River to function as a navigable water of the United States. The design of the bank protection is expected to fully compensate for impacts on habitat values through the use of suitable types of substrate, vegetation, and instream woody material.

The Levee Raise-in-Place Alternative would include creation of the same acreages of new irrigation and drainage canals and marsh habitat as described for the Proposed Action, more than offsetting the landside filling and dewatering of waters of the United States included in this alternative.

Therefore, the permanent impacts of the Levee Raise-in-Place Alternative on waters of the United States on the landside would be approximately the same as the Proposed Action. This impact is considered **potentially significant**. ***(Greater)***

Mitigation Measure 4.7-a: Minimize Effects on Jurisdictional Waters of the United States, Complete Detailed Design of Habitat Creation Components and Secure Management Agreements to Ensure Compensation of Waters Filled, and Comply with Section 404, Section 401, Section 10, and Section 1602, Permit Processes

Proposed Action and Levee Raise-in-Place Alternative

SAFCA shall implement the measures described below to reduce impacts related to loss or fill of jurisdictional waters of the United States.

- Waters of the United States, including wetlands, shall be identified and the primary engineering and construction contractors shall ensure, through coordination with a qualified biologist(s), that construction is implemented in a manner that minimizes disturbance of canals, ditches, and seasonal wetlands. Temporary fencing shall be used during construction to prevent disturbance of waters of the United States that are located adjacent to construction areas but can be avoided.

- To mitigate for permanent impacts to sensitive aquatic resources, at least 1 acre of irrigation/drainage canal or 1 acre of seasonal wetland shall be created for every acre that is lost. The mitigation ratio that is ultimately required will be determined by USACE through the Section 404 permitting process. Features planned in the Phase 3 Project (under both action alternatives), would provide aquatic habitat that has been designed to offset the effects described above. These features include the creation of approximately 38 acres of aquatic habitat resulting from construction of the new GGS/Drainage Canal (including nearly 21 acres in the Phase 3 Project) and creation of approximately 32 acres of new irrigation canal (i.e., the replacement Elkhorn and Riverside Canals) (including nearly 4.5 acres in the Phase 3 Project), for a total of about 70 acres of new canal-associated habitat.

- Develop and implement a Mitigation and Monitoring Plan (MMP) and Long-Term Management Plan (LTMP) in coordination with and subject to approval of USACE, USFWS, and DFG. The MMP and LTMP shall provide complete detailed designs of habitat creation components and management protocols. SAFCA shall also enter into agreements with entities responsible for long-term management of created canals and marsh habitats to ensure that performance standards and long-term management goals will be met and provide assurances of adequate funding for habitat creation and management. Such agreements and funding assurances shall be subject to approval of USACE, USFWS, and DFG. SAFCA shall secure all such agreements and implement all conditions of the agreements.

- Obtain the following applicable permits prior to the start of construction activities that would affect the resources covered by these permits: an individual permit pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act from

USACE, Section 401 certification from the Central Valley Regional Water Quality Control Board, and a Section 1602 streambed alteration agreement from DFG. All measures adopted through these permitting processes shall be implemented by SAFCA.

Overall, because the action alternatives would include the creation of waters of the United States that are expected to be more extensive than those filled by the project, and because implementing this mitigation measure would ensure that new jurisdictional waters would be managed in a manner that minimizes maintenance disturbance and provides the essential functions of the habitats that would be lost, both the Proposed Action and the Levee Raise-in-Place Alternative, with implementation of this mitigation measure, would have a **less-than-significant (beneficial)** impact on the overall acreage and quality of waters of the United States in the Natomas Basin. ***(Similar)***

4.7.3 RESIDUAL SIGNIFICANT IMPACTS

Under the No-Action Alternative, there would be no impacts to sensitive aquatic habitats; however in the event of levee failure under the No-Action Alternative, impacts are uncertain. Because of this uncertainty, this potential impact is considered too speculative for meaningful consideration. Additionally, mitigation measures cannot be required for the No-Action Alternative; therefore, impacts that result from the No-Action Alternative would not be mitigated.

Implementation of the mitigation measures described in this section would not result in any residual significant impacts related to sensitive aquatic habitats under the Proposed Action and the Levee Raise-in-Place Alternative. In fact, successful implementation of the mitigation measures would have a beneficial impact on overall acreage and quality of waters of the United States in the Natomas Basin.

4.8 VEGETATION AND WILDLIFE

4.8.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.8.1.1 METHODOLOGY

The following analysis is based on the results of field surveys and review of existing documentation. Biologists conducted multiple reconnaissance-level and focused biological surveys of the project area during 2004–2008 as part of project-related studies and planning efforts. Specific documents reviewed to support the analysis in this section include the NBHCP (City of Sacramento, Sutter County, and TNBC 2003); TNBC's annual monitoring reports; and multiple wetland delineation reports that cover portions of the Phase 3 Project area, including areas along the Sacramento River east levee (USACE Reference ID #200700211), the Airport north bufferlands (USACE Reference ID #200300776 and #20060032), the Brookfield borrow site (USACE Reference ID #200700211 and #20081039), the Krumenacher borrow site and Twin Rivers stock pile (USACE Reference ID #200501087), and the Sutter Pointe and Dunmore borrow sites, the PGCC (Howsely Road to Sankey Road), and the NEMDC (Elkhorn Boulevard south to Northgate Boulevard) (Preliminary Jurisdictional Determination, USACE Reference ID #20081039).

Riparian woodlands, a native woodland habitat, are those that are directly associated with a major water body, such as the Sacramento River, Pleasant Grove Creek, or the Natomas Cross Canal. Riparian woodlands are typically of higher value than landside woodlands because they maintain hydrologic, nutrient, and chemical connections to their associated waterbodies. This association makes them rich in biological fauna and flora and provides valuable resources and protection for aquatic habitats. They are considered sensitive habitats subject to the jurisdiction of the California Department of Fish and Game (DFG) under California Fish and Game Code Section 1602. Waterside woodlands also host the vast majority of nesting Swainson's hawks in the Natomas Basin. Removal of riparian woodlands is considered to be a greater impact than removal of landside woodlands.

Landside woodlands in the Natomas Basin provide important nesting and roosting habitat for a wide variety of wildlife species and serve as movement corridors for these species within the Basin. The following analysis of the effects of the Phase 3 Project on woodlands considers not only short-term, construction-related impacts, but also long-term impacts taking into account compensatory efforts to preserve existing woodlands and create new woodlands. Because of the lead times involved in creating new woodlands, SAFCA included substantial woodland planting activity in the Phase 2 Project with the expectation that the resulting increase in habitat values would also compensate for unavoidable losses of woodlands attributable to the Phase 3 Project. The analysis contained in this EIS/EIR reflects this expectation.

4.8.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action or the alternatives under consideration were determined to result in a significant impact related to vegetation and wildlife if they would do any of the following:

- have a substantial adverse effect on native woodland habitats; or
- interfere substantially with the movement of any native resident or migratory wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

4.8.2 IMPACTS AND MITIGATION MEASURES

Tables 4.8-1 and **4.8-2** summarize the impacts on woodland habitats discussed in this section.

Table 4.8-1
Estimated Short-Term Impacts of the Phase 3 Project Alternatives on Woodlands

Location	No-Action Alternative	Proposed Action	Levee Raise-in-Place Alternative
Woodland Removal			
Sacramento River East Levee Reaches 5A–9B: Land Side	No impact	12 acres	3 acres
Sacramento River East Levee Reaches 5A–9B: Water Side	22.5 acres	<1 acre	22.5 acres
Sacramento River East Levee Reaches 10–12A: Land Side	No impact	20 acres	8.5 acres
Alignments of Replacement Elkhorn Canal and New GGS/Drainage Canal South of Teal Bend	No impact	1.1 acres	1.1 acres
RD 1000 Pumping Plant No. 2	No impact	4.6 acres	4.6 acres
Total Losses (approximate)	**22.5 acres**	38 acres	**40 acres**

Notes: GGS = Giant Garter Snake; RD = Reclamation District.
Source: Estimates calculated by EDAW in 2008 and 2009 based on construction data provided by Wood Rodgers, Mead & Hunt, and HDR, Inc. in 2008

Table 4.8-2
Estimated Long-Term Impacts of the Phase 3 Project Alternatives on Woodlands (with Compensation)

Project Activity	Phase 3 Project Alternatives (acres)			Phase 2 Project (acres)
	No-Action Alternative	Proposed Action	Levee Raise-In-Place Alternative	
Short-term Impact	22.5	38.0	40.0	17.0
Woodlands Preserved	0	2.5	0	19.5
Woodlands Created	0	35.5	157.0	50.0
Total Compensation	**0**	**38.0**	**157.0**	**69.5**
Net Gain[1]	**(22.5)**	**0.0**	**109.0**	**52.5**
Net Gain with Phase 2 Project[2]	**47.0**	**52.5**	**161.5**	**N/A**

[1] Net Gain = Short-term impact - (woodlands preserved + woodlands created).
[2] Net Gain with Phase 2 Project = Proposed Action Net Gain + Phase 2 Project Net Gain.
Source: Data compiled by EDAW in 2009

Impact 4.8-a: Loss of Woodland Habitats

No-Action Alternative

No Project Construction

Under the No-Action Alternative, there would be no improvements to the Natomas perimeter levee system. However, removal of approximately 22.5 acres of woodland located on the water side of the Sacramento River east levee would be required to conform with USACE guidance regarding levee encroachments. This impact is considered **potentially significant**. ***(Greater)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in flooding that could adversely or beneficially affect woodland habitats, depending on timing, location, and duration of flooding. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

The Proposed Action would: (1) widen the Sacramento River east levee flood damage reduction facilities and maintenance access by approximately 90–300 feet through the construction of the adjacent levee and seepage berms in Reaches 5A–9B; (2) flatten the PGCC west levee and widen its footprint by 60–130 feet; (3) flatten the NEMDC west levee from Elkhorn Boulevard to the NEMDC stormwater pumping station and widen its footprint by 60–130 feet; (4) construct seepage and slope remediation from the NEMDC stormwater pumping station to Northgate Boulevard; and (5) remove vegetation in Sacramento River east levee Reaches 10–12A in the footprint of the levee improvements to prepare for future flood damage reduction work (as part of a subsequent project phase). Woodland corridors up to 130 feet wide would also be planted next to the project footprint in Reaches 5A–9B of the Sacramento River east levee. New irrigation canals and the new GGS/Drainage Canal would be constructed west of the Airport.

Short-term Impact Due to Loss of Woodland Habitat: Potential impacts on waterside woodlands would be substantially reduced by shifting the Sacramento River east levee prism landward as proposed under the Proposed Action, but nonetheless would result in the need for removal of several landside woodland groves and individual trees. Proposed improvements along the Sacramento River east levee would remove as much as 12 acres of landside woodland habitat and less than 1 acre of waterside woodland habitat in Reaches 5A–9B, and approximately 1.1 acres of landside woodland habitat where replacement irrigation/drainage canal segments to be constructed in Reaches 6B–9B would intersect with existing woodland and connect to existing lateral canals. An additional 4.6 acres of woodland could be removed by the reconstruction of RD 1000's Pumping Plant No. 2. No woodlands are expected to be removed along the PGCC and NEMDC levees. Approximately 20 acres of landside woodlands would be removed in Reaches 10–12A of the Sacramento River east levee to prepare for future flood damage reduction work (as part of a subsequent project phase). Borrow sites for the Phase 3 Project are currently either fallow, agricultural cropland, or active or inactive rice; therefore, no impacts on woodlands would result from the use of these sites for borrow activities. As described in more detail below, the Phase 3 Project includes offsetting this loss of woodland by preserving and creating woodlands; however, there would be a short-term temporal loss of woodland habitat as the replacement plantings mature within 10 to 15 years. This impact due to loss of woodland habitat while the replacement plantings are maturing is considered **significant**.

Long-term Impact Due to Loss of Woodland Habitat: The woodlands that would be removed as part of the Phase 3 Project do not occur within the jurisdictional boundaries subject to the Sacramento County Tree Preservation Ordinance (Sacramento City Code 480 Section 1, 1981); therefore, the removal of these trees, which includes native oak trees, would not require a permit from Sacramento County (Stackhouse, pers. comm., 2009). However, these woodlands are subject to *Sacramento County General Plan* policies for native and landmark tree protection (Sacramento County 1993a). The project's proposed conservation strategy for planting and preserving woodland groves and corridors would comply with the County General Plan policies regarding replacing woodlands because the Phase 3 Project would include creating equivalent woodland habitat, monitoring of these areas to ensure success, and protecting the created and preserved woodlands in perpetuity, as described below.

Loss of woodland habitat under the Proposed Action would be offset by creating approximately 35.5 acres of new woodland habitat and preserving 2.5 acres of existing woodland along corridors on the land side of the adjacent levee along the Sacramento River in the Phase 3 Project footprint. These compensatory measures would complement woodland preservation and creation activities carried out as part of the Phase 2 Project, as shown in

Table 4.8-2. The Proposed Action, when considered together with the Phase 2 Project, would result in a net increase of 52.5 acres of landside woodlands in the Basin.

The woodland mitigation plan includes transplanting suitable trees from the Phase 3 Project footprint, where feasible, as well as planting a variety of native tree species that could become woodland habitat. To provide adequate compensation for lost habitat, the woodlands must be created and/or managed in a manner that provides the essential woodland habitat functions. A detailed design of the woodland habitats to be created is being developed and provided for USFWS and DFG review and approval; protective mechanisms and specific management protocols for the woodlands are currently being prepared by SAFCA in coordination with these agencies (as described in Chapter 2.0, "Alternatives," Section 2.3.3, "Conservation Components"). However, if habitat creation/preservation is not effectively implemented to provide woodland habitat, a long-term adverse effect could occur. This impact is considered **significant**.

Levee Raise-in-Place Alternative

The Levee Raise-in-Place Alternative would be similar to the Proposed Action except that no adjacent setback levee would be constructed along the Sacramento River east levee in Reaches 5A–9B. However, as much as 22.5 acres of riparian woodland on the waterside of these levee reaches would likely be removed to construct cutoff walls and conform with USACE guidance regarding levee encroachments. The adverse effects of such vegetation removal would be greater than under the Proposed Action, particularly in terms of the quality of the habitat lost, but also the amount of habitat lost. In addition, an estimated 8.5 acres of woodlands would be removed in Reaches 10–12A to prepare for future flood damage reduction work (as part of a subsequent project phase) and to accommodate construction and encroachment guidance, as identified in the programmatic and cumulative impact analyses contained in the Phase 2 Landside EIR and Phase 2 EIS.

Habitat creation and preservation components of this alternative would require planting of 157 acres of woodland habitat along the land side of the adjacent levee along the Sacramento River east levee as part of the Phase 3 Project. This measure would complement woodland preservation and creation activities carried out as part of the Phase 2 Project, as shown in **Table 4.8-2**. However, these woodland creation and preservation efforts would not fully compensate for the extensive loss of mature waterside vegetation even if the habitat creation and management are properly implemented. This impact is considered **significant**. ***(Greater)***

Mitigation Measure 4.8-a: Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Loss of Habitat, Implement all Management Agreements, and Comply with the DFG Section 1602 Permit Process

Proposed Action and Levee Raise-in-Place Alternative

To reduce impacts on the loss of woodland habitat, SAFCA shall implement the measures described below:

- Native woodland areas shall be identified and the primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction is implemented in a manner that minimizes disturbance of such areas to the extent feasible. Temporary fencing shall be used during construction to prevent disturbance of native trees that are located adjacent to construction areas but can be avoided.

- All native trees removed (and not transplanted) shall be replaced with an appropriate number of native plantings, based on the diameter at breast height (dbh) of the removed tree. The exact number of replacement plantings shall be determined in coordination with DFG but is anticipated to be consistent with the following recent DFG requirements: three replacement trees for each removed tree of 4–9 inches dbh, four replacement trees for each removed tree of 9–18 inches dbh, and one replacement tree for each inch of diameter

removed of trees greater than 18 inches dbh. The woodland planting sites shall be seeded with native perennial grasses when trees are planted. The site designs shall include open woodland canopy for grassland savannah with edge habitat surrounding small open meadows and inclusions of seasonal wetlands where natural drainage at specific sites is feasible. SAFCA shall develop a detailed woodland planting design and management protocols in coordination with USFWS, DFG, and SCAS (if on Airport property). SAFCA shall also enter into agreements with entities responsible for long-term management of created woodland habitats to ensure that performance standards and long-term management goals are met and provide assurances of adequate funding for habitat creation and management. Such agreements and funding assurances shall be subject to approval of USFWS and DFG. SAFCA shall implement all terms and conditions of the agreements.

- A Section 1602 streambed alteration agreement from DFG shall be obtained before any trees within a stream zone under DFG jurisdiction are removed, and all terms and conditions of the agreement shall be implemented by SAFCA.

Implementing this mitigation measure would minimize adverse effects of the Proposed Action on woodland habitat when this measure is coupled with the amount of landside woodlands that is being created and preserved as part of the Phase 2 Project. The result is a net increase of 52.5 acres of landside woodlands in the Basin, which would reduce long-term impacts to woodland habitats to a **less-than-significant** level. However, in the short-term, this impact would remain **significant and unavoidable** because replacement plantings would require 10 to 15 years to mature.

While the woodland restoration and preservation proposed for the Levee Raise-in-Place Alternative may be adequate to offset the removal of landside woodlands, these replacement woodlands would not be adequate to compensate for the extensive loss of mature waterside vegetation. Additional woodland mitigation could be provided through the purchase of credits from an authorized woodland mitigation bank; however, there are currently no such banks in operation along the Sacramento River. Thus, the loss of woodland habitat for the Levee Raise-in-Place Alternative would remain **significant and unavoidable**. ***(Greater)***

Impact 4.8-b: Impacts on Wildlife Corridors

No-Action Alternative

No Project Construction

Under the No-Action Alternative, there would be no improvements to the Natomas perimeter levee system. Additionally, as described under Impact 4.8-a, even under the No-Action Alternative, there would be extensive removal of the corridor of riparian vegetation on the water side of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments. Removal of a large portion of this riparian vegetation would adversely affect the movement and dispersal of the native birds and wildlife species that depend on woodland cover. This impact is considered **potentially significant**. ***(Greater)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in flooding that could adversely or beneficially affect wildlife corridors, depending on timing, location, and duration of flooding. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact, whether adverse or beneficial is unknown.

Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

Impacts on Movement Corridors for Aquatic Species: Irrigation/drainage ditches and canals within the project area and larger Natomas Basin serve as critical corridors for movement of aquatic species, particularly the giant garter snake. Adverse impacts on these corridors under the Proposed Action would consist of temporary disturbance and permanent loss of canals, ditches, and their associated habitat values due to filling, redesign, and reconfiguring these facilities to accommodate project improvements.

Under the Proposed Action, a total of approximately 16 acres of canal habitat would be permanently lost due to the filling and relocation of the Elkhorn Canal (5 acres), the redesign and reconfiguration of the Airport West Ditch (9 acres), placing rip rap on the water side of the PGCC for erosion control (1 acre), and the filling and relocation of private irrigation facilities (1 acre). SAFCA proposes to offset this impact by creating 22 acres of new canal habitat, 10 acres of associated marsh, and 22 acres of associated upland habitat.

The new canal habitat created as part of the Proposed Action would provide new movement corridors for aquatic species. The configuration and preliminary design of these new corridors were specifically formulated based on the goal of enhancing giant garter snake movement opportunities between populations in the northern and southern portions of the Natomas Basin. This is anticipated to result in an overall, long-term enhancement in the quality of aquatic movement corridors in the western portion of the Basin. A detailed design of the new canal habitat is being developed and will be provided for USFWS and DFG agency review; protective mechanisms and specific management protocols are currently being prepared by SAFCA in coordination with USFWS and DFG. To provide adequate compensation for the canal habitat that would be lost, the new canal habitat must be created and managed in a manner that provides the essential functions of habitat that would be lost. If this objective is not achieved, project impacts on aquatic movement corridors would be considered **significant**.

Impacts on Movement Corridors for Bird Species: The existing woodland corridor along the waterside and landside of the Sacramento River east levee provides valuable nesting and rearing habitat for a variety of bird species. Under the Proposed Action, a total of approximately 38 acres of woodlands would be removed, as described under Impact 4.8-a.

To offset this impact, approximately 35.5 acres of riparian woodland plantings would be created on the land side of the adjacent setback levee. These compensatory woodlands would complement the woodlands created as part of the Phase 2 Project, as shown in **Table 4.8-2**. This compensatory vegetation would not mature for 10 to 15 years, and its habitat value would therefore be limited in the near term in comparison with the value of the existing landside woodland corridor. In addition, approximately 2.5 acres of existing landside woodlands would be preserved as part of the Proposed Action, thus adding to the 19 acres of woodlands preserved as part of the Phase 2 Project (see **Table 4.8-2**). The Proposed Action would leave the higher quality waterside riparian woodland on the waterside of the levee undisturbed, thus substantially preserving the integrity of the existing woodland corridors during the interim period while the new woodland plantings mature. The net result of the Proposed Action would be a net increase of landside woodland habitat when the accomplishments of the Proposed Action are considered along with those of the Phase 2 Project (see **Table 4.8-2**). Nevertheless, because of the time required for the woodland plantings to mature, this impact would be **potentially significant**.

Levee Raise-in-Place Alternative

Impacts on Movement Corridors for Aquatic Species: Impacts on the amount and quality of canal habitat under the Levee Raise-in-Place Alternative would be the same as described for the Proposed Action.

Impacts on Movement Corridors for Bird Species: Under the Levee-Raise-in-Place Alterative, there would be extensive removal of large woody vegetation from the riparian corridor on the water side of the Sacramento River east levee to conform to USACE guidance regarding levee encroachments.

As described under Impact 4.8-a, approximately 40 acres of woodland habitat would be removed under the Raise-in-Place Alternative, including up to 11.5 acres from the landside Sacramento River east levee, 22.5 acres of riparian woodland from the waterside of the levee, 1.1 acres in the alignments of the replacement canals, and 4.6 acres at RD 1000's Pumping Plant No. 2.

Removal of a large portion of this riparian vegetation would adversely affect the movement and dispersal of the native birds and wildlife species that depend on woodland cover. Without the creation of a levee setback area in the Natomas Basin to accommodate the planting of waterside riparian vegetation (as proposed under the Proposed Action), there is no known feasible mitigation that would adequately and fully compensate for the likely loss of waterside vegetation along the Sacramento River east levee under the Levee Raise-in-Place Alternative. For these reasons, the Levee Raise-in-Place Alternative could adversely affect wildlife movement corridors, and this impact is considered **significant**. ***(Greater)***

Mitigation Measure 4.8-b: Implement Mitigation Measure 4.8-a, "Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Loss of Quantity and Quality of Habitat, Implement all Agreements, and Comply with the DFG Section 1602 Permit Process," and Mitigation Measure 4.9-c, "Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Develop Detailed Design of Managed Marsh and New Canals and Management Agreements to Ensure Adequate Compensation for Loss of Habitat, Implement all Management Agreements, and Obtain Incidental Take Authorization"

Proposed Action

Implementing Mitigation Measure 4.8-a would ensure that significant adverse impacts on woodlands that provide wildlife movement corridors are minimized through the creation and preservation of landside woodlands, which would facilitate wildlife movement. These replacement woodlands would reduce effects on wildlife movement and dispersal to a **less-than-significant** level.

Implementing Mitigation Measure 4.9-c would ensure that significant adverse impacts on irrigation/drainage ditches and canals that provide wildlife movement corridors are minimized through the creation of replacement aquatic corridors, which would facilitate wildlife movement. Created canals that would serve as aquatic corridors would reduce effects on wildlife movement and dispersal to a **less-than-significant** level.

Levee Raise-in-Place Alternative

Implementing Mitigation Measures 4.8-a and 4.9-c would ensure that adverse effects on landside woodlands and irrigation/drainage ditches and canals that provide wildlife movement corridors are minimized through the creation of replacement woodland and aquatic corridors, which would facilitate wildlife movement. Created woodlands and canals would partially reduce the effects of wildlife movement and dispersal, but not to a less-than-significant level because there is no known feasible mitigation that would adequately and fully compensate for the likely loss of waterside vegetation along the Sacramento River east levee under the Levee Raise-in-Place Alternative. Thus, this impact would remain **significant and unavoidable**. ***(Greater)***

4.8.3 RESIDUAL SIGNIFICANT IMPACTS

Under the No-Action Alternative impacts on waterside woodland and wildlife corridors cannot be reduced to a less-than-significant level without the creation of waterside planting areas sufficient in size to fully and adequately compensate for the removal of extensive amounts of waterside vegetation along the Sacramento River east levee. Because mitigation cannot be required for the No-Action Alternative, this impact would remain

significant and unavoidable. In the event of levee failure under the No-Action Alternative, impacts to waterside woodlands and wildlife corridors are uncertain. Because of this uncertainty, these potential impacts are considered too speculative for meaningful consideration.

Implementation of mitigation measures described above would reduce long-term impacts to woodlands and wildlife corridors for aquatic and bird species to a less-than-significant level under the Proposed Action; however, in the short-term, impacts to woodland habitats would remain significant and unavoidable because replacement plantings would require 10 to 15 years to mature. However, implementation of these measures for the Levee Raise-in-Place Alternative would not be sufficient to fully mitigate impacts on woodland habitats and wildlife corridors lost along the waterside or landside of the Sacramento River east levee. Because no other feasible mitigation measures are available, impacts under the Levee Raise-in-Place Alternative would remain significant and unavoidable.

4.9 SPECIAL-STATUS TERRESTRIAL SPECIES

4.9.1 METHODOLOGY AND THRESHOLDS OF SIGNIFICANCE

4.9.1.1 METHODOLOGY

The following analysis is based on the results of field surveys and review of existing documentation. Biologists conducted multiple reconnaissance-level and focused special-status species surveys of the project area during 2004–2008, as part of project-related studies and planning efforts. These have included focused surveys for special-status plants, elderberry shrub mapping and stem counts, evaluation of giant garter snake habitat, and surveys for nesting raptors. Existing information reviewed for this analysis includes documents that discuss the status of special-status species in the region, including the NBHCP (City of Sacramento, Sutter County, and TNBC 2003) and annual monitoring reports of TNBC. The CNDDB (2008) and the NBHCP were used as the primary sources to identify previously reported occurrences of special-status species in the project area and vicinity.

As discussed in Section 4.8.1.1, "Methodology," in Section 4.8, "Vegetation and Wildlife," woodlands in the Natomas Basin provide important nesting and roosting habitat for a wide variety of wildlife species, including special-status avian species such as the Swainson's hawk. The analysis of the effects of the Phase 3 Project on this nesting habitat considers not only short-term, construction-related impacts, but also long-term impacts from woodland removal taking into account compensatory efforts to preserve existing woodlands and create new woodlands. Because of the lead times involved in creating new woodlands, SAFCA included substantial woodland planting activity in the Phase 2 Project with the expectation that the resulting increase in habitat values would also compensate for unavoidable losses of woodlands attributable to the Phase 3 Project. The analysis contained in this EIS/EIR reflects this expectation.

The analysis of impacts to giant garter snake habitat due to project construction takes into account the USFWS programmatic BO and draft DFG Section 2081 permit issued in connection with the Phase 2 Project. These authorizations have relied on or are expected to rely on the creation of managed marsh in the vicinity of Fisherman's Lake to compensate for permanently affected rice fields, which are considered giant garter snake habitat; the replacement or enhancement of existing canal habitat with the GGS/Drainage Canal, which would connect giant garter snake population centers; and the reclamation and preservation of existing rice fields within the Basin, which would compensate for any temporary losses of habitat. Overall, these authorizations require the completion of the suite of giant garter snake habitat components for construction to fully proceed, though incidental take permits would be issued for each project phase, as would the construction of phased giant garter snake habitat components. The analysis reflects this expectation.

4.9.1.2 THRESHOLDS OF SIGNIFICANCE

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action and alternatives under consideration were determined to result in a significant impact related to special-status terrestrial species if they would do any of the following:

- have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by DFG or USFWS; or
- conflict with the provisions of the NBHCP.

4.9.2 IMPACTS AND MITIGATION MEASURES

Impact 4.9-a: Impacts on Special-Status Plants Species

No-Action Alternative

No Project Construction

Under the No-Action Alternative, there would be no improvements to the Natomas perimeter levee system and associated modifications of irrigation and drainage facilities. Therefore, there would be **no impact** on special-status plant species and their habitats. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure in the Natomas Basin could result in flooding that could adversely or beneficially affect special-status plants and their habitats, depending on timing, location, and duration of flooding. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact, whether beneficial or adverse is unknown. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Of the three special-status plant species that were determined to have the potential to occur in the project area (rose mallow, Delta tule pea, and Sanford's arrowhead), all would occur in aquatic habitats (see Section 3.3.9.1, "Special-Status Plant Species," for further discussion).

No surveys have been conducted to confirm that the species in question are present in these habitats; however, surveys for special-status plants within the Phase 3 Project area will be conducted during the appropriate time for identification in 2009, before project construction. Project implementation would result in fill and disturbance of these habitats and could result in significant adverse impacts on special-status plants, if present. Adverse impacts on potentially suitable habitat for these three special-status plant species would be similar under the Proposed Action and the Levee Raise-in-Place Alternative and would include permanent loss of approximately 5 acres of relatively unvegetated irrigation/drainage canals adjacent to the Sacramento River east levee. In addition, less than 1 acre of habitat provided by an irrigation/drainage ditch along the toe of the PGCC levee and another 1 acre along the water side of the PGCC west levee would be lost as a result of the levee improvements at these sites. Another 9 acres of habitat would be affected through the redesign and reconfiguration of the Airport West Ditch. The Levee Raise-in-Place Alternative, which has a narrower footprint than the Proposed Action, would still affect a similar quantity of habitat because the canals and ditches would need to be relocated farther away from the toe of the levee; thus, the overall effect on special-status plant habitat would be similar to that of the Proposed Action.

Loss of potentially occupied special-status plant habitat in the Phase 3 Project footprint would be offset by creation of new irrigation and drainage canals habitat. A detailed design of these habitat components is being developed and provided for USFWS and DFG agency review; and protective mechanisms and specific management protocols are currently being prepared by SAFCA in coordination with these agencies (see Section 2.3.3, "Habitat Conservation Components"). If they are to provide adequate compensation, these habitats must be created and managed in a manner that provides the essential functions of habitat areas that would be lost as a result of the project. However, if habitat creation and management are not effectively implemented to provide replacement habitat for special-status plants, an overall adverse effect could occur. This potential impact is considered **significant**. ***(Similar)***

Mitigation Measure 4.9-a: Conduct Focused Surveys for Special-Status Plants, Minimize Effects, and Develop Detailed Design of Created Habitat and Management Agreements to Ensure Compensation for Loss of Habitat, and Implement all Management Agreements

Proposed Action and Levee Raise-in-Place Alternative

To reduce impacts on special-status plant species, SAFCA shall implement the measures described below.

- Before any ground-disturbing activities begin, a qualified biologist retained by SAFCA shall conduct surveys for special-status plants in appropriate habitat within the project footprint, in accordance with USFWS and/or DFG guidelines and at the appropriate time of year when the target species would be clearly identifiable. If no special-status plants are found during focused surveys, no further action shall be required.

- If special-status plants are found in the project footprint, areas of occupied habitat shall be identified and the primary engineering and construction contractors shall ensure, through coordination with the biologist, that construction activities are implemented in a manner that minimizes disturbance of these areas (e.g., temporary fencing shall be used during construction to protect all occupied habitat that is located adjacent to construction areas that can be avoided).

- If special-status plants are present in areas that cannot be avoided, SAFCA shall coordinate with USFWS and DFG to determine whether transplanting would be appropriate to further minimize adverse effects. Affected plants may potentially be transplanted to the GGS/Drainage Canal, if feasible. At least 1 acre of irrigation/drainage canal or marsh habitat shall be created for every acre of occupied special-status plant habitat that is lost. SAFCA shall develop detailed design of habitat creation components and management protocols in coordination with and subject to approval of the resource agencies. SAFCA shall also enter into agreements with entities responsible for long-term management of created canals and marsh habitats to ensure that performance standards and long-term management goals are met and provide assurances of adequate funding for habitat creation and management. Such agreements and funding assurances shall be subject to approval of USFWS and DFG. SAFCA shall implement all terms and conditions of the management agreements.

Implementing this mitigation measure would reduce the impact on special-status plants to a **less-than-significant** level because SAFCA would conduct protocol-level plant surveys in accordance with applicable regulatory agency (e.g., USFWS, DFG, and CNPS) protocols at the appropriate time of year, ensure no-net-loss of special-status plant species habitat (if plants are present), avoid plant populations (if present) to the maximum extent feasible, and consult with the appropriate regulatory agencies to develop an implementation plan to further minimize impacts. ***(Similar)***

Impact 4.9-b: Impacts on Valley Elderberry Longhorn Beetle

Table 4.9-1 summarizes the project-related impacts on elderberry shrubs, the host plant of the valley elderberry longhorn beetle, discussed below.

Table 4.9-1
Impacts of the Phase 3 Project Alternatives on Elderberry Shrubs

Location	No-Action Alternative	Proposed Action	Levee Raise-in-Place Alternative
Sacramento River East Levee Reaches 5A–9B: Land Side	No impact	Removal of approximately 48 shrubs	Removal of approximately 20 shrubs
Sacramento River East Levee Reaches 10–12A: Land Side	No impact	Removal of approximately 15 shrubs	Removal of approximately 15 shrubs
Sacramento River East Levee Reaches 5A–9B: Water Side	Removal of an estimated 4 shrubs and 22.5 acres of woodlands	No impact	Removal of an estimated 4 shrubs and 22.5 acres of woodlands
Total	**4 Shrubs; 22.5 Acres of Woodlands**	**63 Shrubs**	**39 Shrubs; 22.5 Acres of Woodlands**
Location of compensation plantings	Unknown	Within 35.5 acres of woodland plantings on land side of the Sacramento River east levee	Within 157 acres of woodland plantings on land side of the Sacramento River east levee

Source: EDAW surveys conducted in 2008; construction data provided by Wood Rodgers, Mead & Hunt, and HDR, Inc. in 2008; and compiled by EDAW in 2008 and 2009

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for direct disturbance on valley elderberry longhorn beetle or elderberry shrubs due to project construction activities. However, there could be extensive removal of elderberry shrubs on the water side of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments, even without project implementation. This potential impact is considered **potentially significant**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Flooding of the Basin might result in beneficial or adverse conditions for elderberry shrubs and, consequently, valley elderberry longhorn beetle, in some locations. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact, whether adverse or beneficial is unknown. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

Approximately 48 elderberry shrubs are known to be present within or adjacent to the Phase 3 Project footprint along the Sacramento River east levee, including one inland along the GGS/Drainage Canal alignment. No elderberry shrubs are located within the Phase 3 Project footprint along the PGCC and NEMDC west levees. Focused surveys of these shrubs have been conducted to document the number of stems, particular size classes, and presence or absence of beetle exit holes. Approximately 15 elderberry shrubs would be removed along Reaches 10–12A of the Sacramento River east levee, in preparation for subsequent phases of levee improvements and to accommodate construction of an adjacent setback levee, seepage remediation, and the relocated Riverside Canal in this section, as identified in the programmatic and cumulative impact analyses contained in Phase 2

Landside EIR and Phase 2 EIS. Focused surveys on these shrubs are currently being conducted. Some of these shrubs may be able to be avoided in place and incorporated into the proposed woodlands corridor.

Per the USFWS's conservation guidelines for this species (USFWS 1999), all of these shrubs would be transplanted during the dormant season into the 35.5 acres of woodland corridors and/or other woodland restoration areas. The loss and/or direct impact of elderberry shrubs and potential loss of beetles under the Proposed Action would be offset by SAFCA's plan to incorporate plantings of elderberry shrubs and other appropriate native species into the woodland corridors and other potential woodland restoration areas. Elderberry shrubs would be planted in numbers adequate to compensate for elderberry shrub loss, based on standard USFWS mitigation guidelines. A detailed plan for woodland creation is being developed and provided for USFWS and DFG review; and protective mechanisms and specific management protocols are currently being prepared by SAFCA in coordination with these agencies. Portions of the woodland areas must be created and managed in a manner that provides the essential functions of valley elderberry longhorn beetle habitat that would be lost through project activities in order for them to provide adequate compensation. However, if habitat creation and management are not effectively implemented to provide replacement habitat for the valley elderberry longhorn beetle, an overall adverse effect could occur. This impact is considered **significant**.

Levee Raise-in-Place Alternative

Under the Levee Raise-in-Place Alternative, potential impacts on valley elderberry longhorn beetle would be somewhat different from those under the Proposed Action (See **Table 4.9-1**). Loss of elderberry shrubs on the land side of the Sacramento River east levee may be reduced under this alternative by the lack of an adjacent setback levee, but as much as 22.5 acres of riparian woodland that supports at least 4 elderberry shrubs on the water side of the levee may require removal to conform with USACE guidance regarding levee encroachments. Per the USFWS's conservation guidelines for this species (USFWS 1999), all of these shrubs would be transplanted during the dormant season into the 157 acres of woodland corridors and other woodland restoration areas. Potential adverse impacts from such vegetation removal could be greater than those within the adjacent setback levee footprint on the land side of the levee under the Proposed Action, particularly in terms of the quality of habitat that is affected. Similar to the Proposed Action, the loss of elderberry shrubs and potential loss of beetles under the Levee Raise-in-Place Alternative would be offset by SAFCA's plan to incorporate plantings of elderberry shrubs and other appropriate native species into the woodland corridors and other potential woodland restoration areas. However, as with the Proposed Action, overall adverse effects could occur if the replacement habitat does not provide the essential components and is not managed in a way that maximizes habitat quality and minimizes potential adverse effects on valley elderberry longhorn beetle. This impact is considered **significant**. ***(Lesser)***

Mitigation Measure 4.9-b: Conduct Focused Surveys for Elderberry Shrubs as Needed, Complete Detailed Design of Woodland/Elderberry Habitat and Management Agreements to Ensure Adequate Compensation for Loss of Shrubs, Implement all Management Agreements, and Obtain Incidental Take Authorization

Proposed Action and Levee Raise-in-Place Alternative

To reduce impacts on valley elderberry longhorn beetle, SAFCA shall implement the measures described below.

- A qualified biologist retained by SAFCA shall conduct focused surveys of elderberry shrubs within 100 feet of the project footprint, in accordance with USFWS guidelines. All elderberry shrubs with potential to be affected by project activities shall be mapped, the number of stems greater than 1 inch in diameter on each shrub that requires removal shall be counted, and these stems shall be searched for beetle exit holes.

- The primary engineering and construction contractors shall ensure, through coordination with the biologist, that construction is implemented in a manner that minimizes disturbance of areas that support elderberry shrubs (e.g., temporary fencing shall be used

during construction to protect all elderberry shrubs that are located adjacent to construction areas but can be avoided). Shrubs that require removal shall be transplanted to the woodland creation areas, if feasible. If none of the areas of suitable habitat to be created as part of the project would be available before the impact would occur, alternative transplantation locations (e.g., other SAFCA mitigation areas or TNBC preserves) shall be identified and shall be approved by USFWS.

- The number of replacement elderberry plantings shall be determined based on USFWS guidelines, which require replacement ratios ranging from 1:1 to 8:1 for lost stems at least 1 inch in diameter, depending on the size of the affected stems and presence or absence of beetle exit holes. Associated native species shall be planted at ratios ranging from 1:1 to 2:1 for each elderberry planting. SAFCA shall develop a detailed woodland/elderberry planting design and management protocols in coordination with and subject to approval of the resource agencies. SAFCA shall also enter into agreements with entities responsible for long-term management of created woodland habitats to ensure performance standards and long-term management goals are met and provide assurances of adequate funding for habitat creation and management. Such agreements and funding assurances shall be subject to approval of the resource agencies. SAFCA shall implement all terms and conditions of the management agreements.

- USACE shall initiate consultation activities with USFWS under Section 7 of the Federal Endangered Species Act (ESA), and authorization for take of valley elderberry longhorn beetle under the Federal ESA shall be obtained if it is determined, in consultation with USFWS, that shrub removal is likely to result in such take. All measures subsequently developed through the Section 7 consultation process shall be implemented by SAFCA.

Implementing this mitigation measure would reduce the impact on valley elderberry longhorn beetle to a **less-than-significant** level because protocol-level surveys would be conducted, construction activities would avoid elderberry shrubs to the maximum extent feasible, elderberry shrub replacement would occur in consultation with USFWS, and USACE would consult with USFWS under Section 7. ***(Similar)***

Impact 4.9-c: Impacts on Giant Garter Snake Related to Project Construction Activities

Table 4.9-2 summarizes the permanent impacts on giant garter snake habitat that would occur from project implementation.

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no direct adverse or beneficial project-related impacts on the giant garter snake. Because no habitat would be affected, there would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure could result in an adverse impact on the Natomas Basin giant garter snake population. Giant garter snakes require upland refugia and may not be able to escape flood waters during their inactive season (October–April), depending on the velocity and depth of the floodwaters and the speed with which the floodwaters inundate the Basin. A catastrophic flood of the Natomas Basin could result in direct mortality of a substantial portion of the Basin's giant garter snake population, as well as extensive damage to habitat for the species, including TNBC

Table 4.9-2
Permanent Impacts of the Phase 3 Project Alternatives on Giant Garter Snake Habitat

Location	No-Action Alternative	Proposed Action and Levee Raise-in-Place Alternative (Acres)
Habitat Impacts		
Canal/ditch and Elkhorn Reservoir habitat near Sacramento River east levee	Unknown, but losses of TNBC preserve habitat and other agricultural habitats in the event of flooding could be substantial	5
Canal habitat near PGCC west levee	Unknown, but losses of TNBC preserve habitat and other agricultural habitats in the event of flooding could be substantial	< 1
PGCC (water side)	No impact	1
Airport West Ditch	No impact	9
Rice near PGCC west levee	Unknown, but losses of rice in the event of flooding could be substantial	45[1]
Total Permanent Impacts	**Unknown, but potentially substantial**	**16 canal/ditch; 45 rice**
Habitat Creation in Project Design		
Canal habitat (Aquatic)	0	22
Canal habitat (Associated Upland)	0	22
Marsh habitat associated with Canal	0	10
Total Habitat Creation	**0**	**54**

Notes: TNBC = The Natomas Basin Conservancy; PGCC = Pleasant Grove Creek Canal

[1] The Phase 2 Project EIS identified permanent impacts to 72.98 acres of rice, which includes this 45 acres that would be affected as part of the Phase 3 Project. The USFWS programmatic BO is conditioned on the creation of 72.98 acres of managed marsh as part of the Phase 4 Project to offset the project's permanent impacts to rice.

Source: EDAW surveys in 2008; construction data provided by Wood Rodgers, Mead & Hunt, and HDR, Inc. in 2008; and compiled by EDAW in 2008 and 2009

preserves and the infrastructure that supports operation of the preserves. The magnitude of the impacts would depend upon the flooding duration, depth, rate, timing, and location; therefore, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Project construction and implementation would result in permanent and temporary loss and disturbance of potential giant garter snake habitat. Fill, temporary and permanent dewatering, land conversion, and staging and other construction disturbances could disturb, injure, or kill snakes using affected habitats, including irrigation ditches, drainage canals, rice fields, and associated uplands. Project construction activities in areas of potentially suitable habitat, as well as geotechnical and cultural resource investigations conducted near suitable habitat, also could result in direct disturbance and loss of individual giant garter snakes.

Adverse impacts on giant garter snake habitat within the project footprint would occur along the PGCC, Reaches 5A–9B of the Sacramento River east levee, the alignments of the new GGS/Drainage Canal and relocated Elkhorn Canal, and the existing Airport West Ditch.

Five acres of canal/ditch and Elkhorn Reservoir habitat near the Sacramento River east levee would be filled and require relocation to accommodate the levee improvements there. The redesign and reconfiguration of the Airport West Ditch would affect approximately 9 acres of existing ditch habitat. Placement of rip rap on the water side of the PGCC for erosion control would fill approximately 1 acre of aquatic habitat in the PGCC, and less than 1 acre of canal habitat near the PGCC west levee would be affected. Approximately 45 acres of rice along the PGCC west levee would be lost to accommodate levee expansion and construction of the adjacent levee. Temporary disturbance of less than 1 acre of aquatic habitat would occur where the replacement irrigation/drainage canals connect to existing lateral canals. In total, 16 acres of canal/ditch and 45 acres of rice would be affected.

Temporary disturbance would also occur on approximately 160 acres of rice fields that would be used for borrow to support the Phase 3 Project. This borrow would come from the rice fields at the Brookfield, Dunmore, or Sutter Pointe sites, depending on negotiations with the owners of the Brookfield and Sutter Pointe sites. (SAFCA owns the Dunmore site, but it is the least attractive of the sites based on its soil properties.) The selected site(s) would be returned to rice production after borrow extraction.

In addition to the currently identified borrow sites listed in **Table 2-2**, the Elkhorn Borrow Area (**Plate 10**) has been identified as an area where additional borrow sites could be used, if needed. Any borrow site developed in the Elkhorn Borrow Area would potentially temporarily convert potential giant garter snake habitat to non-usable habitat (less than 5 acres of irrigation and drainage ditches). As described in Section 2.3.8, "Borrow Material," in selecting borrow sites, consideration would be given to ensure that activities result in minimal adverse impacts to the environment. Beneficial impacts to giant garter snake would include SAFCA's proposed creation of approximately 54 acres of habitat resulting from construction of the new GGS/Drainage Canal, expansion of the existing West Drainage Canal, and relocation of the irrigation canal. This habitat includes approximately 22 acres of aquatic canal habitat (12 acres for the newly constructed GGS/Drainage Canal, 7 acres for the relocated Elkhorn Canal, and 3 acres for the reconfigured West Drainage Canal), approximately 10 acres of marsh habitat associated with the GGS/Drainage Canal and West Drainage Canal, and approximately 22 acres of associated uplands for all the canals.

The habitat quality of the new GGS/Drainage Canal and West Drainage Canal is anticipated to eventually be substantially higher than that of the canal habitat that would be lost. Creation and enhancement of these canals would include a number of features designed to maximize the amount and quality of habitat, as well as minimize the need for maintenance activities that temporarily reduce habitat quality and can result in injury and mortality of giant garter snakes. In addition, the configuration and design of the GGS/Drainage Canal and West Drainage Canal enhancement were specifically formulated based on the goal of providing a functional travel corridor between giant garter snake populations in the northern and southern portions of the Natomas Basin. Loss and deterioration in the quality of existing travel corridors has been identified as a primary concern in maintaining a genetic connection between these two snake populations. The shoreline and lower banks of the GGS/Drainage Canal and West Drainage Canal would be planted and managed to promote tule vegetation as suitable cover and foraging habitat for giant garter snake. Although the primary function of the relocated Elkhorn Canal would be irrigation supply, it is anticipated to provide habitat comparable to that of the irrigation canal that would be filled as a result of the project. It is also being designed to minimize maintenance and resulting habitat degradation and snake injury and mortality.

Loss of giant garter snake habitat would be offset by the proposed creation of new irrigation and drainage canals and marsh habitat as described above. In addition, compensatory habitat creation required under the programmatic BO and draft Section 2081 permit issued in connection with the Phase 2 Project (see Section 4.9.1.1, "Methodology") would further offset giant garter snake habitat loss. These created and preserved habitats would result in an overall improvement in habitat conditions for the giant garter snake in the Natomas Basin, because the

habitats would be managed to maximize their quality and improve connectivity between TNBC preserves. To provide adequate compensation, the canal, marsh, and rice habitats must be created and/or managed in a manner that provides the essential functions of giant garter snake habitat. A detailed design of the habitats to be created is being developed and provided for USFWS and DFG review. Protective mechanisms and specific management protocols for the GGS/Drainage Canal are currently being prepared by SAFCA in coordination with these agencies. However, if habitat creation and management are not effectively implemented to provide replacement habitat for the giant garter snake, an overall adverse effect could occur. This impact is considered **potentially significant**. ***(Similar)***

Mitigation Measure 4.9-c: Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Develop Detailed Design of Managed Marsh and New Canals and Management Agreements to Ensure Adequate Compensation for Loss of Habitat, Implement all Management Agreements, and Obtain Incidental Take Authorization

Proposed Action and Levee Raise-in-Place Alternative

To reduce impacts on the giant garter snake, SAFCA shall implement the measures described below.

- The primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction is implemented in a manner that minimizes disturbance of giant garter snake habitat (e.g., temporary fencing shall be used during construction to protect all aquatic and adjacent upland habitat that is located adjacent to construction areas that can be avoided).

- Additional measures consistent with the goals and objectives of the NBHCP shall be implemented to minimize the potential for direct injury or mortality of individual giant garter snakes during project construction. Such measures shall be finalized in consultation with USFWS and DFG, and are likely to include conducting worker awareness training, timing initial ground disturbance to correspond with the snake's active season (as feasible in combination with project needs and minimizing disturbance of nesting Swainson's hawks), dewatering aquatic habitat before fill, conducting preconstruction surveys, erecting fencing around habitat features that can be avoided to ensure that these remain undisturbed by construction vehicles and personnel, conducting biological monitoring during construction, and removing any temporary fill or construction debris and restoring temporarily disturbed areas to their pre-project conditions according to the USFWS's *Guidelines for the Restoration and/or Replacement of Giant Garter Snake Habitat* (USFWS 1997).

- SAFCA shall develop detailed design of habitat creation components and management protocols in coordination with and subject to approval of USFWS and DFG. SAFCA shall also enter into agreements with entities responsible for long-term management of created canals and marsh habitats to ensure that performance standards and long-term management goals are met and provide assurances of adequate funding for habitat creation and management. Such agreements and funding assurances shall be subject to approval of USACE, USFWS, and DFG. SAFCA shall implement all terms and conditions of the management agreements.

- Authorization for take of giant garter snake under the Federal ESA and CESA shall be obtained. All measures subsequently adopted through the permitting process shall be implemented.

Implementing this mitigation measure would reduce this impact related to giant garter snake to a **less-than-significant** level because construction would be implemented in a manner that reduces loss of habitat and direct mortality, measures that are part of the NBHCP related to giant garter snake would be implemented, a management plan would be created and

implemented in consultation with USFWS and DFG, and take permits would be obtained. ***(Similar)***

Impact 4.9-d: Impacts on Giant Garter Snake Related to Operational Activities of RD 1000's Pumping Plant No. 2

No-Action Alternative

No Project Construction

Under the No-Action Alternative, RD 1000's Pumping Plant No. 2 would not be reconstructed. No operational activities would occur; therefore, there would be no impacts on the giant garter snake. Thus, there would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. A levee failure could result in an adverse impact on the Natomas Basin giant garter snake population, as described under Impact 4.9-c, above. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Project implementation would involve reconstruction of RD 1000's Pumping Plant No. 2, including an intake structure situated in the interior of the Basin, a landside pumping plant structure, and an outfall structure in the Sacramento River. The intake structure would be located below the water line in the North Drainage Canal, which is considered suitable aquatic habitat for the giant garter snake. This intake would be operated seasonally to pump out agricultural drainage and storm water from the interior of the basin to the Sacramento River. Operation of this pumping plant would potentially disturb or injure aquatic fauna in the North Drainage Canal.

Aquatic fauna swimming near the intake structure could potentially be trapped by the intake velocities. However, giant garter snakes, which typically swim near the water surface, are likely to avoid entrapment through their strong swimming skills and behavioral avoidance of areas that are routinely disturbed (Hansen 2008; Hansen and Brode 1993). Therefore, because giant garter snakes are likely to avoid the area, operational activities at RD 1000's Pumping Plant No. 2 are not likely to cause disturbance or injury to the snake. Operation of RD 1000's Pumping Plant No. 2 would result in a **less-than-significant** impact to giant garter snakes utilizing the North Drainage Canal. ***(Similar)***

Mitigation Measure: No mitigation is required.

Impact 4.9-e: Impacts on Northwestern Pond Turtle

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for direct disturbance of northwestern pond turtle habitat or population. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Floodwaters could inundate habitat areas and result in direct mortality of northwestern pond turtles, depending on

the location, depth, speed, and duration of flooding. A precise determination of significance is not possible and cannot be made because the extent of the magnitude of impact is unknown. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Proposed improvements to the Sacramento River east levee, PGCC west levee, and Airport West Ditch would result in the permanent loss of approximately 16 acres of suitable pond turtle habitat to accommodate fill and realignment of portions of irrigation/drainage canals near the landside toe of the levees, placing rip rap on the water side of the PGCC west levee for erosion control, and to accommodate the reconfiguration of the Airport West Ditch.

Adverse effects on suitable turtle habitat in the Phase 3 Project footprint would include the permanent loss of approximately 5 acres of relatively unvegetated irrigation/drainage canals and a portion of Elkhorn Reservoir along the Sacramento River east levee. Less than one acre of habitat provided by an irrigation/drainage ditch along the toe of the PGCC levee would be lost as a result of the improvements to this levee. Another 9 acres of potential habitat would be affected by the redesign and reconfiguration of the Airport West Ditch.

In addition to the currently identified borrow sites listed in **Table 2-2**, the Elkhorn Borrow Area (**Plate 10**) has been identified as an area where additional borrow sites could be used, if needed. Any borrow site developed in the Elkhorn Borrow Area would potentially convert potential northwestern pond turtle habitat to non-usable habitat temporarily (less than 5 acres of irrigation and drainage ditches). As described in Section 2.3.8, "Borrow Material," in selecting borrow sites, consideration would be given to ensure that activities result in minimal adverse impacts to the environment.

These habitat losses would be offset by the proposed habitat creation components of the project. In addition, compensatory habitat creation that would be implemented as part of the Phase 2 Project (as described above in Section 4.9.1.1, "Methodology") would further offset the loss of pond turtle habitat. There is potential, however, for direct loss of pond turtles to occur if they are present within the affected habitats. This is considered a **potentially significant** impact. ***(Similar)***

Mitigation Measure 4.9-e: Conduct Focused Surveys for Northwestern Pond Turtles and Relocate Turtles, if Needed

Proposed Action and Levee Raise-in-Place Alternative

A qualified biologist retained by SAFCA shall conduct surveys in aquatic habitats to be dewatered and/or filled during project construction. Surveys shall be conducted immediately after dewatering and before fill of aquatic habitat suitable for pond turtles. If pond turtles are found, the biologist shall capture them and move them to nearby areas of suitable habitat that would not be disturbed by project construction.

Implementing this mitigation measure would reduce the potential impact to a **less-than-significant** level because surveys would be conducted and turtles would be physically relocated (if present). ***(Similar)***

Impact 4.9-f: Impacts on Swainson's Hawk and Other Special-Status Birds

Tables 4.9-3 and **4.9-4** summarize impacts on Swainson's hawk foraging and nesting habitat that would occur with project implementation.

Table 4.9-3
Permanent Impacts of the Phase 3 Project Alternatives on Swainson's Hawk Habitat

Location of Impact	No-Action Alternative (acres)	Proposed Action (acres)	Levee Raise-in-Place Alternative (acres)
Grasslands (Sacramento River east levee, PGCC, NEMDC, new canals and woodland corridors)	Unknown, but losses of TNBC preserve habitat and other agricultural habitats in the event of flooding could be substantial	69	27
Croplands (Sacramento River east levee, woodland corridor, and new canals)	Unknown, but losses of TNBC preserve habitat and other agricultural habitats in the event of flooding could be substantial	115	12
Woodlands (Sacramento River east levee and new canals)	22.5 water side	37 land side 1 water side[1]	17.5 land side 22.5 water side
Total Permanent Impacts	**Unknown, but potentially substantial**	**184 foraging 38 nesting**	**39 foraging 40 nesting**

Notes: NEMDC = Natomas East Main Drainage Canal; PGCC = Pleasant Grove Creek Canal; TNBC = The Natomas Basin Conservancy

[1] Impacts on Sacramento River east levee water side from Garden Highway drain outlets (rounded up to 1 acre).

Source: EDAW surveys in 2008; construction data provided by Wood Rodgers, Mead & Hunt, and HDR, Inc. in 2008

Table 4.9-4
Summary of Permanent Impacts of the Phase 3 Project on Swainson's Hawk Foraging Habitat (in Acres)

Affected Crops[1]	Created Crops	Net Crops	Affected Grassland	Created Grassland	Net Grassland	Total Loss	Total Increase	Total Net
-115	60	**-55**	-69	237	**168**	-184	297	**113**

[1] Total of affected crops includes 55 acres of alfalfa.

Source: Data compiled by EDAW in 2008 and 2009

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no adverse or beneficial impacts on suitable habitat for Swainson's hawk and other special-status birds due to project construction. However, even under the No-Action Alternative, there could be extensive removal of riparian vegetation on the water side of the Sacramento River east levee to conform to USACE guidance regarding levee encroachments (see **Table 4.8-1**). The habitat along the water side of the Sacramento River east levee supports the majority of Swainson's hawk nest sites in the Natomas Basin. Removal of this vegetation would have a substantial impact on Swainson's hawks; therefore, this impact is considered **potentially significant**. ***(Greater)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Flooding could cause destruction of Swainson's hawk or other special-status bird habitat. The magnitude of the impacts would depend upon the flooding duration, depth, rate, timing, and location. Therefore, a definite

determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action

Potential adverse effects on the Swainson's hawk would include loss of suitable foraging and nesting habitat and disturbance of nesting pairs during project construction. Other special-status birds, including white-tailed kite and Cooper's hawk, could also be similarly affected. The effects on foraging and nesting habitat would result from construction of levees, berms, and maintenance, operation, and utility corridors along the Sacramento River, PGCC, and NEMDC; the construction of the new GGS/Drainage and realigned Elkhorn Canals; reconstruction of RD 1000's Pumping Plant No. 2; and the creation of woodland corridors.

Impacts to Foraging Habitat: As summarized in **Table 4.9-3**, above, foraging habitat affected by the Proposed Action would be primarily croplands (115 of 184 acres) and grasslands (69 of 184 acres). This impact would be offset by the creation of 297 acres of foraging habitat, of which 60 acres would be croplands and 237 acres would be grasslands. As shown in **Table 4.9-4**, this would result in a net increase of 113 acres of foraging habitat. However, due to conversion of land cover types in the project footprint, the composition of this habitat would permanently shift from 62% croplands (and 28% grasslands) to 20% croplands (and 80% grasslands), leading to a decrease in the quality of foraging habitat for Swainson's hawk. Approximately 55 acres (48%) of the total croplands being permanently affected are considered high-quality foraging habitat. The loss of high-quality foraging habitat could force Swainson's hawks to forage farther from the nest or increase competition for prey with other hawks in the area. To offset impacts to this high-quality foraging habitat, SAFCA would preserve approximately 60 acres of land in high-quality foraging habitat within reclaimed borrow sites. This would reduce the permanent impact to foraging habitat by ensuring preservation of field crops with the highest foraging value. The permanent loss of croplands represents 1.4% of the total estimated agricultural lands in the Basin and, therefore, is not considered a substantial reduction of foraging habitat.

Land cover conversion of the borrow sites would be temporary. Approximately 603 acres of foraging habitat would be temporarily affected by the Phase 3 Project borrow activities and then returned to their prior conditions within approximately 2 years. This would include 240 acres of fallow crop, 97 acres of alfalfa, 143 acres of other crops, and 115 acres of grasslands. Some of these borrow sites have been identified for field crop preservation to offset the impacts to foraging habitat. The selection of sites for field crop preservation lands, whether or not they are used as borrow sites, would be based on cropland parcels that would be suitable for farming alfalfa, hay, or other similar crops (e.g., well-drained, permeable soils) and that are located within reasonable proximity of potential Swainson's hawk nesting habitat. Where borrow sites are identified for field crop preservation, the limit of excavation would be, at minimum, 2 feet above the high water table. Further, these sites would be recontoured to have positive drainage so that the sites can be gravity-drained to collector drains off-site to ensure that the root zones would not be saturated. Finally, the foot of topsoil removed and stockpiled prior to borrow removal would be respread over the borrow sites after soil excavation, thereby increasing the depth of soil above the water table.

In addition to the currently identified borrow sites listed in **Table 2-2**, the Elkhorn Borrow Area (**Plate 10**) has been identified as an area where additional borrow sites could be used, if needed. Any borrow site developed in the Elkhorn Borrow Area would potentially convert foraging habitat for special-status birds to non-foraging habitat temporarily (583 acres of cropland and 11 acres of grassland). As described in Section 2.3.8, "Borrow Material," in selecting borrow sites, consideration would be given to ensure that activities result in minimal adverse impacts to the environment, including habitat for Swainson's hawk and other special-status birds.

However, if habitat creation/preservation is not effectively implemented to provide foraging habitat for Swainson's hawk or other special-status bird species, an overall adverse effect could occur. This impact is considered **potentially significant**.

Short-term Impacts to Nesting Habitat: An estimated 600 acres of riparian and nonriparian woodland habitat is present on the land side of the Natomas Basin and approximately 420 acres of riparian woodland habitat is present along the water side of the Sacramento River east levee and American River north levee, totaling approximately 1,020 acres. The vast majority of Swainson's hawk nests in the Basin are within the mature riparian forest/ woodlands along the water side of the Sacramento River east levee. The design of the adjacent setback levee along the Sacramento River east levee avoids the need to remove waterside riparian forest/woodlands, which would otherwise be removed if the levee were being rebuilt and upgraded in place or no action was taken. The woodlands that would be affected are along the land side of the Sacramento River east levee where no nests have been documented since 2001. Most nests that have been documented on the land side of the Sacramento River east levee are within woodlands in substantial riparian corridors along ditches, sloughs, and canals towards the interior of the Basin.

The Proposed Action would affect approximately 38 acres of primarily landside woodlands; this acreage includes an understory of scrub and grassland components. This includes removing as much as 12 acres of landside woodland habitat in Reaches 5A–9B, approximately 1.1 acres of landside woodland habitat where replacement irrigation/drainage canal segments to be constructed in Reaches 6B–9B would intersect with existing woodland and connect to existing lateral canals, 4.6 acres of woodland in the footprint of RD 1000's Pumping Plant No. 2 reconstruction site, and less than 1 acre of riparian woodlands on the water side of Reaches 5A–9B where drainage outlets would be constructed. Additionally, approximately 20 acres of landside woodlands along Reaches 10–12A of the Sacramento River east levee and in the Riverside Canal alignment would be removed in preparation for construction work that would be conducted in a subsequent project phase.

In addition to the specific borrow sites listed in **Table 2-2**, the Elkhorn Borrow Area (**Plate 10**) has been identified as an area where additional borrow sites could be used, if needed. Any borrow site developed in the Elkhorn Borrow Area would potentially convert nesting habitat for special-status birds to non-nesting habitat temporarily (5 acres of woodland). As described in Section 2.3.8, "Borrow Material," in selecting borrow sites, consideration would be given to ensure that activities result in minimal adverse impacts to the environment.

Long-term Impacts to Nesting Habitat: Compensation for adverse impacts on foraging and nesting habitat and potential unavoidable loss of active nests would include creating and/or preserving approximately 38 acres of woodlands along the landside of the Sacramento River east levee. As shown in **Table 4.8-2**, in Section 4.8, "Vegetation and Wildlife," when this compensatory measure is added to the creation of 50 acres and preservation of 19.5 acres of landside woodlands as part of the Phase 2 Project, the result is a net increase of 52.5 acres of woodlands. Nevertheless, there would be a short-term temporal loss of woodlands providing potential nesting habitat, which is considered **significant**.

The woodland mitigation plan includes transplanting suitable trees from the project footprint, where feasible, as well as planting a variety of native tree species that could become potential nesting habitat for Swainson's hawk. To provide adequate compensation for lost habitat, the woodlands must be created and/or managed in a manner that provides the essential habitat functions for special-status bird species. A detailed design of the woodland habitats to be created is being developed and provided for USFWS and DFG review and approval; protective mechanisms and specific management protocols for the woodlands are currently being prepared by SAFCA in coordination with these agencies (as described in Chapter 2.0, Section 2.3.3, "Conservation Components"). However, if habitat creation/preservation is not effectively implemented to provide nesting habitat for Swainson's hawk or other special-status bird species, an overall adverse effect could occur. This impact is considered **potentially significant**.

Impacts to Nesting Behavior: Project construction would occur during the Swainson's hawk nesting season and could disrupt nesting behavior. If project construction is already under way when pairs return to their nesting territories, project activity could render previously occupied territories unsuitable. If active nests are present near construction areas when construction begins, the nesting pairs could be disturbed, potentially resulting in nest abandonment and loss of eggs or young. Various conservation measures would be implemented to avoid and

minimize take of Swainson's hawks. These measures include conducting surveys for and monitoring of Swainson's hawk nests before and during construction to identify active nests in the vicinity of project activities, and establishing and maintaining buffers around the nests, in coordination with DFG, so that project activity does not result in detectable adverse effects on active nests. This impact is considered **potentially significant**.

Impacts Related to Power Pole Relocations: The Phase 3 Project includes relocating or replacing Pacific Gas & Electric Company (PG&E) power poles. Power poles may benefit raptors by providing perching and/or nesting structures (or both) in areas where few natural perches or nest sites exist. However, these structures can also pose a threat to raptors and other birds through electrocutions or collisions. Mortality is most common with large birds, such as eagles or cranes. Electrocution can occur when a bird simultaneously touches two energized parts or an energized part and a grounded part of the electrical equipment. PG&E has developed and implemented an Avian Protection Plan (APP) to better protect birds and improve safety and reliability for its customers. The APP, which has been in place since 2002, includes outfitting all new poles and replacement poles in bird-sensitive locations with bird-safe equipment. PG&E is also a founding member of the Avian Power Line Interaction Committee (APLIC), a collaboration between utilities and USFWS that began nearly 20 years ago. The APLIC has guidelines and industry standards to avoid bird collisions and electrocutions.

The Proposed Action would not result in an increase in power pole related hazards for the Swainson's hawk and other birds since the Phase 3 Project requires relocation or replacement of existing power poles. While SAFCA has no direct control over the specific design and retrofitting of the relocated and replaced power poles, it can be expected that PG&E will implement its APP and follow the APLIC guidelines and industry standards to reduce electrocution of birds perching on the power poles and power lines. The Proposed Action would have **no impact** on Swainson's hawks and other birds as a result of power pole relocations.

Levee Raise-in-Place Alternative

Under the Levee Raise-in-Place Alternative, potential effects on Swainson's hawk associated with the Sacramento River east levee improvements would be somewhat different from those under the Proposed Action. Compared to the Proposed Action, loss of nesting and foraging habitat on the land side of the levee would be reduced under the Levee Raise-in-Place Alternative to approximately 17.5 acres of nesting habitat lost and to approximately 39 acres of foraging habitat lost (70% of which could be grasslands). However, an estimated 22.5 acres of riparian woodland on the water side of these levee reaches provide suitable nesting habitat for Swainson's hawk and may require removal to conform to USACE guidance regarding levee encroachments. Potential adverse impacts from such vegetation removal are likely to be greater than those under the Proposed Action, in terms of both the amount and quality of that habitat. The foraging habitat affected by this alternative would be cropland replaced by grasslands along levee and berms resulting in an equal amount of foraging habitat, but a conversion of 12 acres of higher-quality croplands to grasslands that provide lesser-quality habitat.

Similar to the Proposed Action, the impacts on nesting habitat and potential unavoidable loss of active nests associated with the removal of landside woodlands would be compensated by the proposed creation of approximately 157 acres of landside woodland habitat at various locations along the Sacramento River east levee. However, it is uncertain whether the new woodlands would be adequate to compensate for the potential extensive loss of Swainson's hawk nest sites on the water side of the Sacramento River east levee. The Levee Raise-in-Place Alternative would also require relocation and replacement of some power poles. As with the Proposed Action, this alternative would not result in an increase in power pole related hazards for the Swainson's hawk and other birds because the project requires relocation or replacement of existing power poles.

As with the Proposed Action, if habitat creation/preservation is not effectively implemented to provide foraging and nesting habitat for Swainson's hawk or other special-status bird species, an overall adverse effect could occur. This impact is considered **potentially significant**. ***(Greater)***

Mitigation Measure 4.9-f: Minimize Potential Impacts on Swainson's Hawk and Other Special-Status Birds Foraging and Nesting Habitat, Monitor Active Nests during Construction, Develop and Implement a Management Plan in Consultation with DFG, Obtain Incidental Take Authorization, and Implement Mitigation Measure 4.8-a, "Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Loss of Quantity and Quality of Habitat, Implement all Agreements, and Comply with the DFG Section 1602 Permit Process"

Proposed Action and Levee Raise-in-Place Alternative

SAFCA and its primary contractors for engineering design and construction shall ensure that the following measures are implemented to avoid, minimize, and compensate for potential project effects on Swainson's hawks and other special-status birds:

- The primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction is implemented in a manner that minimizes disturbance of potential nesting habitat for special-status birds through the following activities:
  - The biologist shall conduct preconstruction surveys to identify active special-status bird nests near construction areas.
  - Surveys for nesting birds shall be conducted before project activities are initiated during the nesting season (March 1–July 31). Surveys shall be conducted in accordance with standardized protocols and NBHCP requirements.
  - Removal of potential nesting habitat shall be conducted during the non-nesting season, to the extent feasible and practicable, to minimize the potential for loss of active nests.
  - If an active nest is found, the biologist shall determine an appropriate buffer that minimizes potential for disturbance of the nest, in coordination with DFG. No project activities shall commence within the buffer area until a qualified biologist confirms that the nest is no longer active or the birds are not dependent on it. Monitoring shall be conducted during construction and by a qualified biologist to ensure that project activity does not result in detectable adverse effects on the nesting pair or their young. The size of the buffer may vary, depending on the nest location, nest stage, construction activity, and monitoring results. If implementation of the buffer becomes infeasible or construction activities result in an unanticipated nest disturbance, DFG shall be consulted to determine the appropriate course of action.
- The primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that staging areas and access routes are designed to minimize disturbance of known Swainson's hawk nesting territories through the following activities:
  - The biologist shall conduct preconstruction surveys to identify active nests within 0.25 mile of construction areas, in accordance with DFG guidelines. Surveys shall be conducted in accordance with NBHCP requirements and *Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley* (Swainson's Hawk Technical Advisory Committee 2000).
  - If an active nest is found, an appropriate buffer that minimizes the potential for nest disturbance shall be determined by the biologist, in coordination with DFG. No project activities shall commence within the buffer area until a qualified biologist confirms that the nest is no longer active or the birds are not dependent on it.

Monitoring shall be conducted during construction and by a qualified biologist to determine whether project activity results in detectable adverse effects on the nesting pair or their young. The size of the buffer may vary, depending on the nest location, nest stage, construction activity, and monitoring results. If implementation of the buffer becomes infeasible or construction activities result in an unanticipated nest disturbance, DFG shall be consulted to determine the appropriate course of action.

- SAFCA shall develop and implement a plan to address management of grassland habitats that are created as part of the proposed project to ensure that the performance standard of no net loss of sensitive habitat is met. The management plan shall, at a minimum, establish specific success criteria for habitat creation, specify remedial measures to be undertaken if success criteria are not met (e.g., supplementary plantings and additional monitoring), and describe short- and long-term maintenance and management of the features (described in Chapter 2.0, "Alternatives," Section 2.3.3, "Conservation Components").

- Long-term protection of the created features and funding for their management shall be provided through appropriate mechanisms to be determined by SAFCA, DFG, and other entities cooperating in implementation of the proposed project.

- The management plan for the grassland habitat creation components of the project shall be reviewed and approved by USFWS and DFG before project implementation. Authorization for take of Swainson's hawk under CESA shall be obtained. All measures subsequently adopted through the permitting process shall be implemented.

Implementation of this mitigation measure as well as Mitigation Measure 4.8-a, would minimize adverse effects of the Proposed Action on Swainson's hawk. Coupled with the amount of land side woodlands that are being created and preserved, as part of the Phase 2 Project, this measure would result in a net increase in potential nesting habitat (landside woodlands). In addition, approximately 60 acres of high quality foraging habitat would be preserved in the Basin. The creation and preservation of nesting and foraging habitat in the Basin would reduce long-term and overall impacts to Swainson's hawk to a **less-than-significant** level. However, because of the time required for replacement woodlands to reach maturity, short-term temporal impacts to nesting habitat would remain **significant and unavoidable**.

Implementation of this mitigation measure as well as Mitigation Measure 4.8-a, would minimize long-term, adverse effects of the Levee Raise-in-Place Alternative on Swainson's hawk, but would not reduce them to a less-than-significant level. However, because it is uncertain whether the new woodlands would be adequate to compensate for the extensive loss of waterside riparian habitat and the potential extensive loss of Swainson's hawk nest sites on the water side of the Sacramento River east levee and because in the short-term replacement plantings would require 10 to 15 years to mature, this impact would remain **significant and unavoidable**. ***(Greater)***

Impact 4.9-g: Impacts on Burrowing Owl

No-Action Alternative

No Project Construction

Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for direct disturbance of burrowing owl habitat or population. There would be **no impact**. ***(Lesser)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. Among special-status bird species found in the Basin, burrowing owls in particular could be adversely affected by winter flooding, as a result of either direct mortality or inundation and destruction of burrows. The magnitude of the impacts would depend upon the flooding duration, depth, rate, timing, and location. Therefore, a precise determination of significance is not possible and cannot be made. Because of this uncertainty, this potential impact is considered **too speculative for meaningful consideration**. ***(Currently Unknown)***

Proposed Action and Levee Raise-in-Place Alternative

Project construction and implementation could result in the destruction of burrows occupied by burrowing owls along the PGCC. There is potential for direct loss of burrowing owls to occur if they are present within the affected habitats. This is considered a **potentially significant** impact. ***(Similar)***

Mitigation Measure 4.9-g: Minimize Potential Impacts on Burrowing Owls and Relocate Owls as Needed

Proposed Action and Levee Raise-in-Place Alternative

To reduce impacts on burrowing owls, SAFCA shall implement the measures described below.

- The primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction is implemented in a manner that minimizes disturbance of potential nesting habitat for burrowing owls (e.g., removal of potential nesting habitat shall be conducted during the non-nesting season, to the extent feasible and practicable, to minimize the potential for loss of active nests).

- The biologist shall conduct preconstruction surveys to identify occupied burrowing owl burrows in the vicinity of construction areas. Surveys for burrowing owl shall be conducted before project activities are initiated at any time of year. Surveys shall be conducted in accordance with standardized protocols, including DFG's *Staff Report on Burrowing Owl Mitigation* (DFG 1995), and NBHCP requirements. If an occupied nest burrow is found, an appropriate buffer that minimizes potential for disturbance of the nest shall be determined by the biologist, in coordination with DFG. No project activities shall commence within the buffer area until a qualified biologist confirms that the nest is no longer active or the birds are not dependent on it. Monitoring shall be conducted by a qualified biologist to ensure that project activity does not result in detectable adverse effects on the nesting pair or their young. The size of the buffer may vary, depending on the nest location, nest stage, construction activity, and monitoring results. If implementation of the buffer becomes infeasible or construction activities result in an unanticipated nest disturbance, DFG shall be consulted to determine the appropriate course of action.

- If an occupied burrowing owl burrow that does not support an active nest is found, SAFCA shall develop and implement a relocation plan, in coordination with and subject to approval of DFG and USFWS and consistent with requirements of the NBHCP, DFG's *Staff Report on Burrowing Owl Mitigation* (DFG 1995), and the Airport *Wildlife Hazard Management Plan* (WHMP). Relocation is anticipated to occur through passive exclusion of owls from the project site (using one-way doors at the burrow entrances). The owls would then be able to reoccupy the area after construction is complete. Because the project would generally result in temporary disturbance of burrowing owl

habitat and conversion from one suitable habitat type to another, no mitigation for temporary burrow or habitat loss would be required.

Implementing this mitigation measure would reduce the impact to a **less-than-significant** level for the Proposed Action and the Levee Raise-in-Place Alternative because construction would be implemented in a manner that reduces loss of nesting habitat and direct mortality. ***(Similar)***

Impact 4.9-h: Impacts on Successful Implementation of the NBHCP

No-Action Alternative

No Project Construction

Under the No-Action Alternative, without levee improvements, vegetation removal from the water side of the levee would be required to conform with USACE guidance regarding levee encroachments, eliminating habitat for several species covered by the NBHCP. This habitat also supports the majority of Swainson's hawk nest sites in the Natomas Basin. As described under Impact 4.9-f, above, the impact of the loss of this vegetation on Swainson's hawks would be significant and may not be mitigable. Impacts on nesting habitat for Swainson's hawks in the near term (i.e., before compensation woodland plantings have developed sufficiently to provide replacement nesting habitat) could substantially affect the successful implementation of the NBHCP. Under the No-Action Alternative, therefore, this impact is considered **significant**. ***(Greater)***

Potential Levee Failure

Without improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. TNBC's reserve infrastructure would be subject to damage in the event of levee failure; however the extent of such damage is uncertain. Without flood risk reduction provided by the project, restrictions would be placed on new urban development and remaining habitat would not be at risk for conversion due to development. Because there would be no habitat loss due to urban development, implementation of this alternative would not directly conflict with the implementation of the NBHCP. This potential impact would be **less-than-significant**. ***(Lesser)***

Proposed Action

Implementation of the Proposed Action could jeopardize successful implementation of the NBHCP through the conversion of habitats and land uses. The Proposed Action would not encroach onto TNBC reserves.

Impacts on NBHCP-Covered Species Viability: The potential for the Proposed Action to threaten the viability of populations of certain covered species, reduce the effectiveness of the NBHCP's conservation strategy, and adversely affect attainment of the goals and objectives of the NBHCP, could jeopardize successful implementation of the NBHCP. This is considered a **significant** impact.

Impacts on Habitat Availability: The Proposed Action would not result in the development of land outside the NBHCP permit area, but it would result in land use conversions. Land use conversion, however, would not cause a net loss in the habitat values provided by these lands for NBHCP-covered species in the Natomas Basin. The following habitat impacts would occur under the Proposed Action: up to approximately 45 acres of active rice fields would be permanently lost through conversion to grassland or levee slopes, 16 acres of canals would be directly affected, up to 37 acres of landside woodlands and 1 acre of waterside woodlands would be removed, and 115 acres of cropland would be converted to grassland. However, the overall habitat quality for NBHCP species that use these habitats is unlikely to be adversely affected because a total of about 54 acres of new canal habitat (including aquatic and associated marsh and upland components) would be created, 38 acres of landside woodlands would be created and/or preserved (to complement 50 acres of landside woodlands created and

19.5 acres preserved as part of the Phase 2 Project), 237 acres of grassland would be created, and 60 acres of field crops would be preserved. The canal habitats would be of higher quality than the canals that are lost due to improved design and configurations that integrate Basin-wide habitat components. While there would be a temporal loss of woodlands in the project area as the replacement woodland plantings mature within 10 to 15 years, the retention of the extensive mature waterside riparian woodlands coupled with the creation and preservation of landside woodlands would protect potential nesting habitat for special-status birds. The conversion of cropland to grassland would be offset through the preservation of field crops with the highest foraging value. This increase in overall habitat quality is anticipated to compensate for the loss associated with land conversions. However, if habitat creation/preservation are not effectively implemented to provide woodland habitat for Swainson's hawk or other special-status species, an overall adverse effect could occur. This impact is considered **potentially significant**.

Levee Raise-in-Place Alternative

The impacts of the Proposed Action on successful implementation of the NBHCP would also occur under the Levee Raise-in-Place Alternative, with the exception that under this alternative, there would also be extensive removal of riparian vegetation on the water side of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments. This habitat is used by a variety of species covered by the NBHCP, and supports the majority of Swainson's hawk nest sites in the Natomas Basin. As described under Impact 4.9-f, above, the impact of the loss of this vegetation on Swainson's hawks would be significant and may not be mitigable. Impacts on nesting habitat for Swainson's hawks in the near term (i.e., before compensation woodland plantings have developed sufficiently to provide replacement nesting habitat) could substantially affect the successful implementation of the NBHCP. Under the Levee Raise-in-Place Alternative, therefore, this impact is considered **significant**. ***(Greater)***

Mitigation Measure 4.9-h: Ensure that Project Encroachment Does Not Jeopardize Successful Implementation of the NBHCP and Implement Mitigation Measures 4.7-a, 4.8-a, and 4.9-a through 4.9-g

Proposed Action and Levee Raise-in-Place Alternative

Implementing this mitigation measure, and Mitigation Measures 4.7-a, 4.8-a, and 4.9-a through 4.9-g would ensure that the Proposed Action would be implemented in a manner that is consistent with and does not jeopardize successful implementation of the NBHCP. Creating woodland and aquatic movement corridors and other replacement habitats, conducting protocol-level surveys for special-status plants and wildlife, implementing construction in a manner that reduces loss of habitat and direct mortality of species, implementing measures that are part of the NBHCP related to special-status species, and creating and implementing a management plan in consultation with USFWS and DFG would reduce the impact on consistency with the NBHCP to a **less-than-significant** level.

Implementing this mitigation measure, and Mitigation Measures 4.7-a, 4.8-a, and 4.9-a through 4.9-g would partially reduce the impact under the Levee Raise-in-Place Alternative, but not to a less-than-significant level. Because of the likely loss of a substantial amount of nesting habitat for Swainson's hawk, these measures could be insufficient to ensure that the Levee Raise-in-Place Alternative would not jeopardize successful implementation of the NBHCP. Thus, this impact would remain **significant and unavoidable**. ***(Greater)***

4.9.3 RESIDUAL SIGNIFICANT IMPACTS

Under the No-Action Alternative removal of waterside vegetation would have a significant impact on the valley elderberry longhorn beetle and Swainson's hawk nesting. Because mitigation measures cannot be required of the No-Action Alternative, these impacts would remain significant and unavoidable.

In the event of levee failure under the No-Action Alternative, impacts on special-status plant and animal species are uncertain. Because of this uncertainty, these potential impacts are considered too speculative for meaningful consideration. Additionally, mitigation measures cannot be required for the No-Action Alternative; therefore impacts that result from the No-Action Alternative would not be mitigated.

Implementation of the mitigation measures described in this section would ensure that the Proposed Action would not jeopardize successful implementation of the NBHCP and would not result in residual impacts. However, due to the likely loss of a substantial amount of nesting habitat for Swainson's hawk, mitigation measures would be insufficient to minimize impacts of the Levee Raise-in-Place Alternative to a less-than-significant level, resulting in significant and unavoidable impacts. With implementation of the mitigation measures described in this section, the Proposed Action and the Levee Raise-in-Place Alternative would not result in any residual significant impacts related to special-status plants, valley elderberry longhorn beetle, giant garter snake, northwestern pond turtle, or burrowing owl. The residual impacts associated with the Levee Raise-in-Place Alternative on Swainson's hawk and other special-status birds would occur because of the extensive loss of waterside vegetation, the temporal loss of habitat while replacement vegetation matures, and the limited extent of the new plantings that would reduce the value of this replacement habitat to wildlife and bird movement. The creation and preservation of Swainson's hawk nesting and foraging habitat in the Basin included in the Proposed Action would reduce long-term and overall impacts to a less-than-significant level; however, because of the temporal loss of habitat while replacement plantings mature, the short-term residual impacts would remain significant and unavoidable.

5.0 CUMULATIVE AND GROWTH-INDUCING IMPACTS, AND OTHER STATUTORY REQUIREMENTS

5.1 CUMULATIVE IMPACTS

This EIS/EIR provides an analysis of overall cumulative impacts of the Natomas Levee Improvement Program (NLIP) taken together with other past, present, and probable (i.e., reasonably foreseeable) future projects producing related impacts, as required by NEPA implementing regulations (40 Code of Federal Regulations [CFR] 1508.7) and the State CEQA Guidelines (14 California Code of Regulations [CCR] Section 15130). The goal of such an exercise is twofold: first, to determine whether the overall long-term impacts of all such projects would be cumulatively significant; and second, to determine whether the NLIP itself would cause a "cumulatively considerable" (and thus significant) *incremental* contribution to any such cumulatively significant impacts. (See the State CEQA Guidelines [CCR Sections 15064(h), 15065(c), 15130(a), 15130(b), and 15355(b)] and *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 120.) In other words, the required analysis first creates a broad context in which to assess the project's incremental contribution to anticipated cumulative impacts, viewed on a geographic or temporal scale well beyond the project site itself. The analysis then determines whether the project's incremental contribution to any significant cumulative impacts from all projects is itself significant (i.e., "cumulatively considerable" in CEQA parlance).

The Council on Environmental Quality (CEQ) regulations implementing provisions of NEPA define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects can result from individually minor, but collectively significant, actions over time and differ from indirect impacts (40 CFR 1508.8). They are caused by the incremental increase in total environmental effects when the evaluated project is added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can thus arise from causes that are totally unrelated to the project being evaluated, and the analysis of cumulative impacts looks at the life cycle of the effects, not the project at issue.

Cumulative impacts are defined in the State CEQA Guidelines (CCR Section 15355) as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." A cumulative impact occurs from "the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time" (CCR Section 15355[b]).

Consistent with the State CEQA Guidelines (CCR Section 15130[a]), the discussion of cumulative impacts in this EIS/EIR focuses on significant and potentially significant cumulative impacts. The State CEQA Guidelines (CCR Section 15130[b]) state that:

> The discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by the standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact.

This section identifies the resources that would be cumulatively affected by the project in combination with other actions, and assesses the extent of potential cumulative impacts. To frame the discussion of cumulative impacts, a

description of relevant NLIP environmental documents that are incorporated by reference in this EIS/EIR is provided below.

5.1.1 GEOGRAPHIC SCOPE AND TIMEFRAME

The geographic area that could be affected by the proposed project varies depending on the type of environmental issue being considered. When the effects of the proposed project are considered in combination with those other past, present, and future projects to identify cumulative impacts, the other projects considered may also vary depending on the type of environmental effects being assessed. The general geographic area associated with different environmental effects of the proposed project defines the boundaries of the area used for compiling the list of projects considered in the cumulative impact analysis. **Table 5-1** presents the general geographic areas associated with the different resources addressed in this EIS/EIR.

Table 5-1
Geographic Areas that Would Be Affected by the Phase 3 Project

Resource Area	Geographic Area
Agriculture	Natomas Basin, with regional implications
Land use	Not applicable, because the only potential impacts on land use from the project relate to possible inconsistency with adopted land use plans and policies, and inconsistency with policies is not cumulative. Land use is not addressed further in this cumulative impact analysis
Geology and soils	Individual construction sites and other ground disturbance sites within the Natomas Basin
Hydrology	Drainage system on the west and east sides of the Natomas Basin and individual grading sites
Hydraulics	Sacramento River system in the vicinity of Natomas Basin
Groundwater	Natomas Basin
Water quality	Ditches and canals on the west and east sides of the Natomas Basin, with implications for the Sacramento River system in the vicinity of Natomas Basin
Fisheries	Habitat at individual waterside improvement sites, with regional implications for species
Sensitive aquatic habitats	Natomas Basin
Terrestrial biological resources	Natomas Basin, with regional implications
Cultural resources	Individual ground disturbance sites, with regional implications
Paleontological resources	Individual ground disturbance sites within the Natomas Basin
Transportation and circulation	Roadway network in the Natomas Basin, with regional implications
Air quality	Regional (FRAQMD and SMAQMD); global for greenhouse gas emissions
Noise	Immediate vicinity of the individual sites of construction activity
Recreation	Local (facilities near construction sites)
Visual resources	Individual levee improvement sites and landscape level
Utilities and service systems	Local service areas
Hazards and hazardous materials	Individual construction and other ground disturbance sites
Airport safety	Airport
Wildlife hazards	Individual construction sites within the Natomas Basin
Environmental justice	Natomas Basin and affected Tribe

Notes: Airport = Sacramento International Airport; FRAQMD = Feather River Air Quality Management District; NA = not applicable; SMAQMD = Sacramento Metropolitan Air Quality Management District

Source: Data compiled by EDAW in 2008

The timeframe for consideration of cumulative impacts is approximately 30 years, generally consistent with the timeframe for buildout of approved and proposed specific plan development projects in the Natomas Basin.

5.1.2 Approach to Phase 3 Project Cumulative Impact Analyses

The cumulative impact analysis contained in this EIS/EIR incorporates by reference the cumulative impact analyses from previous NLIP environmental documents. Information that was not known at the time of preparation of the earlier documents is also presented in this chapter, as well as any cumulative impacts not previously covered in the earlier documents.

The cumulative impact analysis contained in this EIS/EIR also addresses the potential cumulative effects from the potential overlap of construction of the Phase 2 and Phase 3 Projects. Any overlapping construction of the two project phases would intensify in the event that both phases are constructed simultaneously.

5.1.3 Summary of Cumulative Impact Analyses from Previous Natomas Levee Improvement Program Environmental Documents

This document analyzes Phase 3 of the NLIP Landside Improvements Project (Phase 3 Project), in accordance with the requirements of NEPA and CEQA. Because this document provides project-level analysis that is tiered from previous program-level analysis, relevant material from the previous documents (listed below) is incorporated by reference in accordance with State CEQA Guidelines Section 15150(c). Incorporation by reference is encouraged by both NEPA (40 CFR 1500.4, 1502.21) and CEQA (State CEQA Guidelines Section 15150). Both NEPA and CEQA require brief citation and summary of the referenced material and the public availability of this material. CEQA also requires citation of the state identification number (i.e., State Clearinghouse Number) of the previous EIR or EIRs cited (State CEQA Guidelines Section 15150). Printed copies of relevant documents are available to the public at USACE's office at 1325 J Street, Sacramento, California and at SAFCA's office at 1007 7th Street, 7th Floor, Sacramento, California.

This section summarizes the analysis of cumulative impacts conducted for (1) the funding mechanisms that provide funding for the project, (2) the NLIP as a whole, and (3) Phase 2 of the Landside Improvements Project (Phase 2 Project). The program-level and cumulative impact analyses contained in the following documents are incorporated by reference herein:

- *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (SAFCA 2007a), State Clearinghouse Number 2006072098 (Local Funding EIR);
- *Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project* (SAFCA 2007b), State Clearinghouse Number 2007062016 (Phase 2 Project EIR); and
- *Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project* (USACE 2008) (Phase 2 Project EIS).

In addition to the Phase 3 Project evaluated in this EIS/EIR, the NLIP Landside Improvements Project analyzed in the previous NLIP documents listed above included a programmatic and cumulative impact analysis of all NLIP project phases (1–4). Refer to Chapter 1.0, "Introduction and Statement of Purpose and Need," for a summary of each project phase and **Table 1-3**, which presents the proposed components and construction timing of the NLIP Phase 1, 2, 3, and 4 Projects.

This analysis of cumulative impacts from previous program- and project-level analysis is incorporated by reference to frame the discussion of cumulative impacts for the Phase 3 Project in the following section.

5.1.3.1 Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area (SAFCA 2007a)

Project Impacts that Would Not Be Cumulatively Considerable

In the Local Funding EIR (SAFCA 2007a), SAFCA analyzed the environmental effects associated with the creation of a new assessment district to fund necessary flood damage reduction measures in the Sacramento region. This funding supports projects such as the NLIP, and thus frames, at a programmatic level, the analysis of environmental effects for flood damage reduction projects in the region, including the NLIP (Phases 1–4).

For the following resource areas, SAFCA found that implementation of local funding mechanisms to fund the NLIP, among other projects, would not result in a cumulatively considerable contribution to the following significant impacts because the effects of the proposed project would not be added to the effects of other related projects because the effects were temporary, localized, or isolated:

- **Geology and Soils:** With the application of mitigation measures, temporary, localized soil erosion and topsoil loss resulting from the project's grading and other earthmoving activities would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Hydrology:** Because of the project design, drainage disruption and alteration of runoff patterns from the proposed project would be limited to the project site; therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Water Quality and Fisheries and Aquatic Resources:** Through compliance with the existing regulatory regimes and the implementation of mitigation measures for instream habitat improvements and shaded riverine aquatic (SRA) habitats, the project's impacts to water quality and fish resulting from past and present actions, the creation of an assessment district and subsequent funded improvements, as well as reasonably foreseeable future actions, would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Terrestrial Biological Resources:** SAFCA found that implementation of local funding mechanisms had the potential to contribute to the loss or degradation of sensitive habitats and to adversely affect special-status species (special-status plants, Swainson's hawks, burrowing owls, other nesting raptors, giant garter snakes, valley elderberry longhorn beetle host plants, and others). Because SAFCA would implement avoidance and compensation measures in accordance with the requirements of the Federal Endangered Species Act (ESA), the California Endangered Species Act (CESA), and California Fish and Game Code Section 1602 (Streambed Alteration Agreement), and would include additional habitat protection and enhancement components. The project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Paleontological Resources:** Earthmoving activities resulting from projects funded by creation of local funding mechanisms could damage unknown unique paleontological resources. SAFCA determined the project would not result in a cumulatively considerable contribution to a significant cumulative impact because potential impacts would be located in discrete locations and would be mitigated.

- **Transportation and Circulation:** Construction activities related to levee and channel improvement projects would temporarily increase traffic levels on local and regional roadways, sometimes substantially. Considering that impacts on traffic would be localized, intermittent, and temporary, SAFCA found that projects funded by new local funding mechanisms would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Noise:** Construction noise effects associated with the proposed projects made possible by new local funding were considered to be significant and unavoidable, but because they would be localized, intermittent, and temporary, the incremental effects of the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Recreation:** Impacts on recreation were located primarily related to foreseeable improvements to Folsom Dam. Effects of levee repair and strengthening and of erosion control activities would be limited to localized areas within the Sacramento area, which has an abundance of water-dependent and water-enhanced recreation opportunities. Temporary construction effects and minor permanent impacts would be minimized through replacement of parkway land, design modifications, and coordination with the public and recreation agencies ensuring that any residual effects would be minimized. Therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Utilities and Service Systems:** Implementation of flood damage reduction funded by new local funding mechanisms could result in impacts to utilities and service systems. The effects resulting from temporary disruptions to service would be geographically isolated and short in duration. Therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Hazards and Hazardous Materials:** If hazardous materials are encountered during construction of improvements funded by the new local funding mechanisms, effects would be localized and would not be expected to be additive with the effects of other actions. Therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

Project Impacts that Would Be Cumulatively Considerable

As identified in the Local Funding EIR (SAFCA 2007a), implementation of local funding mechanisms (referred to below as "the project") would result in a cumulatively considerable contribution to significant cumulative impacts for the following resource areas:

- **Agriculture and Land Use:** In combination with the permanent conversions of Important Farmland associated with past, current, and future projects, particularly in the Natomas area, the contribution caused by improvements funded by the project would be significant and unavoidable because there are no feasible means of replacing Important Farmland after it has been converted to nonagricultural uses. For these reasons, the project and related projects would result in a cumulatively considerable (i.e., significant) impact associated with agricultural land conversion, and the project would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

- **Cultural Resources:** SAFCA found that it is likely that known or unknown archaeological resources could be disturbed, and cultural resources damaged or destroyed during project-related construction activities. Significant and unavoidable losses of a unique archaeological resource as defined in Public Resources Code (PRC) Section 21083.2 could occur where excavations encounter archaeological deposits that cannot be removed or recovered (e.g., under levees). Historic resources could also be damaged or require removal from areas near flood damage reduction facilities under levee integrity program activities. If these resources would meet the definition of historical resources as defined in PRC Section 21084.1 or are eligible for listing on the National Register of Historic Places according to Section 106, their modification or destruction would be considered significant. Although mitigation would be implemented to reduce effects on potentially significant cultural resources, significant impacts, particularly on archaeological resources, may still occur. Losses of archaeological resources would add to an historical trend in the loss of these resources as artifacts of cultural significance and as objects of research importance. For these reasons, the project and related projects would result in a cumulatively considerable (i.e., significant) impact associated with cultural resources, and the project would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

- **Air Quality:** The project would fund construction of improvements which would result in significant and unavoidable temporary and short-term construction-related air quality impacts associated with generation of oxides of nitrogen (NO_X) and respirable particulate matter with an aerodynamic diameter of 10 micrometers or less (PM_{10}), even with implementation of mitigation measures. Other medium-sized and large reasonably foreseeable projects, such as the anticipated developments in the Natomas area, would similarly contribute substantially to air quality impacts. Given the large scale of development that is expected in the Natomas Basin alone, as well as the nonattainment status of the Sacramento Valley Air Basin for ozone and PM_{10}, cumulative construction-related air quality impacts are expected to be significant and unavoidable. For these reasons, the project and related projects would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

- **Visual Resources:** Levee improvements in the Natomas area funded by the project would include the removal of trees, other vegetation, and possibly agricultural structures where the levee toe needs to be widened or a berm would be constructed. Bank protection and long-term levee integrity program actions in this area could also require the removal of vegetation and other features that currently add to the rural and riverine character of views in the area. SAFCA found that these changes would contribute to the substantial degradation of scenic resources in Natomas and determined that changes to scenic resources resulting from the proposed project when combined with the past and anticipated future actions would be significant and unavoidable. For these reasons, the project and related projects would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

5.1.3.2 Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project (SAFCA 2007b)

This document analyzed the construction of flood damage reduction measures in the Natomas Basin at a program- and a project-level. The improvements would provide 100-year flood protection while laying the groundwork for creation of "200-year" flood protection over time (SAFCA 2007b).

Project Impacts that Would Not Be Cumulatively Considerable

For the following resource areas, SAFCA found that implementation of the Landside Improvements Project, evaluated in the 2007 Landside EIR (SAFCA 2007b), would not result in a cumulatively considerable contribution to the following significant cumulative impacts because the effects of the proposed project would not be added to the effects of other related projects as the effects were either temporary, localized, or isolated:

- **Geology and Soils:** SAFCA found that through the implementation of Best Management Practices (BMPs) during grading and other earthmoving activities would reduce the temporary and localized soil erosion and topsoil loss to a less-than-significant level. Therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Local Drainage:** The widening of levees and construction of landside seepage berms along the Sacramento River east levee, associated modification of irrigation and drainage infrastructure, and borrow activities on large parcels could interfere with the functioning of drainage systems and alter surface drainage. Project design would incorporate measures to prevent a significant drainage disruption or alteration in runoff patterns, and any temporary effects would be limited to the vicinity of the individual disturbance sites. Therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Water Quality and Fisheries and Aquatic Resources:** Construction activities have the potential to temporarily degrade water quality and fish habitat and populations through the direct release of soil and construction materials into water bodies or the indirect release of contaminants into water bodies through runoff. SAFCA determined that by complying with the regulatory regime and through design features for fish

habitat and SRA habitat that the projects impacts on water quality and fish when added with past, present, and future projects, would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Terrestrial Biological Resources:** Implementation of the proposed project has the potential to contribute to the loss or degradation of sensitive habitats and to adversely affect special-status terrestrial species (special-status plants, valley elderberry longhorn beetle, giant garter snake, Swainson's hawk, burrowing owl, and others). These effects could contribute to species declines and losses of habitat that have led to the need to protect these species under the Federal ESA and CESA. Because SAFCA would implement minimization, avoidance, and compensation measures in accordance with the requirements of ESA, CESA, and other relevant regulatory requirements, and the project would include additional habitat protection and enhancement components, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Paleontological Resources:** Earthmoving activities could damage unknown unique paleontological resources, but potential damage would occur in discrete locations and the significance would be reduced to a less-than-significant level with the incorporation of mitigation measure. Therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Transportation and Circulation:** The proposed construction activities would temporarily increase traffic levels on local and regional roadways. Mitigation would be implemented to reduce effects to the extent feasible, but the proposed project would still result in substantial temporary increases in traffic in relation to the existing traffic load. Because of the limited potential for the traffic associated with the proposed project to combine with increased traffic from other probable future projects, and because of the short-term, intermittent nature of any cumulative traffic impacts, SAFCA determined that the project not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Recreation:** Effects of the proposed project on recreational uses would be limited to potential disturbance of access to facilities in the western part of the Natomas Basin during construction, potential temporary degradation in the quality of recreational experiences as a result of construction activity and noise, and potential removal of land at the City of Sacramento's undeveloped Costa Park site from future recreational use. Because of the temporary nature of the construction effects, these effects are not considered substantial enough to make a cumulatively considerable contribution to a cumulative impact. The potential encroachment on the Costa Park site would be a localized effect that would be offset through compensation in the form of payment or land. Therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Utilities and Service Systems:** SAFCA found that disruption to utilities and services resulting from construction of the landside improvements would be localized and temporary. Therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Hazardous Materials:** With the implementation of mitigation, SAFCA found that the potential exposure of people or the environment to hazardous materials encountered during construction activity or to fire hazards would not expected to be additive with the effects of other past, present, and probable future actions. Therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Hazards Related to Airport Operations:** The potential for night lighting of project areas that would adversely affect aircraft operations is a function of the location of construction areas in relation to the Sacramento International Airport Critical Zone and the runway approaches. There are no other known projects that would affect lands within the Airport Critical Zone. Therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

Project Impacts that Would Be Cumulatively Considerable

As identified in the 2007 Landside EIR (SAFCA 2007b), the Landside Improvements Project (referred to below as "the project") would result in a cumulatively considerable contribution to significant cumulative impacts for the following resource areas:

- **Agricultural Resources:** Implementation of the project would involve the permanent conversion of large acreages of Important Farmland (Prime Farmland and Farmland of Statewide Importance). SAFCA found that the conversion of agricultural land that would result from the project in combination with the past conversions and expected future conversions of Important Farmland in the Natomas Basin would be significant and unavoidable because it is not feasible to replace farmland by creating new farmland after it has been converted to nonagricultural uses. For these reasons, the project and related projects would result in cumulatively considerable (i.e., significant) impact associated with agricultural land conversion, and the project would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

- **Cultural Resources:** SAFCA determined that it is likely that known or unknown archaeological resources could be disturbed and cultural resources damaged or destroyed during construction activities for the proposed project. Historic resources could also be damaged or require removal from areas near flood damage reduction facilities under the proposed project. Losses of archaeological resources would add to a historical trend in the loss of these resources as artifacts of cultural significance and as objects of research importance. Despite the implementation mitigation measures, the project has the potential to result in a significant and unavoidable impact on cultural resources. For these reasons, the project and related projects would result in cumulatively considerable (i.e., significant) impact associated with cultural resources, and the project would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

- **Air Quality:** Probably future projects will contribute to air pollutant emissions in Sutter and Sacramento Counties and to the nonattainment status of the Feather River Air Quality Management District (FRAQMD) and the Sacramento Metropolitan Air Quality Management District (SMAQMD) for ozone and PM_{10}. When taken in total with other projects in the region, the project's construction-related emissions was considered significant and unavoidable cumulatively considerable. For these reasons, the project and related projects would result in cumulatively considerable (i.e., significant) impacts associated with temporary and short-term air quality impacts (ozone and PM_{10}), and the project would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

  In comparison to criteria air pollutants, such as ozone and PM_{10}, carbon dioxide (CO_2) emissions persist in the atmosphere for a much longer period of time. Greenhouse gas (GHG) emissions generated by the proposed project would predominantly be in the form of CO_2. Project construction would result in a net increase in emissions to occur over a period of 3 years (2008–2010), despite the implementation of mitigation measures. While any increase in GHG emissions would add to the quantity of emissions that would contribute to global climate change, it is noteworthy that emissions associated with the proposed project occur over a finite period of time (3 years), as opposed to operational emissions, which would occur over the lifetime of a project. SAFCA determined that the project's incremental contribution to climate change from construction emissions would be significant and unavoidable. For these reasons, the project and related projects would result in cumulatively considerable (i.e., significant) GHG impact and the project would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

- **Noise:** The project would have a temporary significant effect on noise levels experienced by the occupants of residences that are near sites of construction activity or haul routes for construction traffic. In some locations along the Sacramento River east levee, construction work could take place simultaneously as part of the proposed project on the land side of the Sacramento River east levee and/or the west end of the NCC and on the water side of the levee as part of SAFCA's bank protection project. These two projects, if constructed in

the same locations during the same time periods, have the potential to cumulatively affect noise levels at residences on the water side of the levee. SAFCA found that residents in these locations could be exposed simultaneously to increased noise levels from levee improvements on the land side of the levee and bank protection activities on the water side, including during noise-sensitive hours. No feasible mitigation measures are available. For these reasons, the project and related projects would result in cumulatively considerable (i.e., significant) impact associated with noise, and the project would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

- **Visual Resources:** The project would include the removal of trees, other vegetation, and structures from the land side of the Sacramento River east levee within the footprint of the adjacent setback levee and berms, may include the removal of some vegetation and structural encroachments from the water side of the Sacramento River east levee as part of encroachment removal actions, and would include the removal of trees from areas along the water side of the NCC south levee. These changes would contribute to the substantial degradation of scenic resources in Natomas that are expected to result with various reasonably foreseeable development projects and expansion of Airport facilities. Although the project includes the establishment of a substantial acreage of woodland plantings around the basin to offset the significant effect of the project on scenic resources, the contributions of the project to changes in the visual character and scenic resources of Natomas in the near term, before the new plantings become well established, would be cumulatively considerable. This impact, in the near term, would be significant and unavoidable. For these reasons, the project and related projects would result in cumulatively considerable (i.e., significant) impact associated with the degradation of visual resources, and the project would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

5.1.3.3 Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project (USACE 2008)

This document analyzed the environmental effects from SAFCA's Phase 2 Project, for which USACE issued a record of decision (ROD) in January 2009.

Project Impacts that Would Not Be Cumulatively Considerable

For the following resource areas, USACE found that implementation of the NLIP would not result in making a cumulatively considerable contribution to a significant cumulative impact because the effects of the proposed project would not be added to the effects of other projects (i.e., no cumulative impact is expected to occur), or because the contribution of the project would not result in a cumulatively considerable contribution to a significant cumulative impact:

- **Geology and Soils:** Grading and other earthmoving activities could result in temporary, localized soil erosion and topsoil loss. These effects would be site specific, particularly with implementation of construction BMPs and any residual effects are not expected to be additive with the effects of any other activities. USACE determined that the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Local Drainage:** The widening of levees along the Sacramento River east levee, associated modification of irrigation and drainage infrastructure, and borrow activities on large parcels could interfere with the functioning of drainage systems and alter surface drainage. Project design would incorporate measures to prevent a significant drainage disruption or alteration in runoff patterns, and any temporary effects would be limited to the vicinity of the individual disturbance sites. Therefore, USACE determined that the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Water Quality and Fish and Aquatic Habitat:** The project would have the potential to degrade water quality and fish habitat by releasing soil and construction materials into directly into water bodies or through runoff. Implementation of BMPs and a storm water pollution prevention plan would ensure that these impacts are less than significant and would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Groundwater:** USACE found that Phase 2 improvements would not have a significant effect on groundwater; however, Phase 3 and Phase 4 improvements have the potential to result in significant impacts on groundwater recharge. USACE further found that it would be unlikely that other projects described above would substantially adversely affect groundwater recharge, although as lands are converted from agricultural use to developed uses, some reduction in groundwater recharge from deep percolation of irrigation water can be expected. Mitigation measures require SAFCA to remediate direct and significant cumulative effects; therefore, this impact would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Sensitive Aquatic Habitats:** The project would include excavation and the placement of fill in sensitive aquatic habitats, resulting in both temporary and permanent effects. With the exception of TNBC-managed lands and Airport mitigation sites that have been developed in the last decade, the overall trend in wetlands and other aquatic habitats within the Natomas Basin is a reduction in acreage and habitat values. Because the project would include the creation of acreages of waters of the United States that are expected to more than offset the filling and dewatering of waters of the United States included in the project, and because new jurisdictional habitats would be created and managed in a manner that minimizes maintenance disturbance and provides the essential functions of the habitats that would be lost, USACE determined that overall effects of the project would be beneficial. Therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Terrestrial Biological Resources:** Implementation of the project has the potential to contribute to the loss or degradation of sensitive habitats and to adversely affect special-status terrestrial species (special-status plants, valley elderberry longhorn beetle, giant garter snake, Swainson's hawk, burrowing owl, and others). SAFCA determined that implementation of project components and mitigation measure would similarly ensure that potential adverse effects on other special-status species and on sensitive habitats are reduced to a less-than-significant level. Therefore, USACE determined that the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Paleontological Resources:** Earthmoving activities could damage unknown unique paleontological resources, but potential damage would be limited by mitigation and would be limited to individual resources in discrete locations. USACE determined that the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Transportation and Circulation:** Effects of construction activities on emergency access would be site-specific, intermittent, and temporary, and are not expected to be cumulatively considerable. The proposed construction activities would temporarily increase traffic levels on some local and regional roadways, but the majority of truck trips would take place off of public roads. In general, the temporary traffic increases associated with the proposed action would be limited to specific roadways. There are no other anticipated projects in the vicinity of the project that are likely to compound the significant temporary traffic effects of the project. Because of the limited potential for the traffic associated with the project to combine with increased traffic from other future projects, and because of the short-term, intermittent nature of any effects, USACE determined that the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Noise:** The project would have a significant effect on noise levels experienced by the occupants of residences that are near sites of construction activity or haul routes for construction traffic. However, there are no other

known projects in the vicinity of proposed project activity (borrow sites, rural roadways, and levee and canal construction areas) that would generate noise levels noticeably above ambient noise levels, which are generated by sources that include aircraft operations, truck traffic on area roadways, and agricultural activity. Therefore, the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Recreation:** Effects of the proposed project on recreational uses would be limited to potential disturbance of access to facilities in the western part of the Natomas Basin during construction, potential temporary degradation in the quality of recreational experiences as a result of construction activity and noise, and potential removal of land at the City of Sacramento's undeveloped Costa Park site from future recreational use. USACE determined that the construction effects and access restrictions or degradation of the quality of recreational experiences would be temporary and therefore not cumulatively considerable. Potential encroachment on the Costa Park site would be a localized effect that would be offset through compensation in the form of payment or land. USACE determined there would be USACE determined that the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Utilities and Service Systems:** Construction may damage irrigation systems and public utility infrastructure, resulting in temporary disruptions to service. Coordination with irrigation system users and consultation with service providers and implementation of appropriate protection measures would minimize the possibility that any significant effect would occur. Any such incidents would be isolated and would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Hazardous Materials:** Mitigation would be implemented to minimize the potential for exposure of people or the environment to hazardous materials encountered during construction activity or to fire hazards. If hazardous materials are encountered or a fire outbreak occurs, the effects would be localized and would not be expected to be additive with the effects of other projects. USACE determined that the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Hazards Related to Airport Operations:** The potential for night lighting of project areas to affect aircraft operations is a function of the location of construction areas in relation to the Airport Critical Zone and the runway approaches. Potential effects would be reduced through lighting restrictions and coordination with the Sacramento County Airport System (SCAS). The project has the possibility of causing increased bird strikes resulting from broad changes to managed land cover types in or near the Airport Critical Zone. There are no other known projects that would affect lands within the Airport Critical Zone. USACE found that the project would not result in a cumulatively considerable contribution to a significant cumulative impact.

Project Impacts that Would Be Cumulatively Considerable

As identified in the Phase 2 EIS (USACE 2008), the NLIP (referred to below as "the project") would result in a cumulatively considerable contribution to significant cumulative impacts for the following resource areas:

- **Agricultural Resources:** Implementation of the project would involve the conversion of large acreages of Important Farmland (Prime Farmland and Farmland of Statewide Importance) to managed marsh and managed grassland at borrow sites, and would entail the conversion of portions of agricultural parcels to nonagricultural uses at levee toe widening, berm, and new canal alignment locations. The proposed project would result in the conversion of agricultural land to non-agricultural uses and, in combination with the conversions of Important Farmland in the Natomas Basin associated with past, current, and probable future projects. For these reasons, USACE determine that the project and related projects would result in cumulatively considerable (i.e., significant) impact associated with agricultural land conversion, and the project would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

- **Cultural Resources:** Prehistoric human habitation sites are common in riverbank and floodplain areas, and burial sites are often encountered in the course of ground-disturbing activities. It is likely that known or unknown archaeological resources could be disturbed and cultural resources damaged or destroyed during construction activities for the project. Losses of a unique archaeological resource could occur where excavations encounter archaeological deposits that cannot be removed or recovered (e.g., under levees), or where recovery would not be sufficient to prevent the loss of significance of the cultural materials. Historic resources could also be damaged or require removal from areas near flood damage reduction facilities under the proposed project. If these resources would be eligible for National Register of Historic Places (NRHP) listing, their modification or destruction would be considered significant. Although mitigation would be implemented to reduce effects on potentially significant cultural resources, adverse effects, particularly on archaeological resources, may still occur. Losses of archaeological resources would add to a historical trend in the loss of these resources as artifacts of cultural significance and as objects of research importance. For these reasons, despite the implementation of mitigation measures, USACE determined that the project and related projects would result in cumulatively considerable (i.e., significant) impact associated with cultural resources, and the project would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

- **Air Quality:** Future projects will contribute to air pollutant emissions in Sutter and Sacramento Counties and to the nonattainment status of the FRAQMD and the SMAQMD for ozone and respirable particulate matter 10 micrometers or less (PM_{10}). The project would cause an impact to air quality through construction emissions. For these reasons, USACE determined that the project and related projects would result in cumulatively considerable (i.e., significant) impact associated with temporary with short-term construction-related ozone and PM_{10} emissions, and the project would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

  In comparison to criteria air pollutants, such as ozone and PM_{10}, CO_2 emissions persist in the atmosphere for a much longer period of time. GHG emissions generated by the proposed project would predominantly be in the form of CO_2. Project construction would result in a net increase in emissions to occur over a period of 3 years (2008–2010), despite the implementation of mitigation measure. Because of the intensity and duration of construction activities, and the lack of available mitigation measures to abate GHG emissions from heavy-duty construction equipment exhaust and on-road hauling emissions, the project's construction emissions would be significant and unavoidable with respect to climate change. For these reasons, USACE determined that the project and related projects would result in cumulatively considerable (i.e., significant) impact associated with GHGs, and the project would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

- **Visual Resources:** The project would include the removal of trees, other vegetation, and structures from the land side of the Sacramento River east levee within the footprint of the adjacent setback levee and berms, may include the removal of some vegetation and structural encroachments from the water side of the Sacramento River east levee as part of encroachment removal actions, and would include the removal of trees from areas along the water side of the NCC south levee. The additional levee and bank protection improvements needed to achieve a "200-year" level of flood protection in the Natomas Basin along with SAFCA's proposed levee integrity program would also require the removal of vegetation and other features that currently add to the rural and riverine character of views in the area. These changes would contribute to the substantial degradation of scenic resources in Natomas that are expected to result with various development projects and expansion of Airport facilities. Although the project includes the establishment of a substantial acreage of woodland plantings around the basin to offset the significant effect of the project on scenic resources (oak and other native trees), the plantings would require several years to become well established. For these reasons, USACE determined that the project and related projects would result in cumulatively considerable (i.e., significant) impact associated with changes in visual character and scenic resources, and the project would

result in a cumulatively considerable incremental contribution to this cumulatively significant impact in the Natomas Basin in the near term.

5.1.4 SAFCA NATOMAS LEVEE IMPROVEMENT PROGRAM

The SAFCA NLIP includes:

- NLIP Natomas Cross Canal South Levee Phase 1 Improvements;
- Post-2010 NLIP Seepage Remediation Projects;
- NLIP Bank Protection Project (2007 Landside EIR)/Erosion Control Projects (Phase 2 EIS);
- Phase 3 Project Section 408 Permission (the subject of this EIS/EIR); and
- Phase 4 Project Section 408 Permission (the subject of a future, separate EIS/EIR).

5.1.4.1 Potential Simultaneous Construction of the Phase 2 and Phase 3 Projects

The Phase 2 Project was analyzed in the Phase 2 Landside EIR, Phase 2 Supplemental EIR, and the Phase 2 EIS (see Section 1.5.4.2, "Phase 2 Project"), and the environmental impacts of the Phase 2 Project are summarized in **Table 2-2** in Section 2.2.2, "No-Action Alternative—NLIP Phase 2 Project Implementation Only." As noted in the above-referenced sections, the Phase 2 Project could be constructed on a stand-alone basis, assuming no further action on the balance of the NLIP is taken. Construction of the Phase 2 Project is planned to begin in early 2009, assuming receipt of all required environmental clearances and permits. Because the Phase 2 Project EIS process was lengthier than originally anticipated, most of Phase 2 Project construction, which was originally planned for 2008, was pushed out to 2009, which then could coincide with construction of the Phase 3 Project. The potential overlap of construction of the Phase 2 and 3 Projects could intensify some of the impacts analyzed in this EIS/EIR. The Phase 2 Project is included as a reasonably foreseeable project in the cumulative impacts for analysis of the Phase 3 Project in combination with other past, present, and probable future actions. **Table 5-2** lists the impacts that overlapped construction would intensify in the event that both the Phase 2 and 3 Projects are constructed simultaneously, and summarizes the effect of this overlap. Quantitative analysis of potential air quality impacts resulting from this concurrent construction is provided in Section 4.13, "Air Quality," in Chapter 4.0, "Environmental Consequences and Mitigation Measures."

5.1.4.2 Phase 4 Project

The set of documents incorporated by reference above includes the program-level analysis of the Phase 4 Project, as discussed most recently in the Phase 2 Project EIS (USACE 2008) and the 2007 Landside EIR (SAFCA 2007b). As a component of the NLIP, the Phase 4 Project is a reasonably foreseeable future project. Impacts related to the Phase 4 Project were addressed, in combination with the Phase 3 Project, at a programmatic level in the Phase 2 Project EIS. **Table 5-3** summarizes the potential impacts that would result from implementation of the Phase 4 Project. These impacts would be associated with both the Proposed Action and the Levee Raise-in-Place Alternative.

Table 5-2
Summary of Impacts of Overlapping Construction of the Phase 2 and Phase 3 Projects

Phase 3 Project Impact (and Significance Conclusion)	Effect on Impact from Overlapping Construction	Mitigation Measures and Residual Significance
Impact 4.9-f: Impacts on Swainson's Hawk and Other Special-Status Birds(Significant and Unavoidable)	Visual and noise disturbance of active nests could be increased where the Phase 2 and Phase 3 Projects are adjacent to each other in Reaches 4B–6B of the Sacramento River east levee, or in the event that the Phase 3 Project haul trucks transport soil material from borrow sites north of West Elverta Road past the Phase 2 Project construction sites along the Sacramento River east levee. The potential effects on nesting of special-status birds from overlapping construction are speculative in nature, but this possible occurrence would tend to intensify this impact, which would remain significant and unavoidable.	Mitigation Measure 4.9-e: Minimize Potential Impacts on Swainson's Hawk and Other Special-Status Bird Species Foraging and Nesting Habitat, Monitor Active Nests during Construction, Develop and Implement a Management Plan in Consultation with DFG, Obtain Incidental Take Authorization, and Implement Mitigation Measure 4.8-a, "Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Loss of Quantity and Quality of Habitat, Implement all Agreements, and Comply with the DFG Section 1602 Permit Process." Even with mitigation, this impact would remain significant and unavoidable.
Impact 4.9-g: Impacts on Burrowing Owl (Less than Significant with Mitigation Incorporated)	Same as above for Impact 4.9-f.	Mitigation Measure 4.9-e: Minimize Potential Impacts on Burrowing Owls and Relocate Owls as Needed. Implementing this mitigation would reduce the loss of nesting habitat and direct mortality, and the impact would be less than significant.
Impact 4.12-a: Temporary Increase in Traffic on Local Roadways (Significant and Unavoidable)	Traffic on some haul routes, such as West Elverta Road, may be increased in the event that haul trucks transporting soil material for both the Phase 2 and Phase 3 Projects use the Dunmore borrow site at the same time. This impact would be significant and unavoidable.	Mitigation Measure 4.12-a: Prepare and Implement a Traffic Safety and Control Plan. Even with mitigation, this impact would remain significant and unavoidable.
Impact 4.13-a: Temporary Emissions of ROG, NO_X, and PM_{10} during Construction (Significant and Unavoidable)	The combination of construction equipment from the Phase 2 and Phase 3 Projects operating simultaneously would generate greater total emissions compared to the emissions generated by construction of a single Phase 2 or 3 Project. See Section 4.13, "Air Quality," for quantitative analysis. This impact would be significant and unavoidable.	Mitigation Measure 4.13-a: Implement District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO_X, and PM_{10} during Construction. Even with mitigation implementation, this impact would remain significant and unavoidable.
Impact 4.13-b: General Conformity with the Applicable Air Quality Plan (Less than Significant with Mitigation Incorporated)	Construction-generated emissions were estimated under the worst-case assumption that the Phase 2 and Phase 3 Projects would be constructed in the same year. See Section 4.13, "Air Quality," for quantitative analysis. This impact would be potentially significant.	Mitigation Measure 4.13-a: Implement District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO_X, and PM_{10} during Construction. Implementing this mitigation would reduce emissions below the Federal *de minimis* thresholds, and the impact would be less than significant.

ROG = reactive organic gases; NO_X = oxides of nitrogen; PM_{10} =respirable particulate matter with an aerodynamic diameter of 10 micrometers or less

Source: Data compiled by EDAW in 2008 and 2009

Table 5-3
Summary of Phase 4 Project (Program-Level) Impacts

Topic Area	Impact Summary
Agricultural Resources	An estimated 124 acres would be converted in the footprint of flood damage reduction facilities, adjacent land for maintenance access, and prevention of encroachment into the flood damage reduction system along the Sacramento River. Approximately 115 acres in the Fisherman's Lake area would be converted from agricultural use to marsh habitat and potentially an additional 75 acres converted to woodland habitat. Phase 4 would also result in permanent agricultural conversion impacts similar to Phase 3.
Land Use	Because analysis of consistency with land use plans is analyzed in terms of the entire Landside Improvements Project, the consistency of the Phase 4 Project would be the same as those of the Phase 3 Project.
Geology and Soils	Because the Phase 4 Project would involve the same types of construction activities as the Phase 3 Project, the potential for localized soil erosion would be similar.
Hydrology and Hydraulics	The hydraulic effects of the Phase 4 Project would be the same as those of the Phase 3 Project. In terms of effects to local drainage, Phase 4 Project construction would involve relocation of the Riverside Canal and improvements to the West Drainage Canal south of I-5, relocation of private irrigation and drainage canals in the footprint of levee improvements, and post-excavation grading of additional borrow sites. Detailed plans for these elements are still under development; however, their construction would cause temporary disruption of drainage and permanently alter drainage patterns.
Water Quality	Because the Phase 4 Project elements would involve ground-disturbing activities, the impact of this phase in terms of temporary effects on water quality from construction would be similar to those of the Phase 3 Project. Water quality effects could also result from outfalls draining stormwater runoff from Garden Highway to the Sacramento River between Reaches 9 and 11B. The Phase 4 Project would also include relief wells along the Sacramento River east levee at various locations. The specific locations of these wells have not been determined; however, the potential effects on groundwater quality would be similar to those of the Phase 3 Project.
Fish and Aquatic Habitat	The Phase 4 Project would involve construction activities along the Sacramento River east levee, American River north levee, and the northern portion of the NEMDC that could temporarily impair water quality if disturbed and eroded soil is discharged into receiving waters. Because Phase 4 construction activities are not planned to take place on the water side of the Sacramento River (other than drainage outfall construction), American River, or NEMDC, shaded riverine aquatic habitat is not expected to be affected.
Sensitive Aquatic Habitats	The Phase 4 Project would affect approximately 13 acres of jurisdictional waters of the United States. These impacts would occur as a result of construction of the Sacramento River east levee improvements in Reaches 10–20A, relocation of the Riverside Canal, and modifications to the Airport West Ditch.
Vegetation and Wildlife	Approximately 39 acres of woodland on the land side of the Sacramento River east levee would be removed in Reaches 10–20A of the Sacramento River east levee to make way for flood damage reduction measures. Up to 15 acres of woodland habitat would be removed on the water side of the Sacramento River east levee to comply with USACE levee management requirements. Additional project detail will be required to assess the potential impact on woodland habitat as a result of seepage remediation on the north levee of the American River.
Special-Status Terrestrial Species	Disturbance of suitable habitat for special-status terrestrial species with implementation of the Phase 4 Project could result in temporary loss of individual plants and animals, but populations would persist if habitat suitability and value are maintained. Permanent loss of habitat could result in permanent loss of special-status plant populations or portions of populations, if present. Surveys for special-status species within the Phase 4 Project area will be conducted in 2009, and potential site-specific impacts will be further evaluated in subsequent NEPA and CEQA documentation.
Cultural Resources	The Phase 4 Project includes the adjacent setback levee and seepage remediation in Reaches 10–20A of the Sacramento River east levee and seepage remediation in Reaches 1–4 of the American River north levee and in the NEMDC north of Elkhorn Boulevard. Surveys in these areas have not yet been conducted, and detail engineering has yet to be completed. However, Phase 4 construction may affect several prehistoric sites, damage previously undiscovered cultural resources, or unearth, damage, or destroy human remains.

Table 5-3
Summary of Phase 4 Project (Program-Level) Impacts

Topic Area	Impact Summary
Paleontological Resources	Areas in the Fisherman's Lake area overlie the Riverside and/or Modesto Formations, which may contain unique paleontological resources. Evaluation of specific borrow sites in this area is ongoing. However, use of this area for borrow material for Phase 4 could potentially disturb these resources.
Transportation and Circulation	Phase 4 Project construction details are still being developed. It is estimated that up to 700 trips per day could occur during construction along the Sacramento River east levee in Reaches 10–20. However, because most of these trips would take place off public roadways, a significant impact on traffic and circulation is not expected as part of the Phase 4 Project.
Air Quality	Because air quality emissions are modeled based on activities that would occur on a worst-case day, it is anticipated that emission levels that would occur during construction of the Phase 4 Project would be similar to those for the Phase 3 Project.
Noise	Residents living along the Sacramento River east levee in Reaches 10–20A could be exposed to temporary, short-term construction noise that exceed the applicable daytime and nighttime standards for non-transportation sources. Noise levels generated by Phase 4 Project truck trips are expected to be similar to Phase 3 Project noise levels, depending upon the number of haul trips that are determined to be necessary following detailed engineering of Phase 4 Project elements.
Recreation	For the Phase 4 Project, recreational use public facilities in Reaches 19A–20A of the Sacramento River east levee would potentially be affected by nearby construction. Use of the Bannon Creek Preserve, located near project construction activities along the American River north levee, may be adversely affected by construction noise and dust. Phase 4 Project construction activities would disrupt use of and may require demolition of the on and off-street bicycle trail located along Garden Highway between Northgate Boulevard and Gateway Oaks Drive.
Visual Resources	The Phase 4 Project would involve permanent tree losses along the Sacramento River east levee in Reaches 10–20 and along the north levee of the American River and northern portion of the NEMDC. Greater project-level detail will be required to quantify this impact. Because this phase would also involve the same types of construction activities as the Phase 3 Project, temporary visual degradation and light and glare impacts would be similar.
Utilities and Service Systems	The Phase 4 Project includes the adjacent setback levee and seepage remediation in Reaches 10–20A of the Sacramento River east levee and seepage remediation in Reaches 1–4 of the American River north levee and on the NEMDC west levee north of Elkhorn Boulevard. Encroachment removal in Sacramento River east levee Reach 20B could impact utilities. Construction activities could damage infrastructure, causing interruptions of water supply and utilities services. Generation of solid waste from project construction would be similar to that of the Phase 3 Project.
Hazards and Hazardous Materials	Previously unknown or undocumented hazardous materials could be present in construction areas, including the identified potential borrow sites or properties that have not yet been specifically identified for use as borrow sources for construction as part of the Phase 4 Project. Excavation at or near areas of currently unrecorded soil and/or groundwater contamination could result in the exposure of construction workers, the general public, and the environment to hazardous materials.
Airport Safety	Part of the Fisherman's Lake area, which would provide borrow material for the Phase 4 Project, is near the aircraft landing approaches for, or is directly north or south of, the Airport runways. Extensive night lighting of construction work and security lighting of construction staging areas at night within these areas could interfere with nighttime aircraft landing operations and create a safety hazard related to aircraft landings. Removal of the irrigation function of the Airport West Ditch and most of its drainage function as part of the Phase 4 Project would reduce hazardous wildlife use of ditches in the Airport Operations Area.
Wildfire Hazards	The Phase 4 Project would be constructed in areas of similar risk for wildland fires as with the Phase 3 Project. Because construction equipment or construction practices would also be similar, Phase 4 Project could ignite fires that may result in wildland fires.

Notes:
Airport = Sacramento International Airport; CEQA = California Environmental Quality Act; I-5 = Interstate 80; NEMDC = Natomas East Main Drainage Canal; NEPA = National Environmental Policy Act; USACE = U.S. Army Corps of Engineers
Source: Data compiled by EDAW in 2008

5.1.5 RELATED PROJECTS IN THE NATOMAS BASIN

Present and probable future projects, as described in both the 2007 Landside EIR and Phase 2 EIS, are those projects that are currently under construction or are in various stages of advanced planning but that have yet to initiate construction. Some of these projects are planned to be under construction during the period in which SAFCA's Proposed Action would be under construction (anticipated 2009–2010), while others are expected to be developed after 2010. These projects are organized into five categories, as organized in the previous environmental documents:

- SAFCA Natomas Levee Improvement Program elements,
- other flood damage reduction system improvements,
- Sacramento International Airport Master Plan,
- development projects, and
- utility infrastructure projects.

The related projects included in the previous documents are listed below by category. Since preparation of the earlier documents, a few additional related projects have become reasonably foreseeable. Those new projects are described in detail below. Those projects in which there have been no substantial changes are only listed.

5.1.5.1 SAFCA Natomas Levee Improvement Program

The elements of the SAFCA NLIP are listed above under Section 5.1.4.

5.1.5.2 Other Flood Damage Reduction System Improvements

Other flood damage reduction system improvement projects previously addressed include:

- SAFCA Levee Integrity Program: As part of its long-term program to improve the Natomas Basin levee system, SAFCA expects to continue waterside and landside levee strengthening efforts, including increasing bank protection, levee armoring, levee toe stabilization, and flattening of landside levee slopes. Specific construction activities are not yet planned, designed, or funded, and their timing is not known.

- California Department of Water Resources/U.S. Army Corps of Engineers Repairs to Critical Erosion Sites: On February 24, 2006, Governor Arnold Schwarzenegger declared a state of emergency for California's levee system. Soon after, he signed Executive Order S-01-06, directing the California Department of Water Resources to identify and repair eroded levee sites on the State/Federal levee system to prevent catastrophic flooding and loss of life. To date, nearly 250 levee repair sites have been identified, and more than 100 of the most critical sites have been completed. Two of these sites are along the bank of the Sacramento River east levee between the NCC and the American River. Rock toe protection has been installed at these sites. These improvements do not overlap temporally with construction for the Proposed Action and alternatives under consideration.

The following flood damage reduction system improvement project was not previously addressed:

SAFCA and Sacramento International Airport Land Swap: SAFCA could enter into an agreement with the Airport to swap lands. The ultimate goal would be to improve land uses on Airport land according to the Airport's draft *Wildlife Hazard Management Plan* (WHMP). The lands and agreement in question, while not finalized, are anticipated to consist of approximately 50–100 acres within the Airport's Critical Zone that is currently owned by SAFCA, which would be swapped with lands in Sutter County outside the Critical Zone currently owned by the Airport/Sacramento County. It is reasonably foreseeable that if the land swap is implemented at some point, bringing the lands within the Critical Zone into compliance with the WHMP

would potentially result in the loss of agricultural production and foraging habitat for the Swainson's hawk, a state-listed species. This would be considered an action by the Airport and not SAFCA. However, SAFCA would likely create or preserve foraging or nesting habitat (woodlands) on the lands that it acquires in Sutter County should the NLIP Phase 4 Project and subsequent impacts require that mitigation. The land swap is currently anticipated to take place concurrent with construction of the Phase 4 Project; however, it is not dependent on the Phase 4 Project construction schedule, and would be analyzed in separate environmental documentation and permitted separately when the agreement between the SAFCA and the Airport is finalized.

5.1.5.3 Sacramento International Airport Master Plan

The Sacramento International Airport Master Plan (SCAS 2007) phases previously addressed in the documents listed under Section 5.1.3 include:

- SMF Master Plan Phase 1 (2007–2013),
- SMF Master Plan Phase 2 (2014–2020), and
- SMF Master Plan Phase 3 (After 2020).

5.1.5.4 Development Projects

The following development projects that were previously addressed in the documents listed under Section 5.1.3 include:

- Camino Norte Project,
- Greenbriar,
- Sutter Pointe Specific Plan, and
- Metro Airpark Specific Plan.

The following development projects that were not previously addressed include:

- Natomas Panhandle Annexation: The City of Sacramento is the process of processing a proposal to annex a strip of land (approximately 595 acres) located adjacent to the eastern edge of the NNCP area. Specifically, the area is located north of Del Paso Road, south of Elkhorn Boulevard, west of East Levee Road and Sorento Road, and east of the North Natomas Community Plan area. This area is proposed to be developed as a Planned Unit Development with a variety of low-, medium-, and high-density residential uses (total of 3,075 residential units), commercial uses, an elementary school, a middle/high school, and recreation and park spaces. Streets, water and sewer lines, and drainage facilities would be installed as part of the proposed development.

- West Lakeside: As detailed in the Memorandum of Understanding for the Natomas Joint Vision , the City of Sacramento has been identified as the appropriate agent for planning new growth in Natomas (City of Sacramento and County of Sacramento 2002). An application for development within the Joint Vision area is on file for the West Lakeside project, but there has been no recent activity on the application. The Natomas Unified School District is currently proposing a high school on the site. No other applications for the Joint Vision area have been filed and its future development potential is in the early consideration stage by the City of Sacramento and Sacramento County.

5.1.5.5 Utility Infrastructure Projects

The following utility infrastructure projects were previously addressed in the documents listed under Section 5.1.3:

- American Basin Fish Screen Habitat Improvement Project,
- Western Area Power Administration Transmission Line/Sacramento Area Voltage Support Project,
- Placer Parkway Corridor Preservation Project,
- Downtown-Natomas-Airport Light Rail Transportation Project,
- Sacramento Municipal Utility District Power Line–Elkhorn Substation Capacity Expansion Project,
- Sacramento River Water Reliability Study, and
- Upper and Lower Northwest Interceptor Projects.

5.1.6 PROJECTS REQUIRING USACE 33 UNITED STATES CODE 408 AUTHORIZATION

As described previously in Chapter 1.0, "Introduction and Statement of Purpose and Need," to implement the Proposed Action, SAFCA is requesting permission from USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (Title 33 of the United States Code, Section 408 [33 USC 408]), hereinafter referred to as "Section 408," to alter a Federal project levee. There are other projects in the Sacramento and San Joaquin River systems where USACE has completed Section 408 authorizations, is currently processing requests for Section 408 authorizations, or expects to receive requests for Section 408 authorizations in the near future. These projects are listed below in **Table 5-4**.

5.1.7 CUMULATIVE IMPACT ANALYSIS: PROJECT IMPACTS THAT WOULD NOT BE CUMULATIVELY CONSIDERABLE

This section describes cumulative effects of all past, present, and probable future projects in relation to SAFCA's Phase 3 Project that were found to not be cumulatively considerable. This analysis includes SAFCA and non-SAFCA projects. For the following resource areas, the Proposed Action and the Levee Raise-in-Place Alternative would not be expected to make a cumulatively considerable contribution to an impact because it is expected that the project impacts would not be added to the impacts of other projects (i.e., no cumulative impact is expected to occur), or because the proposed project's contribution to any potential cumulative impact would be isolated or very minor and not cumulatively considerable.

- **Geology and Soils:** Grading and other earthmoving activities could result in temporary, localized soil erosion and topsoil loss. These site-specific impacts would be less-than-significant, with implementation of construction BMPs (Mitigation Measure 4.3-a), and any residual impacts are not expected to be additive with the effects of any other activities. Each project would implement construction BMPs. Therefore, implementation of the proposed project and related projects would not result in a cumulatively considerable contribution to a significant cumulative impact on geology and soils because the impact would be temporary and soil erosion and loss of topsoil would be localized.

Table 5-4
Other Section 408 Projects

Flood Damage Reduction Project or System	Project Title	Lead Agency/Agencies	Status of Section 408 Request
Previously Completed Section 408 Authorizations			
Sacramento River Flood Control Project	Feather River Segment 1 and 3 Improvements	Three Rivers Levee Improvement Authority	Section 408 request already approved
Sacramento River Flood Control Project	Feather River Segment 2 Improvements	Three Rivers Levee Improvement Authority	Section 408 request already approved
Sacramento River Flood Control Project	Natomas Cross Canal and Sacramento River modifications – Phase 2 Project	SAFCA	Section 408 request already approved
Ongoing Section 408 Reviews			
Sacramento River Flood Control Project	Natomas Levee Improvement Program (project evaluated in this EIS/EIR) – Phase 3 Project	SAFCA	Section 408 request under review
Anticipated Future Section 408 Requests			
Sacramento River Flood Control Project	Setback Levee at Star Bend	Levee District No. 1	Winter 2009
Sacramento River Flood Control Project	2008-2009 Improvements	West Sacramento Flood Control Agency	Fall 2009
Sacramento River Flood Control Project	2009-2011 Improvements	West Sacramento Flood Control Agency	Winter 2010
San Joaquin River Flood Control System	Implementation Repairs (San Joaquin)	Reclamation District 17	2009
San Joaquin River Flood Control System	Urban Protection Project	Reclamation District 17	2011
San Joaquin River Flood Control System	Implementation Project (Calaveras)	San Joaquin Area Flood Control Agency	2009
San Joaquin River Flood Control System	Urban Protection Project	San Joaquin Area Flood Control Agency	2011
San Joaquin River Flood Control System	River Islands Levee Alteration	City of Lathrop	Winter 2010
San Joaquin River Flood Control System	Urban Protection Project	Reclamation District 404	2009
San Joaquin River Flood Control System	Urban Protection Project	Reclamation District 404	2011

Source: Compiled by EDAW in 2008 and 2009

- **Hydrology and Hydraulics (Excluding Groundwater):** As discussed in Section 4.4, "Hydrology and Hydraulics," and in **Appendix B1**, a hydraulic impact analysis was performed to analyze the cumulative impacts of combining the Proposed Action with federally authorized "early implementation" improvements to Folsom Dam and improvements to the Sacramento River Flood Control Project's (SRFCP's) urban levees aimed at providing urban areas outside the Natomas Basin with "200-year" flood protection. The project would not significantly alter water surface elevations in the project area or in the larger SRFCP, or contribute cumulatively to any such alteration. The widening of levees along the Sacramento River east levee, associated modification of irrigation and drainage infrastructure, and borrow activities on large parcels could interfere with the functioning of drainage systems and alter surface drainage. Project design would incorporate measures to prevent a significant drainage disruption or alteration in runoff patterns (Mitigation Measure 4.4-b), and any temporary impacts would be limited to the vicinity of the individual disturbance sites. Each related project that would discharge stormwater runoff would also be required to comply with NPDES discharge permits from the Central Valley RWQCB, which are designed to prevent significant water quality-related impacts. Therefore, implementation of the proposed project and related projects would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Groundwater:** The evaluation of potential groundwater impacts prepared by Luhdorff & Scalmanini Consulting Engineers (LSCE) investigated the impacts of the Proposed Action, in combination with existing and projected land and water use changes in the Natomas Basin and on the Basin's groundwater budget (see **Appendix B2** for the full report). The impacts of the Proposed Action include reduction in irrigated lands covered by the footprint of the proposed levee improvements, increase in recharge from the proposed canal improvements, and changes in land use and irrigation practices following excavation of soil and reclamation of the potential borrow sites. Without the Proposed Action, the simulation results show a reduction in groundwater storage of 4,971 acre-feet per year (afy) in the Natomas Basin. With the Proposed Action, the decrease in groundwater storage would be slightly smaller (4,248 afy). Subsurface outflow from the Natomas Basin to the east would decrease slightly (from 21,738 afy to 21,118 afy) as a result of the Proposed Action. Overall, the Proposed Action would have a small positive impact on groundwater supplies in the Natomas Basin and a small negative impact on groundwater east of the Natomas Basin based on existing conditions.

  The results of the 2030 simulation without the Proposed Action show a positive change in groundwater storage in the Natomas Basin of 1,572 afy. With the Proposed Action, this positive change would be reduced slightly to 1,527 afy. The proposed cutoff walls would cause a small increase in groundwater outflow (from 1,200 to 1,238 afy). Overall, the cumulative impact of the Proposed Action on future groundwater conditions is predicted to be negligible. The cumulative contribution of the Levee Raise-in-Place Alternative to cumulative impacts on groundwater would be similar to that of the Proposed Action. Therefore, neither the Proposed Action nor the Levee Raise-in-Place Alternative would result in a cumulatively considerable contribution to a significant cumulative impact.

- **Sensitive Aquatic Habitats:** With the exception of TNBC-managed lands and Airport mitigation sites that have been developed in the last decade, the overall trend in wetlands and other aquatic habitats within the Natomas Basin is a reduction in acreage and habitat values. As described in the NBHCP, approximately one-fourth to one-fifth of the 53,000-acre Basin contained areas of seasonal open water or riparian scrub historically, as indicated by 1908 mapping. Since 1914, land reclamation and reclamation facilities, canals, levees, and pumping stations have allowed over 80% of the Basin to be converted to agricultural production, with irregular small-scale topographic features of the earlier landscape having largely been eliminated by agriculture. As part of this conversion, the drainage pattern of the Basin was altered to collect runoff into canals, from which it is pumped into the surrounding canals and Sacramento River. Except on TNBC parcels and other mitigation lands, natural vegetation in the Basin is now primarily found along irrigation canals, drainage ditches, pastures, and uncultivated fields.

The Phase 3 Project would result in permanent impacts to approximately 10.79 acres and temporary impacts to potentially, if all the borrow sites were affected, 354.01 acres of wetlands and other waters of the United States. Proposed mitigation for the above impacts includes the creation of at least 1 acre of irrigation/drainage canal or 1 acre of seasonal wetland for every acre that is lost (Mitigation Measure 4.7-a). Ultimately, the required mitigation ratio will be determined by USACE through the 404 permitting process based on what is required to replace affected aquatic resource functions. Features that would be designed to offset the effects described above and provide additional aquatic habitat values include the creation of approximately 38 acres of aquatic habitat resulting from construction of the new GGS/Drainage Canal (including nearly 21 acres as part of the Phase 3 Project) and creation of approximately 32 acres of new irrigation canal (i.e., the replacement Elkhorn and Riverside Canals) (including nearly 4.5 acres as part of the Phase 3 Project), for a total of about 70 acres of new canal-associated habitat.

The proposed new GGS/Drainage Canal would improve overall aquatic habitat functions in the Basin because it would have: (1) a reliable water supply; (2) more gradual and consistent side slopes than are found typically in existing Reclamation District (RD) 1000 canals, which would result in reduced erosion and sedimentation and the associated need for frequent disturbance by heavy equipment of vegetation and soil on canal banks; and (3) maintenance access that would allow for easy mowing, precluding the need for the typical high-disturbance practice of flail mowing or scraping vegetation from the banks and canal with a drag bucket.

Because the Proposed Action would include the creation of acreages of waters of the United States that are expected to more than offset the filling and dewatering of waters of the United States included in the project, and because new jurisdictional habitats would be created and managed in a manner that minimizes maintenance disturbance and provides the essential functions of the habitats that would be lost (Mitigation Measure 4.7-a), overall impacts of the Proposed Action's cumulative contribution on jurisdictional habitats in the Natomas Basin would be beneficial, and thus would not result in a cumulatively considerable contribution to a significant cumulative impact.

The Levee Raise-in-Place Alternative would include creation of the same types and acreages of waters of the United States described for the Proposed Action. Because these acreages are expected to more than offset the filling and dewatering of waters of the United States included in this alternative, and because new aquatic habitats would be created and managed in a manner that minimizes maintenance disturbance and provides the essential functions of the habitats that would be lost (Mitigation Measure 4.7-a), overall impacts of the Levee Raise-in-Place Alternative's cumulative contribution on sensitive aquatic habitats in the Natomas Basin would be beneficial, and thus would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Paleontological Resources:** Earthmoving activities could damage unknown unique paleontological resources, but potential damage would be limited by implementation of Mitigation Measure 4.11-a, and would be limited to individual resources in discrete locations. Because of the low probability that any project would encounter unique, scientifically-important fossils, and the benefits that would occur from recovery and further study of those fossils if encountered, development of the related projects and other development in the region are not considered to result in a cumulatively considerable impact related to paleontological resources. Therefore, the proposed project and related projects would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Transportation and Circulation:** Impacts of construction activities on emergency access would be site-specific, intermittent, and temporary, and are not expected to be cumulatively considerable. The proposed construction activities would temporarily increase traffic levels on some local and regional roadways, but the majority of truck trips would take place off of public roads. In general, the temporary traffic increases associated with the Proposed Action—in addition to Phase 2 Project construction that would also take place in 2009—would be limited to the roadways between the Brookfield and RD 1001 borrow sites and the PGCC

west levee, and between the Sutter Pointe and Dunmore borrow sites and the Sacramento River east levee. There are no other anticipated projects in the vicinity that are likely to compound the significant temporary traffic impacts of the project. Because of the limited potential for the traffic associated with the project to combine with increased traffic from other future projects, and because of the temporary, short-term, intermittent nature of any impacts, no cumulatively significant traffic impacts are expected to occur. Therefore, the Proposed Action would not result in a cumulatively considerable contribution to a significant cumulative impact. For the same reasons as the Proposed Action, the Levee Raise-in-Place Alternative would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Recreation:** Impacts of the Proposed Action and the Levee Raise-in-Place Alternative on recreational uses would be limited to potential temporary disturbance of access to facilities on the western, eastern, and southern perimeter of the Natomas Basin during construction; potential temporary degradation in the quality of recreational experiences as a result of construction activity and noise; and damage to recreational facilities on and adjacent to the NEMDC (Ueda Parkway bicycle trail and Gardenland Park). Because of the temporary nature of the construction impacts and the likelihood that any access restrictions or degradation of the quality of recreational experiences would last for less than one construction season in any location, these impacts are not considered substantial enough to make a cumulatively considerable contribution to a cumulative impact. Reconstruction and restoration of damaged park facilities would be required (Mitigation Measure 4-15a). Recreation impacts would occur on a temporary project-specific basis rather than a cumulative basis, and any such incidents would be isolated. Therefore the proposed project and related projects would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Utilities and Service Systems:** Construction may damage irrigation systems and public utility infrastructure, resulting in temporary disruptions to service. Coordination with irrigation system users and consultation with service providers and implementation of appropriate protection measures (Mitigation Measures 4.17-a and 4.17-b) would minimize the possibility that any significant effect would occur. Because utility and service system impacts would be fully mitigated on a project-by-project basis, the proposed project and related flood facility improvement projects would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Hazards and Hazardous Materials:** Mitigation would be implemented to minimize the potential for exposure of people or the environment to hazardous materials encountered during construction activity (Mitigation Measure 4.18-b). If hazardous materials are encountered, the impacts would be localized and would not be expected to be additive with the impacts of other projects. Because hazards and hazardous materials impacts would occur on a project-specific basis rather than a cumulative basis, the proposed project and related projects would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Airport Safety:** The potential for night lighting of project areas to affect aircraft operations is a function of the location of construction areas in relation to the Airport Critical Zone and the runway approaches. Potential impacts would be reduced through lighting restrictions and coordination with SCAS (Mitigation Measure 4.19-a). The potential of the project to increase the possibility of collisions between aircraft and wildlife is a result of the project including broad changes to managed land cover types in or near the Airport Critical Zone. There are no other known projects that would affect lands within the Airport Critical Zone, therefore the proposed project and related projects would not result in a cumulatively considerable contribution to a significant cumulative impact.

- **Wildfire Hazards:** Mitigation would be implemented to minimize the potential for wildland fires (Mitigation Measures 4.20-a). If a wildland fire outbreak occurs, the impacts would be localized and would not be expected to be additive with the impacts of other projects. Because wildfire hazard impacts would occur on a project-specific basis rather than a cumulative basis, and any such incidents would be isolated, therefore the

proposed project and related projects would not result in a cumulatively considerable contribution to a significant cumulative impact.

5.1.8 CUMULATIVE IMPACT ANALYSIS: PROJECT IMPACTS THAT COULD BE CUMULATIVELY CONSIDERABLE

The following subsections discuss the potential for the Proposed Action and the Levee Raise-in-Place Alternative to result in cumulatively considerable incremental contributions to the following cumulatively significant impacts:

- agricultural resources,
- water quality/fisheries,
- terrestrial biological resources,
- cultural resources,
- air quality,
- noise, and
- visual resources.

The contribution to cumulatively considerable impacts was made by considering all project components, proposed construction of such improvements, excavation of borrow from the sites listed in **Table 2-2**, use of roadways in the Basin, and temporary and permanent changes in land cover and vegetation.

5.1.8.1 AGRICULTURAL RESOURCES

Proposed Action

As described in Section 4.1, "Agricultural Resources," the estimated maximum total of agricultural land that is expected to be permanently converted as a result of implementation of the Proposed Action would total 361.5 acres.

The Phase 4 Project is expected to convert approximately 450 acres of Important Farmland to non-agricultural uses. Further, as described in Section 5.1.5.2, above, the proposed land swap between SAFCA and the Airport could result in an incremental decrease (approximately 50–100 acres) in the amount of agriculture production in the Natomas Basin (Sacramento and Sutter Counties) if the agreement is reached as planned. Land in Sacramento County would likely be changed from row crop production to grassland or fallow agriculture (undeveloped land), and land in Sutter County would likely be converted from field crop to a grassland/woodland mix which provides nesting and foraging habitat for bird species.

The Natomas Basin has already experienced the conversion of a substantial area of agricultural land, much of it Prime Farmland and other categories of Important Farmland, to residential and commercial development. The Natomas Basin is the focus of much of the growth planning in the Sacramento area, in both Sutter County and Sacramento County, and substantial losses of Important Farmland to urban development are expected to continue in this area. As noted in Section 3.3.1, "Agricultural Resources," Important Farmland in the Natomas Basin totaled approximately 40,000 acres in 2006, the last year for which California farmland mapping data are available, representing 6% of the total of approximately 715,000 acres of Important Farmland mapped by the Farmland Mapping and Monitoring Program in Sutter and Sacramento Counties in 2006. Of this amount, approximately half is expected to be converted to developed uses and half maintained in agriculture or in a condition compatible with future agricultural use (i.e., undeveloped) within TNBC parcels, Airport north bufferlands, lands anticipated to be maintained in an undeveloped condition as part of the Joint Vision, and land managed by SAFCA. The loss of an additional approximately 20,000 acres in the Natomas Basin would continue an overall trend of net loss of Important Farmland that has been documented in Sutter and Sacramento Counties for each consecutive 2-year interval of mapping by the California Department of Conservation from 1992 through

2006. As described elsewhere in this EIS/EIR, development of land in the Natomas Basin is consistent with regional land use planning efforts (see Section 5.2, "Growth Inducement") which promote the concentration of urban growth within the borders of existing cities and their immediate adjacent areas, including the Natomas Basin specifically, and discourage both sprawling development and development expansion into existing nonurbanized floodplains that would result in greater regional conversion of agricultural land to nonagricultural uses. (See Section 5.2, "Growth Inducement"; Section 6.1.10, "Executive Order 11988, Floodplain Management"; and Section 6.1.13, "Farmland Protection Policy Act," for more discussion of this issue.)

Nevertheless, the Proposed Action would result in the conversion of agricultural land to nonagricultural uses and, in combination with the conversions of Important Farmland in the Natomas Basin associated with past, current, and future projects, would result in cumulatively considerable (i.e., significant) impact associated with agricultural land conversion, and the Proposed Action would result in a cumulatively considerable incremental contribution to this cumulatively significant impact.

Levee Raise-in-Place Alternative

The narrower footprint of the levee raise-in-place method of addressing levee height deficiencies would have a greater impact on Important Farmland than would the Proposed Action due to the increased requirement for woodland habitat creation. However, conversion of Important Farmland within the canal footprints and borrow sites would be similar to the conversion associated with the Proposed Action. Therefore, the contribution of the Levee Raise-in-Place Alternative to the cumulative loss of Important Farmlands, would be similar to the Proposed Action, and would result in cumulatively considerable (i.e., significant) incremental contribution to this cumulatively significant impact.

5.1.8.2 Water Quality/Fisheries

Construction activities have the potential to temporarily degrade water quality and fish habitat through the direct release of soil and construction materials into water bodies or the indirect release of contaminants into water bodies through runoff. Other projects, including the extensive array of development projects anticipated in the Natomas Basin and SAFCA's bank protection projects, would have a similar potential to release materials into watercourses that support fish and other aquatic resources. In addition, vegetation that may provide SRA habitat would be removed under all alternatives. As noted in Section 3.3.6.1, "Fish Species Found in the Lower Sacramento River, Pleasant Grove Creek Canal, and Natomas East Main Drainage Canal," modifications of the channels bordering the Natomas Basin have resulted over time in homogenous, trapezoidal channels lacking in-stream structure with narrow and sparse bands of riparian vegetation that provide only limited SRA habitat functions and limited recruitment of large woody debris. Combined, these alterations have resulted in marginal habitat conditions that provide only limited habitat functions for most native fish species and other aquatic organisms.

Proposed Action

The implementation of BMPs and adherence to the conditions of a storm water pollution prevention plan (Mitigation Measure 4.5-a) would ensure that the requirements of the Clean Water Act and Porter-Cologne Water Quality Control Act are met. Given the temporary nature of any impacts and the protections afforded by regulatory programs under the Clean Water Act and Porter-Cologne Water Quality Control Act, any degradation of surface waters by construction activities of the Proposed Action and other projects would be minimized. Consequently, the potential impacts of project construction are not expected to make a considerable contribution to a significant cumulative impact on water quality, fish or fish habitat, or other aquatic species. Therefore, Proposed Action would not result in a cumulatively considerable contribution to a significant cumulative impact.

As part of the Phase 4 Project, proposed improvements along the NCC south levee would include waterside slope stabilization activities (flattening of oversteepened areas of the waterside slope) that would require the removal of

small amounts of vegetation, which may constitute a loss of SRA habitat. Given the small amount of habitat involved, adherence to California Fish and Game Code Section 1602 permit conditions (likely similar to Mitigation Measure 4.6-b) would limit potential disturbance to fish habitat associated with levee improvements on the water side of the NCC and would ensure that restoration, rehabilitation, and/or replacement of any affected channel habitat would result in no net loss of SRA habitat. Other projects in the Natomas Basin would be required to implement similar measures to prevent adverse impacts. In addition, SAFCA's bank protection project would incorporate features that would compensate for temporary impacts on SRA habitat and result in long-term increases in nearshore and SRA cover values relative to pre-project conditions, creating beneficial effects. Consequently, the Proposed Action would not result in a cumulatively considerable contribution to a significant cumulative impact.

Levee Raise-in-Place Alternative

Along the Sacramento River east levee, the Levee Raise-in-Place Alternative would have a narrower landside levee improvement footprint than the Proposed Action. Under this alternative, erosion control improvements would be implemented along approximately 1,260 feet of river bank at River Mile 73.5 (Site G) on the Sacramento River east levee. Construction of these improvements would require tree removal and trimming of canopies of other trees growing on the eroding bank, resulting in a short-term reduction in riparian canopy providing overhead SRA cover. Direct and cumulative impacts resulting from construction of the setback levee and the erosion control improvements would be avoided through the design of the improvements and through implementation of BMPs and adherence to the conditions of a storm water pollution prevention plan (Mitigation Measure 4.5-a) would ensure that the requirements of the Clean Water Act and Porter-Cologne Water Quality Control Act are met. Adherence to California Fish and Game Code Section 1602 permit conditions (Mitigation Measure 4.6-b) would limit potential disturbance to fish habitat associated with the project improvements and would ensure that restoration, rehabilitation, and/or replacement of any affected channel habitat would result in no net loss of SRA habitat.

However, removal of woody vegetation from the water side of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments could have a substantial effect on SRA habitat along this levee. The loss of SRA habitat along the Sacramento River and reduction in input of woody debris associated with this removal could be a significant contribution to historical loss; it is unknown whether adequate mitigation could be provided to compensate for this impact. Given these circumstances, the Levee Raise-in-Place Alternative could result in a cumulatively considerable contribution to a significant cumulative impact.

5.1.8.3 TERRESTRIAL BIOLOGICAL RESOURCES

Implementation of the project has the potential to contribute to the loss or degradation of sensitive habitats and to adversely affect special-status terrestrial species (special-status plants, valley elderberry longhorn beetle, giant garter snake, northwestern pond turtle, Swainson's hawk and other special-status birds, and burrowing owl). Potential impacts of the Proposed Action and the Levee Raise-in-Place Alternative related to wildlife would be associated with vegetation removal needed to clear the path for Phase 3 and Phase 4 improvements, construction disturbances of wildlife and their habitats, as well as permanent loss of habitat for the affected species. These impacts could contribute to species declines and losses of habitat that have led to the need to protect these species under the Federal ESA and the CESA.

Proposed Action

As described above, the proposed land swap between SAFCA and the Airport could result in a change in the amount of bird foraging habitat in the Natomas Basin (Sacramento and Sutter Counties) if the agreement is reached as planned. Land in Sacramento County would likely be changed from row crop production to grassland or fallow agriculture (undeveloped land), thus resulting in an overall decrease in the quantity and quality of

foraging habitat in the Basin. Land in Sutter County would likely be converted from field crop to a grassland/ woodland mix, which would increase the nesting and foraging habitat for bird species. Although the details of the agreement have not yet been finalized and may not for some time, it is conceivable that the swap may result in a zero net loss of foraging habitat and an increase in nesting habitat for birds.

Proposed NCMWC projects, including the Sankey Diversion and Fish Screen Project, would also result in habitat and wildlife disturbances during construction. The Sankey Diversion would include permanent loss of habitat for some special-status species, including giant garter snake, but an appropriate habitat replacement and management plan is being developed in consultation with USFWS and DFG to provide adequate compensation for the loss. Despite construction-related adverse impacts from the fish screen project, the overall impact would be beneficial and habitat quality would improve and thus, would not result in a cumulatively considerable contribution to a significant cumulative impact.

The Airport Master Plan includes a number of components that are anticipated to result in adverse impacts on sensitive habitats and special-status species. The majority of these impacts would be associated with Phases 2 and 3 of the Airport Master Plan, which would not commence until 2014. Adverse impacts in all phases could include a combination of permanent habitat loss and construction-related impacts. There could also be impacts from expanded long-term operation of the Airport. SCAS has identified some habitat enhancement and protection measures that would be implemented to compensate for adverse impacts, and additional measures are anticipated to be identified as subsequent CEQA evaluation and regulatory permitting is completed.

Significant adverse impacts on special-status species and sensitive habitats would be associated with the extensive future urban growth expected to occur in the Natomas Basin. This growth would continue to reduce the amount of habitat available to support populations of special-status species. Potential adverse impacts from future approved expansion within the Basin have been addressed through the development of the NBHCP, and successful implementation of the NBHCP would ensure that there is no overall adverse impact on special-status species from implementation of these projects. Similarly, an HCP is being implemented for the Metro Air Park Project. Additional urban expansion is being promoted through the Joint Vision, which would result in development and open space conservation within the Sacramento County portion of the Natomas Basin that was not covered in the NBHCP. Potential impacts on biological resources from implementation of this potential future development are at various stages of evaluation. Projects would be required to incorporate adequate impact avoidance and minimization measures and permanent habitat conservation to mitigate and compensate for the anticipated adverse impacts.

Implementation of the Proposed Action and mitigation measures in Sections 4.8 and 4.9 of this EIS/EIR would ensure that the impacts of the project are reduced or avoided in accordance with the requirements of the ESA and CESA and other regulatory programs that protect habitats, such as Section 404 of the Clean Water Act and Section 1602 of the California Fish and Game Code. As discussed in Chapter 2.0, “Alternatives,” the project incorporates habitat creation, modification, and preservation components designed to offset the project’s adverse impacts. In addition, mitigation measures require further development of these habitat improvement components, including preparation and approval of management plans. Successful implementation of these mitigation measures would result in permanent protection and management of giant garter snake habitat, including creation and enhancement of connectivity between giant garter snake populations in the Natomas Basin, expected to result in an overall improvement of conditions for giant garter snakes in the Basin. An increase in permanently protected foraging habitat for Swainson’s hawk, eventual increase in potential nesting habitat, and preservation of existing nest sites would also maintain or improve current conditions for this species in the Natomas Basin. Implementation of the Proposed Action and mitigation measures would similarly ensure that potential adverse impacts on other special-status species and on sensitive habitats and thus, would not result in a cumulatively considerable contribution to a significant cumulative impact on terrestrial biological resources.

Successful implementation of the NBHCP depends on a number of assumptions that could be jeopardized by implementation of other projects and activities in the Basin, including the Proposed Action and the various cumulative projects. The Proposed Action has been designed to support achievement of the goals and objectives of the NBHCP, and implementation of Mitigation Measure 4.9-h would ensure that the Proposed Action does not jeopardize successful implementation of the NBHCP.

The Proposed Action would include minimization, avoidance, and compensation measures in accordance with the requirements of ESA, CESA, and other relevant regulatory requirements, as well as additional habitat protection and enhancement components. As a result of these measures, the Proposed Action would not contribute to a cumulatively significant impact on terrestrial biological resources, including special-status species. This impact, while significant and unavoidable, would not result in a cumulatively considerable contribution to a significant cumulative impact.

Levee Raise-in-Place Alternative

Because of its inclusion of erosion control improvements at one site along the Sacramento River east levee, the Levee Raise-in-Place Alternative would involve a slightly different set of impacts to terrestrial biological resources than the Proposed Action. The narrower landside levee footprint of the Levee Raise-in-Place Alternative would avoid some losses of woodland and grassland habitat that would be unavoidable under the Proposed Action. However, under the Levee Raise-in-Place Alternative, as much as 22.5 acres of riparian woodland on the water side of the levee in Reaches 5A–9B of the Sacramento River east levee could be removed to conform with USACE guidance regarding levee encroachments. In addition to its overall value as habitat for various species, this woodland supports active Swainson's hawk nests, elderberry shrubs, and other important biological resources. Adverse impacts on these resources on the water side of the levee would be more difficult to mitigate than the adverse impacts from the adjacent setback levee footprint on the land side of the levee under the Proposed Action, both in terms of the acreage of habitat lost and the quality of that habitat. Implementation of this alternative would include minimization, avoidance, and compensation measures in accordance with the requirements of ESA, CESA, and other relevant regulatory requirements. However, it is uncertain whether adequate compensation could be developed for the extensive loss of mature waterside vegetation under this alternative. Therefore, it is possible that the Levee Raise-in-Place Alternative could result in a potentially significant and unavoidable impact on terrestrial biological resources, including special-status bird species for which the waterside trees provide important nesting habitat. This impact would result in a cumulatively considerable contribution to a significant cumulative impact.

5.1.8.4 CULTURAL RESOURCES

Proposed Action

Prehistoric human habitation sites are common in riverbank and floodplain areas, and burial sites are often encountered in the course of ground-disturbing activities. It is likely that known or unknown archaeological resources could be disturbed and cultural resources damaged or destroyed during construction activities for the Proposed Action. Losses of a unique archaeological resource could occur where excavations encounter archaeological deposits that cannot be removed or recovered (e.g., under levees), or where recovery would not be sufficient to prevent the loss of significance of the cultural materials. Historic resources could also be damaged or require removal from areas near flood damage reduction facilities under the Proposed Action. However, USACE and the SHPO have concurred that identified historic resources lack significance that might make them eligible for listing on the NRHP or the California Register of Historic Resources. Although mitigation would be implemented to reduce impacts on potentially significant cultural resources, adverse impacts, particularly on archaeological resources, may still occur. Losses of archaeological resources would add to a historical trend in the loss of these resources as artifacts of cultural significance and as objects of research importance. For these reasons, despite the implementation of Mitigation Measures 4.10-c, 4.10-d, and 4.10-e, the Proposed Action has

the potential to result in a significant and unavoidable impact. Thus, the Proposed Action would result in a cumulatively considerable contribution to a significant cumulative impact.

Levee Raise-in-Place Alternative

The Levee Raise-in-Place Alternative would require large quantities of borrow material. Because excavation of borrow material has the potential to affect cultural resources that would be identified during inventory efforts and resources that may be identified only during construction, cumulative impacts associated with the Levee Raise-in-Place Alternative would be similar to that of the Proposed Action and, therefore, would result in a cumulatively considerable contribution to a significant cumulative impact.

5.1.8.5 AIR QUALITY

Proposed Action

Future projects will contribute to air pollutant emissions in Sutter and Sacramento Counties and to the nonattainment status of FRAQMD and SMAQMD for ozone and PM_{10}. The Proposed Action would cause a temporary impact on air quality through construction emissions. When taken in total with other projects in the region, this impact would be significant and unavoidable, and would result in a cumulatively considerable contribution to a significant cumulative impact on air quality in the region.

No air district in California, including FRAQMD or SMAQMD, has identified a significance threshold for analyzing GHG emissions generated by a proposed project or a methodology for analyzing cumulative impacts related to global warming. Although the state of California has identified GHG reduction goals through adoption of Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006, the effect of GHG emissions as they relate to global climate change is inherently a cumulative impact issue. While the emissions of one single project would not cause global climate change, GHG emissions from multiple projects throughout the world could result in a cumulatively considerable contribution to a significant cumulative impact with respect to global climate change.

To meet AB 32 goals, California would need to generate less GHGs than current levels. It is recognized, however, that for most projects there is no simple metric available to determine if a single project would substantially increase or decrease overall GHG emission levels.

While AB 32 focuses on stationary sources of GHG emissions, the primary objective of AB 32 is to reduce California's contribution to global warming by reducing California's total annual production of GHG emissions. The impact that GHG emissions have on global climate change does not depend on whether they were generated by stationary, mobile, or area sources or whether they were generated in one region or another. Thus, the net change in total GHG levels generated by a project or activity is the best metric for determining whether a project would contribute to global warming. In the case of the Proposed Action and the alternatives under consideration, if the size of the increase in emissions from the project is considered to be substantial, then the impact of the project would be cumulatively considerable.

In comparison to criteria air pollutants, such as ozone and PM_{10}, CO_2 emissions persist in the atmosphere for a much longer period of time. GHG emissions generated by the Proposed Action would predominantly be in the form of CO_2. Project construction would result in a net increase in emissions to occur over a period of 3 years (2008–2010), despite the implementation of Mitigation Measure 4.13-a. While any increase in GHG emissions would add to the quantity of emissions that would contribute to global climate change, it is noteworthy that emissions associated with the Proposed Action occur over a finite period of time (3 years), as opposed to operational emissions, which would occur over the lifetime of a project. The project would have no net increase in operational GHG emissions. Nonetheless, because of the intensity and duration of construction activities, and the lack of available mitigation measures to abate GHG emissions from heavy-duty construction equipment exhaust

and on-road hauling emissions, the project's construction emissions would make an incremental contribution to climate change. Nonetheless, because of the intensity and duration of construction activities, and the lack of available mitigation measures to abate GHG emissions from heavy-duty construction equipment exhaust and on-road hauling emissions, the project's construction emissions would make a contribution to climate change.

Previous GHG analyses conducted for the Phase 2 Project (2007 Landside EIR [SAFCA 2007] and the Phase 2 EIS [USACE 2008]) both concluded that the project's contribution to cumulative GHG impacts would be considerable and would be a significant and unavoidable cumulative impact (see Sections 5.1.3.2 and 5.1.3.3, above). However, the recent introduction of quantification methodologies and threshold concepts from the California Air Pollution Control Officers Association (CAPCOA) in the *CEQA & Climate Change* document (CAPCOA 2008), from the California Office of Planning and Research (OPR) in the *Preliminary Draft CEQA Guideline Amendments for Greenhouse Gas Emissions* (OPR 2009), and from the California Air Resources Board (ARB) in the recently adopted *Climate Change Proposed Scoping Plan* (ARB 2008a) and the *Preliminary Draft Staff Proposal Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the California Environmental Quality Act* (ARB 2008b), have allowed further refinement of the GHG analysis in this EIS/EIR. Using this guidance, it is possible to discuss the project's emissions of GHG in a larger context.

As calculated in **Appendix E**, construction of the Phase 2 and Phase 3 Projects would generate approximately 4,600 tons (4,170 metric tons) of CO_2 during 2009 associated with mobile equipment exhaust. CO_2 emissions in subsequent years (2010–2011) would be equal to or less than in 2009.

To establish additional context in which to consider the order of magnitude of project-generated GHG emissions, it may be noted that facilities (i.e., stationary, continuous sources of GHG emissions) that generate greater than 25,000 metric tons CO_2/year are mandated to report GHG emissions to the California Air Resources Board (ARB) pursuant to AB 32. In addition, a threshold of 10,000 metric tons CO_2/year was recommended by the Market Advisory Committee for inclusion in a GHG cap and trade system, a threshold of 10,000 metric tons CO_2e/year adopted by the South Coast Air Quality Management District for stationary/industrial projects, and a draft preliminary threshold of 7,000 metric tons of CO_2e/year for industrial projects by ARB. Absent any agency-adopted threshold for GHG emissions, it is notable that the Proposed Action would generate emissions substantially less than 25,000 metric tons CO_2/year (and other recommended targets). This information is presented for informational purposes, and it is not the intention of SAFCA to adopt 25,000 metric tons CO_2/year as a numeric threshold. Rather, the intention is to put project-generated GHG emissions in the appropriate statewide context in order to evaluate the contribution to the global impact of climate change. Because the project's emissions would be temporary and short-term in nature, and far below the minimum standard for reporting requirements under AB 32, the project's GHG emissions would not result in a cumulatively considerable contribution to a significant cumulative impact on GHG emissions and global climate change.

Levee Raise-in-Place Alternative

The Levee Raise-in-Place Alternative would require approximately 40% fewer trips for hauling borrow material than the Proposed Action. Therefore, it would result in a smaller but nevertheless cumulatively considerable contribution to a significant cumulative impact on air quality.

In addition, construction of the Levee Raise-in-Place Alternative would result in approximately 2,500 tons (2,270 metric tons) of CO_2 emissions during 2009. This would be well below 25,000 metric tons CO_2/year, the minimum GHG emissions level for facility mandatory reporting to ARB pursuant to AB 32. For the same reasons described under the Proposed Action, would not result in a cumulatively considerable contribution to a significant cumulative impact on global climate change under the Levee Raise-in-Place Alternative.

5.1.8.6 NOISE

Proposed Action

The Proposed Action would have a significant and unavoidable project-level impact on noise levels experienced by the occupants of residences that are near sites of construction activity or haul routes for construction traffic. A substantial number of residences are located adjacent to the NEMDC where cutoff walls would be installed. However, there are no other known projects in the vicinity of proposed project activity (borrow sites, rural roadways, levee and canal construction areas) that would generate noise levels noticeably above ambient noise levels, which are generated by sources that include aircraft operations, truck traffic on area roadways, and agricultural activity. Therefore, the Proposed Action is not expected to contribute to any significant cumulative noise impact. This localized impact would not result in a cumulatively considerable contribution to a significant cumulative impact.

Levee Raise-in-Place Alternative

Under the Levee Raise-in-Place Alternative, levee improvement activity would occur directly along the Sacramento River east levee at many locations adjacent to residences on the water side of the Garden Highway, and to a lesser extent, the land side of the levee. In addition, the Levee Raise-in-Place Alternative would require the implementation of erosion control improvements at site G along the water side of the Sacramento River east levee. The combined effect of noise from simultaneous construction of erosion control improvements on the water side and levee improvements on the land side would be amplified and would affect a small number of residences on Garden Highway in the vicinity of the erosion control site, causing a project-level significant impact. However, this impact could be decreased by scheduling construction of the erosion control improvements to occur before or after the nearby levee improvement work. Furthermore because these impacts would be temporary, they would not be combined with future ongoing noise impacts, if any. Therefore, the Levee Raise-in-Place Alternative would not result in a cumulatively considerable contribution to a significant cumulative impact.

5.1.8.7 VISUAL RESOURCES

Proposed Action

The Proposed Action would include the removal of trees, other vegetation, and structures from the land side of the Sacramento River east levee within the footprint of the adjacent setback levee and berms, and may include the removal of some vegetation and structural encroachments from the water side of the Sacramento River east levee as part of encroachment removal actions. The additional levee and bank protection improvements needed to achieve a “200-year” level of flood protection in the Natomas Basin along with SAFCA’s proposed levee integrity program would also require the removal of vegetation and other features that currently add to the rural and riverine character of views in the area. These changes would contribute to the substantial degradation of scenic resources in the Natomas Basin that are expected to result with various development projects and expansion of Airport facilities, as the area’s visual character changes from rural agricultural landscape to urban/suburban setting. Although the project includes the establishment of a substantial acreage of woodland plantings around the Basin to offset the significant effect of the project on scenic resources (oak and other native trees), the plantings would require several years to become well established. Therefore, the Proposed Action would make a cumulatively significant contribution to changes in the visual character and scenic resources of the Natomas Basin in the near term. This impact would be significant and unavoidable in the near term, but less than significant in the long term. The long-term impact is anticipated to be less than significant, and the effects from the Proposed Action would not result in a cumulatively considerable contribution to a significant cumulative impact on visual resources in the long term.

Levee Raise-in-Place Alternative

The cumulative contribution of Levee Raise-in-Place Alternative would be slightly less than that of the Proposed Action on the land side of the Sacramento River east levee where trees would need to be removed to accommodate raising the levee in place, and significantly greater on the water side of this levee where trees would need to be removed to meet USACE encroachment guidelines. This alternative would result in cumulatively considerable near-term and long-term contributions to changes in the visual character and scenic resources of the Natomas Basin, which would be greater than the cumulative impact under the Proposed Action. This impact would be significant and unavoidable in the near term, but less than significant in the long-term. The long-term impact is anticipated to be less than significant, and the effects from this alternative would not result in a cumulatively considerable contribution to a significant cumulative impact on visual resources in the long term.

5.2 GROWTH INDUCEMENT

5.2.1 INTRODUCTION

Both NEPA (40 CFR 1508[a] and [b]) and CEQA (State CEQA Guidelines (CCR Section 15126.2[d]) require an examination of the direct and indirect impacts of the proposed project, including the potential of the project to induce growth leading to changes in land use patterns and population densities and related impacts on environmental resources. Specifically, CEQA states that the EIR shall:

> Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a wastewater treatment plant might, for example, allow for more construction in service areas). Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects. Also, discuss the characteristics of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

Direct growth inducement would result if a project involved construction of new housing. Indirect growth inducement would result, for instance, if implementing a project resulted in any of the following:

- substantial new permanent employment opportunities (e.g., commercial, industrial, or governmental enterprises);
- substantial short-term employment opportunities (e.g., construction employment) that indirectly stimulates the need for additional housing and services to support the new temporary employment demand; and/or
- removal of an obstacle to additional growth and development, such as removing a constraint on a required public utility or service (e.g., construction of a major sewer line with excess capacity through an undeveloped area).

Growth inducement itself is not an environmental effect, but it may foreseeably lead to changes in land use patterns and population densities and related impacts on environmental resources.

Within the project area, population growth and urban development are driven by local, regional, and national economic conditions. Local land use decisions are within the jurisdiction of the cities and counties within the project area: the City of Sacramento and Sacramento and Sutter Counties. Each of these agencies has adopted a

general plan consistent with state law. These general plans provide an overall framework for growth and development within the jurisdiction of each agency, including the project area. Although each of these agencies is a member of SAFCA, as a joint powers agency, SAFCA is limited to exercising powers common to all of its constituent members, including RD 1000 and American River Flood Control District, neither of which has any land use planning authority. Accordingly, SAFCA has no authority to permit development and has only limited authority to impose conditions on the development that is permitted.

5.2.2 INCORPORATION BY REFERENCE

This section summarizes the growth-inducing effects that were previously evaluated for the NLIP. CEQA documents that are incorporated by reference here are the same documents listed above in Section 5.1.3, "Summary of Cumulative Impact Analyses from Previous NLIP Environmental Documents," with the State Clearinghouse numbers as required by the State CEQA Guidelines (Section 15150[d]). Printed copies of relevant documents are available at USACE's office at 1325 J Street, Sacramento, California and at SAFCA's office at 1007 7th Street, 7th Floor, Sacramento, California.

These documents evaluated expected growth that could occur with implementation of the local general plans for the City of Sacramento and Sacramento and Sutter Counties. They also considered growth projected in the SACOG Blueprint, which is a joint vision for regional growth through the year 2050, endorsed by the SACOG counties (El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba) and the 22 cities within these counties. The State Plan of Flood Control, which would require new development to have a minimum of "200-year" flood protection, was described in relation to the Proposed Action. Using the above information, which is incorporated by reference, combined with an evaluation of residual flood risk, SAFCA concluded that there is substantial evidence that the project evaluated for the NLIP as a whole would accommodate anticipated growth in the project area in a manner that would be consistent with adopted local and regional growth management plans and with an emerging State Plan of Flood Control. This finding is hereby incorporated by reference.

5.3 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

NEPA requires that an EIS include a discussion of the relationship between short-term uses of the environment and long-term productivity. Within the context of this EIS/EIR, "short-term" refers to the construction period, while "long-term" refers to the operational life of the project and beyond.

Project construction would result in short-term construction-related effects such as interference with local traffic and circulation, and increased air emissions, ambient noise levels, dust generation, and disturbance of wildlife. These effects would be temporary, occurring only during construction, and are not expected to alter the long-term productivity of the natural environment. Project implementation would also result in long-term effects, including permanent loss of farmland, changes in visual resources, and adverse effects on existing waters, wetlands, and woodland habitat.

Project implementation would also assist in the long-term productivity of the environment by improving the levee system that protects the Natomas Basin by providing at least a 100-year level of flood protection by the end of 2010 and a "200-year" level of protection by the end of 2012, and reducing wildlife hazards in the vicinity of the Airport. They would also preserve and improve, over the long term, important habitat upon which the Natomas Basin species of concern to USFWS and DFG depend, by increasing acreages, connectivity, and habitat quality of wetlands and other waters of the United States in the Basin.

These long-term beneficial effects of the project would outweigh its potentially significant short-term impacts to the environment.

5.4 SIGNIFICANT AND UNAVOIDABLE ENVIRONMENTAL IMPACTS

State CEQA Guidelines Section 21100(b)(2)(A) provides that an EIR shall include a detailed statement setting forth "any significant effect on the environment that cannot be avoided if the project is implemented." Chapter 4.0, "Environmental Consequences and Mitigation Measures," provides a detailed analysis of all potentially significant, direct and indirect, environmental impacts of the project, feasible mitigation measures that could reduce or avoid the project's significant impacts, and whether these mitigation measures would reduce these impacts to less-than-significant levels. The project's significant cumulative impacts are discussed in Section 5.1, "Cumulative Impacts," above. If a specific impact cannot be reduced to a less-than-significant level, it is considered a significant and unavoidable impact. The project would have the following significant and unavoidable environmental impacts (direct, indirect, and/or cumulative), which are presented in the order they appear in Chapter 4.0, "Environmental Consequences and Mitigation Measures":

- conversion of Important Farmland to nonagricultural uses;
- conflicts with lands under Williamson Act Contracts;
- potential to physically divide or disrupt an established community;
- impacts on Swainson's hawk and other special-status birds;
- potential damage or disturbance to known prehistoric resources from ground-disturbance or other construction-related activities;
- potential damage to or destruction of previously undiscovered cultural resources from ground-disturbance or other construction-related activities;
- potential discovery of human remains during construction;
- temporary increase in traffic on local roadways;
- temporary emissions of ROG, NO_X, and PM_{10} during construction;
- generation of temporary, short-term construction noise;
- exposure of sensitive receptors to or generation of excessive groundborne vibration;
- temporary, short-term exposure of residents to increased traffic noise levels from hauling activity;
- alteration of scenic vistas, scenic resources, and existing visual character of the project area; and
- new sources of light and glare that adversely affect views.

Where feasible mitigation exists, it has been included to reduce these impacts; however, the mitigation would not be sufficient to reduce the impacts to a less-than-significant level.

5.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that an EIS include a discussion of the irreversible and irretrievable commitments of resources which may be involved should the project be implemented. Similarly, the State CEQA Guidelines require a discussion of the significant irreversible environmental changes that would be caused by the project should it be implemented.

The irreversible and irretrievable commitment of resources is the permanent loss of resources for future or alternative purposes. Irreversible and irretrievable resources are those that cannot be recovered or recycled, or those that are consumed or reduced to unrecoverable forms. Project implementation would result in the irreversible and irretrievable commitment of energy and material resources during project construction and maintenance, including the following:

- construction materials, including such resources as soil and rocks;
- land and water area committed to new/expanded project facilities; and
- energy expended in the form of electricity, gasoline, diesel fuel, and oil for equipment and transportation vehicles that would be needed for project construction, operation, and maintenance.

The use of these nonrenewable resources is expected to account for only a small portion of the region's resources and would not affect the availability of these resources for other needs within the region. Construction activities would not result in inefficient use of energy or natural resources. Construction contractors selected would use best available engineering techniques, construction and design practices, and equipment operating procedures. Long-term project operation would not result in substantial long-term consumption of energy and natural resources.

6.0 REGULATORY SETTING

This chapter summarizes Federal, state, regional, and local laws and regulations that apply to the project, aside from NEPA and CEQA, and describes the project's compliance with those laws and regulations, where appropriate.

6.1 FEDERAL

6.1.1 CLEAN WATER ACT (SECTION 404)

The U.S. Environmental Protection Agency (EPA) is the lead Federal agency responsible for water quality management. The Clean Water Act of 1972 (CWA) is the primary Federal law that governs and authorizes water-quality control activities by EPA as well as the states. Various elements of the CWA address water quality, as discussed below.

CWA Section 404 establishes a requirement for a project proponent to obtain a permit from the U.S. Army Corps of Engineers (USACE) before engaging in any activity that involves discharge of dredged or fill material into "waters of the United States," including wetlands. Fill material means material placed in waters of the United States where the material has the effect of replacing any portion of a water of the United States with dry land, or changing the bottom elevation of any portion of a water of the United States. Examples of fill material include but are not limited to rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mining or other excavation activities, and material used to create any structure or infrastructure in waters of the United States. Waters of the United States include navigable waters of the United States; interstate waters; all other waters where the use, degradation, or destruction of the waters could affect interstate or foreign commerce; tributaries to any of these waters; and wetlands that meet any of these criteria or that are adjacent to any of these waters. Wetlands are defined as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Jurisdictional wetlands must meet three criteria: hydrophytic vegetation, hydric soil, and wetland hydrology. In addition, under Section 404, jurisdictional wetlands must: be adjacent to traditional navigable waters; directly about relatively permanent waters; or have a significant nexus with a traditional navigable water.

Before USACE can issue a permit under CWA Section 404, it must determine that the project is in compliance with the CWA Section 404(b)(1) Guidelines. The Section 404(b)(1) Guidelines specifically require that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (CFR Title 40, Section 230.10[a] [40 CFR 230.10(a)]). To comply with this provision, the applicant is required to evaluate opportunities that would result in less adverse impact on the aquatic ecosystem. A permit cannot be issued for a project, therefore, in circumstances where a less environmentally damaging practicable alternative exists that would fulfill the project purpose. An alternative is practicable if it is available and capable of being done after cost, existing technology, and logistics are taken into consideration in light of the overall project purpose as determined by USACE. If it is otherwise a practicable alternative, an area not presently owned by the project applicant(s) that could reasonably be obtained, used, expanded, or managed to fulfill the purpose of the proposed activity may be considered.

As described in Section 4.7, "Sensitive Aquatic Habitats," either action alternative would require an individual permit from USACE under Section 404 of the CWA for the discharge of fill into waters of the United States, including wetlands. USACE verified the wetland delineation prepared for Phase 2 of the Landside Improvements Project on July 24, 2008. The Sutter Pointe and Dunmore borrow sites were surveyed for wetlands as part of the Phase 3 Project wetland delineation. A preliminary jurisdictional determination form was issued by USACE in

November 2008. This EIS/EIR will be used to support USACE's decision whether to grant SAFCA an individual permit for the Proposed Action or a project alternative.

6.1.2 RIVERS AND HARBORS ACT OF 1899, AS AMENDED (SECTIONS 14 AND SECTION 10)

Under Section 14 of the Rivers and Harbors Act of 1899 (33 United States Code [USC] 408), referred to as "Section 408," the Secretary of the Army, on the recommendation of the Chief of Engineers, may grant permission for the alteration of the Federal levee system by a non-Federal entity if the alteration would not be injurious to the public. The Proposed Action is subject to Section 408 permission. This EIS/EIR will be used to support USACE's decision whether to grant permission for the Proposed Action or a project alternative pursuant to Section 408.

Under Section 10 of the Rivers and Harbors Act of 1899, work in, over, or under; excavation of material from; or deposition of material into navigable waters is regulated by USACE. Navigable waters of the United States are defined as those waters subject to the ebb and flow of the tide shoreward to the mean high-water mark and those that are currently used, have been used in the past, or may be susceptible to use to transport interstate or foreign commerce. The jurisdiction of USACE under CWA overlaps and extends beyond the geographic scope of its jurisdiction under the Rivers and Harbors Act. USACE permitting authority under the Rivers and Harbors Act is not subject to EPA oversight or any other restrictions specific to the CWA, and, in some cases the Rivers and Harbors Act alone will apply to waters. A permit from USACE is required prior to any work in, over, or under; excavation of material from; or deposition of material into navigable waters.

The reconstruction of Reclamation District 1000 Pump Station No. 2 would include extending replacement discharge pipes to a replacement outfall structure in the Sacramento River, and small outfall pipes and riprap would be placed in the bank of the Sacramento River east levee to direct filtered stormwater from the east levee to the river. This project element would be subject to permission from USACE under Section 10.

6.1.3 FISH AND WILDLIFE COORDINATION ACT OF 1934, AS AMENDED

The Fish and Wildlife Coordination Act (FWCA) ensures that fish and wildlife receive consideration equal to that of other project features for projects that are constructed, licensed, or permitted by Federal agencies. The FWCA requires that the views of the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and the applicable state fish and wildlife agency (in this case, the California Department of Fish and Game [DFG]) be considered when impacts are evaluated and mitigation needs determined.

USACE is coordinating with USFWS, NMFS, and DFG to determine the effects of the Proposed Action on fish and wildlife in the project area. A FWCA report will be required. USACE and SAFCA are providing USFWS, NMFS, and DFG with copies of this EIS/EIR for review and comment.

6.1.4 ENDANGERED SPECIES ACT OF 1973, AS AMENDED

Pursuant to the Federal Endangered Species Act (ESA), USFWS and NMFS have regulatory authority over Federally listed species. Under ESA, a permit to "take" a listed species is required for any Federal action that may harm an individual of that species. Take is defined under ESA Section 9 as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Under Federal regulation, take is further defined to include habitat modification or degradation where it would be expected to result in death or injury to listed wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. ESA Section 7 outlines procedures for Federal interagency cooperation to conserve Federally listed species and designated critical habitat. Section 7(a)(2) requires Federal agencies to consult with USFWS and/or

NMFS to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species.

SAFCA held biweekly meetings to discuss project features with USFWS during the NLIP alternatives formulation and CEQA compliance process (see Section 7.3, "Coordination with Other Federal, State, and Local Agencies"). USACE and SAFCA subsequently held informal consultation meetings in January through September 2008 to clarify project details and discuss information needs for ESA permitting.

In October 2008, a programmatic Biological Opinion (BO) was issued by USFWS for the NLIP with incidental take authorization for the Phase 2 Project. A Biological Assessment (BA) for the Phase 3 Project is under development and will be very similar to the Phase 2 Project BA. The Phase 3 Project BA will request incidental take authorization for the Phase 3 Project.

USACE and SAFCA are providing USFWS, NMFS, and DFG with copies of this EIS/EIR for review and comment.

6.1.5 MIGRATORY BIRD TREATY ACT OF 1918

The Migratory Bird Treaty Act (MBTA) implements a series of international treaties that provide for migratory bird protection. The MBTA authorizes the Secretary of the Interior to regulate the taking of migratory birds; the act provides that it shall be unlawful, except as permitted by regulations, "to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird…" (16 USC 703). This prohibition includes both direct and indirect acts, although harassment and habitat modification are not included unless they result in direct loss of birds, nests, or eggs. The current list of species protected by the MBTA includes several hundred species and essentially includes all native birds. Permits for take of nongame migratory birds can be issued only for specific activities, such as scientific collecting, rehabilitation, propagation, education, taxidermy, and protection of human health and safety and personal property.

Compliance with the MBTA is being addressed through compliance with the ESA and the California Endangered Species Act (CESA). The project incorporates mitigation measures that would help ensure that construction activities do not result in the take of migratory birds, as discussed in Section 4.9, "Special-Status Terrestrial Species."

6.1.6 BALD EAGLE PROTECTION ACT OF 1940

The Bald Eagle Protection Act provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession, and commerce of such birds.

The project area does not contain bald eagle or golden eagle nesting habitat, and the Proposed Action would not result in the take of bald or golden eagles. The project incorporates mitigation measures that would ensure that construction activities do not result in the take of any raptors, as discussed in Section 4.9, "Special-Status Terrestrial Species."

6.1.7 CLEAN AIR ACT OF 1963, AS AMENDED

The Federal Clean Air Act (CAA) required EPA to establish national ambient air quality standards (NAAQS). EPA has established primary and secondary NAAQS for the following criteria air pollutants: ozone, respirable particulate matter with an aerodynamic diameter of 10 micrometers or less (PM_{10}), fine particulate matter with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead. The primary standards protect the public health and the secondary standards protect public welfare. The CAA also required each state to prepare an air quality control plan referred to as a State Implementation Plan (SIP).

Under the CAA, the primary responsibility for planning for attainment and maintenance of the NAAQS rests with the state and local agencies. Accordingly, state and local air quality agencies are also designated as the primary permitting and enforcement authorities for most CAA requirements. During SAFCA's preparation of the Phase 2 Project EIR, the air management districts with jurisdiction over the project area, the Feather River Air Quality Management District (FRAQMD) and the Sacramento Metropolitan Air Quality Management District (SMAQMD), were given the opportunity to comment on the project with regard to the scope and content of the Phase 2 Project EIR and EIS in relation to each agency's statutory responsibilities and regulatory oversight of the project. In addition, FRAQMD was also consulted through several written and verbal exchanges regarding its air emissions regulations. SMAQMD provided written comments on the Phase 2 Project EIR and EIS, and revisions to the air quality information were incorporated into the Final EIR and EIS based on this input. The air quality effects analysis and associated mitigation measures in this Phase 3 Project EIS/EIR are consistent with the approach that was used in the Phase 2 Project EIR and EIS. Mitigation Measure 4.13-a directs SAFCA to implement control measures recommended by FRAQMD and SMAQMD to minimize temporary emissions of reactive organic gases (ROG), oxides of nitrogen (NO_X), and PM_{10} during project construction, and comply with all applicable rules and regulations of FRAQMD and SMAQMD.

As described under Impact 4.13-b in Section 4.13, "Air Quality," the Proposed Action (including implementation of proposed mitigation measures) would not exceed the EPA's general conformity *de minimis* thresholds or hinder the attainment of air quality objectives in the local air basin.

USACE and SAFCA are providing FRAQMD and SMAQMD with copies of this EIS/EIR for review and comment.

6.1.8 NATIONAL HISTORIC PRESERVATION ACT OF 1966, AS AMENDED

Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations (36 Code of Federal Regulations [CFR] 800, as amended in 2004) require Federal agencies to consider the potential effects of their proposed undertakings on historic properties. Historic properties are cultural resources that are listed on, or are eligible for listing on, the National Register of Historic Places (NRHP) (36 CFR 800.16[l]). Undertakings include activities directly carried out, funded, or permitted by Federal agencies. Federal agencies must also allow the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the proposed undertaking and its potential effects on historic properties.

The project incorporates treatment measures to protect resources listed on or eligible for listing on the NRHP, as discussed in Section 4.10, "Cultural Resources." Determinations of the specific mitigation measures to be implemented will be made by USACE and SAFCA in consultation with the SHPO as part of the determination and eligibility and effect process, as required by NHPA Section 106. Implementation of the selected mitigation measures will be ensured through the execution of a Programmatic Agreement (PA). Signatories to the PA are SAFCA, USACE, and the SHPO. The ACHP has been consulted and waived participation as a signatory to the PA.

The PA addresses the scope of the Area of Potential Effect (APE) and provides that the APE will be defined for each project phase. The APE for each phase will be submitted with the cultural resources inventory reports, and will be consulted upon by SHPO. If areas are added to the project development activities subsequent to the SHPO concurrence on the map of the APE for a specific phase, SAFCA will complete an inventory of historic properties within the expanded APE. If historic properties that would be adversely affected by the project are identified in cultural resources inventories, SAFCA will prepare a Historic Properties Treatment Plan (HPTP) for review and written approval by USACE and the SHPO for those specific properties. Areas of archaeological sensitivity will be monitored in accordance with the HPTPs. A final report documenting the results of work prepared under the HPTPs will be submitted to USACE and the SHPO. The PA provides for public notice and consultation with Native Americans and the public. The signed and executed PA is included in **Appendix D1**.

The regulations implementing Section 106 hold that:

> Compliance with the procedures established by an approved programmatic agreement satisfies the agency's section 106 responsibilities for all individual undertakings of the program covered by the agreement until it expires or is terminated by the agency, the president of NCSHPO when a signatory, or the Council (36 CFR Part 800.14[b][2][iii]).

The regulations further clarify that execution of agreement documents under 36 CFR Part 800.6, *Resolution of Adverse Effects* (including programmatic agreements adopted under that section per 36 CFR Part 800.14[b][3]) evidence satisfaction of Section 106 (36 CFR Part 800.6[b][3]):

> A memorandum of agreement executed and implemented pursuant to this section evidences the agency official's compliance with section 106 and this part and shall govern the undertaking and all of its parts. The agency official shall ensure that the undertaking is carried out in accordance with the memorandum of agreement.

Thus, execution of the PA, which was prepared through the process provided in 36 CFR Part 800.6 evidences USACE's compliance with Section 106. This does not mean that technical management activities under the PA are complete; they in fact are ongoing, as described above.

Appendix D2 contains a number of documents that are part of the record demonstrating Section 106 compliance. These include the following:

- June 7, 2007, letter from SAFCA's project archaeologist to the Native American Heritage Commission (NAHC) requesting a list of Native American individuals and organizations to contact regarding the project;
- June 19, 2007, response letter from the NAHC to SAFCA's project archaeologist supplying a list of the requested individuals and organizations;
- June 21, 2007, letters from SAFCA's project archaeologist to Native American individuals and organizations soliciting concerns and any information about cultural resources in the project area;
- July 9, 2007, telephone record of conversation between SAFCA's project archaeologist and Rose Enos (referred to by the NAHC as "Miwok/Maidu") regarding Ms. Enos' general concern regarding avoidance of burial sites and request to be contacted if work is conducted on such sites;
- January 2008 letter (and enclosures) from USACE to the SHPO initiating Section 106 consultation;
- February 1, 2008, letter from USACE to the United Auburn Indian Community of Auburn regarding an invitation to participate as a concurring party in the PA [note: this is an example of about 20 letters that were sent to tribal entities inviting them to participate in the PA];
- May 8, 2008, letter from Shingle Springs Rancheria to the SHPO, USACE, and SAFCA regarding comments on the Draft PA and a request for formal consultation;
- June 11, 2008, response letter from USACE to Shingle Springs Rancheria regarding May 8, 2008 letter;
- June 12, 2008, response letter from SAFCA to Shingle Springs Rancheria regarding May 8, 2008 letter and the June 4, 2008, meeting; and
- July 23, 2008, letter from SAFCA to the California Department of Water Resources (DWR) providing further agency and public notice of the PA, per Stipulation VI of the PA, Native American and Other Consultation

and Public Notice. (Note: This is an example of letters that were sent to local municipalities, relevant state agencies, Native American individuals and organizations, and local preservation societies.)

While this record is not necessarily exhaustive, it documents the critical steps for Section 106 compliance completed by USACE.

6.1.9 AMERICAN INDIAN RELIGIOUS FREEDOM ACT

The American Indian Religious Freedom Act of 1978 is also applicable to Federal undertakings. This act established "the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions…including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites" (Public Law 95-431). Consultations with Native Americans to determine concerns regarding the Phase 3 Project are discussed in Section 7.2, "Native American Consultation."

6.1.10 WILD AND SCENIC RIVERS ACT

The Wild and Scenic Rivers Act (16 USC 1271 et seq.) establishes a National Wild and Scenic Rivers System for the protection of rivers with important scenic, recreational, fish and wildlife, and other values. Rivers are classified as wild, scenic, or recreational. The act designates specific rivers for inclusion in the System and prescribes the methods and standards by which additional rivers may be added. The lower American River is included in the System and is designated as "Recreational."

None of the internal water features of the project are tributary to the lower American River or any other river included in the System. Therefore, the action alternatives would have no effect on Wild or Scenic Rivers.

6.1.11 EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT

Executive Order (EO) 11988, Floodplain Management (May 24, 1977), directs Federal agencies to issue or amend existing regulations and procedures to ensure that the potential effects of any action it may take in a floodplain are evaluated and that its planning programs and budget requests reflect consideration of flood hazards and floodplain management. The purpose of this directive is "to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative." Guidance for implementation of EO 11988 is provided in the floodplain management guidelines of the U.S. Water Resources Council (40 CFR 6030; February 10, 1978) and in *A Unified National Program for Floodplain Management*, prepared by the Federal Interagency Floodplain Management Taskforce.

Recognizing that improving the Natomas Basin perimeter levee system would indirectly support population growth within the Basin, USACE in 1991 conducted extensive studies of the feasibility of constructing a cross levee spanning the Basin from east to west to limit the extent of flood protection improvements and associated floodplain development to the southern one-half to two-thirds of the Basin. The present study reconsidered a cross-levee measure. For the reasons described in Section 2.1.5.1, "Alternatives Evaluated and Rejected in Previous SAFCA NLIP Environmental Documents," this flood protection alternative has been determined to be impracticable and unlikely to prevent the urbanization of the northern portion of the Basin without a very costly program for acquiring flowage easements and retiring development rights on the lands north of the cross levee. Consequently, improvements to the Natomas Basin perimeter levee system have been determined by USACE, the State, and SAFCA to be the feasible method of providing adequate flood protection to existing development within the Basin and to the planned development. Although improving the perimeter levee system would fail to discourage further development within the Basin, this action is consistent with efforts by the State of California to comprehensively address floodplain development and flood risk on a regional scale. This comprehensive approach differentiates between flood protection requirements for urbanized and nonurbanized floodplain areas

and will direct urban development away from those floodplains where a "200-year" level of flood protection cannot be achieved while ensuring that this level of protection is provided for already heavily populated areas such as the Natomas Basin.

The project would reduce the risk of flood loss and minimize the impact of floods on human health, safety, and welfare by strengthening existing flood damage reduction infrastructure (see Section 4.4, "Hydrology and Hydraulics," for a discussion of the methodology and analysis of the Phase 3 Project's potential flood-related impacts). As noted in Section 2.5.1, "Residual Risk of Flooding," implementation of the Phase 3 Project would substantially lessen the probability of a flood in the Basin due to levee failure; however, the Natomas Basin would remain subject to a residual risk of flooding under both of the action alternatives. SAFCA would be required to maintain an ongoing residual risk management program, as described in Section 2.5.1. The Phase 3 Project would also create natural habitat that would serve ecological functions associated with natural floodplains (see Section 2.3.3, "Habitat Conservation Components"). Because there is no practicable alternative to the urban floodplain development indirectly associated with the project; the project would reduce flood damage and provide habitat values; and SAFCA would maintain an ongoing residual risk management program, it satisfies EO 11988.

6.1.12 EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS

The purpose of EO 11990 is to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands." To meet these objectives, EO 11990 requires Federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. EO 11990 applies to: acquisition, management, and disposition of Federal lands and facilities construction and improvement projects which are undertaken, financed or assisted by Federal agencies; and Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities. SAFCA has taken actions to minimize project effects on wetlands where possible and to create new wetlands as part of the project, and has applied for a CWA Section 404 permit from USACE. The replacement of Elkhorn Reservoir with a new sediment basin, part of the Phase 2 Project, is being designed to incorporate setbacks from the adjacent slough to minimize disturbance of wetlands there.

Implementation of the project as proposed would ensure no net loss of aquatic resource function and services through SAFCA's proposed compensatory mitigation. Wetlands and other waters of the United States that would be created as part of the project are described in Section 2.3.3, "Habitat Conservation Components." These features would all be considered giant garter snake habitat and are quantified under Impact 4.9-c in Section 4.9, "Special-Status Terrestrial Species." Wetlands that would be created as part of the project include marsh habitat in a portion of the Sacramento International Airport (Airport) north bufferlands borrow area, for which SAFCA has developed a preliminary design. Additional wetlands in the form of marsh are expected to be created on land used as a borrow source in the Fisherman's Lake area. Small wetland areas may also be created in nodes as part of the GGS/Drainage Canal system.

6.1.13 EXECUTIVE ORDER 12898, FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS

EO 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (59 Federal Register 7629 [1994]) requires Federal agencies to identify and address disproportionately high and adverse health or environmental affects on minority populations, low-income populations, and Native Americans that may result from any proposed action. The Council on Environment Quality (CEQ) has oversight of the Federal government's compliance with the EO. To facilitate compliance, CEQ prepared and issued, in association with EPA, "Environmental Justice Guidance Under the National Environmental Policy Act" (CEQ December 1997). The Environmental Justice Guidance provides six principles by which environmental justice issues should be identified and addressed (CEQ 1994:9):

1. Consider the composition of the affected area to determine whether minority populations, low-income populations, or Indian tribes are present in the area affected by the proposed action, and if so, determine if human health or environmental affects would be disproportionately high on those populations.

2. Consider relevant public health data and industry data concerning the potential for multiple or cumulative exposure to human health or environmental hazards including historical patterns of exposure to hazards.

3. Recognize the interrelated cultural, social, occupational, historical, or economic factors that may amplify the natural and physical environmental effects of the action.

4. Develop effective public participation strategies.

5. Assure meaningful community representation in the process.

6. See tribal representation in the process.

The project area adjacent to the NEMDC west levee has the highest concentration of residences. Data from the 2000 Census show that this area has a higher percentage of minority and low-income populations than does the city of Sacramento as a whole (U.S. Census Bureau 2000).

While not currently residing in the local project vicinity as a distinct population group, Native American tribes are known to have lived in the project study area in the past and there is evidence of their occupation of the project study area. The sites of occupation by Native American tribes are considered culturally significant, therefore, addressed in this EIS/EIR.

See Section 3.3.21 and 4.21, "Environmental Justice," for more information on project effects of minority and low-income populations, as well as on Native American tribes.

6.1.14 FARMLAND PROTECTION POLICY ACT

The Natural Resources Conservation Service (NRCS) is the agency primarily responsible for implementing the Federal Farmland Protection Policy Act (FPPA). The purpose of the FPPA is to minimize Federal contributions to the conversion of farmland to nonagricultural uses by ensuring that Federal programs are administered in a manner compatible with state government, local government, and private programs designed to protect farmland.

NRCS administers the FPPA, which is a voluntary program that provides funds to help purchase development rights to keep productive farmland in agricultural uses. The program provides matching funds to state, local, or tribal government entities and nongovernmental organizations with existing farmland protection programs to purchase conservation easements. Participating landowners agree not to convert the land to nonagricultural uses and retain all rights to the property for future agriculture. A minimum 30-year term is required for conservation easements, and priority is given to applications with perpetual easements. NRCS provides up to 50% of the fair market value of the easement (NRCS 2004).

Both action alternatives require converting areas of farmland along the perimeter of the Natomas Basin to flood damage reduction facilities. Additional areas of farmland would be used as sources of soil borrow material. The topsoil on these lands would be retained and replaced after several feet of underlying soil is removed, and most of these lands would continue to be farmable, although some would be converted to marsh habitat. In addition, mitigation intended to reduce project effects on farmland is included in this EIS/EIR. Mitigation includes the acquisition of agricultural conservation easements at a 1:1 ratio (i.e., 1 acre on which easements are acquired to 1 acre of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance removed from agricultural use), with the lands on which the permanent easements are acquired maintained in agricultural use.

Also, the proposed modifications of the agricultural irrigation and drainage infrastructure included in the action alternatives would support the maintenance of agricultural practices on the west side of the Natomas Basin.

The project complies with the FPPA because it provides for compensation for unavoidable direct conversion of agricultural land to nonagricultural uses, would provide infrastructure that would support the continuation of agricultural uses on the west side of the Natomas Basin, and is consistent with state and regional planning efforts that will protect farmland on a regional scale from development. Consultation with the NRCS (including submittal of the Farmland Conservation Impact Rating form) does not apply to Federal activities involving permitting and licensing (see 7 CFR 658) and therefore is not required for the project.

6.1.15 WILDLIFE HAZARDS ON OR NEAR AIRPORTS

The FAA addresses control of hazardous wildlife in Advisory Circular (AC) 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*. The FAA provides direction on where public-use airports should restrict land uses that have the potential to attract hazardous wildlife. FAA recommends a distance of 10,000 feet separating wildlife attractants and aircraft movement areas. The area within a 10,000-foot radius of the Airport Operations Area is designated as the Critical Zone. The FAA definition of wildlife attractants in AC 150/5200-33A includes human-made or natural areas, such as poorly drained areas, retention ponds, agricultural activities, and wetlands. AC 150/5200-33A recommends against the use of airport property for agricultural production within a 5-mile radius of the Airport Operations Area unless the income from the agricultural crops is necessary for the economic viability of the airport.

Section 2.3.2, "Avian Safety Components," describes FAA's regulatory interest in managing wildlife attractants within 5 miles of the edge of the Airport's Area of Operations. Potential borrow sites within this area have been identified based on balancing multiple management priorities (including flood risk management, aviation safety, and habitat conservation) and minimizing the cost and environmental effects of borrow haulage activities. Within the 10,000-foot Airport Critical Zone, management of the grasslands created by borrow operations would also be consistent with the Airport's *Wildlife Hazard Management Plan* (Sacramento County Airport System 2007).

6.1.16 FEDERAL EMERGENCY MANAGEMENT AGENCY

LEVEE REQUIREMENTS

For a levee accredited by the Federal Emergency Management Agency (FEMA) as providing a "100-year" level of flood protection, the levee must be shown to satisfy several criteria, including protection of the embankment against erosion. Specific requirements are contained in Code of Federal Regulations Title 44, Section 65.10.

FLOOD ZONE DESIGNATIONS

Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area. In January 2008, FEMA proposed remapping the Natomas Basin as an AE zone, with the designation to take effect in December 2008. FEMA defines AE zones as areas with a 1% annual chance of flooding. The designation would result in the requirement that the bottom floor of all new buildings be constructed at or above base flood elevation—as little as 3 feet in some areas of Natomas but up to 20 feet above the ground level in much of the Basin. It is therefore anticipated that this designation would effectively stop any projects that are not issued building permits by the time the new map takes effect. An alternative to this designation, the A99 zone, may be applied where it can be shown that an area with a 1% annual chance of flooding will be protected by a Federal flood damage reduction system where construction has reached specified legal requirements. The main requirements are that 100% of the cost of the flood protection system restoration project must be authorized, 60% must be appropriated, 50% must be expended, and "critical features" must be under construction and 50% completed (FEMA 2007). Construction is not constrained and there are no

FEMA-specified building elevation requirements with an A99 designation. Mandatory flood insurance purchase requirements apply to both designations, however.

6.1.17 SUSTAINABLE FISHERIES ACT

In response to growing concern about the status of United States fisheries, Congress passed the Sustainable Fisheries Act of 1996 (Public Law [PL] 104-297) to amend the Magnuson-Stevens Fishery Conservation and Management Act (PL 94-265), the primary law governing marine fisheries management in the Federal waters of the United States. Under the Sustainable Fisheries Act, consultation is required by NMFS on any activity that might adversely affect essential fish habitat (EFH). EFH includes those habitats that fish rely on throughout their life cycles. It encompasses habitats necessary to allow sufficient production of commercially valuable aquatic species to support a long-term sustainable fishery and contribute to a healthy ecosystem. The Sacramento River and the lowermost segment of the NEMDC have been designated as Essential Fish Habitat by the Pacific Fishery Management Council.

6.1.18 RESOURCE CONSERVATION AND RECOVERY ACT

Hazardous substances may exist within the Natomas Basin or be brought in and used for construction-related purposes (See Section 3.3.18, "Hazards and Hazardous Materials," and Section 4.18, "Hazards and Hazardous Materials," for more information). At the Federal level, the principal agency regulating the generation, transport, and disposal of hazardous substances is the U.S. Environmental Protection Agency (EPA), under the authority of the Resource Conservation and Recovery Act (RCRA). RCRA established an all-encompassing Federal regulatory program for hazardous substances that is administered in California by the Department of Toxic Substances Control (DTSC). Under RCRA, DTSC regulates the generation, transportation, treatment, storage, and disposal of hazardous substances. RCRA was amended in 1984 by the Hazardous and Solid Waste Amendments of 1984, which specifically prohibits the use of certain techniques for the disposal of various hazardous substances. The Federal Emergency Planning and Community Right-to-Know Act of 1986 imposes hazardous materials planning requirements to help protect local communities in the event of accidental release.

6.1.19 STATUTORY REQUIREMENTS FOR SOCIOECONOMICS

Section 3.3.2.3, "Socioeconomics and Population and Housing" and Section 4.2, "Land Use, Socioeconomics, and Population and Housing," discusses socioeconomic issues relevant to the Phase 3 Project.

6.1.20 UNIFORM RELOCATION ASSISTANCE AND REAL PROPERTY ACQUISITION POLICIES ACT

All or portions of parcels within the Phase 3 Project footprint would need to be acquired to construct either of the action alternatives (See **Appendix H**, "Construction Details," for specific parcels). Federal, state, local government agencies, and others receiving Federal financial assistance for public programs and projects that require the acquisition of real property, must comply with the policies and provisions set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended in 1987 (42 USC 4601 *et seq.*) (Uniform Act), and implementing regulation, Title 49 CFR Part 24. Relocation advisory services, moving costs reimbursement, replacement housing, and reimbursement for related expenses and rights of appeal are provided for in the Uniform Act.

Project implementation would (1) require acquisition of property to construct flood damage reduction facilities (applies to both the Proposed Action and the Levee Raise-in-Place Alternative); (2) require closure of Garden Highway in 1.5- to 2-mile segments for approximately 8 to 12 weeks at a time, preventing access to residences in these areas and, thus, potentially requiring affected residents to relocate during that time period (applies only to the Levee Raise-in-Place Alternative); and (3) prevent land-based access to two marinas during project

construction along the Sacramento River east levee near the I-5 Bridge, potentially requiring closure of the businesses associated with the marinas (restaurants, bars, boat rentals) for approximately 8 to 12 weeks during the summer season (applies to both the Proposed Action and the Levee Raise-in-Place Alternative).

Property acquisition and relocation services, compensation for living expenses for temporarily relocated residents, and negotiations regarding any compensation for temporary loss of business would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act and California Government Code Section 7267 *et seq*. (see Section 6.2.22, below).

6.2 STATE

6.2.1 CENTRAL VALLEY FLOOD PROTECTION BOARD ENCROACHMENT PERMIT

The California Central Valley Flood Protection Board (CVFPB, formerly The Reclamation Board) requires an encroachment permit for any non-Federal activity along or near Federal flood damage reduction project levees and floodways or in Board-designated floodways to ensure that proposed local actions or projects do not impair the integrity of existing flood damage reduction systems to withstand flood conditions. The permits are conditioned upon SAFCA receipt of permission from USACE for alteration of the Federal project works pursuant to Section 408.

6.2.2 CALIFORNIA SURFACE MINING AND RECLAMATION ACT

The California Surface Mining and Reclamation Act of 1975 (PRC Section 2710 et seq.) (SMARA) addresses surface mining. Activities subject to SMARA include, but are not limited to, mining of minerals, gravel, and borrow material. The SMARA statute requires mitigation to reduce adverse impacts on public health, property, and the environment. Because SAFCA would require borrow material for project construction, SAFCA must comply with SMARA. SMARA applies to an individual or entity that would disturb more than 1 acre or remove more than 1,000 cubic yards of material through surface mining activities, including the excavation of borrow pits for soil material. SMARA is implemented through ordinances for permitting developed by local government "lead agencies" that provide the regulatory framework under which local mining and reclamation activities are conducted. The State Mining and Geology Board reviews the local ordinances to ensure that they meet the procedures established by SMARA.

Sutter and Sacramento Counties are the SMARA lead agencies for borrow excavation operations for the Proposed Action. In general, SMARA permitting requires lead agency approval of a permit and a reclamation plan and the posting of approved financial assurance for the reclamation of the mined land. SAFCA is coordinating with the Sacramento and Sutter Counties' planning departments to complete SMARA compliance for project borrow activities. Compliance would be achieved by either obtaining SMARA permits or exemptions from SMARA. A permit or exemption for the Airport north bufferlands borrow site (which may be used for borrow in 2009) is anticipated in spring 2009, before the start of construction, assuming timely completion of the NEPA and CEQA processes. Additional permits or exemptions would also apply to other sources of borrow material.

6.2.3 CALIFORNIA IMPORTANT FARMLAND INVENTORY SYSTEM AND FARMLAND MAPPING AND MONITORING PROGRAM

The California Department of Conservation, Office of Land Conservation, maintains a statewide inventory of farmlands. These lands are mapped by the Division of Land Resource Protection as part of the Farmland Mapping and Monitoring Program (FMMP). The maps are updated every 2 years with the use of aerial photographs, a computer mapping system, public review, and field reconnaissance. Farmlands are divided into the following five categories based on their suitability for agriculture:

- **Prime Farmland**—land that has the best combination of physical and chemical characteristics for crop production. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed.

- **Farmland of Statewide Importance**—land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production.

- **Unique Farmland**—land that does not meet the criteria for Prime Farmland or Farmland of Statewide Importance, but that has been used for the production of specific crops with high economic value.

- **Farmland of Local Importance**—land that is either currently producing crops or has the capability of production, but that does not meet the criteria of the categories above.

- **Grazing Land**—land on which the vegetation is suited to the grazing of livestock.

These categories are sometimes referred to as Important Farmland. Other categories used in the FMMP mapping system are "urban and built-up lands," "lands committed to nonagricultural use," and "other lands" (land that does not meet the criteria of any of the other categories).

Much of the farmland in the Natomas Basin is designated by the FMMP as Prime Farmland and Farmland of Statewide Importance (California Department of Conservation 2008). **Plate 19** shows the designated farmland within and surrounding the Natomas Basin according to the latest data available from FMMP.

6.2.4 CALIFORNIA LAND CONSERVATION ACT OF 1965 (WILLIAMSON ACT)

The California Land Conservation Act of 1965, commonly known as the Williamson Act (California Government Code Section 51200 et seq.), enables local governments to enter into contracts with private landowners for the purpose of promoting the continued use of the relevant land in agricultural or related open space use. In return, landowners receive property tax assessments that are based on farming and open space uses instead of full market value. Local governments receive an annual subvention (subsidy) of forgone property tax revenues from the state via the Open Space Subvention Act of 1971.

The Williamson Act empowers local governments to establish "agricultural preserves" consisting of lands devoted to agricultural uses and other compatible uses. Upon establishment of such preserves, the locality may offer to owners of included agricultural land the opportunity to enter into annually renewable contracts that restrict the land to agricultural use for at least 10 years (i.e., the contract continues to run for 10 years following the first date upon which the contract is not renewed). In return, the landowner is guaranteed a relatively stable tax rate, based on the value of the land for agricultural/open space use only and unaffected by its development potential.

As a public agency that may acquire lands within agricultural preserves, including lands under contract, SAFCA is exempt from the normal cancellation process for Williamson Act contracts, because the contract is nullified for the portion of the land actually acquired (California Government Code Section 51295). SAFCA must provide notice to the California Department of Conservation prior to acquiring such lands (California Government Code Section 51291[b]). A second notice is required within 10 working days after the land is actually acquired (California Government Code Section 51291[c]). As the land would be acquired for flood damage reduction measures, SAFCA is exempt from the findings required in California Government Code Section 51292 (California Government Code Section 51293[e][1]) because the proposed project consists of flood control works. The preliminary notice to the California Department of Conservation, provided before lands are actually acquired, would demonstrate the purpose of the project and the exemption from the findings.

Much of the farmland in the Natomas Basin is in an agricultural preserve, with portions of those lands currently held in a Williamson Act Contracts (**Plate 20**).

6.2.5 CLEAN WATER ACT (SECTION 401)

Under Federal law, EPA has published water quality regulations under Volume 40 of the Code of Federal Regulations (40 CFR). Section 303 of the CWA requires states to adopt water quality standards for all surface waters of the United States. As defined by the CWA, water quality standards consist of two elements: (1) designated beneficial uses of the water body in question, and (2) criteria that protect the designated uses. Section 304(a) requires EPA to publish advisory water quality criteria that accurately reflect the latest scientific knowledge on the kind and extent of all effects on health and welfare that may be expected from the presence of pollutants in water. Where multiple uses exist, water quality standards must protect the most sensitive use. In California, EPA has delegated responsibility to the State Water Resources Control Board (SWRCB) and its nine regional water quality control boards (RWQCBs) for identifying beneficial uses and adopting applicable water quality objectives.

Under CWA Section 401(a)(1), applicants for a Federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects with a Federal component that may affect state water quality (including projects that require Federal agency approval such as issuance of a Section 404 permit) must also comply with CWA Section 401. The Section 401 water quality certification certifies that the proposed activity will not violate state water quality standards. The RWQCBs administer the Section 401 program with the intent of prescribing measures necessary to avoid, minimize, or mitigate adverse impacts of proposed projects on water quality.

SAFCA is applying to the Central Valley RWQCB for Section 401 water quality certification for the Proposed Action.

6.2.6 PORTER-COLOGNE WATER QUALITY CONTROL ACT AND CLEAN WATER ACT (SECTION 402)

Sacramento River water quality may be compromised by implementation of the Phase 3 Project from RD 1000 Pumping Plant No. 2 discharges; stormwater runoff from Garden Highway drainage outlet; or temporary construction-related stormwater runoff, erosions, or spills (See Section 4.5, “Water Quality,” for more information).

The SWRCB and RWQCBs regulate discharges of waste into waters of the state through National Pollutant Discharge Elimination System (NPDES) permits, authorized under Section 402 of the CWA for waste discharges to waters of the United States, and through waste discharge requirements (WDRs), authorized under the state’s Porter-Cologne Water Quality Control Act (Porter-Cologne Act). The RWQCBs issue NPDES permits and WDRs to ensure that projects that may discharge wastes to land or water conform to water quality objectives and policies and procedures of the applicable water quality control plans. The Porter-Cologne Act defines waters of the state as “any surface water or ground water, including saline waters, within the boundaries of the state.” Some waters that qualify as waters of the state, such as isolated wetlands, do not necessarily qualify as waters of the United States.

The RWQCBs issue NPDES permits for waste discharges to surface water from both point and nonpoint sources. The NPDES permit system includes an individual permit system for municipal wastewater treatment plants and several categories of stormwater discharges. General NPDES stormwater permits apply to industrial facilities and any general ground-disturbing construction activity greater than 1 acre. Before construction of such projects, applicants must submit a Notice of Intent (NOI) to the RWQCB and prepare a Storm Water Pollution Prevention

Plan (SWPPP). A SWPPP generally describes proposed construction activities, receiving waters, stormwater discharge locations, and best management practices (BMPs) that will be used to reduce project construction effects on receiving water quality. A number of "good housekeeping" BMPs are also generally included in a SWPPP to control waste discharges during the dry months. An appropriate selection of post-construction permanent pollution control and treatment measures must also be considered for implementation where necessary to prevent long-term water quality impairment.

Under the Porter-Cologne Act ,the RWQCBs issue WDRs to regulate activities of entities subject to the state's jurisdiction that would discharge waste that may affect groundwater quality or that may discharge waste in a diffused manner (e.g., through erosion from soil disturbance). WDRs specify terms and conditions that must be followed during the implementation and operation of a project.

The RWQCB administers a general WDR/NPDES permit process for low-threat discharges from construction dewatering activities that discharge to surface waters (i.e., removal of accumulated water during excavation). SAFCA will be required to submit a NOI for discharge to the RWQCB before commencement of construction activities. The general order contains a set of standard terms and conditions for compliance with discharge prohibitions, specific effluent and receiving water limitations, required solids disposal activities, water quality monitoring protocols, and applicable water quality criteria. When numerous discharge locations are anticipated, the general order allows the applicant to submit a Pollution Prevention, Monitoring, and Reporting Plan that provides for consolidated identification of discharges, monitoring, and reporting procedures. The RWQCB can also issue a waiver to dewatering discharges if the discharge would not enter a water body.

SAFCA would implement BMPs, prepare and implement a SWPPP, and comply with NPDES permit conditions.

6.2.7 CALIFORNIA ENDANGERED SPECIES ACT

Pursuant to CESA, a permit from DFG is required for projects that could result in the take of a plant or animal species that is state listed as threatened or endangered. Under CESA, "take" is defined as an activity that would directly or indirectly kill an individual of a species, but the CESA definition of take does not include "harming" or "harassing," as the Federal ESA definition does. As a result, the threshold for take is higher under CESA than under ESA. SAFCA will coordinate with DFG to discuss CESA compliance requirements and will apply to DFG for take authorization under Section 2081 of the California Fish and Game Code. SAFCA will obtain a Section 2081 permit prior to construction and comply with its conditions.

6.2.8 CALIFORNIA FISH AND GAME CODE SECTION 1602—STREAMBED ALTERATION AGREEMENT

All diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake in California that supports wildlife resources are subject to regulation by DFG under Section 1602 of the California Fish and Game Code. Under Section 1602, it is unlawful for any person, governmental agency, or public utility to do the following without first notifying DFG:

- substantially divert or obstruct the natural flow of, or substantially change or use any material from, the bed, channel, or bank of any river, stream, or lake; or

- deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

A stream is defined as a body of water that flows at least periodically or intermittently through a bed or channel that has banks and supports fish or other aquatic life. This definition includes watercourses with a surface or subsurface flow that supports or has supported riparian vegetation. DFG's jurisdiction within altered or artificial

waterways is based on the value of those waterways to fish and wildlife. A DFG streambed alteration agreement must be obtained for any project that would affect a river, stream, or lake.

SAFCA is applying for a Section 1602 Streambed Alteration Agreement for the project.

6.2.9 CALIFORNIA FISH AND GAME CODE SECTIONS 3503 AND 3503.5—PROTECTION OF BIRD NESTS AND RAPTORS

Section 3503 of the California Fish and Game Code states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. Section 3503.5 specifically states that it is unlawful to take, possess, or destroy any raptors (i.e., species in the orders Falconiformes and Strigiformes), including their nests or eggs. Typical violations of these codes include destruction of active nests resulting from removal of vegetation in which the nests are located. Violation of Section 3503.5 could also include failure of active raptor nests resulting from disturbance of nesting pairs by nearby project construction. This statute does not provide for the issuance of any type of incidental take permit.

6.2.10 CALIFORNIA FISH AND GAME CODE—FULLY PROTECTED SPECIES

Protection of fully protected species is described in Sections 3511, 4700, 5050, and 5515 of the California Fish and Game Code. These statutes prohibit take or possession of fully protected species and do not provide for authorization of incidental take of fully protected species. DFG has informed non-Federal agencies and private parties that their actions must avoid take of any fully protected species.

6.2.11 BASIN PLAN

Pursuant to the Porter-Cologne Act, the Central Valley RWQCB prepares and updates the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins* (Basin Plan) every 3 years; the most recent update was completed in February 2007 (Central Valley RWQCB 2007). The Basin Plan describes the officially designated beneficial uses for specific surface water and groundwater resources and the enforceable water quality objectives necessary to protect those beneficial uses. The Natomas Basin is located within the Central Valley RWQCB jurisdiction and is subject to the Basin Plan.

The Basin Plan includes numerical and narrative water quality objectives for physical and chemical water quality constituents. Numerical objectives are set for temperature, dissolved oxygen, turbidity, and pH; total dissolved solids, electrical conductivity, bacterial content, and various specific ions; trace metals; and synthetic organic compounds. Narrative objectives are set for parameters such as suspended solids, biostimulatory substances (e.g., nitrogen and phosphorus), oil and grease, color, taste, odor, and aquatic toxicity. Narrative objectives are often precursors to numeric objectives. The primary method used by the Central Valley RWQCB to ensure conformance with the Basin Plan's water quality objectives and implementation policies and procedures is to issue WDRs for projects that may discharge wastes to land or water. WDRs specify terms and conditions that must be followed during the implementation and operation of a project.

6.2.12 CALIFORNIA TOXICS RULE AND STATE IMPLEMENTATION POLICY

The California Toxics Rule (CTR) was promulgated in 2000 in response to requirements of the EPA National Toxics Rule (NTR). The NTR and CTR criteria are regulatory criteria adopted for inland surface waters, enclosed bays, and estuaries in California that are subject to regulation pursuant to Section 303(c) of the CWA. The NTR and CTR include criteria for the protection of aquatic life and human health. Human health criteria (water and organisms) apply to all waters with a Municipal and Domestic Supply beneficial use designation as indicated in the RWQCBs' basin plans. The *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California,* also known as the State Implementation Plan, was adopted by the

SWRCB in 2000 to establish provisions for translating CTR criteria, NTR criteria, and basin plan water quality objectives for toxic pollutants into the following:

- NPDES permit effluent limits,
- compliance determinations,
- monitoring for dioxin (2,3,7,8-TCDD) equivalents,
- chronic toxicity control provisions,
- initiating site-specific objective development, and
- granting exceptions.

See Section 3.5.2.1, "Surface Water Quality," for project-related information.

6.2.13 CALIFORNIA REGISTER OF HISTORIC PLACES

The CRHR includes resources that are listed in or formally determined eligible for listing in the National Register of Historic Places (NRHP) (see Section 3.3.10, "Cultural Resources"), as well as some California State Landmarks and Points of Historical Interest (PRC Section 5024.1, 14 California Code of Regulations [CCR] Section 4850). Properties of local significance that have been designated under a local preservation ordinance (local landmarks or landmark districts) or that have been identified in a local historical resources inventory may be eligible for listing in the CRHR and are presumed to be significant resources for purposes of CEQA unless a preponderance of evidence indicates otherwise (State CEQA Guidelines Section 15064.5[a][2]). The eligibility criteria for listing in the CRHR are similar to those for NRHP listing but focus on the importance of the resources to California history and heritage. A cultural resource may be eligible for listing in the CRHR if it:

(1) is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

(2) is associated with the lives of persons important in our past;

(3) embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

(4) has yielded, or may be likely to yield, information important in prehistory or history.

See 14 CCR Section 4852.

6.2.14 NATIVE AMERICAN HERITAGE COMMISSION

The NAHC identifies and catalogs places of special religious or social significance to Native Americans and known graves and cemeteries of Native Americans on private lands, and performs other duties regarding the preservation and accessibility of sacred sites and burials and the disposition of Native American human remains and burial items. Section 7.2.2, "Native American Consultation Under CEQA," details correspondence between SAFCA and the NAHC.

6.2.15 CALIFORNIA CLEAN AIR ACT

The California Air Resources Board (ARB) is the agency responsible for coordination and oversight of state and local air pollution control programs in California and for implementing the California Clean Air Act (CCAA). The CCAA, which was adopted in 1988, required ARB to establish California ambient air quality standards (CAAQS) (**Table 3.11-1**). ARB has established CAAQS for sulfates, hydrogen sulfide, vinyl chloride, visibility-reducing particulate matter, and the above-mentioned criteria air pollutants. In most cases, the CAAQS are more stringent than the NAAQS. Differences in the standards are generally explained by the health effects studies

considered during the standard-setting process and the interpretation of the studies. In addition, the CAAQS incorporate a margin of safety to protect sensitive individuals.

The CCAA requires that all local air districts in the state endeavor to achieve and maintain the CAAQS by the earliest practical date. The act specifies that local air districts should focus particular attention on reducing the emissions from transportation and areawide emission sources, and provides districts with the authority to regulate indirect sources.

Other ARB responsibilities include:

- overseeing local air district compliance with California and Federal laws;
- approving local air quality attainment plans (AQAPs);
- submitting State Implementation Plans (SIPs) to EPA;
- monitoring air quality;
- determining and updating area designations and maps; and
- setting emissions standards for new mobile sources, consumer products, small utility engines, off-road vehicles, and fuels.

See Section 4.13, "Air Quality," for project-related details regarding air pollutant emissions.

6.2.16 CALIFORNIA CLIMATE SOLUTIONS ACT OF 2006

In September 2006, Governor Arnold Schwarzenegger signed AB 32, the California Climate Solutions Act of 2006. AB 32 requires that statewide greenhouse gas (GHG) emissions be reduced to 1990 levels by 2020. This reduction will be accomplished through an enforceable statewide cap on GHG emissions that will be phased in starting in 2012. To effectively implement the cap, AB 32 directs ARB to develop and implement regulations to reduce statewide GHG emissions from stationary sources. AB 32 specifies that regulations adopted in response to AB 1493 should be used to address GHG emissions from vehicles. However, AB 32 also includes language stating that if the AB 1493 regulations cannot be implemented, then ARB should develop new regulations to control vehicle GHG emissions under the authorization of AB 32.

AB 32 requires that ARB adopt a quantified cap on GHG emissions representing 1990 emissions levels and disclose how it arrives at the cap; institute a schedule to meet the emissions cap; and develop tracking, reporting, and enforcement mechanisms to ensure that the state achieves the reductions in GHG emissions necessary to meet the cap. AB 32 also includes guidance to institute emissions reductions in an economically efficient manner and conditions to ensure that businesses and consumers are not unfairly affected by the reductions.

Contributions of GHG emissions related to the Phase 3 Project is discussed in Section 5.1.3, "Summary of Cumulative Impact Analyses from Previous NLIP Environmental Documents," under the subheading, "Project Impacts that Would Be Cumulatively Considerable."

6.2.17 STATE OF CALIFORNIA GENERAL PLAN GUIDELINES

The Governor's Office of Planning and Research (OPR) published the *State of California General Plan Guidelines* (OPR 2003), which provide guidance for the acceptability of projects within specific day-night average noise level (L_{dn}) contours. Generally, residential uses (e.g., mobile homes) are considered to be acceptable in areas where exterior noise levels do not exceed 60 A-weighted decibels (dBA) L_{dn}. Residential uses

are normally unacceptable in areas exceeding 70 dBA L_{dn} and conditionally acceptable within 55–70 dBA L_{dn}. Schools are normally acceptable in areas up to 70 dBA L_{dn} and normally unacceptable in areas exceeding 70 dBA L_{dn}. Commercial uses are normally acceptable in areas with a community noise equivalent level (CNEL) of up to 70 dBA. Commercial uses are conditionally acceptable where the L_{dn} is between 67.5 and 77.5 dBA, depending on the noise insulation features and the noise reduction requirements. The guidelines also provide adjustment factors for determining noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

Noise studies and project-related impacts and mitigation are discussed in Section 4.14, "Noise."

6.2.18 CALIFORNIA CODE OF REGULATIONS, TITLE 24

Title 24 of the California Code of Regulations establishes standards governing interior noise levels that apply to all new multifamily residential units in California. These standards require that acoustical studies be performed before construction begins at locations where the existing L_{dn} exceeds 60 dBA. Such acoustical studies are required to establish mitigation measures that limit maximum L_{dn} levels to 45 dBA in any habitable room. Although no generally applicable interior noise standards are pertinent to all uses, many communities in California have adopted an L_{dn} of 45 dBA as an upper limit on interior noise in all residential units.

Noise studies and project-related impacts and mitigation are discussed in Section 4.14, "Noise."

6.2.19 CALIFORNIA EXECUTIVE ORDER S-01-06, IDENTIFICATION AND REPAIR OF CRITICAL EROSION SITES

On February 24, 2006, Governor Arnold Schwarzenegger declared a state of emergency for California's levee system. Soon after, he signed Executive Order S-01-06, directing DWR to identify and repair eroded levee sites on the Federal/state levee system to prevent catastrophic flooding and loss of life. To date, nearly 250 levee repair sites have been identified, and more than 100 of the most critical sites have been completed. Two of the sites are along the bank of the Sacramento River east levee between the Natomas Cross Canal (NCC) and the American River. Rock toe protection has been installed at these sites. These improvements do not overlap temporally with construction of the action alternatives.

6.2.20 CENTRAL VALLEY FLOOD CONTROL ACT OF 2008

The Central Valley Flood Control Act of 2008, passed in 2007, recognizes that the Central Valley of California, which includes the Natomas Basin, is experiencing unprecedented development, resulting in the conversion of historically agricultural lands and communities to densely populated residential and urban centers. Because of the potentially catastrophic consequences of flooding, the Act recognizes that the Federal government's current 100-year flood protection standard is not sufficient to protect urban and urbanizing areas within flood-prone areas throughout the Central Valley and declares that the minimum standard for these areas is a "200-year" level of flood protection. To continue with urban development, cities and counties must develop and implement plans for achieving this new standard by 2025. With respect to flood risk reduction, the Central Valley Flood Control Act also calls upon DWR to develop a comprehensive Central Valley Flood Protection Plan by the end of 2012 for protecting the lands currently within the Sacramento–San Joaquin River Flood Management System.

6.2.21 CALIFORNIA REGULATIONS FOR ENVIRONMENTAL JUSTICE

Most state governments have plans and policies intended to protect and expand the local and regional economies affecting the communities and residents within their jurisdictions. State plans and policies also frequently address

other social and economic impact topics, including fiscal conditions and related public services that affect local residents' quality of life.

Within California, Senate Bill (SB) 115 (Chapter 690, Statutes of 1999) was signed into law in 1999. The legislation established OPR as the coordinating agency for state environmental justice programs (California Government Code, Section 65040.12[a]) and defined environmental justice in statute as "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies" (Government Code Section 65040.12[e]). SB 115 further required the California Environmental Protection Agency (Cal/EPA) to develop a model environmental justice mission statement for boards, departments, and offices within the agency by January 1, 2001 (Public Resources Code, Sections 72000–72001).

In 2000, SB 89 (Chapter 728, Statutes of 2000) was signed, which complemented SB 115 by requiring the creation of an environmental justice working group and an advisory group to assist Cal/EPA in developing an intra-agency environmental justice strategy (Public Resources Code, Sections 72002–72003). SB 828 (Chapter 765, Statutes of 2001) added and modified due dates for the development of Cal/EPA's intra-agency environmental justice strategy and required each board, department, and office within Cal/EPA to identify and address, no later than January 1, 2004, any gaps in its existing programs, policies, and activities that may impede environmental justice (Public Resources Code, Sections 71114–71115).

Cal/EPA adopted its environmental justice policy in 2004 (California Public Resources Code, Sections 71110–71113). This policy (or strategy) provides guidance to its resource boards, departments, and offices. It is intended to help achieve the state's goal of "achieving fair treatment of people of all races, cultures and incomes with respect to the development, adoption, implementation and enforcement of environmental laws and policies."

Assembly Bill (AB) 1553 (Chapter 762, Statutes of 2001) required OPR to incorporate environmental justice considerations in the *General Plan Guidelines.* AB 1553 specified that the guidelines should propose methods for local governments to address the following:

- planning for the equitable distribution of new public facilities and services that increase and enhance community quality of life,
- providing for the location of industrial facilities and uses that pose a significant hazard to human health and safety in a manner that seeks to avoid over-concentrating these uses in proximity to schools or residential dwellings,
- providing for the location of new schools and residential dwellings in a manner that avoids proximity to industrial facilities and uses that pose a significant hazard to human health and safety, and
- promoting more livable communities by expanding opportunities for transit-oriented development.

Although environmental justice is not a mandatory topic in the general plan, OPR is required to provide guidance to cities and counties for integrating environmental justice into their general plans. The 2003 edition of the *General Plan Guidelines* included the contents required by AB 1553 (see pages 8, 12, 20–27, 40, 114, 142, 144, and 260 of the revised *General Plan Guidelines*).

Environmental justice issues pertaining to the Phase 3 Project are discussed in Section 3.3.2.1, "Environmental Justice," and Section 4.21, "Environmental Justice."

6.2.22 RELOCATION ASSISTANCE AND PROPERTY ACQUISITION

The State of California's Government Code Section 7260, et seq. brings the California Relocation Act into conformity with the Federal Uniform Act. In the acquisition of real property by a public agency, both the Federal and state acts seek to (1) ensure consistent and fair treatment of owners of real property, (2) encourage and expedite acquisition by agreement to avoid litigation and relieve congestion in the courts, and (3) promote confidence in public land acquisition.

The Relocation Assistance and Real Property Acquisition Guidelines (Guidelines) were established by 25 CCR 1.6. The Guidelines were developed to assist public entities with developing regulations and procedures implementing Title 42, Chapter 61 of the United States Code – the Uniform Act, for Federal and federally assisted programs. The Guidelines are designed to ensure that uniform, fair, and equitable treatment is given to people displaced from their homes, businesses, or farms as a result of the actions of a public entity. Under the Act, persons required to relocate temporarily are not considered "displaced," but must be treated fairly. Such persons have a right to temporary housing that is decent, safe, and sanitary and must be reimbursed for all reasonable out-of-pocket expenses. In accordance with these Guidelines, people shall not suffer disproportionate injury as a result of action taken for the benefit of the public as a whole. Additionally, public entities must ensure consistent and fair treatment of owners of such property, and encourage and expedite acquisitions by agreement with owners of displaced property to avoid litigation.

Project implementation would (1) require acquisition of property to construct flood damage reduction facilities (applies to both the Proposed Action and the Levee Raise-in-Place Alternative); (2) require closure of Garden Highway in 1.5 to 2-mile segments for approximately 8 to 12 weeks at a time, preventing access to residences in these areas and, thus, potentially requiring affected residents to relocate during that time period (applies only to the Levee Raise-in-Place Alternative); and (3) prevent land-based access to two marinas during project construction along the Sacramento River east levee near the I-5 Bridge, potentially requiring closure of the businesses associated with the marinas (restaurants, bars, boat rentals) for approximately 8 to 12 weeks during the summer season (applies to both the Proposed Action and the Levee Raise-in-Place Alternative).

Property acquisition and relocation services, compensation for living expenses for temporarily relocated residents, and negotiations regarding any compensation for temporary loss of business would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act (see Section 6.1.20, above) and California Government Code Section 7267 *et seq*.

6.3 REGIONAL AND LOCAL

The Natomas Basin includes portions of the city of Sacramento, Sacramento County, and Sutter County in which the project is proposed.

6.3.1 SUTTER COUNTY GENERAL PLAN

The Conservation/Open Space–Natural Resources Element of the *Sutter County General Plan* includes the following goal and policies that may be relevant to the analysis of fish and wildlife habitat:

- **Goal 4.C:** To protect and enhance habitats that support fish and wildlife species.

    - **Policy 4.C-1.** The County shall strive to preserve those areas of wildlife habitat designated "high habitat value" as shown on the biological sensitivity map in Chapter 9 of the Background Report.

    - **Policy 4.C-2.** The County shall encourage preservation and proper management of those areas designated "moderate habitat value" on the biological sensitivity map in Chapter 9 of the Background Report. The

County shall support the preservation and re-establishment of fisheries in the rivers and streams within the County.

- **Policy 4.C-3.** The County shall participate in the process of developing mitigation programs for threatened and endangered species to ensure that Sutter County's agricultural, economic, fiscal, and future urbanization and natural resource goals and policies are met.

The Land Use Element of the *Sutter County General Plan* (Sutter County 1996a) designates the proposed general distribution, location, and extent of all uses of land, including land for agriculture, and includes the following agricultural resource goal and policy that may be relevant to this analysis.

- **Goal 6.A:** To preserve high-quality agricultural land for agricultural purposes.

  - **Policy 6.B-3.** The County shall encourage the continued operation and expansion of existing agricultural industries.

The Land Use Element of the *Sutter County General Plan* includes the following goal and policies that may be relevant to the analysis of socioeconomics:

- **Goal 1.I:** To preserve and promote a healthy and diverse economy to serve the needs of Sutter County residents.

  - **Policy 1.I-1.** The County shall work to preserve and expand business and employment opportunities within Sutter County.

  - **Policy 1.I-2.** The County shall support and facilitate, to the extent possible, implementation of the strategies identified within the Yuba-Sutter Overall Economic Development Plan (OEDP) and any other economic development plans accepted by the County.

  - **Policy 1.I-3.** Recruitment efforts should attempt to focus on businesses and industries capable of creating a majority of positions that provide salaries above minimum wage.

  - **Policy 1.I-4.** Economic development efforts should attempt to diversify the County's economic base while encouraging retention and expansion of existing businesses and industries.

6.3.2 SACRAMENTO COUNTY GENERAL PLAN

The *Sacramento County General Plan* is currently being updated. At the time that this EIS/EIR was written, Sacramento County had issued a public review draft, which will be subject to environmental review before final certification. The Agricultural Element of the current *Sacramento County General Plan* (Sacramento County 1993a) describes the goals of this element as the challenge of "maintenance of the County's agricultural lands, [and] their agricultural productivity...." The following objective and policies of the current general plan may be relevant to this analysis. Objective: Retain agricultural land holdings in units large enough to guarantee future and continued agricultural use.

- **Policy AG-7.** Agricultural zoning district boundaries shall be rational and shall respect parcel boundaries.

- **Policy AG-8.** Agricultural land divisions shall not adversely affect the integrity of agricultural pursuits. Agricultural land divisions may be denied if the reviewing authority finds that the division of land is likely to create circumstances inconsistent with this policy.

The Conservation Element of the *Sacramento County General Plan* (Sacramento County 1993a) provides overall guidance for resource conservation in Sacramento County and includes several resource conservation goals and

objectives. It includes a specific goal to preserve and protect fisheries in county waterways and describes policies and programs under four objectives:

1. Water flows monitored and maintained, when climatic conditions allow, to promote fish propagation and migration.

2. Maintenance of channelized areas to reduce detritus accumulation and increase fish populations.

3. Water quality and runoff levels maintained to provide a healthy aquatic environment for fisheries.

4. Riparian vegetation and topographic diversity maintained by stream channel and bank stabilization projects.

The Conservation Element of the *Sacramento County General Plan* includes policies concerning native trees, flood channels, streamcourses, and waterways. Policies CO-130 through CO-136, which apply to discretionary projects, are intended to conserve native oaks and other native tree species. To preserve the natural characteristics of these areas, policies in the Conservation Element call for maintenance of riparian vegetation, buffer zones adjacent to stream corridors that contain riparian vegetation, and unlined watercourses. Policy CO-107 requires that topographic diversity and variation be retained when channels are realigned or modified, including maintaining meandering characteristics, varied berm width, and naturalized side slope. In addition, the Open Space Element contains general policies related to the protection of open space areas. Policy OS-1 calls for the permanent protection, as open space, of areas of natural resource value, including wetland preserves, riparian corridors, woodlands, and floodplains. Policy OS-2 promotes the maintenance of open space and natural areas that are interconnected and of sufficient size to protect biodiversity, accommodate wildlife movement, and sustain ecosystems (Sacramento County 1993a).

6.3.3 CITY OF SACRAMENTO GENERAL PLAN

The *City of Sacramento General Plan 2030* is under development. The *City of Sacramento General Plan 2006* contains goals and policies related to flood damage reduction and the phased conversion of agricultural properties, as well as the provision of sufficient housing and commercial and economic opportunities (City of Sacramento 1988). The City of Sacramento has a program with USACE and SAFCA in which it works with SAFCA and other responsible agencies to resolve floodplain restrictions. The following policies may be relevant to this analysis.

CONSERVATION AND OPEN SPACE

- **Policy 10.** To conserve and protect natural resources and planned open space areas and to phase the conversion of agricultural lands to planned urban uses.

  The City will provide open space for recreation. The American and Sacramento River Parkways will be conserved and protected. The City has other open space areas that can also be developed to their recreational use potential. These areas include utility easements, floodways, and floodplains.

RESOURCE PROTECTION

- **Policy B.10.** The City shall seek to minimize or avoid adverse impacts to historic and cultural resources from natural disasters. To this end, the City shall promote seismic safety, flood protection, and other building programs that preserve, enhance, and protect these resources.

FLOOD CONTROL

The *City of Sacramento General Plan 2006* also contains goals and policies related to flood control. These policies call for the preservation of riparian woodlands and grasslands along waterways in north Sacramento, and

the establishment of standards for water-related open space to enhance the visual characteristics of area water resources.

TOXIC SUBSTANCES

The City of Sacramento has established a Toxic Substances Commission whose task it is to develop long-range plans for issues related to toxic substances (hazardous materials) within the Sacramento city limits. The Sacramento County Hazardous Waste Management Plan is considered a part of the City of Sacramento General Plan (City of Sacramento 1988) to ensure that suitable locations are available for needed hazardous waste facilities and that land uses near the facilities, or proposed sites for facilities, are compatible with their operation.

6.3.4 SACRAMENTO INTERNATIONAL AIRPORT COMPREHENSIVE LAND USE PLAN

Some of the proposed project elements would be located within the "Critical Zone" of the Airport, managed by Sacramento County Airport System (SCAS). The Airport has a comprehensive land use plan that includes policies to protect public health, safety, and welfare through the adoption of land use standards that minimize the public's exposure to safety hazards and excessive levels of noise, and prevent the encroachment of incompatible land uses around the Airport.

6.3.5 NATOMAS BASIN HABITAT CONSERVATION PLAN

The Natomas Basin Habitat Conservation Plan (NBHCP) (City of Sacramento, Sutter County, and The Natomas Basin Conservancy [TNBC] 2003) was developed to promote biological conservation in conjunction with economic and urban development in the Natomas Basin. The NBHCP establishes a multispecies conservation program to minimize and mitigate the expected loss of habitat values and incidental take of "covered species" that could result from urban development and operation and maintenance of irrigation and drainage systems. Mitigation lands established in the Natomas Basin in accordance with the NBHCP are managed by TNBC. The NBHCP is described in Section 3.3.9.2, "Special-Status Wildlife Species."

6.3.6 LOCAL TREE ORDINANCES

The Tree Preservation Ordinance of Sacramento County (Sacramento County Code 480 Section 1, 1981) requires the protection of native oak trees within Sacramento County. This ordinance requires a permit for the removal of trees or for grading, excavating, or trenching within the dripline of a tree within the jurisdictional boundaries of the ordinance. A "tree" is defined as any living native oak tree having at least one trunk of 6 inches or more in diameter or a multitrunked native oak tree having an aggregate diameter of 10 inches or more. Removing woodlands during the Phase 3 Project would adversely affect native oaks within this size range as well as other trees that occur within Sacramento County; however, the NLIP is not located within the jurisdictional boundaries of the ordinance and, therefore, a permit is not required. Section 6.3.2, "Sacramento County General Plan," describes the policies related to the conservation of native trees with which the NLIP would be required to comply.

6.3.7 LOCAL GOVERNMENT NOISE STANDARDS

Construction activities associated with the proposed project could affect noise-sensitive land uses in Sutter and Sacramento Counties and the city of Sacramento. Most jurisdictions have adopted standards for both transportation and nontransportation noise sources in the noise elements of their general plans and/or in noise ordinances. Below is a summary of the applicable noise standards for this project. These standards are applicable to the evaluation in this EIS/EIR of the project's potential impacts related to noise (see Section 4.14, "Noise").

A project could have a significant effect on the environment if it conflicts with the applicable adopted noise standards, substantially increases the ambient noise levels for adjacent areas, or causes adverse noise impacts for sensitive receptors, such as residences and schools. All jurisdictions where project-related construction vehicle traffic would occur have adopted local ordinances regulating noise levels to minimize impacts on sensitive land uses. These local standards have been established for both nontransportation and transportation noise sources. **Table 6-1** lists the nontransportation noise standards in the relevant jurisdictions, and **Table 6-2** lists the transportation noise standards in those jurisdictions where the project may involve trucks hauling materials.

Table 6-1
Local Government Nontransportation Noise Standards (dBA)

Noise Element Jurisdiction/Land Use Category	Maximum Allowable Exterior Noise Levels					
	Daytime 7:00 a.m.–7:00 p.m.		Evening 7:00 p.m.–10:00 p.m.		Nighttime 10:00 p.m.–7:00 a.m.	
Sutter County	Daytime Hourly		Evening Hourly		Nighttime Hourly	
	L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
	50	70	50	70	45	65
	Construction noise is not exempt from Sutter County noise standards during any hours of the day.					
Sacramento County Residential Areas	Hourly		Hourly		Hourly	
	L_{50}	L_{max}	L_{50}	L_{max}	L_{50}	L_{max}
	50	70	50	70	45	65
	Construction noise is exempt from the Sacramento County noise regulations provided that construction does not take place before 6:00 a.m. or after 8:00 p.m. Monday through Friday, and before 7:00 a.m. or after 8:00 p.m. on Saturday and Sunday.					
City of Sacramento Residential Areas	Exterior L_{dn}/CNEL				Interior L_{dn}/CNEL	
	60				45	
	Construction noise is exempt from the City of Sacramento noise regulations provided that construction does not take place before 7:00 a.m. or after 6:00 p.m. Monday through Saturday, and before 9:00 a.m. or after 6:00 p.m. on Sunday.					

Notes: dBA = A-weighted decibel; L_{50} = noise level exceeded 50% of the time; L_{max} = maximum noise level; L_{dn} = day-night average noise level; CNEL = community noise equivalent level; L_{eq} = energy-equivalent noise level.
Sources: City of Sacramento 1988, Sacramento County 1998, Sutter County 1996a

Table 6-2
Local Government Transportation Noise Standards (dBA)

Noise Element Jurisdiction/Land Use Category	Maximum Allowable Noise Levels	
	Exterior L_{dn}/CNEL[1]	Interior L_{dn}/CNEL
Sutter County[2]		
Residential areas	60	45
Commercial areas—office buildings	–	–
Other sensitive areas—playground, parks and riding stables	70	–
Other sensitive areas—hospitals, nursing homes, churches, transient lodging	60	45
Sacramento County and City of Sacramento		
Residential areas	60	45

Notes: dBA = A-weighted decibel; L_{dn} = day-night average noise level; CNEL = community noise equivalent level.

[1] The jurisdictions with standards for transportation noise impacts have adopted a maximum L_{dn}/CNEL noise limit of 60 dBA for residential land uses, with a potential allowable L_{dn}/CNEL exceedance level 65 dBA, if 60 dBA is not feasible in a situation given the application of the best-available noise reduction measures.

[2] Worst-case 1-hour L_{eq} noise standards for interior spaces of 35–45 dBA have been adopted for theaters, auditoriums, music halls, churches, meeting halls, office buildings, schools, libraries and museums.

Sources: City of Sacramento 1988, Sacramento County 1998, Sutter County 1996a

Construction noise may affect receptors in unincorporated areas of Sutter and Sacramento Counties and in the city of Sacramento. These jurisdictions either have nontransportation noise standards based on time of day and land use sensitivity or provide exemptions for construction as long as those activities occur during the daytime. Residential areas are considered the most noise-sensitive land use, and the most restrictive noise standards apply. Other noise-sensitive land uses, such as riding stables, playgrounds, and parks, have restrictive noise standards for nontransportation noise as well. Each of the jurisdictions has established maximum allowable exterior noise standards for both daytime and nighttime hours as shown in **Table 6-1**.

Noise generated by a transportation source is also regulated according to land use. All the jurisdictions with standards for transportation noise impacts have adopted a normally acceptable L_{dn}/CNEL noise standard of 60 dBA for residential land uses and a conditionally acceptable L_{dn}/CNEL noise standard of 65 dBA, provided that the best available noise reduction measures have been applied. Many of the jurisdictions have adopted a maximum L_{dn}/CNEL noise limit of 70 dBA for playgrounds and parks.

Both the City of Sacramento Noise Control Code and the Sacramento County Noise Control Code conditionally exempt construction activity, but during different times of the day and week. The City Noise Control Code exempts noise generated by construction activity that occurs during the hours of 7:00 a.m. to 6:00 p.m. Monday through Saturday, and from 9:00 a.m. to 6:00 p.m. on Sunday (8.68.080 Exemptions, Noise Control Standards, City of Sacramento Municipal Code). The Sacramento County Noise Control Code exempts noise generated by construction activity that occurs during the hours of 6:00 a.m. to 8:00 p.m. Monday through Friday, and 7:00 a.m. to 8:00 p.m. on Saturday and Sunday (Chapter 6.68 Noise Control, County of Sacramento Code). Sutter County does not have noise ordinances nor exemptions for construction noise; therefore, the performance standards contained in **Table 6-1** are applied in this EIS/EIR to construction noise (Follas, pers. comm., 2007).

7.0 CONSULTATION AND COORDINATION

This chapter summarizes public and agency involvement activities undertaken by USACE and SAFCA that have been conducted to date for this project, and which satisfy NEPA and CEQA requirements for public scoping and agency consultation and coordination. The next steps in the NEPA and CEQA processes are also detailed.

Additionally, Native American consultation activities are described.

7.1 PUBLIC INVOLVEMENT UNDER NEPA AND CEQA

7.1.1 NOTICE OF INTENT, NOTICE OF PREPARATION, AND SCOPING MEETING

USACE published the notice of intent (NOI) to prepare the Phase 3 Project EIS in the *Federal Register* on July 18, 2008. SAFCA filed the notice of preparation (NOP) of the Phase 3 Project EIR with the State Clearinghouse and released it publicly on July 18, 2008. In addition to the State Clearinghouse's distribution of the NOP to potentially interested state agencies, copies of the NOP were mailed to more than 600 Federal, state, regional, and local agencies, as well as individual residents in the project area and homeowners associations, to solicit input as to the scope and content of the Phase 3 Project EIS/EIR. The NOI and NOP are included in **Appendix A1**.

A joint NEPA/CEQA public scoping meeting was held on August 6, 2008, to brief interested parties on the Phase 3 Project, and obtain the views of agency representatives and the public on the scope and content of the Phase 3 Project EIS/EIR. **Appendix A2** contains the public outreach materials for the August 6, 2008 scoping meeting.

Verbal and written comments were received during the scoping meeting, and additional written comments from agencies and individuals were received throughout the scoping period, which ended on August 18, 2008. All comment letters received during the scoping period are included in **Appendix A1** and are summarized in **Table 7-1**.

Table 7-1
Written Comments Received on the NOI/NOP

Commenter	Date
Federal Emergency Management Agency, Region IX	July 22, 2008
► Recommends that USACE and SAFCA review the current effective Flood Insurance Rate Maps, revised July 6, 1998, for Sacramento County. ► Notes that Sacramento County is a participant in the National Flood Insurance Program and subject to floodplain management building requirements.	
Federal Aviation Administration	August 18, 2008
► Notes that the EIS/EIR should address whether or not the project would be consistent with the guidelines in Federal Aviation Administration (FAA) Circular 150/5200-33B *Hazardous Wildlife Attractants on or Near Airports*, whether the project would increase the amount of habitat available for wildlife hazardous to aircraft, and whether the project would increase the risk of wildlife-aircraft collisions at Sacramento International Airport (Airport). ► Notes that Airport revenue and assets must be used to support aviation purposes, including the use of airport property for borrow material. ► Notes that FAA approval may be required for future project implementation.	
Native American Heritage Commission	August 6, 2008
► Requests that SAFCA complete a records search at the appropriate information center. ► Requests that, if an archaeological inventory survey is required, SAFCA prepare a professional report detailing the findings and recommendations of the records search and field survey. ► Requests that SAFCA contact the Native American Heritage Commission for a Sacred Lands File Check and a list of appropriate Native American contacts. ► Notes that mitigation plans should include provisions for the identification and evaluation of accidentally discovered archaeological resources, the disposition of recovered artifacts, and the discovery of Native American human remains.	

Table 7-1 Written Comments Received on the NOI/NOP	
Commenter	Date
California Department of Transportation, District 3—Sacramento Area Office	August 27, 2008
► Notes that the EIS/EIR should identify access points to the State Highway System and provide the estimated type and number of vehicles. ► Notes that a transportation management plan should be prepared and submitted to the California Department of Transportation District 3 Traffic Manager. ► Notes that encroachment permits will be required for work conducted within state right-of-way and for the installation of "project information" or "truck pull-out" signs near the work site.	
County of Sacramento, Department of Transportation	August 15, 2008
► Notes that the project proponent should enter into a maintenance agreement with the Maintenance and Operations Section of the County of Sacramento, Department of Transportation (SACDOT) to cover the maintenance and repair of any roadway damaged by the project construction. ► Requests the coordination of roadway closure and detour plans with SACDOT. ► Requests the coordination of proposed improvement plans that result from a change of geometrics at the Garden Highway intersections of West Elverta Road, West Elkhorn Boulevard, and Power Line Road with SACDOT. ► SACDOT staff would like to work with SAFCA regarding the possibility of adding a public pathway on top of the levee for use by pedestrians and bicyclists.	
Sutter County Public Works Department	August 18, 2008
► Notes that the EIS/EIR should address impacts on existing county roads in Sutter County. ► Notes that traffic impacts caused by the increased volume of truck traffic should be analyzed using a traffic impact study, which should also be used to determine potential haul routes, project traffic routes, and staging areas. ► Notes that a traffic routing plan and traffic safety and control plan should be developed and reviewed by state and local law enforcement and state and local road agencies.	
City of Sacramento, Department of Parks and Recreation	August 12, 2008
► Notes that construction along the Natomas East Main Drainage Canal (NEMDC) will affect the multi use trail along the NEMDC from the Sacramento Northern Parkway to Elkhorn Boulevard, also known as the Ueda Parkway. ► Notes that this EIS/EIR should discuss whether or not the Ueda Parkway will remain open during construction or if a detour is planned, how the Parkway and adjacent open space will be restored after construction, and if the access points to the Parkway will be reinstituted. ► Notes that a potential borrow site located south of Elkhorn Boulevard has been identified by the Department of Parks and Recreation as potential open space and park sites for the proposed Panhandle project. Asks how SAFCA's project will limit the department's use of the land and asks whether a permit will be required to use the land if SAFCA's plan to create marsh and upland habitat is successful. ► Expresses concern regarding impacts on an on-street and off-street bike trail along Garden Highway, the Sand Cove park site, and the Costa open space site.	
Rio Linda & Elverta Recreation and Park District	August 7, 2008
► Requests a presentation to the District's Board of Directors on the Phase 2, 3, and 4 Projects. ► Requests consideration of land acquisition for potential park space—the Ueda Parkway could be extended from Elkhorn Boulevard north to Sutter and Placer Counties and equestrian, pedestrian, and cycling pathways could be created. ► Notes that the district could have a potential role in maintaining this potential park space.	
Melvin Borgman	August 17, 2008
► Expresses concern regarding actions that may reduce flow capacity or increase water elevation. ► Notes that regional solutions are needed. ► Expresses concern regarding removal of agricultural land and cumulative effects associated with future removal of agricultural land caused by development and mitigation as a result of levee improvements.	

7.1.2 OTHER PUBLIC OUTREACH ACTIVITIES

To help the community stay informed about current project activities, information is provided in a variety of ways:

- USACE and SAFCA each maintain Web sites (http://www.spk.usace.army.mil and http://www.safca.org/Programs_Natomas.html, respectively) that contain public documents related to the NLIP. Additionally, SAFCA's Web site contains public notices, project maps, schedule updates, news articles, SAFCA Board of Director meeting agendas and meeting summaries, and other project-related materials;

- SAFCA periodically mails Executive Director Updates to property owners located adjacent to the project footprint;

- NLIP updates are provided at the monthly SAFCA Board of Directors meetings, which typically occur on the third Thursday of each month. These meetings are held at the Sacramento County Board of Supervisors Chambers at 700 H Street, Sacramento, California, 95814 and they begin at 3:00 p.m.; and

- Additionally, SAFCA has held several meetings with landowner groups and other interest groups during conceptual project design and will continue to meet with these groups to address concerns and interests.

7.1.3 MAJOR AREAS OF CONTROVERSY

Based on the comments received during the scoping period and the history of the NEPA and CEQA processes undertaken by USACE and SAFCA, respectively, the major areas of public controversy associated with the project are (1) temporary, construction-related effects on Garden Highway residents; (2) concerns regarding the hydraulic modeling used to analyze the project's hydraulic impacts; and (3) construction-related impacts on cultural and biological resources. The first two issues were the subject of a lawsuit filed by the Garden Highway Community Association challenging the Phase 2 Project EIR prepared by SAFCA, which was settled. A copy of the settlement agreement is included as **Appendix G**, and applies to all affected Garden Highway residents. SAFCA intends to apply the design and construction provisions in the agreement to all Sacramento River phases of the project. Agreements made by SAFCA in the settlement regarding construction practices are reflected, as appropriate, in the mitigation measures in this EIS/EIR or as part of the project, and the hydraulic modeling approach has been updated for this EIS/EIR. Cultural and biological resource issues are being addressed through the appropriate Federal and state regulatory processes.

7.1.4 ADDITIONAL STEPS IN THE ENVIRONMENTAL REVIEW PROCESS

In accordance with NEPA and CEQA review requirements, this EIS/EIR is being distributed for public and agency review and comment for a 45-day period. This distribution ensures that interested parties have an opportunity to express their views regarding the significant environmental effects and other aspects of the project, and to ensure that information pertinent to permits and approvals is provided to the decision makers of USACE, SAFCA, NEPA cooperating agencies, and CEQA responsible and trustee agencies. This document will be available for public review during the public review period during normal business hours at the following locations:

- USACE, Sacramento District office at 1325 J Street, Sacramento, California
- SAFCA office at 1007 7th Street, 7th Floor, Sacramento, California

Additionally, this document can be viewed at USACE's and SAFCA's Web sites at http://www.spk.usace.army.mil and http://www.safca.org/Programs_Natomas.html, respectively.

USACE and SAFCA will hold one or more public meetings during the comment period to receive input from agencies and the public on the EIS/EIR. In addition, written comments from the public, reviewing agencies, and stakeholders will be accepted throughout the public comment period.

Following consideration of these comments, USACE and SAFCA will prepare written responses to comments and prepare and circulate a final EIS/EIR (FEIS/FEIR) that will describe the disposition of any significant environmental issues raised in the comments on the DEIS/DEIR. The SAFCA Board of Directors will then consider certifying the FEIR if it is determined to be in compliance with CEQA, and will rely on the certified FEIR when considering project approval. To support a decision on the project, the SAFCA Board of Directors must prepare and adopt written findings of fact for each significant environmental impact identified in the EIS/EIR; a Statement of Overriding Considerations, if needed; and a Mitigation Monitoring and Reporting Program (MMRP) to ensure implementation of the mitigation measures and project revisions, if any, identified in the EIS/EIR. Following project approval, a Notice of Determination (NOD) documenting the decision will be issued.

USACE will circulate the FEIS for 30 days prior to taking action on the project and issuing its record of decision (ROD). The ROD will identify USACE's decision regarding the alternatives considered, address substantive comments received on the FEIS, and determine whether the Proposed Action complies with Section 408, Section 404, and Section 10.

7.2 NATIVE AMERICAN CONSULTATION

7.2.1 SECTION 106 COMPLIANCE

USACE is the lead agency for Native American consultation under NEPA. On May 1, 2008, the California State Historic Preservation Officer (SHPO) signed the Programmatic Agreement (PA) among USACE, SAFCA, and SHPO, regarding the issuance of permission under the authority of Section 408 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act for the Natomas Levee Improvement Program (NLIP), Landside Improvements Project. USACE consulted The Ione Band of Miwok Indians, the Shingle Springs Band of Miwok Indians, and the United Auburn Indian Community, and invited them to concur in this PA. On June 23, 2008, the Central Valley Flood Protection Board concurred in the PA. The PA envisioned that preparation of inventory reports for consultation between USACE and SHPO for identification of Areas of Potential Effect (APEs) would be based on phases of construction work. USACE, SAFCA, and SHPO compiled a list of members of the interested public who were provided notice of this PA. The Section 106 process requires that USACE make good faith efforts to identify and take into account the opinions and preferences of local Native Americans with cultural ties to the APE, as well as the public for historic preservation actions taken in accordance with the PA. Native American monitors have been assisting SAFCA in the treatment of Native American human remains and items associated with Native American burials discovered during project activities in accordance with California Public Resources Code Section 5097.98 and California Health and Safety Code Section 7050.5(b) and 7050.5(c).

In April 2008, in response to requests from the project archaeologists, the Native American Heritage Commission (NAHC) identified a Most Likely Descendant (MLD) for discoveries of human remains at CA-Sac-485/H, Mr. John Tayaba of the Shingle Springs Rancheria. Mr. Tayaba is being consulted with regard to the disposition of prehistoric remains encountered in preliminary archaeological investigations in the project area. Shingle Springs Rancheria is a Federally recognized tribe and is actively participating in consultation regarding the identification and treatment of cultural resources subject to Section 106 of the National Historic Preservation Act.

In implementing the provisions of the PA, USACE archaeologists, SAFCA, and SAFCA's project archaeologists, and tribal representatives meet weekly to discuss project progress, and the general approach to inventory, evaluation, and treatment of cultural resources for the project. Discussions include specific consideration of preferred construction methods from a tribal perspective, and treatment of identified and significant resources. Section 106 consultation is ongoing, and conducted in close coordination with Native Americans.

7.2.2 NATIVE AMERICAN CONSULTATION UNDER CEQA

SAFCA is the lead agency for Native American consultation under CEQA. During the scoping period for the Phase 2 Project, SAFCA's project archaeologists sent a letter of inquiry to the NAHC on June 12, 2007, asking for information or concerns regarding the project area, as well as a list of individuals or organizations that might have information or concerns regarding the project area. On June 19, 2007, Debbie Pilas-Treadway of the NAHC responded and indicated that no known sites were found in the Sacred Lands File that were located within the project area or in the immediate vicinity. Ms. Pilas-Treadway also provided the project archaeologists with a list of individuals who could be contacted concerning cultural resources in the project area. These individuals were sent contact letters on June 21, 2007, with information regarding the proposed project and a request for any information they might provide or concerns that they might have about the project. No written responses were received; therefore, follow-up phone calls were made on July 9, 2007. Only one individual, Rose Enos (referred to by the NAHC as "Miwok/Maidu"), answered. Ms. Enos expressed general concern regarding avoidance of burial sites and asked to be contacted if work is conducted on such sites. Messages were left for the remaining people on the contact list; however, no response from any of these individuals was received.

In addition, Randy Yonemura of the Ione Band of the Miwok was contacted in January 2008 for information on areas of concern. Mr. Yonemura led an archaeologist on a field visit of the project area and provided anecdotal information on areas of potential Native American burials. Since spring 2008, Mr. Yonemura and a team of Native American monitors have been observing archaeological field efforts and offering insight and advice regarding cultural resources finds. Mr. Yonemura is also closely involved with consultation conducted for the Section 106 process.

7.3 COORDINATION WITH OTHER FEDERAL, STATE, REGIONAL, AND LOCAL AGENCIES

Chapter 6.0, "Regulatory Setting," describes the project's compliance with applicable Federal, state, regional, and local laws and regulations, including consultation to date with various agencies. The following briefly summarizes these consultation and coordination efforts.

7.3.1 AIRPORT COORDINATION

The Federal Aviation Administration (FAA) is serving as a cooperating agency under NEPA for the Phase 3 Project. USACE and SAFCA met with the FAA and the Sacramento County Airport System (SCAS) on September 10, 2008, regarding project features within the Sacramento International Airport (Airport) north bufferlands. The FAA and SCAS have noted that the Airport has developed the Airport's *Wildlife Hazard Management Plan* (WHMP), with which the project would comply, to the extent practicable and feasible, to ensure aviation safety. Further, the FAA and SCAS have expressed concern that the project, if inappropriately designed, could change existing vegetation and wildlife habitat in ways that could attract wildlife hazardous to aviation safety and increase wildlife-aircraft collisions.

7.3.2 RESOURCE AGENCY COORDINATION

Over the course of project planning and environmental review for the NLIP Landside Improvements Project, USACE and SAFCA have coordinated informally with the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the California Department of Fish and Game (DFG), and The Natomas Basin Conservancy (TNBC).

Informal interagency meetings regarding project effects on habitats and the design of habitat features to offset project effects were held throughout 2008 and early 2009. USACE held coordination meetings with USFWS, DFG, and SAFCA from January 2008 through January 2009. A programmatic Biological Opinion (BO) was

issued by USFWS for the NLIP in fall 2008 that will provide programmatic coverage for the NLIP Phase 2, 3, and 4 Projects (the programmatic BO authorized incidental take coverage for the Phase 2 Project only; incidental take for subsequent project phases will occur through subsequent consultation processes). A programmatic 2081 incidental take permit is also expected to be issued to SAFCA by DFG in February 2009. Similar to the BO, it would authorize incidental take authorization for only the Phase 2 Project and subsequent consultation processes. A Section 404 individual permit has been issued for the Phase 2 Project to SAFCA by USACE. A Biological Assessment (BA) for the Phase 3 Project is under development by SAFCA. Formal and informal consultation with USFWS and NMFS under Section 7 of the Endangered Species Act will proceed concurrent with public review of the EIS/EIR.

8.0 REFERENCES

EXECUTIVE SUMMARY

Sacramento Area Flood Control Agency. 2007a (February). *Final Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area.* State Clearinghouse #2006072098. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

———. 2007b (October). *Natomas Levee Improvement Project: Economic and Risk Analysis*. Prepared by David Ford Consulting Engineers, Inc. Sacramento, CA.

———. 2007c (November). *Final Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project.* State Clearinghouse #2007062016. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

Sacramento County Airport System. 2007. *Sacramento International Airport Wildlife Hazard Management Plan*. Sacramento, CA.

SAFCA. *See* Sacramento Area Flood Control Agency.

USACE. *See* U.S. Army Corps of Engineers.

U.S. Army Corps of Engineers. 2008 (November). *Final Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA*. Prepared by EDAW, Sacramento, CA.

1.0 INTRODUCTION AND STATEMENT OF PURPOSE AND NEED

California Reclamation Board and U.S. Army Corps of Engineers. 2002 (December). *Sacramento and San Joaquin River Basins Comprehensive Study Technical Studies Documentation, Appendix B, Synthetic Hydrology Technical Documentation, Attachment B.6.* Tables B.6-1, B.6-6, B.6-15, B.6-17, and B.6-24. Sacramento, CA.

FAA. *See* Federal Aviation Administration.

Federal Aviation Administration. 2007. Hazardous Wildlife Attractants on or Near Airports. FAA Advisory Circular 150/5200-33B. Available: <http://www.faa.gov/airports_airtraffic/airports/ resources/ advisory_circulars/ index.cfm?template=Document_Listing&Keyword=150/5200-33&DocumentSelected=1>.

Roos, Maurice. 1997 (June 28). The Great New Year's Flood of 1997 in Northern California. In *Proceedings of 1997 California Weather Symposium*. Sierra College. Rocklin, CA.

Sacramento Area Flood Control Agency. 2006 (July 14). *Natomas Levee Evaluation Study Final Report Prepared for SAFCA in Support of the Natomas Basin Components of the American River Common Features*.

———. 2007a (February). *Final Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area.* State Clearinghouse #2006072098. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

———. 2007b (October). *Natomas Levee Improvement Project: Economic and Risk Analysis*. Prepared by David Ford Consulting Engineers, Inc. Sacramento, CA.

———. 2007c (November). *Final Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project.* State Clearinghouse #2007062016. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

SAFCA. *See* Sacramento Area Flood Control Agency.

USACE. *See* U.S. Army Corps of Engineers.

U.S. Army Corps of Engineers. 2008 (November). *Final Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA*. Prepared by EDAW, Sacramento, CA.

2.0 ALTERNATIVES

FAA. *See* Federal Aviation Administration.

Federal Aviation Administration. 2007. Hazardous Wildlife Attractants on or Near Airports. FAA Advisory Circular 150/5200-33B. Available: <http://www.faa.gov/airports_airtraffic/airports/ resources/ advisory_circulars/ index.cfm?template=Document_Listing&Keyword=150/5200-33&DocumentSelected=1>.

Sacramento Area Flood Control Agency. 2007a (February). *Final Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area.* State Clearinghouse #2006072098. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

———. 2007b (November). *Final Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project.* State Clearinghouse #2007062016. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

Sacramento County Airport System. 2007. *Sacramento International Airport Wildlife Hazard Management Plan.* Sacramento, CA.

SAFCA. *See* Sacramento Area Flood Control Agency.

USACE. *See* U.S. Army Corps of Engineers.

U.S. Army Corps of Engineers. 2000 (January 1). *Engineering and Design Guidelines for Landscape Planting and Vegetation Management at Floodwalls, Levees, and Embankment Dams*. Engineering Manual 1110-2-301. Available: <http://140.194.76.129/publications/eng-manuals/em1110-2-301/entire.pdf>. Accessed January 12, 2009.

———. 2008 (November). *Final Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA*. Prepared by EDAW, Sacramento, CA.

Airport Land Use Commission. 1994 (January). *Sacramento International Airport (Formerly Sacramento Metropolitan Airport) Comprehensive Land Use Plan*. Amended January 1994. Sacramento, CA. Cited in City of Sacramento and Sacramento LAFCo.

Anderson, Byron C. Senior Engineer Geologist. Kleinfelder West, Inc, Sacramento, CA. June 26, 2008—letter to John Bassett regarding a preliminary evaluation of naturally occurring asbestos that may be present in the Natomas Levee Improvement Project area including Sacramento and Sutter Counties, California.

ARB. *See* California Air Resources Board.

Barnhart, R. A. 1986 (June). Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Southwest)—Steelhead. (Biological Report 82 [11.60], TREL-82-4.) U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, Coastal Ecology Group, Waterways Experiment Station. Slidell, LA.

Baxter, R. D. 1999. Status of Splittail in California. California Fish and Game 85(1):28–30.

Bouey, P. D., and R. Herbert. 1990. Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project. Report on file, North Central Information Center, California State University, Sacramento, CA.

Bouey, P. D., J. Berg, and C. A. Hunter. 1991. Cultural Resources Test Excavations, Sacramento Urban Area Flood Control Project, Sacramento County, California. Report on file, North Central Information Center, California State University, Sacramento, CA.

California Air Resources Board. 2008a. Air Quality Data Statistics. Available: <www.arb.ca.gov/adam/welcome.html>. Accessed February 2008 and July 9, 2008.

———. 2008b. Area Designation Maps / State and National. Available: <www.arb.ca.gov/desig/adm/adm.htm#state>. Accessed July 9, 2008.

California Department of Conservation, Division of Land Resource Protection. 2008. 2004-2006 Land Use Conversion, Farmland Mapping and Monitoring Program. .. Available: <ftp.consrv.ca.gov/pub/dlrp/fmmp>. Last updated 2008. Accessed August 6, 2008.

California Department of Fish and Game. 1994. Staff Report on Mitigation for Impacts to Swainson's hawks (Buteo swainsoni) in the Central Valley of California. Sacramento, CA.

_____. 1998. A Status Review of the Spring-Run Chinook Salmon (*Oncorhynchus tshawytscha*) in the Sacramento River Drainage. Report to the Fish and Game Commission, Candidate Species Status Report 98-01.

_____. 2006. Weekly Anadromous Fish Counts. Available: <http://www.dfg.ca.gov/lands/fh/weekly_counts/feather.htm>. Last updated December 3, 2005. Accessed June 8, 2006.

California Department of Forestry and Fire Protection. 2001. Fuels: Fire Hazard Severity Zones (1985). Statewide map of Fire Hazard Severity Zones for State Responsibility Area lands. Available: <http://frap.cdf.ca.gov/data/frapgismaps/select.asp>. Cited in SAFCA 2006.

_____. 2007a. <http://frap.cdf.ca.gov/data/frapgismaps/select.asp?record=fhsz_map>. [Wildland] Fire Threat. Last updated October 20, 2005. Accessed July 17, 2007.

_____. 2007b. Very High Fire Hazard Severity Zones (AB 337). Available: <http://frap.cdf.ca.gov/webdata/maps/sacramento/ab337_map.34.pdf>. Last updated December 5, 2005. Accessed April 23, 2007.

_____. 2007c. State Responsibility Areas (SRA) for Fire Protection for Sutter County. Available: <http://frap.cdf.ca.gov/webdata/maps/sutter/sramap..pdf>. Last updated December 18, 2006. Accessed August 1, 2008.

_____. 2007d. State Responsibility Areas (SRA) for Fire Protection for Sacramento County. Available: <http://frap.cdf.ca.gov/webdata/maps/sacramento/sramap.34.pdf>. Last updated July 31, 2007. Accessed August 1, 2008.

California Department of Transportation. 1998 (October). *Traffic Noise Analysis Protocol: Technical Noise Supplement*. Sacramento, CA.

_____. 2002 California Airport Land Use Planning Handbook. Sacramento, CA. Available: <www.dot.ca.gov/hq/planning/aeronaut/documents/>.

California Department of Water Resources. 1997a. Feasibility Report – American Basin Conjunctive Use Project. Sacramento, CA.

_____. 1997b. Implications of the Delay at the Suisun Marsh Salinity Control Gates on Chinook Salmon Upstream Migrants. Environmental Services Office. Sacramento, CA.

_____. 2003. Bulletin 118 – Description of the North American Subbasin. Available: <http://www.dpla2.water.ca.gov/publications/groundwater/bulletin118/basins/pdfs_desc/5-21.64.pdf>. Accessed January 31, 2008.

_____. 2005 (December). California Water Plan, Update 2005: A Framework for Action. Bulletin 160-05. Sacramento, CA.

_____. 2006. California's Groundwater. Bulletin 118. Sacramento Valley Groundwater Basin, North American Subbasin. Last updated January 20, 2006. Sacramento, CA.

California Geological Survey. 1999. Index to Official Maps of Alquist-Priolo Earthquake Fault Zones. Available: <http://www.consrv.ca.gov/CGS/rghm/ap/Map_index/index.htm>. Accessed July 2007.

California Integrated Waste Management Board. 2007. Solid Waste Information System (SWIS) facility database. Available: <http://www.ciwmb.ca.gov/SWIS/Search.asp>. Accessed August 2007.

California Native Plant Society. 2007. Electronic Inventory of Rare and Endangered Vascular Plants of California. Rare Plant Scientific Advisory Committee, D. P. Tibor, Convening Ed. Sacramento, CA.

California Natural Diversity Database. 2007. Results of electronic record search. California Department of Fish and Game, Wildlife and Habitat Data Analysis Branch. Sacramento, CA.

———. 2008. Results of electronic record search. California Department of Fish and Game, Wildlife and Habitat Data Analysis Branch. Sacramento, CA.

Caltrans. *See* California Department of Transportation.

Cavanaugh, Thomas J. Acting Chief, Central California/Nevada Section. Department of the Army. U.S. Army Engineer District, Sacramento Corps of Engineers, Sacramento, CA March 21, 2006a.—letter to Tim Hawkins (letter number 200300776) of the Department of Environmental Review and Assessment

regarding wetland delineation verification; June 29, 2005—letter to Greg Rowe (letter number 200300776) of the Sacramento County Airport System, regarding wetland delineation verification; November 7, 2006b—letter to John Bassett (letter number 200300795) of the Sacramento Area Flood Control Agency regarding wetland delineation verification.

CDF. *See* California Department of Forestry and Fire Protection.

Central Valley Regional Water Quality Control Board. 2002. 2002 CWA Section 303(d) List of Water Quality Limited Segment, Central Valley Regional Water Quality Control Board. Approved by U.S. Environmental Protection Agency, July 2003. Available: <http://www.swrcb.ca.gov/tmdl/docs/2002reg5303dlist.pdf>. Accessed August 20, 2007.

_____. 2007. Water Quality Control Plan (Basin Plan) for the Sacramento River Basin and the San Joaquin River Basin. Fourth Edition, revised February 2007 (with approved amendments). Rancho Cordova, CA.

Central Valley RWQCB. *See* Central Valley Regional Water Quality Control Board.

Churchill, R. K., and R. L. Hill. 2000. A General Location Guide for Ultramafic Rocks in California—Areas More Likely to Contain Naturally Occurring Asbestos. California Division of Mines and Geology Open-File Report 2000–19.

City of Sacramento. 1988. *City of Sacramento General Plan*. Adopted January 19, 1988; reflects city council amendments through 2002. Sacramento, CA. Available: < http://www.cityofsacramento.org/planning/long-range/citywide-and-regional/general-plan.cfm>. Accessed July 18, 2007 and other dates.

_____. 2005 (June). 2030 General Plan Technical Background Report. Sacramento, CA.

City of Sacramento, Sutter County, Natomas Basin Conservancy. 2003. Final Natomas Basin Habitat Conservation Plan. Available: <www.natomasbasin.org/content/view/144/118/>. Accessed September 2008.

City of Sacramento and Sacramento LAFCo. *See* City of Sacramento Environmental Planning Services and Sacramento Local Agency Formation Commission.

City of Sacramento, Department of Parks and Recreation. 2007. Parks in South Natomas Area. Available: <http://www.cityofsacramento.org/parksandrecreation/parks/snatomas.htm>. Last updated May 24, 2007. Accessed July 2007 and June 30, 2008.

City of Sacramento Environmental Planning Services and Sacramento Local Agency Formation Commission. 2006 (July). Greenbriar Development Project, Sacramento, California, Draft Environmental Impact Report. State Clearinghouse #2005062144. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

City of Sacramento Planning Department. 2006. South Natomas Community Plan website: http://www.cityofsacramento.org/planning/long-range/community-and-neighborhood/community-plans/south-natomas.cfm. Last modified May 7, 2008. Accessed October 3, 2008.

_____. 2007. North Natomas Community Plan website. Available: <http://www.cityofsacramento.org/planning/long-range/community-and-neighborhood/community-plans/north-natomas.cfm>. Last modified May 28, 2008. Accessed October 3, 2008.

Clinkenbeard, J., R. Churchill, and K. Lee. 2002. *Guidelines for Geologic Investigations of Naturally Occurring Asbestos in California.* Special Publication 124. Available: <http://www.consrv.ca.gov/cgs/minerals/hazardous_minerals/asbestos/Asbestos_Guidelines_SP124.pdf>. Accessed April 2007.

CNDDB. *See* California Natural Diversity Database.

CNPS. *See* California Native Plant Society.

Contreras, Carlos. Engineer. Wood Rogers, Sacramento, CA. July 7, 2008—e-mail correspondence with Marianne Lowenthal of EDAW regarding existing utility encroachments along the Sacramento River east levee within the project footprint.

Cramer, S. P., and D. B. Demko. 1997. The Status of Late-Fall and Spring Chinook Salmon in the Sacramento River Basin Regarding the Endangered Species Act. Submitted to the National Marine Fisheries Service on behalf of the Association of California Water Agencies and California Urban Water Agencies.

Dames & Moore. 1993. Department of Parks and Recreation Series 523 Site Record forms for CA-Sac-16H. On file, North Central Information Center, California State University, Sacramento, CA.

_____. 1994a. Historic Property Treatment Plan for Reclamation District 1000 Rural Historic Landscape District for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California. Report on file, North Central Information Center, California State University, Sacramento, CA.

_____. 1994b. Archaeological Inventory Report, Natomas Locality, Cultural Resources Inventory and Evaluation, American River Watershed Investigation, El Dorado, Placer, Sacramento, and Sutter Counties, California. Report on file, North Central Information Center, California State University, Sacramento, CA.

Davis, S. N., and F. R. Hall. 1959. Water Quality of Eastern Stanislaus and Northern Merced Counties, California. Stanford University Publications, Geological Sciences, Vol. 6, No. 1.

Derr, E. 1983. Historic Resource Evaluation Report for the Arden-Garden Connector Project CT-03-30274.B1 Sacramento County, California.

DFG. *See* California Department of Fish and Game.

Dosanjh, Kenwarjit. Engineer. HDR, Sacramento, CA. August 2007—telephone conversation with Nisha Chauhan of EDAW regarding preliminary information on utilities along the Sacramento River east levee project area; July 9, 2008—e-mail correspondence with Marianne Lowenthal of EDAW regarding existing utility encroachments along the PGCC and NEMDC, south of Elkhorn Project Footprint.

DWR. *See* California Department of Water Resources.

England, A. S., M. J. Bechard, and C. S. Houston. 1997. Swainson's Hawk (Buteo swainsoni). In A. Poole and F. Gill (eds.), The Birds of North America, No. 265. The Academy of Natural Sciences and The American Ornithologists' Union. Philadelphia, PA, and Washington, DC.

EPA. *See* U.S. Environmental Protection Agency.

Estep, J. A. 1984. Diurnal Raptor Eyrie Monitoring Program. California Department of Fish and Game, Nongame Wildlife Investigations. Project Report W-65-R-1, Job No. II-2.0. Sacramento, CA.

_____. 1989. Biology, Movements, and Habitat Relationships of the Swainson's Hawk in the Central Valley of California, 1986–87. California Department of Fish and Game, Nongame Bird and Mammal Section Report. Sacramento, CA.

_____. 2003. Nesting Swainson's Hawks (*Buteo swainsoni*) in the Natomas Basin Habitat Conservation Plan Area, 2003 Annual Survey Results. Prepared for The Natomas Basin Conservancy. Sacramento, CA.

_____. 2007. Estep Environmental Consulting, Sacramento, CA. July 20 and August 16, 2007─personal communication with Leo Edson and Anne King of EDAW regarding the value of types of foraging habitat.

FAA. *See* Federal Aviation Administration.

Farmland Mapping and Monitoring Program. 2006. Important Farmland. Available: <ftp://ftp.consrv.ca.gov/pub/dlrp/FMMP/2006/>. California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program.

Federal Aviation Administration. 2005. FAA Bird Strike Database. Washington, DC.

Finan, Mike. Project Manager, Wetland Specialist. Department of the Army. U.S. Army Engineer District, Sacramento Corps of Engineers, Sacramento, CA. July 24, 2008—letter to Sarah Bennett (letter number 200700211) of EDAW regarding wetland delineation verification.

Fisher, F. W. 1994. Past and Present Status of Central Valley Chinook Salmon. Conservation Biology 8(3):870–873.

Geographical Information Center at California State University, Chico. 2007. Sacramento River—A Guide to Recreation and Public Access. 2007. Available: <www.sacramentoriver.org>. Accessed July 2007.

Haenngi, Teresa. Parks Planner. City of Sacramento, Sacramento, CA. July 20, 2007—telephone call with Dave Rader of EDAW regarding location and planned use of the Costa Park site.

Hallock, R. J., and F. W. Fisher. 1985. Status of the Winter-Run Chinook Salmon (*Oncorhynchus tshawytscha*) in the Sacramento River. (Anadromous Fisheries Branch Office Report.) California Department of Fish and Game. Sacramento, CA.

Hansen, E. C. 1998. Cherokee Canal Sediment Removal Project Post-construction Giant Garter Snake (*Thamnophis gigas*) Surveys. Unpublished final report for California Department of Water Resources, Contract No. B-81535. Sacramento, CA.

Hansen, G. E. 1988. Review of the Status of the Giant Garter Snake (*Thamnophis couchii gigas*) and its Supporting Habitat during 1986–87. Unpublished final report for the California Department of Fish and Game, Contract C-2060. Sacramento, CA.

Hansen, G. E., and J. M. Brode. 1980. Status of the Giant Garter Snake Thamnophis couchii gigas (Fitch). Inland Fisheries Endangered Species Special Publication 80(5):1–14. California Department of Fish and Game, Sacramento, CA.

Hart, E. W., and W. A. Bryant. 1999. Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zone Maps. California Division of Mines and Geology, Special Publication 42.

Hay, O. P. 1927. The Pleistocene of the Western Region of North America and its Vertebrated Animals. Carnegie Institute Washington, Publication 322B.

Helley, E. J., and D. S. Harwood. 1985. Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierran Foothills, California. U.S. Geological Survey MF-1790.

Higgins, C. T., and Clinkenbeard J. R. 2006. Relative Likelihood for the Presence of Naturally Occurring Asbestos in Eastern Sacramento County California. California Geological Survey. Special Report 192.

Hilton, R. P., D. C. Dailey, and H. G. McDonald. 2000. A Late Pleistocene Biota from the Arco Arena Site, Sacramento, California. PaleoBios Abstracts 20(1), April 15, 2000. University of California Museum of Paleontology. Berkeley, CA.

Jefferson, G. T. 1991a. A Catalogue of Late Quaternary Vertebrates from California: Part One, Nonmarine Lower Vertebrate and Avian Taxa. Natural History Museum of Los Angeles County, Technical Report no. 5.

_____. 1991b. A Catalogue of Late Quaternary Vertebrates from California: Part Two: Mammals. Natural History Museum of Los Angeles County, Technical Report no. 7.

Jennings, C. W. 1994. Fault Activity Map of California and Adjacent Areas. California Division of Mines and Geology. Geologic Data Map No. 6.

Jennings, M. R., and M. P. Hayes. 1994. Amphibian and Reptile Species of Special Concern in California. California Department of Fish and Game. Sacramento, CA.

Jones & Stokes. 2001 (June 20). Change in Potential Stranding Losses of Splittail and Juvenile Chinook Salmon in the Sacramento Bypass, 1999–2001. Final Report. (J&S FO32.) Sacramento, CA. Prepared for U.S. Army Corps of Engineers, Sacramento, CA.

Kauffman, E., and K. Kauffman. 1987. California Department of Parks and Recreation Series 523 Site Record forms for CA-Sac-16H. On file, North Central Information Center, California State University, Sacramento, CA.

Kohlhorst, D. W., L. W. Botsford, J. S. Brennan, and G. M. Cailliet. 1991. Aspects of the Structure and Dynamics of an Exploited Central California Population of White Sturgeon (*Acipenser transmontanus*). Pages 277–283 in P. Williot (ed.), Acipenser: Actes du premier colloque international sur l'esturgeon. CEMAGREF, Bordeaux, France.

Kolber, M. 2004. Mammoth Coup: Discovery of Huge Fossil Near Elk Grove is a Big Deal for Northern California. Sacramento Bee, July 27, 2004.

Kroeber, A. L. 1925. Handbook of the Indians of California. Reprinted in 1976 by Dover Publications. New York, NY.

Lipscomb, D. M., Ph.D., and A. C. Taylor, Jr., Ph.D. 1978. Noise Control Handbook of Principles and Practices. Van Nostrand Reinhold Company. New York, NY.

Lundelius, E. L., Jr., R. W. Graham, E. Anderson, J. Guilday, J. A. Holman, D. W. Steadman, and S. D. Webb. 1983. Late Quaternary Environments of the United States. Volume 1, The Late Pleistocene. University of Minnesota Press. Minneapolis.

LSCE. *See* Luhdorff & Scalmanini, Consulting Engineers.

Luhdorff & Scalmanini, Consulting Engineers. 2008 (February 21). Evaluation of Potential Groundwater Impacts Due to Proposed Sacramento River East Levee Improvements with Emphasis on Reaches 2 and 3. Woodland, CA. Prepared for Sacramento Area Flood Control Agency, Sacramento, CA.

Marchand, D. E., and A. Allwardt. 1981. Late Cenozoic Stratigraphic Units, Northeastern San Joaquin Valley, California. U.S. Geological Survey Bulletin 1470.

McEwan, D., and T. A. Jackson. 1996. Steelhead Restoration and Management Plan for California. California Department of Fish and Game, Inland Fisheries Division. Sacramento, CA.

Moratto, M. J. 1984. California Archaeology. Academic Press. New York, NY.

Moyle, P. B. 2002. Inland Fishes of California, Revised and Expanded. 2nd edition. University of California Press. Berkeley, CA.

Moyle, P. B., P. J. Foley, and R. M. Yoshiyama. 1992. Status of Green Sturgeon, Acipenser medirostris, in California. Final report submitted to National Marine Fisheries Service. University of California, Davis. Davis, CA.

Moyle, P. B., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayoke. 1995. Fish Species of Special Concern of California. California Department of Fish and Game. Rancho Cordova, CA.

MWH. 2001. Final Letter Report—Sacramento River Watershed Project (Common Features), CA: Sacramento River East-Side Levee Strengthening Project Cut-Off Wall Evaluation. Sacramento, CA. Prepared by Mary Paasch; submitted by Sergio Jimenez to Barry Jarvis, Civil Engineer, U.S. Army Corps of Engineers.

National Marine Fisheries Service. 2005. Green Sturgeon (*Acipenser medirostris*) Status Review Update. Prepared by Biological Review Team, Santa Cruz Laboratory, Southwest Fisheries Science Center. Santa Cruz, CA.

Natural Resources Conservation Service. 1988. Soil Survey of Sutter County.

_____. 1993. Soil Survey of Sacramento County.

NMFS. *See* National Marine Fisheries Service.

NRCS. *See* Natural Resources Conservation Service.

Pacific Fishery Management Council. 2003. Pacific Coast Salmon Plan, Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and California. As revised through Amendment 14 (adopted March 1999). Portland, OR.

Peak, A. S., H. L. Crew, and R. Gerry. 1984. The 1971 Archaeological Salvage of the Bennett Mound, CA-SAC-16, Sacramento, CA. Report on file, North Central Information Center, California State University, Sacramento, CA.

Petersen, M. D., W. A. Bryant, C. H. Cramer, T. Chao, M. S. Reichle, A. D. Frankel, J. J. Lienkaemper, P. A. McCory, and D. P. Schwartz. 1996. *Probabilistic Seismic Hazard Assessment for the State of California*. California Division of Mines and Geology Open-File Report 96-08 and U.S. Geological Survey Open-File Report 96-706.Piper, A. M., H. S. Gale, H. E. Thomas, and T. W. Robinson. 1939. Geology and Ground-Water Hydrology of the Mokelumne Area, California. U.S. Geological Survey Water-Supply Paper 780.

Placer County Water Agency. 2003. West Placer Groundwater Management Plan. Adopted October 6, 1998; updated November 6, 2003.

Raleigh, R. F., W. J. Miller, and P. C. Nelson. 1986. Habitat Suitability Index Models and Instream Flow Suitability Curves: Chinook Salmon. Biological Report 82 (10.122). U.S. Fish and Wildlife Service. Washington, DC.

Reynolds, F. L., T. Mills, R. Benthin, and A. Low. 1993. Central Valley Anadromous Fisheries and Associated Riparian and Wetlands Areas Protection and Restoration Action Plan. Draft. California Department of Fish and Game, Inland Fisheries Division. Sacramento, CA.

Roukey, Kevin J. Chief, Central California/Nevada Section. Department of the Army. U.S. Army Engineer District, Sacramento Corps of Engineers, Sacramento, CA. September 29, 2006—letter to Greg Rowe (letter number 200300332) of the Sacramento County Airport System regarding wetland delineation verification.

Sacramento Area Council of Governments. 2005. SACOG Projections Adopted 12/16/04 for RAD 2005–2025. Available <http://sacog.org/demographics/projections/files/split/>. Last updated May 31, 2005. Accessed November 2006.

Sacramento Area Flood Control Agency. 2007 (November). *Final Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project*. State Clearinghouse #2007062016. Prepared by EDAW, Sacramento, CA.

Sacramento County. 1993a (December). Sacramento County General Plan. Sacramento, CA. Available: <http://www.planning.saccounty.net/general-plan/index.html>. Sacramento, CA. Accessed 2007.

_____. 2007a. Municipal Services Agency Department of Transportation Traffic Count Program. Available: <http://www.sacdot.com/services/traffic_counts.asp>. Accessed August 26, 2007.

_____. 2007b (March). Draft Environmental Impact Report for the Sacramento International Airport Master Plan. Sacramento, CA.

Sacramento County Airport System. 2007. *Sacramento International Airport Wildlife Hazard Management Plan*. Sacramento, CA.

Sacramento County Department of Environmental Review and Assessment. 2007. Notice of Preparation for the Sacramento County General Plan 2030. Sacramento, CA.

Sacramento County Department of Regional Parks. 2007. *Our Parks*. Available: <http://www.sacparks.net/our-parks/index.html>. Accessed July 26, 2007.

Sacramento County Regional Parks. *See* County of Sacramento, Department of Regional Parks.

Sacramento Groundwater Authority. 2002. *State of the Basin Report 2002*. Citrus Heights, CA.

_____. 2003 (December). Sacramento Groundwater Authority Groundwater Management Plan. Citrus Heights, CA.

Sacramento LAFCo. *See* Sacramento County Local Agency Formation Commission.

Sacramento County Local Agency Formation Commission. 2007. Directory of Sacramento County Service Providers. Available: < http://www.saclafco.org/service-providers/maps/index.html>. Accessed August 2007.

SAFCA. *See* Sacramento Area Flood Control Agency.

Slinas, Julio. Staff Toxicologist. Office of Health Hazard Assessment, Sacramento, CA. August 3, 2004─telephone conversation with Kurt Legleiter of EDAW regarding exposure period for determining health risk.

Savage, D. E. 1951. Late Cenozoic Vertebrates of the San Francisco Bay Region. *Univ. Calif. Public. Geol. Sci.*, Vol. 28, No. 10.

SCAS. *See* Sacramento County Airport System.

Schlorff, R., and P. H. Bloom. 1984. Importance of Riparian Systems to Nesting Swainson's Hawks in the Central Valley of California. Pages 612–618 in R. E. Warner and K. M. (eds.), *California Riparian Systems: Ecology, Conservation, and Productive Management*. University of California Press. Berkeley, CA.

SGA. *See* Sacramento Groundwater Authority.

Sommer, T., R. Baxter, and B. Herbold. 1997. Resilience of Splittail in the Sacramento–San Joaquin Estuary. *Transactions of the American Fisheries Society* 126:961–976.

Sommer, T. R., M. L. Nobriega, W. C. Harrell, W. Batham, and W. J. Kimmerer. 2001. Floodplain Rearing of Juvenile Chinook Salmon: Evidence of Enhanced Growth and Survival. *Canadian Journal of Fisheries and Aquatic Sciences* 58:325–333.

Stevens, D. E. 1989. *When do Winter-Run Chinook Salmon Smolts Migrate through the Sacramento–San Joaquin Delta?* Memorandum: June 19, 1989. California Department of Fish and Game. Stockton, CA.

Stirton, R. A. 1939. Late Cenozoic Vertebrates of the San Francisco Bay Region. Univ. Calif. Public. Geol. Sci., Vol. 24.

Sutter County. 1996a (November). *County of Sutter General Plan 2015 Policy Document*. Available: <http://www.co.sutter.ca.us/doc/government/depts/cs/ps/cs_planning_services>. Yuba City, CA.

Sutter County. 1996 (May). *County of Sutter General Plan 2015 Background Report*. Community Services Department. Yuba City, CA.

The Natomas Basin Conservancy. 2007. Biological Effectiveness Monitoring for the Natomas Basin Habitat Conservation Plan Area 2006 Annual Survey Results. Sacramento, CA.

The Natomas Basin Conservancy. 2008. Biological Effectiveness Monitoring for the Natomas Basin Habitat Conservation Plan Area 2007 Annual Survey Results. Sacramento, CA.

Thelander, C. G. (ed.). 1994. Life on the Edge: A Guide to California's Endangered Natural Resources and Wildlife. Biosystems Analysis, Inc.

TNBC. *See* The Natomas Basin Conservancy.

Tracy, C. 1990. Memorandum: Green Sturgeon Meeting and Comments. State of Washington Department of Fisheries.

UCMP. *See* University of California Museum of Paleontology.

USACE. *See* U.S. Army Corps of Engineers.

University of California Museum of Paleontology. 2006. Paleontology Collections Database. University of California, Berkeley. Available: <http://bscit.berkeley.edu/ucmp/loc.shtml>. Accessed September 11, 2006.

U.S. Army Corps of Engineers. In Prep. Environmental Site Assessment Common Features GRR Project. Sacramento, CA.

U.S. Census Bureau. 2000. Results of electronic record search. Census 2000 American Factfinder. Available <http://factfinder.census.gov>.

U.S. Department of Housing and Urban Development. 2000. HUD USER home page. FY 2000 income Limits. Available: <http://www.huduser.org/DATASETS/il/fmr00/index.html>. Updated March 31, 2005.

U.S. Environmental Protection Agency. 2008a. Monitor Values Report. Available: <http://www.epa.gov/air/data/reports.html>. Accessed July 9, 2008.

U.S. Fish and Wildlife Service. 1993. Abundance and Survival of Juvenile Chinook Salmon in the Sacramento–San Joaquin Estuary. (1992 Annual Progress Report.) Stockton, CA.

_____. 1997 (November 13). Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effects on the Giant Garter Snake within Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter and Yolo Counties, California. Sacramento Fish and Wildlife Office. Sacramento, CA. Available: <http://www.fws.gov/sacramento/es/documents/ggs%20programmatic%20bo.pdf>. Accessed November 2006.

_____. 1999. Draft Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*). Portland, OR.

_____. 2005. Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon. Portland, OR.

_____. 2006a. Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Office. Sacramento, CA.

_____. 2006b (April 13). Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the California Red-Legged Frog, and Special Rule Exemption Associated With Final Listing for Existing Routine Ranching Activities; Final Rule. Federal Register 71(71):19244–19292.

U.S. Fish and Wildlife Service, City of Sacramento, and Sutter County. 2003. Natomas Basin Habitat Conservation Plan Final Environmental Impact Report/Environmental Impact Statement. Sacramento, CA.

USFWS. *See* U.S. Fish and Wildlife Service.

U.S. Geological Survey. 2000. Water-Quality Assessment of the Sacramento River Basin, California: Water-Quality, Sediment and Tissue Chemistry, and Biological Data, 1995–1998. Open-File Report 00-391. Sacramento, CA.

_____. 2008. Mineral commodity summaries 2008: U.S. Geological Survey. Washington, DC.

USGS. *See* U.S. Geological Survey.

Wagner, D. L., C. W. Jennings, T. L. Bedrossian, and E. J. Bortugno. 1987. Geologic Map of the Sacramento Quadrangle. Regional Geologic Map Series, Map No. 1A. California Division of Mines and Geology.

Wang, J. C. S. 1986. Fishes of the Sacramento–San Joaquin Estuary and Adjacent Waters, California: a Guide to the Early Life Histories. (FS/10-4ATR86-9.) California Department of Water Resources. Sacramento, CA. Prepared for Interagency Ecological Study Program for the Sacramento–San Joaquin Estuary, Sacramento, CA.

Wilson, N. L., and A. H. Towne. 1978. Nisenan. R. F. Heizer (ed.), Handbook of North American Indians, Vol. 8. Smithsonian Institution Press. Washington, DC.

Woodbridge, B. 1998. Swainson's Hawk (*Buteo swainsoni*). In *The Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Riparian-Associated Birds in California. California Partners in Flight.* Available: <http://www.prbo.org/calpif/htmldocs/species/riparian/swainsons_hawk.htm>.

Yoshiyama, R. M., F. W. Fisher, P. B. Moyle. 1998. Historical Abundance and Decline of Chinook Salmon in the Central Valley Region of California. North American Journal of Fisheries Management 18:487–521.

4.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

Allen, Dana. Senior Planner. City of Sacramento Department of Parks and Recreation, Sacramento, CA. August 12, 2008—email to John Bassett of SAFCA regarding the Phase 3 and 4 Projects' potential construction impacts on existing and planned park facilities.

Bell, M. C. 1991. Fisheries Handbook of Engineering Requirements and Biological Criteria. Third edition. U.S. Army Corps of Engineers, Office of the Chief of Engineers, Fish Passage Development and Evaluation Program. Portland, OR.

Bolt Beranek and Newman Inc. (BBN). 1981. *Noise Control for Buildings and Manufacturing Plants*. Cambridge MA.

California Department of Fish and Game. 1995 (October 17). *Staff Report on Burrowing Owl Mitigation*. Sacramento, California.

California Department of Transportation. 2002 (February 20). *Transportation Related Earthborne Vibrations*. Sacramento, CA.

_____. 2007. California Scenic Highway Mapping System. Available: <http://www.dot.ca.gov/hq/ LandArch/scenic_highways/index.htm>. Last updated December 7, 2007.

_____. 1996. Manual of Traffic Controls for Construction and Maintenance Work Zone. Available: <http://www.dot.ca.gov/hq/ LandArch/scenic_highways/index.htm>. Last updated December 7, 2007.

California Natural Diversity Database. 2008. Results of electronic record search. California Department of Fish and Game, Wildlife and Habitat Data Analysis Branch. Sacramento, CA.

California Integrated Waste Management Board. 2007. Results of electronic record search. Solid Waste Information System (SWIS) facility database. Accessed September 2008.

Caltrans. *See* California Department of Transportation.

City of Sacramento. 1988. *City of Sacramento General Plan*. Adopted January 19, 1988; reflects city council amendments through 2002. Sacramento, CA. Available: <www.cityofsacramento.org/planning/long-range/citywide-and-regional/general-plan.cfm>. Accessed July 18, 2007.

City of Sacramento, Sutter County, and The Natomas Basin Conservancy. 2003. Final Natomas Basin Habitat Conservation Plan. Sacramento, CA.

Cleary, E. C., R. A. Dolbeer, and S. E. Wright. 2004. Wildlife Strikes to Civil Aircraft in the United States, 1990–2003. National Wildlife Strike Database, Serial Report Number 10. Federal Aviation Administration. Office of Airport Safety and Standards. Washington, DC. Available: <http://wildlife.pr.erau.edu/Bash90-03.pdf>.

CNDDB. *See* California Natural Diversity Database.

Contreras, Carlos. Engineer. Wood Rogers, Sacramento, CA. July 7, 2008—e-mail correspondence with Marianne Lowenthal of EDAW regarding existing utility encroachments along the Sacramento River east levee within the project footprint.

Department of Water Resources. Stormwater Utility. Stormwater Quality Program. 2007 (May). *Stormwater Quality Design Manual for the Sacramento and South Placer Regions.*

Department of Fish and Game. Swainson's Hawk Technical Advisory Committee. 2000 (May 31). Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley.

Dosanjh, Kenwarjit. Engineer. HDR, Sacramento, CA. July 9, 2008—e-mail correspondence with Marianne Lowenthal of EDAW regarding existing utility encroachments along the PGCC and NEMDC, south of Elkhorn Project Footprint.

EPA. *See* U. S. Environmental Protection Agency.

Esparza, John. Section Chief, Environmental Chemistry Section. U.S. Army Corps of Engineers, Sacramento, CA. August—telephone conversation with Marianne Lowenthal of EDAW regarding the *Common Features General Reevaluation Report Environmental Site Assessment*.

Feather River Air Quality Management District. 1998. Indirect Source Review Guidelines. Marysville, CA.

_____. 2007. CEQA Planning: Air Quality CEQA Review. FRAQMD Web site. Available: <http://www.fraqmd.org/PlanningTools.htm>. Accessed July 2007 and July 9, 2008.

Federal Aviation Administration. 2007. Hazardous Wildlife Attractants on or Near Airports. FAA Advisory Circular 150/5200-33B. Available: <http://www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars/index.cfm?template=Document_Listing&Keyword=150/5200-33&DocumentSelected=1>.

Federal Highway Administration. 1978 (December). Federal Highway Traffic Noise Prediction Model.

Federal Transit Administration. 2006 (May). *Transit Noise and Vibration Impact Assessment*. Washington, DC. Prepared by: Harris Miller Miller & Hanson Inc., Burlington, MA.

FHWA. *See* Federal Highway Administration.

FRAQMD. *See* Feather River Air Quality Management District.

FTA. *See* Federal Transit Administration.

Hansen, Eric. Consulting Herpetologist. Sacramento, CA. November 25, 2008─personal communication with Kelly Fitzgerald of EDAW regarding giant garter snake in the Natomas Basin.

Hansen, G. E. and J. M. Brode. 1993. Results of relocating canal habitat of the giant garter snake (*Thamnophis gigas*) during widening of State Route 99/70 in Sacramento and Sutter counties, California. Final report for Caltrans Interagency Agreement 03E325 (FG7550) (FY 87/88-91-92). Unpublished. 36 pp.

Huffman & Carpenter. 2003. *Cumulative Water Quality Analyses Report for Lahontan Development 1996-2002*. Reno, NV.

Institute of Transportation Engineers. 1989. Traffic Access and Impact Studies for Site Development. Transportation Planners Council. Washington, DC.

ITE. *See* Institute of Transportation Engineers.

National Park Service. 1998. National Register Bulletin 38. Guidelines for Evaluating and Documenting Traditional Cultural Properties. Washington, DC.

Natural Resources Conservation Service. 1988. Soil Survey of Sutter County.

_____. 1993. Soil Survey of Sacramento County.

Peak & Associates. 1997. Historic American Engineering Record Reclamation District 1000 HAER No. CA-187. Prepared for Sacramento Area Flood Control Agency. Sacramento, CA.

Sacramento Area Flood Control Agency. 2007 (November). *Final Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project*. State Clearinghouse #2007062016. Prepared by EDAW, Sacramento, CA.

_____. 2008 (December). *Supplement to the Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project – Phase 2 Project*. Prepared by EDAW, Sacramento, CA.

Sacramento County Airport System. 2007. *Sacramento International Airport Wildlife Hazard Management Plan*. Sacramento, CA.

Sacramento County. 1993a. *Sacramento County General Plan*. Sacramento, CA. Available: <http://www.planning.saccounty.net/general-plan/index.html>. Sacramento, CA.

_____. 1993b (December). Sacramento County General Plan. Noise Element. Includes revisions as of May 2, 1997. Sacramento, CA. Available: <http://www.planning.saccounty.net/general-plan/index.html>. Accessed 2007.

Sacramento County Board of Supervisors. 2008 (November 4). Summary Report – Continuity of Airport Operations Flood Contingency Action Plan For Sacramento County Airport Systems. Sacramento, CA. Available: <http://www.agendanet.saccounty.net/sirepub/pubmtgframe.aspx?meetid=9774&doctype=summary>. Accessed January 26, 2009.

Sacramento Metropolitan Air Quality Management District. 2004 (July). Guide to Air Quality Assessment in Sacramento County. Sacramento, CA.

SAFCA. *See* Sacramento Area Flood Control Agency.

SCAS. *See* Sacramento County Airport System.

SMAQMD. *See* Sacramento Metropolitan Air Quality Management District.

Society of Vertebrate Paleontology. 1995. Assessment and mitigation of adverse impacts to nonrenewable paleontologic resources-standard guidelines. Society of Vertebrate Paleontology News Bulletin, vol. 163, pp. 22–27.

Stackhouse, Eric. Environmental analyst/biologist/certified arborist WE-7515A. Department of Environmental Review and Assessment, Sacramento County, Sacramento, CA. January 7, 2009–e-mail message to Peter Buck of SAFCA regarding the applicability of the Sacramento County Tree Preservation Ordinance to the Natomas Levee Improvement Program.

Sutter County. 1996a (November). *County of Sutter General Plan 2015 Policy Document. Available:* <http://www.co.sutter.ca.us/doc/government/depts/cs/ps/cs_planning_services>.Yuba City, CA.

The Natomas Basin Conservancy. 2007. *Biological Effectiveness Monitoring for the Natomas Basin Habitat Conservation Plan Area 2006 Annual Survey Results*. Sacramento, CA.

TNBC. *See* The Natomas Basin Conservancy.

USACE. *See* U.S. Army Corps of Engineers.

USACE and SAFCA. *See* U.S. Army Corps of Engineers and Sacramento Area Flood Control Agency.

U.S. Army Corps of Engineers. 2000 (April 20). *Engineering and Design—Design and Construction of Levees.* Engineering Manual 1110-2-1913. Washington, DC.

U.S. Army Corps of Engineers and Sacramento Area Flood Control Agency. 2008 (November). Historic-Era Resources Eligibility Assessment Report. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

U.S. Environmental Protection Agency. 1971 (December). Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. Washington, DC.

U.S. Fish and Wildlife Service. 1999. Conservation Guidelines for the Valley Elderberry Longhorn Beetle. U.S. Fish and Wildlife Service. Portland, Oregon.

_____. 1997. *Guidelines for the Restoration and/or Replacement of Giant Garter Snake Habitat*.

USFWS. *See* U.S. Fish and Wildlife Service.

USACE. *See* U.S. Army Corps of Engineers.

Waters, T. F. 1995. Sediment in Streams: Sources, Biological Effects, and Control. American Fisheries Society Monograph 7. Bethesda, MD.

5.0 CUMULATIVE AND GROWTH-INDUCING IMPACTS, AND OTHER STATUTORY REQUIREMENTS

ARB. *See* California Air Resources Board.

California Air Pollution Control Officers Association. 2008. *CEQA & Climate Change.*

California Air Resources Board. 2008a (October). *Climate Change Proposed Scoping Plan.*

_____. 2008b. *Preliminary Draft Staff Proposal Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the California Environmental Quality Act.*

California Office of Planning and Research. 2009. *Preliminary Draft CEQA Guideline Amendments for Greenhouse Gas Emissions.*

CAPCOA. *See* California Air Pollution Control Officers Association.

City of Sacramento. 2008 (May 14). Annexation Quarterly Activity Report. Planning Department New Growth Division. Sacramento, CA. Available: <www.cityofsacramento.org/planning/new-growth/annexations/documents/Spring2008QuarterlyActivityReport.pdf>. Accessed August 14, 2008.

City of Sacramento. 1994 (April 25). Staff report regarding certification of Supplemental Environmental Impact Report (SCH No. 93012011) for the North Natomas Community Plan. Includes Findings and Statement of Overriding Considerations. Sacramento, CA.

_____. 1996 (April 16). North Natomas Community Plan. Adopted by City Council Resolution No. 94-259 May 3, 1994, amended by City Council Resolution No. 96-156 April 16, 1996. Sacramento, CA. Available: <http://www.cityofsacramento.org/dsd/about/planning/NorthNatomasCommunityPlan.cfm>.

_____. 2005 (June). City of Sacramento General Plan Update Technical Background Report. Available: <http://www.sacgp.org/documents.html#tbr>. Accessed February 2008.

_____. 2006 (July). Natomas Joint Vision. Available: <http://www.cityofsacramento.org/dsd/about/planning/NatomasJointVision.cfm>.

City of Sacramento and Sacramento Area Local Agency Formation Commission. 2007 (August). Greenbriar Development Project, Sacramento, California Final Environmental Impact Report Responses to Comments and Additional Information. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

City of Sacramento and County of Sacramento. 2002 (December 10). *Resolution No. 2002-830. A Resolution Authorizing the City Manager to Execute a Memorandum of Understanding Between the City and County of Sacramento Regarding Principles of Land Use and Revenue Sharing for the Natomas Area* (Joint Vision). (M02-014). Sacramento, CA.

City of Sacramento, Sutter County, and The Natomas Basin Conservancy. 2003. Final Natomas Basin Habitat Conservation Plan. Sacramento, CA.

HUD. *See* U.S. Department of Housing and Urban Development.

Luhdorff & Scalmanini, Consulting Engineers. 2008 (February 21). Evaluation of Potential Groundwater Impacts Due to Proposed Sacramento River East Levee Improvements with Emphasis on Reaches 2 and 3. Woodland, CA. Prepared for Sacramento Area Flood Control Agency, Sacramento, CA.

OPR. *See* California Office of Planning and Research.

Placer Parkway Corridor Preservation. 2007. Project Description. Available: <http://www.pctpa.org/placerparkway/description.htm>. Accessed August 2007.

SACOG. *See* Sacramento Area Council of Governments.

Sacramento Area Council of Governments. 2002 (January 22). Population and Housing for Sacramento County by Regional Analysis District (RAD). Available <http://sacog.org/demographics/pophsg/radlist.cfm>. Accessed February 2008.

_____. 2005. SACOG Projections Adopted 12/16/04 for RAD 2005–2025. Available: <http://sacog.org/demographics/projections/files/split/>. Last updated May 31, 2005. Accessed November 2006.

Sacramento Area Flood Control Agency. 2007a (February). *Final Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area.* State Clearinghouse #2006072098. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

———. 2007b (November). *Final Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project.* State Clearinghouse #2007062016. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

Sacramento County Airport System. 2007. *Sacramento International Airport Master Plan*. Sacramento, CA.

SAFCA. *See* Sacramento Area Flood Control Agency.

The Natomas Basin Conservancy. 2007 (December 17). 2007 Base Map. Available: <http://www.natomasbasin.org/content/view/148/112/ >. Accessed September 2008.

TNBC. *See* The Natomas Basin Conservancy.

USACE. *See* U.S. Army Corps of Engineers.

U.S. Army Corps of Engineers. 2008 (November). *Final Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA*. Prepared by EDAW, Sacramento, CA.WAPA. *See* Western Area Power Administration.

Western Area Power Administration. 2007 (July). Sierra Nevada Region Sacramento Area Voltage Support Draft Supplemental Environmental Impact Statement and Environmental Impact Report. State Clearinghouse No. 2006052119. Folsom, CA.

6.0 REGULATORY SETTING AND OTHER NEPA AND CEQA STATUTORY

California Department of Conservation. 2008. Important Farmland (agricultural land use) layers. Division of Land Resource Protection, Farmland Mapping and Monitoring Program. Available: <ftp.consrv.ca.gov/pub/dlrp/fmmp>. Last updated 2008. Accessed August 6, 2008.

City of Sacramento, Sutter County, and The Natomas Basin Conservancy. 2003. Final Natomas Basin Habitat Conservation Plan. Sacramento, CA.

Central Valley Regional Water Quality Control Board. 2007. *Water Quality Control Plan (Basin Plan) for the Sacramento River Basin and the San Joaquin River Basin*. Fourth Edition, revised February 2007 (with approved amendments). Rancho Cordova, CA.

Central Valley RWQCB. *See* Central Valley Regional Water Quality Control Board.

City of Sacramento. 1988. *City of Sacramento General Plan*. Adopted January 19, 1988; reflects city council amendments through 2002. Sacramento, CA. Available: <www.cityofsacramento.org/planning/long-range/citywide-and-regional/general-plan.cfm>. Accessed July 18, 2007.

FAA. *See* Federal Aviation Administration.

Federal Aviation Administration. 2007. Hazardous Wildlife Attractants on or Near Airports. FAA Advisory Circular 150/5200-33B. Available: <http://www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars/index.cfm?template=Document_Listing&Keyword=150/5200-33&DocumentSelected=1>.

Federal Emergency Management Agency. 2007 (September 27). Letter to Ray Kerridge, City Manager, City of Sacramento. Available: <http://www.cityofsacramento.org/utilities/flood/FEMA_Letter_100807.pdf>. Accessed February 17, 2008.

FEMA. *See* Federal Emergency Management Agency.

Follas, Dale. Associate Planner. Sutter County Planning Department, Yuba City, CA. September 7, 2007─telephone conversation with Chris Shields of EDAW regarding noise ordinance in Sutter County.

Governor's Office of Planning and Research. 2003. State of California General Plan Guidelines. Sacramento, CA.

NRCS 2004. Farm and Ranchlands Protection Program. Available: <http://www.nrcs.usda.gov/programs/frpp/>. Accessed September 2008.

OPR. *See* Governor's Office of Planning and Research.

Sacramento County. 1993 (December). Sacramento County General Plan. Sacramento, CA. Available: <http://www.planning.saccounty.net/gpupdate/gpu-index.html>. Accessed July 11, 2007.

Sacramento County Airport System. 2007. *Sacramento International Airport Wildlife Hazard Management Plan*. Sacramento, CA.

Sutter County. 1996a (November). *County of Sutter General Plan 2015 Policy Document*. Available: <http://www.co.sutter.ca.us/doc/government/depts/cs/ps/cs_planning_services>. Yuba City, CA.

7.0 CONSULTATION AND COORDINATION

California Spatial Information Library. 2006. Base Layers. Available: <http://casil.ucdavis.edu/casil/inlandWaters/>.

City of Sacramento. 2008. Parks. Geographic Information Systems Data. Available: <http://maps.cityofsacramento.org/datalist.htm>.

Department of Conservation. 2006 (May). Farmland Mapping & Monitoring Program. Division of Land Resource Protection, Farmland Mapping and Monitoring Program. Available: <http://www.conservation.ca.gov/DLRP/FMMP/Pages/Index.aspx>.

———. 2007. Williamson Act Program. Available: <http://www.conservation.ca.gov/dlrp/lca/Pages/Index.aspx>.

Egan, David M. 1988. *Architectural Acoustics*. McGraw-Hill, Inc. San Francisco, CA.

FAA. *See* Federal Aviation Administration.

Federal Aviation Administration. 2007. Hazardous Wildlife Attractants on or Near Airports. FAA Advisory Circular 150/5200-33B. Available: <http://www.faa.gov/airports_airtraffic/airports/resources/

advisory_circulars/index.cfm?template=Document_Listing&Keyword=150/5200-33&DocumentSelected=1>.

PlatesNAIP. *See* National Agricultural Imagery Program.

National Agricultural Imagery Program. 2006. Available: <http://datagateway.nrcs.usda.gov/GatewayHome.html>.

Office of Community Planning and Development. The Noise Guide Book. Available: <http://www.hud.gov/offices/cpd/environment/training/guidebooks/noise/>.

PLATES

CaSIL. *See* California Spatial Information Library.

SACOG. *See* Sacramento Area Council of Governments.

Sacramento Area Council of Governments. 2004. Sacramento Region Blueprint. Available: <http://www.sacregionblueprint.org/sacregionblueprint/home/cfm>.

———. 2007. Regional Street Centerlines. Available: <http://www.sacog.org/mapping/clearinghouse/>.

———. 2008 (July). Parks. Available: <http://www.sacog.org/mapping/clearinghouse/metadata/Parks.htm>.

Sacramento Area Flood Control Agency. 2007a. *Natomas Levee Improvement Program Landside Environmental Impact Report*. Prepared by EDAW, Sacramento, CA.

———. 2007b. *Natomas Levee Improvement Program Bank Protection Project Draft Environmental Impact Report*. Prepared by Jones and Stokes, Sacramento, CA.

Sacramento County Airport System. 2007. Sacramento International Airport Wildlife Hazard Management Plan. Sacramento, CA.

Wagner, D. L., C. W. Jennings, T. L. Bedrossian, and E. J. Bortugno. 1987. Geologic Map of the Sacramento Quadrangle. Regional Geologic Map Series, Map No. 1A. California Division of Mines and Geology.

9.0 LIST OF PREPARERS

This EIS/EIR was prepared by EDAW at the direction of USACE and SAFCA, with assistance from MBK Engineers, HDR Engineering, Mead & Hunt, and Wood Rodgers.

Following is a list of the individuals who prepared sections of the EIS/EIR, provided significant background materials, or participated in preparing the EIS/EIR.

U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT

Name	Title	Experience
Kathleen Dadey, Ph.D.	Chief, California South Branch, Regulatory	16 years
Elizabeth Holland	Social Science Environmental Manager	23 years
Meegan Nagy, P.E.	Chief, Flood Protection & Navigation Section	13 years
Dan Tibbitts, P.E.	Programs and Project Manager	18 years
Daniel Bell	Archaeologist	31 years
Ethan Thompson	Senior Hydraulic Engineer	9 years
Lisa Clay	Assistant District Counsel	21 years

SACRAMENTO AREA FLOOD CONTROL AGENCY

Timothy Washburn, J.D. ..... Agency Counsel
John Bassett, P.E. ..... Director of Engineering, Project Manager
Peter Buck .....Natural Resource Supervisor

EDAW

Name	Qualifications and Experience	Participation
Phil Dunn	B.S. Zoology; M.S. Fisheries Biology; 27 years experience	Principal-in-Charge, Senior Reviewer/Advisor
Francine Dunn	B.A. Environmental Studies; 24 years experience	Principal, NEPA/CEQA Task Leader, EIS/EIR Project Manager
Sarah Henningsen	B.S. Community and Regional Development; 5 years experience	NEPA/CEQA Assistant Project Manager
Mike Eng	B.S. Ecology; B.A. English; 5 years experience	Permitting Task Leader, Sensitive Aquatic Habitats
Melinda Rivasplata	B.A. Environmental Biology; 25 years experience	Agricultural Resources, Land Use and Socioeconomics, Geology and Soils, Recreation, and Visual Resources
Marianne Lowenthal	B.S. Environmental Toxicology; 2 years experience	EIS/EIR Task Coordinator, Utilities and Service Systems, Hazards and Hazardous Materials

Name	Qualifications and Experience	Participation
David Rader	B.A. Print Journalism; M.A. Business Economics; 4 years experience	Project Description, Hydrology and Hydraulics, Water Quality, and Transportation and Circulation
Steve Chainey	B.S. Landscape Architecture; M.S. Range and Wildlands Science; 26 years experience	Lead Ecologist, Habitat Planning
Chris Fitzer	B.A. Geography (Environmental Concentration); M.A. Environmental Planning (Watershed/Water Resource Concentration); 12 years experience	Fisheries
Lisa Mangione	B.S. Animal Science; 18 years experience	Sensitive Aquatic Habitats
Kelly Holland	B.S. Environmental Studies; M.S. Environmental Science; 12 years experience	Vegetation and Wildlife, Special-Status Terrestrial Species
Ann Chrisney	B.S. Animal Science; M.S. Natural Resources; 27 years experience	Vegetation and Wildlife, Special-Status Terrestrial Species
Mike Aviña	B.A. Anthropology; J.D. Law; 13 years experience	EIS/EIR Task Coordinator, Cultural Resources, Environmental Justice
Wendy Copeland	B.S. Plant Science; M.S. Plant Pathology; 9 years experience	Paleontological Resources, Geology and Soils Senior Reviewer
Heather Phillips	B.S. Atmospheric Science; M.S. Atmospheric Science; 5 years experience	Air Quality
Chris Shields	B.A. Environmental Studies; 2 years experience	Noise
Honey Walters	B.S. Environmental Science; M.S. Atmospheric Science; 11 years experience	Air Quality and Noise Senior Reviewer
Lisa Clement	B.S. Environmental and Resource Sciences; 9 years experience	Geographic Information Systems
Phi Ngo	B.A. Communication (GIS Minor); 3 years experience	Geographic Information Systems
Julie Nichols	B.A. Political Science; M.S. Journalism; 20 years experience	Technical Editing
Christy Seifert	B.A. English; 11 years experience	Technical Editing
Lorrie Jo Williams	B.S. Design; 21 years experience	Graphics
Christy Anderson	B.A. Fine Art; 29 years experience	Graphics
Deborah Jew	22 years experience	Word Processing, Production
Amber Giffin	12 years experience	Word Processing, Production

MBK ENGINEERS

Name	Qualifications	Participation
Joe Countryman, P.E.	B.S. Civil Engineering; 42 years experience	Hydraulic Modeling Review
Ric Reinhardt, P.E.	B.S. Civil Engineering; M.S. Civil Engineering; 14 years experience	Hydraulic Modeling Review
Mike Archer, P.E.	B.S. Civil Engineering; M.S. Civil Engineering; 27 years experience	Hydraulic Modeling

HDR ENGINEERING

Name	Qualifications	Participation
Chris Krivanec, P.E., G.E.	B.S. Civil Engineering; M.S. Civil Engineering (Geotechnical); M.E. Civil Engineering (Geotechnical); 15 years experience	Project Manager, Sacramento River East Levee Design

MEAD & HUNT

Name	Qualifications	Participation
Steve Sullivan, P.E.	B.S. Civil Engineering; 28 years experience	Project Manager, Canal Design and Borrow Investigation

WOOD RODGERS

Name	Qualifications	Participation
Jonathan Kors, P.E.	B.S. Civil Engineering; 12 years experience	Project Manager, Natomas Cross Canal South Levee Design

10.0 LIST OF RECIPIENTS

10.1 ELECTED OFFICIALS AND REPRESENTATIVES

Bonnie Pannell, Sacramento City Council
James Gallagher, Sutter County Supervisor
Don Nottoli, Sacramento County Supervisor
Doris Matsui, Congresswoman, 5th Congressional District
Howard Schmidt, Sacramento County 3rd District
Jimmie Yee, Sacramento County Supervisor
Tom McClintock, Congressman, 4th Congressional District
Kevin McCarty, Sacramento City Council
Lauren Hammond, Sacramento City Council
Mayor Kevin Johnson, Sacramento City Council
Ray Tretheway, Sacramento City Council
Rob Fong, Sacramento City Council
Robbie Waters, Sacramento City Council
Roberta MacGlashan, Sacramento County Supervisor
Roger Dickinson, Sacramento County Supervisor
Sandy Sheedy, Sacramento City Council
Steve Cohn, Sacramento City Council
Susan Peters, Sacramento County Supervisor
Ted Wolter, Sacramento County 4th District

10.2 GOVERNMENT DEPARTMENTS AND AGENCIES

UNITED STATES GOVERNMENT

Bureau of Indian Affairs, Pacific Regional Office
Federal Aviation Administration
Federal Emergency Management Agency, Region IX
National Marine Fisheries Service
Natural Resources Conservation Service
U.S. Bureau of Reclamation, Central Valley Operations
U.S. Department of Agriculture, National Rural Development Council
U.S. Environmental Protection Agency, Division 9
U.S. Fish and Wildlife Service

TRIBAL GOVERNMENT

Shingle Springs Rancheria

STATE OF CALIFORNIA

California Bay-Delta Authority
California Department of Boating and Waterways, Regulations Unit
California Department of Fish and Game
California Department of Transportation
California Department of Water Resources
California Environmental Protection Agency

California Regional Water Quality Control Board, Central Valley Region
Central Valley Flood Protection Board
Native American Heritage Commission
Office of Historic Preservation, State Historic Preservation Officer
Office of Planning and Research, State Clearinghouse
State Lands Commission, Division of Environmental Planning and Management
State Water Resources Control Board

REGIONAL, COUNTY, CITY, AND OTHER LOCAL AGENCIES

Amador County
American River Flood Control District
Butte County
Central Valley Flood Control Association
City of Davis
City of Sacramento
City of Sacramento Department of General Services
City of Sacramento Department of Parks and Recreation
City of Sacramento Department of Transportation Engineering Services
City of Sacramento Department of Utilities
City of Stockton
City of West Sacramento
City of Woodland
Colusa County
Contra Costa County
El Dorado County
Feather River Air Quality Management District
Natomas Central Mutual Water Company
Placer County
Placer County Water Agency
Port of Sacramento
Reclamation District 150
Reclamation District 307
Reclamation District 537
Reclamation District 730
Reclamation District 785
Reclamation District 900
Reclamation District 999
Reclamation District 1000
Reclamation District 1001
Reclamation District 1500
Reclamation District 1600
Regional Water Authority
Rio Linda and Elverta Recreation and Park District
Sacramento Area Council of Governments
Sacramento County
Sacramento County Airport System
Sacramento County Department of Environmental Review and Assessment
Sacramento County Department of Regional Parks
Sacramento County Department of Transportation
Sacramento County Department of Water Resources
Sacramento County Planning and Community Development Department

Sacramento County Water Agency
Sacramento Metropolitan Air Quality Management District
San Joaquin County
San Joaquin County Flood Control and Water Conservation District
Solano County
Sutter County
Sutter County Department of Public Works
Sutter County Department of Transportation
Sutter County Planning Department
Sutter County Resource Conservation District
Sutter County Water Resources Division
Three Rivers Levee Improvement Authority
Twin Rivers Unified School District
Yolo County
Yolo County Flood Control and Water Conservation District
Yolo County Parks and Natural Resources Management Division
Yolo County Planning and Public Works Department
Yuba County
Yuba County Water Agency
Yuba-Sutter County Farm Bureau

10.3 NONPROFIT ORGANIZATIONS, PARTNERSHIPS, PRIVATE ORGANIZATIONS, AND BUSINESSES

APCO Worldwide
California Native Plant Society, Sacramento Valley Chapter
Cassidy & Associates
Citizens for Good Government
Community Watchdog Committee
Creekside Natomas Neighborhood Association
Dawson and Associates
Delta Citizens Municipal Advisory Council
Downtown Partnership
Environmental Council of Sacramento
Friends of the River
Friends of the Sacramento River Greenway
Friends of the Swainson's Hawk
Garden Highway Community Association
Gardenland-Northgate Neighborhood Association
The Gualco Group
Habitat 2020
Heritage Park Homeowners Association
Law Offices of Gregory Thatch
Metro Airpark
Natomas Chamber of Commerce
Natomas Community Association
Natomas Park Master Association
North Natomas Alliance
North Natomas Community Association
Pacific Gas & Electric Company
Planning & Conservation League
Port of Sacramento

Regency Park Community Association
Rio Linda Union School District
River Oaks Community Association
Sacramento Area Bicycle Advocates
Sacramento Association of Realtors
Sacramento Builders Exchange
Sacramento County Farm Bureau
Sacramento County Taxpayers
Sacramento Groundwater Authority and Regional Water Authority
Sacramento Metro Chamber
Sacramento Public Library, Central Library, Federal Documents
Sacramento River Property Owners Association
Save Our Sandhill Cranes
Save the American River Association
Sierra Club, Mother Lode Chapter
Steinberg & Associates
Sutter County Resource Conservation District
Terrace Park Neighborhood Association
The Natomas Basin Conservancy
The Nature Conservancy, Sacramento River Program
Urban Creeks Council
Valley View Acres Community Association
Water Forum
West Natomas Community Association
West Sacramento Chamber of Commerce
Yuba-Sutter County Farm Bureau

10.4 MEDIA

Daily Recorder
Folsom Telegraph
N Magazine
Natomas Journal
Sacramento Bee
Sacramento Business Journal
Sacramento News & Review

11.0 INDEX

TOPIC **PAGE NUMBER**

12.0 GLOSSARY

100-year flood A flood that has a 1% or greater annual probability of occurring. Federal Emergency Management Agency accreditation means that a levee provides protection for the base flood (100-year) event, based on certification provided by a civil engineer.

"200-year" flood A flood that has a 0.5% or greater annual probability of occurring. Both state policy and recently enacted state legislation (Senate Bill [SB] 5) call for 200-year (0.5% annual chance) flood protection to be the minimum level of protection for urban and urbanizing areas in the Central Valley. Senate Bill 5 requires that the "200-year" protection be consistent with criteria used or developed by the California Department of Water Resources. SB 5 sets a target date of 2025 for all urban and urbanizing areas protected by state/Federal project levees to achieve 200-year flood protection, and calls for building limitations after 2015 if adequate progress toward achieving this standard is not met.

"500-year" flood A flood that has a 0.2% or greater annual probability of occurring.

adjacent setback levee As proposed in this project, a new "adjacent" levee would widen the existing levee structure on the inland side.

affected environment The environment of the area affected or created by the Proposed Action and alternatives under consideration. The "affected environment" also constitutes the "environmental setting," for CEQA purposes.

alternative Alternate actions that could reasonably accomplish the Proposed Action's purpose and need.

borrow Soil or sediment taken from a site for use in constructing a structure, such as a levee.

canal An artificial watercourse cut (or constructed above grade) through a land area for irrigation or drainage.

Construction heading A group of construction workers and equipment operating at the same time.

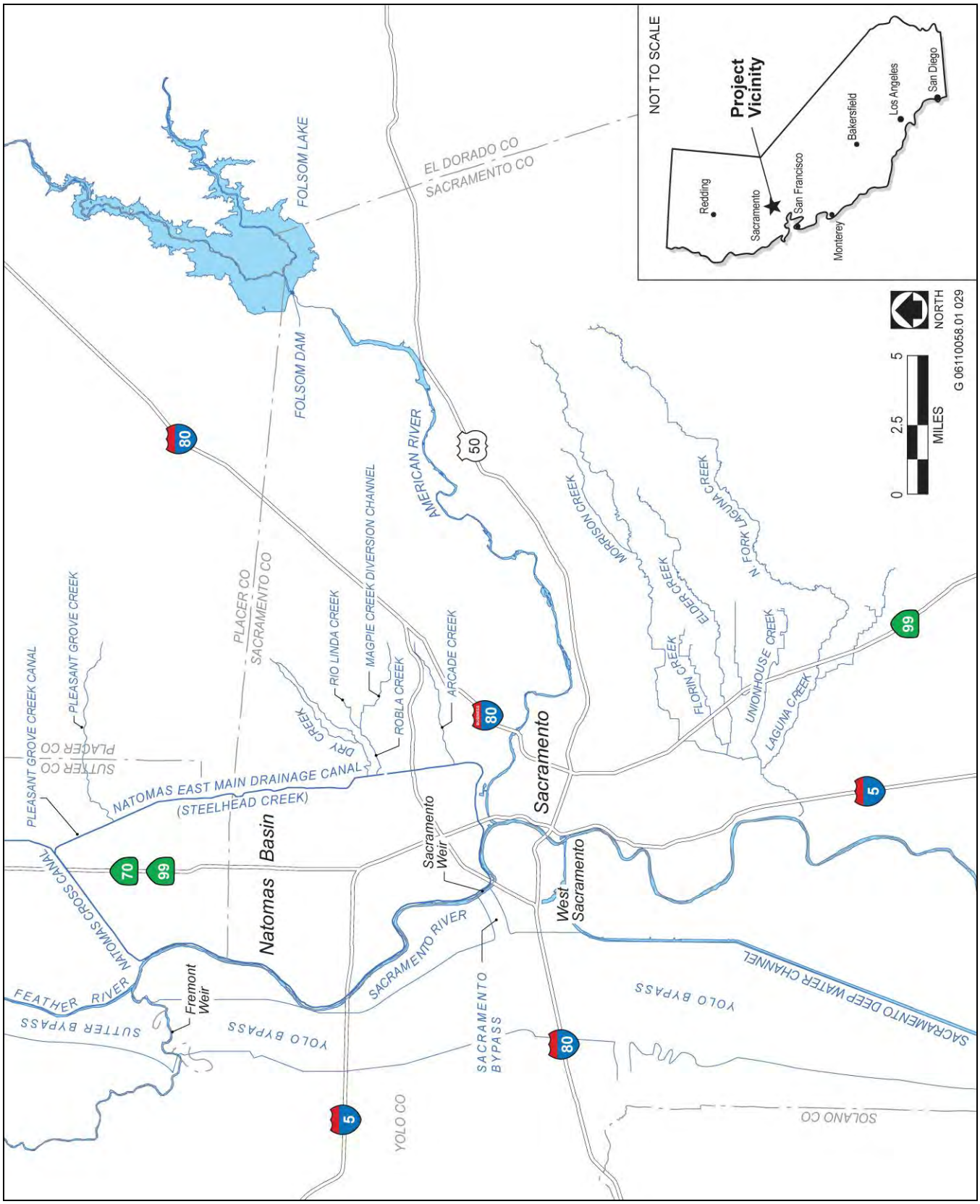
crown The top of a levee.

cutoff wall An engineered low permeability feature constructed underground to reduce the flow of water through permeable soils (sands and gravels) in flood damage reduction facilities. A trench is typically excavated within the levee or levee foundation area using a modified backhoe to reach down to less permeable foundation soils (silts and clays) under the levee footprint. The trench is backfilled by blending the excavated soil with minerals (typically bentonite clay) that increase the length of time for water to travel through the subsurface.

ditch A channel to convey water for irrigation or drainage.

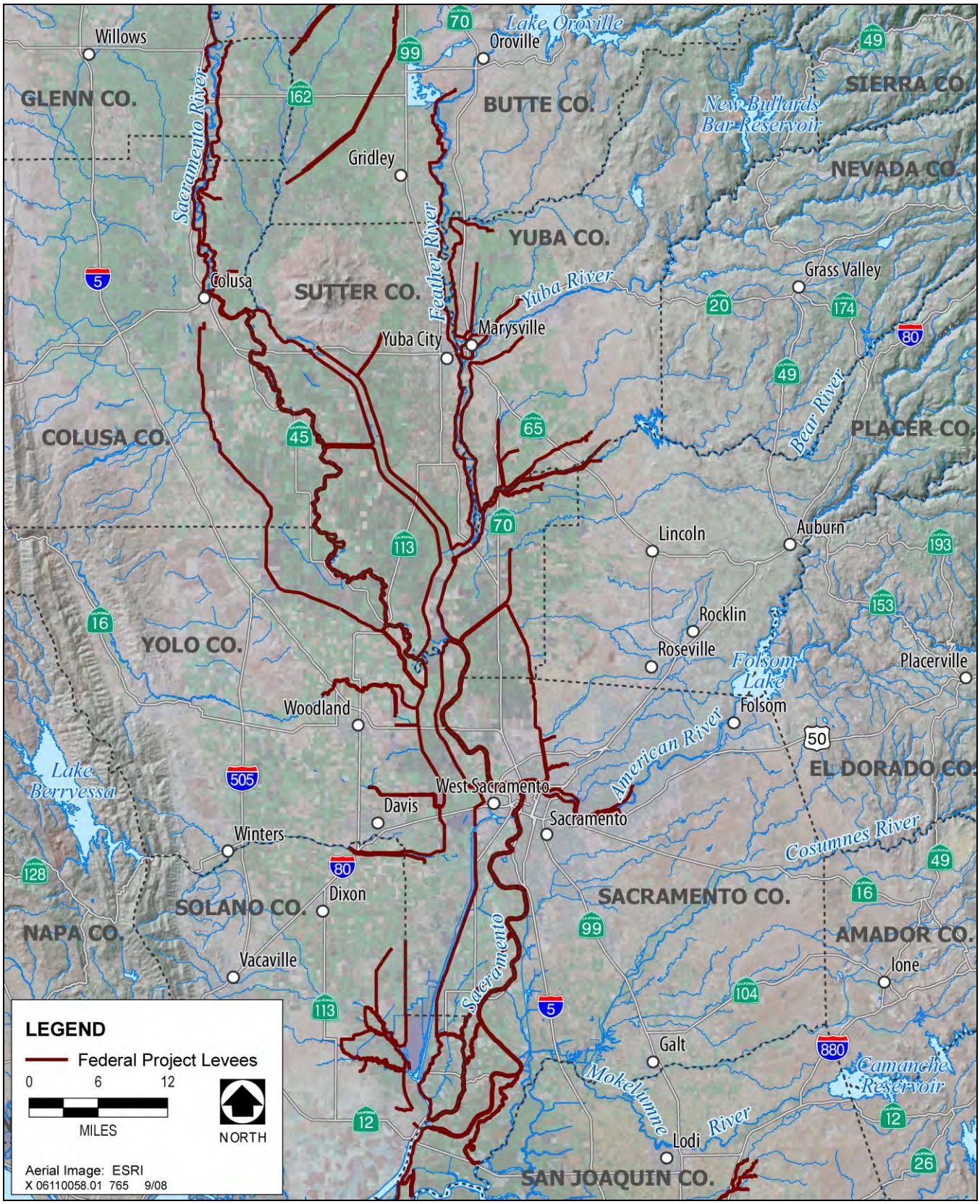
encroachment	Anything that is built or grows within the Federal project levee right-of-way and is not part of the levee system. Encroachments may obstruct visibility or prevents access for inspection of a levee from crown to toe, on both the water side and the land side of a levee.
ecosystem function net gain	An increase in the ability of living organisms and the nonliving environment to thrive in a given area, as measured by the relationships between biological, geochemical, and geophysical systems.
General Re-evaluation report (GRR)	A report prepared by USACE to evaluate proposed modifications to a federally authorized levee project. The report is a series of technical studies that support decision making by describing the process used to reevaluate the levee system, the evaluation criteria, and the results of the evaluation.
hydraulics	The study and computation of the characteristics (e.g., depth [water surface elevation], velocity, slope) of water flowing in a stream or river.
jurisdictional waters of the United States	Waters under the USACE's jurisdiction, such as wetlands or other navigable water, as determined when the USACE issues jurisdictional determinations under Section 404 of the Clean Water Act and Sections 9 and 10 of the Rivers and Harbors Act of 1899.
landside	Describes an area (location) on the land side of the levee.
levee	A large dike or artificial embankment typically constructed of earthen materials, often having an access road along the top, which is designed as part of a system to protect land from floods.
levee height	The height of the levee measured from the surface of the water, on the surface of the adjacent ground, to the top of the levee.
relief wells	All water retention structures are subject to seepage through their foundations and abutments. Relief wells are controlled artificial springs that relieve the confined water pressures to safe values, thus preventing the removal of soil via piping or internal erosion caused by the uplift pressures beneath elements of the levee or beneath landward soil next to the levee.
seepage	The movement of water through, for example, small cracks, pores, or interstices of a material into or out of a body of surface or subsurface water.
toe	Where a levee slope meets the ground.
waterside	Describes an area (location) on the water side of the levee.

PLATES



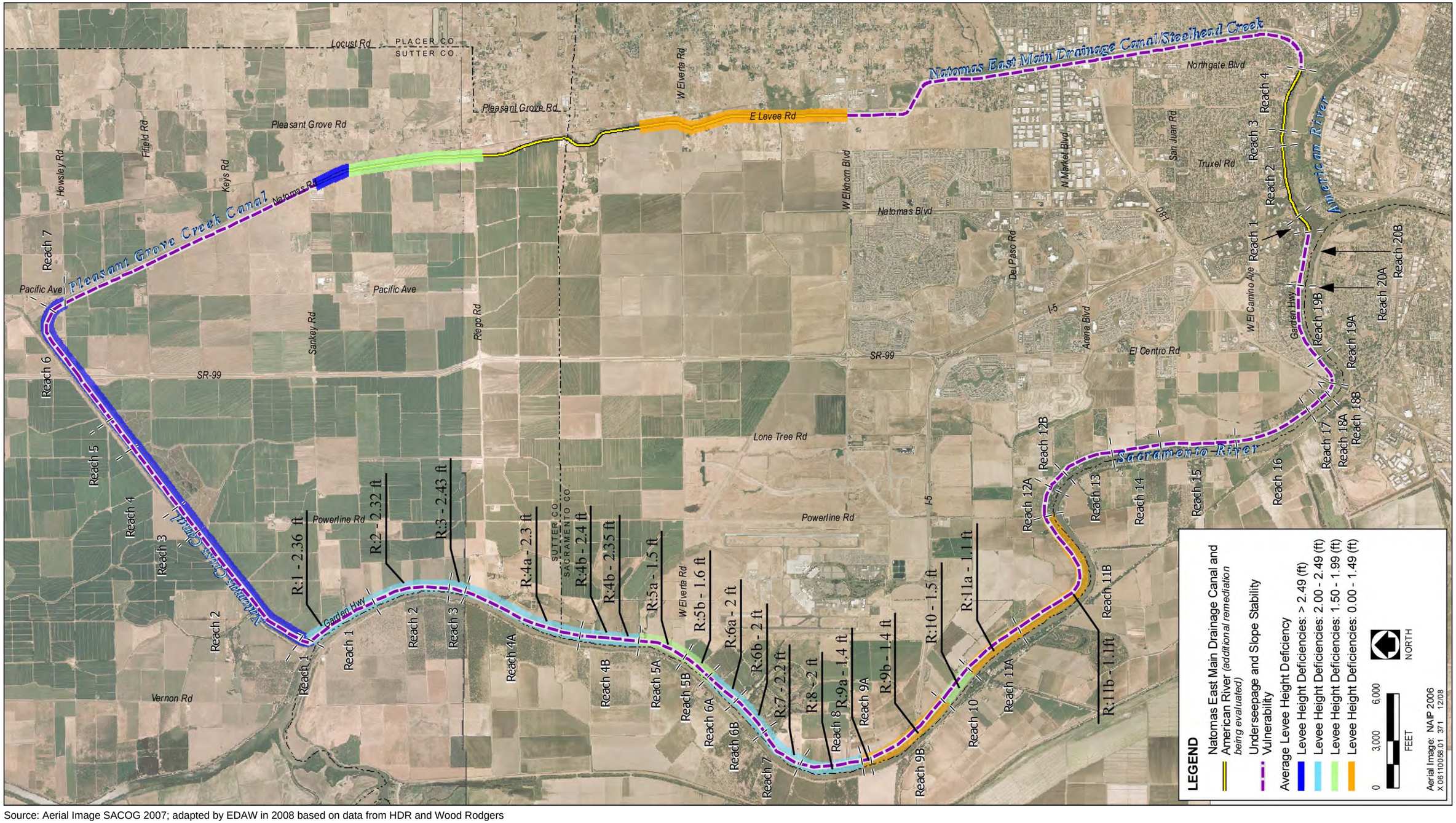
Source: Adapted by EDAW in 2007 based on CASIL Layers; SAFCA 2007a

Project Location **Plate 1**



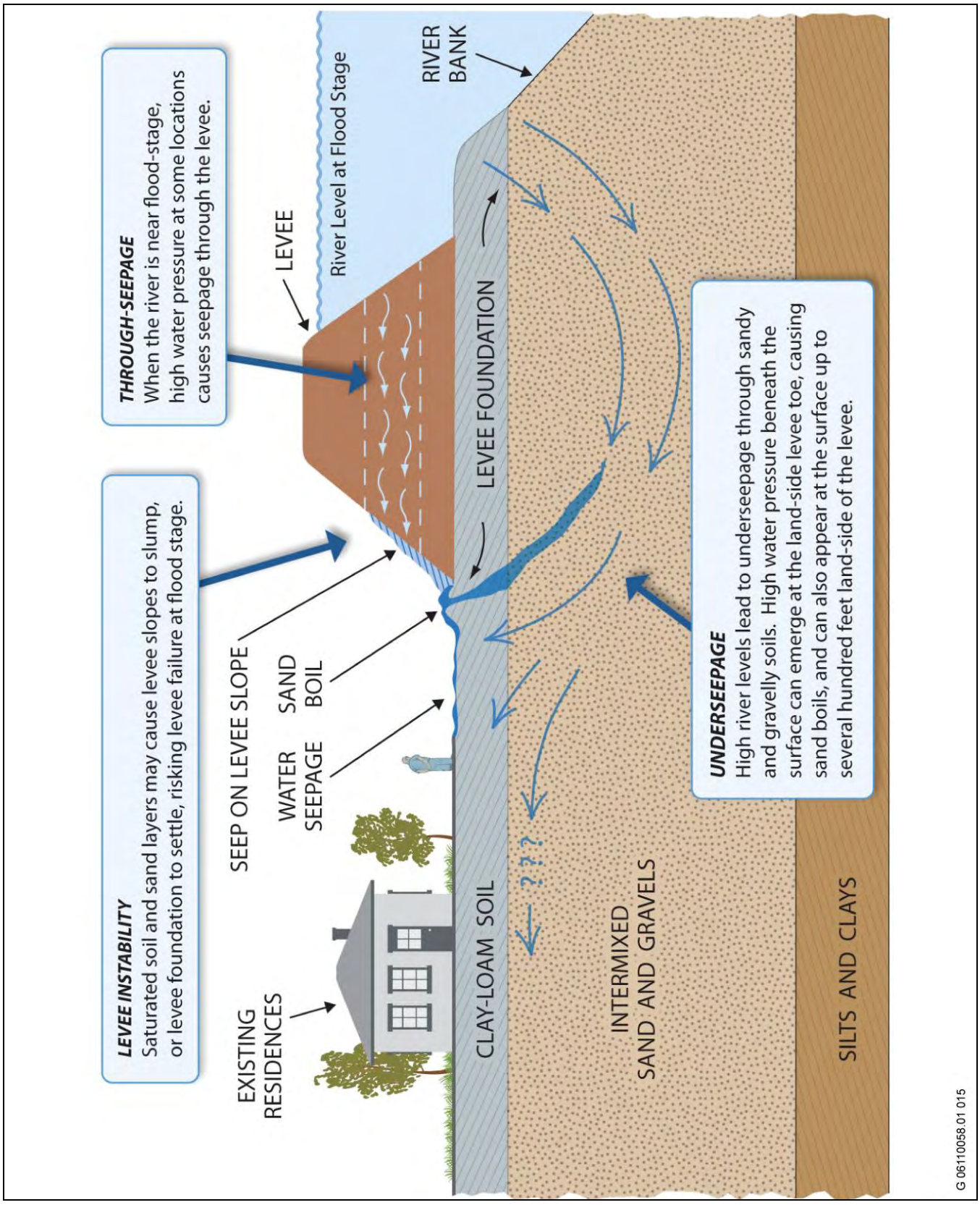
Source: Adapted by EDAW in 2006 based on data from MBK Engineers

Sacramento River Flood Control Project **Plate 2**



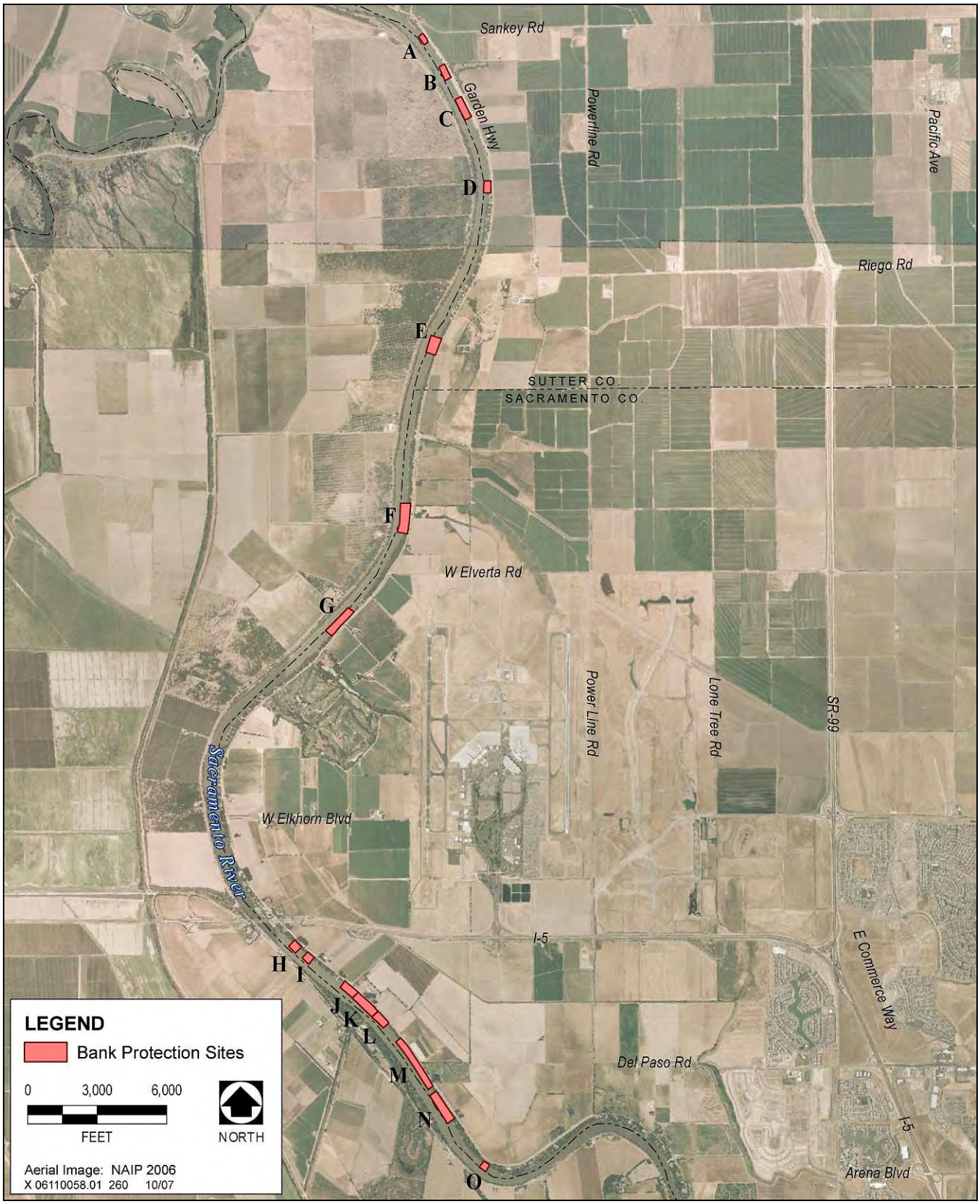
Source: Aerial Image SACOG 2007; adapted by EDAW in 2008 based on data from HDR and Wood Rodgers

Levee Segments Requiring Seepage Remediation and Levee Height Increases **Plate 3**



Source: SAFCA 2007b

Underseepage and Through-Seepage Levee Risks **Plate 4**

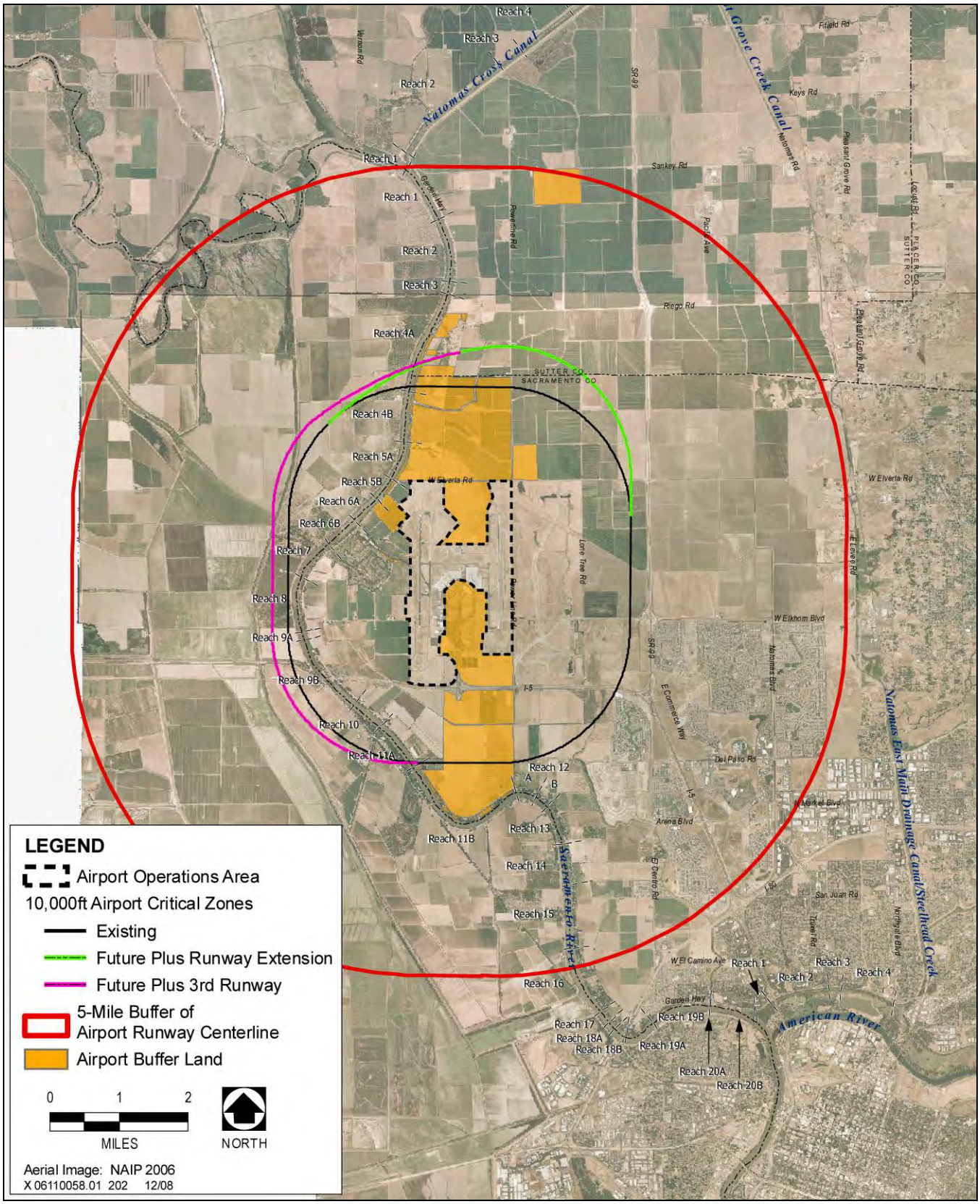


Source: Aerial image SACOG 2007; adapted by EDAW in 2007 based on data from SAFCA 2007b

Natomas Basin Erosion Sites **Plate 5**

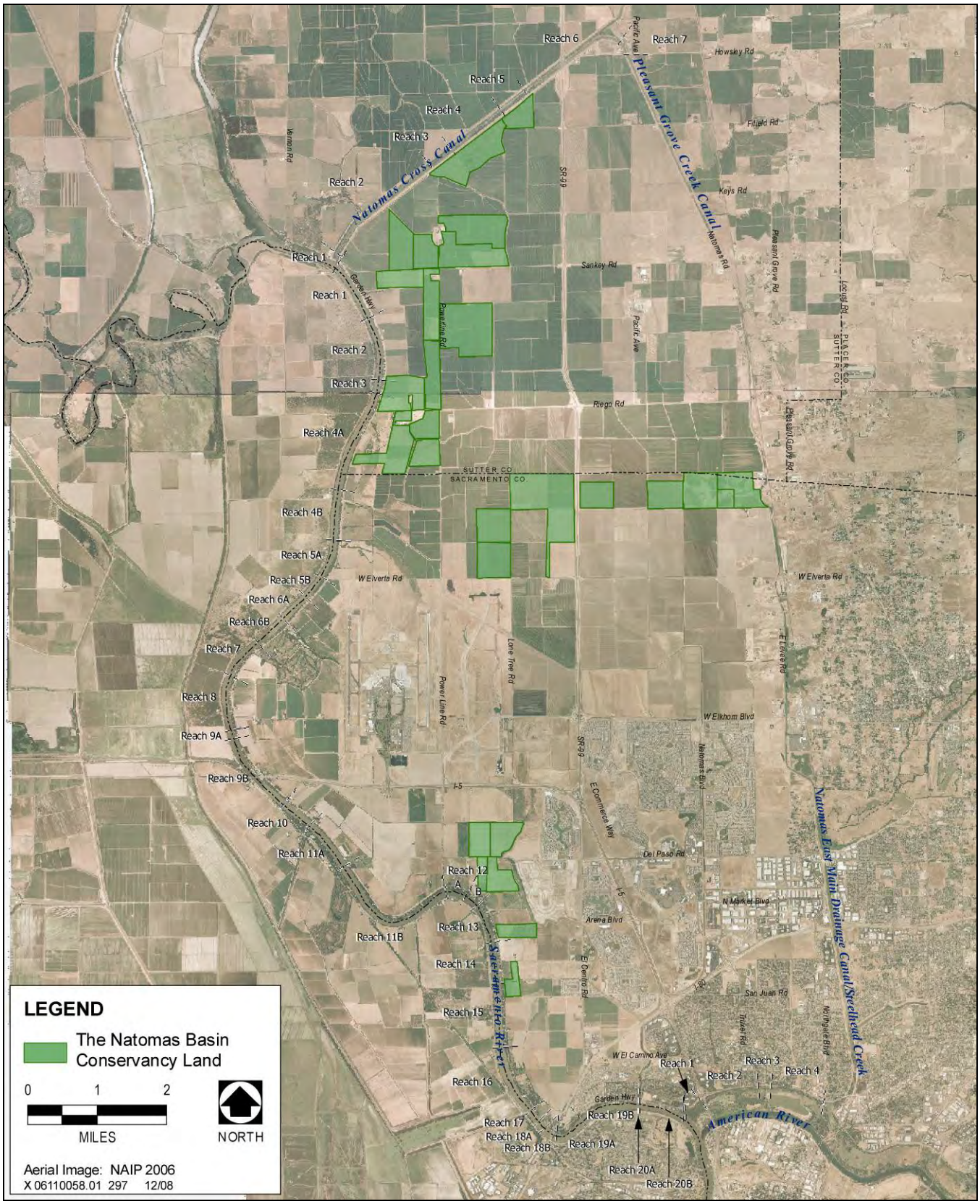
Source: Photographs taken by EDAW in 2007

Examples of Waterside Encroachments on the Sacramento River East Levee **Plates 6a and b**



Source: Aerial image SACOG 2007, adapted by EDAW in 2007 based on data from HDR and Wood Rodgers

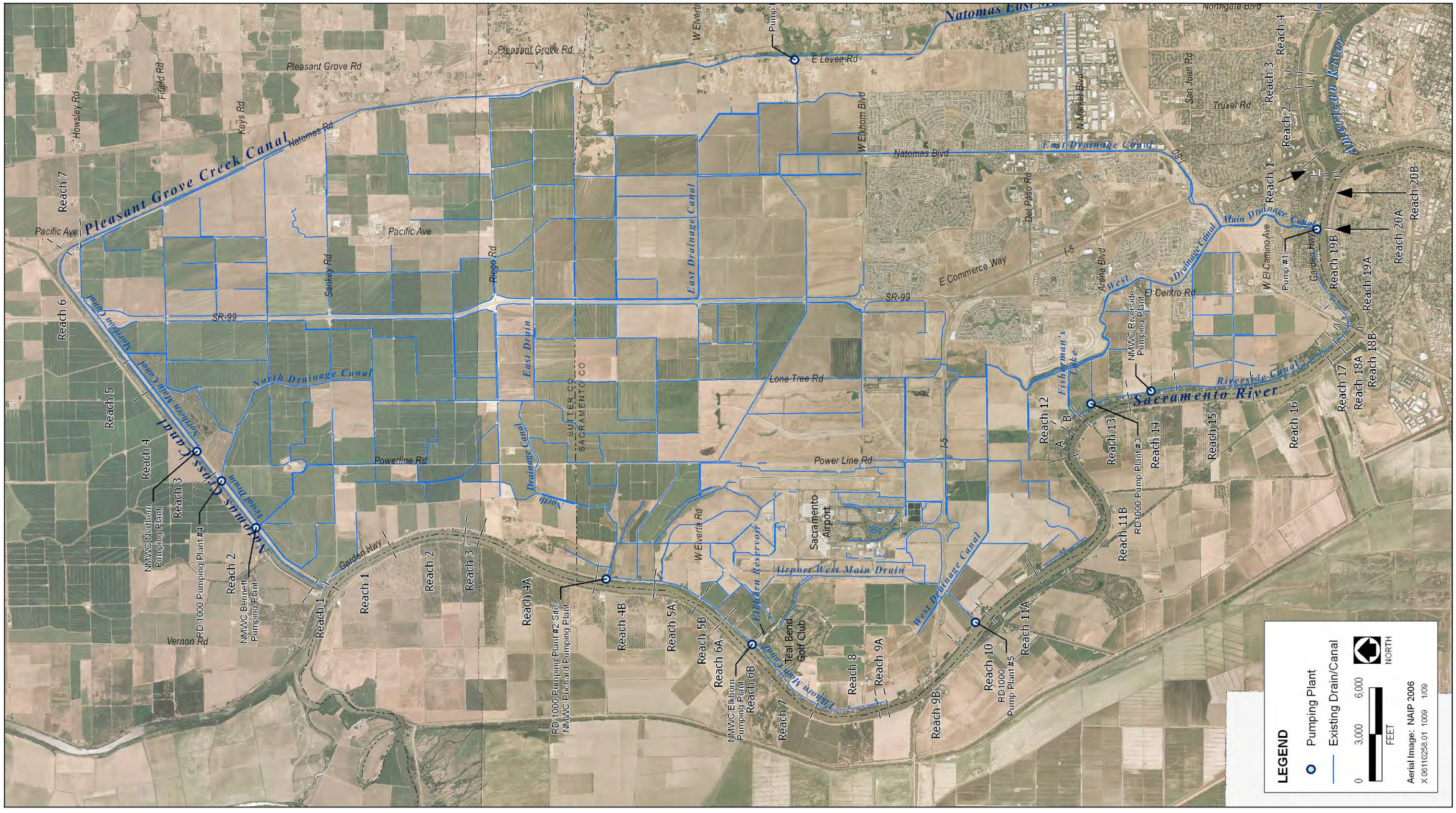
Sacramento International Airport **Plate 7**



Source: Aerial image SACOG 2007, adapted by EDAW in 2007 based on data from The Natomas Basin Conservancy in 2008

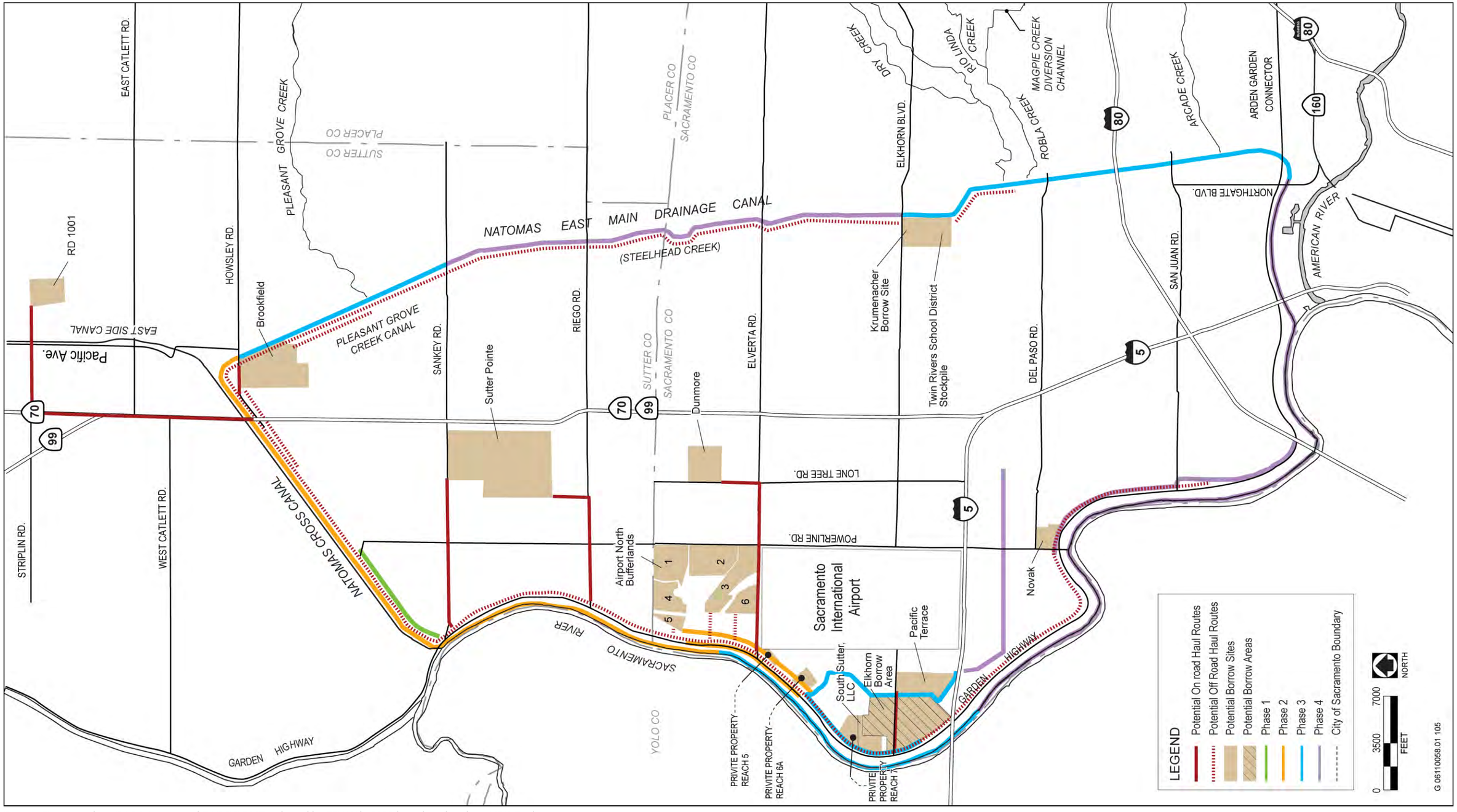
Natomas Basin Conservancy Lands **Plate 8**

This page intentionally blank.



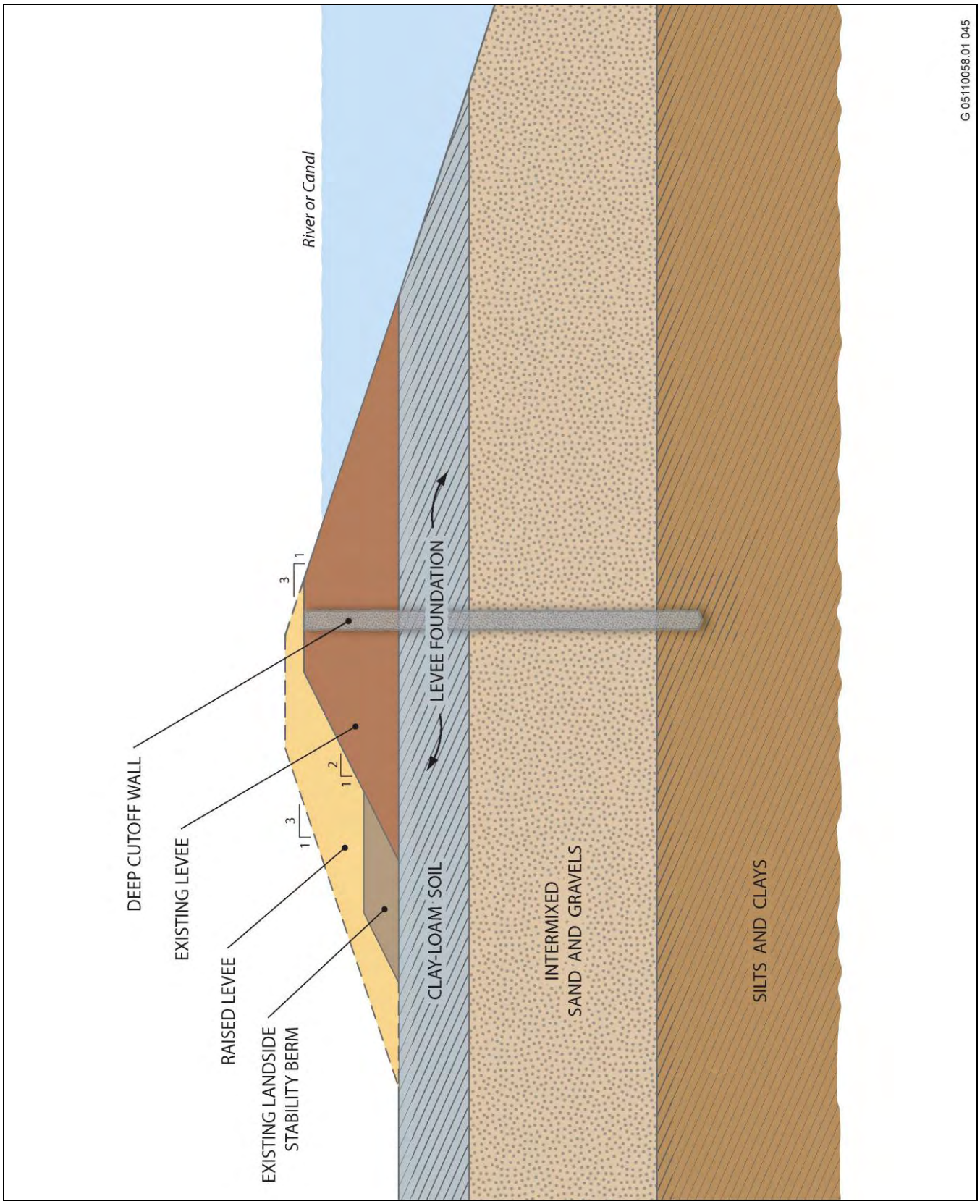
Source: Aerial image SACOG 2007; adapted by EDAW in 2007 based on data from Eric Hansen

Existing Natomas Basin Drainage and Irrigation Features **Plate 9**



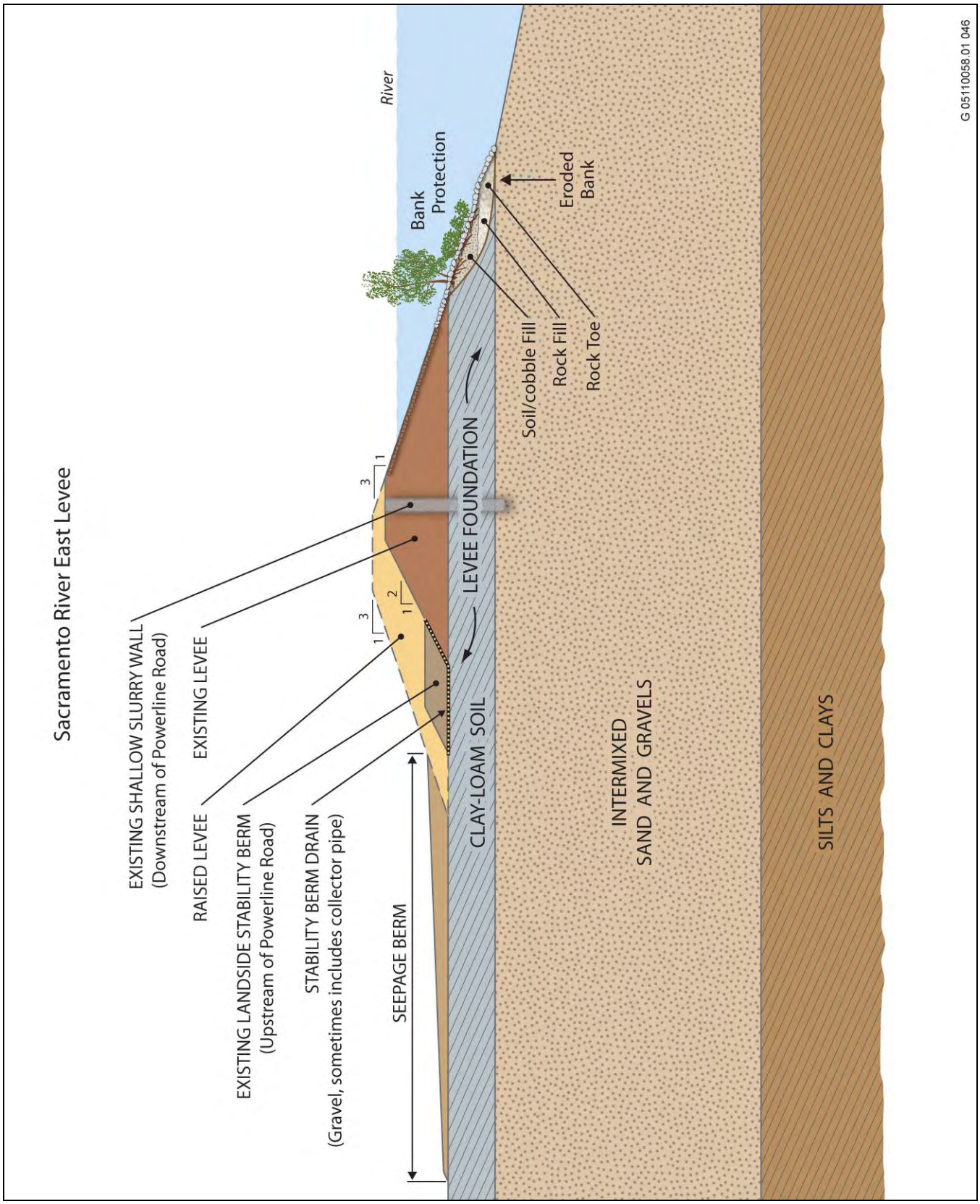
Source: Base map from CASIL Layers and SACOG 2007; adapted by EDAW in 2008 based on data from MBK Engineers

NLIP Construction Phasing and Anticipated Haul Routes from Soil Borrow Areas **Plate 10**



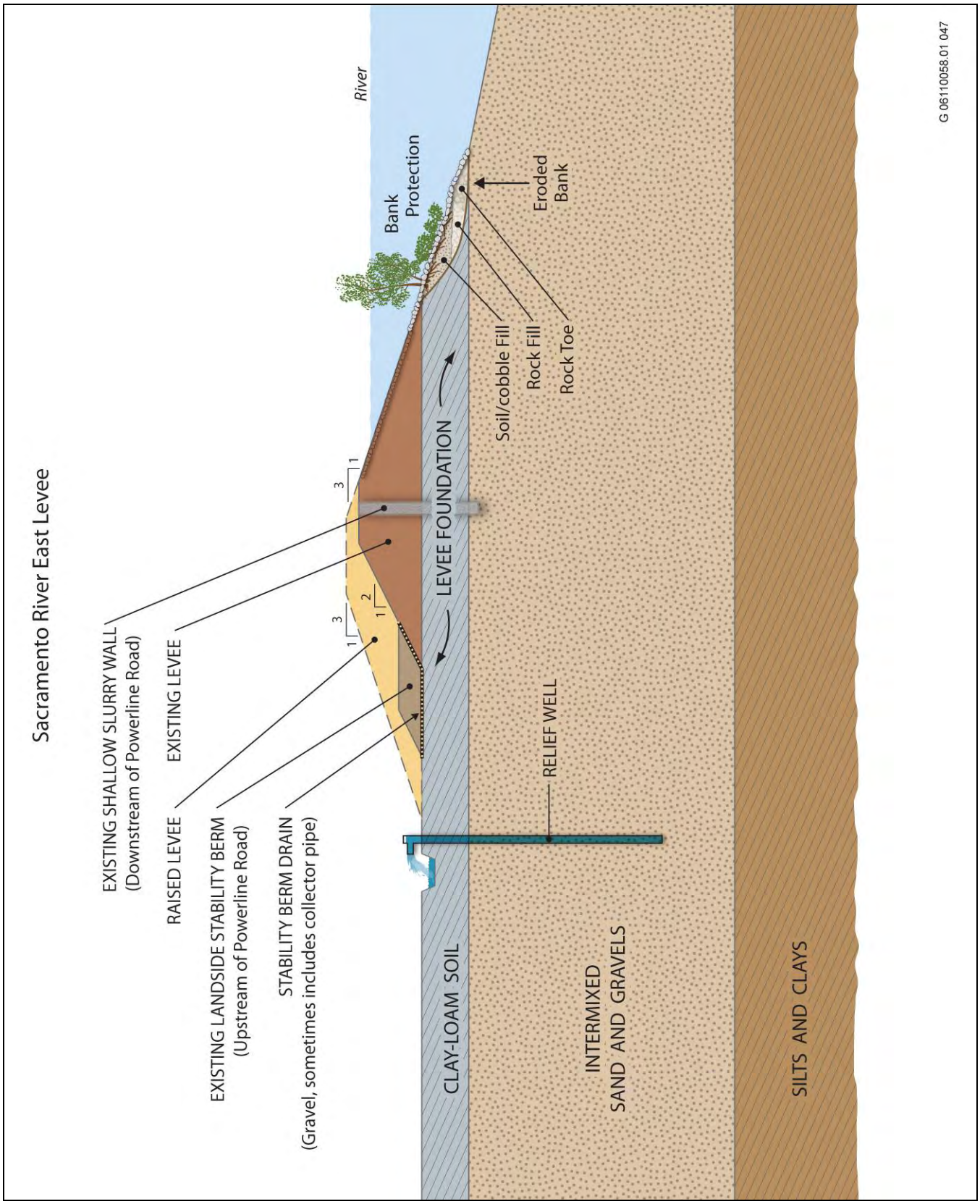
Source: SAFCA 2007b

Typical Levee Raise, Flattening of Landside Levee Slope, and Seepage Cutoff Wall **Plate 11**



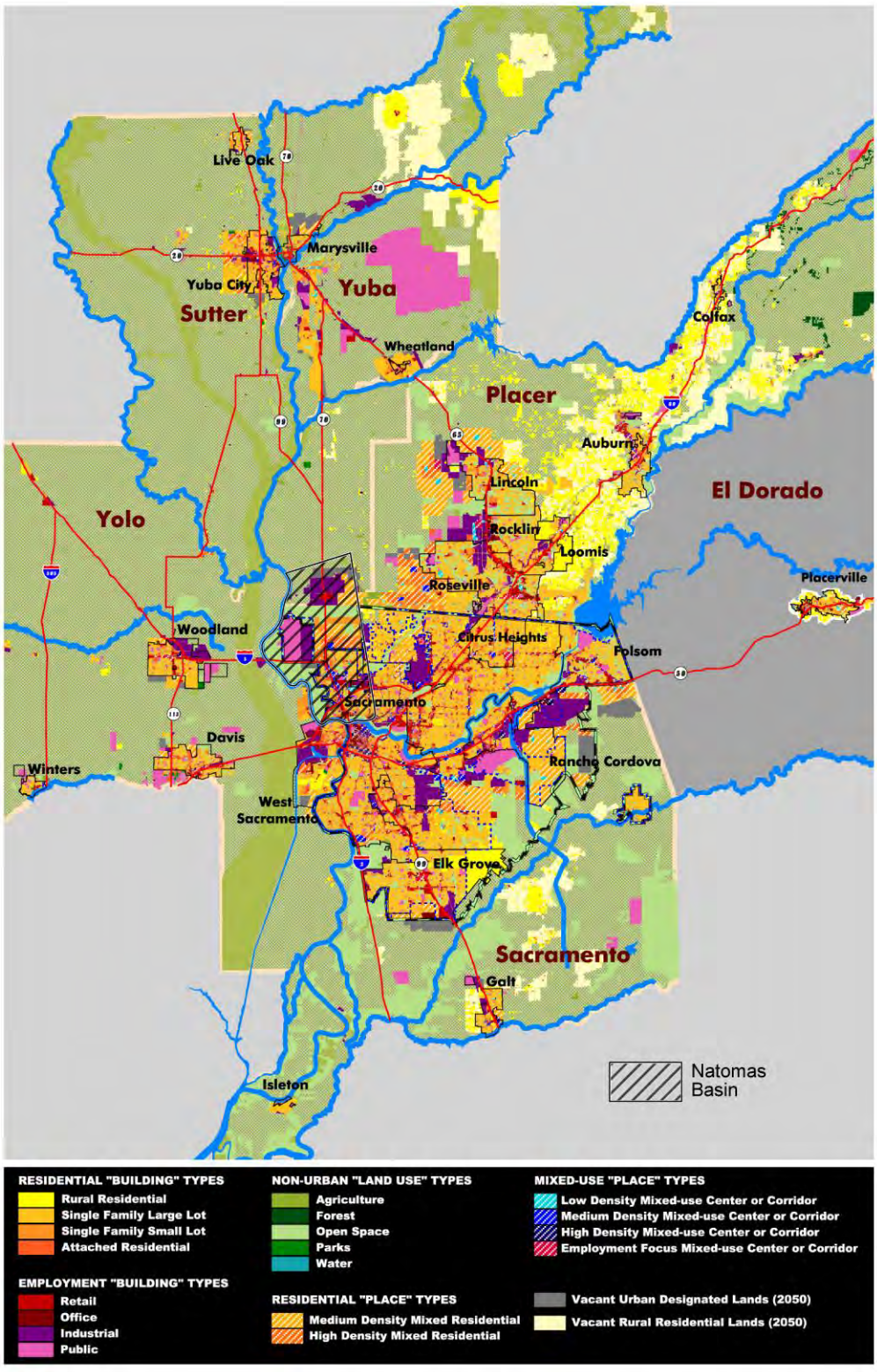
Source: SAFCA 2007b

Typical Seepage Berm **Plate 12**



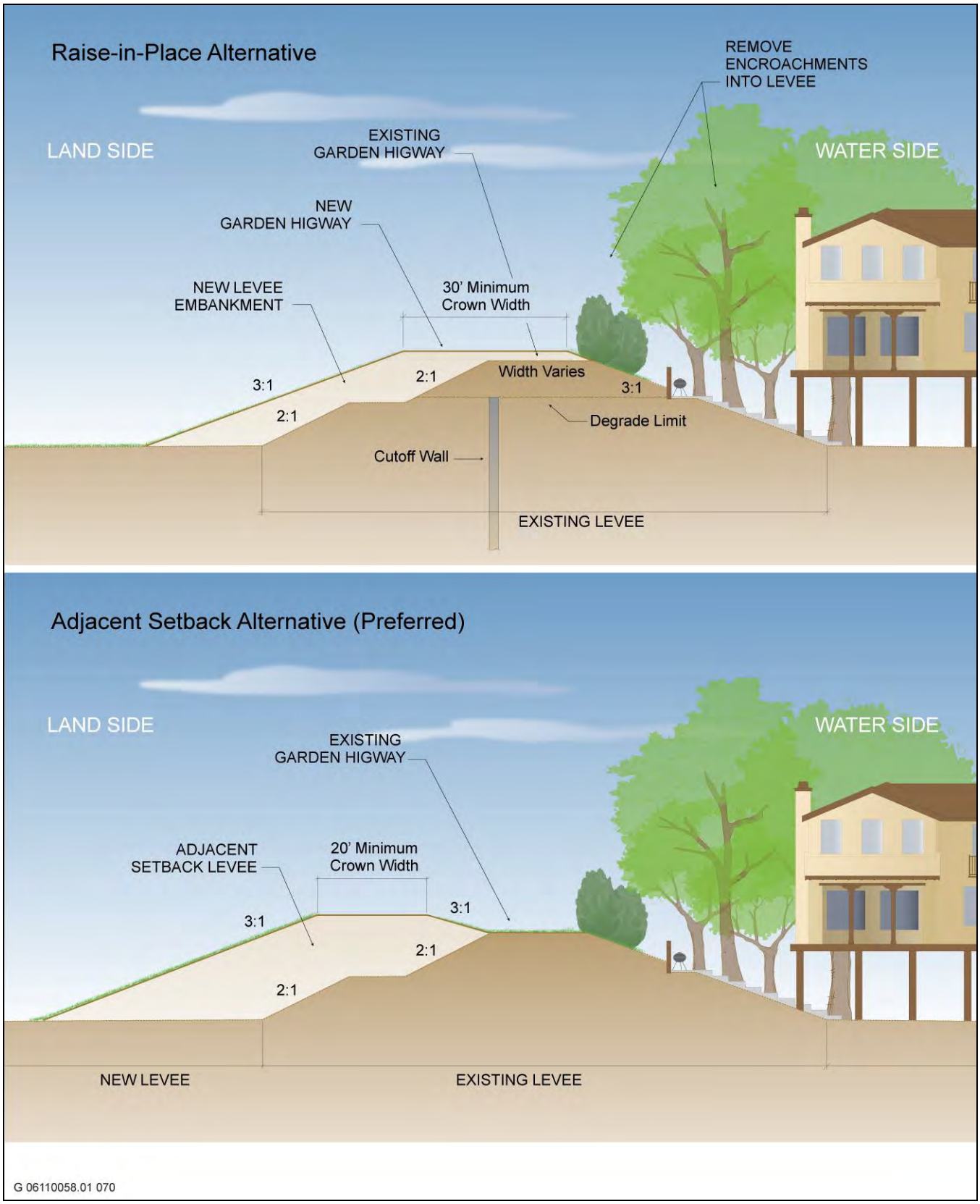
Source: SAFCA 2007b

Typical Relief Well **Plate 13**



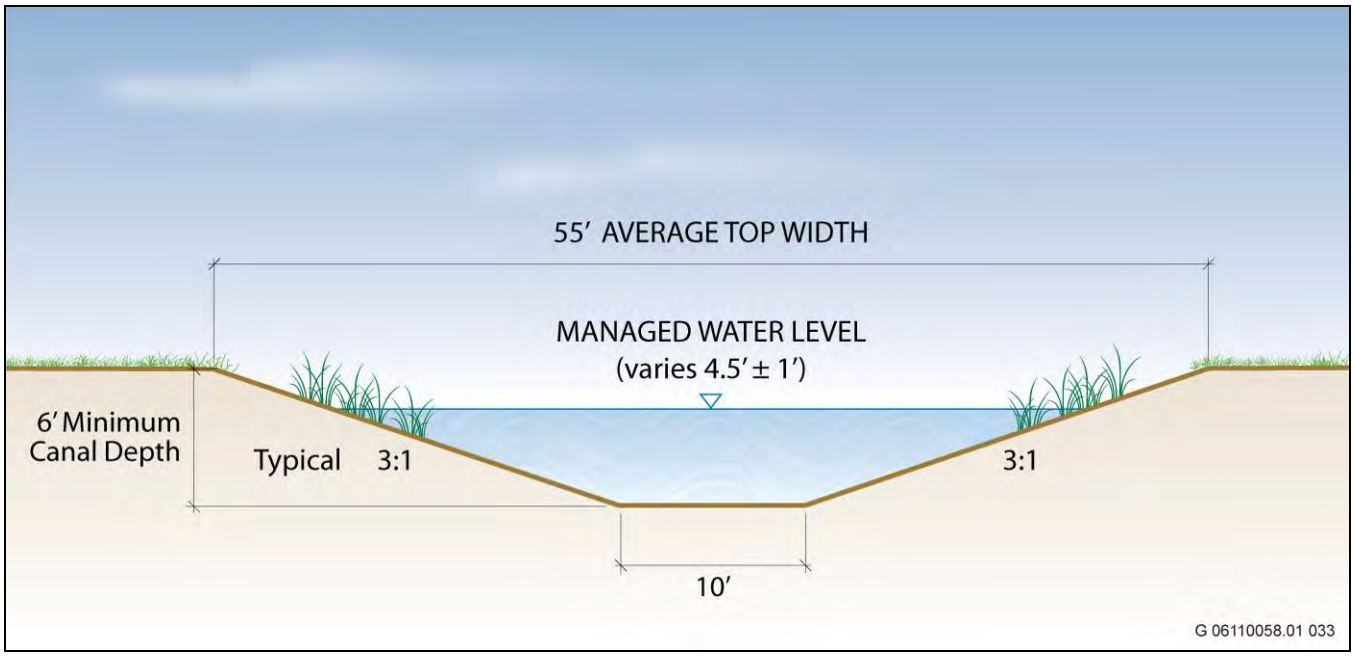
Source: SACOG 2004

SACOG Preferred Blueprint Scenario Map **Plate 14**



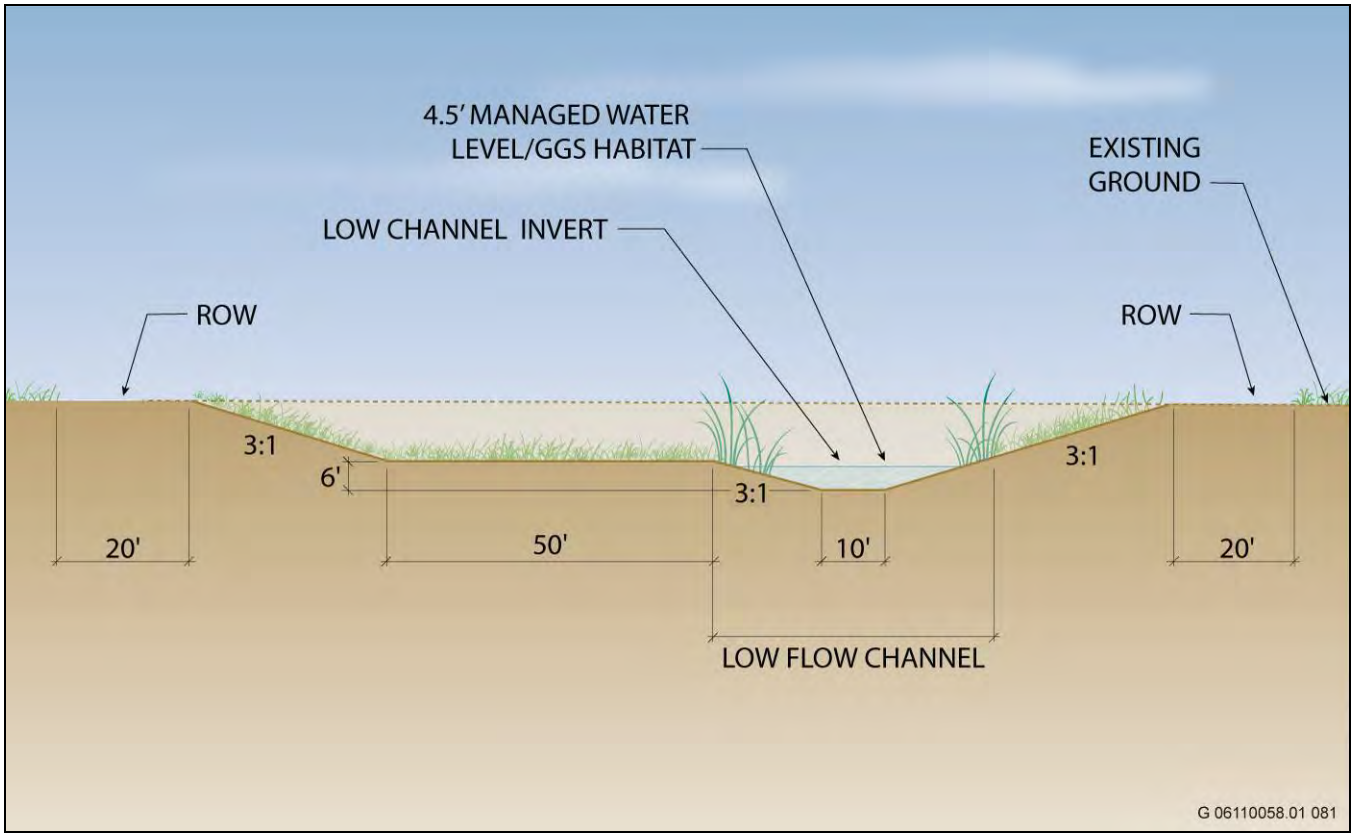
Source: Adapted by EDAW in 2008 based on data from HDR

Alternative Methods for Increasing Levee Height **Plate 15**



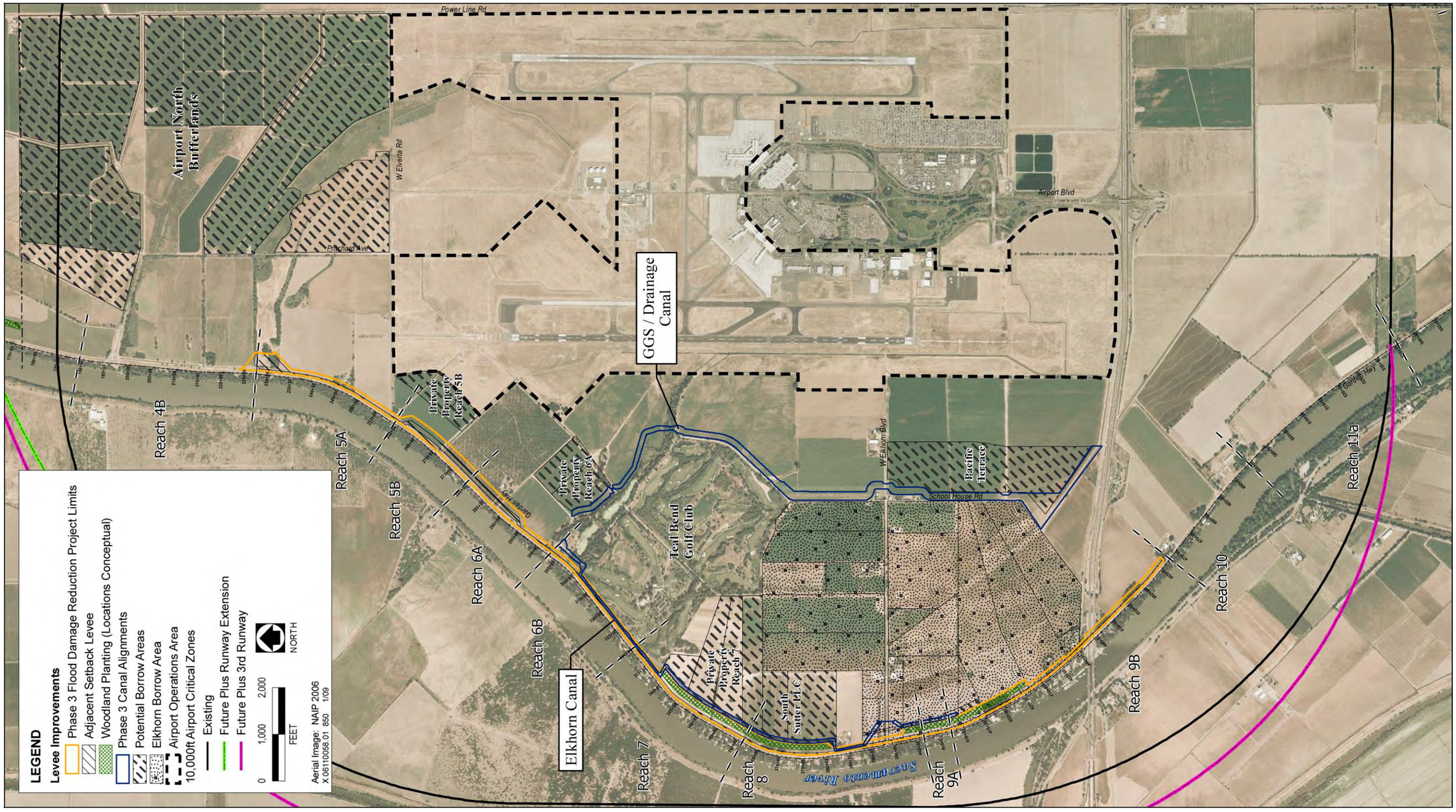
Source: Adapted by EDAW in 2007 based on data from Mead & Hunt

Typical Cross Section of the New GGS/Drainage Canal From Walnut Road to Southeast Corner of Teal Bend Golf Course **Plate 16a**



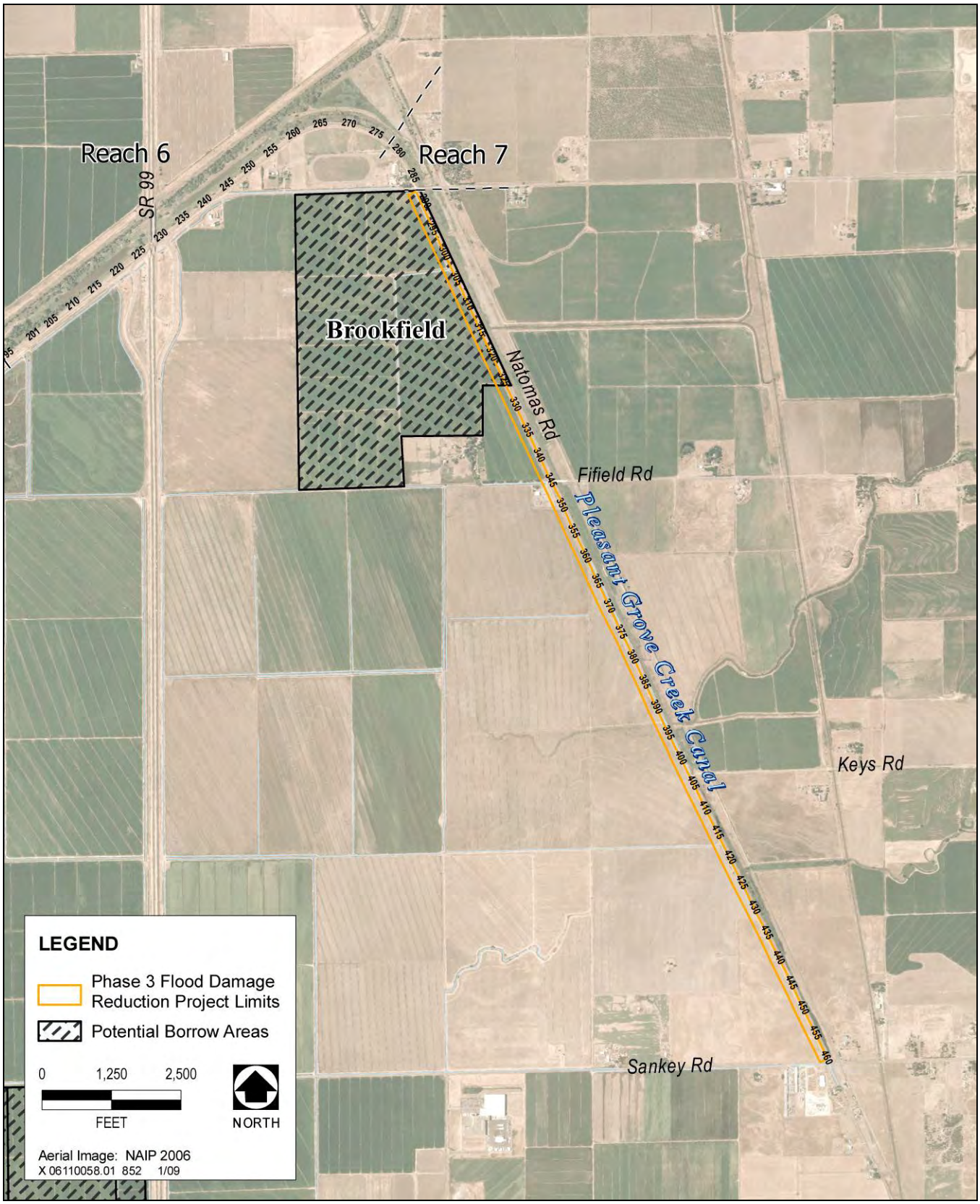
Source: Adapted by EDAW in 2007 based on data by Mead & Hunt

Typical Cross Section of the New GGS/Drainage Canal South of Teal Bend Course to West Drainage Canal **Plate 16b**



Source: Aerial image SACOG 2007; adapted by EDAW in 2008 based on data from HDR, Mead & Hunt, and Wood Rogers

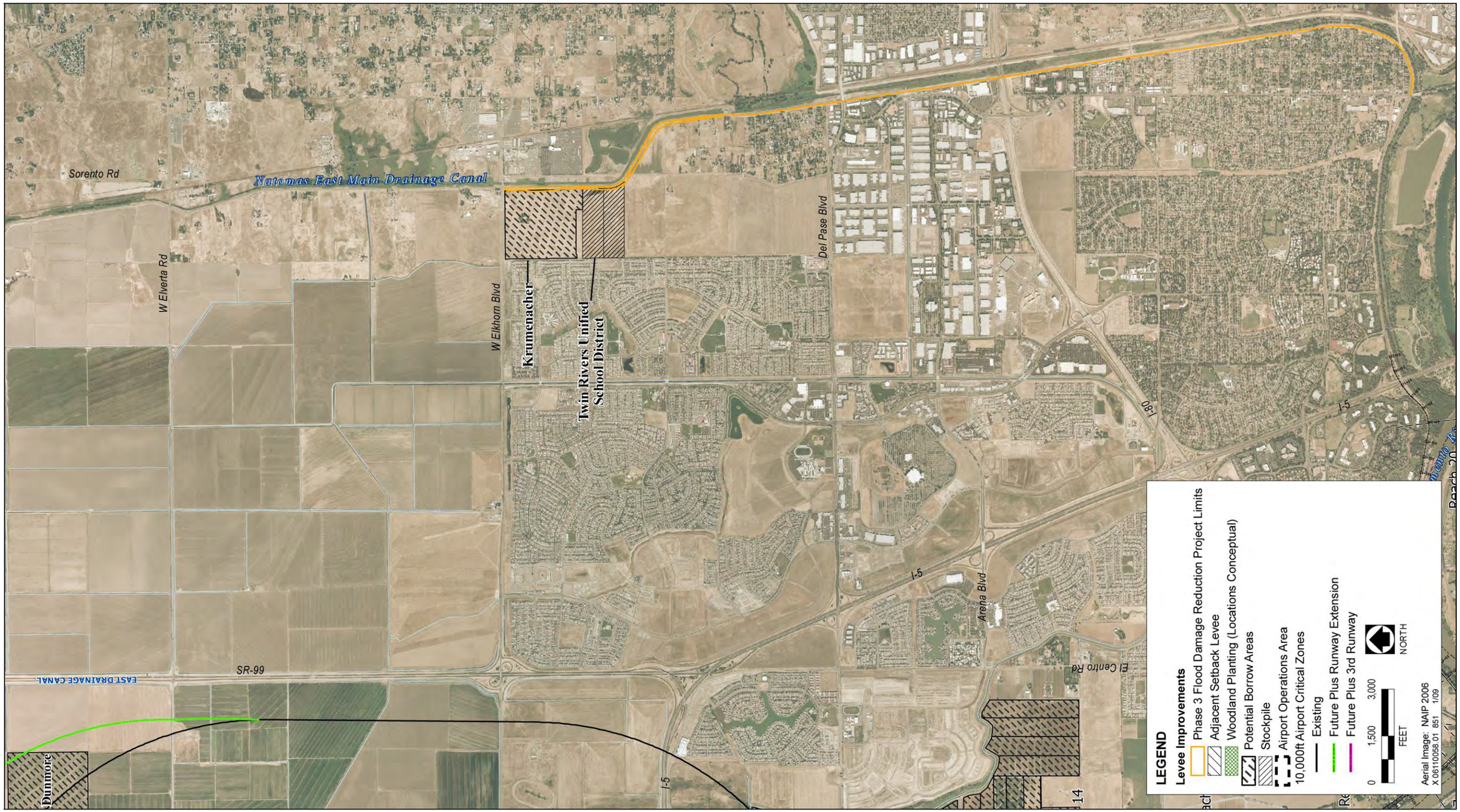
Overview of Proposed Project Features **Plate 17a**



Source: Aerial image SACOG 2007; adapted by EDAW in 2008 based on data from HDR, Mead & Hunt, and Wood Rogers

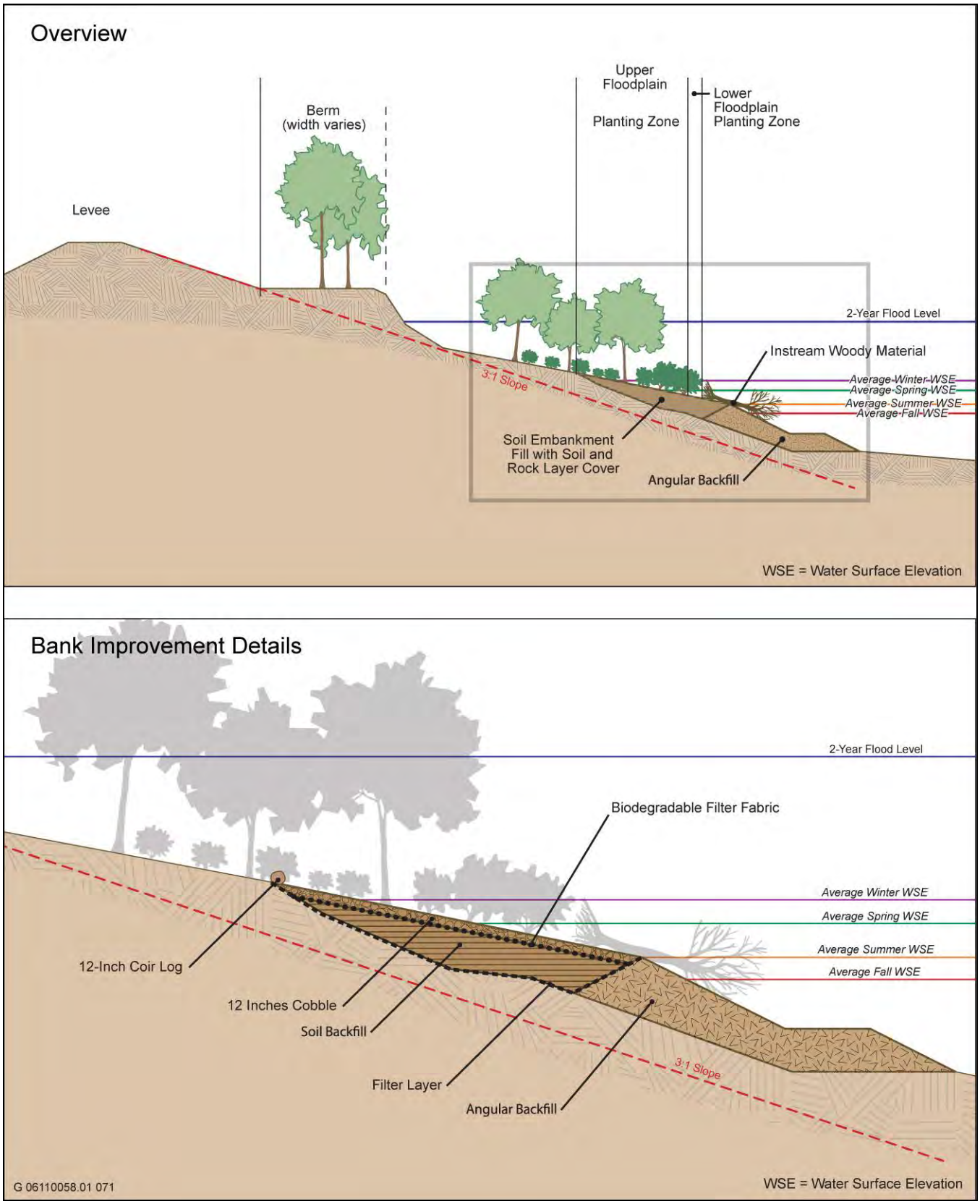
Overview of Proposed Project Features **Plate 17b**

This page intentionally blank.



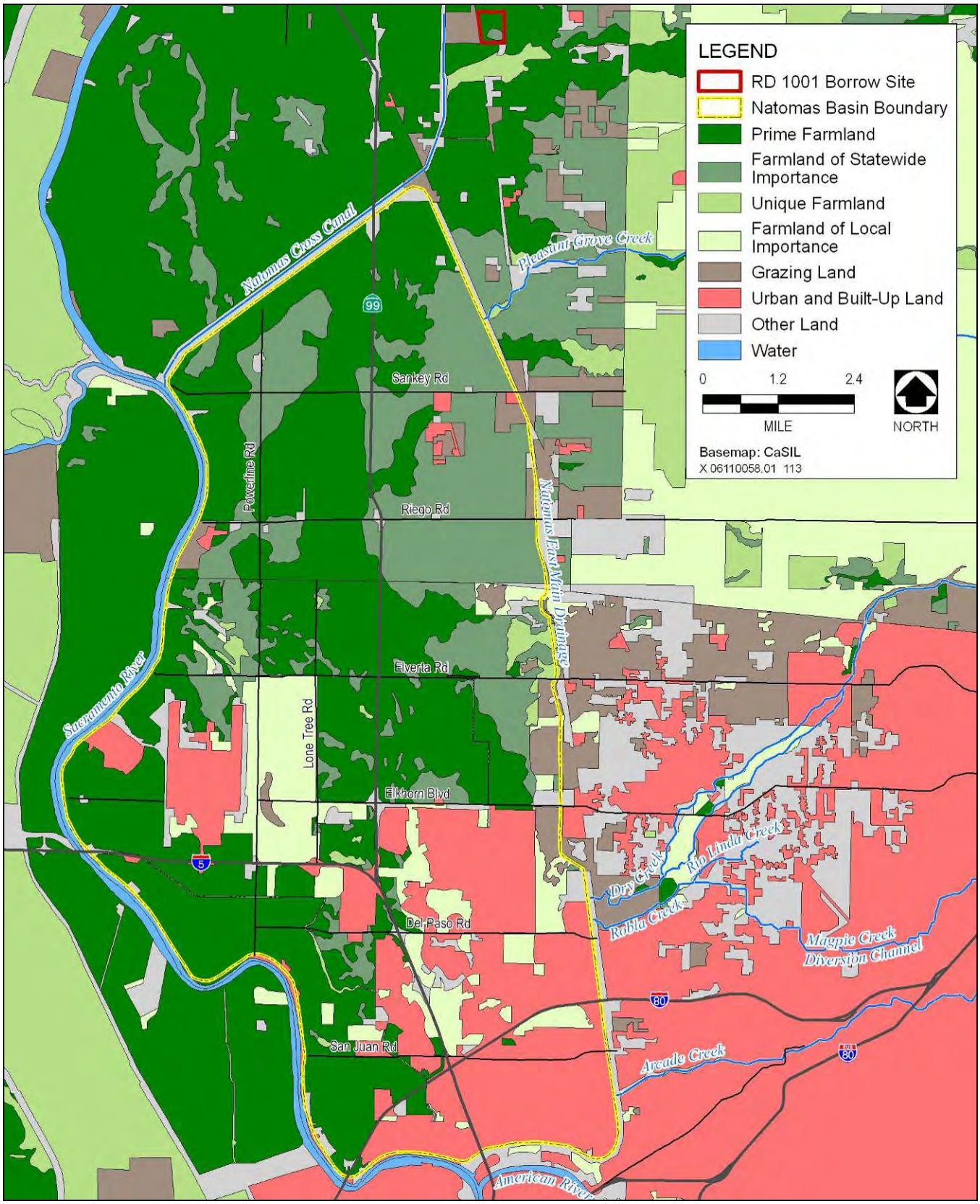
Source: Aerial image SACOG 2007; adapted by EDAW in 2008 based on data from HDR, Mead & Hunt, and Wood Rogers

Overview of Proposed Project Features **Plate 17c**



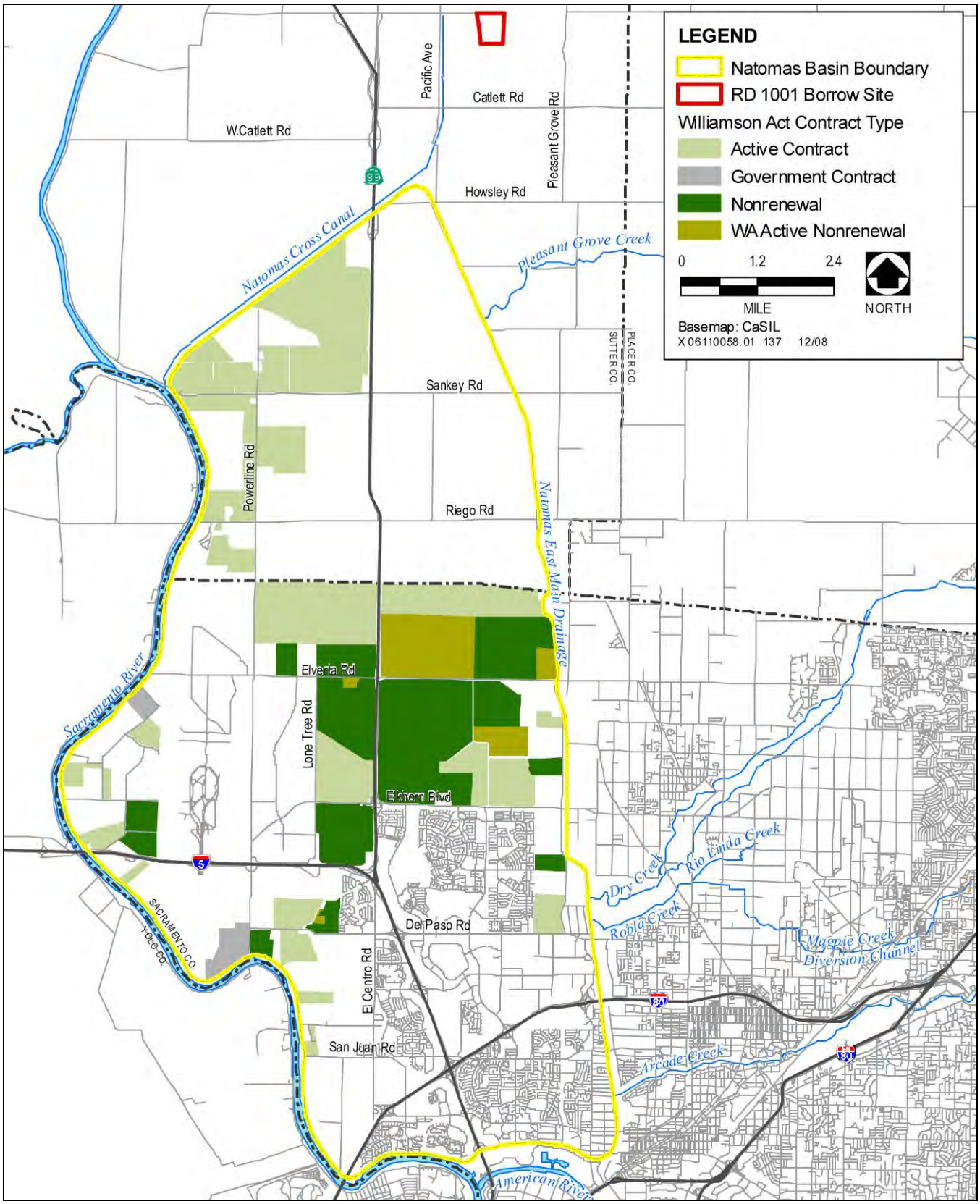
Source: SAFCA 2007b

Bank Protection Improvement Concept **Plate 18**



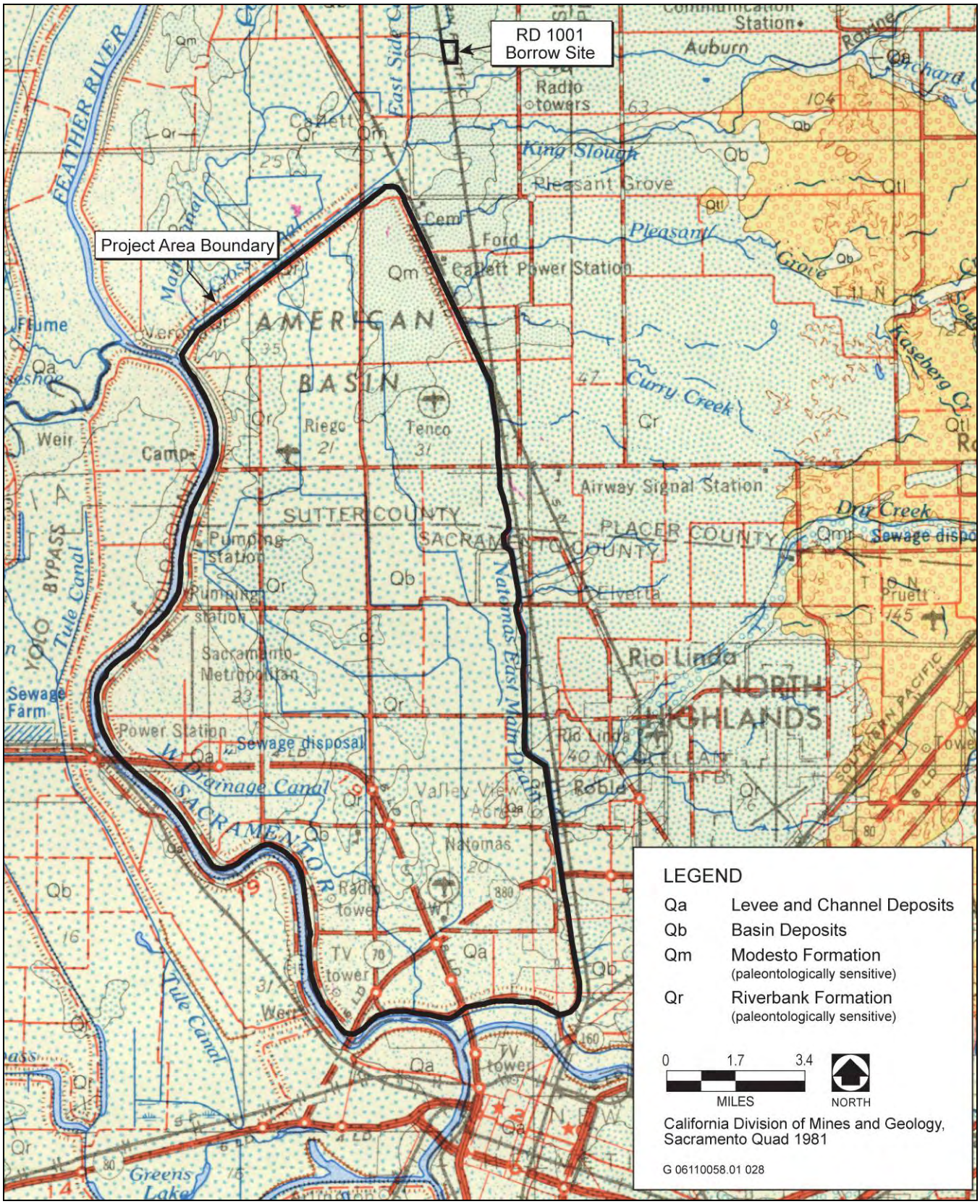
Source: Department of Conservation 2006

Important Farmland in the Project Area **Plate 19**



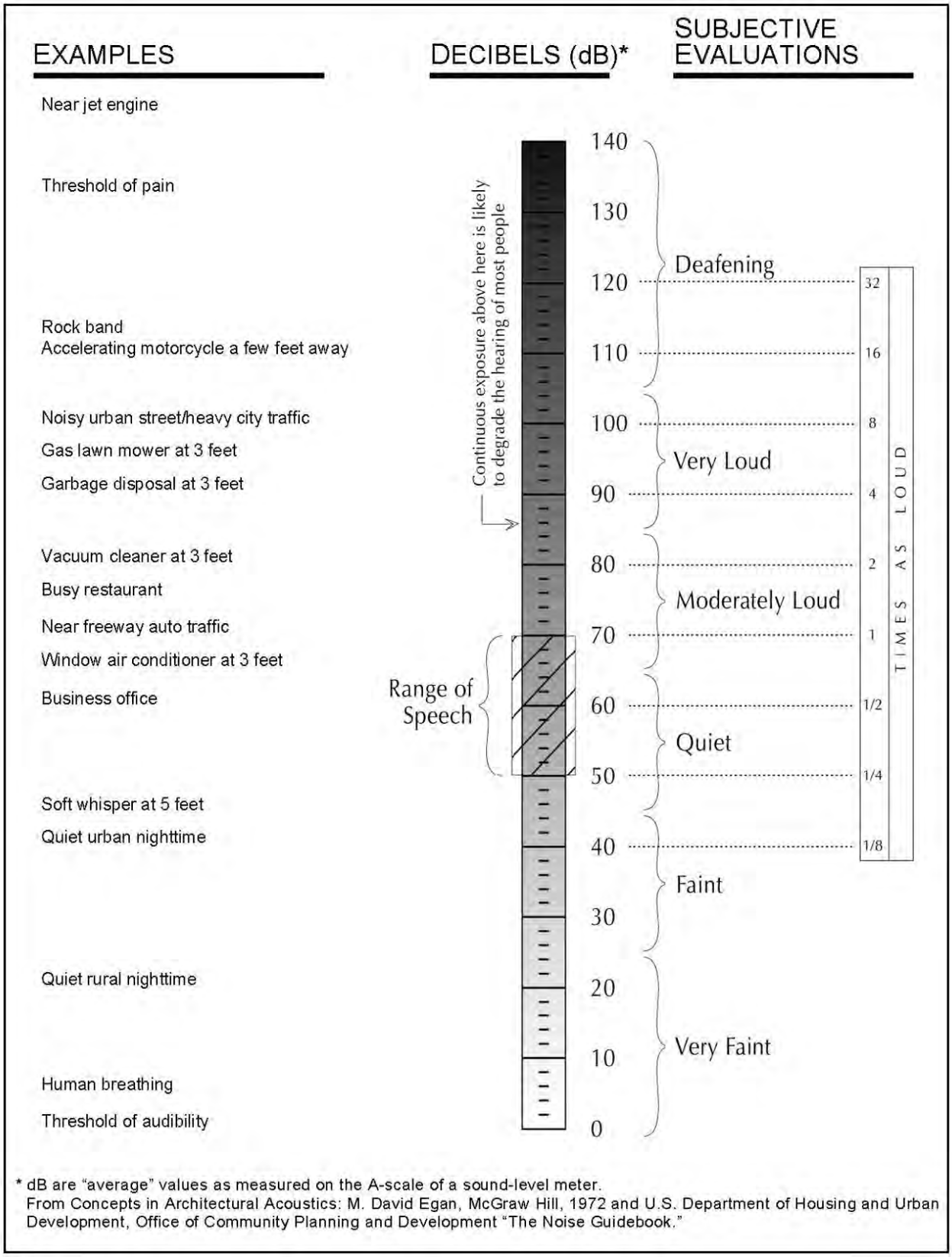
Source: Base map from CASIL Layers; adapter by EDAW in 2008 with data from Department of Conservation 2007

Williamson Act Contracted Land within the Project Area **Plate 20**



Source: Adapted by EDAW in 2007 based on Wagner et al. 1987

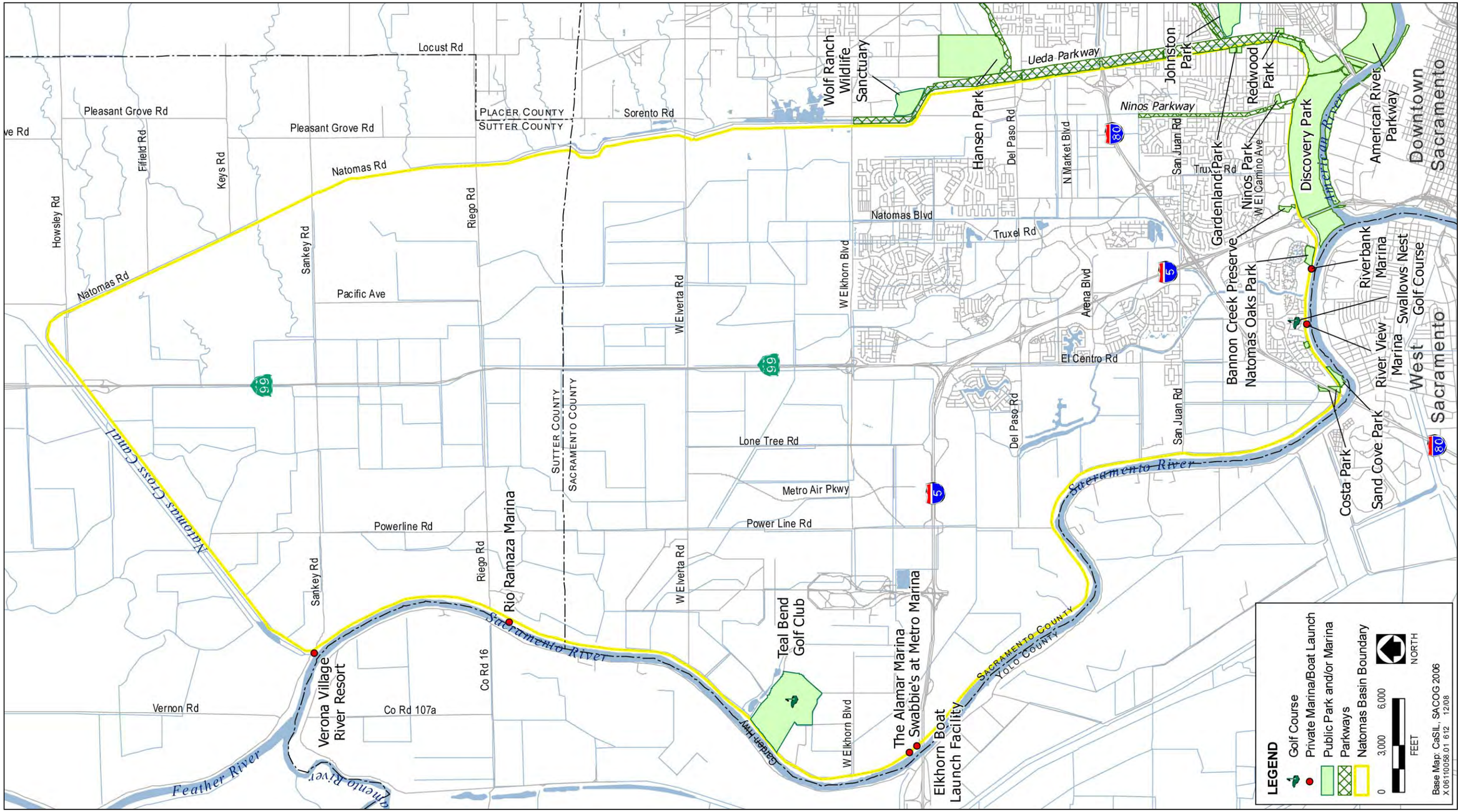
Rock Formations in the Project Area **Plate 21**



Source: Data compiled by EDAW in 2008

Typical Noise Levels **Plate 22**

This page intentionally blank.

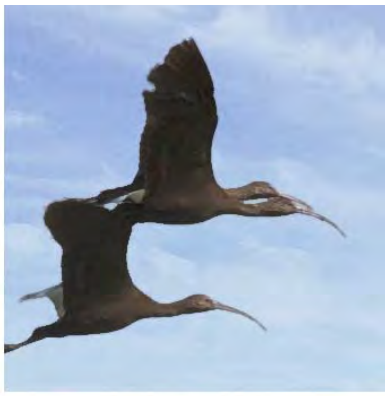


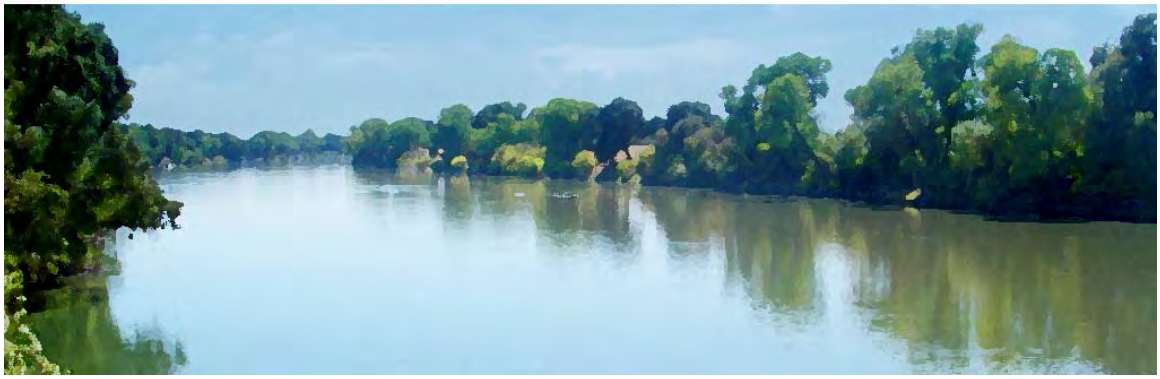
Source: Base map from CASIL Layers and SACOG 2007; adapted by EDAW in 2008 based on data from City of Sacramento 2008

Recreation Facilities in or Near the Project Area **Plate 23**

Draft Environmental Impact Statement/Draft Environmental Impact Report on the

Natomas Levee Improvement Program
Phase 3 Landside Improvements Project





State Clearinghouse No. 2008072060

Volume II - Appendices

Prepared for:

US Army Corps of Engineers ®
Sacramento District

SAFCA
Sacramento Area Flood Control Agency

February 2009

Draft Environmental Impact Statement/Draft Environmental Impact Report on the

Natomas Levee Improvement Program
Phase 3 Landside Improvements Project

State Clearinghouse No. 2008072060

Volume II - Appendices

Prepared for:

U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814

Contact:

Elizabeth Holland
Planning Division
(916) 557-6763

Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Contact:

John Bassett, P.E.
Director of Engineering
(916) 874-7606

Prepared by:

EDAW
2022 J Street
Sacramento, CA 95811

Contact:

Francine Dunn
NEPA/CEQA Project Manager
(916) 414-5800

February 2009

TABLE OF CONTENTS

APPENDICES – VOLUME II ***(If not printed, please see CD on back cover)***

APPENDIX A

Public Outreach

A1 NEPA Notice of Intent

Duty), DD Form 1821 (Contractor Crewmember Record); Name, Social Security Number (SSN), home address, date of birth, security clearance data, education, waivers, qualifications, disqualifications, re-qualifications, training, proficiency, and experience data, medical and physiological data, approvals to operate Government aircraft, requests for approval or contractor flight crewmember and contractor qualification training, and similar relevant documents.

AUTHORITY FOR MAINTENANCE OF THE SYSTEM:

10 U.S.C. 3013, Secretary of the Army; DoD Instruction 6055.1, DoD Safety and Occupational Health Program; Army Regulation 95–1, Aviation Flight Regulations; Army Regulation 95–20, Contractor Flight and Ground Operations; and E.O. 9397 (SSN).

PURPOSE(S):

To record the flying experience, qualifications and training data of each aviator, crew member, UAS operator and flight surgeon in aviation service; and to monitor and manage individual contractor flight and ground personnel records.

ROUTINE USES OF RECORDS MAINTAINED IN THE SYSTEM, INCLUDING CATEGORIES OF USERS AND THE PURPOSES OF SUCH USES:

In addition to those disclosures generally permitted under 5 U.S.C. 552a(b) of the Privacy Act, these records or information contained therein may specifically be disclosed outside the DoD as a routine use pursuant to 5 U.S.C. 552a(b)(3) as follows:

Information may be disclosed to the Federal Aviation Agency and/or the National Transportation Safety Board.

The DoD 'Blanket Routine Uses' set forth at the beginning of the Army's compilation of system of record notices apply to this record system.

POLICIES AND PRACTICES FOR STORING, RETRIEVING, ACCESSING, RETAINING, AND DISPOSING OF RECORDS IN THE SYSTEM:

STORAGE:

Paper records in file folders and notebooks, and on electronic storage media.

RETRIEVABILITY:

By name, Social Security Number (SSN), or other personal identifier.

SAFEGUARDS:

Records are maintained in secure areas available only to designated persons having official need for the record. Automated systems employ computer hardware/software safeguard features and controls which meet administrative, physical, and technical safeguards.

RETENTION AND DISPOSAL:

PERMANENT. Keep in Current Files Area (CFA) until no longer needed for conducting business, then retire to Records Holding Area/Army Electronic Archives (RHA/AEA). The Transition Center will pull the most current DA Form 759, Individual Flight Record and Flight Certificate-Army from the Individual Flight Record Folder (IFRF) and forward it to the Official Military Personnel File (OMPF) Custodian for inclusion in the soldier's OMPF. The remainder of the IFRF will be given to the soldier upon separation processing at the Transition Center.

SYSTEM MANAGER(S) AND ADDRESS:

Product Manager, Aviation Mission Equipment (PM AME), CAFRS, Sparkman Center, Building 5309, Redstone Arsenal, AL 35898–5000.

NOTIFICATION PROCEDURE:

Individuals seeking access to records about themselves contained in this record system may visit or address written inquiries to the Flight Operations Section of their current unit, contractor facility or via the CAFRS Help Desk at *cafrs.help@us.army.mil* or *https://www.us.army.mil/suite/page/420577.*

Individual should provide the full name, Social Security Number, and any details which will help locate the records, current address, and signature.

RECORD ACCESS PROCEDURES:

Individuals seeking access to records about themselves contained in this record system may visit or address written inquiries to the Flight Operations Section of their current unit, contractor facility or via the CAFRS Help Desk at *cafrs.help@us.army.mil* or *https://www.us.army.mil/suite/page/420577.*

Individual should provide the full name, Social Security Number, and any details which will help locate the records, current address, and signature.

CONTESTING RECORD PROCEDURES:

The Army's rules for accessing records, contesting contents, and appealing initial determinations are contained in Army Regulation 340–21; 32 CFR part 505; or may be obtained from the system manager.

RECORD SOURCE CATEGORIES:

From the individual, Federal Aviation Administration, flight surgeons, evaluation reports, proficiency and readiness tests, and other relevant records and reports.

EXEMPTIONS CLAIMED FOR THE SYSTEM:

None.

[FR Doc. E8–16416 Filed 7–17–08; 8:45 am]

BILLING CODE 5001–06–P

DEPARTMENT OF DEFENSE

Department of the Army; Army Corps of Engineers

Notice of Intent To Prepare an Environmental Impact Statement/ Environmental Impact Report for Natomas Levee Improvement Program Phase 3 Landside Improvements Project, Sacramento, CA

AGENCY: Department of the Army, U.S. Army Corps of Engineers; DoD.

ACTION: Notice of intent.

SUMMARY: The action being taken is preparation of an environmental impact statement/environmental impact report (EIS/EIR) for the Natomas Levee Improvement Program (NLIP) Phase 3 Landside Improvements Project. The Corps is considering a request to issue both 408 permission to the Central Valley Flood Protection Board and 404 permit to Sacramento Area Flood Control Agency (SAFCA) for work on the NLIP. Under 33 U.S.C. 408, the Chief of Engineers may grant permission to alter an existing Federal project if it is not injurious to the public interest and does not impair the usefulness of the project. Under Section 404 of the Clean Water Act, the District Engineer permits the discharge of dredged or fill material into waters of the United States if the discharge meets the requirements of the Environmental Protection Agency's 404 (b)(1) guidelines and is not contrary to the public interest. The NLIP is located in Sacramento and Sutter Counties, CA. The 408 permission and 404 permit are needed for construction along the landside of the Sacramento River east levee, the Natomas East Main Drain Canal, the Natomas Cross Canal, and the Pleasant Grove Creek Canal.

DATES: A public scoping meeting will be held on August 6, 2008 from 4 p.m. until 7 p.m. at Sierra Health Facility (see **ADDRESSES**). Send written comments by August 18, 2008 to (see **ADDRESSES**).

ADDRESSES: Public Scoping Meeting, Sierra Health, 1321 Garden Highway, Bannon Island room, Sacramento, CA. Send written comments and suggestions concerning this study to Ms. Elizabeth Holland, U.S. Army Corps of Engineers, Sacramento District, Attn: Planning Division (CESPK–PD–R), 1325 J Street, Sacramento, CA 95814–2922. Requests

to be placed on the mailing list should also be sent to this address.

FOR FURTHER INFORMATION CONTACT: Questions about the proposed action and EIS/EIR should be addressed to Ms. Elizabeth Holland at (916) 557–6763, e-mail *Elizabeth.g.holland@usace.army.mil* or by mail (see **ADDRESSES**).

SUPPLEMENTARY INFORMATION:

1. Proposed Action. The U.S. Army Corps of Engineers is preparing an EIS/EIR to analyze the impacts of the work proposed by SAFCA to implement the NLIP Phase 3. The NLIP Phase 3 is proposed by SAFCA to reduce the risk of flooding to portions of the City and County of Sacramento and Sutter County, CA lying within the Natomas Basin.

2. Alternatives. The EIS/EIR will address an array of flood risk management alternatives. Alternatives analyzed during the investigation will consist of a combination of one or more flood protection measures. These measures include raising the existing levee in place, constructing seepage berms, constructing adjacent setback levees, installing seepage wells and seepage cutoff walls, and relocating irrigation ditches.

3. Scoping Process. a. A public scoping meeting will be held on August 6, 2008 to present information to the public and to receive comments from the public. This meeting will begin a process to involve concerned individuals, and local, State, and Federal agencies.

b. Significant issues to be analyzed in depth in the EIS/EIR include effects on hydraulic, wetlands and other waters of the U.S., vegetation and wildlife resources, special-status species, cultural resources, land use, fisheries, water quality, air quality, transportation, and socioeconomics. The EIS/EIR will also evaluate the cumulative effects of the proposed NLIP and other related projects in the study area.

c. The Corps is consulting with the State Historic Preservation Officer to comply with the National Historic Preservation Act, and with the U.S. Fish and Wildlife Service to provide a Fish and Wildlife Coordination Act Report.

d. A 45-day public review period will be provided for individuals and agencies to review and comment on the draft EIS/EIR. All interested parties are encouraged to respond to this notice and provide a current address if they wish to be notified of the draft EIS/EIR circulation.

4. Availability. The draft EIS/EIR is scheduled to be available for public review and comment in late 2008.

Dated: July 9, 2008

Thomas Chapman,

P.E., COL, EN, Commanding.

[FR Doc. E8–16445 Filed 7–17–08; 8:45 am]

BILLING CODE 3710–EZ–P

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Notice of Availability of a Supplemental Environmental Impact Statement/ Supplemental Environmental Impact Report (SEIS/SEIR) for the Port of Los Angeles Channel Deepening Project, Los Angeles, CA

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DOD.

ACTION: Notice of availability.

SUMMARY: The U.S. Army Corps of Engineers, Los Angeles District (USACE) and the Los Angeles Harbor Department (Port) have prepared a joint Supplemental Environmental Impact Statement/Supplemental Environmental Impact Report (SEIS/SEIR) for the Port of Los Angeles Channel Deepening Project, Los Angeles, California. This Draft SEIS/SEIR describes the affected resources and evaluates the potential impacts to those resources as a result of the Proposed Action and alternatives. The purpose of the Proposed Action is to dispose of approximately 3.0 million cubic yards of dredge material required to complete the Channel Deepening Project and to beneficially reuse the dredge material within the Port of Los Angeles.

Three Alternatives have been analyzed in the Draft SEIS/SEIR, including No Action. Alternative 1, Port Development and Environmental Enhancement was developed with a focus on using dredge material for port development and environmental enhancement and would involve use and development of the following disposal sites: Berths 243–245, the Northwest Slip, CSWH Expansion, the Eelgrass Habitat Area, and LA–2. Alternative 2, Environmental Enhancement and Ocean Disposal was developed with a focus on environmental enhancement related uses of the remaining material and does not include any disposal options associated with port development. Under Alternative 2, dredge material would be disposed at the CSWH Expansion, Eelgrass Habitat Area, LA–2 and the Anchorage Road Soil Storage Site. Under Alternative 3, the No Action Alternative, no further dredging would take place and the Channel Deepening Project would not be completed.

This Notice also serves as the Public Notice/Notice of Availability for the Section 404 Permit under Clean Water Act (CWA). A preliminary application has been received for a Department of the Army permit for the activity described herein. The Corps is considering an application submitted by the Port for a permit, in accordance with Section 404 of the CWA and Section 10 of the Rivers and Harbors Act, to complete dredging activities outside of the Federal Channel and placement of the dredge material in waters of the United States in the Port of Los Angeles.

This SEIS/SEIR would be used by the Corps as part of their application review process. The Corps and the Port independently determined under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), respectively, that there are potential significant environmental impacts associated with the proposed action, and an Environmental Impact Statement and Environmental Impact Report are required.

DATES: Submit comments on or before September 1, 2008.

ADDRESSES: U.S. Army Corps of Engineers, Los Angeles District, CESPL–PD–RN, c/o Joy Jaiswal, P.O. Box 532711, Los Angeles, CA 90053–2325.

FOR FURTHER INFORMATION CONTACT: Ms. Joy Jaiswal, Chief, Ecosystem Planning Section, at (213) 452–3851 or e-mail at *Jyotsna.I.Jaiswal@usace.army.mil. Additional Information:* This Draft SEIS/SEIR has been filed with the Environmental Protection Agency (EPA) to be published in the **Federal Register** and is available for a forty-five (45) day public review period. The public review period for the Draft SEIS/EIR will be from July 18, 2008 to September 1, 2008. Please forward your comments on the Draft SEIS/SEIR by mail, email, or fax to the contacts listed below by September 1, 2008.

Ms. Joy Jaiswal, Chief, Ecosystem Planning Section, Attn: Ms. Megan Wong, U.S. Army Corps of Engineers, P.O. Box 532711, Los Angeles, California 90053–2325, Fax: (213) 452–4204, *Megan.T.Wong@usace.army.mil*; or

Dr. Ralph Appy, Los Angeles Harbor Department (LAHD), 425 South Palos Verdes Street, San Pedro, CA 90731.

SUPPLEMENTARY INFORMATION:

1. Authorization

The Port of Los Angeles Channel Deepening Project was authorized for

CEQA Notice of Preparation and Comments Received

Sacramento Area Flood Control Agency

NOTICE OF PREPARATION

To: Agencies and Interested Parties

From: Sacramento Area Flood Control Agency

Date: July 18, 2008

Subject: **Announcement of:**

1) **Notice of Preparation of a Draft Environmental Impact Statement/Environmental Impact Report on the Natomas Levee Improvement Program, Phase 3 Landside Improvements Project;**
2) **Public Scoping Meeting to be held on August 6, 2008; and**
3) **Scoping comments due by August 18, 2008**

The U.S. Army Corps of Engineers (USACE), Sacramento District, and the Sacramento Area Flood Control Agency (SAFCA) will be the federal and state lead agencies, respectively, and will prepare an environmental impact statement/environmental impact report (EIS/EIR) pursuant to the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) for the subject project in the Natomas Basin in Sacramento and Sutter Counties, California. USACE and SAFCA are soliciting input from interested agencies and the public as to the scope and content of the EIS/EIR.

INTRODUCTION

The California Environmental Quality Act (CEQA) specifies that a public agency must prepare an EIR on any project that it proposes to carry out or approve that may have a significant direct or indirect effect (also referred to as "significant impact") on the environment (Public Resources Code Section 21080[d]). SAFCA is proposing the Natomas Levee Improvement Program (NLIP), Phase 3 Landside Improvements Project (Phase 3 Project), as described below, and has determined that the proposed project may have significant impacts on the environment. Therefore, acting as the lead agency for CEQA compliance, SAFCA will prepare an EIR that evaluates these significant environmental impacts.

To implement the proposed project, SAFCA requires a permit from USACE pursuant to Section 404 of the Clean Water Act for the discharge of fill into jurisdictional waters of the United States, and permission pursuant to Section 408 of the Rivers and Harbors Act for alteration of a federal project levee. A joint EIS/EIR will be prepared to evaluate the significant environmental impacts of the proposed project, including those impacts associated with USACE's decision making processes for Sections 404 and 408.

PURPOSE OF THE NOTICE OF PREPARATION

The purposes of this notice are to:

1. briefly describe the proposed project and the anticipated content of the draft EIS/EIR to be prepared for the proposed project;

2. announce the public scoping meeting to facilitate public input and to be held: Wednesday, August 6, 2008, from 4:00 to 7:00 p.m. at 1321 Garden Highway (Sierra Health Foundation) in Sacramento, California; and

3. solicit input by August 18, 2008, from interested federal and state agencies, and from interested organizations and individuals about the content and scope of the draft EIS/EIR, including the alternatives to be addressed and the potentially significant environmental impacts.

PROJECT BACKGROUND

The Landside Improvements Project is part of SAFCA's efforts to reduce flood risk for the Sacramento area, and is part of the NLIP evaluated in SAFCA's programmatic *EIR on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (State Clearinghouse # 2006072098). Volume II of that EIR contained a project-level evaluation of the Natomas Cross Canal South Levee Phase 1 Improvements (Phase 1 Project). In 2007, SAFCA prepared the *EIR on the NLIP Landside Improvements Project* (State Clearinghouse # 2007062016), which covers the three additional phases of "landside" improvements to the levees protecting the Natomas Basin in Sacramento and Sutter Counties, including the Phase 2 Project and Phase 3 Project. The Phase 2 Project was analyzed at a project level and the remainder of the Landside Improvement Project was analyzed at a program level. On November 29, 2007, the SAFCA Board of Directors certified the EIR and approved implementation of the Phase 2 Project components proposed for construction in 2008. Following completion of the *EIR on the NLIP Landside Improvements Project*, USACE prepared an EIS to meet USACE's NEPA requirements to support USACE's decisions on 408 permission and 404 permitting. A Record of Decision (ROD) is expected to be signed by USACE in October 2008.

The EIS/EIR to be prepared for the Phase 3 Project will evaluate the environmental effects of the Phase 3 Project at a project level, and will evaluate subsequent phases of the Landside Improvements Project at a general, program level. These subsequent phases will be subject to additional project-specific NEPA and CEQA analysis in the future prior to approval and implementation.

PROJECT DESCRIPTION

The following objectives were adopted by SAFCA in connection with approval of the NLIP: (1) provide at least a 100-year level of flood protection to the Natomas Basin as quickly as possible, (2) provide "200-year" protection to the basin over time, and (3) avoid any substantial increase in expected annual damages as new development occurs in the basin.

The specific purpose of the Landside Improvements Project is to provide at least 100-year flood protection as quickly as possible while laying the groundwork to achieve at least "200-year" flood protection over time.

Additional project objectives adopted by SAFCA in connection with approval of the Phase 2 Project that are also applicable to the Phase 3 Project are to:

(1) use flood control projects in the vicinity of the [Sacramento International] Airport to facilitate changes in the management of Airport lands that reduce hazards to aviation safety, and

(2) use flood control projects to increase the extent and connectivity of the lands in Natomas being managed to provide habitat for giant garter snake, Swainson's hawk, and other special-status species.

The Phase 3 Project includes the following major activities, which will be analyzed at a project level in the EIS/EIR:

- Along the Sacramento River east levee, construct a raised adjacent setback levee from just north of Elkhorn Reservoir to just south of Interstate 5 (I-5) (Reaches 5A–9B) with cutoff walls and seepage berms where required to reduce seepage potential, and install woodland plantings.

- Widen the Pleasant Grove Creek Canal (PGCC) west levee between Howsley Road and Sankey Road and construct cutoff walls or seepage berms where required to reduce seepage potential.

- Widen the Natomas East Main Drainage Canal (NEMDC) west levee from Elkhorn Boulevard to the NEMDC Stormwater Pumping Station.

- Construct a cutoff wall in the NEMDC west levee from the NEMDC Stormwater Pumping Station to Northgate Boulevard where required to reduce seepage potential.

- Construct a new canal designed to provide drainage and associated giant garter snake habitat (referred to as the "GGS/Drainage Canal") between Elkhorn Reservoir and the West Drainage Canal at I-5, relocate the Elkhorn Canal downstream of Elkhorn Reservoir, and reconstruct the Reclamation District 1000 Pumping Plant No. 2.

- Recontour the land and create marsh and upland habitat at borrow locations.

- Realign and relocate irrigation and drainage canals and other infrastructure, such as utility poles, as needed to accommodate the flood control improvements.

- Remove encroachments as required to meet USACE, Central Valley Flood Protection Board, and Federal Emergency Management Agency (FEMA) criteria.

Phase 4 of the Landside Improvements Project will include the following activities that will be analyzed at a program level in the EIS/EIR:

- Along the Sacramento River east levee, construct an adjacent setback levee (raised where needed to provide adequate freeboard) from just south of I-5 to Gateway Oaks Drive (Reaches 10–20B) with cutoff walls and seepage berms where required to reduce seepage potential

- Construct a cutoff wall in the American River north levee between Gateway Oaks Drive and Northgate Boulevard where required to reduce seepage potential.

- Widen the NEMDC west levee from Sankey Road to Elkhorn Boulevard.

- Relocate the Riverside Canal, improve the West Drainage Canal south of I-5 to provide enhanced GGS habitat, and construct modifications to several pumping plants.

- Recontour the land and create marsh and upland habitat at borrow locations.

- Remove encroachments as required to meet USACE, Central Valley Flood Protection Board, and FEMA criteria.

PROBABLE ENVIRONMENTAL EFFECTS

The EIS/EIR will describe the direct and indirect significant environmental effects of the Phase 3 Project. The EIS/EIR will also evaluate cumulative effects of the project when considered in conjunction with the other phases of the Landside Improvements Project and other related past, present, and reasonably foreseeable future projects, including other SAFCA projects.

On the basis of preliminary evaluation, USACE and SAFCA have determined that the probable environmental effects of the proposed project are as follows:

- **Agricultural Resources**: Conversion of farmland to non-agricultural use; temporary effects on agricultural productivity.
- **Land Use and Socioeconomics**: Temporary disturbance of an existing community.
- **Topography, Geology, and Soils**: Potential for soil erosion or loss of topsoil during construction.
- **Hydrology and Hydraulics**: Minimized flood risk; potential temporary and/or permanent alteration of local drainage patterns; potential effects on groundwater recharge.
- **Water Quality**: Temporary effects on water quality during construction.
- **Fish and Aquatic Habitat**: Loss of fish or aquatic habitat through increased sedimentation and turbidity or release of contaminants during construction; loss of shaded riverine aquatic habitat (SRA).
- **Sensitive Aquatic Habitats**: Temporary disturbance or permanent loss of jurisdictional waters of the United States.
- **Vegetation and Wildlife**: Temporary disturbance or permanent loss of woodland habitats and wildlife corridors.
- **Special-Status Terrestrial Species**: Temporary disturbance or permanent loss of special-status species habitats; construction disturbance or take of special-status terrestrial species, especially to Swainson's hawk and giant garter snake.
- **Cultural Resources**: Disturbance of historic or archaeological resources.
- **Paleontological Resources**: Potential disturbance of previously undiscovered fossils during earthmoving activities.
- **Transportation and Circulation**: Temporary increase in traffic and traffic hazards on local roadways during construction; temporary closure of roadways during construction of flood control improvements across the roadways.
- **Air Quality**: Temporary increases in pollutant emissions associated with construction activities.
- **Noise**: Temporary increases in noise and vibration levels near sensitive receptors during construction.
- **Recreation**: Temporary disturbance of recreational uses at Teal Bend Golf Club; temporary closure of the Ueda Parkway bike trail on the NEMDC west levee.

- **Visual Resources**: Temporary and long-term changes in scenic views or visual character of the project area.
- **Utilities and Service Systems**: Temporary disruption of irrigation supply; potential disruption of utility service.
- **Hazards and Hazardous Materials**: Potential spills of hazardous materials; potential exposure to hazardous materials at project sites; potential for higher frequency of collisions between aircraft and wildlife at the Sacramento International Airport.

PUBLIC SCOPING MEETING

A public scoping meeting will be held to inform interested parties about the proposed project, and to obtain the views of agency representatives and the public on the scope and content of the EIS/EIR. The meeting will be held on Wednesday, August 6, 2008, from 4:00 to 7:00 p.m., at 1321 Garden Highway (Sierra Health Foundation) in Sacramento, California.

The meeting will have an open-house format with multiple stations set up to highlight different aspects of the proposed project and the NEPA/CEQA process. Attendees will have the opportunity to ask questions and discuss the project and the EIS/EIR process with project team members and to provide oral and written comments. The meeting space is accessible to persons with disabilities. Individuals needing special assistive devices will be accommodated to the best of our ability. For more information, contact Elizabeth Holland with USACE at (916) 557-6763 at least 48 hours before the meeting.

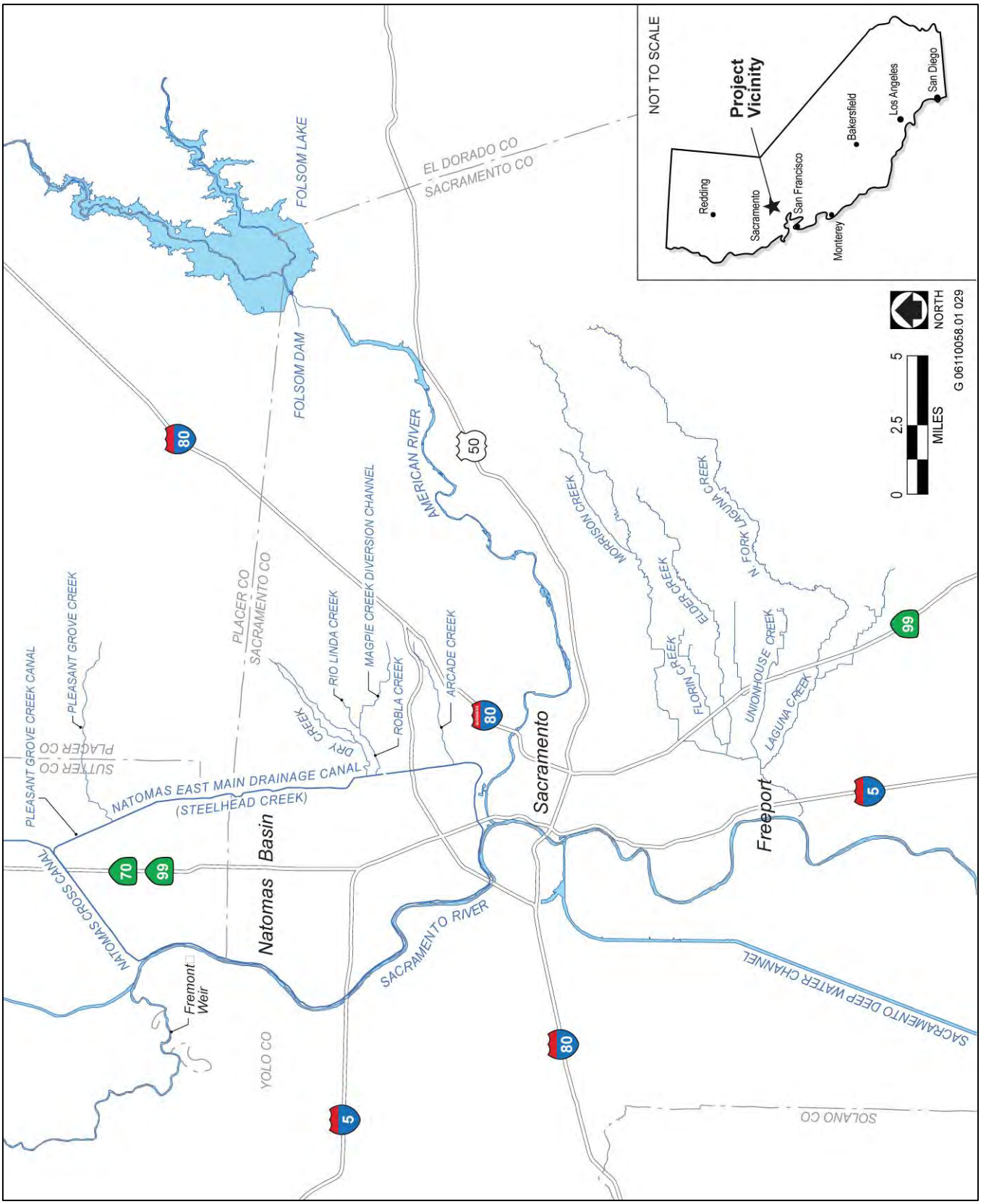
PROVIDING COMMENTS ON THE NOP

Interested parties may provide written or oral comments on the content and scope of the EIS/EIR at the public scoping meeting or may provide written comments directly to USACE or SAFCA. **Written comments must be provided to USACE or SAFCA at the earliest possible date, but must be received no later than 5 p.m. on Monday, August 18, 2008**. Agencies that will need to use the EIS/EIR when considering permits or other approvals for the proposed project should provide the name of a contact person. Comments provided by e-mail should include the name and address of the sender. Please send all written and/or e-mail comments to:

Elizabeth Holland, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814
Telephone: (916) 557-6763
E-mail: Elizabeth.G.Holland@usace.army.mil

Or

John Bassett, Director of Engineering
Sacramento Area Flood Control Agency
1007 Seventh Street, 7th Floor
Sacramento, CA 95814
Telephone: (916) 874-7606
Fax: (916) 874-8289
E-mail: BassettJ@saccounty.net

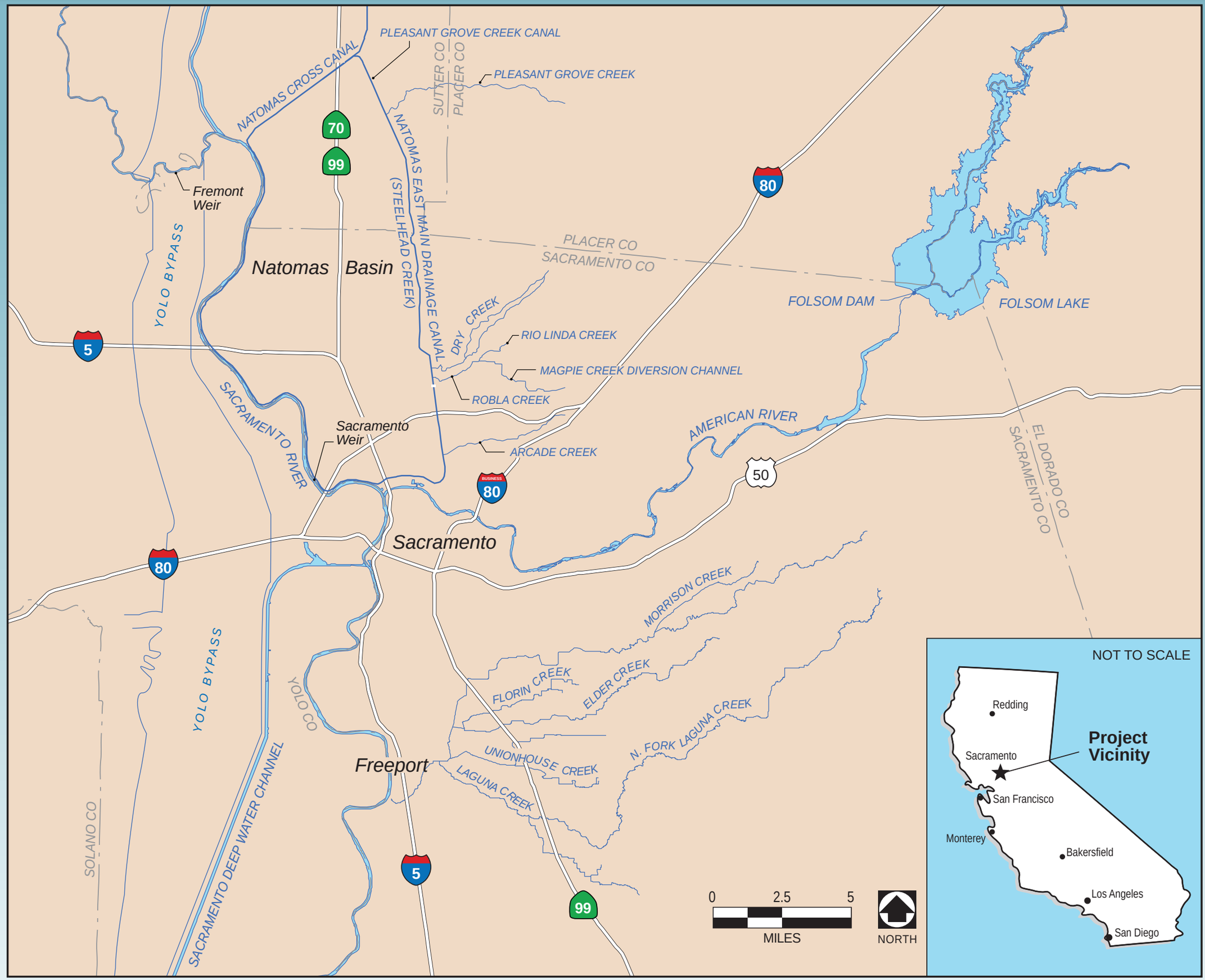


Source: CaSil, Adapted by EDAW in 2007

Project Location Exhibit

A2 Public Outreach Materials for August 6, 2008 Scoping Meeting

Station 1 – Project Location



Station 1 – History and Proposed Project Process

Natomas Basin Flood Control History

1911–1915	Basin reclaimed: levees and interior drainage
1917	Levees authorized as part of Sacramento River Flood Control Project (SRFCP)
1968	National Flood Insurance Program (NFIP) authorized
1978	First NFIP flood maps issued
1986	Major Floods lead to SRFCP system re-evaluation
1989	Sacramento urban area mapped into regulatory floodplain
1990 – 1993	Sacramento Urban Area Levee Reconstruction
1993 – 1998	North Area Local Project
1996	Congress authorizes raise of Sacramento River East Levee
1997	Major flood in SRFCP
1998	Natomas Basin restores 100-year FEMA flood protection
1999	Congress authorizes raise of Natomas Cross Canal south levee
1999	Post 1997 Flood Assessment recognizes underseepage as a threat
2000	USACE initiates Natomas Basin Common Features Design
2002	USACE conducts public scoping meetings
2003	USACE Levee Task Force completes development of seepage criteria
2004	USACE adopts Standard Operating Levee Design Procedures
2004	USACE initiates General Re-evaluation of the Common Features Project
2004	SAFCA initiates planning for Natomas Levee Evaluation Program (NLEP)
2006	SAFCA completes NLEP
2006	USACE recommends levee decertification based on new geotechnical information and new standards
2006	SAFCA initiates Natomas Levee Improvement Program (NLIP)
2007	SAFCA Board certifies EIR for NLIP Phase 2 Landside Improvement Project
2008	USACE issues Draft EIS for NLIP Phase 2 Landside Improvement Project

Proposed Project

Natomas Levee Improvement Program Landside Improvements Project – Preferred Alternative

- Raise, realign and install a seepage cutoff wall in the Natomas Cross Canal (NCC) south levee
- Construct an adjacent setback levee along the Sacramento River east levee from the NCC to the American River north levee, raised and with seepage remediation where needed
- Flatten slopes and construct seepage remediation along the Pleasant Grove Creek Canal west levee and Natomas East Main Drainage Canal west levee
- Construct cutoff wall in American River north levee to reduce seepage potential
- Implement related landscape changes at borrow sites and irrigation/drainage infrastructure modifications

USACE Permitting Required

- Permission to alter Federal Project levees under Section 408 of the Rivers and Harbors Act of 1899
- Permission to place fill in jurisdictional waters of the U.S. under Section 404 of the Clean Water Act

Relationship to the General Re-evaluation of the Common Features Project

- USACE initiated a general re-evaluation of the Natomas Basin elements of the Common Features Project.
- This followed changes in engineering standards, to address underseepage that were not identified when Congress authorized the project in 1996 and modified the authorization in 1999.
- USACE to present a General Re-evaluation Report (GRR) to Congress in 2010 likely recommending project scope and cost modifications.
- The NLIP will be considered in the GRR.

Station 2 – EIS/EIR Process Phase 3

NEPA/CEQA Compliance

Purpose and Need	▸ Defines problems that the project is designed to address and the reason for the problems.
Alternatives Development/ Evaluation/Refinement	▸ Defines alternatives that could address the project objectives.
Environmental Impact Analysis	▸ Evaluates the impacts of potential alternatives and develops mitigation measures (NEPA). ▸ Evaluates the significant environmental impacts (CEQA).
Scoping	▸ Defines the study by identifying issues and obtaining comments from the general public, agencies, and jurisdictions.
Draft EIS/EIR	▸ Describes the purpose and need, alternatives considered, alternatives rejected or accepted, and a comprehensive, detailed, interdisciplinary evaluation of the significant environmental impacts that the alternatives would likely cause, and conceptual mitigation. Identifies the least environmentally damaging alternative, and the USACE's preferred alternative.
Public Review Period	▸ At least a 45-day period during which the public reviews the Draft EIS/EIR and submits comments to USACE and SAFCA about that document.
Final EIS/EIR	▸ Addresses the comments on the Draft EIS/EIR and from the Public Hearing, presents the final evaluation of project-induced environmental impacts and ways to mitigate unavoidable impacts.
Record of Decision (ROD)	▸ SAFCA Board certifies EIR. ▸ USACE uses information in the Final EIS/EIR and the project record to prepare the ROD.

EIS/EIR Organization

NLIP Landside Improvement Project Phase 3

- Phase 3 EIS/EIR will tier off 2008 EIS and 2007 EIR Programmatic documents
- Phase 3 components will be described in detail and analyzed at a project level
- Phase 4 construction components will be described more generally and analyzed at a general, program level

Proposed Table of Contents

- Summary
- Purpose of and Need for Action
- Alternatives
- Affected Environment
- Environmental Consequences
- Cumulative and Growth-Inducing Effects
  - Combined Phase 2/Phase 3 single-year construction analysis
- Compliance with Other Environmental Laws and Regulations (includes Environmental Justice)
- Consultation and Coordination

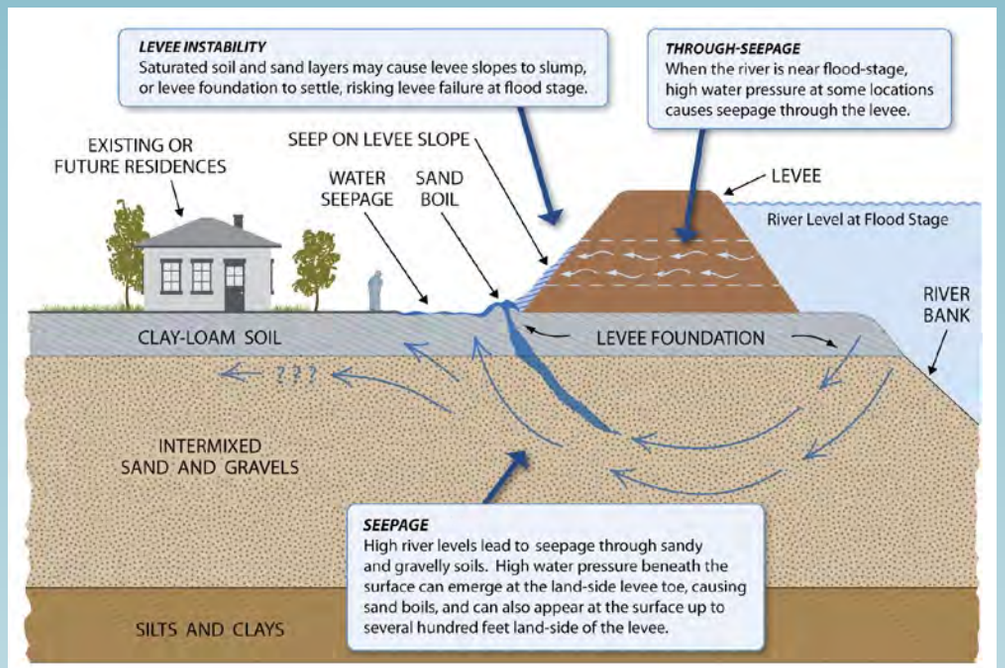
Station 3 – Project Purpose and Need

SAFCA's Project Purpose

Provide at least 100-year flood protection as quickly as possible while laying the groundwork to achieve at least "200-year" flood protection over time

Project Need: Levee Problems

Seepage: Geotechnical studies have identified seepage beneath and through segments of the Natomas levee system as a significant risk to the stability and reliability of the system.



Height Deficiency: Much of the Natomas levee system is not high enough to meet the FEMA criteria for the National Flood Insurance Program and the Urban Level of Flood Protection required by state law.

Encroachments: USACE levee guidance requires the removal of vegetation greater than 2 inches in diameter on the levee slopes and within 15 feet of the waterside and landside levee toes.
Other encroachments that penetrate the levee and limit access on the land side and the water side (e.g., fences, retaining walls and driveways) may also be subject to removal.

Levee Segments Requiring Seepage Remediation and Levee Height Increases

Source: HDR 2007, Wood Rodgers 2007, SACOG 2006, EDAW 2007

Station 4 – Alternatives

Alternatives Considered and Eliminated

Measure	Reasons for Elimination
Yolo Bypass Improvements: Redesign of Fremont Weir, new setback levee from Fremont Weir to north levee of Sacramento Bypass.	• Need for interagency coordination would delay improvements well beyond 2010 • Would not address seepage deficiencies
Reduced Natomas Urban Levee Perimeter: Construction of an east-west cross levee across Natomas Basin approximately 500 feet north of Elkhorn Boulevard.	• High cost of land acquisition, road relocation and levee materials. • Would strand current investments in levee system in northern part of basin. • Would not protect a portion of Sutter County designated for development • Does not meet project objectives

General Remediation Methods

Levee Height

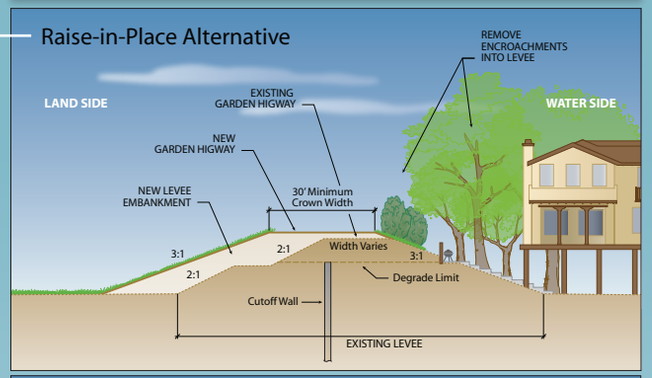
- Raise existing levee where needed (would require substantial encroachment removal)
- Construct adjacent levee, raised where needed (would reduce need to remove encroachments)
- Construct Sacramento River setback levee where feasible, raised where needed

Seepage

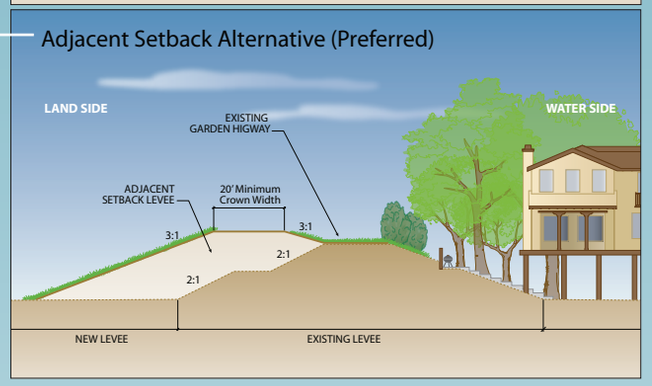
- Seepage berms (extending 100-300 feet from landside levee toe)
- Seepage cutoff walls
- Relief wells

Methods depend on localized conditions

Comparison of Levee Raise Approaches



Raising the levee in place would require closing sections of Garden Highway and worsen the problem of managing encroachments in the levee footprint subject to USACE's policies.



Along the Sacramento River east levee, an adjacent setback levee would reduce impacts to Garden Highway and the problem of encroachment management. However, it would substantially increase the amount of earth moving.

Alternatives To Be Evaluated

- No-Action Alternative A—No Authorization for Phase 2 or Phase 3
- No-Action Alternative B—Authorization for Phase 2 but Not for Phase 3
- Alternative 1 (Preferred Alternative)—Construct an Adjacent Setback Levee along the Sacramento River East Levee (combined with PGCC west levee, NEMDC west levee, and American River north levee improvements)
- Alternative 2—Raise Levee in Place along the Sacramento River East Levee (combined with PGCC west levee, NEMDC west levee and American River north levee improvements).

All action alternatives would include increasing levee height on the NCC south levee and implementing a combination of seepage remediation measures.

Station 5 – Construction

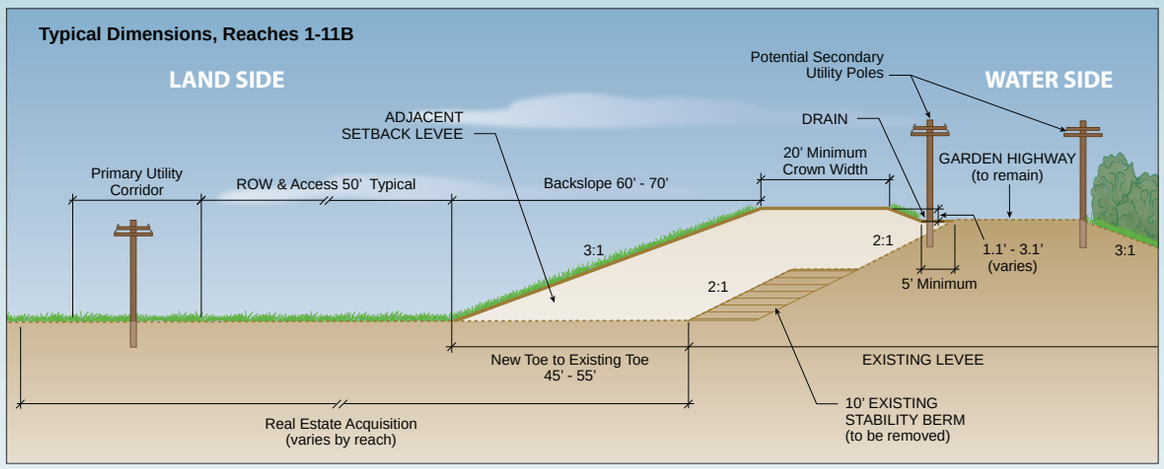
Construction Methods

Hauler and excavator on levee crown

Levee embankment grading

Construction of a slurry cutoff wall

Utility Pole Relocations



Project Commitments

Construction Noise, Dust and Vibrations

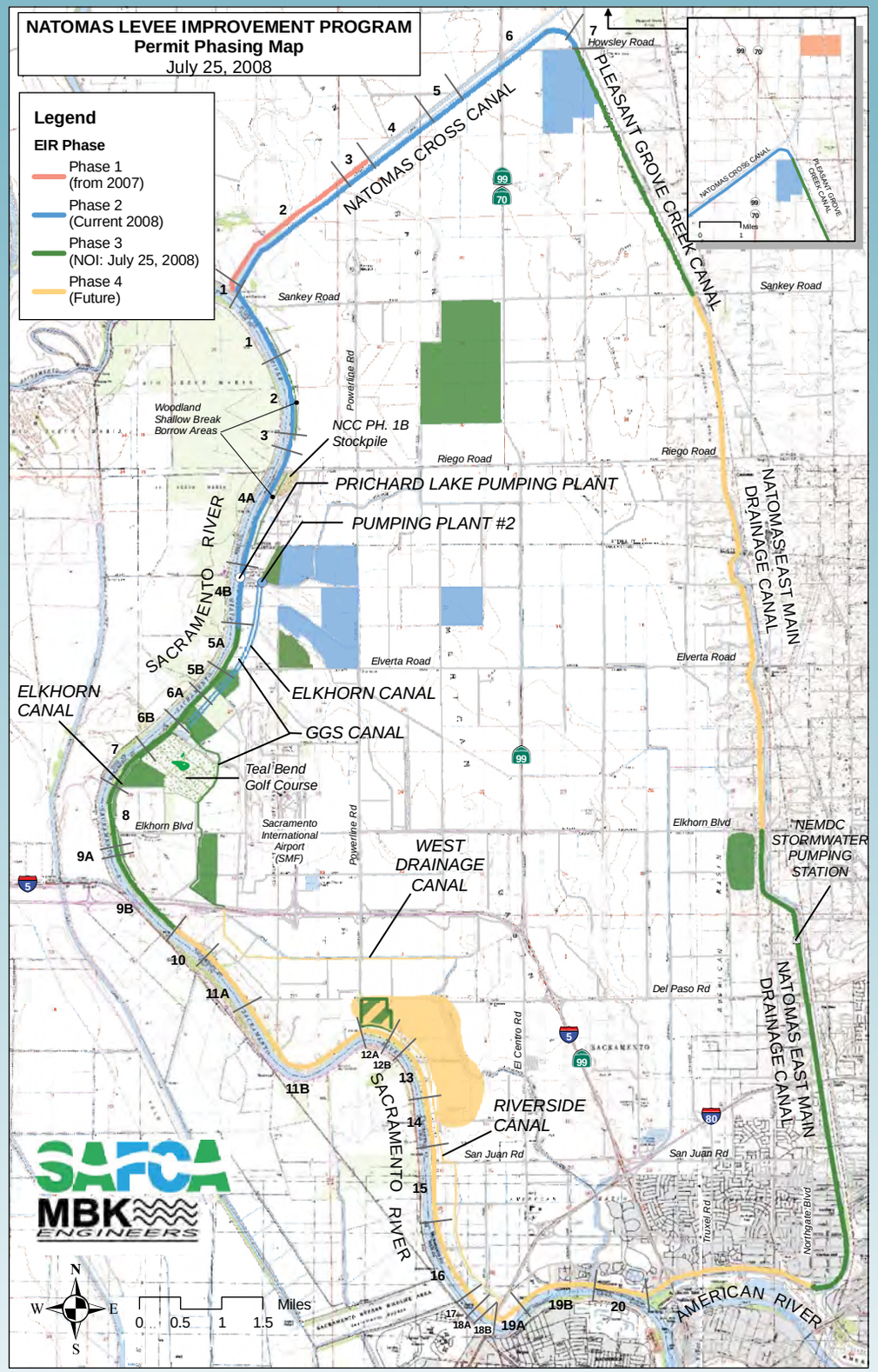
- Dust control best management practices
- Vibration monitoring
- Written notification prior to construction activity within 500 feet of homes and businesses
- Minimized traffic on Garden Highway

Traffic Management and Safety

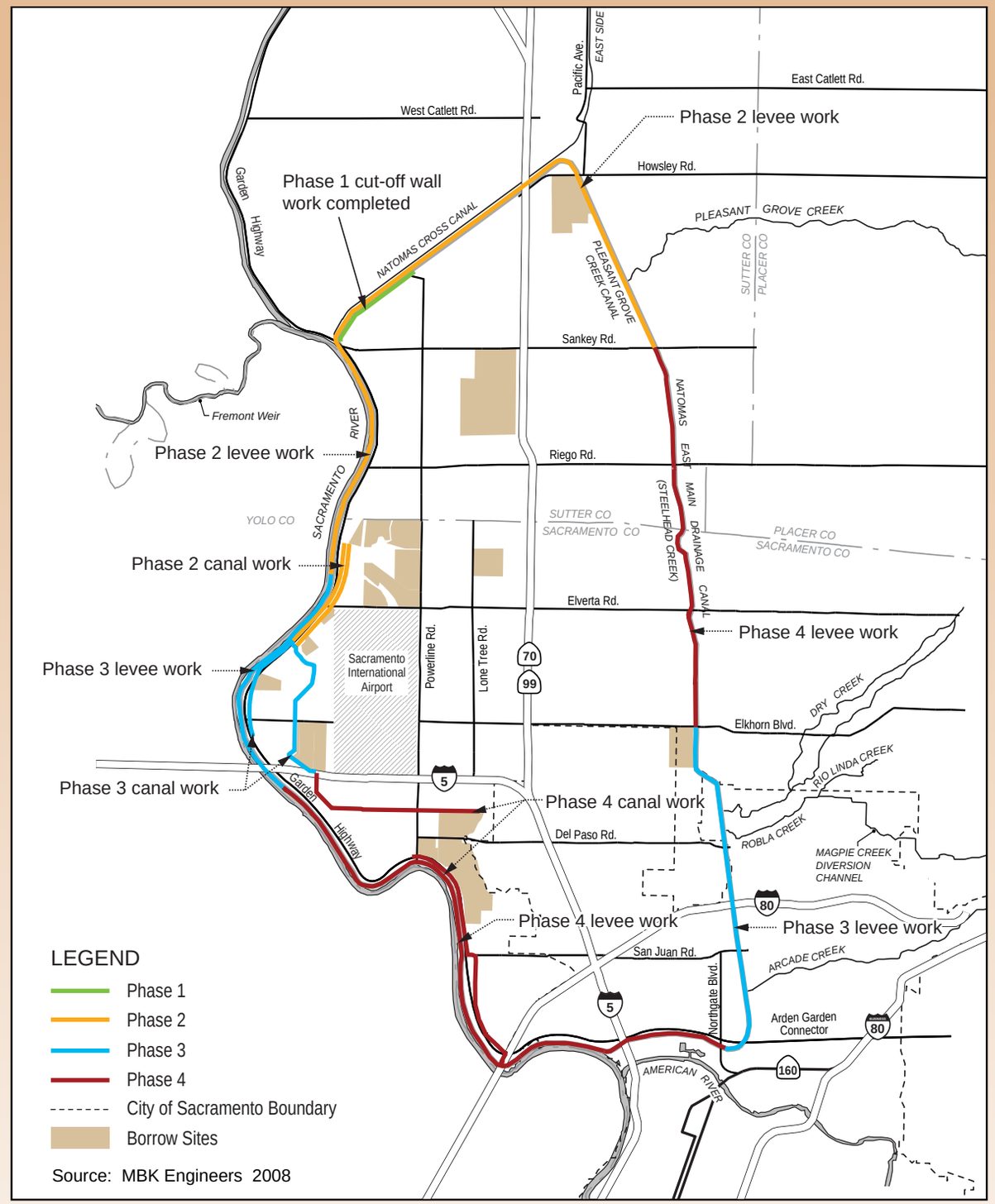
- Implementation of traffic safety and control measures in each construction season
- City and county review of traffic control plans
- Use of traffic control personnel and signage
- Point-of-contact to address public concerns about construction activity will be provided

Station 5 – Phasing

Permit Phasing



Construction Phasing



Phase 3 construction will be evaluated at a project level, while Phase 4 construction will be evaluated at a program level.

Station 6 – NEPA/CEQA Issues

Topics of Major Concern

Air Quality, Noise, Traffic

- Temporary effects during construction

  Best management practices and environmental commitments for construction will reduce localized construction effects.

- Cumulative effects of combined construction phases

Cultural Resources

- Changes to elements of RD 1000 rural historic landscape district
- Potential effects on archaeological resources

  Programmatic Agreement between USACE, SAFCA, State Historic Preservation Officer, and Advisory Council on Historic Preservation will govern phased approach to cultural resource protection.

- On going coordination with tribal representatives to protect resources and minimize impacts

Agricultural Land Conversion

- Conversion in footprint of flood control facilities, relocated and new canals, borrow sites

  Additional lands to be preserved in agricultural use under public ownership.

Biological Resources

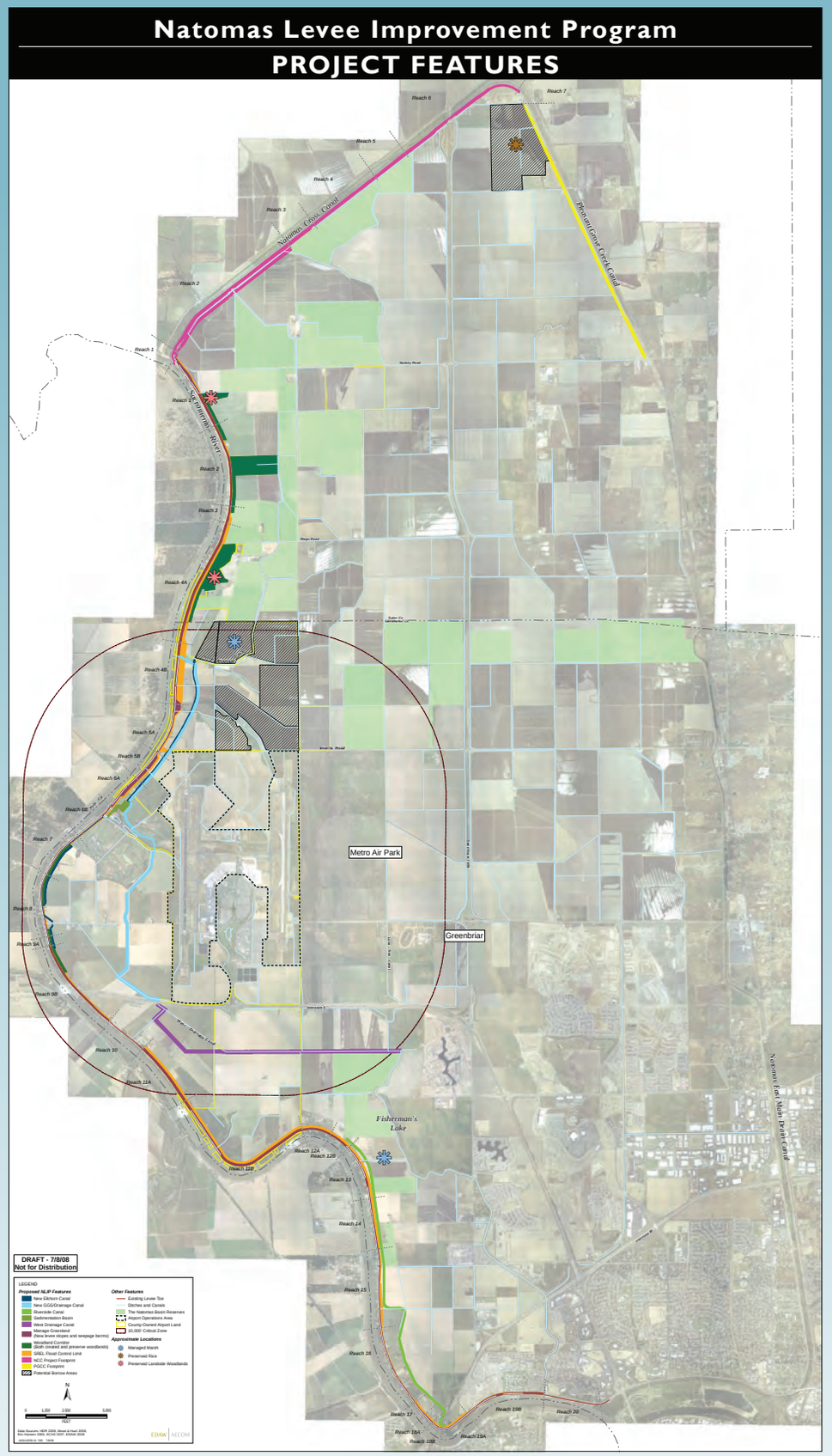
- Effects on habitats of species protected under the Natomas Basin Habitat Conservation Plan
  - Canals and rice fields that provide Giant garter snake (GGS) habitat
  - Agricultural cropland used for foraging by Swainson's hawks
  - Trees potentially used for nesting by Swainson's hawk and other birds

  Habitat replacement and conservation strategies in project design: marsh habitat for GGS use, new drainage canal to connect GGS population areas, grassland on flood control features and in borrow sites, lands preserved in agricultural use, new woodland groves.

Hydraulics

- Required levee height increases for compliance with regulations
- Minimize work in channels
- No impact on Sacramento River Flood Control Project design profiles

Station 6 – NEPA/CEQA Issues

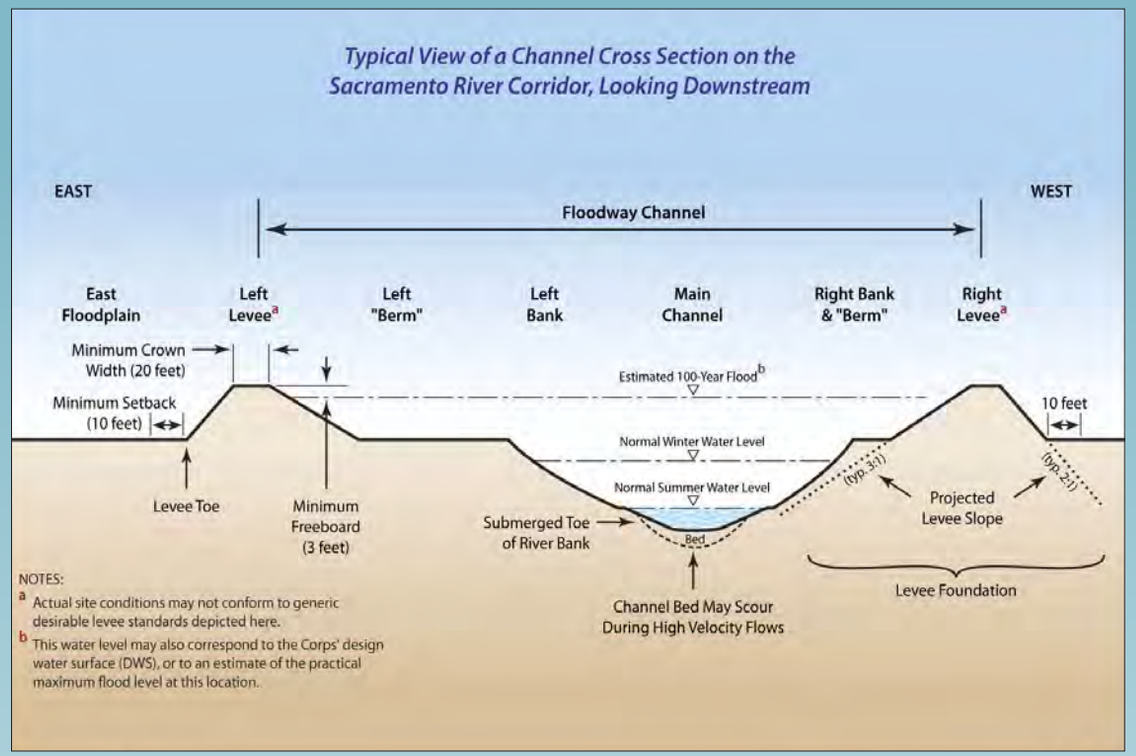


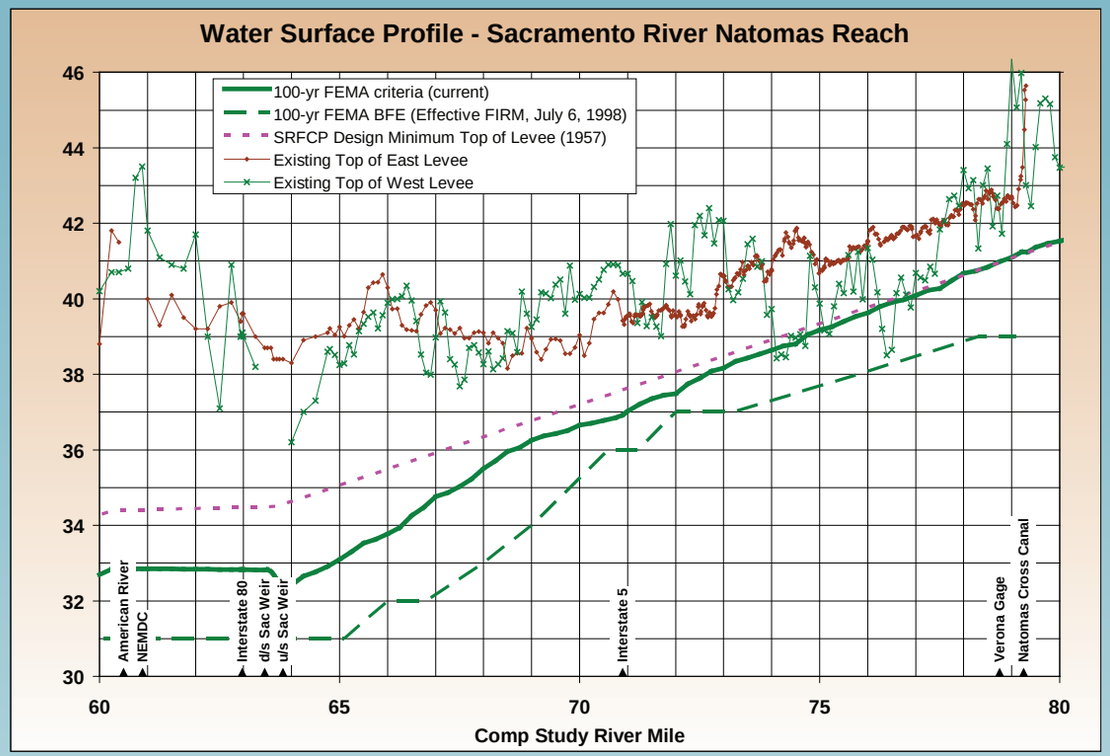
Habitat

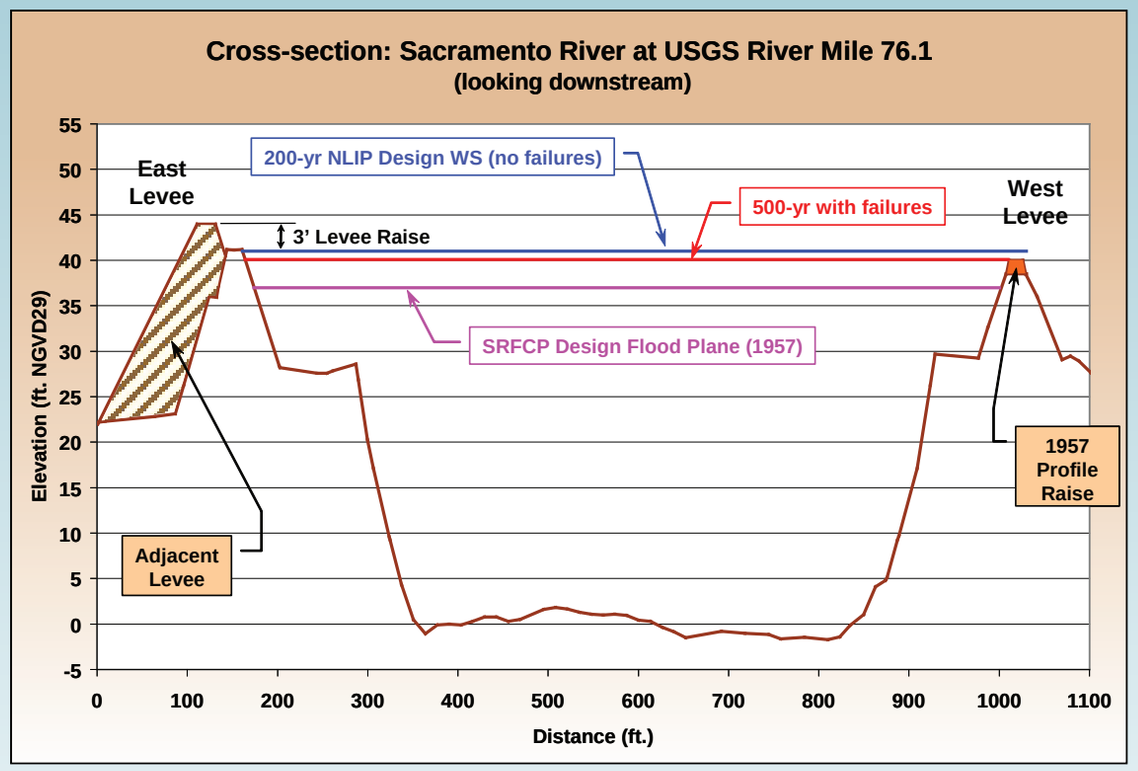
Habitat Compensation/Conservation

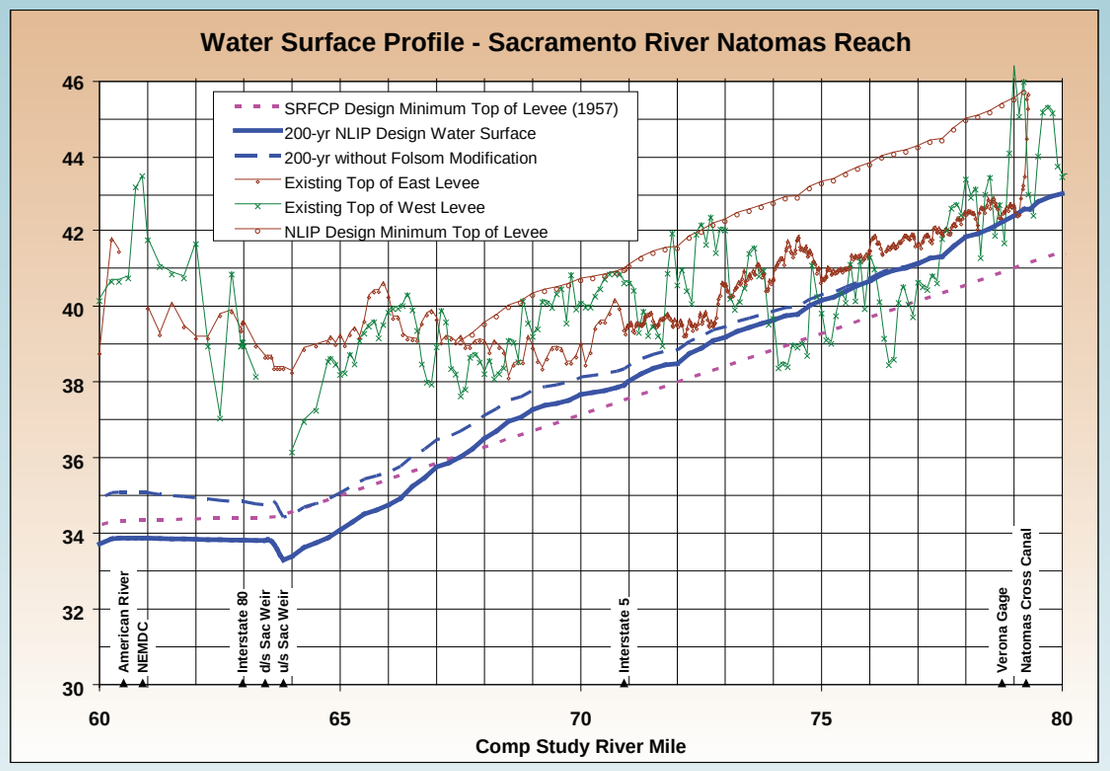
- Compensate for habitat losses in project design
- Produce net gains to ecosystem function
- Advance Natomas Basin Habitat Conservation Plan goals for sustainability
- Secure Giant garter snake movement corridors linking populations in north and south
- Reduce Airport wildlife hazards
- Create replacement canals and uplands; use managed marsh or rice field preservation for Giant garter snake
- Create managed grassland or preserve farmland for Swainson's hawk
- Establish replacement tree plantings based on affected trees and woodland plantings

Station 7 – Hydraulics



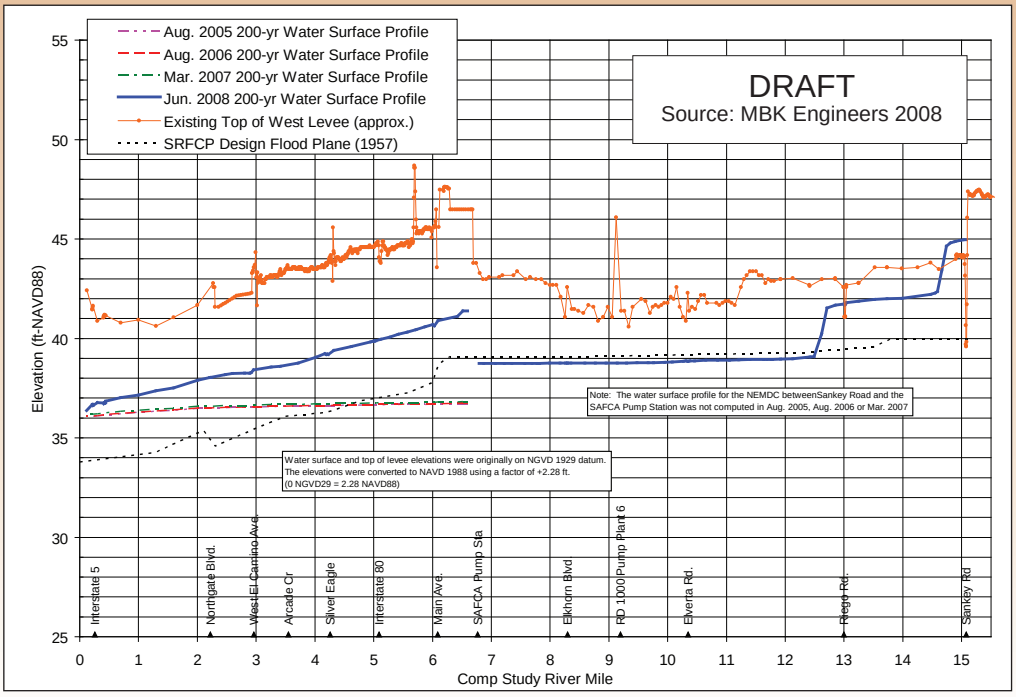




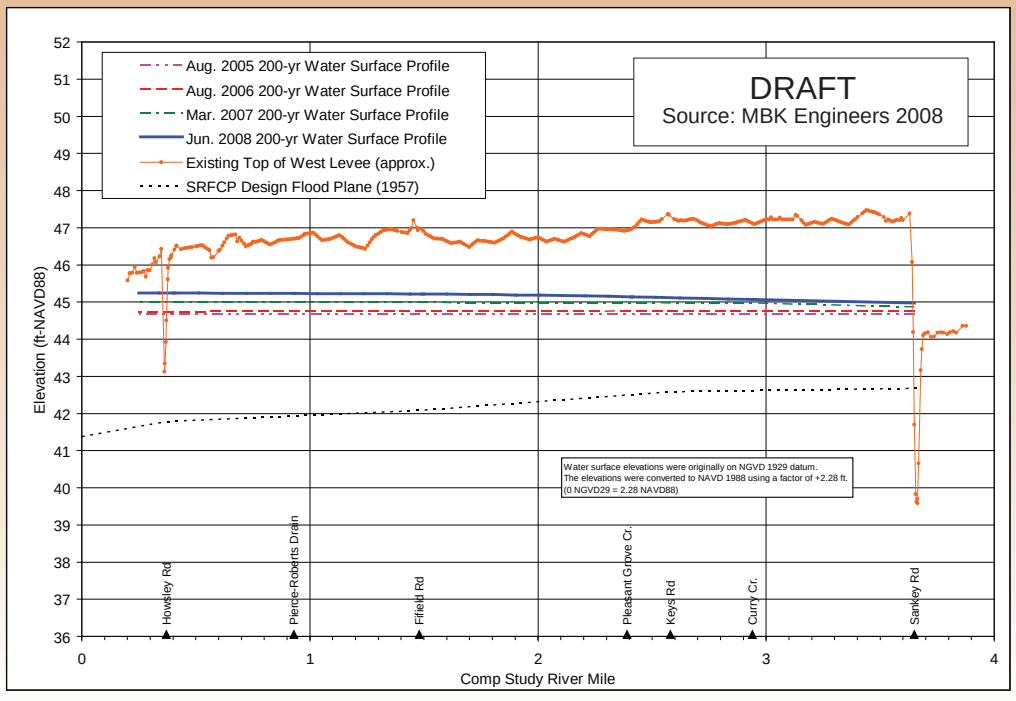


Station 7 – Hydraulics

Comparison of 200-year Design Water Surface Profiles, Natomas East Main Drainage Canal



Comparison of 200-year Design Water Surface Profiles, Pleasant Grove Creek Canal



APPENDIX B

Hydraulics and Hydrology

B1 Hydraulic Impact Analysis

SACRAMENTO AREA FLOOD CONTROL AGENCY

NATOMAS LEVEE IMPROVEMENT PROGRAM

SUMMARY REPORT ON HYDRAULIC IMPACT ANALYSES

Prepared for

SAFCA
Sacramento Area Flood Control Agency

Prepared by

MBK ENGINEERS
2450 Alhambra Blvd., 2nd Floor
Sacramento, CA 95817
916/456-4400 (phone) • 916/456-0253 (fax)

April 22, 2008
Revised: February 5, 2009

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. OVERVIEW

The Sacramento Area Flood Control Agency (SAFCA) is proposing to raise and strengthen portions of the federal project levee system protecting the Natomas Basin in Sacramento and Sutter Counties in order to provide urban development in the basin with at least a 100-year level of flood protection as quickly as possible, while laying the groundwork for providing at least a 200-year level of flood protection over time. This effort is referred to as the Natomas Levee Improvement Program (or "NLIP"). It is part of a larger program of improvements, including modifications to Folsom Dam that would provide the Sacramento area as a whole with at least a 200-year level of flood protection.

The April 22, 2008 version of this report was originally prepared for and included with the Final Environmental Impact Statement, 408 Permission, and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, California, in November 2008. The report has been revised to include more detail on the modeling of the "With Project" and "Without Project" condition and to include results for the Pleasant Grove Creek Canal (PGCC) and Natomas East Main Drainage Canal (NEMDC) reaches.

Under applicable federal law, no federal project levee or related flood control facility may be altered unless: Congress has authorized the alteration; or, pursuant to 33 U.S.C. 408, the Secretary of the Army acting through the Chief of Engineers of the U.S. Army Corps of Engineers ("USACE") has granted permission for the alteration based on a determination that the proposed work will not be injurious to the public interest and will not otherwise impair the usefulness of the affected facility. Under Title 23 of the California Water Code, such alterations must also be: authorized by the State Legislature; or permitted by the California Central Valley Flood Protection Board ("Board"), formerly the Reclamation Board. In order to coordinate these federal and state decision-making processes, the Board's recent practice has been to issue a letter to the USACE requesting permission for proposed alterations after the Board has made its own determination that the work will not have a detrimental impact on the affected flood control system.

At the heart of both processes is an analysis of the hydraulic effects of the proposed alteration. SAFCA has historically conducted this analysis by evaluating the potential effects of its levee improvement projects on water surface elevations in the stream and river channels in the project area and in the larger watershed within which the project is situated. This approach was used to evaluate the flood related impacts of the NLIP for purposes of meeting the requirements of the California Environmental Quality Act (CEQA). Specifically, SAFCA's engineering consultant, MBK Engineers ("MBK"), has used a UNET hydraulic computer model of the Sacramento River Flood Control Project ("SRFCP"), which was reviewed and approved for use for this project in 2006 by the USACE Sacramento District, to compare existing conditions in the waterways surrounding the Natomas Basin and in the larger SRFCP with and without the NLIP improvements and the other improvements comprising the 200-year flood protection program for the Sacramento area. MBK's initial routings assumed that the levees outside the project area would fail when overtopped. However, in order to test the sensitivity of this assumption, a later set of routings was performed assuming that none of these levees would fail even if overtopped.

The results of the initial routings were presented in the program-level Environmental Impact Report ("EIR") on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area, which was certified by the SAFCA Board of Directors in February 2007. Using the same methodology, the analysis was performed again and presented in the Draft EIR for the NLIP Landside Improvements Project in September 2007. The 'no levee failure' routings were performed thereafter and presented in the Landside Improvements Final EIR which was certified by the SAFCA Board in November 2007. The modeling showed that the proposed NLIP improvements by themselves would not alter any of the identified water surface elevations in the river channels comprising the SRFCP. Moreover, when the NLIP improvements are analyzed as part of the larger 200-year flood protection program for the Sacramento area, including modifications to Folsom Dam, the result is a lowering of water surface elevations for the 100-year and 200-year floods along the lower Sacramento River for most of the reach adjacent to the Natomas Basin. On this basis, SAFCA has concluded that the NLIP improvements would not cause any significant hydraulic impacts.

This report is a summary of the previous hydraulic impact analyses conducted for the NLIP. The report also presents new information requested by the USACE as part of their National Environmental Policy Act (NEPA) compliance for review of the proposed levee alterations.

2. SRFCP SYSTEM BACKGROUND

The perimeter levee system around the Natomas Basin is part of a larger integrated system of levees, dams, and bypass channels comprising the SRFCP (Figure 1). This system encompasses five historic flood basins in the Sacramento Valley (Colusa, Sutter, Feather, Yolo, and American Flood Basins) and the sub-basins contained therein. Planning, design, and construction of the SRFCP has been ongoing since the early 1900s under the leadership of the USACE and the State of California (State), with local levee and reclamation districts playing the principal role in operating and maintaining the system.

The SRFCP levees were set close to the river channel in order to improve navigation by having the rivers scour hydraulic mining sediments. The design of the system assumed no levee failures, but included five engineered diversions and one natural overflow diversion. The natural diversion is to Butte Basin, which is upstream from the SRFCP levees. This diversion did not include flowage easements because the Butte Basin is a historic flood basin. The five engineered diversions include two additional diversions to Butte Basin (Moulton and Colusa Weirs), one diversion to the Sutter Bypass (Tisdale Weir), and two diversions to the Yolo Bypass (Fremont and Sacramento Weirs). All of the engineered diversions included the acquisition of property rights to support the diversions. The deliberate planning, construction, and maintenance of the diversions ensured that they would function during flood conditions and serve as reliable features of the flood project.

Initially, the river channel and bypass levees in each segment of the system were constructed based on a standard geometry. The levees were designed with a predetermined freeboard allowance tied to specified flows and associated water surface elevations, generally matched to observed conditions during the 1907 and 1909 floods. Over time, the standard levee section was

increased because of numerous levee failures. The minimum standard levee changed from a levee with a top width of 10 feet to one with a top width of 20 feet. In addition, the design flows were modified substantially on the Feather and American Rivers. This was the result of floods that occurred after 1909, which demonstrated these rivers could produce substantially greater flows than occurred during the 1907 and 1909 floods. Because numerous levee failures occurred along the Feather River levees between 1920 and 1934, these levees were set back and enlarged to accommodate greater flows. These changes were summarized in memorandums issued by the USACE which define the minimum freeboard requirements for each segment of the SRFCP, collectively referred to as the "USACE 1957 Profile." Over the years, the system capacity of the SRFCP was also greatly expanded by the construction of five major multiple-purpose reservoirs (Shasta, Black Butte, Oroville, New Bullards Bar, and Folsom Reservoirs), containing 2.7 million acre-feet of flood control storage space.

The record floods of 1986 and 1997 triggered additional system modifications. Although these floods were significantly larger than the 1907 and 1909 floods, the availability of reservoir storage largely prevented flows in the system from exceeding the design of the SRFCP. Nevertheless, numerous project levees experienced unexpectedly severe stress and some failed. This experience caused the USACE, the State, and their local partners to perform a series of geotechnical evaluations on the SRFCP levees and to adopt new, more rigorous levee design standards, including updated standards for seepage through and under project levees. To meet these standards, USACE, the State, and local flood control agencies have made substantial investments in addressing identified deficiencies in levees throughout the SRFCP and in improving the level of flood protection provided by the levees, particularly in urban areas. Federal, State and local support for these levee improvements has been secured under several federally authorized projects, including the Sacramento Urban Levee Reconstruction Project, the American River Watershed Investigation, the West Sacramento Levee Improvement Project, the Sutter Basin Project and the Yuba River Basin Project. In the aftermath of the flooding of New Orleans, these authorized projects are being expanded to support an even broader scope of urban levee improvement activity.

The evolution of these urban levee improvements is occurring within a SRFCP management framework that has historically allowed necessary adaptations to the system without undermining its basic operational principles. These principles may be summarized as follows. First, the SRFCP is not intended to provide a uniform level of flood protection (statistical probability of flooding) to the various sub-basins within the protected area. Rather, each sub-basin is protected by levees that are required to at least meet the SRFCP minimum geometrical standards, including freeboard reflecting the water surface profile prescribed for that segment of the system. Second, each sub-basin's flood protection is dependent on the fitness of its own levees and not on the condition (or failure) of any other sub-basin's levees. Accordingly, each sub-basin has the right to keep its levees in the fittest possible condition to ensure that these levees will perform as reliably as possible in a flood. This right ensures the orderly operation and maintenance of the system since even the most modest levee work has the potential to trigger a "transfer of risk" from one sub-basin to another, at least in theory; and there are no data or modeling tools available to quantify such transfers of risk, assess their significance, or determine how they might be mitigated. Third, for this reason, the administration of the SRFCP has

historically relied on "change in design water surface elevation" as the guideline for evaluating the effects of any proposed levee work.

The strictest scrutiny is given to levee work involving physical changes in the geometry of the river channel since these changes have the most potential to alter water surface elevations prescribed by the SRFCP design water surface profiles (SRFCP 1957 profiles). This work includes placement of fill or construction of structures in the floodway, construction of new levees, relocation of existing levees, excavation within the floodway, construction of large berms for protecting riverbanks, raising an existing levee (waterside raise), construction of a new bypass, and planting of vegetation within the floodway. Landside levee work of the type proposed as part of the NLIP, such as placing a cutoff wall in a levee, adding a seepage berm to a levee, placing a field of seepage relief wells along a levee, raising a levee (landside raise), widening a levee (increased top width), and relocating a seepage ditch, is also strictly scrutinized; but is not likely to cause impacts.

The standard procedure for this evaluation is to use hydrologic and hydraulic computer modeling tools such as, HEC-1, HEC-2, UNET, HEC-RAS, RMA2, FESWMS, etc. The analysis consists of calibrating the hydraulic model to historic flood events using high-water marks and stream gage data. The calibration activity is normally conducted on a system-wide basis instead of a site-specific basis. However, data available for computer model calibration can be sparse or nonexistent. In addition, assumptions must be made regarding reservoir operations. Because all of the reservoirs that contribute to the operation of the SRFCP (Shasta, Black Butte, Oroville, New Bullards Bar and Folsom) are governed by water control manuals issued by USACE, current reservoir operations are assumed to continue except where it is reasonably foreseeable that the current operation would change. Examples of such changes are at the Folsom Dam and Reservoir: where Congress has directed USACE to formalize the variable space storage operation that has been in effect by agreement between SAFCA and the U.S. Bureau of Reclamation since 1995; and where water control structures are being modified as part of the Folsom Dam Joint Federal Project.

3. APPROACH TO MODELING ANALYSIS

As discussed above, in order to evaluate the hydraulic impacts of the levee alterations proposed as part of the NLIP, MBK used a UNET hydraulic computer model calibrated to historic flood events using high-water marks and stream gage data gathered in connection with the 1997 Flood. Figure 2 displays the geographical extent of the UNET model. Figure 3 provides the UNET model river mile stationing around the Natomas Basin. Results of the model calibration are shown in Figures 4 through 7.

The hydraulic impacts of the levee alterations proposed as part of the NLIP were evaluated based on the potential of the proposed levee alterations to increase one or more of the SRFCP's recognized design water surface elevations: (1) the SRFCP 1957 water surface profiles that serve as the minimum design standard for the SRFCP; (2) the 100-year flood elevations that govern management of SRFCP protected floodplains under the National Flood Insurance Program (33 CFR. 65.10); and (3) the 200-year water surface elevations that are likely to govern

implementation of floodplain management standards recently adopted by the State Legislature (Statutes of 2008, Chapter 364 [adding Water Code Section 9602(i)]). In addition, SAFCA has provided information on the project impacts to the 500-year flood elevation. This flood represents an extreme flood event and is the largest flood event for which hydrologic input data has been developed for the hydraulic simulation model.

The modeling runs compare the "Existing", "Without Project" and "With Project" conditions under each of the above flood scenarios. The Existing Condition analysis provides an evaluation of the levee and reservoir system as it exists in April 2008. The Without Project condition assumes implementation of federally authorized improvements to Folsom Dam and anticipated improvements to the levees protecting existing urban areas outside the Natomas Basin (American River Basin, West Sacramento, Yuba Basin, and Sutter Basin) so as to provide these areas with 200-year flood protection. The With Project condition adds the improvements proposed as part of the NLIP to the Without Project condition. The NLIP improvements consist of levee raises on the Sacramento River, Natomas Cross Canal, PGCC, and NEMDC in the locations shown in Figure 3. The levee raising that is part of the Phase 3 EIS/EIR is highlighted on Figure 3. The magnitude of the levee raise is shown in the levee profile plots provided in Figures 8 through 11. The low spots in the PGCC levee at Howsley Road and Sankey Road (see Figure 10) are not raised and are assumed to retain their existing configurations in the With Project condition. All fill related to the levee raises would occur on the landside of the levees with the exception of an approximately one mile reach of the Natomas Cross Canal where some waterside fill would be required. Figure 12 shows a typical section showing the waterside fill.

In order to compare these conditions, assumptions about the performance of SRFCP levees under flow conditions that exceed the design of the levee system are necessary for the 100-year, 200-year, and 500-year floods. As noted above, the design of the SRFCP was not historically based on assumed levee failures. For floods exceeding the design of the SRFCP, it is improbable to assume that no levees will fail, even in extreme floods that would cause vast lengths of levee overtopping throughout the system. Therefore, these floods have been modeled assuming that failure will occur when the water reaches the top of the levee. However, in order to test the sensitivity of this approach, and in order to model a scenario that resembles the SRFCP's "no basin relies on another basin's failure for protection" tenet, a secondary "no levee failure" scenario has also been modeled. Under this scenario, it is assumed that SRFCP levees that do not currently meet the minimum freeboard requirements of the SRFCP are raised to meet the minimum levee standard and that levees, which are overtopped under any of the targeted flood conditions will not fail. The assumptions supporting these modeling scenarios are summarized in Table 1.

Table 1. Definition of Model Assumptions for Various Conditions			
Condition	**Top of Levee Assumption**	**Levee Failure Assumption**	**Reservoir Ops Assumption**
Existing	Existing top of levee grade April 2008	Levees fail when water reaches the top of the levee	Existing reservoirs and current (2008) operation criteria
Without Project	Same as Existing with the following changes. Federally authorized improvements to Folsom Dam are implemented and urban area levees outside the Natomas Basin are assumed to have levees at 200-year water surface + 3 feet of freeboard. NLIP levees same as Existing Condition.	Levees fail when water reaches the top of levee.	Same as Existing except Folsom Dam will be operated in accordance with the Joint Federal Project currently under construction
With Project	Same as Without Project except NLIP levees raised to design level	Same as Without Project	Same as Without Project
Without Project Sensitivity Analysis	Same as Without Project except that SRFCP levees with top elevations below SRFCP design standard are assumed to be raised to meet this standard	No levee failures	Same as Without Project
With Project Sensitivity Analysis	Same as With Project except that SRFCP levees with top elevations below SRFCP design standard are assumed to be raised to meet this standard	No levee failures	Same as Without Project

As noted above, the Without Project condition assumes that urban areas (outside the Natomas Basin) will be provided with 200-year protection. This is the most likely near term future condition of the levee system based on the information currently available. This condition is reasonable based on California voters November 2006 approval of a bond measure that would provide over $3 billion for urban levee improvements in the Central Valley. Additionally, in September 2007, the State Legislature enacted the Central Valley Flood Protection Act of 2008 (Act), Water Code Section 9600 et seq., which was signed into law by the governor in October 2007. The Act is based on the following findings:

- The Central Valley of California is experiencing unprecedented development, resulting in the conversion of historically agricultural lands and communities to densely populated residential and urban centers.

- The legislature recognizes that by their nature, levees, which are earthen embankments typically founded on fluvial deposits, cannot offer complete protection from flooding, but can decrease its frequency.

- The legislature recognizes that the level of flood protection afforded rural and agricultural lands by the original flood control system would not be adequate to protect those lands if

they are developed for urban uses, and that a dichotomous system of flood protection for urban and rural lands has developed through many years of practice.

- The legislature further recognizes that levees built to reclaim and protect agricultural land may be inadequate to protect urban development unless those levees are significantly improved.

- Cities and counties rely upon federal floodplain information when approving developments, but the information available is often out of date and the flood risk may be greater than that indicated using available federal information.

- The legislature recognizes that the current federal flood standard is not sufficient to protect urban and urbanizing areas within flood prone areas throughout the Central Valley.

(Statutes of 2007, Chapter 364, Section 9.)

Based on these findings, the Act embraces a new flood protection standard for urban areas (defined as "developed areas in which there are 10,000 residents or more") located in levee-protected floodplains in the Central Valley. This new "urban level of flood protection" is defined as "the level of protection that is necessary to withstand flooding that has a 1-in-200 chance of occurring in any given year using criteria consistent with, or developed by, the Department of Water Resources." (Statutes of 2007, Chapter 364 [adding Water Code Section 9602(i)]).

4. RESULTS OF MODELING ANALYSIS

The flood routings described herein indicate that under the Existing condition, all SRFCP levees would contain the SRFCP 1957 design flood profile. The 100-year flood would overtop some non-urban levees, but this flood would be contained by all urban levees under the Existing condition. The 200-year flood would generate multiple levee overtopping locations in several non-urban areas under both the Existing and Without Project conditions and along the Lower American River under the Existing condition. However, this flood would be effectively contained under both the Existing and Without Project conditions by all existing urban levees outside the American River basin, including the levees around the Natomas Basin. The 500-year flood would cause massive levee overtopping affecting all segments of the system under the Existing and Without Project conditions. Only West Sacramento and the Natomas Basin would avoid overtopping under these conditions with upstream levee failures. Table 2 provides a summary of these conditions.

Table 2. Levee Failure Summary (Number of Levee Failures)

Condition	Design Flood			
	SRFCP (1957)	100-year	200-year	500-year
Existing	0	3	26	62
Without Project	0	3	18	80
With Project	0	3	18	77

Tables 3, 4 and 5 summarize the maximum water surface elevations at several locations in and around the project area for the Existing, Without Project, and With Project conditions for the 100-year, 200-year and 500-year flood events, respectively.

Tables 6, 7 and 8 present the hydraulic impacts of the Project (Without Project to With Project change) from the sensitivity analyses.

Table 3. 100-year Maximum Water Surface Elevation Summary, Levees Fail When Water Reaches Top of Levee

Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NGVD29)			Change (ft)	
	Existing	Without Project	With Project	Existing to Without Project	Without Project to With Project
Sacramento River					
at Knight's Landing (90.22)	41.49	41.47	41.47	-0.02	0
at Fremont Weir, west end (84.75)	40.18	40.17	40.17	-0.01	0
at Natomas Cross Canal (79.21)	40.24	40.20	40.21	-0.04	+0.01
at I-5 (71.00)	35.82	35.73	35.73	-0.09	0
at Sacramento Bypass (63.82)	31.18	30.81	30.81	-0.37	0
at NEMDC (61.0)	31.68	31.30	31.30	-0.38	0
at I St. (59.695)	31.40	31.03	31.03	-0.37	0
at Freeport Bridge (46.432)	25.03	24.91	24.91	-0.12	0
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	40.36	40.38	40.39	+0.02	+0.01
Pleasant Grove Creek Canal					
at Sankey Rd. (3.65)	40.36	40.38	40.39	+0.02	+0.01
at Fifield Rd. (1.49)	40.44	40.46	40.47	+0.02	+0.01
at Howsley Rd. (0.40)	40.43	40.45	40.46	+0.02	+0.01
Natomas East Main Drainage Canal					
at Elverta Road (10.35)	28.24	28.24	28.24	0	0
at Elkhorn Blvd. (8.35)	28.02	28.02	28.02	0	0
at Main Ave. (6.09)	36.47	35.93	35.93	-0.54	0
at West El Camino Ave. (2.96)	34.65	33.80	33.80	-0.85	0
Feather River					
at Nicolaus Gage (8.00)	48.54	48.53	48.53	-0.01	0
Yolo Bypass					
at Woodland Gage (51.10)	32.62	32.60	32.60	-0.02	0
American River					
at H St. (6.471)	42.99	40.71	40.71	-2.28	0

Table 4. 200-year Maximum Water Surface Elevation Summary, Levees Fail When Water Reaches Top of Levee					
Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NGVD29)			Change (ft)	
	Existing	Without Project	With Project	Existing to Without Project	Without Project to With Project
Sacramento River					
at Knight's Landing (90.22)	41.69	41.69	41.69	0	0
at Fremont Weir, west end (84.75)	40.94	40.95	40.96	+0.01	+0.01
at Natomas Cross Canal (79.21)	41.00	41.00	41.00	0	0
at I-5 (71.00)	36.72	36.19	36.19	-0.53	0
at Sacramento Bypass (63.82)	34.42	32.30	32.30	-2.12	0
at NEMDC (61.0)	35.40	32.85	32.85	-2.55	0
at I St. (59.695)	35.13	32.57	32.57	-2.56	0
at Freeport Bridge (46.432)	28.01	26.03	26.03	-1.98	0
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	41.04	41.04	41.04	0	0
Pleasant Grove Creek Canal					
at Sankey Rd. (3.65)	41.03	41.04	41.05	+0.01	+0.01
at Fifield Rd. (1.49)	41.10	41.12	41.13	+0.02	+0.01
at Howsley Rd. (0.40)	41.07	41.07	41.08	0	+0.01
Natomas East Main Drainage Canal					
at Elverta Road (10.35)	30.21	30.25	30.29	+0.04	+0.04
at Elkhorn Blvd. (8.35)	29.50	29.56	29.62	+0.06	+0.06
at Main Ave. (6.09)	40.00	37.72	37.72	-2.28	0
at West El Camino Ave. (2.96)	39.03	36.05	36.05	-2.98	0
Feather River					
at Nicolaus Gage (8.00)	50.16	50.16	50.16	0	0
Yolo Bypass					
at Woodland Gage (51.10)	33.48	33.47	33.47	-0.01	0
American River					
at H St. (6.471)	46.51	44.25	44.25	-2.26	0

Table 5. 500-year Maximum Water Surface Elevation Summary, Levees Fail When Water Reaches Top of Levee

Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NGVD29)			Change (ft)	
	Existing	Without Project	With Project	Existing to Without Project	Without Project to With Project
Sacramento River					
at Knight's Landing (90.22)	41.60	41.64	41.64	+0.04	0
at Fremont Weir, west end (84.75)	40.79	40.85	40.85	+0.06	0
at Natomas Cross Canal (79.21)	40.86	40.86	40.86	0	0
at I-5 (71.00)	37.30	37.12	37.12	-0.18	0
at Sacramento Bypass (63.82)	35.30	35.06	35.06	-0.24	0
at NEMDC (61.0)	36.45	36.22	36.22	-0.23	0
at I St. (59.695)	36.16	35.93	35.93	-0.23	0
at Freeport Bridge (46.432)	28.55	28.40	28.40	-0.15	0
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	41.25	41.37	41.38	+0.12	+0.01
Pleasant Grove Creek Canal					
at Sankey Rd. (3.65)	41.75	41.80	41.82	+0.05	+0.02
at Fifield Rd. (1.49)	41.77	41.85	41.86	+0.08	+0.01
at Howsley Rd. (0.40)	41.49	41.65	41.66	+0.16	+0.01
Natomas East Main Drainage Canal					
at Elverta Road (10.35)	32.30	32.23	33.05	-0.07	+0.82 [1]
at Elkhorn Blvd. (8.35)	31.78	31.76	32.40	-0.02	+0.64 [1]
at Main Ave. (6.09)	41.04	41.12	41.12	+0.08	0
at West El Camino Ave. (2.96)	40.37	40.29	40.29	-0.08	0
Feather River					
At Nicolaus Gage (8.00)	50.12	50.12	50.12	0	0
Yolo Bypass					
At Woodland Gage (51.10)	33.25	33.53	33.53	+0.28	0
American River					
At H St. (6.471)	46.56	47.66	47.66	+1.10	0

[1] It should be noted that the computed 500-year "With Project" water surface elevations of 33.05 feet (NGVD29) at Elverta Road and 32.40 feet (NGVD29) at Elkhorn Blvd. are significantly lower than the SRFCP Design Flood Plane elevations of 36.9 feet (NGVD29) at Elverta Road and 36.8 feet (NGVD29) at Elkhorn Blvd. The with project water surface elevation is also significantly less than the elevation of 36.8 feet (NGVD29) that was experienced in the February 1986 flood at both of these locations. The water surface is lower as a result of construction of the Stormwater Pump Station north of Dry Creek. The NEMDC upstream of Elkhorn Blvd. is in Phase 4b and will be evaluated in more detail as part of a future EIS/EIR.

Table 6. 100-year Maximum Water Surface Elevation Summary, No Levee Failures (Sensitivity Analysis)			
Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NGVD29)		Change (ft.)
	Without Project	With Project	Without Project to With Project
Sacramento River			
at Knight's Landing (90.22)	42.10	42.10	0
at Fremont Weir, west end (84.75)	40.90	40.90	0
at Natomas Cross Canal (79.21)	41.45	41.45	0
at I-5 (71.00)	36.90	36.90	0
at Sacramento Bypass (63.82)	31.45	31.45	0
at NEMDC (61.0)	32.02	32.02	0
at I St. (59.695)	31.74	31.74	0
at Freeport Bridge (46.432)	25.54	25.54	0
Natomas Cross Canal			
u/s Hwy 99/70 (4.82)	41.50	41.50	0
Pleasant Grove Creek Canal			
at Sankey Rd. (3.65)	41.37	41.37	0
at Fifield Rd. (1.49)	41.50	41.50	0
at Howsley Rd. (0.40)	41.51	41.51	0
Natomas East Main Drainage Canal			
at Elverta Road (10.35)	31.20	31.21	+0.01
at Elkhorn Blvd. (8.35)	30.29	30.30	+0.01
at Main Ave. (6.09)	35.85	35.85	0
at West El Camino Ave. (2.96)	33.70	33.70	0
Feather River			
at Nicolaus Gage (8.00)	48.90	48.90	0
Yolo Bypass			
at Woodland Gage (51.10)	33.21	33.21	0
American River			
at H St. (6.471)	40.81	40.81	0

Table 7. 200-year Maximum Water Surface Elevation Summary, No Levee Failures (Sensitivity Analysis)			
Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NGVD29)		Change (ft.)
	Without Project	With Project	Without Project to With Project
Sacramento River			
at Knight's Landing (90.22)	43.39	43.39	0
at Fremont Weir, west end (84.75)	42.47	42.48	+0.01
at Natomas Cross Canal (79.21)	42.90	42.92	+0.02
at I-5 (71.00)	38.24	38.24	0
at Sacramento Bypass (63.82)	33.48	33.48	0
at NEMDC (61.0)	34.06	34.07	+0.01
at I St. (59.695)	33.78	33.78	0
at Freeport Bridge (46.432)	27.40	27.41	+0.01
Natomas Cross Canal			
u/s Hwy 99/70 (4.82)	42.92	42.94	+0.02
Pleasant Grove Creek Canal			
at Sankey Rd. (3.65)	42.66	42.67	+0.01
at Fifield Rd. (1.49)	42.90	42.91	+0.01
at Howsley Rd. (0.40)	42.92	42.94	+0.02
Natomas East Main Drainage Canal			
at Elverta Road (10.35)	35.10	35.49	+0.39
at Elkhorn Blvd. (8.35)	34.89	35.30	+0.41
at Main Ave. (6.09)	36.59	36.59	0
at West El Camino Ave. (2.96)	35.85	35.85	0
Feather River			
at Nicolaus Gage (8.00)	51.19	51.20	+0.01
Yolo Bypass			
at Woodland Gage (51.10)	34.56	34.57	+0.01
American River			
at H St. (6.471)	44.40	44.40	0

Table 8. 500-year Maximum Water Surface Elevation Summary, No Levee Failures (Sensitivity Analysis)			
Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NGVD29)		Change (ft.)
	Without Project	With Project	Without Project to With Project
Sacramento River			
at Knight's Landing (90.22)	44.27	44.31	+0.04
at Fremont Weir, west end (84.75)	43.79	43.85	+0.06
at Natomas Cross Canal (79.21)	43.68	43.85	+0.17
at I-5 (71.00)	39.76	39.85	+0.09
at Sacramento Bypass (63.82)	37.97	38.00	+0.03
at NEMDC (61.0)	37.97	38.00	+0.03
at I St. (59.695)	37.67	37.69	+0.02
at Freeport Bridge (46.432)	30.28	30.30	+0.02
Natomas Cross Canal			
u/s Hwy 99/70 (4.82)	43.45	43.71	+0.26
Pleasant Grove Creek Canal			
at Sankey Rd. (3.65)	43.25	43.42	+0.17
at Fifield Rd. (1.49)	43.50	43.71	+0.21
at Howsley Rd. (0.40)	43.48	43.73	+0.25
Natomas East Main Drainage Canal			
at Elverta Road (10.35)	40.36	41.72	+1.36
at Ellkhorn Blvd. (8.35)	40.35	41.71	+1.36
at Main Ave. (6.09)	43.76	43.77	+0.01
at West El Camino Ave. (2.96)	42.71	42.72	+0.01
Feather River			
at Nicolaus Gage (8.00)	53.45	53.47	+0.02
Yolo Bypass			
at Woodland Gage (51.10)	35.96	36.01	+0.05
American River			
at H St. (6.471)	49.16	49.17	+0.01

Computed water surface elevation profiles for each of the key flow conditions in the project area (Sacramento River channel downstream of the Fremont Weir) are shown in Figures 13 through 28. Figures 13 through 16 show the relationship between the 1957 design and the height of the levees for the Sacramento River, Natomas Cross Canal, PGCC and NEMDC, respectively. Figure 13 also shows the locations in which the non-urban Sacramento River west levee would be raised to meet the minimum freeboard requirements of the SRFCP 1957 design standard under the sensitivity analysis. Figures 17 through 20 show the profile of the current 100-year flood. Figures 21 through 24 show the profile of the 200-year design condition (no levee failure) flood. Figures 21 through 24 also show the likely 200-year water surface profile assuming

upstream levee failures in non-urban areas. Figure 21 shows that the current height of the Sacramento River east levee along the Natomas Basin is essentially at the same elevation as the 200-year (no levee failure) design water surface profile and considerably higher than the likely water surface profile assuming upstream levee failures. It also shows the extent to which the Sacramento River west levee across from Natomas would be overtopped in a 200-year flood. Figures 25 through 28 show the profiles for the 500-year flood with upstream levee failures. The 500-year (with levee failures) water surface elevation in the Sacramento River channel is lower throughout the most critical portion of this reach than the 200-year (no levee failure) design water surface elevation. As reflected in Figures 25 through 28, under the likely assumption that upstream levees will fail when water reaches the top of the levee, the water surface elevations around Natomas would be dramatically lower than the 200-year (no levee failure) profile that was used for design of NLIP. This 200-year levee design condition thus represents a worst-case scenario for the Sacramento River and the Natomas Cross Canal, and underscores the high degree of protection against Natomas Basin levee overtopping that would be provided by the design of the NLIP improvements.

Under the sensitivity analysis of the 500-year (no levee failure) flood, the maximum water surface elevation change on the Sacramento River between the Without Project and With Project conditions, as shown in Table 8, is 0.17 feet. The maximum water surface change in the NCC is 0.26. However, even these relatively minor impacts are considered extremely implausible, given that over 80 miles of upstream and adjacent levees could be overtopped (see Table 9) by this flood without any levee failures occurring.

Table 9. Extent of Levee Overtopping, 500-year Flood Event, No Failures (all values approximate)

River	Leveed Length (miles)	Left Bank		Right Bank	
		Length of Overtopped Levee (miles)	Max. Depth of Overtopping (ft.)	Length of Overtopped Levee (miles)	Max. Depth of Overtopping (ft.)
American River	13	7	4	12	3
Feather River	50	14	3	13	3
Natomas Cross Canal	5	4	1	3.5	2.5
Sacramento Bypass	1.7	0.5	0.5	0.2	0.5
Sacramento R. upstream of Natomas Cross Canal	90	13	4	7	3
Sacramento R. Adjacent to Natomas	18	8	1	6	3
Sacramento R. downstream of American R.	60	2	2	2	2
Sutter Bypass	30	4	4	7	4
Tisdale Bypass	4	0.5	0.5	0.5	1
Wadsworth Canal	4	4	1	4	2
Yolo Bypass	37	5	2.5	2	2

5. SUPPORT OF IMPACT ANALYSIS METHODOLOGY

California Legislature

Consistent with its approval of a new more rigorous standard for urban flood protection, the State Legislature also approved "the project features necessary to provide a 200-year level of flood protection along the American and Sacramento Rivers and within the Natomas Basin as described in the final engineer's report dated April 19, 2007, adopted by the Sacramento Area Flood Control Agency." (Statutes of 2007, Chapter 641 [amending Water Code Section 12670.14(b)]). Moreover, in connection with this approval, the legislature adopted the following findings and declarations (Statutes of 2007, Chapter 641, Section 1[k]):

> *As evidenced by the environmental impact reports certified in connection with these projects, including the hydrology and hydraulics impact analysis set forth in the environmental impact report prepared by the Sacramento Area Flood Control Agency with regard to local funding mechanisms for comprehensive flood control improvements for the Sacramento area dated February 2007, the increase in flood protection associated with improving the American and Sacramento River levees and modifying Folsom Dam will be accomplished without altering or otherwise impairing the design flows and water surface elevations prescribed as part of the Sacramento River Flood Control Project. Accordingly, these improvements will not result in significant adverse hydraulic impacts to the lands protected by the Sacramento River Flood Control Project. Thus, it is not necessary or appropriate to require these projects to include hydraulic mitigation.*
>
> *The projects authorized in Section 12670.14 of the Water Code will increase the ability of the existing flood control system in the lower Sacramento Valley to protect heavily urbanized areas within the City of Sacramento and the Counties of Sacramento and Sutter against very rare floods without altering the design flows and water surface elevations prescribed as part of the Sacramento River Flood Control Project or impairing the capacity of other segments of the Sacramento River Flood Control Project to contain these design flows and to maintain water surface elevations. Accordingly, the projects authorized in that section will not result in significant adverse hydraulic impacts to the lands protected by the Sacramento River Flood Control Project and neither the Reclamation Board nor any other state agency shall require the authorized projects to include hydraulic mitigation for these protected lands.*

Although these findings are not legally binding, they indicate the legislature's concurrence with SAFCA's approach to analyzing hydraulic impacts. Congressional authorization for raising and strengthening a twelve-mile reach of the Sacramento River east levee in the 1996 Water Resources Development Act ("WRDA"), and for raising and strengthening all five-plus miles of the NCC south levee in the 1999 WRDA without in either case requiring hydraulic mitigation, offers additional indirect legislative support for SAFCA's approach.

USACE HQ

USACE has been using a risk-based analysis for economic evaluation for some time and has been moving to a risk-based analysis for system performance, largely for certification of levees for FEMA. However, in his memo dated *August 2, 2007, Subject: Section 408 Approval of a Flood Control Project Alteration - Sacramento River Flood Control Project, Feather and Yuba Rivers, California* (copy enclosed), Deputy Director of Civil Works Steven L. Stockton indicated that the discussion of flood protection in terms such as 100-year or 200-year level of protection is acceptable to comply with NEPA and other environmental statues. However, a risk-based analysis as required by ER 1105-2-100 and ER 1105-2-101 will be needed to determine the terms of any eventual Section 104 reimbursement.

6. NLIP COORDINATION WITH REGIONAL IMPROVEMENTS

SAFCA's approach to providing an urban standard of flood protection to the Natomas Basin is being replicated in the other urbanizing sub-basins in the lower Sacramento Valley (West Sacramento, Marysville extending south to Reclamation District 784, and Yuba City). However, these improvements are intended to complement rather than substitute for pursuing improvements on a regional scale that would improve the flow of water through the Yolo and Sacramento Bypass systems and lower water surface elevations throughout the lower Sacramento Valley. In 2002 through 2003, SAFCA made substantial investments in hydraulic studies and analyses of the improvements that would be required to move more flood water into and through the Yolo Bypass during large flood events in the Sacramento-Feather River watershed to reduce flows and water surface elevations in the Sacramento River channel downstream of the Fremont weir. The Lower Sacramento River Regional Project Initial Report (SAFCA 2003) indicated that this could be accomplished by widening the Fremont weir, setting back the levees on the east side of the Yolo Bypass, discharging flood flows into the Sacramento Deep Water Ship Channel, and eliminating low, restricted elevation levees at the lower end of the Yolo Bypass. However, these improvements would be extremely costly and time consuming to implement; they would occur entirely outside SAFCA's jurisdiction, and would require extraordinary cooperation among affected federal, state, and local interests; and they would not resolve the seepage problems affecting the Sacramento River east levee and the Natomas Cross Canal south levee adjacent to the Natomas Basin. For these reasons, SAFCA concluded that this alternative would not achieve the objectives of the NLIP; and therefore, it was not carried forward for further analysis.

On a long-term basis; however, regionally oriented improvements to the Yolo and Sacramento Bypass systems may help to address potential changes in hydrology due to climate change and may reduce the risk of uncontrolled flooding on a system-wide basis. Although this flooding is most likely to occur in lightly populated agricultural areas, reducing its frequency by increasing the conveyance capacity of the SRFCP would avoid the cost of repairing and reconstructing damaged levees and other public infrastructure and would increase public support for the "dichotomous system of flood protection for urban and rural lands" that exists in the Sacramento Valley. Early implementation of the NLIP, as well as early implementation of proposed improvements to SRFCP levees protecting other urban areas, would not preclude any of the alternatives contemplated for the update of the Central Valley Flood Protection Plan.

7. CONCLUSION

Raising and strengthening portions the federal project levee system protecting the Natomas Basin in Sacramento and Sutter Counties as proposed by SAFCA would not result in any significant, adverse hydraulic impacts to other sub-basins protected as part of the SRFCP. Furthermore, these improvements would be consistent with the principles that have guided the management of the SRFCP over the past century and with the policies adopted by the State Legislature calling for an immediate and comprehensive effort to increase the level of flood protection provided to Sacramento and the other urban areas within the SRFCP. The NLIP improvements would also be consistent with the direction given by Congress when it approved raising and strengthening 12 miles of the Sacramento River east levee (WRDA 1996) and 5.3 miles of the Natomas Cross Canal south levee (WRDA 1999).

Figure 1. Sacramento River Flood Control System Map

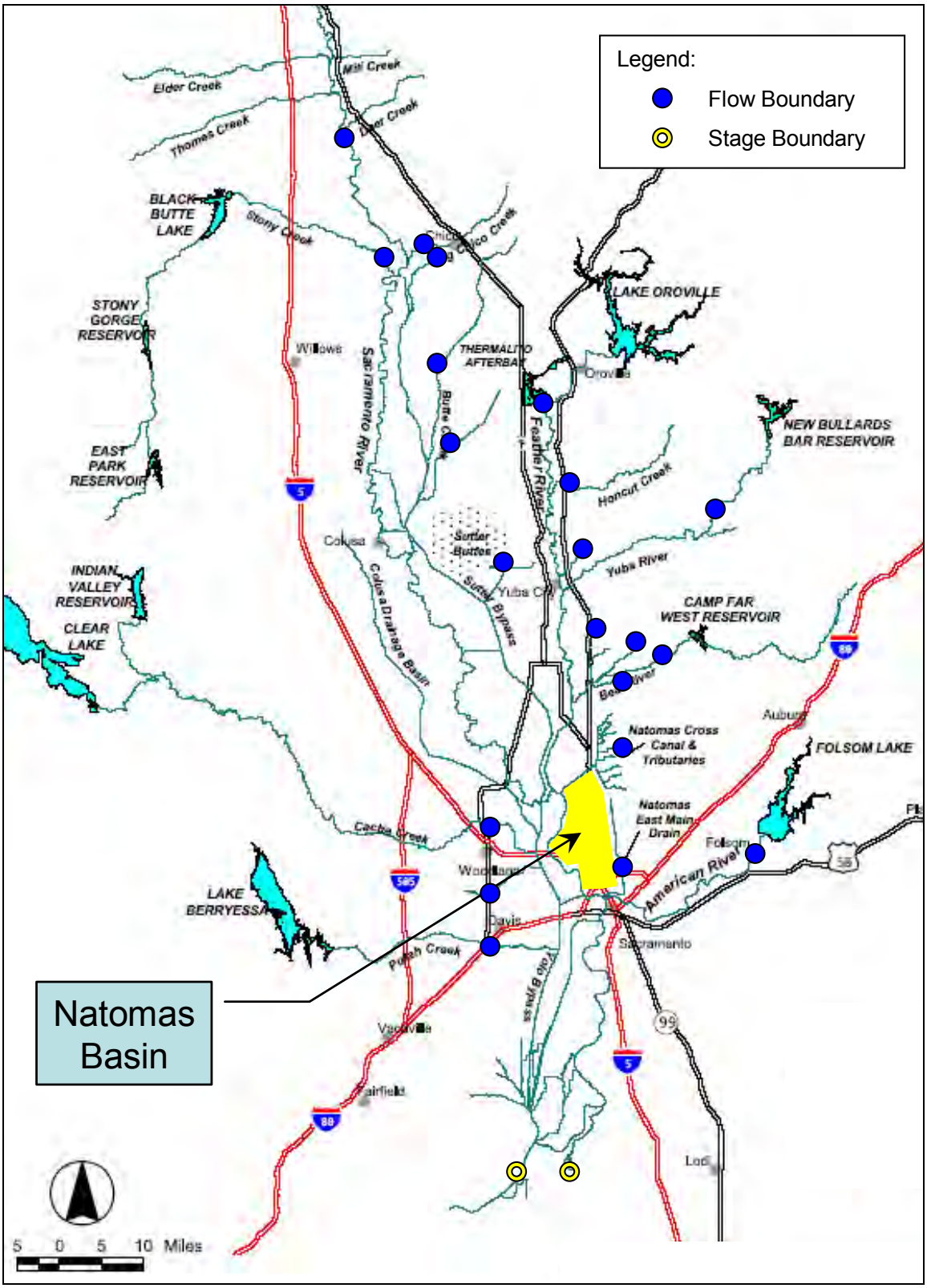


Figure 2. Sacramento River UNET Model Extents

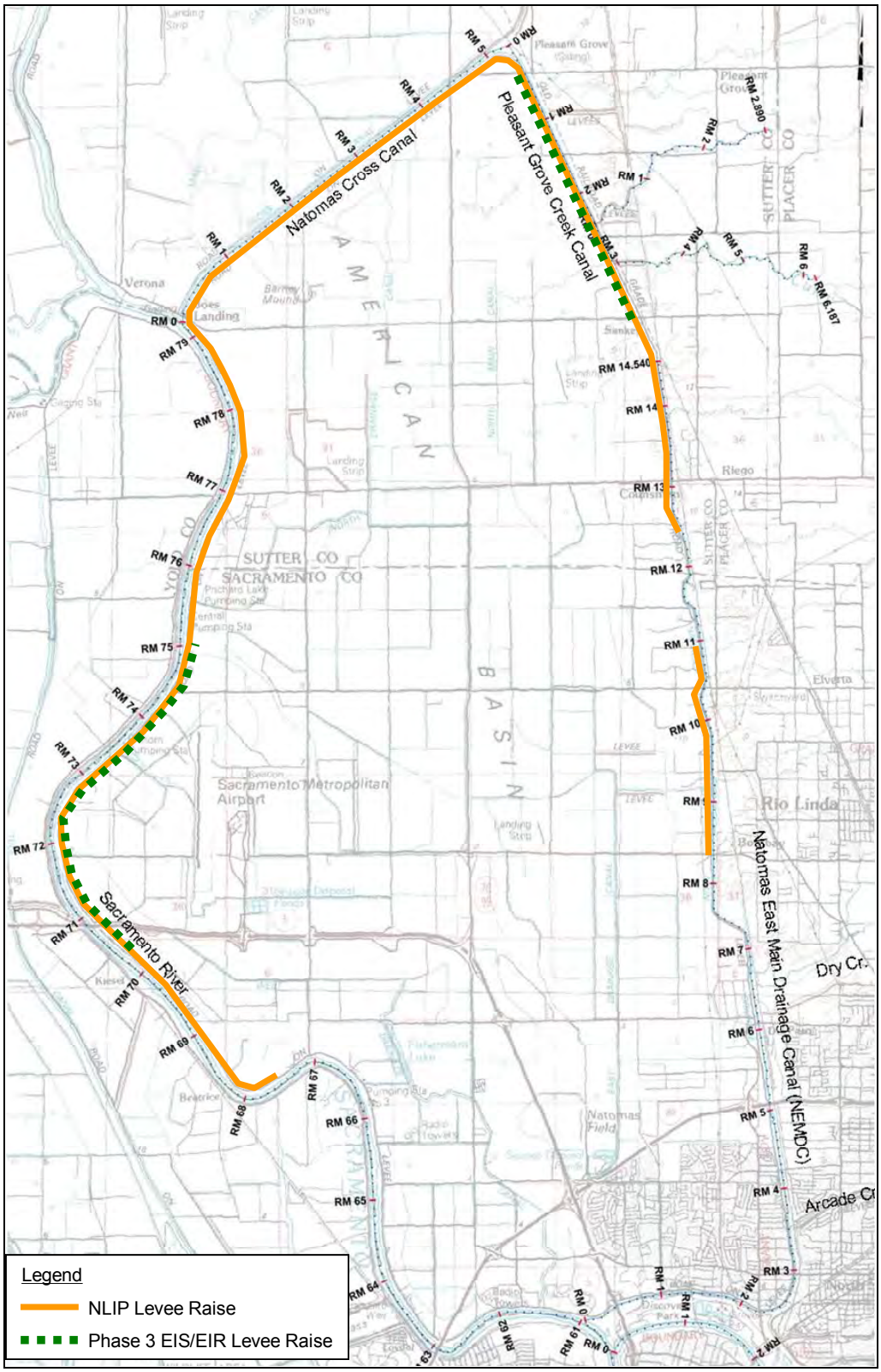


Figure 3. Natomas Levee Improvement Program Study Area

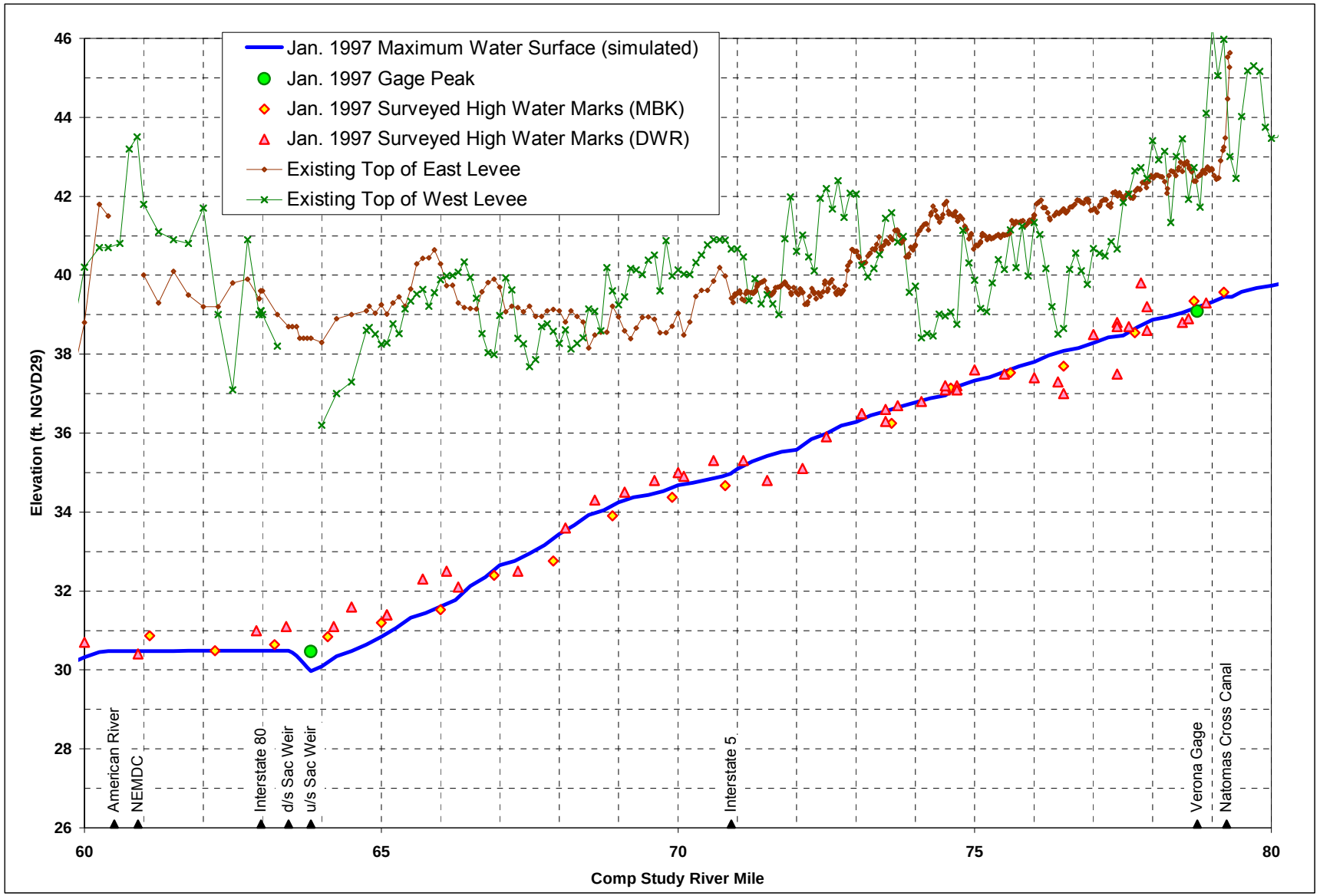


Figure 4. Model Calibration – Sacramento River Profile

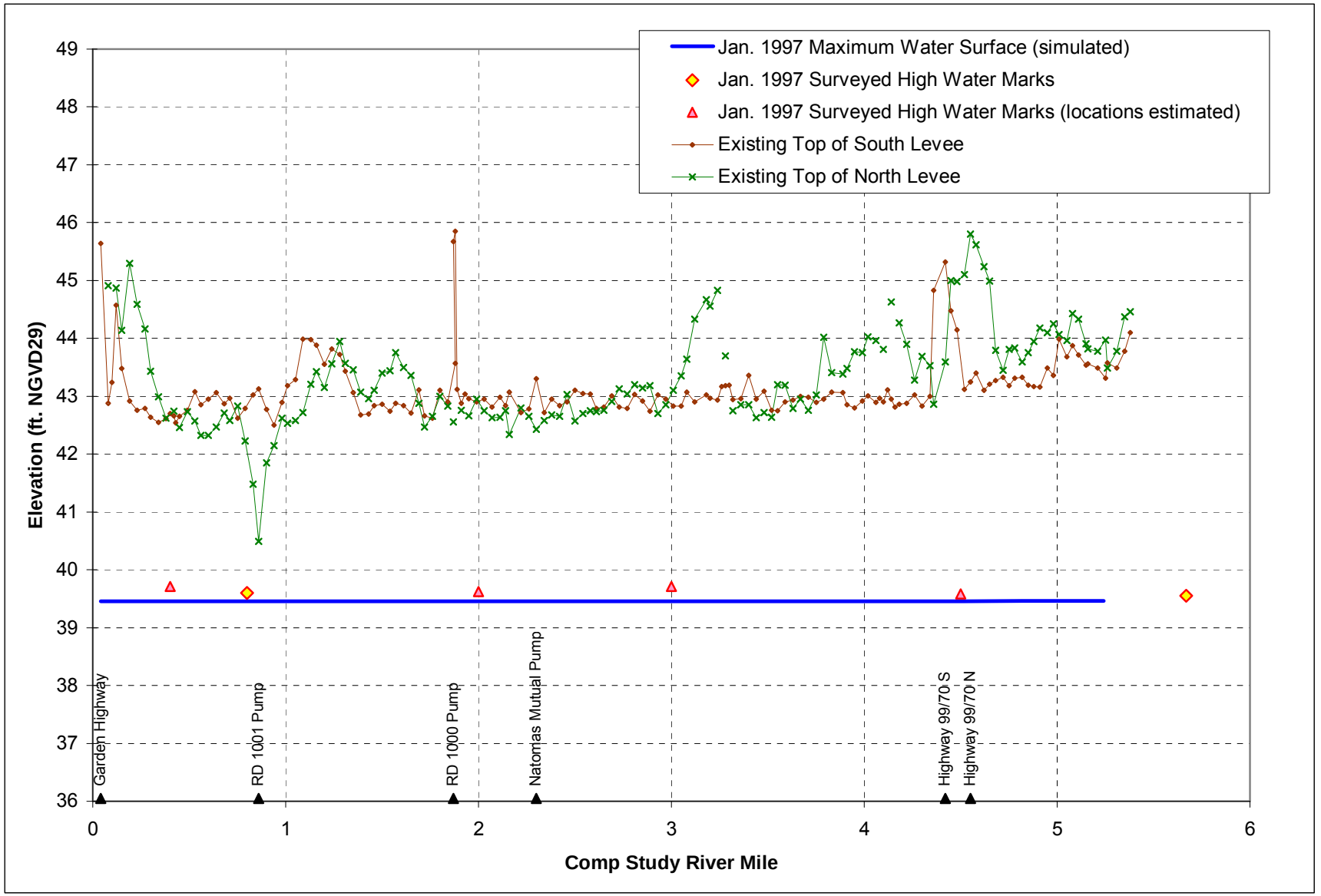


Figure 5. Model Calibration – Natomas Cross Canal Profile

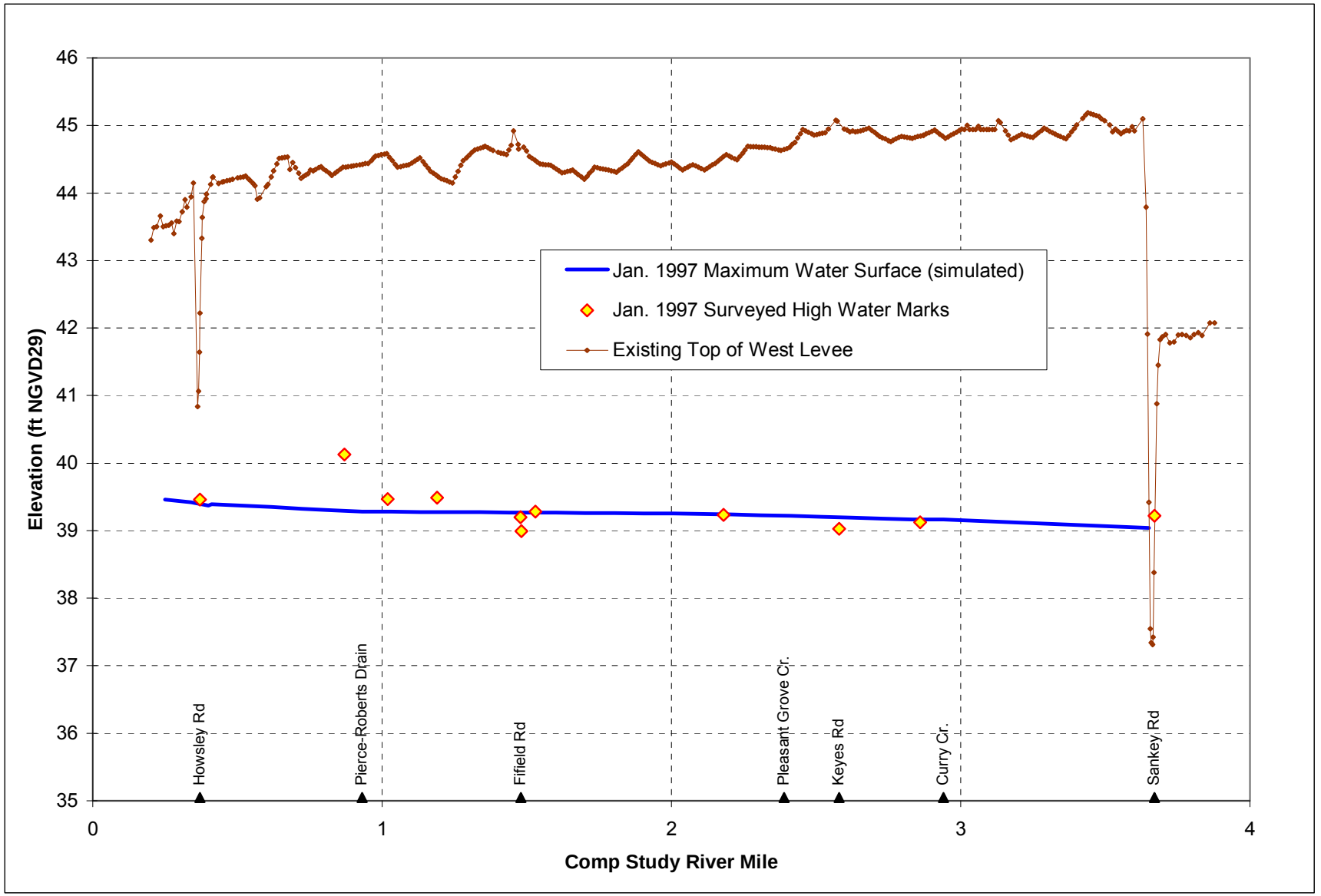


Figure 6. Model Calibration – Pleasant Grove Creek Canal Profile

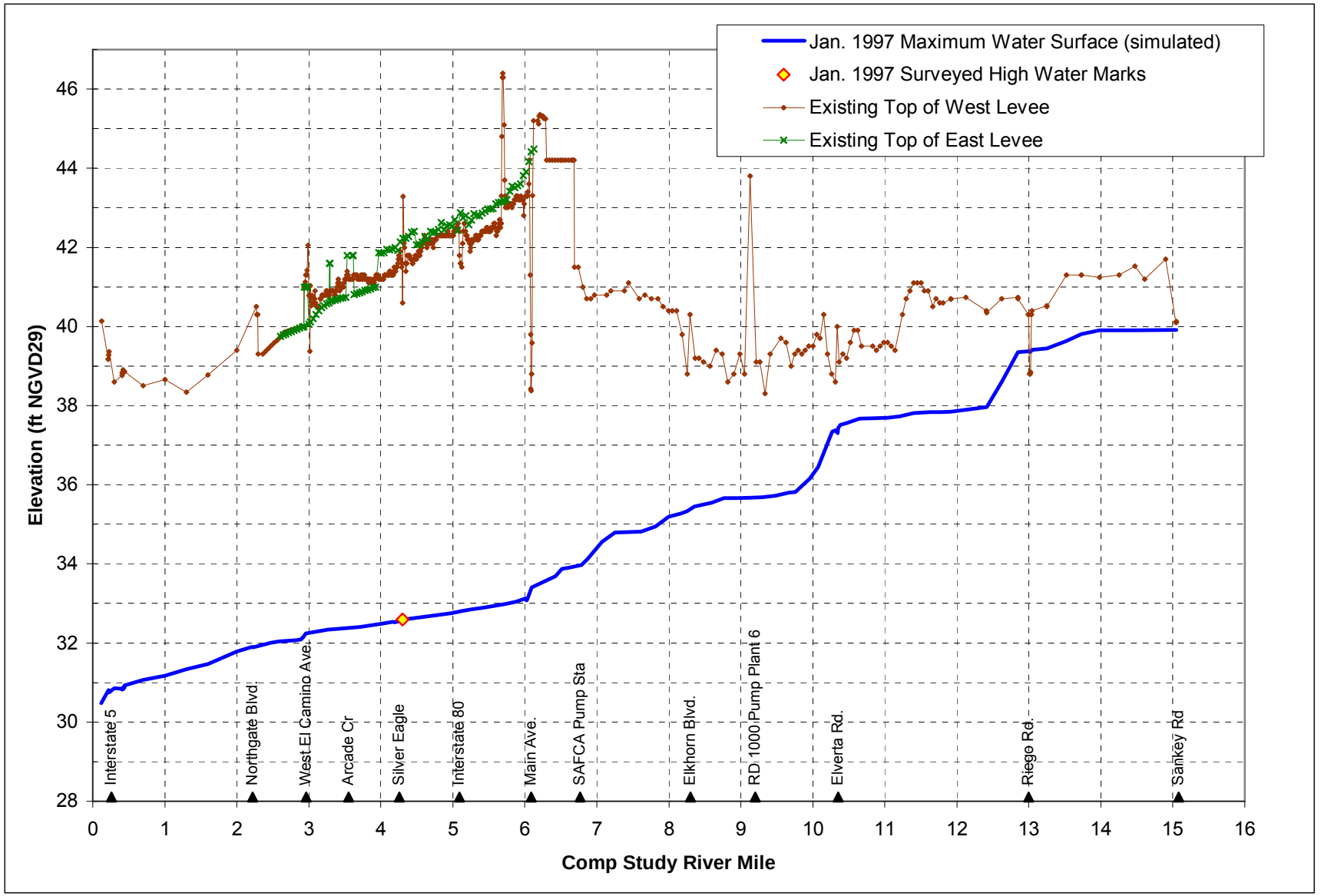


Figure 7. Model Calibration – NEMDC Profile

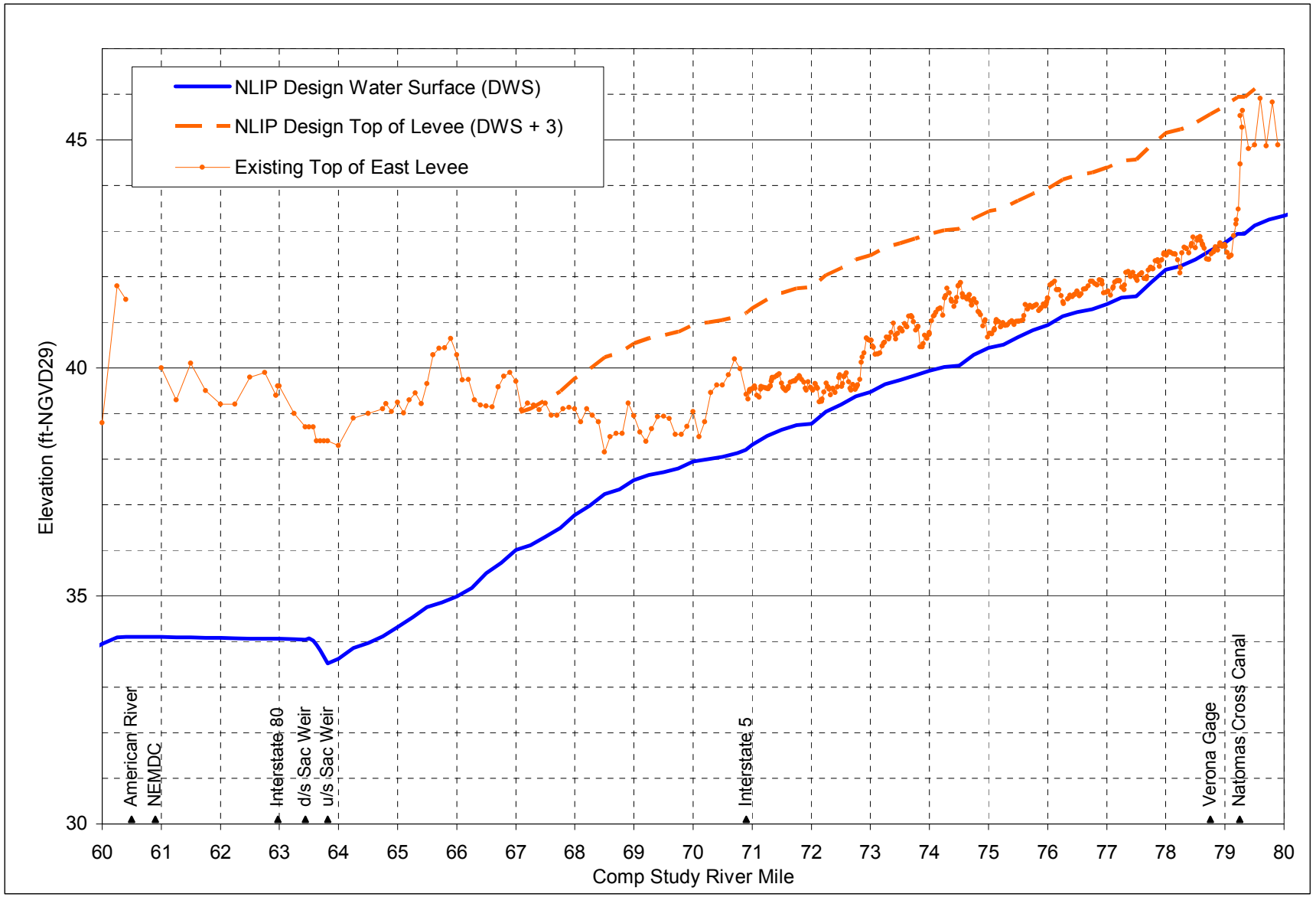


Figure 8. NLIP Design Top of Levee Profile – Sacramento River

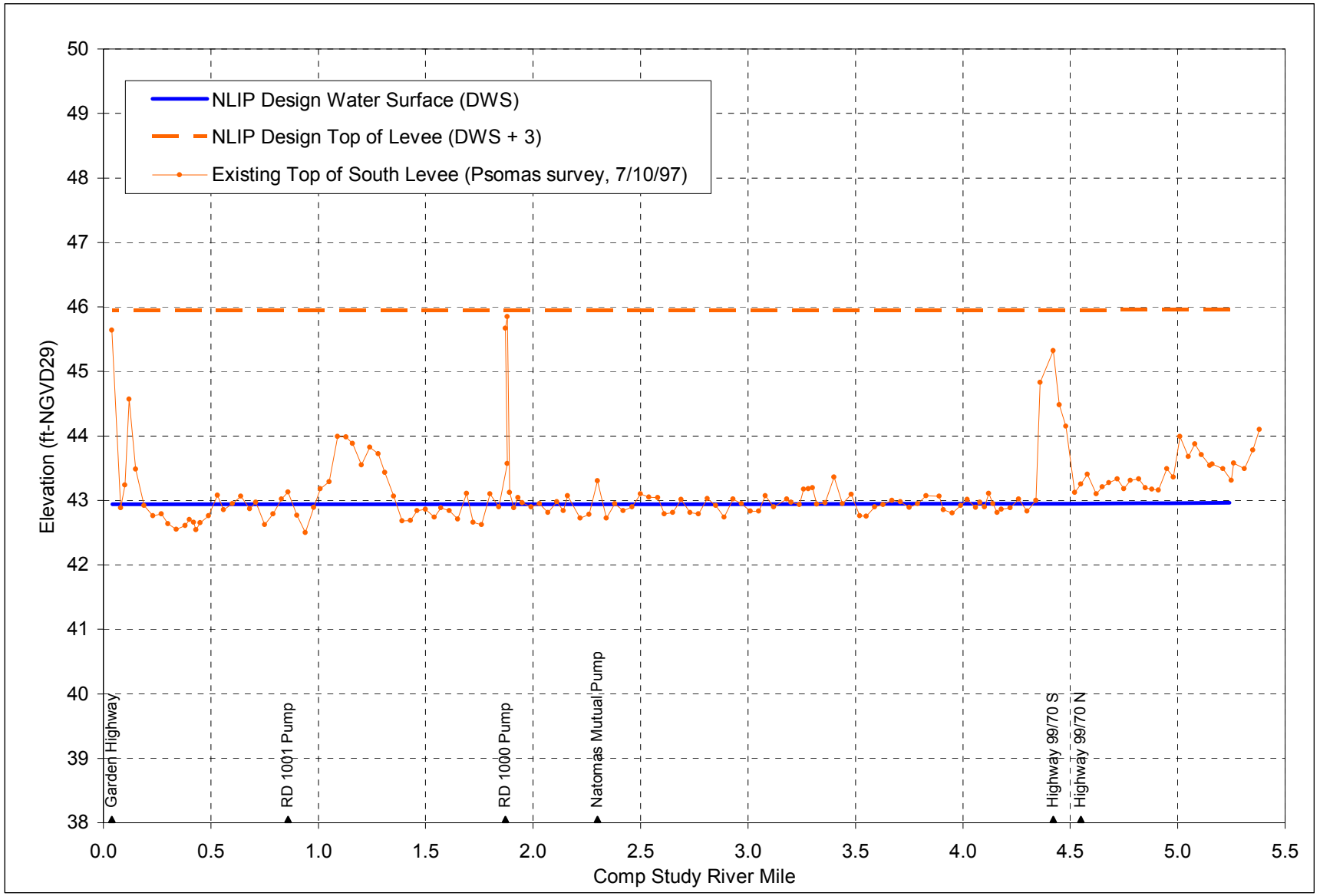


Figure 9. NLIP Design Top of Levee Profile – Natomas Cross Canal

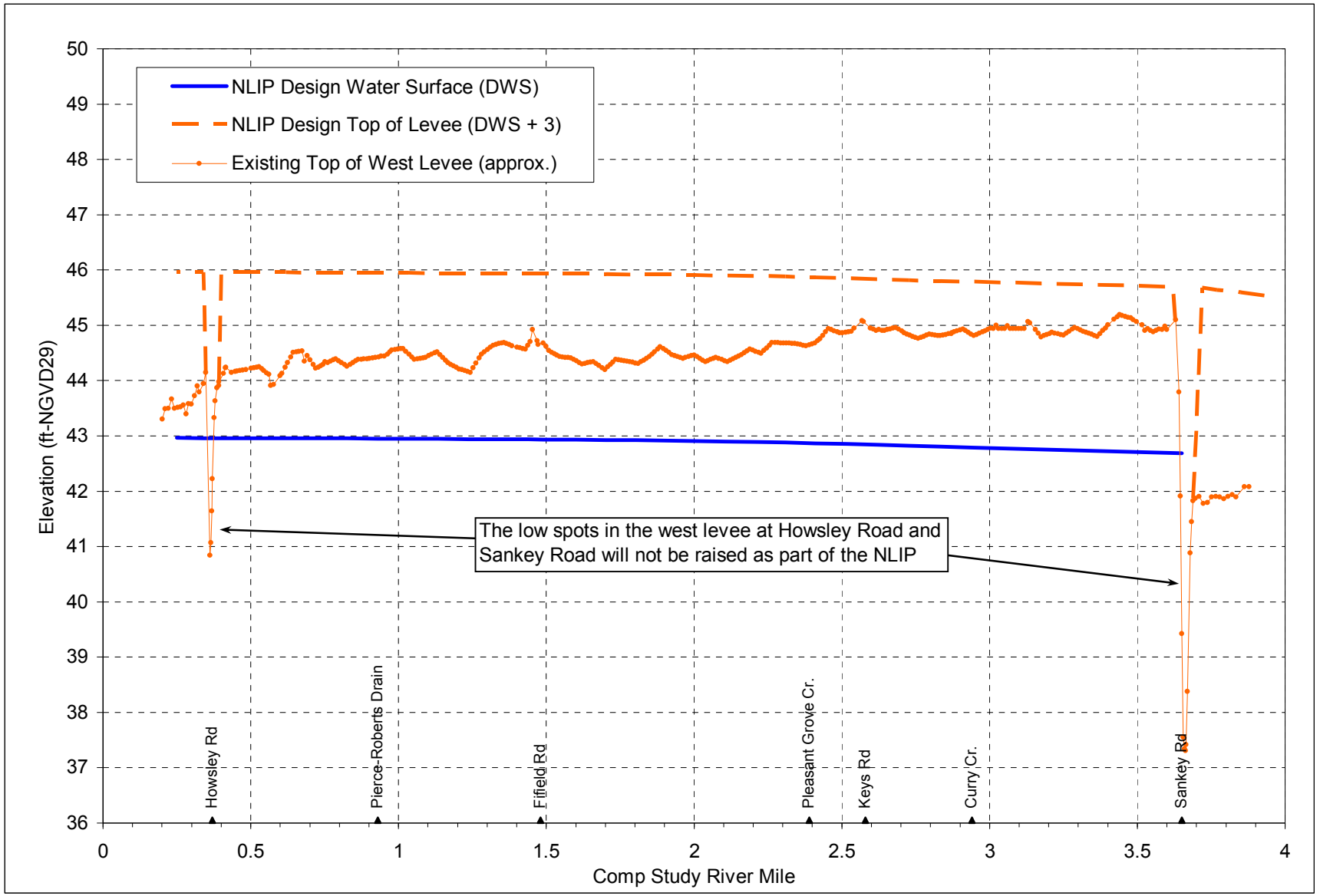


Figure 10. NLIP Design Top of Levee Profile – Pleasant Grove Creek Canal

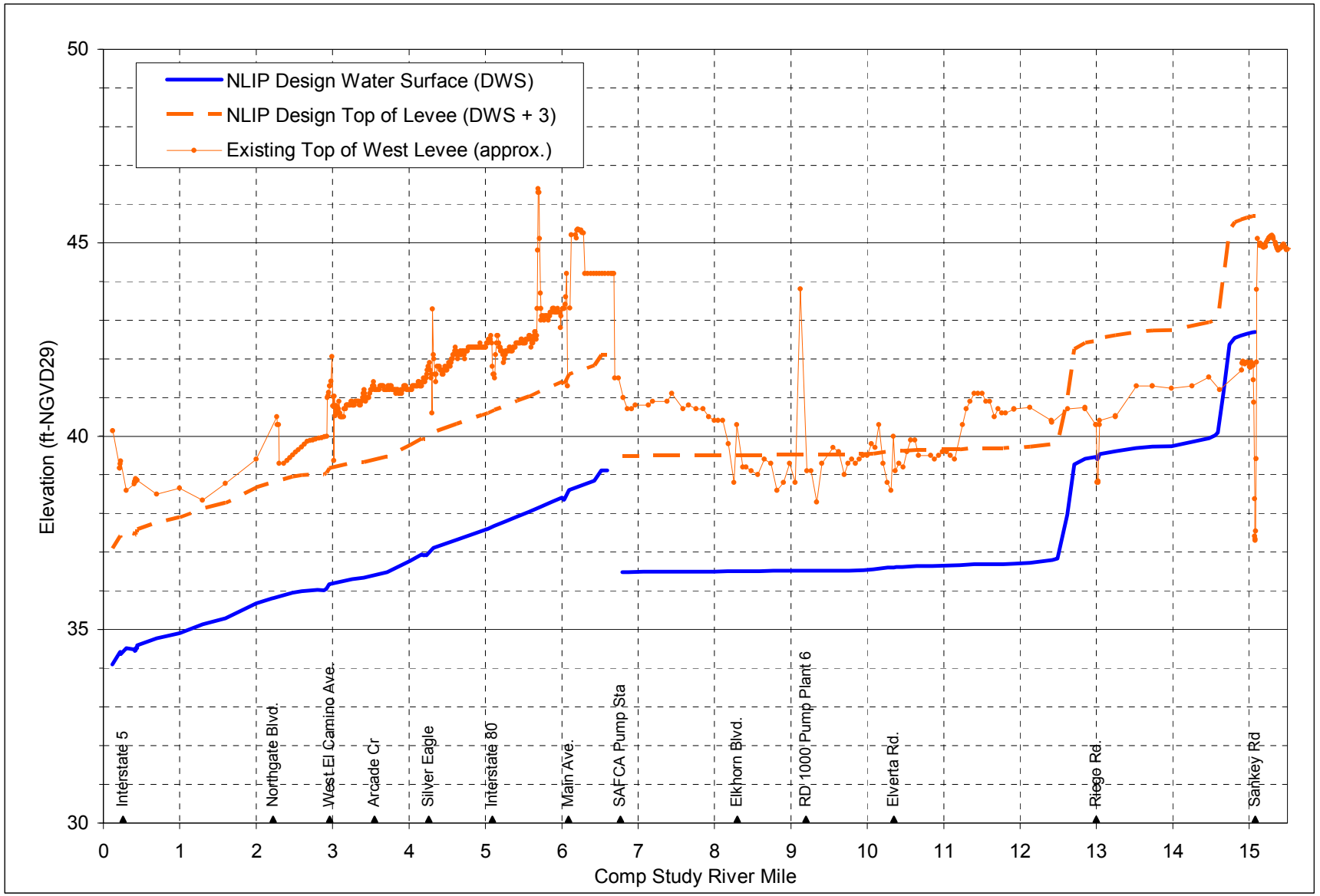


Figure 11. NLIP Design Top of Levee Profile – NEMDC

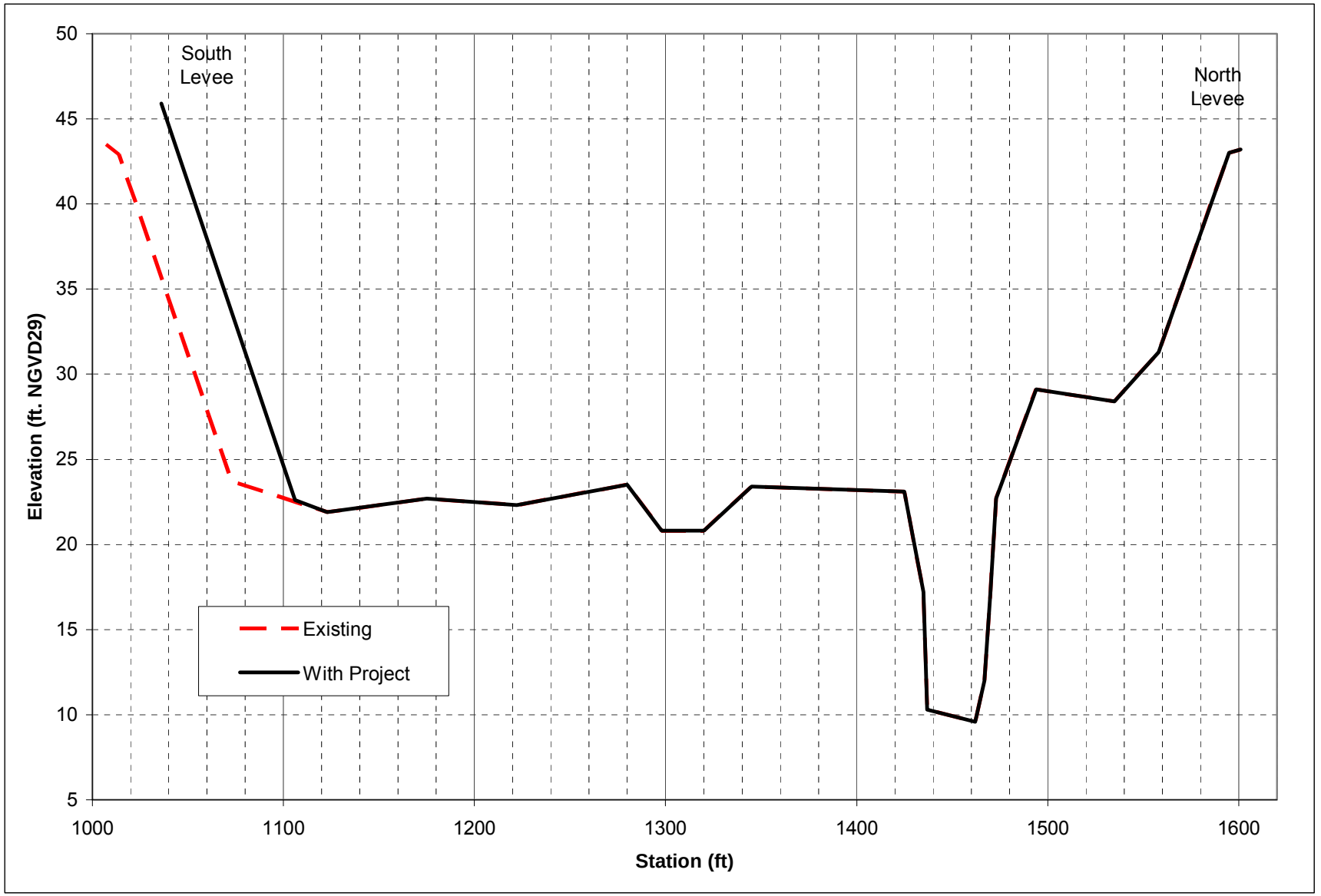


Figure 12. Typical Natomas Cross Canal Section with Waterside Fill

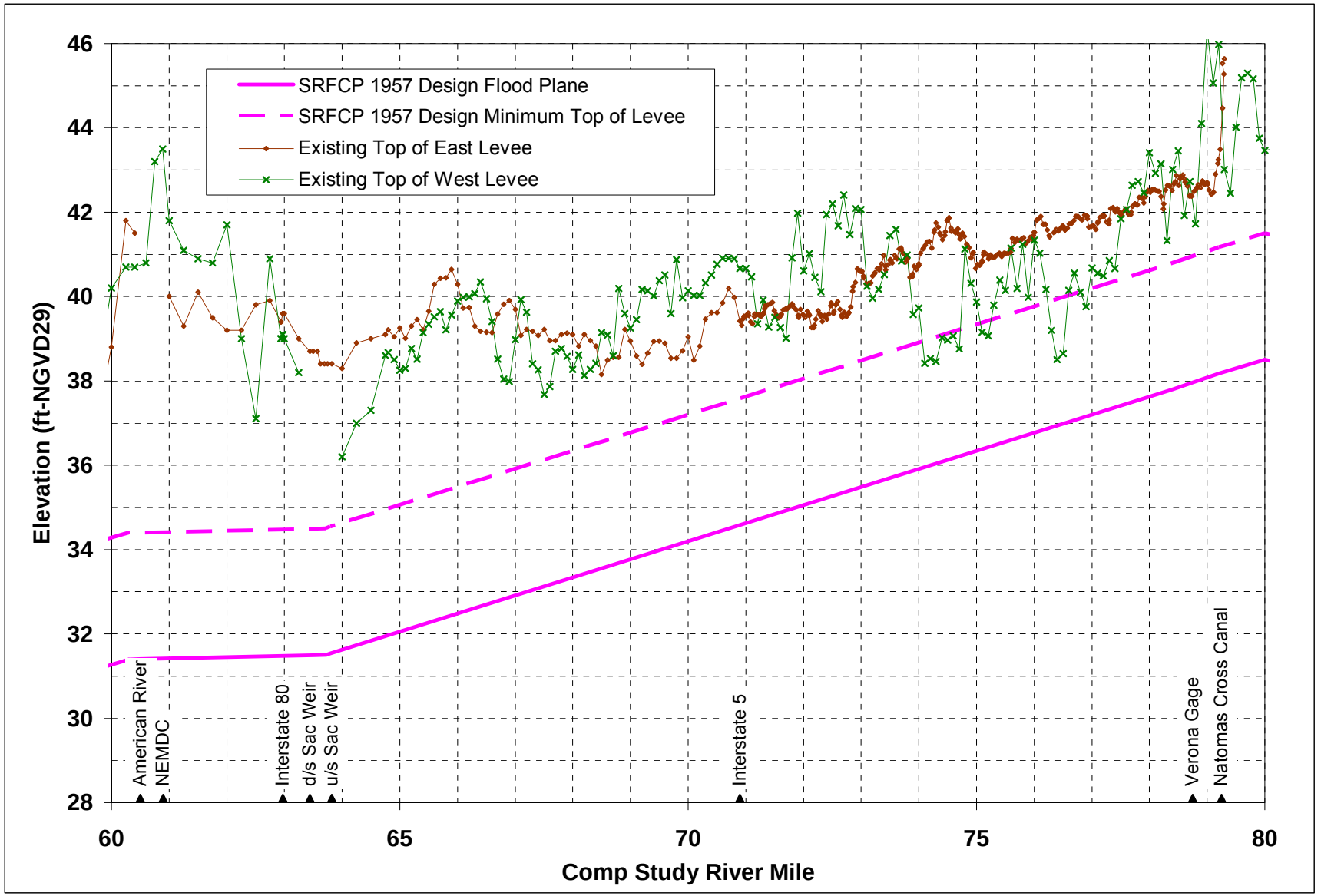


Figure 13. SRFCP 1957 Design Profile, Sacramento River Natomas Reach

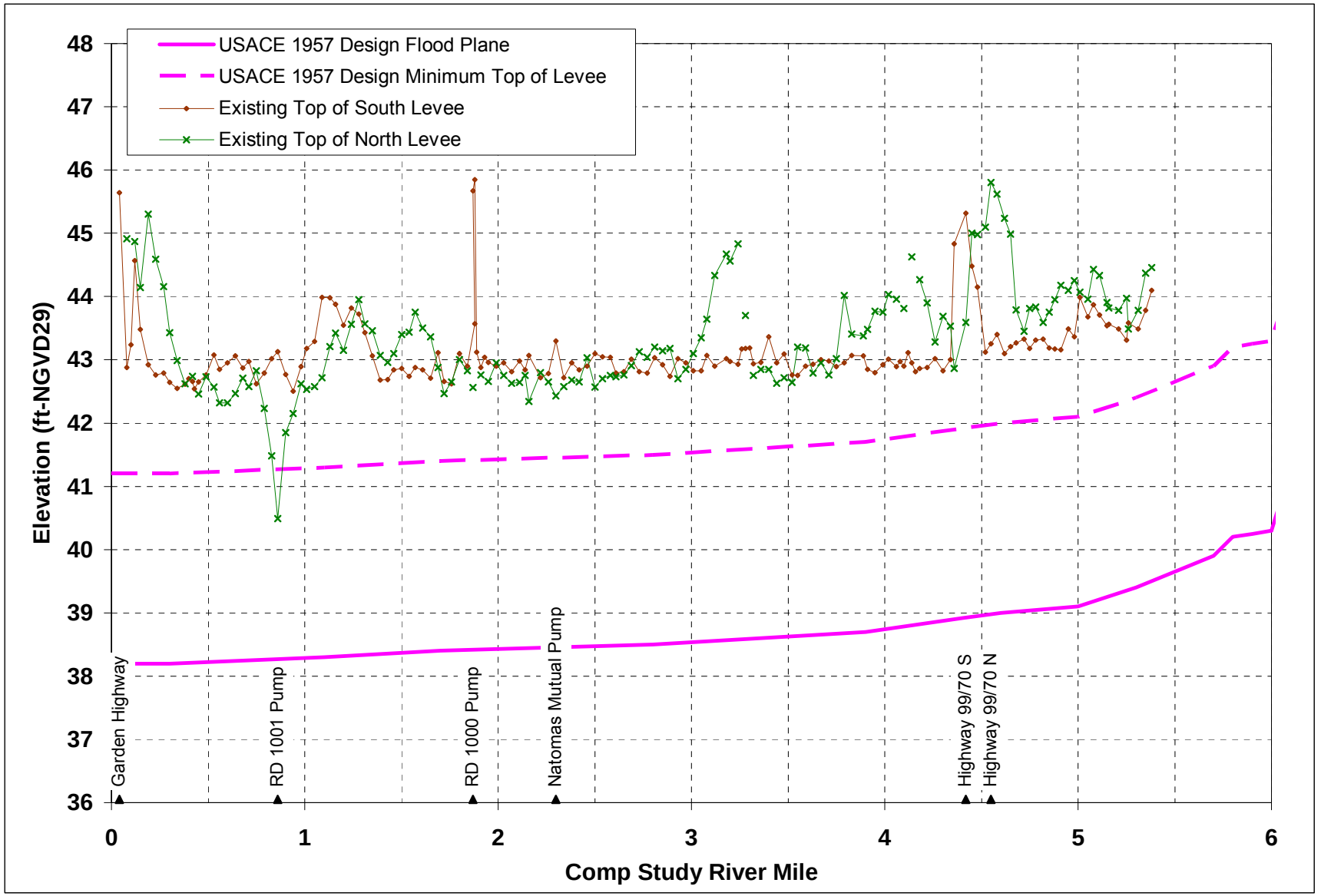


Figure 14. SRFCP 1957 Design Profile, Natomas Cross Canal

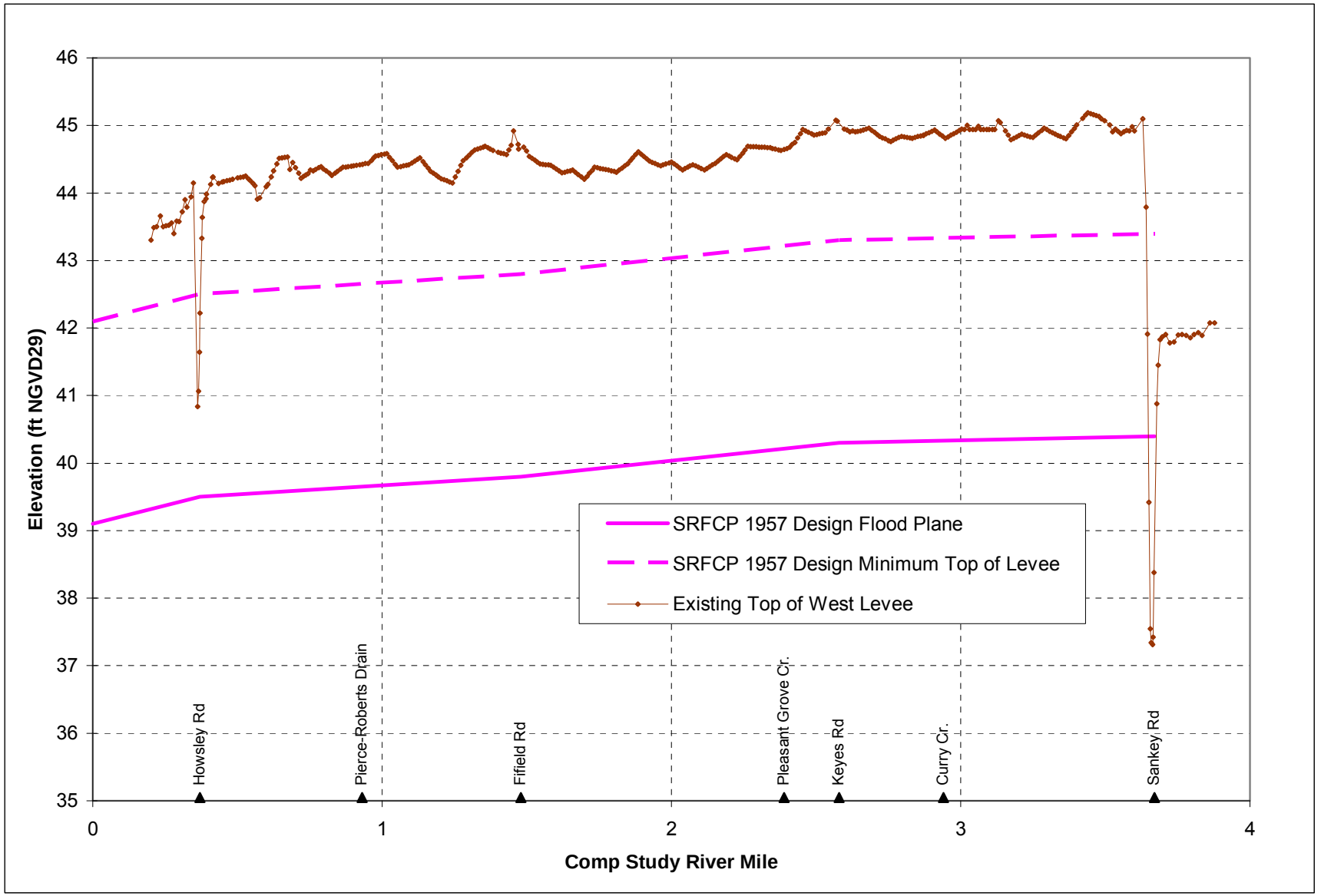


Figure 15. SRFCP 1957 Design Profile, Pleasant Grove Creek Canal

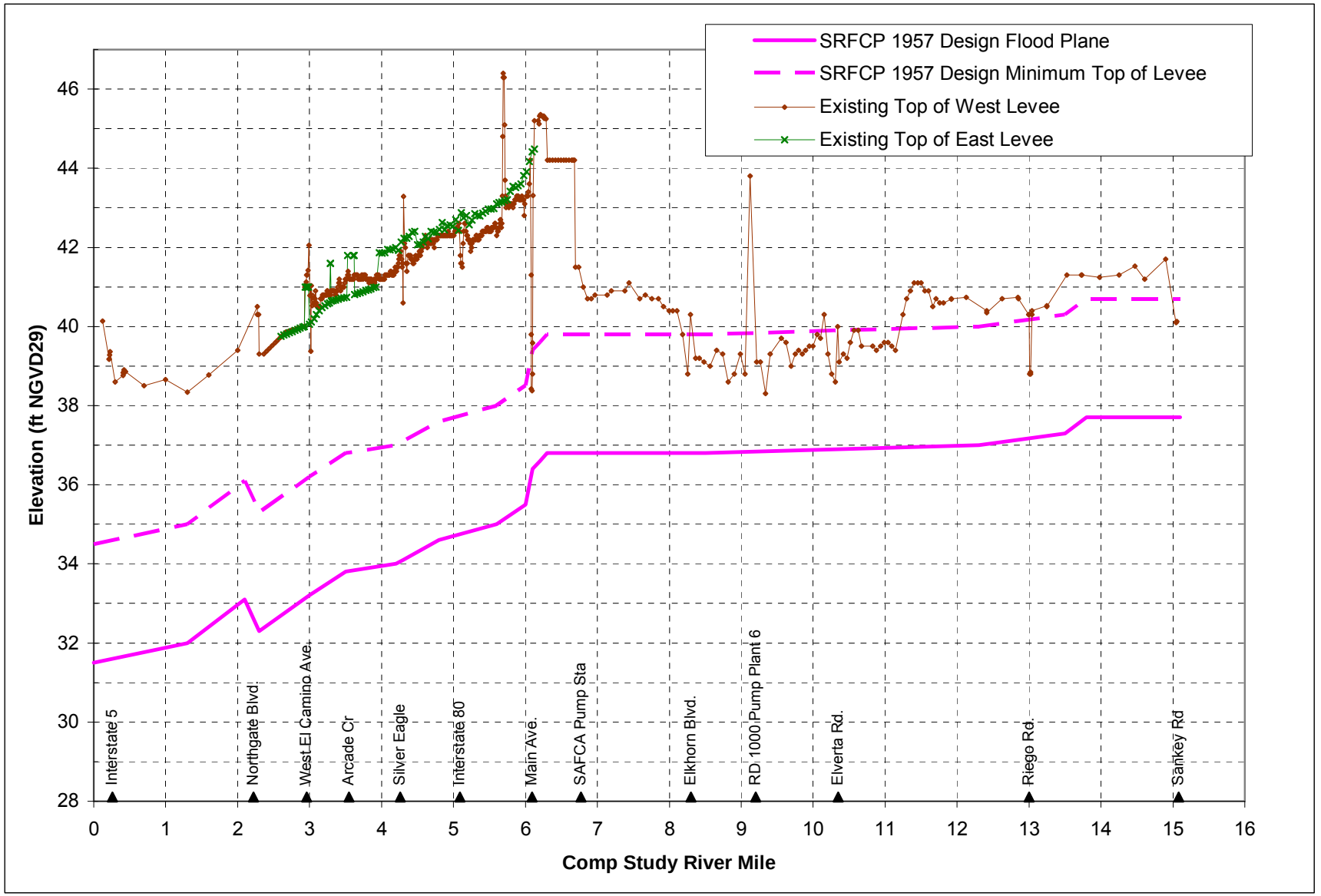


Figure 16. SRFCP 1957 Design Profile, NEMDC

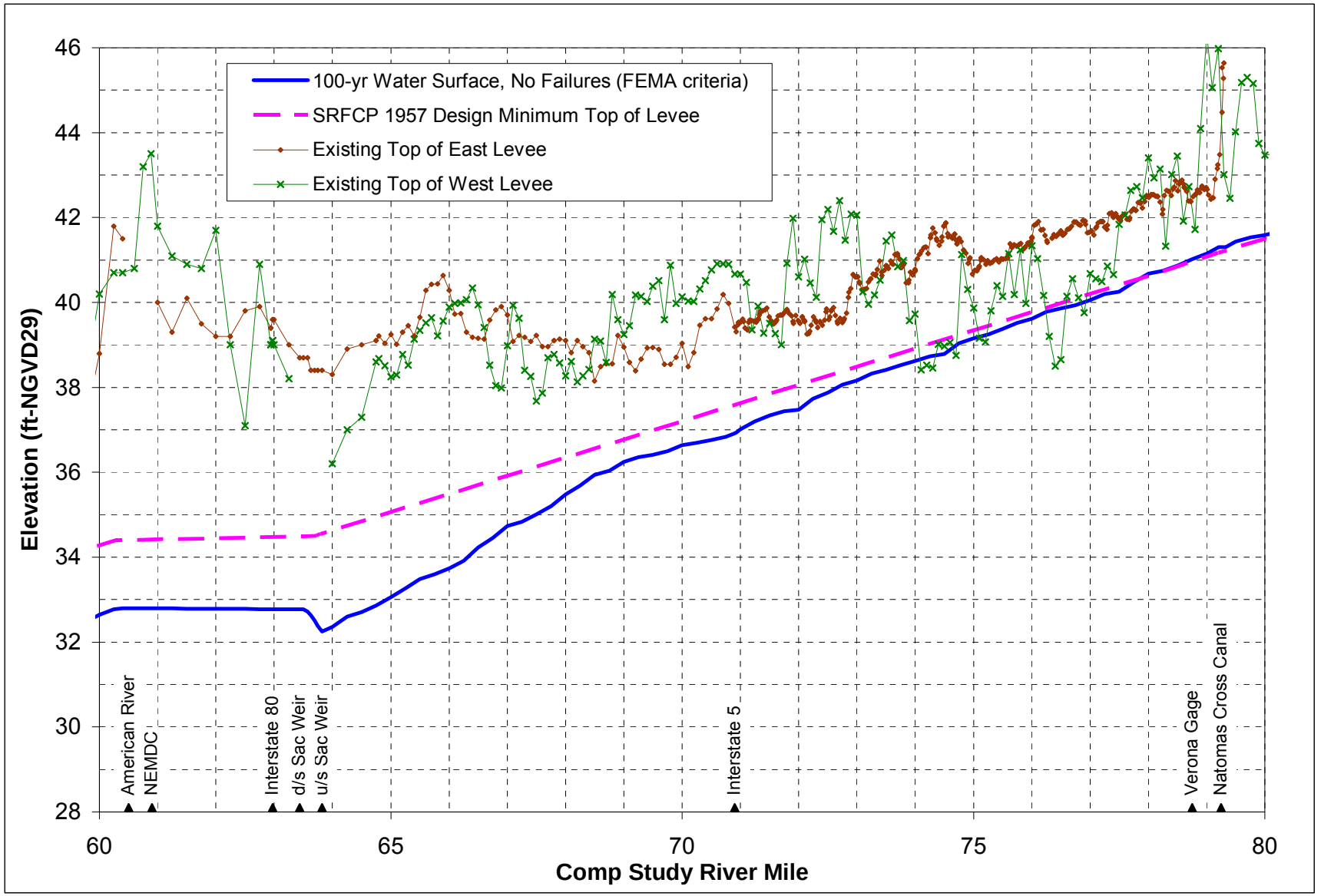


Figure 17. 100-year Water Surface Profile – Sacramento River Natomas Reach

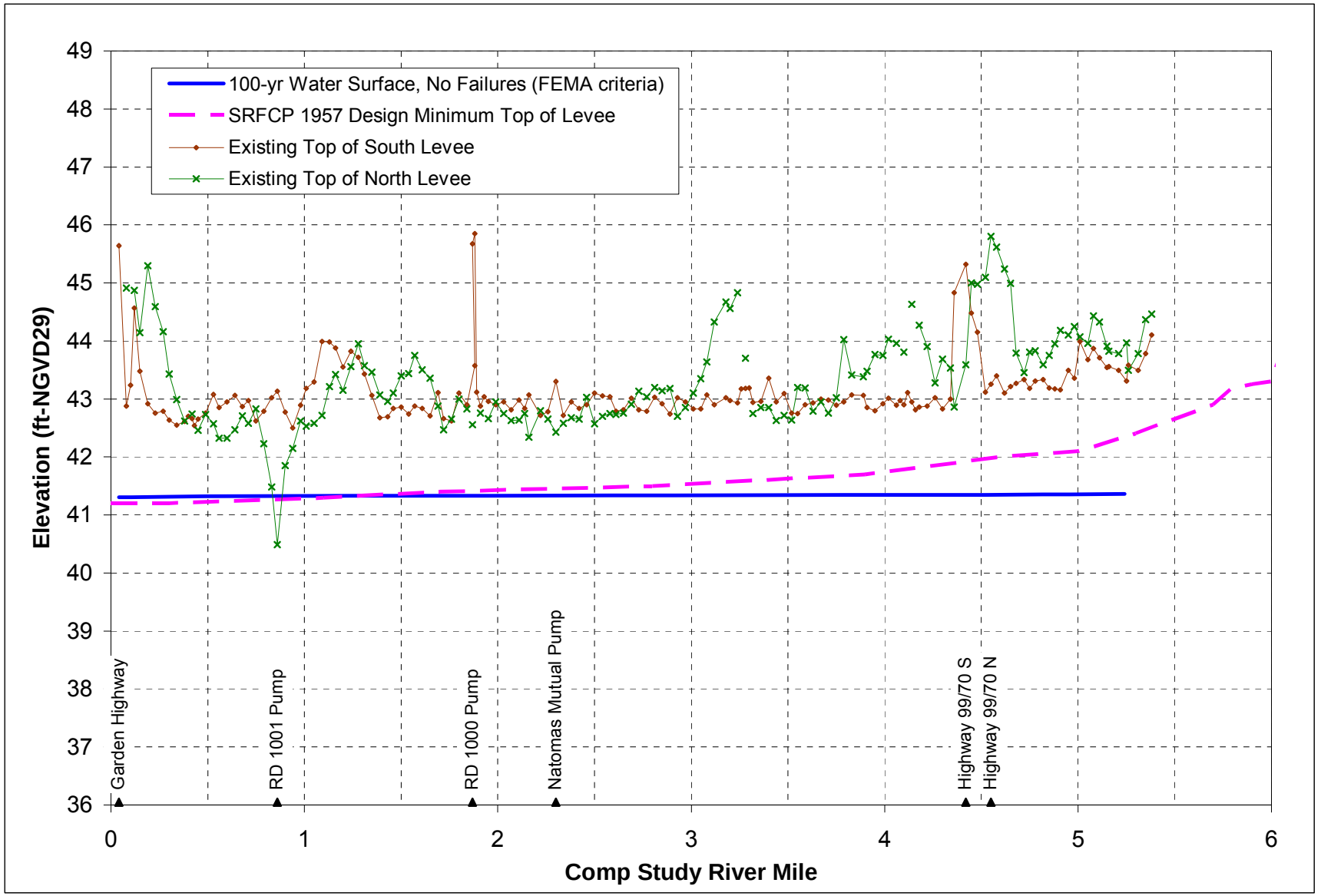


Figure 18. 100-year Water Surface Profile – Natomas Cross Canal

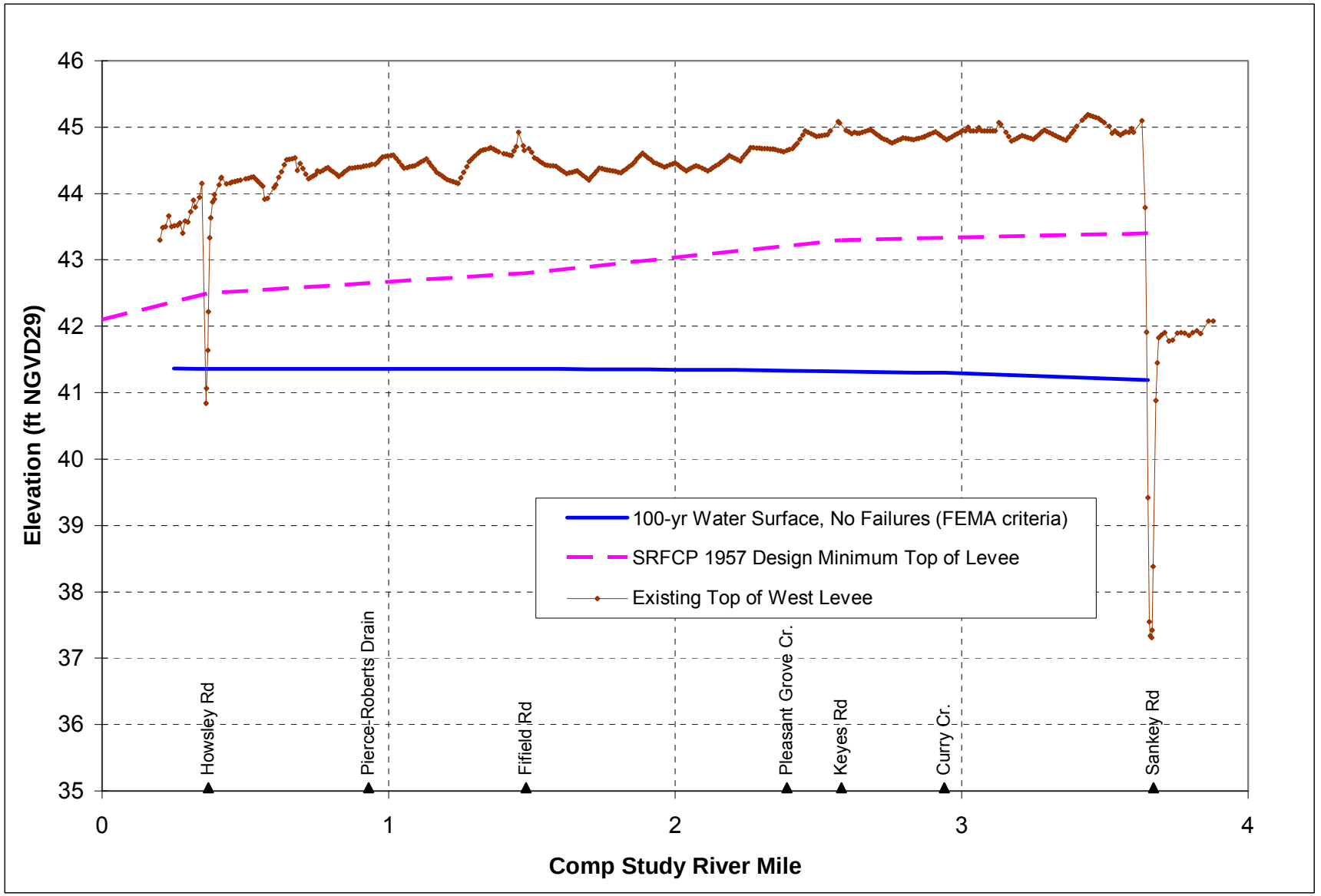


Figure 19. 100-year Water Surface Profile – Pleasant Grove Creek Canal

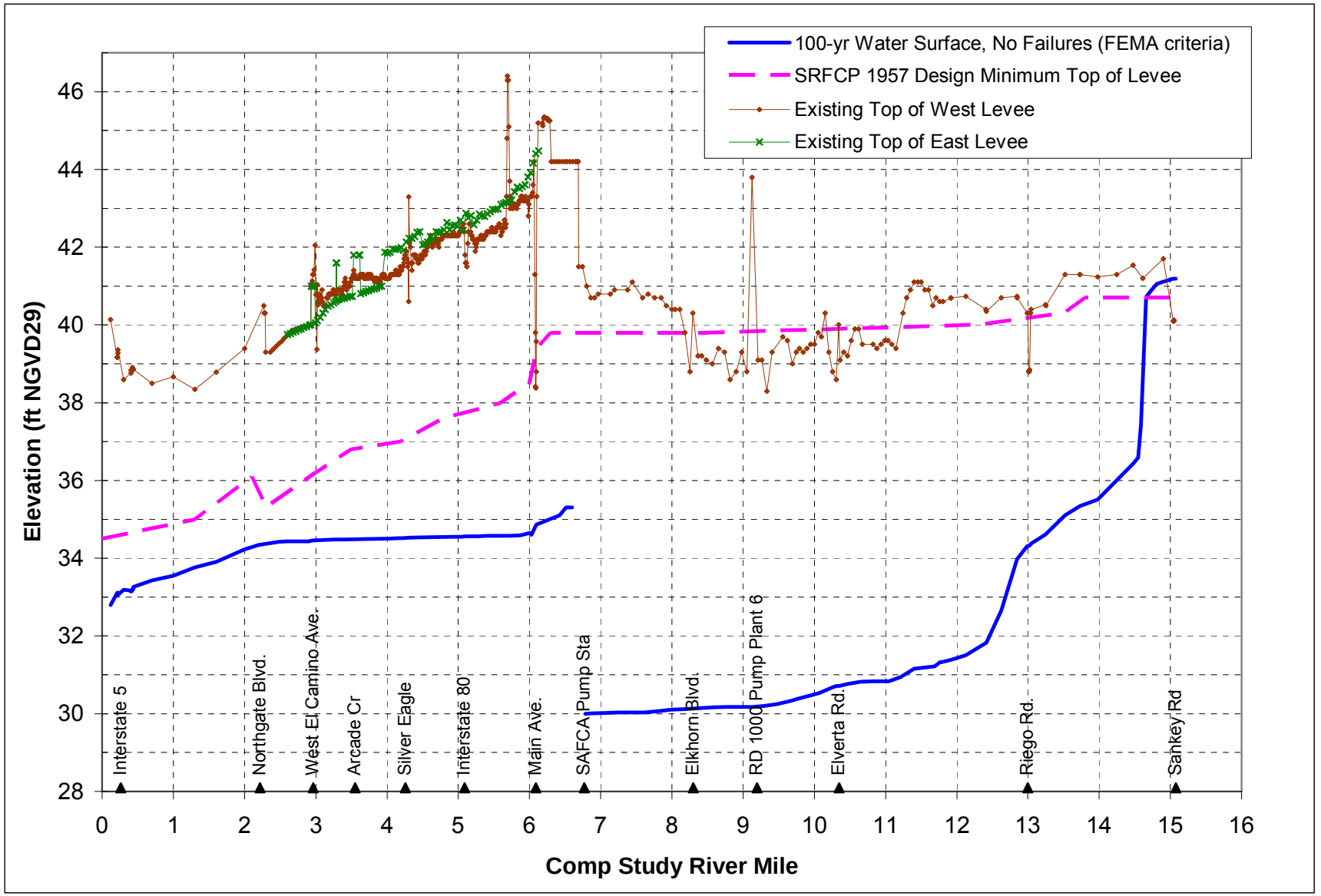


Figure 20. 100-year Water Surface Profile – NEMDC

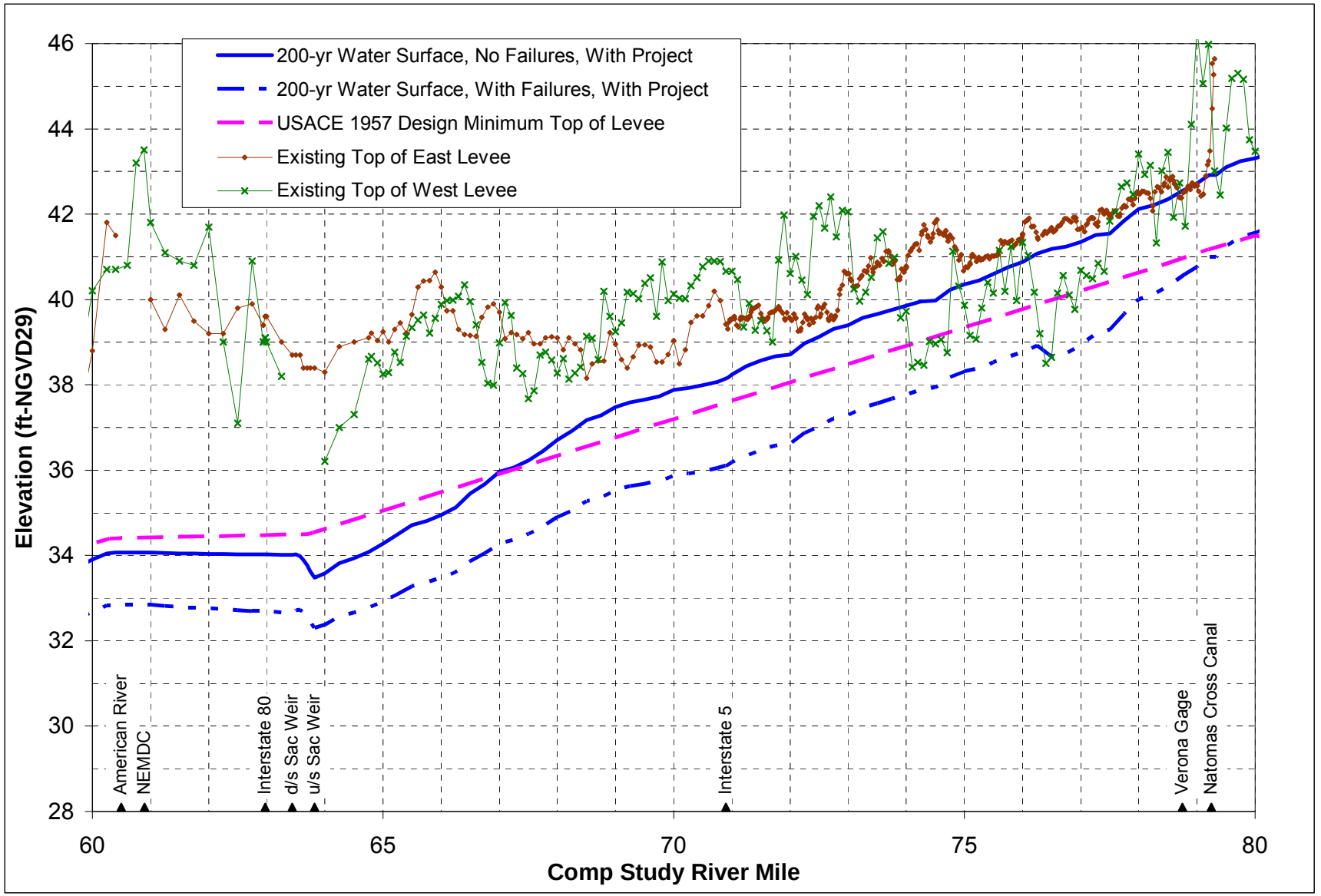


Figure 21. 200-year Water Surface Profile – Sacramento River Natomas Reach

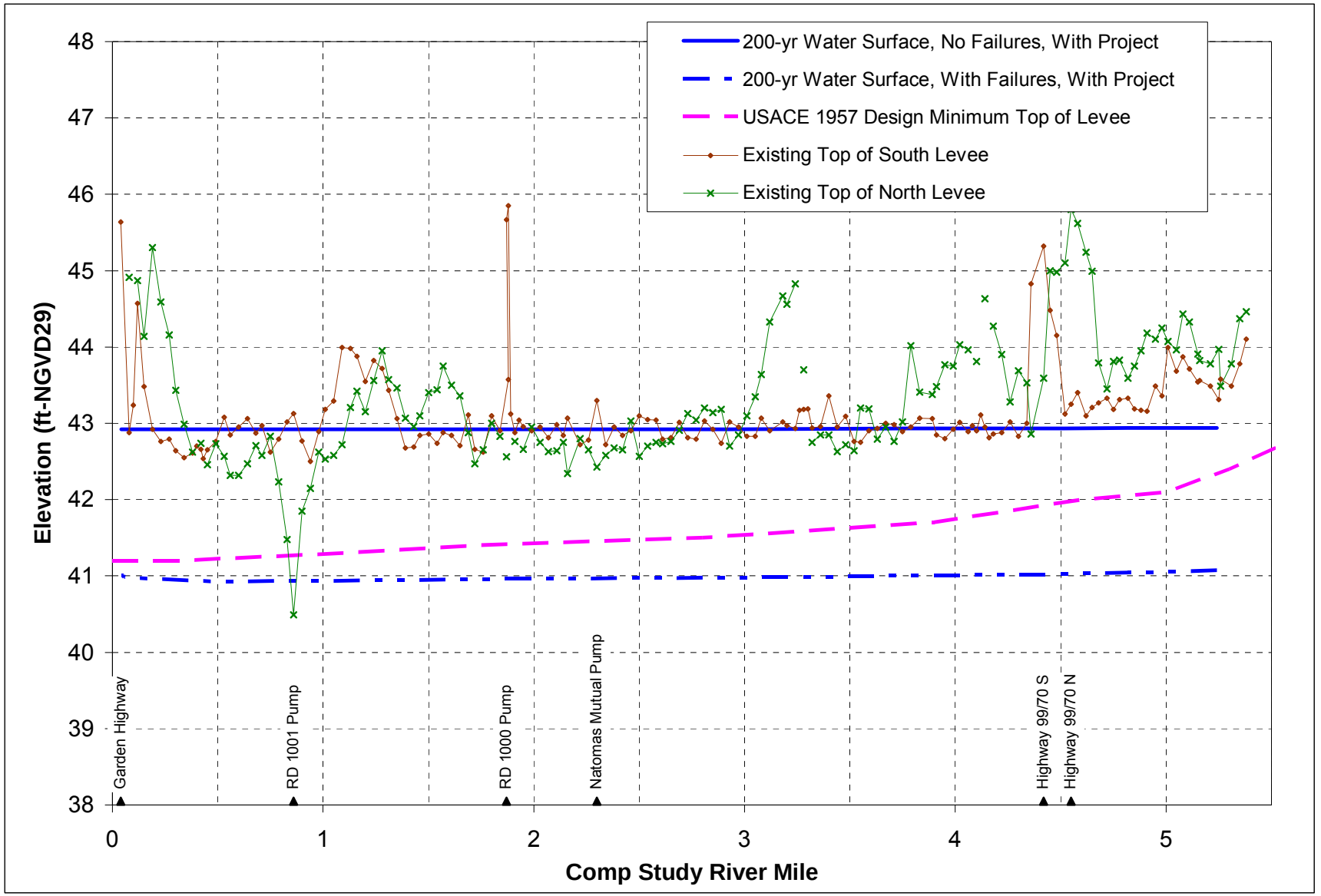


Figure 22. 200-year Water Surface Profile – Natomas Cross Canal

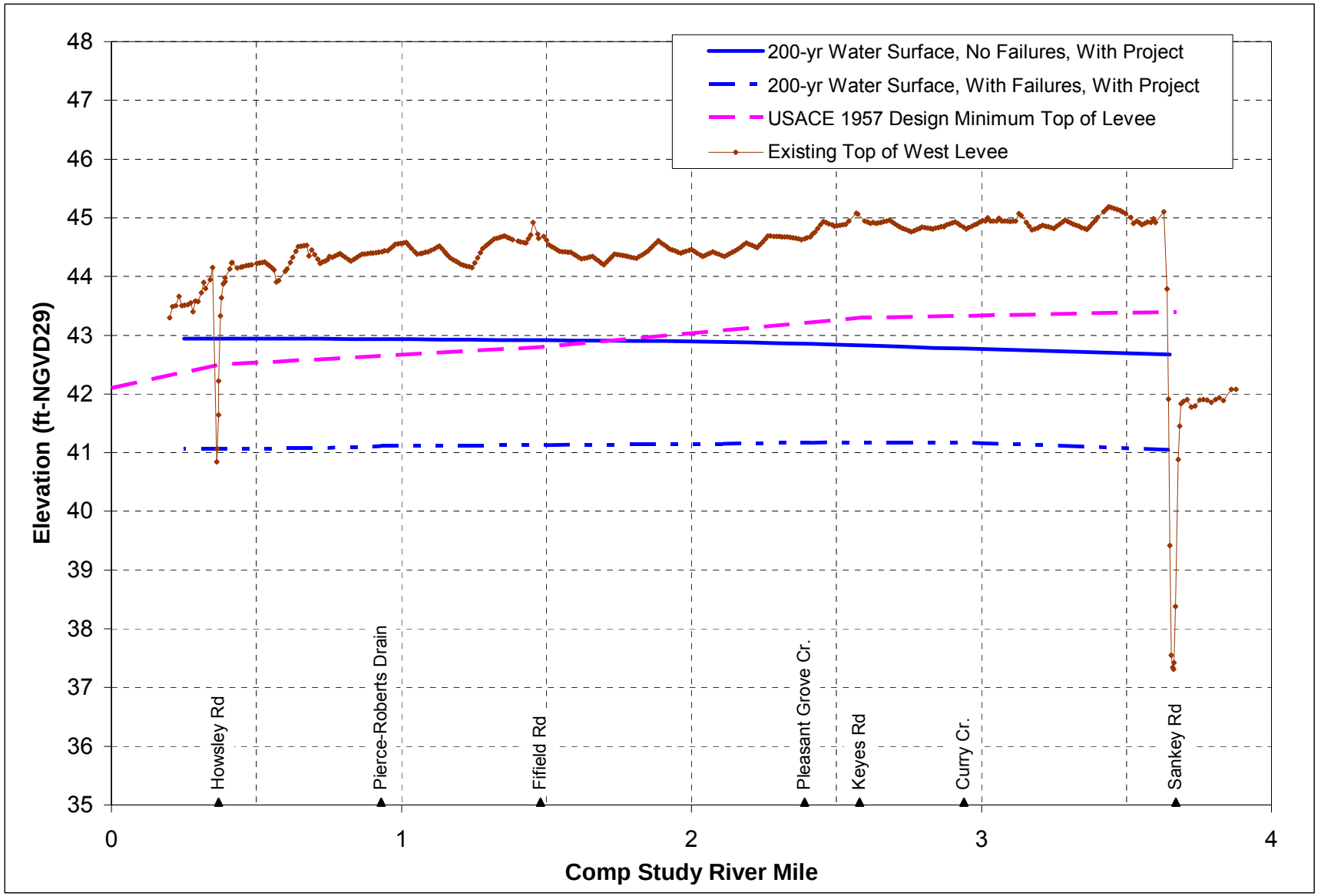


Figure 23. 200-year Water Surface Profile – Pleasant Grove Creek Canal

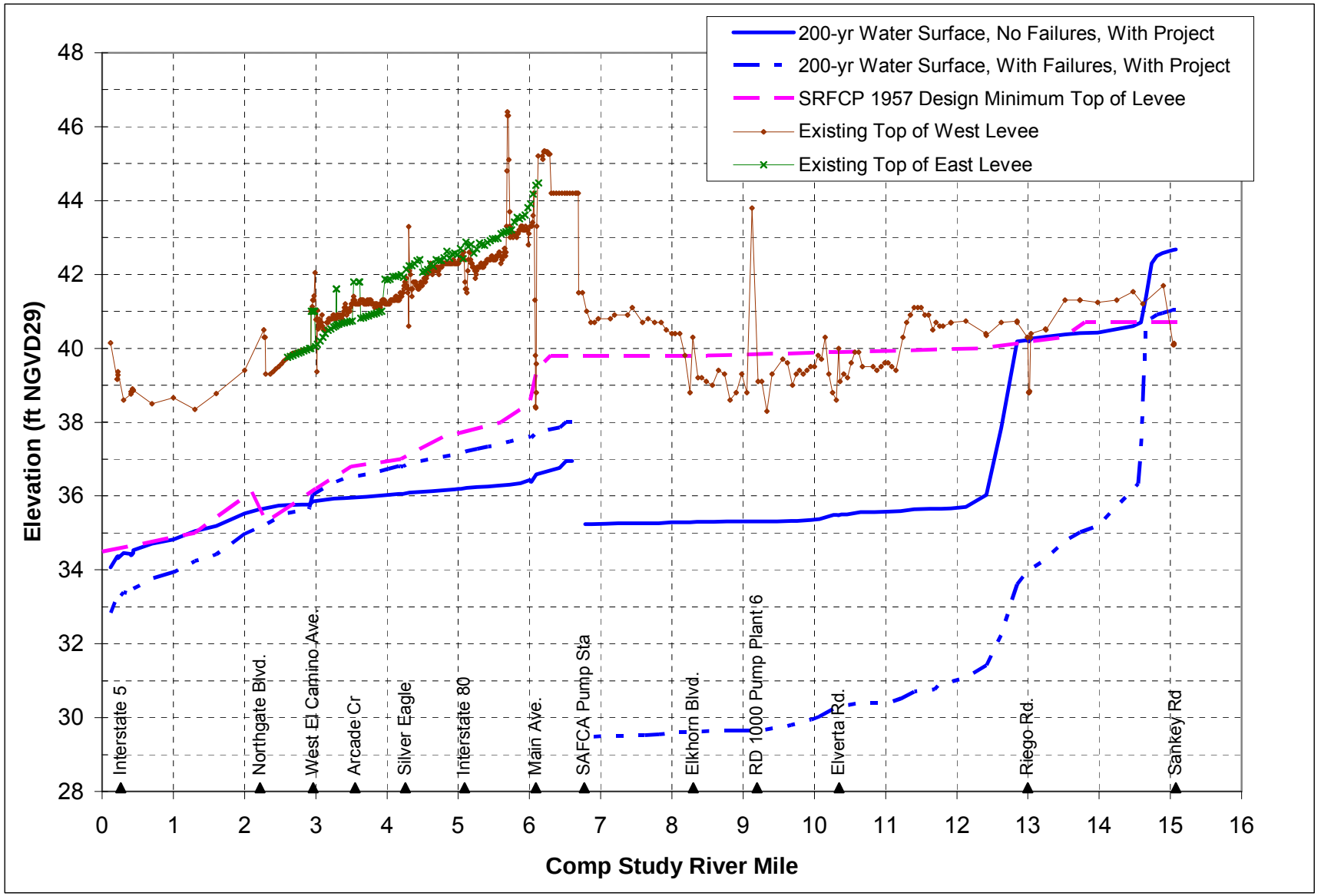


Figure 24. 200-year Water Surface Profile – NEMDC

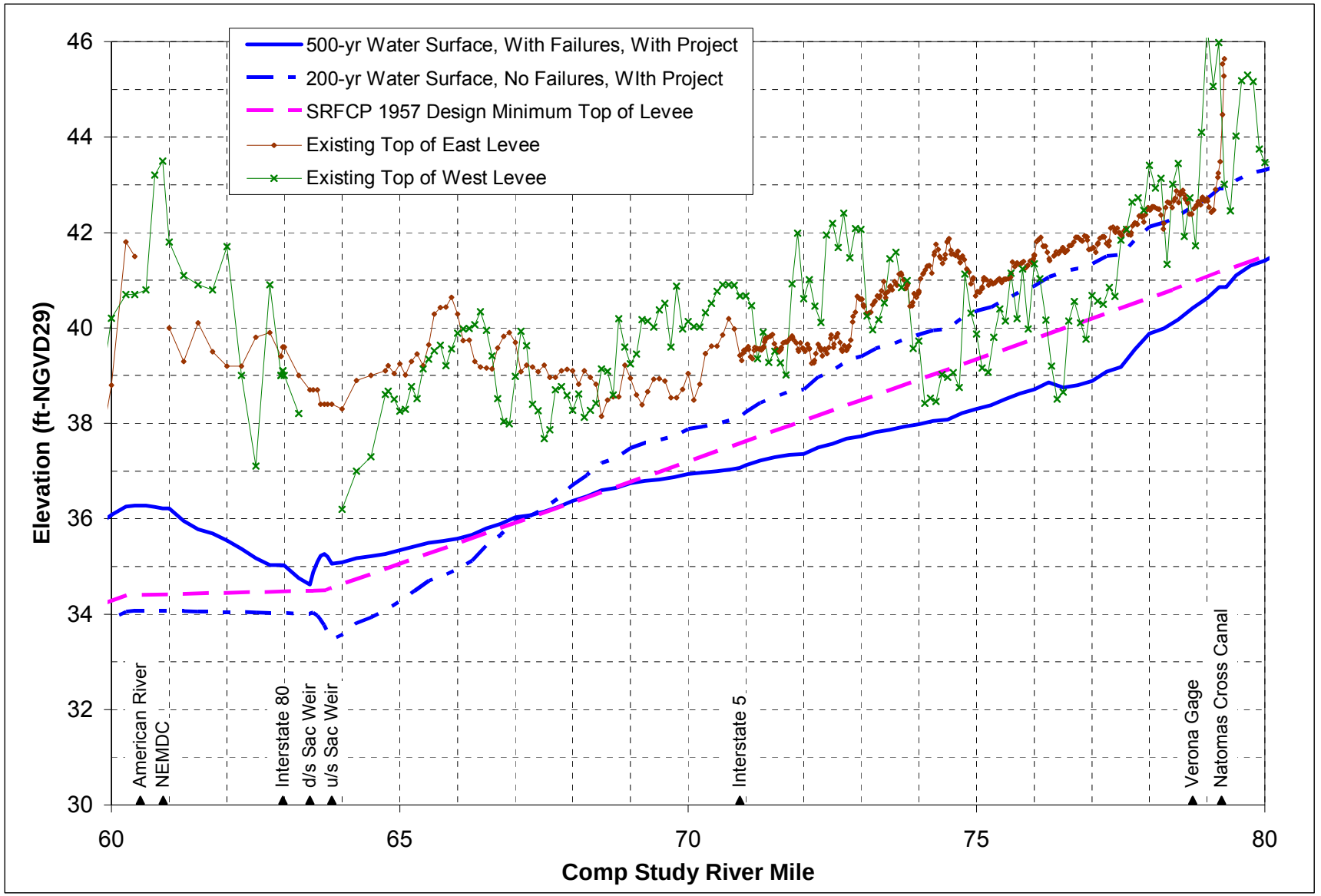


Figure 25. 500-year Water Surface Profile – Sacramento River Natomas Reach

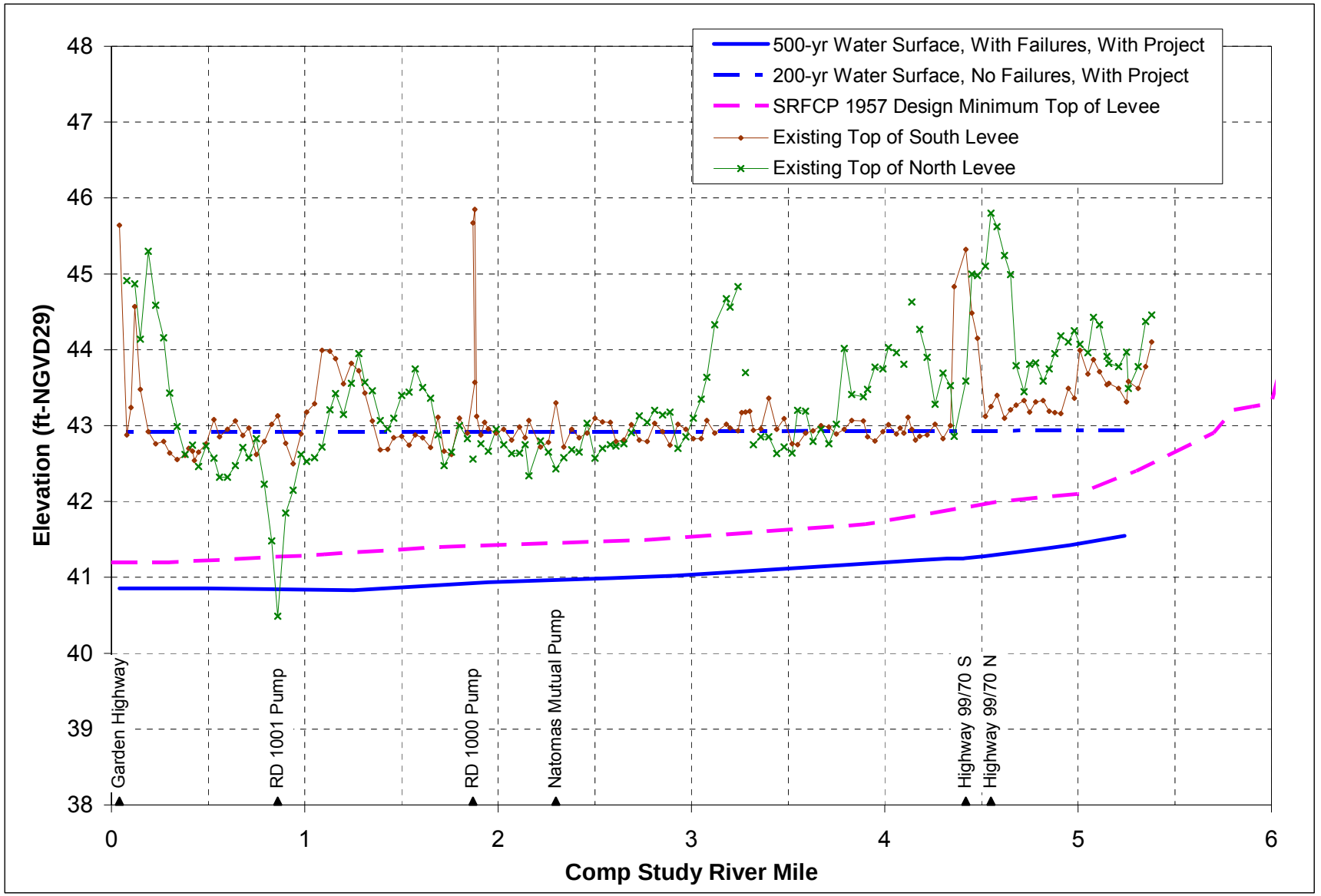


Figure 26. 500-year Water Surface Profile – Natomas Cross Canal

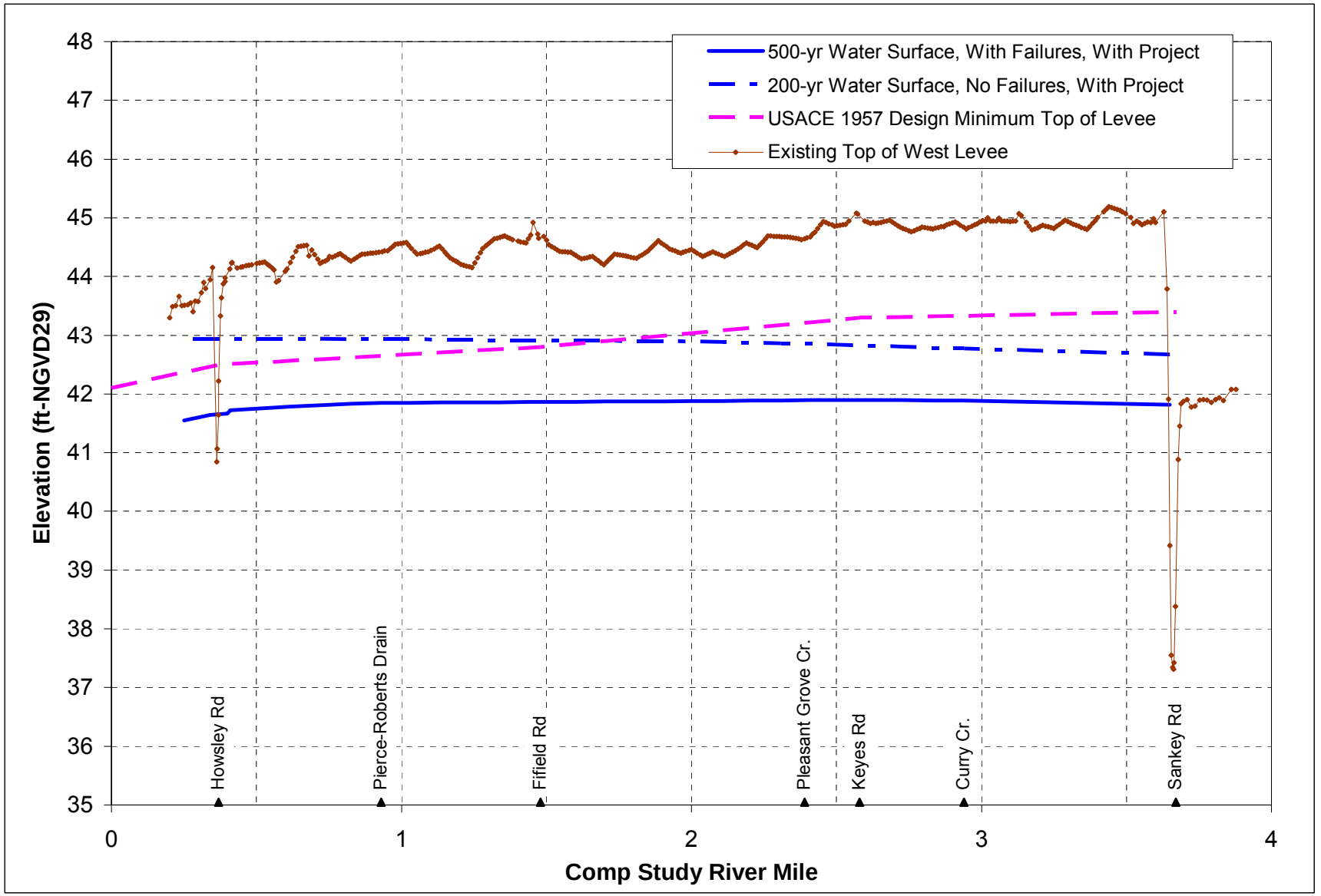


Figure 27. 500-year Water Surface Profile – Pleasant Grove Creek Canal

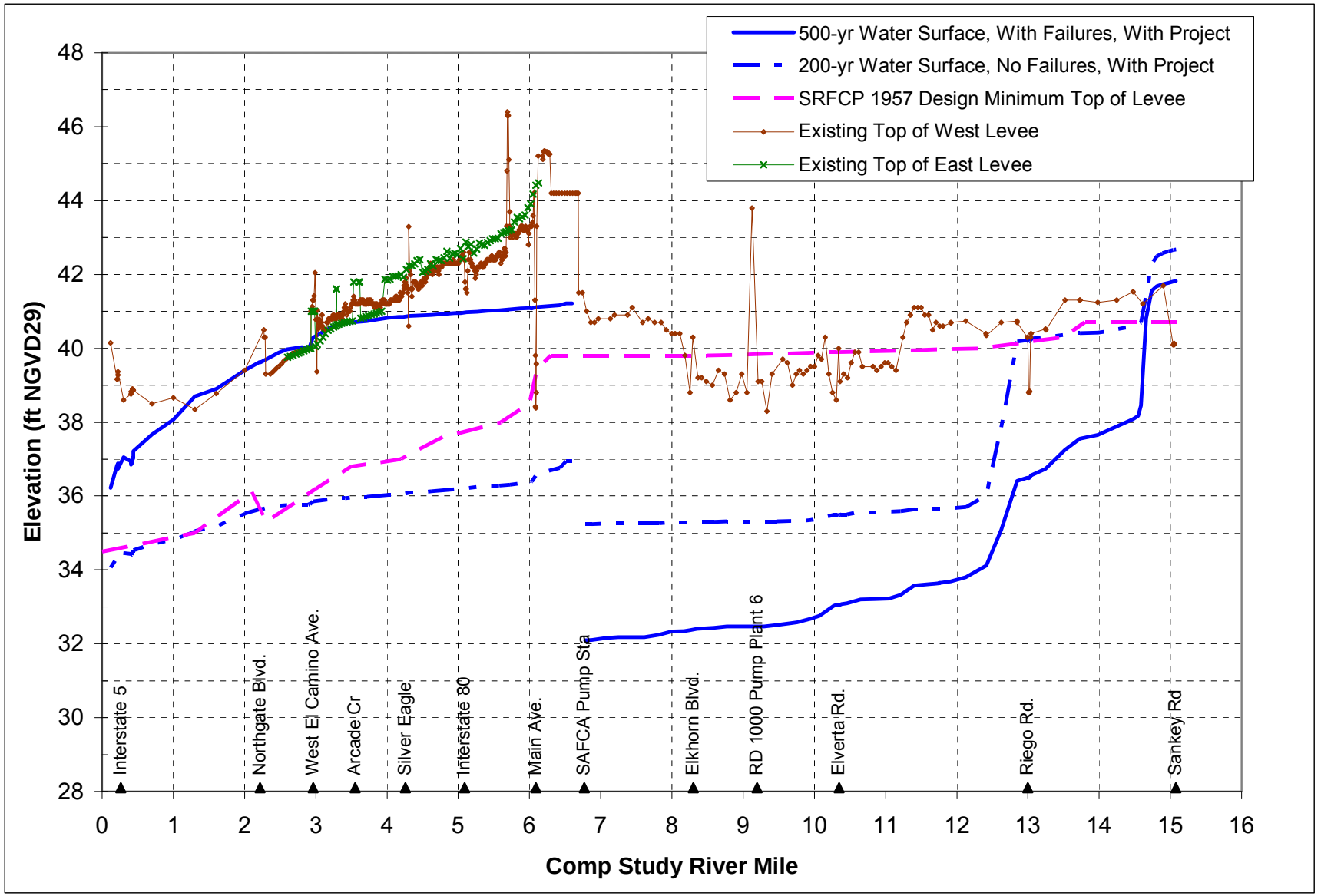


Figure 28. 500-year Water Surface Profile – NEMDC

B2 Groundwater Impact Analysis

Evaluation of Potential Groundwater Impacts Due to Proposed Construction for Natomas Levee Improvement Program

prepared for:

Sacramento Area Flood Control Agency
(SAFCA)

prepared by:

Luhdorff & Scalmanini,
Consulting Engineers

November 14, 2008

Table of Contents

Table of Contents (continued)

Tables

Tables (continued)

After Page

Figures

After Page

Figures (continued)

After Page

Acronyms and Abbreviations

AFB	Air Force Base
af	acre-feet
af/ac/yr	acre-feet per acre per year
af/ft^2	acre-feet per square foot
afy	acre-feet per year
CVIGSM	Central Valley Integrated Groundwater and Surface Water Model
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ET	evapotranspiration
FAA	Federal Aviation Agency
ft	feet
ft/day	feet per day
ft/ft	feet per foot
GGS	giant garter snake
GPS	Global Positioning System
HEC	Hydrologic Engineering Center
IGSM	Integrated Groundwater and Surface Water Model
lf	linear feet
LSCE	Luhdorff & Scalmanini, Consulting Engineers
M&H	Mean & Hunt
M&I	municipal and industrial
msl	mean sea level
MW	Montgomery Watson
MWH	Montgomery Watson Harza
NARIGSM	North American River Integrated Groundwater and Surface Water Model
NBC	Natomas Basin Conservancy
NBHCP	Natomas Basin Habitat Conservation Plan
NCC	Natomas Cross Canal
NCMWC	Natomas Central Mutual Water Company
NEMDC	Natomas East Main Drainage Canal
NLIP	Natomas Levee Improvement Project
pers. comm.	personal communication
PGCC	Pleasant Grove Creek Canal
RD 1000	Reclamation District No. 1000
SACIGSM	Sacramento County Integrated Groundwater and Surface Water Model
SAFCA	Sacramento Area Flood Control Agency
SCS	Soil Conservation Service
SIA	Sacramento International Airport
URS	URS Corporation
USACE	U.S. Army Corp of Engineers
WRIME	Water Resources & Information Management Engineering

1.0 Introduction

The Sacramento Area Flood Control Agency (SAFCA) requested that Luhdorff and Scalmanini, Consulting Engineers (LSCE) conduct an investigation of the potential groundwater impacts of levee improvements proposed by SAFCA along portions of the levees surrounding the Natomas Basin. These include the Sacramento River East Levee, the Natomas Cross Canal (NCC) South Levee, the Pleasant Grove Creek Canal (PGCC) West Levee, the Natomas East Main Drainage Canal (NEMDC) and Steelhead Creek West Levee, and the American River North Levee. Most of the proposed levee improvements will have no effect on groundwater, but there are potential effects due to land use changes, slurry cutoff walls, new or relocated canals, and borrow site excavation. LSCE (2008a) prepared a preliminary evaluation on the effects of proposed Sacramento River East Levee slurry cutoff walls in a previous report entitled *Evaluation of Potential Groundwater Impacts Due to Proposed Sacramento River East Levee Improvements with Emphasis on Reaches 2 and 3*. The information in this report updates and supercedes the contents of the previous report.

This report includes detailed water budgets prepared for the Natomas Basin to evaluate the groundwater impacts of all proposed SAFCA construction activities. The water budgets are partially based on the results of two existing numerical groundwater flow models that together simulate the North and South American Subbasins (including the Natomas Basin) in Sutter, Placer, and Sacramento Counties. Water Resources and Information Management Engineering, Inc. (WRIME) updated these models in 2007-2008 to better reflect existing and predicted future land and water use in the Natomas Basin. Some of the groundwater budget results summarized below are based on the 2030 simulations, which are summarized in LSCE (2008b). A groundwater budget for proposed SAFCA construction activities was calculated separately and was used to evaluate the cumulative impacts of these activities on existing and future groundwater conditions in the Natomas Basin and the North American Subbasin.

1.1 Project Description

The analysis of groundwater impacts in this report relies on project descriptions for proposed SAFCA construction activities obtained from a variety of sources. These include the Draft and Final Environmental Impact Report (EIR) for the Natomas Levee Improvement Project (NLIP) prepared by EDAW (2007a and 2007b) and the Draft Environmental Impact Statement (EIS) prepared by the U.S. Army Corps of Engineers (USACE, 2008). Design and engineering work for most of these projects is still in progress, so assumptions were made about the most likely configuration of each project. In cases where even preliminary project descriptions were not available, a conservative option was selected for analysis. Assumptions about many of these projects were provided primarily via personal communications (pers. comm.) with David Rader of EDAW and Marieke Armstrong of Mead & Hunt (M&H). Other information was provided by Wood Rodgers and the engineering team at Kleinfelder, Inc. (Kleinfelder).

1.1.1 Levee Improvements

Groundwater impacts from proposed levee improvements are primarily limited to the potential effects of land use changes and slurry cutoff walls. Slurry cutoff walls and seepage berms are proposed mitigation measures to reduce problems of excess seepage beneath the levees, but no direct groundwater impacts are expected from seepage berms because they would be above the water table. The slurry cutoff walls are intended to reduce groundwater flow beneath the levees, and impacts resulting from this reduction are addressed in this report. The location of the five levees discussed below are shown in **Figure 1-1**.

Sacramento River East Levee – Levee improvements will require land use changes, including removal of 20 acres of rice, 175 acres of field crops, and five acres of orchard. Slurry cutoff walls are proposed for 12 reaches (total of eight miles) of the 18.1 mile length of the East Levee. These cutoff walls will range in depth from about 50 to 110 feet, with an average depth of about 78 feet.

Natomas Cross Canal South Levee – Proposed land use changes along the NCC South Levee will require removal of about five acres of rice fields. Slurry cutoff walls are being constructed for the entire length (about 5.3 miles) of the NCC. These cutoff walls are projected to be about 70 feet deep. Approximately 5,400 lineal feet (lf) of cutoff wall was installed in 2007, and another 3,600 lf will be installed in 2008.

Pleasant Grove Creek Canal West Levee – The PGCC West Levee is about 3.3 miles long. Improvements to the PGCC West Levee are in the early planning stages, but slurry cutoff walls with an average depth of 60 feet are currently proposed for about 5,000 lf of the levee. Proposed land use changes along the PGCC West Levee would require removal of about 50 acres of rice fields.

Natomas East Main Drainage Canal West Levee – The NEMDC and Steelhead Creek West Levee is about 13.3 miles long. Improvements to the NEMDC West Levee are in the very early planning stages, but slurry cutoff walls are being considered for about 16,000 lf (three miles) of the levee. The estimated depths of these cutoff walls are about 80 feet for 7,000 lf of wall and 60 feet for 9,000 lf of wall. Land use changes due to NEMDC levee improvements have not been evaluated, but irrigated agriculture is limited to the northern portion of the levee and effects are expected to be minimal.

American River North Levee – The American River North Levee is about 2.2 miles long in the Natomas Basin. Planning for improvements to this levee is in the very early planning stages, but slurry cutoff walls with an estimated depth of 85 feet are under consideration for up to 5,000 lf of this levee between Interstate 5 and Northgate Blvd. There is no irrigated agriculture in this area to be affected by levee improvements.

1.1.2 Canal Improvements

SAFCA is planning to construct one new canal in the Natomas Basin and relocate or improve three existing canals. This construction will necessitate land use changes, including the loss of irrigated agricultural land. Although seepage from existing canals has not been quantified, it is

considered to be a significant contributor to groundwater recharge in the Natomas Basin. The new and relocated canals will be unlined and will result in an overall increase in the rate of canal seepage. The proposed locations of new and existing canals discussed below are shown on **Figure 1-1**.

Giant Garter Snake/Drainage Canal – SAFCA plans to construct a new Giant Garter Snake (GGS) and Drainage Canal east and roughly parallel to the Sacramento River East Levee. The GGS/Drainage Canal will be about 4.4 miles long and 50 feet wide at the waterline, and will be unlined. A total of 45 acres of the land where the GGS/Drainage Canal will be constructed is currently planted to field crops.

West Drainage Canal – The GGS/Drainage Canal begins at the terminus of the West Drainage Canal. A number of improvements to the West Drainage Canal are planned, including rerouting of about 4,700 lf of the existing canal. The overall length of the canal will increase from about 3.6 to 3.9 miles, and the average width at the waterline will increase from 30 to 72 feet.

Elkhorn Canal – The Elkhorn Canal, which is located east of the Sacramento River East Levee and northwest of the Sacramento International Airport (SIA), is about 3.8 miles long and 16 feet wide. SAFCA plans to relocate this canal to make room for levee improvements. The relocated canal will be about 4.2 miles long and 32 feet wide. Approximately one mile of the existing Elkhorn Canal is lined with concrete, and about 6,000 lf of the relocated canal is proposed to be lined. In addition, two sections of the relocated canal (total of about 3,950 lf), primarily through the Teal Bend Golf Course, would be piped.

Riverside Canal – This canal, which is located east of the Sacramento River East Levee in the southwestern corner of the Natomas Basin is about 3.7 miles long and seven feet wide. SAFCA plans to relocate the Riverside Canal to accommodate levee construction, and the new canal would be about 3.9 miles long and ten feet wide.

1.1.3 Borrow Sites

SAFCA will require several borrow sites in the Natomas Basin to obtain sufficient soil for the proposed levee and canal improvements. The locations of these borrow sites are shown on **Figure 1-1**.

Airport North Bufferlands – The Airport North Bufferlands borrow site consists of 737 acres owned by the SIA and located north of the airport. Approximately 630 acres of this site that had previously been planted to rice have recently been removed from rice cultivation or other land uses that would attract water fowl at the request of the Federal Aviation Agency (FAA) and is currently fallow. SAFCA plans to remove about four to six feet of borrow material and restore the site to non-irrigated grassland.

Brookfield Property – The Brookfield property consists of 353 acres at the northern tip of the Natomas Basin. Approximately 325 acres of this property is currently planted to rice, and SAFCA plans to restore it to rice cultivation after removing the borrow material. The current crop mix is about 50% regular rice and 50% wild rice (Jack DeWit, pers. comm., July 8, 2008). Up to six feet of soil will be excavated, including one foot of topsoil that will be stockpiled and

replaced after borrow operations are complete. The property is currently irrigated with groundwater, but SAFCA plans to provide the infrastructure so that most of the property can be irrigated with surface water after removal of borrow material. Engineering work is still in progress, but SAFCA estimates that about 80 percent of the property would be irrigated with surface water in the future after reclamation is complete.

Fisherman's Lake – The Fisherman's Lake borrow site is located at the northern end of the existing Fisherman's Lake in the southwestern portion of the Natomas Basin. Engineering work has not been completed for this site, but SAFCA estimates that about 100 acres of land currently planted to rice would be used for borrow material and would be restored to managed marsh.

1.2 Potential Impacts

The purpose of this report is to evaluate the potential groundwater impacts of SAFCA's proposed construction activities. These potential impacts can be grouped into three general categories:

1) Changes in groundwater recharge. These will occur due to land use changes and canal improvements. Specifically, the conversion of land from irrigated to non-irrigated land uses will reduce groundwater recharge, and canal construction and widening will increase groundwater recharge.
2) Changes in groundwater flow. Groundwater flow beneath the levees surrounding the Natomas Basin will be reduced due to the proposed slurry cutoff walls. Reductions in groundwater flow will generally be in the form of:
    a) Reduced groundwater recharge from the Sacramento and American Rivers;
    b) Reduced subsurface inflow from the north beneath the NCC; or
    c) Reduced subsurface outflow to the east beneath the PGCC and NEMDC.
3) Changes in groundwater pumping.

Other potential groundwater impacts include:

- Groundwater quality degradation in the Natomas Basin due to reduced inflow of good quality recharge from the River and reduced groundwater outflow; and
- Impacts to the yield of wells located along levees where the cutoff walls would be constructed.

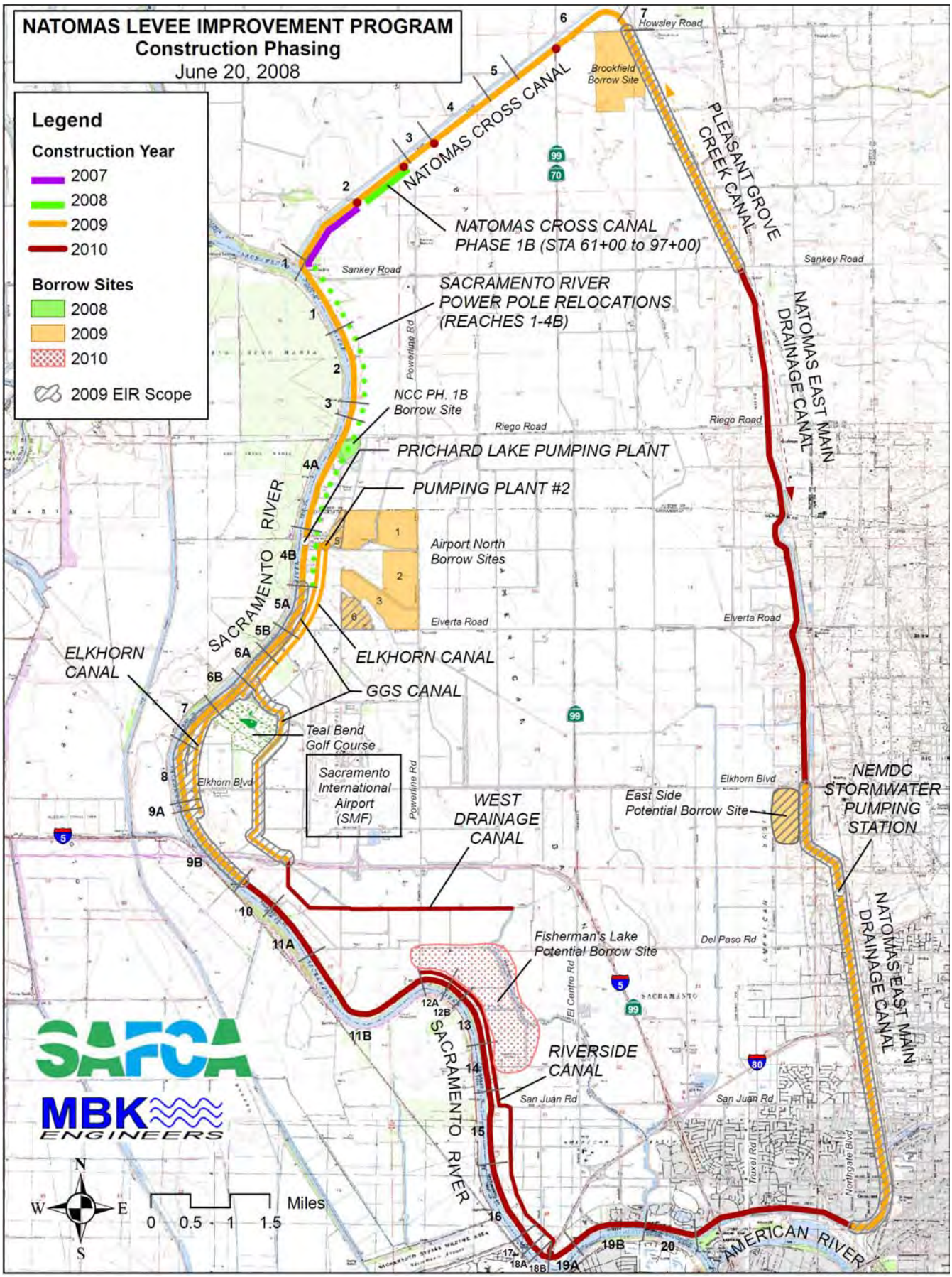


Figure 1-1
Proposed SAFCA Construction Locations for Natomas Levee Improvement Program

2.0 Hydrogeologic Conditions

2.1 Land Use and Water Supply

The Natomas Basin was used as the primary study area for the water budgets discussed below. As shown on **Figure 1-1**, the Natomas Basin is located on the east side of the Sacramento River, between the rural community of Pleasant Grove and the City of Sacramento, in Sutter and Sacramento counties. It consists of about 54,400 acres of agricultural and urban land surrounded by the Sacramento River on the west, the NCC on the north, the PGCC and the NEMDC on the east, and the American River on the south. Except for the SIA and the Teal Bend Golf Course, urban development in the area is primarily limited to the southeast corner of the Natomas Basin at present. This is expected to change in the future as several large developments are in the planning stages.

The Natomas Basin is surrounded by 42 miles of levees, which are maintained by Reclamation District No. 1000 (RD 1000). RD 1000 also operates and maintains a large drainage system within its boundaries to recirculate or dispose of agricultural and urban runoff. This system includes seven large pumping plants and 180 miles of canals and ditches.

Land use in the Natomas Basin is primarily agricultural, with rice being the primary crop. Approximately 28,700 acres were irrigated in 2004, and rice accounted for about 79 percent of the total. Other crops include alfalfa, clover, and oat hay; tomatoes and sugar beets; and crops such as wheat and safflower that are rotated with rice and tomatoes. Most of the agricultural land is irrigated by surface water diverted from the Sacramento River by Natomas Central Mutual Water Company (NCMWC). Much of the information provided below is based on the NCMWC Draft Groundwater Management Plan (2002) and the Integrated Water Resources Management Plan (American States Water Company, et al., 2006).

NCMWC operates three primary river diversions on the Sacramento River. Water is also diverted at two locations from the NCC. Water diverted from the NCC flows from north to south, while water diverted from the River flows generally from west to east, then south. NCMWC's surface water diversions average about 100,000 acre-feet per year (afy). This includes an estimated 10,000 afy diverted during the fall and winter to reflood fields for rice straw decomposition.

NCMWC completed the installation of a tailwater recirculation system in 1986 so that drainage water can be reused during the irrigation season to improve Sacramento River water quality, reduce river diversions, and increase overall efficiency. The recirculation system recaptures tailwater for re-use either directly to fields or back into the main irrigation canals. In recent years, NCMWC has relied heavily on recycled tailwater to supplement its Sacramento River entitlement. Tailwater is recycled partly because it cannot be discharged back to the Sacramento River due to water quality regulations. During a normal irrigation season, all agricultural drainage water is recirculated during the rice growing season, which typically ends in August.

The NCMWC Draft Groundwater Management Plan contains an estimate of 30,000 afy of recycled tailwater (NCMWC, 2002).

Approximately 3,300 acres of agricultural land are irrigated primarily with groundwater. This includes the entire northeastern portion of the Natomas Basin, which is not served by the existing NCMWC surface water distribution systems. The total groundwater pumpage in the Natomas Basin was estimated to be about 24,500 af in 2004 (LSCE, 2008b). Most of this was agricultural pumpage and included about 18,500 af in Sutter County and 6,000 af in Sacramento County.

The Natomas Basin Conservancy (NBC) currently owns over 4,000 acres of land in the Natomas Basin. The NBC began land acquisitions after completion of the Natomas Basin Habitat Conservation Plan (NBHCP) by the U.S. Fish and Wildlife Service and the California Department of Fish and Game in 1997. The NBHCP specified that lands be acquired for habitat conservation as mitigation for the effects of urban development in the Natomas Basin on endangered species and other wildlife. Under the terms of the NBHCP, NBC will ultimately acquire about 8,750 acres of land to mitigate the loss of approximately 17,500 acres slated for development. Most of the NBC mitigation lands have historically been planted to rice, and NBC plans to keep 50 percent of the lands in rice production and convert 25 percent to managed marsh and another 25 percent to upland habitat. As of 2004, approximately 475 acres had been converted to managed marsh.

Irrigated acreage within the Natomas Basin has decreased in recent years as more land has been converted to urban uses. Land use estimates indicate that the acreage irrigated with surface water decreased by about 4.7 percent per year between 1996 and 2006 (American States Water Company, et al., 2006). NCMWC land use data indicate that the amount of irrigated shareholder lands decreased by about 5.2 percent per year between 2004 and 2007.

2.2 Groundwater Basin and Subbasin Description

The Natomas Basin does not represent a groundwater basin or subbasin as defined by the California Department of Water Resources (DWR). It is located within the North American Subbasin, which is part of the Sacramento Valley Groundwater Basin. The North American Subbasin is located along the eastern edge of the Sacramento River Valley and encompasses about 351,000 acres in Sutter, Placer, and Sacramento counties. The North American Subbasin is bounded by the Bear River on the north, the Feather and Sacramento Rivers on the west, the American River on the south, and the approximate edge of the alluvial aquifer in the Sierra Nevada foothills on the east. The North American Subbasin and adjacent groundwater subbasins are shown on **Figure 2-1**.

2.3 Geology of the Natomas Basin

Prior to development, groundwater in the northern portion of the North American Subbasin flowed to the west and southwest from the Sierra Nevada toward the Feather and Sacramento Rivers. Most wells in the subbasin pump groundwater from either the volcanic Mehrten Formation or the overlying alluvial deposits, which have a westerly dip toward the axis of the valley. The following summary of geologic conditions in the Natomas Basin is based primarily

on the *Feasibility Report, American Basin Conjunctive Use Project* (DWR, 1997). This summary focuses on the shallow aquifers that could potentially be impacted by the proposed slurry cutoff walls.

The thickness of the fresh water-bearing deposits in the Natomas Basin increases from about 1,100 feet in the northeast to over 2,000 feet in the southwest. These deposits can be divided into upper and lower aquifer systems. The division between the two aquifer systems is inexact due to data limitations and the difficulty in accurately determining formation contacts. DWR (1997) indicates that the upper aquifer system consists of saturated Laguna Formation and younger sediments that collectively extend to a depth of 200 to 300 feet. For purposes of this study, the upper zone is defined as the upper 300 feet of the aquifer system, and the lower zone is assumed to extend from a depth of 300 feet to the base of fresh water.

The upper aquifer system in the Natomas Basin generally appears to be unconfined or semi-confined due to the presence of clay and silt confining layers within and underlying the upper zone. Sands and gravels in the upper zone are generally thin and laterally discontinuous, and there are thick sequences of fine-grained strata between the more permeable aquifer materials.

The youngest geologic units in the Natomas Basin are flood basin deposits and alluvium. Laterally extensive exposures generally occur along the western margin, adjacent to and within the active channels of the Sacramento River. The flood basin deposits are predominantly fine-grained sediments that have accumulated in flood basins along the major rivers of the Sacramento Valley. The flood basin deposits consist primarily of silt and clay, which yield little water to wells. The flood basin deposits also contain local lenses of sand and gravel deposited by the migrating ancestral river channels. These lenses have high permeabilities and can yield large quantities of groundwater to wells. The thickness of the flood basin deposits in the subbasin ranges up to 100 feet (Olmstead and Davis, 1961).

The alluvium consists primarily of sand, gravel, and silt, with minor amounts of clay, deposited in Recent geologic time (last 10,000 years) by the Sacramento River. Although the alluvium is highly permeable, it is too thin to represent a significant groundwater source. Most high-yield wells completed in the recent alluvium also draw groundwater from underlying formations.

Underlying the alluvium, the Riverbank and Modesto formations of Pleistocene age consist of a heterogeneous mixture of silt, sand, gravel, and clay. The units exhibit large variability in grain size over short distances, both laterally and vertically. The maximum combined thickness of the two units is 50 to 75 feet in the subbasin. On average, these units have moderate permeability but contain some coarser zones with high permeability (Olmstead and Davis, 1961).

The Laguna Formation of Pliocene age and the Turlock Lake Formation of early Pleistocene-age underlie the Riverbank and Modesto formations. Both formations consist primarily of a heterogeneous mixture of interbedded silt, clay, and sand. They contain a few gravel lenses, which are poorly sorted and have relatively low permeability. In general, these two formations are more fine-grained than overlying units, although it is difficult to determine subsurface contacts from drillers' logs. Wells completed in clean Laguna Formation sands and gravels can

produce significant quantities of groundwater. The combined thickness of the two units in the subbasin is probably less than 200 feet.

The lower aquifer system consists of non-marine, Mehrten Formation deposits and includes a smaller percentage of coarse-grained sediments. However, individual coarse-grained zones in the lower aquifer are typically thicker than in the upper aquifer. In some areas, the lower aquifer is further divided into two distinct units. The upper unit is comprised of gray to black andesitic sand and associated lenses of stream gravel containing andesitic cobbles and boulders interbedded with thicker blue or brown clay. The lower unit has been described as a dense, hard, gray tuff breccia. It is composed of angular pieces and blocks of andesite in a cemented matrix of andesite, devitrified lapilli, and ash derived from volcanic eruptions in the Sierra Nevada. Based on information from DWR monitoring wells, the Mehrten Formation is at least 900 feet thick near the Sacramento Airport, and the typical lower unit gray tuff does not occur at that location. The lower zone exhibits more confinement than the upper zone but is still considered to be semi-confined. There is a delayed response to imposed stresses in the upper aquifer, indicating hydraulic interconnection between these water-bearing strata.

2.4 Aquifer Hydraulic Conductivity

The ability of an aquifer to transmit water is measured by its hydraulic conductivity (which is closely related to permeability) and saturated thickness; the product of these two parameters is commonly known as aquifer transmissivity. The hydraulic conductivity of alluvial aquifer materials varies over many orders of magnitude, with fine-grained materials (clay and silt) at the bottom of the range and coarse-grained materials (sand and gravel) at the top. Most groundwater flow occurs through sand units, which are much more common in the subsurface than gravels. The hydraulic conductivity of sands is highly variable, depending on grain size, sorting, and cementation.

Long-term, constant-rate pumping tests are the preferred method for estimating hydraulic conductivity and other aquifer properties. Other field methods include short-term pumping tests and slug tests. If borehole logs are available, equations that estimate hydraulic conductivity based on grain-size distribution can be used in the absence of test data. The most common of these is the Kozeny-Carman equation (Kozeny, 1927 and Carman, 1937 and 1956) which has been used by Kleinfelder and URS Corporation (URS) to estimate the hydraulic conductivity of geologic materials beneath the east levee.

As further discussed below, the hydraulic conductivity of sand units underlying the levees is a primary input and the source of greatest uncertainty for models used to estimate seepage beneath the levees. A summary of hydraulic conductivity estimates for the Natomas Basin is provided in **Table 2-1**. The estimates vary by more than an order of magnitude, from 14 to 488 feet per day (ft/day), with a mean of 116 ft/day and a median of 51 ft/day. Values at the low end of the range were estimated by Kleinfelder using the Kozeny-Carman equation, and the highest value was estimated from a short-term pumping test. LSCE estimated a hydraulic conductivity of 36 ft/day based on an aquifer test conducted in the Paulson well in southern Sutter County (LSCE, 2008b).

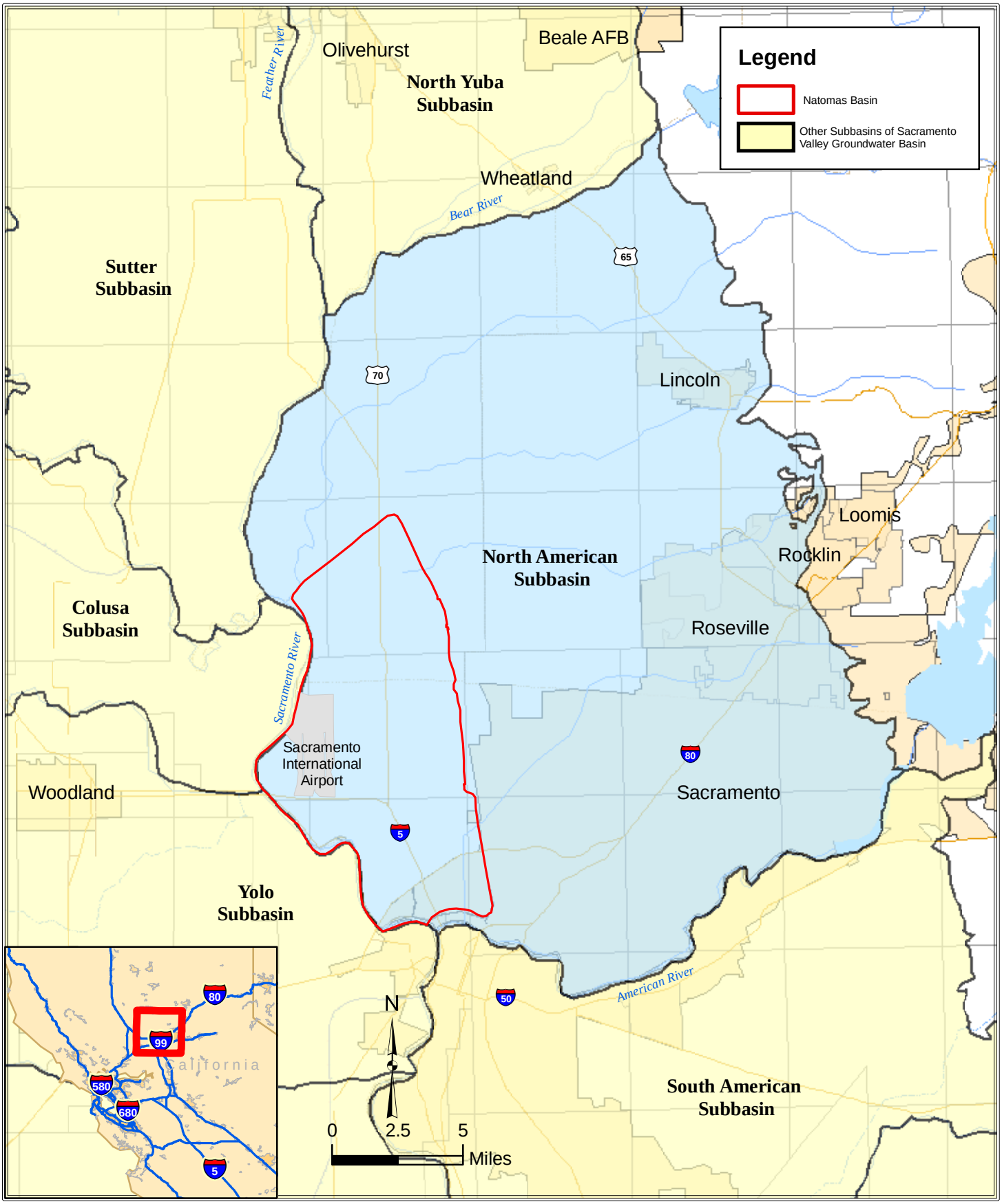
Groundwater flow models that encompass the North American Subbasin also have relatively high hydraulic conductivities in the Natomas Basin. Hydraulic conductivity estimates used in

numerical groundwater flow models are typically adjusted during the calibration process. A groundwater flow model of the Sacramento Valley developed by DWR (1978) used hydraulic conductivity estimates of 51 to 139 ft/day for the upper layer of the model in the Natomas Basin. The groundwater models discussed in Chapter 4 have hydraulic conductivities in the upper layer ranging from 33 to 118 ft/day in the Natomas Basin.

Table 2-1
Hydraulic Conductivity Estimates in Natomas Basin

Estimated By	Location	Hydraulic Conductivity (ft/day)	Material Type	Source
Kleinfelder (2007)[1]	-	14	Sand with 3-7% silt	Kozeny-Carman equation
	-	28	Sand with 0-2% silt	Kozeny-Carman equation
URS (2007)[2]	STA 217+00	56	Sand to silty-sand	Kozeny-Carman equation
		283	Gravel	Kozeny-Carman equation
LSCE	Bianchi Wells 1 and 2	33-49	Sand to silty-sand	Estimated from specific capacity
	Lennar Westlake Well 1	488	Fine to coarse sand with gravel	2-hour pump test (11/21/00) in well perforated 112-132 ft.
	Lennar Paulson Well	36	Sand to silty-sand	36-hour pump test (7/3/07) in well perforated 185-397 ft.
DWR (1978)[3]	Node 37 (Sutter County)	51	Mixed	Sacramento Valley groundwater flow model
	Node 43 (Sacramento County)	139	Mixed	Sacramento Valley groundwater flow model
WRIME	Sutter County portion of Natomas Basin	86-118	Mixed	Layer 1 of North American River IGSM model
	Sacramento County portion of Natomas Basin	33-53	Mixed	Layer 1 of Sacramento County IGSM model
Average		**116**		
Median		**51**		

1. Kleinfelder, Inc. 2007. Basis of Design Report, Sacramento River East Levee Reaches 1 Through 4B (Draft)
2. URS Corporation, 2007. Preliminary Geotechnical Reevaluation Report, Sacramento River East Levee (Draft)
3. DWR. 1978. Evaluation of Groundwater Resources: Sacramento Valley



FILE: \public\SAFCA\GIS\Figure 2-1.mxd DATE: 2/11/2008 10:55:44 AM

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 2-1
Location of North American Subbasin and Adjoining Subbasins of the Sacramento Valley Groundwater Basin

3.0 Groundwater Levels and Flow

3.1 Sacramento River East Levee Piezometers

DWR has conducted groundwater level monitoring at a number of wells in the Natomas Basin since 1948. DWR monitored approximately 20 wells in 2003 but only 7 wells in 2007. In addition to the wells monitored by DWR, a series of shallow piezometers was constructed along the Sacramento River East Levee in the Natomas Basin to collect groundwater level data for previous investigations of seepage beneath the levee. A total of 38 piezometers has been installed along the levee since 1991, and at least some groundwater level data are available for 27 of these. Groundwater elevations measured in these piezometers have been plotted in order to determine the location and seasonal fluctuations of gaining and losing reaches along the Sacramento River East Levee. The 27 piezometers with water level data include four installed by Kleinfelder in 1998, 13 installed by USACE in 2001, and ten installed by Kleinfelder in 2004. The construction of the piezometers is summarized in **Table 3-1**, and the piezometer locations are shown on **Figure 3-1**. The piezometers range in depth from 12 to 90 feet, but most are between 25 and 50 feet deep. Many of the piezometers are paired based either on depth (shallow vs. deep) or location (closer to the River vs. further away). The latter pairings are particularly useful to show the direction and magnitude of the hydraulic gradient near the River.

Water level measurements at the piezometers have been intermittent, resulting in varying periods of record for water level data between 1999 and 2007. Data from the USACE piezometers are the most useful because the wellhead elevations have been surveyed and manual water level measurements are available. The USACE piezometers have a period of record from January 2002 to October 2003.

The Kleinfelder piezometers were not surveyed at the time of installation, and those installed in 1998 have a short period of record (December 2005 to April 2006). The piezometers installed by Kleinfelder in 2001 have a longer period of record (October 2004 to July 2006). There are no manual measurements available for these piezometers, however, and some of the transducer data are questionable as discussed below. The Kleinfelder piezometers were surveyed by LSCE on February 28 and 29, 2008 using survey-grade Global Positioning System (GPS) equipment with a vertical accuracy of at least one inch. The survey results are shown in **Table 3-1**. No bollards were installed to protect these piezometers, and two of them (PZ-4 and PZ-7) had been destroyed (apparently by farm equipment) by the time of the survey.

Data from the shallow levee piezometers were combined with other water level data to prepare contour maps of equal groundwater elevation for the North American Subbasin and more detailed maps for the Natomas Basin. The contour maps were prepared prior to the GPS survey of the Kleinfelder piezometers; therefore, data from these piezometers were not used to create the contour maps. Hydrographs were also prepared showing groundwater elevations in 23 piezometers and estimated stage in the Sacramento River adjacent to the piezometers. These contour maps and hydrographs were used to evaluate gaining and losing conditions along the

Sacramento River and to estimate the hydraulic gradient between the River and the shallow aquifer.

3.2 Groundwater Elevation Contour Maps

Groundwater elevations and flow directions in the study area are illustrated on groundwater elevation contour maps. DWR (1997) includes spring water level contour maps for the years 1950, 1960, 1965, 1970, 1977, 1980, 1985, 1990, and 1992. As noted by DWR, groundwater generally flowed in a southwesterly direction (from the foothills toward the axis of the valley) under pre-development conditions. Groundwater levels began to decline during the 1940s (or earlier), and the 1960 water level contour map shows three pumping depressions. From north to south, these were located east of Nicolaus, near Pleasant Grove, and near the eastern edge of the Natomas Basin along the Sutter-Sacramento County line. By 1965, the pumping depression east of Nicolaus had largely disappeared, but the pumping depression near Pleasant Grove had deepened and merged with that along the eastern edge of the Natomas Basin. The 1980 DWR contour map shown on **Figure 3-2** indicates that, by 1980, the pumping depression southeast of Pleasant Grove had deepened to about –30 feet msl and merged with a deeper pumping depression beneath McClellan Air Force Base (AFB) in Sacramento County. These pumping depressions are centered about three miles east of the eastern edge of the Natomas Basin.

A fall 1997 groundwater elevation contour map for all of Sacramento County prepared by the Sacramento County Water Resources Division and reproduced in NCMWC (2002) is shown on **Figure 3-3**. This contour map indicates that the McClellan AFB pumping depression was linked with two other pumping depressions centered beneath the City of Elk Grove and east of the City of Galt. The Elk Grove pumping depression is the largest and deepest of the three, with a groundwater elevation below –70 feet msl at the center. The Pleasant Grove and McClellan AFB pumping depressions are located in the North American Subbasin; the other two depressions are located in the South American Subbasin.

The DWR and Sacramento County groundwater elevation contour maps were developed using data from wells of variable and often unknown perforated intervals. These composite maps must be considered approximations that do not reflect the fact that groundwater elevations can be significantly different in wells of different depths. Hydrographs of DWR's multiple-completion monitoring wells show that deeper wells in the area typically have lower groundwater elevations than shallower wells because most groundwater pumping occurs from deeper zones, which are more confined. Upper zone groundwater elevation contour maps were prepared for this study, as discussed below.

Water level data for wells completed in the upper zone in the North American Subbasin were evaluated to select recent periods with sufficient data for contouring purposes. Because the primary focus of this investigation is on groundwater flow in the Natomas Basin, contour maps were prepared for periods for which data from the USACE levee piezometers (the only piezometers with surveyed wellhead elevations prior to 2008) were available, and spring and fall contour maps were prepared for 2003. Two versions of the 2003 contour maps were created, one showing the entire subbasin and another showing a more detailed view of the Natomas Basin. Data from about 90 wells were used to prepare each map. The subbasin-scale groundwater

elevation contour maps have a contour interval of ten feet; the more detailed maps have a two-foot contour interval. The vertical datum for all contour maps and hydrographs prepared for this report is NGVD29. The periods selected for groundwater elevation contour maps, area of coverage, and the number of wells used for each map are as follows:

- **Figure 3-4:** Spring 2003 (North American Subbasin),
- **Figure 3-5**: Spring 2003 (Natomas Basin),
- **Figure 3-6**: Fall 2003 (North American Subbasin),
- **Figure 3-7**: Fall 2003 (Natomas Basin).

The spring 2003 groundwater elevation contour map for the North American Subbasin (**Figure 3-4**) shows that the direction of groundwater flow in the upper zone in most of the subbasin is toward the pumping depression centered in the McClellan AFB area, which had a minimum elevation of about –40 feet msl based on data from McClellan AFB monitoring wells. The northeastern portion of the subbasin is the only area where the groundwater flow direction was not toward the McClellan AFB pumping depression on **Figure 3-4**. The direction of groundwater flow in the northeastern area is toward the Bear and Feather Rivers, which indicates that both rivers were gaining in the spring of 2003. A gaining reach occurs when groundwater levels are higher than the river stage, creating a gradient for groundwater to flow to the river. Losing conditions occur when the river stage is higher than groundwater levels adjacent to the river, which results in recharge from the River to the aquifer.

The Sacramento River west of the Natomas Basin appeared to be a losing reach in spring 2003. Groundwater elevations shown on **Figure 3-4** range from about 20 feet msl in the northern and northwestern portions of the Natomas Basin to about –20 feet msl along the eastern edge. The direction of groundwater flow was easterly toward the McClellan AFB pumping depression. The hydraulic gradient was relatively flat especially in the northern half of the study area (about three ft/mile) but became much steeper along the eastern edge (up to 20 ft/mile).

In order to provide additional detail on groundwater elevations and flow directions in the Natomas Basin, the spring 2003 water level data were re-contoured with a contour interval of two feet. The resulting map, shown on **Figure 3-5**, confirms that the direction of groundwater flow was easterly across most of the Natomas Basin. All reaches of the Sacramento River appeared to be losing in the spring of 2003, but the magnitude of the hydraulic gradient near the River gradually increases from north to south. In the northern portion of the Natomas Basin, the hydraulic gradient for flow away from the River was less than three ft/mile. In the southern portion, the easterly hydraulic gradient increased to about nine ft/mile.

The fall 2003 groundwater elevation contour map shown on **Figure 3-6** is generally similar to the spring 2003 map, and the direction of groundwater flow was essentially the same during both periods. Comparison of the two contour maps indicates that fall groundwater levels along the Sacramento River were five to ten feet lower than in the spring, but levels at these two times were similar in the eastern portion of the Natomas Basin. Fall 2003 groundwater levels were also similar to spring levels in the McClellan AFB pumping depression but were about ten feet lower than in the spring in the pumping depression in southwestern Placer County.

Figure 3-7 shows fall 2003 groundwater levels in the Natomas Basin re-contoured with a contour interval of two feet. Although groundwater levels in fall 2003 were lower along the Sacramento River than in the spring, the general direction of groundwater flow was still easterly in most of the study area. The only exception is the northern portion of the Natomas Basin where the direction of groundwater flow was to the south-southwest parallel to the Sacramento River. These reaches of the River appear to be neutral (no significant gain or loss) in fall 2003. Losing conditions prevailed in the southern reaches, but the gradient for flow away from the River was less steep than in the spring.

3.3 Hydrographs of Groundwater Levels and River Stage

Water level hydrographs were prepared for the shallow piezometers along the Sacramento River East Levee in order to evaluate seasonal variations in gaining and losing conditions. In addition to groundwater elevation data from the levee piezometers, river stage estimates are also shown on the hydrographs. Under separate contract for SAFCA, MBK Engineers used stage data from the Verona, Bryte, and I Street gages (**Figure 3-8**) to estimate the daily average stage at each piezometer location based on a linear interpolation (Mike Archer, MBK, pers. comm., January 22, 2008). One source of error in the stage estimates is that tidal effects at the Bryte and I Street gages do not propagate upstream to the Verona gage. However, MBK checked the estimates against stage profiles simulated with a calibrated Hydrologic Engineering Center (HEC) surface water model, and concluded that the stage estimates were reasonable.

Hydrographs of groundwater elevations in the shallow piezometers and estimated Sacramento river stage are shown from north to south on **Figures 3-9** through **3-16**. Where piezometers are paired based on distance from the River, data from both piezometers are plotted on the same hydrograph using different symbols. As discussed above, losing conditions occur when groundwater elevations are lower than river stage. For the paired piezometers, a gradient away from the River indicates losing conditions, while a gradient toward the River indicates gaining conditions. The groundwater level data are color coded on the hydrographs, with data showing losing conditions plotted in red and data showing gaining conditions plotted in blue. For the piezometers with surveyed elevations, stage estimates can also be compared with measured groundwater elevations to indicate gaining or losing conditions at unpaired piezometer locations. The groundwater level data plotted on these hydrographs are also color coded to show gaining or losing conditions. Uncertainty in the data is highlighted by the fact that a number of hydrographs show gaining conditions in the spring and fall of 2003 even in the southern half of the Natomas Basin, while the groundwater elevation contour map (**Figure 3-8**) shows losing conditions in this area.

During the winter when the river stage is high, all hydrographs show losing conditions and steep gradients for groundwater flow away from the River. The results are much more variable during the rest of the year when the river stage is lower. Hydraulic gradients are relatively flat during periods of low stage, and gradient reversals appear to be common. Gaining conditions are most likely to occur during the summer and fall when the river stage is lowest. There is more uncertainty about the determination of gaining or losing conditions during the summer and fall because groundwater levels and river stage are similar during these periods. There is also uncertainty during periods of rapidly declining stage because groundwater levels decline at a

slower rate than river stage. Continuous data would be needed during these periods to accurately determine the fluctuations between gaining and losing conditions.

Gaining and losing reaches vary by both location and time. URS (2003) indicated that river stage was approximately nine to ten feet above groundwater levels at high stage and one to three feet below groundwater levels at low stage at the northernmost USACE piezometer (2F-01-15N). At the southernmost USACE piezometer (2F-01-19S), river stage was approximately four to five feet above groundwater levels at high stage and one to 1.5 feet below groundwater levels at low stage. For USACE paired piezometers 2F-01-26N and 28N, URS noted that groundwater levels were about 1.25 feet higher in the piezometer closer to the River during high stage and generally similar during low stage. For paired piezometers 2F-01-68N and 69N, URS indicated that groundwater levels were about three feet higher in the piezometer closer to the River during high stage and generally similar during low stage. URS also noted that groundwater levels tended to lag river stage by several days (URS, 2003). The individual hydrographs are discussed below.

Figure 3-9 shows hydrographs of the northernmost piezometers. This includes USACE piezometer 2F-01-15N in Reach 2 and paired Kleinfelder piezometers PZ-7 and PZ-8 in Reach 4a. The hydrograph of 2F-01-15N shows losing conditions during periods of high stage in the winter and spring and gaining conditions during the rest of the year. This is the deepest of the levee piezometers with a screened interval of 80 to 90 feet. This makes the comparison with river stage less valid, but there are no nearby shallow piezometers to show the head difference between shallow and deeper zones. Paired piezometers PZ-7 and PZ-8 show losing conditions during a limited period of record (intermittent from October 13, 2004 to July 12, 2006). The fact that the groundwater elevations were notably lower than the stage estimates for all periods suggests inaccuracies in either the stage estimates, the wellhead elevation, or the water level measurements. The indication of consistently losing conditions should be considered questionable since most other piezometers show a mix of gaining and losing conditions.

Figure 3-10 shows hydrographs of paired USACE piezometers 2F-01-26N and 28N in Reach 4b and paired Kleinfelder piezometers PZ-5D and PZ-6D in Reach 6b. Both piezometer pairs show generally losing conditions during the winter and spring and consistently gaining conditions during the summer and fall. The continuous transducer data from the Kleinfelder piezometers clearly show losing conditions at high stage and gaining conditions at low stage during the winter and spring. This effect is especially noticeable from December 2004 to May 2005 but also occurred during the winter and spring of 2005-2006.

Figure 3-11 show hydrographs of unpaired USACE piezometers 2F-01-51N in Reach 8 and 2F-01-49N in Reach 9a, and **Figure 3-12** show hydrographs of unpaired USACE piezometers 2F-01-56N in Reach 9b and 2F-01-62N in Reach 11b. Compared against estimated river stage, all four piezometers show mostly losing conditions except during periods of rapidly fluctuating stage in the spring and periods of very low stage during the fall. The spring of 2003 was the longest period of gaining conditions during the 22-month period of record.

Figure 3-13 shows hydrographs of paired Kleinfelder PZ-3 and PZ-4 and USACE piezometers 2F-01-68N and 69N in Reach 11b. Piezometers PZ-3 and PZ-4 show losing conditions based on groundwater level data during the entire period of record (October 13, 2004 to October 7, 2006).

As for piezometers PZ-7 and PZ-8, the fact that the groundwater elevations were notably lower than the stage estimates for all periods suggests inaccuracies in either the stage estimates, the wellhead elevation, or the water level measurements. The indication of consistently losing conditions should be considered questionable since most other piezometers show a mix of gaining and losing conditions. The data from paired USACE piezometers 2F-01-68N and 69N in Reach 11b are more similar to piezometers in other reaches, with losing conditions occurring during periods of high stage and a mixture of gaining and losing conditions during the rest of the year. Gaining conditions occurred primarily in the spring of 2002 and during periods of lowest stage.

Figure 3-14 shows hydrographs of unpaired USACE piezometers 2F-01-05S in Reach 13 and 2F-01-15S in Reach 15 compared with estimated stage. Most of the data from 2F-01-05S appear to be questionable, with low groundwater levels in the spring and higher levels during the summer, especially in 2002. The data from USACE piezometer 2F-01-15S in Reach 13 track the estimated stage much more closely, but the estimated stage appears to be low relative to the groundwater levels. In particular, the indication of gaining conditions during almost all of 2002 is probably incorrect. The stage estimates appear to be more accurate from December 2002 through October 2003, with losing conditions during periods of high or rising stage and gaining conditions during periods of low or declining stage.

Figure 3-15 shows hydrographs of unpaired USACE piezometers 2F-01-17S and 2F-01-19S in Reach 16 compared with estimated stage. Both piezometers have similar hydrographs, and the estimated stage tracks the groundwater data closely. The hydrographs generally show losing conditions during periods of high or rising stage and gaining conditions during periods of low or declining stage.

Figure 3-16 shows hydrographs of paired Kleinfelder piezometers in Reaches 18b and 19a. The transducers in Kleinfelder piezometers PZ-1 and PZ-2 were not working during most of the monitoring period. Almost all of the data that were collected in January and June-August 2005 show gaining conditions, which is inconsistent with the other piezometers. Water level measurements in paired Kleinfelder piezometers LMW-1 and LMW-4 were made manually, but the measurements made prior to January 2006 appear to be too high when compared with the estimated stage. The measurements made from December 2005 to April 2006 appear to be more reasonable but were made only during periods of high stage. The groundwater level data indicate losing conditions throughout this period.

Depths to water measured in the USACE piezometers located on the land side levee toe typically range from about six feet during the winter to about 18 feet during the summer and fall. This represents a seasonal fluctuation of only about 12 feet. Similarly high groundwater levels and small seasonal fluctuations have been observed at DWR's multiple-completion wells elsewhere in the Natomas Basin. The small seasonal fluctuations are due to a combination of the buffering effect of recharge from the River and from rice fields throughout the Natomas Basin and the fact that most pumping is from deeper zones. Recharge from rice irrigation in the summer months keeps shallow groundwater levels high and is a primary factor in the gaining conditions observed at many of the levee piezometers during periods of low stage.

3.4 Hydraulic Gradient Estimates

The differences in hydraulic head between the paired piezometers and also between the unpaired piezometers and the estimated River stage are tabulated in **Table 3-2**, and these head differences were used to estimate the hydraulic gradient. Losing conditions are indicated by positive head differences and hydraulic gradients, and negative values indicate gaining conditions. Head differences were calculated for the entire period of record and range from about –3 feet to more than 11 feet. For paired piezometers that have been surveyed, head differences were calculated based on both groundwater data and stage estimates.

Average annual head differences and hydraulic gradients were calculated for each individual or paired piezometer based on the most recent 12-month period for which data are available. Due to the problems with some of the piezometer data discussed above, hydraulic gradients were not calculated for USACE piezometer 2F-01-15S and Kleinfelder piezometers PZ-1, PZ-2, LMW-1, and LMW-4. For the two sets of paired USACE piezometers, gradients were estimated by comparing the estimated stage with head in the piezometer closest to the River. Because more data were available from the USACE piezometers during the winter and spring, an average hydraulic gradient was calculated for each month. The monthly gradients were then averaged to determine the average hydraulic gradient for the 12-month period.

As shown in **Table 3-2**, the minimum hydraulic gradient at each piezometer location ranged from –0.0098 to 0.0003 ft/ft, with an average of –0.0039 ft/ft. The minimum hydraulic gradient was negative at all but one site, which indicates gaining conditions. The maximum hydraulic gradient ranged from 0.0054 to 0.0239 ft/ft, with an average of 0.0161 ft/ft. The magnitude of the average maximum hydraulic gradient (0.0239 ft/ft) is more than twice as large as the average minimum gradient (–0.0098 ft/ft) because the gradient is steeper during periods of high stage.

Average monthly hydraulic gradients were calculated for 13 piezometer locations (individual or paired), and an average annual gradient was calculated by averaging the monthly values. As shown in **Table 3-2**, the average annual hydraulic gradient at each piezometer ranged from 0.0006 to 0.0089 ft/ft. All of the average annual hydraulic gradients were positive, which indicates that all reaches exhibited losing conditions over the 12-month period. Although the groundwater elevation contour maps show steeper gradients in the southern portion of the Natomas Basin, there are too many sources of error in the gradient estimates to allow quantification of these spatial variations.

The average annual hydraulic gradient for all piezometers shown in **Table 3-2** was 0.0032 ft/ft or about 17 ft/mile. This represents the estimated average annual gradient for seepage loss from the River to the shallow aquifer based on a combination of piezometer data and estimated stage. This gradient is almost twice as steep as the maximum gradient east of the Sacramento River shown on the spring and fall 2003 groundwater elevation contour maps for the Natomas Basin (**Figures 3-5** and **3-7**). The groundwater contour maps are based on groundwater data only and have too large a scale to show the gradient between these closely spaced piezometers. The steeper gradient near the River calculated above is also due to the low permeability of the riverbed and the fact that the greatest head differences between surface water and groundwater occur during periods of high stage.

Table 3-1
Construction of Sacramento River East Levee Piezometers in Natomas Basin

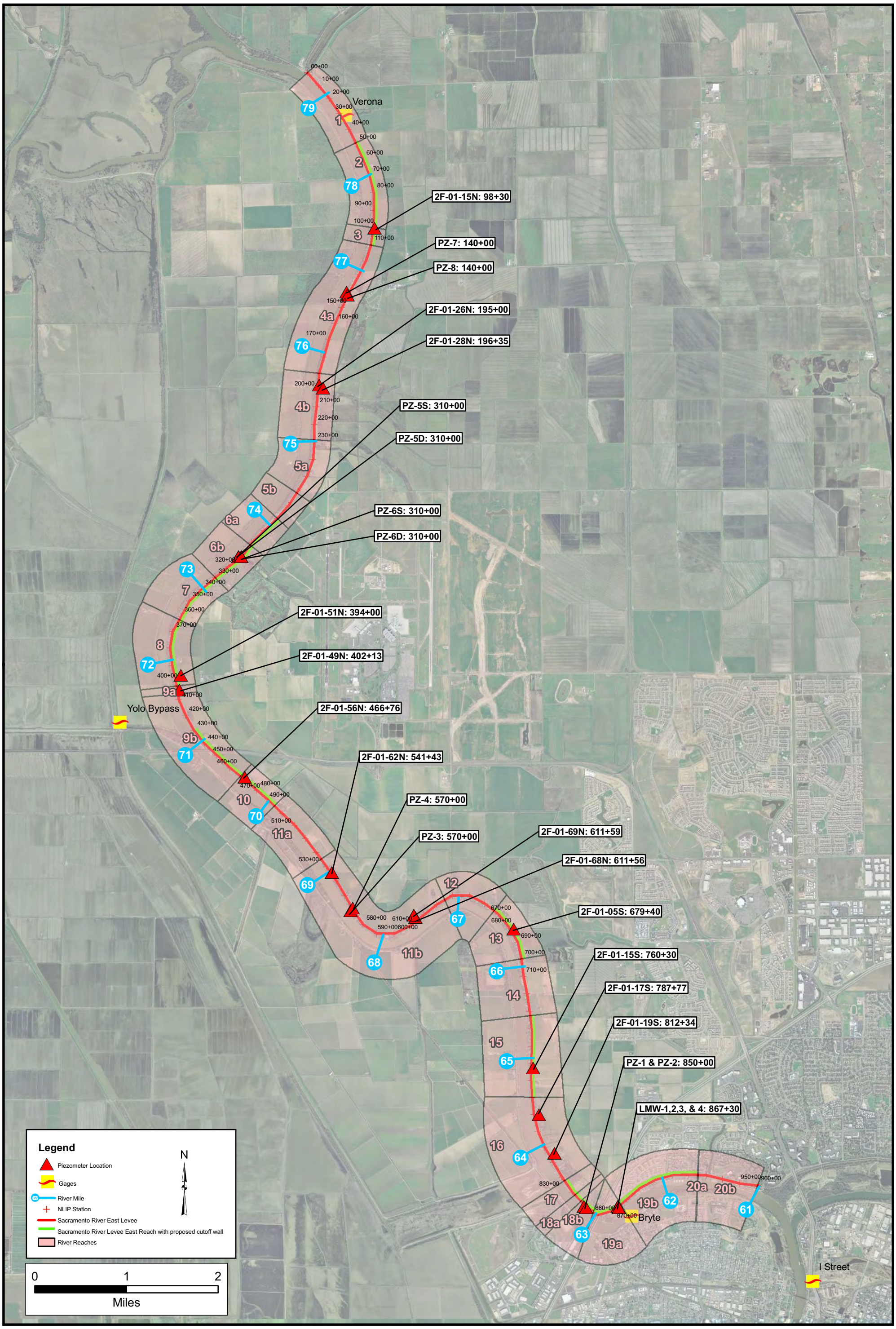
Well ID	NLIP Station	River Mile (Approx)	Levee Mile (Approx)	Land Side Offset (Approx.) (ft)	Ground Surface Elevation (ft msl)[1]	Wellhead Elevation (ft msl)[1]	Screened Interval (ft)	Northing (ft)[2]	Easting (ft)[2]	Installed By	Date Drilled
2F-01-15N	98+30	76.8	1.9	0	25.10	26.90	80 - 90	2037443	6678210	USACE	2001
2F-01-26N	195+00	74.9	3.7	0	26.16	28.98	45 - 46	2028392	6675030	USACE	2001
2F-01-28N	196+35	74.9	3.7	250	27.51	28.75	38 - 48	2028227	6675252	USACE	2001
2F-01-51N	394+00	71.0	7.5	200	23.38	23.08	30 - 37	2011639	6667053	USACE	2001
2F-01-49N	402+13	70.9	7.6	0	25.39	25.01	40 - 60	2010756	6666969	USACE	2001
2F-01-56N	466+76	69.7	8.8	100	23.15	25.51	30 - 40	2005770	6670729	USACE	2001
2F-01-62N	541+43	68.2	10.3	50	24.88	27.06	33 - 43	2000269	6675756	USACE	2001
2F-01-68N	611+56	67.0	11.6	50	22.67	22.50	30 - 40	1997685	6680572	USACE	2001
2F-01-69N	611+59	67.0	11.6	200	21.71	21.51	26 - 36	1997813	6680474	USACE	2001
2F-01-05S	679+40	65.9	12.9	100	21.75	21.22	25 -35	1996993	6686228	USACE	2001
2F-01-15S	760+30	64.3	14.4	0	24.50	27.05	25 - 35	1988983	6687344	USACE	2001
2F-01-17S	787+77	63.7	14.9	100	19.53	19.28	30 - 40	1986284	6687689	USACE	2001
2F-01-19S	812+34	63.2	15.4	250	20.27	22.88	35 - 45	1984077	6688570	USACE	2001
LMW-1	867+30	62.2	16.5	Land Side	21.0	37.78	20 - 25	1980996	6692226	Kleinfelder	Oct. 1998
LMW-4	867+30	62.2	16.5	Water Side	20.0	38.08	20 - 25	1980918	6692285	Kleinfelder	Oct. 1998
LMW-2	867+30	62.2	16.5	Land Side	18.4	37.78	40 - 45	1980996	6692226	Kleinfelder	Oct. 1998
LMW-3	867+30	62.2	16.5	Water Side	19.6	38.08	40 - 45	1980918	6692285	Kleinfelder	Oct. 1998
PZ-7[3]	140+00	76.1	2.7	0	21.5	-	32 - 33	2033745	6676601	Kleinfelder	Oct. 2004
PZ-8	140+00	76.1	2.7	100	19.6	21.63	32 - 33	2033576	6676663	Kleinfelder	Oct. 2004
PZ-5S	310+00	72.7	5.9	0	34.0	35.43	11 - 12	2018478	6670369	Kleinfelder	Oct. 2004
PZ-5D	310+00	72.7	5.9	0	34.0	35.43	34 - 35	2018478	6670369	Kleinfelder	Oct. 2004
PZ-6S	310+00	72.7	5.9	100	30.2	31.5	12 - 13	2018489	6670533	Kleinfelder	Oct. 2004
PZ-6D	310+00	72.7	5.9	100	30.2	31.5	30.5 - 31.5	2018489	6670533	Kleinfelder	Oct. 2004
PZ-3	570+00	67.8	10.8	0	25.0	26.28	29.5 - 30.5	1998067	6676831	Kleinfelder	Oct. 2004
PZ-4[3]	570+00	67.8	10.8	100	23.4	-	32 - 33	1998216	6676951	Kleinfelder	Oct. 2004
PZ-1	850+00	62.5	16.1	0	21.0	23.53	32 - 33	1981001	6690265	Kleinfelder	Oct. 2004
PZ-2	850+00	62.5	16.1	100	19.2	21.83	31 - 32	1980925	6690401	Kleinfelder	Oct. 2004

1. Vertical datum = NGVD29.
2. Horizontal datum = NAD83, California State Plane Zone 2.
3. Destroyed.

Table 3-2
Hydraulic Gradients Along Sacramento River East Levee Based on Groundwater Elevations in Shallow Piezometers and Estimated Stage

Reach	NLIP Station	Monitoring Location		Distance[1] (ft)	Period of Record	Period for Annual Average	Head Difference (ft)[2]			Hydraulic Gradient (ft/ft)[2]		
		River Side	Land Side				Min	Max	Annual Average[3]	Min	Max	Annual Average[3]
2	98+30	River	2F-01-15N	370	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-2.70	8.83	0.47	-0.0073	0.0239	0.0013
4a	140+00	PZ-7	PZ-8	100	10/13/04 - 07/05/06	08/01/05 - 07/31/06	-0.35	1.31	0.89	-0.0035	0.0131	0.0089
4b	195+00	2F-01-26N	2F-01-28N	220	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-0.40	1.26	0.20	-	-	-
	196+35	River	2F-01-26N	260		11/01/02 - 10/31/03	-0.35	5.40	1.29	-0.0014	0.0208	0.0050
6b	310+00	PZ-5D	PZ-6D	100	10/14/04 - 07/12/06	08/01/05 - 07/31/06	-0.42	2.03	0.37	-0.0042	0.0203	0.0037
8	394+00	River	2F-01-51N	600	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-1.83	9.92	1.82	-0.0030	0.0165	0.0030
9a	402+13	River	2F-01-49N	260	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-1.47	6.28	0.99	-0.0057	0.0241	0.0038
9b	466+76	River	2F-01-56N	330	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-1.34	4.98	0.77	-0.0041	0.0151	0.0023
11b	541+43	River	2F-01-62N	300	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-2.95	3.45	0.33	-0.0098	0.0115	0.0011
	570+00	PZ-3	PZ-4	100	10/13/04 - 10/07/06	10/01/05 - 09/30/06	0.03	1.54	0.60	0.0003	0.0154	0.0060
	611+56	2F-01-68N	2F-01-69N	160	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-0.53	2.94	0.44	-	-	-
	611+59	River	2F-01-68N	500		11/01/02 - 10/31/03	-1.95	7.13	0.54	-0.0039	0.0143	0.0011
13	679+40	River	2F-01-05S	520	03/05/02 - 09/30/03	10/01/02 - 09/30/03	-2.14	10.71	2.30	-0.0041	0.0206	0.0044
15	760+30	River	2F-01-15S	270	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-0.97	1.92	-0.11	-	-	-
16	787+77	River	2F-01-17S	370	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-0.76	2.90	0.29	-0.0020	0.0078	0.0008
	812+34	River	2F-01-19S	550	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-0.97	2.96	0.32	-0.0018	0.0054	0.0006
18b	850+00	PZ-1	PZ-2	100	01/20/05 - 08/19/05	01/20/05 - 08/19/05	-1.21	1.06	-0.78	-	-	-
19a	867+30	LMW-4	LMW-1	100	02/03/99 - 04/24/06	11/01/05 - 10/31/06	-1.73	8.86	1.80	-	-	-
						Average	**-1.22**	**4.64**	**0.70**	**-0.0039**	**0.0161**	**0.0032**

1. Approximate distance between paired piezometers or between unpaired piezometers and Sacramento River.
2. Positive head differences and gradients indicate losing conditions (flow away from the River); negative values indicate gaining conditions.
3. The annual average was calculated from monthly averages to adjust for seasonal variations in the measurement frequency.

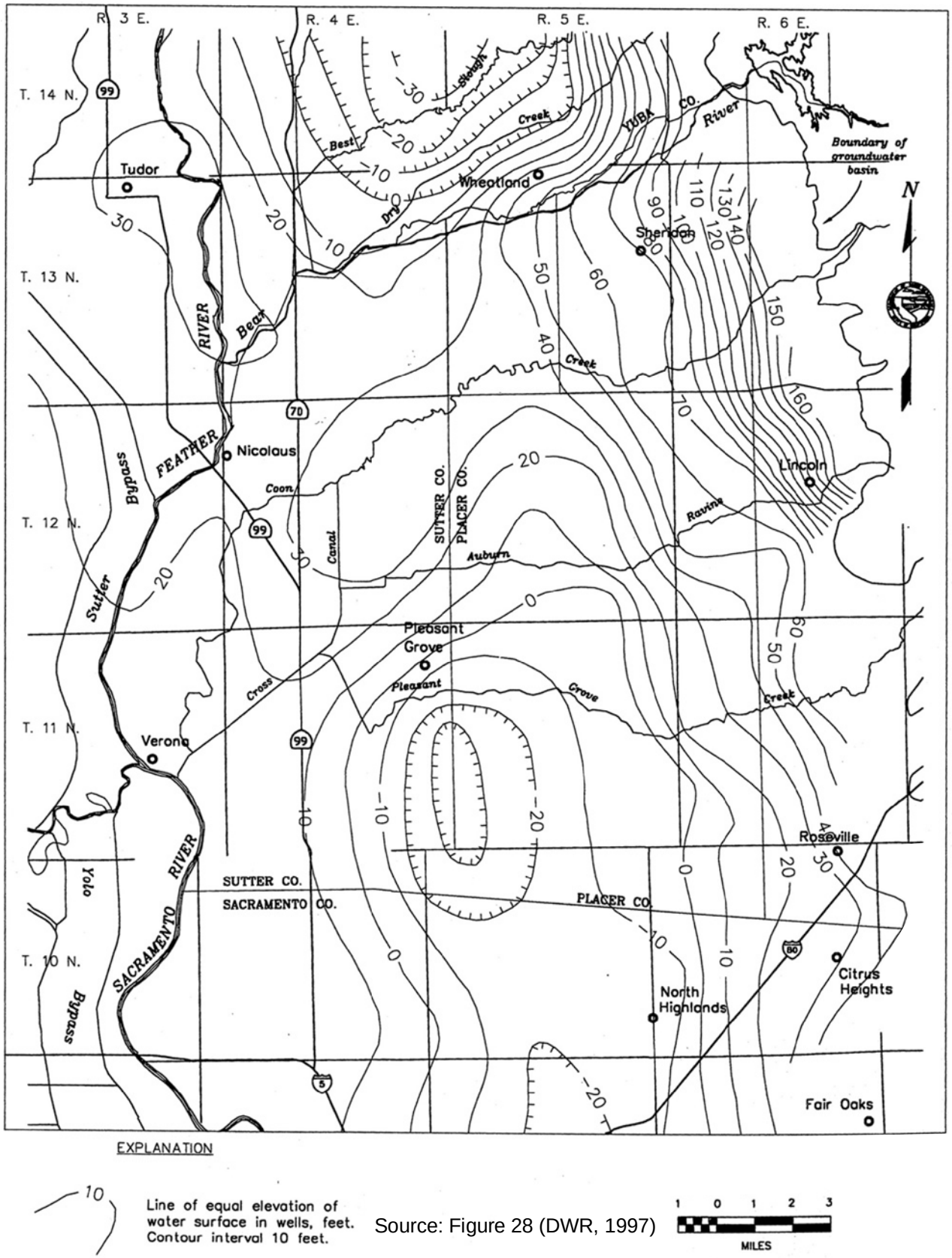


FILE: \public\SAFCA\GIS\Wells and Levee Location map.mxd

DATE: 1/30/2008 4:01:06 PM

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 3-1
Piezometer Locations Along Sacramento River East Levee in Natomas Basin

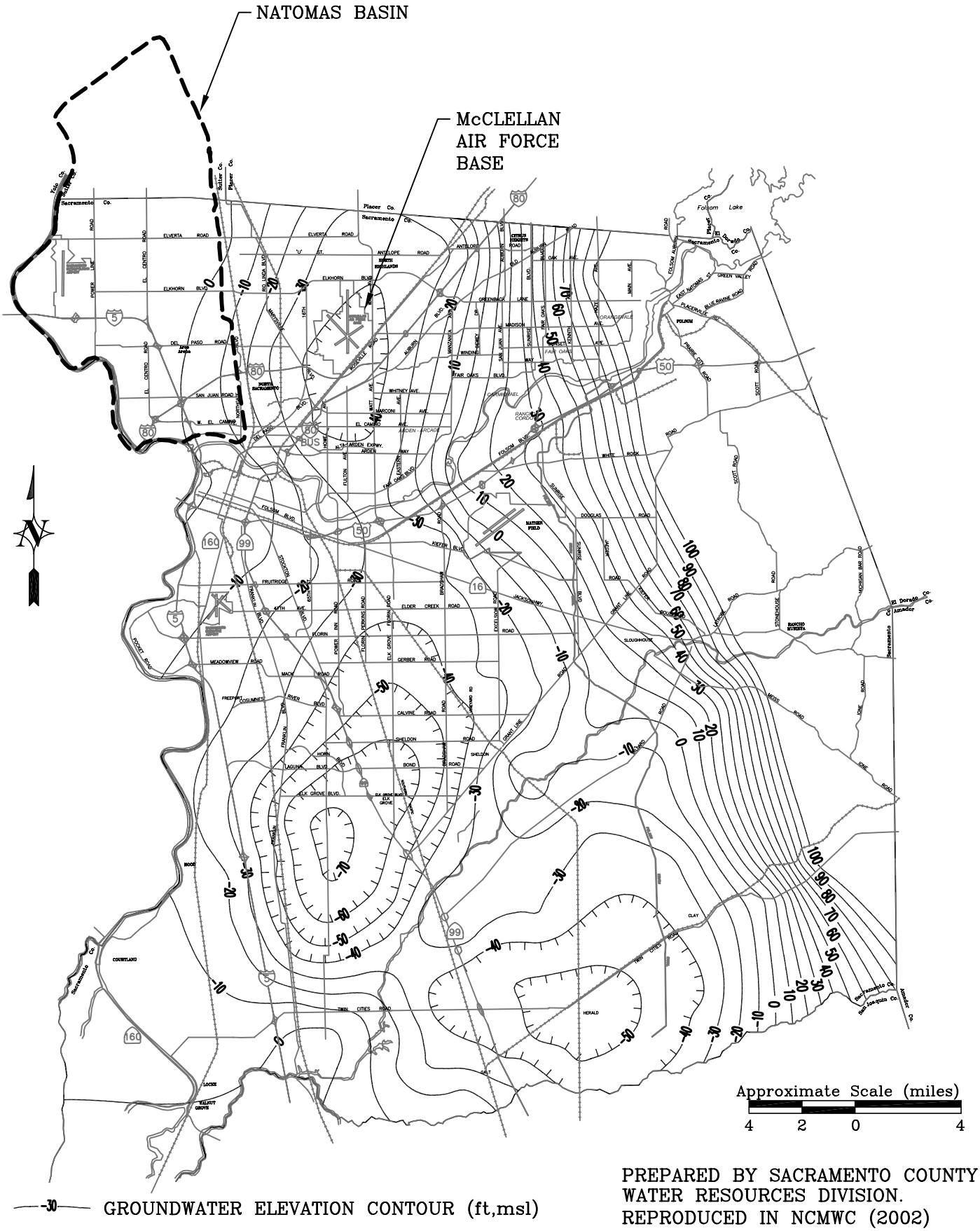


Source: Figure 28 (DWR, 1997)

FILE: \public\Sutter Pointe 07-1-012\GIS\Figure 4-4 Spring 1980 GWE contours.mxd DATE: 2/13/2008 11:12:09 AM

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

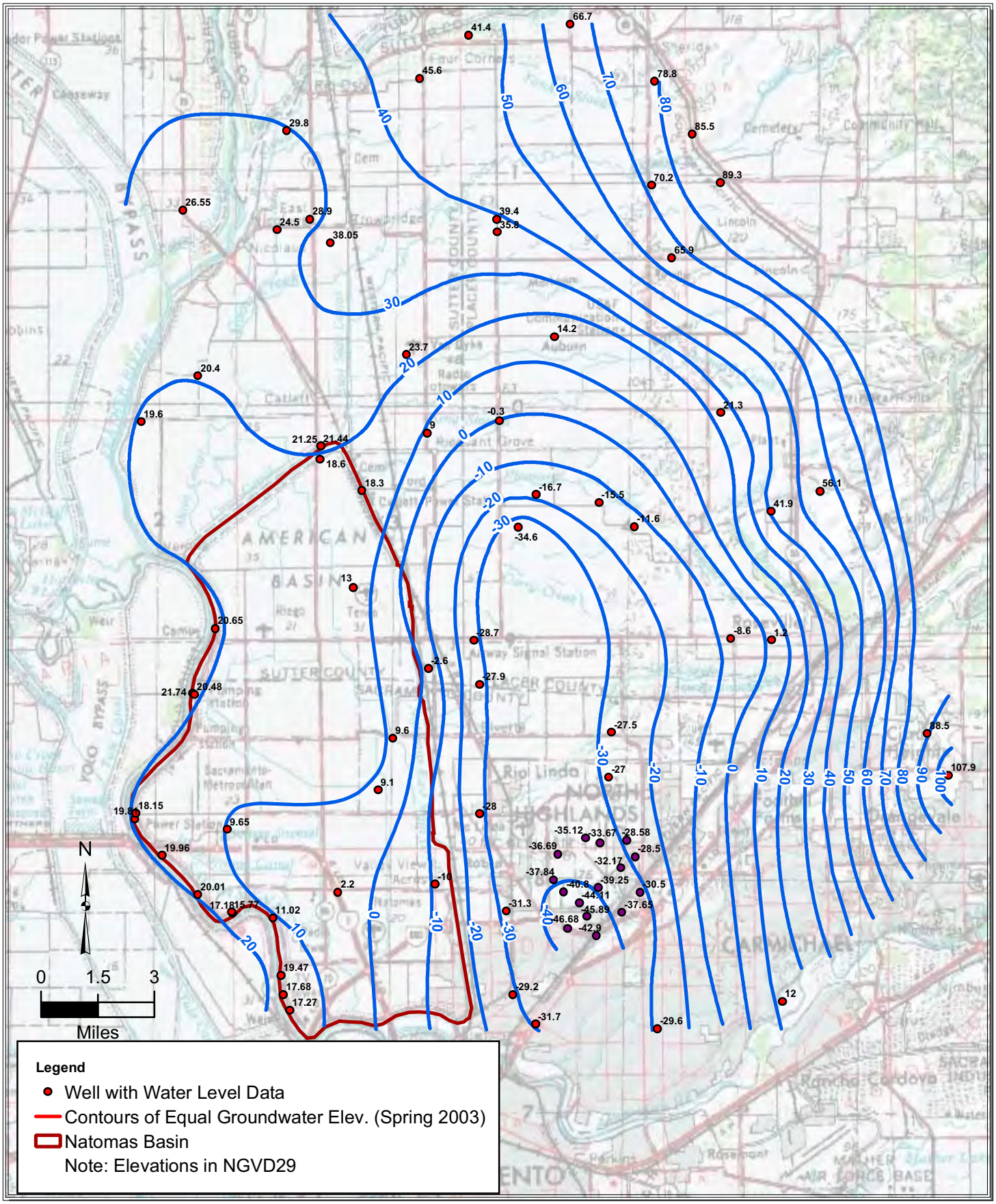
Figure 3-2
Spring 1980 Groundwater Elevation Contours
Multiple Zone Wells in North American Subbasin



CAD FILE: G:/Projects/SAFCA/07-1-084/Figure 4-3.dwg CFG FILE: LSCE2500.PCP_MRG DATE: 02-13-08 1:44pm

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

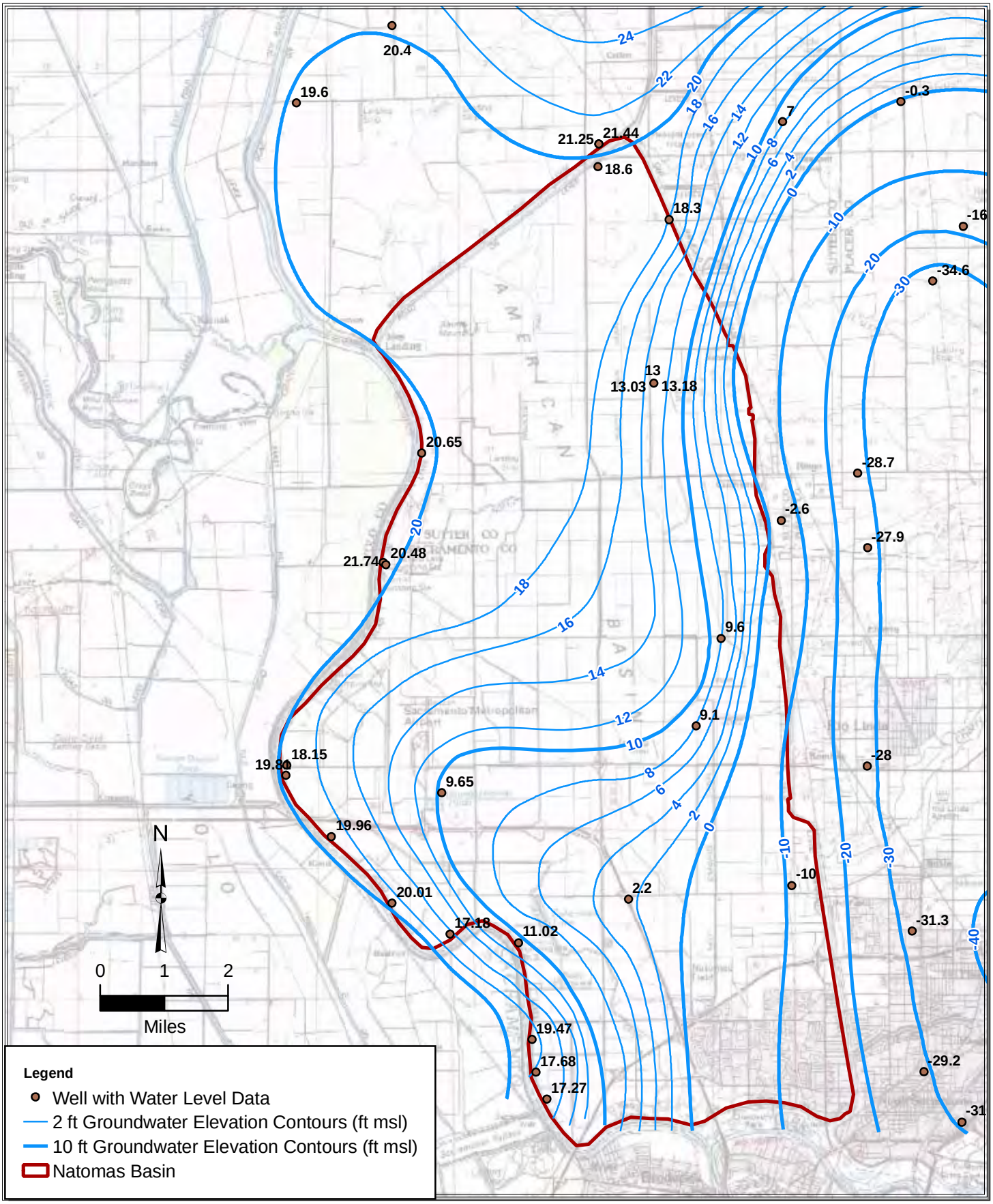
Figure 3-3
Fall 1997 Groundwater Elevation Contours
Multiple Zone Wells in Sacramento County



FILE: \\server_pe2900\public\Sutter Pointe 07-1-012\GIS\Spring 2003WLEContourMap_portrait_8.5x11.mxd Date: 11/14/2008

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

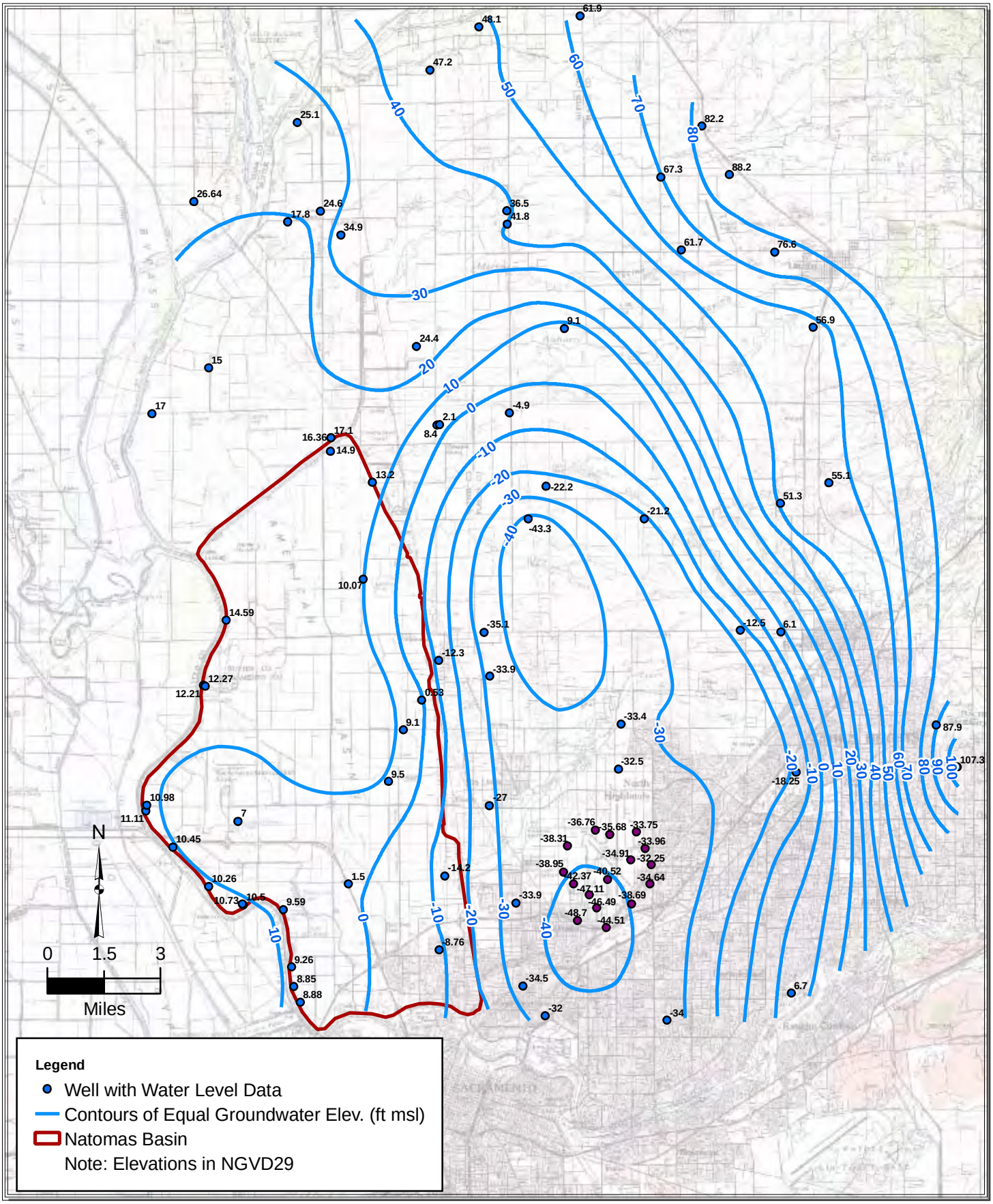
Figure 3-4
Spring 2003 Groundwater Elevations Contours for Upper Zone Wells in North American Subbasin



FILE: \public\Sutter Pointe 07-1-012\GIS\Spring 2003 WLENatomasContourMap_portrait.mxd DATE: 2/13/2008 11:32:12 AM

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

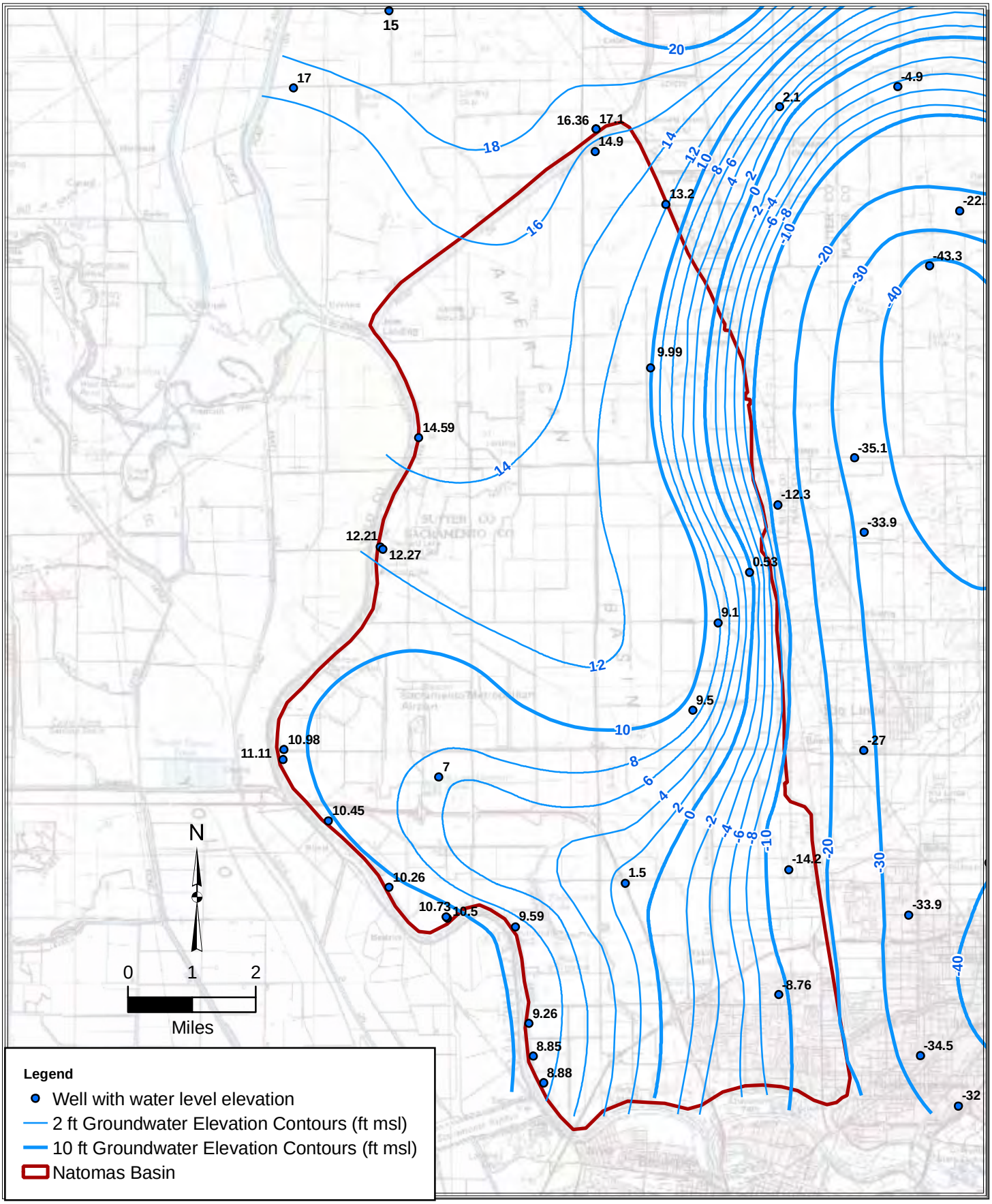
Figure 3-5
Spring 2003 Groundwater Elevation Contours for Upper Zone Wells in Natomas Basin



FILE: \public\Sutter Pointe 07-1-012\GIS\Fall 2003WLEContourMap_portrait_8.5x11.mxd DATE: 2/15/2008 9:40:14 AM

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

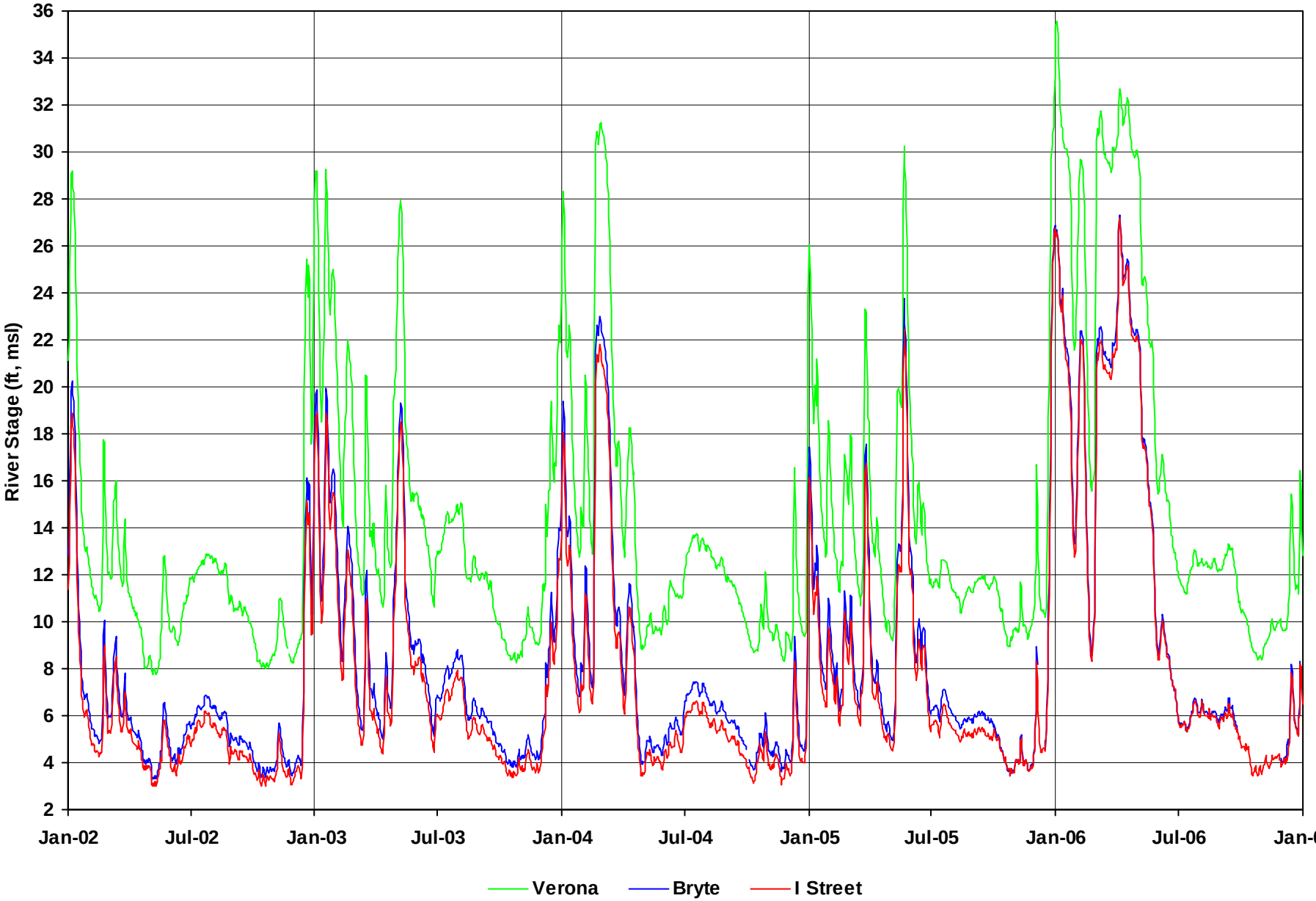
Figure 3-6
Fall 2003 Groundwater Elevations Contours for Upper Zone Wells in North American Subbasin



FILE: \public\Sutter Pointe 07-1-012\GIS\Fall 2003 WLENatomasContourMap_portrait.mxd DATE: 2/15/2008 9:43:59 AM

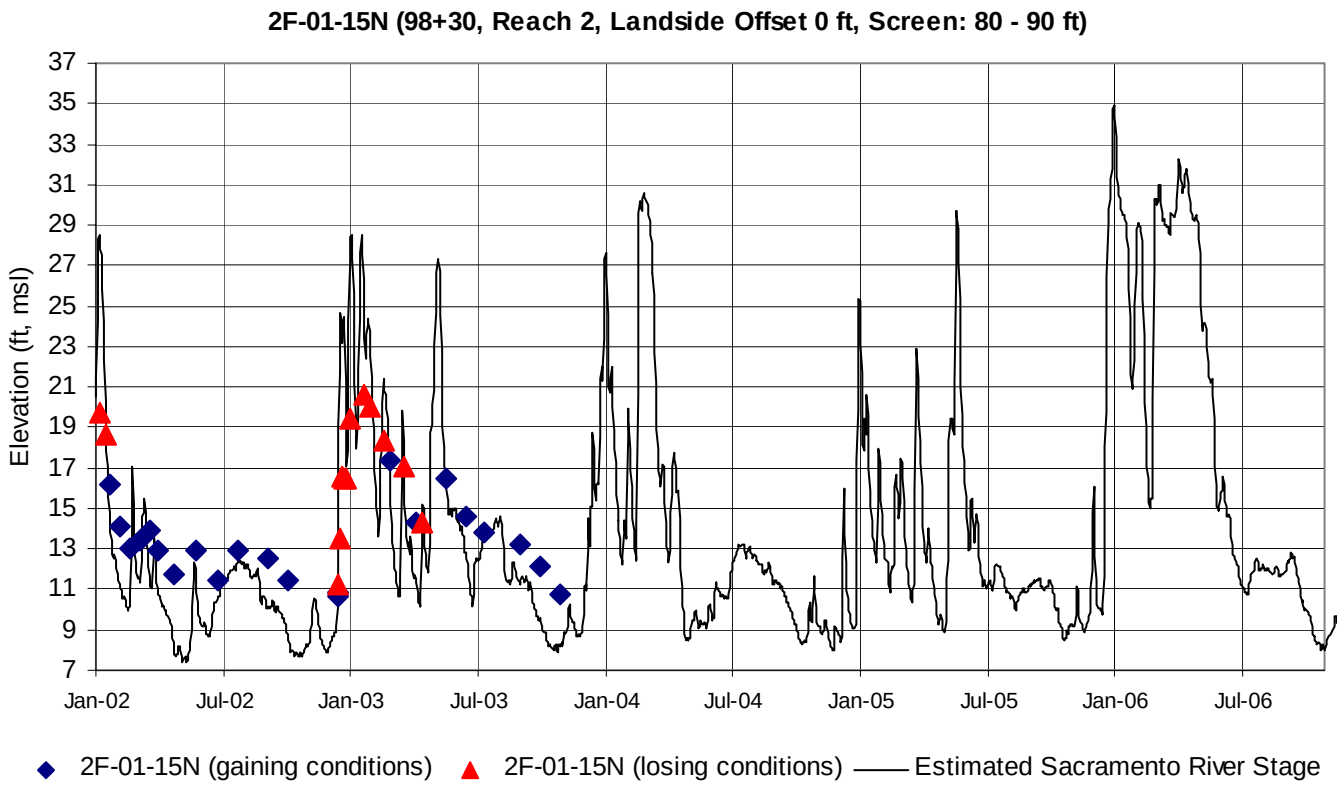
LUHDORFF & SCALMANINI CONSULTING ENGINEERS

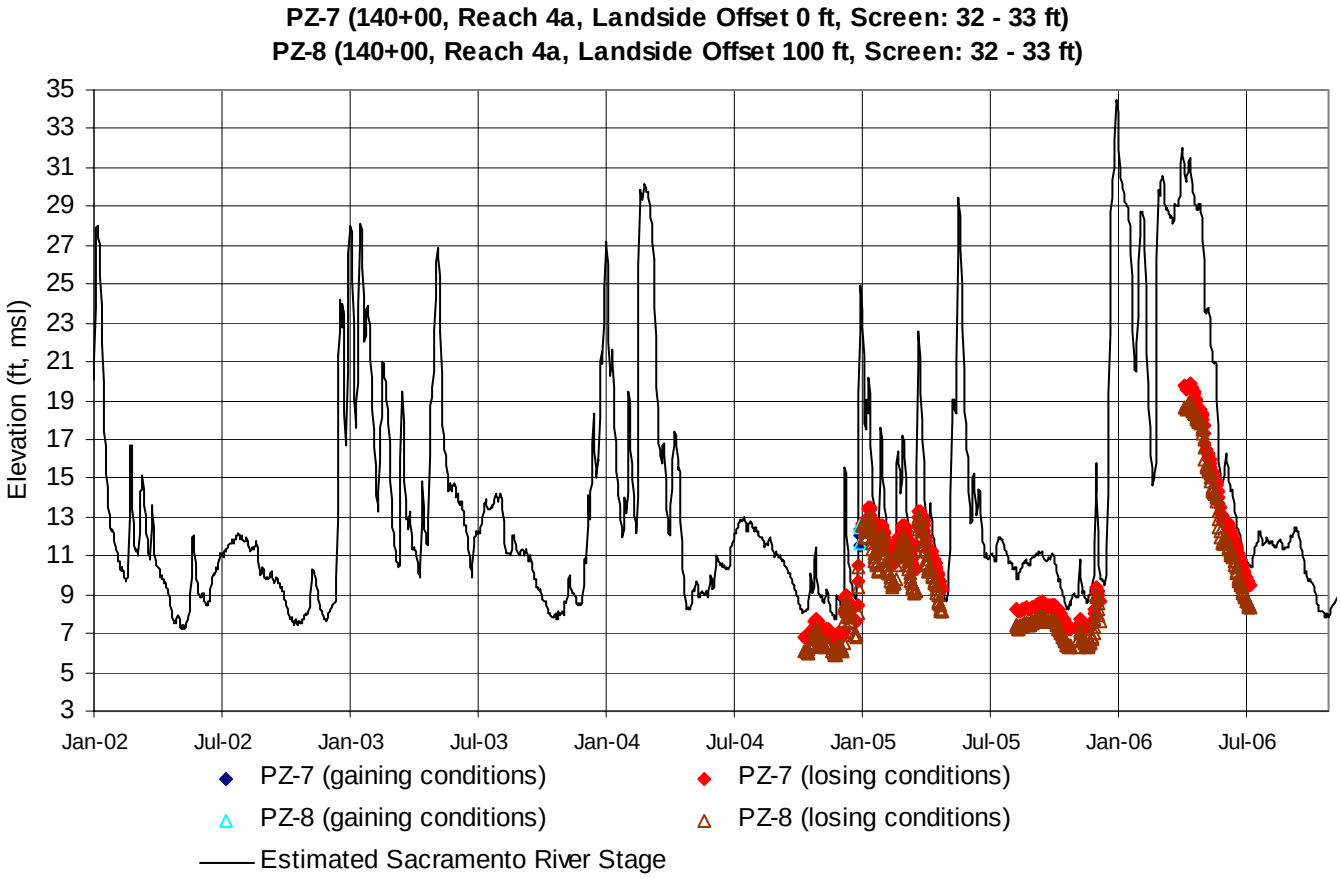
Figure 3-7
Fall 2003 Groundwater Elevation Contours for Upper Zone Wells in Natomas Basin



LUHDORFF & SCALMANINI CONSULTING ENGINEERS

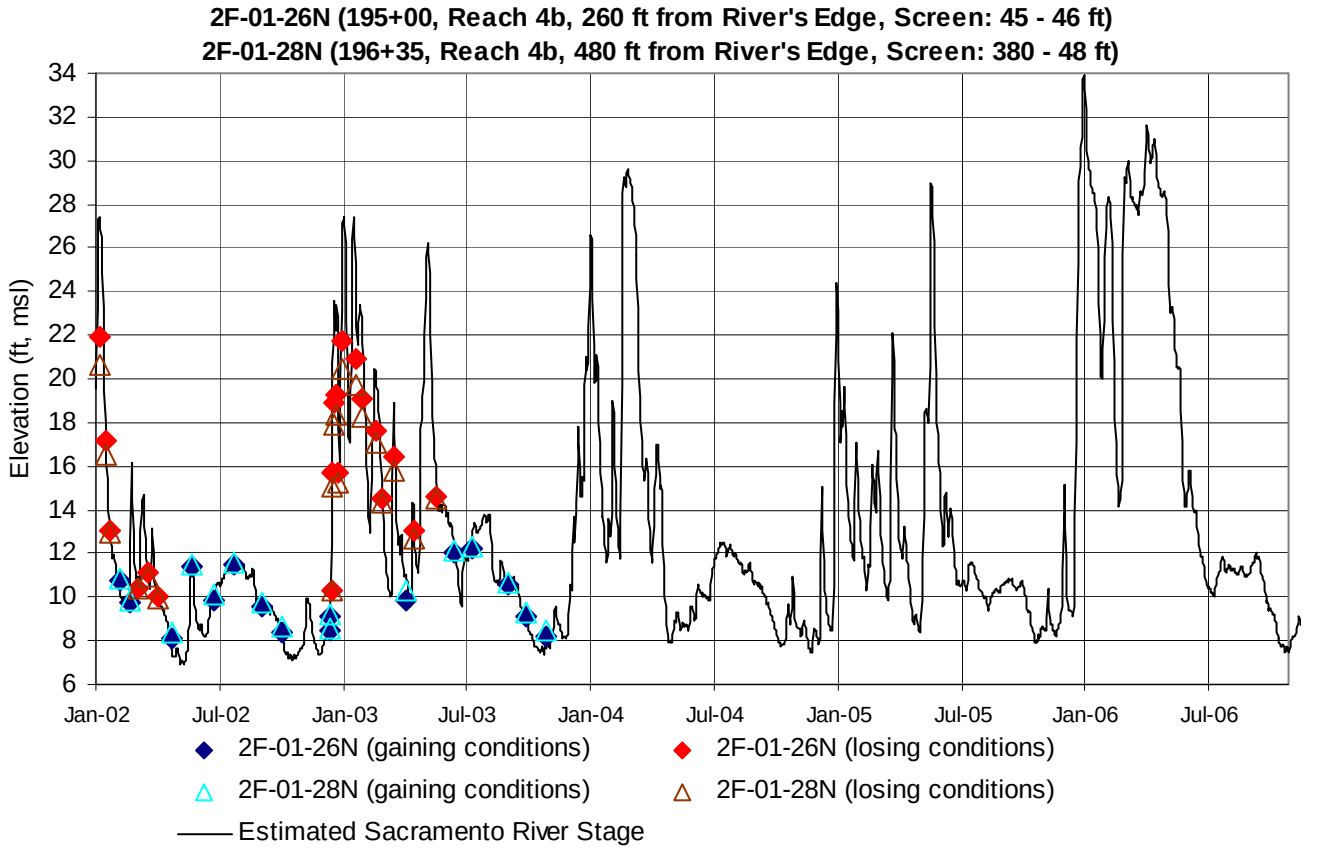
Figure 3-8
Hydrographs of Sacramento River Stage at the Verona, Bryte, and I Street Gages

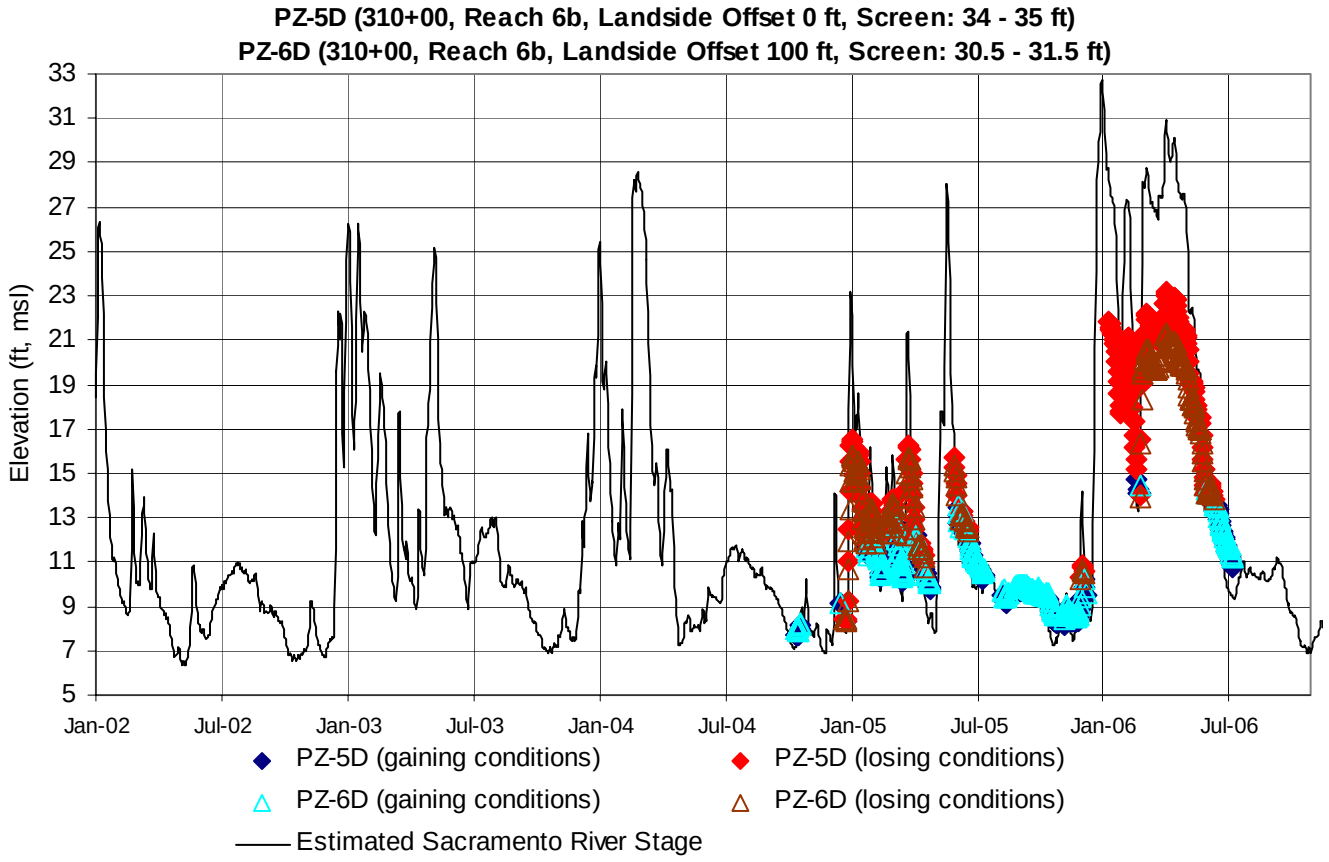




LUHDORFF & SCALMANINI CONSULTING ENGINEERS

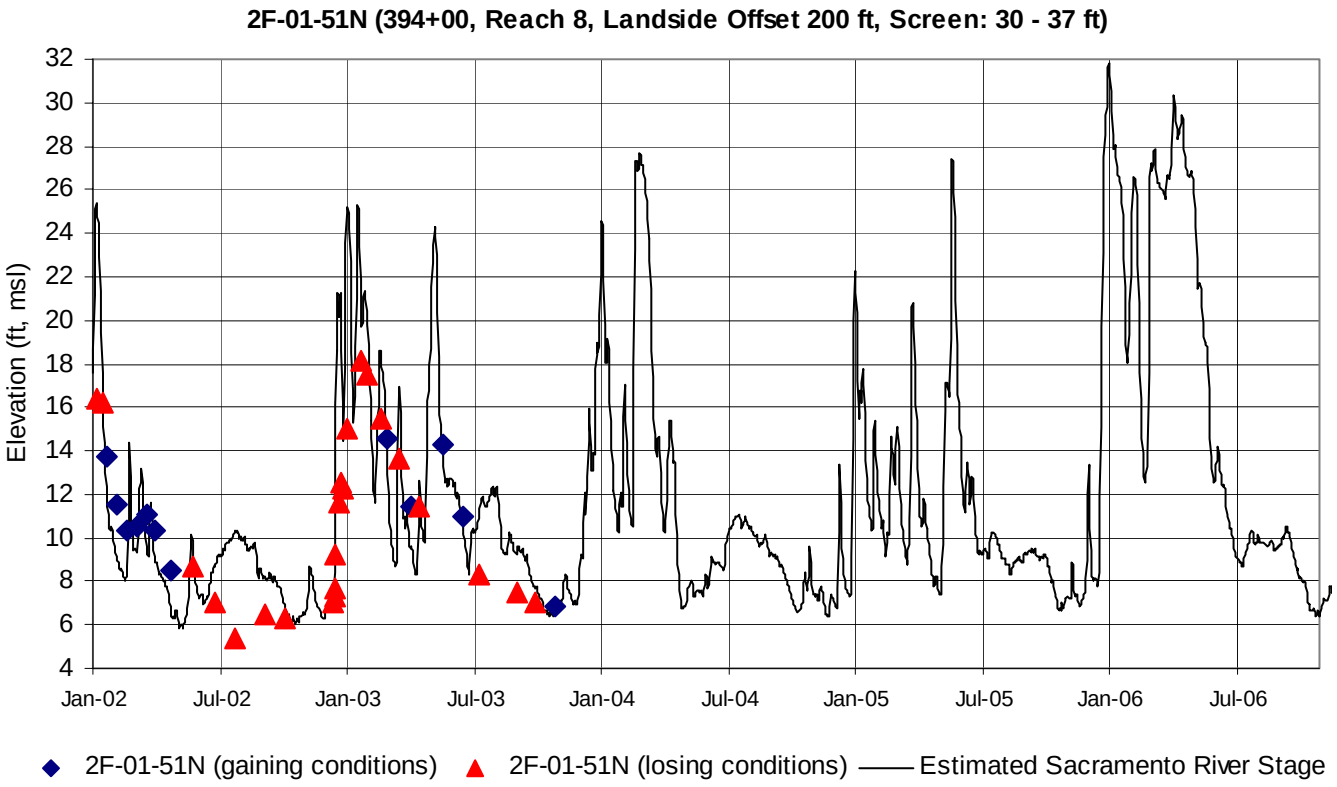
Figure 3-9
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reaches 2 and 4a

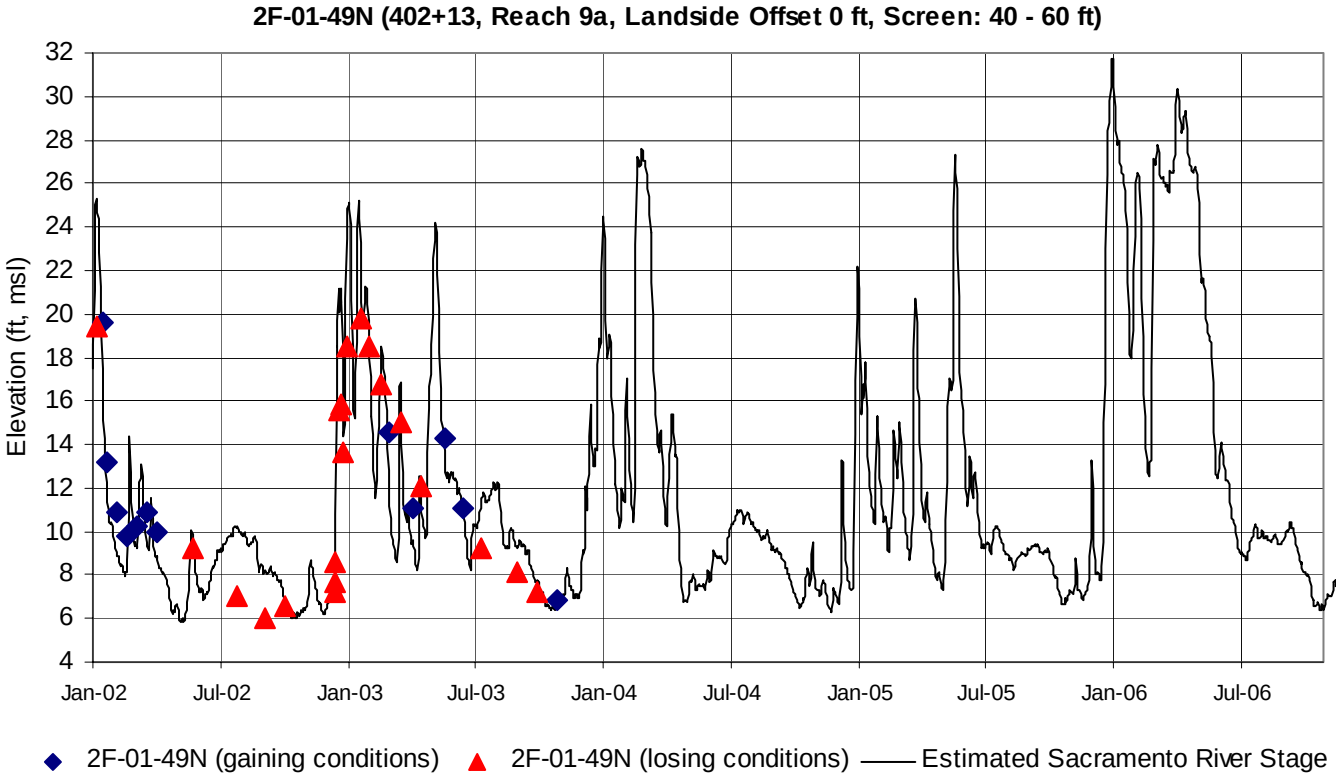




LUHDORFF & SCALMANINI CONSULTING ENGINEERS

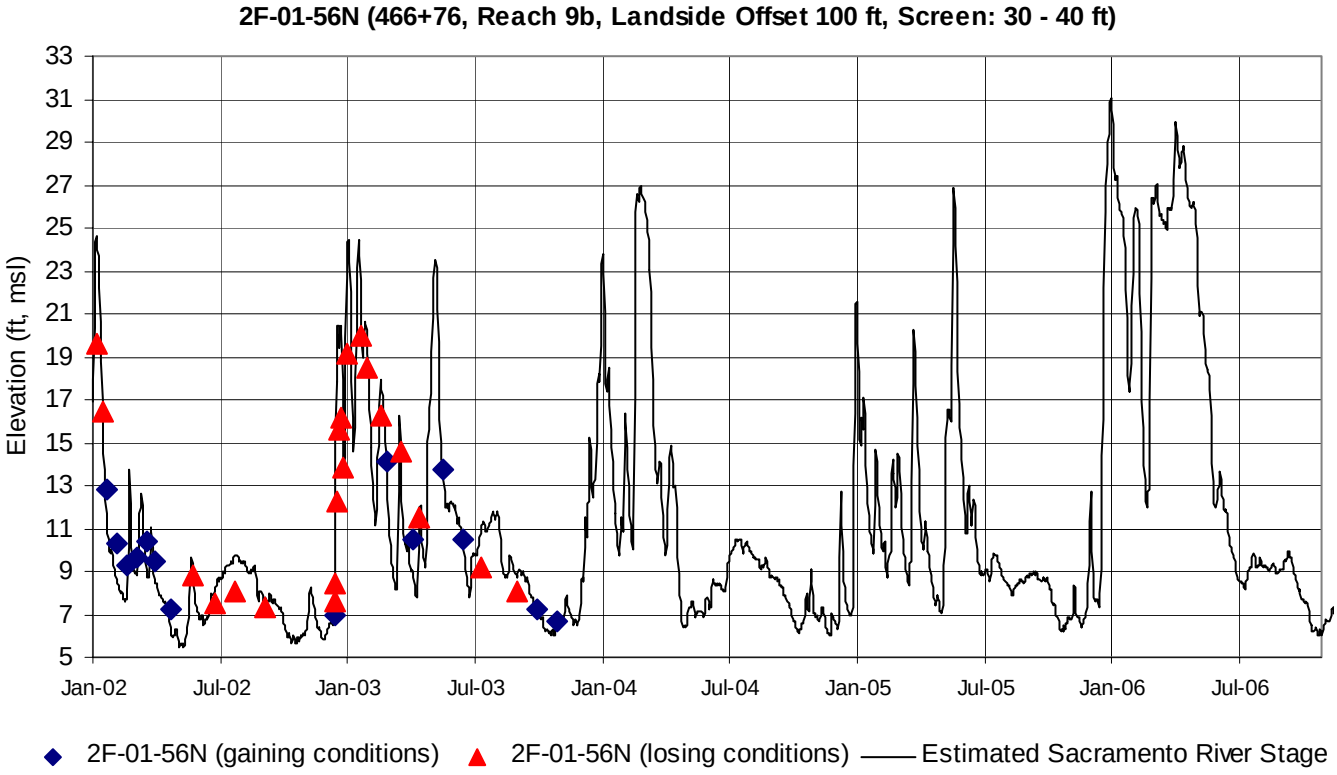
Figure 3-10
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reaches 4b and 6b

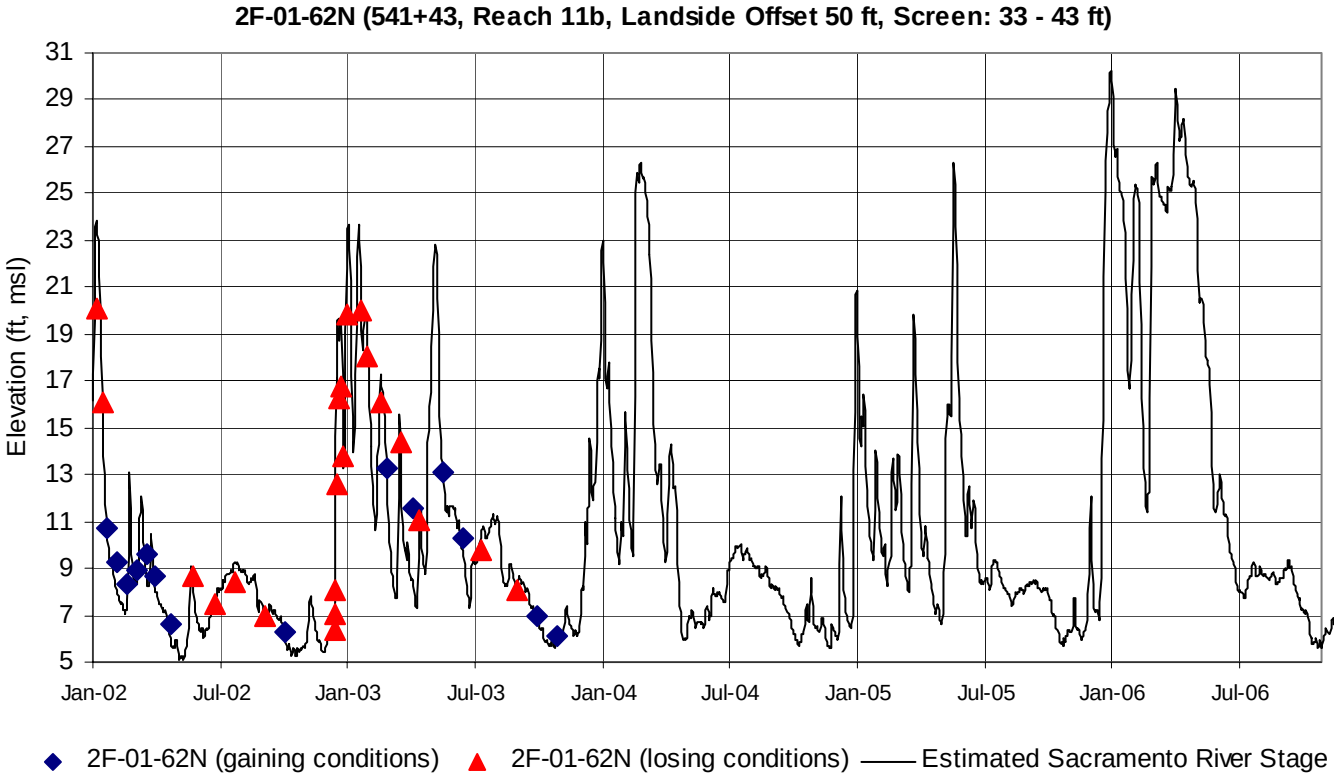




LUHDORFF & SCALMANINI CONSULTING ENGINEERS

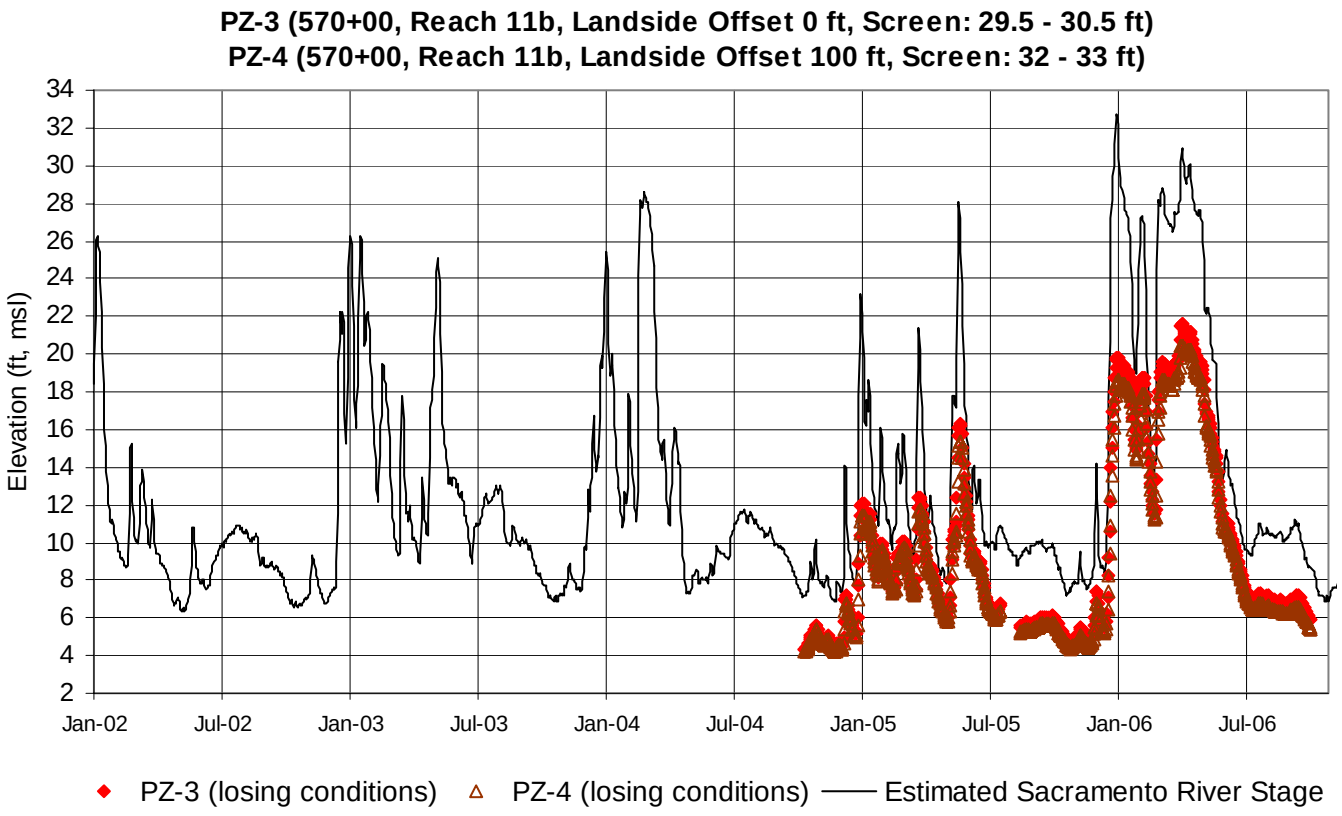
Figure 3-11
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reaches 8 and 9a

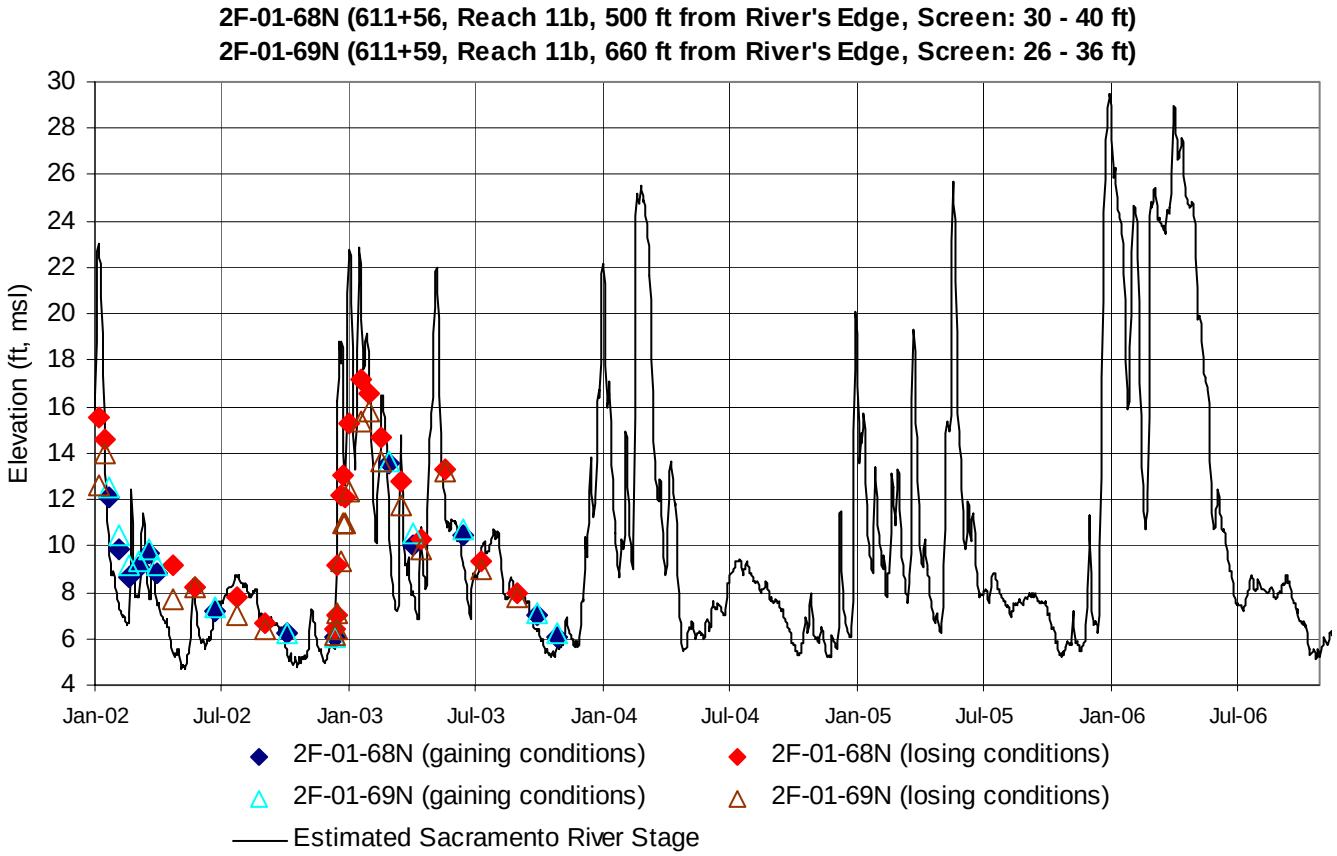




LUHDORFF & SCALMANINI CONSULTING ENGINEERS

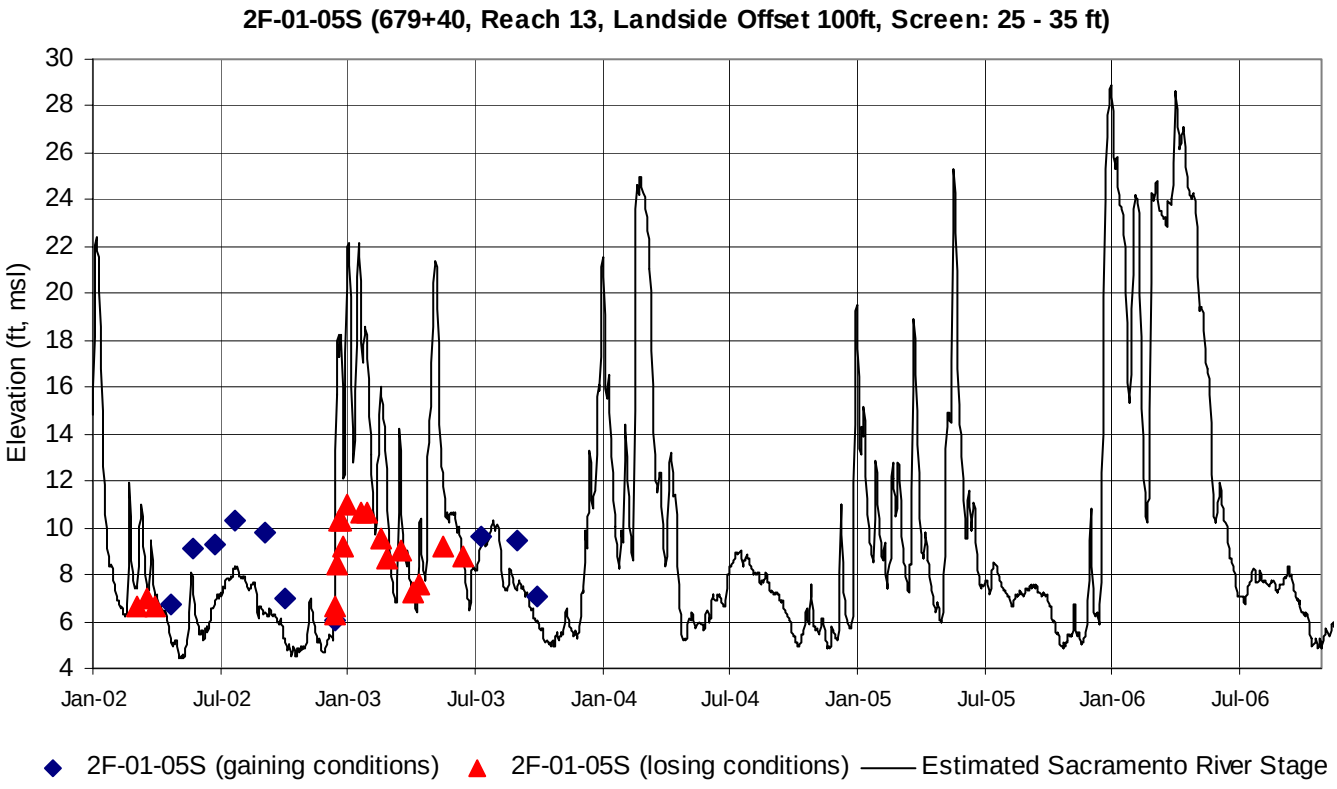
Figure 3-12
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reaches 9b and 11b

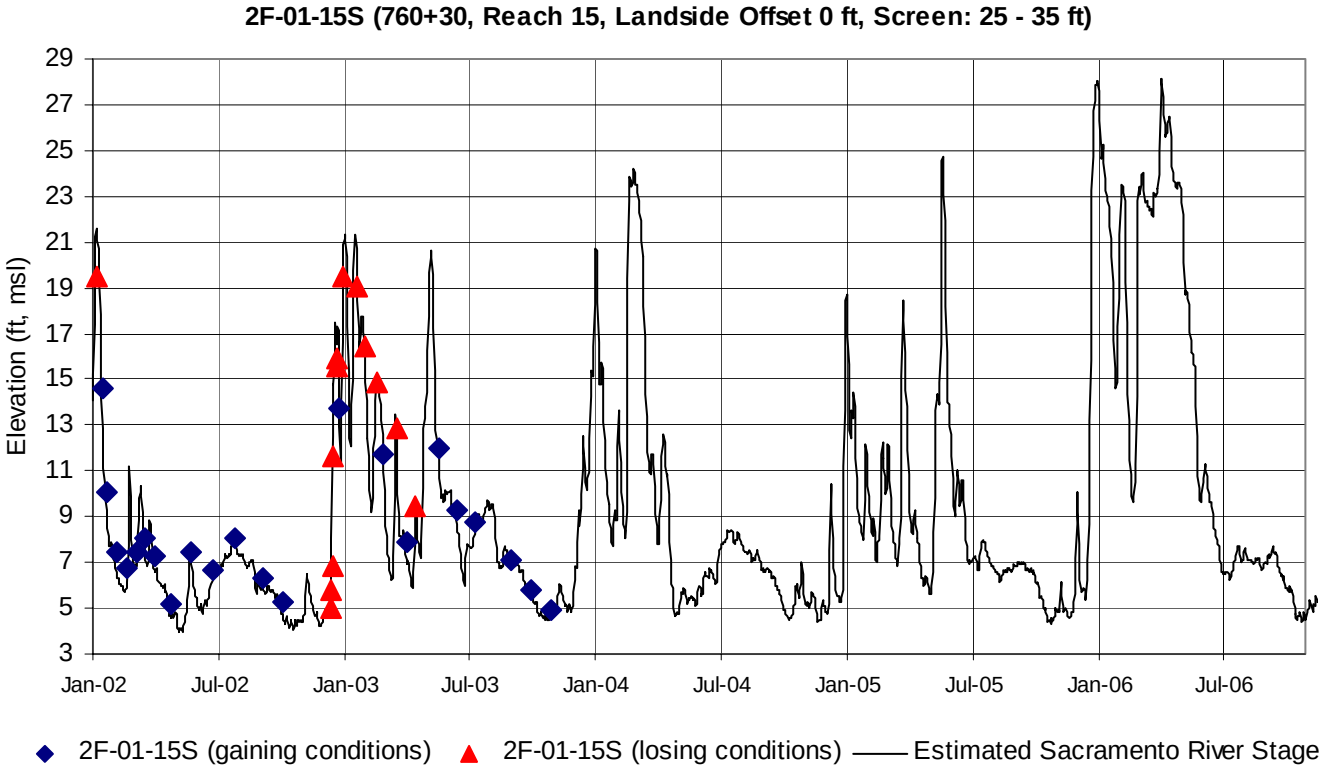




LUHDORFF & SCALMANINI CONSULTING ENGINEERS

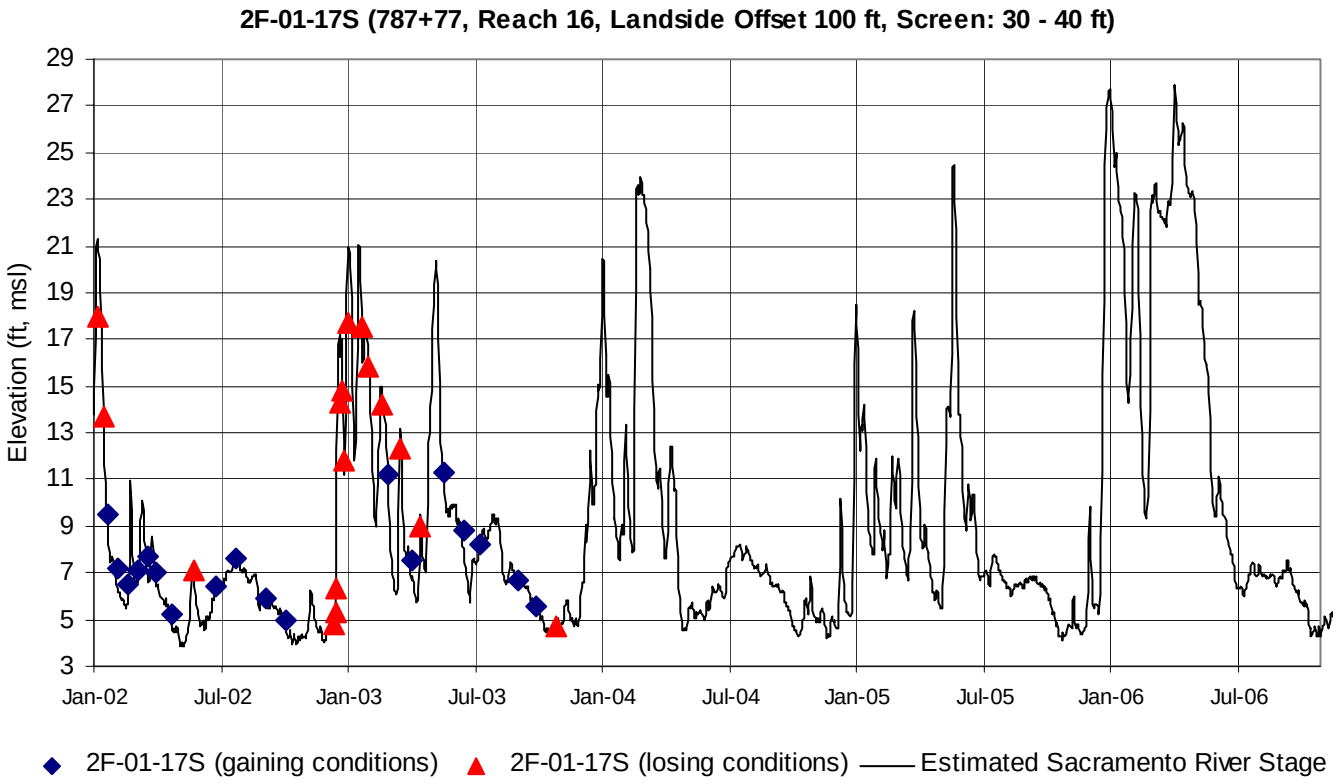
Figure 3-13
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reach 11b

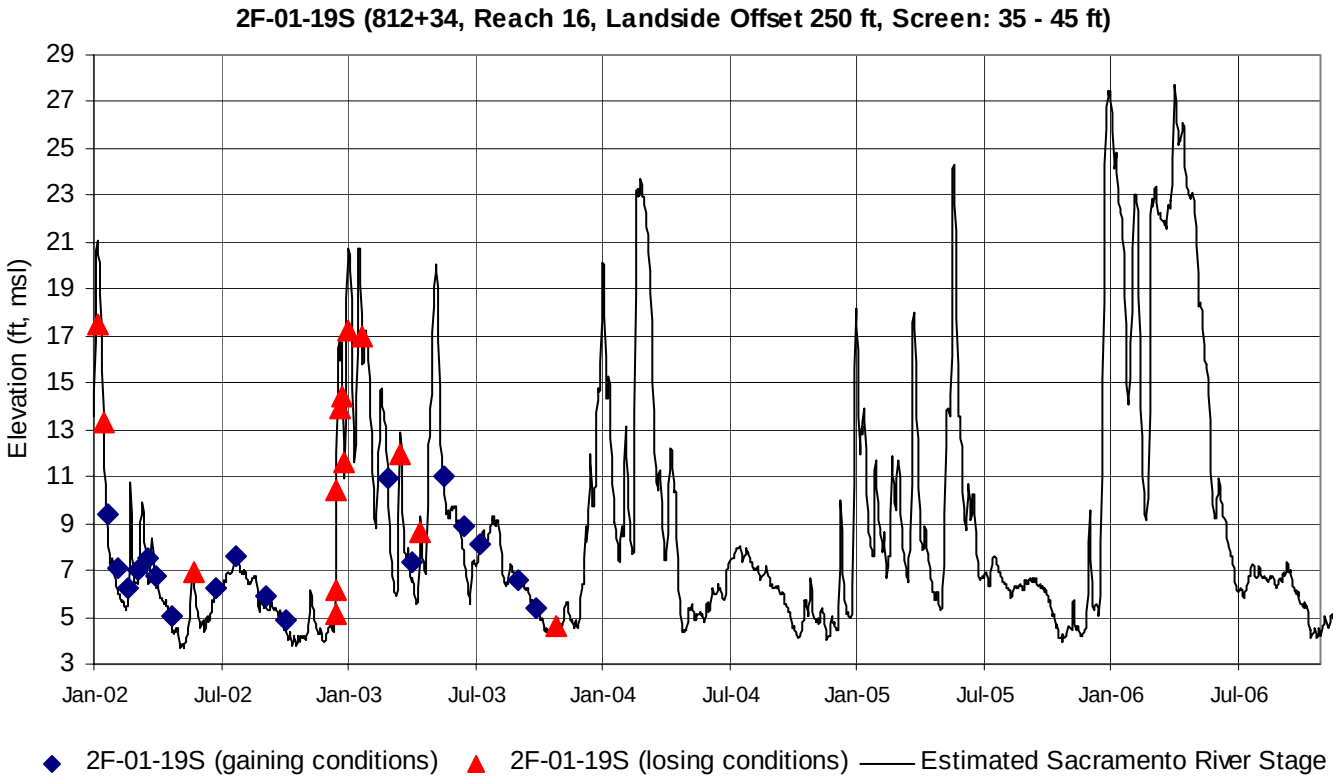




LUHDORFF & SCALMANINI CONSULTING ENGINEERS

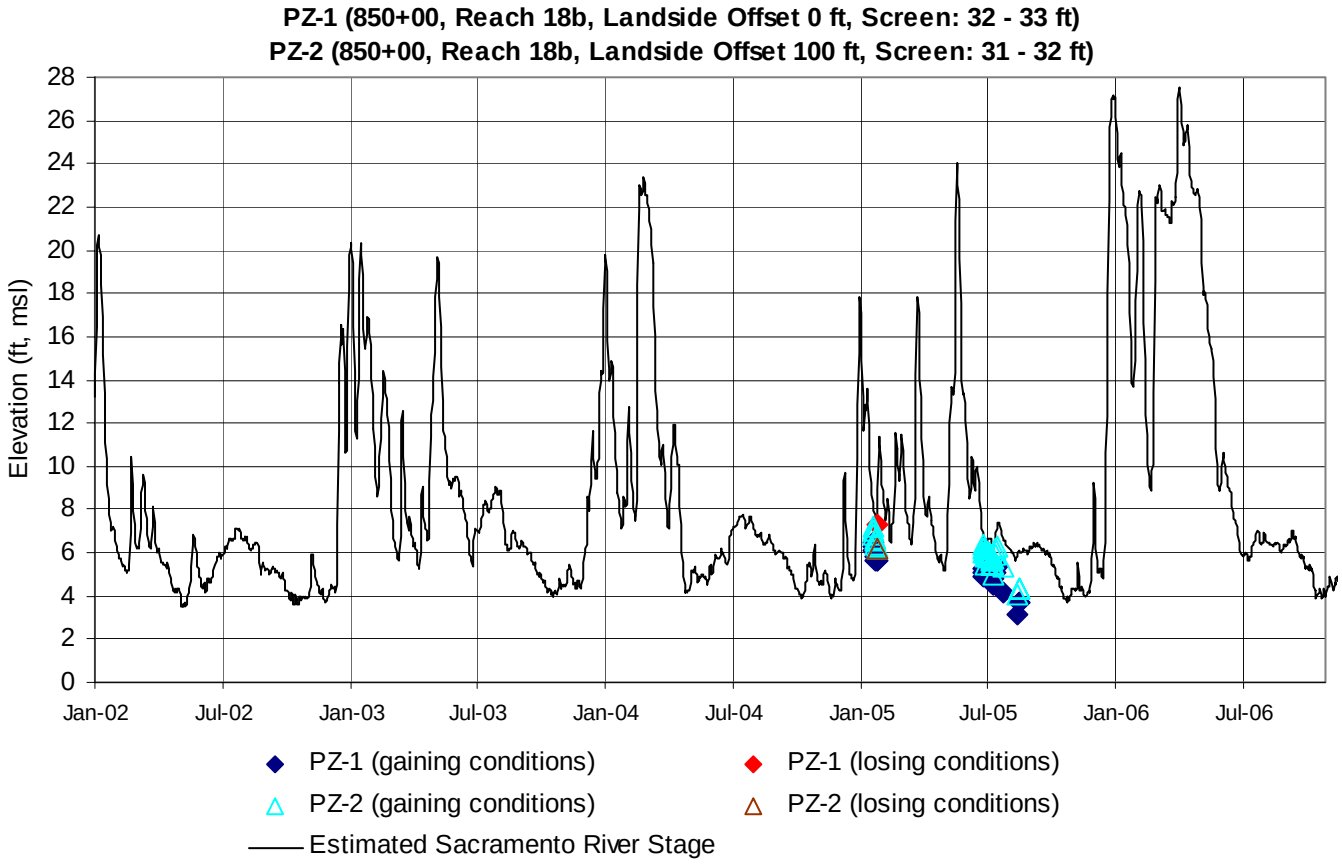
Figure 3-14
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reaches 13 and 15

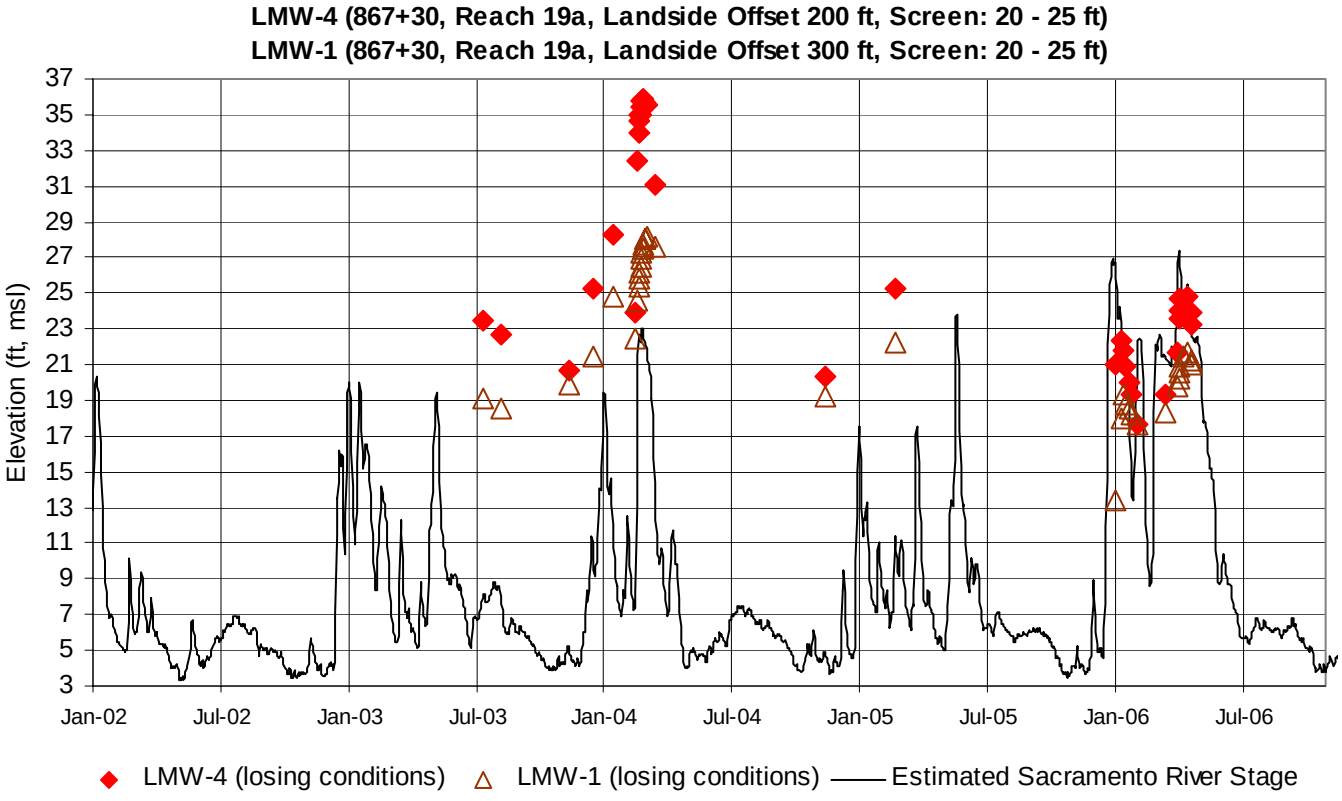




LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 3-15
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reach 16





LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 3-16
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reaches 18b and 19a

4.0 Water Budgets for Existing and Future Groundwater Conditions in the Natomas Basin

4.1 IGSM Models

In order to evaluate the cumulative effects of SAFCA's proposed construction activities on groundwater conditions, a pair of existing numerical groundwater flow models were used to simulate groundwater conditions in the North American Subbasin and calculate groundwater budgets for the Natomas Basin. The models are based on the Integrated Groundwater and Surface Water Model (IGSM) platform developed by Montgomery Watson, Inc. (MW) in the 1990s. As discussed below, model results were used to calculate groundwater budgets for existing conditions (based on 2004) and future conditions (based on 2030).

The Sacramento County IGSM model is referred to as the SACIGSM and was originally developed by MW in 1993. The SACIGSM was updated by MW in 1995 and by WRIME in 2005, 2007, and 2008. The IGSM model for the Sutter/Placer County portion of the North American Subbasin is referred to as the North American River (NAR) IGSM and was originally developed by MW in 1995. The NARIGSM was subsequently updated by DWR (1997) and MW (2001). The grids used for both models are shown on **Figure 4-1**.

The IGSM models were updated most recently by WRIME in 2008 to reflect more current conditions in the Natomas Basin in order to simulate the groundwater impacts of the proposed Sutter Pointe Specific Plan development in southeastern Sutter County, which were summarized in the *Sutter Pointe Specific Plan Groundwater Supply Assessment* prepared by LSCE (2008b) . WRIME linked the NARIGSM and SACIGSM models and used them to simulate the effect of variations in the rate, timing, and location of pumping to supply the proposed Sutter Pointe development along with other land use and pumping projected for a 35-year simulation period that included different water year types.

IGSM is a finite element, quasi three-dimensional numerical groundwater flow model that simulates all major components of the hydrologic cycle. These include precipitation, runoff, evaporation, consumptive use, groundwater recharge, groundwater extraction and injection, and subsurface inflow and outflow along the model boundaries. As indicated in the model name, the simulation also includes interactions between surface water (streams and lakes) and groundwater. The primary components of the groundwater budget calculated by IGSM are:

Inflows

- Deep percolation from rainfall and irrigation applied water;
- Recharge due to stream seepage;
- Recharge from other sources such as irrigation canals and recharge ponds;
- Boundary inflows from outside the model area; and
- Subsurface inflows from adjacent model areas.

Outflows

- Groundwater pumping;
- Outflow to streams and rivers;
- Subsurface outflows to adjacent model areas; and
- Boundary outflows.

4.1.1 Sacramento County IGSM Model

The Sacramento County IGSM model covers most of Sacramento County and includes portions of northern San Joaquin County and western Amador County (**Figure 4-1**). The model is physically represented as a three-layer system consisting of the following layers: 1) the uppermost layer represents the unconfined or semi-confined aquifer system consisting of alluvial sediments that overlie the Mehrten Formation, 2) the middle layer represents the confined aquifer system of the Mehrten Formation, and 3) the lowermost layer represents groundwater of generally poorer quality in marine sediments underlying the Mehrten Formation. Near the southern boundary of the Natomas Basin, Layer 1 is about 200 feet thick and is overlain and underlain by aquitards with thicknesses of about 60 and 130 feet, respectively. Layer 2 starts at a depth of about 360 feet and is over 1,500 feet thick in this area. Layering of the SACIGSM model in the southern portion of the Natomas Basin is shown on **Figure 4-2** (see **Figure 4-1** for cross-section location). All groundwater pumping is simulated in the two upper layers.

Boundary conditions were established to designate heads for all boundary nodes and allow for surface and subsurface flows through the model boundaries. Boundary conditions reported by WRIME (2007) are as follows:

- The eastern boundary of the model is a no flow boundary but incorporates surface-water inflow to the model based on ungaged watersheds.

- General head conditions are used for the southern boundary (along the Mokelumne River). The heads for this boundary are obtained from the Stanislaus Basin IGSM, which has a simulation period ending in 1993, and values of head in nodes along this boundary in 1995 to 2004 use values from 1993.

- The western model boundary is along the Sacramento River. The northern section (north of Pocket Road) uses general head boundary conditions provided by the Central Valley IGSM (CVIGSM). The southern section of the western boundary (south of Pocket Road) is simulated as a constant head boundary. Both the general head and constant head conditions are interpolated from prior model nodes to the updated SACIGSM nodes for the western boundary. Because the general heads in the prior SACIGSM stop in 1995, the updated SACIGSM uses the 1995 values for subsequent years (1996 to 2004).

- General head conditions are used for the northern model boundary. These heads are provided by the NARIGSM, which was run concurrently with the SACIGSM. The linkage between the two models was done by correlating the boundary nodes of the models, updating the NARIGSM from monthly to daily time steps, and using the 1995 general heads in the NARISGM for subsequent years (1996 to 2004).

4.1.2 North American River IGSM Model

As shown on **Figure 4-1**, the NARIGSM includes the portions of eastern Sutter County and western Placer County that comprise the northern two-thirds of the North American Subbasin. This includes the Sutter County portion of the Natomas Basin. In 2001, the NARIGSM was refined to better assess groundwater impacts resulting from the water supply project and program alternatives being considered for the Regional Water Master Plan (MWH, 2001). The data sets that were updated included land use, streamflow, agricultural demand, surface-water diversions, urban water demand, groundwater pumping, precipitation, and groundwater levels.

The layering of the NARIGSM is similar to that of the SACIGSM. In the Sutter County portion of the Natomas Basin, Layer 1 extends from about 80 to 300 feet in depth and is overlain and underlain by aquitards. Layer 2 extends from about 420 to 1,400 feet in depth.

The boundaries for the NARIGSM were developed based on a combination of geological, hydrological, and political boundaries. MWH (1995) describes the original model boundaries as follows:

- The western model boundary is the Feather and Sacramento Rivers, which are an important source of recharge that create a groundwater divide in the upper aquifer system. General head conditions are used for this boundary based on the regional CVIGSM.

- The southern model boundary follows the Placer/Sacramento and Sutter/Sacramento County lines, and extends from the Sacramento River in the west to the eastern edge of the groundwater basin. This boundary is also the northern boundary of the SACIGSM. General head conditions are used for this boundary. As described above, the SACIGSM was linked to the NARIGSM to achieve consistent heads along this boundary.

- The eastern model boundary represents the geologic boundary between the Sacramento Valley Groundwater Basin and the Sierra Nevada foothills. No flow conditions are used for this boundary.

- The northern model boundary is the Bear River, which coincides with the Placer/Yuba and Sutter/Yuba County lines. General head conditions are used for this boundary based on the regional CVIGSM.

4.2 Model Inputs

Both the calibration and the future conditions simulations were run for a 35-year simulation period based on 1970-2004 hydrologic conditions. This was a period of approximately average precipitation, which included three single-dry years and three periods of multiple-dry years based on DWR's Sacramento River Basin Index. Initial conditions (starting heads) for the beginning of the calibration period were established using historical groundwater levels published by DWR to generate regional groundwater level contour maps and assign initial (September/October

1969) groundwater levels to each model node. Initial conditions for the 2030 simulation are discussed in Section 4.4 below.

The IGSM models simulate transient conditions whereby hydraulic heads and groundwater flow can vary with time. Discretization over time occurs by dividing the continuous simulation period into time steps. Both models originally used monthly time steps, but have since been updated to use daily time steps (WRIME, 2007). Some model inputs such as streamflow and precipitation are daily, while others such as surface-water deliveries and municipal and industrial (M&I) groundwater pumping are monthly. Agricultural water demands are estimated by the model based on historical crop acreage, soil moisture requirements, effective rainfall, potential evapotranspiration (ET), and irrigation efficiency.

The aquifer properties required by the model include hydraulic conductivity, storage coefficient, and specific yield for each layer. In the Natomas Basin, the hydraulic conductivity used for Layer 1 ranges from 33 to 118 ft/day across the Natomas Basin. Hydraulic conductivities are lower in Layer 2 (15-20 ft/day) and Layer 3 (3-12 ft/day).

Specific yield values used in the models range from 0.08 to 0.12 for the NARIGSM and from 0.04 to 0.20 for the SACIGSM. Storage coefficients in the Natomas Basin area ranged from 1.4×10^{-4} to 1.4×10^{-3} in Layer 1 to 3.5×10^{-5} to 3.0×10^{-4} in Layer 2, and 3.0×10^{-5} to 3.0×10^{-3} in Layer 3.

4.2.1 Simulation of Streams

To simulate streamflow, the IGSM models calculate a water balance for each stream element. The stream elements are a series of one-dimensional line elements that are used to describe the stream system in the model area. The gain or loss due to stream-aquifer interaction is computed based on head in the stream (stage) and head in the underlying aquifer (WRIME, 2006). The stream stage is computed using stage-discharge relationships at the corresponding stream node. Input data for the stream system include:

- Stream configuration;
- Stream node elevation;
- Stream channel cross section;
- Stage-discharge relationship;
- Stream inflows at boundary (including surface-water flow entering the model area and also gains or losses of the stream system due to stream-aquifer interaction);
- Tributary inflows;
- Wastewater discharges to streams; and
- Streamflow diversions that remove water from the stream system.

In the Natomas Basin, only the Sacramento and American Rivers are simulated as streams (recharge from smaller streams and canals is included in areal recharge estimate discussed below).

4.2.2 Areal Recharge

The IGSM models account for a number of processes in the soil zone, including ET, direct runoff, infiltration, and deep percolation from rainfall and applied water (WRIME, 2006). ET is computed based on crop consumptive use requirements and available soil moisture. Direct runoff from rainfall and applied water is computed using a modified Soil Conservation Service (SCS) runoff curve number method. Input data for simulation of hydrologic processes in the soil zone include (MW, 1995; WRIME, 2006):

- Initial soil moisture;
- Rainfall;
- Land use category;
- SCS hydrologic soil group;
- Minimum soil moisture requirements for each crop type;
- Crop consumptive use (amount of applied water consumptively used to satisfy ET or soil moisture requirements);
- Root zone depth for each crop; and
- Surface drainage pattern.

The two primary sources of water to the soil zone in agricultural and urban areas are precipitation and applied water. Agricultural areas in the NARIGSM area tend to have the largest amount of deep percolation due to the volume of irrigation water applied to rice fields in addition to the natural rainfall, while the amount of deep percolation from non-irrigated areas is relatively small (MW, 1995).

Water infiltrating beyond the soil zone (deep percolation) results in groundwater recharge. IGSM models simulate the vadose zone with the mathematical equation of unsaturated flow solved numerically at every time step (WRIME, 2006). The vadose zone is divided into a number of discrete layers of specified thickness; the water passing through the soil zone becomes the inflow to the uppermost vadose zone layer. This process repeats until the outflow from the last vadose zone layer becomes inflow to the first layer of the aquifer system. As discussed further in Chapter 5, deep percolation is a significant inflow component of the overall groundwater budget.

4.2.3 Model Calibration

Calibration is the process of adjusting parameters used in the model so that the model approximates the observed behavior of the aquifer system, especially measured groundwater levels. After the model is calibrated, it can be used to evaluate the response of the aquifer system to new or changing stresses. The original model calibration period for both IGSM models was water years 1970-1990. For the current versions of the models, the calibration period has been extended to water years 1970-1995 for the NARIGSM (MWH, 2001) and to 1970-2004 for the SACIGSM (WRIME, 2007).

During the calibration process, model generated heads were compared against measured water levels at selected calibration wells. In total, 81 calibration wells were used for the NARIGSM,

and 138 wells were used for calibration of the SACIGSM. The models were found to generally produce simulated water levels that were in good agreement with observed values under various hydrologic conditions. For the northern portion of the SACIGSM model, including the Sacramento County portion of the Natomas Basin, WRIME (2007) reported that 76 percent of the simulated heads fell within ten feet of observed heads.

Since they were last calibrated (2001 for the NARIGSM and 2007 for the SACIGSM), a number of changes have been made to both models. A check of the calibration was performed in fall 2007 after the refinement of the hydraulic conductivity values in the Natomas Basin to match recent aquifer test data provided by LSCE. Additional updates and refinements were made to the models through late 2007 and early 2008, but were considered to have only a minor effect on the calibration.

Since the models are an approximation of the physical system, they do not exactly reproduce observed groundwater levels. Although the calibration was considered acceptable for the primary intended purpose of the model (regional planning), there are notable differences between measured and simulated heads in the Natomas Basin. In particular, calibration hydrographs included in LSCE (2008b) and WRIME (2007) show declining heads at some of the Natomas Basin calibration wells over the 1970-2004 period. This is not supported by actual data, which generally show stable or increasing water levels since the early 1980s except for small seasonal fluctuations.

4.3 Water Budget for Existing Conditions

The groundwater budget for existing conditions in the Natomas Basin is based on the final water year of the 1970-2004 calibration period for the SACIGSM model. For the NARIGSM model, the calibration period ended in 1995, but the simulation period was extended to 2004 to create the water budget. Although a number of other IGSM simulations have been conducted for different purposes, the calibration period simulation was considered the best available representation of existing groundwater conditions in the Natomas Basin.

The groundwater budget for the end of calibration simulation (2004) is shown in **Table 4-1** and summarized below The results are grouped into inflow and outflow components, and the change in storage represents the difference between the inflow and outflow.

Inflow Components

- Deep Percolation – This includes infiltration from precipitation, applied irrigation water, seepage from ditches and canals, and recharge from smaller streams. Deep percolation is assumed to be greatest from agricultural land planted to rice. A deep percolation rate of 1.32 acre-feet per acre per year (af/ac/yr), not including precipitation, was estimated for rice in the Natomas Basin (WRIME, 2008). The simulated deep percolation shown in **Table 4-1** totaled 31,429 af in 2004.

- Net Recharge from Streams – The direction of flow between streams and the underlying aquifer can vary seasonally or by reach. Flow from a stream to the aquifer system (losing

conditions) is classified as inflow to the groundwater basin, and flow from the aquifer system to a stream (gaining conditions) is classified as outflow. For the Natomas Basin, only flow to and from the Sacramento and American Rivers is included in this component. Although there is some seasonal variation, all reaches of the Sacramento and American Rivers were simulated as losing in 2004. The simulated net recharge from streams shown in **Table 4-1** was 6,469 afy for the Sacramento River and 1,086 afy for the American River.

- Net Boundary Inflow – This represents groundwater inflow or outflow through model boundaries. The Sacramento River forms the western boundary of both IGSM models, and positive values of boundary inflow represent groundwater flow from the west beneath the Sacramento River. Boundary inflow shown in **Table 4-1** totaled 10,365 afy. Available water level data do not show a noticeable gradient for significant groundwater flow beneath the Sacramento River from the west. Therefore, some of this boundary inflow, especially that which occurs in Layer 1, may actually represent additional recharge from the Sacramento River.

- Subsurface Inflow – This component represents groundwater inflow from one model subregion to another. For the Natomas Basin, there is a small amount of inflow from the north beneath the NCC (241 afy) and a larger amount of outflow from the south beneath the American River (2,714 afy). The total inflow shown in **Table 4-1** is 2,955 afy.

Outflow Components

- Subsurface Outflow – This component represents groundwater outflow from one model subregion to another. For the 2004 simulation, there was a large amount of outflow from the Natomas Basin to the east (21,738 afy), as shown in **Table 4-1**.

- Groundwater Pumping – This represents the largest outflow component and, in the Natomas Basin, is primarily for agricultural use. The simulated groundwater pumping shown in **Table 4-1** is 35,537 afy.

Change in Storage

- Change in Storage – The basic equation for a water budget is:

  Inflow – Outflow = Change in Storage.

  A positive change in storage indicates rising groundwater levels while a negative change in storage indicates declining groundwater levels. As discussed above, hydrographs indicate that groundwater levels in the Natomas Basin are generally stable but show small fluctuations in response to climatic conditions. 2004 was classified as a normal year based on DWR's Sacramento River Basin Index, but precipitation in the Sacramento area was slightly below average. The simulated change in storage shown in **Table 4-1** is -4,970 afy.

This reduction in groundwater storage means that simulated heads were declining at the end of the calibration simulation. A decline in groundwater storage of almost 5,000 afy divided by the area of the Natomas Basin represents a small decrease in storage on a per acre basis (less than 0.1 af/ac/yr). As discussed above, the specific yield used in the model ranges from 0.04 to 0.20. Assuming a specific yield of 0.10, the simulated decrease in storage equates to an average decrease in head of about one foot.

4.4 Simulation of Future Conditions

The water budget for future conditions discussed below is based on a simulation conducted by WRIME to estimate the effect of proposed land and water use changes due to proposed developments in the North American Subbasin on groundwater conditions in 2030. For this scenario, the IGSM models were run for a 35-year simulation period based on 1970-2004 hydrologic conditions. As discussed above, this was a period of approximately average precipitation, which included three single-dry years and three periods of multiple-dry years based on DWR's Sacramento River Basin Index. This simulation represents proposed future land and water uses in the Natomas Basin, including the Sutter Pointe development at buildout (labeled Scenario 2B in LSCE, 2008b).

The 2030 simulation is based on estimated conditions in the groundwater basin in 2030 without SAFCA's construction activities. Future water supply conditions for northern Sacramento County were primarily based on Urban Water Management Plans for individual water districts in the area. As reported by WRIME (2007), most of the plans indicate a significant transition from groundwater to surface-water utilization to meet municipal water demands. Future water supply conditions for Placer County were based on several sources including the *Western Placer County Groundwater Management Plan* prepared by MWH (2007) on behalf of the City of Roseville, City of Lincoln, Placer County Water Agency, and California American Water. Water demand and supply data for proposed developments such as Placer Vineyards and Placer Ranch were obtained from the Specific Plan, EIR, or Notice of Preparation for each development.

The 2030 water budget presented below is based on Scenario 2B in LSCE (2008b), which includes full buildout of the Sutter Pointe development along with the other developments in the North American Subbasin discussed above. All agricultural land uses in the proposed development areas are simulated as being replaced by M&I land uses by 2030. Groundwater usage in the Sutter Pointe area is projected to be 13,072 afy in a normal year, which represents about 52 percent of the total demand M&I water demand, with the remainder supplied by surface water.

4.4.1 Water Budget for Future Conditions

The groundwater budget for the simulation of future conditions (2030) without SAFCA's planned construction is shown in **Table 4-1**. The future conditions water budget is based on the last 23 years of the simulation period (1982-2004). Precipitation during this period was approximately average, and this period includes nine wet years, four normal years, two single-dry years, and two multiple-dry periods (1987-1992 and 2001-2002) based on the Sacramento River 40-30-30 Index.

There are significant differences between the water budgets for the 2004 and 2030 simulations shown in **Table 4-1**. Many of these differences are due to much higher heads east of the Natomas Basin in 2030 due to the planned transition from groundwater to surface water to meet M&I demands in northern Sacramento County. Heads are also higher in most of the Natomas Basin due in part to reduced pumping outside of the Sutter Pointe area. Higher heads result in less recharge from streams, less boundary inflow, and less subsurface outflow for the Natomas Basin water budget.

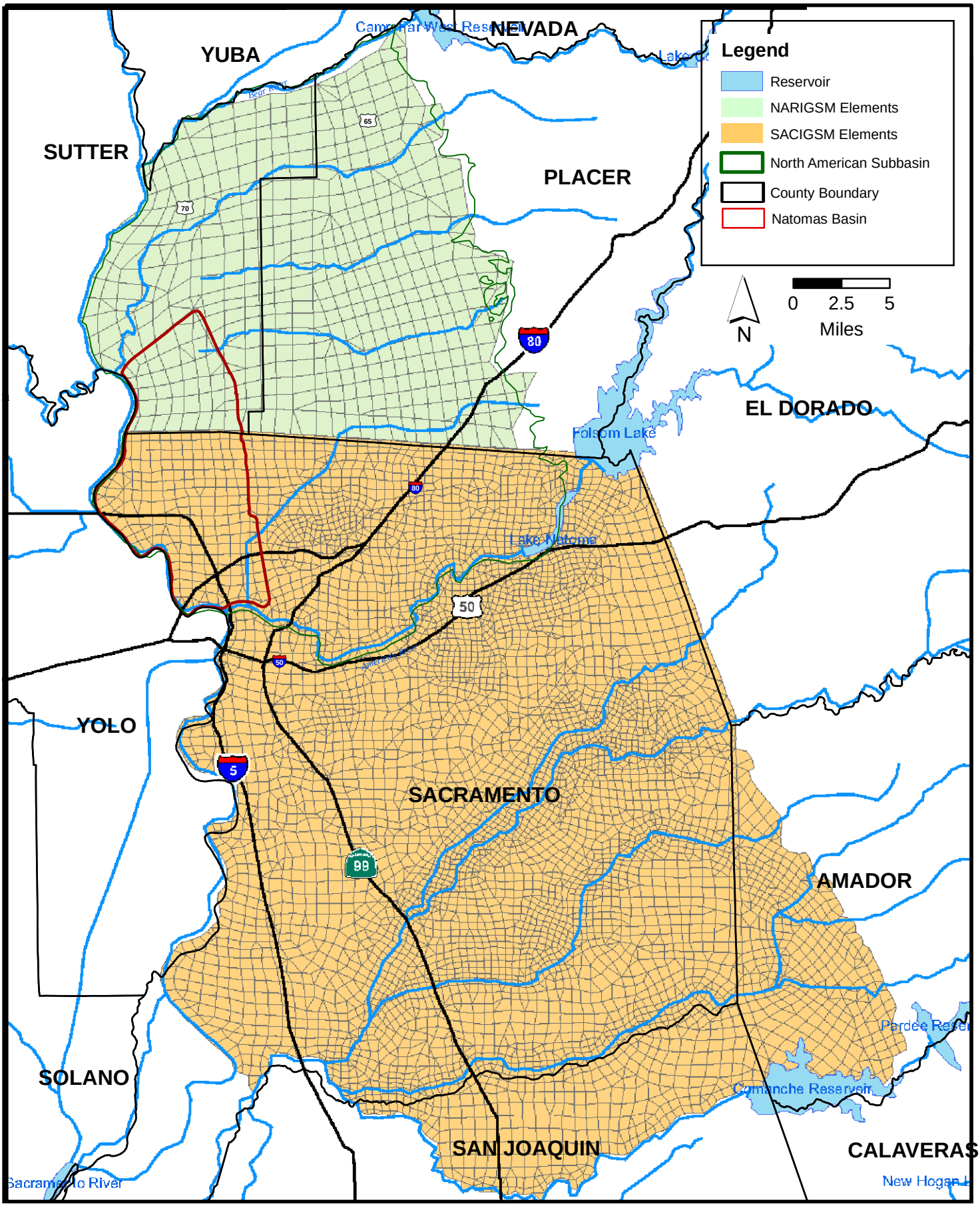
There are also differences between the values shown in **Table 4-1** for the 2030 simulation and the Scenario 2B results summarized in LSCE (2008b). These differences occurred because the latter simulation included an area of about 1,000 acres east of the Natomas Basin in southern Sutter County, which was removed from the area used for the water budget in **Table 4-1**. Due to the additional area, deep percolation and groundwater pumping were 2,300 and 3,000 afy higher, respectively, for the Scenario B water budget (LSCE, 2008b).

The inflow components shown in **Table 4-1** are deep percolation (27,187 afy), which represents a reduction of 4,243 afy from 2004 due to increased urbanization. Recharge from streams is 1,100 afy for the Sacramento River and –500 afy for the American River. The negative recharge for the American River indicates that it is simulated as a gaining reach for this model run. The total net recharge from streams (600 afy) is 6,955 afy lower than for the 2004 simulation. Boundary inflow from the west in 2030 (3,700 afy) is 6,665 afy lower than in 2004. Subsurface inflow from the north and south (3,700 afy) is 745 afy higher, however, due primarily to drawdown caused by proposed Sutter Pointe pumping in southern Sutter County. The outflow components for the 2030 simulation include groundwater pumping (31,615 afy), which is 3,922 afy lower than in 2004. The other outflow components, subsurface outflow to the east and south, total 2,000 afy, which is 19,738 afy lower than in 2004. The average change in storage was 1,572 afy, which indicates increasing heads over the simulation period.

Table 4-1
Simulated Groundwater Budgets for Natomas Basin
(Not Including SAFCA Activities)

	Water Budget Component	2004 Simulation[1] (afy)	2030 Simulation[2] (afy)	Difference (afy)
Inflow	Deep Percolation (Including Canal Seepage)	31,429	27,187	4,242
	Recharge from Sacramento River	6,469	1,100	5,369
	Recharge from American River	1,086	-500	1,586
	Boundary Inflow from West	10,365	3,700	6,665
	Subsurface Inflow from North and South	2,955	3,700	-745
	Total Inflow	**52,304**	**35,187**	**17,117**
Outflow	Groundwater Pumping	35,537	31,615	3,922
	Subsurface Outflow to East	21,738	1,200	20,538
	Subsurface Outflow to South	0	800	-800
	Total Outflow	**57,275**	**33,615**	**23,660**
Inflow minus Outflow	**Change in Storage**	**-4,971**	**1,572**	**-6,543**

1. Based on final year of calibration simulation (LSCE, 2008b).
2. Based on 1982-2004 average for Sutter Pointe Project Scenario 2B (LSCE, 2008b).



FILE: C:\Temp\SAFCA\Figure 7-1 Model Grids.mxd Date: 8/6/2008

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 4-1
Model Grids for SACIGSM and NARIGSM Groundwater Flow Models

5.0 Effects of SAFCA Construction Activities

Most of SAFCA's proposed levee improvements will have no effect on groundwater in the Natomas Basin, but the proposed slurry cutoff walls are intended to reduce groundwater flow beneath the levees and will affect groundwater conditions. Some of SAFCA's construction activities will involve land use changes that will reduce groundwater recharge. This reduction will be at least partially offset by seepage from new and relocated canals, which will increase groundwater recharge. Finally, water supply changes at the Brookfield property borrow site will result in a large reduction in groundwater pumping. A summary of assumptions about proposed SAFCA construction activities used to prepare water budgets and evaluate impacts is provided in **Table 5-1**. The groundwater impacts of proposed slurry cutoff walls are addressed in Chapter 6; the groundwater impacts of SAFCA's other proposed construction activities are summarized below.

5.1 Deep Percolation from Irrigated Agricultural Land

Most groundwater recharge in the Natomas Basin results from deep percolation of applied irrigation water. As shown in **Table 5-2**, estimates of applied water for various crops range from 2.5 af/ac/yr for field crops, grains, and hay to 6.5 af/ac/yr for rice (LSCE, 2008b). Most of this water is consumed by ET but some goes to tailwater runoff and deep percolation. The amount of deep percolation is estimated to range from about ten percent of applied water for field crops (0.25 af/ac/yr) to 17 percent of applied water for orchards (0.68 af/ac/yr). These estimates represent deep percolation from irrigation only; they do not include deep percolation from direct precipitation in the winter and spring. Deep percolation from precipitation was estimated to be about 0.23 af/ac/yr and is not included in the estimates because it would occur regardless of land use (except for areas covered by pavement or other impermeable materials). Estimates of deep percolation from applied water for other crops include 0.77 af/ac/yr for rice, 0.41 af/ac/yr for grains and hay, and 0.61 af/ac/yr for pasture (LSCE, 2008b).

5.2 Land Use Changes Due to Levee Construction

Proposed levee construction activities that will affect land use include raising levees, modifying levee slopes, and adding seepage berms. As summarized in **Table 5-1**, planned improvements to the Sacramento River East Levee will require about 486.5 acres of land and will result in the loss of about 20 acres of rice, 175 acres of field crops, and five acres of orchard (EDAW, 2008). Proposed improvements to other levees are expected to result in the loss of an additional five acres of rice along the NCC South Levee and 50 acres of rice along the PGCC West Levee. Improvements to the NEMDC West Levee are still in the design phase, but irrigated crop land is limited to the northern portion of this levee and any changes in agricultural land use are expected to be small. No agricultural land would be affected by improvements to the American River North Levee, which is located within the City of Sacramento.

Table 5-3 shows existing and future agricultural land uses affected by proposed levee improvements and the resulting change in deep percolation from applied water. The estimated loss of deep percolation is 74 afy for the Sacramento River East Levee, seven afy for the NCC South Levee, and 66 afy for the PGCC West Levee.

5.3 Effects of Canal Improvements

Construction of the new GGS/Drainage Canal and relocation/improvement of three existing canals will increase groundwater recharge in the Natomas Basin. The new GGS/Drainage Canal and most of the relocated canals will be unlined, which will result in additional seepage from the canals to the underlying aquifer. Canal construction activities will also necessitate land use changes, including the loss of some irrigated agricultural land. The assumptions shown in **Table 5-1** were used to estimate the effects of land use changes and seepage from the canals for the water budget. For canals that would be relocated, this includes the total length of the existing and relocated canals, the length of any lined or piped segments, the approximate width of the canals at the waterline, existing land uses for the area where the relocated canal would be constructed, and the proposed future land uses for the existing canal that would be removed.

5.3.1 Giant Garter Snake/Drainage Canal

The new GGS/Drainage Canal will be about 23,200 feet (4.4 miles) long and will extend from the west end of the West Drainage Canal at the south to Pumping Plant No. 2 (east of the Pritchard Lake Pumping Plant) at the north (**Figure 1-1**). The new canal will be entirely unlined, with an average width at the waterline of about 50 feet including benches.

Construction of the GGS/Drainage Canal and associated infrastructure will require about 58.5 acres of land, as indicated in **Table 5-1**. Approximately 45 acres of this area is currently planted to field crops such as corn (EDAW, 2008). As shown in **Table 5-3**, the total amount of deep percolation that will be lost due to the removal of these field crops is estimated to be 11 afy.

The loss of deep percolation of applied water would be offset by increased seepage from the canal. Kleinfelder (2007b) used the SEEP/W groundwater flow model to estimate seepage from a two-mile segment of the new GGS/Drainage canal. The canal was simulated with a ten-foot width and an underlying soil hydraulic conductivity of 10^{-5} cm/sec. The canal was simulated as being filled with about five feet of water from May through December, but some seepage was also assumed to occur during the winter. The Kleinfelder seepage estimate was 1.4 af/1,000 lf or 1.4×10^{-4} af per square foot of wetted canal area (af/ft^2). For the total length (23,200 lf) and average width (50 feet) of the GGS/Drainage Canal, this represents a seepage rate of 162 afy, as shown in **Table 5-4**. As discussed below, the estimated seepage rate per wetted area (1.4×10^{-4} af/ft^2) was also used to estimate increased seepage due to relocation or improvement of the West Drainage Canal, the Elkhorn Canal, and the Riverside Canal.

5.3.2 West Drainage Canal

The West Drainage Canal is located south of I-5 and the SIA (**Figure 1-1**) and is about 19,000 feet long. Approximately 4,700 lf of this canal is proposed to be relocated. The existing canal is unlined, and the relocated segment of the canal is also planned to be unlined. In addition to the

partial relocation, SAFCA plans to widen the entire canal from about 30 feet to 72 feet, including a bench area that will be planted to tules (EDAW, 2008; M&H, 2008). As shown in **Table 5-1**, only about 1.5 acres of the area where the relocated canal will be constructed is currently planted to field crops. The loss of deep percolation from applied water due to the canal relocation is estimated to be 0.4 afy (**Table 5-3**).

Canal seepage was estimated using the seepage rate calculated from the Kleinfelder model for the GGS/Drainage Canal (1.4×10^{-4} af/ft^2). As shown in **Table 5-4**, seepage from the existing West Drainage Canal was estimated to be about 80 afy. Due to lengthening and widening of the canal, the future seepage rate is projected to be 208 afy, which represents an increase of 128 afy.

5.3.3 Elkhorn Canal

The existing Elkhorn Canal is located just east of the Sacramento River East Levee (**Figure 1-1**) and is about 19,850 feet (3.8 miles) long and 16 feet wide. Approximately one mile of the existing canal is concrete lined. The canal is being relocated farther east to make room for levee widening and other improvements. The relocated canal will be about 22,300 feet long and 32 feet wide. Approximately 6,100 lf of the relocated canal are planned to be lined, and another 2,950 lf would be piped. This includes the 2,050 lf alignment crossing the Teal Bend Golf Course and another 900 lf adjacent to an area of existing homes (M&H, 2008).

As shown in **Table 5-1**, relocation of the Elkhorn Canal and associated infrastructure will require about 30 acres of land. Most of the area where the new canal will be constructed is currently planted to irrigated crops. As shown in **Table 5-3**, there are about 15 acres of field crops, three acres of orchard, and 11 acres of grains, hay, and pasture. The loss of deep percolation due to removal of these crops is estimated to be 11 afy.

Canal seepage was estimated similarly to the West Drainage Canal, using the seepage rate calculated from the Kleinfelder model for the GGS/Drainage Canal (1.4×10^{-4} af/ft^2). As shown in **Table 5-4**, seepage from the existing Elkhorn Canal was estimated to be about 33 afy. The seepage rate of the relocated canal is projected to be 59 afy, which represents an increase of 27 afy.

5.3.4 Riverside Canal

The existing Riverside Canal is located just east of the southern portion of the Sacramento River East Levee in the Natomas Basin (**Figure 1-1**) and is about 19,600 feet (3.7 miles) long and seven feet wide. The Riverside Canal is also being relocated farther east to make room for levee improvements. The relocated canal is planned to be about 20,550 feet long and ten feet wide (M&H, 2008).

As shown in **Table 5-1**, relocation of the Riverside Canal and associated infrastructure will require about 54 acres of land. Most of the area where the new canal will be constructed is currently planted to irrigated crops. As shown in **Table 5-3**, there are about four acres of rice, 33 acres of field crops, six acres of orchard, and seven acres of grains, hay, and pasture. The loss of deep percolation due to removal of these crops is estimated to be 21 afy.

Canal seepage was again estimated using the seepage rate calculated from the Kleinfelder model for the GGS/Drainage Canal (1.4×10^{-4} af/ft^2). As shown in **Table 5-4**, seepage from the existing Riverside Canal was estimated to be 19 afy. The seepage rate of the relocated canal is projected to be 29 afy, which represents an increase of ten afy.

5.4 Effects of Borrow Sites

Excavation of the three borrow sites that will be the primary source of soil for SAFCA's proposed levee improvements and other construction activities will have effects on groundwater recharge in the Natomas Basin. **Table 5-1** includes a summary of assumptions about the borrow sites that were used for water budget estimates. These include the area of each borrow site and existing and proposed future land uses.

5.4.1 Airport North Bufferlands

The Airport North Bufferlands is a 737-acre site located north of the SIA (**Figure 1-1**). Approximately 630 acres of this site that had previously been planted to rice has recently been removed from rice cultivation or other land uses that would attract water fowl by the SIA. SAFCA plans to remove about four to six feet of borrow material from this site, which is currently considered non-irrigated grassland. Topsoil will be stockpiled and replaced after borrow operations are complete, and future land uses are not expected to change after reclamation of the site. As shown in **Table 5-3**, there will be no change in deep percolation from this site as a result of SAFCA's activities.

5.4.2 Brookfield Property

The Brookfield property consists of 353 acres at the northern tip of the Natomas Basin. Approximately 325 acres of this property is currently planted to rice, and SAFCA plans to restore most of this site to rice cultivation. Up to six feet of soil will be excavated, including one foot of topsoil that will be stockpiled and replaced after borrow operations are complete.

SAFCA plans to return about 286 acres of the Brookfield property to rice cultivation after construction activities are complete. The remaining 39 acres of rice fields would be lost due to construction along the PGCC West Levee and other factors. As shown in **Table 5-3**, an estimated 51 afy of deep percolation will be lost due to the conversion of rice land to other uses. The Brookfield property is currently irrigated entirely with groundwater, but SAFCA plans to provide the infrastructure so that most of the borrow site can be irrigated with surface water in the future. Engineering work is still in progress, but current estimates are that about 80 percent of the property would be irrigated with surface water rather than groundwater after reclamation (M&H, 2008). The current crop mix is about 50 percent regular rice and 50 percent wild rice (Jack DeWit, pers. comm., July 8, 2008). Regular rice and wild rice have estimated water demands of 6.5 and 6.0 af/ac/yr, respectively. Therefore, current groundwater pumpage to irrigate this property is estimated to be about 2,030 afy. This would be reduced by 1,625 afy due to the planned transition from groundwater to surface water.

In addition to increasing heads in the vicinity of the Brookfield site, the reduction in pumping would also result in increased groundwater outflow from the northern portion of the Natomas

Basin. An analytical groundwater model based on the Theis (1935) equation for groundwater flow in a confined aquifer was used to estimate the amount of water level recovery that would occur due to the reduced pumping. An aquifer transmissivity of 7,620 ft^2/day and a storage coefficient of 0.001 were used for this simulation based on LSCE (2008b). The maximum simulated water level recovery beneath the Brookfield property was about 17 feet at the end of the irrigation season in September. At the midpoint of the PGCC West Levee (south of the Brookfield property), the simulated recovery ranged from 1.6 to 7.6 feet, with an average annual value of 3.8 feet. This would result in an average increase in the hydraulic gradient for flow to the east of about 4.4×10^{-5} ft/ft. The increase in subsurface outflow was estimated using Darcy's Law (Darcy, 1856), which can be written as:

$$Q = KAi$$

where: Q = volumetric flow rate,
K = hydraulic conductivity of the porous medium,
A = cross-sectional area of the porous medium, and
i = hydraulic gradient.

The cross-sectional area was estimated based on the assumption that almost all of the flow would occur in the upper 400 feet of the aquifer system. Using this equation, the increase in subsurface outflow from the Natomas Basin was predicted to be 76 afy.

5.4.3 Fisherman's Lake

Fisherman's Lake – The Fisherman's Lake borrow site is located at the northern end of Fisherman's Lake in the southwestern portion of the Natomas Basin. Engineering work has not been completed for this site, but the current estimate is that about 400 acres of land would be used for borrow material.

As shown in **Table 5-1**, current land uses on this site are 49 acres of rice, 266 acres of field crops, and 85 acres of managed marsh. After reclamation, there would be about 175 acres of managed marsh and 225 acres of non-irrigated grassland or woodland. As shown in **Table 5-3**, the creation of managed marsh will result in an increase in deep percolation of 51 afy. Overall, however, there will be a net loss in deep percolation of 15 afy due to the conversion of field crops to non-irrigated grassland.

5.5 Summary

This chapter summarized the groundwater impacts of SAFCA's proposed construction activities, with the exception of slurry cutoff walls, which are addressed in Chapter 6. The above analysis included three types of groundwater impacts:

- Land use changes due to levee and canal improvements and borrow sites will result in the conversion of some irrigated agricultural land to non-irrigated land uses, which will reduce groundwater recharge from deep percolation of applied water. The total loss of deep percolation from applied water is estimated to be 256 afy, as shown in **Table 5-3**.

- The new and relocated canals would result in increased groundwater recharge due to additional canal seepage. The total estimated increase in canal seepage is 327 afy, as shown in **Table 5-4**.
- There will be a large reduction in groundwater pumping due to the planned shift in water supply from groundwater to surface water for 80 percent of the Brookfield property. The reduction in pumping is estimated to be about 1,625 afy. This will result in higher heads and increased groundwater outflow in the northern portion of the Natomas Basin.

Table 5-1
SAFCA Construction Assumptions for Water Budget Estimates

	Total Length (ft)	Slurry Cutoff Walls		Canals		Total Area (ac)	Existing Agricultural Land Uses	Future Land Uses	Notes/Sources
		Length (ft)	Average Depth (ft)	Length of Lined or Piped Segments (ft)	Average Width at Waterline (ft)				
Levees									
Sacramento River East Levee	96,000	42,490	78	-	-	486.5	20 ac rice, 175 ac field crops, 5 ac orchard	Levee	Kleinfelder (2007b); Land use based on EDAW Table 3
NCC South Levee	28,700	28,700	70	-	-	148.5	5 ac rice	Levee	Kleinfelder (2008), Land use based on EDAW Table 3
PGCC West Levee	17,400	5,000	60	-	-	89.5	50 ac rice	Levee	Wood Rodgers (2008), land use based on EDAW Table 3
NEMDC West Levee	70,000	16,000	69	-	-	-	South NEMDC - none; North NEMDC - unknown	Levee	Length & depth per John Lloyd, Kleinfelder, 4-11-08 memo:
American River North Levee	11,600	5,000	85	-	-	-	None	Levee	David Rader, EDAW (7-7-08)
Canals									
GGS/Drainage Canal	23,200	-	-	0	50	58.5	45 ac field crops	-	Width (M&H, 7-15-08); Land use based on EDAW Table 3
West Drainage Canal (Existing)	19,000	-	-	0	30	7	-	Managed grassland	4,700 LF section to be relocated
West Drainage Canal (Relocated)	20,600	-	-	0	72	8	1.5 ac field crops	-	Relocated section = 6,300 LF, rest widened to 72 ft.
Elkhorn Canal (Existing)	19,850	-	-	5,280	16	30	-	Levee	Length & width (M&H, 7-15-08)
Elkhorn Canal (Relocated)	22,300	-	-	9,050	32	34	15 ac field crops, 3 ac orchard, 11 ac other	-	Land use estimated by LSCE based on 2004 land use map from LSCE (2008b)
Riverside Canal (Existing)	19,600	-	-	0	7	50	-	Levee	
Riverside Canal (Relocated)	20,550	-	-	0	10	54	12 ac rice, 102 ac field crops, 17 ac orchard, 24 ac other	-	Land use estimated by LSCE based on 2004 land use map from LSCE (2008b)
Borrow Sites									
Airport North Bufferlands	-	-	-	-	-	737	Previously planted to rice but currently non-irrigated at request of FAA.	Managed grassland	Acreage (M&H, 7-15-08); current land uses per SAFCA
Brookfield Property	-	-	-	-	-	353	325 ac rice irrigated w/ 100% groundwater (1/2 & 1/2 reg. & wild rice)	286 ac rice irrigated w/ 20% groundwater, 80% surface water	Assumption of 286 ac in rice in future based on work on adjacent PGCC west levee (M&H, 2008)
Fisherman's Lake	-	-	-	-	-	400	49 ac rice, 266 ac field crops, 85 ac marsh	175 ac managed marsh, 225 ac grassland or woodland	Acreage, land use from Marieke Armstrong, M&H (7-18-08)

Table 5-2
Deep Percolation from Applied Water in the Natomas Basin

Crop	Applied Water[1] (af/ac/yr)	Deep Percolation from Applied Water[2]	
		(af/ac/yr)	(%)
Rice or managed marsh	6.5	0.77	12%
Field and Row Crops	2.5	0.25	10%
Orchard	4.0	0.68	17%
Grains and Hay	2.5	0.41	16%
Pasture	4.8	0.61	13%

1. Source: LSCE (2008b).
2. Source: LSCE 2008b. Estimated as total deep percolation minus deep percolation from precipitation.

Table 5-3
Effects of Land Use Changes Due to Proposed SAFCA Construction on Deep Percolation

SAFCA Construction Activity	Existing Agricultural Land Uses (ac)				Future Agricultural Land Uses (ac)		Loss of Deep Percolation from Applied Water (afy)				Total Loss of Deep Percolation from Applied Water (afy)
	Rice[1]	Field Crops	Orchard	Grains, Hay, and Pasture	Rice or Managed Marsh	Other	Rice[2]	Field Crops[3]	Orchard[4]	Grains, Hay, and Pasture[5]	
Levee Improvements:											
Sacramento River East Levee	20	175	5	0	0	0	15	44	3	0	63
NCC South Levee	5	0	0	0	0	0	4	0	0	0	4
PGCC West Levee	50	0	0	0	0	0	39	0	0	0	39
NEMDC West Levee[6]	0	0	0	0	0	0	0	0	0	0	0
American River North Levee	0	0	0	0	0	0	0	0	0	0	0
Subtotal	**75**	**175**	**5**	**0**	**0**	**0**	**58**	**44**	**3**	**0**	**105**
Canals:											
GGS/Drainage Canal	0	45	0	0	0	0	0	11	0	0	11
West Drainage Canal	0	1.5	0	0	0	0	0	0.4	0	0	0.4
Elkhorn Canal	0	15	3	11	0	0	0	4	2	5	11
Riverside Canal	4	33	6	7	0	0	3	8	4	3	19
Subtotal	**4**	**95**	**9**	**18**	**0**	**0**	**3**	**24**	**6**	**8**	**41**
Borrow Sites:											
Airport North Bufferlands	0	0	0	0	0	0	0	0	0	0	0
Brookfield Property	325	0	0	0	286	0	30	0	0	0	30
Fisherman's Lake	134	266	0	0	173	0	-30	67	0	0	36
Subtotal	**459**	**266**	**0**	**0**	**459**	**0**	**0**	**67**	**0**	**0**	**67**
Total	**538**	**536**	**14**		**459**	**0**	**61**	**134**	**10**	**8**	**213**

1. Includes 85 ac of managed marsh at the Fisherman's Lake borrow site.
2. Deep percolation from applied water estimated to be 0.77 af/ac/yr for rice by LSCE (2008b).
3. Deep percolation from applied water estimated to be 0.25 af/ac/yr for field crops by LSCE (2008b).
4. Deep percolation from applied water estimated to be 0.68 af/ac/yr for orchards by LSCE (2008b).
5. Deep percolation from applied water estimated to be 0.41 af/ac/yr for grains/hay and 0.61 af/ac/yr for pasture by LSCE (2008b). A weighted average of 0.47 af/ac was used above.
6. Design of NEMDC levee improvements is in the early stages, and there is no current estimate of land use changes due to levee constructiion. An estimate of 50 ac of rice based on the PGCC was also used for the NEMDC because land uses west of the northern portion of the NEMDC is similar to the PGCC. Land uses west of the southern portion of the NEMDC are urbanized or vacant.

Table 5-4
Effects of SAFCA's Proposed Canal Construction on Canal Seepage

Canal Name		Total Length (ft)	Length of Lined or Piped Segments (ft)	Length of Unlined Portion (ft)	Width at Waterline (ft)	Area at Waterline[1] (ft^2)	Seepage Rate per Sq. Foot[2] ($af/ft^2/yr$)	Total Seepage Rate (afy)	Seepage Increase (afy)
GGS/Drainage Canal	New	23,200	0	23,200	50	1,160,000	1.4E-04	162	162
West Drainage Canal	Existing	19,000	0	19,000	30	570,000	1.4E-04	80	
	Relocated	20,600	0	20,600	72	1,483,200	1.4E-04	208	128
Elkhorn Canal	Existing	19,850	5,280	14,570	16	233,120	1.4E-04	33	
	Relocated	22,300	9,050	13,250	32	424,000	1.4E-04	59	27
Riverside Canal	Existing	19,600	0	19,600	7	137,200	1.4E-04	19	
	Relocated	20,550	0	20,550	10	205,500	1.4E-04	29	10
Total	**Existing**	**58,450**	**5,280**	**53,170**		**940,320**		**132**	
	New or Relocated	**86,650**	**9,050**	**77,600**		**3,272,700**		**458**	**327**

1. Area of unlined portion only.
2. Based on results of Kleinfelder (2007b) seepage model for portion of GGS/Drainage Canal.

6.0 Effects of Slurry Cutoff Walls

Slurry cutoff walls are currently proposed for a total of about 17 miles of the levees surrounding the Natomas Basin. This includes eight miles of the Sacramento River East Levee, all (5.4 miles) of the NCC South Levee, 0.9 miles of the PGCC West Levee, three miles of the NEMDC West Levee, and 0.9 miles of the American River North Levee. Groundwater flow beneath the levees with and without the proposed cutoff walls was estimated by various methods. These methods and the resulting estimates are discussed in this section.

Groundwater flow beneath the Sacramento River East Levee and the NCC South Levee with and without slurry cutoff walls was estimated by both URS and Kleinfelder using the SEEP/W groundwater flow model. The most recent estimates were made by Kleinfelder and are summarized below. LSCE used a spreadsheet model to develop a revised estimate for the Sacramento River East Levee.

No modeling has been done to estimate the impacts of proposed slurry cutoff walls along the other three levees that surround the Natomas Basin. For these areas, groundwater flow without slurry cutoff walls was estimated based on the IGSM models discussed in Chapter 4. Two different simulations were used for this purpose: one representing existing conditions based on 2004 data, and the other representing future conditions in 2030. To be conservative, the estimate of cutoff wall impacts used in the water budget was based on the simulation that showed the largest impact. Based on the model results, an estimate of groundwater flow per cross-sectional area was developed. For the reaches where slurry cutoff walls are proposed, the estimate flow per cross-sectional area were reduced by a fixed percentage based on the Kleinfelder model results for the Sacramento River East Levee and the NCC South Levee.

6.1 Sacramento River East Levee

Measures proposed to mitigate seepage problems beneath the Sacramento River East Levee are shown in **Table 6-1**. Slurry cutoff walls are currently proposed for 14 reaches, seepage berms are proposed for four reaches, and no mitigation is planned for seven reaches. The reaches where cutoff walls are proposed are shown in **Figure 6-1**.

6.1.1 Kleinfelder Model

Kleinfelder (2007b) used the SEEP/W groundwater flow model to estimate seepage beneath the Sacramento River East Levee with and without slurry cutoff walls and summarized the results in a report entitled *Evaluation of Cutoff Walls Impact on Groundwater Recharge, Sacramento River East Levee, Natomas Levee Improvement Project, Sacramento and Sutter Counties, California*. SEEP/W is a two-dimensional, finite-element model based on Darcy's Law (Darcy, 1856). As discussed in Chapter 5, the inputs to Darcy's equation are the hydraulic conductivity, the hydraulic gradient, and the cross-sectional area for groundwater flow. SEEP/W has the capability to simulate flow in multiple layers, and a separate hydraulic conductivity is required for each layer. Hydraulic conductivities used in the Kleinfelder model ranged from

0.028 ft/day for clay to 283 ft/day for gravel. The maximum hydraulic conductivity used for the permeable layers in most reaches was 14 ft/day (representing sand).

The SEEP/W model allows both steady-state and transient simulations to be conducted. As discussed below, a transient simulation was conducted for one station, but the results were not used in the overall seepage estimate. The reported model results were based on steady-state simulations conducted for four stations, which were considered to be representative of the different geologic conditions observed on geologic profiles created from borehole data. The modeled stations were located at Stations 27+00 in Reach 1, 70+00 in Reach 2, 217+00 in Reach 4b, and 353+00 in Reach 7b. Model results from these stations were applied to other reaches with similar geology. The percentage of the entire length of the Sacramento River East Levee represented by each modeled station was 11 percent for Station 27+00, 23 percent for Station 70+00, 42 percent for Station 217+00, and 24 percent for Station 353+00,

Kleinfelder used an "average" groundwater elevation of 15 ft msl for all simulations. This was compared against river stage at the Verona gage ranging from 15 to 32 ft msl in one-foot increments to calculate the gradient between the River and shallow groundwater. The steady-state model was run separately for each stage height, and the estimated seepage was multiplied by the number of days that the stage was calculated to be at each elevation based on data from 1995-2007. The lowest stage height (15 ft msl) had the longest duration (20 days/year), and the three highest stage heights (30, 31, and 32 ft msl) each had a duration of ten days/year.

Since almost all of the groundwater flow occurs in the sand layers, the model is very sensitive to the hydraulic conductivity used for sands. A hydraulic conductivity of 14 ft/day was used for sand layers in three of the four modeled reaches, and the calculated seepage rate was relatively low (2.6 to 13.4 afy/1,000 lf) in these reaches. Hydraulic conductivities of 56 and 283 ft/day were used for sand and gravel, respectively, at Station 217+00, and the resulting seepage rate was much higher (129 afy/1,000 lf). These seepage estimates were multiplied by the length of each reach to estimate the total seepage, and the results are shown in **Table 6-2**. The total seepage was estimated to be about 5,650 afy without slurry cutoff walls using this approach.

The model was rerun for Stations 70+00 and 353+00 with the slurry cutoff walls in place to estimate the effect of the cutoff walls. A hydraulic conductivity of 2.8×10^{-3} ft/day was estimated for the cutoff walls. For Station 70+00, the cutoff wall was assumed to fully penetrate the permeable sand layer and a seepage reduction of 85 percent was calculated. At Station 353+00, the cutoff wall was assumed to not fully penetrate the permeable sand layer and was calculated to reduce seepage by only 40 percent. The model results for the four stations were multiplied by one of these percentages to estimate the impacts of the other cutoff walls. The 85 percent reduction was used for reaches where the cutoff wall was considered to fully penetrate the permeable sand layer, and the 40 percent reduction was used for reaches where the wall would not be fully penetrating. As shown in **Table 6-2**, the total amount of groundwater flow that would be blocked by the eight miles of proposed slurry cutoff walls is about 1,320 afy, which represents 23 percent of the total flow for the entire 18-mile reach of the River in the Natomas Basin.

A transient version of the model was created for Station 70+00 to check the results of the steady-state simulations. The transient model was run with and without the slurry cutoff walls for a one-year period divided into 34 time steps. Groundwater elevations and river stage were allowed to fluctuate based on stage measured at the Verona gage and groundwater levels at USACE piezometer 2F-01-15N. Seepage without the cutoff wall calculated with the transient model was three times higher than that calculated with the steady-state model. Seepage through the cutoff wall was about four times higher with the transient model as compared to the steady-state model. On a percentage basis, the calculated flow reduction for the transient model was about 80 percent, which is slightly less than the 85 percent reduction calculated with the steady-state model.

Overall, the Kleinfelder transient model results appear to be more realistic than the steady-state results. This would be expected since steady-state models require an assumption of equilibrium conditions and cannot simulate conditions that vary with time. For this reason, transient model results are considered more accurate for most applications. However, steady-state model results had to be used for Kleinfelder's overall seepage estimate shown in **Table 6-2** because only one station was simulated with the transient model. As discussed below, some of the Kleinfelder transient model results were used for LSCE's evaluation of cutoff wall impacts on seepage from the River and head changes in private wells along the east levee.

On a percentage basis, the transient and steady-state models showed similar results for flow reductions caused by the cutoff walls. Flow reductions of 80 to 85 percent due to horizontal flow through a fully-penetrating cutoff walls were considered to be reasonable estimates. These estimates are conservative in that they do not account for increased vertical flow beneath the cutoff walls or horizontal flow around the cutoff walls. A three-dimensional model would be expected to show a somewhat smaller flow reduction due to the cutoff walls.

6.12 LSCE Seepage Estimates

Since almost all of the groundwater flow beneath the levees occurs in the permeable sand and gravel layers, a seepage estimate equivalent to the SEEP/W model can be obtained by simply calculating groundwater flow in the sand and gravel layers using Darcy's equation. The estimate made by LSCE (2008a) is summarized in **Table 6-3** and discussed in this section. As noted above, Darcy's equation states that the volumetric rate of groundwater flow is equal to the product of the hydraulic conductivity, the cross-sectional area, and the hydraulic gradient (Darcy, 1856). Groundwater flow for 25 reaches was estimated separately and then summed to estimate the total net recharge from the River. The term "net recharge" is used because the hydraulic gradient used for the simulations is an average value that accounts for the fact that the Sacramento River fluctuates between gaining and losing conditions over the course of the year. On an annual basis, however, all reaches of the Sacramento River in the Natomas Basin appear to be losing, as discussed above in Chapter 3.

For these seepage estimates, groundwater flow in fine to medium sands was calculated separately from that in coarse sands and gravels. For each category, the hydraulic conductivity and gradient were assumed to be constant for all reaches. Hydraulic conductivities used in the model are based on estimates summarized in **Table 2-1**. A hydraulic conductivity of 28 ft/day was used for the fine to medium sands, which is higher than the estimate used by Kleinfelder for three of the

stations simulated with the SEEP/W model (14 ft/day). A hydraulic conductivity of 140 ft/day was used for coarse sands and gravels, which is within the range of estimates used by Kleinfelder for similar materials at Station 217+00 (56 to 283 ft/day).

The hydraulic gradient used for the Darcy's Law estimate was 0.0033 ft/ft based on the average annual value estimated in LSCE (2008a). As discussed in Section 4, this hydraulic gradient accounts for the large seasonal fluctuations observed in the hydrographs of groundwater levels and estimated stage. Steep positive gradients (losing conditions) occurring during periods of rising and high stage are partially offset by shallow negative gradients (gaining conditions) during periods of declining and low stage. Although the groundwater contour maps show that the gradient is steeper in the southern portion of the Natomas Basin, the piezometer data and stage estimates were not accurate enough to allow this spatial variability to be quantified.

For each reach, the saturated thickness of permeable sands and gravels was estimated from the geologic profiles, which contain data for the upper 100 to 120 feet of the aquifer system. The permeable saturated thickness for fine to medium sands ranged from 20 to 80 feet, with an average of 45 feet. The permeable saturated thickness for coarse sands to gravels ranged from zero to 53 feet, with an average of eight feet. These thicknesses were multiplied by the length of each reach to estimate the cross-sectional area for groundwater flow. Because the overall length of the Sacramento River East Levee is about 18 miles, the total cross-sectional area is very large (about 5.6 million square feet or almost 130 acres).

As shown in **Table 6-3**, the estimated groundwater flow in each reach ranges by several orders of magnitude, from 5 to about 3,100 afy. The total estimated groundwater flow in the shallow aquifer without slurry cutoff walls is 8,470 afy. Although the coarse sand and gravel layers account for only 25 percent of the total saturated thickness, groundwater flow in these layers accounts for 63 percent of the total estimated flow. The total flow is about 55 percent more than was estimated by Kleinfelder using the steady-state SEEP/W model but is less than would be expected had Kleinfelder applied its transient model to all reaches.

The estimated effect of the slurry cutoff walls was partially based on the Kleinfelder transient model results. The estimate of an 80 percent reduction in groundwater flow obtained with the transient model was used for reaches where the cutoff wall fully penetrated the permeable sand layer. LSCE's interpretation of the geologic profiles indicates that the slurry cutoff walls will only be fully penetrating for three of the 13 reaches where cutoff walls are proposed. For the other ten reaches, an 80 percent flow reduction was assumed for the depth of the cutoff wall and no flow reduction below the bottom of the cutoff wall. Using this approach, the effect of the cutoff walls is estimated to range from 6 to 70 percent of the total flow in these reaches. The estimated flow reduction due to all proposed cutoff walls is 1,245 afy, as shown in **Table 6-3**. This represents a reduction of about 15 percent of the total estimated flow beneath the Sacramento River East Levee.

The estimate of slurry cutoff wall impacts in **Table 6-3** is based on existing groundwater conditions in the Natomas Basin. In order to estimate impacts in 2030, the hydraulic gradient was increased to reflect the steeper gradient that would occur in the northern portion of the Natomas Basin primarily due to pumping to supply the proposed Sutter Pointe development. As

shown in **Table 6-4**, the magnitude of the predicted increase ranges from a maximum of 0.0018 ft/ft in Reaches 2 and 3 to zero in Reaches 14 through 20. The total estimated recharge from the River without slurry cutoff walls would increase to 9,370 afy, and the estimated flow reduction due to all proposed cutoff walls would increase to 1,350 afy.

Like the Kleinfelder model results, the reduction in flow due to the proposed slurry cutoff walls calculated by LSCE is conservative because the model only accounts for horizontal flow through the cutoff walls. Increased vertical flow beneath the cutoff walls and increased horizontal flow around the ends of the cutoff walls are not included in the model, which means that the actual flow reduction would be less than simulated. The reduction in groundwater flow beneath the levee due to the cutoff walls equates to reduced recharge from the Sacramento River to the Natomas Basin. During periods when the River is losing, heads will be lower on the land side of the levee and higher on the river side due to the impedance caused by the cutoff walls and the resultant reduction in groundwater flow. Flow that would be impeded by the cutoff walls would be expected to remain in the River, which will provide a benefit to downstream users.

6.2 Natomas Cross Canal South Levee

Seepage beneath the NCC South Levee with and without slurry cutoff walls was also estimated by Kleinfelder using the SEEP/W groundwater flow model. The model results are included in a report entitled *Evaluation of Cutoff Walls Impact on Groundwater Recharge, Natomas Cross Canal South Levee, Natomas Levee Improvement Project, Sacramento and Sutter Counties, California* (Kleinfelder, 2008) and are summarized below.

Hydraulic conductivities used in the model ranged from 0.028 ft/day for clay to 28 ft/day for sand. The maximum hydraulic conductivity is an order of magnitude less than the 283 ft/day used for some reaches of the Sacramento River East Levee because boreholes drilled along the NCC South Levee did not encounter significant gravel lenses. However, the permeable sand layers were assigned a hydraulic conductivity of 28 ft/day, which is double that used for model of the Sacramento River East Levee.

Both steady state and transient simulations were conducted for the NCC South Levee, but the results of the transient simulations were not used for the overall seepage estimate. The reported model results were based on steady-state simulations conducted for three stations, which were considered to be representative of the different geologic conditions observed on geologic profiles created from borehole data. The modeled stations were located at Stations 135+00 (Reach 4), 183+00 (Reach 5), and 213+00 (Reach 6). Stations 135+00 and 183+00 were modeled as having two relatively thin sand layers separated by a clay layer. Station 213+00 was modeled as having a single thicker sand layer. Model results from these stations were applied to other reaches with similar geology. The percentage of the entire length of the NCC South Levee represented by each modeled station was 35 percent for Station 135+00, 40 percent for Station 183+00, and 25 percent for Station 213+00.

An “average” depth to water of 7.5 feet was used for all simulations. This equates to a groundwater elevation of 25.3 to 32.3 ft msl and was compared against NCC stage ranging from 17.3 to 34.3 ft msl in one-foot increments to calculate the gradient between the canal and

shallow groundwater. The steady-state model was run separately for each stage height, and the estimated seepage was multiplied by the number of days that the stage was calculated to be at each elevation based on data from the Sacramento River Verona gage for 1995-2007. The lowest stage height (17.3 ft msl) had the longest duration (about 20 days/year), and the three highest stage heights (32.3, 33.3, and 34.3 ft msl) each had a duration of about ten days/year.

Unlike its seepage model of the Sacramento River East Levee, Kleinfelder modeled all three stations of NCC South Levee using the same hydraulic conductivity (28 ft/day) for the most permeable layers. Therefore, the simulated seepage for the NCC was much less variable. Station 135+00 had the lowest estimated seepage rate (3.1 afy/1,000 lf). Station 183+00 had a seepage rate of 9.8 afy/1,000 lf, and Station 213+00 had a seepage rate of 9.1 afy/1,000 lf. These seepage estimates were multiplied by the length of each reach to estimate the total seepage, and the results are shown in **Table 6-5**. The total seepage was estimated to be about 218 afy without slurry cutoff walls using this approach.

The model was rerun for all three stations with the slurry cutoff walls in place to estimate the effect of the cutoff walls on seepage from the NCC. A hydraulic conductivity of 2.8×10^{-3} ft/day was assumed for the cutoff walls. For Station 135+00, the cutoff wall was assumed to fully penetrate both sand layers, resulting in an estimated seepage reduction of 90 percent. For Station 183+00, however, the cutoff wall was assumed to penetrate only the upper sand layer, which resulted in an estimated seepage reduction of 30 percent. For Station 213+00, the cutoff wall was assumed to fully penetrate the single sand layer, which also resulted in an estimated seepage reduction of 90 percent. The model results for the four stations were multiplied by one of these percentages to estimate the impacts of the other cutoff walls. As shown in **Table 6-5**, the total amount of groundwater flow that would be blocked by the slurry cutoff walls along the NCC South Levee under existing conditions is about 126 afy. This represents 90 percent of the flow through the cutoff wall cross section and 58 percent of the total flow calculated by the model.

In addition to the Kleinfelder model results for existing conditions, slurry cutoff wall impacts were estimated for 2030 conditions based in part on the IGSM model results. Estimated groundwater flow with and without slurry cutoff walls for all five levees based on existing and future conditions are shown in **Table 6-6**. Groundwater flow beneath the NCC South Levee without slurry cutoff walls was estimated to be much larger (about 3,700 afy) in 2030 (**Table 4-1**) due primarily to drawdown caused by proposed M&I pumping in the Sutter County portion of the Natomas Basin. It was assumed that almost all of this flow would occur in the upper 400 feet of the aquifer system. Flow through the cross-sectional area where cutoff walls are proposed was estimated to be 648 afy, and an 80 percent flow reduction due to the slurry cutoff walls was assumed based on the Kleinfelder transient simulation for the Sacramento River East Levee. The estimated flow reduction for the 2030 simulation is 518 afy.

As discussed above for the model of the Sacramento River East Levee, these estimates are conservative in that they do not account for increased vertical flow beneath the cutoff walls or horizontal flow around the cutoff walls. A three-dimensional model would be expected to show a somewhat smaller flow reduction due to the cutoff walls.

6.3 Pleasant Grove Creek Canal West Levee

As discussed above, no modeling has been done to estimate the impacts of proposed slurry cutoff walls along the PGCC West Levee, the NEMDC West Levee, and the American River North Levee. For these areas, groundwater flow without slurry cutoff walls was estimated based on the IGSM groundwater model results discussed in Chapter 4. Based on the model results, an estimate of groundwater flow per cross-sectional area was developed for the 2004 and 2030 simulations (**Table 6-6**). For the reaches where slurry cutoff walls are proposed, flow through the cross-sectional area of the cutoff walls was reduced by a fixed percentage (80 percent) based on the Kleinfelder transient model results for the Sacramento River East Levee.

Flow beneath the PGCC West Levee with and without slurry cutoff walls is estimated in **Table 6-6**. Groundwater flow to the east beneath the levee without cutoff walls was estimated to be 4,328 afy based on the 2004 IGSM simulation and 239 afy based on the 2030 simulation. It was assumed that almost all of this flow occurs in the upper 400 feet of the aquifer system, which corresponds to Layer 1 and the upper portion of Layer 2 of the IGSM models. The slurry cutoff walls along the PGCC West Levee were assumed to be 5,000 feet long and an average of 60 feet deep. Groundwater flow through this cross section without the cutoff walls was estimated to be 187 afy and ten afy, based on the 2004 and 2030 simulations, respectively. An 80 percent flow reduction due to the slurry cutoff walls was assumed based on the Kleinfelder transient simulation for the Sacramento River East Levee. The estimated flow reduction is 149 afy for the 2004 simulation and 8 afy for the 2030 simulation, as shown in **Table 6-6**. These flow reductions will be at least partially offset by the estimated increase in groundwater outflow beneath the PGCC due to pumping reductions planned for the Brookfield borrow site.

6.4 Natomas East Main Drainage Canal West Levee

The impacts of proposed slurry cutoff walls along the NEMDC West Levee were estimated similarly to the PGCC West Levee in **Table 6-6**. Groundwater flow to the east beneath the levee without cutoff walls was estimated to be 17,410 afy based on the IGSM 2004 simulation and 961 afy based on the 2030 simulation. As for the PGCC, it was assumed that almost all of this flow occurs in the upper 400 feet of the aquifer system. The slurry cutoff walls along the NEMDC West Levee were assumed to be 16,000 feet long and an average of 69 feet deep.

Groundwater flow through this cross-sectional area without the cutoff walls was estimated to be 684 afy and 38 afy, based on the 2004 and 2030 simulations, respectively. An 80 percent flow reduction due to the slurry cutoff walls was assumed based on the Kleinfelder transient simulation for the Sacramento River East Levee. The estimated flow reduction is 547 afy for the 2004 simulation and 30 afy for the 2030 simulation, as shown in **Table 6-6**.

6.5 American River North Levee

The impacts of proposed slurry cutoff walls along the American River North Levee were estimated similarly to the PGCC and NEMDC West Levees in **Table 6-6**. Recharge from the American River to the Natomas Basin was estimated to be 1,086 afy based on the IGSM 2004 simulation. For the 2030 simulation, the direction of groundwater flow was toward the River

(gaining conditions), and simulated groundwater flow to the River was 500 afy. For both simulations, it was assumed that almost all of the flow to and from the River occurs in the upper 120 feet of the aquifer system. The slurry cutoff walls along the American River North Levee were assumed to be 5,000 feet long and an average of 85 feet deep.

Recharge from the River through the cross-sectional area where cutoff walls are proposed was estimated to be 332 afy for the 2004 simulation and –153 afy for the 2030 simulation. An 80 percent flow reduction due to the slurry cutoff walls was again assumed based on the Kleinfelder transient simulation for the Sacramento River East Levee. The estimated reduction in flow from the River was 265 afy for the 2004 simulation as shown in **Table 6-6**. The estimated reduction in flow to the River was 122 afy for the 2030 simulation,

6.6 Summary

The proposed slurry cutoff walls are expected to reduce groundwater flow beneath the levees as intended. Cutoff wall impacts shown in **Table 6-6** were estimated separately based on simulations of existing (or 2004) and future (2030) conditions. Estimates were based on models by Kleinfelder (2007 and 2008) and LSCE (2008a) and IGSM model results (WRIME, 2007 and LSCE, 2008b). The predicted impacts of cutoff walls beneath each of the five levees surrounding the Natomas Basin discussed in Chapter 7 are based on both the existing/2004 and 2030 results because the maximum impact varies both by location and simulation period. The maximum impact to groundwater supplies in the Natomas Basin occurs for the 2004 simulation for the American River North Levee and the 2030 simulation for the other four levees. The total predicted impact of all slurry cutoff walls is 940 afy based on "existing" or 2004 conditions and 1,707 afy based on future conditions in 2030.

There are also potential groundwater impacts east of the Natomas Basin, primarily because the proposed slurry cutoff walls beneath the PGCC and NEMDC West Levees will reduce groundwater outflow from the Natomas Basin. These impacts are predicted to occur primarily under existing conditions (based on the 2004 simulation) because the gradient for groundwater flow to the east is relatively flat for the 2030 simulation. As shown in **Table 6-6**, the reduction in groundwater outflow due to the slurry cutoff walls based on the 2004 simulation is 149 afy for the PGCC West Levee and 547 afy for the NEMDC West Levee. The total predicted reduction in groundwater outflow is 696 afy. This would be reduced to 620 afy due to increased outflow beneath the PGCC West Levee resulting from pumping reductions at the Brookfield borrow site.

Table 6-1
Proposed Mitigation for Seepage Beneath Sacramento River East Levee[1]

Reach	Stations	Proposed Mitigation	Length of Reach (ft)	Length of Cutoff Wall (ft)	Top of Levee Elevation (ft msl)	Cutoff Wall Bottom Elevation (ft msl)	Sand Layer Bottom Elevation (ft msl)	Depth of Cutoff Wall (ft)
1	00+00 to 48+00	None	4,800					
2	48+00 to 100+00	Cutoff Wall	5,200	5,200	43	-25	-85	68
3	100+00 to 110+00	Cutoff Wall	1,000	1,000	43	-25	-80	68
4a	110+00 to 190+00	100-ft Berm	8,000					
4b	190+00 to 228+00	300-ft Berm	3,800					
5a	228+00 to 263+00	100-ft Berm	3,500					
5b	263+00 to 280+00	None	1,700					
6	280+00 to 330+00	Cutoff Wall	5,000	5,000	41	-70	-65	111
7	330+00 to 362+00	Cutoff Wall	3,200	3,200	40	-60	-50	100
8	362+00 to 402+00	Cutoff Wall	4,000	4,000	39	-60	-50	99
9a	402+00 to 430+10	None	2,810					
9b	430+10 to 468+10	Cutoff Wall	3,800	3,800	39	-70	-50	109
10	468+10 to 495+00	Cutoff Wall	2,690	2,690	39	-25	-60	64
11	495+00 to 635+00	100-ft Berm	14,000					
12	635+00 to 667+00	None	3,200					
13	667+00 to 700+00	Cutoff Wall	3,300	3,300	39	-20	-100	59
14	700+00 to 732+00	None	3,200					
15	732+00 to 780+00	Cutoff Wall	4,800	4,800	39	-10	-80	49
16	780+00 to 832+00	None	5,200					
17	832+00 to 842+00	Cutoff Wall	1,000	1,000	39	-25	-80	64
18	842+00 to 857+00	Cutoff Wall	1,500	1,500	39	-25	-80	64
19a	857+00 to 875+00	Cutoff Wall	1,800	1,800	39	-25	-80	64
19b	875+00 to 925+00	Cutoff Wall	5,000	5,000	38	-25	-40	63
20a	925+00 to 927+00	Cutoff Wall[2]	200	200	38	-12	-40	50
20b	927+00 to 960+00	None	3300					
		Total Length	96,000	42,490				

1. Partially based on Table 3 in Kleinfelder (2007b).
2. Cutoff wall 200 to 500 feet long proposed at pump station in Reaches 20a and 20b.

Table 6-2
Kleinfelder Model Results: Estimated Groundwater Flow Beneath Sacramento River East Levee in Natomas Basin With and Without Slurry Cutoff Walls[1]

Reach	Stations		Seepage Based on Simulated Station	Length of Reach (ft)	Seepage Without Cutoff Walls (afy)	Seepage With Cutoff Walls (afy)	Impact of Cutoff Walls	
	Start	End					(afy)	(%)
1	00+00	48+00	27+00	4,800	19	19	0	0
2	48+00	100+00	70+00	5,200	14	2	12	85
3	100+00	110+00	70+00	1,000	3	0.4	2.6	85
4a	110+00	120+00	70+00	1,000	3	3	0	0
4a	120+00	190+00	353+00	7,000	95	95	0	0
4b	190+00	228+00	217+00	3,800	490	490	0	0
5a	228+00	263+00	70+00	3,500	10	10	0	0
5b	263+00	280+00	27+00	1,700	6	6	0	0
6	280+00	330+00	217+00	5,000	650	100	550	85
7a	330+00	345+00	353+00	1,500	20	3	17	85
7b	345+00	362+00	353+00	1,700	23	3	20	85
8	362+00	402+00	353+00	4,000	55	8	47	85
9	402+00	430+00	353+00	2,800	38	38	0	0
9	430+00	468+10	353+00	3,800	50	8	42	85
10	468+10	495+00	217+00	2,690	350	210	140	40
11	495+00	635+00	217+00	14,000	1810	1810	0	0
12	635+00	640+00	217+00	500	65	65	0	0
12	640+00	667+00	70+00	2,700	7	7	0	0
13	667+00	700+00	353+00	3,300	45	30	15	40
14	700+00	732+00	70+00	3,200	8	8	0	0
15	732+00	780+00	217+00	4,800	620	375	245	40
16	780+00	832+00	217+00	5,200	675	675	0	0
17	832+00	842+00	217+00	1,000	130	80	50	40
18	842+00	857+00	217+00	1,500	195	120	75	40
19a	857+00	875+00	217+00	1,800	235	140	95	40
19b	875+00	925+00	70+00	5,000	15	8	7	40
20a	925+00	925+50	27+00	50	0.2	0.2	0	0
20b	925+50	960+00	27+00	3,550	13	13	0	0
Total				**96,090**	**5,650**	**4,330**	**1,320**	**23**

1. Based on Table 5 in Kleinfelder (2007b). Shading indicates reaches with proposed cutoff walls.

Table 6-3
Darcy's Law Estimate of Groundwater Recharge from Sacramento River to Natomas Basin
With and Without Slurry Cutoff Walls Based on Existing Conditions

Reach	Length (ft)	Current Proposed Mitigation[1]	Cutoff Wall Depth (ft)	Average Depth to Water (ft)	Saturated Fine/Medium Sand Thickness		Saturated Coarse Sand & Gravel Thickness		Permeable Area (length x thickness)				Hydraulic Conductivity[2]		Hydraulic Gradient[3] (ft/ft)	Estimated Flow Without Cutoff Walls			Flow Through Cross-Sectional Area of Cutoff Walls (afy)	Estimated Flow With Cutoff Walls			Impact of Cutoff Walls	
									Fine/Medium Sand Area		Coarse Sand & Gravel Area													
					Total (ft)	To Base of Wall (ft)	Total (ft)	To Base of Wall (ft)	Total (sq. ft)	To Base of Wall (sq. ft)	Total (sq. ft)	To Base of Wall (sq. ft)	Fine/ Medium Sand (ft/day)	Coarse Sand & Gravel (ft/day)		Fine/ Medium Sand (afy)	Coarse Sand & Gravel (afy)	Total Flow (afy)		Flow Through Cutoff Walls[4] (afy)	Flow Beneath/ Around Cutoff Walls (afy)	Total Flow (afy)	(afy)	(%)
1	4,800	None	-		35	-	0	-	168,000	N/A	0	N/A	28	140	0.0032	126	0	126	0	0	126	126	0	0
2	5,200	Cutoff Wall	68	12	67	22	0	0	348,400	114,400	0	0	28	140	0.0032	262	0	262	86	17	176	193	69	26
3	1,000	Cutoff Wall	68		23	19	0	0	23,000	19,000	0	0	28	140	0.0032	17	0	17	14	3	3	6	11	66
4a	8,000	100-ft Berm	-		33	-	27	-	264,000	N/A	216,000	N/A	28	140	0.0032	198	811	1,009	0	0	1,009	1,009	0	0
4b	3,800	300-ft Berm	-	16	40	-	15	-	152,000	N/A	57,000	N/A	28	140	0.0032	114	214	328	0	0	328	328	0	0
5a	3,500	100-ft Berm	-		27	-	10	-	94,500	N/A	35,000	N/A	28	140	0.0032	71	131	202	0	0	202	202	0	0
5b	1,700	None	-		22	-	0	-	37,400	N/A	0	N/A	28	140	0.0032	28	0	28	0	0	28	28	0	0
6	5,000	Cutoff Wall	111		47	47	20	20	235,000	235,000	100,000	100,000	28	140	0.0032	176	375	552	552	110	0	110	441	80
7	3,200	Cutoff Wall	100		45	38	0	0	144,000	121,600	0	0	28	140	0.0032	108	0	108	91	18	17	35	73	68
8	4,000	Cutoff Wall	99	12	35	35	0	0	140,000	140,000	0	0	28	140	0.0032	105	0	105	105	21	0	21	84	80
9a	2,800	None	-	13	42	-	0	-	117,600	N/A	0	N/A	28	140	0.0032	88	0	88	0	0	88	88	0	0
9b	3,800	Cutoff Wall	109	14	32	32	0	0	121,600	121,600	0	0	28	140	0.0032	91	0	91	91	18	0	18	73	80
10	2,690	Cutoff Wall	64		28	10	22	22	75,320	26,900	59,180	59,180	28	140	0.0032	57	222	279	242	48	36	85	194	70
11	14,000	100-ft Berm	-	13	32	-	53	-	448,000	N/A	742,000	N/A	28	140	0.0032	336	2,785	3,122	0	0	3,122	3,122	0	0
12	3,200	None	-		65	-	0	-	208,000	N/A	0	N/A	28	140	0.0032	156	0	156	0	0	156	156	0	0
13	3,300	Cutoff Wall	59	13	40	5	20	15	132,000	16,500	66,000	49,500	28	140	0.0032	99	248	347	198	40	149	188	159	46
14	3,200	None	-		53	-	0	-	169,600	N/A	0	N/A	28	140	0.0032	127	0	127	0	0	127	127	0	0
15	4,800	Cutoff Wall	49	17	60	10	15	0	288,000	48,000	72,000	0	28	140	0.0032	216	270	487	36	7	450	458	29	6
16	5,200	None	-	12	58	-	12	-	301,600	N/A	62,400	N/A	28	140	0.0032	226	234	461	0	0	461	461	0	0
17	1,000	Cutoff Wall	64		73	16	2	0	73,000	16,000	2,000	0	28	140	0.0032	55	8	62	12	2	50	53	10	15
18	1,500	Cutoff Wall	64		75	16	0	0	112,500	24,000	0	0	28	140	0.0032	84	0	84	18	4	66	70	14	17
19a	1,800	Cutoff Wall	64		80	26	0	0	144,000	46,800	0	0	28	140	0.0032	108	0	108	35	7	73	80	28	26
19b	5,000	Cutoff Wall	63		60	20	0	0	300,000	100,000	0	0	28	140	0.0032	225	0	225	75	15	150	165	60	27
20a	200	Cutoff Wall	50		20	0	2	0	4,000	0	400	0	28	140	0.0032	3	2	5	0	0	5	5	0	0
20b	3,400	None	-		24	-	2	-	81,600	N/A	6,800	N/A	28	140	0.0032	61	26	87	0	0	87	87	0	0
Average				**14**	**45**	**21**	**8**	**4**																
Total	**96,090 ft total (42,490 ft of cutoff walls)**								**4,183,120**	**1,029,800**	**1,418,780**	**208,680**				**3,140**	**5,330**	**8,470**	**1,560**	**310**	**6,910**	**7,220**	**1,245**	**15**

1. Shading indicates reaches where cutoff walls are proposed.
2. Hydraulic conductivity based on estimates in Table 2-1.
3. Hydraulic gradient based on annual average value in Table 3-2.
4. Assumes an 80% reduction in flow through the cutoff wall based on the Kleinfelder transient model results (Kleinfelder, 2007).

Table 6-4
Darcy's Law Estimate of Groundwater Recharge from Sacramento River to Natomas Basin With and Without Slurry Cutoff Walls Including Increase in Hydraulic Gradient Due to Additional Pumping in 2030

Reach	Length (ft)	Current Proposed Mitigation[1]	Cutoff Wall Depth (ft)	Average Depth to Water (ft)	Saturated Fine/Medium Sand Thickness		Saturated Coarse Sand & Gravel Thickness		Permeable Area (length x thickness)				Hydraulic Conductivity[2]		Increase in Hydraulic Gradient[3] (ft/ft)	Hydraulic Gradient Including Sutter Pointe Pumping (ft/ft)	Estimated Flow Without Cutoff Walls			Flow Through Cross-Sectional Area of Cutoff Walls (afy)	Estimated Flow With Cutoff Walls			Impact of Cutoff Walls	
									Fine/Medium Sand Area		Coarse Sand & Gravel Area														
					Total (ft)	To Base of Wall (ft)	Total (ft)	To Base of Wall (ft)	Total (sq. ft)	To Base of Wall (sq. ft)	Total (sq. ft)	To Base of Wall (sq. ft)	Fine/ Medium Sand (ft/day)	Coarse Sand & Gravel (ft/day)			Fine/ Medium Sand (afy)	Coarse Sand & Gravel (afy)	Total Flow (afy)		Flow Through Cutoff Walls[4] (afy)	Flow Beneath/ Around Cutoff Walls (afy)	Total Flow (afy)	(afy)	(%)
1	4,800	None	-		35	-	0	-	168,000	N/A	0	N/A	28	140	0.0010	0.0042	164	0	164	0	0	164	164	0	0
2	5,200	Cutoff Wall	68	12	67	22	0	0	348,400	114,400	0	0	28	140	0.0018	0.0050	407	0	407	134	27	273	300	107	26
3	1,000	Cutoff Wall	68		23	19	0	0	23,000	19,000	0	0	28	140	0.0018	0.0050	27	0	27	22	4	5	9	18	66
4a	8,000	100-ft Berm	-		33	-	27	-	264,000	N/A	216,000	N/A	28	140	0.0011	0.0043	268	1,097	1,365	0	0	1,365	1,365	0	0
4b	3,800	300-ft Berm	-	16	40	-	15	-	152,000	N/A	57,000	N/A	28	140	0.0011	0.0043	154	289	444	0	0	444	444	0	0
5a	3,500	100-ft Berm	-		27	-	10	-	94,500	N/A	35,000	N/A	28	140	0.0005	0.0037	82	151	233	0	0	233	233	0	0
5b	1,700	None	-		22	-	0	-	37,400	N/A	0	N/A	28	140	0.0005	0.0037	32	0	32	0	0	32	32	0	0
6	5,000	Cutoff Wall	111		47	47	20	20	235,000	235,000	100,000	100,000	28	140	0.0003	0.0035	191	406	596	596	119	0	119	477	80
7	3,200	Cutoff Wall	100		45	38	0	0	144,000	121,600	0	0	28	140	0.0002	0.0034	116	0	116	98	20	18	38	78	68
8	4,000	Cutoff Wall	99	12	35	35	0	0	140,000	140,000	0	0	28	140	0.0002	0.0034	110	0	110	110	22	0	22	88	80
9a	2,800	None	-	13	42	-	0	-	117,600	N/A	0	N/A	28	140	0.0001	0.0033	92	0	92	0	0	92	92	0	0
9b	3,800	Cutoff Wall	109	14	32	32	0	0	121,600	121,600	0	0	28	140	0.0001	0.0033	95	0	95	95	19	0	19	76	80
10	2,690	Cutoff Wall	64		28	10	22	22	75,320	26,900	59,180	59,180	28	140	0.0001	0.0033	59	231	290	252	50	38	88	202	70
11	14,000	100-ft Berm	-	13	32	-	53	-	448,000	N/A	742,000	N/A	28	140	0.0001	0.0033	348	2,884	3,232	0	0	3,232	3,232	0	0
12	3,200	None	-		65	-	0	-	208,000	N/A	0	N/A	28	140	0.0001	0.0033	162	0	162	0	0	162	162	0	0
13	3,300	Cutoff Wall	59	13	40	5	20	15	132,000	16,500	66,000	49,500	28	140	0.0001	0.0033	102	255	357	204	41	153	194	163	46
14	3,200	None	-		53	-	0	-	169,600	N/A	0	N/A	28	140	0.0000	0.0032	127	0	127	0	0	127	127	0	0
15	4,800	Cutoff Wall	49	17	60	10	15	0	288,000	48,000	72,000	0	28	140	0.0000	0.0032	216	270	487	36	7	450	458	29	6
16	5,200	None	-	12	58	-	12	-	301,600	N/A	62,400	N/A	28	140	0.0000	0.0032	226	234	461	0	0	461	461	0	0
17	1,000	Cutoff Wall	64		73	16	2	0	73,000	16,000	2,000	0	28	140	0.0000	0.0032	55	8	62	12	2	50	53	10	15
18	1,500	Cutoff Wall	64		75	16	0	0	112,500	24,000	0	0	28	140	0.0000	0.0032	84	0	84	18	4	66	70	14	17
19a	1,800	Cutoff Wall	64		80	26	0	0	144,000	46,800	0	0	28	140	0.0000	0.0032	108	0	108	35	7	73	80	28	26
19b	5,000	Cutoff Wall	63		60	20	0	0	300,000	100,000	0	0	28	140	0.0000	0.0032	225	0	225	75	15	150	165	60	27
20a	200	Cutoff Wall	50		20	0	2	0	4,000	0	400	0	28	140	0.0000	0.0032	3	2	5	0	0	5	5	0	0
20b	3,400	None	-		24	-	2	-	81,600	N/A	6,800	N/A	28	140	0.0000	0.0032	61	26	87	0	0	87	87	0	0
Average				**14**	**45**	**21**	**8**	**4**																	
Total	**96,090 ft total (42,490 ft of cutoff walls)**								**4,183,120**	**1,029,800**	**1,418,780**	**208,680**					**3,520**	**5,850**	**9,370**	**1,690**	**340**	**7,680**	**8,020**	**1,350**	**14**

1. Shading indicates reaches where cutoff walls are proposed.
2. Hydraulic conductivity based on estimates in Table 2-1.
3. Increase from hydraulic gradient of 0.0032 shown in Tables 3-2 and 6-3. Increase simulated by IGSM models for Sutter Pointe Scenario 2B.
4. Assumes an 80% reduction in flow through the cutoff wall based on the Kleinfelder transient model results (Kleinfelder, 2007).

Table 6-5
Kleinfelder Model Results: Estimated Groundwater Flow Beneath Natomas Cross Canal South Levee With and Without Slurry Cutoff Walls[1]

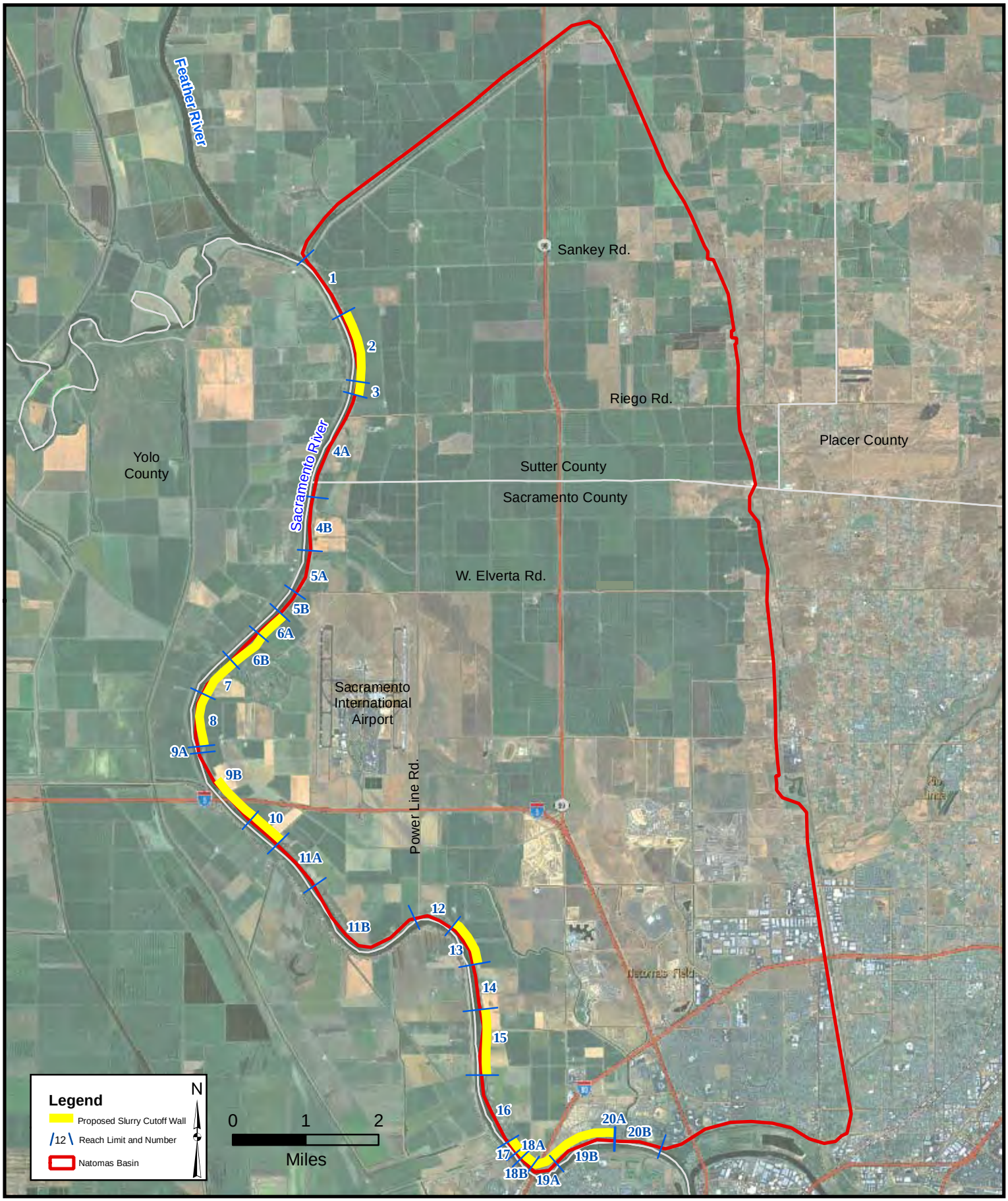
Reach	Stations		Seepage Based on Simulated Station	Length of Reach (ft)	Seepage Without Cutoff Walls (afy)	Seepage With Cutoff Walls (afy)	Impact of Cutoff Walls	
	Start	End					(afy)	(%)
1	00+00	5+70	135+00	570	2	0.2	1.8	90
2	5+70	20+00	135+00	1,430	5	0.5	4.5	90
2	20+00	70+00	183+00	5,000	50	35	15	30
2	70+00	105+00	135+00	3,500	10	1	9	90
3	105+00	123+00	135+00	1,800	6	0.6	5.4	90
4	123+00	150+00	135+00	2,700	8	0.8	7.2	90
4	150+00	170+00	213+00	2,000	20	2	18	90
4	170+00	173+00	183+00	300	3	2.1	0.9	30
5	173+00	195+00	183+00	2,200	22	15.4	6.6	30
6	195+00	207+00	183+00	1,250	15	10.5	4.5	30
6	207+00	260+00	213+00	5,250	50	5	45	90
6	260+00	280+00	183+00	2,000	20	14	6	30
7	280+00	287+00	183+00	700	7	4.9	2.1	30
Total				**28,700**	**218**	**92**	**126**	**58**

1. Based on Table 5 in Kleinfelder (2008).

Table 6-6
Effects of Proposed Slurry Cutoff Walls on Groundwater Flow

Levee	Time Period	Total Length of Levee (ft)	Saturated Thickness for Ground-Water Flow (ft)	Cross-Sectional Area for Flow (ft^2)	Total Flow Without Cutoff Walls[1] (afy)	Flow per Cross-Sectional Area (afy/ft^2)	Length of Proposed Cutoff Walls (ft)	Avg. Depth of Cutoff Walls (ft)	Cross-Sectional Area of Cutoff Walls (ft^2)	Flow Through Cross-Sectional Area of Cutoff Walls (afy)	Flow Through, Beneath, or Around Cutoff Walls (afy)	Flow Reduction Due to Cutoff Walls[7] (afy)	(%)
Sacramento River East Levee	Existing	96,000	120	11,520,000	8,470 [2]	7.35E-04	42,490	78	3,314,220	1,557	7,225	1,245	15
	2030				9,379 [3]	8.14E-04				1,688	8,029	1,350	14
NCC South Levee	Existing	28,700	110	3,157,000	218 [4]	6.91E-05	28,700	70	2,009,000	102	92	126	58
	2030		400	11,480,000	3,700 [5]	3.22E-04				648	3,182	518	14
PGCC West Levee	2004	17,400	400	6,960,000	-4,328 [6]	-6.22E-04	5,000	60	300,000	-187	-4,178	-149	3
	2030				-239 [4]	-3.43E-05				-10	-231	-8	
NEMDC West Levee	2004	70,000	400	28,000,000	-17,410 [6]	-6.22E-04	16,000	69	1,100,000	-684	-16,863	-547	3
	2030				-961 [5]	-3.43E-05				-38	-931	-30	
American River North Levee	2004	11,600	120	1,392,000	1,086 [6]	7.80E-04	5,000	85	425,000	332	821	265	24
	2030				-500 [5]	-3.59E-04				-153	-378	-122	
Total (Existing or 2004)					**-11,964**					**1,120**	**-12,904**	**940**	
Total (2030)					**11,379**					**2,135**	**9,672**	**1,707**	
Total (All)		**223,700**					**97,190**		**7,148,220**				

1. Positive values indicate groundwater inflow; negative values indicate goundwater outflow.
2. Source of total flow estimate = Kleinfelder (2007b) and LSCE (2008a).
3. Source of total flow estimate = Table 6-4 with increased gradient due to Sutter Pointe pumping (LSCE, 2008b).
4. Source of total flow estimate = Kleinfelder (2008).
5. Source of total flow estimate = IGSM 2030 Simulation.
6. Source of total flow estimate = IGSM 2004 Simulation.
7. Increased groundwater inflow (or decreased outflow) shown as positive value; increased outflow (or decreased inflow) is shown as negative. 80% flow reduction assumed for slurry cutoff walls except for NCC South Levee based on Kleinfelder (2007b). 90% flow reduction assumed for NCC South Levee cutoff walls based on Kleinfelder (2008).



FILE: \public\SAFCA\GIS\Fig 1-1 SlurryCutoffLocation map.mxd

DATE: 2/19/2008 8:58:50 AM

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 6-1
Proposed Slurry Cutoff Walls
Along Sacramento River East Levee

7.0 Groundwater Impacts of SAFCA Construction Activities

The effects of SAFCA's proposed construction activities on groundwater conditions in the Natomas Basin were evaluated using the water budget approach discussed above. Water budget impacts resulting from land use changes and canal construction were addressed in Chapter 5, and water budget impacts due to proposed slurry cutoff walls were addressed in Chapter 6. All of the predicted impacts of SAFCA's activities are summarized in **Table 7-1** for existing/2004 conditions and in **Table 7-2** for 2030 conditions. This chapter also addresses cumulative impacts for 2004 and 2030 conditions based on the groundwater budgets calculated by the IGSM models.

7.1 Levee Improvements

Groundwater impacts from proposed levee improvements are primarily limited to the effects of land use changes and slurry cutoff walls. No direct groundwater impacts are expected from increasing the height or width of levees, modifying levee slopes, or building seepage berms because all of this construction would be above the water table.

Proposed land use changes will result in the loss of about 20 acres of rice, 175 acres of field crops, and five acres of orchard along the Sacramento River East Levee. Other land use changes include the loss of five acres of rice along the NCC South Levee and 50 acres of rice along the PGCC West Levee. As shown in **Tables 7-1** and **7-2**, these changes are estimated to reduce deep percolation from applied water by a total of 105 afy.

Estimated reductions in groundwater flow beneath the levees due to the proposed slurry cutoff walls are shown in **Table 6-6** based both on simulations of "existing" (or 2004) and future (2030) conditions. The 2004 simulation summarized in **Table 7-1** showed smaller impacts in the Natomas Basin and larger impacts east of the Natomas Basin compared to the 2030 simulation. Estimated inflow reductions for existing/2004 conditions include 1,510 afy of recharge from the Sacramento and American Rivers and 126 afy of inflow to the Natomas Basin beneath the NCC. Cutoff walls along the PGCC and the NEMDC are estimated to reduce subsurface outflow from the Natomas Basin to the east by 149 and 547 afy, respectively. The effect of all proposed slurry cutoff walls along the levees surrounding the Natomas Basin based on the 2004 simulation will be to reduce groundwater inflow by 1,741 afy and groundwater outflow by 696 afy, resulting in a decrease in groundwater storage of 1,045 afy.

Estimated inflow reductions for 2030 conditions shown in **Table 7-2** include 1,228 afy of recharge from the Sacramento and American Rivers and 518 afy of inflow to the Natomas Basin beneath the NCC. Cutoff walls along the PGCC and the NEMDC are estimated to reduce subsurface outflow from the Natomas Basin to the east by 8 and 30 afy, respectively. The estimated effect of all proposed slurry cutoff walls based on the 2030 simulation will be to reduce groundwater inflow by 1,851 afy and groundwater outflow by 38 afy, resulting in a larger decrease in groundwater storage (1,812 afy).

7.2 Canal Improvements

The construction of the new GSS/Drainage Canal and relocation and improvements to the West Drainage Canal, the Elkhorn Canal, and the Riverside Canal will affect deep percolation from applied water (due to land use changes) and seepage from the canals. For all four canals, deep percolation is estimated to decrease by 43 afy and canal seepage is estimated to increase by 327 afy (**Tables 7-1** and **7-2**). The net effect of proposed canal construction would be to increase groundwater storage in the Natomas Basin by about 285 afy.

7.3 Borrow Sites

Excavation and reclamation of the Brookfield and Fisherman's Lake borrow sites is expected to have an indirect effect on groundwater conditions due to proposed land use and water supply changes. No such changes are planned for the Airport North Bufferlands borrow site.

At the Brookfield borrow site, approximately 325 acres are currently planted to rice, and SAFCA plans to restore about 286 acres to rice cultivation after construction activities are complete. As shown in **Tables 7-1** and **7-2**, an estimated 30 afy of deep percolation will be lost at this site due to the reduction in irrigated acreage. The Brookfield site is currently irrigated entirely with groundwater, but SAFCA plans to provide the infrastructure so that about 80 percent of the borrow site can be irrigated with surface water after reclamation. This transition would reduce groundwater pumping by about 1,625 afy. Groundwater levels will increase due to the reduced pumping, resulting in an increase in subsurface outflow beneath the PGCC of about 76 afy.

At the Fisherman's Lake borrow site, about 400 acres of land would be used for borrow material, including 49 acres currently planted to rice, 266 acres of field crops, and 85 acres of managed marsh. After reclamation, there would be about 175 acres of managed marsh and 225 acres of non-irrigated grassland or woodland. The predicted net loss in deep percolation is 36 afy at this site, as shown in **Tables 7-1** and **7-2**.

The reduction in groundwater pumping at the Brookfield site more than offsets the loss of deep percolation at all borrow sites. The net effect of excavation and reclamation of all borrow sites will be to increase groundwater storage by about 1,483 afy.

7.4 Summary of SAFCA Groundwater Impacts

The totals at the bottom of **Tables 7-1** and **7-2** show the combined effect of SAFCA's proposed construction activities based on exising/2004 and 2030 conditions, respectively. For both simulations, deep percolation is estimated to decrease by 213 afy, seepage from canals is estimated to increase by 327 afy, and groundwater pumping is estimated to decrease by 1,625 afy. Other changes for existing/2004 conditions include decreases in net recharge from streams (1,510 afy), subsurface inflow (126 afy), and subsurface outflow (620 afy). Summing these terms results in an increase in groundwater storage in the Natomas Basin of 723 afy for 2004, which means that groundwater levels would be expected to increase slightly due to the construction activities. The reduction in subsurface outflow of 620 afy would have a slightly negative effect on groundwater levels and storage east of the Natomas Basin.

The totals at the bottom of **Table 7-2** show the combined effect of SAFCA's proposed construction activities based on future conditions in 2030. Estimated changes in deep percolation, seepage from canals, and groundwater pumping are the same as for existing/2004 conditions. The estimated reduction in net recharge from streams (1,228 afy) is smaller than in 2004, and the reduction in subsurface inflow (518 afy) is larger. A small decrease in groundwater storage in the Natomas Basin (45 afy), and a small increase in subsurface outflow to the east (38 afy) are predicted in 2030.

7.5 Cumulative Effects

The cumulative impacts of SAFCA's construction activities on existing groundwater conditions based on the 2004 and 2030 IGSM simulation are shown in **Tables 7-3** and **7-4**. On these tables, the estimated SAFCA impacts discussed above are added to the groundwater budget for the Natomas Basin discussed in Chapter 4. The 2004 groundwater budget showed a total groundwater inflow to the Natomas Basin of 52,304 afy without the effects of SAFCA's activities and 50,782 afy including SAFCA proposed construction (**Table 7-3**). There is a similar reduction in groundwater outflow from 57,275 afy without SAFCA's construction activities to 55,030 afy including SAFCA. The simulated reduction in groundwater storage for 2004 is 4,971 afy without SAFCA, which represents an average water level decline of about one foot. The decrease in groundwater storage would be smaller (4,248 afy) due to SAFCA's construction activities. Overall, SAFCA's proposed construction would have a small positive impact on groundwater supplies in the Natomas Basin based on existing conditions. Outside of the Natomas Basin, the predicted reduction in groundwater outflow to the east (620 afy) would have a small negative impact on groundwater levels and storage within the cones of depression east of the Natomas Basin.

The estimate of the cumulative impacts of SAFCA's construction activities based on the simulation of future (2030) groundwater conditions is summarized in **Table 7-4**. SAFCA's estimated groundwater impacts are slightly negative for the Natomas Basin, and the positive change in storage indicated by the 2030 IGSM simulation would decrease slightly from 1,572 afy to 1,527 afy due to SAFCA's activities. Subsurface outflow to the east would increase slightly to 1,238 afy. Overall, SAFCA's activities would have a negligible effect on groundwater levels and storage within and east of the Natomas Basin in 2030.

Table 7-1
Groundwater Budget for Proposed SAFCA Construction Activities Based on Existing Conditions

SAFCA Construction Activity	Inflow (afy)[1]					Outflow (afy)[1]			Change in Storage (afy)
	Deep Percolation	Net Recharge from Streams	Seepage from Canals	Subsurface Inflow	Total Inflow	Subsurface Outflow	Groundwater Pumping	Total Outflow	
Levee Improvements[2]									
Sacramento River East Levee	-63	-1,245	0	0	**-1,308**	0	0	**0**	-
NCC South Levee	-4	0	0	-126	**-130**	0	0	**0**	-
PGCC West Levee	-39	0	0	0	**-39**	-149	0	**-149**	-
NEMDC West Levee	0	0	0	0	**0**	-547	0	**-547**	-
American River North Levee	0	-265	0	0	**-265**	0	0	**0**	-
Subtotal	**-105**	**-1,510**	**0**	**-126**	**-1,741**	**-696**	**0**	**-696**	**-1,045**
Canal Improvements									
New GGS/Drainage Canal	-11	0	162	0	**151**	0	0	**0**	-
West Drainage Canal	0	0	128	0	**127**	0	0	**0**	-
Elkhorn Canal relocation	-11	0	27	0	**16**	0	0	**0**	-
Riverside Canal relocation	-19	0	10	0	**-9**	0	0	**0**	-
Subtotal	**-41**	**0**	**327**	**0**	**285**	**0**	**0**	**0**	**285**
Borrow Sites									
Airport North	0	0	0	0	**0**	0	0	**0**	-
Brookfield	-30	0	0	0	**-30**	76	-1,625	**-1,549**	-
Fisherman's Lake	-36	0	0	0	**-36**	0	0	**0**	-
Subtotal	**-67**	**0**	**0**	**0**	**-67**	**76**	**-1,625**	**-1,549**	**1,483**
Total	**-213**	**-1,510**	**327**	**-126**	**-1,522**	**-620**	**-1,625**	**-2,245**	**723**

1. Increased groundwater inflow (or decreased outflow) shown as a positive value; increased outflow (or decreased inflow) is shown as negative.
2. Effect of slurry cutoff walls represent existing/2004 results from Table 6-6.

Table 7-2
Groundwater Budget for Proposed SAFCA Construction Activities Based on Future (2030) Conditions

SAFCA Construction Activity	Inflow (afy)[1]					Outflow (afy)[1]			Change in Storage (afy)
	Deep Percolation	Net Recharge from Streams	Seepage from Canals	Subsurface Inflow	Total Inflow	Subsurface Outflow	Groundwater Pumping	Total Outflow	
Levee Improvements[2]									
Sacramento River East Levee	-63	-1,350	0	0	**-1,413**	0	0	**0**	-
NCC South Levee	-4	0	0	-518	**-522**	0	0	**0**	-
PGCC West Levee	-39	0	0	0	**-39**	-8	0	**-8**	-
NEMDC West Levee	0	0	0	0	**0**	-30	0	**-30**	-
American River North Levee	0	122	0	0	**122**	0	0	**0**	-
Subtotal	**-105**	**-1,228**	**0**	**-518**	**-1,851**	**-38**	**0**	**-38**	**-1,812**
Canal Improvements									
New GGS/Drainage Canal	-11	0	162	0	**151**	0	0	**0**	-
West Drainage Canal	0	0	128	0	**127**	0	0	**0**	-
Elkhorn Canal relocation	-11	0	27	0	**16**	0	0	**0**	-
Riverside Canal relocation	-19	0	10	0	**-9**	0	0	**0**	-
Subtotal	**-41**	**0**	**327**	**0**	**285**	**0**	**0**	**0**	**285**
Borrow Sites									
Airport North	0	0	0	0	**0**	0	0	**0**	-
Brookfield	-30	0	0	0	**-30**	76	-1,625	**-1,549**	-
Fisherman's Lake	-36	0	0	0	**-36**	0	0	**0**	-
Subtotal	**-67**	**0**	**0**	**0**	**-67**	**76**	**-1,625**	**-1,549**	**1,483**
Total	**-213**	**-1,228**	**327**	**-518**	**-1,632**	**38**	**-1,625**	**-1,587**	**-45**

1. Increased groundwater inflow (or decreased outflow) shown as a positive value; increased outflow (or decreased inflow) is shown as negative.
2. Effect of slurry cutoff walls represent 2030 results from Table 6-6.

Table 7-3
Groundwater Budget for Natomas Basin Showing Effect of SAFCA Activities on Existing Groundwater Conditions (Based on 2004 Simulation)

	Water Budget Component	2004 Simulation[1] (afy)	Impact of SAFCA Activities (afy)	2004 Simulation Plus SAFCA Activities (afy)
Inflow	Deep Percolation (Including Canal Seepage)	31,429	114	31,543
	Recharge from Sacramento River	6,469	-1,245	5,224
	Recharge from American River	1,086	-265	821
	Boundary Inflow from West	10,365	0	10,365
	Subsurface Inflow from North and South	2,955	-126	2,829
	Total Inflow	**52,304**	**-1,522**	**50,782**
Outflow	Groundwater Pumping	35,537	-1,625	33,912
	Subsurface Outflow to East	21,738	-620	21,118
	Total Outflow	**57,275**	**-2,245**	**55,030**
Inflow minus Outflow	**Change in Storage**	**-4,971**	**723**	**-4,248**

1. Based on final year (2004) of calibration simulation (LSCE, 2008b).

Table 7-4
Groundwater Budget for Natomas Basin Showing Effect of SAFCA Activities on Future Groundwater Conditions (Based on 2030 Simulation)

	Water Budget Component	2030 Simulation[1] (afy)	Impact of SAFCA Activities (afy)	2030 Simulation Plus SAFCA Activities (afy)
Inflow	Deep Percolation (Including Canal Seepage)	27,187	114	27,301
	Recharge from Sacramento River[2]	1,100	-1,350	-250
	Recharge from American River	-500	122	-378
	Boundary Inflow from West	3,700	0	3,700
	Subsurface Inflow from North	3,700	-518	3,182
	Total Inflow	**35,187**	**-1,632**	**33,555**
Outflow	Groundwater Pumping	31,615	-1,625	29,990
	Subsurface Outflow to East	1,200	38	1,238
	Subsurface Outflow to South	800	0	800
	Total Outflow	**33,615**	**-1,587**	**32,028**
Inflow minus Outflow	**Change in Storage**	**1,572**	**-45**	**1,527**

1. Based on 1982-2004 average for Sutter Pointe Project Scenario 2B (LSCE, 2008b).

8.0 Effects on Groundwater Quality and Private Wells

8.1 Potential Groundwater Quality Impacts

The primary potential groundwater quality impact of SAFCA's proposed construction activities is a slight reduction in groundwater recharge to the Natomas Basin, including stream recharge and deep percolation from rice fields and other irrigated farmland. This recharge is generally of high quality, especially the stream recharge, which typically has very low salinity and few contaminants. Seepage from canals is another source of good quality recharge, and this will increase due to SAFCA's proposed canal construction. Water recharged via deep percolation has somewhat higher salinity than river water due to the use of recycled tailwater and the effects of ET.

As estimated above, the combined effect of SAFCA's proposed construction activities would be to reduce low-salinity groundwater recharge from rivers and canals by 1,183 afy for existing conditions and by 901 afy for future conditions. These inflow reductions would be expected to have a slight impact on groundwater quality but represent less than three percent of the total groundwater inflow to the Natomas Basin. Based on estimates for existing conditions, salt accumulation in the Natomas Basin could also increase slightly because slurry cutoff walls along the PGCC and NEMDC are estimated to reduce groundwater outflow by 620 afy. This represents less than three percent of the total groundwater outflow from the Natomas Basin to the east. The opposite would occur for the 2030 simulation, which shows a slight increase in groundwater outflow of 38 afy. The effect on groundwater quality in the Natomas Basin due to decreased groundwater inflow and outflow can be considered negligible.

In the vicinity of the Brookfield borrow site, groundwater quality would improve due to the transition from groundwater to surface water for about 80 percent of the rice acreage. Groundwater quality would improve in this area because deep percolation from fields irrigated with surface water will have lower salinity than from fields irrigated with groundwater.

The slurry cutoff walls will be constructed primarily of soil mixed with bentonite, but Portland cement may be used as an additive in some cases. Bentonite is a naturally occurring form of clay, and Portland cement is made from limestone and clay. Neither bentonite nor cured Portland cement are water soluble, and grouts composed of both materials are widely used in the water well industry. Both bentonite and cement are used to construct seals in wells drilled for various purposes, including drinking water supply. No groundwater contamination would be expected due to construction of the proposed slurry cutoff walls and other improvements proposed for the levees surrounding the Natomas Basin.

Although SAFCA's proposed construction activities would cause slight groundwater quality impacts in some areas and improvements in other areas, the effects would be too small to be measurable. The overall effect of SAFCA's proposed construction on groundwater quality in the Natomas Basin can be considered negligible.

8.2 Potential Impacts to Private Wells

For the *Sacramento River Basinwide Water Management Plan*, DWR reviewed drillers' logs in the Natomas Basin and reported that average well depths were 149 feet for domestic wells, 313 feet for irrigation wells, 378 feet for industrial wells, and 308 feet for municipal wells (DWR, 2003c). The majority of the wells in the Natomas Basin are either domestic or agricultural wells, which typically extract groundwater from the upper aquifer system as defined above.

Figure 8-1 shows wells with known well locations in and near the Natomas Basin. "Private wells" along the Sacramento River East Levee and the NCC South Levee are primarily domestic wells mapped by M&H (Stephen Sullivan, pers. comm., January 23, 2008) but include some irrigation wells. Well numbers provided for these wells correspond to numbers assigned by M&H. Wells along the Sacramento River East Levee probably represent the majority of the domestic wells in the Natomas Basin, but the map is incomplete in that similar mapping has not been conducted in other areas. **Figure 8-1** also shows wells with water level data have been mapped by LSCE based on locations provided by DWR and other sources. Symbols used for these wells indicate the depth zone (upper, lower, multiple, and unknown). Most of these are agricultural wells, M&I wells, or monitoring wells. If available, the wells are numbered based on the last four digits of the State Well Number.

Approximately 138 private wells along the Sacramento River East Levee have been mapped by M&H (2008), and these are grouped by depth and type in **Table 8-1**. There are 103 domestic wells, 15 irrigation wells, and 20 wells used for other or unknown purposes. Monitoring and municipal wells are not included on this table. All of the domestic wells are less than 300 feet deep, and 84 percent are between 100 and 200 feet deep. All but one of the irrigation wells are also less than 300 feet deep, with 6 wells between 100 and 200 feet deep and 8 wells between 200 and 300 feet deep. The average depth of the private wells along the Sacramento River East Levee is 158 feet. As reported by LSCE (2008a), approximately two-thirds of these wells are located on the river side of the levee and one-third of the land side. Wells on the river side of the levee have an average depth of 151 feet, and wells on the land side have an average depth of 163 feet. The land side wells are slightly deeper on average because they include more irrigation wells.

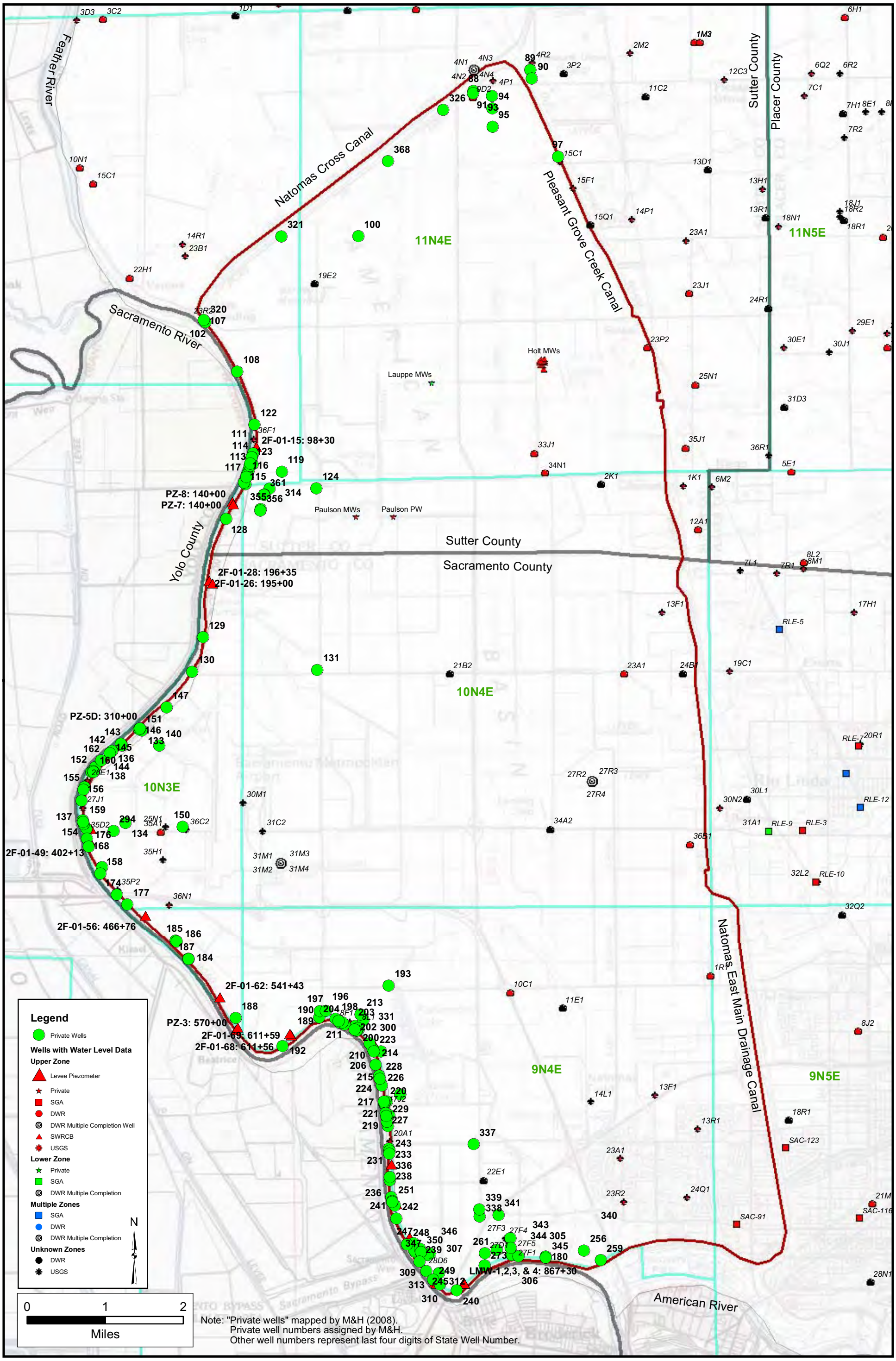
As shown in **Table 8-1**, nine wells along the NCC South Levee were mapped by M&H (2008). These include one domestic well and eight irrigation wells. The domestic well is between 100 and 200 feet deep. One of the irrigation wells is between 100 and 200 feet deep, three are between 200 and 300 feet deep, two are between 300 and 400 feet deep, and two are of unknown depth. The average depth of wells with depth information is 260 feet.

Kleinfelder (2007b) estimated the water level changes due to the slurry cutoff walls along the Sacramento East Levee using the steady-state and transient versions of the seepage model discussed above. The transient version of the model is considered to be more accurate, and the changes in head due to the slurry cutoff walls along the Sacramento River East Levee predicted by the transient model are shown on **Figure 8-2**. On the river side of the levee, the predicted effects of the cutoff walls are negligible at low stage, and there would be a slight increase in head (less than one foot) at high stage. On the land side of the levee, the Kleinfelder simulation shows

that heads would be slightly lower due to the cutoff wall (typically 0.25 to 0.5 foot). Head changes due to slurry cutoff walls along the NCC South Levee would likely be similar to those along the Sacramento River East Levee. These small effects are considered to be negligible even for the shallowest domestic wells (less than 100 feet deep). No measurable decreases in well yields or increases in pumping costs are expected due to slurry cutoff walls.

Table 8-1
Depths of Private Wells Along Sacramento River East Levee and Natomas Cross Canal South Levee

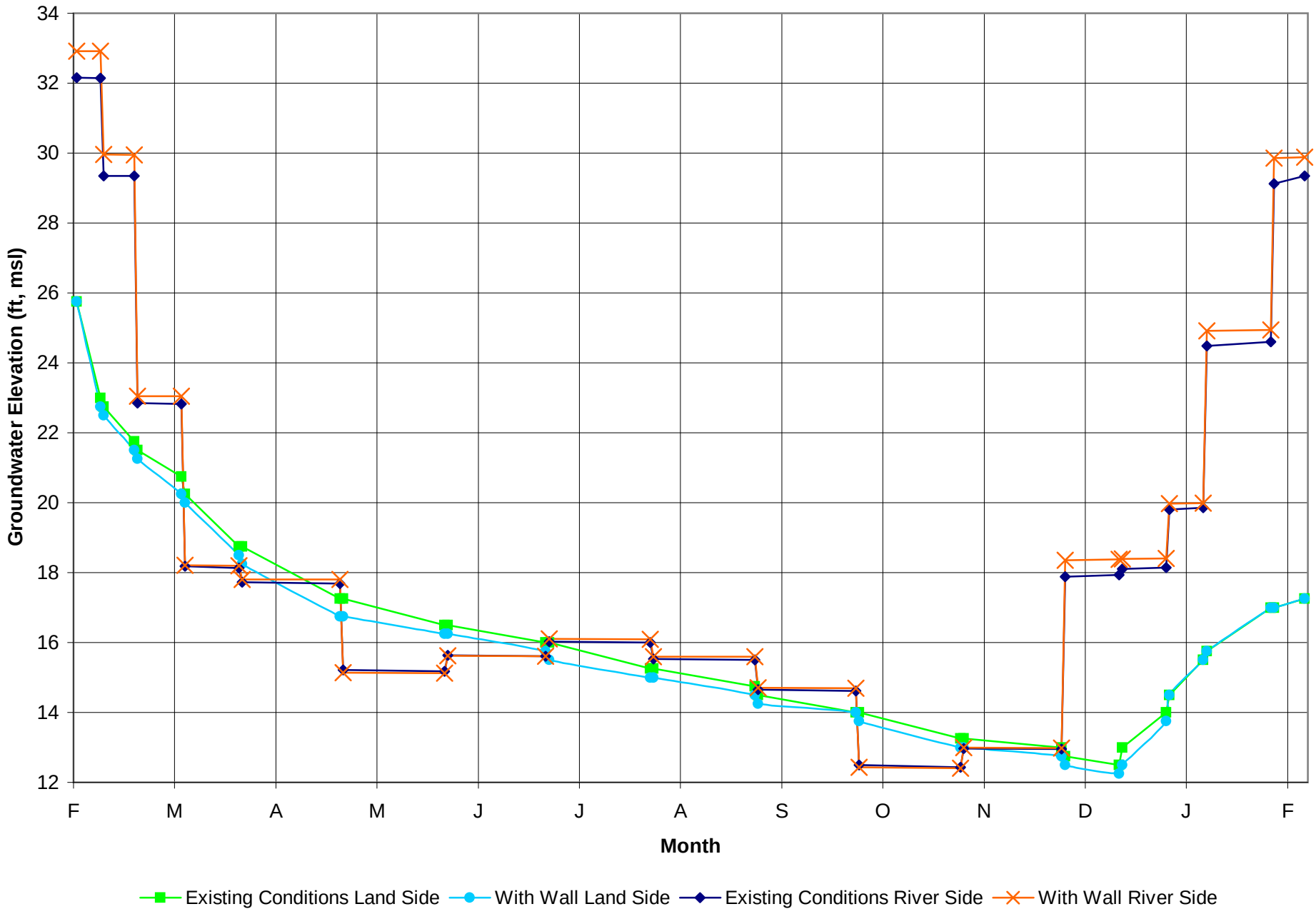
Levee	Well Type	Well Depth						Total
		0-100 ft	100-200 ft	200-300 ft	300-400 ft	> 400 ft	Unknown	
Sacramento River East Levee	Domestic	10	87	6	0	0	0	103
	Irrigation	0	6	8	0	1	0	15
	Other/Unknown	6	6	6	0	0	2	20
	Subtotal	**16**	**99**	**20**	**0**	**1**	**2**	**138**
Natomas Cross Canal South Levee	Domestic	0	1	0	0	0	0	1
	Irrigation	0	1	3	2	0	2	8
	Subtotal	**0**	**2**	**3**	**2**	**0**	**2**	**9**
Total		**16**	**101**	**23**	**2**	**1**	**4**	**147**



FILE: \\Lincoln_office\public\SAFCA\GIS\Well Location map.mxd Date: 8/6/2008

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 8-1
Wells in and Near the Natomas Basin



Y:\SAFCA\Cutoff Wall Impacts\Kleinfelder model\2000-2007 12-14-2007.xls\GWL

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 8-2
Simulated Groundwater Elevations from Kleinfelder Transient Model With and Without Slurry Cutoff Walls

9.0 Summary of Potential Impacts

Most of SAFCA's proposed levee improvements will have no effect on groundwater in the Natomas Basin, but the proposed slurry cutoff walls are intended to reduce groundwater flow beneath the levees and will affect groundwater conditions. Some of SAFCA's construction activities will involve land use changes that will reduce groundwater recharge. This reduction will be at least partially offset by seepage from new and relocated canals, which will increase groundwater recharge. Finally, water supply changes at the Brookfield property borrow site will result in a large reduction in groundwater pumping.

The effects of SAFCA's proposed construction activities on groundwater conditions in the Natomas Basin were evaluated using the water budget approach and other methods discussed above. Potential impacts resulting from land use changes and canal construction were addressed in Chapter 5, potential impacts due to proposed slurry cutoff walls were addressed in Chapter 6, and the potential cumulative impacts were addressed in Chapter 7. The analysis of potential impacts to groundwater quality and private wells was discussed in Chapter 8. Each of these potential impacts is summarized below.

9.1 Potential Water Budget Impacts

9.1.1 Levee Improvements

Groundwater impacts from proposed levee improvements are primarily limited to the effects of land use changes and slurry cutoff walls. No direct groundwater impacts are expected from increasing the height or width of levees, modifying levee slopes, building seepage berms, or other construction above the water table.

Proposed land use changes for all five levees will result in the loss of about 75 acres of existing rice, 175 acres of field crops, and five acres of orchard. These changes are estimated to reduce deep percolation from applied water by a total of 105 afy.

Groundwater flow reductions due to the slurry cutoff walls were estimated based on simulations of "existing" (or 2004) and future (2030) conditions. The combined effect of all proposed slurry cutoff walls along the levees surrounding the Natomas Basin for existing/2004 conditions is estimated to reduce groundwater inflow by 1,741 afy and groundwater outflow by 696 afy, resulting in a reduction in groundwater storage in the Natomas Basin of about 1,045 afy (**Table 7-1**). For 2030 conditions, groundwater inflow is predicted to be reduced by 1,851 afy and groundwater outflow by 38 afy, resulting in a reduction in groundwater storage of about 1,812 afy (**Table 7-2**).

9.1.2 Canal Improvements

The construction of the new GSS/Drainage Canal and relocation and improvements to the West Drainage Canal, the Elkhorn Canal, and the Riverside Canal will affect deep percolation from

applied water (due to land use changes) and seepage from the canals. For all four canals, deep percolation is estimated to decrease by 41 afy and canal seepage is estimated to increase by 327 afy. The net effect of proposed canal construction would be to increase groundwater storage in the Natomas Basin by about 285 afy (**Tables 7-1** and **7-2**).

9.1.3 Borrow Sites

Excavation of two of the three primary borrow sites is expected to have an indirect effect on groundwater conditions due to proposed land use and water supply changes. At the Brookfield borrow site, approximately 325 acres are currently planted to rice, and SAFCA plans to restore about 286 acres to rice cultivation after construction activities are complete. At the Fisherman's Lake borrow site, about 400 acres of land would be used for borrow material, including 49 acres currently planted to rice, 266 acres of field crops, and 85 acres of managed marsh. After reclamation, there would be about 175 acres of managed marsh and 225 acres of non-irrigated grassland or woodland. No land use changes are planned at the Airport North Bufferlands borrow site due to airport safety considerations. The predicted net loss in deep percolation for all borrow sites is 67 afy.

The Brookfield borrow site is currently irrigated entirely with groundwater, but SAFCA plans to provide the infrastructure so that about 80 percent of the borrow site can be irrigated with surface water after reclamation. This transition would reduce groundwater pumping in the Natomas Basin by about 1,625 afy. The reduction in groundwater pumping at the Brookfield site more than offsets the loss of deep percolation at all borrow sites. The reduced pumping would also result in slightly increased groundwater outflow from the northern portion of the Natomas Basin. The net effect of excavation and reclamation of all borrow sites will be to increase groundwater storage by about 1,483 afy (**Tables 7-1** and **7-2**).

9.1.4 Summary of Potential Water Budget Impacts

The combined effects of SAFCA's proposed construction activities for both existing and future conditions include estimated decreases in deep percolation (213 afy) and groundwater pumping (1,625 afy) and an increase in seepage from canals (327 afy). The effect on other water budget components varies between the existing/2004 and 2030 simulations. For the existing/2004 period, there are predicted decreases in net recharge from streams (1,510 afy), subsurface inflow (126 afy), and subsurface outflow (620 afy). Groundwater storage is estimated to increase by 723 afy for the existing/2004 period. This means that groundwater levels in the Natomas Basin would be expected to increase slightly due to SAFCA's construction activities. The estimated reduction in subsurface outflow (620 afy) would result in a small decrease in groundwater levels and storage east of the Natomas Basin.

For the 2030 period, decreases in groundwater inflow include net recharge from streams (1,228 afy) and subsurface inflow (518 afy). There would be a small decrease groundwater storage (45 afy) and a small increase in subsurface outflow (38 afy). These small changes would have a negligible effect on groundwater levels in or near the Natomas Basin.

The cumulative impacts of SAFCA's proposed construction activities on existing and future groundwater conditions were based primarily on the 2004 and 2030 IGSM simulations discussed

in Chapter 4. The 2004 simulation results show a reduction in groundwater storage of 4,971 afy in the Natomas Basin without SAFCA's construction; this equates to an average head decline of about one foot. The decrease in groundwater storage would be slightly smaller (4,248 afy) due to SAFCA's construction activities. Subsurface outflow from the Natomas Basin to the east would decrease slightly (from 21,738 to 21,118 afy) due to SAFCA's activities. Overall, SAFCA's activities would have a small positive impact on groundwater supplies in the Natomas Basin and a small negative impact on groundwater east of the Natomas Basin based on existing conditions.

The 2030 IGSM simulation provides an estimate of the cumulative impacts of SAFCA's construction activities on future groundwater conditions. The results of the 2030 simulation show a positive change in groundwater storage in the Natomas Basin of 1,572 afy, which would decrease slightly to 1,527 afy due to SAFCA's activities. This means that heads in the Natomas Basin would still be expected to increase but at a slightly slower rate. There would be a similarly small increase in groundwater outflow (from 1,200 to 1,238 afy). Overall, the cumulative impact of SAFCA's proposed construction activities on future groundwater conditions is predicted to be negligible.

9.2 Potential Water Quality Impacts

This investigation also included a summary of potential impacts to groundwater quality due to SAFCA's construction activities. The primary potential groundwater quality impact will be a slight reduction in groundwater recharge to the Natomas Basin, including stream recharge and deep percolation from rice fields and other irrigated farmland. This recharge is generally of high quality, especially the stream recharge, which has very low salinity. Seepage from canals is generally considered to be a source of good quality recharge, and increased seepage due to SAFCA's proposed canal construction will offset some of the reductions in groundwater recharge due to slurry cutoff walls. In the vicinity of the Brookfield borrow site, groundwater quality would improve due to the transition from groundwater to surface water for about 80 percent of the rice acreage. No groundwater contamination would be expected due to construction of the proposed slurry cutoff walls and other improvements proposed for the levees surrounding the Natomas Basin.

Although SAFCA's proposed construction activities would cause slight groundwater quality degradation in some areas and improvements in other areas, the effects would be too small to be measurable. The overall effect of SAFCA's proposed construction on groundwater quality in the Natomas Basin can be considered negligible.

9.3 Potential Impacts to Private Wells

The majority of the domestic wells along the Sacramento River East Levee are between 100 and 200 feet deep, and irrigation wells in this area are slightly deeper. The average depth of the domestic and irrigation wells along the Sacramento River East Levee is 158 feet.

Kleinfelder estimated the water level changes due to the slurry cutoff walls along the Sacramento East Levee using the SEEP/W groundwater model. On the river side of the levee, the predicted

effect of the cutoff wall is negligible at low stage, and there would be a slight increase in head (less than one foot) at high stage. On the land side of the levee, the simulated heads are slightly lower due to the cutoff wall (typically 0.25 to 0.5 foot). In both cases, any impacts would be small enough to be considered negligible even for the shallowest domestic wells (less than 100 feet deep). No measurable decrease in groundwater levels or well yields or increase in pumping costs is expected due to the slurry cutoff walls.

10.0 References

American States Water Company, Wood Rodgers, Inc., Stratecon, Inc., and Hatch & Parent. 2006. *Integrated Water Resources Management Plan*. Prepared for Natomas Central Mutual Water Company. Sacramento, CA.

California Department of Water Resources. 1978. *Evaluation of Ground Water Resources: Sacramento Valley*. Bulletin 117-6. Sacramento, CA.

California Department of Water Resources. 1997. *Feasibility Report, American Basin Conjunctive Use Project*. Sacramento, CA.

California Department of Water Resources. 1998a. *California Water Plan Update Bulletin.* Bulletin 160-98. Sacramento, CA. Sacramento, CA.

California Department of Water Resources. 1998b. *Evaluation of Ground Water Resources: Sacramento Valley*. Bulletin 117-6. Sacramento, CA.

California Department of Water Resources. 2003b. *California's Groundwater, Bulletin 118 - Update 2003*. Sacramento, CA.

California Department of Water Resources. 2003c. *Sacramento River Basinwide Water Management Plan.* Sacramento, CA.

California Department of Water Resources. 2006. *Groundwater Basin Descriptions*. Available: http://www.groundwater.water.ca.gov/bulletin118/basin_desc/. Sacramento, CA.

Carman, P.C. 1937. Fluid Flow Through a Granular Bed. *Transaction of Institution of Chemical Engineers.* Vol. 15, pp. 150-156. London.

Carman, P.C. 1956. *Flow of Gases Through Porous Media*. Butterworths Scientific Publications. London.

Darcy, H. 1856. Dètermination des lois d'ècoulement de l'eau à travers le sable. p. 590–594. In *Les Fontaines Publiques de la Ville de Dijon*. (in French) Victor Dalmont, Paris.

EDAW. 2007a. *Draft Environmental Impact Report on the Natomas Levee Improvement Program, Land Side Improvement Project*. Prepared for SAFCA. Sacramento, CA.

EDAW. 2007b. *Final Environmental Impact Report on the Natomas Levee Improvement Program, Land Side Improvement Project, Responses to Comments and Revisions to the Draft EIR*. Prepared for SAFCA. Sacramento, CA.

EDAW. 2008. *Biological Assessment, Natomas Levee Improvement Program, Land Side Improvement Project*. Prepared for SAFCA. Sacramento, CA.

Kleinfelder, Inc. 2007a. *Basis of Design Report, Sacramento River East Levee Reaches 1 Through 4B, Natomas Basin Evaluation, Reclamation District 1000, Sacramento and Sutter Counties, California (Draft)*. Prepared for SAFCA. Sacramento, CA.

Kleinfelder, Inc. 2007b. *Evaluation of Cutoff Walls Impact on Groundwater Recharge, Sacramento River East Levee, Natomas Levee Improvement Project, Sacramento and Sutter Counties, California*. Prepared for SAFCA. Sacramento, CA.

Kleinfelder, Inc. 2008. *Evaluation of Cutoff Walls Impact on Groundwater Recharge, Natomas Cross Canal South Levee, Natomas Levee Improvement Project, Sacramento and Sutter Counties, California*. Prepared for SAFCA. Sacramento, CA.

Kozeny, J. 1927. *Uber Kapillare Lietung Des Wassers im Boden*. Sitzungsber. Akad. Wiss. Vol. 136, pp. 271-306. (in German) Wien, Austria.

Luhdorff & Scalmanini, Consulting Engineers. 2007. *Well Construction and Testing Summary of the Lennar Communities Paulson Production Well.* Prepared for Lennar Communities. Woodland, CA.

Luhdorff & Scalmanini, Consulting Engineers. 2008a. *Evaluation of Potential Groundwater Impacts Due to Proposed Sacramento River East Levee Improvements with Emphasis on Reaches 2 and 3.*. Prepared for SAFCA. Woodland, CA.

Luhdorff & Scalmanini, Consulting Engineers. 2008b. *Sutter Pointe Specific Plan Groundwater Supply Assessment.* Prepared for Lennar Communities. Woodland, CA.

Montgomery Watson. 1993. *Sacramento County Water Agency, County Groundwater Model, Model Development and Basin Groundwater Yield.*

Montgomery Watson. 1995. *North American River Service Area Groundwater Model, Model Development and Basin Groundwater Management.*

Montgomery Watson Harza. 2002. *Sacramento Groundwater Authority, Summary of Basin Conditions*. Sacramento, CA.

Montgomery Watson Harza. 2005. *Western Placer County Groundwater Storage Study Final Report.* Prepared for Placer County Water Agency.

Montgomery Watson Harza. 2007. *Western Placer County Groundwater Management Plan.* Prepared for City of Roseville, City of Lincoln, Placer County Water Agency, and California American Water.

Natomas Central Mutual Water Company. 2002. *Natomas Area Ground-Water Management Plan, Sacramento and Sutter Counties, California (Draft).*

Olmsted, F.H. and G.H. Davis. 1961. *Geologic Features and Ground-Water Storage Capacity of the Sacramento Valley, California*. U.S. Geological Survey, Water-Supply Paper 1497. Menlo Park, CA.

Theis, C.V. 1935. *The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage.* American Geophysical Union Transactions, v. 16, p. 519-524.

URS Corporation. 2003. *Final Observation Wells Report II For Reaches North and South of Powerline Road.* Prepared for USACE. Sacramento, CA.

URS Corporation. 2007. *Preliminary Geotechnical Reevaluation Report, Sacramento River East Levee (Draft).* Prepared for USACE. Sacramento, CA.

U.S. Army Corps of Engineers. 2008. *Draft Environmental Impact Statement,408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Program, Sacramento, CA.* Prepared for SAFCA. Sacramento, CA.

WRIME, Inc. 2007. *Technical Memorandum, Sacramento County Integrated Groundwater and Surface Water Model (SACIGSM, v. 3), Model Refinement – North Area.* Prepared for Regional Water Authority and Sacramento Groundwater Authority. Sacramento, CA.

B3 Evaluation of Cutoff Walls

December 19, 2007
File No.: 72834

Mr. Timothy Washburn
SAFCA
1007 7th Street, 7th Floor
Sacramento, CA 95814

Subject: **Evaluation of Cutoff Walls Impact on Groundwater Recharge**
Sacramento River East Levee
Natomas Levee Improvement Project
Sacramento and Sutter Counties, California

Dear Mr. Washburn:

One of the design alternatives considered for remediation of the Sacramento River East Levee from Reach 1 to Reach 20 includes construction of cutoff walls through an adjacent levee. These soil-bentonite (SB) walls are proposed to mitigate underseepage concerns and reduce exit seepage gradients to the acceptable levels, according to the established project criteria. Based on the design recommendations provided by Kleinfelder, the SB wall material should have permeability of $5x10^{-7}$ cm/sec or lower and extend at least 5 feet into a fine grained layer underneath the permeable foundation layer. To account for the variability of the slurry and the potential for construction defects, for this study the SB wall was modeled with and average overall permeability of $1x10^{-6}$ cm/sec.

A concern has been raised that the SB walls could potentially impede seepage from the river through the levee foundation and adversely impact groundwater recharge landward of the levee. To address these concerns, we have performed simplified seepage analyses to estimate seepage flow from the river into the aquifer under both existing conditions and with cutoff walls in place.

In addition, we have evaluated potential seepage loss from the proposed Giant Garter Snake ditch. This new 2 mile long unlined canal will be located approximately 500 to 1,000 feet landward of the levee toe and will follow the existing levee alignment between Stations 200+00 and 305+00. In general, the canal will be filled with water during summer month and will be dry during the winter months. During periods of time when the canal is filled with water, seepage through its bottom and side slopes may temporarily affect the groundwater table in the area.

General Assumptions

- Indealized stratigraphic models at Stations 27+00, 70+00, 217+00, and 353+00 were selected to represent the range of subsurface conditions along the

Sacramento River East Levee. Analyses at Station 217+00 are based on the stratigraphy model developed by URS, as presented in the URS "Draft Subsurface Investigation Report for Sacramento River East Levee, Natomas General Reevaluation Report" prepared for US Army Corps of Engineers, Sacramento District, dated 18 July 2007. Analyses at Stations 27+00, 70+00, and 353+00 are based on the models developed by Kleinfelder as presented in the Draft Basis of Design Report (Kleinfelder, 2007).

- Total length and location of the SB wall were estimated based on the information provided in the Final Draft Basis of Design Report dated December 18, 2007 and in the Alternatives Analysis Report for Seepage Mitigation Revision 1 dated September 24, 2007. Two representative cross-sections (Stations 70+00 and 353+00) have been selected to represent the proposed wall locations and depths.
- Seepage analyses were completed using steady state and transient analysis procedures with the finite element program SEEP/W version 6.17, provided with the GeoStudio 2004 package. These analyses do not account for 3-D effects, such as flow around the cutoff wall.
- All elevations are assumed to be NGVD29 datum unless otherwise noted.
- Typical seasonal river level fluctuations were estimated based on the information provided by the Department of Water Resources, Division of Flood Management (http://cdec.water.ca.gov/queryStation.html) for the Sacramento River gage at Verona. River stage data recorded at Verona from 11/26/1995 to 11/26/2007 are presented on Plates 1 through 5. Please note that river elevations on Plates 1 through 6 are reported in United States Engineering Datum (USED). In the Sacramento and San Joaquin River Basins, the adjustment from USED to NGVD varies from gaging station to gaging station within a range of 2.48 feet to 3.2 feet. The commonly used adjustment, when not otherwise known, is 3.0 feet. Elevation reported in USED is approximately 3 feet higher than elevation reported in NGVD29.
- Elevation of the groundwater table landward of the levee was estimated based on piezometer data obtained from "Final Observation Wells Report II: for Reaches North and South of Powerline Road", prepared by URS.
- A summary of permeability values used in the seepage analyses is presented on each of the Plates 6 through 10. Seepage parameters selected for this study are consistent with those presented in the Basis of Design Report.
- Only recharge due to seepage from the river was considered. The model does not account for flow into or out of the system due to precipitation, pumping or groundwater flow in a direction parallel to the levee axis.

Analysis Approach

We have performed simplified seepage analyses to estimate seepage flow from the river into the aquifer under both existing conditions and with cutoff walls in place and to evaluate the impact of the proposed canal construction based on the methodology outlined below. The following sections of this memo discuss analysis assumptions and details and present the results.

1. Review available historical data and develop representative seasonal river level and ground water table hydrographs.
2. Perform series of steady state seepage analyses at four representative cross-sections to estimate seepage through levee foundation under the existing conditions as a function of river elevation. Estimate seepage quantities in one foot increment of the water surface elevation for river levels between Elevations 15 and 32. Boundary conditions used in steady state seepage modeling simulations are defined below. Fixed-head boundary conditions set to the water surface elevations were applied along the boundary nodes of the upstream slope, river bottom, and the upstream (riverside) vertical edge of the model. Nodes along the bottom of the model were modeled as no flow boundary (zero total flux boundary condition). Infinite elements with fixed-head boundary conditions were used along the right vertical edge of the model. The total head along the vertical edge was set to an estimated groundwater table elevation landward of the levee. The landside slope of the levee and the ground surface were modeled as potential seepage exit surfaces.
3. Using results from Steps 1 and 2 for each representative cross-section estimate seepage flow under the existing conditions over a typical year report seepage quantities in acre-feet per year per 1,000 feet of levee.
4. Using results from Step 3 and subsurface condition profiles at the landside toe of the levee, estimate seepage flow under the existing conditions over the entire length of the levee. Report seepage quantities in acre-feet per year.
5. Perform series steady state seepage analyses at two representative cross-sections (Stations 70+00 and 353+00) to estimate seepage through levee foundation with a cutoff wall in place as a function of river elevation. Estimate seepage quantities in one foot increments of the water surface elevation for river levels between Elevations 15 and 32.
6. Using results from Steps 1 and 5, for Stations 70+00 and 353+00 estimate seepage flow with a cutoff wall in place over a typical year. Report seepage quantities in acre-feet per year per 1,000 feet of levee.
7. Using results from Steps 4 and 6, calculate reduction in seepage quantities at Stations 70+00 and 353+00 due to the cutoff wall.
8. Using river and groundwater table hydrographs from Step 1, perform transient seepage analyses at Station 70+00 with and without the cutoff wall. The purpose of this analysis is two-fold: 1) better understand the impact of the cutoff wall on the recharge of the aquifer throughout the year; 2) verify percent reduction estimated based on the steady state analysis.
9. Using results from Steps 4 and 7 and subsurface condition profiles at the landside toe of the levee, estimate impact of the cutoff wall construction over the entire length of the levee. Report seepage quantities in acre-feet per year.
10. Perform transient analysis at Station 70+00 with the cutoff wall and canal to estimate seepage from the canal during a typical year.

Analysis Results

Step1

Historical data recorded by the Sacramento River gage station at Verona from 11/26/1995 to 11/26/2007 are plotted on Plates 1 through 5. We have estimated typical number of days per year river level remains at a given elevation as presented on Plate 6. We have also developed a representative annual river hydrograph (river level as a function of time) as shown graphically on Plate 7 and in tabular format on Plate 8. Transient seepage analyses utilized this hydrograph as a time-dependent boundary condition on the river side of the model.

Data from piezometer 2F-01-15N located north of Powerline Road indicates that the ground water elevation varies throughout the year from about 5 to 15 feet below ground level, see Attachment A. Based on the piezometer data, we have developed a representative groundwater table hydrograph as shown on Plate 7. Transient seepage analyses utilized this hydrograph as a time-dependent boundary condition on the landside of the model. For our steady state analyses we have set the groundwater table at 7 feet below ground surface, or Elevation 15. Our assumption of Elevation 15 is also supported by the groundwater contour maps from County of Sacramento, Department of Water Resources for the spring and fall. The groundwater contours immediately landward of the levee near Reach 4B indicate groundwater elevations greater than 10 feet but generally less than 20.

Steps 2 and 3

Estimated seepage quantities through the levee foundation as a function of river elevation under the existing conditions (no cutoff wall) at Stations 27+00, 70+00, 217+00, and 353+00 are summarized in Table 1 and presented on Plate 9. Seepage analyses results for WSE at Elevation 32 are presented graphically on Plates 10 through 13. As shown in this table and graphically on Plate 9, the seepage quantities increase two orders of magnitude as the river level rises from Elevations 15 to 32. These results also indicate Station 217+00 provides the greatest contribution to the aquifer recharge landward of the levee. For a given river stage, estimated seepage quantities at Station 217+00 are approximately 100 times greater than the estimated quantities at the other three stations. Seepage quantities at Stations 27+00, 70+00, and 353+00 are approximately the same order of magnitude. The higher seepage quantities at Station 217+00 are primarily due to the presence of thick highly permeably sand and gravel layers in the foundation.

The second result worth noting is the aquifer only recharges when the river level is above the groundwater elevation. When the river elevation is below the groundwater table (Elevation 15), the direction of the seepage flow in the model is reversed, indicating flow out of the aquifer.

Table 1
Estimated Seepage Quantities Versus River Stage
Existing Conditions

Elevation	27+00 Flow Existing Conditions	70+00 Flow Existing Conditions	217+00 Flow Existing Conditions	353+00 Flow Existing Conditions
15	-4.98E-11	8.61E-03	1.51E+00	-3.69E-12
16	8.53E-02	4.31E-02	6.06E+00	3.89E-01
17	1.71E-01	7.75E-02	1.21E+01	7.78E-01
18	2.56E-01	1.12E-01	1.82E+01	1.17E+00
19	3.41E-01	1.46E-01	2.42E+01	1.56E+00
20	4.26E-01	1.81E-01	3.03E+01	1.96E+00
21	5.13E-01	2.15E-01	3.63E+01	2.35E+00
22	5.99E-01	2.50E-01	4.24E+01	2.74E+00
23	6.84E-01	2.85E-01	4.85E+01	3.14E+00
24	7.70E-01	3.19E-01	5.45E+01	3.53E+00
25	9.24E-01	3.54E-01	6.07E+01	3.92E+00
26	1.08E+00	3.89E-01	6.68E+01	4.87E+00
27	1.43E+00	5.17E-01	7.33E+01	6.09E+00
28	1.93E+00	8.47E-01	7.97E+01	7.47E+00
29	2.60E+00	1.40E+00	8.62E+01	9.05E+00
30	3.26E+00	2.10E+00	9.28E+01	1.08E+01
31	4.08E+00	2.99E+00	9.95E+01	1.28E+01
32	5.07E+00	4.21E+00	1.06E+02	1.51E+01
Total Flux Acre ft/yr/1000ft	3.9	2.6	129	13.4

Note: All fluxes in ft^3/day/ft unless noted otherwise and elevations are reported in ft (NGVD29)

Step 4

The total length of the Sacramento River East Levee between Station 0+00 (Reach 1) and Station 960+00 (Reach 20) is approximately 18.1 miles. The general profile for the subsurface conditions along the levee crown/landside toe was is provided in Attachment B. In general, the subsurface conditions profile is comprised of five units. These strata listed in order of increasing depth include: existing levee, surficial clay/fine grain soil blanket, silty and clayey sand layer, clean sand layer, gravel layer, and a lower clay/lower permeability soil region. As shown in Table 2, conditions at Station 27+00 are representative of approximately 1.8 miles or 11 percent of the entire length of the Sacramento River East Levee. Conditions at Station 70+00 are representative of approximately 4 miles or 23 percent of the entire length of the Sacramento River East Levee. Conditions at Station 217+00 are representative of approximately 7.6 miles or 42 percent of the entire length of the Sacramento River East Levee. Conditions at Station 353+00 are representative of approximately 4.7 miles or 24 percent of the entire length of the Sacramento River East Levee. Accordingly, the total estimated flow from the Sacramento River through the levee foundation between Station 0+00 and Station 960+00 is approximately 5,650 acre-feet per year.

Table 2
Estimated Seepage Quantities, Entire East Levee
Existing Conditions

Reach	Stations	Representative Station	Length of Stretch (ft)	Seepage without Cutoff Wall (ac-ft/yr)
1	00+00 to 48+00	27+00	4,800	19
2	48+00 to 100+00	70+00	5,200	14
3	100+00 to 110+00	70+00	1,000	3
4a	110+00 to 120+00	70+00	1,000	3
4a	120+00 to 190+00	353+00	7,000	95
4b	190+00 to 228+00	217+00	3,800	490
5a	228+00 to 263+00	70+00	3,500	10
5b	263+00 to 280+00	27+00	1,700	6
6	280+00 to 330+00	217+00	5,000	650
7	330+00 to 345+00	353+00	1,500	20
7	345+00 to 362+00	353+00	1,700	23
8	362+00 to 402+00	353+00	4,000	55
9a	402+00 to 430+00	353+00	2,800	38
9b	430+00 to 468+10	353+00	3,810	50
10	468+10 to 495+00	217+00	2,690	350
11	495+00 to 635+00	217+00	14,000	1810
12	635+00 to 640+00	217+00	500	65
12	640+00 to 667+00	70+00	2,700	7
13	667+00 to 700+00	353+00	3,300	45
14	700+00 to 732+00	70+00	3,200	8
15	732+00 to 780+00	217+00	4,800	620
16	780+00 to 832+00	217+00	5,200	675
17	832+00 to 842+00	217+00	1,000	130
18	842+00 to 857+00	217+00	1,500	195
19a	857+00 to 875+00	217+00	1,800	235
19b	875+00 to 925+00	70+00	5,000	15
20a	925+00 to 925+50	27+00	50	.2
20b	925+50 to 960+00	27+00	3,450	13
Total Seepage ac-ft/year				**5,650**

Steps 5 and 6

Cutoff soil-bentonite (SB) walls are currently proposed at thirteen locations along the east levee, as summarized in Table 3. The total length of the proposed SB walls is approximately 8 miles. The proposed depth of the wall varies from location to location based on the subsurface conditions and the required underseepage mitigation. Idealized cross-sections at Stations 70+00 and 353+00 are selected to represent the range of conditions at the proposed cutoff wall locations. At Station 70+00 where the surficial clay blanket is relatively thin and the underlying permeable layer is relatively shallow, the wall would completely penetrate the sand layer and key into the clay layer beneath. On the other hand at Station 353+00, only a partially penetrating cutoff wall is

required. Proposed depth of the wall relative to the estimated bottom of the permeable layer at each location is presented in Table 3.

Table 3
Proposed Cutoff Wall Locations

Reach	Stations	Length of Stretch	Proposed depth of wall, Elevation	Depth of Sand layer, Elevation	Representative station for wall impact evaluation
2	48+00 to 100+00	5,200	-25	-25	70+00
3	100+00 to110+00	1,000	-25	-10	70+00
6	280+00 to 330+00	5,000	-70	-65	70+00
7	330+00 to 362+00	3,200	-60	-50	70+00
8	362+00 to 402+00	4,000	-60	-50	70+00
9	430+00 to 468+00	3,800	-70	-45	70+00
10	468+10 to 495+00	2,690	-25	-70	353+00
13	667+00 to 700+00	3,300	-20	-100	353+00
15	732+00 to 780+00	4,800	-10	-100	353+00
17	832+00 to 842+00	1,000	-25	-100	353+00
18	842+00 to 857+00	1,500	-25	-100	353+00
19a	857+00 to 875+00	1,800	-25	-100	353+00
19b	875+00 to 925+00	5,000	-25	-40	353+00

We have performed a series of steady state seepage analyses to estimate seepage quantities through the levee foundation with an SB wall in place. The analyses results for Stations 70+00 and 353+00 with WSE at Elevation 32 are presented on Plates 14 and 15. Total flow through a flux section located immediately landward of the SB wall was calculated with and without the cutoff wall in place. The two results were compared to estimate the groundwater recharge effects of the cutoff wall. Seepage quantities as a function of river stage are summarized in Table 4.

Table 4
Estimated Seepage Quantities versus River Stage
With and Without Cutoff Wall

Elevation	70+00 Flow Existing Conditions	70+00 Flow With Cutoff Wall	353+00 Flow Existing Conditions	353+00 Flow With Cutoff Wall
15	8.61E-03	4.56E-03	-3.69E-12	-5.97E-13
16	4.31E-02	2.29E-02	3.89E-01	3.90E-01
17	7.75E-02	4.14E-02	7.78E-01	7.80E-01
18	1.12E-01	6.00E-02	1.17E+00	1.17E+00
19	1.46E-01	7.87E-02	1.56E+00	1.56E+00
20	1.81E-01	9.75E-02	1.96E+00	1.96E+00
21	2.15E-01	1.16E-01	2.35E+00	2.35E+00

Table 4 (Cont.)

Elevation	70+00 Flow Existing Conditions	70+00 Flow With Cutoff Wall	353+00 Flow Existing Conditions	353+00 Flow With Cutoff Wall
22	2.50E-01	1.36E-01	2.74E+00	2.74E+00
23	2.85E-01	1.55E-01	3.14E+00	3.13E+00
24	3.19E-01	1.74E-01	3.53E+00	3.52E+00
25	3.54E-01	1.93E-01	3.92E+00	3.92E+00
26	3.89E-01	2.13E-01	4.87E+00	4.31E+00
27	5.17E-01	2.33E-01	6.09E+00	4.70E+00
28	8.47E-01	2.54E-01	7.47E+00	5.12E+00
29	1.40E+00	2.75E-01	9.05E+00	5.59E+00
30	2.10E+00	2.95E-01	1.08E+01	6.06E+00
31	2.99E+00	3.16E-01	1.28E+01	6.54E+00
32	4.21E+00	3.37E-01	1.51E+01	7.02E+00
Total Flux Acre ft/yr/1000ft	2.6	0.4	13.4	8.4

Note: Flows in ft^3/day/ft unless noted otherwise and elevations are reported in ft (NGVD29)

Step 7

Based on the results of steady state seepage analyses presented in Table 4, the cutoff wall could potentially reduce seepage through the foundation by 40 to 85 percent depending on the subsurface conditions and the proposed depth of the wall. At the locations where the wall fully penetrates the permeable sand layer (Station 70+00) seepage quantities could be reduced by approximately 85 percent. At the locations, where the cutoff is shallow and only partially penetrates the sand layer (Station 353+00), the reduction would be approximately 40 percent.

Step 8

To verify and validate steady state seepage analyses described above, we have performed transient seepage analyses for Station 70+00. The purpose of these analyses was to better understand effects of seasonal groundwater table fluctuations on the estimated seepage quantities with and without the cutoff wall and more accurately model typical river conditions throughout the year. Time-dependent boundary conditions assigned to the riverside and the landside of the model as shown on Plate 16 and summarized in a tabular form on Plate 8 were used in these analyses. Seepage quantity computations were performed at 34 time steps, starting in February and ending a year later.

Transient seepage analyses results are presented on Plates 17 through 20. Existing seepage flow regime during typical winter and summer conditions is illustrated on Plates 17 and 18 respectively. Seepage conditions with the cutoff wall in place are shown on

Plates 19 and 20. The plates show calculated seepage velocity vectors which illustrate the direction and the amount of flow - the larger the arrow, the higher the velocity and the larger the flow. A consistent scale was used on all four plates for easier visual comparison. The results indicate seepage occurs primarily through the permeable foundation sand layer and the existing sand levee. The flow is significantly higher during the elevated river stages (winter). Further, conditions may exist during the year when the river water surface is lower than the groundwater table. During these periods of time, the direction of the flow is reversed indicating seepage flow toward the river as illustrated on Plate 18.

Seepage quantities through levee foundation with and without the cutoff wall as a function of time are presented on Plate 21. Positive seepage quantities indicate flow from the river landward of the levee while the negative sign indicates flow in the opposite direction. As shown on Plate 21, construction of the cutoff wall impedes flow in both direction and as a result may prevent flow into the river during the summer months.

Based on the transient seepage analyses, flow through the levee foundation at Station 70+00 without the wall is estimated at 8 acre-ft/year per 1,000 feet of the levee. Seepage through the levee foundation with the wall in place is approximately 1.7 acre-ft/year per 1,000 feet. Compared to the steady state analyses results for the same station, the transient seepage analyses estimate higher seepage quantities. However, the estimated reduction in flow due to the wall is comparable in both analyses. Based on the transient analysis, the seepage quantities would be reduced by about 80% compared to 85% estimated from the steady-state seepage analyses. Accordingly, we conclude the steady state seepage analyses should reasonably well approximate the effect of the cutoff walls.

Step 9

The overall effect of the cutoff wall construction can be estimated based on the information presented in Table 5. Based on our evaluations, construction of the SB wall could potentially reduce the inflow to the aquifer by approximately 1,300 acre-feet per year.

Table 5
Estimated Seepage Quantities through Levee Foundation
Reaches 1 through 20

Reach	Stations	Representative Station	Stretch Length (ft)	Seepage without Cutoff Wall (ac-ft/yr)	Percent reduction based on cross section	Seepage with Cutoff Wall (ac-ft/yr)	Is Cutoff Wall Proposed at this Location?
1	00+00 to 48+00	27+00	4,800	19	0	19	N
2	48+00 to 100+00	70+00	5,200	14	85	2	Y
3	100+00 to 110+00	70+00	1,000	3	85	.4	Y
4a	110+00 to 120+00	70+00	1,000	3	0	3	N

Table 5 (Cont.)

Reach	Stations	Representative Station	Stretch Length (ft)	Seepage without Cutoff Wall (ac-ft/yr)	Percent reduction based on cross section	Seepage with Cutoff Wall (ac-ft/yr)	Is Cutoff Wall Proposed at this Location?
4a	120+00 to 190+00	353+00	7,000	95	0	95	N
4b	190+00 to 228+00	217+00	3,800	490	0	490	N
5a	228+00 to 263+00	70+00	3,500	10	0	10	N
5b	263+00 to 280+00	27+00	1,700	6	0	6	N
6	280+00 to 330+00	217+00	5,000	650	85	100	Y
7a	330+00 to 345+00	353+00	1,500	20	85	3	Y
7b	345+00 to 362+00	353+00	1,700	23	85	3	Y
8	362+00 to 402+00	353+00	4,000	55	85	8	Y
9	402+00 to 430+00	353+00	2,800	38		38	N
9	430+00 to 468+10	353+00	3,800	50	85	8	Y
10	468+10 to 495+00	217+00	2,690	350	40	210	Y
11	495+00 to 635+00	217+00	14,000	1810	0	1810	N
12	635+00 to 640+00	217+00	500	65	0	65	N
12	640+00 to 667+00	70+00	2,700	7	0	7	N
13	667+00 to 700+00	353+00	3,300	45	40	30	Y
14	700+00 to 732+00	70+00	3,200	8	0	8	N
15	732+00 to 780+00	217+00	4,800	620	40	375	Y
16	780+00 to 832+00	217+00	5,200	675	0	675	N
17	832+00 to 842+00	217+00	1,000	130	40	80	Y
18	842+00 to 857+00	217+00	1,500	195	40	120	Y
19a	857+00 to 875+00	217+00	1,800	235	40	140	Y
19b	875+00 to 925+00	70+00	5,000	15	40	8	Y
20a	925+00 to 925+50	27+00	50	.2	0	.2	N
20b	925+50 to 960+00	27+00	3,550	13	0	13	N
Total Seepage				**5,650**		**4,330**	

The results of this study indicate the construction of cutoff walls could potentially impede the groundwater aquifer recharge landward of the levee by approximately 20-25% of its current recharge rate. Seepage through the levee foundation without the wall is estimated at 5,650 acre-feet per year. Seepage with the SB cutoff wall in place is approximately 4,350 acre-feet per year. The resulting impact to the groundwater recharge is approximately 1,300 acre-feet per year. In our opinion, these results are likely conservative and represent the upper-bound estimate. The actual impact is likely lower, due to 3-D effects but cannot be assessed with the existing modeling.

Step 10

A new 2 mile long canal will be constructed along the east levee between Stations 200+00 and 305+00. This canal, shown in plan in Attachment C, will be located approximately 500 to 1,000 feet landward of the levee toe and will follow the existing

levee alignment. In general, the canal will be filled with water during summer months and will be dry during the winter months.

We have evaluated the impact of the canal operation on the groundwater conditions in the area. Transient analyses were performed to estimate seepage quantities from and into the canal at various times throughout the year. The analyses were performed for Station 70+00 with a cutoff wall in place. The canal cross-section was incorporated into the transient analysis model described in Step 8 above as a 8 feet deep and 10 feet wide ditch with 3H:1V side slopes positioned 1,000 ft landward of the levee. The canal was assumed to be filled with up to 5 feet of water from May through November and was allowed to seep in the winter, modeled as a free seepage discharge face. The canal operation was modeled as another time-dependent boundary condition applied, as shown on Plate 22. The canal will be excavated through the surficial clay blanket which consists primarily of CL with some CH and ML soils with percent fines between 50 and 70 percent. The permeability of this layer is estimated at 10^{-5} cm/sec. This permeability was assigned to the surface layer to represent base-case conditions. Clay blanket thickness varies across the site and excavation of the canal may result in a complete removal of the surficial clay at some locations. To account for variability in subsurface conditions and the possibility of a complete removal of the clay blanket, we have conducted a sensitivity analysis with permeability of the surface layer increased by one order of magnitude (10^{-4} cm/sec). The results of this analysis provide an upper bound estimate of seepage losses from the canal.

Seepage quantities were calculated using a flux line placed along the perimeter of canal cross-section. Positive and negative quantities indicate flow from and into the ditch, respectively. The estimated seepage quantities as a function of time are shown on Plate 23. Based on the results of the transient analyses, seepage loss is estimated at 1.4 acre-ft/year per 1,000 feet of the canal for base-case conditions. Only positive flow (flow from the canal) was considered in these computations. Seepage loss over the entire length of the canal is estimated at 15 acre-ft per year. The upper bound estimate is approximately 90 acre-ft per year.

We have also evaluated the combined impact of the cutoff wall construction and the canal operation on the groundwater table in the vicinity of the levee. This evaluation was performed based on the transient seepage analysis results from Steps 8 and 10. The groundwater table elevation was estimated as a function of time at the location halfway between the existing levee and the proposed canal. The results, provided on Plate 24, indicate minimal impact during winter months. However, during summer months groundwater table elevation in the immediate vicinity of the proposed wall locations could increase by as much as 3 feet. This increase is likely due to the combined effect of the cutoff wall preventing backflow into the river and the additional inflow from the canal.

Conclusions

The key findings and conclusions presented in this memorandum are as follows:

- Under the existing conditions seepage from the Sacramento River through the levee foundation along Sacramento River East Levee between Stations 00+00 and 960+00 is estimated at 5,650 acre-ft/year.
- At the proposed wall locations seepage flow could be reduced locally by up 85 percent, depending on stratigraphy and proposed wall depth.
- The overall impact of the proposed cutoff walls is estimated at approximately 1,300 acre-ft/year (20 percent reduction of the total recharge rate)
- The cutoff wall could impede seepage flow towards the river in the summer months when the river level is low.
- Construction of an irrigation canal may increase aquifer recharge by approximately 15 to 90 acre-ft per year.
- Construction of the cutoff wall and the canal may locally increase the groundwater level up to 3 feet in the summer months.

Due to the limitations of the model, the analyses can only provide an order-of-magnitude estimate of the seepage quantities. Additional analyses with a three-dimensional model such as MODFLOW are recommended to properly characterize groundwater flow regime in the area and quantify the impact of the proposed SB cutoff wall on the aquifer recharge.

If you have questions regarding this design or require additional information, please contact either Elena Sossenkina at (303) 237-6601 or the undersigned.

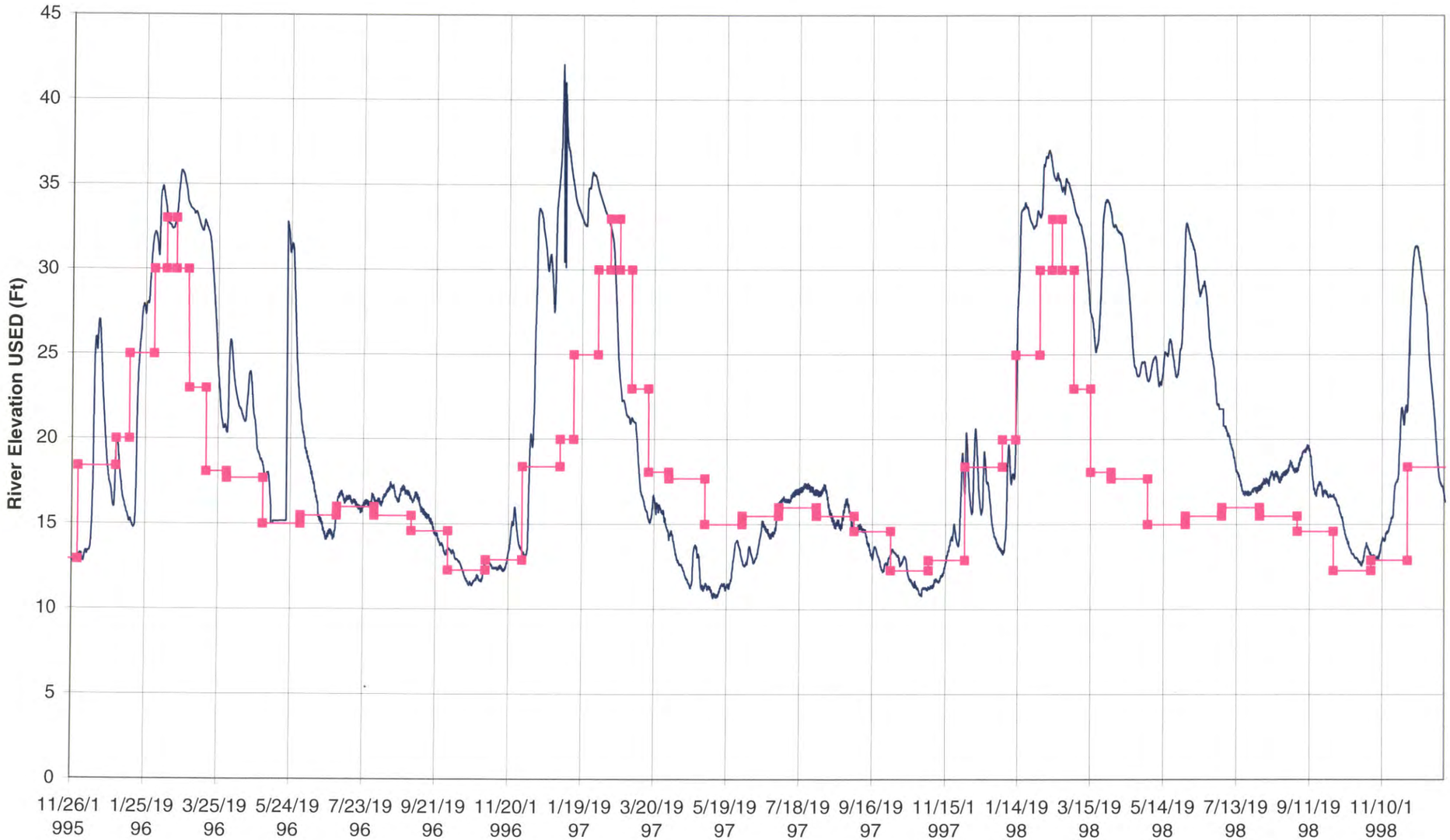
Sincerely,

KLEINFELDER WEST, INC.

Keith A. Ferguson, PE
Principal Engineer

PLATES

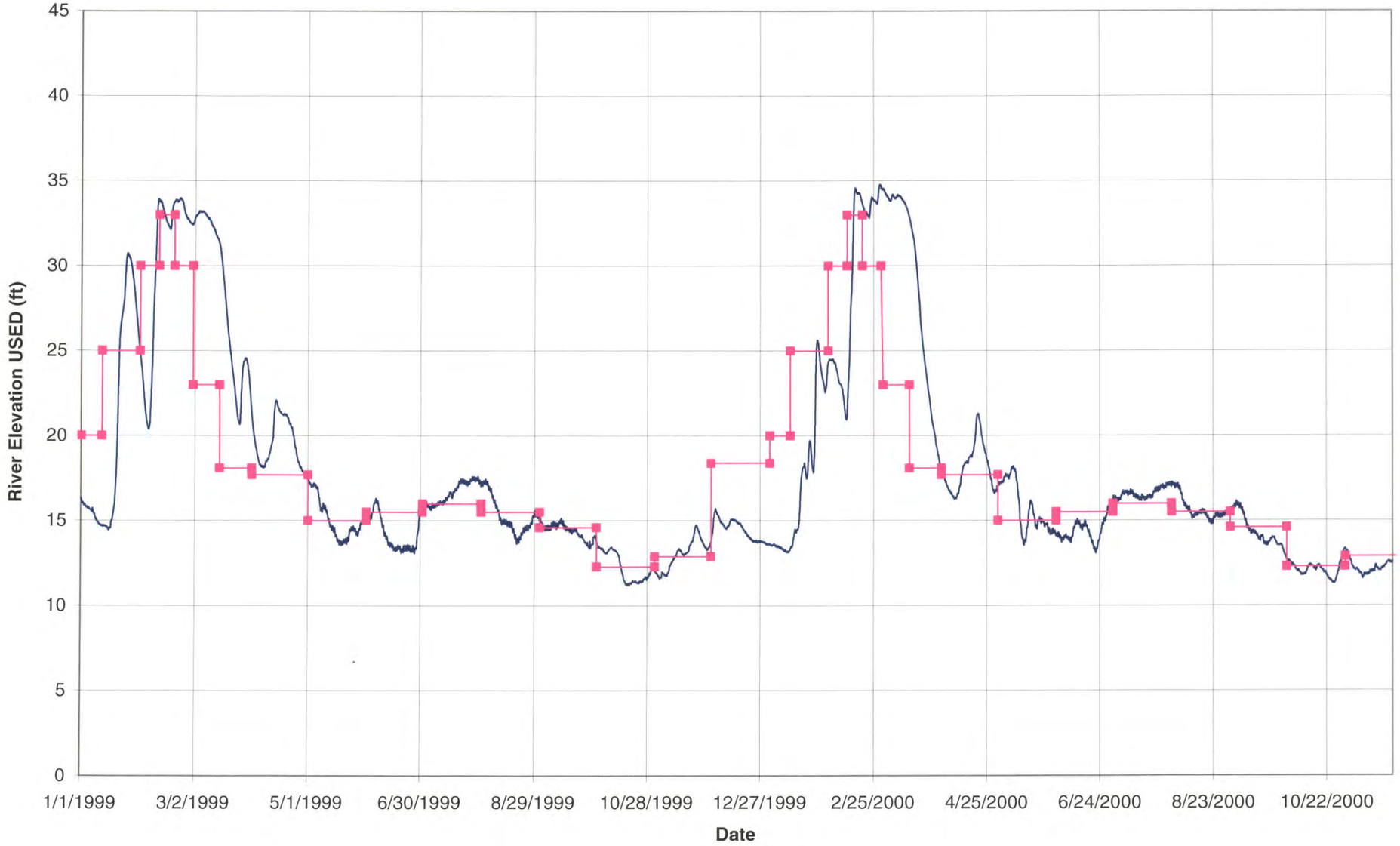
11/26/1995 - 12/31/1998



Ref: http://cdec.water.ca.gov/queryStation.html

KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 1
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

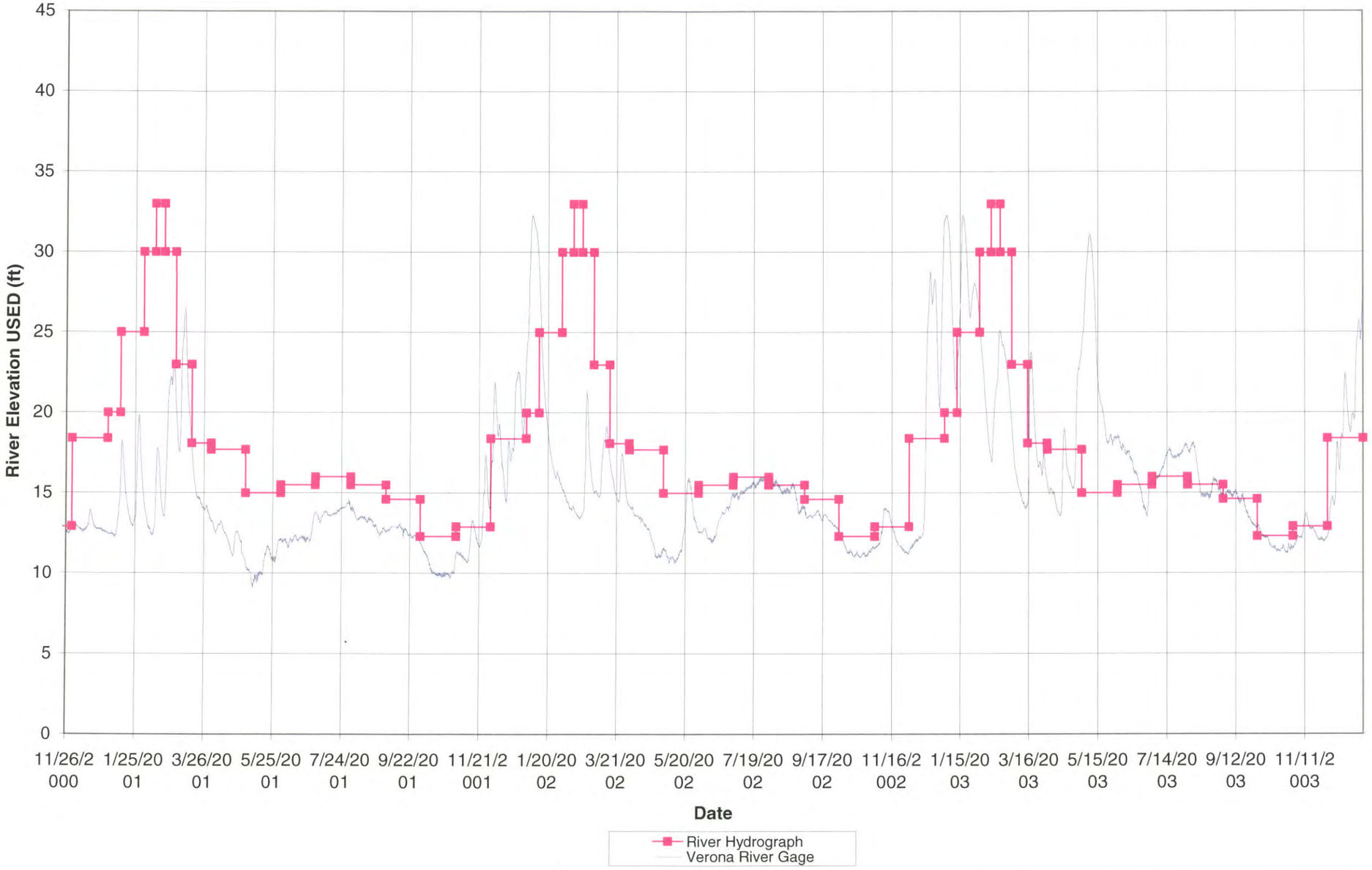
01/01/1999 - 11/26/2000



Ref: http://cdec.water.ca.gov/queryStation.html

KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 2
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

11/26/2000 - 12/31/2003



Ref: http://cdec.water.ca.gov/queryStation.html

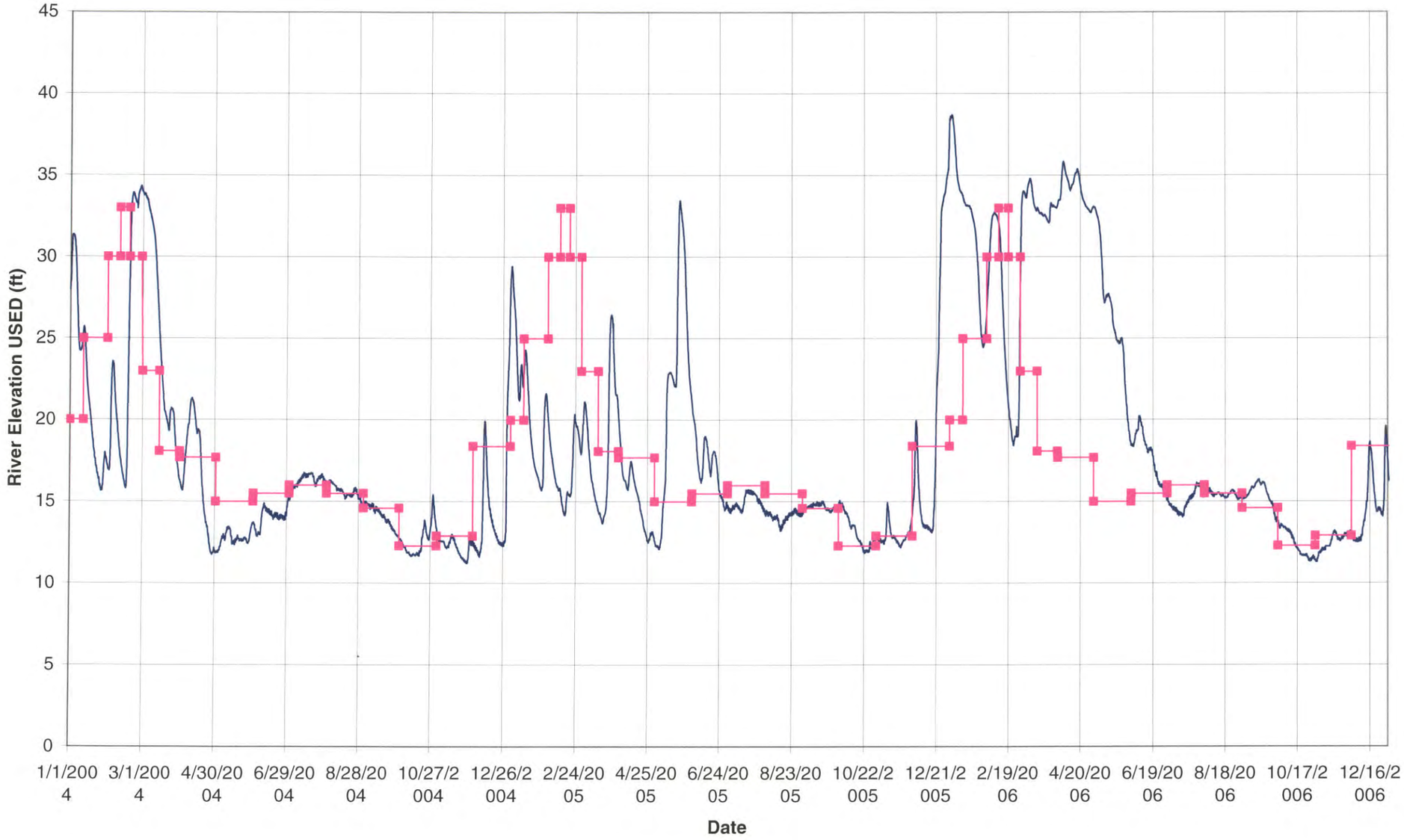
KLEINFELDER

Graphic By: ESS	Date: 11/29/2007
Project No. 72834	File: App. Cutoff Wall

Evaluation of Cutoff Wall Impact on Groundwater Recharge
Sacramento River East Levee

PLATE 3

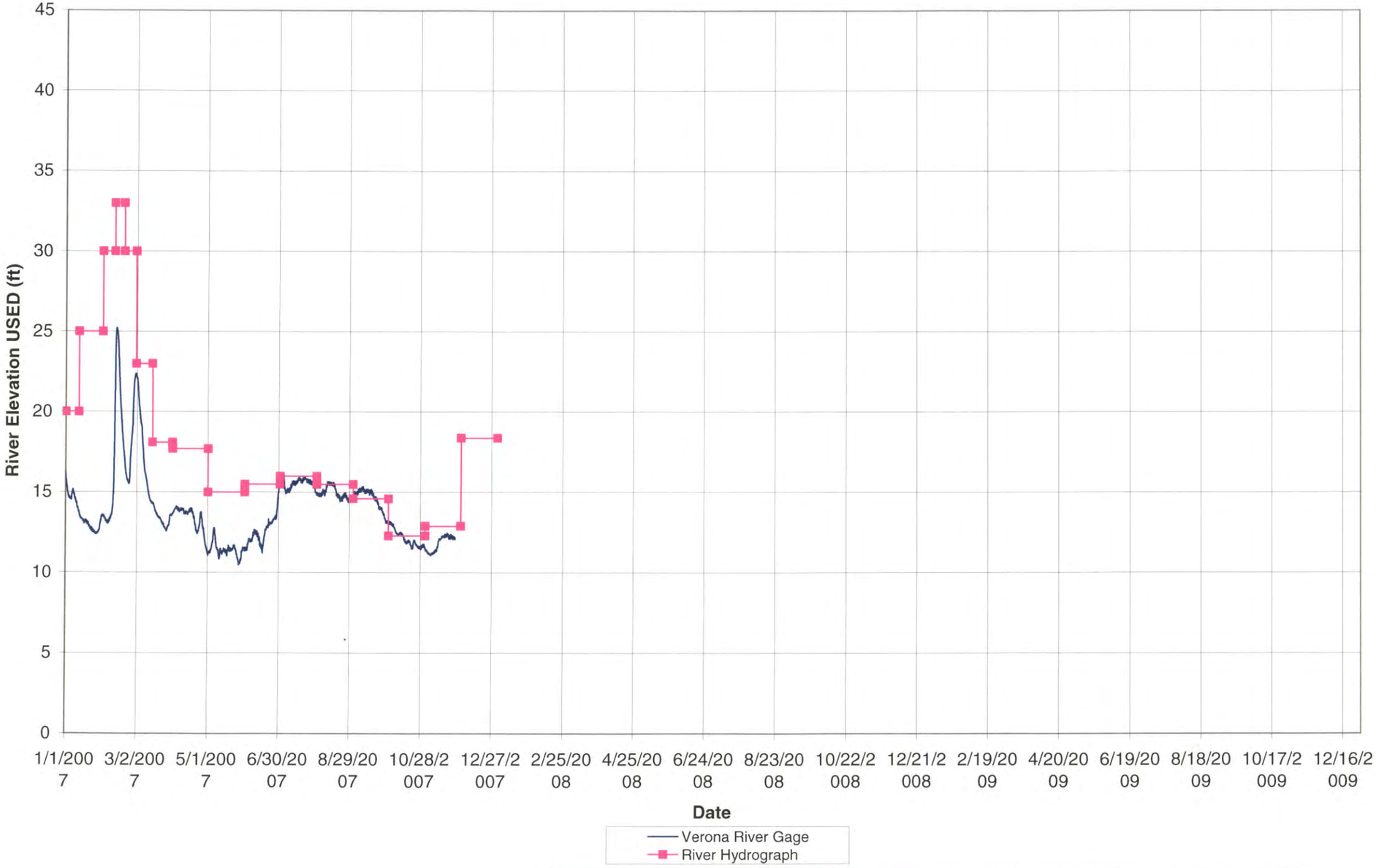
01/01/2004 - 12/31/2006



Ref: http://cdec.water.ca.gov/queryStation.html

KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 4
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

01/01/2007 - 11/26/2007



Ref: http://cdec.water.ca.gov/queryStation.html

KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 5
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

Sacramento River Elevation in ft

Elevation	% of Days per Year River at Given El.	Days per Year River at El.
15	5.4	20
16	3.5	1
17	2.3	8
18	1.8	7
19	1.9	7
20	1.5	6
21	1.4	5
22	1.7	6
23	1.2	4
24	0.8	3
25	1	4
26	0.8	3
27	0.7	3
28	0.8	3
29	1.2	4
30	2.6	10
31	2.8	10
32	2.7	10

Note: Historical river elevations in Plates 1-5 are reported in the USED datum. Elevations reported above are using NGVD29 datum. Satistics are based on data from the Verona River Gage obtained from http://cdec.water.ca.gov/queryStation.html from the period 11/26/1995-11/26/2007.

KLEINFELDER

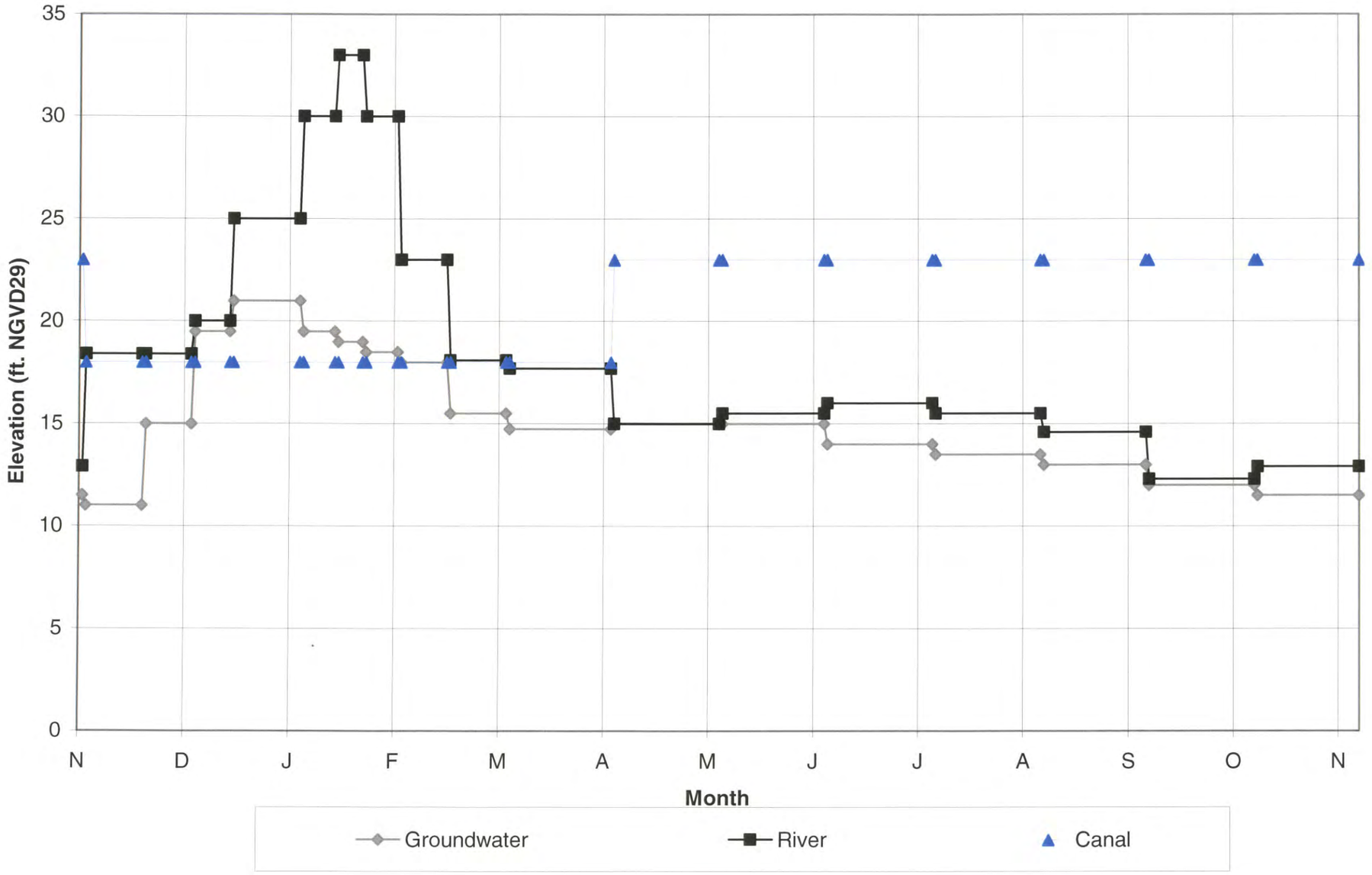
Graphic By: ESS
Project No. 72834

Date: 11/29/2007
File: App. Cutoff Wall

Evaluation of Cutoff Wall Impact on Groundwater Recharge
Sacramento River East Levee

PLATE 6

Groundwater, River, and Canal Hydrographs



KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 7
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

Transient Time Step Table

Time Step	Date	River Elevation	Ground Water Elevation	Canal Elevation	Time Step	Date	River Elevation	Ground Water Elevation	Canal Elevation
1	2/11	33	19	18	18	8/31	15.5	13.5	23
2	2/18	33	19	18	19	9/1	14.6	13	23
3	2/19	30	18.5	18	20	9/30	14.6	13	23
4	2/28	30	18.5	18	21	10/1	12.3	12	23
5	3/1	23	18	18	22	10/31	12.3	12	23
6	3/14	23	18	18	23	11/1	12.9	11.5	23
7	3/15	18.1	15.5	18	24	11/30	12.9	11.5	23
8	3/31	18.1	15.5	18	25	12/1	18.4	11	18
9	4/1	17.7	14.75	18	26	12/17	18.4	11	18
10	4/30	17.7	14.75	18	27	12/18	18.4	15	18
11	5/1	15	15	23	28	12/31	18.4	15	18
12	5/31	15	15	23	29	1/1	20	19.5	18
13	6/1	15.5	15	23	30	1/11	20	19.5	18
14	6/30	15.5	15	23	31	1/12	25	21	18
15	7/1	16	14	23	32	1/31	25	21	18
16	7/31	16	14	23	33	2/1	30	19.5	18
17	8/1	15.5	13.5	23	34	2/10	30	19.5	18

KLEINFELDER

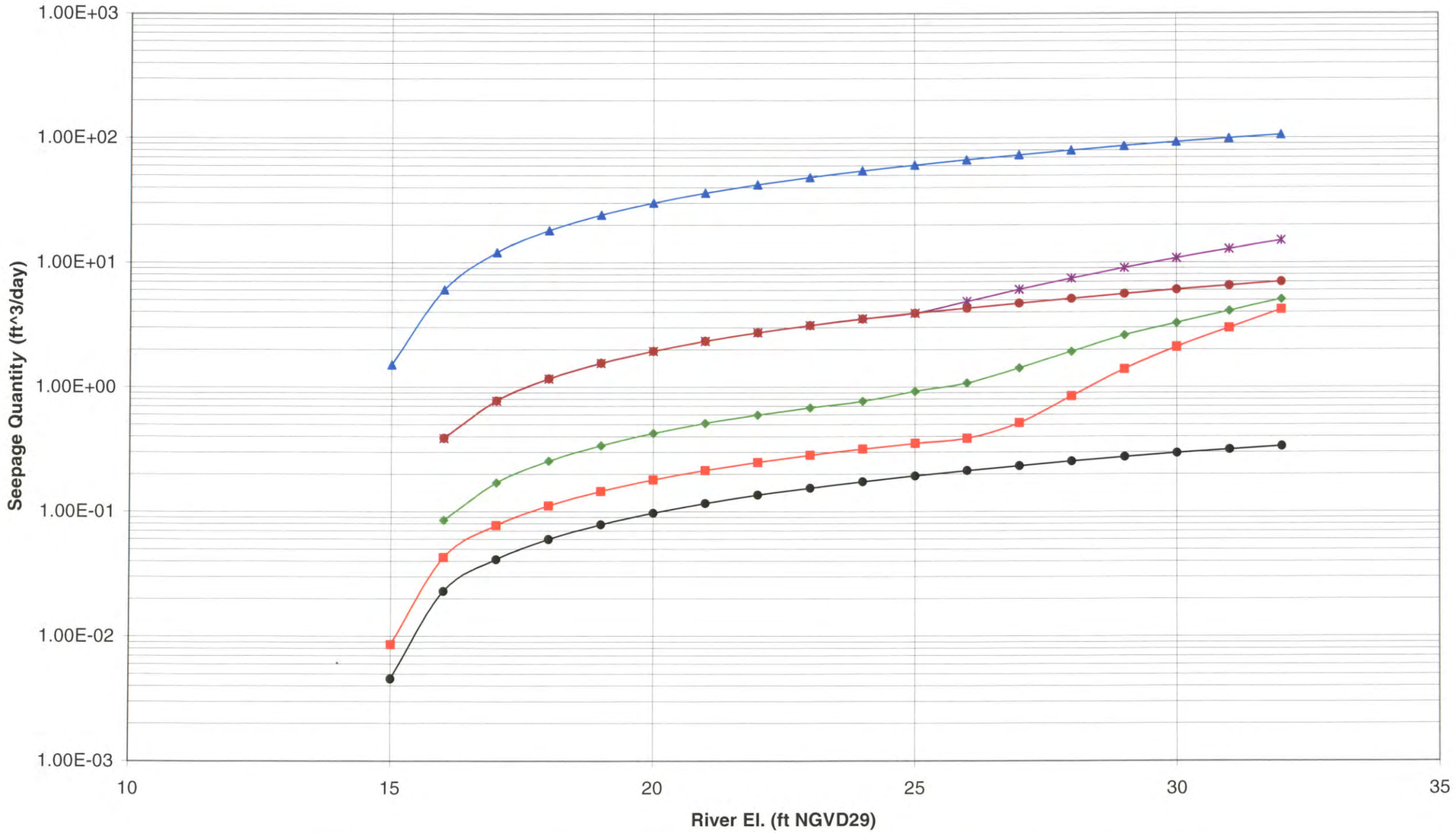
Graphic By: ESS
Project No. 72834

Date: 11/29/2007
File: App. Cutoff Wall

Evaluation of Cutoff Wall Impact on Groundwater Recharge
Sacramento River East Levee

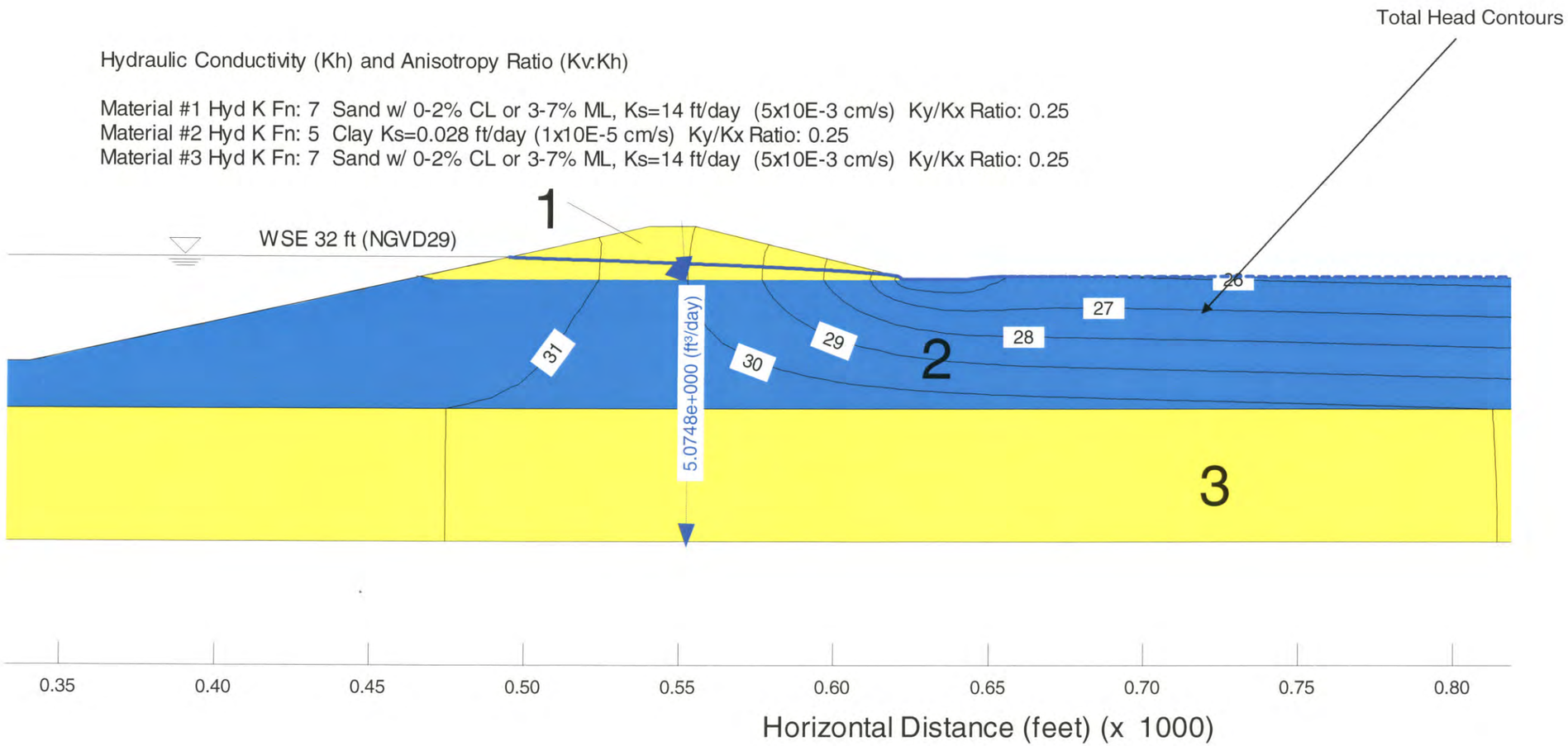
PLATE 8

Estimated Seepage vs River El.



KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 9
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

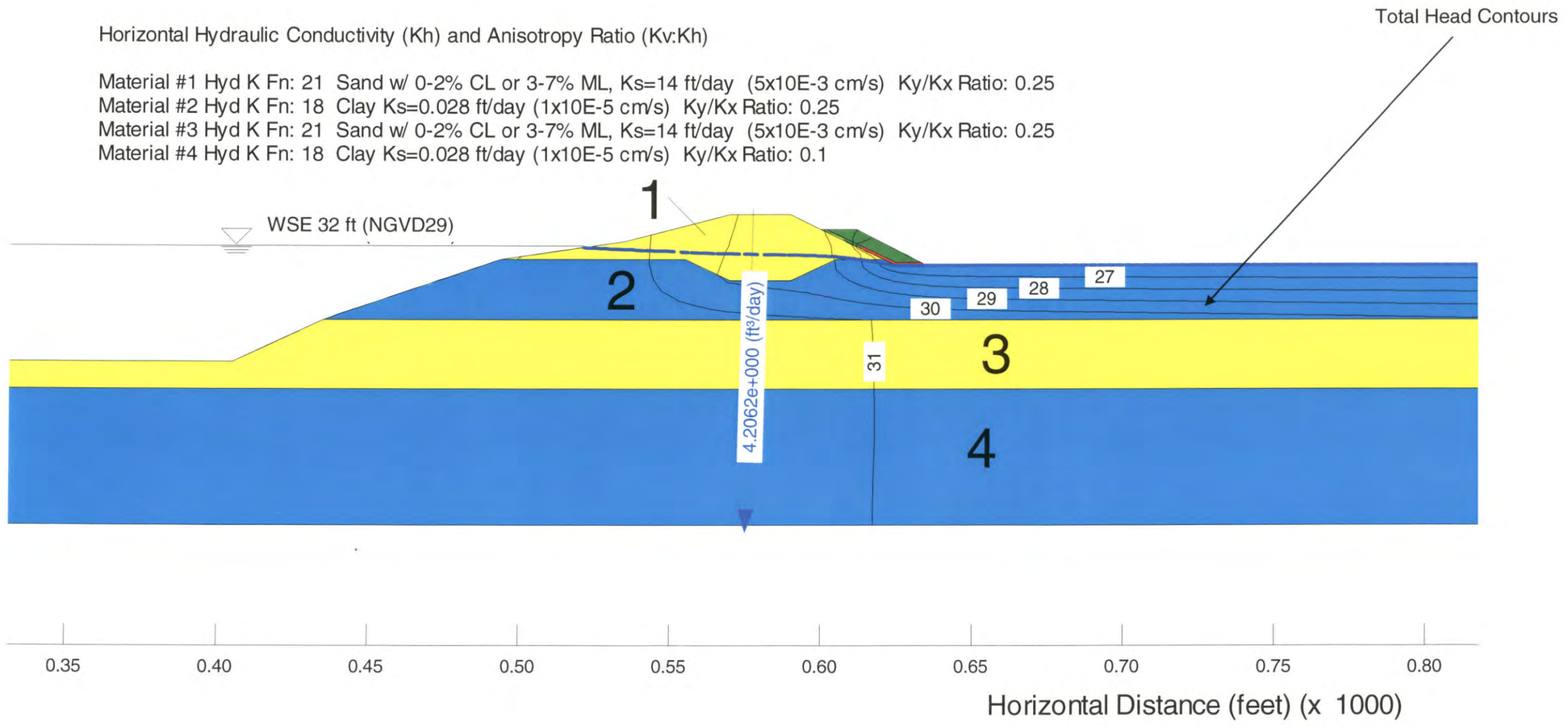
STA 27+00, steady-state analysis, existing conditions
Total Flow: 3.9 acre ft/yr/1000 ft



Note: Cutoff wall impact is determined using a simplified cross section at STA 70+00 and STA 353+00 in conjunction with STA 27+00 and STA 217+00 to best represent the actual conditions present. El. 15 through El. 32 were used to run our model.

KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 10
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

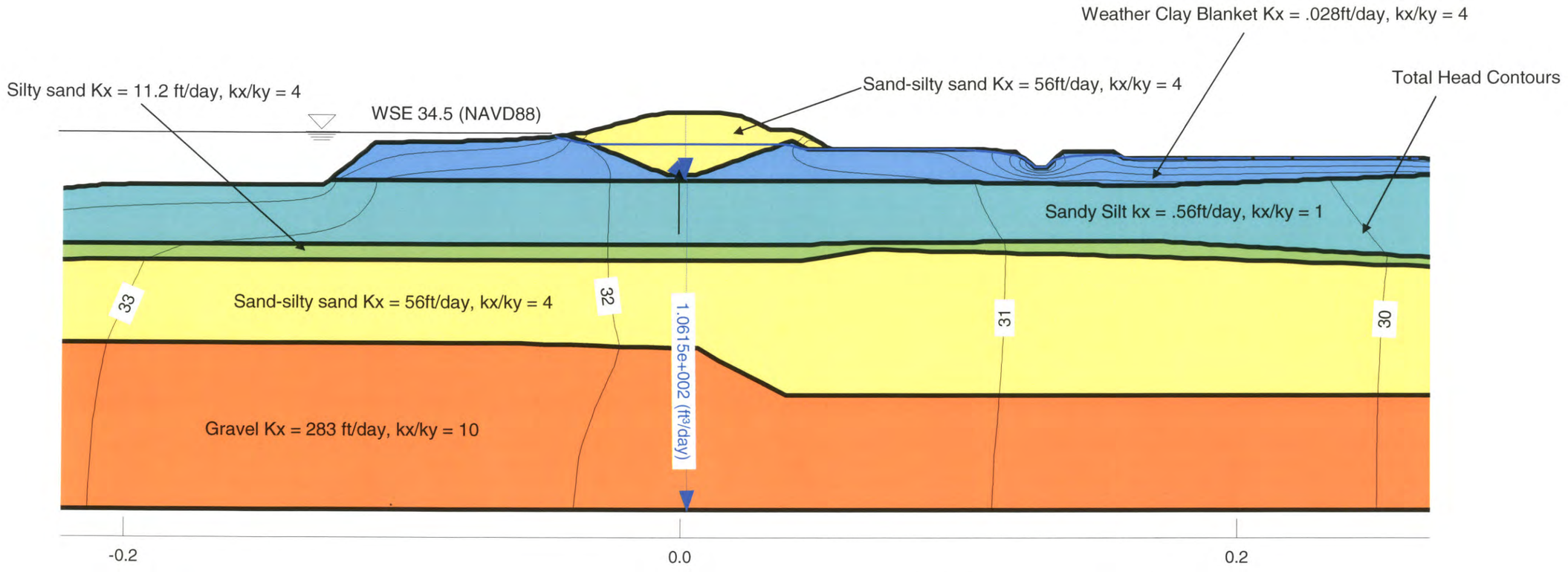
STA 70+00, steady-state analysis, existing conditions
Total Flow: 2.6 acre ft/yr/1000 ft



Note: Cutoff wall impact is determined using a simplified cross section at STA 70+00 and STA 353+00 in conjunction with STA 27+00 and STA 217+00 to best represent the actual conditions present. El. 15 through El. 32 were used to run our model.

KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 11
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

STA 217+00, steady-state analysis, existing conditions
Total Flow: 129 acre ft/yr/1000 ft
Ref: URS model 217+00 from Sac Levees report 2007



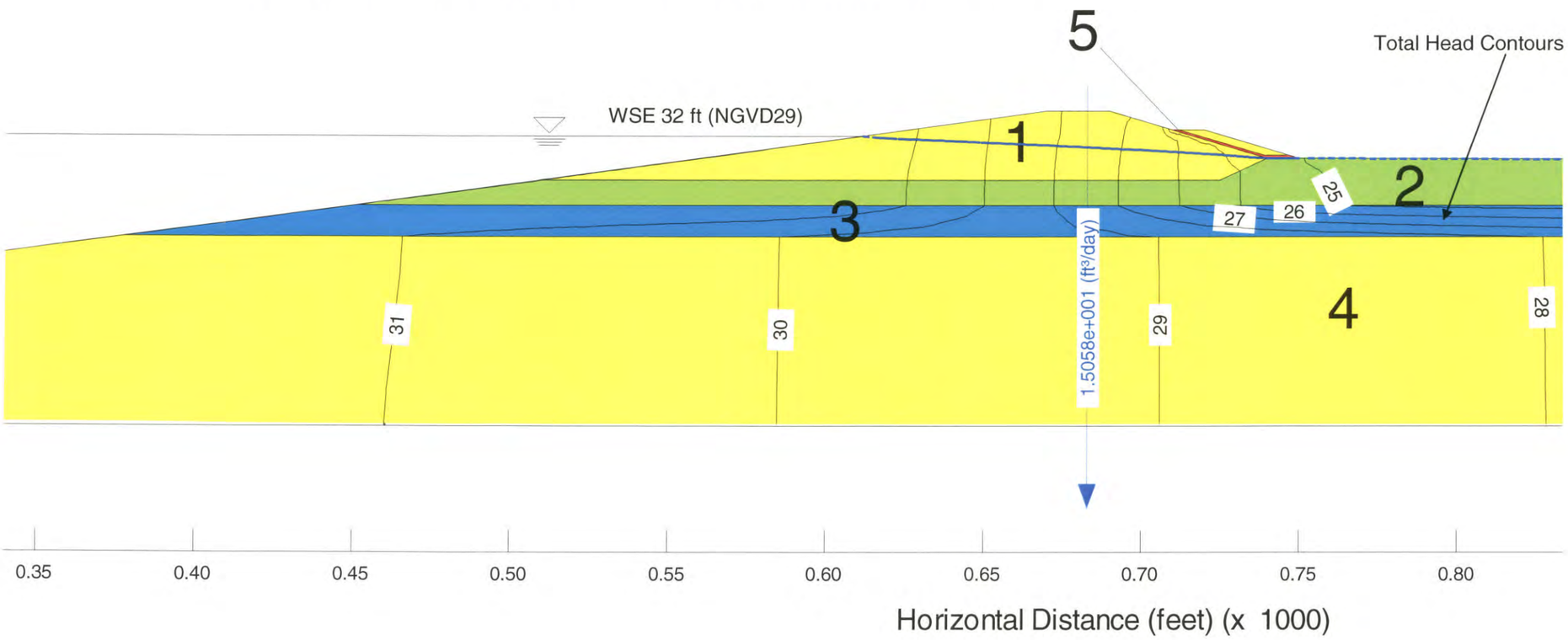
Note: Cutoff wall impact is determined using a simplified cross section at STA 70+00 and STA 353+00 in conjunction with STA 27+00 and STA 217+00 to best represent the actual conditions present. El. 15 through El. 32 were used to run our model.

KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 12
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

STA 353+00, steady-state analysis, existing conditions
Total Flow: 13.4 acre ft/yr/1000 ft

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 9 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 7 Silt Ks=0.56 ft/day (2x10E-4 cm/s) Ky/Kx Ratio: 1
Material #3 Hyd K Fn: 5 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #4 Hyd K Fn: 9 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #5 Hyd K Fn: 8 Drainage Rock Ks=2800 ft/day (10 cm/s) Ky/Kx Ratio: 1



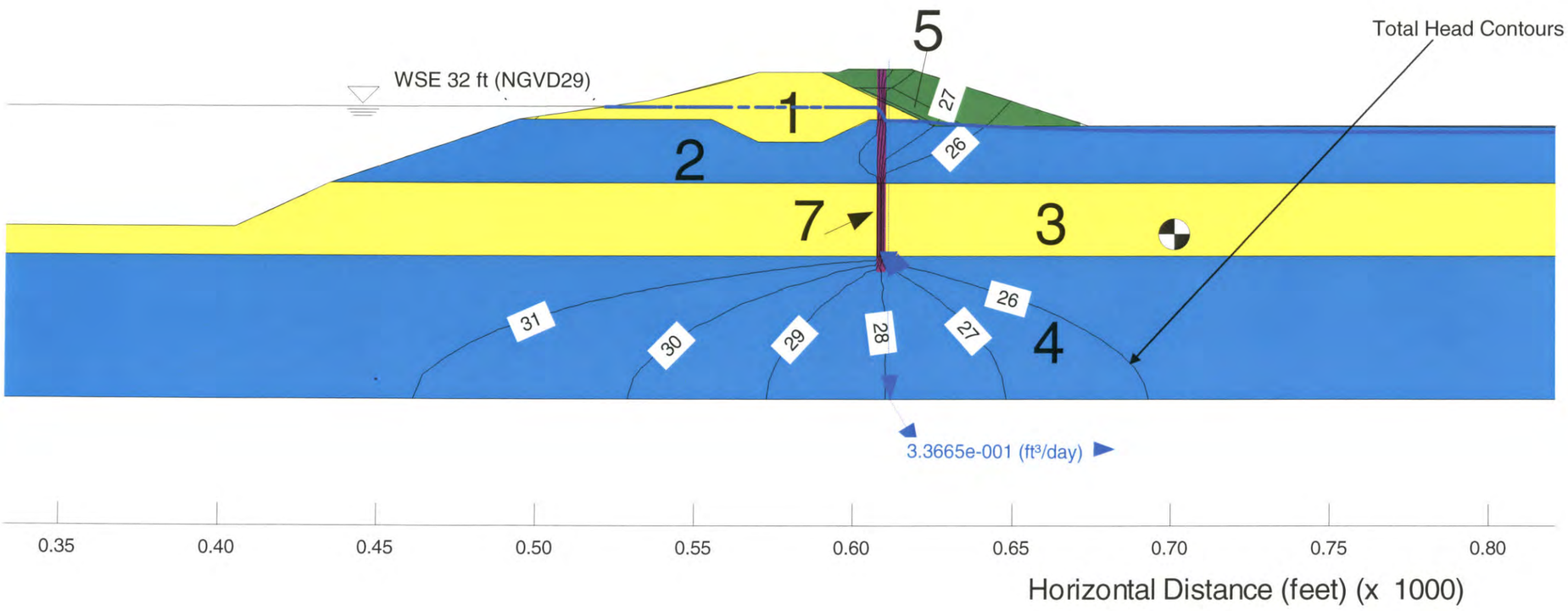
Note: Cutoff wall impact is determined using a simplified cross section at STA 70+00 and STA 353+00 in conjunction with STA 27+00 and STA 217+00 to best represent the actual conditions present. El. 15 through El. 32 were used to run our model.

KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 13
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

STA 70+00, steady-state analysis, adjacent levee, with wall
Total Flow: 0.4 acre ft/yr/1000 ft

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 10 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 7 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #3 Hyd K Fn: 10 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #4 Hyd K Fn: 7 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #5 Hyd K Fn: 8 Silt Ks= 0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #7 Hyd K Fn: 11 Cutoff wall Ks = 0.0028ft/day (1.0x10-6 cm/sec) Ky/Kx Ratio: 1



Note: Cutoff wall impact is determined using a simplified cross section at STA 70+00 and STA 353+00 in conjunction with STA 27+00 and STA 217+00 to best represent the actual conditions present. El. 15 through El. 32 were used to run our model.

KLEINFELDER

Graphic By: ESS	Date: 11/29/2007
Project No. 72834	File: App. Cutoff Wall

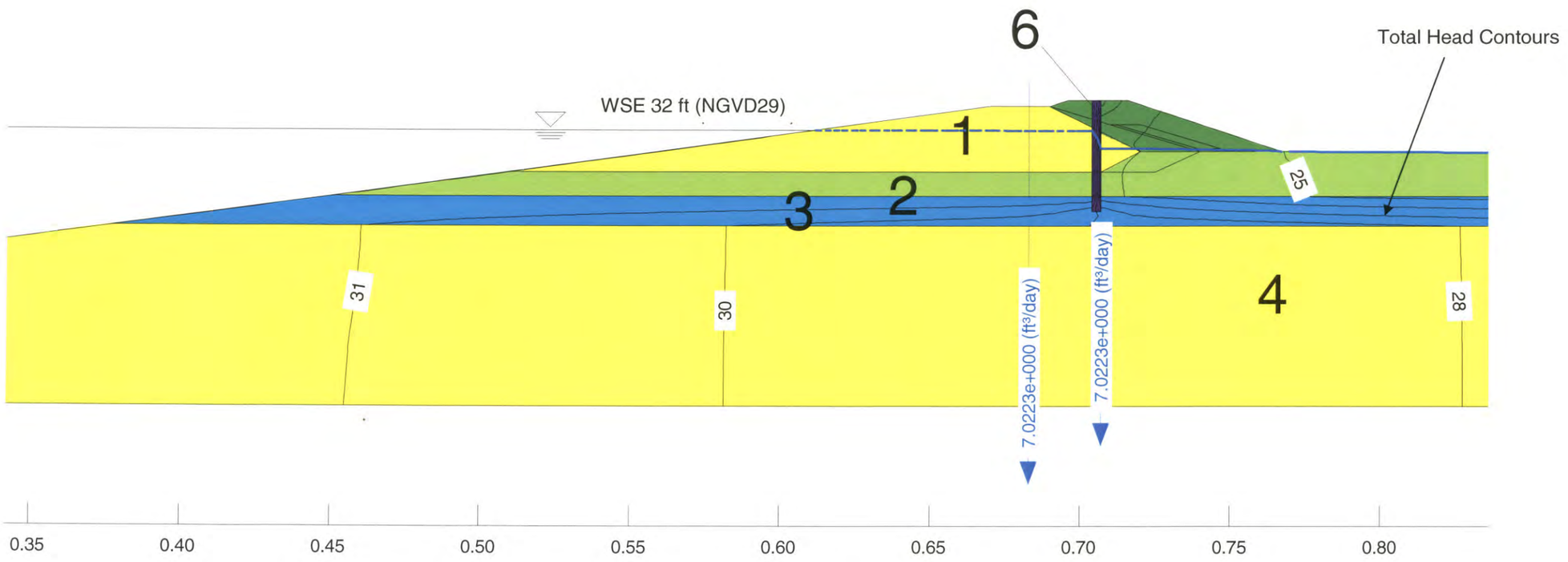
Evaluation of Cutoff Wall Impact on Groundwater Recharge
Sacramento River East Levee

PLATE 14

STA 353+00, steady-state analysis, adjacent levee, with wall
Total Flow: 8.4 acre ft/yr/1000 ft

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

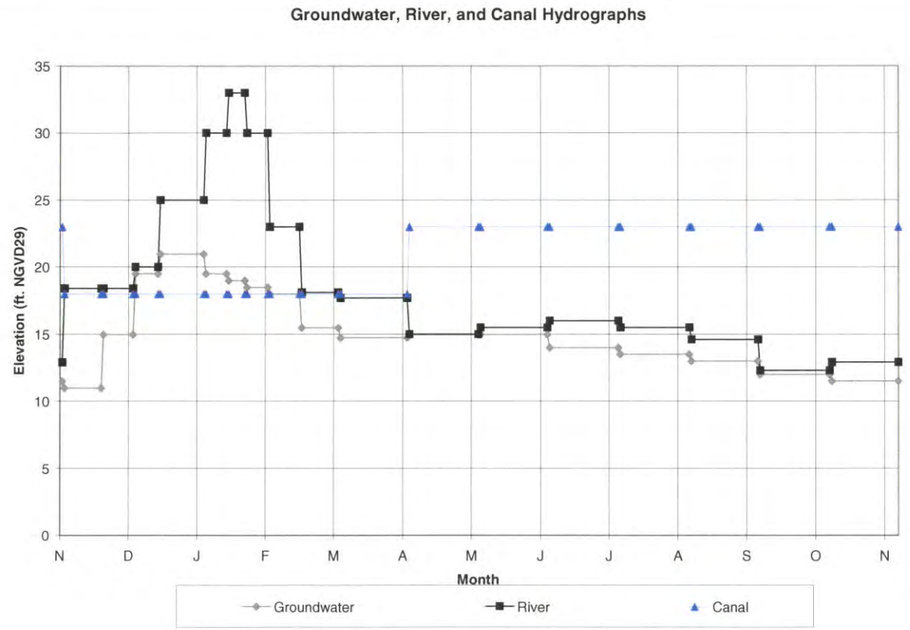
Material #1 Hyd K Fn: 9 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 7 Silt Ks=0.56 ft/day (2x10E-4 cm/s) Ky/Kx Ratio: 1
Material #3 Hyd K Fn: 5 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #4 Hyd K Fn: 9 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #6 Hyd K Fn: 10 Cutoff wall Ks = 0.0028 ft/day (1.0x10-6 cm/sec) Ky/Kx Ratio: 1

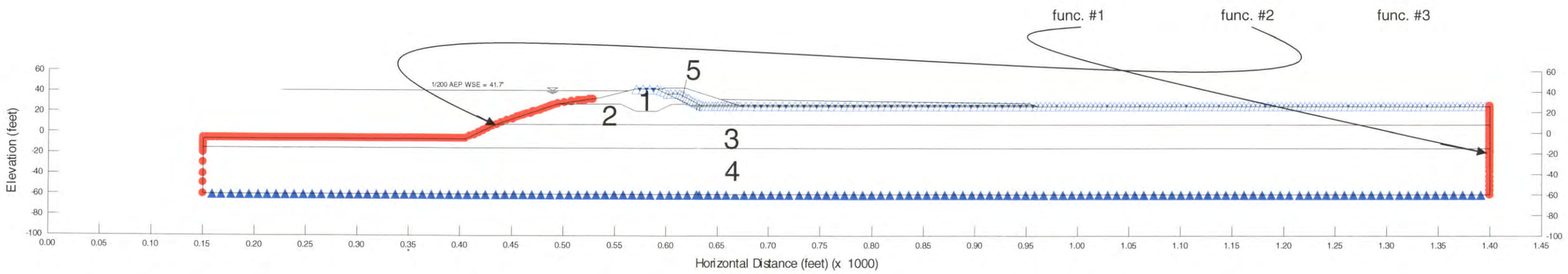


Note: Cutoff wall impact is determined using a simplified cross section at STA 70+00 and STA 353+00 in conjunction with STA 27+00 and STA 217+00 to best represent the actual conditions present. El. 15 through El. 32 were used to run our model.

KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 15
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

STA 70+00, boundary conditions
Transient analysis, existing conditions



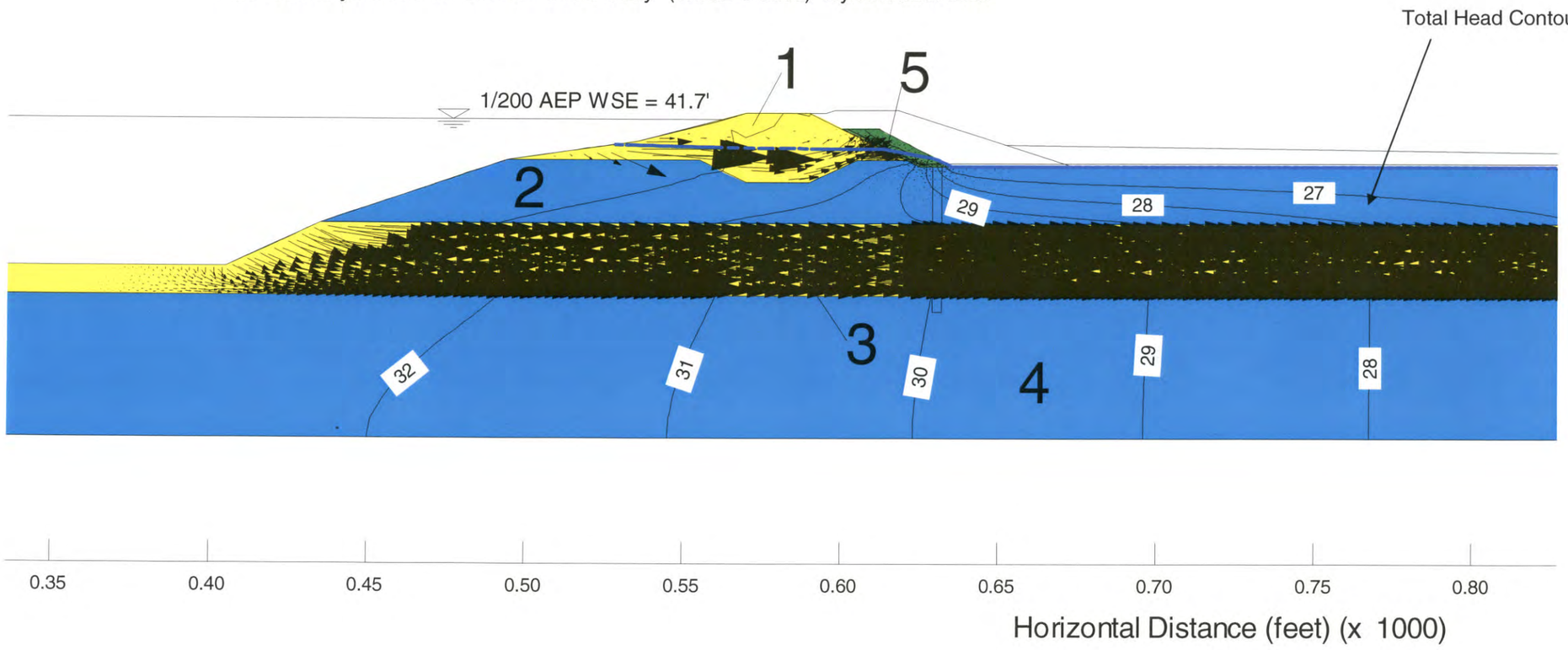


KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 16
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

STA 70+00, transient analysis, existing conditions
Time Step: 2 (Winter)

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #3 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #4 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #5 Hyd K Fn: 19 Silt Ks= 0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25

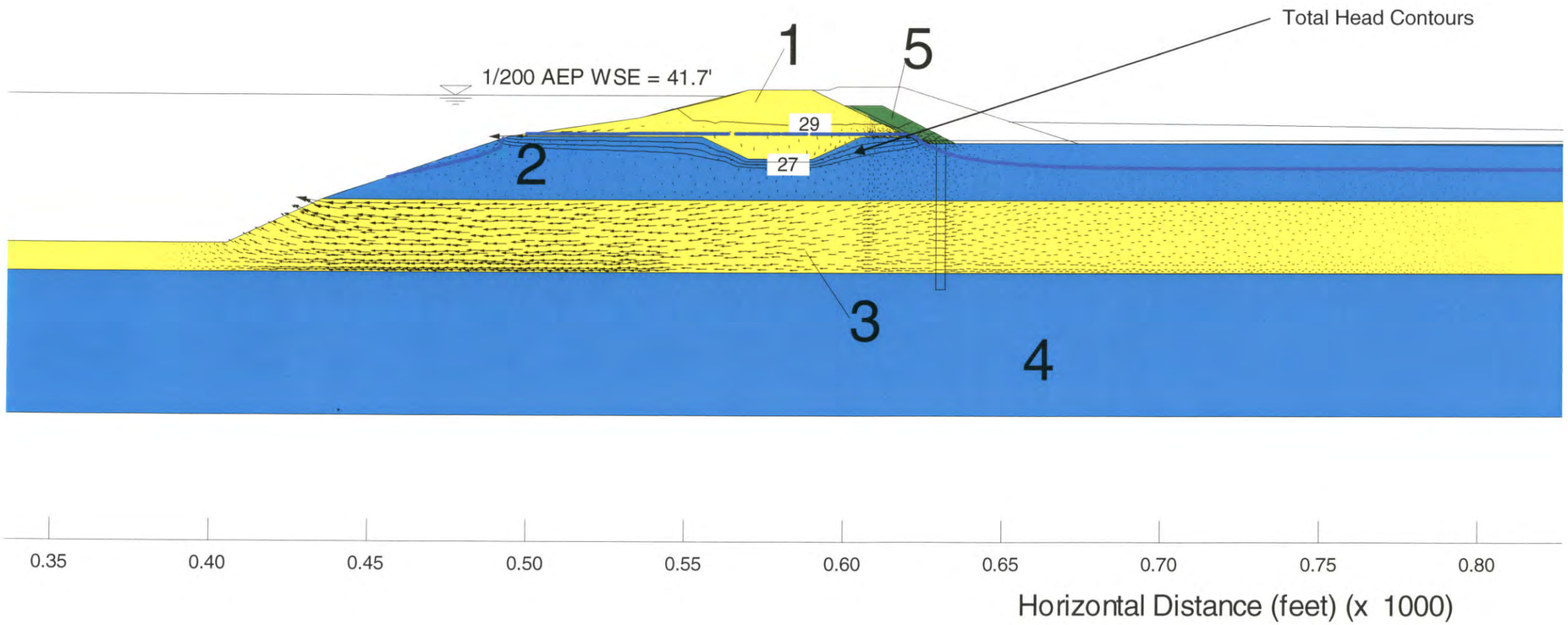


KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 17
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

STA 70+00, transient analysis, existing conditions
Time Step: 11 (Summer)

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #3 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #4 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #5 Hyd K Fn: 19 Silt Ks= 0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25

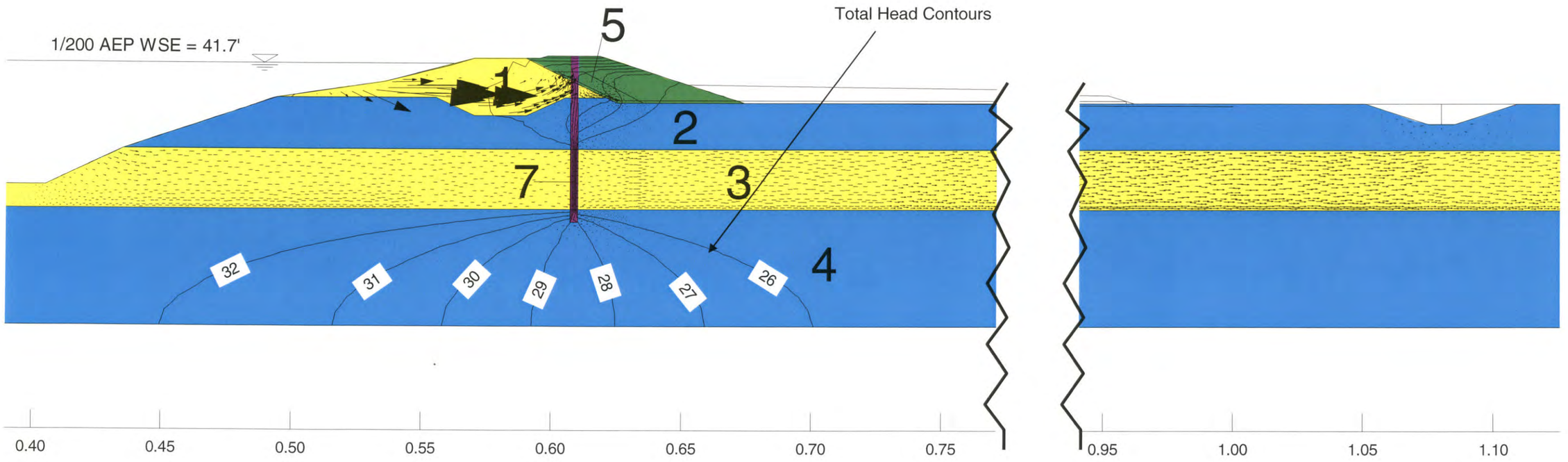


KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 18
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

STA 70+00, transient analysis with cutoff wall
Time Step: 2 (Winter)

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #3 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #4 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #5 Hyd K Fn: 19 Silt Ks= 0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #7 Hyd K Fn: 22 Cutoff wall Ks = 0.0028 ft/day (1.0x10-6 cm/sec) Ky/Kx Ratio: 1

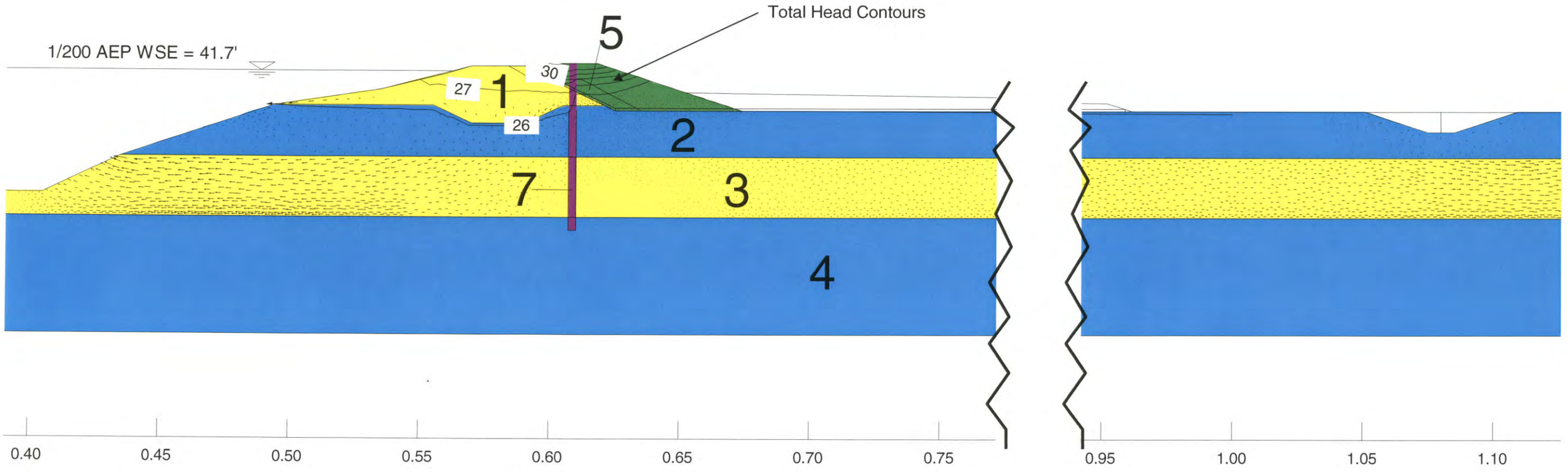


KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 19
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

STA 70+00, transient analysis with cutoff wall
Time Step: 16 (Summer)

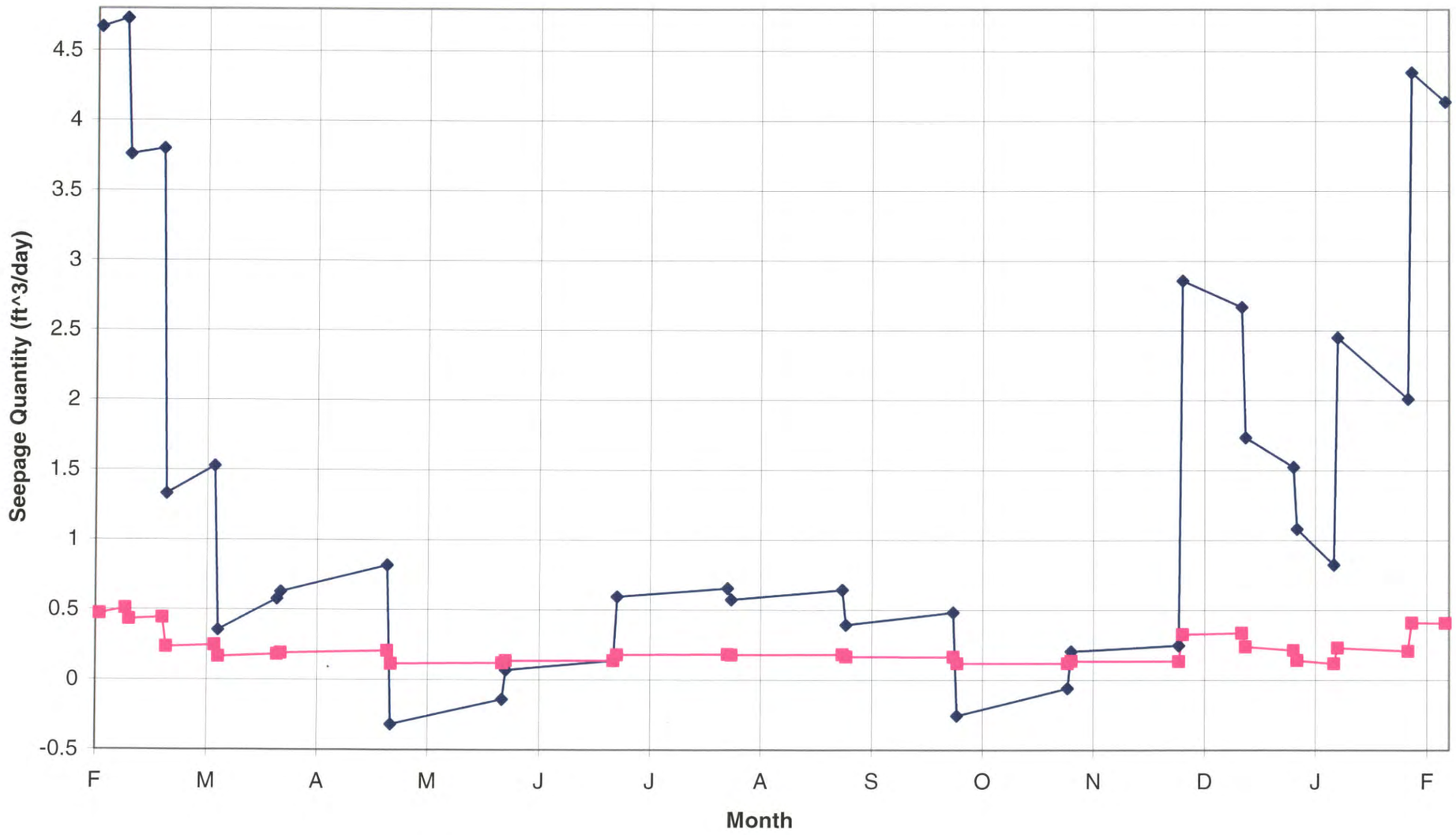
Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #3 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #4 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #5 Hyd K Fn: 19 Silt Ks= 0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #7 Hyd K Fn: 22 Cutoff wall Ks = 0.0028 ft/day (1.0x10-6 cm/sec) Ky/Kx Ratio: 1



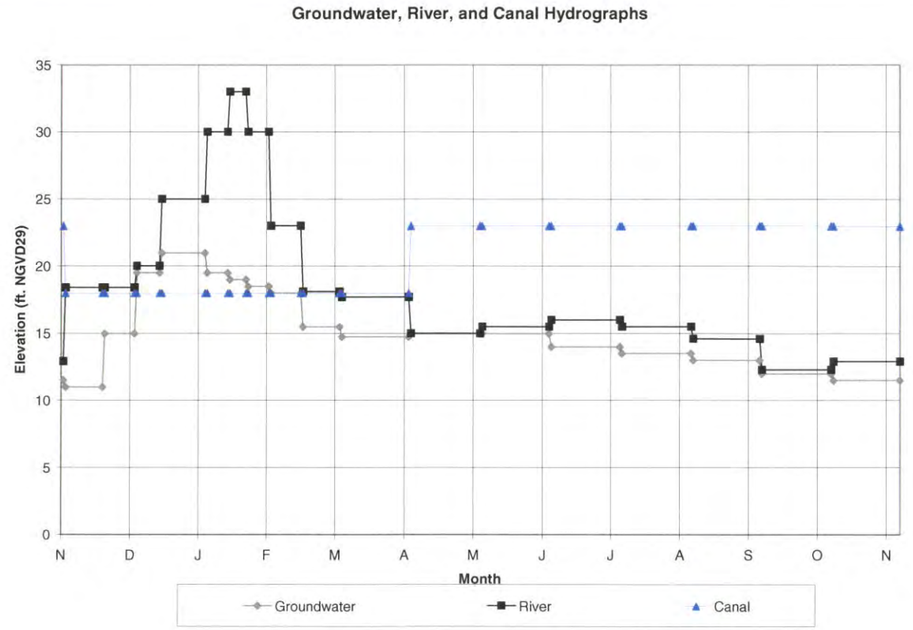
KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 20
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

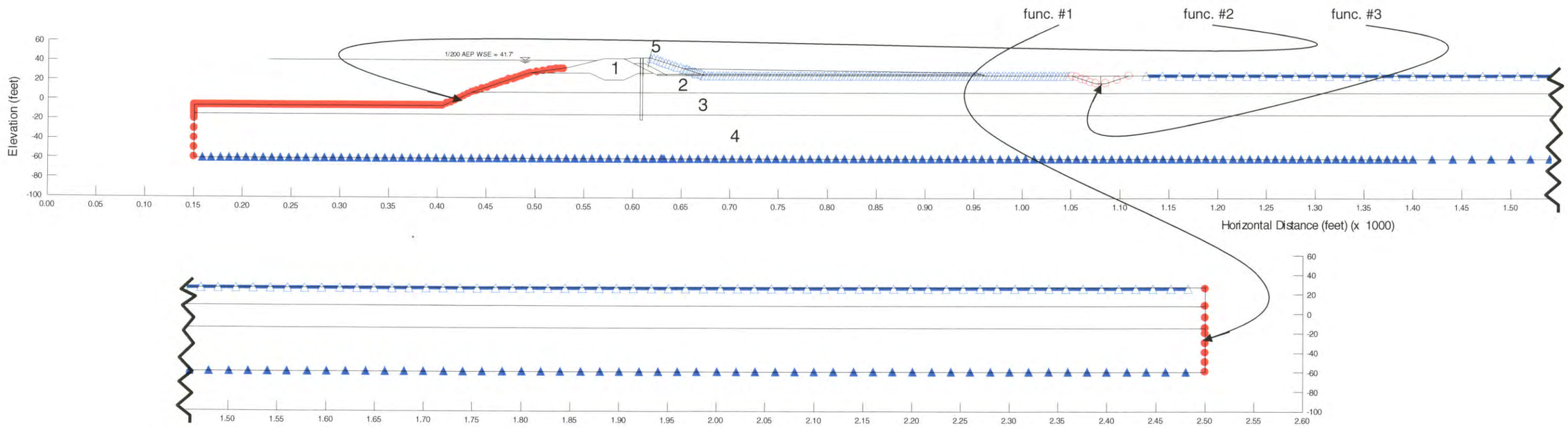
Flux Directly Landside of Cutoff Wall



KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 21
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

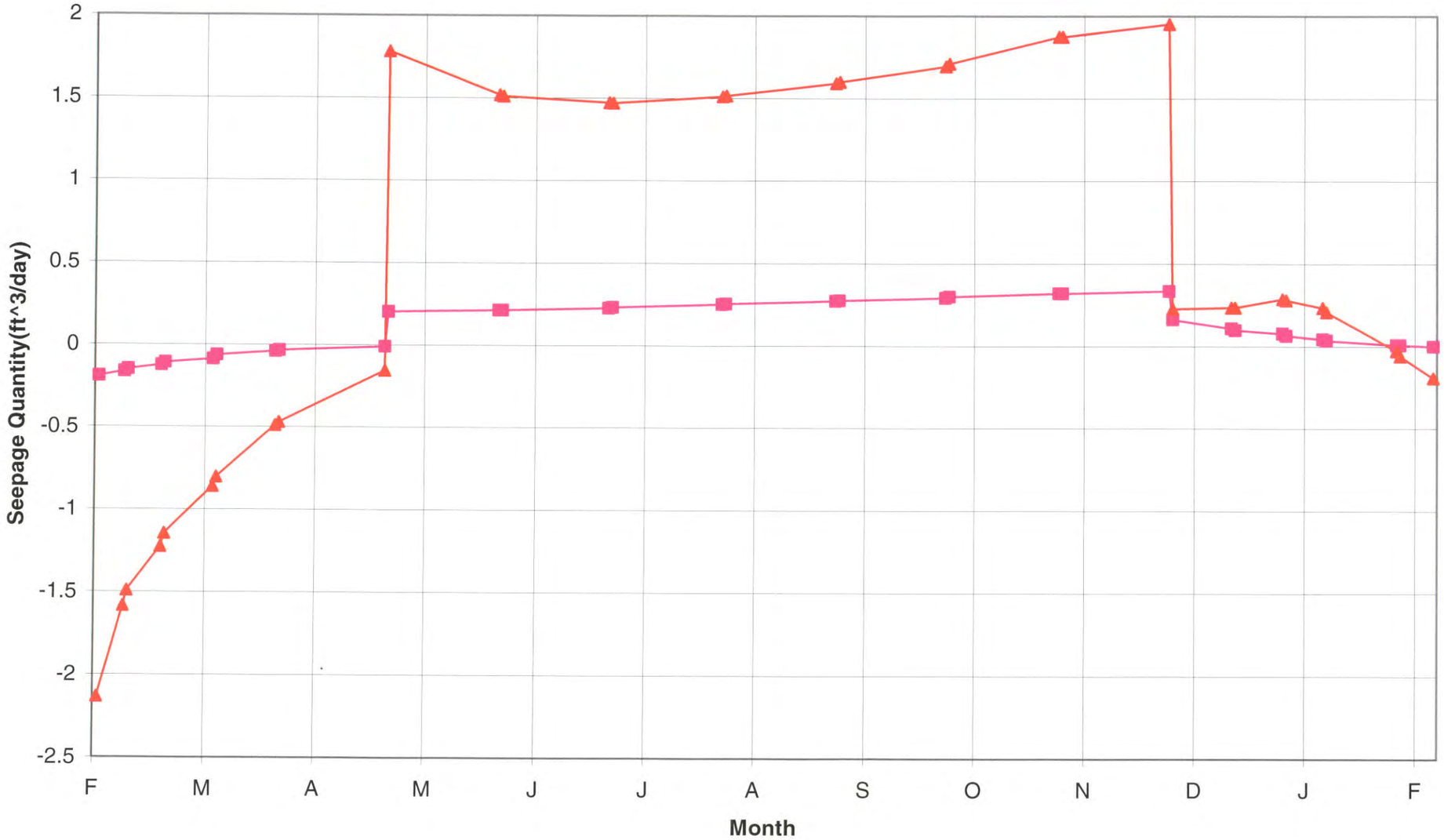
STA 70+00, boundary conditions, Transient analysis with cutoff wall and canal





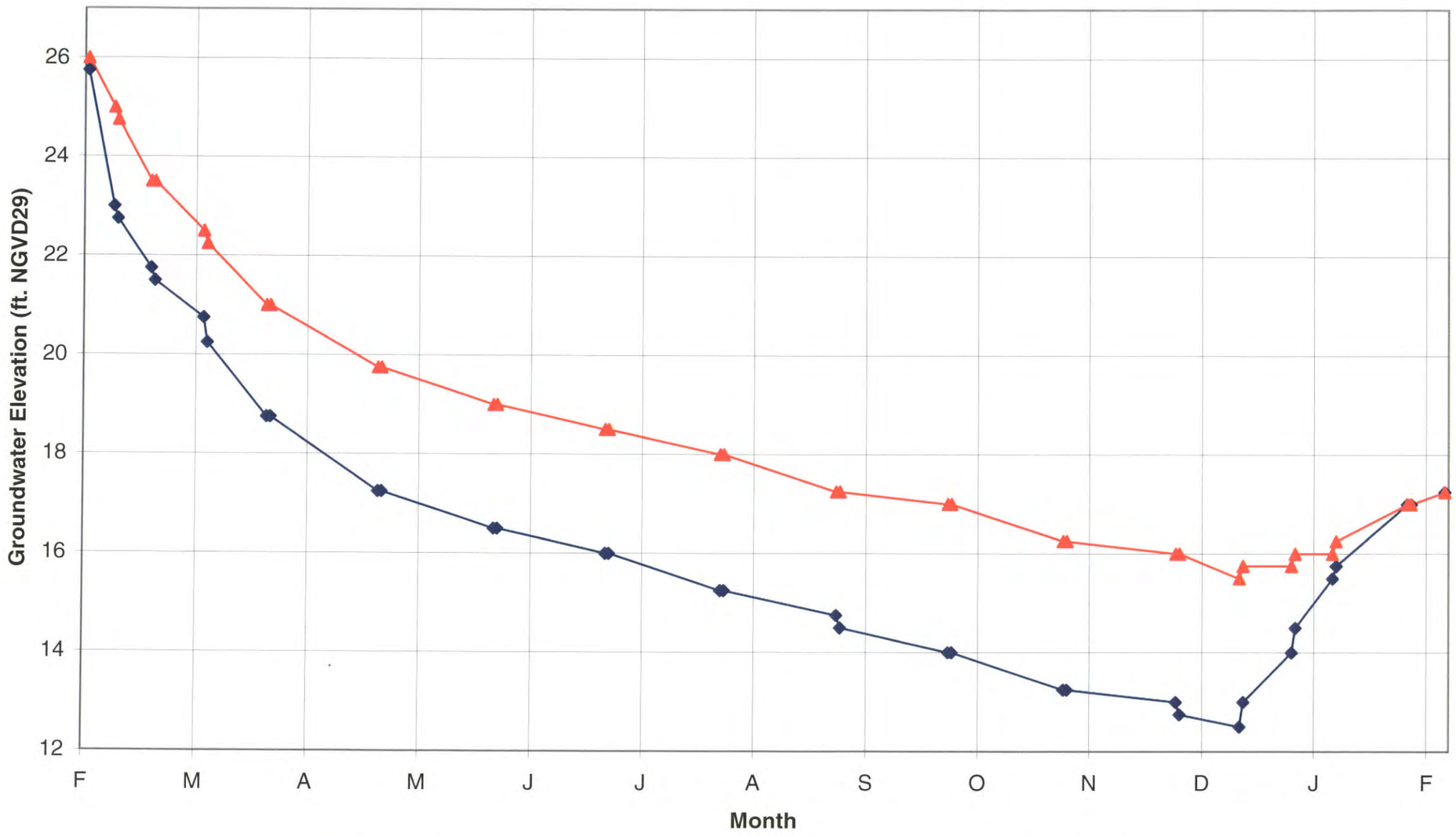
KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 22
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

Estimated Canal Seepage Loss



KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 23
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

Estimated Groundwater Table Elevation

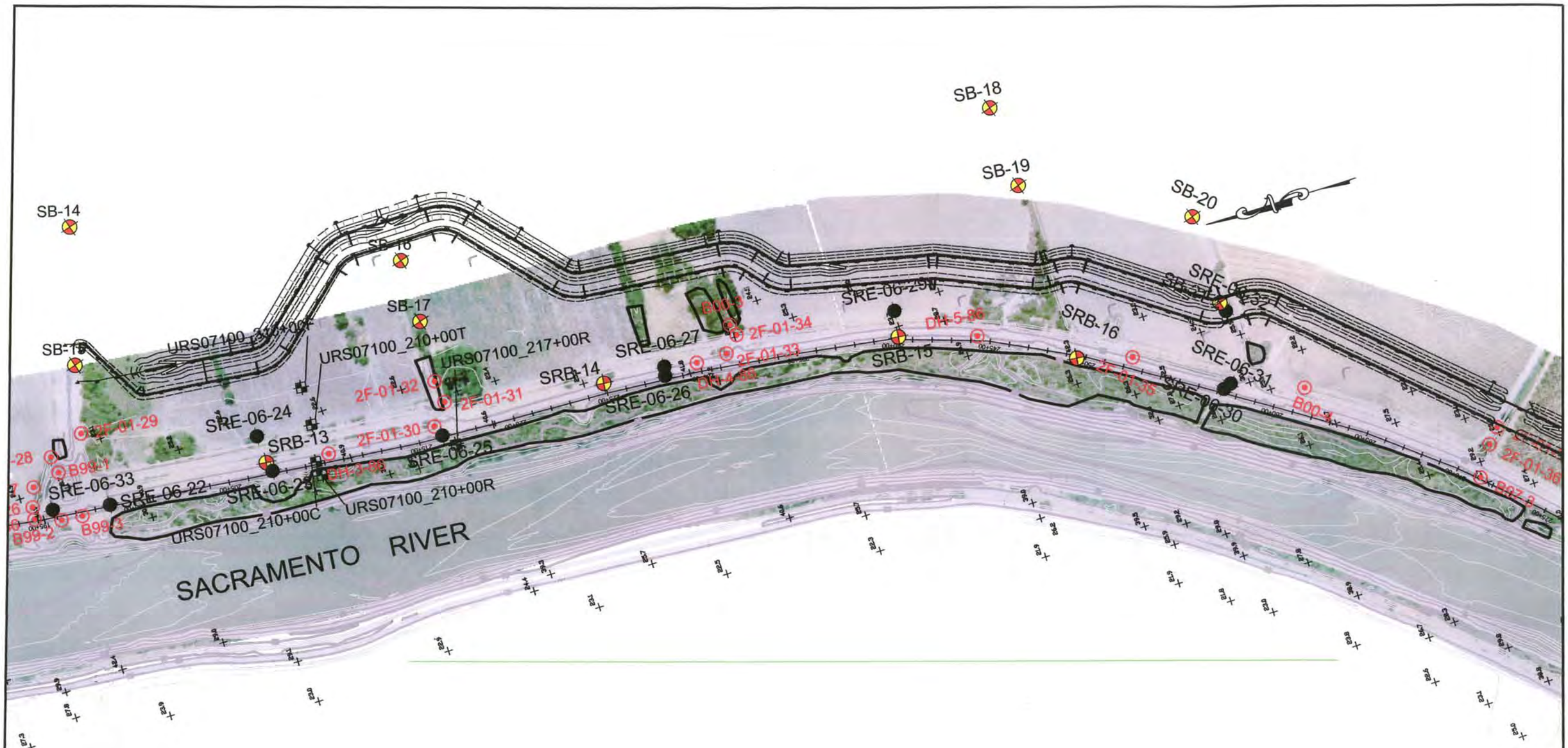


Note: Groundwater table elevation estimated at the locations halfway between the existing levee and the canal (~500 ft from levee toe)

KLEINFELDER		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 24
Graphic By: ESS Project No. 72834	Date: 11/29/2007 File: App. Cutoff Wall		

ATTACHMENT C

PROPOSED CANAL PLAN



LEGEND

- Approximate Exploration Location (Current Study)
- Approximate URS Exploration (2007)
- Approximate Exploration Location (KA 2006)
- Approximate Exploration Location (KA 2005)
- Approximate Exploration Location (Previous Studies)

500 0 250 500 1,000

APPROXIMATE SCALE: 1 inch = 500 ft.

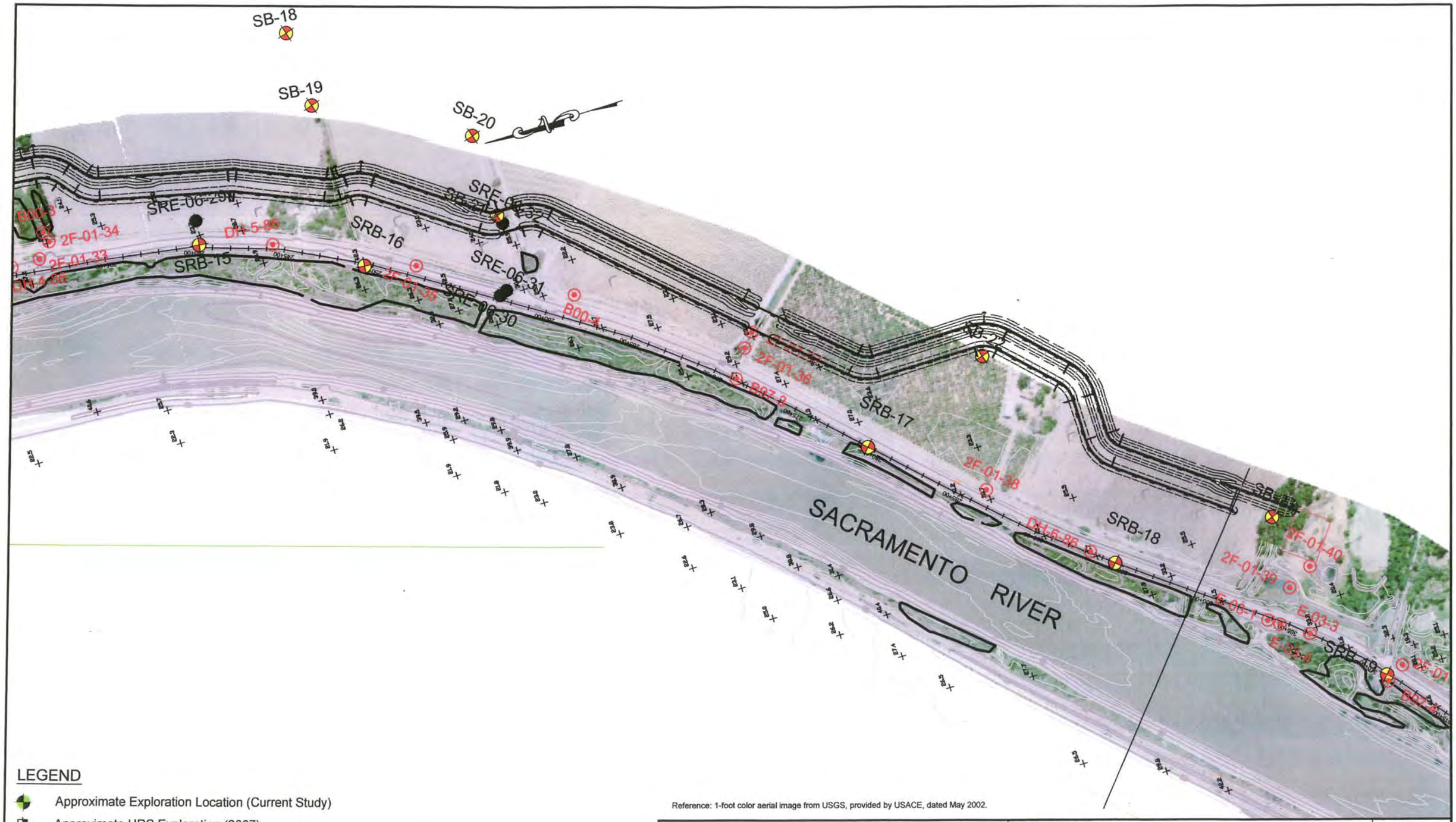
Reference: 1-foot color aerial image from USGS, provided by USACE, dated May 2002.

KLEINFELDER

Drawn By: D. ROSS	Date: 10/21/2005
Project No.: 58824/PSRE	Filename: 58824SAC2.dwg

BORING LOCATION MAP
SACRAMENTO RIVER
EAST LEVEE
NATOMAS BASIN EVALUATION
SACRAMENTO AND SUTTER COUNTIES, CALIFORNIA

PLATE 1



LEGEND

- Approximate Exploration Location (Current Study)
- Approximate URS Exploration (2007)
- Approximate Exploration Location (KA 2006)
- Approximate Exploration Location (KA 2005)
- Approximate Exploration Location (Previous Studies)

500 0 250 500 1,000

APPROXIMATE SCALE: 1 inch = 500 ft.

Reference: 1-foot color aerial image from USGS, provided by USACE, dated May 2002.

KLEINFELDER

Drawn By: D. ROSS | Date: 10/21/2005
Project No.: 58824/PSRE | Filename: 58824SAC2.dwg

BORING LOCATION MAP
SACRAMENTO RIVER
EAST LEVEE
NATOMAS BASIN EVALUATION
SACRAMENTO AND SUTTER COUNTIES, CALIFORNIA

PLATE 2

APPENDIX C

Biological Resources

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

July 24, 2008

Regulatory Division (SPK-2007-00211)

Sarah Bennett
EDAW, Inc.
2022 J Street
Sacramento, California 95811

Dear Ms. Bennett:

We are responding to your request, on behalf of the Sacramento Area Flood Control Agency, for an approved jurisdictional determination for a portion of the Natomas Levee Improvement Program Landside Improvements Project (NLIP) site. This approximately 5,283-acre site is located in the Natomas Basin in Northern Sacramento and Southern Sutter Counties, California.

Based on available information, we concur with the estimate of waters of the United States, as depicted on your June 4, 2008, revised Maps 1-19. Approximately 212.3 acres of waters of the United States, including wetlands, are present within the survey area. These waters are regulated under Section 404 of the Clean Water Act, since they are tributary and adjacent to navigable waters of the United States, in particular the Sacramento River.

The 7.04 acres of features identified as Field Ditches on the above drawings appear to have been constructed wholly in and drain only uplands. As such, we do not consider these to be waters of the United States. This disclaimer of jurisdiction is only for Section 404 of the Federal Clean Water Act. Other Federal, State, and local laws may apply to activities in these features. In particular, authorization from the California State Water Resources Control Board and/or the U.S. Fish and Wildlife Service may be necessary.

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. This letter contains an approved jurisdictional determination for your subject site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331.

A Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form is enclosed. If you request to appeal this determination you must submit a completed RFA form to the South Pacific Division Office at the following address: Administrative Appeal Review Officer, Army Corps of Engineers, South Pacific Division, CESPD-PDS-O, 1455 Market Street, San Francisco, California 94103-1399, Telephone: 415-503-6574, FAX: 415-503-6646.

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been

received by the Division Office within 60 days of the NAP. Should you decide to submit an RFA form, it must be received at the above address by 60 days from the date of this letter. It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this letter.

You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

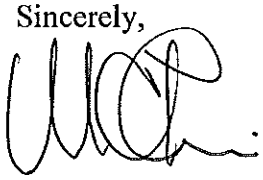
This determination has been conducted to identify the limits of Corps of Engineers' Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

The extent of waters on other portions of the approximately 9,661-acre project site was separately verified under our identification numbers 200300776, 200600332, and 200600795. Based on available information, there are a total of approximately 610 acres of waters of the United States, in the overall NLIP area. This total does not include the Sacramento River itself which is outside of this project site.

We appreciate your feedback. At your earliest convenience, please complete our customer survey at *http://www.spk.usace.army.mil/customer_survey.html*. Your passcode is "conigliaro".

Please refer to identification number SPK-2007-00211 in any correspondence concerning this project. If you have any questions, please contact Mike Finan at our California North Branch , 1325 J Street, Room 1480, Sacramento California 95814-2922, email *michael.c.finan@usace.army.mil*, or telephone (916) 557-5324. You may also use our website: *www.spk.usace.army.mil/regulatory.html*.

Sincerely,



Mike Finan
Project Manager, Wetland Specialist

Enclosure(s)

Copy furnished without enclosure(s):

John Bassett, Sacramento Area Flood Control Agency, 1007 7th Street, 7th Floor, Sacramento, California 95814

William Marshall, Central Valley Regional Water Quality Control Board, 11020 Sun Center Drive, #200, Rancho Cordova, California 95670-6114

Ken Sanchez, U.S. Fish and Wildlife Service, Endangered Species Division, 2800 Cottage Way, W-2605, Sacramento, California 95825

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

RECEIVED MAY 2 3 2008

DEPARTMENT OF THE ARMY PERMIT

Permittee: Grant Joint Union High School District

Permit Number: SPK-2005-01087

Issuing Office: U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 "J" Street
Sacramento, California 95814-2922

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below. A notice of appeal options is enclosed.

Project Description:

To place fill material into 1.8734 acres of waters of the United States, including 0.9 acre of stock pond, 0.22 acre of vernal pools, 0.72 acre of seasonal wetland swales and 0.03 acre of jurisdictional drainage ditch for the construction of a joint middle/high school, and associated infrastructure.

All work is to be completed in accordance with the attached plan(s).

Project Location:

South of Elkhorn Boulevard and north of Del Paso Road in Section 36, Township 10 North, Range 4 East, in Sacramento County, California, USGS Topographic Quadrangle Rio Linda; Latitude 38.6770° North, Longitude 121.4903° West.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **May 23, 2013**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal

and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. To mitigate for the loss of 1.8734 acres of waters of the United States, including 0.9 acre of stock pond, 0.22 acre of vernal pools, 0.72 acre of seasonal wetland swales and 0.03 acre of jurisdictional drainage ditch, you shall purchase 3.9 acre vernal pool creation and 0.2 seasonal wetland creation credits at a Corps approved wetland mitigation bank. Evidence of this purchase shall be provided to this office prior to proceeding with any activity otherwise authorized by this permit. A list of approved mitigation banks has been included for your reference.

2. This Corps permit does not authorize you to take an endangered species, in particular the vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp (*Lepidurus packardi*), or designated critical habitat. In order to legally take a listed species, you must have separate authorization under the Endangered Species Act (e.g., an Endangered Species Act Section 10 permit, or a Biological Opinion under Endangered Species Act Section 7, with "incidental take" provisions with which you must comply). The enclosed Fish and Wildlife Service Biological Opinion, (Number 1-1-0+-F-0294), dated July 25, 2007, and (Number 1-1-07-F-0140, dated April 5, 2007, and the December 18, 2007 revision, contains mandatory terms and conditions to implement and reasonable and prudent measures that are associated with "incidental take" that is also specified in the Biological Opinion. Your authorization under this Corps permit is conditional upon your compliance with all of the mandatory terms and conditions associated with incidental take of the attached Biological Opinion, which terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with the incidental take statement in the Biological Opinion, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Corps permit. The Fish and Wildlife Service is the appropriate authority to determine compliance with the terms and conditions of its Biological Opinion, and with the Endangered Species Act. You must comply with all conditions of this Biological Opinion.

3. To document pre and post-project construction conditions, you shall submit pre-construction photos of the project site prior to project implementation and post-construction photos of the project site within 30 days after completion of authorized activities.

4. You must allow representatives from the Corps of Engineers to inspect the authorized activity and any mitigation, preservation, or avoidance areas at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

5. You shall employ construction best management practices (BMPs) onsite to prevent degradation to on-site and off-site waters of the U.S. You shall submit photodocumentation of your BMPs to our office within 30 days of commencement of construction. Photos may be submitted electronically to regulatory-info@usace.army.mil.

6. You shall stabilize and protect against erosion any unstable fills in or adjacent to wetlands and other waters of the U.S. by using appropriate erosion controls such as the use of matting, seeding, or other effective methods. The erosion controls shall remain in place until all exposed areas are permanently stabilized.

7. You shall clearly identify the project limits in the field by using survey markers and/or construction fencing, prior to beginning any construction activities to ensure waters of the United States outside of the project footprint are not impacted. Identification of these areas shall be maintained until construction is complete. No heavy equipment or work is permitted in waters of the United States beyond those authorized through this permit.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal projects.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data. The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant.

Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Permittee

May 23, 2008
Date

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Kathleen A. Dadey, PhD, Chief,
Sacramento Office
(For the District Engineer)

May 23, 2008
Date

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

Transferee

Date

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

June 29, 2005

Regulatory Branch (200300776)

Greg Rowe
Sacramento County Airport System
6900 Airport Boulevard
Sacramento, California 95837-1109

Dear Mr. Rowe:

We are responding to your consultant's request for an approved jurisdictional determination for the Sacramento Airport Land Management area. This approximately 2,838-acre site is located on or near the Sacramento River, in Sections 19, 30 & 31, Township 10 North, Range 4 East, and Sections 24, 25 & 36, Township 10 North, Range 3 East, M.D.B.&M., approximate Latitude 38° 41′ 19.7″ & Longitude 121° 35′ 56.7″, Sacramento County, California.

Based on available information and with the exception of the jurisdictional determinations on the map, we concur with the estimate of waters of the United States, as depicted on the **May 5, 2005, SMF LMP Wetland Delineation Maps 1-4** drawings prepared by **EDAW, Inc.** Approximately 27.86 acres of waters of the United States, including wetlands, are present within the survey area. These waters are regulated under Section 404 of the Clean Water Act since they are tributary, or adjacent to a tributary, to the Sacramento River.

You have determined that hydrology for wetlands FM4 and FM5 are solely supported by a "leaky-pipe" and based on Regulatory Branch Memorandum (RBM) 2004-03 the wetlands are not jurisdictional. Although RBM 2004-03 only addressed "leaky-ditch" wetlands, for this case we believe RBM 2004-03 and RBM 2003-04 ("Irrigated" Wetlands) are applicable to this situation. Based on the available information, including topography, we believe there is uncertainty regarding the source of hydrology for these wetlands. In accordance with the above RBMs, we will assume that these wetlands are supported, at least partially, by natural hydrology, unless clearly demonstrated otherwise. Therefore, at this time, we consider these wetlands jurisdictional. If practical, we recommend you consider closing the valve to this pipe and monitoring the hydrology to clearly demonstrate the source of hydrology. Detailed topography and the exact location of the pipe relative to wetlands may also be helpful in determining the source of hydrology.

The wetlands identified as Swales 4, 5 and 9, acreages 0.04, 0.04 and 0.01 respectively, on the above drawings are intrastate isolated waters with no apparent interstate or foreign commerce connection. As such, these waters are not currently regulated by the Corps of Engineers. This disclaimer of jurisdiction is only for Section 404 of the Federal Clean Water Act. Other Federal, State, and local laws may apply to your activities. In particular, you may need authorization from the California State Water Resources Control Board and/or the U.S. Fish and Wildlife Service.

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. A *Notification of Administrative Appeal Options and Process and Request for Appeal* form is enclosed. If you wish to appeal this approved jurisdictional determination, please follow the procedures on the form. You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This determination has been conducted to identify the limits of Corps of Engineers' Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

Please refer to identification number 200300776 in any correspondence concerning this project. If you have any questions, please contact Justin Cutler at our Sacramento Office, 1325 J Street, Room 1480, Sacramento, California 95814-2922, email *Justin.Cutler@usace.army.mil*, or telephone 916-557-5258. You may also use our website: *www.spk.usace.army.mil/regulatory.html*.

Sincerely,

Thomas J. Cavanaugh
Acting Chief, Central California/Nevada Section

Enclosure(s)

Copies furnished without enclosure(s):

Anne King, EDAW, Incorporated, 2002 J Street, Sacramento, California 95814
Camille Garibaldi, Federal Aviation Administration, 831 Mitten Road, Suite 210, Burlingame, California 94010
George Day, Storm Water and Water Quality Certification Unit, Central Valley Regional Water Quality Control Board, 11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114
Oscar Balaguer, Chief, Water Quality Certification Unit, California State Water Resources Control Board, 1001 I Street, Sacramento, California 95814
U.S. Fish and Wildlife Service, Wetlands Branch, 2800 Cottage Way, Suite W2605, Sacramento, California 95825-3901
U.S. Fish and Wildlife Service, Endangered Species Division, 2800 Cottage Way, Suite W2605, Sacramento, California 95825-3901
Richard Radmacher, Assistant Planner, Planning and Community Development Department, County of Sacramento, 827 7th Street, Room 230, Sacramento, California 95814-2406

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

March 21, 2006

Regulatory Branch (200300776)

Tim Hawkins
Associate Environmental Analyst
Department of Environmental Review and Assessment
827 7th Street, Suite 220
Sacramento, California 95814

Dear Mr. Hawkins:

We are responding to your request for an approved jurisdictional determination for the Sacramento International Airport Parcel South of I-5 site. This approximately 300-acre site is located on or near Section 19, 24, 25, 30, 31, 36, Township 10 North, Range 3, 4 East, MDB&M, Latitude 38° 41′ 19.7″, Longitude 121° 35′ 56.7″, Sacramento County, California.

Based on available information, we concur with the estimate of waters of the United States, as depicted on the map included in your February 8, 2006 submittal to Kathleen Dadey of our office. Approximately 3.72 acres of waters of the United States, including wetlands, are present within the survey area. These waters are regulated under Section 404 of the Clean Water Act since they are tributary to the Sacramento River, or adjacent to a tributary of the River.

The water identified as an agricultural ditch in the February 8, 2006 report (shown as a yellow line in the north central portion of the aforementioned map) is an intrastate isolated water with no apparent interstate or foreign commerce connection. As such, this water is not currently regulated by the Corps of Engineers. This disclaimer of jurisdiction is only for Section 404 of the Federal Clean Water Act. Other Federal, State, and local laws may apply to your activities. In particular, you may need authorization from the California State Water Resources Control Board and/or the U.S. Fish and Wildlife Service.

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. This letter contains an approved jurisdictional determination for the airport's potential expansion (parking lot). If you object to this verification, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this verification, you must submit a completed RFA form to the South Pacific Division Office at the following address:

Doug Pomeroy, Administrative Appeal Review Officer
Army Corps of Engineers, South Pacific Division
CESPD-PDS-O
333 Market Street, Room 923
San Francisco, California 94105-2195
Telephone: 415-977-8035
FAX: 415-977-8129

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within 60 days of the NAP. Should you decide to submit an RFA form, it must be received at the above address by May 20, 2006. It is not necessary to submit an RFA form to the Division Office if you do not object to the verification in this letter.

You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This determination has been conducted to identify the limits of Corps of Engineers' Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

Please refer to identification number 200300776 in any correspondence concerning this project. If you have any questions, please contact Ms. Kathleen Dadey at our Sacramento Office, 1325 J Street, Room 1480, Sacramento, California 95814-2922, email *kathleen.a.dadey@usace.army.mil*, or telephone 916-557-7253. You may also use our website: *www.spk.usace.army.mil/regulatory.html*.

Sincerely,

ORIGINAL SIGNED
Thomas J. Cavanaugh
Acting Chief
Central California/Nevada Section

Enclosure(s)

Copy furnished without enclosure

Greg Rowe, Sacramento County Airport System, 6900 Airport Boulevard, Sacramento, California 95837-1109
Camille Garibaldi, Federal Aviation Administration, 831 Mitten Road, Suite 210, Burlingame, California 94010
William Marshall, Storm Water and Water Quality Certification Unit, Central Valley Regional Water Quality Control Board, 11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114
Oscar Balaguer, Chief, Water Quality Certification Unit, California State Water Resources Control Board, 1001 I Street, Sacramento, California 95814
U.S. Fish and Wildlife Service, Wetlands Branch, 2800 Cottage Way, Suite W2605, Sacramento, California 95825-3901
U.S. Fish and Wildlife Service, Endangered Species Division, 2800 Cottage Way, Suite W2605, Sacramento, California 95825-3901
Richard Radmacher, Assistant Planner, Planning and Community Development Department, County of Sacramento, 827 7th Street, Room 230, Sacramento, California 95814-2406

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

September 29, 2006

Regulatory Branch (200600332)

Greg Rowe
Sacramento County Airport System
6900 Airport Boulevard
Sacramento, California 95837

Dear Mr. Rowe:

We are responding to your consultant's request for an approved jurisdictional determination for the Sacramento Intl Airport North site. This approximately 900-acre site is located adjacent to the Sacramento River, north of the Sacramento International Airport, in Township 10N, Range 3E, MDB&M, Latitude 38.722, Longitude 121.594, Sacramento County, California.

Based on available information, we concur with the estimate of waters of the United States, as depicted on Exhibit 3, Elverta North Wetland Delineation, dated August 23, 2006 prepared by EDAW, Inc.. Approximately 94.57 acres of waters of the United States, including wetlands, are present within the survey area. These waters are regulated under Section 404 of the Clean Water Act since they are adjacent and/or tributary to the Sacramento River or are adjacent to one of a number of ditches which are tributary to the Sacramento River. The Sacramento River is a navigable water of the United States.

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. This letter contains an approved jurisdictional determination for your subject site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the South Pacific Division Office at the following address: Doug Pomeroy, Administrative Appeal Review Officer, Army Corps of Engineers, South Pacific Division, CESPD-PDS-O, 333 Market Street, Room 923, San Francisco, California 94105-2195, Telephone: 415-977-8035 FAX: 415-977-8129.

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within 60 days of the NAP. Should you decide to submit an RFA form, it must be received at the above address by November 28, 2006. It

is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this letter.

You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This determination has been conducted to identify the limits of Corps of Engineers' Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

Please refer to identification number 200600332 in any correspondence concerning this project. If you have any questions, please contact at our Sacramento Valley Office, 1325 J Street, Room 1480, Sacramento, California 95814-2922, email kathleen.a.dadey@usace.army.mil, or telephone 916-557-7253. You may find additional information on our website: *www.spk.usace.army.mil/regulatory.html*.

Sincerely,

ORIGINAL SIGNED
Kevin J. Roukey
Chief, Central California/Nevada
Section

Enclosure(s)

Copy furnished without enclosure(s):

Matt Wacker, EDAW, Inc. 2022 J Street, Sacramento, California 95814

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

November 7, 2006

Regulatory Branch (200600795)

John Bassett
Sacramento Area Flood Control Agency
1007 7th Street 7th Floor
Sacramento, California 95814

Dear Mr.:

We are responding to your consultant's request for an approved jurisdictional determination for the Natomas Cross Canal site. This approximately 340.0-acre site is located on or near Sacramento River in Section , Township 11 North, Range 4 East, MDB&M, Latitude 038° 48′ 25.4″, Longitude 121° 33′ 59.4″, Sutter County, California.

Based on available information, we concur with the estimate of waters of the United States, as depicted on the **October 18, 2006, Natomas Cross Canal** drawing prepared by **EDAW**. Approximately **271.22** acres of waters of the United States, including wetlands, are present within the survey area. These waters are regulated under Section 404 of the Clean Water Act since they are **a broad continuum of wetland features adjacent to the Natomas Cross Canal, which is a tributary to the Sacramento River.**

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. This letter contains an approved jurisdictional determination for your subject site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the South Pacific Division Office at the following address: Doug Pomeroy, Administrative Appeal Review Officer, Army Corps of Engineers, South Pacific Division, CESPD-PDS-O, 333 Market Street, Room 923, San Francisco, California 94105-2195, Telephone: 415-977-8035 FAX: 415-977-8129.

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within 60 days of the NAP. Should you decide to submit an RFA form, it must be received at the above address by January 7, 2007. It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this letter.

You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This determination has been conducted to identify the limits of Corps of Engineers' Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

Please refer to identification number 200600795 in any correspondence concerning this project. If you have any questions, please contact Tom Cavanaugh at our Sacramento Valley Office, 1325 J Street, Room 1480, Sacramento, California 95814-2922, email *Brian.E.Vierria@usace.army.mil*, or telephone 916-557-7728. You may also use our website: *www.spk.usace.army.mil/regulatory.html.*

Sincerely,

ORIGINAL SIGNED

Thomas J. Cavanaugh
Chief, Sacramento Valley Office

Enclosure(s)

Copy furnished without enclosure(s):

Ann King, Edaw, 2022 J Street, Sacramento, California 95814

APPENDIX D

Cultural Resources

D1 Programmatic Agreement

PROGRAMMATIC AGREEMENT
AMONG THE U.S. ARMY CORPS OF ENGINEERS,
THE SACRAMENTO AREA FLOOD CONTROL AGENCY, AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

REGARDING THE ISSUANCE OF PERMISSION UNDER THE AUTHORITY OF SECTION 408 OF THE RIVERS AND HARBORS ACT OF 1899 AND SECTION 404 OF THE CLEAN WATER ACT FOR THE NATOMAS LEVEE IMPROVEMENT PROGRAM, LANDSIDE IMPROVEMENTS PROJECT

WHEREAS, the U.S. Army Corps of Engineers, Sacramento District (Corps) proposes to review an application that seeks permission for alteration of flood control structures under the authority of Section 408 of the Rivers and Harbors Act and to issue one or more permits to discharge fill to the waters of the United States under the authority of Section 404 of the Clean Water Act to the Sacramento Area Flood Control Agency (SAFCA) for the Natomas Levee Improvement Program Landside Improvements Project (Project); and

WHEREAS, The Corps has determined that the issuance of these permissions and permits constitute an undertaking per 36 CFR 800.16(y), which require compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended (16 U.S.C. 470f); and

WHEREAS the Project includes improvements to an extensive levee system surrounding the Natomas Basin and landscape and irrigation/drainage infrastructure modifications that will be implemented in three construction phases, currently scheduled for 2008, 2009, and 2010; and

WHEREAS, the Corps has determined that this undertaking will have an adverse effect on at least one Historic Property that has been determined eligible for inclusion in the National Register of Historic Places (NRHP), CA-SAC-485/H; and

WHEREAS, because of the complex and phased nature of the improvements, the Corps has not yet determined the exact area of potential effects (APE), nor has SAFCA acquired all of the rights-of-entry, easements and ownership interests that would allow a complete inventory and determination of effects on Historic Properties; and

WHEREAS, the Natomas Basin is sensitive for buried archaeological resources that cannot be accurately located prior to construction; and such buried sites may also be Historic Properties, and therefore SAFCA and the Corps need to document a framework for managing post-review discoveries per 36 CFR Section 800.13, including evaluation of those resources, assessment of effects, and resolution of potential adverse effects; and

WHEREAS, at such time as any unevaluated cultural resource may be discovered, it may require archaeological data recovery and/or other historic preservation activities, in compliance with Section 106 of the National Historic Preservation Act, concurrent with *active* construction; and

WHEREAS, the urgency of flood control improvements require a management framework for Historic Properties that will be implemented after the execution of this agreement in an expedited manner that thus departs from the process normally used under 36 CFR Section 800 et seq., yet still fulfills the requirements of Section 106 of the NHPA; and

WHEREAS, SAFCA has been invited to participate as a signatory to this Programmatic Agreement (PA) by the Corps and the California State Historic Preservation Officer (SHPO; and

WHEREAS, the Corps has consulted The Ione Band of Miwok Indians, the Shingle Springs Band of Miwok Indians and the United Auburn Indian Community, and they have been invited to concur in this PA; and

WHEREAS, the Corps shall make the terms and conditions of this PA as part of the conditions of any permissions and permits issued by the Corps for this project; and

WHEREAS, SAFCA has agreed to undertake responsibility for compliance with the NHPA on its own behalf, and on behalf of the Central Valley Flood Protection Board; and

WHEREAS, the Corps has consulted with the SHPO and the Advisory Council on Historic Preservation in accordance with regulations implementing Section 106 of the NHPA;

WHEREAS, the Council has been consulted and declined to participate in this agreement;

NOW, THEREFORE, the Corps, the SHPO, and SAFCA agree that the Project shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on Historic Properties.

The Corps shall ensure that the following stipulations of this PA are carried out.

STIPULATIONS

I. DEFINITIONS

The terms used in this Programmatic Agreement shall be as defined in regulations implementing Section 106 of the NHPA, and as follows:

"APE (Area of Potential Effect)" means any location at which any Project development activity will be constructed; and locations of any Project-related construction staging areas, borrow areas, and materials stockpile areas; and the locations of any other Project development activities. The APE shall be defined so as to include the maximum spatial dimensions of all Project-related construction and operations rights-of-way, easements, areas which potentially may be affected by Project activities, and other properties to which SAFCA has access, whether on a temporary or permanent basis, or ownership for Project development.

"Concurring parties" means their concurrence indicates that they are in agreement with the terms of the PA.

"Consulting parties" means the Corps, the SHPO, and SAFCA who are signatories to this PA. Only signatories have the authority to amend or terminate this PA.

"Cultural resources" means any property or location that was created, modified, or used by people at least 50 years in the past. Cultural resources include but are not limited to Historic Properties and traditional cultural properties/places (i.e., NRHP listed or eligible properties as defined at 36 CFR Part 60).

"Historic Property" means a cultural resource that has been determined eligible for or is listed on the NRHP (i.e., NRHP listed or eligible properties as defined at 36 CFR Part 60), either by formal nomination

and listing or by concurrence between federal agencies and the SHPO.

"Historic preservation" means any activity conducted in accordance with the NHPA and its implementing regulations to, among other things, inventory, evaluate, manage, or treat cultural resources such as buildings, structures, sites, districts, and objects eligible for, or that may be determined eligible for, listing in the NRHP according to eligibility criteria at 36 CFR Part 60.

"Project development activities" means any physical action related to the Project that has the potential to damage or otherwise alter those characteristics of Historic Properties that would make them eligible for listing in the NRHP.

II. STANDARDS

(A.) Professional Qualifications. All technical work required for historic preservation activities implemented pursuant to this Programmatic Agreement shall be carried out by or under the direct supervision of a person or persons meeting at a minimum the *Secretary of Interior's Professional Qualifications Standards* for archaeology or history, as appropriate (48 FR 44739). "Technical work" here means all efforts to inventory, evaluate, and perform subsequent treatment such as data recovery excavation or recordation that is required under this Programmatic Agreement. This stipulation shall not be construed to limit peer review, guidance, or editing of documents by SAFCA or SAFCA's consultants.

(B.) Historic Preservation Standards. Historic preservation activities carried out pursuant to this Programmatic Agreement shall meet the *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44740) as well as standards and guidelines for historic preservation activities established by the SHPO. The Corps shall ensure that all reports prepared pursuant to this Programmatic Agreement will be provided to the consulting parties and shall ensure that all such reports meet published standards of the California Office of Historic Preservation, specifically, *Preservation Planning Bulletin* Number 4(a), "Archaeological Resources Management Reports (ARMR): Recommended Contents and Format" (December 1989).

III. PROJECT DESCRIPTION

(A) PROJECT Description. A description of the Project is found in the Final Environmental Impact Report (November 2007). A summary of the Project's description in the environmental impact report is provided as **Attachment A** and is made a part of this Programmatic Agreement.

(B) Existing Conditions. An archival search and archaeological survey have been completed for all areas of the APE as currently defined to which SAFCA currently has access, and which currently are not covered by paving, built environment features, or agricultural crops. A report of the results of archival research and archaeological survey, "Cultural Resources Inventory Reports, Part 1 – Natomas Levee Improvement Program Landside Improvements Project, Sacramento and Sutter Counties, California" (October 2007) is made **Attachment B** to this Programmatic Agreement.

A number of prehistoric sites are known to be present along the banks of the Sacramento River. However, archaeological survey of the area is of limited value because the alluvial depositional environment may obscure and bury sites, leaving no surface manifestation of those archaeological resources. For most of the length of the Project, levees have been built on the riverbanks. These levees are one focus of the Project's activity, and occupy a substantial portion of the Project's APE. Furthermore, it has not been established

whether certain known sites in proximity to the Project's development activities extend under the existing levees. The existing levees both obscure ground surfaces and prevent subsurface archaeological testing within their footprints. Because of these conditions, a full assessment of archaeological sites that may be present in the APE cannot be made in advance of construction. There is no definitive information, even for sites known to be in Project's proximity, of site boundaries relative to the APE, or of the significance or integrity of any portions of such sites that may be within the APE. For these reasons, even though archaeological deposits may extend into the APE, and even though some of these deposits may qualify as Historic Properties, it is impossible to develop meaningful site-specific Historic Properties Treatment Plans (HPTP) prior to all construction, or to carry out all necessary data recovery in advance of the Corps' approvals, permitting and construction.

For these reasons, unforeseen discoveries shall be treated pursuant to the provisions of 36 CFR 800.13 (Post-review discoveries).

(C) Project Phasing and Potential Changes to the APE: Because the improvements will occur in three phases (anticipated to be 2008, 2009, and 2010), it will be necessary to define the APE for each phase. The APE for each phase shall be submitted with the cultural resources inventory reports, and shall be consulted upon as part of that document, pursuant to **Stipulation IV**, below.

After the initial concurrence, changes to the APE may be necessary as SAFCA refines its phased Project plans. In particular, the ability of SAFCA to obtain access permissions of private landowners, determination of borrow sites and ongoing negotiations with resource agencies regarding species mitigation requirements may affect final Project's design, and may expand the current APE in some areas. Any changes to the APE shall be made in accordance with subsections D and E (below) of this Stipulation III. The SHPO, Corps, and SAFCA shall consult and reach concurrence in any changes to the APE. The final APE shall account for all Project development activities for the as-built Project. SAFCA shall notify the Corps of any change in the APE and the Corps shall determine the potential for Project development activities in a revised APE to affect cultural resources, through cultural resources inventory and testing as needed.

(1) If there is the potential that cultural resources exist in the revised APE, SAFCA shall submit to the Corps:
   (a) a map of the revised APE; and
   (b) a description of Project development activities to take place in the revised APE; and
   (c) a description of the inventory, nature, location, and known or potential significance of cultural resources in the revised APE; and
   (d) a description of any archaeologically sensitive areas in the revised APE that require monitoring by an archaeologist, and Native American monitor as appropriate; and
   (e) a plan for managing cultural resources in a manner that either avoids Project-related effects to cultural resources, or which mitigates any adverse effects, and which provides for the management of unforeseen cultural resources discoveries.

(2) If no cultural resources are identified within a revised APE, SAFCA shall document such a determination, provide documentation to the Corps and keep such documentation on file at its principal offices.

After the Corps and SAFCA agree to a revised APE and if such a change has the potential to have an effect on cultural resources, the Corps shall submit the documentation to the SHPO for their review. The SHPO

shall have 30 calendar days from the date of receipt of the notice of a revision to the APE to review and to provide in writing either concurrence with or objection to the definition of the revised APE, and any proposed historic preservation activities. Should the SHPO not respond in writing within 30 calendar days, the Corps and SAFCA shall proceed as though the SHPO has concurred in the revised APE, and the proposed historic preservation activities, if any.

Should the SHPO object to the definition of the revised APE or proposed historic preservation activities, the Corps, SAFCA, and the SHPO shall consult for a period not to exceed 15 calendar days following the date of the receipt of the SHPO's written objection in an effort to come to agreement on the issues to which the SHPO has objected. Should the SHPO, the Corps, and SAFCA be unable to agree on the issues to which the SHPO has objected, the consulting parties to this Programmatic Agreement shall proceed in accordance with **Stipulation VIII (Resolving Objections)**, below.

(D) Scope of Identification Efforts in the APE: Inventories of Historic Properties within the established or revised APE shall be completed in accordance with **Stipulation IV (Inventory of Historic Properties)** of this Programmatic Agreement. Treatment of any adverse effects to Historic Properties within the established or revised APE shall be completed in accordance with **Stipulation V (Treatment of Effects)** of this Programmatic Agreement.

(E) Scope of the APE: For purposes of this Programmatic Agreement, a revised APE shall be defined to meet, at a minimum, the following criteria:

(1) The APE for any segment of the Natomas levees that are being improved as part of the Project and shall include the levee segment and a corridor extending not less than 75 feet from the land side toe of the levee segment. The APE also shall include:

- The extent of all Project construction and excavation activity required to construct flood control facilities and to modify irrigation and drainage infrastructure,
- The additional right-of-way/easements obtained by SAFCA as part of the Project's features,
- All areas used for excavation of borrow material and habitat creation, and
- All construction staging areas.

(2) The APE for Project activities shall include the direct footprint of the activity and a reasonable buffer determined by consultation between SAFCA and the Corps, according to the nature of the activity, SAFCA's ownership interest or easement, and the probability that ground-disturbing work may extend beyond the footprint of planned improvements and activities.

(3) The APE for any other type of Project development activities shall be defined by the Corps in consultation with the consulting parties.

IV. INVENTORY OF HISTORIC PROPERTIES

(A) Identification Efforts to Date and Further Work Required: An inventory of Historic Properties within the APE has been initiated consistent with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716–44740). The SAFCA shall submit a completed inventory and evaluation for each phase of Project work (2008, 2009, 2010) to the Corps. Such inventory shall be deemed complete by the Corps when the SHPO concurs in the NRHP eligibility recommendation for all cultural resources within the APE for that phase.

Areas of Archaeological Sensitivity: Areas of archaeological sensitivity will be monitored in accordance with HPTPs.

(C) Changes in the APE: If areas are added to the Project development activities subsequent to the SHPO concurrence on the map of the APE for a specific phase, SAFCA shall complete an inventory of Historic Properties within the expanded APE. Such inventory shall be undertaken and completed consistent with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716–44740). Such inventory shall be deemed completed by the Corps at such time as the SHPO concurs in the NRHP eligibility of all cultural resources within the established and revised APE for the Project, pursuant to this Stipulation IV.

V. TREATMENT OF EFFECTS

(A) Historic Property Treatment Plans: If Historic Properties are identified in cultural resources inventories that would be adversely affected by the Project, SAFCA shall prepare a Historic Properties Treatment Plan (HPTP) for review and written approval by the Corps and the SHPO for those specific properties. An HPTP applicable to every Historic Property that may sustain adverse effects by the Project shall be prepared, including for those Historic Properties found during construction. An HPTP may address individual or multiple Historic Properties. An HPTP shall stipulate those actions SAFCA shall take to resolve the adverse effects of the Project on Historic Properties. SAFCA shall ensure that all provisions of an HPTP are carried out in a timely manner. Any changes to an HPTP shall be reviewed and approved by the Corps. Copies of all reports pertaining to the treatment of Historic Properties shall be submitted to the consulting parties to this Programmatic Agreement. Reports and other data pertaining to the inventory of, and treatment of effects on, Historic Properties may be distributed to concurring parties to this Programmatic Agreement and to other members of the public consistent with **Stipulation VII (Confidentiality)** of this Programmatic Agreement. Individual HPTPs may be submitted simultaneously with the cultural resources inventory report for specific Project phases. If HPTPs are submitted simultaneously with an inventory report for a Project phase or with an addendum to such report for an expanded APE or Project description, the Corps and SHPO review period for such HPTP shall run concurrently with the review period for the inventory report.

Review Schedule: The SHPO and the Corps shall have 30 calendar days to review and comment upon in writing any HPTP submitted by SAFCA. The SHPO and the Corps shall indicate in their review that they find the HPTP either acceptable or not. In the event that comments are not made by the SHPO within 30 calendar days, the Corps shall assume the SHPO has accepted the HPTP as submitted. In the event the Corps and/or the SHPO provide written comment within the 30-day period, either SAFCA shall accept the comments and revise the HPTP accordingly, or SAFCA and the Corps may object to some or all comments. Comments from the Corps or the SHPO that are not acceptable to SAFCA shall be resolved by consultation among the Corps, the SHPO, and SAFCA for a period of not more than 15 calendar days. Should the Corps, the SHPO, and SAFCA be unable to resolve any dispute regarding the Corps or the SHPO comments, the consulting parties shall proceed in accordance with **Stipulation VIII (Resolving Objections)** of this Programmatic Agreement.

The Corps shall submit to the SHPO for review and comment any amendment, addendum, revision or other change to an HPTP. SAFCA shall proceed to make changes to an HPTP as per the procedure and schedule for the review and approval of an original HPTP. If a Historic Property is discovered within an expanded APE subsequent to an initial inventory effort for a phase, and the Corps and SAFCA agree that

the Project may adversely affect the property, SAFCA shall submit an addendum to the HPTP or a new HPTP. The review schedule for this submittal follows the provisions of Stipulation V.

(B) Commencement of Construction and Project Work: Project development activities may commence within the APE after a Historic Properties inventory has been completed (per **Stipulations III and IV**, above), and prior to treatment of adverse effects on Historic Properties within the APE provided that:

(1) A plan to respond to inadvertent archaeological discoveries is prepared by SAFCA and approved by the Corps prior to the commencement of Project activities anywhere in the APE for that phase of the Project; and

(2) Project development activities do not encroach within 30 meters (100 ft) of the known boundaries of any Historic Property as determined from archaeological site record forms, other documentation, or as otherwise defined in consultation with the SHPO; and

(3) An archaeological monitor is present during any Project activities that are anticipated to extend either vertically or horizontally into any areas designated to be archaeologically sensitive by SAFCA in consultation with the Corps.

(C) Final Report Documenting Implementation of the Historic Properties Treatment Plan(s): Within one year after the completion of all work performed as part of the Project SAFCA shall submit to the Corps and SHPO a final report documenting the results of all work prepared under the HPTPs. This report shall be submitted to the Corps and SHPO for review and comments, which SAFCA shall incorporate.

VI. NATIVE AMERICAN AND OTHER PUBLIC CONSULTATION AND PUBLIC NOTICE

Members of the interested public shall be invited to consult regarding this Programmatic Agreement. Within 30 calendar days of the signing date of this Programmatic Agreement, the Corps, the SHPO, and SAFCA shall consult to compile a list of members of the interested public who shall be provided notice of this Programmatic Agreement. The opinions of local Native Americans with cultural ties to the APE and the opinions of other members of the public shall be taken into account by the consulting parties for historic preservation actions taken in accordance with this Programmatic Agreement. Native Americans and other members of the public may be invited to concur in this Programmatic Agreement. Native American monitor(s) shall be invited to assist SAFCA in the treatment of any Native American human remains and items associated with Native American burials discovered during the Project in accordance with California Public Resources Code Section 5097.98 and California Health and Safety Code Section 7050.5(b) and 7050.5(c).

VII. CONFIDENTIALITY

Confidentiality regarding the nature and location of the archaeological sites and any other cultural resources discussed in this Programmatic Agreement shall be maintained on a "need-to know" basis limited to appropriate personnel and agents of SAFCA, the Corps, and the SHPO involved in planning, reviewing and implementing this Programmatic Agreement consistent with Section 304 of the NHPA.

VIII. RESOLVING OBJECTIONS

(A.) Should any party to this Programmatic Agreement object to any action proposed or carried out

pursuant to this Programmatic Agreement, the Corps shall consult with the objecting party(ies) for a period of time not to exceed *30 calendar days* to resolve the objection. If the Corps determines that the objection cannot be resolved, the Corps shall forward all documentation relevant to the dispute to the Council. Within 30 calendar days after receipt of all pertinent documentation, the Council shall either:

(1) Provide the Corps with recommendations, which the Corps shall take into account in reaching a final decision regarding the objection; or

(2) Notify the Corps that the Council will comment in accordance with the requirements of Section 106 of the NHPA, and proceed to comment. Any Council comment provided in response shall be taken into account by the Corps, pursuant to the requirements of Section 106 of the NHPA.

(3) Should the Council not exercise one of the above options within 30 days after receipt of all pertinent documentation, the Corps may assume the Council's concurrence in its proposed response to the objection.

(4) The Corps shall take into account any Council recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection; the Corps' responsibility to carry out all actions under this Programmatic Agreement that are not the subjects of the objection shall remain unchanged.

(B.) At any time during implementation of the measures stipulated in this Programmatic Agreement should an objection pertaining to the Programmatic Agreement be raised by a member of the public, the Corps or SAFCA shall notify the consulting parties to the Programmatic Agreement and take the objection into account, consulting with the objector and, should the objector so request, with any of the consulting parties to this Programmatic Agreement to address the objection.

IX. AMENDMENTS

Any consulting party to this Programmatic Agreement may propose that the Programmatic Agreement be amended, whereupon the Corps shall consult with the other consulting parties to this Programmatic Agreement to consider such amendment. Any amendment shall be executed by the consulting parties in the same manner as the original Programmatic Agreement.

If the Project has not been completed within five years of the date of the execution of this Programmatic Agreement, the consulting parties shall consult on a date not less than 90 days prior to the fifth anniversary of this Programmatic Agreement to either amend this Programmatic Agreement and acknowledge its continued applicability for the undertaking for a designated period of time, or terminate this Programmatic Agreement and proceed to again consult regarding the undertaking in accordance with regulations implementing Section 106 of the NHPA.

All attachments to this Programmatic Agreement, and other instruments prepared pursuant to this agreement such as, but not limited to, the Project's description, initial cultural resource inventory report and maps of the APE, HPTPs, and monitoring and discovery plans may be amended without requiring amendment of this Programmatic Agreement. Such amendments will be consulted on by the concurring parties and shall be final when agreement is reached by the parties.

X. FAILURE TO CARRY OUT THE TERMS OF THE AGREEMENT

Should the Corps fail to ensure that the terms of this Programmatic Agreement are carried out, the Corps shall notify the parties to this Programmatic Agreement and again consult with the SHPO and the Council in accordance with regulations implementing Section 106 of the NHPA. The Corps shall not take any action or make any irreversible decision that would affect an Historic Property, preclude historic preservation alternatives, or foreclose any opportunities for the Council to comment on the undertaking prior to completion of the process for considering and resolving effects on Historic Properties provided in this document.

XI. SCOPE OF THE PROGRAMMATIC AGREEMENT

Execution of this Programmatic Agreement by the Corps, the SHPO, and SAFCA, and implementation of its terms, evidence that Corps has afforded the Council an opportunity to comment on the undertaking for SAFCA Natomas Levee Improvement Program Landside Improvements Project, pursuant to 16 U.S.C. 470f, and that the Corps has taken into account the effects of the undertaking on Historic Properties. This Programmatic Agreement is limited in scope to the undertaking defined herein and is entered into solely for that purpose.

CONSULTING PARTIES:

U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT

By: _____ Date: 10 Apr 08

Title: COL Thomas Chapman, District Engineer, Sacramento District, U.S. Army Corps of Engineers

SACRAMENTO AREA FLOOD CONTROL AGENCY

By: _____ Date: 4/11/08

Title: Stein M. Buer, Executive Director, Sacramento Area Flood Control Agency

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

By: _____ Date: 5/1/08

Title: Milford Wayne Donaldson, F.A.I.A., California State Historic Preservation Officer

CONCUR:

CENTRAL VALLEY FLOOD PROTECTION BOARD

By: Jay S. Punia Date: 6/23/08

Title: Jay S. Punia, Executive Officer, Central Valley Flood Protection Board

By: JAY S. PUNIA Date: 6/23/08

Title: Executive Officer, CVFPB

Attachment A: Project Description Summary

Attachment B: "Cultural Resources Inventory Reports, Part 1 – Natomas Levee Improvement Program Landside Improvements Project, Sacramento and Sutter Counties, California" (report).

D2 Correspondence Regarding Cultural Resources

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 7, 2007

Debbie Pilas-Treadway
Native American Heritage Commission
915 Capitol Mall, Room 364
Sacramento, Ca 95814

RE: Natomas Levee Improvement Project

Dear Ms. Pilas-Treadway:

EDAW is conducting cultural resources studies for the above-referenced project located generally north of the City of Sacramento, in Sacramento and Sutter counties, and located on the Grays Bend, Taylor Monument, Verona, Rio Linda, Pleasant Grove, Sacramento East, and Sacramento West USGS quadrangle maps. Background research and field studies conducted for this project will identify cultural resources that may be impacted by proposed levee improvements throughout the American River basin. This letter is intended to initiate part of the consultation process that will eventually be required under Section 106 National Historic Preservation Act.

I am pleased to bring this activity to your attention, and would appreciate any information you can provide regarding prehistoric, historic, or ethnographic Native American land use. I am interested in any contemporary Native American values that may be present near or within the project area and would like to request a search of the NAHC Sacred Land files.

Please send via mail or facsimile (916-414-5850) a listing of local Native American representatives at your earliest convenience, so that I may contact appropriate individuals and account for their potential concerns in the planning process.

If you have any questions or comments feel free to contact me at my office. I can be reached by email at charlane.gross@edaw.com, or by phone at 916-414-5800. I look forward to hearing from you soon.

Sincerely,

Charlane Gross, M.A., R.P.A.
Senior Archaeologist

STATE OF CALIFORNIA Arnold Schwarzenegger, Governor

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
Fax (916) 657-5390

June 19, 2007

Charlene Gross
EDAW Inc.
2011 J Street
Sacramento, CA 95814

Sent Via Fax: 916-414-5850
Of Pages: 3

RE: Natomas Levee Improvement project, Sacramento and Sutter Counties

Dear Ms. Gross:

The Native American Heritage Commission has reviewed the Sacred Lands File and found several burial/recorded sites in/near the project area. The location of sites is confidential.

I recommend that you contact the North Central Information Center, Ca State University, Sacramento, 6000 J Street, Adams Building, Suite 103, Sacramento, CA 916-278-6217 for sites in Sacramento County and Northeast Information Center, Ca State University, Chico, Building 25, Suite 204, Chico, CA 95929, 530-898-4413 for Sutter County, for further information of recorded sites located in/near the APE.

I have enclosed a list of Native Americans individuals/organizations contacts may have knowledge of additional cultural resources in the project area. The Commission makes no recommendation or preference of a single individual, or group over another. These lists should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated, if they cannot supply information, they might recommend other with specific knowledge. A minimum of two weeks must be allowed for responses after notification.

If you receive notification of change of addresses and phone numbers from any these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at (916) 653-4038.

If you have any questions or need additional information, please contact me.

Sincerely,

Debbie Pilas-Treadway
Environmental Specialist III

Native American Contacts
Sacramento and Sutter Counties
June 19, 2007

√ = CALL
√ = CALL W/MESSAGE
√+ = CALL SPOKE W/INDIVIDUAL (SEE CALL LOG RECORD)

√+
Rose Enos
15310 Bancroft Road — Maidu
Auburn , CA 95603 — Washoe
(530) 878-2378

Shingle Springs Band of Miwok Indians
Nicholas Fonseca, Chairperson
P.O. Box 1340 — Miwok
Shingle , CA 95682 — Maidu
nfonseca@ssband.org
(530) 676-8010
(530) 676-8033 Fax

√
Enterprise Rancheria of Maidu Indians
Frank Watson, Vice Chairperson
1940 Feather River Blvd., Suite B — Maidu
Oroville , CA 95965
eranch@cncnet.com
(530) 532-9214
(530) 532-1768 FAX

Strawberry Valley Rancheria
Calvine Rose, Chairperson
PO Box 667 — Maidu — No #
Marysville , CA 95901 — Miwok

√
Enterprise Rancheria of Maidu Indians
Glenda Nelson, Chairperson
1940 Feather River Blvd., Suite B — Maidu
Oroville , CA 95965
eranch@cncnet.com
(530) 532-9214
(530) 532-1768 FAX

Strawberry Valley Rancheria
Robert Kerfoot
PO Box 667 — Maidu — No #
Marysville , CA 95901 — Miwok

√
Shingle Springs Band of Miwok Indians
Jeff Murray, Cultural Resources Manager
P.O. Box 1340 — Miwok
Shingle , CA 95682 — Maidu
jmurray@ssband.org
(530) 676-8010
(530) 676-8033 Fax

√
United Auburn Indian Community of the Auburn
Jessica Tavares, Chairperson
575 Menlo Drive, Suite 2 — Maidu
Rocklin , CA 95765 — Miwok
916 663-3720
916 663-3727 - Fax

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed Natomas Levee Improvement project, Sacramento and Sutter Counties.

Native American Contacts
Sacramento and Sutter Counties
June 19, 2007

United Auburn Indian Community of the Auburn
Tribal Preservation Committe
575 Menlo Drive, Suite 2 Maidu
Rocklin , CA 95765 Miwok
916 663-3720
916 663-3727 - Fax

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed Natomas Levee Improvement project, Sacramento and Sutter Counties.

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

United Auburn Indian Community of the Auburn
Tribal Preservation Committee
575 Menlo Drive, Suite 2
Rocklin, CA 95765

Subject: Natomas Levee Improvement Project(s)

To Whom It May Concern:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

United Auburn Indian Community of the Auburn
Jessica Tavares, Chairperson
575 Menlo Drive, Suite 2
Rocklin, CA 95765

Subject: Natomas Levee Improvement Project(s)

Dear Ms. Tavares:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Strawberry Valley Rancheria
Robert Kerfoot
P.O. Box 667
Marysville, CA 95901

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Kerfoot:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Strawberry Valley Rancheria
Calvine Rose, Chairperson
P.O. Box 667
Marysville, CA 95901

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Rose:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Single Springs Band of Miwok Indians
Nicholas Fonseca, Chairperson
P.O. Box 1340
Shingle Springs, CA 95682

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Fonseca:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Shingle Springs Band of Miwok Indians
Jeff Murray, Cultural Resources Manager
P.O. Box 1340
Shingle Springs, CA 95682

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Murray:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Enterprise Rancheria of Maidu Indians
Glenda Nelson, Chairperson
1940 Feather River Blvd., Suite B
Oroville, CA 95965

Subject: Natomas Levee Improvement Project(s)

Dear Ms. Nelson:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Enterprise Rancheria of Maidu Indians
Frank Watson, Vice Chairperson
1940 Feather River Blvd., Suite B
Oroville, CA 95965

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Watson:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Rose Enos
15310 Bancroft Road
Auburn, CA 95603

Subject: Natomas Levee Improvement Project(s)

Dear Ms. Enos:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW

Project Name: 05110058.01
Project Number: SAFCA / N. NATOMAS LEVEE

Telephone Contact Report

CONFIDENTIAL

Call Participants: LBM – ROSIE ENOS

Title: ? – MAIN / WASHOE CONTACT

Initiated By: LBM

Organization: (SEE ABOVE)

Phone Number: 530-878-2378

Location: EDAW SAC

Subject: SAFCA / NATOMAS C.C. LEVEE

Date/Time: 7-9-07 12:30

Discussion Item(s):

- CONCERN IS BURIAL SITE AVOIDANCE

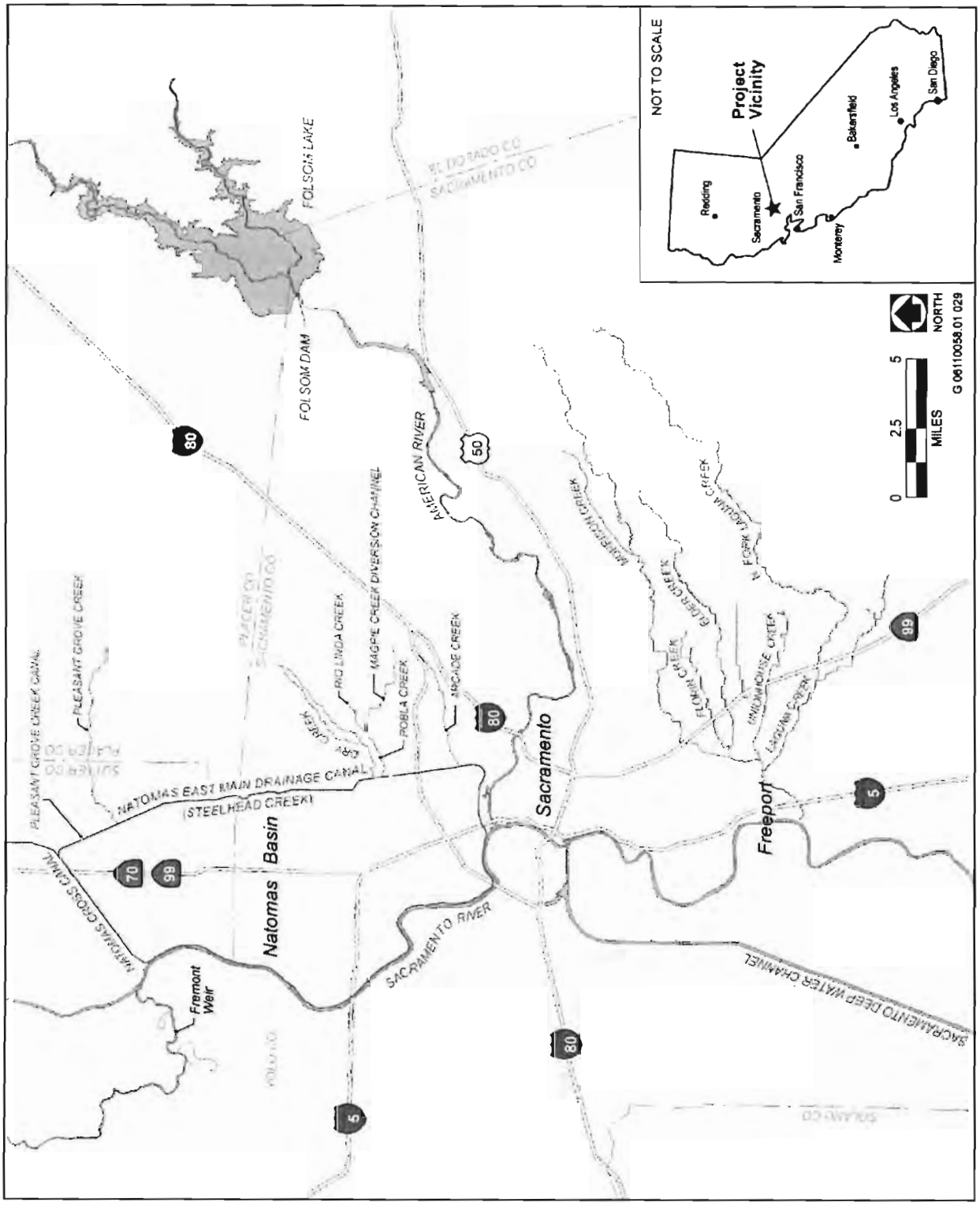
- WOULD LIKE ANY INFORMATION CONCERNING ANY FURTHER WORK CONCERNING SUCH SITES

Action Item(s):

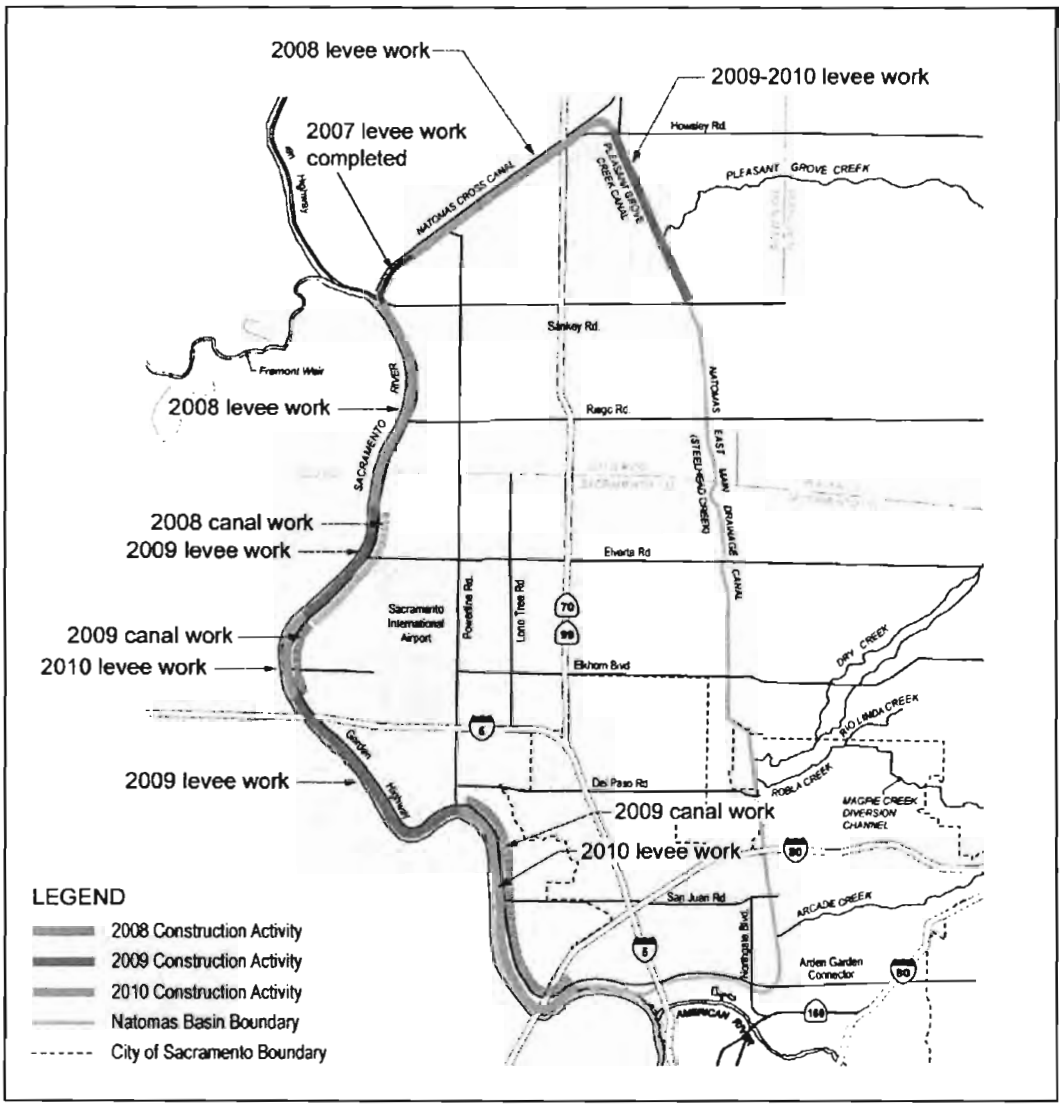
Distribution:

ENCLOSURE 4

PROGRAMMATIC AGREEMENT
NATOMAS LEVEE IMPROVEMENT PROJECT



Enclosure 1: Project Location



Enclosure 2: Project Construction by Phase

ENCLOSURE 3

PROJECT SUMMARY

ENCLOSURE 3

DESCRIPTION OF THE SACRAMENTO AREA FLOOD CONTROL AGENCY'S NATOMAS LEVEE IMPROVEMENT PROGRAM LANDSIDE IMPROVEMENTS PROJECT

PURPOSE AND NEED

PROJECT OVERVIEW

The Natomas Levee Improvement Program (NLIP) Landside Improvements Project proposed by the Sacramento Area Flood Control Agency (SAFCA) is intended to provide urgently needed flood control system improvements to the Natomas Basin in southern Sutter and northern Sacramento Counties, California (Exhibit 1). The project would improve the levee system that protects the 53,000-acre Natomas Basin, including a portion of the city of Sacramento. The Natomas Basin is bounded by leveed reaches of the Natomas Cross Canal (NCC) on the north, the Sacramento River on the west, the American River on the south, and the Pleasant Grove Creek Canal (PGCC) and Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek on the east (Exhibit 1).

SAFCA's intent is to provide the Natomas Basin with at least a 100-year level of flood protection by the end of 2010 and a "200-year" level of protection by the end of 2012. Achievement of these aims would significantly reduce the risk of an uncontrolled flood in the Natomas Basin that would result in a catastrophic loss of property (estimated at $7 billion) and a prolonged interruption of commercial activity, including the operation of Sacramento International Airport (Airport) and closure of Interstate 5 (I-5) and State Route (SR) 99/70. Flooding is particularly hazardous in a heavily urbanized basin like Natomas because of the depths that floodwaters can reach—more than 10 feet in some areas.

DEFICIENCIES OF THE NATOMAS LEVEE SYSTEM AND PROPOSED REMEDIES

Approximately 26 miles of the NCC south levee, the Sacramento River east levee, and the PGCC west levee require one or more forms of remediation to address the potential for failure in a 100-year or "200-year" flood event, as follows:

- Inadequate freeboard—The NCC south levee and portions of the Sacramento River east levee must be raised to provide at least 3 feet of freeboard above the 100-year water surface elevation, and several reaches of the Sacramento River east levee must be raised to provide 3 feet of freeboard above the "200-year" design water surface elevation.

- Underseepage and through-seepage vulnerability—Most of these same reaches do not meet recently adopted federal criteria for safely containing underseepage and through-seepage when the water surface in the adjacent channel reaches the 100-year elevation or, in some cases, the "200-year" elevation.

Underseepage problems can occur where levees are constructed on low-permeability foundation soil (silt and clay) underlain by a layer of higher permeability (sand and gravel). Excessive underseepage makes the levee susceptible to failure during periods of high river stage. Under these conditions, seepage travels horizontally under the levee and then is forced vertically upward through the low-permeability foundation layer, often referred to as a "blanket." Failure of the blanket can occur either by uplift, a condition in which the blanket does not have enough weight to resist the confined pressure acting on the bottom of the blanket, or by piping (internal erosion) caused by water flowing under high vertical gradients through the erodible blanket and carrying fine soil particles out of the foundation materials. Through-seepage is seepage through a levee embankment that can occur during

periods of high river stage. Depending on the duration of high water and the permeability of embankment soil, seepage may exit the landside face of the levee. Seepage can also pass directly through pervious layers in the levee if such layers are present. Under these conditions, the stability of the landside levee slope may be reduced.

The project encompasses addressing freeboard deficiencies through levee raises; addressing seepage potential using a combination of seepage berms, cutoff walls, and relief wells; and acquiring additional right-of-way to construct the improvements and to prevent encroachment into the flood control system. In addition, the project has been designed to include an enlarged levee embankment (adjacent setback levee) along the land side of the existing Sacramento River east levee to preclude the need for substantial removal of vegetation and structural encroachments on the water side of this levee in compliance with U.S. Army Corps of Engineers (Corps) guidance. These improvements would include recontouring the levee slopes where necessary.

The following subsections summarize the methods to address freeboard deficiencies and seepage potential, which will be used in various combinations on the NCC south levee, Sacramento River east levee, and the PGCC west levee.

Levee Raises

The freeboard increases would be accomplished through raises of the existing NCC south levee or through construction of the raised adjacent setback levee adjacent to the existing Sacramento River east levee:

- Raise of existing levee (NCC south levee). A full levee raise is required for the NCC south levee, consisting of an embankment raise from the landside or waterside toe (or both) upward to the increased levee crown elevation. This requires partially excavating the levee slope to provide a working platform for equipment, typically 10 feet wide, and rebuilding the levee to the appropriate elevation by benching the new embankment material into the existing embankment material.

- Adjacent setback levee (Sacramento River east levee). The levee raise of the Sacramento River east levee would be accomplished through the construction of an "adjacent setback levee" adjoining the Sacramento River east levee. The adjacent setback levee would be constructed with a crown elevation 3 feet above the "200-year" water surface profile. In the upper reaches, where the existing levee has freeboard deficiencies of as much as 3 feet, the crown of the adjacent setback levee would be higher than the existing levee and Garden Highway roadway. In the lower reaches, where the existing levee has sufficient freeboard, the adjacent setback levee would be the same height as the existing levee.

Seepage Berms

Seepage berms are wide embankments placed outward from the landside toe of the levee to lengthen the underseepage path, thereby lowering, to acceptable levels, the erosive potential of seepage passing through permeable layers under the levees. Seepage berms typically extend 100 to 400 feet from the levee. The berm thickness depends on the severity of the seepage pressure, but generally berms are 5 feet thick near the landside toe and taper to a thickness of 3 feet at the prescribed distance from the toe. A seepage collection ditch is often constructed at the landward toe of all seepage berms. Seepage berms are planned for construction along portions of the Sacramento River east levee and the PGCC west levee.

Cutoff Walls

Conventional slurry cutoff walls are typically constructed using an excavator with a long-stick boom capable of digging a trench to the maximum required depth. Bentonite slurry is pumped into the trench during trench excavation to prevent caving. The soil, cement, and bentonite are mixed to achieve the required cutoff wall strength and permeability, and the mixture is backfilled into the trench. Select fill is used to rebuild the levee. The NLIP includes construction of cutoff walls along portions of the NCC south levee and the Sacramento east levee. Cutoff wall construction may also be required in some areas along the PGCC west levee.

For the NCC south levee, preparation for construction of the cutoff wall would begin with using scrapers (or other suitable equipment, depending on the slope) to clear and grub/strip the surface to a depth of 2 inches to remove low-growing vegetation, loose stone, and surface soils. The aggregate base from the operating road also would be removed and stockpiled for later reuse. Waste material would be hauled to an off-site location.

Construction of the cutoff wall would include degrading the existing levee to a depth equal to one-half its total height (approximately 9 feet). A 70-foot-deep cutoff wall would be constructed for the total length of 23,150 lineal feet, with the method of installation at the contractor's discretion. Material degraded to support cutoff wall construction would be compacted at the landside toe of the levee to support raising portions of the NCC south levee. Unsuitable material generated from cutoff wall construction would be disposed of off-site. Equipment that would be used in phases of the cutoff wall construction includes excavators, scrapers, loaders, bulldozers, rollers, haul trucks, water trucks, hydroseeding trucks, pickup trucks, slurry pumps, and generators.

Work on the Sacramento River east levee includes construction of an adjacent levee with construction of a cutoff wall to occur in several reaches of the adjacent levee. Borrow material would be excavated from several locations in the project area and would be delivered to the levee construction sites by scrapers or haul trucks where it would be spread by motor graders and compacted by sheepsfoot rollers to build the adjacent levee up to a height equal to about two-thirds of the height of the existing levee. This would create a working platform for cutoff wall installation using an excavator with a long-stick boom capable of digging a trench to a maximum depth of approximately 80 feet. Bentonite slurry would be pumped into the trench during excavation to prevent caving. The soil excavated from the trench would be mixed with bentonite and backfilled into the trench to create the cutoff wall.

RELIEF WELLS

Relief wells provide protection against levee underseepage by providing a path for underseepage to exit to the ground surface at the landside toe of the levee without creating sand boils or piping levee foundation materials. Relief wells are an option for addressing underseepage in reaches where continuous sand and gravel layers have been identified by the geotechnical analysis.

Relief wells are constructed near the levee landside toe to provide pressure relief beneath surficial fine-grained soils. The wells are constructed using soil boring equipment to bore a hole vertically through the fine-grained blanket layer and into the coarse-grained aquifer layer beneath. Pipe casings and filters are installed to allow the pressurized water to flow to the ground surface, thereby relieving the pressures beneath the clay blanket. Relief wells either may discharge onto open ground or may require conveyance to a stormwater drainage system or a pump station. Relief wells cause the least amount of construction disturbance but require routine maintenance of the wells themselves and the drainage and pumping facilities necessary to support them.

EXISTING PROJECT FACILITIES AND POTENTIAL BORROW SITES

All project construction activities would take place within the Natomas Basin, except for the development of a borrow site on Reclamation District (RD) 1001 land northeast of the basin (Exhibit 2). The following sections describe the existing flood control facilities, their general setting, and adjacent irrigation infrastructure and the potential borrow sources. These features, as well as the borrow locations, constitute the physical infrastructure and locations where the project may result in effects on historic properties.

FLOOD CONTROL AND IRRIGATION FACILITIES

NATOMAS CROSS CANAL SOUTH LEVEE

The NCC is a 5.3-mile-long channel that carries water from several tributary watersheds in western Placer County and eastern Sutter County to the Sacramento River. The NCC begins at the PGCC and East Side Canal and extends southwest to its confluence with the Sacramento River near the Sankey Road/Garden Highway

intersection. During periods of flooding, the Sutter Bypass, Sacramento River, and NCC all contribute to raised water elevations that can affect the NCC levees. For engineering purposes, the levee is divided into seven reaches. Much of the south levee contains an existing stability berm with an internal drainage system. An approximately 80- to 100-foot maintenance access area extends along the land side of the levee through most of the NCC's length.

Farms and rural residences are located on both sides of the NCC, with rice the primary crop under cultivation. The Lucich North and Frazer Habitat Preserves, maintained by The Natomas Basin Conservancy (TNBC), lie south of the NCC south levee from the eastern end of Reach 2 through the western end of Reach 6. A drainage canal, referred to as the Vestal Drain, runs parallel to the NCC south levee through much of Reach 2, approximately 100 feet from the landside levee toe. A private irrigation pump and irrigation canal are located at the landside levee toe in Reach 1. Natomas Central Mutual Water Company's (NMWC's) Bennett Pumping Plant and RD 1000's Pumping Plant No. 4 are located in Reach 2, and the NMWC Northern Pumping Plant is located in Reach 3. NMWC's North Main Canal runs parallel to the levee through Reaches 4 and 5, approximately 100 feet from the landside levee toe.

SACRAMENTO RIVER EAST LEVEE

An 18-mile-long section of the east levee of the Sacramento River protects the west side of the Natomas Basin between the NCC and the American River. For planning purposes, the levee is divided into 20 reaches. The Garden Highway is located on top of the levee crown within all 20 reaches. A drained, 10-foot-wide stability berm is present on the landside slope of the levee between the NCC and Powerline Road (Reaches 1–12). Cutoff walls were previously constructed through the levee in Reaches 12–20.

The land uses along the levee vary from north to south. Along the land side, Reaches 1–13 are bordered mainly by private agricultural lands containing a few rural residences, Airport bufferlands, and two farmed TNBC parcels. Teal Bend Golf Club is west of the Airport, adjacent to the levee along Reach 6. The parcels bordering Reaches 14–18 contain more residences, several rural estates, and three TNBC parcels. The land side of Reaches 19 and 20 is bordered by residential subdivisions, a business park, and City parklands.

Several irrigation canals, pipelines, wells, and pump stations exist along the Sacramento River east levee. The Elkhorn Canal and the Riverside Canal are key agricultural irrigation canals in the NMWC system. The Elkhorn Canal runs parallel to the Sacramento River east levee from the North Drainage Canal in Reach 4B through Reach 8 and into the start of Reach 9 (1,250 feet south of Elkhorn Boulevard). The Riverside Canal extends from just north of Reach 13 to the middle of Reach 19. Several lateral canals connect to the Elkhorn and Riverside Canals. These canals have earthen embankments with side slopes that are nearly vertical, requiring regular maintenance. Both canals are supplied by pumping plants on the Sacramento River.

In addition to the NMWC irrigation systems, there are several landowner-operated systems along the levee. These facilities are located primarily in Reaches 1–4A and 9–12, in areas not currently served by the NMWC systems. The areas are serviced by either well pumps on the land side or river pumps, which discharge into buried pipelines, small irrigation ditches, or directly onto fields. The distribution systems run along the landside toe of the levee to supply fields that slope away from the levee.

Several drainage pumping plants are operated by RD 1000 along the Sacramento River east levee. These facilities pump drain water from the main drainage canal system into the river. They include Pumping Plant No. 2, located in Reach 4B; Pumping Plant No. 5, located in Reach 10; Pumping Plant No. 3, located in Reach 13; and Pumping Plant No. 1, located in Reach 20A. Pumping Plant No. 2 was temporarily removed as part of an emergency levee repair in 2006 and would be replaced as an element of the project in 2009–2010. In addition to these RD 1000 pumping stations, the City of Sacramento operates the Willow Creek drainage pumping station which is located in Reach 19B.

Pleasant Grove Creek Canal West Levee

The PGCC west levee extends southerly from the east end of the NCC south levee to the north end of the NEMDC/Steelhead Creek levee near the Sankey Road crossing. The PGCC west levee protects the Natomas Basin from flood flows from Pleasant Grove Creek and other creeks in western Placer County, as well as from water that backs up in the NCC during high river stages in the Sacramento River. Natomas Road is located on top of the levee crown. No berms support this levee. A private canal extends parallel to the PGCC west levee for about 1,500 feet at the landside levee toe. Farms and scattered rural residences are located on the land side of the PGCC west levee, and a manufacturing facility and a railroad siding are located within several hundred feet of the levee, just south of Sankey Road.

Borrow Sites

Borrow sites are areas from which earthen materials would be removed for use in construction. The sites would be recontoured and developed as either managed marsh or grassland habitat following excavation for this use. Where borrow sites would be used over more than one construction season, the work would progress in cells that would be incrementally developed as habitat as the borrow activities are completed.

SAFCA has identified borrow sources for the project in 2008, 2009, and 2010 flood control and irrigation infrastructure improvements and redundant sources that may be pursued if negotiations regarding the preferred sources are unsuccessful or additional quantities are found to be needed during construction:

- Brookfield property (2008 preferred, 2009 preferred, 2010 preferred)
- Airport bufferlands north of the Airport complex (2008 preferred, 2009 preferred, 2010 potential)
- Fisherman's Lake area (2010 preferred) (no specific parcels identified for this borrow site)
- RD 1001 (2008 potential, 2009–2010 potential)

Except for the Fisherman's Lake area in the southern part of the Natomas Basin, these borrow areas are shown in Exhibit 3.

DESCRIPTION OF PROJECT ELEMENTS AND ACTIVITIES

The elements of the project are described in this section in four broad, overlapping categories:

- levee raising and seepage remediation,
- improvements to major irrigation and drainage infrastructure,
- habitat development and management, and
- additional actions to meet Federal Emergency Management Agency (FEMA) requirements: encroachment management and bridge crossing modifications.

Expanding the landside footprint of the Sacramento River east levee necessitates redesigning and relocating the irrigation and drainage infrastructure currently located along the landside toe of the levee. Relocation of other major and minor irrigation and drainage canals located near the NCC south levee and the PGCC west levee will be necessary with implementation of levee improvements. Modifications to the existing irrigation and drainage systems will include creation of a new canal designed to provide giant garter snake (GGS) habitat and improved stormwater drainage west of the Airport (GGS/Drainage Canal).

Site preparation would entail removing trees and other large vegetation from the construction area and stripping the top 6 inches of material from the landside slope of the existing levee, the footprint of the adjacent setback levee, the seepage berm areas, and the 50-foot-wide permanent maintenance access corridor. Large roots and

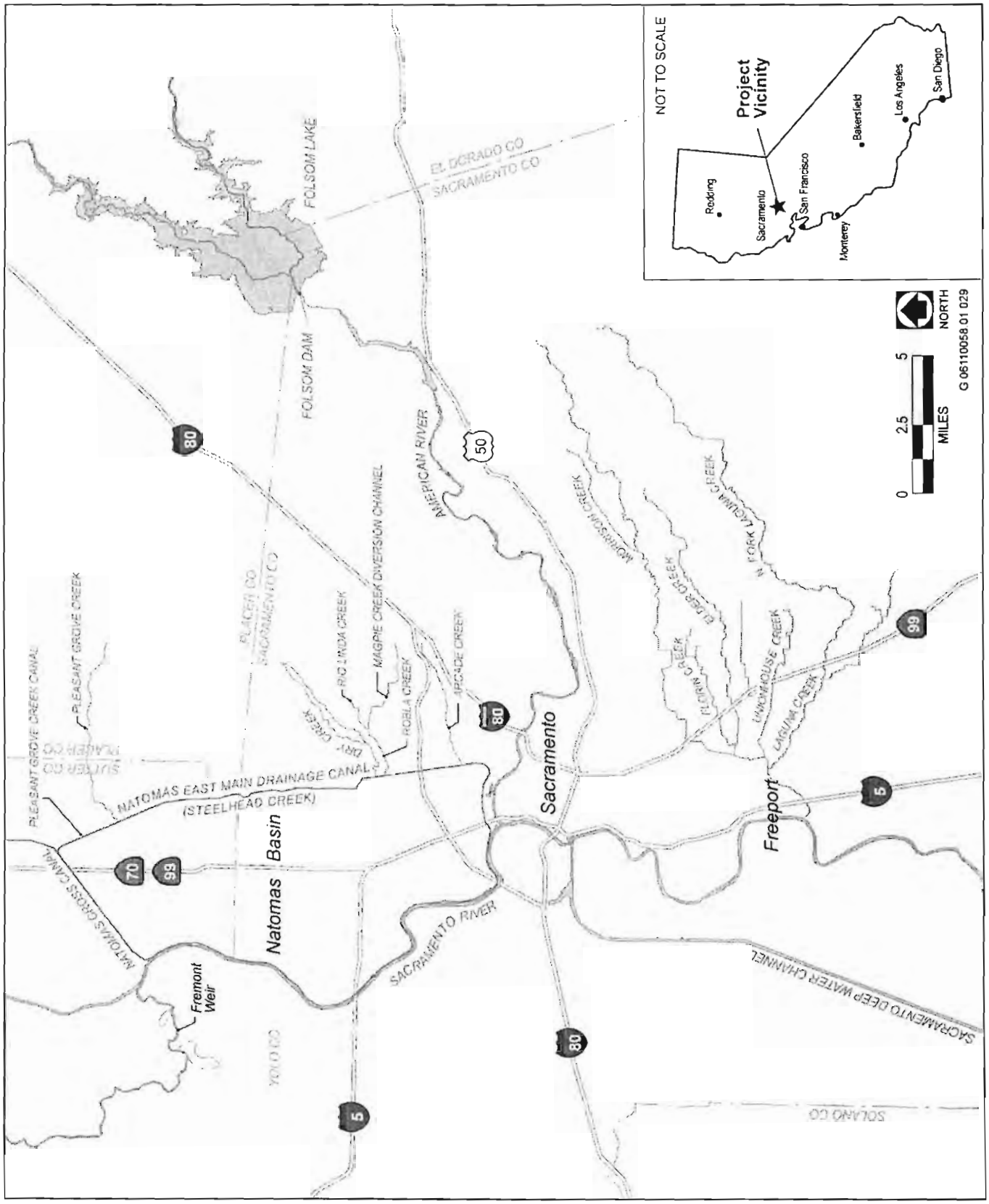
deleterious material would then be grubbed from the working area. To the extent feasible, trees that must be removed from within the footprint of the adjacent setback levee or berms would be relocated outside of the footprint to new woodland planting areas, where a substantial number of new trees would also be planted. Excess earth materials (organic soils, roots, and grass from borrow areas and the adjacent levee foundation and excavated material that does not meet levee embankment criteria) would be used in the reclamation of borrow areas or hauled off-site to landfills. Cleared vegetation (i.e., trees, brush) would be hauled off-site to landfills. After construction, the levee slopes and any previously vegetated areas disturbed during construction, including staging areas, would be seeded with a grass mix.

The major project elements and related activities are summarized in Table 1.

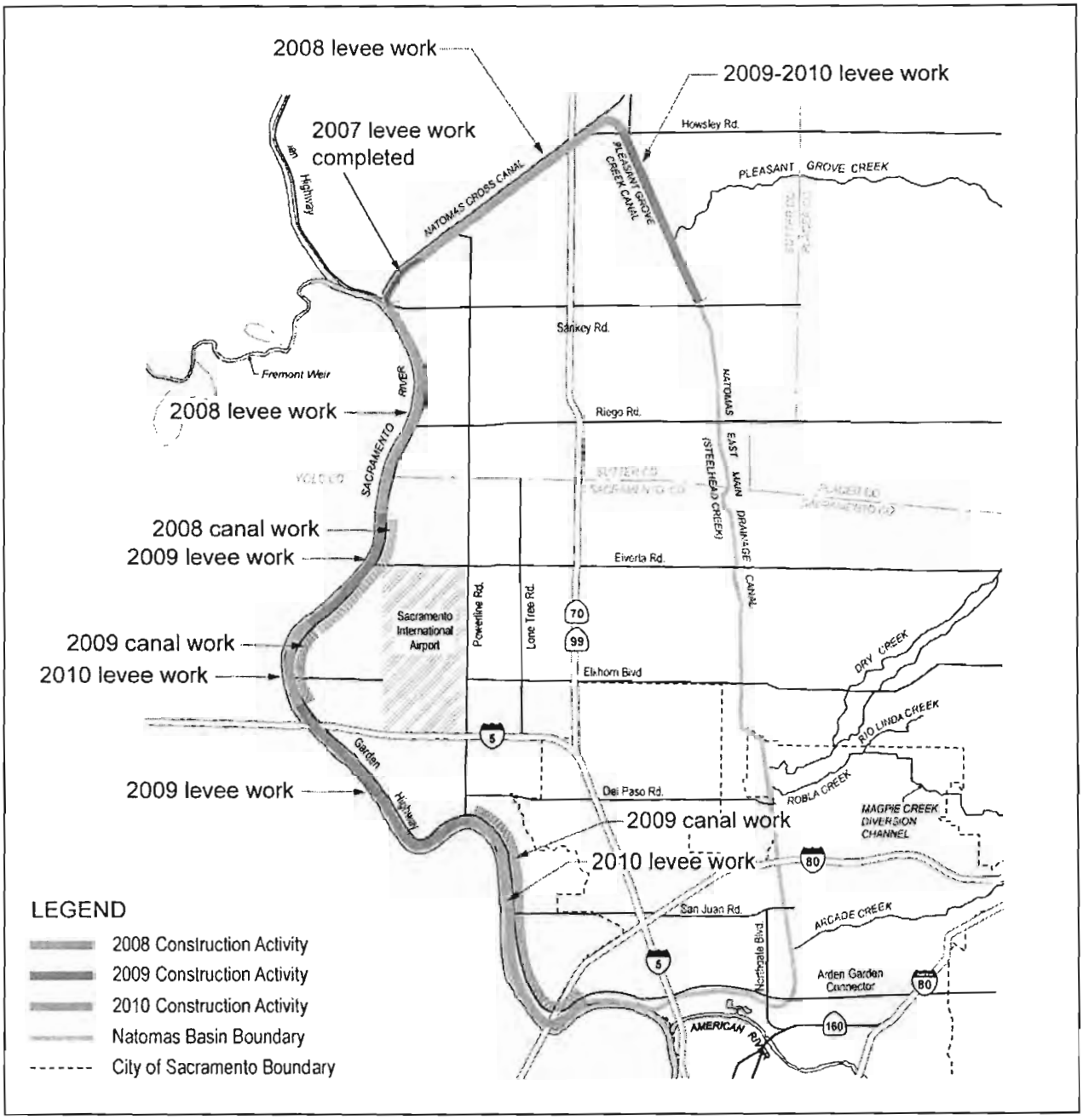
Table 1
Summary of the Major Elements of the Project

Project Element	Project Activity and Timing
2008 Construction	
Levee raising and seepage remediation: NCC south levee	Raise and realign the NCC south levee to provide additional freeboard and more stable waterside and landside slopes and to reduce the need for removal of waterside vegetation. (May 8–November 1, 2008) Construct a seepage cutoff wall through the levee crown in Reaches 3–7. (May 8–October 15, 2008)
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct a raised adjacent setback levee from the NCC to just south of the North Drainage Canal (Reaches 1–4B, except Stations 55+00 to 68+00 in Reach 2) with a 100-foot seepage berm in Reach 4A and a 300-foot seepage berm in Reach 4B. (May 1–November 1, 2008)
Improvements to major irrigation and drainage infrastructure	Construct a new canal designed to provide drainage and associated giant garter snake habitat (the GGS/Drainage Canal) between the North Drainage Canal and Elkhorn Reservoir. (May 1–November 1, 2008) Relocate the Elkhorn Canal (highline irrigation canal) between the North Drainage Canal and Elkhorn Reservoir in anticipation of the filling of the existing Elkhorn Canal at the toe of the Sacramento River east levee in late 2008 and in 2009. (May 1–November 1, 2008) Remove a deep culvert at the location of Pumping Plant No. 2. (May 1–November 1, 2008)
Habitat creation and management	Establish vegetative habitat features in the new GGS/Drainage Canal. (Fall 2008) Recontour and create managed marsh and grassland on lands used as borrow sources. (Fall 2008 or spring 2009) Establish grassland on the adjacent setback levee slopes and seepage berms. (August 1–December 31, 2008) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint. (Fall 2008)
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites and along the flood control system. (Before construction)
2009–2010 Construction	
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct an adjacent setback levee along Stations 55+00 to 68+00 in Reach 2 and from just south of the North Drainage Canal to the American River north levee (Reaches 5A–20B), raised where needed to provide adequate freeboard, with seepage berms, relief wells, and cutoff walls for seepage remediation as required (specific seepage remediation measures are still under study). (May 1–November 1, 2009, and May 1–November 1, 2010)
Seepage remediation: PGCC west	Flatten waterside and landside slopes, and construct seepage berms along the PGCC west levee (specific berm widths and potential use of cutoff walls in some areas to be

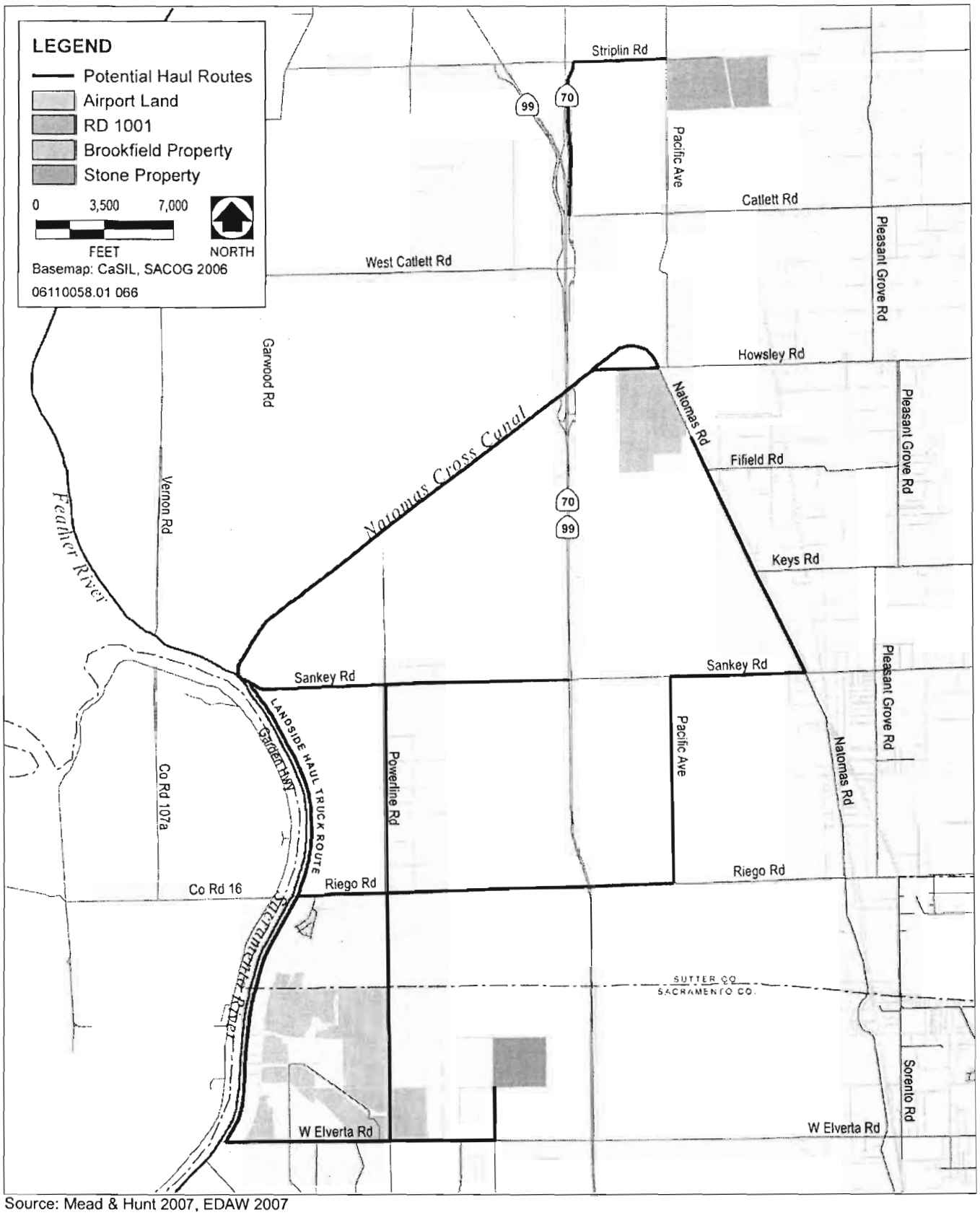
Table 1 Summary of the Major Elements of the Project	
Project Element	**Project Activity and Timing**
levee	determined). (May 1–November 1, 2010)
Improvements to major irrigation and drainage infrastructure	Construct the new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal (specific alignment to be determined), and improve the West Drainage Canal to provide enhanced giant garter snake habitat. (May 1–November 1, 2009) Implement Airport West Ditch improvements in connection with construction of the GGS/Drainage Canal to allow the Airport to decommission the agricultural irrigation function of this facility and eliminate the hazards currently associated with it. The Airport stormwater detention function provided by this ditch would continue. The ditch would therefore be recontoured as a gently sloping swale to facilitate periodic maintenance such as mowing. (May 1–November 1, 2009) Relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir (specific alignments to be determined) and fill the existing canals. (May 1–November 1, 2009) Construct RD 1000 Pumping Plant No. 2. (April 1, 2009–September 1, 2010)
Habitat creation and management	Establish habitat enhancements in the new GGS/Drainage Canal and improved West Drainage Canal. (Fall 2009) Recontour and create marsh and managed grassland on lands used as borrow sources. (Fall or spring after borrow excavation in 2009 and 2010) Establish grassland on the adjacent setback levee slopes and seepage berms. (Fall after construction in 2009 and 2010) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint (locations to be determined). (Fall 2009 and 2010)
Additional actions to meet FEMA requirements: encroachment management on the Sacramento River east levee, and bridge crossing modifications at the NCC	Remove encroachments from a portion of the water side and land side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the NFIP and USACE design criteria (specific criteria still under discussion). (Timing to be determined) Modify the SR 99/70 crossing of the NCC as needed to meet FEMA requirements. (Timing to be determined)
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites and along the flood control system. (Before construction)
Notes: Airport = Sacramento International Airport; Elkhorn Canal = Elkhorn Main Irrigation Canal; FEMA = Federal Emergency Management Agency; GGS = Giant Garter Snake; NCC = Natomas Cross Canal; NFIP = National Flood Insurance Program; PGCC = Pleasant Grove Creek Canal; RD = Reclamation District; Riverside Canal = Riverside Main Irrigation Canal; SR = State Route; USACE = U.S. Army Corps of Engineers	



Project Location **Exhibit 1**



Project Construction By Phase **Exhibit 2**



Source: Mead & Hunt 2007, EDAW 2007

Anticipated Borrow Areas and Local Haul Routes **Exhibit 3**

ENCLOSURE 4

PROGRAMMATIC AGREEMENT
NATOMAS LEVEE IMPROVEMENT PROJECT

PROGRAMMATIC AGREEMENT
AMONG THE U.S. ARMY CORPS OF ENGINEERS,
THE SACRAMENTO AREA FLOOD CONTROL AGENCY, AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

REGARDING THE ISSUANCE OF PERMISSION UNDER THE AUTHORITY OF SECTION 408 OF THE RIVERS AND HARBORS ACT OF 1899 AND SECTION 404 OF THE CLEAN WATER ACT FOR THE NATOMAS LEVEE IMPROVEMENT PROGRAM, LANDSIDE IMPROVEMENTS PROJECT

WHEREAS, the U.S. Army Corps of Engineers, Sacramento District (Corps) proposes to review an application that seeks permission for alteration of flood control structures under the authority of Section 408 of the Rivers and Harbors Act and to issue one or more permits to discharge fill to the waters of the United States under the authority of Section 404 of the Clean Water Act to the Sacramento Area Flood Control Agency (SAFCA) for the Natomas Levee Improvement Program Landside Improvements Project (Project); and

WHEREAS, The Corps has determined that the issuance of these permissions and permits constitute an undertaking per 36 CFR 800.16(y), which require compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended (16 U.S.C. 470f); and

WHEREAS the Project includes improvements to an extensive levee system surrounding the Natomas Basin and landscape and irrigation/drainage infrastructure modifications that will be implemented in three construction phases, currently scheduled for 2008, 2009, and 2010; and

WHEREAS, the Corps has determined that this undertaking will have an adverse effect on at least one Historic Property that has been determined eligible for inclusion in the National Register of Historic Places (NRHP), CA-SAC-485/H; and

WHEREAS, because of the complex and phased nature of the improvements, the Corps has not yet determined the exact area of potential effects (APE), nor has SAFCA acquired all of the rights-of-entry, easements and ownership interests that would allow a complete inventory and determination of effects on Historic Properties; and

WHEREAS, the Natomas Basin is sensitive for buried archaeological resources that cannot be accurately located prior to construction; and such buried sites may also be Historic Properties, and therefore SAFCA and the Corps need to document a framework for managing post-review discoveries per 36 CFR Section 800.13, including evaluation of those resources, assessment of effects, and resolution of potential adverse effects; and

WHEREAS, at such time as any unevaluated cultural resource may be discovered, it may require archaeological data recovery and/or other historic preservation activities, in compliance with Section 106 of the National Historic Preservation Act, concurrent with *active* construction; and

WHEREAS, the urgency of flood control improvements require a management framework for Historic Properties that will be implemented after the execution of this agreement in an expedited manner that thus departs from the process normally used under 36 CFR Section 800 et seq., yet still fulfills the requirements of Section 106 of the NHPA; and

WHEREAS, SAFCA has been invited to participate as a signatory to this Programmatic Agreement (PA) by the Corps and the California State Historic Preservation Officer (SHPO; and

WHEREAS, the Corps has consulted The Ione Band of Miwok Indians, the Shingle Springs Band of Miwok Indians and the United Auburn Indian Community, and they have been invited to concur in this PA; and

WHEREAS, the Corps shall make the terms and conditions of this PA as part of the conditions of any permissions and permits issued by the Corps for this project; and

WHEREAS, The Central Valley Flood Protection Board has delegated all authority for SAFCA to comply with the terms of this agreement on its behalf; and

WHEREAS, the Corps has consulted with the SHPO and the Council in accordance with regulations implementing Section 106 of the NHPA;

WHEREAS, the Council has been consulted and declined to participate in this agreement;

NOW, THEREFORE, the Corps, the SHPO, and SAFCA agree that the Project shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on Historic Properties.

The Corps shall ensure that the following stipulations of this PA are carried out.

STIPULATIONS

I. DEFINITIONS

The terms used in this Programmatic Agreement shall be as defined in regulations implementing Section 106 of the NHPA, and as follows:

"APE (Area of Potential Effect)" means any location at which any Project development activity will be constructed; and locations of any Project-related construction staging areas, borrow areas, and materials stockpile areas; and the locations of any other Project development activities. The APE shall be defined so as to include the maximum spatial dimensions of all Project-related construction and operations rights-of-way, easements, areas which potentially may be affected by Project activities, and other properties to which SAFCA has access, whether on a temporary or permanent basis, or ownership for Project development.

"**Concurring parties**" means their concurrence indicates that they are in agreement with the terms of the PA.

"Consulting parties" means the Corps, the SHPO, and SAFCA who are signatories to this PA. Only signatories have the authority to amend or terminate this PA.

"**Cultural resources**" means any property or location that was created, modified, or used by people at least 50 years in the past. Cultural resources include but are not limited to Historic Properties and traditional cultural properties/places (i.e., NRHP listed or eligible properties as defined at 36 CFR Part 60).

"Historic Property" means a cultural resource that has been determined eligible for or is listed on the NRHP (i.e., NRHP listed or eligible properties as defined at 36 CFR Part 60), either by formal nomination and listing or by concurrence between federal agencies and the SHPO.

"Historic preservation" means any activity conducted in accordance with the NHPA and its implementing regulations to, among other things, inventory, evaluate, manage, or treat cultural resources such as buildings, structures, sites, districts, and objects eligible for, or that may be determined eligible for, listing in the NRHP according to eligibility criteria at 36 CFR Part 60.

"Project development activities" means any physical action related to the Project that has the potential to damage or otherwise alter those characteristics of Historic Properties that would make them eligible for listing in the NRHP.

II. STANDARDS

(A.) Professional Qualifications. All technical work required for historic preservation activities implemented pursuant to this Programmatic Agreement shall be carried out by or under the direct supervision of a person or persons meeting at a minimum the *Secretary of Interior's Professional Qualifications Standards* for archaeology or history, as appropriate (48 FR 44739). "Technical work" here means all efforts to inventory, evaluate, and perform subsequent treatment such as data recovery excavation or recordation that is required under this Programmatic Agreement. This stipulation shall not be construed to limit peer review, guidance, or editing of documents by SAFCA or SAFCA's consultants.

(B.) Historic Preservation Standards. Historic preservation activities carried out pursuant to this Programmatic Agreement shall meet the *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44740) as well as standards and guidelines for historic preservation activities established by the SHPO. The Corps shall ensure that all reports prepared pursuant to this Programmatic Agreement will be provided to the consulting parties and shall ensure that all such reports meet published standards of the California Office of Historic Preservation, specifically, *Preservation Planning Bulletin* Number 4(a), "Archaeological Resources Management Reports (ARMR): Recommended Contents and Format" (December 1989).

III. PROJECT DESCRIPTION

(A) PROJECT Description. A description of the Project is found in the Final Environmental Impact Report (November 2007). A summary of the Project's description in the environmental impact report is provided as **Attachment A** and is made a part of this Programmatic Agreement.

(B) Existing Conditions. An archival search and archaeological survey have been completed for all areas of the APE as currently defined to which SAFCA currently has access, and which currently are not covered by paving, built environment features, or agricultural crops. A report of the results of archival research and archaeological survey, "Cultural Resources Inventory Reports, Part 1 – Natomas Levee Improvement Program Landside Improvements Project, Sacramento and Sutter Counties, California" (October 2007) is made **Attachment B** to this Programmatic Agreement.

A number of prehistoric sites are known to be present along the banks of the Sacramento River. However, archaeological survey of the area is of limited value because the alluvial depositional environment may

obscure and bury sites, leaving no surface manifestation of those archaeological resources. For most of the length of the Project, levees have been built on the riverbanks. These levees are one focus of the Project's activity, and occupy a substantial portion of the Project's APE. Furthermore, it has not been established whether certain known sites in proximity to the Project's development activities extend under the existing levees. The existing levees both obscure ground surfaces and prevent subsurface archaeological testing within their footprints. Because of these conditions, a full assessment of archaeological sites that may be present in the APE cannot be made in advance of construction. There is no definitive information, even for sites known to be in Project's proximity, of site boundaries relative to the APE, or of the significance or integrity of any portions of such sites that may be within the APE. For these reasons, even though archaeological deposits may extend into the APE, and even though some of these deposits may qualify as Historic Properties, it is impossible to develop meaningful site-specific Historic Properties Treatment Plans (HPTP) prior to all construction, or to carry out all necessary data recovery in advance of the Corps' approvals, permitting and construction.

For these reasons, unforeseen discoveries shall be treated pursuant to the provisions of 36 CFR 800.13 (Post-review discoveries).

(C) Project Phasing and Potential Changes to the APE: Because the improvements will occur in three phases (anticipated to be 2008, 2009, and 2010), it will be necessary to define the APE for each phase. The APE for each phase shall be submitted with the cultural resources inventory reports, and shall be consulted upon as part of that document, pursuant to **Stipulation IV**, below.

After the initial concurrence, changes to the APE may be necessary as SAFCA refines its phased Project plans. In particular, the ability of SAFCA to obtain access permissions of private landowners, determination of borrow sites and ongoing negotiations with resource agencies regarding species mitigation requirements may affect final Project's design, and may expand the current APE in some areas. Any changes to the APE shall be made in accordance with subsections D and E (below) of this Stipulation III. The SHPO, Corps, and SAFCA shall consult and reach concurrence in any changes to the APE. The final APE shall account for all Project development activities for the as-built Project. SAFCA shall notify the Corps of any change in the APE and the Corps shall determine the potential for Project development activities in a revised APE to affect cultural resources, through cultural resources inventory and testing as needed.

(1) If there is the potential that cultural resources exist in the revised APE, SAFCA shall submit to the Corps:
   (a) a map of the revised APE; and
   (b) a description of Project development activities to take place in the revised APE; and
   (c) a description of the inventory, nature, location, and known or potential significance of cultural resources in the revised APE; and
   (d) a description of any archaeologically sensitive areas in the revised APE that require monitoring by an archaeologist, and Native American monitor as appropriate; and
   (e) a plan for managing cultural resources in a manner that either avoids Project-related effects to cultural resources, or which mitigates any adverse effects, and which provides for the management of unforeseen cultural resources discoveries.

(2) If no cultural resources are identified within a revised APE, SAFCA shall document such a determination, provide documentation to the Corps and keep such documentation on file at its

principal offices.

After the Corps and SAFCA agree to a revised APE and if such a change has the potential to have an effect on cultural resources, the Corps shall submit the documentation to the SHPO for their review The SHPO shall have 30 calendar days from the date of receipt of the notice of a revision to the APE to review and to provide in writing either concurrence with or objection to the definition of the revised APE, and any proposed historic preservation activities. Should the SHPO not respond in writing within 30 calendar days, the Corps and SAFCA shall proceed as though the SHPO has concurred in the revised APE, and the proposed historic preservation activities, if any.

Should the SHPO object to the definition of the revised APE or proposed historic preservation activities, the Corps, SAFCA, and the SHPO shall consult for a period not to exceed 15 calendar days following the date of the receipt of the SHPO's written objection in an effort to come to agreement on the issues to which the SHPO has objected. Should the SHPO, the Corps, and SAFCA be unable to agree on the issues to which the SHPO has objected, the consulting parties to this Programmatic Agreement shall proceed in accordance with **Stipulation VIII (Resolving Objections)**, below.

(D) Scope of Identification Efforts in the APE: Inventories of Historic Properties within the established or revised APE shall be completed in accordance with **Stipulation IV (Inventory of Historic Properties)** of this Programmatic Agreement. Treatment of any adverse effects to Historic Properties within the established or revised APE shall be completed in accordance with **Stipulation V (Treatment of Effects)** of this Programmatic Agreement.

(E) Scope of the APE: For purposes of this Programmatic Agreement, a revised APE shall be defined to meet, at a minimum, the following criteria:

(1) The APE for any segment of the Natomas levees that are being improved as part of the Project and shall include the levee segment and a corridor extending not less than 75 feet from the land side toe of the levee segment. The APE also shall include:

- The extent of all Project construction and excavation activity required to construct flood control facilities and to modify irrigation and drainage infrastructure,
- The additional right-of-way/easements obtained by SAFCA as part of the Project's features,
- All areas used for excavation of borrow material and habitat creation, and
- All construction staging areas.

(2) The APE for Project activities shall include the direct footprint of the activity and a reasonable buffer determined by consultation between SAFCA and the Corps, according to the nature of the activity, SAFCA's ownership interest or easement, and the probability that ground-disturbing work may extend beyond the footprint of planned improvements and activities.

(3) The APE for any other type of Project development activities shall be defined by the Corps in consultation with the consulting parties.

IV. INVENTORY OF HISTORIC PROPERTIES

(A) Identification Efforts to Date and Further Work Required: An inventory of Historic Properties

within the APE has been initiated consistent with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716–44740). The SAFCA shall submit a completed inventory and evaluation for each phase of Project work (2008, 2009, 2010) to the Corps. Such inventory shall be deemed complete by the Corps when the SHPO concurs in the NRHP eligibility recommendation for all cultural resources within the APE for that phase.

Areas of Archaeological Sensitivity: Areas of archaeological sensitivity will be monitored in accordance with HPTPs.

(C) Changes in the APE: If areas are added to the Project development activities subsequent to the SHPO concurrence on the map of the APE for a specific phase, SAFCA shall complete an inventory of Historic Properties within the expanded APE. Such inventory shall be undertaken and completed consistent with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716–44740). Such inventory shall be deemed completed by the Corps at such time as the SHPO concurs in the NRHP eligibility of all cultural resources within the established and revised APE for the Project, pursuant to this Stipulation IV.

V. TREATMENT OF EFFECTS

(A) Historic Property Treatment Plans: If Historic Properties are identified in cultural resources inventories that would be adversely affected by the Project, SAFCA shall prepare a Historic Properties Treatment Plan (HPTP) for review and written approval by the Corps and the SHPO for those specific properties. An HPTP applicable to every Historic Property that may sustain adverse effects by the Project shall be prepared, including for those Historic Properties found during construction. An HPTP may address individual or multiple Historic Properties. An HPTP shall stipulate those actions SAFCA shall take to resolve the adverse effects of the Project on Historic Properties. SAFCA shall ensure that all provisions of an HPTP are carried out in a timely manner. Any changes to an HPTP shall be reviewed and approved by the Corps. Copies of all reports pertaining to the treatment of Historic Properties shall be submitted to the consulting parties to this Programmatic Agreement. Reports and other data pertaining to the inventory of, and treatment of effects on, Historic Properties may be distributed to concurring parties to this Programmatic Agreement and to other members of the public consistent with **Stipulation VII (Confidentiality)** of this Programmatic Agreement. Individual HPTPs may be submitted simultaneously with the cultural resources inventory report for specific Project phases. If HPTPs are submitted simultaneously with an inventory report for a Project phase or with an addendum to such report for an expanded APE or Project description, the Corps and SHPO review period for such HPTP shall run concurrently with the review period for the inventory report.

Review Schedule: The SHPO and the Corps shall have 30 calendar days to review and comment upon in writing any HPTP submitted by SAFCA. The SHPO and the Corps shall indicate in their review that they find the HPTP either acceptable or not. In the event that comments are not made by the SHPO within 30 calendar days, the Corps shall assume the SHPO has accepted the HPTP as submitted. In the event the Corps and/or the SHPO provide written comment within the 30-day period, either SAFCA shall accept the comments and revise the HPTP accordingly, or SAFCA and the Corps may object to some or all comments. Comments from the Corps or the SHPO that are not acceptable to SAFCA shall be resolved by consultation among the Corps, the SHPO, and SAFCA for a period of not more than 15 calendar days. Should the Corps, the SHPO, and SAFCA be unable to resolve any dispute regarding the Corps or the SHPO comments, the consulting parties shall proceed in accordance with **Stipulation VIII (Resolving**

Objections) of this Programmatic Agreement.

The Corps shall submit to the SHPO for review and comment any amendment, addendum, revision or other change to an HPTP. SAFCA shall proceed to make changes to an HPTP as per the procedure and schedule for the review and approval of an original HPTP. If a Historic Property is discovered within an expanded APE subsequent to an initial inventory effort for a phase, and the Corps and SAFCA agree that the Project may adversely affect the property, SAFCA shall submit an addendum to the HPTP or a new HPTP. The review schedule for this submittal follows the provisions of Stipulation V.

(B) Commencement of Construction and Project Work: Project development activities may commence within the APE after a Historic Properties inventory has been completed (per **Stipulations III and IV**, above), and prior to treatment of adverse effects on Historic Properties within the APE provided that:

(1) A plan to respond to inadvertent archaeological discoveries is prepared by SAFCA and approved by the Corps prior to the commencement of Project activities anywhere in the APE for that phase of the Project; and

(2) Project development activities do not encroach within 30 meters (100 ft) of the known boundaries of any Historic Property as determined from archaeological site record forms, other documentation, or as otherwise defined in consultation with the SHPO; and

(3) An archaeological monitor is present during any Project activities that are anticipated to extend either vertically or horizontally into any areas designated to be archaeologically sensitive by SAFCA in consultation with the Corps.

(C) Final Report Documenting Implementation of the Historic Properties Treatment Plan(s): Within one year after the completion of all work performed as part of the Project SAFCA shall submit to the Corps and SHPO a final report documenting the results of all work prepared under the HPTPs. This report shall be submitted to the Corps and SHPO for review and comments, which SAFCA shall incorporate.

VI. NATIVE AMERICAN AND OTHER PUBLIC CONSULTATION AND PUBLIC NOTICE

Members of the interested public shall be invited to consult regarding this Programmatic Agreement. Within 30 calendar days of the signing date of this Programmatic Agreement, the Corps, the SHPO, and SAFCA shall consult to compile a list of members of the interested public who shall be provided notice of this Programmatic Agreement. The opinions of local Native Americans with cultural ties to the APE and the opinions of other members of the public shall be taken into account by the consulting parties for historic preservation actions taken in accordance with this Programmatic Agreement. Native Americans and other members of the public may be invited to concur in this Programmatic Agreement. Native American monitor(s) shall be invited to assist SAFCA in the treatment of any Native American human remains and items associated with Native American burials discovered during the Project in accordance with California Public Resources Code Section 5097.98 and California Health and Safety Code Section 7050.5(b) and 7050.5(c).

VII. CONFIDENTIALITY

Confidentiality regarding the nature and location of the archaeological sites and any other cultural

resources discussed in this Programmatic Agreement shall be maintained on a "need-to know" basis limited to appropriate personnel and agents of SAFCA, the Corps, and the SHPO involved in planning, reviewing and implementing this Programmatic Agreement consistent with Section 304 of the NHPA.

VIII. RESOLVING OBJECTIONS

(A.) Should any party to this Programmatic Agreement object to any action proposed or carried out pursuant to this Programmatic Agreement, the Corps shall consult with the objecting party(ies) for a period of time not to exceed *30 calendar days* to resolve the objection. If the Corps determines that the objection cannot be resolved, the Corps shall forward all documentation relevant to the dispute to the Council. Within 30 calendar days after receipt of all pertinent documentation, the Council shall either:

(1) Provide the Corps with recommendations, which the Corps shall take into account in reaching a final decision regarding the objection; or

(2) Notify the Corps that the Council will comment in accordance with the requirements of Section 106 of the NHPA, and proceed to comment. Any Council comment provided in response shall be taken into account by the Corps, pursuant to the requirements of Section 106 of the NHPA.

(3) Should the Council not exercise one of the above options within 30 days after receipt of all pertinent documentation, the Corps may assume the Council's concurrence in its proposed response to the objection.

(4) The Corps shall take into account any Council recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection; the Corps' responsibility to carry out all actions under this Programmatic Agreement that are not the subjects of the objection shall remain unchanged.

(B.) At any time during implementation of the measures stipulated in this Programmatic Agreement should an objection pertaining to the Programmatic Agreement be raised by a member of the public, the Corps or SAFCA shall notify the consulting parties to the Programmatic Agreement and take the objection into account, consulting with the objector and, should the objector so request, with any of the consulting parties to this Programmatic Agreement to address the objection.

IX. AMENDMENTS

Any consulting party to this Programmatic Agreement may propose that the Programmatic Agreement be amended, whereupon the Corps shall consult with the other consulting parties to this Programmatic Agreement to consider such amendment. Any amendment shall be executed by the consulting parties in the same manner as the original Programmatic Agreement.

If the Project has not been completed within five years of the date of the execution of this Programmatic Agreement, the consulting parties shall consult on a date not less than 90 days prior to the fifth anniversary of this Programmatic Agreement to either amend this Programmatic Agreement and acknowledge its continued applicability for the undertaking for a designated period of time, or terminate this Programmatic Agreement and proceed to again consult regarding the undertaking in accordance with regulations implementing Section 106 of the NHPA.

All attachments to this Programmatic Agreement, and other instruments prepared pursuant to this agreement such as, but not limited to, the Project's description, initial cultural resource inventory report and maps of the APE, HPTPs, and monitoring and discovery plans may be amended without requiring amendment of this Programmatic Agreement. Such amendments will be consulted on by the concurring parties and shall be final when agreement is reached by the parties.

X. FAILURE TO CARRY OUT THE TERMS OF THE AGREEMENT

Should the Corps fail to ensure that the terms of this Programmatic Agreement are carried out, the Corps shall notify the parties to this Programmatic Agreement and again consult with the SHPO and the Council in accordance with regulations implementing Section 106 of the NHPA. The Corps shall not take any action or make any irreversible decision that would affect an Historic Property, preclude historic preservation alternatives, or foreclose any opportunities for the Council to comment on the undertaking prior to completion of the process for considering and resolving effects on Historic Properties provided in this document.

XI. SCOPE OF THE PROGRAMMATIC AGREEMENT

Execution of this Programmatic Agreement by the Corps, the SHPO, and SAFCA, and implementation of its terms, evidence that Corps has afforded the Council an opportunity to comment on the undertaking for SAFCA Natomas Levee Improvement Program Landside Improvements Project, pursuant to 16 U.S.C. 470f, and that the Corps has taken into account the effects of the undertaking on Historic Properties. This Programmatic Agreement is limited in scope to the undertaking defined herein and is entered into solely for that purpose.

CONSULTING PARTIES:

U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT

By: _____ Date:
Title: COL Thomas Chapman, District Engineer, Sacramento District, U.S. Army Corps of Engineers

SACRAMENTO AREA FLOOD CONTROL AGENCY

By: _____ Date:
Title: Stein M. Buer, Executive Director, Sacramento Area Flood Control Agency

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

By: _____ Date:
Title: Milford Wayne Donaldson, F.A.I.A., California State Historic Preservation Officer

CONCUR:

CENTRAL VALLEY FLOOD PROTECTION BOARD

By: _____ Date:

Title: Benjamin Carter, President, Central Valley Flood Protection Board

By: _____ Date:
Title:

Attachment A: Project Description Summary
Attachment B: "Cultural Resources Inventory Reports, Part 1 – Natomas Levee Improvement Program Landside Improvements Project, Sacramento and Sutter Counties, California" (report).

ATTACHMENT A

Project Description Summary

ATTACHMENT A

DESCRIPTION OF THE SACRAMENTO AREA FLOOD CONTROL AGENCY'S NATOMAS LEVEE IMPROVEMENT PROGRAM LANDSIDE IMPROVEMENTS PROJECT

PURPOSE AND NEED

PROJECT OVERVIEW

The Natomas Levee Improvement Program (NLIP) Landside Improvements Project proposed by the Sacramento Area Flood Control Agency (SAFCA) is intended to provide urgently needed flood control system improvements to the Natomas Basin in southern Sutter and northern Sacramento Counties, California (Exhibit 1). The project would improve the levee system that protects the 53,000-acre Natomas Basin, including a portion of the city of Sacramento. The Natomas Basin is bounded by leveed reaches of the Natomas Cross Canal (NCC) on the north, the Sacramento River on the west, the American River on the south, and the Pleasant Grove Creek Canal (PGCC) and Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek on the east (Exhibit 1).

SAFCA's intent is to provide the Natomas Basin with at least a 100-year level of flood protection by the end of 2010 and a "200-year" level of protection by the end of 2012. Achievement of these aims would significantly reduce the risk of an uncontrolled flood in the Natomas Basin that would result in a catastrophic loss of property (estimated at $7 billion) and a prolonged interruption of commercial activity, including the operation of Sacramento International Airport (Airport) and closure of Interstate 5 (I-5) and State Route (SR) 99/70. Flooding is particularly hazardous in a heavily urbanized basin like Natomas because of the depths that floodwaters can reach—more than 10 feet in some areas.

DEFICIENCIES OF THE NATOMAS LEVEE SYSTEM AND PROPOSED REMEDIES

Approximately 26 miles of the NCC south levee, the Sacramento River east levee, and the PGCC west levee require one or more forms of remediation to address the potential for failure in a 100-year or "200-year" flood event, as follows:

- Inadequate freeboard—The NCC south levee and portions of the Sacramento River east levee must be raised to provide at least 3 feet of freeboard above the 100-year water surface elevation, and several reaches of the Sacramento River east levee must be raised to provide 3 feet of freeboard above the "200-year" design water surface elevation.

- Underseepage and through-seepage vulnerability—Most of these same reaches do not meet recently adopted federal criteria for safely containing underseepage and through-seepage when the water surface in the adjacent channel reaches the 100-year elevation or, in some cases, the "200-year" elevation.

Underseepage problems can occur where levees are constructed on low-permeability foundation soil (silt and clay) underlain by a layer of higher permeability (sand and gravel). Excessive underseepage makes the levee susceptible to failure during periods of high river stage. Under these conditions, seepage travels horizontally under the levee and then is forced vertically upward through the low-permeability foundation layer, often referred to as a "blanket." Failure of the blanket can occur either by uplift, a condition in which the blanket does not have enough weight to resist the confined pressure acting on the bottom of the blanket, or by piping (internal erosion) caused by water flowing under high vertical gradients through the erodible blanket and carrying fine soil particles out of the foundation materials. Through-seepage is seepage through a levee embankment that can occur during

periods of high river stage. Depending on the duration of high water and the permeability of embankment soil, seepage may exit the landside face of the levee. Seepage can also pass directly through pervious layers in the levee if such layers are present. Under these conditions, the stability of the landside levee slope may be reduced.

The project encompasses addressing freeboard deficiencies through levee raises; addressing seepage potential using a combination of seepage berms, cutoff walls, and relief wells; and acquiring additional right-of-way to construct the improvements and to prevent encroachment into the flood control system. In addition, the project has been designed to include an enlarged levee embankment (adjacent setback levee) along the land side of the existing Sacramento River east levee to preclude the need for substantial removal of vegetation and structural encroachments on the water side of this levee in compliance with U.S. Army Corps of Engineers (Corps) guidance. These improvements would include recontouring the levee slopes where necessary.

The following subsections summarize the methods to address freeboard deficiencies and seepage potential, which will be used in various combinations on the NCC south levee, Sacramento River east levee, and the PGCC west levee.

Levee Raises

The freeboard increases would be accomplished through raises of the existing NCC south levee or through construction of the raised adjacent setback levee adjacent to the existing Sacramento River east levee:

- Raise of existing levee (NCC south levee). A full levee raise is required for the NCC south levee, consisting of an embankment raise from the landside or waterside toe (or both) upward to the increased levee crown elevation. This requires partially excavating the levee slope to provide a working platform for equipment, typically 10 feet wide, and rebuilding the levee to the appropriate elevation by benching the new embankment material into the existing embankment material.

- Adjacent setback levee (Sacramento River east levee). The levee raise of the Sacramento River east levee would be accomplished through the construction of an "adjacent setback levee" adjoining the Sacramento River east levee. The adjacent setback levee would be constructed with a crown elevation 3 feet above the "200-year" water surface profile. In the upper reaches, where the existing levee has freeboard deficiencies of as much as 3 feet, the crown of the adjacent setback levee would be higher than the existing levee and Garden Highway roadway. In the lower reaches, where the existing levee has sufficient freeboard, the adjacent setback levee would be the same height as the existing levee.

Seepage Berms

Seepage berms are wide embankments placed outward from the landside toe of the levee to lengthen the underseepage path, thereby lowering, to acceptable levels, the erosive potential of seepage passing through permeable layers under the levees. Seepage berms typically extend 100 to 400 feet from the levee. The berm thickness depends on the severity of the seepage pressure, but generally berms are 5 feet thick near the landside toe and taper to a thickness of 3 feet at the prescribed distance from the toe. A seepage collection ditch is often constructed at the landward toe of all seepage berms. Seepage berms are planned for construction along portions of the Sacramento River east levee and the PGCC west levee.

Cutoff Walls

Conventional slurry cutoff walls are typically constructed using an excavator with a long-stick boom capable of digging a trench to the maximum required depth. Bentonite slurry is pumped into the trench during trench excavation to prevent caving. The soil, cement, and bentonite are mixed to achieve the required cutoff wall strength and permeability, and the mixture is backfilled into the trench. Select fill is used to rebuild the levee. The NLIP includes construction of cutoff walls along portions of the NCC south levee and the Sacramento east levee. Cutoff wall construction may also be required in some areas along the PGCC west levee.

For the NCC south levee, preparation for construction of the cutoff wall would begin with using scrapers (or other suitable equipment, depending on the slope) to clear and grub/strip the surface to a depth of 2 inches to remove low-growing vegetation, loose stone, and surface soils. The aggregate base from the operating road also would be removed and stockpiled for later reuse. Waste material would be hauled to an off-site location.

Construction of the cutoff wall would include degrading the existing levee to a depth equal to one-half its total height (approximately 9 feet). A 70-foot-deep cutoff wall would be constructed for the total length of 23,150 lineal feet, with the method of installation at the contractor's discretion. Material degraded to support cutoff wall construction would be compacted at the landside toe of the levee to support raising portions of the NCC south levee. Unsuitable material generated from cutoff wall construction would be disposed of off-site. Equipment that would be used in phases of the cutoff wall construction includes excavators, scrapers, loaders, bulldozers, rollers, haul trucks, water trucks, hydroseeding trucks, pickup trucks, slurry pumps, and generators.

Work on the Sacramento River east levee includes construction of an adjacent levee with construction of a cutoff wall to occur in several reaches of the adjacent levee. Borrow material would be excavated from several locations in the project area and would be delivered to the levee construction sites by scrapers or haul trucks where it would be spread by motor graders and compacted by sheepsfoot rollers to build the adjacent levee up to a height equal to about two-thirds of the height of the existing levee. This would create a working platform for cutoff wall installation using an excavator with a long-stick boom capable of digging a trench to a maximum depth of approximately 80 feet. Bentonite slurry would be pumped into the trench during excavation to prevent caving. The soil excavated from the trench would be mixed with bentonite and backfilled into the trench to create the cutoff wall.

Relief Wells

Relief wells provide protection against levee underseepage by providing a path for underseepage to exit to the ground surface at the landside toe of the levee without creating sand boils or piping levee foundation materials. Relief wells are an option for addressing underseepage in reaches where continuous sand and gravel layers have been identified by the geotechnical analysis.

Relief wells are constructed near the levee landside toe to provide pressure relief beneath surficial fine-grained soils. The wells are constructed using soil boring equipment to bore a hole vertically through the fine-grained blanket layer and into the coarse-grained aquifer layer beneath. Pipe casings and filters are installed to allow the pressurized water to flow to the ground surface, thereby relieving the pressures beneath the clay blanket. Relief wells either may discharge onto open ground or may require conveyance to a stormwater drainage system or a pump station. Relief wells cause the least amount of construction disturbance but require routine maintenance of the wells themselves and the drainage and pumping facilities necessary to support them.

EXISTING PROJECT FACILITIES AND POTENTIAL BORROW SITES

All project construction activities would take place within the Natomas Basin, except for the development of a borrow site on Reclamation District (RD) 1001 land northeast of the basin (Exhibit 2). The following sections describe the existing flood control facilities, their general setting, and adjacent irrigation infrastructure and the potential borrow sources. These features, as well as the borrow locations, constitute the physical infrastructure and locations where the project may result in effects on historic properties.

Flood Control and Irrigation Facilities

Natomas Cross Canal South Levee

The NCC is a 5.3-mile-long channel that carries water from several tributary watersheds in western Placer County and eastern Sutter County to the Sacramento River. The NCC begins at the PGCC and East Side Canal and extends southwest to its confluence with the Sacramento River near the Sankey Road/Garden Highway

intersection. During periods of flooding, the Sutter Bypass, Sacramento River, and NCC all contribute to raised water elevations that can affect the NCC levees. For engineering purposes, the levee is divided into seven reaches. Much of the south levee contains an existing stability berm with an internal drainage system. An approximately 80- to 100-foot maintenance access area extends along the land side of the levee through most of the NCC's length.

Farms and rural residences are located on both sides of the NCC, with rice the primary crop under cultivation. The Lucich North and Frazer Habitat Preserves, maintained by The Natomas Basin Conservancy (TNBC), lie south of the NCC south levee from the eastern end of Reach 2 through the western end of Reach 6. A drainage canal, referred to as the Vestal Drain, runs parallel to the NCC south levee through much of Reach 2, approximately 100 feet from the landside levee toe. A private irrigation pump and irrigation canal are located at the landside levee toe in Reach 1. Natomas Central Mutual Water Company's (NMWC's) Bennett Pumping Plant and RD 1000's Pumping Plant No. 4 are located in Reach 2, and the NMWC Northern Pumping Plant is located in Reach 3. NMWC's North Main Canal runs parallel to the levee through Reaches 4 and 5, approximately 100 feet from the landside levee toe.

SACRAMENTO RIVER EAST LEVEE

An 18-mile-long section of the east levee of the Sacramento River protects the west side of the Natomas Basin between the NCC and the American River. For planning purposes, the levee is divided into 20 reaches. The Garden Highway is located on top of the levee crown within all 20 reaches. A drained, 10-foot-wide stability berm is present on the landside slope of the levee between the NCC and Powerline Road (Reaches 1–12). Cutoff walls were previously constructed through the levee in Reaches 12–20.

The land uses along the levee vary from north to south. Along the land side, Reaches 1–13 are bordered mainly by private agricultural lands containing a few rural residences, Airport bufferlands, and two farmed TNBC parcels. Teal Bend Golf Club is west of the Airport, adjacent to the levee along Reach 6. The parcels bordering Reaches 14–18 contain more residences, several rural estates, and three TNBC parcels. The land side of Reaches 19 and 20 is bordered by residential subdivisions, a business park, and City parklands.

Several irrigation canals, pipelines, wells, and pump stations exist along the Sacramento River east levee. The Elkhorn Canal and the Riverside Canal are key agricultural irrigation canals in the NMWC system. The Elkhorn Canal runs parallel to the Sacramento River east levee from the North Drainage Canal in Reach 4B through Reach 8 and into the start of Reach 9 (1,250 feet south of Elkhorn Boulevard). The Riverside Canal extends from just north of Reach 13 to the middle of Reach 19. Several lateral canals connect to the Elkhorn and Riverside Canals. These canals have earthen embankments with side slopes that are nearly vertical, requiring regular maintenance. Both canals are supplied by pumping plants on the Sacramento River.

In addition to the NMWC irrigation systems, there are several landowner-operated systems along the levee. These facilities are located primarily in Reaches 1–4A and 9–12, in areas not currently served by the NMWC systems. The areas are serviced by either well pumps on the land side or river pumps, which discharge into buried pipelines, small irrigation ditches, or directly onto fields. The distribution systems run along the landside toe of the levee to supply fields that slope away from the levee.

Several drainage pumping plants are operated by RD 1000 along the Sacramento River east levee. These facilities pump drain water from the main drainage canal system into the river. They include Pumping Plant No. 2, located in Reach 4B; Pumping Plant No. 5, located in Reach 10; Pumping Plant No. 3, located in Reach 13; and Pumping Plant No. 1, located in Reach 20A. Pumping Plant No. 2 was temporarily removed as part of an emergency levee repair in 2006 and would be replaced as an element of the project in 2009–2010. In addition to these RD 1000 pumping stations, the City of Sacramento operates the Willow Creek drainage pumping station which is located in Reach 19B.

PLEASANT GROVE CREEK CANAL WEST LEVEE

The PGCC west levee extends southerly from the east end of the NCC south levee to the north end of the NEMDC/Steelhead Creek levee near the Sankey Road crossing. The PGCC west levee protects the Natomas Basin from flood flows from Pleasant Grove Creek and other creeks in western Placer County, as well as from water that backs up in the NCC during high river stages in the Sacramento River. Natomas Road is located on top of the levee crown. No berms support this levee. A private canal extends parallel to the PGCC west levee for about 1,500 feet at the landside levee toe. Farms and scattered rural residences are located on the land side of the PGCC west levee, and a manufacturing facility and a railroad siding are located within several hundred feet of the levee, just south of Sankey Road.

BORROW SITES

Borrow sites are areas from which earthen materials would be removed for use in construction. The sites would be recontoured and developed as either managed marsh or grassland habitat following excavation for this use. Where borrow sites would be used over more than one construction season, the work would progress in cells that would be incrementally developed as habitat as the borrow activities are completed.

SAFCA has identified borrow sources for the project in 2008, 2009, and 2010 flood control and irrigation infrastructure improvements and redundant sources that may be pursued if negotiations regarding the preferred sources are unsuccessful or additional quantities are found to be needed during construction:

- Brookfield property (2008 preferred, 2009 preferred, 2010 preferred)
- Airport bufferlands north of the Airport complex (2008 preferred, 2009 preferred, 2010 potential)
- Fisherman's Lake area (2010 preferred) (no specific parcels identified for this borrow site)
- RD 1001 (2008 potential, 2009–2010 potential)

Except for the Fisherman's Lake area in the southern part of the Natomas Basin, these borrow areas are shown in Exhibit 3.

DESCRIPTION OF PROJECT ELEMENTS AND ACTIVITIES

The elements of the project are described in this section in four broad, overlapping categories:

- levee raising and seepage remediation,
- improvements to major irrigation and drainage infrastructure,
- habitat development and management, and
- additional actions to meet Federal Emergency Management Agency (FEMA) requirements: encroachment management and bridge crossing modifications.

Expanding the landside footprint of the Sacramento River east levee necessitates redesigning and relocating the irrigation and drainage infrastructure currently located along the landside toe of the levee. Relocation of other major and minor irrigation and drainage canals located near the NCC south levee and the PGCC west levee will be necessary with implementation of levee improvements. Modifications to the existing irrigation and drainage systems will include creation of a new canal designed to provide giant garter snake (GGS) habitat and improved stormwater drainage west of the Airport (GGS/Drainage Canal).

Site preparation would entail removing trees and other large vegetation from the construction area and stripping the top 6 inches of material from the landside slope of the existing levee, the footprint of the adjacent setback levee, the seepage berm areas, and the 50-foot-wide permanent maintenance access corridor. Large roots and

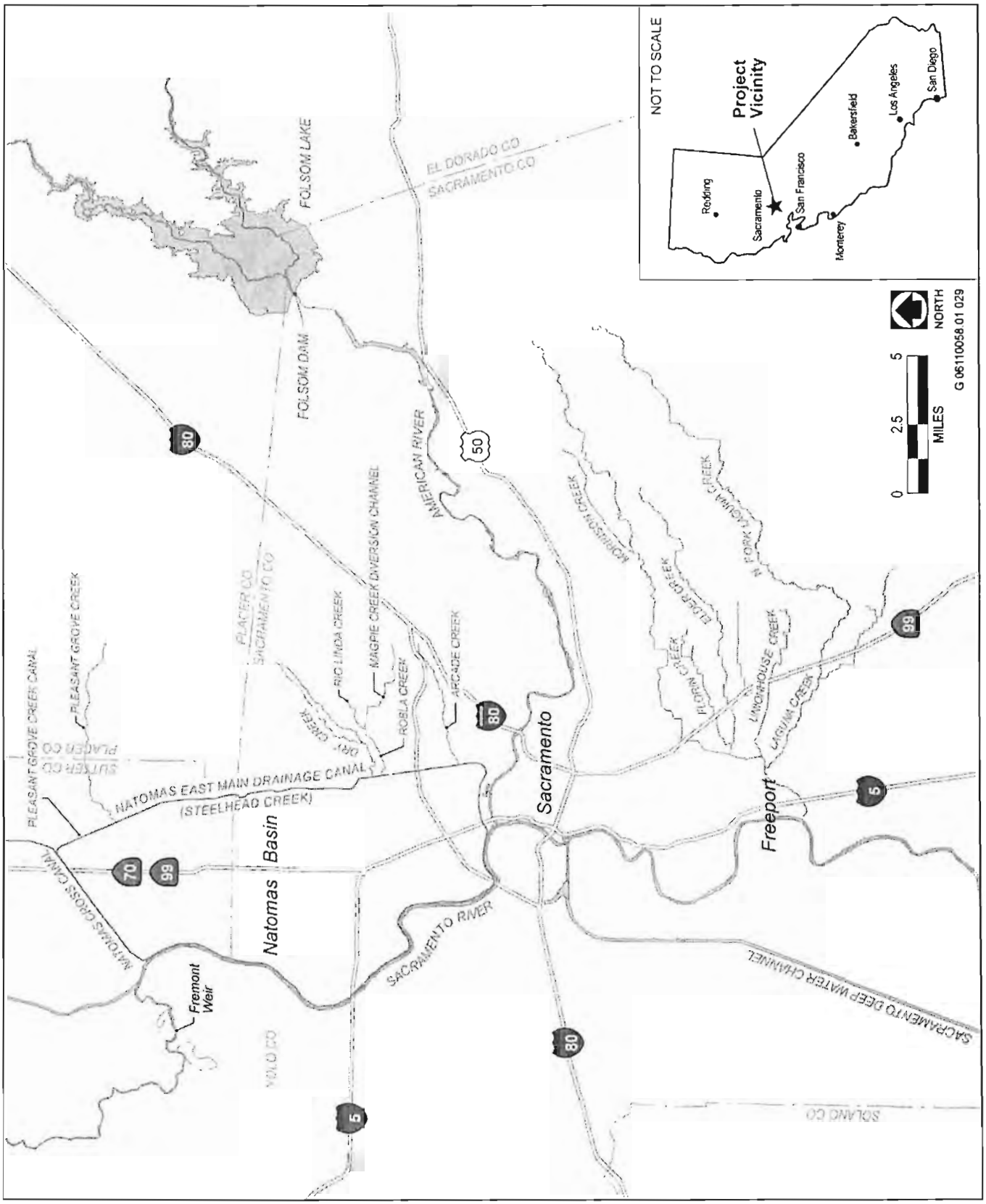
deleterious material would then be grubbed from the working area. To the extent feasible, trees that must be removed from within the footprint of the adjacent setback levee or berms would be relocated outside of the footprint to new woodland planting areas, where a substantial number of new trees would also be planted. Excess earth materials (organic soils, roots, and grass from borrow areas and the adjacent levee foundation and excavated material that does not meet levee embankment criteria) would be used in the reclamation of borrow areas or hauled off-site to landfills. Cleared vegetation (i.e., trees, brush) would be hauled off-site to landfills. After construction, the levee slopes and any previously vegetated areas disturbed during construction, including staging areas, would be seeded with a grass mix.

The major project elements and related activities are summarized in Table 1.

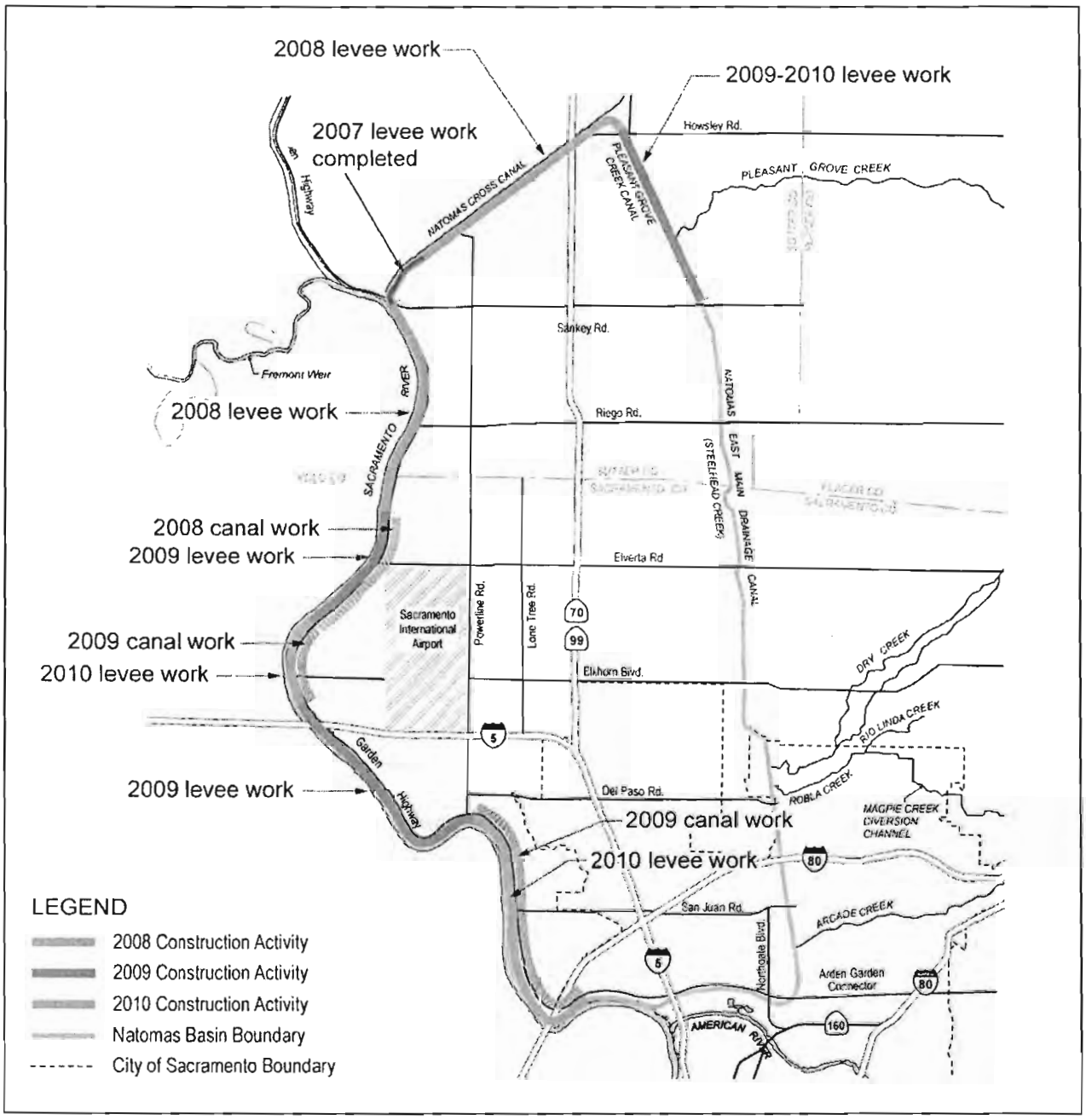
Table 1
Summary of the Major Elements of the Project

Project Element	Project Activity and Timing
2008 Construction	
Levee raising and seepage remediation: NCC south levee	Raise and realign the NCC south levee to provide additional freeboard and more stable waterside and landside slopes and to reduce the need for removal of waterside vegetation. (May 8–November 1, 2008) Construct a seepage cutoff wall through the levee crown in Reaches 3–7. (May 8–October 15, 2008)
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct a raised adjacent setback levee from the NCC to just south of the North Drainage Canal (Reaches 1–4B, except Stations 55+00 to 68+00 in Reach 2) with a 100-foot seepage berm in Reach 4A and a 300-foot seepage berm in Reach 4B. (May 1–November 1, 2008)
Improvements to major irrigation and drainage infrastructure	Construct a new canal designed to provide drainage and associated giant garter snake habitat (the GGS/Drainage Canal) between the North Drainage Canal and Elkhorn Reservoir. (May 1–November 1, 2008) Relocate the Elkhorn Canal (highline irrigation canal) between the North Drainage Canal and Elkhorn Reservoir in anticipation of the filling of the existing Elkhorn Canal at the toe of the Sacramento River east levee in late 2008 and in 2009. (May 1–November 1, 2008) Remove a deep culvert at the location of Pumping Plant No. 2. (May 1–November 1, 2008)
Habitat creation and management	Establish vegetative habitat features in the new GGS/Drainage Canal. (Fall 2008) Recontour and create managed marsh and grassland on lands used as borrow sources. (Fall 2008 or spring 2009) Establish grassland on the adjacent setback levee slopes and seepage berms. (August 1–December 31, 2008) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint. (Fall 2008)
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites and along the flood control system. (Before construction)
2009–2010 Construction	
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct an adjacent setback levee along Stations 55+00 to 68+00 in Reach 2 and from just south of the North Drainage Canal to the American River north levee (Reaches 5A–20B), raised where needed to provide adequate freeboard, with seepage berms, relief wells, and cutoff walls for seepage remediation as required (specific seepage remediation measures are still under study). (May 1–November 1, 2009, and May 1–November 1, 2010)
Seepage remediation: PGCC west	Flatten waterside and landside slopes, and construct seepage berms along the PGCC west levee (specific berm widths and potential use of cutoff walls in some areas to be

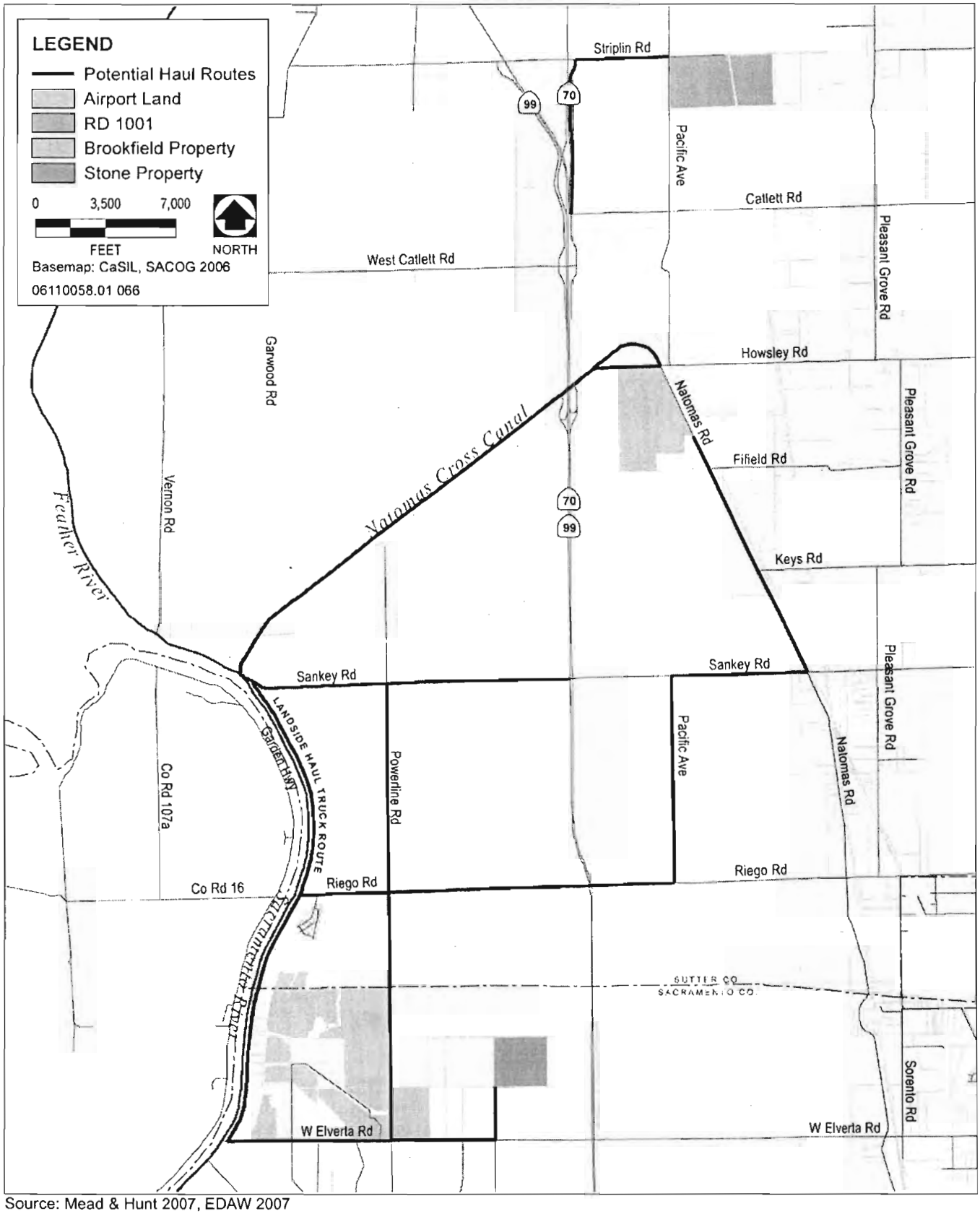
Table 1 Summary of the Major Elements of the Project	
Project Element	**Project Activity and Timing**
levee	determined). (May 1–November 1, 2010)
Improvements to major irrigation and drainage infrastructure	Construct the new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal (specific alignment to be determined), and improve the West Drainage Canal to provide enhanced giant garter snake habitat. (May 1–November 1, 2009) Implement Airport West Ditch improvements in connection with construction of the GGS/Drainage Canal to allow the Airport to decommission the agricultural irrigation function of this facility and eliminate the hazards currently associated with it. The Airport stormwater detention function provided by this ditch would continue. The ditch would therefore be recontoured as a gently sloping swale to facilitate periodic maintenance such as mowing. (May 1–November 1, 2009) Relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir (specific alignments to be determined) and fill the existing canals. (May 1–November 1, 2009) Construct RD 1000 Pumping Plant No. 2. (April 1, 2009–September 1, 2010)
Habitat creation and management	Establish habitat enhancements in the new GGS/Drainage Canal and improved West Drainage Canal. (Fall 2009) Recontour and create marsh and managed grassland on lands used as borrow sources. (Fall or spring after borrow excavation in 2009 and 2010) Establish grassland on the adjacent setback levee slopes and seepage berms. (Fall after construction in 2009 and 2010) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint (locations to be determined). (Fall 2009 and 2010)
Additional actions to meet FEMA requirements: encroachment management on the Sacramento River east levee, and bridge crossing modifications at the NCC	Remove encroachments from a portion of the water side and land side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the NFIP and USACE design criteria (specific criteria still under discussion). (Timing to be determined) Modify the SR 99/70 crossing of the NCC as needed to meet FEMA requirements. (Timing to be determined)
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites and along the flood control system. (Before construction)
Notes: Airport = Sacramento International Airport; Elkhorn Canal = Elkhorn Main Irrigation Canal; FEMA = Federal Emergency Management Agency; GGS = Giant Garter Snake; NCC = Natomas Cross Canal; NFIP = National Flood Insurance Program; PGCC = Pleasant Grove Creek Canal; RD = Reclamation District; Riverside Canal = Riverside Main Irrigation Canal; SR = State Route; USACE = U.S. Army Corps of Engineers	



Project Location **Exhibit 1**



Project Construction By Phase **Exhibit 2**



Source: Mead & Hunt 2007, EDAW 2007

Anticipated Borrow Areas and Local Haul Routes **Exhibit 3**

ATTACHMENT B

Cultural Resources Inventory Reports, Part 1
Natomas Levee Improvement Program Landside Improvements Project
Sacramento and Sutter Counties, California

Cultural Resources Inventory Reports, Part I

Natomas Levee Improvement Program
Landside Improvements Project
Sacramento and Sutter Counties, California

Prepared for:

U.S. Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento, California 95814-2922

and

Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Prepared by:

EDAW
2022 J Street
Sacramento, CA 95811

Contact:

Charlane Gross, M.A., RPA
916/414-5800

October 2007

TABLE OF CONTENTS

Exhibits

Tables

Appendices

ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
Airport	Sacramento International Airport
APE	area of potential effect
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cmbs	centimeters below surface
CRHR	California Register of Historical Resources
HPTP	historic property treatment plan
I-5	Interstate 5
I-80	Interstate 80
MLD	Most Likely Descendant
MOA	Memorandum of Agreement
NAHC	Native American Heritage Commission
NCC	Natomas Cross Canal
NCIC	North Central Information Center
NEIC	Northeast Information Center
NEMDC	Natomas East Main Drainage Canal
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLIP	Natomas Levee Improvement Program
NRHP	National Register of Historic Places
PA	Programmatic Agreement
PGCC	Pleasant Grove Creek Canal
PRC	Public Resources Code
RD	Reclamation District
SAFCA	Sacramento Area Flood Control Agency
SHPO	State Historic Preservation Officer
SRFCP	Sacramento River Flood Control Project
STP	shovel test pit
The Reclamation Board	State of California Reclamation Board
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

INTRODUCTION

PURPOSE OF THIS REPORT

This report describes the work completed to date to identify cultural resources that have the potential to be affected by the Natomas Levee Improvement Program (NLIP) Landside Improvements Project, which is proposed for implementation by Sacramento Area Flood Control Agency (SAFCA). The proposed project consists of improvements to the levee system in the Natomas Basin and related landscape modifications and drainage and irrigation infrastructure improvements. This work will be completed in phases, starting in 2008 and continuing through 2010. As a local public agency in California, SAFCA must comply with the requirements of the California Environmental Quality Act (CEQA) regarding unique archaeological resources and historical resources as defined in Public Resources Code (PRC) Section 21083.2(g) and California Code of Regulations (CCR) Section 15064.5(a), respectively, and has prepared a draft environmental impact report that meets CEQA requirements. The project requires approvals from the U.S. Army Corps of Engineers (USACE), which must comply with the requirements of Section 106 of the National Historic Preservation Act (NHPA) for assessing impacts of projects on historic properties. Therefore, project implementation also must meet Section 106 requirements. This report provides preliminary information to support Section 106 compliance for the project.

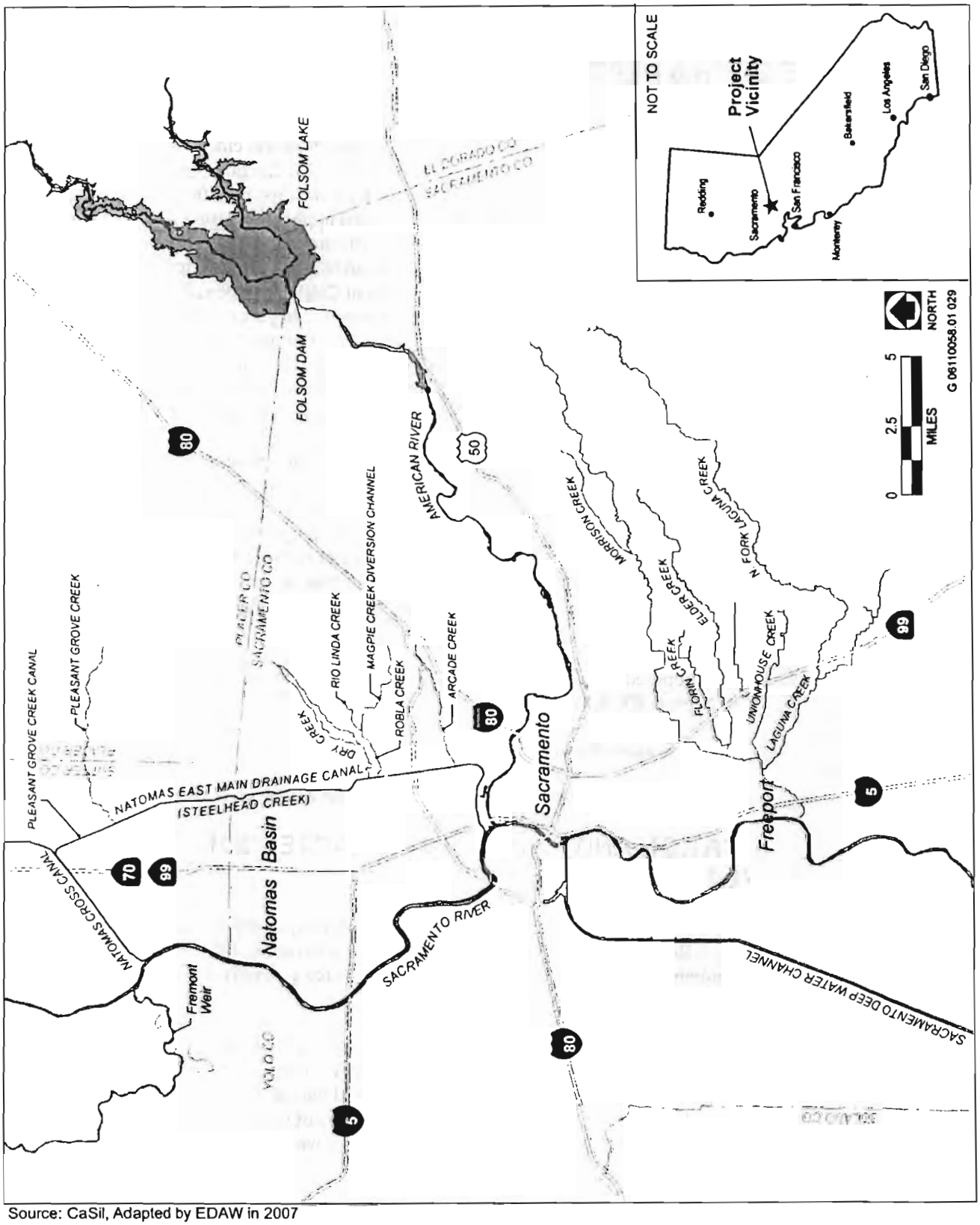
The report provides an overview of the proposed project; presents relevant setting information for the project area; and describes the following components of Section 106 compliance for the project:

- the regulatory context for cultural resources, including an existing programmatic agreement (PA) between USACE, the Bureau of Reclamation, the California State Office of Historic Preservation (SHPO), and the Advisory Council on Historic Preservation (ACHP) for projects that are a part of the federal American River Watershed Project. Additional signatories of the PA include the State of California Reclamation Board (The Reclamation Board) and SAFCA;
- the phased approach proposed for identification of cultural resources, pursuant to 36 Code of Federal Regulations (CFR) Section 800.4(b)(2);
- cultural resources identification efforts performed to date; and
- the scope of remaining identification and management efforts that will be undertaken.

PROJECT LOCATION AND GENERAL CHARACTERISTICS OF THE PROJECT AREA

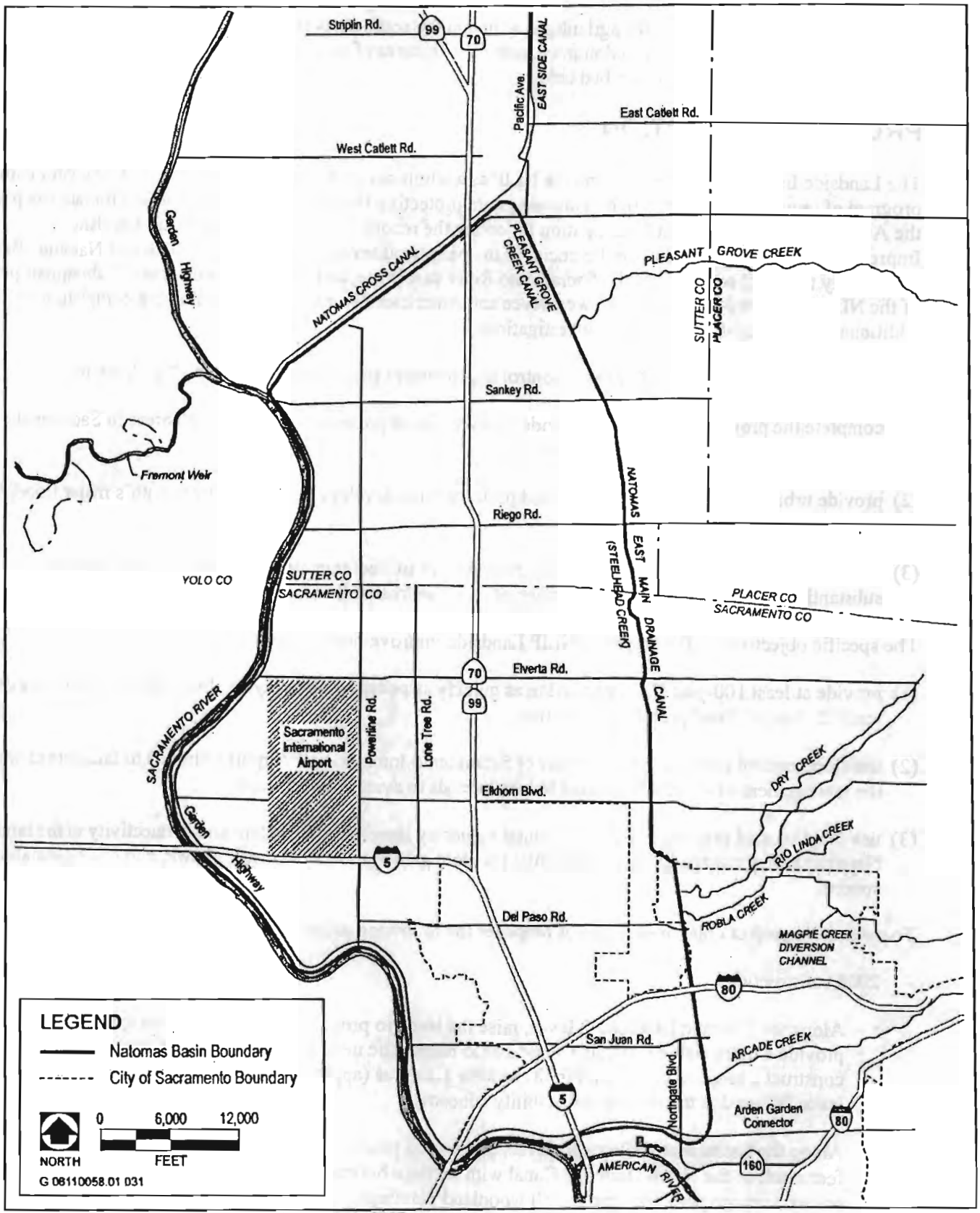
The project area is located in Townships 9-11 North and Ranges 3-5 East, as depicted on the Sacramento East, Sacramento West, Gray's Bend, Taylor Monument, Verona, Pleasant Grove, and Rio Vista U.S. Geological Survey (USGS) 7.5'quadrangle maps. Elevations across the project area generally range from 20 feet to 40 feet (at the top of the levees) above mean sea level.

The project area is in the Natomas Basin in northern Sacramento and southern Sutter Counties, which is bounded by the Natomas Cross Canal (NCC) to the north, the Sacramento River to the west, the Sacramento and American rivers to the south, and the Pleasant Grove Creek Canal (PGGC) and the Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek to the east. The regional and local settings of the Landside Improvements Project are shown in Exhibits 1 and 2, respectively. Most of the project activities would take place in the western portion of the Natomas Basin and along the NCC and PGCC.



Source: CaSil, Adapted by EDAW in 2007

Regional Setting **Exhibit 1**



Source: CaSil; SACOG 2007; Adapted by EDAW in 2007

Local Setting **Exhibit 2**

The project area is mainly used for agriculture, although the southern portion of the area is urbanized and lies within the City of Sacramento. The dominant landscape features of most of the area are elements of Reclamation District (RD) 1000, which are described below.

PROJECT DESCRIPTION

The Landside Improvements Project and the NLIP as a whole are part of the American River Common Features program of improvements to the flood control system protecting the Sacramento area that was initiated as part of the American River Watershed Investigation following the record flood of 1986. The NLIP Landside Improvement Project will address deficiencies in the peripheral levee system of the 53,000-acre Natomas Basin, specifically the NCC south levee, the Sacramento River east levee, and the PGCC west levee. Subsequent phases of the NLIP will address the NEMDC west levee and American River north levee following completion of additional geotechnical and hydraulic investigations.

The overall objectives of SAFCA's flood control improvement program, including the NLIP, are to:

(1) complete the projects necessary to provide 100-year flood protection for developed areas in Sacramento's major floodplains as quickly as possible,

(2) provide urban-standard ("200-year") flood protection for developed areas in Sacramento's major floodplains over time, and

(3) ensure that new development in the undeveloped areas of Sacramento's major floodplains does not substantially increase the expected damage of an uncontrolled flood.

The specific objectives of the proposed NLIP Landside Improvements Project are to:

(1) provide at least 100-year flood protection as quickly as possible while laying the groundwork to achieve at least "200-year" flood protection over time,

(2) use flood control projects in the vicinity of Sacramento International Airport (Airport) to facilitate changes in the management of Airport lands that reduce hazards to aviation safety, and

(3) use flood control projects to enhance habitat values by increasing the extent and connectivity of the lands in Natomas being managed to provide habitat for giant garter snake, Swainson's hawk, and other special-status species.

To meet these project objectives, SAFCA proposes the following project activities:

- 2008 construction

  - Along the 5.3-mile NCC south levee, raise the levee to provide additional freeboard; realign the levee to provide a more stable waterside slope and to reduce the need for removal of waterside vegetation, and construct a seepage cutoff wall in the eastern 4.3 miles (approximately) of the levee to reduce the risk of levee failure due to seepage and stability concerns.

  - Along the Sacramento River east levee, construct a raised adjacent setback levee from the NCC to 1,700 feet south of the North Drainage Canal with seepage berms, relief well, and cutoff walls where required to reduce seepage potential, and install woodland plantings.

  - Construct a new canal designed to provide drainage and associated giant garter snake habitat (referred to as the "GGS/Drainage Canal"), relocate the Elkhorn Canal between the North Drainage Canal and the

Elkhorn Reservoir settling basin ("Elkhorn Reservoir"), and remove a deep culvert from under the levee near the Pumping Plant No. 2 site.

- Recontour the land and create marsh and upland habitat at borrow locations.

- 2009 and 2010 construction

  - Along the Sacramento River east levee south of the limits of the 2008 improvements, construct an adjacent setback levee (raised where needed to provide adequate freeboard) with seepage berms, relief wells, and cutoff walls as required, and install woodland plantings.

  - Along the PGCC west levee, widen the levee, flatten the waterside and landside slopes, and construct seepage berms.

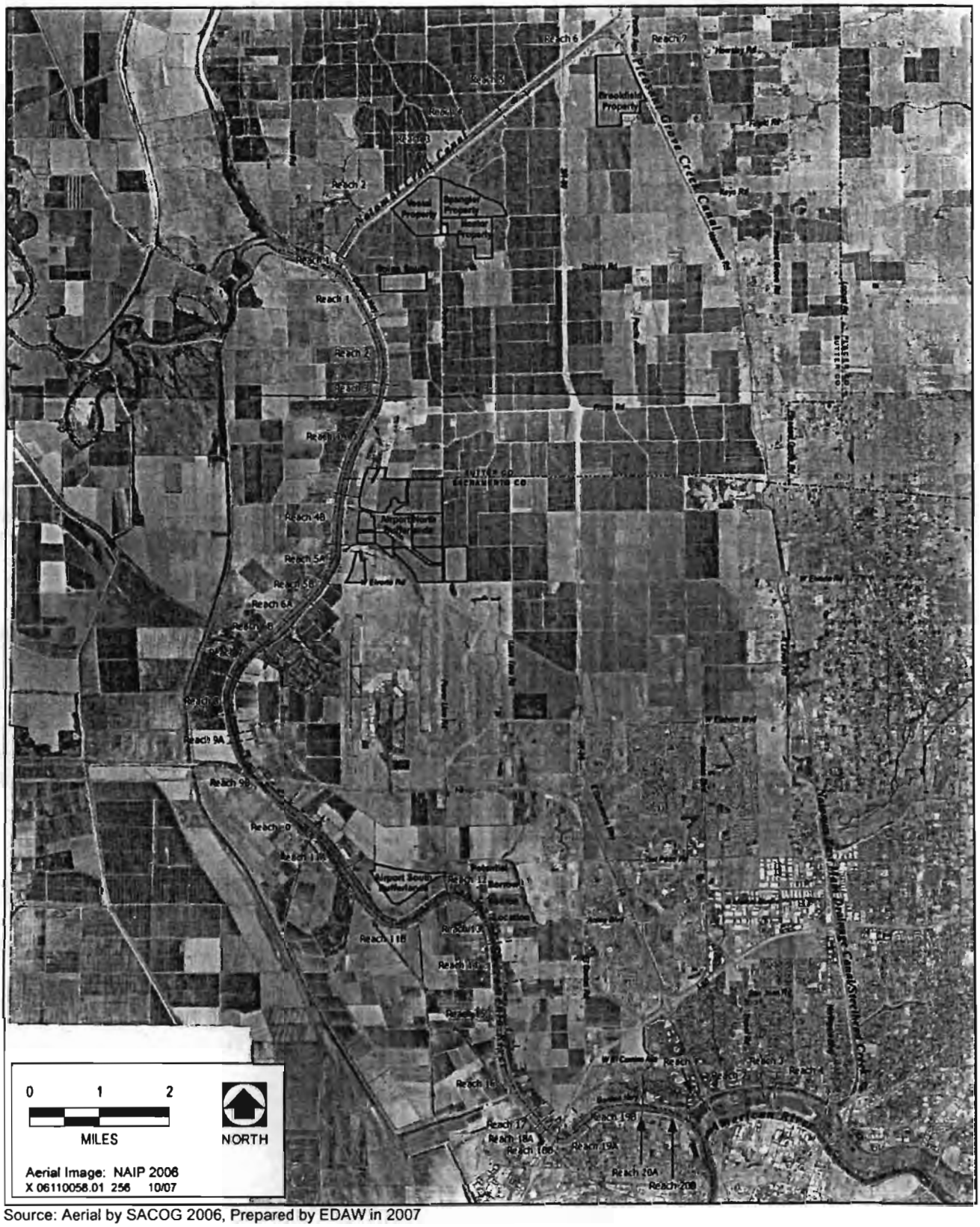
  - Construct a new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal, improve the West Drainage Canal, relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir, and reconstruct the Reclamation District 1000 Pumping Plant No. 2.

  - Recontour the land and create marsh and upland habitat at borrow locations.

  - Remove encroachments from the water side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the National Flood Insurance Program and USACE design criteria, and address Federal Emergency Management Agency requirements for the State Route (SR) 99/70 bridge crossing of the NCC.

Project construction would include a range of soil-disturbing activities in a region that is highly sensitive for cultural resources, particularly prehistoric archaeological sites. Levee improvements would require the excavation of inspection and cutoff wall trenches and extensive soil stripping and grading in the footprint of the adjacent setback levee along the existing Sacramento River east levee and where 100- to 300-foot-wide seepage berms would be constructed along the Sacramento River east levee and the PGCC west levee. Borrow material would be obtained through shallow excavation of several hundred acres of land in the Natomas Basin and excavation of a site northeast of the basin. The new GGS/Drainage Canal would be excavated for approximately 8 miles through the western part of the basin. Project implementation also would alter structures and landscapes associated with Reclamation District (RD) 1000, a resource eligible for listing on the National Register of Historic Places (NRHP).

The approximately 1 million cubic yards of borrow material for the NCC south levee and PGCC west levee improvements would be obtained from land owned by RD 1001 northeast of the Natomas Basin. Approximately 4.4 million cubic yards of soil material would be needed for construction of the levee embankment, berms, and relocated canals along the Sacramento River east levee. About 600,000 cubic yards would be obtained through excavation of the new GGS/Drainage Canal between RD 1000's existing North Drainage Canal north of the Airport and its existing West Drainage Canal southwest of the Airport. SAFCA would obtain the balance of the fill material it needs for the improvements along the Sacramento River east levee from parcels in the Airport bufferlands, land planned for habitat development by The Natomas Basin Conservancy, and nearby privately owned agricultural land (Exhibit 3).



Source: Aerial by SACOG 2006, Prepared by EDAW in 2007

Potential Borrow Areas **Exhibit 3**

BACKGROUND INFORMATION

REGULATORY SETTING

The project is subject to the provisions of CEQA, as well as Section 106 of the NHPA.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

CEQA includes provisions that specifically address the protection of cultural resources. CEQA requires consideration of impacts of a project on unique archaeological resources and historical resources. A unique archaeological resource, as defined in PRC Section 21083.2(g), is an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it:

(1) contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information;

(2) has a special and particular quality such as being the oldest of its type or the best available example of its type; or

(3) is directly associated with a scientifically recognized important prehistoric or historic event or person.

Section 15064.5(a) of the State CEQA Guidelines generally defines a historical resource as:

(1) a resource listed in, or determined to be eligible by the State Historical Resources Commission for listing in, the California Register of Historical Resources (CRHR);

(2) a resource included in a local register of historical resources or identified as significant in a historical resource survey; and

(3) any other object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant, provided that the lead agency's determination is supported by substantial evidence.

CALIFORNIA REGISTER OF HISTORICAL RESOURCES

The CRHR includes resources that are listed in or formally determined eligible for listing in the NRHP (see below), as well as some California State Landmarks and Points of Historical Interest (PRC Section 5024.1, 14 CCR Section 4850). Properties of local significance that have been designated under a local preservation ordinance (local landmarks or landmark districts) or that have been identified in a local historical resources inventory may be eligible for listing in the CRHR and are presumed to be significant resources for purposes of CEQA unless a preponderance of evidence indicates otherwise (State CEQA Guidelines Section 15064.5[a][2]). The eligibility criteria for listing in the CRHR are similar to those for NRHP listing but focus on the importance of the resources to California history and heritage. A cultural resource may be eligible for listing in the CRHR if it:

(1) is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

(2) is associated with the lives of persons important in our past;

(3) embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

(4) has yielded, or may be likely to yield, information important in prehistory or history.

(See 14 CCR Section 4852.)

NATIVE AMERICAN HERITAGE COMMISSION

The Native American Heritage Commission (NAHC) identifies and catalogs places of special religious or social significance to Native Americans and known graves and cemeteries of Native Americans on private lands, and performs other duties regarding the preservation and accessibility of sacred sites and burials and the disposition of Native American human remains and burial items.

NATIONAL HISTORIC PRESERVATION ACT

Section 106 of the NHPA and its implementing regulations (36 CFR 800, as amended in 2004) require federal agencies to consider the potential effects of their proposed undertakings on historic properties. Historic properties are cultural resources that are listed on, or are eligible for listing on, the NRHP (36 CFR 800.16[l]). Undertakings include activities directly carried out, funded, or permitted by federal agencies. Federal agencies must also allow the Advisory Council on Historic Preservation (ACHP) to comment on the proposed undertaking and its potential effects on historic properties. Implementation of the proposed project would require permitting under Section 404 of the Clean Water Act and Section 408 approval from the USACE. Therefore, USACE compliance with Section 106 is required in relation to the proposed project.

SECTION 106 PROCESS

The implementing regulations for Section 106 of the NHPA require consultation with the State Historic Preservation Officer (SHPO), the ACHP, federally recognized Indian tribes and other Native Americans, and interested members of the public throughout the compliance process. The four principal steps are:

- Initiate the Section 106 process (36 CFR Section 800.3).
- Identify historic properties, resources eligible for inclusion in the NRHP (36 CFR Section 800.4).
- Assess the effects of the undertaking to on historic properties within the area of potential effect (APE) (36 CFR Section 800.5).
- Resolve adverse effects (36 CFR Section 800.6).

Adverse effects on historic properties are often resolved through preparation of a memorandum of agreement or PA developed in consultation between the federal agency, the SHPO, Indian tribes, and interested members of the public. The ACHP is also invited to participate. The agreement describes stipulations to mitigate adverse effects on historic properties.

NATIONAL REGISTER OF HISTORIC PLACES

The NRHP listing criteria are as follows (36 CFR Section 60.4):

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:

(a) that are associated with events that have made a significant contribution to the broad patterns of our history; or

(b) that are associated with the lives of persons significant in our past; or

(c) that embody the distinctive characteristics of a type, period or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) that have yielded, or may be likely to yield, information important in prehistory or history.

RURAL HISTORIC LANDSCAPES

The rural historic landscape is a category of resources that is evaluated under the Section 106 process. This resource category is relevant to this project because RD 1000, the local geographic setting of the proposed project, is eligible for NRHP listing as a Rural Historic Landscape District. National Register Bulletin 30 defines a rural historic landscape as a geographical area that historically has been used by people or shaped or modified by human activity, occupancy, or intervention and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, roads and waterways, and natural features. Rural landscapes commonly reflect the day-to-day occupational activities of people engaged in traditional work such as mining, fishing, and various types of agriculture. Often, they have developed and evolved in response to both the forces of nature and the pragmatic need of people to make a living. Landscapes that are small and that have no buildings or structures, such as an experimental orchard, are classified as sites. Most, however, being extensive in acreage and containing a number of buildings, sites, and structures—such as a ranch or farming community—are classified as historic districts. Large acreage and a proportionately small number of buildings and structures differentiate rural historic landscapes from other kinds of historic properties.

National Register Bulletin 30 distinguishes rural historic landscapes from designed landscapes. Rural landscapes usually are not the work of a professional designer and have not been developed according to academic or professional design standards, theories, or philosophies of landscape architecture. These properties possess tangible features, called landscape characteristics, that have resulted from historic human use. In this way, they also differ from natural areas that embody important cultural values but have experienced little modification, such as sites having religious meaning for Native American groups.

EXISTING PROGRAMMATIC AGREEMENT

USACE, the SHPO, the Bureau of Reclamation, and the ACHP in 1991 executed a PA that governs the Section 106 process for implementation of the American River Watershed Project, including constructing levee, channel, and related flood control improvements in the Natomas Basin. The PA covers implementation of the specific elements of the proposed improvements that would involve the USACE as the federal lead agency. Additional signatories of the PA include The Reclamation Board and SAFCA.

The PA is relevant to the present study because it controls the Section 106 process for work within the American River Watershed Project, a flood control program that coincides in part with the proposed project. Furthermore, it acknowledges the following: "the Project may be modified based on public input, congressional authorization, and ongoing negotiations among the primary sponsors." Portions of the proposed project that also coincide with the American River Watershed Project must satisfy the provisions of the PA.

The PA includes procedures for the treatment of indirect and direct impacts of the levee improvements associated with the American River Watershed Project. The executed PA specifies inventory and NRHP evaluation procedures for historic properties, as well as the process for development of Historic Property Treatment Plans (HPTPs). Additionally, the PA details report format and review, participation of interested parties, curation of

recovered materials, and professional qualifications. Mitigation measures may include archaeological documentation, architectural and engineering documentation, and historical documentation, following standards and guidelines promulgated by the Secretary of the Interior.

NATURAL SETTING

The geological information presented here is taken from SAFCA's Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area (SAFCA 2007).

The project area lies in the Sacramento Valley portion of the Great Valley Geomorphic Province. The Great Valley is a large valley trending northwest-southeast that is bounded by the Sierra Nevada to the east and south, the Coast Ranges to the west, and the Klamath Mountains to the north. The Great Valley is drained by the Sacramento and San Joaquin Rivers, which join and flow out of the Great Valley province through San Francisco Bay. This geomorphic province is an asymmetric trough approximately 400 miles long and 50 miles wide that is characterized by a relatively flat alluvial plain made up of a deep sequence of sediment deposits from Jurassic to Recent age. The sediments in the Great Valley vary between 3 and 6 miles in thickness and were derived primarily from erosion of the Sierra Nevada to the east, with lesser material fro the Coast Ranges to the west. The eastern edge of the Sacramento Valley is flanked by uplifted and tilted sedimentary strata that overlie rocks of the Foothills Metamorphic Belt and are in turn overlain on the west by younger alluvium.

The Sacramento Valley has been a depositional basin throughout most of the late Mesozoic and Cenozoic time. A vast accumulation of sediments was deposited during cyclic transgressions and regressions of a shallow sea that once inundated the valley. Overlying the thick sequence of sedimentary rock units that form the deeply buried bedrock units in the mid-basin areas of the valley are Late Pleistocene and Holocene (Recent) alluvial deposits, consisting of reworked fan and stream materials that were deposited by streams prior to the construction of the existing flood control systems. The youngest geomorphic features in the area are low floodplains, which are found primarily along the Sacramento and American Rivers. The natural floodplains of these rivers are very wide in this area because the land is relatively flat. These major drainage ways were originally confined within broad natural levees sloping away from the rivers or streams. The natural levees formed through the deposition of alluvium during periods of flooding. As flood waters lost energy, the coarser materials settled out nearest the rivers and streams, forming the natural levees and sand bars in the vicinity of the river channel. The finer material was carried in suspension farther from the rivers or streams, and settled out in quiet water areas such as swales, abandoned meander channels, and lakes. However, because the streams have meandered and reworked the previously deposited sediments, extreme variations in material types may be found over a limited distance or depth.

Flanking the Recent alluvial deposits are late Pleistocene alluvial fan and terrace deposits of the Modesto and Riverbank Formations (Helley and Harwood 1985). Stream terrace deposits, mapped as the Modesto Formation, are higher in elevation and older than floodplain sediments. Before the construction of the existing levees, these stream terraces were occasionally flooded, but only small amounts of sediment were deposited during flood events. The lower fan terraces of the Riverbank Formation are higher in elevation and older than stream terraces, and were only rarely flooded.

The Natomas Basin is situated within the climatic band classified as the Lower Sonoran Zone. The climatic pattern is characterized as Mediterranean, with cool, wet winters and hot, dry summers. Locally, this pattern consists of approximately 17 inches of annual rainfall, high summer temperatures, and low humidity. The dominant vegetative communities in this area are prairie grasslands and tule marshes, with some areas of riparian woodland. Valley oak (*Quercus lobata*), cottonwood (*Populus fremontii*), sycamore (*Platanus racemosa*), and willow trees (*Salix* spp.) once grew on the verge of streams and rivers. Tule marshes included stands of tules, cattails, sedges, rushes, and clumps of willow trees.

Faunal species that frequented the prehistoric prairie grasslands and tule marshes included mule deer (*Odocoileus hemionus*), tule elk (*Cervus elaphus*), antelope (*Antilocapra americana*), weasel (*Mustela frenata*), river otter (*Lutra canadensis*), raccoon (*Procyon lotor*), and beaver (*Castor canadensis*). Migratory waterfowl, such as geese (*Branta canadensis*) and swans (*Olor* sp.), passed through during winter, joining resident white pelicans (*Pelecanus erythrorhynchus*), great blue and black-crowned herons (*Ardea herodias*, *Nycticorax nycticorax*), ibis (*Plegadis guarauna*), cranes (*Grus canadensis*), cormorants (*Phalacrocorax* sp.), and eagles (*Haliaetus leucocephalus*). Badgers (*Taxidea taxus*), coyotes (*Canis latrans*), skunks (*Mephitis mephitis*), jackrabbits (*Lepus californicus*), and cottontail rabbits (*Sylvilagus audubonii*) inhabited higher ground.

Within the waterways, chinook salmon (*Oncorhynchus tshawytscha*), rainbow trout (*Salmo gairdneri*), Pacific lamprey (*Lampetra tridentate*), and white sturgeon (*Acipenser transmontanus*) seasonally joined the other fish species indigenous to the area. Predators such as mountain lions (*Felis concolor*), grizzly bears (*Ursus americanus*), wolves (*Canis lupus*), kit fox (*Vulpes macrotis*), and bobcats (*Lynx rufus*) also roamed the area (Moratto 1984).

PREHISTORIC SETTING

PALEO-INDIAN AND LOWER ARCHAIC PERIODS

The earliest well-documented entry and spread of humans into California occurred at the beginning of the Paleo-Indian Period (10;000–6000 B.C.). Social units are thought to have been small and highly mobile. Known occupation sites have been identified within the contexts of ancient pluvial lake shores and coastlines, where characteristic hunting implements, such as fluted projectile points and chipped stone crescent forms, have been found. Prehistoric adaptations over the ensuing centuries have been identified in the archaeological record by numerous researchers working in the area since the early 1900s, as summarized by Fredrickson (1974) and Moratto (1984). Because of its plentiful resources and temperate climate, the Central Valley was well populated prehistorically and served as the location for some of the more substantial village sites known in California.

Beardsley (1948), Heizer and Fenenga (1939), and others conducted numerous studies that form the core of our early understanding of upper Central Valley archaeology. Little has been found archaeologically that dates to the Paleo-Indian or Lower Archaic (6000–3000 B.C.) time periods. However, archaeologists have recovered much data from sites occupied by the Middle Archaic period. The lack of discovery of sites from earlier periods may be the result of high sedimentation rates that have left the earliest sites deeply buried and inaccessible.

MIDDLE ARCHAIC, UPPER ARCHAIC, AND EMERGENT PERIODS

During the Middle Archaic Period (3000–1000 B.C.), the broad regional patterns of foraging subsistence strategies gave way to more intensive procurement practices. Subsistence economies were more diversified, possibly including the introduction of acorn processing technology. Human populations were growing and occupying more diverse settings. Permanent villages occupied year-round were established, primarily along major waterways. The onset of status distinctions and other indicators of growing sociopolitical complexity mark the Upper Archaic Period (1000 B.C.–A.D. 500). Exchange systems become more complex and formalized. Evidence of regular, sustained trade between groups was seen for the first time.

Several technological and social changes characterized the Emergent Period (A.D. 500–1800). The bow and arrow were introduced, ultimately replacing the dart and atlatl. Territorial boundaries between groups became well established. It became increasingly common that distinctions in an individual's social status could be linked to acquired wealth. Exchange of goods between groups became more regularized with more goods, including raw materials, entering into the exchange networks. In the latter portion of this period (A.D. 1500–1800), exchange relations became highly regularized and sophisticated. The clamshell disk bead became a monetary unit for exchange, and increasing quantities of goods moved greater distances. Specialists arose to govern various aspects of production and exchange.

The Middle and Upper Archaic and Emergent Periods are further broken down under the Central California Taxonomic System. These three time periods are well represented in archaeological assemblages in the vicinity of the project area. The assemblages are discussed in detail in Bennyhoff and Fredrickson (1969) and Moratto (1984) and are summarized here.

The **Windmiller Pattern (3000–500 B.C.)** of archaeological assemblages included an increased emphasis on acorn use and a continuation of hunting and fishing activities. Ground and polished charmstones, twined basketry, baked-clay artifacts (frequently used as a substitute for stone in the Central Valley), and worked shell and bone were hallmarks of Windmiller culture. Widely ranging trade patterns brought goods in from the Coast Range and trans-Sierran sources as well as closer trading partners. Perforated charmstones were associated with some burials. Mano and metate and small mortars were used but were rare.

Distinctive burial practices (ventrally extended, oriented westward) identified with the Windmiller Pattern also appeared in the Sierra Nevada foothills, indicating possible seasonal migration into the Sierra Nevada. The specific orientation of burials reinforces the idea that summers were spent in the Sierra Nevada and winters in the Central Valley. Men were generally buried in separate areas, in deeper graves, and with more artifacts than women, possibly indicating a higher social status. However, the rich offerings found with some women and children suggest that wealth also followed lineages or some sort of social patterns as well.

The **Berkeley Pattern (200 B.C.–A.D. 700)** represented a greater reliance on acorns as a food source than was seen previously. Distinctive stone and shell artifacts distinguished it from earlier or later cultural expressions, and may indicate the arrival and spread of ancestral Plains Miwok from the Bay Area region. Burials were predominantly placed in a tightly flexed position and frequently included red ochre. Minimally shaped mortar and pestle technology was much more prevalent than mano/metate. Nonstemmed projectile points become more common.

The **Augustine Pattern (A.D. 700–1800)** was marked by increasing populations resulting from more intensive food procurement strategies, and also by a marked change in burial practices and increased trade activities. Intensive fishing, hunting and gathering, complex exchange systems, and a wider variety in mortuary patterns were all hallmarks of this period. Mortars and pestles were more carefully shaped, and bow-and-arrow technology was present. Fishing implements became more common, trade increased, and cremation was used for some higher-status individuals. A well-developed ceramic industry has been noted at a site near Sloughhouse, east of Sacramento.

ETHNOGRAPHIC SETTING

The project area is situated within the lands traditionally occupied by the Nisenan, or Southern Maidu. The language of the Nisenan, which includes several dialects, is classified within the Maiduan family of the Penutian linguistic stock (Kroeber 1925). The western boundary of Nisenan territory was the western bank of the Sacramento River and the area between present-day Sacramento and Marysville. In the Sacramento Valley, the triblet, consisting of a primary village and a few satellite villages, served as the basic political unit (Moratto 1984). Valley Nisenan territory was divided into three triblet areas, each populated with several large villages (Wilson and Towne 1978), generally located on low, natural rises along streams and rivers or on slopes with a southern exposure. One important village, *Pusune*, near Discovery Park, appears to have been recorded as CA-SAC-26. Other villages—*Wollok, Leuchi, Wishuna, Totola,* and *Nawrean*—were located east of the confluence of the Feather and Sacramento Rivers, near the northwestern portion of the Natomas Basin.

Nisenan houses were domed structures covered with earth and tule or grass and measured 10–15 feet in diameter. Brush shelters were used in the summer and at temporary camps during food-gathering rounds. Larger villages often had semisubterranean dance houses that were covered in earth and tule or brush and had a central smoke hole at the top and an east-facing entrance, as well as smaller sweathouses. Another common village structure was a granary, which was used for storing acorns (Wilson and Towne 1978). Valley Nisenan people followed a

seasonal round of food gathering, as did most California Indians. The wide variety of food resources available was exploited year round, but hunting and gathering activities were at their most intense in late summer and early fall. Food staples included acorns, buckeyes, pine nuts, hazelnuts, various roots, seeds, mushrooms, greens, berries, and herbs. Game, roasted, baked, or dried, included mule deer, elk, antelope, black bear, beaver, squirrels, rabbits, fish, shellfish, and other small animals and insects (Wilson and Towne 1978). Seasonal harvests were carried out by families or the larger community, engendering social behavior such as sharing, trading, and conducting ceremonies.

Euro-American contact with the Nisenan began with infrequent excursions by Spanish explorers and Hudson Bay Company trappers traveling through the Sacramento and San Joaquin Valleys in the early 1800s. In general, Nisenan lifeways remained stable for centuries until the early to middle decades of the 19th century. With the coming of Russian trappers and Spanish missionaries, cultural patterns began to be disrupted as social structures were stressed. An estimated 75% of the Valley Nisenan population died in the malaria epidemic of 1833. With the influx of Europeans during the Gold Rush era, the population was further reduced as a result of disease and violent relations with the miners. However, today the Maidu are reinvesting in their traditional culture and, through newfound political, economic, and social influence, now constitute a growing and thriving native community in California.

HISTORIC SETTING

EARLY EXPLORATION

Although Russian trappers and traders associated with the Hudson's Bay Company likely traveled through Sacramento, Sutter, and Yuba Counties during earlier years, the first well-documented European exploration of the general region occurred in 1808, when Spanish explorer Gabriel Moraga led an expedition from Mission San Jose to the northern Sacramento Valley (Hoover, Rensch, and Rensch 1966). The earliest Euro-American settlement coincided with the establishment of land grants by the Mexican government in the 1840s. John A. Sutter obtained the first such grant in the region in 1841. Sutter's New Helvetia Rancho encompassed lands on the east bank of the Feather and Sacramento Rivers within the project area (Beck and Haase 1974).

MINING

Although there are no records of large-scale mining having been conducted in the project area or in the immediate vicinity, the industry had considerable indirect effects on historical developments in the region. The diggings and mines in the Sierra Nevada foothills dramatically increased economic activity in the region, leading to increased prosperity and the rise of larger and more numerous support industries, such as cattle ranches and farms. In addition, sediments washing into the Central Valley watercourses, including the Feather, Sacramento, and American Rivers, had a negative impact on water quality and on the scale and frequency of seasonal flooding.

Hydraulic mining, first conducted in Nevada in 1852, was the most cost-effective means of recovering placer gold from deeply buried gravels along and near river and stream channels. To access these deeply buried deposits, miners used streams of water under high pressure to wash away sediments and gravels. The sands and gravels were passed through sluices that separated out the placer gold. Silt and sand washed into nearby creeks, streams, and rivers, raising watercourse beds, clogging the channels, and generally polluting the waters. Between 1849 and 1909, 195 million cubic meters of mining debris entered the channels of the American River basin. The deposition of silt in the rivers resulted in the raising of the riverbeds and increased flooding. After 1861, catastrophic floods became more common, prompting the development of a levee system and beginning the process of land reclamation for agricultural purposes.

Construction of a railroad was a natural outgrowth of Sacramento's expansion and the need to deliver supplies to the California foothills. The railroad was completed by February 1856. The first rail line ran to the town of Folsom, where at least 21 different wagon trains then carted goods from the train to outlying areas as far away as Carson City, Nevada. The Central Pacific Railroad bought the Sacramento Valley Railroad in 1865 and added its

facilities to those already being built for the Transcontinental Railroad. The Central Pacific and its successor, the Southern Pacific Railroad, became the major industry in Sacramento after 1863. It is estimated that early in its history, the railroad employed 20–30% of salaried employees in Sacramento (Historic Environment Consultants 1998).

AGRICULTURE AND FLOOD CONTROL

GENERAL

Agriculture and ranching were the primary industries in the present-day Sacramento and Sutter County region during the historic period. Regional ranching originated on the New Helvetia rancho in the early 1840s. The Gold Rush precipitated growth in agriculture and ranching, as ranchers and farmers realized handsome returns from supplying food and other goods to miners. Frequent floods plagued the residents of the region, however, and posed a significant threat to the viability of agricultural interests and further settlement.

Initial efforts at flood control were usually uncoordinated and consisted of small levees and drains constructed by individual landowners. These features proved insufficient to protect cultivated land, and much of the project area flooded regularly (Dames & Moore 1994a). In 1861, the California Legislature created the State Board of Swampland Commissioners to reclaim swamp and overflow lands. The State Board of Swampland Commissioners established 32 districts that attempted to enclose large areas with natural levees. Lack of cooperation among the landowners in the districts led to chronic financial crises. When the legislature terminated the State Board of Swampland Commissioners in 1866, responsibility for swamp and overflow land fell to the individual counties. Many counties offered incentives to landowners for reclaiming agriculturally unproductive land. If a landowner could certify that he had spent at least $2 per acre in reclamation, the county would refund the purchase price of the property to the owner. Speculators took advantage of this program and a period of opportunistic and often-irrational levee building followed (Thompson 1958).

In the early part of the 20th century, the state legislature established The Reclamation Board to exercise jurisdiction over reclamation districts and levee plans. That year, the state approved and began implementation of the Sacramento River Flood Control Project (SRFCP). The ambitious project included the construction of levees, weirs, and bypasses along the river to channel floodwaters away from population centers. Under the SRFCP, new reclamation districts were created, including RD 1000, consisting of approximately 55,000 acres in the Natomas Basin. RD 1000 was largely controlled by the Natomas Company, which had access to more money than any individual landowner. The Natomas Company was formed in 1851 in Sacramento County to supply water for placer mining and irrigation. It later became involved in dredging for gold and expanded its water supply business. The Natomas Company became involved in land reclamation in part as a rebuttal of criticism that farmland was being destroyed by the company's gold dredging activities (Dames & Moore 1994a).

RD 1000 RURAL HISTORIC LANDSCAPE DISTRICT

The infrastructure of RD 1000 (Exhibit 4) was completed in the 1920s. It includes levees, drainage canals, pumps, irrigation systems, agricultural fields, and roads, as well as remnant natural features. The originally constructed features included levees and exterior drainage canals, an interior drainage canal system, nine pumping plants, a series of levee and interior roads, and unpaved rights-of-way between the farm fields.

Previous efforts to document and mitigate impacts on elements of RD 1000 are relevant to the proposed project. The RD 1000 area has been identified as eligible for inclusion in the NRHP as a Rural Historic Landscape District. The evaluation process was conducted both to determine the NRHP eligibility of the district and to evaluate whether the district would be significantly affected by flood control projects planned and subsequently implemented by the USACE as part of the American River Watershed Project (Dames & Moore 1994a). The "determination of effects" statement concluded that the USACE projects would adversely affect both contributing

and noncontributing elements of the Rural Historic Landscape District by allowing for greater development to occur in the region. Mitigation measures were recommended and adopted. These consisted of Historic American Engineering Record documentation, which was prepared by Peak & Associates (1997); videotapes of historic properties; and a list of repositories where copies of the information would be made available to the public.

Dames & Moore determined that RD 1000 appears to be eligible for listing as a Rural Historic Landscape District at the state level of significance for the period from 1911 to 1939 under Criterion A. The area of significance was listed as reclamation and the historical context was listed as the flood control and reclamation of the Sacramento River basin within the SRFCP as an important part of the history of reclamation and flood control. The district retains much of its historic integrity, including location design, setting, materials, workmanship, feeling, and association. The contributing and noncontributing elements of the district were defined as part of this effort. Contributing elements were described as follows:

- **Drainage System:** East Levee, River Levee, Cross Canal Levee; Natomas East Main Drainage Canal; Cross Canal; Pleasant Grove Canal; Pumping Plants No. 1-A, 2, and 3; the canal connecting Pumping Plant No. 3 and the West Drainage Canal, North Drainage Canal, East Drainage Canal, West Drainage Canal, Natomas Main Drainage Canal, and the drainage ditches within the areas of contributing large-scale land patterns.

- **Road System:** Garden Highway from Orchard Lane north to the Cross Canal; East Levee/Natomas Road; Sankey Road; Riego Road; Elverta Road; Elkhorn Boulevard from Garden Highway to the western boundary of the Sacramento Airport; Del Paso Road from Powerline Road to its intersection with Interstate 5 (I-5); San Juan Road from Garden Highway to its intersection with I-5; Powerline Road; El Centro Road from north of Interstate 80 (I-80) to its intersection with Bayou Way; and the right-of-way roads within fields in the areas of contributing large scale land patterns.

- **Large-Scale Land Patterns:** Land area that consists of open fields formed by the intersection of the canals and roads in the area bounded as follows: west of the East Levee; west of Sorrento Road; north of Del Paso Road between the East Levee and I-5, west of I-5 from its intersection with Del Paso Road to its intersection with I-80; north of I-80 from its intersection with I-5 to the River Levee; east of the River Levee; and south of the Cross Canal Levee.

Noncontributing resources include parts of the drainage system (some pumping plants and associated branch canals); parts of the road system; some large-scale land patterns (the area bounded by Sorrento Road to the east levee, south of Del Paso Road between I-5 and the east levee, south of I-80, and the Airport); and some land uses, vegetation, boundary demarcations, buildings, and structures such as those more closely associated with agriculture than reclamation, municipal structures, commercial structures, and electric power lines.

STUDY METHODOLOGY

This section describes the methods used to date to identify cultural resources in the study area and to satisfy the relevant statutory and regulatory framework. The methodology is consistent with state and federal standards, was developed to meet the requirements of CEQA and NHPA Section 106, and is consistent with the PA. All study elements described in this section have been completed by archaeologists that meet the Secretary of the Department of the Interior's professional qualification standards.

The cultural resource inventory efforts will be completed in phases, as access to project lands is acquired. A phased identification process is specifically authorized at 36 CFR Section 8004.2(b)(2):

> Where alternatives under consideration consist of corridors or large land areas, or where access to properties is restricted, the agency official may use a phased process to conduct identification and evaluation efforts. The agency official may also defer final identification and evaluation of historic properties if it is specifically provided for in a memorandum of agreement executed pursuant to § 800.6, a programmatic agreement executed pursuant to § 800.14 (b), or the documents used by an agency official to comply with the National Environmental Policy Act pursuant to § 800.8. The process should establish the likely presence of historic properties within the area of potential effects for each alternative or inaccessible area through background research, consultation and an appropriate level of field investigation, taking into account the number of alternatives under consideration, the magnitude of the undertaking and its likely effects, and the views of the SHPO/THPO and any other consulting parties. As specific aspects or locations of an alternative are refined or access is gained, the agency official shall proceed with the identification and evaluation of historic properties in accordance with paragraphs (b)(1) and (c) of this section.

The following sections describe background research conducted to identify existing resources and sensitivity of resources, completed identification efforts, and future work required under the phased approach.

NATIVE AMERICAN CONTACT PROGRAM

EDAW sent a letter of inquiry to the NAHC on June 12, 2007, asking for information or concerns regarding the project area, as well as a list of individuals or organizations that might have information or concerns regarding the project area (Appendix A). On June 19, 2007, Debbie Pilas-Treadway of the NAHC responded and indicated that no known sites were found in the Sacred Lands File that were located within the project area or in the immediate vicinity. Ms. Pilas-Treadway also provided EDAW with a list of individuals who could be contacted concerning cultural resources in the project area. These individuals were sent contact letters on June 21, 2007, with information regarding the proposed project and a request for any information they might provide or concerns that they might have about the project. No written responses were received; therefore, follow-up phone calls were made on July 9, 2007. Only one individual, Rose Enos (referred to by the NAHC as "Miwok/Maidu"), answered. Ms. Enos expressed general concern regarding avoidance of burial sites and asked to be contacted if work is conducted on such sites. Messages were left for the remaining people on the contact list; however, no response from any of these individuals has been received. In addition, EDAW contacted Randy Yonemura of the Ione Band of the Miwok to request information on areas of concern. Mr. Yonemura led an EDAW archaeologist on a field visit of the project area and provided anecdotal information on areas of potential Native American burials.

INFORMATION CENTER RECORDS SEARCHES

Records searches were conducted in stages in 2006 and 2007 for different portions of the proposed project footprint. Most of the searches were conducted at the North Central Information Center (NCIC) of the California Historical Resources Information System, located at California State University, Sacramento. The NCIC records search covered portions of the project area in Sacramento County. Records searches were also conducted at the

Northeast Information Center (NEIC), which maintains cultural resource records for Sutter County. The searches at both facilities included, but were not necessarily restricted to, an examination of the following resources:

- The State Office of Historic Preservation's *Historic Property Directory and Determination of Eligibility* (2006)
- The National and California Registers of Historic Places (2006)
- *California Inventory of Historic Resources* (1976 and updates)
- *Historic Properties Directory* (2006)
- *California Historical Landmarks* (1996 and updates)
- *California Points of Historical Interest* (1992 and updates)
- *Caltrans Local Bridge Survey* (1987)
- Various historic maps

The NEIC and NCIC reported that several cultural resource inventories have been conducted within the project area. These are listed in Tables 1 and 2, respectively.

Table 1
Previous Cultural Resources Surveys Conducted in the Project Area in Sutter County

NEIC Report No.	Author(s)	Title	Date
1135	Bass, H. O.	*Department of Transportation Negative Archaeological Survey Report: State Route 99*	1983
7173	Cultural Resources Unlimited	*A Cultural Resources Study for Sutter Bay Project, Sutter County, California*	1992
7175	Cultural Resources Unlimited	*A Cultural Resources Study for Sutter Bay Project Highway 99/70 Interchange/Crossroad Improvements Sutter County, California*	1992
3469B	Dames & Moore	*Rural Historic Landscape Report for Reclamation District 1000 for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1996
5777	Dames & Moore	*Historic Property Treatment Plan for Reclamation District 1000 Rural Historic Landscape District for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1994a
4197	Dames & Moore	*Archaeological Inventory Report, Natomas Locality, Cultural Resources Inventory and Evaluation, American River Watershed Investigation, El Dorado, Placer, Sacramento, and Sutter Counties, California*	1994b
6892	Derr, E. H.	*American Basin Fish Screen and Habitat Improvement Project, Feasibility Study: Alternative 1C, 2C, 3, Sacramento and Sutter Counties, California*	2002
6944	Ebasco Environmental	*Cultural Resources Survey of the Sacramento Energy Project Sacramento County, California*	1992
5655	Egherman, R., and B. Hatoff	*Roseville Energy Facility Cultural Resources Appendix J-1 of Application for Certification*	2002
6945	Foster, J. W., and D. G. Foster	*An Archaeological Survey of the South Sutter Industrial Center Property, Sutter County, California*	1992
2987	Jensen, P.	*Historic Properties Survey Report for the Proposed Fifield Road at Pleasant Grove Creek Canal, Caltrans District 3, Sutter County, California*	1999
6893	Kaptain, N.	*Historic Property Survey Report for the State Route 99/Riego Road Interchange Project Sutter and Sacramento Counties*	2005
4658	Nelson, W. J., M. Carpenter, and K. L. Holanda	*Cultural Resources Survey for the Level (3) Communications Long Haul Fiber Optics Project. Segment WPO4: Sacramento to Redding*	2000
3469A	Peak & Associates	*Historic American Engineering Record Reclamation District 1000 HAER No. CA-187*	1997
1141	Wilson, K.L.	*Sacramento River Bank Protection Unit 34 Cultural Resources Survey Final Report*	1978

Note: NEIC = Northeast Information Center
Source: Data provided by the Northeast Information Center in 2007

Table 2
Previous Cultural Resources Surveys Conducted in the Project Area in Sacramento County

NCIC Report No.	Author(s)	Title	Date
–	Banek, B.	*An Archaeological Reconnaissance of the South Natomas Area for the River Bank Holding Company, Sacramento County, California*	1982
4188	Billat, L. B.	*Nextel Communications Wireless Telecommunications Service Facility—Sacramento County*	2001
–	Bouey, P. D.	*Cultural Resources Inventory and Evaluation: Sacramento River Bank Protection (Unit 44) Project*	1989
4206, part 1	Bouey, P. D., and R. Herbert	*Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project*	1990
6519	Bouey, P., J. Berg, J., and C. A. Hunter	*Cultural Resources Test Excavations, Sacramento Urban Area Flood Control Project, Sacramento County, California*	1991
4457	California Department of Transportation	*Negative Historic Property Survey Report for the Proposed Installation of Automatic Vehicle Census Systems on Interstate 80 East of the West El Camino Over-Crossing and on Highway 51 East of the "E" Street Ramps, Sacramento County, California*	2003
4194	Chavez, D., L. H. Shoup, C. Desgrandchamp, and W. G. Slater	*Cultural Resources Evaluations for the North Natomas Community Plan Study Area, Sacramento, California*	1984
4193	County of Sacramento Department of Environmental Review and Assessment	*Draft Environmental Impact Report for Teal Bend Golf Course Use Permit*	1995
4190	CRS Archaeological Consulting and Research Services	*Sacramento Metro Airport Airmail Facility*—letter report	1988
3409	Cultural Resources Unlimited	*A Cultural Resources Study for Sacramento Area Flood Control Agency Borrow Sites Project Sacramento County*	1993
4463	Cultural Resources Unlimited	*A Cultural Resources Survey and Archival Review for the Arden-Garden Connector Project Sacramento County, California*	1992
3469B	Dames & Moore	*Rural Historic Landscape Report for Reclamation District 1000 for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1996
4197	Dames & Moore	*Archaeological Inventory Report, Natomas Locality, Cultural Resources Inventory and Evaluation, American River Watershed Investigation, El Dorado, Placer, Sacramento, and Sutter Counties, California*	1994b
5777	Dames & Moore	*Historic Property Treatment Plan for Reclamation District 1000 Rural Historic Landscape District for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1996
4195	Derr, E.	*Cultural Resources Report: North Natomas Comprehensive Drainage Plan; Levee Improvements, Canal Widening and Additional Pumping Capacity*	1997
4466	Derr, E.	*Historic Resource Evaluation Report for the Arden-Garden Connector Project CT-03-30274.B1 Sacramento County, California*	1983
6892	Derr, E. H.	*American Basin Fish Screen and Habitat Improvement Project, Feasibility Study: Alternative 1C, 2C, 3, Sacramento and Sutter Counties, California*	2002
6944	Ebasco Environmental	*Cultural Resources Survey of the Sacramento Energy Project Sacramento County, California*	1992

Table 2
Previous Cultural Resources Surveys Conducted in the Project Area in Sacramento County

NCIC Report No.	Author(s)	Title	Date
5655	Egherman, R., and B. Hatoff	*Roseville Energy Facility Cultural Resources Appendix J-1 of Application for Certification*	2002
3489A	Far Western Anthropological Research Group	*Report on the First Phase of Archaeological Survey for the Proposed SMUD Gas Pipeline Between Winters and Sacramento Yolo and Sacramento Counties, California*	1993
3489B	Far Western Anthropological Research Group	*Addendum to the Report on the First Phase of Archaeological Survey for the Proposed SMUD Gas Pipeline Between Winters and Sacramento Yolo and Sacramento Counties, California*	1993
4206, part 2	Far Western Anthropological Research Group	*Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project*—letter report to SHPO	2005
–	Foster, J. W.	*A Cultural Resource Investigation of the Blue Oaks Skilled Nursing Facility Site Auburn, California*	1995
–	Glover, L. C., and P. D. Bouey	*Sacramento River Flood Control System Evaluation, Mid-Valley Area Cultural Resources Survey, Colusa, Sacramento, Sutter, Yolo, and Yuba Counties, California*	1990
4449	Herbert, R. F.	*Report on the National Register Eligibility of the Sacramento River Docks Building 37 McClellan Air Force Base, Sacramento, California*	1995
5803	Herbert, R. F.	*Report on the National Register Eligibility of the Sacramento River Dock Complex including Building 4635 (Dock) and Building 4637 (Warehouse) McClellan Air Force Base, Sacramento, California*	1995
4202	Humphreys, S., and L. McBride	*A Review of the Work Carried Out at Sacramento 16, the Bennett Mound*	1966
4178	Jones & Stokes	*Archaeological Survey Report for the North Natomas Drainage System's San Juan Pump Station*	1992
2956	Nadolski, J. A.	*Archaeological Survey Report for the Jibboom Street Bridge Project Sacramento, California*	2001
4435	Nadolski, J. A.	*Archaeological Investigations for the Sacramento-KOVR Diverse Lateral Overbuild in Sacramento and Yolo Counties*	2001
5810	PAR Environmental Services, Inc.	*Northgate Boulevard/Arden-Garden Intersection Cultural Resources Investigation, City of Sacramento, Sacramento County, California*	n.d.
4187	Pastron, A. G., and R. K. Brown	*Historical and Cultural Resource Assessment Proposed Telecommunications Facility Natomas Park, Site No. SA-750-01 2450 Del Paso Road, Sacramento County, California*	2001
173	Peak, A. S.	*American River Parkway An Archaeological Perspective*	1973
2764	Peak & Associates	*Historic Property Survey Report and Finding of No Adverse Effect for the Proposed American River Parkway Bike Trail Improvement Project, City and County of Sacramento, California*	2001
2765	Peak & Associates	*Archaeological Survey Report for the Proposed American River Parkway Bike Trail Improvement Project, City and County of Sacramento, California*	
3469A	Peak & Associates	*Historic American Engineering Record Reclamation District 1000 HAER No. CA-187*	1997
4173	Peak & Associates	*Report on the Archaeological Testing Within the Riverbend Classics Project Area, City of Sacramento, California*	1999
4181	Peak & Associates	*Cultural Resources Overview for the North Natomas Long-Term Planning Area, Sacramento County, California*	4181

Table 2
Previous Cultural Resources Surveys Conducted in the Project Area in Sacramento County

NCIC Report No.	Author(s)	Title	Date
6830	Peak & Associates	*Determination of Eligibility and Effect for the Natomas Panhandle Annexation Project Area Sacramento County, California*	2005
4201	Peak, A. S., H. L. Crew, and R. Gerry	*The 1971 Archaeological Salvage of the Bennett Mound, CA-SAC-16, Sacramento, CA*	1984
4456	Ritchie, M.	*Finding of Effect for the Proposed Safety Improvements and Rehabilitation of the Jibboom Street Bridge on Jibboom Street, Bridge No. 24C-022, Sacramento, Sacramento County, California*	2001
–	Snyder, J.W.	*Historic Property Survey Report (Positive) for the Jibboom Street Bridge Safety Improvements and Rehabilitation Project Jibboom Street, Sacramento County, California*	2003
4441	Sonoma State Anthropological Studies Center	*Archaeological Surface Reconnaissance and Backhoe Testing for the South Natomas Projects (P92-122, P92-160) Sacramento County, California*	
3408	Theodoratus Cultural Research	*Discovery Park Construction Site Examination for Archaeological Resources in the Area of CA-Sac-26*—letter report	1981
4458	True, D. L.	*8-Acre Survey at 1801 Garden Highway, Sacramento, California*	1983
1141	Wilson, K. L.	*Sacramento River Bank Protection Unit 34 Cultural Resources Survey Final Report*	1978

Note: SHPO = State Historic Preservation Officer
Source: North Central Information Center Record Search 2007

Numerous archaeological investigations have covered portions of the Natomas Basin. These have generally focused on areas closest to the rivers and levees. There has been very little archaeological inventory of lands more than 100 feet from the levee toes, and ground surface visibility has frequently been poor even in surveyed areas.

The most comprehensive of these investigations were completed by Dames & Moore and Far Western. In 1994, Dames & Moore (1994b) conducted a broad survey in the Natomas Basin as part of the American River Watershed Investigation. Surveying of selected parcels along the Sacramento River resulted in the identification of 17 primarily historic sites. During the same effort, Dames & Moore visited an additional 10 previously identified cultural resources to update site records for those locations. At the same time, Dames & Moore (1994a) prepared a draft Historic Property Treatment Plan that explored the history and elements of RD 1000. In 1996, Dames & Moore completed its evaluation of RD 1000, concluding that it appeared to be eligible for listing on the NRHP under Criterion A at a state level of significance as an example of reclamation and flood control in the Sacramento River basin during the period 1911–1939. This report extensively documents both the contributing and noncontributing resources of RD 1000. Previously, in 1990, Far Western had conducted surveys of areas along the same route surveyed by Dames & Moore in 1994 (Dames & Moore 1994b), as well as of additional areas (Bouey and Herbert 1990). Far Western (Bouey, Berg, and Hunter 1991) followed up with limited test excavations of two sites that may be within or near the footprint of 2009–2010 project components (borrow areas) that have not yet been fully defined.

Numerous cultural resources were identified in the course of previous survey efforts, including ranches and farms; agricultural, transportation, and reclamation features; and debris scatters, as well as prehistoric occupation and burial sites consisting of mounds or the disturbed remnants of mounds (Tables 3 and 4).

EDAW FIELD SURVEYS

Fieldwork undertaken by EDAW in 2007 focused on the areas that would be affected by project construction in 2008: the NCC south levee, Sacramento River east levee Reaches 1–4B to Station 214+00, the proposed right-of-way of the relocated Elkhorn Canal and the new GGS/Drainage Canal, and potential borrow sites. EDAW conducted pedestrian surveys of those portions of these areas that were accessible; however, only a small proportion of the land area in the potential project footprint for 2008 was accessible to surveys, mainly because of the presence of crops. As access to the unsurveyed lands becomes available, pedestrian surveys will be completed in these areas.

In April/May 2007, an EDAW archaeologist examined the NCC south levee and adjacent lands within the existing maintenance right-of-way. In July/August 2007, a crew of EDAW archaeologists conducted field surveys in accessible parcels within Sacramento County–owned Airport bufferlands north of the Airport. On the Airport bufferlands, the surveys covered a 400-foot-wide strip east of the Sacramento River east levee and small portions of the proposed borrow sites in the Airport north bufferlands. Survey areas within 1,000 feet of the Sacramento River and the locations of prehistoric lakebeds were walked using transects 15 meters apart. Farther from the Sacramento River and prehistoric lakebeds, the transect interval was widened to 30 meters. The potential borrow sites were almost completely inaccessible because they contained rice crops. Exhibit 5 shows those portions of the project area that were surveyed by EDAW in 2007. Areas with poor ground surface visibility (i.e., less than 50%), would require subsequent survey at a time of year when ground surface visibility would be improved.

Two new historic sites, NLIP-1 and NLIP-2, were identified during the surveys adjacent to Garden Highway, and four groups of farm buildings, NLIP-3 through NLIP-6, were also identified and evaluated (Appendix B).

As mentioned above, Randy Yonemura of the Ione Band of the Miwok also showed an EDAW archaeologist the locations of subsurface cultural resources that have not been recorded in any of the previously prepared documentation filed with the NCIC and NEIC, which are known to him from anecdotal information.

IDENTIFIED CULTURAL RESOURCE SITES IN THE SUTTER COUNTY PORTION OF THE PROJECT AREA

Table 3 lists the known cultural resource sites in the Sutter County portion of the project area. Most of the listed sites are in areas proposed for 2009–2010 construction. The sites that may be affected by 2008 construction are shown with an asterisk. The sites listed in Table 3 are described below.

Table 3
Cultural Resources in the Sutter County Portion of the Project Area

Trinomial*	P-No.*	Historic/ Prehistoric	Description	Date Recorded	Quadrangle	NRHP/CRHR Status If Known
CA-SUT-84H*	51-000084	Historic	Natomas Cross Canal/Pleasant Grove Creek Canal levees	1994	Pleasant Grove, Verona	Eligible
	51-000096H*	Historic	1950s-era ranch	2002	Taylor Monument	
NLIP-3*		Historic	Farm Complex	2007	Verona	Not eligible
NLIP-4*		Historic	Farm Complex	2007	Verona	Not eligible
NLIP-5*		Historic	Farm Complex	2007	Verona	Not eligible
NLIP-6*		Historic	Farm Complex	2007	Verona	Not eligible
Barney Mound*		Prehistoric	Intact occupation mound site	not	Verona	Potentially eligible

Notes:
CRHR = California Register of Historic Resources; NRHP = National Register of Historic Places.
* Sites that would be or may be affected by the 2008 construction elements are marked with an asterisk.
Source: Data compiled by EDAW in 2007

CA-SUT-84H (P-51-000084)

This trinomial includes both the NCC south levee and the Pleasant Grove Creek Canal (PGCC) west levee, the northernmost contributing resources to RD 1000. The NCC levee measures approximately 25 feet wide at the top, 75 feet wide at the base, and 15 feet high. The top has been graded and graveled for vehicle traffic. The PGCC levee is smaller, measuring approximately 20 feet wide at the top, 60 feet wide at the base, and 10 feet high. There is also an associated retention basin, constructed of concrete and measuring 50 feet by 35 feet across and 15 feet deep. A concrete and steel pump foundation is located within the basin. Concrete footings running from a hole in the side of the basin to the top of the NCC levee indicate that a large pipe once connected the two features.

Archaeologists reported that the levee (unclear which one) was raised and strengthened twice, after flooding during 1938–1939 and after flooding in RD 1001 during 1955. RD 1000 modified the NCC south levee and its adjacent canals in 1987 and SAFCA modified them in 1996. SAFCA constructed a cutoff wall in the western portion of the NCC south levee in 2007.

P-51-000096H

Located on the Sacramento/Sutter county line and at the edge of a proposed borrow area, this resource consists of a historic ranch complex that includes two residences, four sheds or barns, and a trailer. The archaeological survey crew was not allowed on the property to record the structures in more detail.

NLIP-3, 7240 Garden Highway

The Sutter County Assessor's records currently list this property along the Sacramento River east levee south of Sankey Road as vacant. No construction date is on file for the buildings. The construction methods and materials appear to date to the early 20th century. This property appears to have always functioned as a residential and agricultural complex. The buildings are in good condition but lack the historic associations or architectural distinctions that would make them eligible for listing on the CRHR or NRHP.

NLIP-4, 11000 Garden Highway

This property is near the Sacramento River east levee north of Riego Road. The Sutter County Assessor's records list one of the two residences on the property as being constructed in 1957. The property has been in the Lauppe family since that time. The land, originally listed as Assessor's Parcel Number 35-020-15, was split into separate parcels several years ago as part of a lot-line adjustment. Because of the split, the 35-020-15 parcel number was retired, and additional parcel numbers (35-020-18, 35-020-19) were assigned.

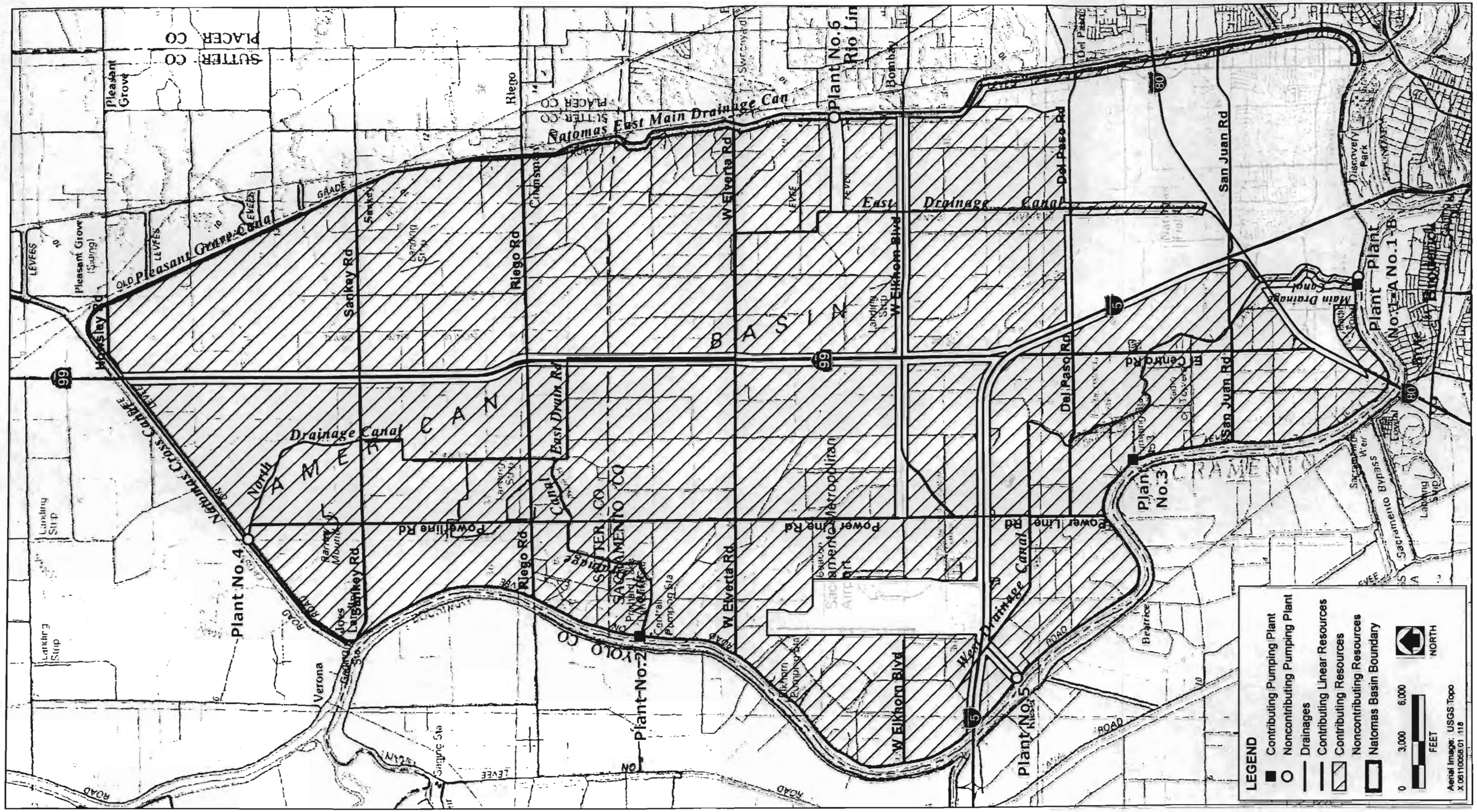
Research did not reveal this property to be significantly associated with an important historic event, and the historic-era building located here is not known to be associated with an individual considered important in local history. The property itself has undergone regular periods of construction over the years, with new buildings added and older structures modified. The buildings lack the historic associations or architectural distinctions that would make them eligible for listing on the CRHR or NRHP.

NLIP-5, Howsley Road at the Natomas Cross Canal

This small complex includes a mid-20th century residence and several turn-of-the-century horse stalls. The buildings are in good condition but lack the historic associations or architectural distinctions that would make them eligible for listing on the CRHR or NRHP.

Source: Aerial by SACOG 2006, Prepared by EDAW in 2007

Survey Coverage Map **Exhibit 5**



Source: Dames & Moore 1996

Contributing Features of the RD 1000 Rural Historic Landscape District

Exhibit 4

NLIP-6, Howsley Road at the Pleasant Grove Creek Canal

This is a small residential complex dating to the mid-20th century. The buildings are in good condition but lack the historic associations or architectural distinctions that would make them eligible for listing on the CRHR or NRHP.

Barney Mound

This is an unrecorded prehistoric occupation mound with a residence on top, located along Powerline Road north of Sankey Road. Although the site has not been recorded officially, it is well known in the region and, as an intact prehistoric mound site in an area where almost all such sites have been destroyed, is likely to be eligible for CRHR and NRHP listing.

IDENTIFIED CULTURAL RESOURCE SITES IN THE SACRAMENTO COUNTY PORTION OF THE PROJECT AREA

Table 4 lists the known cultural resource sites in the Sacramento County portion of the project area. This table does not include several known sites in the southeastern portion of the Natomas Basin (located mainly along the Natomas East Main Drainage Canal [NEMDC]/Steelhead Creek) because there are no proposed project elements in that part of the basin. Most of the listed sites are in areas proposed for 2009–2010 construction. The sites that may be affected by 2008 construction are shown with an asterisk, and those that may be affected by 2009–2010 construction are shown with a plus sign. The sites listed in Table 4 are described below.

Table 4
Cultural Resources in the Sacramento County Portion of the Project Area

Trinomial[a,b]	P-No.[a]	Historic/ Prehistoric	Description	Date Recorded	Quadrangle	NRHP/CRHR Status if Known
CA-Sac-15/H+	34-000042	Both	Occupation mound with historic debris	1934, 1990, 1993	Taylor Monument	
CA-Sac-16/H+	34-000043	Both	Occupation/burial mound with historic debris and foundations	1934, 1966, 1984, 1987, 1990, 1993	Taylor Monument	Potentially eligible
CA-Sac-17+	34-000044	Prehistoric	May have been destroyed	1934, 1990	Taylor Monument	
CA-Sac-18	34-000045	Prehistoric	Lithic scatter	1934, 1994	Taylor Monument	
CA-Sac-160/H+	34-000187	Both	Occupation/burial mound with historic farm	1947, 1949, 1994	Taylor Monument	
CA-Sac-164+	34-000191	Prehistoric	Occupation/burial site nominated to NRHP	1972, 1982, 1988, 1989, 1990, 1991, 2001–2007	Sacramento West	Eligible
CA-Sac-430H	34-000457	Historic	West drainage canal	1991, 1993, 1997	Taylor Monument	
CA-Sac-485/H*+	34-000512	Both	Occupation mound and historic home site	1994	Taylor Monument	Potentially eligible
CA-Sac-486H	34-000513	Historic	Historic home site	1994	Taylor Monument	
CA-Sac-487H	34-000514	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-488H	34-000515	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-489H	34-000516	Historic	Historic debris and vegetation	1994	Taylor Monument	

Table 4 Cultural Resources in the Sacramento County Portion of the Project Area						
Trinomial[a,b]	P-No.[a]	Historic/ Prehistoric	Description	Date Recorded	Quadrangle	NRHP/CRHR Status If Known
CA-Sac-490H	34-000517	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-491H	34-000518	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-492H	34-000519	Historic	Historic well, pipes and vegetation	1994	Taylor Monument	
CA-Sac-493H	34-000520	Historic	Historic debris	1994	Taylor Monument	
CA-Sac-494H+	34-000521	Historic	Historic debris	1994	Taylor Monument	
CA-Sac-569H	34-000741	Historic	Paved road	1994, 1998	Taylor Monument, Rio Linda	
CA-Sac-836H*	34-001354	Historic	Farm complex	2005	Taylor Monument	Not eligible
	34-000883	Historic	Paved road	1998	Taylor Monument	
	34-000884	Historic	Paved road	1998	Taylor Monument	
	34-000886	Historic	Paved road	1998	Rio Linda, Taylor Monument	
	34-001552	Historic	House	2002	Taylor Monument	
	34-001557*	Historic	Pumping plant	2006	Taylor Monument	
	34-001558*	Historic	Pumping plant	2006	Taylor Monument	
	34-001559*	Historic	Pumping plant	2006	Taylor Monument	
NLIP-1*		Historic	Lean-to and shed	2007	Taylor Monument	Not eligible
NLIP-2*		Historic	Historic debris scatter	2007	Taylor Monument	Not eligible

Note:
[a] Sites that would be or may be affected by the 2008 construction elements are marked with an asterisk.
[b] Sites that may be affected by 2009–2010 construction elements are marked with a plus sign.
Source: Data provided by EDAW in 2007

CA-SAC-15/H

This site, near the Sacramento River east levee south of I-5, consists of a prehistoric occupation midden mound with a concentration of debitage, flaked stone tools, shell artifacts, faunal remains, fire-cracked rock, and baked clay objects. The mound has been heavily affected by farming and ranching activities. There is a ranch complex including a bunkhouse, garden, shed, chicken coop, water tower, garage, and driveway on the mound; historic debris on the site includes glass and broken ceramic fragments. A limited auger testing program was carried out west of the mound along the Sacramento River east levee and found no cultural materials along that transect (Bouey and Herbert 1990), however the authors suggested that the site may have been mis-mapped.

CA-SAC-16/H (P-34-000043)

CA-Sac-16/H is south of the Airport on a property that would be a potential borrow source for the proposed project. This site has been variously called the Bennett Mound, Mound Ranch, Willey Mound, and S-16. It includes the remains of a prehistoric occupation mound, possibly the largest in the Sacramento Valley, but has been leveled in stages by agricultural activities. The site location corresponds to the ethnographic village of *Nawrean*. What remains today consists of dark midden soils in plowed fields with fragments of human remains, shell, fire-cracked rock, baked clay objects, groundstone, faunal bone, flaked stone artifacts, and debitage. A few historic artifacts, such as brick and ceramic fragments, are also present. Today, two separate loci have been identified and recorded as CA-Sac-16/H; the larger, Locus I, represents the approximate original location of the

mound. Locus II is an area of redeposited soil taken from the mound in the past. There is also a historic-era component of the site from the remnants of a slaughterhouse and brick factory present before the 1930s. Historic artifacts noted include bricks, sawed mammal bone, a filled-in privy, bottles, ceramic and metal fragments, and glass.

The site was originally described as very large, up to 7 acres in area, and 20 feet high. The earliest investigations were conducted in 1923 by Zallio, who excavated at the site a number of times and recovered projectile points, bone tools, Haliotis ornaments, and other artifacts (Bouey, Berg, and Hunter 1991). It was first formally recorded in 1934 by Heizer, who identified it as a large mound with stone artifacts and freshwater shell on the surface. Sacramento Junior College excavated pits and trenches up to 18 feet deep in 1936–1937. The main focus of this effort was on recovery of mortuary remains; however, considerable quantities of nonburial associated artifacts were also documented. More excavations were conducted by Sacramento State College in 1953 and by American River College between 1966 and 1971, and more artifacts and burials were salvaged by Peak, Crew, and Gerry (1984) when what was left of the mound was leveled. At that time, Peak, Crew, and Gerry estimated that as much as 13 feet of the mound might still be present below the plowed surface. As an interesting side note—and as an indication of the original CA-Sac-16/H mound's prominence—Peak, Crew, and Gerry mention that Heinrich Schliemann (an amateur archaeologist and later the discoverer of Troy) visited the site in 1851–1852.

More recently, Bouey and Herbert (1990) completed a surface survey and excavated two auger holes at the toe of the levee that forms the western boundary of the site; they reported evidence of subsurface cultural deposits, including shell midden. Larger-scale excavations (Bouey, Berg, and Hunter 1991), dug within 100 feet of the levee toe and the ramp leading up to Garden Highway, confirmed that midden deposits still exist; however, agricultural activity seems to have destroyed any stratigraphic integrity the deposits might have had that close to the levee. Testing farther from the levee toe was not undertaken.

The summary of the research done by 1991 (Bouey, Berg, and Hunter 1991) agreed with the conclusions of Derr (1983) that the site was a large, permanent habitation locus occupied from the Upper Archaic (ca. 1000 B.C.) to just after the beginning of European contact. Derr found that the upper 20–60 centimeters of soil (in the areas he examined near the levee) consisted of redistributed midden with artifacts and isolated human remains. What appears to be missing from any of these analyses is an attempt to define the original mound or to find intact elements of the site that may have been located beyond the original mound. If there are intact subsurface deposits associated with CA-Sac-16/H, then the site may be eligible for listing on the CRHR or NRHP because of the potential information contained in those deposits.

The earliest documentation, Heizer's site record form from 1934, does not give dimensions for the mound and does not contain specific enough information to provide for relocation of the original boundaries of the mound. It is presumed that the dispersed midden from the mound now covers a larger surface area than the mound used to occupy. However, it is unclear exactly how large an area that is because various investigations have reported Locus I (the larger site deposit) as measuring 110 meters by 185 meters (Bouey and Herbert 1990), 250 meters by 250 meters (Kauffman and Kauffman 1983), and 450 meters by 850 meters (Dames & Moore 1993). The Dames & Moore site record form appears to be the only one that maps out the secondary Locus II area, northeast of the main deposit and east of a drainage ditch (as of 1993).

CA-SAC-17 (P-34-000044)

This is the location of a mound site reported by Heizer in 1934 west of Fisherman's Lake; however, none of the mound remains. In 1990, Bouey and Herbert attempted to locate any cultural remains but could not find any evidence of cultural deposits on the surface or in auger holes. The site is near the Undercome Ranch.

CA-SAC-18 (P-34-000045)

This site, landward of the Sacramento River east levee north of San Juan Road, consists of a sparse scatter of basalt debitage, one cryptocrystalline biface fragment, a polished stone, and possible fire-cracked rock. It was originally described by Heizer as a mound 30 yards in diameter and 5 feet high; however, Heizer may have misinterpreted a natural rise in the landscape as a mound. CA-Sac-18 appears to be lacking the intensive cultural deposits that are the hallmark other nearby known mound sites (Dames & Moore 1994b).

CA-SAC-160/H (P-34-000187)

This is a multicomponent site near the Sacramento River east levee north of San Juan Road. It includes a prehistoric occupation mound with a farm complex situated on top. Excavations in the 1940s removed numerous burials and artifacts including groundstone, flaked stone tools, shell beads and ornaments, fire-cracked rock, baked clay objects, stone beads, faunal remains, bone awls, bird bone tubes and whistles, obsidian drills, quartz crystals, charmstones, and historic glass trade beads, as well as historic debris related to farming and occupation of the top of the mound.

CA-SAC-164 (P-34-000191)

CA-Sac-164 is a very large, deeply stratified prehistoric occupation and burial mound near Sand Cove Park on the Sacramento River that has been explored a number of times using archaeological techniques; however, in spite of these efforts, the true boundaries of the site remain unknown. The site includes shell midden with abundant cultural materials including fire-cracked rock, flaked and ground stone tools, charmstones, polished bone implements, debitage, quartz crystals, bone and shell beads, baked clay objects, and plentiful faunal remains. Large fire-cracked rock features and hearths have also been noted. Because of its significant scientific value and the integrity, CA-Sac-164 was nominated for NRHP listing in 2001.

The site was first recorded in 1951, after a newspaper article reported that human remains and stone tools were eroding out of the cutbank and into the Sacramento River. Observers who walked along the edge of the cutbank in summer and fall when the river was at its lowest noted that site deposits, interspersed with flood-deposited silt, extended at least 4 meters below the current-day surface. Excavations in the 1970s, 1980s, and 1990s confirmed the depth of intact and resource-bearing cultural strata at the site, at least along the river exposure. Work on the land side of the Sacramento River levee indicated that downward-trending cultural strata might be found there as well, beginning well over a meter below the ground surface, however the site's depth, extent, and boundaries have never been completely defined.

Annual river height fluctuation, wave action resulting from boat wakes, and looting combined to cause continual erosion and collapse of the cutbank. This resulted in artifacts and remains falling onto the beach area below, where they either washed into the river or collected by the public. To address this issue, a site stabilization program was implemented in 2005 that included placing dirt and plantings over the cutbank and creating a wave break near the river's edge of the site.

CA-SAC-430H (P-34-000457)

This feature is the West Drainage Canal, a relatively unmodified canal that originates at Fisherman's Lake and flows southeast to the East and Main Drainage Canals.

CA-SAC-485/H (P-34-000512)

This site, between the Sacramento River east levee and the proposed location of the relocated Elkhorn Canal, was once a prehistoric occupation and burial mound that has been leveled by agricultural activities and was documented by Dames & Moore in 1994. The remains of a historic-era homestead, consisting mainly of

ornamental vegetation, driveway, and historic debris, were noted on top of the prehistoric site. Dames & Moore archaeologists noted that the prehistoric component was large, measuring 220 meters by 160 meters with two depositional loci—a larger area near Garden Highway and a smaller deposit to the east. Prehistoric artifacts noted at the time included obsidian and basalt flakes and tools, shell beads and ornaments, faunal remains, groundstone fragments, charmstones, baked clay, imported exotic tool stone, and shell.

In August 2007, EDAW archaeologists undertook a limited shovel testing program at CA-Sac-485/H to determine whether there was an undisturbed subsurface deposit that could be affected by the proposed canal construction in the vicinity of this site (Exhibit 6). The August investigation began with a survey of the site area where a sparse assortment of artifacts was visible; because no concentrations of artifacts were identified on the surface, the Dames & Moore archaeological site map was used to guide the placement of shovel test pits (STPs). Brian Padilla, of the El Dorado Miwok, was present while the STPs were excavated.

During the course of excavations, archaeologists uncovered artifacts including obsidian and basalt flakes; clamshell disk beads; burned earth; faunal remains, including freshwater mussel shell; and fire-cracked rock. Human remains were uncovered in three of the STPs; the Sacramento County coroner and NAHC were contacted, excavation of each of those three STPs was halted immediately, and the remains were reburied where they were found. None appeared to be part of a larger, intact burial and all were found in the upper 50 centimeters of soil.

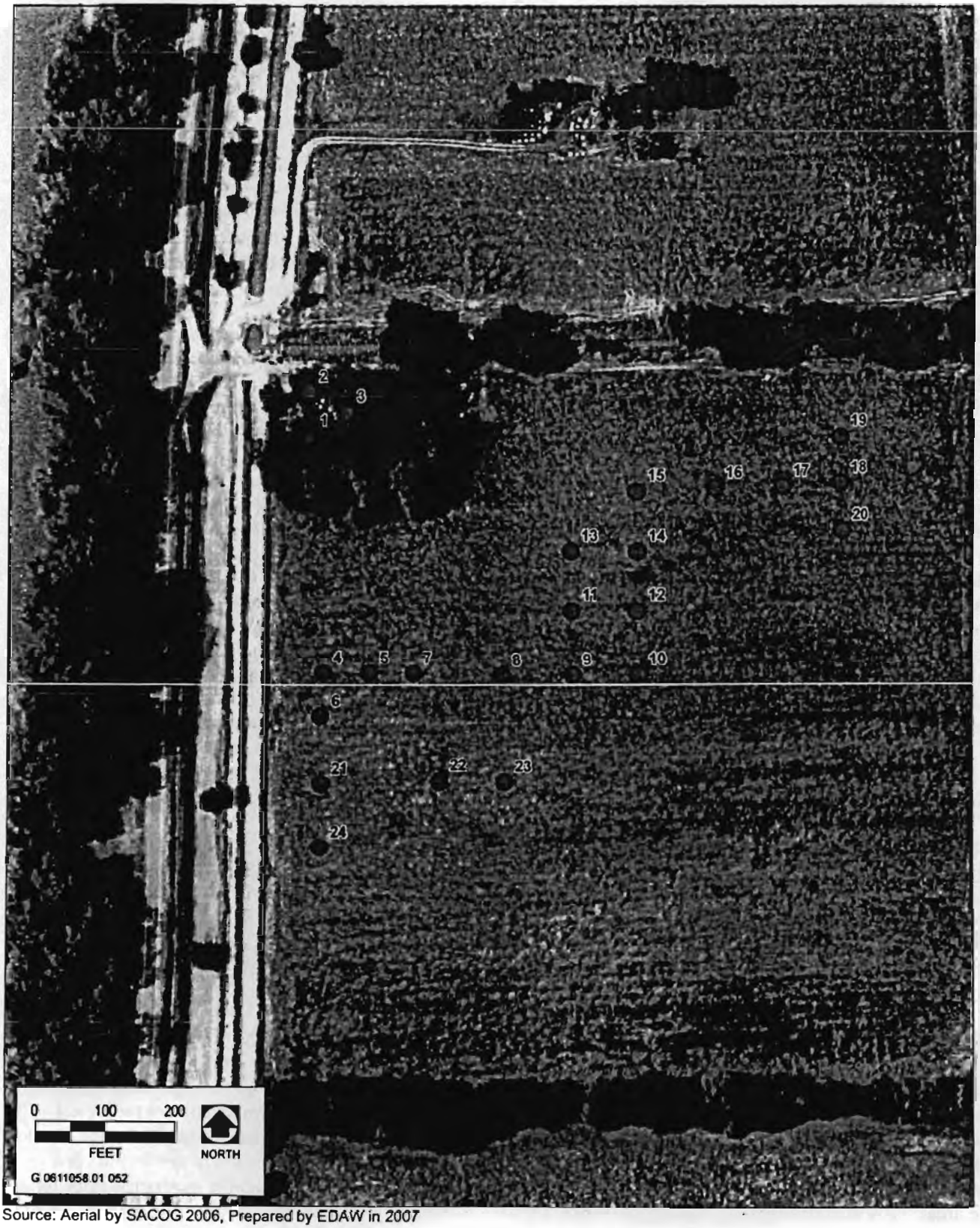
In general, site soils consisted of dry compact silts with a small sand and clay content; excavation and screening were difficult because the soils were very dry and hard. If artifacts were recovered, excavation generally proceeded to 100 centimeters below surface (cmbs); where no artifacts were found, excavations terminated around 80 cmbs. A deeply buried midden layer was identified in each of the four STPs (Nos. 4, 6, 21, and 24) closest to the levee, beginning anywhere from 55 cmbs to 80 cmbs. Excavation halted at approximately 100 cmbs in these STPs without reaching the bottom of the midden deposit; a split-spoon probe was used in STP No. 21 to find the bottom of the deposit, which was reached at approximately 160 cmbs. Although the northern and southern edges of the midden deposit were not located, the STP program was halted on the assumption that a more formal testing program, using a combination of test units and additional STPs, would be implemented as part of more detailed design of the proposed project. Based on the data collected during the brief testing at CA-Sac-485/H, it appears that significant intact prehistoric deposits may be found below capping soils at the site. If this is true, CA-Sac-485/H may be eligible for listing on the CRHR or NRHP for the site's data potential.

CA-SAC-486H (P-34-000513)

This site near the Sacramento River east levee below the North Drainage Canal consists of the remains of a historic-era homestead. The structure that once stood on the site has been demolished. Remnant landscape plantings and debris consisting of ceramic fragments, bottle glass, ceramic, bricks, mortar, and metal fragments were noted. The structures were visible in a 1937 aerial photograph and were depicted on the 1967 U.S. Geological Survey topographic quadrangle map. The archaeologists who identified the site in 1994 noted that some of the trees appeared to be less than 30 years old, although a fragment of amethyst glass (generally associated with the turn of the century) was noted.

CA-SAC-487H (P-34-000514)

Like CA-Sac-486H, this location near the Sacramento River east levee below the North Drainage Canal includes historic debris, such as concrete fragments, milled lumber, metal fence posts, wire, farm machinery parts, clear and green glass, window glass, and ornamental plantings, all of which indicate that a structure existed at the site at one point but has since been demolished. Also like the previous site, a structure was visible in this location in a 1937 aerial photograph; several structures were indicated on the 1950 and 1975 topographic quadrangle maps for the area.



Source: Aerial by SACOG 2006, Prepared by EDAW in 2007

CA-Sac-485/H Shovel Test Map **Exhibit 6**

CA-SAC-488H (P-34-000515)

This is another site near the Sacramento River east levee below the North Drainage Canal where a structure appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is on the site today. Historic debris, ornamental vegetation, and a fence line remain. The debris included various concrete fragments, corrugated metal, wire, culvert pipe, and a large section of iron pipe.

CA-SAC-489H (P-34-000516)

This is another site near the Sacramento River east levee below the North Drainage Canal where a structure appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is on the site today. The associated debris includes a fenced-off well head, concrete fragments, lumber, window glass, wooden posts, galvanized pipes, old fencing overgrown by an oak tree, an enamelware bucket, tires, ceramic fragments, bottle glass, and a metal bucket. Ornamental landscaping plants were also noted.

CA-SAC-490H (P-34-000517)

This site, near the south end of Powerline Road, had three structures that appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is on the site today. The historic debris is similar to the debris found at sites CA-Sac-486H through CA-Sac-489H, including concrete, brick, iron piping, a fence post, bottle glass, ceramic fragments, and galvanized metal pipe, as well as remnant ornamental vegetation.

CA-SAC-491H (P-34-000518)

This site, also near the south end of Powerline Road, was likely used in association with four structures that appeared on the 1950 topographic quadrangle map. The 1937 aerial photograph associated with other sites listed here includes coverage of this property, however, only trees are clearly visible in the photograph. The artifacts consist of a sparse scatter, including a wood fence, concrete fragments, bricks, and metal fence posts. Ornamental vegetation was noted nearby.

CA-SAC-492H (P-34-000519)

This site, near the south end of Powerline Road, consists of a concrete-capped well, associated water pipes, and remnant ornamental vegetation and fruit trees that were likely associated with a structure visible on the 1950 topographic quadrangle map of the area. A cluster of trees is visible in the 1937 aerial photograph, but no structures are clearly visible. The site is now used to keep honeybees.

CA-SAC-493H (P-34-000520)

The 1950 topographic quadrangle map and 1937 aerial photograph of the region indicate that there was once a large barn and associated structure at this location near the Sacramento River east levee south of I-5. Today, scattered historic debris—clear and colored glass, porcelain and earthenware, iron pipe, bone fragments, brick, and a white ceramic insulator—is all that remains.

CA-SAC-494H (P-34-000521)

This is another site, west of Fisherman's Lake, where a structure appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is present today. Associated debris documented by an archaeological team in 1994 included concrete and brick fragments, an iron water pipe, white ceramic insulators, and clear bottle glass. In addition, the archaeologists noted abundant modern debris on the site, making it difficult to distinguish between modern and historic artifacts.

ADDITIONAL EFFORTS TO BE UNDERTAKEN

The project area, including portions of the area that may be within the footprint of 2008 construction elements, has not been completely surveyed to date. As shown in Table 5, several sites that are potentially eligible for CRHR or NRHP listing may be affected by the proposed project, and elements of RD 1000 would be modified. For sites that do not appear to be eligible for listing in the NRHP or on the CRHR, or that are eligible but that would not be affected by a proposed project, no further action would be recommended. A draft Research Design is being prepared to describe recommended efforts to define the sites listed in Table 5 to determine the potential for their avoidance, if possible; methods for testing to determine their eligibility for listing as necessary; and a plan for identifying potential cultural resources that are not known from the published records.

In addition, for each phase of the NLIP Levee Improvements Project, the following efforts will be conducted:

- completion of pedestrian surveys for the entire project footprint, once access is acquired;
- preparation of further Cultural Resources Inventory Reports with recommendations of eligibility, finding of effects, and recommended mitigation measures; and
- preparation of a Historic Property Treatment Plan for resources determined to be eligible or recommended as eligible for NRHP listing, in accordance with Stipulation 4 of the PA.

REFERENCES

Beardsley, R. K. 1948. Cultural Sequences in Central California Archaeology. *American Antiquity* 14(1):1–28.

Beck, W.A. and Y. D. Haase. 1974. *Historical Atlas of California*. University of Oklahoma Press. Norman and London.

Bennyhoff, J. A., and D. A. Fredrickson. 1969. A Proposed Integrative Taxonomic System for Central California Archaeology. *University of California, Archaeological Research Facility, Contributions* 52:15–24.

Bouey, P. D., J. Berg, and C. A. Hunter. 1991. *Cultural Resources Test Excavations, Sacramento Urban Area Flood Control Project, Sacramento County, California*. Report on file, North Central Information Center, California State University, Sacramento, CA.

Bouey, P. D., and R. Herbert. 1990. *Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project*. Report on file, North Central Information Center, California State University, Sacramento, CA.

Dames & Moore. 1993. Department of Parks and Recreation Series 523 Site Record forms for CA-Sac-16H. On file, North Central Information Center, California State University, Sacramento, CA.

————. 1994a. *Historic Property Treatment Plan for Reclamation District 1000 Rural Historic Landscape District for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*. Report on file, North Central Information Center, California State University, Sacramento, CA.

————. 1994b. *Archaeological Inventory Report, Natomas Locality, Cultural Resources Inventory and Evaluation, American River Watershed Investigation, El Dorado, Placer, Sacramento, and Sutter Counties, California*. Report on file, North Central Information Center, California State University, Sacramento, CA.

————. 1996. *Rural Historic Landscape Report for Reclamation District 1000 for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*. Report on file, North Central Information Center, California State University, Sacramento, CA.

Derr, E. 1983. *Archaeological Investigations at CA-Sac-16: Interpretations of a Middle/Late Horizon Village in the Lower Sacramento Valley of California.* Master's thesis on file, California State University, Sacramento, CA.

EDAW. 2006. *Draft Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area. Volume I: Programmatic Evaluation of the Proposed Funding Mechanisms*. Prepared for Sacramento Area Flood Control Agency.

Fredrickson, D. A. 1974. Cultural Diversity in Early Central California: A View from the North Coast Ranges. *Journal of California Anthropology* 1(1):41–54.

Heizer, R. F., and F. Fenenga. 1939. Archaeological Horizons in Central California. *American Anthropologist* 41:378–399.

Helley, E. J. and D. S. Harwood. 1985. *Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierran Foothills, California*. U.S.G.S. MF-1790.

Historic Environment Consultants. 1998. *Central Pacific/Southern Pacific Railyards: Historic Property Inventory and Evaluation Report.* Prepared for Union Pacific Railroad Company.

Hoover, M. B., H. E. Rensch, and E. G. Rensch. 1966. *Historic Spots in California.* Third Edition. Revised by W. N. Abeloe. Stanford University Press. Stanford, CA.

Kaptain, N. 2005. California Department of Parks and Recreation Series 523 Site Record forms for P-51-000115. Based on work performed for the Historical Resources Evaluation Report of the SR 99/Riego Road Interchange Project.

Kauffman, E., and K. Kauffman. 1987. California Department of Parks and Recreation Series 523 Site Record forms for CA-Sac-16H. On file, North Central Information Center, California State University, Sacramento, CA.

Kroeber, A. L. 1925. *Handbook of the Indians of California.* Reprinted in 1976 by Dover Publications. New York, NY.

Moratto, M. J. 1984. *California Archaeology.* Academic Press. New York, NY.

Peak & Associates. 1997. *Historic American Engineering Record Reclamation District 1000 HAER No. CA-187.* Prepared for Sacramento Area Flood Control Agency.

Peak, A. S., H. L. Crew, and R. Gerry. 1984. *The 1971 Archaeological Salvage of the Bennett Mound, CA-SAC-16, Sacramento, CA.* Report on file, North Central Information Center, California State University, Sacramento, CA.

Sacramento Area Flood Control Agency. 2007. *Environmental Impact Report on Programmatic Evaluation of Proposed Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area.* Volume I: Programmatic Evaluation of Proposed Funding Mechanisms. Prepared by EDAW. Sacramento, CA.

Thompson, J. 1958. *The Settlement and Geography of the Sacramento-San Joaquin Delta, California.* University Microfilms International. Ann Arbor, MI.

Wilson, N. L., and A. H. Towne. 1978. Nisenan. R. F. Heizer (ed.), *Handbook of North American Indians, Vol. 8.* Smithsonian Institution Press. Washington, DC.

APPENDIX A

Project Correspondence

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 7, 2007

Debbie Pilas-Treadway
Native American Heritage Commission
915 Capitol Mall, Room 364
Sacramento, Ca 95814

RE: Natomas Levee Improvement Project

Dear Ms. Pilas-Treadway:

EDAW is conducting cultural resources studies for the above-referenced project located generally north of the City of Sacramento, in Sacramento and Sutter counties, and located on the Grays Bend, Taylor Monument, Verona, Rio Linda, Pleasant Grove, Sacramento East, and Sacramento West USGS quadrangle maps. Background research and field studies conducted for this project will identify cultural resources that may be impacted by proposed levee improvements throughout the American River basin. This letter is intended to initiate part of the consultation process that will eventually be required under Section 106 National Historic Preservation Act.

I am pleased to bring this activity to your attention, and would appreciate any information you can provide regarding prehistoric, historic, or ethnographic Native American land use. I am interested in any contemporary Native American values that may be present near or within the project area and would like to request a search of the NAHC Sacred Land files.

Please send via mail or facsimile (916-414-5850) a listing of local Native American representatives at your earliest convenience, so that I may contact appropriate individuals and account for their potential concerns in the planning process.

If you have any questions or comments feel free to contact me at my office. I can be reached by email at charlane.gross@edaw.com, or by phone at 916-414-5800. I look forward to hearing from you soon.

Sincerely,

Charlane Gross, M.A., R.P.A.
Senior Archaeologist

STATE OF CALIFORNIA Arnold Schwarzenegger, Governor

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
Fax (916) 657-5390

June 19, 2007

Charlene Gross
EDAW Inc.
2011 J Street
Sacramento, CA 95814

Sent Via Fax: 916-414-5850
Of Pages: 3

RE: Natomas Levee Improvement project, Sacramento and Sutter Counties

Dear Ms. Gross:

The Native American Heritage Commission has reviewed the Sacred Lands File and found several burial/recorded sites in/near the project area. The location of sites is confidential.

I recommend that you contact the North Central Information Center, Ca State University, Sacramento, 6000 J Street, Adams Building, Suite 103, Sacramento, CA 916-278-6217 for sites in Sacramento County and Northeast Information Center, Ca State University, Chico, Building 25, Suite 204, Chico, CA 95929, 530-898-4413 for Sutter County, for further information of recorded sites located in/near the APE.

I have enclosed a list of Native Americans individuals/organizations contacts may have knowledge of additional cultural resources in the project area. The Commission makes no recommendation or preference of a single individual, or group over another. These lists should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated, if they cannot supply information, they might recommend other with specific knowledge. A minimum of two weeks must be allowed for responses after notification.

If you receive notification of change of addresses and phone numbers from any these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at (916) 653-4038.

If you have any questions or need additional information, please contact me.

Sincerely,

Debbie Pilas-Treadway
Environmental Specialist III

Native American Contacts
Sacramento and Sutter Counties
June 19, 2007

✓ = CALL
✓ = CALL W/MESSAGE
✓+ = CALL SPOKE W/INDIVIDUAL (SEE CALL LOG RECORD)

✓+
Rose Enos
15310 Bancroft Road — Maidu
Auburn , CA 95603 — Washoe
(530) 878-2378

Shingle Springs Band of Miwok Indians
Nicholas Fonseca, Chairperson
P.O. Box 1340 — Miwok
Shingle , CA 95682 — Maidu
nfonseca@ssband.org
(530) 676-8010
(530) 676-8033 Fax

✓ Enterprise Rancheria of Maidu Indians
Frank Watson, Vice Chairperson
1940 Feather River Blvd., Suite B — Maidu
Oroville , CA 95965
eranch@cncnet.com
(530) 532-9214
(530) 532-1768 FAX

Strawberry Valley Rancheria
Calvine Rose, Chairperson
PO Box 667 — Maidu
Marysville , CA 95901 — Miwok
No #

✓+ Enterprise Rancheria of Maidu Indians
Glenda Nelson, Chairperson
1940 Feather River Blvd., Suite B — Maidu
Oroville , CA 95965
eranch@cncnet.com
(530) 532-9214
(530) 532-1768 FAX

Strawberry Valley Rancheria
Robert Kerfoot
PO Box 667 — Maidu
Marysville , CA 95901 — Miwok
No #

✓ Shingle Springs Band of Miwok Indians
Jeff Murray, Cultural Resources Manager
P.O. Box 1340 — Miwok
Shingle , CA 95682 — Maidu
jmurray@ssband.org
(530) 676-8010
(530) 676-8033 Fax

✓ United Auburn Indian Community of the Auburn
Jessica Tavares, Chairperson
575 Menlo Drive, Suite 2 — Maidu
Rocklin , CA 95765 — Miwok
916 663-3720
916 663-3727 - Fax

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed Natomas Levee Improvement project, Sacramento and Sutter Counties.

Native American Contacts
Sacramento and Sutter Counties
June 19, 2007

United Auburn Indian Community of the Auburn
Tribal Preservation Committe
575 Menlo Drive, Suite 2 Maidu
Rocklin , CA 95765 Miwok
916 663-3720
916 663-3727 - Fax

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed Natomas Levee Improvement project, Sacramento and Sutter Counties.

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

United Auburn Indian Community of the Auburn
Tribal Preservation Committee
575 Menlo Drive, Suite 2
Rocklin, CA 95765

Subject: Natomas Levee Improvement Project(s)

To Whom It May Concern:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

United Auburn Indian Community of the Auburn
Jessica Tavares, Chairperson
575 Menlo Drive, Suite 2
Rocklin, CA 95765

Subject: Natomas Levee Improvement Project(s)

Dear Ms. Tavares:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Strawberry Valley Rancheria
Robert Kerfoot
P.O. Box 667
Marysville, CA 95901

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Kerfoot:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Strawberry Valley Rancheria
Calvine Rose, Chairperson
P.O. Box 667
Marysville, CA 95901

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Rose:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Single Springs Band of Miwok Indians
Nicholas Fonseca, Chairperson
P.O. Box 1340
Shingle Springs, CA 95682

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Fonseca:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Shingle Springs Band of Miwok Indians
Jeff Murray, Cultural Resources Manager
P.O. Box 1340
Shingle Springs, CA 95682

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Murray:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Enterprise Rancheria of Maidu Indians
Glenda Nelson, Chairperson
1940 Feather River Blvd., Suite B
Oroville, CA 95965

Subject: Natomas Levee Improvement Project(s)

Dear Ms. Nelson:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Enterprise Rancheria of Maidu Indians
Frank Watson, Vice Chairperson
1940 Feather River Blvd., Suite B
Oroville, CA 95965

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Watson:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Rose Enos
15310 Bancroft Road
Auburn, CA 95603

Subject: Natomas Levee Improvement Project(s)

Dear Ms. Enos:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW

Project Name: 05110058.01
Project Number: SAFCA / N. NAGUMAS LEVEE

Telephone Contact Report

CONFIDENTIAL

Call Participants: LBM — ROSIE ENOS

Title: ? — MAIDU / WASHOE CONTACT

Initiated By: LBM

Organization: (SEE ABOVE)

Phone Number: 530 - 878-2378

Location: EDAW SAC

Subject: SAFCA, NATOMAS C.C. LEVEE

Date/Time: 7-9-07 12:30

Discussion Item(s):

— CONCERN IS BURIAL SITE AVOIDANCE

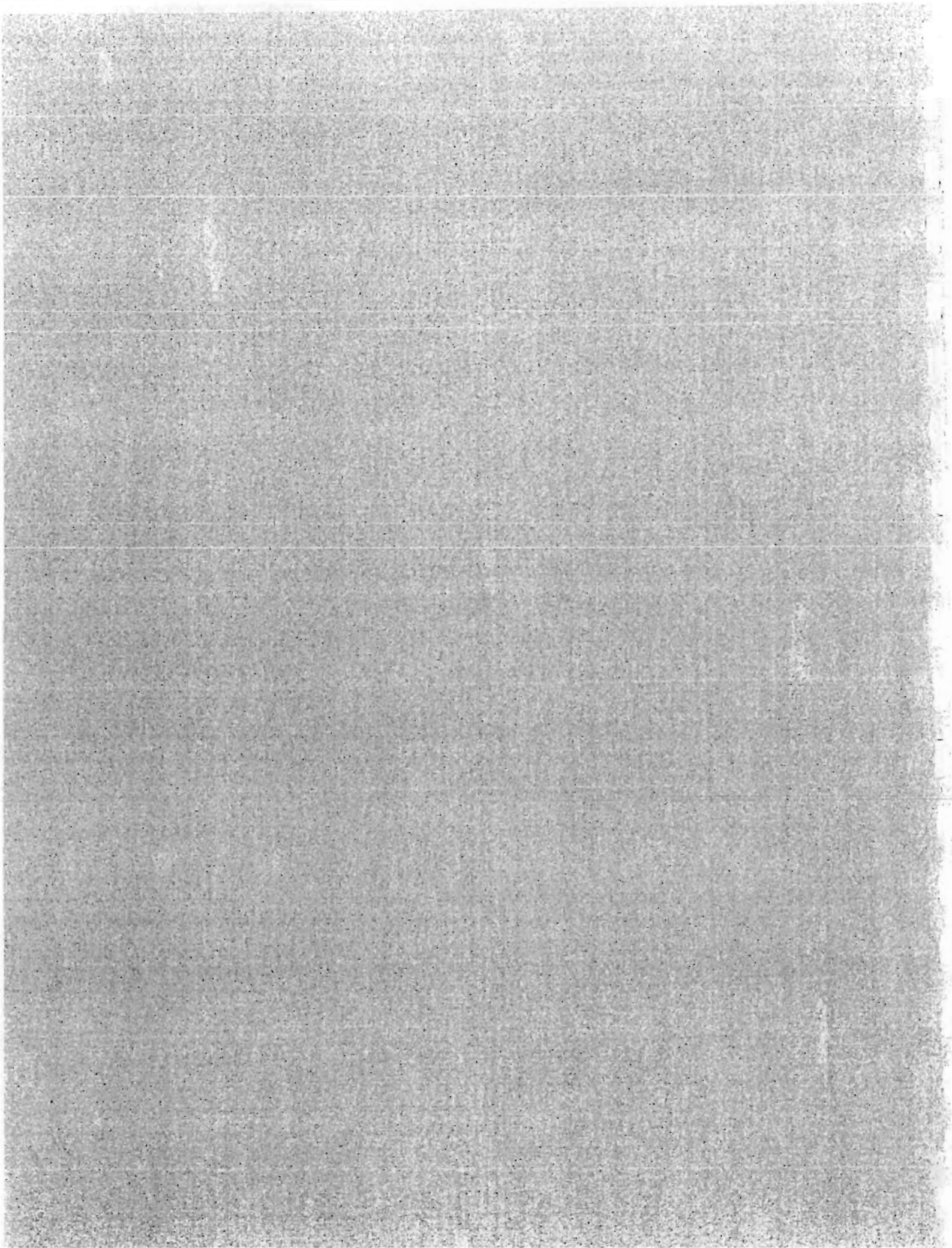
— WOULD LIKE ANY INFORMATION CONCERNING ANY FURTHER WORK CONCERNING SUCH SITES

Action Item(s):

Distribution:

APPENDIX B

Department of Parks and Recreation Site Record Forms



State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code | Reviewer | Date

*Resource Name or #: NLIP-1

P1. Other Identifier:

P2. Location: ☒Not for Publication ☐Unrestricted ***a. County:** Sutter

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

b. USGS 7.5' Quad: Taylor Monument **Date:** 7-31-07 **T10N; R4E;** NW¼ **of** NW ¼ **of Sec** 6 ; Mount Diablo **B.M.**

c. Address: **City:** **Zip:**

d. UTM: Zone 10S ; 622214 **mE/** 4289367 **mN,** 622229 **mE/** 4289319 **mN,** 622244 **mE/** 4289358 **mN**

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)

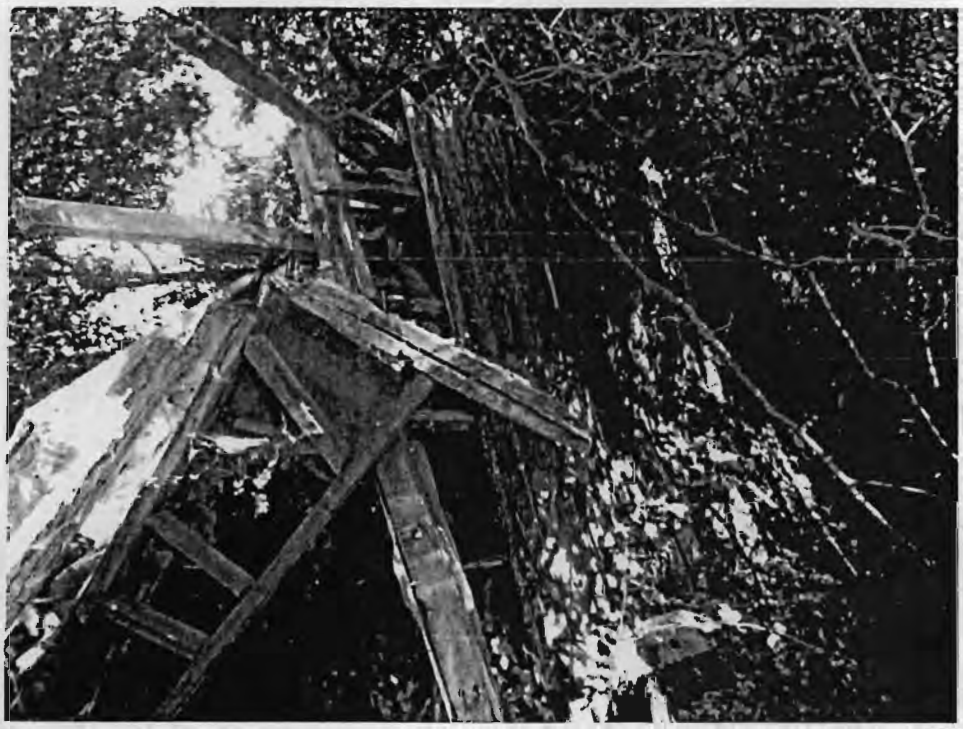
The lean-to structure, shed, associated debris and looter's pit are located approximately (?) feet east of Garden Highway, south of the intersectionof Garden Highway Reigo Road.

P3a. Description: The dilapidated remains of of a structure and shed include a rectangular wood frame "lean-to" style building with a corrugated metal roof, which stands on a concrete pad, and a smaller , square wooden shed. An assortment of debris litters the area between the two structures and includes: white earthenware, tires, window glass, clear and brown bottle glass, corrugated metal sheets, and rusted metal objects., milled lumber fragments, tires, window blind fragments, and pieces of dislodged mortar. Also, what appears to be a looter's pit is nearbay with 1950'5 and 1960's era bottles, plastic, and a porcelain drawer pull within or near it. The site was found in a dense cluster of trees, poison oak and blackberry brambles; the numerous blackberry bushes and other groundcover obscure the availability of a full description of the structure. None of the site components appeared to be more than 40-50 years old. The Taylor Monument USGS quadrangle indicates two structures that match the site location, and both of these appear as a part of the 1980 photorevision of the 1967 original. This site does not appear to contain values that would make it eligible for listing on the CRHR or NRHP.

P3b. Resource Attributes:

AH2 (structure pad), AH15 (standing structure), AH4 (trash scatter)

P4. Resources Present: ☐Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)



P5b. Description of Photo: Remnants of structure- facing north-northeast

P6. Date Constructed/Age and Sources: ☒Historic ☐Prehistoric ☐Both

P7. Owner and Address:

P8. Recorded by:
Charlane Gross
EDAW
2022 J Street
Sacramento, CA 95811

P9. Date Recorded:

7-31-07

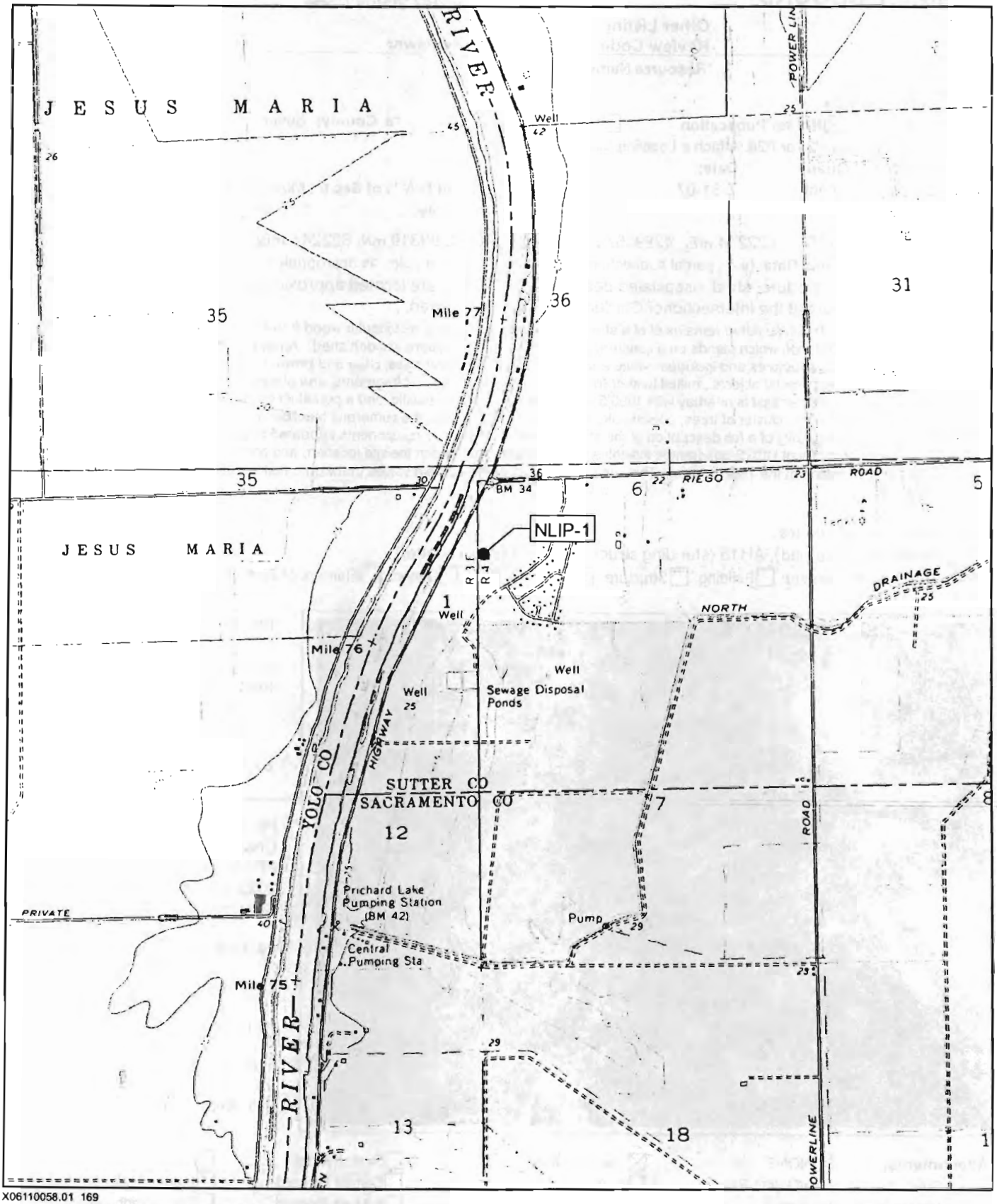
P10. Survey Type:

Intensive

P11. Report Citation:

***Attachments:** ☐NONE ☒Location Map ☐Sketch Map ☐Continuation Sheet
☐Building, Structure/Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record
☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record
☐Other (List):

*Required information



X06110058.01 169

Source: Taylor Monument Quad, 08-027-07

NLIP-1

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code | Reviewer | Date

*Resource Name or #: NLIP-2

P1. Other Identifier:

P2. Location: ☒Not for Publication ☐Unrestricted ***a. County:** Sacramento

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

b. USGS 7.5' Quad: Taylor Monument **Date:** 7-31-07 **T10N; R4E;** SW¼ **of** SW ¼ **of Sec** 13 ; Mount Diablo **B.M.**

c. Address: **City:** **Zip:**

d. UTM: Zone 10S ; 621430 **mE/** 4286256 **mN**

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
East of the Garden Highway approximately (?) feet

P3a. Description: This site consisted of a small historic debris scatter noted in a dirt farm road east of the Sacramento River East Levee and a drainage ditch. There appeared to be a mix of modern debris and a fragment of amnethyst glass. It is presumed that this deposit was relocated from one of the nearby farm sites. The mixture of historic and modern debris and the location in an area disturbed by levee, ditch, and road construction all indicate that this site does not retain sufficient integrity to make it eligible for listing on the CRHR or NRHP.

P3b. Resource Attributes:
AH4 (trash scatter)

P4. Resources Present: ☐Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☒Other (Isolates, etc.)

P5b. Description of Photo:
None available

P6. Date Constructed/Age and Sources: ☒Historic ☐Prehistoric ☐Both

P7. Owner and Address:

P8. Recorded by:
Charlane Gross
EDAW
2022 J Street
Sacramento, CA 95811

P9. Date Recorded:

7-31-07

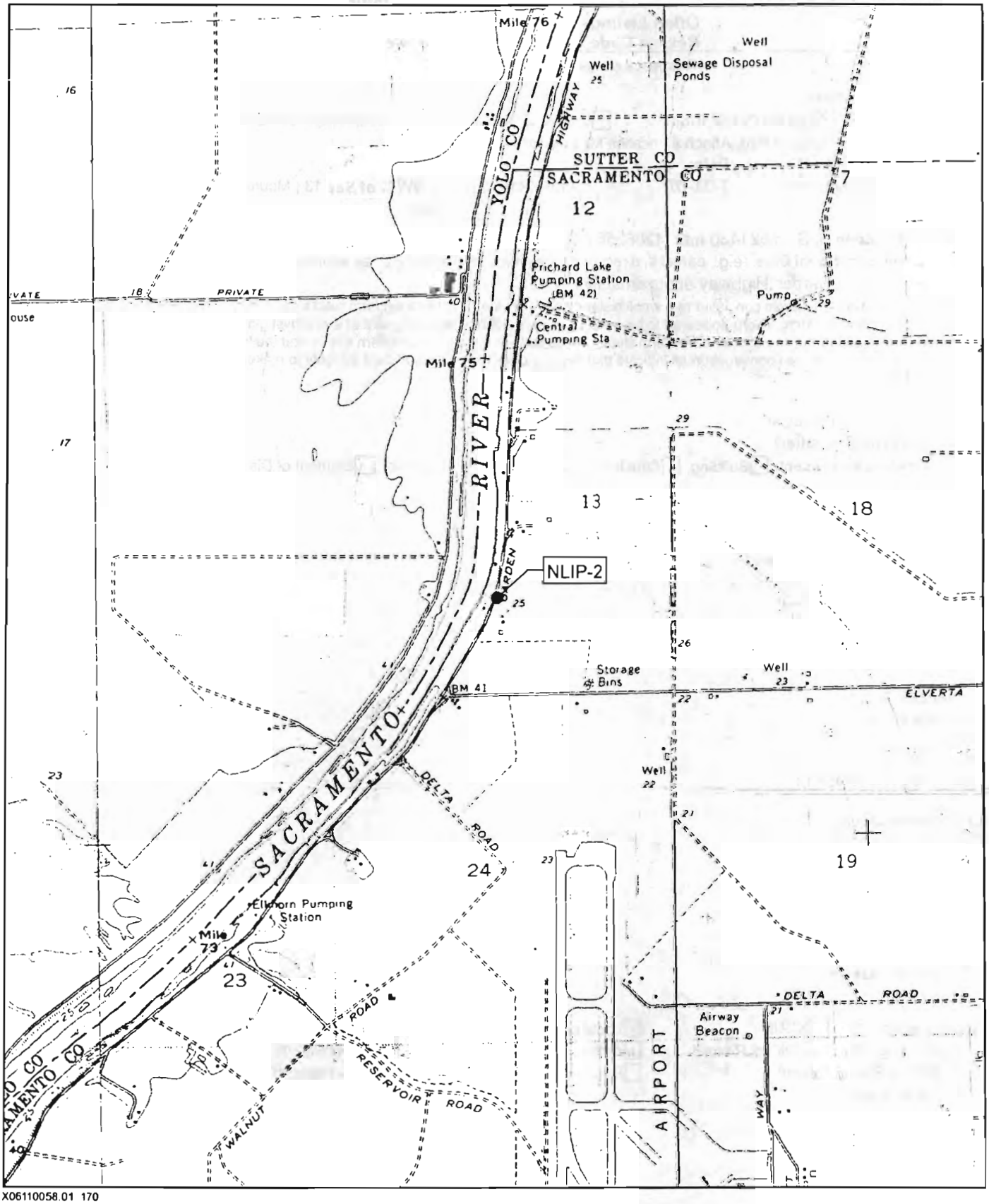
P10. Survey Type:

Intensive

P11. Report Citation:

***Attachments:** ☐NONE ☒Location Map ☐Sketch Map ☐Continuation Sheet
☐Building, Structure/Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record
☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record
☐Other (List):

*Required information



X06110058.01 170

Source: Taylor Monument Quad, 08-027-07

NLIP-2

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code | Reviewer | Date

*Resource Name or #: NLIP-3 7240 Garden Highway

P1. Other Identifier:

*P2. Location: ☐Not for Publication ☐Unrestricted *a. County: Sutter

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad: Verona Date: 1967 T 11N ; R 3E ; ¼ of ¼ of Sec ; Mount Diablo B.M.

c. Address: 7240 Garden Highway City: Nicolaus Zip: 95659

d. UTM: Zone ; mE/ mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
APN: 935-0020-011

*P3a. Description: (Describe resource and major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
Barn

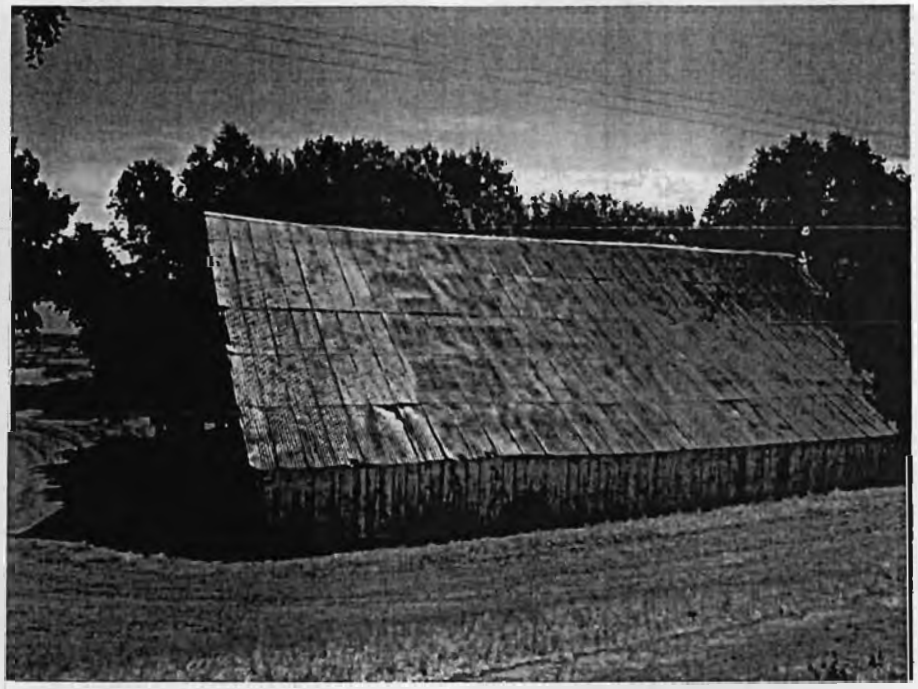
Two-story, wood-frame building with a corrugated metal gable roof fitted with an outrigger on the northern façade. The exterior of this building features both vertical and board and batten siding. Two double-wide openings and a single-entry door are located on the northern elevation.

House 1

East of the barn is a small wood-frame house. (see Continuation).

*P3b. Resource Attributes: (List attributes and codes)
HP2 – House; HP4 – Barn, shed.

*P4. Resources Present: ☒Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)



P5b. Description of Photo:
(View, date, accession #)
Photo 19, Lkg East

*P6. Date Constructed/Age and Sources: ☒Historic ☐Prehistoric ☐Both
Ca. 1920

*P7. Owner and Address:
William Cummings
1625 Creekside Dr.
Folsom, CA 95630

*P8. Recorded by:
Tomes, A.
EDAW, Inc.
2022 J Street
Sacramento, CA 95814

*P9. Date Recorded:
8/6/07

*P10. Survey Type: (Describe)
Reconnaissance

*P11. Report Citation: (Cite survey report and other sources, or enter "none".)

*Attachments:
☐NONE ☐Location Map ☐Sketch Map ☒Continuation Sheet
☒Building, Structure/Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record
☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record
☐Other (List):

B1. Historic Name: Unknown
B2. Common Name: N/A

B3. Original Use: Agricultural Complex B4. Present Use: Vacant

*B5. **Architectural Style:**
Vernacular

*B6. **Construction History:** (Construction date, alterations, and date of alterations)
Constructed ca. 1920

*B7. **Moved?** ☒No ☐Yes ☐Unknown **Date:** **Original Location:**

*B8. **Related Features:**
Outbuildings: Sheds, Barn.

B9a. Architect: Unknown B9b. Builder: Unknown

*B10. **Significance:** **Theme** Agricultural Architecture **Area** Nicolaus, CA
Period of Significance N/A **Property Type** Agricultural **Applicable Criteria** N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period and geographic scope. Also address integrity.)

Sutter County Assessor's records currently list this property as vacant. No construction date is listed on file for the buildings; however the construction methods and materials appear to date to the early twentieth century.

The earliest known owners of this property were G.H. Lyall and Hardin et al. Currently, the property is owned by William C. Cummings (Verona Farming Partnership). Cummings received ownership of the parcel in October 2004, in a grant deed from Metro Air Park, LLC (Assessor document # 0029189). (see Continuation)

B11. Additional Resource Attributes: (List attributes and codes)

*B12. **References:**
Sutter County Asseessor's records.

B13. Remarks:

*B14. **Evaluator:**
Tomes, A.
*Date of Evaluation:
8/7/07

(Sketch Map with north arrow required.)

P3a (Description) continued:

This building is partially obscured by tree cover, and was not completely visible during the field visit. The building appeared to be situated on a concrete foundation.

Shed 1

A wood-frame shed is located northeast of the house. This building features a saltbox roof with exposed rafter tails. Sash window openings (minus glazing) are located on the northern elevation. The east façade displays two single-entry doors.

House 2

This building is a single-story, wood-frame house with a corrugated metal roof and little eave overhang. The exterior of this building features shiplap siding. A boarded up window opening is present on the eastern façade. This building sits upon a concrete foundation.

House 3

This is a wood-frame building with a partially collapsing flat roof. A porch, supported by square wooden posts, is located on the western elevation. This building is partially concealed by tree cover, and was not completely visible during the field visit.

Shed 2

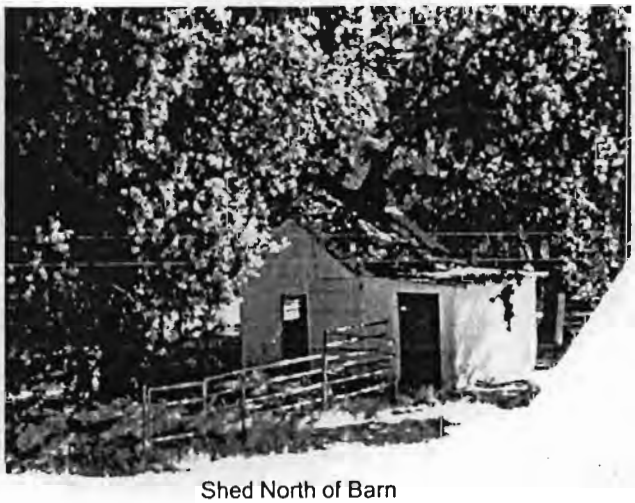
This small building is of wood construction and features a shed roof.

B10 (Significance) continued:

This property appears to have always functioned as a residential and agricultural complex. Research did not reveal the property to be significantly associated with an important historic event (CRHR Criterion 1). Little information was found on early owners of the property, George Lyall and James Hardin. Lyall was originally from Illinois, and settled in the Verona Township of Sutter County sometime between 1880 and 1900. Hardin was originally from Tennessee, and settled in the Nicolaus Township of Sutter County around the same time (Sutter County Census records). Neither the property nor known past owners are listed in the various secondary references reviewed during this study which chronicled significant properties and pioneers in Sutter County history.

The buildings on this property do not appear to be significantly associated with an important individual(s) in local history (CRHR Criterion 2). Although the buildings appear to exhibit a good degree of integrity, they do not embody distinctive architectural characteristics, nor do they represent the work of a master (CRHR Criterion 3). While buildings and structures can sometimes provide important information on historic construction techniques and technologies, these types of buildings are well represented in both written and visuals sources, and do not appear likely to yield important primary information (CRHR Criterion 4). These buildings do not appear to be eligible for listing on the CRHR.

House East of Barn



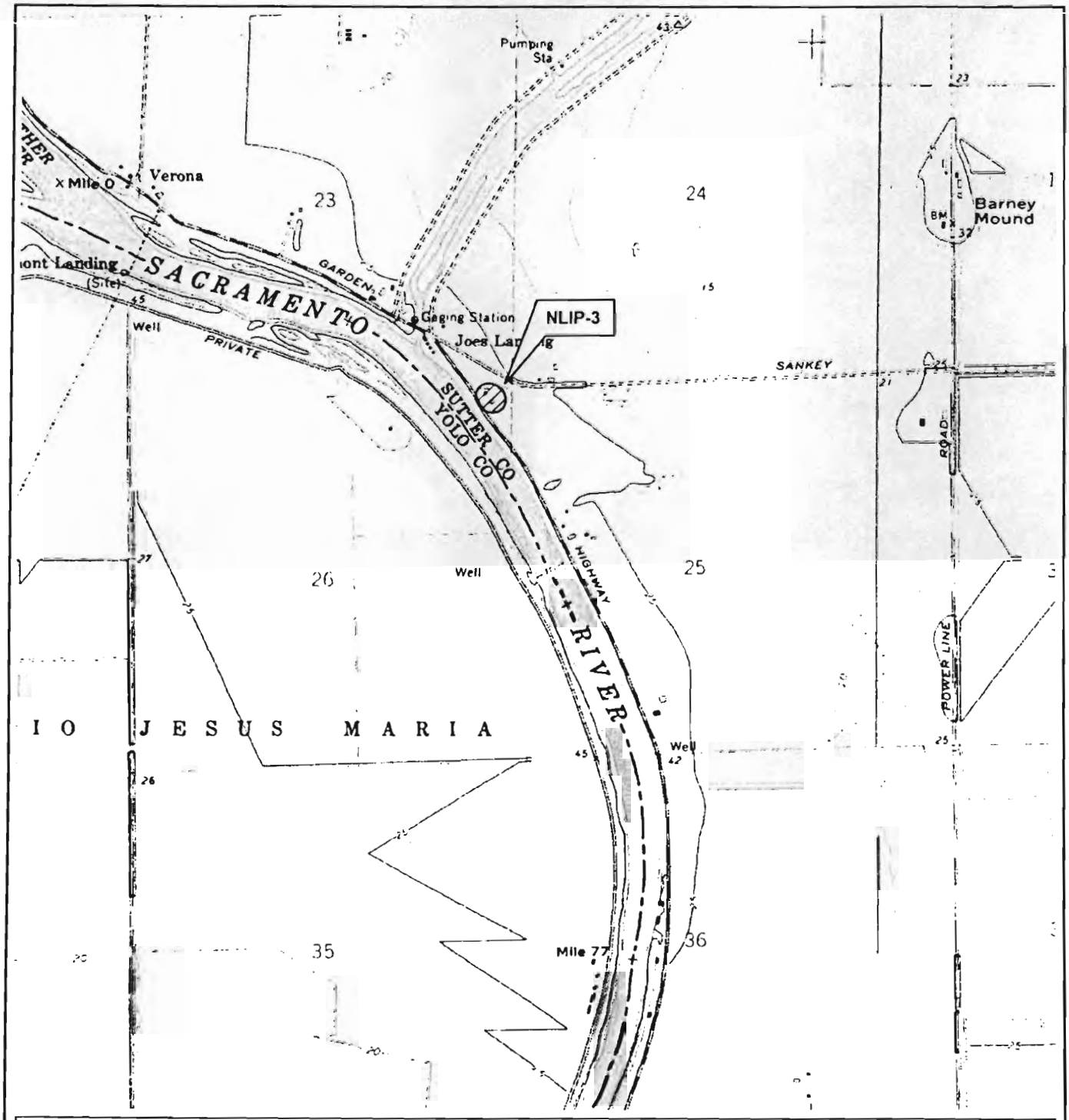
Shed North of Barn

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # _____
HRI# _____
Trinomial _____

Page 5 of 5 *Resource Name or # (Assigned by recorder) NLIP-3

*Map Name: USGS Verona Quad *Scale: 1:24 000 *Date of Map: 1978



Source: USGS Verona Quad 1967 (photo revised 1978) – Contour Interval 5 Feet

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

TN

QUADRANGLE LOCATION

DPR 523J (1/95)

*Required Information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code | Reviewer | Date

*Resource Name or #: NLIP-4 11100 Garden Highway

P1. Other Identifier:

***P2. Location:** ☐Not for Publication ☐Unrestricted **and** (P2b and P2c or P2d. Attach a Location Map as necessary.)

***a. County:** Sutter

***b. USGS 7.5' Quad:** Verona **Date:** 1967 **T** 11N ; **R** 3E ; **¼ of** **¼ of Sec** ; Mount Diablo **B.M.**

c. Address: 11100 Garden Highway City: Nicolaus Zip: 95837

d. UTM: Zone ; mE/ mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
APN: 935-0020-015

***P3a. Description:** (Describe resource and major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

The historic-era residence on this property is a wood-frame building with a hipped roof and composition shingles. The exterior features stucco siding, and a combination of aluminum sliding and one-over-one sash windows. An enclosed porch is located on the southern façade. This building is situated on a gentle slope, and sits upon a concrete foundation.

***P3b. Resource Attributes:** (List attributes and codes)
HP2 - House

***P4. Resources Present:** ☒Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5b. Description of Photo:
(View, date, accession #)
Photo 8; Lkg NE

***P6. Date Constructed/Age and Sources:** ☒Historic ☐Prehistoric ☐Both

***P7. Owner and Address:**
Burton Lauppe
11100 Garden Highway
Sacramento, CA 95837

***P8. Recorded by:**
Tomes, A.
EDAW, Inc.
2022 J Street
Sacramento, CA 95814

***P9. Date Recorded:**
8/7/07

***P10. Survey Type:** (Describe)
Reconnaissance

***P11. Report Citation:** (Cite survey report and other sources, or enter "none".)

***Attachments:** ☐NONE ☐Location Map ☐Sketch Map ☒Continuation Sheet
☒Building, Structure/Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record
☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record
☐Other (List):

B1. Historic Name: Unknown
B2. Common Name: N/A

B3. Original Use: Residence B4. Present Use: Residence

*B5. **Architectural Style:**
Vernacular

*B6. **Construction History:** (Construction date, alterations, and date of alterations)
Constructed 1957

*B7. **Moved?** ☒No ☐Yes ☐Unknown **Date:** **Original Location:**

*B8. **Related Features:**
Sheds

B9a. Architect: B9b. Builder:

*B10. **Significance:** **Theme** Residential Architecture **Area** Nicolaus
Period of Significance N/A **Property Type** Residence **Applicable Criteria** N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period and geographic scope. Also address integrity.)
This residential complex is mostly comprised of contemporary (post-1957) buildings. Sutter County Assessor records list one of the two residences on the property as being constructed in 1957. The property has been in the Lauppe family since this time. The parcel is currently owned by Alan Lauppe, who received the property from Burton and Kathryn Lauppe in December 2006 (Assessor document # 0030459). (see Continuation).

B11. Additional Resource Attributes: (List attributes and codes)

*B12. **References:**
Sutter County Assessor's records.

B13. Remarks:

*B14. **Evaluator:**
Tomes, A.
***Date of Evaluation:**
8/7/07

(Sketch Map with north arrow required.)

*Recorded by: Tomes, A.

*Date: ☒ Continuation ☐ Update

Affiliation: EDAW, 2022 J Street, Sacramento, CA

B10 (Significance) continued:

The land, originally listed as APN: 35-020-15, was split into separate parcels several years ago due to a lot line adjustment. Because of the split, the 35-020-15 parcel number was retired, and additional parcel numbers (35-020-18, 35-020-19) were assigned (Sutter County Assessor).

Research did not reveal this property to be significantly associated with an important historic event (CRHR Criterion 1). The historic-era building on this property is not known to be associated with an individual(s) considered important in local history (CRHR Criterion 2). The property itself has undergone regular intervals of construction over the years, with new buildings (e.g. garage-1987, second residence- 1977, and sheds) being built on the property. The historic-era residence maintains only a fair degree of integrity; the porch on the southern façade has been enclosed, and some of the windows have been replaced over the years. This simple vernacular building, in its current configuration, does not embody distinctive architectural characteristics, nor does it appear to be the work of a master (CRHR Criterion 3). This type of building is well represented locally and on a state-wide level, and therefore does not appear likely to yield important primary information (CRHR Criterion 4). This building does not appear eligible for CRHR listing.

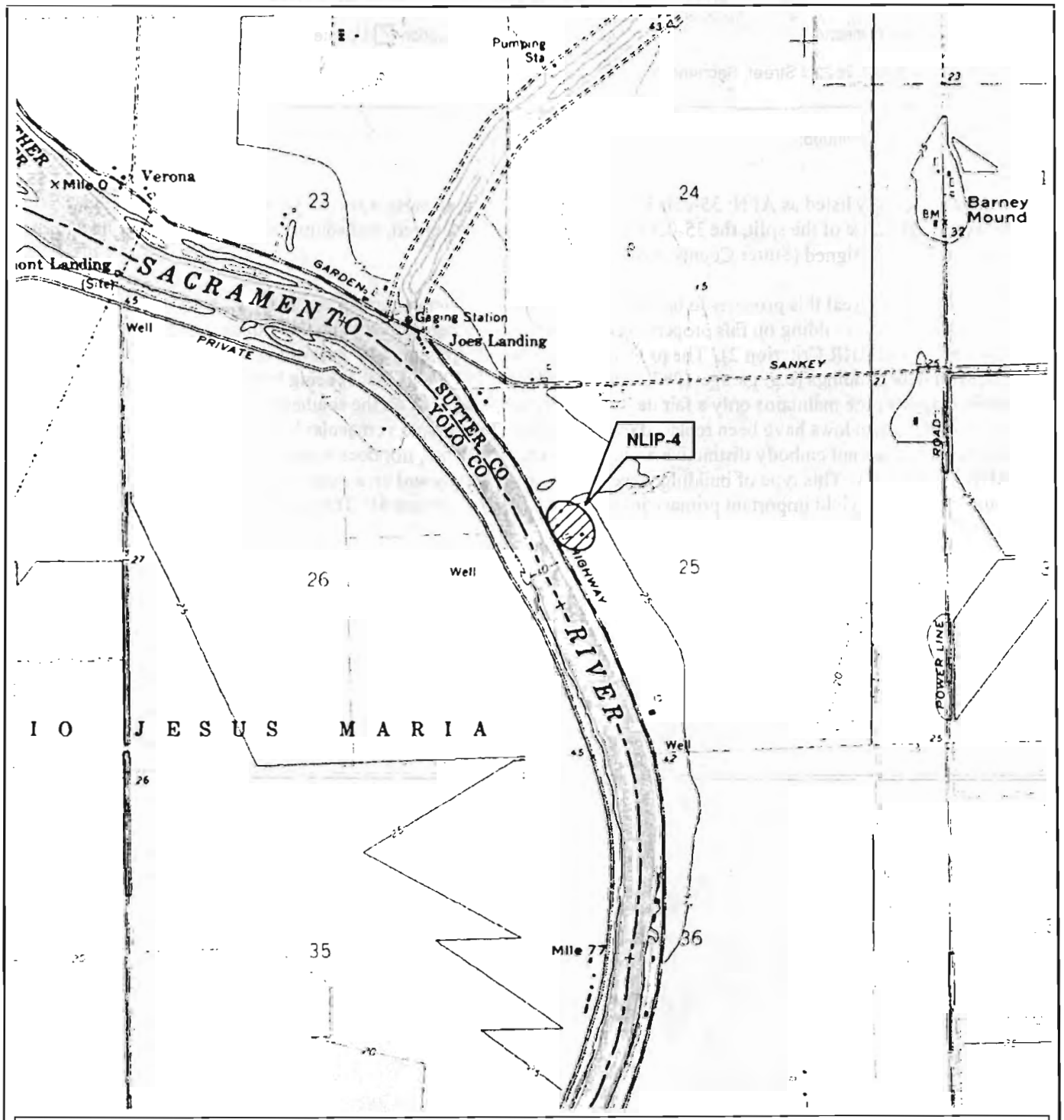
State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary # _____
HRI# _____
Trinomial _____

Page 4 of 4 *Resource Name or # (Assigned by recorder) NLIP-4

*Map Name: USGS Verona Quad *Scale: 1:24 000 *Date of Map: 1978



Source: USGS Verona Quad 1967 (photo revised 1978) – Contour Interval 5 Feet

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

TN

QUADRANGLE LOCATION

DPR 523J (1/95)

*Required Information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code | Reviewer | Date

*Resource Name or #: NLIP-5 2434 Howsley Road

P1. Other Identifier:

***P2. Location:** ☐Not for Publication ☐Unrestricted **and** (P2b and P2c or P2d. Attach a Location Map as necessary.)

***a. County:** Sutter

***b. USGS 7.5' Quad:** Verona **Date:** 1967 **T** ; **R** ; **¼ of** **¼ of Sec** ; Mount Diablo **B.M.**

c. Address: 2434 Howsley Road City: Pleasant Grove Zip: 95668

d. UTM: Zone ; mE/ mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
APN: 35-050-030

***P3a. Description:** (Describe resource and major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The historic-era buildings on this property include a residence, and what appear to be stalls. The residence was constructed in 1952 (Sutter County Assessor's records). The two stalls, although not listed in the assessor's records, appear to predate the residence by approximately 10 – 15 years.

The residence on the property is partially obscured by tree cover, and was not completely visible during the field visit. What was visible showed a single-story residence with an overall L-shape plan, and cross-gable roof. A full-width porch is present on the southern façade. This building sits upon a concrete foundation. (see Continuation).

***P3b. Resource Attributes:** (List attributes and codes)
HP2 – House; HP2 – Animal stall

***P4. Resources Present:** ☒Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5b. Description of Photo: (View, date, accession #)
Photo 13; Lkg North

***P6. Date Constructed/Age and Sources:** ☒Historic ☐Prehistoric ☐Both
1952

***P7. Owner and Address:**
Warren Shelley
2434 Howsley Road
Pleasant Grove, CA 95668

***P8. Recorded by:**
Tomes, A.
EDAW, Inc.
2022 J Street
Sacramento, CA 95814

***P9. Date Recorded:**
8/17/07

***P10. Survey Type:** (Describe)
Reconnaissance

***P11. Report Citation:** (Cite survey report and other sources, or enter "none".)

***Attachments:** ☐NONE ☐Location Map ☐Sketch Map ☒Continuation Sheet
☒Building, Structure/Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record
☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record
☐Other (List):

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
BUILDING, STRUCTURE, AND OBJECT RECORD

Primary #
HRI #
*NRHP Status Code

 *Resource Name or #: NLIP-5 2434 Howsley Road

B1. Historic Name: Unknown
B2. Common Name: N/A

B3. Original Use: Ranch B4. Present Use: Ranch

*B5. **Architectural Style:**
Vernacular

*B6. **Construction History:** (Construction date, alterations, and date of alterations)
Constructed in 1952.

*B7. **Moved?** ☒No ☐Yes ☐Unknown **Date:** **Original Location:**

*B8. **Related Features:**
Outbuildings: Sheds, stalls, trailers.

B9a. Architect: Unknown B9b. Builder: Unknown

*B10. **Significance:** **Theme** Residential Architecture **Area** Pleasant Grove, CA
Period of Significance N/A **Property Type** Residence **Applicable Criteria** N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period and geographic scope. Also address integrity.)

The community of Pleasant Grove was established ca. 1867 at its present location. Originally known as Gouge Eye, the name was changed to Pleasant Grove Creek that same year when a post office was established. In 1875 the name was shortened to the present name Pleasant Grove.

Early buildings in the community included a saloon, hotel, boarding house, shoe shop, schoolhouse, and doctor's office. Approximately a dozen dwellings and two blacksmith shops were located in the immediate vicinity. The primary impetus to the economy was agriculture, with grain and livestock forming the principal crops. In later years rice also became an important crop. (see Continuation).

B11. Additional Resource Attributes: (List attributes and codes)

*B12. **References:**
Sutter County Assessor's Records.
Wagner, Phydelia. 1992. A Brief History of Pleasant Grove.
Thompson and West. 1879. History of Sutter County, CA.

B13. Remarks:

*B14. **Evaluator:**
Tomes, A.
*Date of Evaluation:
8/17/07

(Sketch Map with north arrow required.)

*Required information

*Recorded by: Tomes, A. *Date: ☒ Continuation ☐ Update

Affiliation: EDAW, 2022 J Street, Sacramento, CA

P3a (Description) continued:

The stalls on this property are of wood construction, and feature horizontal milled wood, and shed roofs covered with corrugated metal. Openings are located on the buildings northern facades. The buildings are in disrepair, and feature sway braces propped against the southern façade of the eastern-most stall. These stalls are situated upon earthen foundations. Other buildings on this property include modern trailers and metal-covered sheds.

B10 (Significance) continued:

One of the largest early ranches in Pleasant Grove was the Spanish Ranch. It contained 2000 acres, and was owned by State Senator Frederick Cox of Sacramento County. The land was later leased by Reese D. Murphy who farmed it for several years (Wagner 1992). Over the years, the Spanish Ranch was broken up into smaller parcels, of which the subject property was part.

2434 Howsley Road (APN: 35-050-030)

This property is zoned as an animal farm. The Sutter County Assessor's Office lists the residence on this property as having been built in 1952. The earliest known owners of the property were N.P. Rogers and an individual with the initials F.E.F. Today, the property is owned by Warren A. Shelley (Sutter County Assessor's records).

This property also appears to be a parcel which was originally part of the larger Spanish Ranch. This property has always functioned for agricultural (husbandry) purposes. Because none of the existing buildings appear to date to the property's earliest usage, research did not reveal the property, in its current configuration, to be significant within that theme (CRHR Criterion 1). This property is not associated with person(s) considered important in local or state history (CRHR Criterion 2). Little information was found on Nathaniel Rogers, other than that he was an early settler in Pleasant Grove. F.E.F. could possibly have been Eben Fifield, of which there is currently a road named near the project area. Fifield, born in Maine in 1834, came to California in 1859. He resided in Amador County for approximately nine years, then in San Joaquin County for approximately five years. He later settled in Sutter County (Thompson and West 1879). Although these individuals were early settlers in the community, none of the existing buildings on the subject property date to their ownership/occupation. None of the buildings, therefore, have an association to, or are eligible for CRHR listing due to an association with these individuals.

The subject buildings on this property retain a good degree of integrity, however, they do not display distinguishing architectural characteristics; nor do they appear to be the work of a master (CRHR Criterion 3). While buildings and structures can sometimes yield important information on historic construction techniques or technologies (CRHR Criterion 4), these types of buildings are well documented in both written and visual material, and do not appear to be sources of important primary information. These buildings do not appear to be CRHR eligible.

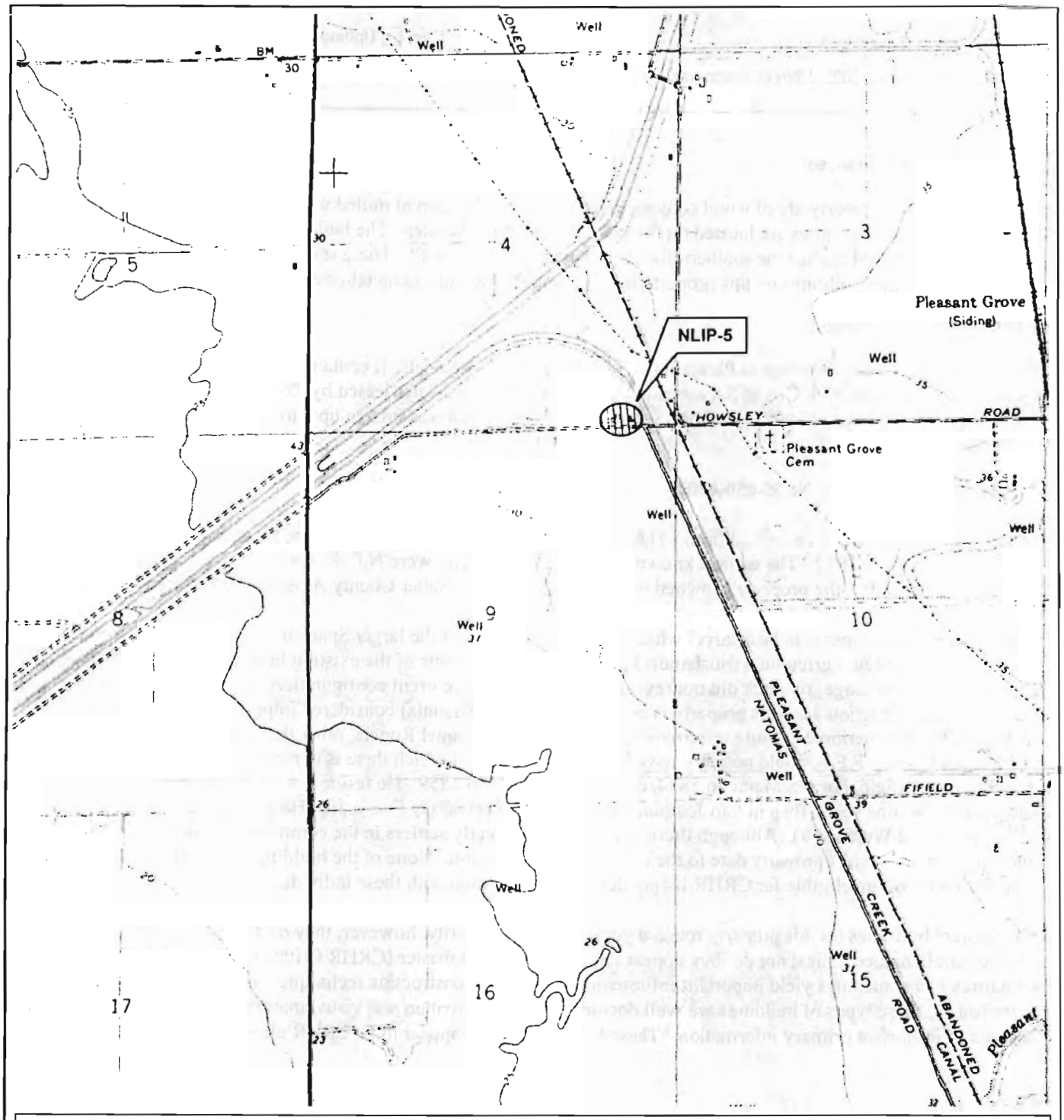
State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary # _____
HRI# _____
Trinomial _____

*Resource Name or # (Assigned by recorder) NLIP-5

*Map Name: USGS Verona Quad *Scale: 1:24 000 *Date of Map: 1978



Source: USGS Verona Quad 1967 (photo revised 1978) – Contour Interval 5 Feet

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

TN

QUADRANGLE LOCATION

*Required Information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code | Reviewer | Date

*Resource Name or #: NLIP-6 2145 Howsley Road

P1. Other Identifier:

***P2. Location:** ☐Not for Publication ☐Unrestricted ***a. County:** Sutter

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad:** Vernona **Date:** 1967 **T** 11N ; **R** 4E ; **¼ of** **¼ of Sec** ; Mount Diablo **B.M.**

c. Address: 2145 Howsley Road City: Pleasant Grove Zip: 95668

d. UTM: Zone ; mE/ mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
APN: 35-080-025

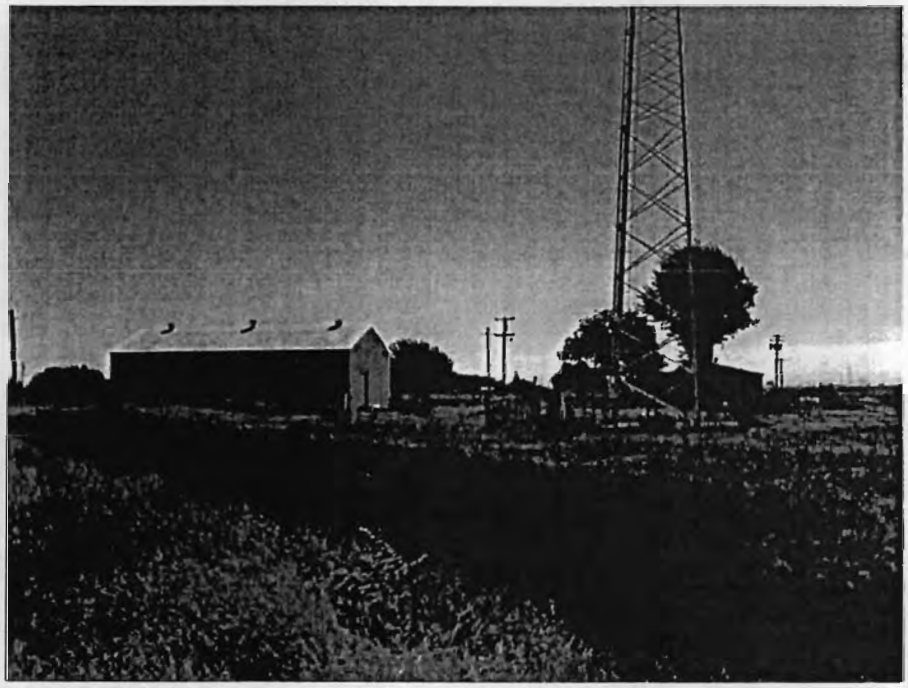
***P3a. Description:** (Describe resource and major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

This residential complex features a mix of contemporary and historic-era buildings. The southern-most residence on the property was constructed in 1957 (Sutter County Assessor's records). This residence is a single-story, wood-frame building with a cross-gable roof and moderate eave overhang. The roofing is composed of composite shingles. This building also features aluminum-sliding windows, and a single-entry door on the northern façade. This residence is situated upon a concrete slab foundation.

Southwest of the residence is a 3-car garage. (see Continuation).

***P3b. Resource Attributes:** (List attributes and codes)
HP2 – House; HP4 – Detached Garage

***P4. Resources Present:** ☒Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)



P5b. Description of Photo:
(View, date, accession #)
Photo 2, Lkg SE

***P6. Date Constructed/Age and Sources:** ☒Historic ☐Prehistoric ☐Both
1957

***P7. Owner and Address:**
Morrison 2000
3559 Howsley Road
Pleasant Grove, CA

***P8. Recorded by:**
Tomes, A.
EDAW, Inc.
2022 J Street
Sacramento, CA 95814

***P9. Date Recorded:**
8/15, 2007

***P10. Survey Type:** (Describe)
Reconnaissance

***P11. Report Citation:** (Cite survey report and other sources, or enter "none".)

***Attachments:** ☐NONE ☐Location Map ☐Sketch Map ☒Continuation Sheet
☒Building, Structure/Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record
☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record
☐Other (List):

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
BUILDING, STRUCTURE, AND OBJECT RECORD

Primary #
HRI #
*NRHP Status Code

*Resource Name or #: NLIP-6 2145 Howsley Road

B1. Historic Name: Unknown
B2. Common Name: N/A
B3. Original Use: Homestead
B4. Present Use: Residential Complex
*B5. **Architectural Style:**
Vernacular
*B6. **Construction History:** (Construction date, alterations, and date of alterations)
Constructed in 1957.
*B7. **Moved?** ☒No ☐Yes ☐Unknown **Date:** **Original Location:**
*B8. **Related Features:**
Outbuildings: Shed and garages.
B9a. Architect: Unknown
B9b. Builder: Unknown
*B10. **Significance:** **Theme** Residential Architecture **Area** Pleasant Grove, CA
Period of Significance N/A **Property Type** Residence **Applicable Criteria** N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period and geographic scope. Also address integrity.)
The community of Pleasant Grove was established ca. 1867 at its present location. Originally known as Gouge Eye, the name was changed to Pleasant Grove Creek that same year when a post office was established. In 1875 the name was shortened to the present name Pleasant Grove.

Early buildings in the community included a saloon, hotel, boarding house, shoe shop, schoolhouse, and doctor's office. Approximately a dozen dwellings and two blacksmith shops were located in the immediate vicinity. The primary impetus to the economy was agriculture, with grain and livestock forming the principal crops. In later years rice also became an important crop. (see Continuation).

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:
Sutter County Assessor's Records.
Thompson and West. 1879. History of Sutter County, CA.
Wagner, Phydelia. 1992. A Brief History of Pleasant Grove.

B13. Remarks:

*B14. Evaluator:
Tomes, A.
*Date of Evaluation:
8/17/07

(Sketch Map with north arrow required.)

*Required information

*Recorded by: Tomes, A.

*Date: ☒ Continuation ☐ Update

Affiliation: EDAW, 2022 J Street, Sacramento, CA

P3a (Description) continued:

This wood-frame, corrugated metal-covered building displays a salt-box shaped roof, and 3 bays on its northern façade. This building is contemporaneous with the residence. The other buildings on this property are contemporary and include: a large metal storage building, a second residence, and a second garage.

B10 (Significance) continued:

One of the largest early ranches in Pleasant Grove was the Spanish Ranch. It contained 2000 acres, and was owned by State Senator Frederick Cox of Sacramento County. The land was later leased by Reese D. Murphy who farmed it for several years (Wagner 1992). Over the years, the Spanish Ranch was broken up into smaller parcels, of which the subject property was part.

2145 Howsley Road (APN: 35-080-025)

This property, in its current configuration, has always functioned as a residential complex. Other parcel numbers for this property have included 35-080-002, and 35-080-023, both of which have been retired (Sutter County Assessor's records).

The property appears to have originally been part of the larger Spanish Ranch, which was later split into several smaller parcels. The earliest known occupants of this parcel were R. Murphy and M. Donaldson. Today the owner of the property is listed as Morrison 2000 (Sutter County Assessor's records).

Research did not reveal this property, in its current configuration, to be associated with an important historic trend or event (CRHR Criterion 1). This property is not known to be associated with an individual considered important in local or state history (CRHR Criterion 2). R. Murphy, born in Missouri in 1863, came to California with his mother in 1872. They settled in Nicolaus, and later purchased a ranch at Pleasant Grove. Mary Donaldson was the wife of Alex, a farmer and stock-raiser. Alex Donaldson came to Sutter County ca. 1861. He was in the mercantile business for a short time, before turning to agriculture. He married Mary Pierce on June 30, 1869 (Thompson and West 1879). Alex stops appearing in the Sutter County Census records in 1900, and is presumed to have died sometime between 1880 (last census he appears in) and 1900. The 1890 census was destroyed in a fire. Although these individuals were early settlers in the community, none of the existing buildings on the subject property dates to their ownership/occupation. None of the buildings, therefore, have an association to, or are eligible for CRHR listing due to an association with these individuals.

Although the buildings retain a good degree of integrity, they are vernacular in style to the 1950s, and do not display distinguishing architectural characteristics that make them notable examples of vernacular architecture. These buildings do not represent the work of a master (CRHR Criterion 3). While buildings and structures can sometimes yield important information on historic construction techniques or technologies (CRHR Criterion 4), these types of buildings are well documented in both written and visual material, and do not appear to be sources of important primary information. The buildings on this property do not appear to be eligible for listing on the CRHR.

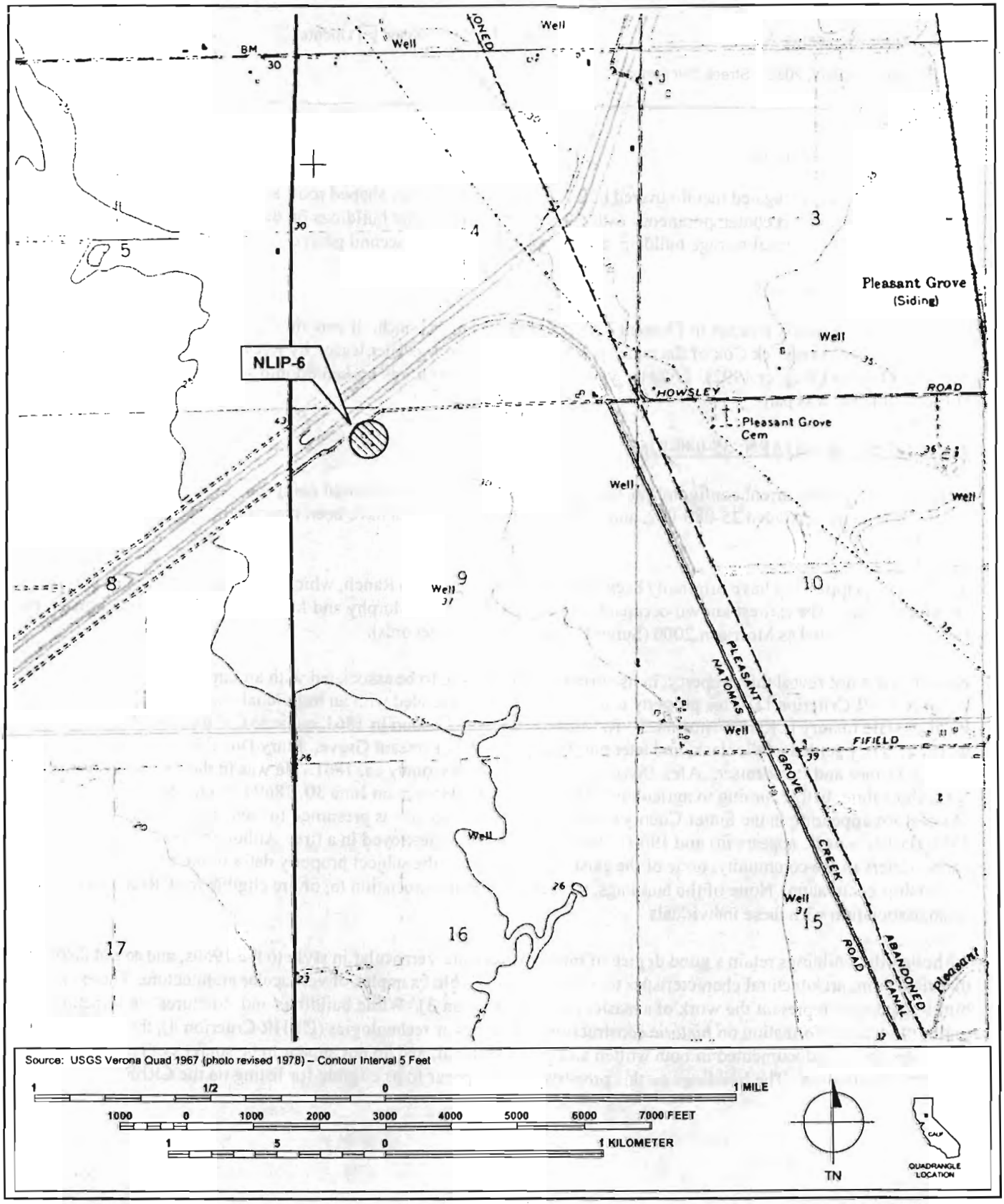
State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary # _____
HRI# _____
Trinomial _____

*Resource Name or # (Assigned by recorder) NLIP-6

*Map Name: USGS Verona Quad *Scale: 1:24 000 *Date of Map: 1978



Source: USGS Verona Quad 1967 (photo revised 1978) – Contour Interval 5 Feet

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

TN

QUADRANGLE LOCATION

*Required Information

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Milford Wayne Donaldson
State Historic Preservation Officer
Office of Historic Preservation
P.O. Box 942896
Sacramento, California 94296-0001

Dear Mr. Donaldson:

Pursuant to the provisions of Section 106 per 36 CFR Section 800.3(c)(3) the U.S. Army Corps of Engineers (Corps) is initiating consultation regarding the issuance of approvals and permits for the Natomas Levee Improvement Program Landside Improvements Project (NLIP.) This letter describes the project proposed by Sacramento Area Flood Control Agency (SAFCA), the NLIP, and the approach proposed by the Corps for satisfying Section 106 of the National Historic Preservation Act (NHPA) for this undertaking. The project is intended to provide urgently needed flood control system improvements and provide at least 100-year flood protection as quickly as possible to the Natomas Basin in southern Sutter and northern Sacramento Counties (Enclosure 1), while laying the groundwork to achieve at least urban-standard ("200-year") flood protection over time.

The project includes improving various portions of the Natomas Basin flood control system and making related landscape and irrigation/drainage infrastructure modifications in three phases in 2008, 2009, and 2010. Enclosure 2 shows the anticipated phases of construction along the levee system. Project activities are summarized as follows and more details are provided in Enclosure 3:

2008 construction

- Along the 5.3-mile Natomas Cross Canal (NCC) south levee, raise the levee to provide additional freeboard; realign the levee to provide a more stable waterside slope and to reduce the need for removal of waterside vegetation, and construct a seepage cutoff wall in the eastern 4.3 miles (approximately) of the levee to reduce the risk of levee failure due to seepage and stability concerns.

- Along the Sacramento River east levee, construct a raised adjacent setback levee from the NCC to about 3,100 feet south of the North Drainage Canal with seepage berms where required to reduce seepage potential, and install woodland plantings.

- Construct a new canal designed to provide drainage and associated giant garter snake habitat (referred to in this EIR as the "GGS/Drainage Canal"), relocate the Elkhorn Canal between the North Drainage Canal and the Elkhorn Reservoir settling basin ("Elkhorn Reservoir"), and remove a deep culvert from under the levee near the Reclamation District 1000 Pumping Plant No. 2 site.

- Re-contour the land and create marsh and upland habitat at borrow locations.

2009 and 2010 construction

Along the Sacramento River east levee south of the limits of the 2008 improvements, construct an adjacent setback levee (raised where needed to provide adequate freeboard) with seepage berms, relief wells, and cutoff walls as required, and install woodland plantings.

- Widen the levee and construct seepage berms along the Pleasant Grove Creek Canal west levee.

- Construct a new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal, improve the West Drainage Canal, relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir, and reconstruct the Reclamation District 1000 Pumping Plant No. 2.

  Re-contour the land and create marsh and upland habitat at borrow locations.

- Remove encroachments from the water side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the National Flood Insurance Program and USACE design criteria, and address Federal Emergency Management Agency (FEMA) requirements for the State Route 99/70 bridge crossing of the NCC.

Through discussion with your office, we have determined that a Programmatic Agreement (PA) is the appropriate vehicle for satisfying Section 106. The nature of the undertaking, the cultural resources management efforts required, and the necessary federal authorizations and permits require a departure from the process for satisfying Section 106 described in 36 CFR Section 800 et. seq. The standard Section 106 process requires federal agencies to identify all historic properties, determine the effect of the undertaking on those resources, and complete dialogue with consulting parties before Section 106 is complete. For the following reasons, this procedure is not possible in this instance:

- The applicant requires both permission to alter federal flood control structures under Section 408 of the Rivers and Harbors Act (33 U.S. Code Section 408) and one or more individual permits to discharge fill to jurisdictional waters under Section 404 of the Clean Water Act (33 U.S. Code Section 1344). The Section 408 permission will be granted separately for each year of project construction, corresponding to the three years of project work (2008, 2009, and 2010) that collectively constitute the entire project.

- The undertaking will likely have an adverse effect on at least one historic property, CA-Sac-485/H. This adverse effect must be resolved via the Section 106 process, and the method of resolution should be documented in an agreement document.

- The Area of Potential Effect (APE) will consist of the work described in the Environmental Impact Report (EIR) on the Natomas Levee Improvement Program Landside Improvements Project. The exact APE for all phases of construction remains unclear.

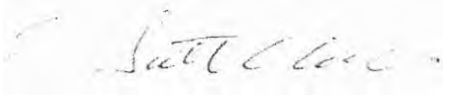
- The applicant is in the process of acquiring rights-of-entry, easements, and ownership interests in the project footprint where effects on historic properties may occur. This phased access will require an ongoing effort to inventory historic properties in the APE, rather than a single inventory effort.

- The project includes landside improvements to the levee along the east bank of the Sacramento River, an area that is sensitive for buried archaeological sites. The method for dealing with unanticipated discoveries needs to be in an agreement document and described in detail in a manner that incorporates the framework provided in 36 CFR Section 800.13 *Post-review Discoveries*.

- The complexity and phased nature of the project dictates that ongoing consultation with federally recognized tribes and other Native American groups and individuals is the best method for incorporating their concerns and input.

The Corps proposes that SAFCA, the USACE, and the SHPO adopt a Programmatic Agreement (PA) providing for a phased identification of resources and assessment of effects. We have included a draft PA (Enclosure 4) for your consideration. Upon receipt of your concurrence, we will notify the Advisory Council on Historic Preservation (ACHP) pursuant to 36 CFR Section 800.14 et. seq. If the ACHP declines to participate, we will collaborate with your office to develop and finalize the management framework provided in the PA. If you have any questions or need any additional information, please do not hesitate to contact me so that we can remedy any information gaps. Comments or questions may be sent to Mr. Daniel A. Bell, U.S. Army Corps of Engineers, CESPK-PD-RA, 1325 J Street, Sacramento, California 95814; email at daniel.a.bell@usace.army.mil; phone at (916) 557-6818, or fax at (916) 557-7856.

Sincerely,



Francis C. Piccola
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNA 95814

REPLY TO
ATTENTION OF

Environmental Resources Branch

FEB 1 - 2008

Ms. Jessica Taveres, Chairperson
United Auburn Indian Community of Auburn
575 Menlo Drive, Suite 2
Rocklin, California 95765

Dear Chairperson;

The U.S. Army Corps of Engineers (Corps), Sacramento District, is writing you in accordance with the National Historic Preservation Act, to inform you of the proposed Natomas Levee Improvement Program Landside Improvements Project (Project) located along the Sacramento River in Sutter and Sacramento Counties. The project requires that the Sacramento Area Flood Control Agency obtain permits from the U.S. Army Corps of Engineers, Sacramento District (Corps), and is therefore considered a federal undertaking pursuant to Section 106 of the National Historic Preservation Act (NHPA) and is subject to the requirements of Section 106 of the National Historic Preservation Act. We are also inviting you to participate as a concurring party in the development and execution of a Programmatic Agreement (PA). The Area of Potential Effects (APE) for the proposed project is shown on the enclosed topographic map (enclosure 1).

The proposed project is intended to provide urgently needed flood control system improvements and provide at least 100-year flood protection as quickly as possible to the Natomas Basin in southern Sutter and northern Sacramento Counties, while laying the groundwork to achieve at least urban-standard ("200-year") flood protection over time.

The proposed project includes improving various portions of the Natomas Basin flood control system and making related landscape and irrigation/drainage infrastructure modifications in three phases in 2008, 2009, and 2010. Enclosure 2 shows the anticipated phases of construction along the levee system. Project activities are summarized as follows:

2008 construction

- Along the 5.3-mile Natomas Cross Canal (NCC) south levee, raise the levee to provide additional freeboard; realign the levee to provide a more stable waterside slope and to reduce the need for removal of waterside vegetation, and construct a seepage cutoff wall in the eastern 4.3 miles (approximately) of the levee to reduce the risk of levee failure due to seepage and stability concerns.

- Along the Sacramento River east levee, construct a raised adjacent setback levee from the NCC to about 3,100 feet south of the North Drainage Canal with seepage berms where required to reduce seepage potential, and install woodland plantings.

- Construct a new canal designed to provide drainage and associated giant garter snake habitat (referred to in this EIR as the "GGS/Drainage Canal"), relocate the Elkhorn Canal between the North Drainage Canal and the Elkhorn Reservoir settling basin ("Elkhorn Reservoir"), and

remove a deep culvert from under the levee near the Reclamation District 1000 Pumping Plant No. 2 site.

- Recontour the land and create marsh and upland habitat at borrow locations.

2009 and 2010 construction

- Along the Sacramento River east levee south of the limits of the 2008 improvements, construct an adjacent setback levee (raised where needed to provide adequate freeboard) with seepage berms, relief wells, and cutoff walls as required, and install woodland plantings.

- Widen the levee and construct seepage berms along the Pleasant Grove Creek Canal west levee.

- Construct a new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal, improve the West Drainage Canal, relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir, and reconstruct the Reclamation District 1000 Pumping Plant No. 2.

- Recontour the land and create marsh and upland habitat at borrow locations.

- Remove encroachments from the water side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the National Flood Insurance Program and USACE design criteria, and address Federal Emergency Management Agency (FEMA) requirements for the State Route 99/70 bridge crossing of the NCC.

The level of effort towards identifying historic properties will be conducted pursuant to 36 CFR 800.4(b)(1) and will include an updated records and literature search, and field survey. We have developed a draft PA to take into account any adverse affects to historic properties as a result of project construction. A PA is a compliance document that specifies procedures that a Federal agency will follow on a project when all of the potential adverse effects are not known. PA's are negotiated and executed between the Federal agency, the State Historic Preservation Officer, and occasionally the Advisory Council on Historic Preservation. Stipulations in the draft PA have been included to take into account any issues or concerns that you may have regarding cultural resources and potential adverse effects on them. We are also requesting information regarding the presence of any traditional cultural properties, sacred sites, or other areas of cultural interest to the members of the Paskenta Band in the project area. A copy of the draft PA is provided for your review and comment (enclosure 3).

We request that you respond within 45 days of receipt of this letter. We would appreciate knowing if you wish to participate in consultation on the PA, and we welcome your comments and suggestions that you may have. Please direct any comments on the draft PA, cultural resources investigation, or any other aspect of our work on the Project to Mr. Daniel A. Bell, Archeologist, at (916) 557-6818, email: daniel.a.bell@usace.army.mil. Questions regarding the overall project may be directed to Mr. Daniel Tibbits, Project Manager, at (916) 557-7372, or email dan.p.tibbits@usace.army.mil. Your time and consideration are greatly appreciated.

Sincerely,

Francis C. Piccola
Chief, Planning Division

Enclosures

SHINGLE SPRINGS RANCHERIA

P.O. BOX 1340; SHINGLE SPRINGS, CA 95682
(530) 676-8010; FAX (530) 676-8033

May 8, 2008

Office of State Historic Preservation
1416 9th Street, Room 1442-7
Sacramento, CA 95814
Attn: Dwight Dutschke, Associate Park & Recreation Specialist, Project Review Unit
Email: ddutschke@parks.ca.gov
Fax: 916-653-9824

U.S. Army Corps of Engineers
Sacramento District
1325 J Street, Room 840
Sacramento, CA 95814
Attn: Col. Thomas C. Chapman, District Engineer
Email: lori.d.whitmer@usace.army.mil
Fax: 916-557-7859
Attn: Linda Brown

Sacramento Area Flood Control Agency [SAFCA]
1007 – 7th Street, 7th Floor
Sacramento, CA 95814
Attn: Stein M. Buer, Executive Director
John Bassett, Director of Engineering
Email: info@safca.org
Fax: 916-874-8289

Re: Draft Programmatic Agreement for the Natomas Levee Improvement Program; Notification of Ongoing Consultation Issues Arising from Ongoing Work at Site

Dear Mr. Dutschke, Col. Chapman, Ms. Brown, Mr. Buer, and Mr. Bassett:

The Shingle Springs Band of Miwok Indians [the Band], designated as the Most Likely Descendant [MLD] by the Native American Heritage Commission, takes this opportunity to provide preliminary comments on the proposed Programmatic Agreement and to request formal consultation before the Programmatic Agreement is finally negotiated, especially to include protocols for the respectful treatment and disposition of human remains, associated funerary objects, and other cultural items.

As a preliminary matter, we wish to advise the addressed agencies that by this letter the Band does not intend to imply that the agencies have not tried to contact the Band's prior representative for these matters, Mr. Jeff Murray. In order to avoid any further delays, the Band has identified John Tayaba, Tribal Vice Chair, to take all responsive actions with regard to our obligations as MLD. Please also understand that our comments are preliminary. The Band has asked our attorney, Brigit S. Barnes, to review the proposed Programmatic Agreement, relevant portions of the NLIP Landside Improvements EIR, and related federal reviews so as to advise Mr. Tayaba on these matters, as well as a pressing issue which must be addressed regardless of the status of negotiations on the Programmatic Agreement. We ask that copies of any and all correspondence to the Band be sent to Mrs. Barnes at Brigit S. Barnes & Associates, Inc., 3262 Penryn Road, Suite 200, Loomis, CA 95650; Telephone: (916) 660-9555; Fax: (916) 660-9554; Email: bsbarnes@landlawbybarnes.com.

Please also consider this letter to request that the Band be treated as a "consulting party" for the Programmatic Agreement, and for all future work along the Natomas River, pursuant to 36 CFR 800.3(f)(3).

1. Possible Disrespectful Treatment of Native American Remains During Sampling by EDAW On Site

The Band has been informed, and its preliminary investigation confirms, that while EDAW was conducting small-scale shovel testing along the eastern side of CA-Sac-485/H, a preliminarily identified burial site was rough-dug, thus resulting in potential damage to the human remains located within the pit. Based on what we have been informed of, the treatment of the site overall does not comport with state or federal law, and we request an immediate investigation into the manner of excavation used by EDAW at the site.

2. Comments to Draft Programmatic Agreement [PA]

General. Has the Advisory Council on Historic Preservations Been Invited to Participate? We request that the Council be involved or otherwise have an opportunity to comment if consultation with the Tribes is inadequate. We do not know whether any of the Tribes identified in the NLIP EIR have been given an ability to speak to the language of this PA, or been invited to be formal signatories to this PA. As the MLD, we request the right to be a formal signatory to this PA after negotiation.

I. DEFINITIONS

APE. The Native American community should be allowed to comment on the Area of Potential Effects [APE] before it is altered. We formally request that the PA definition notes that "the Tribes have been consulted about the nature and location of the APE and their concerns have been adequately considered", or some similar language.

Cultural Resources. It is appropriate to include traditional cultural places in this definition, but traditional cultural properties should be moved to the following definition.

"Historic Property" explicitly includes traditional cultural properties as properties of value to cultural groups that have been determined eligible for or are listed on the National Register of Historic Places.

II. STANDARDS

(A.) Professional Qualifications. Please include specific mention of an ethnographer for places of value to the Native American community. The perspective of the Tribes needs to be addressed by a professional who understands and communicates tribal interests, and whose values are not at odds with tribal values.

(B.) Historic Preservation Standards. Please include the following: "The Corps shall insure that the Tribes are provided with all draft reports prepared pursuant to this Programmatic Agreement, and that the Tribes will be offered the opportunity to review and comment on the reports. All comments by the Tribes shall be appropriately considered in the preparation of the final report."

III. PROJECT DESCRIPTION

(C.) Project Phasing and Potential Changes to the APE. Please note our request under definition of the APE above, and include throughout this document as necessary.

IV. INVENTORY OF HISTORIC PROPERTIES

(C.) Changes to the APE. Please note our request under the definition of APE above.

V. TREATMENT OF EFFECTS

(A.) Historic Property Treatment Plans. The Tribes wish to be included in the review and comment of HPTPs that involve resources of value to the Native American community. The PA says that concurring parties <u>may</u> be distributed to the Tribes as concurring parties. We request that this word be changed to "shall".

Review Schedule. The Tribes should be included in the 30-day review period.

(C.) Final Report. The Tribes should be offered the draft report and an opportunity to review and comment. A copy of the revised final report shall be provided to the Tribes.

VI. NATIVE AMERICANS AND OTHER PUBLIC CONSULTATION AND PUBLIC NOTICE

The Tribes are not members of the public for purposes of consultation, and should be afforded their full role as specified in the 2001 Final Rule of 36 CFR 800 and the intent within the 1999 revisions to Section 106 of the National Historic Preservation Act.

IX. AMENDMENTS

Please include the concurring parties at the table for amendments if the Project has not been completed within five years.

Concurring Parties Signature Page. The Tribes should be individually listed and afforded a place for signature on page 10 of 10.

We hope that receipt of this letter will result in a consultation to resolve many of our questions regarding the treatment of historic and culturally significant finds along the Natomas River.

Sincerely,

THE SHINGLE SPRINGS BAND OF MIWOK INDIANS

By: John Tayaba, Tribal Vice Chair

cc: Debbie Pilas-Treadway, Native American Heritage Commission

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Executive Office

JUN 1 1 2008

Mr. John Tayaba, Tribal Vice Chair
Shingle Springs Rancheria
Post Office Box 1340
Shingle Springs, California 95682

Dear Vice Chair Tayaba:

I am responding to your May 8, 2008, letter requesting that the Shingle Springs Band of Miwok Indians (The Band) be treated by the U.S. Army Corps of Engineers (Corps) as a "consulting party" for the National Historic Preservation Act (NHPA) Programmatic Agreement (PA) for the Natomas Levee Improvement Program, Landside Improvements Project (NLIP).

Your correspondence indicates you have three primary areas of concern. First, you notified the Corps that The Band is designated as the Most Likely Descendant (MLD) by the Native American Heritage Commission, for certain actions involving the NLIP. Second, requested we investigate the actions of EDAW, a consulting firm to the Sacramento Area Flood Control Agency (SAFCA), regarding its treatment of Native American remains during recent field investigations at the site identified as CA-Sac-485/H. Lastly, you requested to be treated as a consulting party on the NLIP PA and provided substantive comments for our consideration.

We appreciate your desire to be fully engaged with all aspects of the PA. Please find enclosed a copy of the executed PA, dated May 1, 2008. As an alternative to amending the completed PA, the Corps would like invite you to consult on the creation of the Historic Properties Treatment Plan (HPTP). It is our belief that the concerns you expressed in your May 8 correspondence can be adequately addressed in the HPTP. Additionally, upon receipt of your letter the Corps, initiated an inquiry into EDAW's actions, and will share the results of this effort with you as soon as we can meet. While the Corps does not have the authority to direct the activities of EDAW or SAFCA, it has been in close contact with both entities and has recommended EDAW, who is acting through SAFCA, review its MLD procedures with the Native American Heritage Commission. That said, we understand controlled investigations/excavations may be continuing, by-way-of field consultations with input from one of the Band's representatives, as a standard operating procedure. Further, EDAW and SAFCA have assured the Corps that every effort is being made to address the Band's concerns and that they will continue to do so.

The Corps acknowledges that the Shingle Springs Band of Miwok Indians is a federally recognized tribe and desire to meet with you and/or your staff as soon as practicable. In preparation for our meeting, please let me know if I have not fully captured your concerns and if there are any other concerns which we may prepare to address.

Mr. Mark Gilfillan is the District's Tribal Liaison and point of contact for all Sacramento District and Tribal Nation consultations and concerns. Mr. Gilfillan will soon be in contact with you or your designated staff to facilitate and arrange our meeting with dates amenable to The Band. If you have any questions regarding our meeting, please contact Mr. Gilfillan at our Colorado West Regulatory Branch, 400 Rood Avenue, Room 142, email address *mark.a.gilfillan@usace.army.mil*, or telephone (970) 243-1199, extension 15. I look forward to our meeting and addressing your concerns.

Sincerely,

Original Signed

Thomas C. Chapman, P.E.
Colonel, U.S. Army
District Engineer

Enclosure

GILFILLAN/rr
CESPK-RD-C

JACOBSON
CESPK-RD-C

JEWELL
CESPK-RD

KORMAN
CESPK-DC

COWAN MEC 4/4/08
CESPK-DE-EA

ALTENDORF
CESPK-DE-PM

PORTER
CESPK-DDE

CHAPMAN
CESPK-DE TC

SAFCA
Sacramento
Area Flood
Control
Agency

June 12, 2008

Mr. John Tayaba

Tribal Vice Chair
Shingle Springs Rancheria
P.O. Box 1340
Shingle Springs, CA
95682

Dear Mr. Tayaba:

RE: Your letter of May 08, 2008 and our meeting on June 04, 2008.

On behalf of the Sacramento Area Flood Control Agency (SAFCA) we wish to thank you for the opportunity to meet in person last week in the office of the Native American Heritage Commission. This letter is in response to the concerns raised in your letter of May 8, 2008 and at our meeting on June 4th regarding the treatment of historic properties that could be affected by the Natomas Levee Improvement Program (Program). This urgently needed Program will address identified deficiencies in the levee system protecting the Natomas Basin and will provide the 80,000 residents of the basin with a high level of protection against potentially catastrophic flooding.

SAFCA values the input of the Shingle Springs Band of Miwok Indians (Band) as we make important decisions about the management of historic properties that could be affected by the Program. We recognize that the Band has a significant role in determining the treatment of historic properties as a consulting party under Section 106 of the National Historic Preservation Act, in addition to your role as the most likely descendant (MLD) under California Public Resources Code Section 5097.98. It is our intention to make every effort to incorporate your input and be responsive to your concerns as we move forward with the Program in a timely fashion. This letter provides a brief discussion of three items of critical concern, and then addresses other issues raised in your letter and at our meeting.

Future Steps for 106 Consultations

The Corps, SAFCA, and the California State Historic Preservation Officer (SHPO) have executed a programmatic agreement (PA) that governs treatment of significant cultural resources that may be affected by the Program. The PA requires consultation with the public and Native American individuals and

Office 916-874-7606
FAX 916-874-8289

1007 - 7th Street, 7th Floor
Sacramento, CA 95814-3407

organizations (Stipulation VI). We expect to collaborate closely with you as the MLD on behalf of the Band in determining how cultural resources are managed for the Program. For each phase of construction (2008, 2009, 2010) we will consult with you regarding the area of potential effects, the inventory of historic properties, and the management of potentially adverse effects under historic property treatment plans.

Excavation of Skeletal Remains at CA-SAC-485/H

SAFCA's consultant, EDAW, is conducting ongoing excavations at CA-SAC-485/H. This site contains burial features and skeletal remains. In accordance with State law, EDAW contacted the Native American Heritage Commission (NAHC) in early March 2008, during the 2008 season of fieldwork, when human remains were encountered during archaeological excavations needed for compliance with Section 106. The NAHC assigned you as MLD on April 15, 2008. To enlist your input and ensure appropriate treatment of human remains, our Consultant has provided the Band (email of May 21, 2008) with proposed field protocols for dealing with cultural resources and a draft burial treatment plan. The Band's review and comment on these documents would be greatly appreciated.

In your May 8th letter you indicate that the burial site may have been inappropriately excavated, and the treatment of the site may not comply with Federal and State law. We are not presently aware of any violation of federal or state law, including your right to determine disposition of human remains under Section 5097.98 of the California Public Resources Code. However, we will conduct an impartial investigation of events at CA-SAC-485/H to determine if the previous activities at the site were in compliance with State and Federal laws as well as standard protocols for site investigation. We will follow up with you as this process moves forward.

Independent Peer Review

As part of our effort to ensure sufficient and appropriate identification and treatment of cultural resources, we are prepared to provide an ethnographer for assistance in the identification process and to retaining consultants acceptable to the Band to conduct an external peer review of EDAW's ongoing efforts and strategy. We have identified Far Western Anthropological Research Group as a firm with regional expertise in archaeology and geomorphology. However, as discussed at the June 4th meeting, we would welcome any alternative suggestions you may have regarding a qualified ethnographer and a firm to conduct the peer review.

Other Concerns

1. Definition of Historic Properties

The Band notes that it is appropriate to include traditional cultural places (TCPs) in the definition of historic properties. Eligible and National Register of Historic Places (NRHP) listed TCPs are included in the definition of historic properties in the implementing regulations, and are included in our definitions by reference to the regulations in the PA.

2. Ongoing Communication & MLD Liaison

SAFCA would appreciate your clarification regarding how SAFCA and its consultants should communicate with the MLD, the Band and its representatives. A clear definition of contacts and their specific roles will help us meet your expectations and facilitate cooperation as the project moves forward.

3. Modified Construction Methods

As discussed at our June 4th meeting SAFCA's engineering staff are developing a series of modifications to standard construction methods proposed for sensitive historic properties. We will be circulating a memo identifying these methods and hope to discuss them with you when we meet again. As the Band offered during the meeting, SAFCA would appreciate receiving the results of the cultural resources 'damage' study that was prepared for an undisclosed site. This study should assist us as we develop our modified construction methods.

4. Final Report

SAFCA will forward a copy of the draft final report(s) to be prepared per Stipulation V(C) of the PA and will consider the Band's comments in making final revisions to that document.

Summary

SAFCA seeks to accomplish the Program in a manner which is respectful and sensitive to Native American heritage. We appreciate your input and welcome your continued assistance in implementing the PA and managing historic properties associated with this important Program. We also look forward to hosting you on a Program field trip at a mutually convenient time. Please contact Peter Buck at 916-874-4581 if you have any questions or need further information, and please coordinate with him by phone or e-mail regarding when you are available to meet with the PA signatories.

Sincerely yours,

Stein M. Buer
Executive Director

cc.

Col. Thomas C. Chapman, District Engineer, US Army Corps of Engineers.
Larry Myers, Executive Secretary, Native American Heritage Commission.
Dwight Dutchske, Assoc. Park & Recreation Specialist, State Historic Preservation Office.
Brigit Barnes, Attorney for the Band, Brigit S. Barnes & Associates Inc.
Michelle LaPena, Attorney, LaPena Law Corporation.

SAFCA
Sacramento
Area Flood
Control
Agency

July 23, 2008

Janis Offermann
Senior Environmental Planner
Department of Water Resources
Division of Environmental Services
Environmental Compliance and Evaluation Branch
1725 23rd Street, Suite 220
Sacramento, CA 95816

Dear Ms. Offermann:

The Sacramento Area Flood Control Agency (SAFCA) is constructing the Natomas Levee Improvement Program (NLIP), Landside Improvements Project. This project will provide necessary improvements to the levee system that surrounds the Natomas Basin, including portions of Sutter County, Sacramento County and the City of Sacramento, California. This project requires permits and authorization from the U.S. Army Corps of Engineers (Corps) to discharge fill to waters of the United States and to modify federal flood control structures. These federal actions require that the Corps comply with Section 106 of the National Historic Preservation Act (NHPA).

Section 106 mandates that federal agencies consider the effects of their undertakings on historic properties and allow the Advisory Council on Historic Preservation (ACHP) a reasonable time to comment on the action. Historic properties are cultural resources such as archaeological sites, historic buildings and objects, and traditional cultural places that are listed on, or are eligible for listing on, the National Register of Historic Places (NRHP).

Compliance with Section 106, as defined in Part 800 of Title 36 of the Code of Federal Regulations (CFR), normally requires five sequential steps:

- determination of the area in which the undertaking may affect historic properties (also referred to as the area of potential effects or "APE")
- identification of cultural resources within the APE
- evaluation of those resources for listing on the NRHP
- identification of adverse effects on NRHP-eligible resources that would result from the undertaking
- and resolution of adverse effects

The Section 106 process also requires the federal agency to consult with the public, Indian Tribes, and the State Historic Preservation Officer (SHPO) during the identification and evaluation of historic properties and to consider ways to minimize adverse effects of the undertaking on those properties. These steps may occur

Office 916-874-7606
FAX 916-874-8289

1007 - 7th Street, 7th Floor
Sacramento, CA 95814-3407

sequentially as the federal agency consults with these parties in the context of routine federal undertakings. For complex undertakings such as the NLIP, however, the Section 106 regulations provide alternate pathways to Section 106 compliance. Agencies may perform phased identification, evaluation, and resolution of adverse effects as an undertaking proceeds, per 36 CFR Part 800.4(b)(2). This section allows a phased management of resources if a specific process is defined in an agreement document such as a programmatic agreement (PA) or memorandum of agreement (MOA).

The Corps, in consultation with SAFCA and the California SHPO, has developed a PA for the NLIP detailing a phased identification, evaluation, and treatment process for this undertaking (a copy of the executed PA is attached for your information and use). This stepwise process will track the phases of project construction during 2008, 2009 and 2010. This phasing is necessary because the Corps must issue separate authorizations and permits under the Rivers and Harbor Act and the Clean Water Act for each year of work. The geographic scale of the construction involved and uncertainty about the exact nature of work for future phases also dictates that the inventory, evaluation, and treatment of historic properties be developed as phases of the NLIP proceed. These circumstances require that historic properties are identified and managed separately for each year of planned project construction. The PA provides for the following steps to comply with Section 106:

- Inventory of historic properties prior to each year of construction, and submission to the Corps and SHPO of an inventory report and APE map for each year (Stipulation III[C], Stipulation IV). This document will evaluate identified resources and make a finding of effects based on the potential of the undertaking to result in adverse effects.
- Resolution of adverse effects by preparation of a historic properties treatment plan for each adversely affected property (Stipulation V[A]).
- Consultation with the public at large and Native American individuals and organizations with cultural ties to the APE.

In summary, SAFCA and the Corps will identify and manage historic properties in phases related to construction activities over the next few years. We understand that this undertaking has the potential to effect historic properties with noteworthy values to both the archaeological and Native American communities. Such resources include CA-SAC-485/H, the remains of a prehistoric site containing numerous features and Native American burials. The full list of potentially affected resources that have been identified within the project area is provided in the Draft Environmental Impact Report (SAFCA, 2007) prepared for the project. We are currently conducting additional archaeological inventory for the 2008 construction season and additional site evaluation efforts are needed for the planned 2009 construction season.

We are contacting you to fulfill the consultation requirements under the PA and to provide you with the opportunity to consult regarding substantive decisions about how to resolve adverse effects on historic properties. This consultation replaces the general

requirement for public and Native American consultation under the Section 106 regulations because the PA replaces these regulations, in part, for these undertakings. A key part of the consultation process is to provide notice and opportunity to participate in the decision making process to determine how adverse effects will be resolved. We are preparing a draft historic property treatment plan to manage potential adverse effects on CA-SAC-485/H. If you would like to review this document please contact our office to be placed on the distribution list. We are also consulting with the Most Likely Descendant designated for CA-SAC-485/H, Mr. John Tayaba of the Shingle Springs Band of Miwok Indians, as required under state law.

Please contact Peter Buck of SAFCA, at 916-874-4581 or buckp@saccounty.net should you have questions or need further information regarding the identification or treatment of historic properties for this undertaking.

Sincerely,

John A. Bassett
Director of Engineering
Design Construction Maintenance

APPENDIX E

Air Quality Modeling Results

Unmitigated 2009 Emissions

Sutter County	Worst-Case lb/day			Tons/year				Sacramento County	Worst-Case lb/day			Tons/year			
	ROG	NOX	PM10	ROG	NOX	PM10	CO2		ROG	NOX	PM10	ROG	NOX	PM10	CO2
NCC	20	106	184	4	25	117	1430	SEL	58	354	4714	4	26	342	694
SEL	42	252	3361	3	18	244	495	Elkhorn GGS	9	75	113	1	6	1	597
PGCC	17	159	341	1	11	16	816	NEMDC	31	195	306	1	8	13	581
TOTAL	79	517	3885	8	55	377	2741	TOTAL	98	623	5133	6	40	356	1872

Mitigated 2009 Emissions

Sutter County	Worst-Case lb/day			Tons/year				Sacramento County	Worst-Case lb/day			Tons/year			
	ROG	NOX	PM10	ROG	NOX	PM10	CO2		ROG	NOX	PM10	ROG	NOX	PM10	CO2
% Reduction	5%	20%	75%	5%	20%	75%	-	% Reduction	5%	20%	75%	5%	20%	75%	-
TOTAL	74.6	413.3	971.4	7.4	43.7	94.3	-	TOTAL	93.3	498.7	1283.3	5.9	32.3	89.0	-
Threshold	25	25	80	25	25	-	-	Threshold	-	85	-	25	25	100	-
Significant?	Y	Y	Y	N	Y	-	-	Significant?	-	Y	Y	N	Y	N	-

*PM10 emissions would likely result in or substantially contribute to a violation of the CAAQS (50 ug/m3)

16

*Post-construction mitigation fee payment

N

SEL Phases 2 & 3	*2009 calendar year comprises reach 1-9b work to occur over 8 months (April - Nov)									Sutter Portion of Reach 4a:	8232.0	ft	Sutter Co total of SEL work in 2009:	19232	ft	41.6%	total length of 1-9b
										Sacramento Portion of Reach 4a:	1568.0	ft	Sac Co total of SEL work in 2009:	26978	ft	58.4%	46210 ft

	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor		
[1]Site Preparation (concurrent with [2,3])						0	yd3						0.0	0.0	8.8	8.8	54.0	days		
Mobile Sources														*assumes haul load=14 yd3		*assumes haul trucks drive length of levee each day				
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	5	trucks	6.2	82.9	3.2	9680.0	lb/yr						0.00220462	lb/gram	
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	270	trips	7.2	5.0	0.0	136.9	lb/yr						0.00220462	lb/gram	
Water Truck(s)	0.11	1.39	0.05	162.82	lb/day	1		5.7	75.3	2.9	8792.1	lb/yr								
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	2		54.7	522.4	21.1	44230.7	lb/yr								
Loader(s)	0.48	3.77	0.21	307.16	lb/day	2		51.8	406.8	22.9	33173.0	lb/yr								
Grader(s)	0.55	4.29	0.24	346.97	lb/day	2		59.3	463.0	26.2	37473.2	lb/yr								
Chipper(s)	0.69	5.45	0.30	443.67	lb/day	2		74.4	589.1	32.7	47916.6	lb/yr								
Crawler Tractor(s)	0.52	4.87	0.20	369.73	lb/day	2		56.3	526.2	22.0	39930.5	lb/yr								
Employee Trips	0.03	0.03	0.00	39.23	g/mile	60	employees	7.5	9.5	1.2	11209.0	lb/yr				40.0	per employee	0.00220462	lb/gram	
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	trucks	-	-	-	-	lb/yr								
Travel on paved roads	-	-	0.28	-	lb/VMT	5	trucks	-	-	670.9	-	lb/yr								
Total								**323.2**	**2680.0**	**803.2**	**232541.9**	**lb/yr**						2000	lb/ton	
Total								**6.0**	**49.6**	**14.9**	**4306.3**	**lb/day**								
[2]Relocate Canal (concurrent with [1,3])						0	yd3						0.0	0.0	8.8	8.8	48.0	days		
Mobile Sources														*assumes haul load=14 yd3		*assumes haul trucks drive length of levee each day				
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	2		46.5	358.6	20.8	31125.3	lb/yr								
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	24	trucks	26.7	353.6	13.9	41301.1	lb/yr						0.00220462	lb/gram	
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	1152	trips	30.8	21.2	0.0	583.9	lb/yr						0.00220462	lb/gram	
Loader(s)	0.48	3.77	0.21	307.16	lb/day	1		23.0	180.8	10.2	14743.6	lb/yr								
Employee Trips	0.03	0.03	0.00	39.23	g/mile	60	employees	6.7	8.4	1.0	9963.5	lb/yr				40.0	per employee	0.00220462	lb/gram	
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	trucks	-	-	-	-	lb/yr								
Travel on paved roads	-	-	0.28	-	lb/VMT	24	trucks	-	-	2,862.6	-	lb/yr								
Total								**133.8**	**922.6**	**3368.5**	**97717.5**	**lb/yr**						2000	lb/ton	
Total								**2.8**	**19.2**	**70.2**	**2035.8**	**lb/day**								

SEL Phases 2 & 3	*2009 calendar year comprises reach 1-9b work to occur over 8 months (April - Nov)									Sutter Portion of Reach 4a:	8232.0	ft	Sutter Co total of SEL work in 2009:	19232	ft	41.6%	total length of 1-9b
										Sacramento Portion of Reach 4a:	1568.0	ft	Sac Co total of SEL work in 2009:	26978	ft	58.4%	46210 ft

	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor		
[3]Excavate Stability Berm/Inspection Trech (concurrent with [1,2])																				
				Airport N Bufferlands		104000	yd3	Transported by haul truck					6.0	7428.6	44571.4	1591.8	28.0	days		
Mobile Sources				Reusable Fill		362000	yd3	Transported by scraper					0.1	25857.1	2585.7	92.3	28.0	days		
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	4		54.3	418.3	24.3	36312.9	lb/yr		*assumes haul load=14 yd3						
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	20		283.4	2708.5	109.5	229344.5	lb/yr								
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	8	trucks	117.2	1554.7	60.9	6485.2	lb/yr						0.00220462	lb/gram	
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	7429	trips	198.8	137.0	0.3	3765.4	lb/yr						0.00220462	lb/gram	
Bulldozers	0.49	4.43	0.19	335.60	lb/day	2		27.6	248.3	10.6	18793.5	lb/yr								
Grader(s)	0.55	4.29	0.24	346.97	lb/day	2		30.7	240.1	13.6	19430.6	lb/yr								
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	2		18.2	177.3	6.6	18156.4	lb/yr								
Employee Trips	0.03	0.03	0.00	39.23	g/mile	60	employees	3.9	4.9	0.6	5812.0	lb/yr				40.0	per employee	0.00220462	lb/gram	
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	-	lb/VMT	2586	VMT/yr	-	-	2,321	-	lb/yr								
Travel on paved roads	-	-	0.28	-	lb/VMT	44571	VMT/yr	-	-	12,585.9	-	lb/yr								
Material Handling													Tons/yd3 (gravel/sand)	Tons/day						
Material loading at borrow	-	-	0.04	-	lb/ton			-	-	23,643.6	-	lb/yr	1.25	20803.57						
Material unloading at levee	-	-	0.005	-	lb/ton			-	-	3,058.1	-	lb/yr	1.25	20803.57						
Bulldozing	-	-	0.41	-	lb/hr	8	hrs/day	-	-	92.00	-	lb/yr								
Total								**734.1**	**5489.1**	**41927.1**	**338100.5**	**lb/yr**						2000	lb/ton	
Total								**26.2**	**196.0**	**1497.4**	**12075.0**	**lb/day**								
[4,5]Construction of Adjacent Levee Raise, Cutoff Wall & Seepage Berms (concurrent with [6,7])																				
				Airport N Bufferlands		3483000	yd3	Includes borrow from Reaches 1-4b, 5a-9b					6.0	248785.7	1492714.3	10662.2	140.0	days		
				Commercial Source		61500	yd3	Includes borrow from Reaches 1-4b, 5a-9b					30.0	4392.9	131785.7	941.3	140.0	days		
Mobile Sources														*assumes haul load=14 yd3						
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	4		181.7	1773.0	65.5	181564.4	lb/yr								
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	2		141.7	1354.3	54.7	114672.2	lb/yr								
Loader(s)	0.48	3.77	0.21	307.16	lb/day	6		403.3	3164.0	178.2	258012.5	lb/yr								
Bulldozer(s)	0.49	4.43	0.19	335.60	lb/day	4		275.7	2482.8	105.8	187934.9	lb/yr								
Other Equipment	0.69	4.31	0.37	352.66	lb/day	3		288.1	1811.1	154.5	148118.3	lb/yr								
Grader(s)	0.55	4.29	0.24	346.97	lb/day	3		230.4	1800.6	101.8	145729.3	lb/yr								
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	4		271.3	2091.5	121.3	181564.3	lb/yr								
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	60	trucks	4272.6	56665.1	2220.5	47273.6	lb/yr						0.00220462	lb/gram	
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	253179	trips	6776.1	4667.9	8.9	128332.9	lb/yr						0.00220462	lb/gram	
Employee Trips	0.03	0.03	0.00	39.23	g/mile	60	employees	19.6	24.5	3.0	29060.2	lb/yr				40.0	per employee	0.00220462	lb/gram	
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	-	lb/VMT	746357	VMT/yr	-	-	670,014.3	-	lb/yr	*assumes that material hauling is along 50% paved and 50% unpaved haul routes							
Travel on paved roads	-	-	0.28	-	lb/VMT	878143	VMT/yr	-	-	247,966.1	-	lb/yr	*assumes that material hauling is along 50% paved and 50% unpaved haul routes							
Material Handling													Tons/yd3 (gravel/sand)	Tons/day						
Material loading at borrow	-	-	0.04	-	lb/ton			-	-	179,838.7	-	lb/yr	1.25	31647.32						
Material unloading at levee	-	-	0.005	-	lb/ton			-	-	23,260.8	-	lb/yr	1.25	31647.32						
Bulldozing	-	-	0.41		lb/hr	8	hrs/day	-	-	459.99	-	lb/yr								
Total								**12860.6**	**75834.9**	**1124554.2**	**1422262.6**	**lb/yr**						2000	lb/ton	
Total								**91.9**	**541.7**	**8032.5**	**10159.0**	**lb/day**								
[6]Reconstruct Garden Hwy/Install Surface Drainage (concurrent with [4,5,7])																				
						0	yd3						10.0	0.0	10.0	10.0	27.0	days		
Mobile Sources														*assumes haul load=14 yd3	*assumes haul trucks drive 10 miles each day					
Backhoe(s)	0.22	1.49	0.08	312.85	lb/day	2		11.9	80.5	4.2	16893.7	lb/yr								

SEL Phases 2 & 3	*2009 calendar year comprises reach 1-9b work to occur over 8 months (April - Nov)									Sutter Portion of Reach 4a:	8232.0	ft	Sutter Co total of SEL work in 2009:	19232	ft	41.6%	total length of 1-9b
										Sacramento Portion of Reach 4a:	1568.0	ft	Sac Co total of SEL work in 2009:	26978	ft	58.4%	46210 ft

	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor		
Loader(s)	0.48	3.77	0.21	307.16	lb/day	2		25.9	203.4	11.5	16586.5	lb/yr								
Drill Rig(s)	0.21	2.77	0.09	426.61	lb/day	1		5.8	74.9	2.4	11518.4	lb/yr								
Roller(s)	0.74	4.43	0.38	318.53	lb/day	2		39.8	239.1	20.5	17200.8	lb/yr								
Paver(s)	0.93	5.43	0.47	352.66	lb/day	1		25.1	146.6	12.7	9521.9	lb/yr								
Off-Highway Truck(s)	0.32	3.17	0.12	324.22	lb/day	4		35.0	341.9	12.6	35016.0	lb/yr								
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	6	trucks	4.3	56.5	2.2	6600.0	lb/yr						0.00220462	lb/gram	
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	162	trips	4.3	3.0	0.0	82.1	lb/yr						0.00220462	lb/gram	
Employee Trips	0.03	0.03	0.00	39.23	g/mile	60	employees	3.8	4.7	0.6	5604.5	lb/yr				40.0	per employee	0.00220462	lb/gram	
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	VMT/yr	-	-	-	-	lb/yr								
Travel on paved roads	-	-	0.28	-	lb/VMT	1620	VMT/yr	-	-	457.4	-	lb/yr								
Total								**155.9**	**1150.7**	**524.2**	**119023.9**	**lb/yr**						2000	lb/ton	
Total								**5.8**	**42.6**	**19.4**	**4408.3**	**lb/day**								
[7]Construct Relief Wells (concurrent with [4,5,6])						0	yd3						0.0	0.0	5.0	5.0	30.0	days		
Mobile Sources														*assumes haul load=14 yd3		*assumes trucks drive 5 miles/day				
Off-Highway Truck(s)	0.32	3.17	0.12	324.22	lb/day	5		48.7	474.9	17.6	48633.3	lb/yr								
Drill Rig(s)	0.21	2.77	0.09	426.61	lb/day	2		12.9	166.5	5.3	25596.5	lb/yr								
Employee Trips	0.03	0.03	0.00	39.23	g/mile	60	employees	4.2	5.3	0.6	6227.2	lb/yr				40.0	per employee	0.00220462	lb/gram	
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	-	lb/VMT	750	VMT/yr	-	-	673.3	-	lb/yr								
Travel on paved roads	-	-	0.28	-	lb/VMT	0	trucks	-	-	-	-	lb/yr								
Total								**65.8**	**646.6**	**696.7**	**80457.0**	**lb/yr**						2000	lb/ton	
Total								**2.2**	**21.6**	**23.2**	**2681.9**	**lb/day**								
[8]Site Restoration/Demobilization						0	yd3						0.1	0.0	5.0	5.0	34.0	days		
Mobile Sources														*assumes haul load=14 yd3		*assumes trucks drive 5 miles/day				
Off-Highway Truck(s)	0.32	3.17	0.12	324.22	lb/day	7		77.2	753.5	27.9	77164.9	lb/yr								
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	3		1.3	17.8	0.7	2077.8	lb/yr						0.00220462	lb/gram	
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	102	trips	2.7	1.9	0.0	51.7	lb/yr						0.00220462	lb/gram	
Employee Trips	0.03	0.03	0.00	39.23	g/mile	60	employees	4.8	6.0	0.7	7057.5	lb/yr				40.0	per employee	0.00220462	lb/gram	
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	-	lb/VMT	510	VMT/yr	-	-	457.8	-	lb/yr								
Travel on paved roads	-	-	0.28	-	lb/VMT	0	VMT/yr	-	-	-	-	lb/yr								
Total								**86.0**	**779.1**	**487.1**	**86351.8**	**lb/yr**						2000	lb/ton	
Total								**2.5**	**22.9**	**14.3**	**2539.8**	**lb/day**								
2009 calendar year																				
Total from SEL								**7.2**	**43.8**	**586.2**	**1188.2**	**TPY**	to occur during 2009 calendar year							
Total from SEL								**99.8**	**605.8**	**8075.2**	**-**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently							
Emissions to occur in Sutter County							**42%**	**3.0**	**18.2**	**244.0**	**494.5**	**TPY**	to occur during 2009 calendar year							
Emissions to occur in Sacramento County							**58%**	**4.2**	**25.5**	**342.2**	**693.7**	**TPY**	to occur during 2009 calendar year							
Emissions to occur in Sutter County							**42%**	**41.5**	**252.1**	**3360.8**	**-**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently							
Emissions to occur in Sacramento County							**58%**	**58.3**	**353.7**	**4714.4**	**-**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently							
*These calculations represent worst-case emissions from construction activities associated with Sacramento East Levee work																				

PGCC		*Work to occur during 2009 is assumed to be phased over 8 months (April - Nov)																		
*assumes all activity to occur in Sutter County																				
	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor		
Cutoff Wall Construction																				
[1]Clearing and Grubbing/Stripping (concurrent with [2])						0	yd3						0.0	0.0	5.0	5.0	10.0	days		
Mobile Sources														*assumes haul load=14 yd3		*assumes haul trucks drive 5 miles each day				
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	15	trucks	2.0	26.2	1.0	3055.5	lb/yr						0.00220462	lb/gram	
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	150	trips	4.0	2.8	0.0	76.0	lb/yr						0.00220462	lb/gram	
Water Truck(s)	0.11	1.39	0.05	162.82	lb/day	2		2.1	27.9	1.1	3256.3	lb/yr								
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	8		40.5	386.9	15.6	32763.5	lb/yr								
Loader(s)	0.48	3.77	0.21	307.16	lb/day	4		19.2	150.7	8.5	12286.3	lb/yr								
Employee Trips	0.03	0.03	0.00	39.23	g/mile	20	employees	0.5	0.6	0.1	691.9	lb/yr				40.0	per employee	0.00220462	lb/gram	
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	trucks	-	-	-	-	lb/yr								
Travel on paved roads	-	-	0.28	-	lb/VMT	15	trucks	-	-	211.8	-	lb/yr								
Total								**68.2**	**595.0**	**238.1**	**52129.6**	**lb/yr**						2000	lb/ton	
Total								**6.8**	**59.5**	**23.8**	**5213.0**	**lb/day**								
[2]Borrow Site Preparation (concurrent with [1])						0	yd3						0.0	0.0	0.0	0.0	5.0	days		
Mobile Sources														*assumes haul load=14 yd3						
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	4		10.1	96.7	3.9	8190.9	lb/yr								
Water Truck(s)	0.11	1.39	0.05	162.82	lb/day	1		0.5	7.0	0.3	814.1	lb/yr						0.00220462	lb/gram	
Employee Trips	0.03	0.03	0.00	39.23	g/mile	20	employees	0.2	0.3	0.0	346.0	lb/yr				40.0	per employee	0.00220462	lb/gram	
Total								**10.9**	**104.0**	**4.2**	**9350.9**	**lb/yr**						2000	lb/ton	
Total								**2.2**	**20.8**	**0.8**	**1870.2**	**lb/day**								

PGCC		*Work to occur during 2009 is assumed to be phased over 8 months (April - Nov)																	
*assumes all activity to occur in Sutter County																			
	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
[3]Working Surface/Cutoff Wall Construction					Brookfield	20000	yd3						3.0	1428.6	4285.7	85.7	50.0	days	
Mobile Sources														*assumes haul load=14 yd3					
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	4		96.9	747.0	43.3	64844.4	lb/yr							
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	15		379.5	3627.5	146.6	307157.8	lb/yr							
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	3	trucks	11.3	149.5	5.9	349.2	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	1429	trips	38.2	26.3	0.1	724.1	lb/yr						0.00220462	lb/gram
Loader(s)	0.48	3.77	0.21	307.16	lb/day	3		72.0	565.0	31.8	46073.7	lb/yr							
Other Equipment	0.69	4.31	0.37	352.66	lb/day	4		137.2	862.4	73.6	70532.5	lb/yr							
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	2		32.4	316.6	11.7	32422.2	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	20	employees	2.3	2.9	0.4	3459.6	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	VMT/yr	-	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	4286	VMT/yr	-	-	1,210.2	-	lb/yr							
Total								**769.9**	**6297.3**	**1523.5**	**525563.4**	**lb/yr**						2000	lb/ton
Total								**15.4**	**125.9**	**30.5**	**10511.3**	**lb/day**							
[4]Demobilization						0	yd3						0.1	0.0	5.0	5.0	12.0	days	
Mobile Sources														*assumes haul load=14 yd3		*assumes trucks drive 5 miles/day			
Off-Highway Truck(s)	0.32	3.17	0.12	324.22	lb/day	4		15.6	152.0	5.6	15562.7	lb/yr							
Loader(s)	0.48	3.77	0.21	307.16	lb/day	1		5.8	45.2	2.5	3685.9	lb/yr							
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	2		0.3	4.2	0.2	488.9	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	24	trips	0.6	0.4	0.0	12.2	lb/yr						0.00220462	lb/gram
Employee Trips	0.03	0.03	0.00	39.23	g/mile	20	employees	0.6	0.7	0.1	830.3	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	120	VMT/yr	-	-	107.7	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	0	VMT/yr	-	-	-	-	lb/yr							
Total								**22.9**	**202.5**	**8.4**	**20579.9**	**lb/yr**						2000	lb/ton
Total								**1.9**	**16.9**	**0.7**	**1715.0**	**lb/day**							
Levee Slope Flattening & Widening																			
[1]Clearing and Grubbing/Stripping						0	yd3						0.0	0.0	5.0	5.0	30.0	days	
Mobile Sources														*assumes haul load=14 yd3		*assumes haul trucks drive 5 miles each day			
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	7	trucks	2.8	36.6	1.4	4277.8	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	210	trips	5.6	3.9	0.0	106.4	lb/yr						0.00220462	lb/gram
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	2		19.5	63.3	2.3	6484.4	lb/yr							
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	10		151.8	1451.0	58.6	122863.1	lb/yr							
Loader(s)	0.48	3.77	0.21	307.16	lb/day	2		28.8	226.0	12.7	18429.5	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	20	employees	1.4	1.8	0.2	2075.7	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	trucks	-	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	15	trucks	-	-	635.3	-	lb/yr							
Total								**209.9**	**1782.6**	**710.7**	**154236.9**	**lb/yr**						2000	lb/ton
Total								**7.0**	**59.4**	**23.7**	**5141.2**	**lb/day**							
[2,3]Levee Raiseing/Slope Flattening/Widening/Borrow Site Excavation					Brookfield	469205	yd3						3.0	33514.6	100543.9	1182.9	85.0	days	
Mobile Sources														*assumes haul load=14 yd3					
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	2		82.4	634.9	36.8	55117.7	lb/yr							
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	13		559.2	5344.5	216.0	452545.8	lb/yr							
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	4	trucks	264.4	3507.1	137.4	4819.1	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	33515	trips	38.2	26.3	0.1	724.1	lb/yr						0.00220462	lb/gram
Loader(s)	0.48	3.77	0.21	307.16	lb/day	2		81.6	640.3	36.1	52216.8	lb/yr							

PGCC		*Work to occur during 2009 is assumed to be phased over 8 months (April - Nov)																		
*assumes all activity to occur in Sutter County																				
	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor		
Dozer(s)	0.49	4.43	0.19	335.60	lb/day	4		167.4	1507.4	64.2	114103.3	lb/yr								
Roller(s)	0.74	4.43	0.38	318.53	lb/day	2		125.2	752.8	64.6	54150.7	lb/yr								
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	4		110.3	1076.5	39.8	110235.6	lb/yr								
Employee Trips	0.03	0.03	0.00	39.23	g/mile	20	employees	4.0	5.0	0.6	5881.2	lb/yr				40.0	per employee	0.00220462	lb/gram	
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	VMT/yr	-	-	-	-	lb/yr								
Travel on paved roads	-	-	0.28	-	lb/VMT	100544	VMT/yr	-	-	28,391.2	-	lb/yr								
Total								**1432.7**	**13494.8**	**28986.8**	**849794.4**	**lb/yr**						2000	lb/ton	
Total								**16.9**	**158.8**	**341.0**	**9997.6**	**lb/day**								
[4]Finish Grading						0	yd3						0.0	0.0	0.0	0.0	10.0	days		
Mobile Sources														*assumes haul load=14 yd3						
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	2		6.5	63.3	2.3	6484.4	lb/yr								
Grader(s)	0.55	4.29	0.24	346.97	lb/day	2		11.0	85.7	4.8	6939.5	lb/yr								
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	2		9.7	74.7	4.3	6484.4	lb/yr								
Employee Trips	0.03	0.03	0.00	39.23	g/mile	20	employees	0.5	0.6	0.1	691.9	lb/yr				40.0	per employee	0.00220462	lb/gram	
Total								**27.6**	**224.3**	**11.6**	**20600.3**	**lb/yr**						2000	lb/ton	
Total								**2.8**	**22.4**	**1.2**	**2060.0**	**lb/day**								
2009 calendar year																				
Total from PGCC								**1.3**	**11.4**	**15.7**	**816.1**	**TPY**	to occur during 2009 calendar year							
Total from PGCC								**16.9**	**158.8**	**341.0**	**-**	**Worst-case lb/day**								

NCC South Levee Phase 3 Improvements								*Construction of reaches 1-7 would occur in 2009.												
*All work would occur in Sutter County																				
	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
[1]Clearing, Grubbing, Stripping						13500	yd3 (export)						10.0	964.3	9642.9	482.1	20.0	days	
Mobile Sources						*(assumes 10 miles to material disposal site)								*(assumes haul load = 14 yd3)					
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	12	trucks	25.4	336.4	13.2	39285.5	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	964	trips	25.8	17.8	0.0	488.8	lb/yr						0.00220462	lb/gram
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	1		6.5	63.3	2.3	6484.4	lb/yr							
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	3		30.4	290.2	11.7	24572.6	lb/yr							
Loader(s)	0.49	4.43	0.19	335.60	lb/day	1		9.8	88.7	3.8	6712.0	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	50	employees	2.3	2.9	0.4	3459.6	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	trucks	-	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	12	trucks	-	-	2,722.9	-	lb/yr							
Material Handling												Tons/yd3 (gravel/sand)		Tons/day					
Truck Loading at Levee	-	-	0.04	-	lb/ton			-	-	685.0	-	lb/yr	1.25	843.75					
Truck Unloading at Off-site Disposal	-	-	0.005	-	lb/ton			-	-	88.6	-	lb/yr	1.25	843.75					
Total								**100.2**	**799.2**	**3527.9**	**81002.9**	**lb/yr**						2000	lb/ton
Total								**5.0**	**40.0**	**176.4**	**4050.1**	**lb/day**							
[2,4]Levee Degrading & Compaction (lags [1] by 14 days)						0	yd3						0.0	0.0	0.0	0.0	135.0	days	
Mobile Sources																			
Bulldozer(s)	0.49	4.43	0.19	335.60	lb/day	4		265.9	2394.2	102.0	181222.9	lb/yr							
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	2		87.6	854.8	31.6	87540.0	lb/yr							
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	4		273.3	2611.8	105.6	221153.6	lb/yr							
Roller(s)	0.74	4.43	0.38	318.53	lb/day	2		198.8	1195.6	102.6	86004.1	lb/yr							
Loader(s)	0.49	4.43	0.19	335.60	lb/day	3		199.4	1795.6	76.5	135917.2	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	50	employees	15.7	19.7	2.4	23352.0	lb/yr				40.0	per employee	0.00220462	lb/gram
Material Handling																			
Bulldozing	-	-	0.41	-	lb/hr	10	hrs/day	-	-	554.45	-	lb/yr							
Total								**1040.7**	**8871.7**	**975.1**	**735189.8**	**lb/yr**						2000	lb/ton
Total								**7.7**	**65.7**	**7.2**	**5445.9**	**lb/day**							

NCC South Levee Phase 3 Improvements								*Construction of reaches 1-7 would occur in 2009.												
*All work would occur in Sutter County																				
	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
[3,5]Cutoff Wall Construction & Borrow Site Excavation (lags [2] by 14 days)						195000	yd3 (borrow)						10.0	13928.6	139285.7	928.6	150.0	days	
Mobile Sources						*(assumes Brookfield borrow site; also assumes exported material is transported on return trip to borrow site)								*(assumes haul load = 14 yd3)						
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	3		218.0	1680.7	97.5	145899.9	lb/yr							
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	1		48.7	474.9	17.6	48633.3	lb/yr							
Other Equipment	0.69	4.31	0.37	352.66	lb/day	6		617.3	3881.0	331.0	317396.3	lb/yr							
Loader(s)	0.49	4.43	0.19	335.60	lb/day	3		221.6	1995.1	85.0	151019.1	lb/yr							
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	4	trucks	366.3	4858.5	190.4	567457.7	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	13929	trips	372.8	256.8	0.5	7060.2	lb/yr						0.00220462	lb/gram
Employee Trips	0.03	0.03	0.00	39.23	g/mile	50	employees	17.5	21.9	2.7	25946.6	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	trucks	-	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	4	trucks	-	-	39,330.9	-	lb/yr							
Material Handling													Tons/yd3 (gravel/sand)	Tons/day					
Truck Loading at Borrow	-	-	0.04	-	lb/ton			-	-	9893.8	-	lb/yr	1.25	1625.00					
Truck Unloading at Levee	-	-	0.005	-	lb/ton			-	-	1279.7	-	lb/yr	1.25	1625.00					
Total								**1862.2**	**13169.0**	**51229.0**	**1263413.2**	**lb/yr**						2000	lb/ton
Total								**12.4**	**87.8**	**341.5**	**8422.8**	**lb/day**							
[6]Demobilization/Cleanup						0	yd3						0.0	0.0	0.0	0.0	14.0	days	
Mobile Sources																			
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	3		13.6	133.0	4.9	13617.3	lb/yr							
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	2	trucks	0.4	5.0	0.2	581.8	lb/yr	*(assumes haul truck drives 5.1 miles/day)					0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	28	trips	0.7	0.5	0.0	14.2	lb/yr						0.00220462	lb/gram
Employee Trips	0.03	0.03	0.00	39.23	g/mile	50	employees	1.6	2.0	0.3	2421.7	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	2	trucks	-	-	128.2	-	lb/yr	*(assumes haul truck drives 5.1 miles/day)						
Travel on paved roads	-	-	0.28	-	lb/VMT	0	trucks	-	-	-	-	lb/yr							
Total								**16.4**	**140.5**	**133.6**	**16635.0**	**lb/yr**						2000	lb/ton
Total								**1.2**	**10.0**	**9.5**	**1188.2**	**lb/day**							
Levee Raise & Borrow Site Excavation						685000	yd3						10.0	48928.6	489285.7	3261.9	150.0	days	
Mobile Sources														*(assumes haul load = 14 yd3)					
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	3		146.0	1424.7	52.7	145900.0	lb/yr							
Bulldozer(s)	0.49	4.43	0.19	335.60	lb/day	2		147.7	1330.1	56.7	100679.4	lb/yr							
Roller(s)	0.74	4.43	0.38	318.53	lb/day	4		441.8	2656.8	228.0	191120.3	lb/yr							
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	5		363.4	2801.2	162.5	243166.5	lb/yr							
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	30	trucks	1286.9	17067.0	668.8	13289.2	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	48929	trips	1309.5	902.1	1.7	24801.3	lb/yr						0.00220462	lb/gram
Employee Trips	0.29	0.61	0.04	0.04	g/mile	65	employees	245.9	522.8	32.7	32.7	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	trucks	-	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	30	trucks	-	-	138,162.3	-	lb/yr							
Material Handling													Tons/yd3 (gravel/sand)	Tons/day					
Truck Loading at Borrow	-	-	0.04	-	lb/ton			-	-	34755.1	-	lb/yr	1.25	5708.33					
Truck Unloading at Levee	-	-	0.005	-	lb/ton			-	-	4495.3	-	lb/yr	1.25	5708.33					
Total								**3941.3**	**26704.8**	**178615.8**	**718989.3**	**lb/yr**						2000	lb/ton
Total								**26.3**	**178.0**	**1190.8**	**4793.3**	**lb/day**							
Finishing Grading						0	yd3						0.0	0.0	0.0	0.0	10.0	days	
Mobile Sources																			
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	2		6.5	63.3	2.3	6484.4	lb/yr							
Grader(s)	0.55	4.29	0.24	346.97	lb/day	3		16.5	128.6	7.3	10409.2	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	55	employees	1.3	1.6	0.2	1902.8	lb/yr				40.0	per employee	0.00220462	lb/gram
Total								**24.2**	**193.5**	**9.8**	**18796.4**	**lb/yr**						2000	lb/ton

NCC South Levee Phase 3 Improvements								*Construction of reaches 1-7 would occur in 2009.												
*All work would occur in Sutter County																				
	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
Total								**2.4**	**19.4**	**1.0**	**1879.6**	**lb/day**							
Operating Road Construction						5000	yd3						0.1	357.1	35.7	3.6	10.0	days	
Mobile Sources						(*assumes 2,500 cy salvaged, and 2,500 cy imported)								*(assumes haul load = 14 yd3)						
Roller(s)	0.74	4.43	0.38	318.53	lb/day	2		14.7	88.6	7.6	6370.7	lb/yr							
Grader(s)	0.22	1.49	0.08	312.85	lb/day	2		2.2	14.9	0.8	3128.5	lb/yr	(*assumes that graders are used for 5 days)						
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	10	trucks	0.1	1.2	0.0	14.6	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	357	trips	9.6	6.6	0.0	181.0	lb/yr						0.00220462	lb/gram
Employee Trips	0.55	4.29	0.24	346.97	g/mile	55	employees	26.6	207.9	11.8	16828.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	2	trucks	-	-	32.1	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	2	trucks	-	-	10.1	-	lb/yr							
Material Handling													Tons/yd3 (gravel/sand)	Tons/day					
Truck Loading of salvage material	-	-	0.04	-	lb/ton					253.7	-	lb/yr	1.25	625.00					
Truck Unloading at road installation	-	-	0.005	-	lb/ton			-	-	32.8	-	lb/yr	1.25	625.00					
Total								**53.2**	**319.2**	**348.8**	**26523.6**	**lb/yr**						2000	lb/ton
Total								**5.3**	**31.9**	**34.9**	**2652.4**	**lb/day**							
2009 calendar year																			
Total from NCC								**4**	**25**	**117**	**1430**	**TPY**	to occur during 2009 calendar year						
Total from NCC								**20**	**106**	**184**	**-**	**Worst-case**	*assumes some phases will be conducted concurrently						
*These calculations represent worst-case emissions from construction activities associated with the NCC																			

GGS/Elkhorn Canal Relocation	*Work to occur during 2009 is assumed to be phased over 8 months (April - Nov)							*Assumes GGS and Elkhorn are constructed concurrently											
***assumes all activity to occur in Sacramento County**																			
	ROG	**NOX**	**PM10**	**CO2**	**Unit**	**Quantity**	**Unit**	**ROG**	**NOX**	**PM10**	**CO2**	**Unit**	**Distance (miles/round-trip)**	**# of Haul Loads**	**Total Miles Traveled**	**Total Miles Traveled/Day**	**Time frame**	**Conversion Factor**	
Clearing and Grubbing/Stripping (Elkhorn+GGS)				Off-site Waste Disposal		47700	yd3						5.0	3180.0	15900.0	387.8	41.0	days	
Mobile Sources														*assumes haul load=15 yd3					
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	30	trucks	41.8	554.6	21.7	64777.5	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	1230	trips	32.9	22.7	0.0	623.5	lb/yr						0.00220462	lb/gram
Water Truck(s)	0.11	1.39	0.05	162.82	lb/day	2		8.6	114.3	4.5	13350.9	lb/yr							
Dozer(s)	0.49	4.43	0.19	335.60	lb/day	4		80.8	727.1	31.0	55038.1	lb/yr							
Loader(s)	0.48	3.77	0.21	307.16	lb/day	10		196.8	1544.3	87.0	125934.7	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	15	employees	1.4	1.8	0.2	2127.6	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	trucks	-	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	30	trucks	-	-	4,489.8	-	lb/yr							
Total								**362.4**	**2964.9**	**4634.2**	**261852.2**	**lb/yr**						2000	lb/ton
Total								**8.8**	**72.3**	**113.0**	**6386.6**	**lb/day**							
Utility Relocations (GGS)						0	yd3						0.0	0.0	0.0	0.0	35.0	days	
Mobile Sources														*assumes haul load=15 yd3					
Dozer(s)	0.49	4.43	0.19	335.60	lb/day	2		34.5	310.4	13.2	23491.9	lb/yr							
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	2		33.9	261.4	15.2	22695.5	lb/yr							
Other Equipment	0.27	2.70	0.10	244.59	lb/day	1		4.8	47.2	1.8	4280.3	lb/yr	*operates for 18 days						
Employee Trips	0.03	0.03	0.00	39.23	g/mile	15	employees	1.2	1.5	0.2	1816.3	lb/yr				40.0	per employee	0.00220462	lb/gram
Total								**74.4**	**620.5**	**30.4**	**52284.0**	**lb/yr**						2000	lb/ton
Total								**2.1**	**17.7**	**0.9**	**1493.8**	**lb/day**							
Water Control Facility Construction (Elkhorn+GGS)						0	yd3						0.0	0.0	260.0	5.0	52.0	days	
Mobile Sources														*assumes haul load=15 yd3		*assumes trucks drive 5 miles/day			
Backhoe(s)	0.22	1.49	0.08	312.85	lb/day	2		23.0	155.1	8.1	32536.0	lb/yr							
Heavy-Duty Truck(s)	1.19	15.82	0.62	1847.96	g/mile	4	trucks	2.7	36.3	1.4	4237.0	lb/yr						0.00220462	lb/gram
Heavy-Duty Truck(s)	12.14	8.36	0.02	229.92	g/trip	208	trips	5.6	3.8	0.0	105.4	lb/yr						0.00220462	lb/gram
Other Equipment	0.69	4.31	0.37	352.66	lb/day	3		107.0	672.7	57.4	55015.4	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	15	employees	1.8	2.3	0.3	2698.5	lb/yr				40.0	per employee	0.00220462	lb/gram
Total								**140.1**	**870.2**	**67.2**	**94592.2**	**lb/yr**						2000	lb/ton
Total								**2.7**	**16.7**	**1.3**	**1819.1**	**lb/day**							

GGS/Elkhorn Canal Relocation	*Work to occur during 2009 is assumed to be phased over 8 months (April - Nov)							*Assumes GGS and Elkhorn are constructed concurrently										
***assumes all activity to occur in Sacramento County**																		
	ROG	**NOX**	**PM10**	**CO2**	**Unit**	**Quantity**	**Unit**	**ROG**	**NOX**	**PM10**	**CO2**	**Unit**	**Distance (miles/round-trip)**	**# of Haul Loads**	**Total Miles Traveled**	**Total Miles Traveled/Day**	**Time frame**	**Conversion Factor**	
Embankment & Access Rd Construction (Elkhorn+GGS)				Commercial source		2690	yd3						30.0	179.3	5380.0	597.8	56.0	days	
Mobile Sources														*assumes haul load=15 yd3					
Dozer(s)	0.49	4.43	0.19	335.60	lb/day	2		55.1	496.6	21.2	37587.0	lb/yr							
Roller(s)	0.74	4.43	0.38	318.53	lb/day	4		164.9	991.9	85.1	71351.6	lb/yr							
Grader(s)	0.55	4.29	0.24	346.97	lb/day	2		61.4	480.2	27.2	38861.1	lb/yr							
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	2		36.3	354.6	13.1	36312.9	lb/yr							
Heavy-Duty Truck(s)	1.19	15.82	0.62	1847.96	g/mile	10	trucks	141.5	1876.6	73.5	219184.2	lb/yr						0.00220462	lb/gram
Heavy-Duty Truck(s)	12.14	8.36	0.02	229.92	g/trip	179	trips	4.8	3.3	0.0	90.9	lb/yr						0.00220462	lb/gram
Employee Trips	0.03	0.03	0.00	39.23	g/mile	15	employees	2.0	2.5	0.3	2906.0	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	VMT/yr	-	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	5380	VMT/yr	-	-	1,519.2	-	lb/yr							
Total								**466.1**	**4205.6**	**1739.6**	**406293.7**	**lb/yr**						2000	lb/ton
Total								**8.3**	**75.1**	**31.1**	**7255.2**	**lb/day**							
Excavation & Trenching (GGS)						246000	yd3						0.0	16400.0	0.0	0.0	110.0	days	
Mobile Sources														*assumes haul load=15 yd3					
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	4		222.7	2128.1	86.0	180199.2	lb/yr							
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	2		106.6	821.7	47.7	71328.9	lb/yr							
Water Truck(s)	0.11	1.39	0.05	162.82	lb/day	2		23.1	306.7	12.0	35819.5	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	15	employees	3.8	4.8	0.6	5708.3	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources													Tons/yd3 (gravel/sand)	Tons/day					
Scraper Unloading	-	-	0.03	-	lb/ton	0		-	-	9,225	-	lb/yr	1.25	2795.45					
Total								**356.2**	**3261.3**	**9371.3**	**293055.8**	**lb/yr**						2000	lb/ton
Total								**3.2**	**29.6**	**85.2**	**2664.1**	**lb/day**							
Canal Lining (Elkhorn)						0	yd3						0.0	0.0	0.0	0.0	9.0	days	
Mobile Sources														*assumes haul load=15 yd3					
Off-Highway Truck(s)	0.32	3.17	0.12	324.22	lb/day	2		5.8	57.0	2.1	5836.0	lb/yr							
Other Equipment	0.69	4.31	0.37	352.66	lb/day	1		6.2	38.8	3.3	3174.0	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	15	employees	0.3	0.4	0.0	467.0	lb/yr				40.0	per employee	0.00220462	lb/gram
Total								**12.3**	**96.2**	**5.5**	**9477.0**	**lb/yr**						2000	lb/ton
Total								**1.4**	**10.7**	**0.6**	**1053.0**	**lb/day**							
Irrigation/Drainage Interconnections (Elkhorn+GGS)						0	yd3						0.0	0.0	0.0	0.0	13.0	days	
Mobile Sources														*assumes haul load=15 yd3					
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	1		4.2	129.8	4.8	13293.1	lb/yr							
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	2		12.6	97.1	5.6	8429.8	lb/yr							
Grader(s)	0.55	4.29	0.24	346.97	lb/day	1		7.1	55.7	3.2	4510.7	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	15	employees	0.5	0.6	0.1	674.6	lb/yr				40.0	per employee	0.00220462	lb/gram
Total								**24.4**	**283.2**	**13.7**	**26908.2**	**lb/yr**						2000	lb/ton
Total								**1.9**	**21.8**	**1.1**	**2069.9**	**lb/day**							
Erosion Control (Elkhorn+GGS)						24400	yd3						30.0	1626.7	48800.0	2218.2	22.0	days	
Mobile Sources														*assumes haul load=15 yd3					
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	2	trucks	128.3	1702.2	66.7	9037.0	lb/yr						0.00220462	lb/gram

GGS/Elkhorn Canal Relocation	*Work to occur during 2009 is assumed to be phased over 8 months (April - Nov)							*Assumes GGS and Elkhorn are constructed concurrently											
*assumes all activity to occur in Sacramento County																			
	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	1627	trips	43.5	30.0	0.1	824.5	lb/yr						0.00220462	lb/gram
Off-Highway Truck(s)	0.32	3.17	0.12	324.22	lb/day	2		14.3	139.3	5.2	14265.8	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	15	employees	0.8	1.0	0.1	1141.7	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	VMT/yr	-	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	48800	VMT/yr	-	-	13,779.9	-	lb/yr							
Total								**15.0**	**140.3**	**5.3**	**15407.4**	**lb/yr**						2000	lb/ton
Total								**0.7**	**6.4**	**0.2**	**700.3**	**lb/day**							
Irrigation Canal Abandonment (Elkhorn)						0	yd3						0.0	0.0	0.0	0.0	9.0	days	
Mobile Sources														*assumes haul load=15 yd3					
Loader(s)	0.48	3.77	0.21	307.16	lb/day	2		8.6	67.8	3.8	5528.8	lb/yr							
Compactor(s)	0.69	4.31	0.37	352.66	lb/day	2		12.3	77.6	6.6	6347.9	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	15	employees	0.3	0.4	0.0	467.0	lb/yr				40.0	per employee	0.00220462	lb/gram
Total								**21.3**	**145.8**	**10.5**	**12343.8**	**lb/yr**						2000	lb/ton
Total								**2.4**	**16.2**	**1.2**	**1371.5**	**lb/day**							
Reclamation (GGS)						0	yd3						0.0	0.0	0.0	0.0	35.0	days	
Mobile Sources														*assumes haul load=15 yd3					
Backhoe(s)	0.22	1.49	0.08	312.85	lb/day	2		4.0	26.8	1.4	5631.2	lb/yr							
Water Truck(s)	0.11	1.39	0.05	162.82	lb/day	2		1.9	25.1	1.0	2930.7	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	15	employees	1.2	1.5	0.2	1816.3	lb/yr				40.0	per employee	0.00220462	lb/gram
Total								**7.1**	**53.5**	**2.6**	**10378.2**	**lb/yr**						2000	lb/ton
Total								**0.2**	**1.5**	**0.1**	**296.5**	**lb/day**							
Demobilization/Cleanup (Elkhorn+GGS)						0	yd3						0.0	0.0	0.0	0.0	3.0	days	
Mobile Sources														*assumes haul load=15 yd3					
Loader(s)	1.24	3.13	0.32	312.85	lb/day	1		11.1	28.2	2.9	2815.6	lb/yr							
Truck(s)	0.11	1.39	0.05	162.82	lb/day	5		4.7	62.7	2.5	7326.7	lb/yr							
Employee Trips	0.49	4.43	0.19	335.60	g/mile	15	employees	2.0	17.6	0.7	1331.8	lb/yr				40.0	per employee	0.00220462	lb/gram
Total								**17.8**	**108.5**	**6.1**	**11474.1**	**lb/yr**						2000	lb/ton
Total								**5.9**	**36.2**	**2.0**	**3824.7**	**lb/day**							
2009 calendar year																			
Total from GGS_Elkhorn Canal								**0.7**	**6.4**	**0.7**	**597.0**	**TPY**	to occur during 2009 calendar year						
Total from GGS_Elkhorn Canal								**8.8**	**75.1**	**113.0**	**-**	**Worst-case lb/day**							

NEMDC	*Work to occur during 2009 is assumed to be phased over 8 months (April - Nov)																		
*assumes all activity to occur in Sacramento County																			
	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
Cutoff Wall Construction																			
[1]Clearing and Grubbing/Stripping/Paving Removal						0	yd3						0.0	0.0	5.0	5.0	10.0	days	
Mobile Sources														*assumes haul load=14 yd3		*assumes haul trucks drive 5 miles each day			
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	15	trucks	2.0	26.2	1.0	3055.5	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	150	trips	4.0	2.8	0.0	76.0	lb/yr						0.00220462	lb/gram
Grinder(s)	0.69	5.45	0.30	443.67	lb/day	0.2		1.4	10.9	0.6	887.3	lb/yr	*operates 2 days						
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	15		75.9	725.5	29.3	61431.6	lb/yr							
Loader(s)	0.48	3.77	0.21	307.16	lb/day	4		19.2	150.7	8.5	12286.3	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	25	employees	0.6	0.7	0.1	864.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	trucks	-	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	15	trucks	-	-	211.8	-	lb/yr							
Total								**103.1**	**916.7**	**251.3**	**78601.7**	**lb/yr**						2000	lb/ton
Total								**10.3**	**91.7**	**25.1**	**7860.2**	**lb/day**							

NEMDC	*Work to occur during 2009 is assumed to be phased over 8 months (April - Nov)																		
*assumes all activity to occur in Sacramento County																			
	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
[2,3]Cutoff Wall Construction/Levee Crown Restoration					East Side	167000	yd3						3.0	11928.6	35785.7	477.1	75.0	days	
Mobile Sources														*assumes haul load=14 yd3					
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	6		218.0	1680.7	97.5	145899.9	lb/yr							
Paver(s)	0.93	5.43	0.47	352.66	lb/day	1.00		0.9	0.0	0.4	0.0	lb/yr	*operates 1 day						
Roller(s)	0.74	4.43	0.38	318.53	lb/day	3		165.7	996.3	85.5	71670.1	lb/yr							
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	18	trucks	94.1	1248.3	48.9	1943.9	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	11929	trips	319.3	219.9	0.4	6046.4	lb/yr						0.00220462	lb/gram
Loader(s)	0.48	3.77	0.21	307.16	lb/day	8		288.0	2260.0	127.3	184294.6	lb/yr							
Other Equipment	0.69	4.31	0.37	352.66	lb/day	6		308.7	1940.5	165.5	158698.2	lb/yr							
Grader(s)	0.55	4.29	0.24	346.97	lb/day	3		123.4	964.6	54.6	78069.3	lb/yr							
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	2		48.7	474.9	17.6	48633.3	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	25	employees	4.4	5.5	0.7	6486.7	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	VMT/yr	-	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	35786	VMT/yr	-	-	10,105.0	-	lb/yr							
Total								**1570.3**	**9790.7**	**10703.0**	**701742.4**	**lb/yr**						2000	lb/ton
Total								**20.9**	**130.5**	**142.7**	**9356.6**	**lb/day**							
[4]Demobilization						0	yd3						0.1	0.0	5.0	5.0	12.0	days	
Mobile Sources														*assumes haul load=14 yd3		*assumes trucks drive 5 miles/day			
Off-Highway Truck(s)	0.32	3.17	0.12	324.22	lb/day	4		15.6	152.0	5.6	15562.7	lb/yr							
Loader(s)	0.48	3.77	0.21	307.16	lb/day	1		5.8	45.2	2.5	3685.9	lb/yr							
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	2		0.3	4.2	0.2	488.9	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	24	trips	0.6	0.4	0.0	12.2	lb/yr						0.00220462	lb/gram
Employee Trips	0.03	0.03	0.00	39.23	g/mile	25	employees	0.7	0.9	0.1	1037.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	120	VMT/yr	-	-	107.7	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	0	VMT/yr	-	-	-	-	lb/yr							
Total								**17.2**	**157.5**	**113.6**	**17101.6**	**lb/yr**						2000	lb/ton
Total								**1.4**	**13.1**	**9.5**	**1425.1**	**lb/day**							
Levee Slope Flattening & Widening																			
[1]Clearing and Grubbing/Stripping						0	yd3						0.0	0.0	5.0	5.0	30.0	days	
Mobile Sources														*assumes haul load=14 yd3		*assumes haul trucks drive 5 miles each day			
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	2	trucks	0.8	10.5	0.4	1222.2	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	60	trips	1.6	1.1	0.0	30.4	lb/yr						0.00220462	lb/gram
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	1		9.7	31.7	1.2	3242.2	lb/yr							
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	2		30.4	290.2	11.7	24572.6	lb/yr							
Loader(s)	0.48	3.77	0.21	307.16	lb/day	1		14.4	113.0	6.4	9214.7	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	25	employees	1.7	2.2	0.3	2594.7	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	trucks	-	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	15	trucks	-	-	635.3	-	lb/yr							
Total								**58.6**	**448.6**	**655.3**	**40876.9**	**lb/yr**						2000	lb/ton
Total								**2.0**	**15.0**	**21.8**	**1362.6**	**lb/day**							
[2,3]Levee Raiseing/Slope Flattening/Widening/Borrow Site Excavation					East Side	225000	yd3						3.0	16071.4	48214.3	567.2	85.0	days	
Mobile Sources														*assumes haul load=14 yd3					
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	1		41.2	317.5	18.4	27558.9	lb/yr							
Scraper(s)	0.51	4.84	0.20	409.54	lb/day	3		129.0	1233.3	49.8	104433.6	lb/yr							
Haul Truck(s)	1.19	15.82	0.62	1847.96	g/mile	1	trucks	126.8	1681.8	65.9	2310.9	lb/yr						0.00220462	lb/gram
Haul Truck(s)	12.14	8.36	0.02	229.92	g/trip	16071	trips	319.3	219.9	0.4	6046.4	lb/yr						0.00220462	lb/gram
Loader(s)	0.48	3.77	0.21	307.16	lb/day	1		40.8	320.2	18.0	26108.4	lb/yr							
Dozer(s)	0.49	4.43	0.19	335.60	lb/day	2		83.7	753.7	32.1	57051.7	lb/yr							
Roller(s)	0.74	4.43	0.38	318.53	lb/day	1		62.6	376.4	32.3	27075.4	lb/yr							
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	2		55.2	538.2	19.9	55117.8	lb/yr							

NEMDC	*Work to occur during 2009 is assumed to be phased over 8 months (April - Nov)																		
*assumes all activity to occur in Sacramento County																			
	ROG	NOX	PM10	CO2	Unit	Quantity	Unit	ROG	NOX	PM10	CO2	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
Employee Trips	0.03	0.03	0.00	39.23	g/mile	25	employees	4.9	6.2	0.8	7351.5	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																			
Travel on unpaved roads	-	-	0.90	-	lb/VMT	0	VMT/yr	-	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	-	lb/VMT	48214	VMT/yr	-	-	13,614.5	-	lb/yr							
Total								**863.5**	**5447.2**	**13852.2**	**313054.6**	**lb/yr**						2000	lb/ton
Total								**10.2**	**64.1**	**163.0**	**3683.0**	**lb/day**							
[4]Finish Grading						0	yd3						0.0	0.0	0.0	0.0	10.0	days	
Mobile Sources														*assumes haul load=14 yd3					
Water Truck(s)	0.32	3.17	0.12	324.22	lb/day	1		3.2	31.7	1.2	3242.2	lb/yr							
Grader(s)	0.55	4.29	0.24	346.97	lb/day	1		5.5	42.9	2.4	3469.7	lb/yr							
Excavator(s)	0.48	3.73	0.22	324.22	lb/day	1		4.8	37.3	2.2	3242.2	lb/yr							
Employee Trips	0.03	0.03	0.00	39.23	g/mile	25	employees	0.6	0.7	0.1	864.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Total								**14.2**	**112.6**	**5.9**	**10819.1**	**lb/yr**						2000	lb/ton
Total								**1.4**	**11.3**	**0.6**	**1081.9**	**lb/day**							
2009 calendar year																			
Total from NEMDC								**1.3**	**8.4**	**12.8**	**581.1**	**TPY**	to occur during 2009 calendar year						
Total from NEMDC								**31.1**	**194.6**	**305.7**	**-**	**Worst-case lb/day**							

Construction Emissons Mitigation Fee Calculation

PART 1: PROJECT INFORMATION

Project Name:	SAFCA - Phase 3 - 2009 NLIP Construction Emissions within SMAQMD's Jurisdiction
Control/Application #:	

Single Family Dwelling Units:		*Note: Enter information only in blue bordered cells*	
Multi Family Dwelling Units:		Total Residential Acreage:	
Non-residential Square Feet:		Total Non-residential Acreage:	

PART 2: EMISSIONS INFORMATION

Year	Activity Phase	NOx (lbs/day) unmitigated	NOx (lbs/day) mitigated*	NOx over threshold (lbs/day)	duration (days)	Total significant NOx (lbs)
2009	SEL	353.70	282.96	197.96	140	27714.67
2009	Elkhorn_GGS	75.10	60.08	0	56	0.00
2009	NEMDC	194.63	155.70	70.70	75	5302.68
	Total project Nox over threshold (lbs)		*33017.35*			
	Total project Nox over threshold (tons)		*16.51*			

PART 3: MITIGATION FEE RESULTS

TOTAL MITIGATION FEE ($16,000/TON)*	***$264,139***
Administrative Fee (5%)	***$13,207***
TOTAL MITIGATION FEE	***$277,346***

>>> *Fee is to be paid to the SMAQMD prior to any ground disturbance either in total or on a by acre basis.*

Mitigation Fee ($/acre)	**-**

* Assumes a construction mitigation plan which achieves a 20% reduction in NOx from on-site, off-road equipment.

** Or the $/ton of NOx cost-effectiveness value in effect at the time the fee is collected.

Alternative 1

Unmitigated 2009 Emissions

Sutter County	Worst-Case lb/day			Worst-Case TPY			
	ROG	NOX	PM10	ROG	NOX	PM10	CO2
TOTAL	78.5	516.6	3885.4	7.8	54.7	377.1	2740.9

Sacramento County	Worst-Case lb/day			Worst-Case TPY			
	ROG	NOX	PM10	ROG	NOX	PM10	CO2
TOTAL	98.2	623.4	5133.1	6.3	40.4	356.0	1871.8

Mitigated 2009 Emissions

Sutter County	Worst-Case lb/day			Worst-Case TPY			
	ROG	NOX	PM10	ROG	NOX	PM10	CO2
% Reduction	5%	20%	75%	5%	20%	75%	-
TOTAL	74.6	413.3	971.4	7.4	43.7	94.3	-
Threshold	25	25	80	25	25	-	-
Significant?	Y	Y	Y	N	Y	-	-

Sacramento County	Worst-Case lb/day			Worst-Case TPY			
	ROG	NOX	PM10	ROG	NOX	PM10	CO2
% Reduction	5%	20%	75%	5%	20%	75%	-
TOTAL	93.3	498.7	1283.3	5.9	32.3	89.0	-
Threshold	-	85	-	25	25	100	-
Significant?	-	Y	Y	N	Y	N	-

*PM10 emissions would likely result in or substantially contribute to a violation of the CAAQS (50 ug/m3)

*Post-construction mitigation fee payment = N

Alternative 2

% change borrow material relative to Alt 1	-45%

% change haul trips relative to Alt 1	-40%

Unmitigated 2009 Emissions

Sutter County	Worst-Case lb/day			Worst-Case TPY			
	ROG	NOX	PM10	ROG	NOX	PM10	CO2
TOTAL	43.2	284.1	2137.0	4.3	30.1	207.4	1507.5

Sacramento County	Worst-Case lb/day			Worst-Case TPY			
	ROG	NOX	PM10	ROG	NOX	PM10	CO2
TOTAL	54.0	342.9	2823.2	3.4	22.2	195.8	1029.5

Mitigated 2009 Emissions

Sutter County	Worst-Case lb/day			Worst-Case TPY			
	ROG	NOX	PM10	ROG	NOX	PM10	CO2
% Reduction	5%	20%	75%	5%	20%	75%	-
TOTAL	41.0	227.3	534.2	4.1	24.0	51.9	-
Threshold	25	25	80	25	25	-	-
Significant?	Y	Y	Y	N	N	-	-

Sacramento County	Worst-Case lb/day			Worst-Case TPY			
	ROG	NOX	PM10	ROG	NOX	PM10	CO2
% Reduction	5%	20%	75%	5%	20%	75%	-
TOTAL	51.3	274.3	705.8	3.3	17.8	49.0	-
Threshold	-	85	-	25	25	100	-
Significant?	-	Y	Y	N	N	N	-

*PM10 emissions would likely result in or substantially contribute to a violation of the CAAQS (50 ug/m3)

Conformity: Regionally Significant Thresholds Calculations

2006 Estimated Annual Average Emissions

SACRAMENTO COUNTY

ROG	CO	NOX	PM10	
64.4	**365.95**	**81.78**	**44.43**	ton/day
23506.00	133571.8	29849.70	16216.95	tpy
2350.60	13357.18	2984.97	1621.70	10% of total

SUTTER COUNTY

ROG	CO	NOX	PM10	
10.34	**43.06**	**20.27**	**14.45**	ton/day
3774.10	15716.90	7398.55	5274.25	tpy
377.41	1571.69	739.86	527.43	10% of total

Equipment Type	Emission Rates for Year 2009									
	ROG	NOX	PM10	CO2	Unit	ROG	NOX	PM10	CO2	Unit
Employee Light-Duty Trucks	0.026	0.033	0.004	39.231	lb/day/employee					
Haul Trucks	1.19	15.82	0.62	1847.96	g/mile	12.14	8.36	0.02	229.92	g/trip
Backhoes	0.2213	1.4909	0.0779	312.8458	lb/day					
Bore/Drill Rigs	0.2148	2.7743	0.0877	426.6079	lb/day					
Concrete/Industrial Saws	0.5200	3.3866	0.2001	415.2317	lb/day					
Cranes	0.2729	2.6974	0.1045	244.5885	lb/day					
Crawler Tractors	0.5212	4.8719	0.2034	369.7268	lb/day					
Crushing/Proc. Equipment	0.6892	5.4543	0.3030	443.6719	lb/day					
Dozer	0.4924	4.4337	0.1889	335.5979	lb/day					
Excavator	0.4846	3.7349	0.2166	324.2221	lb/day					
Forklifts, Rough Terrain	0.7685	4.5324	0.4144	341.2863	lb/day					
Grader	0.5486	4.2871	0.2425	346.9745	lb/day					
Loaders, Rubber Tired	0.4801	3.7667	0.2122	307.1577	lb/day					
Off-Highway Trucks	0.3245	3.1661	0.1170	324.2222	lb/day					
Other Construction Equip.	0.6859	4.3122	0.3678	352.6626	lb/day					
Pavers	0.9293	5.4283	0.4711	352.6623	lb/day					
Paving Equipment	0.7885	4.6169	0.3992	301.4696	lb/day					
Rollers	0.7364	4.4281	0.3800	318.5338	lb/day					
Scraper	0.5061	4.8366	0.1955	409.5437	lb/day					
Signal Boards	2.0363	4.6463	0.4849	443.6722	lb/day					
Skid Steer Loaders	1.2375	3.1296	0.3184	312.8459	lb/day					
Surfacing Equipment	0.2415	2.6507	0.0953	255.9647	lb/day					
Tractors	0.2213	1.4909	0.0779	312.8458	lb/day					
Trenchers	1.1030	6.5422	0.5508	426.6081	lb/day					
Water Trucks	0.11	1.39	0.05	162.82	lb/day					
Fugitive Dust			10		lb/acre/day					

Assumptions: Emission factors from the Road Construction Emissions Model, Version 6.3 (SMAQMD 2008) for model year 2009 which assumes equipment operates 8hrs/day

Travel on Unpaved Haul Roads (Heavy Duty Trucks):		
E(lbs/VMT)=(k)(s/12)^a (W/3)^b	*AP-42 12/03, 13.2.2-4 eq 1a	
Where:	**PM10**	
k=Particle Size Multiplier:	1.5	*AP-42 12/03 Table 13.2.2-2; PM10 emissions; industrial roads
s=Silt Content:	4.3	*AP-42 12/03 Table 13.2.2-1, service road
empirical constants		
a	0.9	*AP-42 12/03 Table 13.2.2-2; PM10 emissions; industrial roads
b	0.45	*AP-42 12/03 Table 13.2.2-2; PM10 emissions; industrial roads
W=Vehicle Weight:	11.375	((2+1.25 T/cy*15 cy truck capacity) + 2)/2 (average weight of loaded and unloaded haul truck; assumed empty truck weighs 2 tons)
	1.08	lbs/VMT
E(ext)= E[(365-P)/365]	*AP-42 12/03 12.2.2-4 eq 2	
Where:		

P=# days/yr with >=0.01 in. precip	63	*AP-42 12/03 Figure 13.2.2-1 for Sacramento Co/NOAA Technical Memorandum NWS WR-272; CLIMATE OF SACRAMENTO, CALIFORNIA (June 2005)
	0.90	lbs/VMT
Travel on Paved Haul Roads (Heavy Duty Trucks):		
E(lbs/VMT)=(k) (sL/2)^.65 (W/3)^1.5 - C	*AP-42 12/03, 13.2.1-4 eq 1	
Where:	**PM10**	
k=Particle Size Multiplier (lb/VMT)	0.016	*AP-42 12/03 Table 13.2.1-1; PM10 emissions; industrial roads
sL=road surface silt loading (g/m2)	8.2	*AP-42 12/03 Table 13.2.1-4; quarry roads
W=Vehicle Weight:	11.375	((2+1.25 T/cy*15 cy truck capacity) + 2)/2 (average weight of loaded and unloaded haul truck; assumed empty truck weighs 2 tons)
C=exhaust, break, tire wear (lb/VMT)	0.00047	*AP-42 12/03 Table 13.2.1-2; PM10 emissions
	0.30	lbs/VMT
E(ext)= E[1-(P/4N)]	*AP-42 12/03 13.2.1 eq 2	
Where:		
P=# days/yr with >=0.01 in. precip	63	*AP-42 12/03 Figure 13.2.2-1 for Sacramento Co/NOAA Technical Memorandum NWS WR-272; CLIMATE OF SACRAMENTO, CALIFORNIA (June 2005)
N=number of days in averaging period	365	
	0.28	lbs/VMT
Fugitive Dust Source Emissions		
	(lb/acre/day)	
Disturbance Area	60.71	
Assumptions: SMAQMD emission factor of 60.71 lbs/acre/day (SMAQMD 1994).		
Aggregate Storage Piles		
Emissions result from several distinct processes within the stockpiling cycle: 1. loading in of materials through batch or drop operations, 2. equipment traffic in storage area, 3. wind erosion of piles, 4. loadout of material through batch or drop operations (AP-42 12/03, chapt. 13.2.4).		
E(lb/ton)=(k)(0.0032)(U/5)^1.3 /(M/2)^1	*AP-42 12/03, 13.2.4-3 eq 1	
Where:	**PM10**	
k=Particle Size Multiplier:	0.35	*AP-42 12/03 13.2.4-3; PM10 emissions
U=mean wind speed (mph)	8	*NOAA Western Regional Climate Center, Sacramento International Airport ASOS station, CA RAWS data from 1996-2006 (http://www.wrcc.dri.edu/htmlfiles/westwind.final.html#CALIFORNIA)
M=moisture content (%):	2.4	*AP-42 7/98 Table 11.9-3, haul truck
	0.002	lbs/ton
Batch Loading at Borrow Area		
E(TSP<15 um)=(.119/(M^0.9))	*AP-42 7/98, Table 11.9-1	
Where:	**PM10**	
M=moisture content (%):	2.4	*AP-42 7/98 Table 11.9-3, haul truck
	0.05	lb/ton
*E(TSP<10um)=(E(TSP<15 um)*S)*	*AP-42 7/98, Table 11.9-1	
S=scaling factor	0.75	*AP-42 7/98 Table 11.9-3, haul truck
	0.04	lb/ton

Truck Unloading										
E(TSP<15 um)	**PM10**									
Where:	**0.007**	lb/ton	*AP-42 7/98 Table 11.9-4, end dump truck unloading (batch drop)							
*E(TSP<10um)=(E(TSP<15 um)*S)*	*AP-42 7/98, Table 11.9-1									
S=scaling factor	0.75	*AP-42 7/98 Table 11.9-1, haul truck								
	0.005	lb/ton								
Bulldozing	**PM10**									
E(TSP<15 um)=(18.6(s)^1.5)/(M^1.4)	*AP-42 7/98, Table 11.9-1									
Where:										
M=moisture content (%):	7.9	*AP-42 7/98 Table 11.9-3, bulldozer								
s=silt content (%)	6.9	*AP-42 7/98 Table 11.9-3, bulldozer								
	18.67	lb/hr								
*E(TSP<10um)=(E(TSP<15 um)*S)*	*AP-42 7/98, Table 11.9-1									
S=scaling factor	0.75	*AP-42 7/98 Table 11.9-1, bulldozer								
	14.00	lb/hr								
Scraper Unloading	**PM10**									
E(TSP<15 um)	**0.04**	lb/ton	*AP-42 7/98 Table 11.9-4, scraper unloading							
*E(TSP<10um)=(E(TSP<15 um)*S)*	*AP-42 7/98, Table 11.9-1									
S=scaling factor	0.75	*AP-42 7/98 Table 11.9-1, bulldozer/haul truck								
	0.03	lb/ton								

APPENDIX F

Noise Modeling Results

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Clearing and Grubbing/Stripping

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	74.6
	200	66.7
	300	62.0
	400	58.7
	500	56.2
	600	54.1
	700	52.3
	800	50.8
	900	49.5
	1000	48.3
	1100	47.2
	1200	46.2

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dozer	85	0.4
Front End Loader	80	0.4
Water Truck	75	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Dozer	81.0
Front End Loader	76.0
Water Truck	71.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
82.5

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log (U.F.) - 20*\log (D/50) - 10*G*\log (D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Dewatering

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	80.9
	200	73.0
	300	68.3
	400	65.0
	500	62.5
	600	60.4
	700	58.6
	800	57.1
	900	55.8
	1000	54.6
	1100	53.5
	1200	52.5

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Crane	85	0.16
Generator	82	0.5
Impact Pile Driver	95	0.2

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Crane	77.0
Generator	79.0
Impact Pile Driver	88.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.8

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log (U.F.) - 20*\log (D/50) - 10*G*\log (D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Excavation

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	76.3
	200	68.4
	300	63.8
	400	60.5
	500	57.9
	600	55.8
	700	54.1
	800	52.5
	900	51.2
	1000	50.0
	1100	48.9
	1200	47.9

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Excavator	85	0.4
Front End Loader	80	0.4
Dump Truck	84	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Excavator	81.0
Front End Loader	76.0
Dump Truck	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.3

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Foundation Construction

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	80.9
	200	73.0
	300	68.3
	400	65.0
	500	62.5
	600	60.4
	700	58.6
	800	57.1
	900	55.8
	1000	54.6
	1100	53.5
	1200	52.5

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Generator	82	0.5
Crane	85	0.16
Impact Pile Driver	95	0.2

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Generator	79.0
Crane	77.0
Impact Pile Driver	88.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.8

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log (U.F.) - 20*\log (D/50) - 10*G*\log (D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Concrete Construction

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	75.8
	200	67.9
	300	63.3
	400	60.0
	500	57.4
	600	55.3
	700	53.6
	800	52.0
	900	50.7
	1000	49.5
	1100	48.4
	1200	47.4

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Generator	82	0.5
Concrete Pump Truck	82	0.2
Concrete Mixer Truck	85	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Generator	79.0
Concrete Pump Truck	75.0
Concrete Mixer Truck	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
83.8

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log (U.F.) - 20*\log (D/50) - 10*G*\log (D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Pipeline Construction

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	75.0
	200	67.1
	300	62.5
	400	59.2
	500	56.6
	600	54.5
	700	52.8
	800	51.2
	900	49.9
	1000	48.7
	1100	47.6
	1200	46.6

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Excavator	85	0.4
Crane	85	0.16
Compactor (ground)	80	0.2

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Excavator	81.0
Crane	77.0
Compactor (ground)	73.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
82.9

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log (U.F.) - 20*\log (D/50) - 10*G*\log (D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Backfill and Finish Grading

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	76.7
	200	68.8
	300	64.2
	400	60.9
	500	58.3
	600	56.2
	700	54.5
	800	53.0
	900	51.6
	1000	50.4
	1100	49.3
	1200	48.3

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Front End Loader	80	0.4
Dozer	85	0.4
Grader	85	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Front End Loader	76.0
Dozer	81.0
Grader	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.7

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log (U.F.) - 20*\log (D/50) - 10*G*\log (D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Electrical and Mechanical Equipment Installation

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold*	100	73.2
	200	65.3
	300	60.6
	400	57.4
	500	54.8
	600	52.7
	700	51.0
	800	49.4
	900	48.1
	1000	46.9
	1100	45.8
	1200	44.8

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Crane	85	0.16
Pickup Truck	55	0.4
Generator	82	0.5

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Crane	77.0
Pickup Truck	51.0
Generator	79.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
81.1

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log (U.F.) - 20*\log (D/50) - 10*G*\log (D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Erosion Control

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	74.4
	200	66.4
	300	61.8
	400	58.5
	500	55.9
	600	53.9
	700	52.1
	800	50.6
	900	49.2
	1000	48.0
	1100	46.9
	1200	45.9

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Drum Mixer	80	0.5
Generator	82	0.5
Hydroseed Truck	80	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Drum Mixer	77.0
Generator	79.0
Hydroseed Truck	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
82.3

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log (U.F.) - 20*\log (D/50) - 10*G*\log (D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Phase 2 Demobilization and Clean Up

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold*	100	73.6
	200	65.6
	300	61.0
	400	57.7
	500	55.1
	600	53.1
	700	51.3
	800	49.8
	900	48.4
	1000	47.2
	1100	46.1
	1200	45.1

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Pickup Truck	55	0.4
Front End Loader	80	0.4
Flat Bed Truck	84	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Pickup Truck	51.0
Front End Loader	76.0
Flat Bed Truck	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
81.5

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F
Haul Truck Trips
Sutter Pointe Borrow Site

Assumptions:	
Mean SEL Reference Level	84.0
Assumed Haul Truck Speed (mph)	25.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	15.0
Amount of Haul Material	1,600,000.0
Number of Haul Days	100.0
Amount of Daily Haul Material	16,000.0
Amount of Hourly Haul Material	1,600.0
Number of Trips per Hour-one way	213.3
Leq for Haul Trips at 50 feet	67.2

Appendix F
Haul Truck Trips
Dunmore Borrow Site

Assumptions:	
Mean SEL Reference Level at 50 feet	84.0
Assumed Haul Truck Speed (mph)	25.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	15.0
Amount of Haul Material	1,000,000.0
Number of Haul Days	100.0
Amount of Daily Haul Material	10,000.0
Amount of Hourly Haul Material	1,000.0
Number of Trips per Hour-one way	133.3
Leq for Haul Trips at 50 feet	65.1

Appendix F
Haul Truck Trips
Pacific Terrace Borrow Site

Assumptions:	
Mean SEL Reference Level at 50 feet	84.0
Assumed Haul Truck Speed (mph)	25.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	15.0
Amount of Haul Material	550,000.0
Number of Haul Days	31.0
Amount of Daily Haul Material	17,741.9
Amount of Hourly Haul Material	1,774.2
Number of Trips per Hour-one way	236.6
Leq for Haul Trips at 50 feet	67.6

Appendix F
Haul Truck Trips
Krumenacher Borrow Site

Assumptions:	
Mean SEL Reference Level at 50 feet	84.0
Assumed Haul Truck Speed (mph)	25.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	15.0
Amount of Haul Material	450,000.0
Number of Haul Days	100.0
Amount of Daily Haul Material	4,500.0
Amount of Hourly Haul Material	450.0
Number of Trips per Hour-one way	60.0
Leq for Haul Trips at 50 feet	61.7

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Clearing and Grubbing/Stripping

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	74.6
	200	66.7
	300	62.0
	400	58.7
	500	56.2
	600	54.1
	700	52.3
	800	50.8
	900	49.5
	1000	48.3
	1100	47.2
	1200	46.2

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dozer	85	0.4
Front End Loader	80	0.4
Water Truck	75	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Dozer	81.0
Front End Loader	76.0
Water Truck	71.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
82.5

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log (U.F.) - 20*\log (D/50) - 10*G*\log (D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Levee Degrading

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	76.7
	200	68.8
	300	64.2
	400	60.9
	500	58.3
	600	56.2
	700	54.5
	800	53.0
	900	51.6
	1000	50.4
	1100	49.3
	1200	48.3

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Scraper	85	0.4
Front End Loader	80	0.4
Dozer	85	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Scraper	81.0
Front End Loader	76.0
Dozer	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.7

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Demolish Canal and Tree Removal

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	76.3
	200	68.4
	300	63.8
	400	60.5
	500	57.9
	600	55.8
	700	54.1
	800	52.5
	900	51.2
	1000	50.0
	1100	48.9
	1200	47.9

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Excavator	85	0.4
Front End Loader	80	0.4
Dump Truck	84	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Excavator	81.0
Front End Loader	76.0
Dump Truck	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.3

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Cutoff Wall Construction

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	76.1
	200	68.2
	300	63.6
	400	60.3
	500	57.7
	600	55.7
	700	53.9
	800	52.4
	900	51.0
	1000	49.8
	1100	48.7
	1200	47.7

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Generator	82	0.5
Excavator	85	0.4
Soil Mix Drill Rig	80	0.5

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Generator	79.0
Excavator	81.0
Soil Mix Drill Rig	77.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.1

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Borrow Site Excavation

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	76.3
	200	68.4
	300	63.8
	400	60.5
	500	57.9
	600	55.8
	700	54.1
	800	52.5
	900	51.2
	1000	50.0
	1100	48.9
	1200	47.9

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Excavator	85	0.4
Front End Loader	80	0.4
Dump Truck	84	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Excavator	81.0
Front End Loader	76.0
Dump Truck	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.3

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Levee Raising

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	75.7
	200	67.8
	300	63.1
	400	59.8
	500	57.3
	600	55.2
	700	53.4
	800	51.9
	900	50.5
	1000	49.3
	1100	48.3
	1200	47.3

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Front End Loader	80	0.4
Roller	85	0.2
Dozer	85	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Front End Loader	76.0
Roller	78.0
Dozer	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
83.6

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log (U.F.) - 20*\log (D/50) - 10*G*\log (D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Surface Drainage Outlets

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	75.7
	200	67.8
	300	63.1
	400	59.8
	500	57.3
	600	55.2
	700	53.4
	800	51.9
	900	50.6
	1000	49.3
	1100	48.3
	1200	47.3

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Backhoe	80	0.4
Paver	85	0.5
Concrete Pump Truck	82	0.2

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Backhoe	76.0
Paver	82.0
Concrete Pump Truck	75.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
83.6

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Construct Relief Wells and Drainage Canals

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold*	100	73.7
	200	65.8
	300	61.1
	400	57.8
	500	55.3
	600	53.2
	700	51.4
	800	49.9
	900	48.6
	1000	47.4
	1100	46.3
	1200	45.3

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Drill Rig Truck	84	0.2
Roller	85	0.2
Concrete Pump Truck	82	0.2

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Drill Rig Truck	77.0
Roller	78.0
Concrete Pump Truck	75.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
81.6

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log (U.F.) - 20*\log (D/50) - 10*G*\log (D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Project-Generated Construction Source Noise Prediction Model

SAFCA - Site Restoration and Demobilization

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	75.9
	200	68.0
	300	63.3
	400	60.0
	500	57.5
	600	55.4
	700	53.6
	800	52.1
	900	50.8
	1000	49.6
	1100	48.5
	1200	47.5

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dump Truck	84	0.4
Flat Bed Truck	84	0.4
Hydroseed Truck	80	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Dump Truck	80.0
Flat Bed Truck	80.0
Hydroseed Truck	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
83.8

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

SAFCA Levee Improvement Project
Levee Work
Summary of Predicted Action Noise Levels

		Distance to Noise Contours in feet	
Action	**Leq**	**50 dBA Contour**	**45 dBA Contour**
SAFCA - Clearing and Grubbing/Stripping	74.6	1698.8	3021.0
SAFCA - Levee Degrading	76.7	2172.6	3863.4
SAFCA - Demolish Canal and Tree Removal	76.3	2073.9	3687.9
SAFCA - Cutoff Wall Construction	76.1	2029.8	3609.5
SAFCA - Borrow Site Excavation	76.3	2073.9	3687.9
SAFCA - Levee Raising	75.7	1923.8	3421.1
SAFCA - Surface Drainage Outlets	75.7	1924.2	3421.7
SAFCA - Construct Relief Wells and Drainage Canals	73.7	1529.4	2719.6
SAFCA - Site Restoration and Demobilization	75.9	1970.2	3503.6

Appendix F
Haul Truck Trips
Sutter Pointe Borrow Site

Assumptions:	
Mean SEL Reference Level	84.0
Assumed Haul Truck Speed (mph)	25.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	15.0
Amount of Haul Material	1,600,000.0
Number of Haul Days	100.0
Amount of Daily Haul Material	16,000.0
Amount of Hourly Haul Material	1,600.0
Number of Trips per Hour-one way	213.3
Leq for Haul Trips at 50 feet	67.2

Appendix F
Haul Truck Trips
Dunmore Borrow Site

Assumptions:	
Mean SEL Reference Level at 50 feet	84.0
Assumed Haul Truck Speed (mph)	25.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	15.0
Amount of Haul Material	1,000,000.0
Number of Haul Days	100.0
Amount of Daily Haul Material	10,000.0
Amount of Hourly Haul Material	1,000.0
Number of Trips per Hour-one way	133.3
Leq for Haul Trips at 50 feet	65.1

Appendix F
Haul Truck Trips
Pacific Terrace Borrow Site

Assumptions:	
Mean SEL Reference Level at 50 feet	84.0
Assumed Haul Truck Speed (mph)	25.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	15.0
Amount of Haul Material	550,000.0
Number of Haul Days	31.0
Amount of Daily Haul Material	17,741.9
Amount of Hourly Haul Material	1,774.2
Number of Trips per Hour-one way	236.6
Leq for Haul Trips at 50 feet	67.6

Appendix F
Haul Truck Trips
Krumenacher Borrow Site

Assumptions:	
Mean SEL Reference Level at 50 feet	84.0
Assumed Haul Truck Speed (mph)	25.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	15.0
Amount of Haul Material	450,000.0
Number of Haul Days	100.0
Amount of Daily Haul Material	4,500.0
Amount of Hourly Haul Material	450.0
Number of Trips per Hour-one way	60.0
Leq for Haul Trips at 50 feet	61.7

APPENDIX G

SAFCA and Garden Highway Settlement Agreement

SETTLEMENT AGREEMENT

This Settlement Agreement ("Agreement" is made as of this 18th day of April 2008 by and between GARDEN HIGHWAY COMMUNITY ASSOCIATION, Inc., a California not-for-profit corporation ("GHCA"), and the Sacramento Area Flood Control Agency, a joint exercise of powers agency created by a Joint Exercise of Powers Agreement made pursuant to Government Code section 6500 *et seq.* ("SAFCA"). GHCA and SAFCA are referred to collectively herein as the "Parties" and each individually as a "Party."

RECITALS

A. The project at issue here is the Natomas Levee Improvement Program ("NLIP") Landside Improvements Project (the "Project"). It includes improvements to the Natomas Cross Canal south levee and the Sacramento River east levee, construction of a new Giant Garter Snake/Drainage Canal, relocation of a portion of the Natomas Mutual Water Company's Elkhorn Canal, and affiliated land recontouring and habitat creation, as more particularly described in the environmental impact report ("EIR") discussed below.

B. SAFCA is entrusted with the reduction of flood risk in the Sacramento region. It is the lead agency for the Project under the California Environmental Quality Act ("CEQA"); Public Resources Code section 21000 *et seq.*

C. GHCA is an incorporated association of landowners who reside in the "Project Area," as depicted and defined in Exhibit A hereto.

D. SAFCA analyzed a regional program of flood control improvements for the Sacramento area, which included improvements to Folsom Dam, the American River, and the South Streams Group, as well as the Natomas Levee Improvement Program (collectively the "Program"), in an Environmental Impact Report on Local Funding Mechanisms for

Comprehensive Flood Control Improvements for the Sacramento Area ("Local Funding EIR"). SAFCA certified the Local Funding EIR in February 2007. SAFCA intends for the Program to provide the Natomas Basin with at least a 100-year level of flood protection by the end of 2010 and a 200-year level of flood protection by the end of 2012.

E. SAFCA analyzed the Project, which is a part of the broader regional Program, in a separate Environmental Impact Report that is "tiered," within the meaning of CEQA, from the Local Funding EIR. The actions analyzed in the NLIP Landside EIR include land side improvements to the levee system in the Natomas Basin and related landscape modifications and drainage and infrastructure improvements, all to be undertaken between 2008 and 2010. The NLIP Landside EIR presents a project-level analysis of the 2008 construction components and a program-level analysis of the 2009-2010 elements. The 2009-2010 elements will require additional environmental review based on more detailed design plans.

F. On November 29, 2007, the SAFCA Board approved Resolution 07-105, which certified the environmental impact report prepared for the Natomas Levee Improvement Program Landside Improvements project; adopted findings and a statement of overriding considerations, mitigation measures, and a mitigation monitoring and reporting program; and approved the Natomas Levee Improvement Program Landside Improvements Project 2008 construction projects, consisting of the "Natomas Cross Canal Phase 2 Improvement Project" and the "Sacramento River East Levee Phase 1 Improvement Project (reaches 1 through 4b)."

G. On December 19, 2007, GHCA filed a Petition for Writ of Mandate and Complaint for Injunctive Relief ("Petition") in Sacramento Superior Court (Case No. 34-2007-00883632-CU-WM-GDS) against SAFCA. The Petition challenges SAFCA's approval of

the 2008 construction components and alleges that the NLIP Landside EIR does not comply with CEQA.

H. In January 2008, the United States Army Corps of Engineers ("USACE") completed a hydraulic analysis of the Natomas Basin, which found that the Natomas Basin has less than a 30-year level of flood protection.

I. On February 7, 2008, SAFCA filed its Answer to the Petition, and on February 19, 2008 SAFCA filed its Notification and Lodging of the Administrative Record. GCHA and SAFCA filed their Statements of Issues on March 7, 2008 and March 17, 2008, respectively.

J. Pursuant to stipulation of the Parties, in March 2008 GHCA and SAFCA engaged in two days of mediation. The mediation resulted in a stipulation for settlement, the majority of which is reproduced below as part of the final Settlement Agreement.

K. Accordingly, the Parties enter into this Agreement to address GHCA's concerns and allow the portion of the Project approved by Resolution 07-105 to proceed. Nevertheless, SAFCA intends to apply the design and construction practices set forth in Paragraphs 1 through 9, below, to the entirety of the Project, as applicable.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing recitals, which are hereby incorporated by reference, and of the mutual covenants set forth herein, and for other good and valuable consideration, the receipt and adequacy is hereby acknowledged, the Parties agree as follows:

1. Power Pole and Overhead Power Line Placement. To the extent that the main electrical power transmission lines and poles serving the Garden Highway must be relocated or replaced to accommodate the Project, the relocation or replacement shall occur east of the new

adjacent levee and in a manner that appropriately accommodates private land side improvements and properties. Existing main electrical power transmission lines and poles on the water side of the existing Garden Highway levee that do not need to be relocated or replaced to accommodate the Project may be left in place. No new main electrical power transmission lines and poles shall be installed on the water side of the Garden Highway levee.

Consistent with sound engineering practices that prioritize the following, individual service lines shall: (i) use existing configurations and facilities, and (ii) any new poles shall be placed on the land side of Garden Highway, subject to the approval of the United States Army Corps of Engineers ("USACE"), Central Valley Flood Protection Board ("CVFPB"), and any other regulatory public agencies and the utility companies.

SAFCA shall advocate power line and pole locations consistent with this provision to the USACE, CVFPB, and other regulatory agencies and utilities by way of one-time master letters, attached hereto as Exhibits B and C, approved as to form by the SAFCA Board as part of this Agreement and signed by the SAFCA Executive Director. These letters, attached as Exhibits B and C, have received the prior approval of GHCA's attorney.

If the property owner and SAFCA cannot agree on a location of an individual service line pole from among locations that are otherwise acceptable to the USACE, CVFPB, other regulatory agencies and the utility provider, SAFCA agrees to pay the cost of a referee, who is a qualified registered civil engineer and agreeable to both Parties, to decide the dispute over the location of the individual service line pole.

SAFCA agrees to provide working drawings sixty (60) days to GCHA's contact person designated pursuant to Paragraph 5, below, in advance of commencing construction of power poles and lines for which locations would be changed as part of the Project.

2. Removal of Encroachments and Existing Landscaping and Fencing. As part of this Agreement, the SAFCA Board directs the SAFCA Executive Director to write a letter, the approved form of which is attached hereto as Exhibit B, to the responsible regulatory agencies advocating SAFCA's project design, which requires minimal removal of encroachments. This letter, attached as Exhibit B, has received the prior approval of GHCA's attorney.

Once SAFCA determines that the Sacramento River east levee is certifiable for the Federal Emergency Management Agency's ("FEMA") flood protection purposes, SAFCA shall make its best efforts to get written agreement from the USACE, CVFPB, and Reclamation District 1000 ("RD1000") that no additional encroachments on the water side of the Garden Highway levee need to be removed.

3. Damage to Existing Wells, Septic Systems, Concrete Structures, etc. As part of the notice provided pursuant to Paragraph 8, below, SAFCA shall give property owners within the Project Area (see Exhibit A) an informational package, which shall have received the prior approval of Petitioner's attorney, advising the property owners that pre-project inspections of their properties are important and that SAFCA will conduct a free pre-construction inspection of the property, but only if requested by the property owner. The scope of the inspection and documentation will be determined by SAFCA in consultation with the property owner.

SAFCA will provide a copy of its February 2008 study entitled, "Evaluation of Potential Groundwater Impacts Due to Proposed Sacramento River East Levee Improvements with Emphasis on Reaches 2 & 3" to the GHCA contact person designated pursuant to Paragraph 5, below. If requested by a property owner within the Project Area, SAFCA will test the owner's domestic well water before and after Project construction for the presence of bentonite, concrete, and cement.

4. Drainage Lines. No roadside swales shall be included in the design of the new adjacent levee downstream of Power Line Road. Consistent with sound engineering practices, and subject to the approval of the USACE, CVFPB, and the Regional Water Quality Control Board ("RWQCB"), any new drainage outfall lines required by the Project shall be buried pipes, located along property lines, and drain to the river. If a property owner does not want a new drain line located along the property line, he or she may request that the drain line be placed elsewhere on his or her property.

SAFCA shall advocate the location, design, and outfall of the drain lines consistent with this provision to the USACE, CVFPB, and the RWQCB by way of one-time master letters, attached hereto as Exhibits B and D, approved as to form by the SAFCA Board as part of this Agreement and signed by the SAFCA Executive Director. These letters, attached as Exhibits B and D, have received the prior approval of GHCA's attorney.

If the property owner and SAFCA cannot agree on a location for a new drain line from among locations that are otherwise acceptable to the USACE, CVFPB, and the RWQCB, SAFCA agrees to pay the cost of a referee, who is a qualified registered civil engineer and agreeable to both parties, to decide the dispute over the location of the drain line.

5. Construction Monitoring. SAFCA agrees to cooperate with a construction monitoring committee established by GHCA to resolve reasonable complaints regarding SAFCA or its contractors' construction activities for the Projects improvements in accordance with this provision. Within fifteen (15) days of the Effective Date of this Agreement, GHCA shall notify SAFCA of the name of a contact person, who shall be a member of GHCA's construction monitoring committee, for purposes of having one contact point for communicating with SAFCA's Ombudsperson and keeping GHCA apprised of the construction schedule for the

Project pursuant to Paragraph 8, below. A complaint procedure and hierarchy shall be developed by the GHCA's contact person and SAFCA's Ombudsperson in time to be included in the informational packet referenced in Paragraph 3, above. In addition, the information packet will include SAFCA's instructions to its contractors regarding appropriate use of the Garden Highway. SAFCA agrees to resolve all complaints pertaining to dangerous activities immediately and to resolve all other reasonable complaints in an expeditious manner.

SAFCA shall prohibit the use of earth moving equipment or haul trucks on the Garden Highway in conjunction with the Project.

6. Relocation. Where a property owner occupies a residence on property to be acquired for the Project, SAFCA will allow up to twelve (12) months, rather that the statutory allowance of three (3) months, for the owner to relocate off the property. The 12 month period shall be counted from the first written offer.

7. Study of Improving Flood Conveyance in Yolo Bypass. SAFCA agrees to provide GHCA with documents prepared by SAFCA synthesizing information gathered by USACE, CVFPB, DWR, and SAFCA regarding the feasibility of increasing flood conveyance through the Yolo Bypass. SAFCA believes these documents are characteristic of the state of knowledge regarding this flood control alternative as of 2003 when these documents were prepared.

8. Construction Schedule. SAFCA will provide GHCA with a timeline for the phased completion of the Project that indicates the role of the various agencies involved in implementing or permitting the Project. SAFCA will post its construction schedule for the Project on the SAFCA website. The schedule shall be updated on a monthly basis. A hard copy of the schedule and monthly updates shall be mailed to the GHCA contact person identified in

Paragraph 5, above. In addition, SAFCA will post a "60-day notice" of Planned Construction on the SAFCA website. A hard copy of the "60-day notice" shall be mailed to the GHCA contact person identified in Paragraph 5, above. "Planned Construction" will not include construction in the event of an emergency or construction necessary to remedy a condition discovered after completion of the Project. However, SAFCA will provide whatever notice is possible under the circumstances to affected, adjacent landowners prior to any emergency or remedial work.

For property owners who request prior inspections/documentation, the inspection/documentation must be scheduled prior to the start of construction within the specified reach of the Sacramento River where Project construction will commence.

9. Bicycle Trail. The Parties agree that the new adjacent levee would provide a good opportunity for creation of a new bicycle trail along the top of the levee consistent with applicable levee operation and maintenance requirements. SAFCA is prepared to work with GHCA and other interested parties in securing funding for a feasibility analysis for this bicycle trail and, based on the results of this feasibility analysis, to secure funding for construction, operation, and maintenance of the bicycle trail.

10. Dismissal of Action. Within five (5) business days of the Effective Date, GHCA shall execute and file a Request for Entry of Dismissal with Prejudice of Case Number 34-2007-00883632-CU-WM-GDS at the Sacramento County Superior Court. The Entry of Dismissal with Prejudice shall have the effect of dismissing the Action against all of the Parties named in the Action. The Parties agree to request that the trial court, in response to said request, enter an order reserving jurisdiction to enforce the Agreement pursuant to Code of Civil Procedure section 664.6, unless the trial court, for whatever reason, will not sign the proposed order reserving jurisdiction, as described immediately below. The Parties agree to submit a proposed

order reserving jurisdiction in the trial court pursuant to a Stipulation and Order substantially in the following form:

> Petitioner/Plaintiff and Respondent/Defendant have entered into a Settlement Agreement ("the Agreement"), a copy of which is attached hereto as Exhibit 1.
>
> The Agreement includes terms anticipating that the trial court enter an order reserving jurisdiction to enforce the Agreement pursuant to Code of Civil Procedure section 664.6.
>
> THEREFORE, it is hereby STIPULATED by Petitioner/Plaintiff and Respondent/Defendant that, and Petitioner/Plaintiff and Respondent/Defendant jointly request that, this Court reserve jurisdiction to enforce the Agreement pursuant to Code of Civil Procedure section 664.6 and this written stipulation of the parties.

In the event that, for whatever reason, the trial court does not grant GHCA's request to enter the proposed order described immediately above, and thus declines to make this Agreement enforceable pursuant to Code of Civil Procedure section 664.6, the Agreement shall instead be enforceable by either party through the filing of new litigation alleging a breach of the Agreement.

11. Attorney's Fees and Costs. SAFCA shall pay, within five business (5) days after the Effective Date of this Agreement, attorney's fees and costs incurred by GHCA in connection with the litigation and settlement of this Action (Sacramento County Superior Court Case No. 34-2007-00883632-CU-WM-GDS) in the sum of $55,000.00 by check made payable to the law firm of Kenyon Yeates, LLP. If GHCA accepts this offer without change, GHCA waives any right to seek recovery of any additional money from SAFCA in connection with the dismissed claims. SAFCA shall bear its own attorney's fees and costs.

12. Mutual Release and Waiver. Except for the rights and obligations set forth in this Agreement, each Party agrees and covenants as follows:

(a) To forever release, quit and discharge the other party and its respective officers, employees, agents, and officials from any and all claims, causes of action, action, rights,

theories, contentions, demands, obligations, suits, losses, costs, expenses, attorneys' fees, liens, liabilities and indemnities of any nature whatsoever, based on contract, tort, statute, or other legal or equitable theory of recovery, whether on account of past, present or potential future liability, whether known or unknown, or any type or character whatsoever, insofar as any of the same related to or arose out of, or could have related, or could have arisen out of the dispute set forth in the foregoing Recitals to this Agreement. The Parties intend this release to apply only to the 2008 Construction Projects, which were analyzed at a project level in the NLIP Landside EIR and were approved by the SAFCA Board of Directors on November 29, 2007. The Parties do not intend the settlement agreement and this mutual release and waiver to apply to the 2009-2010 construction phase, which was analyzed at a program level in the NLIP Landside EIR and has not yet been approved by the SAFCA Board of Directors.

(b) To expressly waive any right or claim of right to assert hereafter that any claim, demand, and/or obligation has, through ignorance, oversight or error been omitted from the terms of this Agreement and further expressly waive any right or claim of right that each may have under the law under any jurisdiction to the effect that those releases herein given do not apply to unknown or unstated claims. It is the express intent of the Parties to waive any and all claims they may have against the other party hereto insofar as any of the same, directly or indirectly, relate to the Project, including any which are presently known, unsuspected, unanticipated, or undisclosed. The Parties hereto acknowledge that they are apprised of the provisions of Civil Code section 1542 which provides:

> **A general release does not extend to claims which the creditor does not know or suspect to exist in his favor at the time of executing the release, which if known by him must have materially affected his settlement with the debtor.**

Having been so apprised, each party elects to waive and does waive all rights that may be granted to them pursuant to Civil Code section 1542 and to assume all risks, known or unknown, covered by this release.

(c) Never to commence, recommence, appeal, or seek certiorari or other review by any court, state or federal, and/or other proceeding against any other party to this Agreement that is based in whole or in part upon the claims, demands, causes of action, obligations, damages and/or liabilities released by this Agreement.

13. Entire, Sole and Final Agreement. This Agreement constitutes the entire understanding between the Parties with respect to the matters set forth herein. Except as otherwise provided herein, this Agreement is intended to be the final expression of the Agreement between the Parties with respect to the subject matter of this Agreement and supersedes and fully and completely extinguishes any prior understandings or agreements by or between the Parties, whether oral or in writing.

14. Amendments. This Agreement may not be modified, supplemented, or amended, or any of its provisions waived, except in writing by the party against whom such modification, supplementation, amendment, or waiver is sought. Any modification, supplementation, amendment, or waiver that would materially affect the rights of both Parties must be signed by both Parties.

15. Warranty of Authority. Each person signing this Agreement warrants to each other party that he or she is authorized by the party on whose behalf he or she is signing to execute this Agreement and to bind such party to the terms of this Agreement.

16. Time of the Essence. Time is of the essence for this Agreement.

17. Mutual Cooperation. The Parties agree to cooperate in good faith to carry out the provisions and intent of this Agreement, including timely execution and delivery of other documents necessary to carry out its provisions. Each of the Parties shall execute and deliver to the others all such further instruments and documents, and take all other such actions, as may be reasonably necessary to carry out the terms and provisions of this Agreement and secure to the others the full and complete enjoyment of their respective rights and privileges hereunder. The Parties agree to meet and confer in good faith to try to resolve any conflicts arising under this Agreement prior to bringing any actions in court to enforce this Agreement.

18. Severability. If any term or provision of this Agreement, or the application of any term or provision of this Agreement to a particular situation, shall be finally found to be void, invalid, illegal or unenforceable by a court of competent jurisdiction, then notwithstanding such determination, such term or provision shall remain in force and effect to the extent allowable by such ruling and all other terms and provisions of this Agreement or the application of this Agreement to other situations shall remain in force and effect.

19. Agreement Admissible in Enforcement Action. The Parties agree that this Agreement is admissible in any action to enforce this Agreement. Nothing in this Agreement shall be used as an admission of any fact or matter in any other challenge.

20. Construction. This Agreement, and each of the provisions hereof, is the product of negotiations between the Parties and their respective attorneys. Each of the Parties hereto expressly acknowledges and agrees that this Agreement shall not be deemed to have been prepared by or drafted by any particular party hereto. The rule of construction to the effect that any ambiguities are to be resolved against the drafting party shall not be employed in the interpretation of this Agreement.

21. Third Party Beneficiaries. Nothing in this Agreement shall be construed to confer any rights or impose any obligations upon any person or entity not a Party to this Agreement.

22. Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of California.

23. Headings and Captions. The headings and captions used in this Agreement are for convenience and ease of reference only, and are not intended to be part of the body of this Agreement, nor are they intended to be referred to in construing the provisions of this Agreement.

24. Exhibits. All exhibits referenced in this Agreement are made part of and incorporated herein.

25. Notices. All notices and other communications in connection with this Agreement shall be in writing and shall be personally delivered, sent by first class United States mail, sent by telefacsimile ("fax") with original sent by United State Postal Service or reputable overnight courier for delivery the following day, or sent by reputable overnight courier to the addresses and fax numbers set forth below. Any Party may at any time change its address or fax number for the delivery of notice upon five (5) days written notice to the other Party.

GARDEN HIGHWAY COMMUNITY ASSOCIATION:

Doug Cummings, President
Garden Highway Community Association, Inc.
1500 W. El Camino Avenue, #640
Sacramento, CA 95833

With a copy to:

Bill Yeates
Kenyon Yeates[LLP]
3400 Cottage Way, Suite K
Sacramento, CA 95825
Fax: (961) 609-5001

SACRAMENTO AREA FLOOD CONTROL AGENCY:

Stein Buer, Executive Director
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814
Fax: (916) 874-8289

With copies to:

Timothy N. Washburn, Agency Counsel
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814
Fax: (916) 874-8289

Ellen J. Garber
Shute, Mihaly & Weinberger LLP
396 Hayes Street
San Francisco, CA 94102
Fax: (415) 552-5816

26. Understanding of Terms. This Agreement is executed voluntarily by each of the Parties without any duress or undue influence on the part of, or on behalf of, any of them. Each of the Parties to this Agreement has read and fully understands the meaning of each provision of this Agreement and has relied on independent advice and representation of legal counsel in entering into this Agreement.

27. Binding Effect. This Agreement and its terms shall be binding upon and inure to the benefit of the Parties hereto and their respective successors, assignees, buyers, grantees, vendees, transferees, officers, directors, principals, agents, employees, representatives, attorneys, insurers and sureties, and any others claiming through or under of having the right to claim through or under any or all of them, wherever located.

28. Equitable Relief. Each Party hereto expressly agrees that the provisions of this Agreement shall be specifically enforceable by either Party and, except as specifically provided

in Paragraphs 1, 3, and 4 of this Agreement for the payment of costs and expenses incurred in a dispute, each Party hereto waives and relinquishes all claims for damages arising from a claim based on breach of this Agreement by any other Party. In the event of breach of any term or provision of this Agreement or any duty or obligation hereunder, remedies shall be limited to bringing an action for specific performance and recovery of such costs and expenses provided for in Paragraphs 1, 3, and 4 of this Agreement.

29. Execution in Counterparts. This Agreement may be executed in counterparts, and photocopies, facsimile copies, or electronic copies of this Agreement may be used as originals. Each such counterpart, photocopy, facsimile copy, or electronic copy of this Agreement shall be deemed an original, but all of which together shall constitute one and the same instrument and shall have the same force and effect as if a single original had been executed by all Parties.

30. Settlement of Disputed Claims. The Parties hereto understand and agree that this settlement is a compromise of disputed claims, and that no Party's actions under this Agreement shall be construed as an admission of liability.

31. Effective Date. This Agreement shall become effective upon execution by all Parties.

IN WITNESS WHEREOF, the Parties have executed this Agreement as of the date and year first set forth above.

Date: 4/15/08

Garden Highway Community Association, Inc.
By Doug Cummings, President

Approved as to form and legality for GHCA:

Date: April 10, 2008

By Bill Yeates
Kenyon Yeates LLP
Attorneys for Garden Highway Community Association, Inc

Date: April 18, 2008

Sacramento Area Flood Control Agency
By Stein Buer, Executive Director

Approved as to form and legality for SAFCA:

Date: April 17, 2008

Timothy N. Washburn, Agency Counsel

Date: APRIL 15, 2008

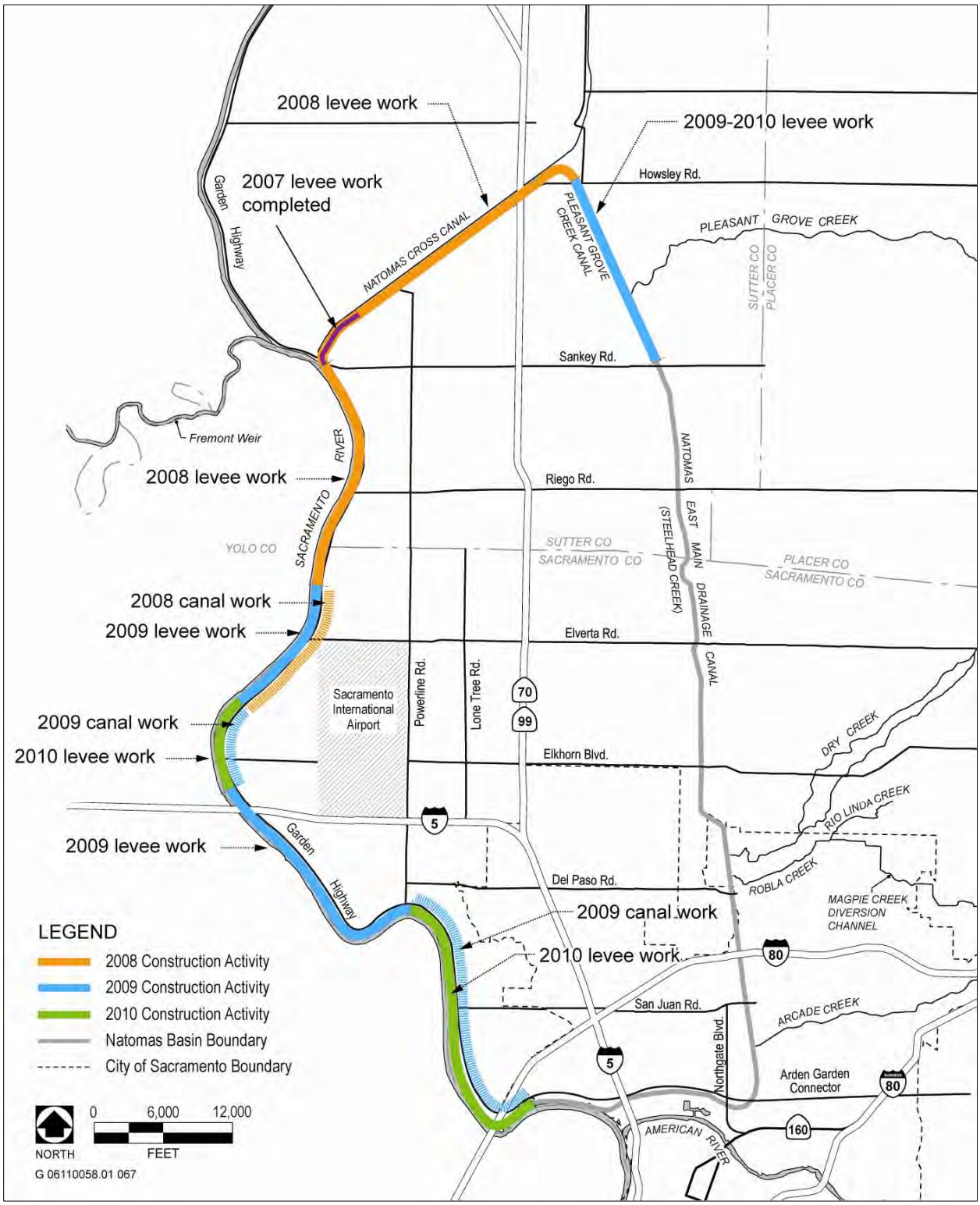
Shute, Mihaly & Weinberger LLP
By Ellen J. Garber

Attorneys for SACRAMENTO AREA FLOOD CONTROL AGENCY

List of Exhibits

Exhibit A: Project Area Map
Exhibit B: Form-Of Letter to CVFPB and DWR
Exhibit C: Form-Of Letter to Utility Company
Exhibit D: Form-Of Letter to CVRWQCB

EXHIBIT A
PROJECT AREA



Source: CaSil; adapted by EDAW in 2007

NLIP Landside Improvements Project Construction Phases

EXHIBIT B
FORM-OF LETTER TO CVFPB and DWR

[SAFCA LETTERHEAD]
[Date]

Jay Punia, Executive Officer
Central Valley Flood Protection Board
P. O. Box 942836
Sacramento, CA 94236

Lester Snow, Director
California Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236

RE: Encroachment Permit for SAFCA Natomas Levee Improvement Program Landside Improvements Project

Dear Sirs:

On March 21, 2008, the Central Valley Flood Protection Board (Board) issued Permit 18159-3 BD to SAFCA to improve portions of the Sacramento River east levee as part of the Agency's Natomas Levee Improvement Program (NLIP) Landside Improvements Project (Project). Permit condition Fourteen states that no work authorized by this permit shall be performed until the Board and the Department of Water Resources (Department) have received, reviewed and approved a complete set of final plans and specifications for the Project. In order to satisfy this condition, under separate cover SAFCA has submitted the required final plans and specifications for review and approval by the Board and the Department.

The purpose of this letter is to highlight several key features of the Project and underscore the SAFCA's commitment to ensuring that these features are incorporated into the final design. First, the final design calls for construction of a new levee adjacent to the existing Sacramento River east levee along Garden Highway. A key objective of this design is to preserve the existing Garden Highway and minimize the removal of levee encroachments located on private lands along the water side of this roadway. SAFCA intends to work closely with the Board and the Department to achieve this objective in a manner that is consistent with the Board's Supplemental Standards for Control of Residential Encroachments in Reclamation District 1000, which are found in Section 133 of Title 23 of the California Code of Regulations.

Second, in order to accommodate the Project footprint and minimize the effects of the Project on residences along the Garden Highway, the final design calls for relocation of portions of the existing main electrical transmission system, including poles and powerlines that provide electricity to these residences, into a new utility operation and maintenance corridor for which

right-of-way has been acquired east of the new adjacent levee. In addition, SAFCA has sought to avoid relocating existing secondary poles and individual service lines that link the main transmission line to the residences. To the extent that such relocations are necessary, wherever possible the new secondary poles have been located along the landside of the Garden Highway between the roadway pavement and the new adjacent levee.

Third, SAFCA has incorporated new storm water drainage facilities into the final design to offset the potential increase in storm water that would otherwise be discharged from the Garden Highway onto the private parcels occupying the water side of the levee. These drainage facilities consist of a collection swale located between the new adjacent levee and the Garden Highway, and new pipes and drainage outfall lines to drain collected storm water to the river. Where these outfalls cross private property, they are located along existing parcel boundaries in buried pipes that drain to the river [or in an alternative location selected in consultation with the property owner].

SAFCA requests that the Board and the Department approve these Project features as shown in the final design package. However, if for any reason the Board or the Department determines that the proposed location of electrical or drainage facilities is unacceptable, SAFCA requests that the Board and/or the Department identify alternative locations that would be acceptable so that affected property owners may have an opportunity to work with SAFCA in selecting from among these alternatives. Please contact us if you have any questions in this regard. We look forward to working with you to continue to improve flood protection for the Natomas Basin.

Very truly yours,

Stein M. Buer
Executive Director

cc: United States Army Corps of Engineers
Reclamation District 1000

EXHIBIT C
FORM-OF LETTER TO UTILITY COMPANY

[SAFCA LETTERHEAD]
[Date]

[Name]
[Name of Utility Company]
[Address]
[City, State ZIP]

RE: Relocation of Electrical and Telephone Utility Poles and Lines
SAFCA Natomas Levee Improvement Program Landside Improvements Project,
[Year] Construction Projects

Dear [Name]:

SAFCA has undertaken the Natomas Levee Improvement Program ("NLIP") Landside Improvements Project (“Project”) in order to provide increased flood protection to the Natomas Basin. The Project will require relocation of utility poles and lines along the levee system in order to accommodate the widened levee and related infrastructure.

Enclosed with this letter please find plans which identify SAFCA’s proposed locations for installation of new poles and lines and relocation of existing facilities to accommodate the footprint of the Project. In order to minimize the effects of the Project on Garden Highway residences, these locations have been selected so as to ensure that no new main transmission lines and poles are installed on the water side of the Garden Highway. In addition, SAFCA has sought to avoid relocating poles that support individual service lines. To the extent such relocations are necessary, wherever possible the new poles have been located on the land side of the Garden Highway.

SAFCA believes the proposed utility relocation plan is consistent with sound engineering practices and we look forward to your approval. However, if for any reason [utility provider] determines that any proposed utility pole location is unacceptable, we request that [utility provider] identify alternative locations that would be acceptable so that the affected property owners may have an opportunity to work with SAFCA in selecting from among these alternatives.

Please contact us if you have any questions or concerns. We appreciate your cooperation on this important Project to improve flood protection for the Natomas Basin.

Very truly yours,

Stein M. Buer
Executive Director

cc: United States Army Corps of Engineers
[Reclamation District 1000]
[Central Valley Flood Protection Board]

EXHIBIT D
FORM-OF LETTER TO CVRWQCB

[SAFCA LETTERHEAD]
[Date]

[Name]
Central Valley Regional Water Quality Control Board
Sacramento Main Office
11020 Sun Center Drive #200
Rancho Cordova, CA 95670-6114

RE: Request for Waste Discharge Requirements for Drainage Pipes and Outfalls
Natomas Levee Improvement Program
Landside Improvements Project, [Year] Construction Projects

Dear [Name]:

SAFCA has undertaken the Natomas Levee Improvement Program ("NLIP") Landside Improvements Project ("Project") in order to provide increased flood protection to the Natomas Basin. The Project will involve the construction of a new adjacent levee on the land side of the existing Sacramento River east levee along the Garden Highway. The section of the adjacent levee between the Natomas cross Canal and Powerline Road will be raised above the elevation of the existing levee. This grade difference results in a change in the drainage pattern associated with the eastern side of the roadway.

Enclosed with this letter please find SAFCA's application for waste discharge requirements associated with the new storm water drainage facilities which are proposed to offset the potential increase in storm water that would otherwise be redirected from eastern side of the Garden Highway onto the private parcels occupying the water side of the levee. These drainage facilities consist of a collection swale located between the new adjacent levee and the Garden Highway, and new pipes and drainage outfall lines to drain collected storm water to the river. In order to minimize the effects of the Project on Garden Highway residences, where these outfalls cross private property, SAFCA has sought to locate the new drainage pipes and outfalls along existing parcel boundaries in buried pipes that drain to the river [or in an alternative location approved by the property owner].

SAFCA believes that the Project and the enclosed application for waste discharge requirements are consistent with sound engineering practices, the Settlement Agreement between the Garden Highway Community Association and SAFCA, and the Porter-Cologne Water Quality Control Act. Accordingly, we request that the Regional Board approve this application. However, if for any reason the Regional Board determines that the location of any proposed new pipe or outfall line is unacceptable, we request that the Regional Board identify alternative

locations that would be acceptable so that the affected property owners may have an opportunity to work with SAFCA in selecting from among these alternatives.

Please contact us if you have any questions or concerns. We look forward to your cooperation on this important Project to improve flood protection for the Natomas Basin.

Very truly yours,

Stein M. Buer
Executive Director

cc: United States Army Corps of Engineers
Central Valley Flood Protection Board

APPENDIX H

Construction Details

APPENDIX H
CONSTRUCTION DETAILS

1 INTRODUCTION

This appendix to the Natomas Levee Improvement Program (NLIP) Phase 3 Landside Improvements Project (Phase 3 Project) Environmental Impact Statement/Environmental Impact Report (EIS/EIR) contains construction details of the project components of the Proposed Action and Levee Raise-in-Place Alternative discussed in Sections 2.3 and 2.4. Project components 1–10 (below) apply to both the Proposed Action and Levee Raise-in-Place Alternative, while project component 11 (below) applies only to the Levee Raise-in-Place Alternative:

- Sacramento River East Levee Reaches 5A–9B
- Pleasant Grove Creek Canal (PGCC) West Levee
- Natomas East Main Drainage Canal (NEMDC) West Levee
- Relocated Elkhorn Canal
- New Giant Garter Snake (GGS)/Drainage Canal
- Airport West Ditch Reconfiguration
- Reclamation District (RD) 1000 Pumping Plant No. 2
- Prichard and Elkhorn Pumping Plant Modifications
- Borrow Site Reclamation
- Private Irrigation Facilities
- Levee Raise-in-Place

Table H-1 lists the parcels located within the project footprint components described in Section 2.3.1 of this EIS/EIR. **Plates H-1a–d** show the locations of those parcels. All or portions of the parcels within the project footprint would need to be acquired to construct either of the action alternatives. Parcels shown as part of borrow sites would not necessarily need to be acquired.

Table H-1
Land Ownership by Parcel Number in the Phase 3 Project Footprint

Drainage Outlets along the Sacramento River (Reaches 5A–9B)	
County of Sacramento	201-0150-036, 201-0150-038, 201-0150-053
Natomas Central Mutual Water Company	201-0250-039
Private Landowner	201-0250-005
Private Landowner	201-0250-021
Private Landowner	201-0250-024
Private Landowner	201-0260-015
Private Landowner	201-0270-026
Private Landowner	201-0270-033
Private Landowner	201-0270-061
Private Landowner	201-0280-003
Private Landowner	201-0280-011
GGS/Drainage Canal	
Citiland, Inc.	201-0240-006, 201-0240-007
Clinical Associates of Erie, Inc.	201-0330-035
Natomas Central Mutual Water Company	201-250-045
Pacific Terrace, LLC	201-0280-061, 201-0280-063

Table H-1 Land Ownership by Parcel Number in the Phase 3 Project Footprint	
Reclamation District 1000	201-0280-053, 201-0330-001
Private Landowner	201-0150-020
Private Landowner	201-0240-008
Private Landowner	201-0240-037
Private Landowner	201-0250-041
Private Landowner	201-0330-041
Private Landowner	201-0330-044
Natomas East Main Drainage Canal	
Twin Rivers Unified School District	201-0320-018, 201-0320-019
Alice and Marie Krumenacher	201-0320-025
Private Landowner	201-0540-073
Private Landowner	214-0010-011
Private Landowner	226-0010-002
Private Landowner	226-0010-003
Private Landowner	226-0010-004
Private Landowner	226-0020-003
Private Landowner	226-0020-004
Private Landowner	226-0020-005
Pleasant Grove Creek Canal	
Brookfield	35-080-021
Private Landowner	35-080-022
Private Landowner	35-120-007
Private Landowner	35-150-005
Private Landowner	35-160-006
Private Landowner	35-160-038
Private Landowner	36-120-003
Sacramento River East Levee Reaches 4B–8 and/or Elkhorn Canal Relocation	
County of Sacramento	201-0140-059, 201-0150-033, 201-0150-055, 201-0280-046
Natomas Center Mutual Water Company	201-0250-042
South Sutter, LLC	201-0250-015, 201-0270-037, 201-0270-037
Teal Bend, LP	201-0250-002, 201-0250-006, 201-0250-008, 201-0250-010
Private Landowner	201-0150-020
Private Landowner	201-0150-041
Private Landowner	201-0150-042
Private Landowner	201-0270-054
Private Landowner	201-0270-069
Private Landowner	201-0270-070
Private Landowner	201-0250-011
Private Landowner	201-0250-012
Private Landowner	201-0250-013
Private Landowner	201-0250-041
Private Landowner	201-0270-020

Table H-1 Land Ownership by Parcel Number in the Phase 3 Project Footprint	
Private Landowner	201-0270-027
Private Landowner	201-0270-047
Private Landowner	201-0150-040
Private Landowner	201-0280-006
Private Landowner	201-0280-013
Private Landowner	201-0280-062
Private Landowner	201-0330-045
Private Landowner	201-0330-043
Private Landowner	201-0330-042
Potential Borrow Sites	
Airport north bufferlands	201-0140-067, 201-0010-015, 201-0130-032, 201-0020-018
Brookfield	35-080-021
Dunmore	201-0120-031
Lower Woodland Corridor	201-0250-011, 201-0250-012, 201-0250-013, 201-0250-015, 201-0270-002, 201-0270-037, 201-0270-054, 201-0270-020, 201-0280-013
Krumenacher	201-0320-025, 201-0320-024
Pacific Terrace	201-0280-063
Private Landowner	201-0250-011, 201-0250-012, 201-0250-013
Private Landowner	201-0150-040, 201-0150-041, 201-0150-042
Private Landowner	201-0150-020, 201-0250-041
RD 1001	33-0280-025
South Sutter, LLC	201-0250-015, 201-0270-002, 201-0270-037
Sutter Pointe	35-0230-019, 35-0230-021, 35-0230-031, 35-0240-017, 35-0240-033
Twin Rivers Unified School District	201-0320-018, 201-0320-019
Notes: GGS = Giant Garter Snake; RD = Reclamation District Source: Data compiled by EDAW in 2008 from information provided by SAFCA	

2 SACRAMENTO RIVER EAST LEVEE REACHES 5A–9B

2.1 GENERAL CONSTRUCTION PLAN

The primary construction staging area would be located on two approximately 1-acre sites, one near Elkhorn Boulevard and one near Elverta Boulevard. The area would be fenced and used for the contractor's and engineer's construction trailers, parking for personnel, machine maintenance tools and parts, possibly water trucks, and the storage of fuels and other materials to be used for construction. The project right-of-way along the construction area also would be used for staging of construction materials and equipment.

The levee improvements would be constructed during the months of April through November. Some related activities, such as utility relocations and removal or relocations of residential or agricultural structures, may be conducted before April. The construction crew size during its peak is estimated at 60 people per shift working 12-hour shifts. The construction sequence would be divided into four different headings.

Personnel, equipment, and imported materials such as aggregate base and asphalt concrete would arrive at the project area via State Route (SR) 99/70, Riego Road, Elverta Road, Elkhorn Boulevard, North Bayou Road, and Powerline Road. Imported materials would come from local quarries identified by the contractor. The primary

corridors that would be used during construction are located off of public roadways, within and through the soil borrow areas, and within the adjacent levee alignment and existing dirt roads used for access to the work areas.

2.2 CONSTRUCTION SEQUENCE

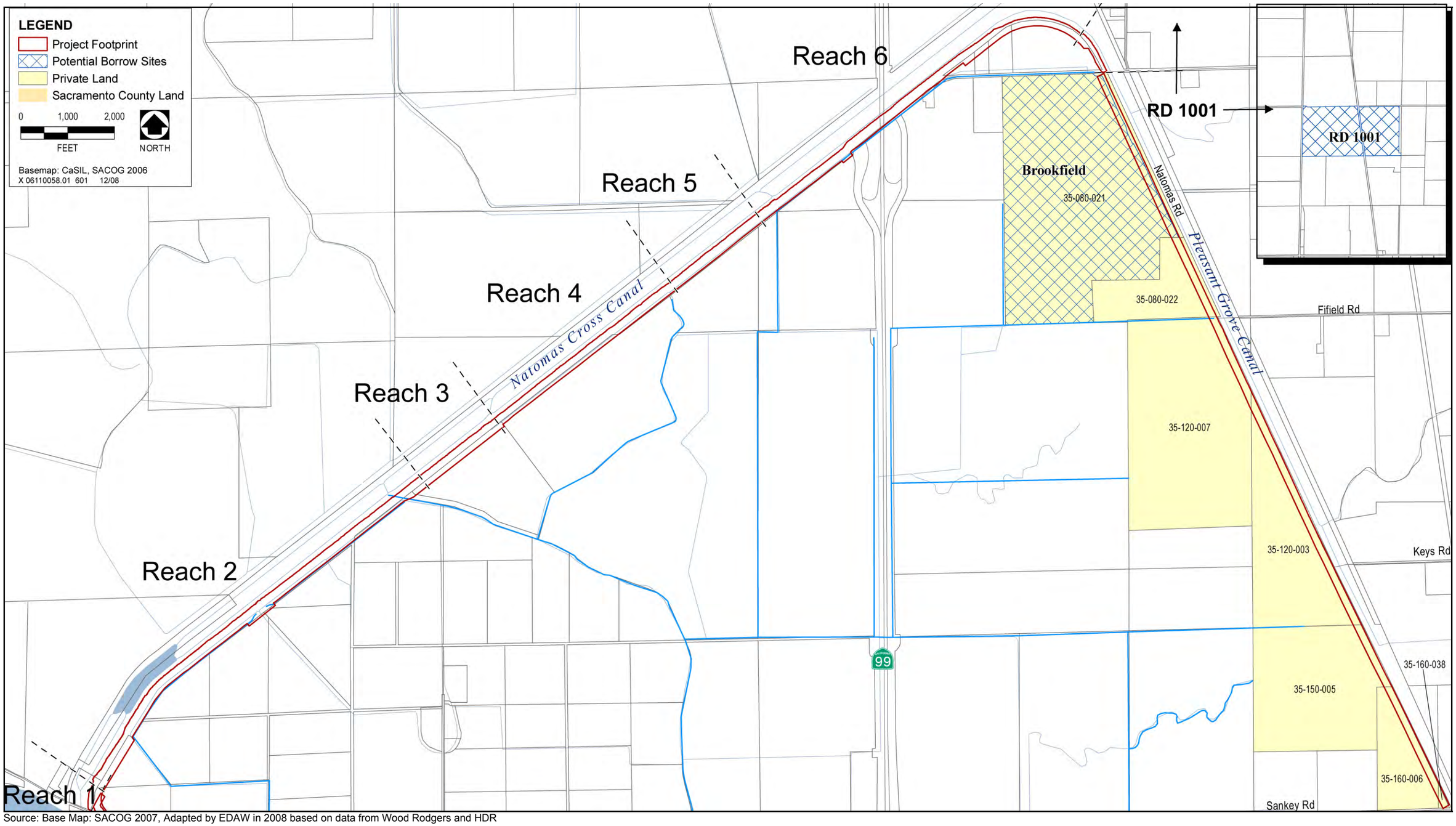
The construction activities would be sequenced as follows:

- **Construction mobilization:** Mobilization would include setting up construction offices and transporting heavy construction equipment to the work site, and may also include borrow site preparation. One or more construction staging areas would be established temporarily on the land side of the levee within the project right-of-way at locations determined by the contractor based on contractor preference and environmental and land use constraints.

- **Site preparation (tree removal, clearing, grubbing, and stripping):** Site preparation would entail removing trees and other large vegetation from the construction area and stripping up to 12 inches of material from the landside slope of the existing levee, the footprint of the adjacent setback levee and seepage berm (as applicable), and the permanent maintenance access corridor. However, in areas where seepage berms are extended as a protective cap over cultural resources, site preparation would be to mow and shallowly disk the area and apply herbicides to remove plant material, and limit stripping to 2 inches, with the exception of cultural resource sites. Large roots, tree stumps, and deleterious material would then be grubbed from the working area. To the extent feasible, trees that must be removed from within the footprint would be removed before the 2009 construction season to avoid Swainson's hawks or other birds nesting in the trees in spring. Trees suitable for relocation would be removed outside of the footprint to new woodland planting areas, where a substantial number of new trees would also be planted. Excess earth materials (organic soils, roots, and grass from borrow areas and the adjacent levee foundation and excavated material that does not meet levee embankment criteria) would be used in the reclamation of borrow areas and levee slopes or hauled off-site to landfills. Cleared vegetation (i.e., trees, brush) would be hauled off-site to landfills or a biorecycling facility.

- **Relocation and removal of landside structures, pavements, irrigation ditches, and other facilities:** Residences and farm structures that are within the proposed footprint of the flood damage reduction facilities would be removed or relocated farther from the flood damage reduction facilities before the start of levee construction in those areas. Irrigation facility collection/distribution boxes, wells, and standpipes within the footprint of the flood damage reduction features would be demolished and replaced as needed. Debris from structure demolition, power poles, utility lines, pavements, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. Demolished concrete could be sent to a concrete recycling facility when feasible. Wells and septic systems would be abandoned in accordance with the applicable state and county requirements. Notifications of work schedule would be made by SAFCA in accordance with the terms of their Settlement Agreement with the Garden Highway Homeowners Association.

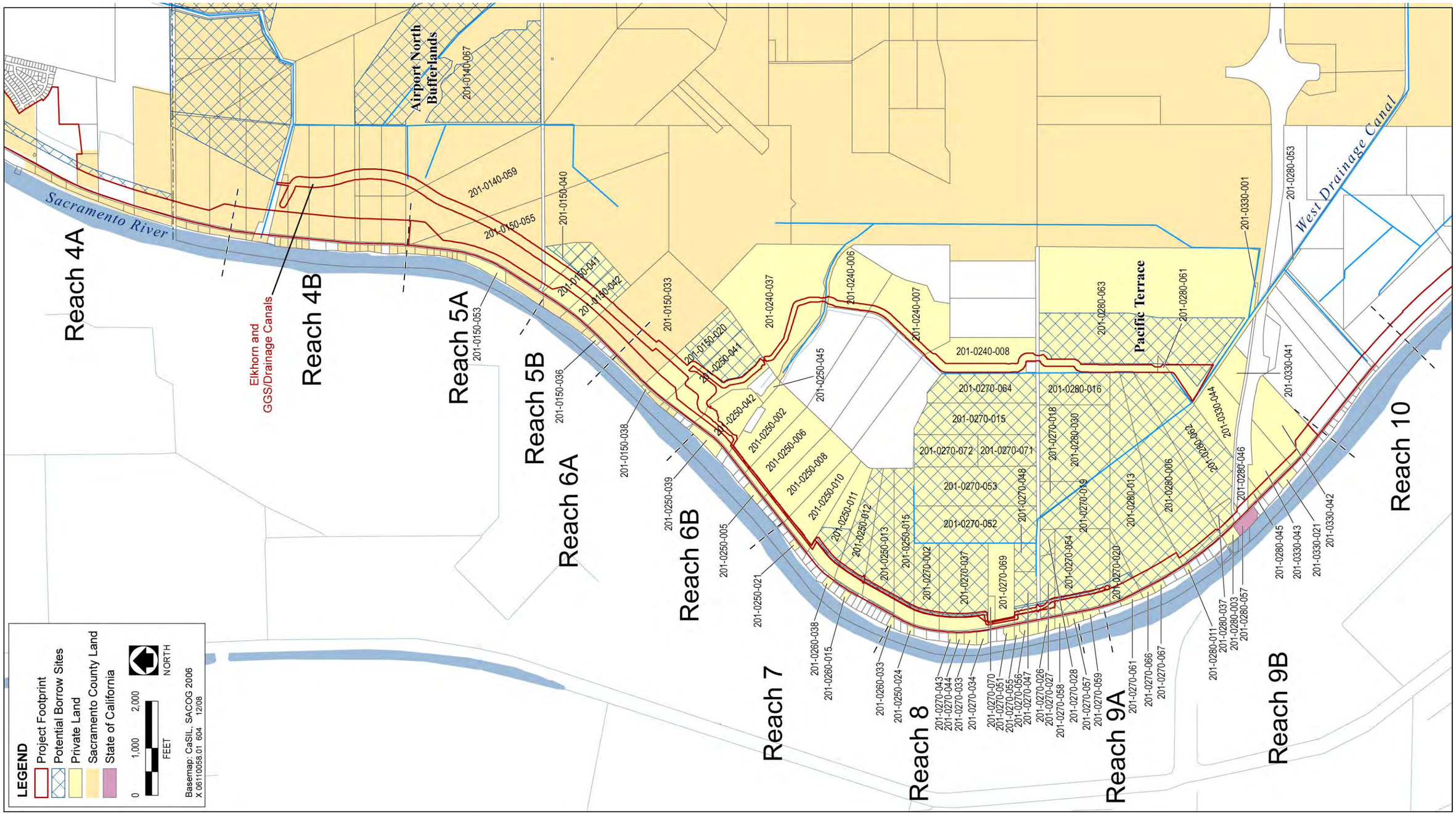
- **Excavation of stability berm and inspection trench:** The existing stability berm along the Sacramento River east levee would be excavated and the material would be used in the construction of the seepage berms. The geotextile fabric from the drain layer would be hauled to a suitable landfill. Prior to the construction of the adjacent levee, a 6-foot-deep inspection trench would be excavated, with the purpose of exposing or intercepting any undesirable underground features such as old drain tile, water or sewer lines, other debris, animal burrows, buried logs, or pockets of unsuitable material (e.g., sand lenses). After inspection, the trench would backfilled and compacted as part of the embankment construction. The material from the inspection trench would be stockpiled and used either in the adjacent setback levee or the seepage berm.



Source: Base Map: SACOG 2007, Adapted by EDAW in 2008 based on data from Wood Rodgers and HDR

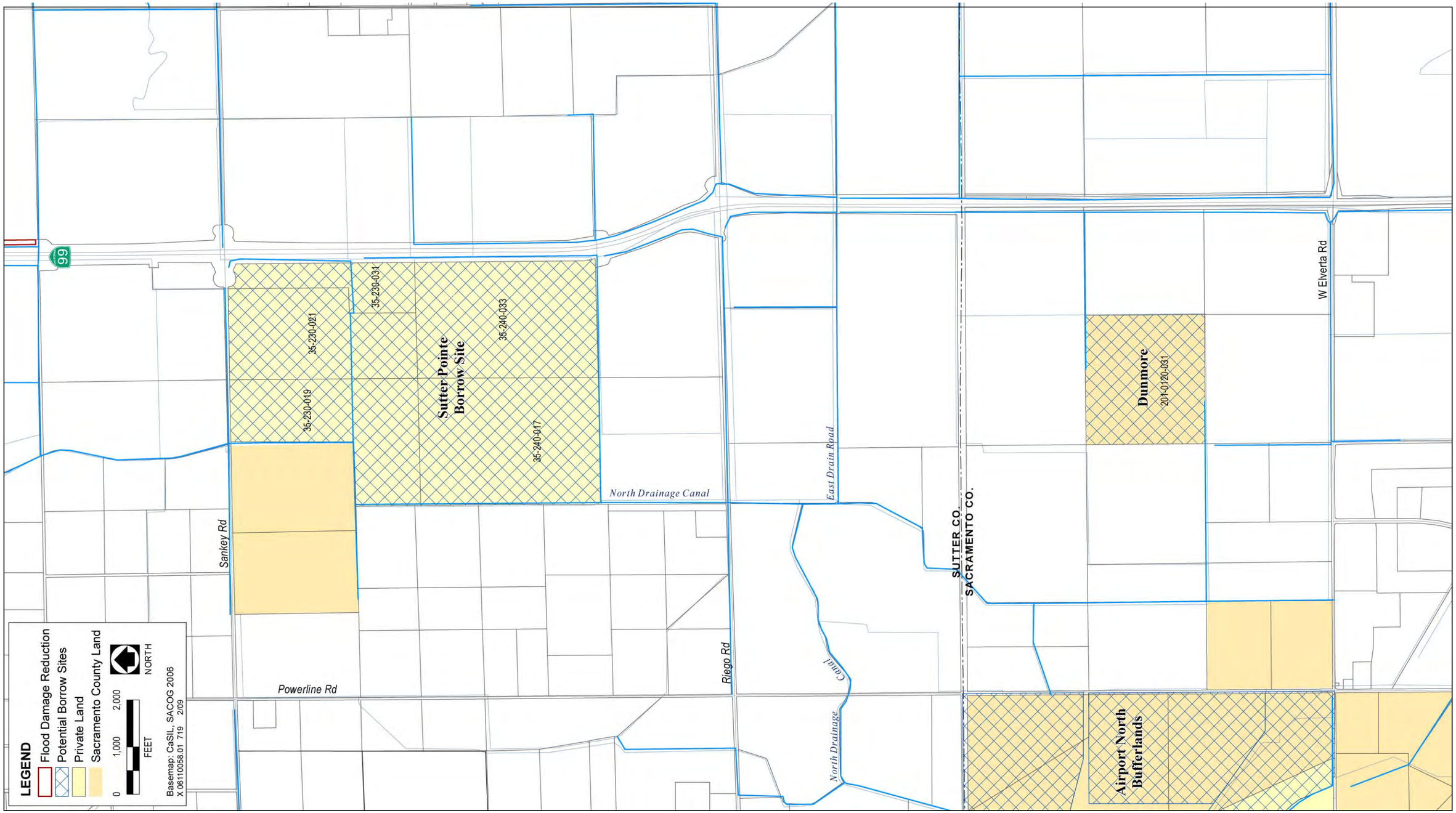
Land Ownership in the Phase 3 Project Footprint

Plate H-1a



Source: Base Map: SACOG 2007, Adapted by EDAW in 2008 based on data from Mead & Hunt and HDR

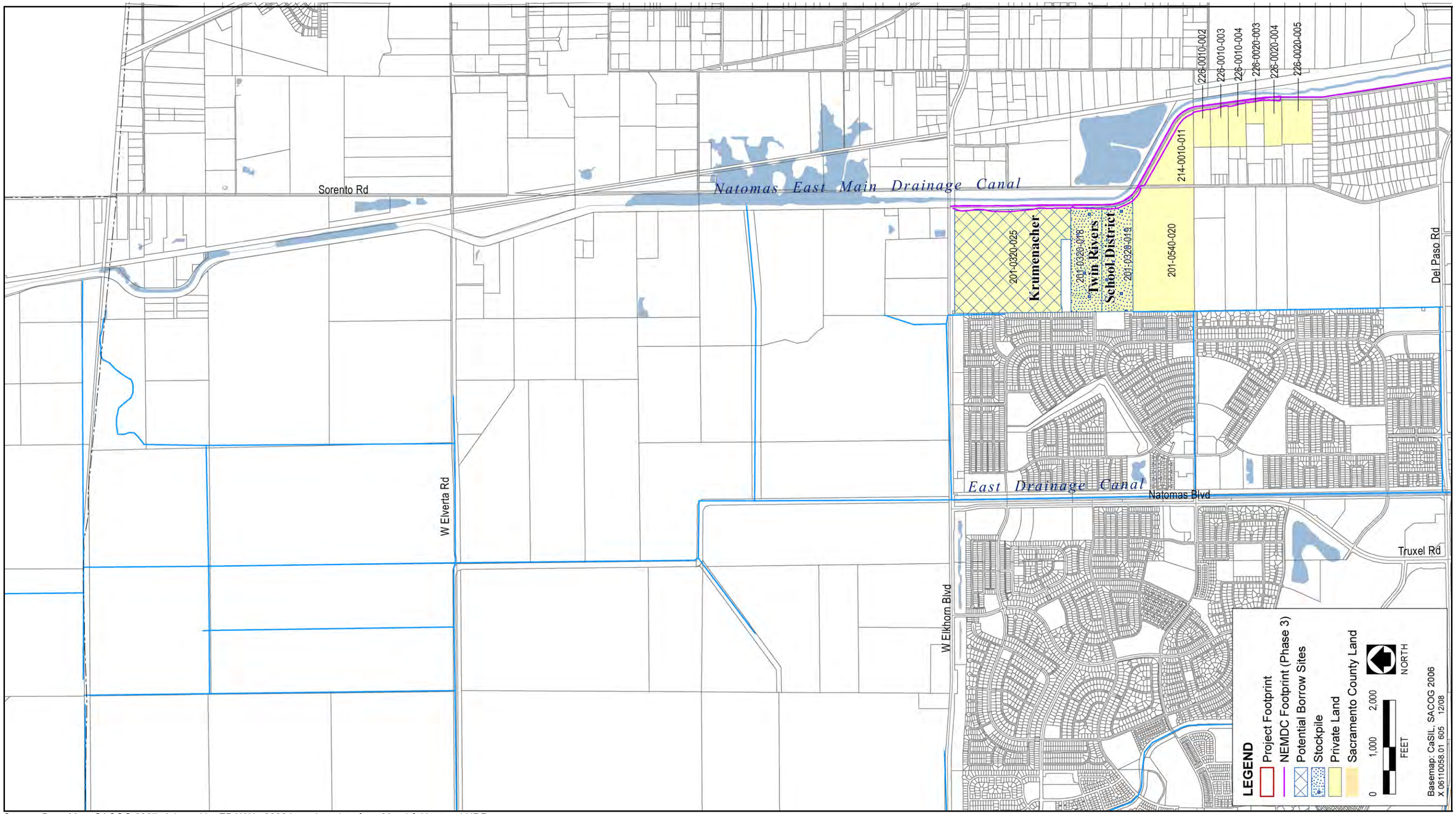
Land Ownership in the Phase 3 Project Footprint **Plate H-1b**



Source: Base Map: SACOG 2007, Adapted by EDAW in 2008 based on data from Mead & Hunt and HDR

Land Ownership in the Phase 3 Project Footprint

Plate H-1c



Source: Base Map: SACOG 2007, Adapted by EDAW in 2008 based on data from Mead & Hunt and HDR

Land Ownership in the Phase 3 Project Footprint

Plate H-1d

- **Construction of adjacent levee, cutoff walls, and seepage berms:** Borrow material would be delivered to the levee construction sites by scrapers or haul trucks where it would be spread by motor graders and compacted by sheepsfoot rollers to build the adjacent levee. In those areas where a cutoff wall is required, the adjacent levee would be built up to a height equal to about one-third of the height of the proposed levee. This would create a working platform for cutoff wall installation using an excavator with a long-stick boom capable of digging a trench to a maximum depth of approximately 85 feet. Bentonite slurry would be pumped into the trench during excavation to prevent caving. The soil excavated from the trench would be mixed with bentonite and backfilled into the trench to create the cutoff wall. The working platform would also be used for cutoff wall installation using a DSM or TRD machine capable of injecting and mixing cement and/or bentonite slurry with the soil simultaneously to a maximum depth of approximately 115 feet. For construction of seepage berms, borrow material would be spread and compacted. However, in areas where seepage berms are extended as a protective cap over cultural resources, special equipment handling methods would be employed, to minimize compaction of the subsurface.

- **Installation of relief wells and monitoring wells:** Between Station 258+00 and Station 293+50 (approximately from Elverta Road to Teal Bend Golf Club), relief wells may be installed adjacent to the seepage berms. Relief wells would be spaced at 60- to 100-foot intervals approximately 20 feet beyond the toe of the berm. However, in areas where seepage berms are extended as a protective cap over cultural resources, no relief wells would be installed, and any monitoring wells or trenches would be located outside of the affected project area.

- **Reconstruction of Garden Highway at intersections:** The Garden Highway intersections at West Elverta Road, West Elkhorn Boulevard, and North Bayou Road would require reconstruction to accommodate the raised adjacent setback levee. It is anticipated that Garden Highway would be extended up and onto the widened adjacent levee at these locations to meet with the secondary roads. Approach embankments at the intersections would be enlarged and the entire intersections would be repaved. The intersecting roads would be raised at a slope of 15H:1V, extending the approach embankment approximately 500 feet outward from the levee. The side slopes of the raised embankments would be at a 3H:1V or 2H:1V slope depending on embankment soil type. Traffic control measures and detours would be required.

- **Installation of surface drainage outlets across Garden Highway:** The portion of levee between the adjacent setback levee and the Garden Highway pavement would include new storm drainage collection facilities to convey surface water beneath Garden Highway and toward the Sacramento River. A grassed surface collection system (drainage swale) would convey runoff water to drop inlets, and new pipe laterals would convey the water beneath Garden Highway to new outfalls in the berm along the east bank of the Sacramento River. In most locations, the outfalls would be placed above the ordinary high water line. The location of the cross culverts would be selected to minimize impacts on existing residential properties and would be located along property lines where feasible. These discharge pipes would require minor landscape improvements to prevent erosion and ensure that applicable water quality standards are met. Rock slope protection (riprap) would be installed to prevent erosion. Excavation of a trench to install the culvert piping across Garden Highway would be required, and those segments where excavation occurs would have to be reconstructed. Single-lane traffic controls and through-traffic detours would be required.

- **Site restoration and demobilization:** Upon completion of construction activities, the levee slopes and the tops of the seepage berms would be hydroseeded. An aggregate base road would be constructed on the crown of the new levee. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to preproject conditions. Demobilization would likely occur in various locations as construction proceeds along the proposed levee alignment.

- **Reclamation of borrow areas:** The borrow sites (mainly the Airport north bufferlands) would be finished graded and planted with grasses after the completion of borrow activities (see "Borrow Sites Reclamation" and **Table H-15**, below, for more details).

Table H-2 shows the quantity of each fill type needed, for a total of 1,785,000 cubic yards (cy) of soil, and 38,500 tons of aggregate base and asphalt concrete. The random fill quantity includes a 25% shrinkage replacement factor to account for volume loss during placement. Note that for some locations, it may be possible to use a scrape-and-place method that would reduce the need for haul trucks. Potential haul routes from the borrow sites to the Sacramento River east levee work area for the Phase 3 Project are shown in **Plate H-2**. The primary haul routes would include Riego Road, West Elverta Road, West Elkhorn Boulevard, and various off-road haul routes.

Table H-2
Quantities of Fill Required for Proposed Improvements to the Sacramento River East Levee in Reaches 5A–9B

Material Type	Quantity
Soil type 1—select fill	522,000 cy
Soil type 2—random fill	1,039,000 cy
Reusable fill	120,000 cy
Stability berm excavation	104,000 cy
Aggregate base	34,000 tons
Asphalt concrete	4,500 tons
Total	**1,785,000 cy/38,500 tons**

cy = cubic yards
Source: Data provided by HDR in 2008 and compiled by EDAW in 2008

Delivery of the material listed in **Table H-2** would require as many as 900–1,000 haul trips per day during construction of the Phase 3 Project. These estimates are based on the assumption that the work would be done in a 6-month construction period with 140 out of the 156 working day window being used to haul material. These estimates are based on conservative assumptions of truck capacities of 15 cubic yards and 24 tons and the use of haul trucks for moving all borrow material from the Airport north bufferlands (rather than a combination of haul trucks and scrapers). **Table H-3** presents the anticipated construction equipment and duration for the Sacramento River east levee Reaches 5A–9B improvements.

2.3 GARDEN HIGHWAY CLOSURE DURING CUTOFF WALL CONSTRUCTION

For the Proposed Action, the Garden Highway at the I-5 Bridge would be closed for a period of approximately 8 to 12 weeks. The Elkhorn Boat Launch Facility (a public boat ramp, dock, and picnic area operated by Sacramento County) would require closure for approximately 8 to 12 weeks, likely through the summer months, while levee improvements are constructed at the I-5 Bridge. Construction would generally consist of closing the Garden Highway between stations 437+00 to 447+00, which is beneath I-5 and about 500 feet upstream and downstream. The roadway embankment would be degraded to within about 5 feet of the adjacent ground. The cutoff wall would then be constructed along the Garden Highway at this location, and would be tied into the adjacent levee alignment. The new cutoff wall would need to settle over a period of about 3–4 weeks. North Bayou Road's intersection with the Garden Highway would remain open; however, the roadway would be

Source: Base Map: CaSIL and SACOG 2006; Adapted by EDAW in 2008 based on data from MBK

NLIP Construction Phasing and Anticipated Haul Routes from Soil Borrow Areas

Plate H-2

Table H-3
Anticipated Construction Equipment and Duration for Proposed Improvements to the Sacramento River East Levee in Reaches 5A–9B

Construction Phase	Equipment Type and Number of Each Type	Duration (Days)
Mobilization	–	27
Site preparation (tree removal, clearing, grubbing, stripping)	Scrapers (2)	27–54
	Front-end loaders (2)	27–54
	Crawler/tractors (tree pushers) (2)	27–54
	Water trucks (1)	27–54
	Motor graders (2)	27–54
	Chippers/grinders (2)	27–54
	Haul trucks (5)	54
Relocation of canal and removal of landside structures and other facilities	Excavators (2)	48
	Haul trucks (24)	48
	Front-end loaders (1)	48
Excavation of stability berm and inspection trench	Excavators (4)	28
	Scrapers (20)	28
	Haul trucks (8)	28
	Bulldozers (2)	28
	Graders (2)	28
	Water trucks (2)	28
Construction of adjacent levee raise and seepage berms (includes borrow site activities)	Scrapers (2)	140
	Excavators (4)	140
	Front-end loaders (6)	140
	Haul trucks (14 cy) (60)	140
	Bulldozers (4)	140
	Sheepsfoot compactors (3)	140
	Motor graders (3)	140
	Water trucks (4)	140
Cutoff wall construction	Long-reach hydraulic excavators (2)	44
	Front-end loaders (2)	44
	Mixing excavators (2)	44
	Bulldozers (1)	44
	Extended-boom pallet loaders (2)	44
	300-kW generators (2)	44
	Slurry pumps (2)	44
	Pickup trucks (6)	44
	Haul trucks (2)	44
	DSM Rig (2)	44
Installation of relief wells and monitoring wells	Truck-mounted auger (2)	30
	Support trucks (3)	30
	Cement trucks (2)	30
Reconstruction of Garden Highway at two intersections	Backhoes (2)	27
	Smooth drum compactors (2)	27
	Asphalt pavers (1)	27
	Haul trucks (6)	27
	Striping trucks (1)	27
	Truck-mounted augers (1)	27
Installation of surface drainage outlets across Garden Highway	Backhoes (2)	27
	Front-end loaders (2)	27
	Concrete trucks (3)	27
	Roller compactors (2)	27
	Asphalt paver (1)	27
	Haul truck (1)	27
Site restoration and demobilization	Hydroseeding trucks (3)	34
	Water trucks (4)	34
	Haul trucks (3)	34

Source: Data provided by HDR in 2008 and compiled by EDAW in 2008

unpaved (gravel). This will allow access to the two private marinas north of the public boat launch ramp to remain open. Following completion of the cutoff wall, the intersection would be rebuilt, and roadway paving would be replaced.

The Levee Raise-in-Place Alternative would require full closure and demolition of Garden Highway to construct the cutoff wall. The Garden Highway provides primary access to the waterside residences and businesses in Reaches 5A–9B. Closures would affect 1.5 to 2-mile segments of Garden Highway at any one time and the duration of closure for each segment could last for approximately 8 to 12 weeks to allow for degrading the levee, installing the cutoff wall, reconstructing the levee, and reconstructing Garden Highway. This would eliminate land-based access to residences and businesses along Garden Highway and would require that residents relocate and businesses close until access is restored. Residents and businesses with docks may be able to maintain access from the waterside of the levee. Construction of the cutoff wall in the vicinity of the I-5 Bridge would cut off land side access to the two marinas and Sacramento County's public boat launch facility for approximately 8 to 12 weeks, during the summer. This would require temporary closure of the businesses associated with the marinas (restaurants, bars, boat rentals) and the boat launch facility.

2.4 PRIVATE IRRIGATION FACILITIES

Numerous private irrigation facilities along the Sacramento River east levee between the end of the Elkhorn Canal and the beginning of the Riverside Canal (Reaches 9B–12) would be disrupted by the proposed levee improvements and would therefore be relocated as part of the Phase 3 Project. These private structures, consisting of five landside water wells and six private river pumps, service the adjacent fields for agricultural use. The water wells would be relocated outside of the flood damage reduction footprint (by drilling replacement wells and abandoning existing wells) and sited at least 100 feet off of the adjacent levee toe. The pumping plant discharge pipes through the levee would be raised, and new control valves would be added. Piping on the water side of the levee may be replaced to a point adjacent to the existing river pumps. In addition to the wells and river pumps, approximately 3,000 feet of local irrigation canals and approximately 9,400 feet of buried irrigation piping would be relocated. The private irrigation facilities would be replaced with in-kind structures compatible with the new levee footprint to prevent disruption of service in the fields.

3 PLEASANT GROVE CREEK CANAL WEST LEVEE

3.1 CUTOFF WALL CONSTRUCTION

Cutoff walls on the PGCC west levee would be constructed within the footprint of the widened levee. To provide a stable working surface for cutoff wall construction, and to mitigate potential levee through-seepage, the adjacent levee would first be constructed up to an elevation corresponding to the 100-year water surface. The working surface would be constructed by hauling earthen material to the levee from the borrow site using elevating scrapers or trucks. The material would be compacted in approximate 6-inch lifts to 90% of maximum density. The cutoff wall would then be constructed from this working surface, through the adjacent levee, to depths of up to 80 feet from the existing levee crown. The conventional, long reach excavator method would be used to construct approximately 17,400 linear feet of cutoff wall through the entire length of the PGCC.

Depending on the nature of the soils encountered during cutoff wall trench excavation, up to 40,000 cubic yards of import material may be required to supplement SB cutoff wall backfill materials.

Cutoff-wall installation for the PGCC west levee is anticipated to occur using two headings in back-to-back 12-hour work shift, with a total of 22 crew members. 24-hours-per-day operations would be needed to complete work before the flood season. Generally, a 6-day work week (Monday to Saturday) with maintenance on Sunday is expected, with a total of 50 working days to complete cutoff wall installation. **Table H-4** presents the anticipated construction equipment and duration for PGCC west levee cutoff wall construction.

3.2 LEVEE RAISING, SLOPE FLATTENING, AND WIDENING

Levee raising, slope flattening, and widening along the PGCC west levee is anticipated to require 475,000 cubic yards of import material (including material as described above to construct a cutoff wall working platform). This material is anticipated to be hauled from the Brookfield borrow site using elevating scrapers for the majority of the PGCC west levee. Where the haul distance exceeds the economical range for elevating scrapers (approximately 1 mile for a one-way trip), hydraulic excavators and off-road dump trucks would be used to load and haul import material. **Table H-4** presents the anticipated construction equipment and duration for PGCC west levee widening and slope flattening. This work is expected to involve 15–20 people working a single, 12-hour work shift 6 days a week.

3.3 TOTAL BORROW, HAULING, AND DELIVERIES

The total borrow quantity for the PGCC west levee is 490,000 cy. This earthwork estimate contains a 25% shrinkage replacement factor. In addition, regular deliveries of bentonite would be made to the project site (two deliveries for each week of cutoff wall construction). Regular deliveries would include equipment haul-in and haul-off (two for each unique item listed in **Tables H-4** and **H-5**), and miscellaneous deliveries including erosion control materials.

Table H-4
Anticipated Construction Equipment and Duration for Construction of the PGCC West Levee Cutoff Wall

Construction Phase	Equipment Type and Number of Each Type	Duration (Days)
[1] Clearing and grubbing/stripping	Elevating scrapers (8)	10
	Water trucks (2)	10
	Front-end loaders (4)	10
	Haul trucks (15)	10
	Pickup trucks (5)	10
[2] Borrow site preparation (concurrent with [1])	Elevating scrapers (4)	5
	Water truck (1)	5
[3] Working surface construction (follows [2])	Scrapers (15)	50
	Water trucks (2)	50
[3] Cutoff-wall construction (lags [2] by 14 days)	Long-reach hydraulic excavators (2)	75
	Hydraulic excavators (2)	75
	Front-end loaders (2)	75
	Extended-boom pallet loader (1)	75
	300-kW generators (2)	75
	Slurry pumps (2)	75
	Pickup trucks (5)	75
	Haul trucks (3)	75
[4] Demobilization/cleanup (follows [3])	Water trucks (2)	12
	Hydroseeding trucks (2)	12
	Extended-boom pallet loader (1)	12
	Haul trucks (2)	12

Note: PGCC = Pleasant Grove Creek Canal
Source: Data provided by Wood Rodgers in 2008 and compiled by EDAW in 2008

Table H-5 Anticipated Construction Equipment and Duration for Widening and Slope Flattening of the PGCC West Levee		
Construction Phase	Equipment Type and Number of Each Type	Duration (Days)
[1] Clearing and grubbing/stripping	Elevating scrapers (14)	30
	Water truck (2)	30
	Front-end loader (3)	30
	Haul trucks (10)	30
	Pickup trucks (4)	30
[2] Levee raising/slope flattening/widening	Dozer (2)	85
	Loader (2)	85
	Water trucks (2)	85
	Sheepsfoot rollers (3)	85
[3] Borrow site excavation (concurrent with [2])	Excavators (2)	85
	Dozer with ripper (2)	85
	Water truck (2)	85
	Elevating scrapers (17)	85
	Haul trucks (5)	85
[4] Finish grading (follows [3])	Motor graders (3)	10
	Water trucks (2)	10
	Hydraulic excavators (2)	10
Note: PGCC = Pleasant Grove Creek Canal Source: Data provided by Wood Rodgers in 2008 and compiled by EDAW in 2008		

3.4 PRIVATE IRRIGATION FACILITIES

Numerous private irrigation facilities along the PGCC west levee would be disrupted by the proposed levee improvements and would be replaced as part of the Phase 3 Project. These private structures, consisting of eight landside water wells and one private river pump, service the adjacent fields for agricultural use. The water wells would be relocated outside of the flood damage reduction footprint (by drilling replacement wells and abandoning the existing wells). The river pump discharge pipes through the levee would be raised and new positive control valves added. In addition to the wells and river pump, approximately 1,900 feet of local irrigation canals and approximately 2,350 feet of buried irrigation piping would be relocated. The private irrigation facilities would be replaced with in-kind structures compatible with the new levee footprint to prevent disruption of service in the fields. In addition, some RD 1000 drainage facilities would be relocated prior to PGCC construction, including 5,900 feet of drainage canal and 750 feet of pipe.

4 NATOMAS EAST MAIN DRAINAGE CANAL WEST LEVEE

4.1 CUTOFF WALL CONSTRUCTION

A cutoff wall would be constructed along the levee to a depth of up to 80 feet from the levee crown along the NEMDC west levee between Elkhorn Boulevard and Northgate Boulevard. To provide a working platform, at a minimum, the gravel operating road surfacing would be removed and stockpiled for later reuse. East Levee Road

and Ueda Bikeway asphalt pavement would be removed for construction of the cutoff wall. Depending on the equipment used to construct the wall, the levee may be degraded between 5–10 feet to provide additional working width. From the NEMDC Stormwater Pumping Station to Northgate Boulevard, approximately 21,000 linear feet of cutoff wall would be constructed up to a depth of 80 feet. Following completion of the cutoff wall, the levee crown would be reconstructed and the operating road surface restored to gravel roadway or asphalt pavement depending on the existing road surface. This operation is anticipated to require three headings working two back-to-back 12-hour shifts per day; 24-hours-per-day operation would be required to complete the cutoff wall before the flood season. A 6-day work week (Monday through Saturday) with maintenance on Sunday is expected, with a total of 75 working days to complete cutoff wall installation. If the cutoff wall is constructed with a CB mix, up to 167,000 cy of excess soil from the excavation of the trench would be used to construct the levee improvement between Elkhorn Boulevard and the NEMDC Stormwater Pump Station.

Table H-6 presents the anticipated construction equipment and duration for NEMDC west levee cutoff wall construction.

Table H-6
Anticipated Construction Equipment and Duration for Construction of the NEMDC West Levee Cutoff Wall

Construction Phase	Equipment Type and Number of Each Type	Duration (Days)
[1] Clearing and grubbing/stripping/asphalt paving removal	Asphalt grinder (1)	2
	Elevating scrapers (15)	10
	Front-end loaders (4)	10
	Haul trucks (15)	10
	Pickup trucks (15)	10
[2] Cutoff wall construction (follows [1])	Long-reach hydraulic excavators (3)	75
	Hydraulic excavators (3)	75
	Front-end loaders (3)	75
	Extended-boom pallet loader (2)	75
	300-kW generators (3)	75
	Slurry pumps (3)	75
	Pickup trucks (6)	75
	Haul trucks (15)	75
[3] Levee crown restoration (lags [2] by 2 weeks)	Asphalt paver (1)	1
	Smooth drum rollers (2)	3
	Sheepsfoot rollers (3)	75
	Front-end loaders (3)	75
	Water truck (2)	75
	Haul trucks (3)	75
	Motor graders (3)	75
[4] Demobilization/cleanup (follows [3])	Water trucks (2)	12
	Hydroseeding trucks (2)	12
	Extended-boom pallet loader (1)	12
	Haul trucks (2)	12

Note: NEMDC = Natomas East Main Drainage Canal
Source: Data provided by Wood Rodgers in 2008 and compiled by EDAW in 2008

4.2 LEVEE RECONSTRUCTION

Levee reconstruction may be required along the NEMDC at two locations between the three planned cutoff wall locations. These two segments are about 2,000 and 5,000 feet in length. The existing levee would be removed and reconstructed within the existing footprint.

4.3 LEVEE WIDENING AND SLOPE FLATTENING

Levee widening and slope flattening work at the NEMDC west levee is scheduled to occur between Elkhorn Boulevard and the NEMDC Stormwater Pumping Station. A total of approximately 225,000 cubic yards of imported earthen material would be required. A potential borrow source at the intersection of East Levee Road and Elkhorn Boulevard (Krumenacher property or Twin River Unified School District property) has been identified as the likely source of borrow material for this segment of the project. Where levee improvements are located within 1 mile of the borrow site, elevating scrapers would likely be used to haul the material to the levee. Where the haul distance exceeds this range, hydraulic excavators and off-road dump trucks would be used to load and haul the material from the borrow site.

Table H-7 includes the anticipated construction equipment and duration for NEMDC west levee widening and slope flattening. The crew size during its peak is estimated at 20–25 people, working 10-hour shifts, 6 days a week.

Table H-7
Anticipated Construction Equipment and Duration for Widening and Slope Flattening of the NEMDC West Levee

Construction Phase	Equipment Type and Number of Each Type	Duration (Days)
[1] Clearing and grubbing/stripping	Elevating scrapers (7)	30
	Water truck (1)	30
	Front-end loader (2)	30
	Haul trucks (5)	30
	Pickup trucks (2)	30
[2] Levee raising/slope flattening/widening	Dozer (1)	85
	Loader (1)	85
	Water trucks (1)	85
	Sheepsfoot rollers (2)	85
[3] Borrow site excavation (concurrent with [2])	Excavators (2)	85
	Dozer with ripper (1)	85
	Water truck (1)	85
	Elevating scrapers (9)	85
	Haul trucks (3)	85
[4] Finish grading (follows [3])	Motor graders (2)	10
	Water trucks (1)	10
	Hydraulic excavators (1)	10

Note: NEMDC = Natomas East Main Drainage Canal
Source: Data provided by Wood Rodgers in 2008 and compiled by EDAW in 2008

One to two daily deliveries of cement and two weekly deliveries of bentonite are anticipated for cutoff wall construction. Regular deliveries would include equipment haul-in and haul-off (two for each unique item listed in **Tables H-6 and H-7**), erosion control materials, aggregate surfacing delivery (70 deliveries), and asphalt concrete paving delivery (250 deliveries).

5 RELOCATED ELKHORN CANAL

Approximately 9,400 feet of the Elkhorn Canal would be relocated and reconstructed several hundred feet east of the landside toe of the Sacramento River east levee. The bottom of the canal would be high enough to raise irrigation water levels above the levels of adjacent fields so that these fields could be fed by gravity flow. The canal would be confined by earthen embankments designed to provide 1 foot of levee height above irrigation water operating levels. To provide for stable banks, the side slopes of the canals would be 3H:1V, 2H:1V in concrete lined areas. To control vegetation and to allow for canal maintenance with minimal disturbance of aquatic habitat along the water's edge, the canals would be concrete-lined only where existing canals are lined for Phase 3 Project improvement reaches. Generally, canals are operated with very flat slopes because of limited available elevation fall between the pumping plants and the service points. The canals also must have sufficient level-control structures (check structures) to maintain specified water levels at service points when flows are at a minimum.

5.1 ALIGNMENT

The Upper Elkhorn Canal (North Drainage Canal to Elkhorn Reservoir) was part of the Phase 2 Project. The Phase 3 Project would include relocation of the remainder of the Elkhorn Canal (Elkhorn Reservoir to just south of Elkhorn Boulevard). The proposed alignment of the new Elkhorn Canal is based primarily on the extent of the planned levee improvements. The canal was cited as close as possible to the projected toe of the new levee (with allowance made for 3H:1V or 5H:1V landside levee slopes). After this initial alignment was determined, a number of site-specific factors were considered and used to refine the alignment. The final alignment minimizes conflicts with known cultural resource sites and existing trees. Based on these site-specific factors and the variations in the proposed seepage remediation methods in different reaches, the alignment is only roughly parallel to the projected levee toe.

Approximately 25 field services (water turnout points), roadway crossings, and diversion boxes are located along the entire length of canal. The turnouts, roadway crossings, and diversion boxes would need to be replaced as part of the Proposed Action. Approximately 4,100 feet of the existing Elkhorn Canal south of the Elkhorn Reservoir sedimentation basin is concrete lined, and the remainder is earth lined.

To minimize project impacts on the Teal Bend Golf Club, the alignment of the Elkhorn Canal through the Teal Bend Golf Club would be piped (approximately 3,200 feet). Two 36-inch pipes would be aligned parallel to the levee toe landside of the flood damage reduction facility corridor (**Plate H-3**). This alignment would avoid existing golf course infrastructure to the largest extent possible. For maintenance purposes, it is assumed that parallel pipelines would be required so that flow could be maintained in one pipeline while the other is being maintained.

South of Teal Bend, the Elkhorn Canal would return to an open channel configuration aligned parallel to the toe of the new levee. The majority of this reach has a design bottom width of 3 feet, with a minimum of 1 foot of levee height and 3H:1V side slopes. A 15-foot-wide patrol road would be located on the top of the field side of the canal. The only portion of the new canal that would have a concrete lined invert would be the section where the existing canal is lined, approximately 4,100 feet. The remaining 1,300 feet of new canal would be earth lined. To reduce impacts on existing residences, a second section (approximately 950 feet through the Mortensen and Breese properties) of the Elkhorn Canal would be piped using a single 36-inch pipe.

5.2 CONSTRUCTION

Timing of the new canal construction would be critical to avoid interruptions in irrigation service. Temporary connections may need to be constructed to avoid agricultural service interruptions to adjacent properties.

Before construction, the canal right-of-way surface would be cleared and stripped to a depth of 4–6 inches, with removal of low-growing vegetation and loose surface soils. Suitable materials removed during this stage could be stockpiled. Unsuitable material would be wasted and hauled off-site. Before any excavation, utility poles in the path of the canal construction would need to be relocated. Natural gas pipelines, wells, and other gas facilities would be avoided or reconfigured in design of the Elkhorn Canal and the proposed drainage canal designed to provide both giant garter snake habitat connectivity and drainage (GGS/Drainage Canal).

During construction, borrow material from the GGS/Drainage Canal excavation would be utilized to build up the embankments of the relocated Elkhorn Canal, which would have a top elevation approximately 4 feet above the channel bottom and 3H:1V side slopes. Concrete-lined sections of the canal would utilize boom trucks and concrete pumps to apply the concrete to the bottom of the channel. Pipe sections would be constructed by excavating open trenches, laying the pipe, and backfilling to provide adequate cover material.

Up to 246,000 cubic yards of material to construct the embankments of the Elkhorn Canal would come primarily from the construction of the GGS/Drainage Canal north of I-5 with the balance obtained from the borrow sites.

New facilities that would be constructed include distribution boxes, gate valves, cast-in-place concrete headwalls and control structures, and culverts. Backhoes and excavators would be used to excavate material for the new facilities. Precast distribution boxes, pipes, and other appurtenances would be transported to the site on trucks. Other concrete facilities would be cast in place and concrete would be transported to the site in redimix trucks. Small compactors would be used to compact fill material around the facilities.

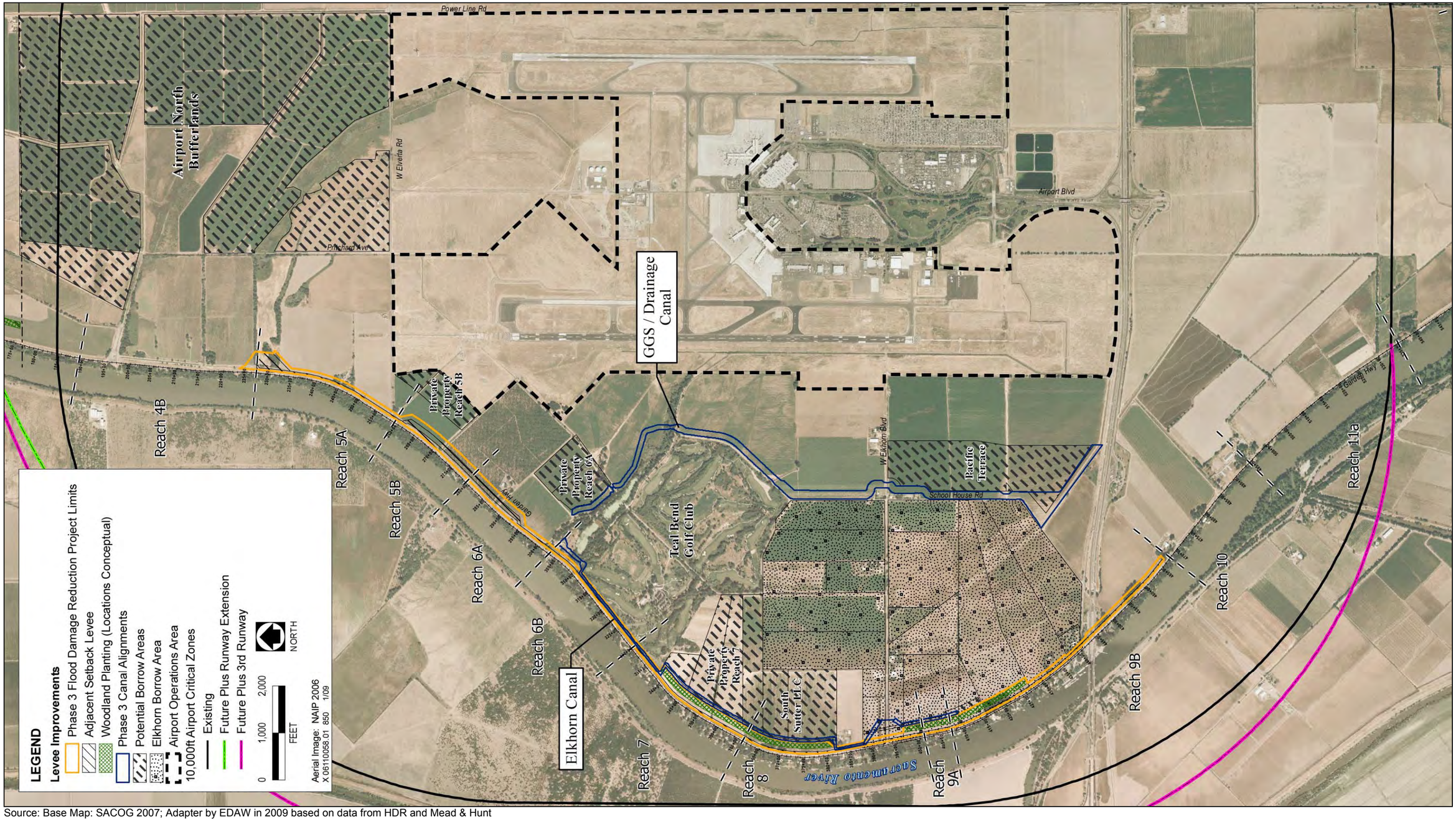
Portions of farm canals and other irrigation canals would be abandoned because of the relocation of the Elkhorn Canal. Such segments that are outside the footprint of the proposed levee improvements would be filled after the relocation of the Elkhorn Canal is completed.

Erosion control measures would be installed prior to the start of construction and maintained throughout the duration of the construction to minimize sedimentation of adjacent waterways. A hydroseeding truck would be used at the end of the construction to seed any disturbed area. Water trucks would be used throughout the construction to control dust in any disturbed areas.

Following construction, all disturbed areas would be vegetated and the construction site would be generally cleaned up including hauling off of unused and waste materials. All construction equipment would be taken off-site.

The anticipated construction labor force would consist of 15–20 people working 10-hour shifts, 6 days per week. The major construction stages are described below. The Phase 3 Project portion of the relocated Elkhorn Canal and the GGS/Drainage Canal would be constructed concurrently. This approach would facilitate the use of material from the GGS/Drainage Canal excavation for use as embankment material along the Elkhorn Canal.

Tables H-8 and H-9 present the anticipated construction equipment and duration, and hauling requirements, respectively, for the relocated Lower Elkhorn Canal.



Source: Base Map: SACOG 2007; Adapter by EDAW in 2009 based on data from HDR and Mead & Hunt

Elkhorn Canal Alignment

Plate H-3

Table H-8
Anticipated Construction Equipment and Duration for the Relocated Lower Elkhorn Canal

Construction Phase	Equipment Type and Number of Each Type	Duration (Days)
Clearing and grubbing/stripping	Dozers (4)	5
	Water trucks (2)	5
	Front-end loaders (4)	5
Water control facility construction	Backhoes (2)	17
	Flatbed trucks (2)	17
	Generators (2)	17
	Compactors (2)	6
	Boom trucks (2)	5
	Concrete pump (1)	5
Embankment and access road construction	Dozers (2)	56
	Sheepsfoot rollers (2)	56
	Water trucks (2)	56
	Smooth drum rollers (2)	3
	Motor graders (2)	56
Canal lining	Boom trucks (2)	9
	Concrete pump (1)	9
Irrigation interconnections	Excavators (2)	3
	Water truck (1)	3
	Motor grader (1)	3
Erosion control	Hydroseeding truck (1)	1
	Water truck (1)	15
Irrigation canal abandonment	Loaders (2)	9
	Compactors (2)	9
Demobilization/cleanup	Trucks (5)	2
	Front-end loader (1)	2

Source: Data provided by Mead & Hunt in 2008 and compiled by EDAW in 2008

Table H-9
Hauling Requirements for Construction of the Relocated Lower Elkhorn Canal

Construction Phase	Material Source	Material Destination	Volume (cubic yards)	Number of Trucks [1]	Total Truck Trips per Day	Duration (Days)
Clearing/grubbing	Project	Waste	4,200	10	80	4
Concrete delivery	Off-site	Project	2,625	10	40	9
Miscellaneous deliveries	Off-site	Project	NA	NA	1	30
Finish grading	Off-site	Seeding	7,000	2	2	14

Notes:
NA = Not available
[1] Truck capacity is assumed to be 15 cubic yards
Source: Data provided by Mead & Hunt in 2008 and compiled by EDAW in 2008

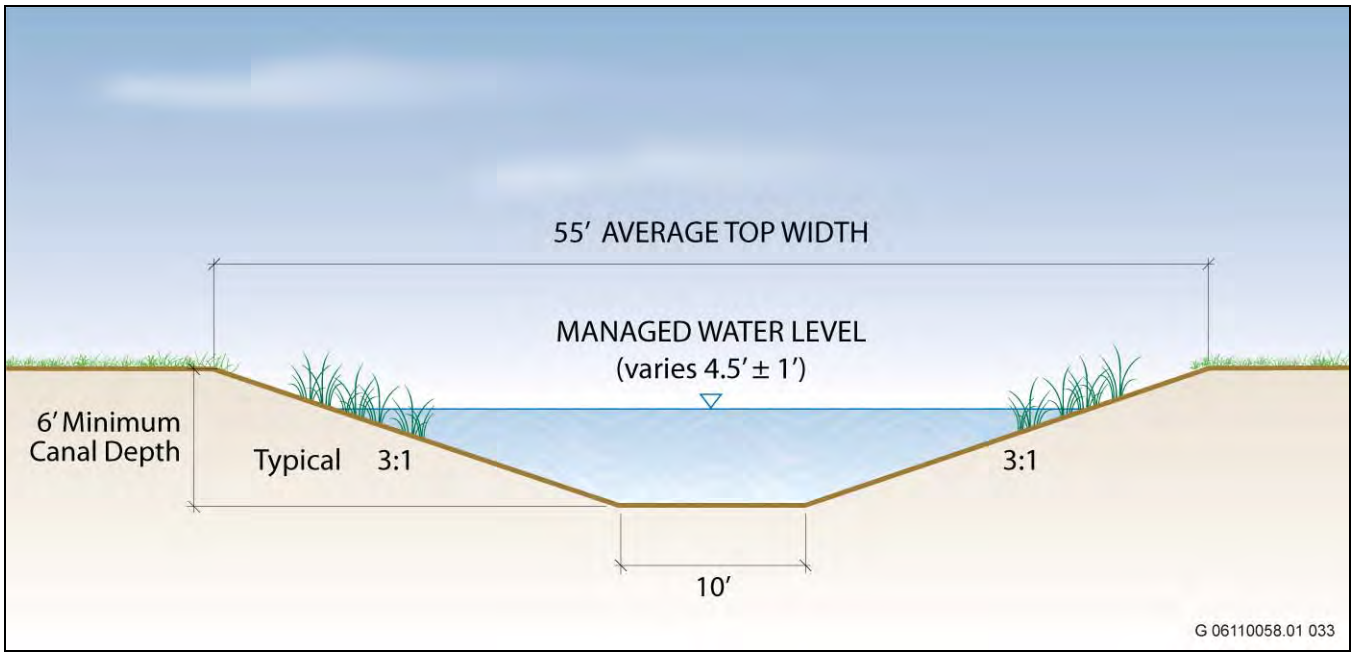
6 NEW GIANT GARTER SNAKE/DRAINAGE CANAL

The new GGS/Drainage Canal would provide improved connectivity of aquatic habitat between the North Drainage Canal and Fisherman's Lake and provide a migration corridor for giant garter snake between these areas. In addition to providing giant garter snake habitat, the GGS/Drainage Canal would intercept drainage flows from non-Airport property sources. Irrigation and drainage water currently flowing into the Airport West Ditch from non-Airport property would flow into the GGS/Drainage Canal.

6.1 ALIGNMENT

The Phase 3 Project component of the GGS/Drainage Canal would connect to the southern extent of the GGS/Drainage Canal completed during the Phase 2 Project and align to the east side of the Teal Bend Golf Club, parallel to School House Road, and extend south to the West Drainage Canal. The length of the Phase 3 portion of the GGS/Drainage Canal would be approximately 13,200 linear feet (**Plate H-3**).

North of Reservoir Road, the canal would be set back a minimum of 200 feet from the projected levee toe to minimize concerns of excessive seepage exit gradients in the bottom of the canal. The canal in this location would have a 10-foot bottom width and 3H:1V side slopes (**Plate H-4**). The depth would be sufficient to provide a minimum water depth of 4.5 feet with allowance for 1 foot of water level variance and a minimum canal depth of 6 feet.



Source: Adapted by EDAW in 2007 based on data from Mead & Hunt

Typical Cross Section of the New GGS/Drainage Canal From Walnut Road to Southeast Corner of Teal Bend Golf Club **Plate H-4**

The Phase 3 Project portion of the GGS/Drainage Canal would begin at the Elkhorn Reservoir and connect to the West Drainage Canal. The GGS/Drainage Canal would have a series of check structures along its length to maintain consistent water levels in the low-flow channel of the canal during the snake's active season (May–October). Water would be provided from Natomas Central Mutual Water Company's (NCMWC's) irrigation system. Vegetation within the canal would be managed by mowing and/or excavation. The GGS/Drainage Canal would cross Jacobs Slough through a control structure with two flashboard risers on the GGS/Drainage Canal and

two box culverts on the slough. The level of water in various part of the slough would be controlled by raising or lowering the flashboards. The normal operating level of the slough would be its existing normal water surface elevation.

There are three distinct reaches for the Phase 3 Project portion of the GGS/Drainage Canal construction, each of which uses a different typical cross section developed for the GGS/Drainage Canal. The GGS/Drainage Canal reaches would use the following cross sections:

- sediment basin through Walnut Road, cross section with bench—Type A;
- Walnut Road to the southeast corner of Teal Bend Golf Club, trapezoidal cross section; and
- south of Teal Bend Golf Club to the West Drainage Canal, cross section with bench—Type B.

These typical cross sections are described in further detail below.

- **Cross Section with Bench—Types A and B.** This typical cross section has a 10-foot bottom width and 3H:1V side slopes with managed water levels of 4.5 feet ± 0.5 feet. In this reach, a bench (Type A = 15 feet wide; Type B = 50 feet wide) would be included on one side of the low-flow channel. The bench area would have a maintained water depth of 3–12 inches. Tules would be planted on the sloped banks and bench and would typically be inundated with water during summer for enhancement of giant garter snake habitat. Overbank areas would have the potential for flooding during 10-year or greater storm events. A 20-foot-wide operation and maintenance corridor would be constructed on each side of the canal.

- **Trapezoidal Cross Section.** This typical cross section would have a 10-foot bottom width and 3H:1V side slopes and no bench. Tules would be planted on the sloped banks and would typically be inundated with water during summer for habitat enhancement.

6.2 CONSTRUCTION

Construction activities for the GGS/Drainage Canal and Elkhorn Canal would be similar, and these components would be constructed concurrently. This approach would facilitate the use of excavated material from the GGS/Drainage Canal north of I-5 for use as embankment material along the Elkhorn Canal. Habitat enhancement would include planting tules on the sloped banks. Backhoes would be used to prepare the planting areas and a water truck would be used to control dust.

Work is anticipated to begin in May 2009 and continue through November 2009, assuming receipt of all regulatory approvals, permits, and clearances. The anticipated construction labor force would consist of 15–20 people working 10-hour shifts, 6 days per week.

Tables H-10 and **H-11** present the anticipated construction equipment and duration, and hauling requirements, respectively, for the GGS/Drainage Canal.

7 AIRPORT WEST DITCH RECONFIGURATION

The Airport West Ditch would be reconfigured and redesigned in coordination with construction of the GGS/Drainage Canal. The NLIP's new GGS/Drainage Canal would intercept the year-round irrigation and drainage sources from adjacent private farms, which currently flow into the Airport West Ditch and the Airport Operations Area (AOA). Additional irrigation infrastructure (e.g., pipelines, check structures and other canal improvements) required to reroute these flows would be implemented along with the new GGS/Drainage Canal construction.

Table H-10
Anticipated Construction Equipment and Duration for the New GGS/Drainage Canal

Construction Phase	Equipment Type and Number of Each Type	Duration (Days)
Clearing and grubbing/stripping	Dozers (4)	41
	Water trucks (2)	41
	Front-end loaders (10)	41
Utility relocations	Dozers (2)	35
	Excavators (2)	35
	Compactor (1)	18
Excavation and trenching	Scrapers (4)	80
	Excavators (2)	110
	Water trucks (2)	110
Facility construction	Backhoes (2)	52
	Flatbed trucks (2)	52
	Generators (2)	52
	Compactor (1)	17
Embankment and access road construction	Dozers (2)	17
	Sheepsfoot rollers (2)	17
	Water trucks (2)	17
	Smooth drum rollers (2)	9
	Motor graders (2)	17
Reclamation	Backhoes (2)	35
	Water trucks (2)	35
Drainage interconnections	Excavators (2)	13
	Water truck (1)	13
	Motor grader (1)	13
Erosion control	Hydroseeding truck (1)	3
	Water truck (1)	22
Demobilization/cleanup	Truck (1)	3
	Front-end loader (1)	3

Note: GGS = Giant Garter Snake
Source: Data provided by Mead & Hunt in 2008 and compiled by EDAW in 2008

The existing Airport West Ditch is up to seven feet deep. This depth and the irrigation and drainage water that flows through the ditch results in standing water conditions that attract wildlife that potentially create a hazard to aircraft. Filling and leveling the ditch would involve placing earthen fill in the bottom of the existing ditch, to a level just below the invert of the existing runway storm drain pipes that outfall into the ditch.

Table H-11
Hauling Requirements for Construction of the New GGS/Drainage Canal Segment

Construction Phase	Material Source	Material Destination	Volume (cubic yards)	Number of Trucks [1]	Total Truck Trips per Day [2]	Duration (Days)
Clearing/grubbing	Project	Waste	43,500	20	80	39
Concrete delivery	Off-site	Project	65	1	1	10
Miscellaneous deliveries	Off-site	Project	NA	NA	1	10
Finish grading	Off-site	Seeding	17,400	2	2	35

Notes:
GGS = Giant Garter Snake; NA = not available
[1] Truck capacity is assumed to be 15 cubic yards
[2] Average round trip haul is assumed to be 2 miles
Source: Data provided by Mead & Hunt in 2008 and compiled by EDAW in 2008

The ditch cross section would be re-graded to form a shallow drainage swale with flattened side slopes to accommodate mowing operations required for vegetation control. The swale would be approximately five feet deep with 5H:1V side slopes. In general practice, a minimum side slope to accommodate machinery access for mowing operations is 3H:1V. The swale is outside the Runway Safety Area (RSA) in accordance with FAA Advisory Circular 150/5300-13. SCAS would be responsible for maintenance of the swale.

8 RECLAMATION DISTRICT 1000 PUMPING PLANT NO. 2

Because the Natomas Basin is surrounded by levees, all excess drainage within the Basin must be pumped out. In general, water is pumped into the Basin using NCMWC facilities and drainage within the Basin is pumped to the Sacramento River via RD 1000's drainage system and pumping plants.

8.1 LAYOUT

In response to underseepage observed during severe winter storms in January 2006, RD 1000's Pumping Plant No. 2 was taken out of service and dismantled. RD 1000 also filled the intake section of the North Drainage Canal approximately 600 feet away from (east of) the levee and drove sheet piles through the ring levee embankment between the sump for the pump station and the adjacent canal to further cut off the underseepage. Between fall 2006 and fall 2008, RD 1000 and SAFCA, in conjunction with the California Department of Water Resources, undertook an emergency levee repair project to excavate the levee, remove a deep culvert, and restore the levee cross section to its existing configuration. The Phase 2 Project would include construction of the adjacent setback levee and seepage berm across the site. As part of the Phase 3 Project, Plant No. 2 would be reconstructed at a site located farther away from the levee than the location of the old site. Pumping capacity of the reconstructed RD 1000 Pumping Plant No. 2 would approximately match historical Pumping Plant No. 2 capacity, which is based on the capacity to pump drainage water from the Natomas Basin during a 100-year base flood event. However, to maintain the equivalent capacity, some additional pumping horsepower would be needed to overcome the losses associated with longer discharge pipes and higher discharge head due to raising the pipes above the "200-year" design water surface elevation.

RD 1000 Pumping Plant No. 2 serves two purposes:

- pumping of drainage water from the North Drainage Canal to the Sacramento River for RD 1000, and
- recycling of irrigation water runoff from the North Drainage Canal back into NCMWC's Central Main irrigation canal.

A geotechnical report conducted in the vicinity of Pumping Plant No. 2 concluded that the material used to fill the portion of the North Drainage Canal in 2006 was not sufficiently compacted, and some unsuitable soil was left in the foundation layer. The condition of the material would not allow the emergency fill to be left in place for the adjacent levee, berm, and pump station foundation. Therefore, before construction of the adjacent levee and berm and the reconstruction of Pumping Plant No. 2, the area would be overexcavated and backfilled with suitable compacted soil material. A remnant portion of the transmission pipeline beneath the former ring levee as well as a French drain installed to relieve seepage adjacent to the former intake channel would also be removed. The excavation area is approximately 550 feet long by 50 feet wide and 32 feet deep at the center tapering to the existing ground with 2H:1V side slopes.

The proposed new Pumping Plant No. 2 would consist of an intake structure in the inlet canal (North Drainage Canal), a pump station and sump, piping over the levee, an outfall structure on the river side of the levee, and a pipe running to the NCMWC Elkhorn distribution box that is part of the Elkhorn Canal improvements component of the Phase 2 Project. The pumping station would have three pumps, with room to add an additional 300 hp pump. Two of the pumps would be 350 horsepower (hp) and the third pump would be 200 hp. The 350-hp pumps would be operated by RD 1000 and the 200-hp pump would be operated by NCMWC. The RD 1000 pumps would be connected to two 42-inch-diameter steel discharge pipes which transition to 36-inch pipes near the proposed levee and connect to a new concrete outfall structure that would be constructed within the bank along the Sacramento River.

The replacement outfall structure would be constructed close to the location of the original Pumping Plant No. 2 outfall structure. The concrete outfall structure would have a footprint of approximately 21 by 21 feet. A sheet pile cofferdam would be utilized to isolate and dewater an area of approximately 23 by 23 feet for the instream construction area of outfall. Upon completion of construction, the sheetpile wall would be cutoff at the foundation level. The embedded portion of the sheetpile wall would be left in place for erosion protection. Riprap stone protection would be placed on the water side of the outfall structure extending down the bank to the streambed and approximately 20 feet into the river channel. Clean stone for riprap armoring would be placed directly within the stream without dewatering. Rock slope protection from the extents of the outfall would tie into the banks upstream and downstream of the structure for erosion control.

The invert of the discharge pipes would cross over the levee above the “200-year” flood elevation of the Sacramento River to maintain the design level of flood risk reduction. A single 36-inch-diameter steel discharge pipe would connect the NCMWC pump to the Elkhorn Canal. An enclosure building would be provided to house the Plant 2 electrical, control, and monitoring equipment. The control system for the pumps would allow operation in a manual or automatic mode. The automatic mode would initiate pump start-up and shut down based on water levels in the North Drainage Canal. A separate electrical metering box outside of the building would be provided for the NCMWC pump to the Central Main Canal. The pumps, electrical equipment, maintenance platform, and pump deck would be elevated above the Natomas Basin interior 100-year flood elevation. Access roads would be provided to the pump deck and intake structure. To maintain access during a catastrophic flood event, the pump deck access road would be constructed above the 100-year flood elevation in the interior of the Natomas Basin. The access road to the intake structure would be constructed at grade level. A concrete box culvert would connect the pump station sump to the intake structure that would be located near the P-6 drain at the western end of the North Drainage Canal. The intake structure would be provided with a trash rack and automated trash rake system, and a maintenance road platform located approximately 1 foot above the adjacent land elevation. Based on the loose foundation soils found in the backfill area, it is anticipated that pipelines and structures would be overexcavated and structural fill would be placed to a depth of 18 inches below the structures to final grade. A geogrid would be placed under the bottom of the structure.

8.2 CONSTRUCTION

Construction of the Pumping Plant No. 2 intake would necessitate dewatering of limited areas within the Sacramento River and the North Drainage Canal. Temporary sheet pile cofferdams would be constructed in the

river beyond the outfall structure limits to provide adequate access to the site and in the North Drainage Canal approximately 550 feet upstream of the canal intake facility. Approximately 250 feet of the P6 Drain would also be dewatered during construction. Temporary pumping would be used to keep the construction area dewatered. Silt fencing or other suitable barriers would be installed in the canal upstream of the cofferdam for sediment control. The intake channel slopes would be laid back to a 3H:1V slope and would be lined with rock to mitigate existing instabilities in the earthen channel slopes during flood events.

Table H-12 presents the anticipated construction equipment and duration for reconstruction of Pumping Plant No. 2.

8.3 OPERATIONS

Pumping Plant No. 2 would be operated to pump water from the North Drainage Canal for drainage and irrigation purposes. The control system for the pumps would allow operation in manual or automatic mode with separate controls for RD 1000 and NCMWC. The automatic mode would initiate pump start-up and shut down based on water levels in the drainage canal. The approach velocity on the trash racks is designed to be less than 2 feet per second under any operating conditions and the discharge velocity into the river would be 7–12 feet per second.

8.3.1 NORMAL SUMMER OPERATIONS

During normal summer operation, NCMWC would operate Pumping Plant No. 2 to recirculate drainage water from the North Drainage Canal for agricultural operations. To facilitate irrigation operations, the water surface elevation in the North Drainage Canal would be maintained between 14.5 and 16.4 feet (NAVD88 Datum). When agricultural drainage causes levels in the North Drainage to rise, the NCMWC pump is operated to recirculate drain water into the irrigation system. Flows from the North Drainage Canal are approximately 51 cubic feet per second (cfs), with an approach velocity at the entrance to Pumping Plant No. 2 of approximately 1 foot per second.

Although Pumping Plant No. 2 is not normally operated for drainage during the summer months, RD 1000 may operate the facility if levels in the drainage system become excessively high. This would occur during infrequent summer storm events and during periods of high agricultural runoff typically at the end of the irrigation season. The pumping plant would be operated to discharge drain water from the North Drainage Canal into the Sacramento River, using one or both of the RD 1000 pumps. Each pump would have an individual bay and approach velocities to the plant entrance that are approximately 1 foot per second or less. The outfall pipes (invert elevation 16.6 [NAVD88 Datum]) would be above the normal summer water surface elevation in the Sacramento River.

8.3.2 NORMAL WINTER OPERATIONS

During normal winter operations, RD 1000 would maintain the water surface elevation in the North Drainage Canal at 12 feet (NAVD88 Datum). However, RD 1000 does not drop the water level to 12 until as late as January 1. In late fall/early winter, RD 1000 would maintain the higher summer water levels in the North Drainage Canal, so that NCMWC can move water into the Pullman and up to the rice fields in the northern part of the Basin. This is accomplished by opening the gate to the pipe from the Elkhorn distribution box into the North Drainage Canal.

At the end of the irrigation season, when RD 1000 drops the North Drainage Canal water level down to 12 feet, NCMWC ceases operating its Prichard Pumping Plant and its recirculation pump at Pumping Plant No. 2. Additionally, Pumping Plant No. 2 is operating most of the time to pump drainage water out of the Basin and into the Sacramento River. Maximum discharge capacity to the Sacramento River is 60 cfs. During normal winter operation, the outfall into the Sacramento River may be partially submerged.

Table H-12
Anticipated Construction Equipment and Duration for Reconstruction of RD 1000 Pumping Plant No. 2

Construction Phase	Equipment Type and Number of Each Type	Duration (Days)
Clearing/grubbing/stripping	Haul trucks (3)	15
	Front-end loader (1)	15
	Dozers (2)	15
	Chain saw (1)	15
	Water trucks (2)	15
Dewatering	Crane (1)	15
	Pile driver (1)	15
	Front-end loaders (1)	15
Utility relocation	Boom trucks (3)	3
	Excavators (1)	3
	Small compactors (1)	3
	Haul truck (1)	3
Demolition of existing structures	Haul truck (1)	1
	Excavator (1)	1
	Front-end loader (1)	1
Excavation/backfill	Haul trucks (25)	68
	Excavators (2)	68
	Dozers (4)	68
	Water trucks (2)	68
	Scrapers (2)	68
	Sheepsfoot rollers (2)	68
	Smooth drum rollers (2)	68
Structural foundation support—pipeline foundation backfill	Haul trucks (5)	2
	Small compactors (2)	2
Structural foundation support—installation of piles underneath intake, sump, and outfall	Pile drivers (2)	14
	Haul truck (1)	3
	Excavator (1)	3
	Small compactor (1)	3
Pipe installation	Haul truck (1)	14
	Welders (3)	14
	Excavators (2)	14
	Small compactors (2)	14
Installation of water control facilities—construction of CIP intake, sump, and pumping platform	Concrete trucks (2)	10
	Boom truck (1)	10
	Crane (1)	10
Installation of water control facilities—construction of CIP outfall structure	Concrete trucks (2)	2
	Boom truck (1)	2
Installation of water control facilities—installation of pumps	Crane (1)	2
	Haul truck (1)	2
	Welder (1)	2
Installation of water control facilities—utility placement	Boom truck (3)	6
	Excavator (1)	6
	Small compactor (1)	6
	Haul truck (1)	6
Erosion control	Water truck (1)	68
	Hydroseeding truck (1)	68
Miscellaneous deliveries	Haul truck (1)	120
Demobilization/cleanup	Hydroseeding truck (1)	2
	Haul truck (1)	10
	Front-end loader (1)	10

Notes:
CIP = cast-in-place; RD = Reclamation District
Source: Data provided by Mead & Hunt in 2008 and compiled by EDAW in 2008

8.3.3 FLOOD EVENT

The 100-year flood water surface elevation in the North Drainage Canal is 20 feet. In anticipation of a storm event, RD 1000 would lower the water level in the North Drainage Canal to elevation 9.0 NAVD, 3 feet below the normal winter operational water surface elevation. During a severe flood event, the trash rack would be completely submerged. Likewise, the outfall pipes would likely be submerged with expected higher water levels in the Sacramento River.

9 PRICHARD AND ELKHORN PUMPING PLANT MODIFICATIONS

Because the Basin is surrounded by levees, all excess drainage within the Basin must be pumped out. In general, water is pumped into the Basin using NCMWC facilities and drainage within the Basin is pumped to the river via RD 1000's drainage system and pumping plants. Because the discharge pipes are required to cross the levee above the new "200-year" design flood elevation, the existing gate structure for the NCMWC Elkhorn Pumping Plant would need to be removed. The existing gate structure for the NCMWC Prichard Pumping Plant would also need to be removed. The existing pumps at both pumping plants would require modification or replacement to allow similar performance after the levee improvements and pipe raising. The superstructure at Prichard Pumping Plant would require retrofitting or other rehabilitation to accommodate the new pipes. Some dredging of sedimentation with the Sacramento River may be required for installation of the new pumps. For removal of the manifold structure, the pump house, the gate structures, use of a backhoe, pneumatic hammers, and a front-end loader and haul truck would likely be required. The material would be wasted and removed from the site or salvaged and returned to NCMWC. For modifications to the pumps, the pumps would be pulled from the platform and replaced with new pumps.

Tables H-13 and **H-14** present the anticipated construction equipment and duration for the Prichard and Elkhorn Pumping Plant modifications, respectively.

10 BORROW SITES RECLAMATION

Borrow sites are areas from which earthen materials would be removed for use in construction. The Phase 3 Project EIS/EIR discusses borrow sites currently identified for Phase 3. The sites would be recontoured and developed as either managed marsh or grassland habitat or would be returned to agricultural cultivation following excavation for this use. Where borrow sites would be used over more than one construction season, the work would progress in cells that would be incrementally developed as habitat or returned to agricultural use as the borrow activities are completed. Sections 8.1 and 8.2, below, provide detail on reclamation activities for the Airport north bufferlands and Brookfield borrow sites.

10.1 AIRPORT NORTH BUFFERLANDS

The Airport north bufferlands borrow sites are located in the northwestern corner of Sacramento County bordered by Elverta Road to the south, the Sacramento County line on the north, and Powerline Road to the east (**Plate H-2**). The Sacramento River is roughly 0.5 mile to the west of the borrow sites. The borrow sites have field access roads on-site between the existing agricultural fields. The borrow sites are currently owned by the Sacramento County Airport System (SCAS) and are managed as open space, since expiration of leases to tenant farmers on December 31, 2007 (Rowe, pers. comm., 2008). The Airport north bufferlands borrow sites would be reclaimed and would be reseeded with grasses compatible with the Airport's Wildlife Hazard Management Plan (WHMP).

10.1.1 CONSTRUCTION

The excavation limits on the Airport north bufferlands borrow sites would be a minimum of 50 feet from the edge of the site boundary or any irrigation or drainage feature. From this setback, the slope from existing grade down to

Table H-13
Anticipated Construction Equipment and Duration for the Prichard Pumping Plant Modifications

Construction Phase	Equipment Type and Number of Each Type	Duration (Days)
Clearing and grubbing/stripping	Haul trucks (2)	2
	Front-end loader (1)	2
	Dozer (1)	2
	Water truck (1)	2
Utility relocation	Boom trucks (3)	6
	Excavator (1)	6
	Small compactor (1)	6
	Haul trucks (1)	6
Excavation/backfill	Haul trucks (4)	13
	Excavators (2)	13
	Dozers (2)	13
	Water trucks (1)	13
	Scraper (1)	13
	Sheepsfoot rollers (2)	13
	Smooth drum rollers (2)	13
Demolition of existing structures (including roadway demolition)	Haul truck (1)	3
	Pneumatic hammers (2)	2
	Excavator (1)	3
	Front-end loader (1)	2
Removal of existing facilities	Haul trucks (2)	5
	Excavators (1)	3
	Crane (1)	2
Pipe installation	Haul truck (2)	9
	Welders (3)	6
	Excavators (2)	6
	Dozer (1)	6
	Water truck (1)	3
	Small compactors (2)	3
Installation of water control facilities	Haul trucks (2)	2
	Crane (1)	2
	Welder (1)	2
Erosion control	Water trucks (1)	60
	Hydroseed truck (1)	60
Miscellaneous deliveries	Haul truck (1)	60
Demobilization/cleanup	Hydroseed truck (1)	1
	Haul truck (1)	1
	Front-end loader (1)	1

Source: Data provided by Mead & Hunt in 2008 and compiled by EDAW in 2008

Table H-14
Anticipated Construction Equipment and Duration for the Elkhorn Pumping Plant Modifications

Construction Phase	Equipment Type and Number of Each Type	Duration (Days)
Clearing and grubbing/stripping	Haul trucks (2)	2
	Front-end loader (1)	2
	Dozer (1)	2
	Chain saw (1)	2
	Water truck (1)	2
Utility relocation	Boom trucks (3)	4
	Excavator (1)	4
	Small Compactor (1)	4
	Haul truck (1)	4
Excavation/backfill	Haul trucks (3)	7
	Excavator (1)	7
	Dozers (2)	7
	Water truck (1)	7
	Scraper (1)	7
	Sheepsfoot roller (1)	7
	Smooth drum roller (1)	7
Demolition of existing structures (including roadway demolition)	Haul truck (1)	4
	Pneumatic hammers (2)	3
	Excavator (1)	4
	Front-end loader (1)	2
Removal of existing facilities	Haul trucks (2)	4
	Excavators (2)	2
	Crane (1)	2
Pipe installation	Haul truck (1)	10
	Welders (2)	7
	Excavator (1)	7
	Small compactors (2)	10
Installation of water control facilities	Haul truck (1)	2
	Crane (1)	2
	Welder (1)	2
Erosion control	Water truck (1)	40
	Hydroseed truck (1)	40
Miscellaneous deliveries	Haul truck (1)	40
Demobilization/cleanup	Hydroseed truck (1)	1
	Haul truck (1)	1
	Front-end loaders (1)	1

Source: Data provided by Mead & Hunt in 2008 and compiled by EDAW in 2008

the bottom of the excavation would be 3H:1V. Cut depths for all the borrow sites would be approximately 4–8 feet. Following excavation, disturbed areas would be finish graded by grading in compliance with drainage criteria in Federal Aviation Administration (FAA) Advisory Circular 150/5320-5C (FAA 2006).

Excavated soils not used for borrow material, such as the organic surface layer or soils considered unsuitable for levee construction, would be stockpiled and respread on-site following excavation. Any unsuitable borrow material would be stockpiled on-site and graded back into the restoration of the site which, for the managed grassland, would result in a finish graded elevation somewhat higher than the final design grades. The borrow site excavation operations would use water for dust control and to maintain proper moisture content in the borrow material. It is not anticipated that any water would be discharged off-site. Revegetation activities would include erosion control on excavated slopes (i.e., hydroseeding), application of fertilizer, and seeding. It is anticipated that no unsuitable material would be hauled off-site. Debris encountered during excavation would be hauled off-site.

Employee and construction equipment parking would be off street, either in the construction staging areas for the levee project, within the borrow site, or in designated parking areas. Construction equipment would be restricted to designated haul routes between the borrow operations and the construction sites. The haul route for a portion of this work may include the use of Powerline Road and/or Elverta Road. Garden Highway would not be used as a haul route.

10.1.2 DRAINAGE

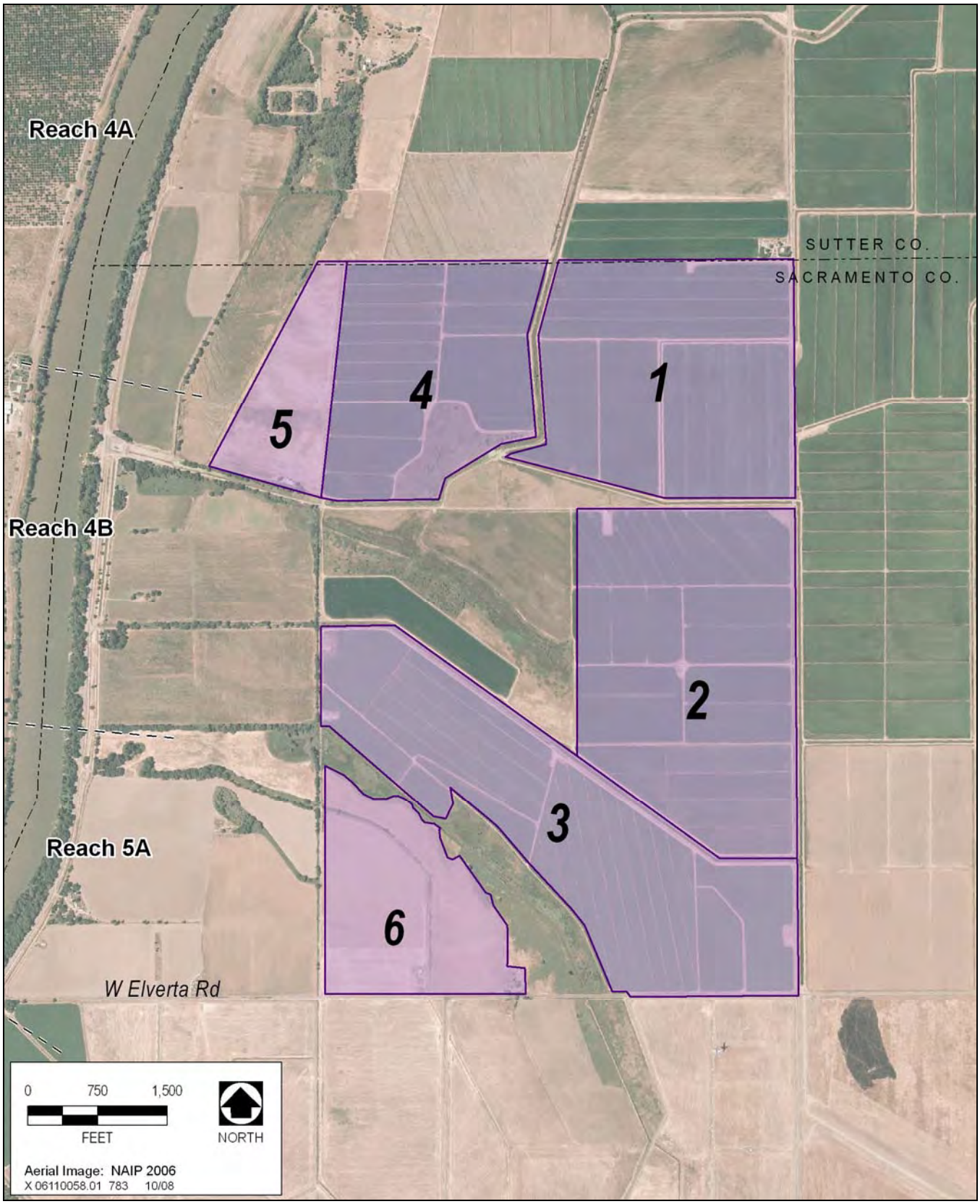
The water table in the borrow sites varies during the course of the year. In general, the spring water surface is highest and fall water surface is the lowest. Depending on Sacramento River levels, North Drainage Canal levels, and local rainfall, the water table level may also fluctuate from year to year.

The North Drainage Canal and its laterals (P-drain and P6-drain) intercept seepage during high groundwater conditions. The source of the seepage may include water from local fields (percolation of rainfall and irrigation water) and the Sacramento River. The North Drainage Canal is typically maintained at an elevation of 10–12 (NAVD 88) feet during the course of winter and early spring. During internal flooding events, the elevation may rise (elevation 19.9 feet NAVD88) in a 100-year event. The elevation typically returns to elevation 10–12 feet within a few days following the flooding event. RD 1000 typically must operate one or two pumps for the overall basin system to maintain the water surface to discharge the seepage or groundwater flow. The North Drainage Canal and its laterals' static water surface elevation of 10–12 feet NAVD88 is below the ground surface elevation of the surrounding fields with typical existing field elevations of 20–25 feet (elevation 17–20 feet proposed for borrow areas). Groundwater from these fields has a gradient toward the drainage canals.

In general, the borrow sites have very little existing rainfall or irrigation water infiltration. On each grassland site, rainfall water would sheet-flow across the property to shallow drainage swales designed to collect the runoff. From there, a field drain would collect the water and discharge it to an existing off-site drainage canal.
The borrow sites have been designed to drain with finish grade elevations 6 inches to 1 foot above the drainage swale elevations and approximately 2–2.5 feet above the existing off-site drainage canal water surface elevations. The sites are designed to drain and should not have any standing water in 10-year or lesser storm events.
In greater storm events, there could be some standing water in the fields in accordance with rising levels in the adjacent canals; however, the fields would drain as soon as water levels in the adjacent canals have receded, generally over a day or two, similar to existing storm water ponding in the rice fields.

10.1.3 INDIVIDUAL SITES

The Airport north bufferlands borrow sites have been divided into six separate sites (**Plate H-5**). This division was made to assist planning and engineering for specific reclamation and postproject land use targets. The division also provides flexibility for assigning borrow material to different project phases along the Sacramento River east levee to avoid conflict between construction crews that may be working on different phases at the same



Source: Base Map: SACOG 2007; adapted by EDAW in 2007 based on data from Mead & Hunt

Airport North Bufferlands Sites **Plate H-5**

time. Sites 1, 2, and 4 would be used for the Phase 2 Project (and are therefore not described further herein), and Sites 3, 5, and 6 would be used for the Phase 3 Project. Borrow from the Airport north bufferlands borrow sites may also be used for the Phase 4 Project. Below are descriptions of each site.

- **Site 3** is approximately 191 acres in size and is bordered by the Central Main Canal to the north, the P-drain to the east, Elverta Road to the south, and Powerline Road to the east. The majority of the Site 3 excavation would follow the 50-foot property offset with 3H:1V side slopes as described earlier. However, to accommodate the airport's future runway extension plans (Runway 16-L), a portion of Site 3 would be excavated no steeper than a 2% slope from Elverta Road for approximately 1,000 feet north and 1,500 feet east of Powerline Road. Following excavation activities, Site 3 would also be finish graded to the standard irrigation slope. Site 3 would generally slope down to the southwest toward a proposed shallow drainage ditch along the southwestern edge of the excavation area. The drainage ditch would flow to the northwest outlet into the P-Drain. The borrow operations should have very little impact on the overall drainage in this area of the Basin.

- **Site 5** is approximately 44 acres and is located north of the North Drainage Canal and west of the P-Drain directly west of Site 4. Like the other Airport north bufferlands sites, Site 5 would be finish graded to a standard irrigation slope. Site 5 would be sloped down toward a shallow drainage ditch along the southern edge of the property, which would outlet at a field drain and then into the existing adjacent North Drainage Canal.

- **Site 6** is approximately 75 acres and is located north of the Elverta Road and east of the P-Drain. Like the other Airport north bufferlands sites, Grassland Site 6 would be finish graded to a standard irrigation slope. Site 6 would be sloped down toward a shallow drainage ditch along the northern edge of the property. The drainage ditch would slope toward a field drain approximately one third of the distance along the northern boundary, east from the P-drain. This would then drain into the adjacent wetland area to the north. A section of the Lambert Ditch bisects the Site 6. This ditch would likely be relocated along the western and southern sides of the site.

- **Table H-15** lists the estimated construction equipment requirements for excavation and reclamation within the Airport north bufferlands borrow sites. Hauling to and from the site is included in the destination project construction.

Table H-15
Anticipated Equipment Requirements and Duration of Use for Reclamation of the Airport North Bufferlands Borrow Sites

Construction Phase	Equipment Type and Number of Each Type	Duration (Days)		
		Site 3	Site 5	Site 6
Stripping of topsoil and stockpiling	Scrapers (8)	25	6	10
	Water trucks (2)	25	6	10
	Graders (2)	25	6	10
	Bulldozers (2)	25	6	10
Respreading and grading of topsoil	Scrapers (8)	25	6	10
	Water trucks (2)	25	6	10
	Graders (2)	25	6	10
	Bulldozers (2)	25	6	10
Cross ripping and land leveling	Bulldozers with rippers (1)	17	4	7
	Bulldozers with land planes (1)	5	2	2
Revegetation	Fertilizer spreaders (1)	4	1	2
	Tractors (1)	2	1	1

Source: Data provided by Mead & Hunt in 2008 and compiled by EDAW in 2008

10.2 BROOKFIELD

The Brookfield property is a 348-acre private property owned by Brookfield California Land Holdings, LLC; the Richter Kazer 1993 Irrevocable Trust, and the J Rise Richter Trust. The property is located between Howsley Road and Fifield Road, west of the PGCC west levee. The property is currently in rice cultivation (summer 2008). **Plate H-6** shows the location of the site and proposed perimeter canal modifications.

The Brookfield property would be used as a borrow site for the Phase 2 and Phase 3 Projects. Currently, there is an outdated and inefficient drainage channel servicing the Brookfield property from a culvert under SR 99/70 connecting to the Brookfield site at the southwestern corner of the property. This drainage canal continues northward along the western side of the Brookfield property. The irrigation canal that services the properties south of the Brookfield site is situated parallel to the drainage channel westward from SR 99/70 and runs along the southern border of the Brookfield site for approximately half its length. Most of the existing drainage water from the Brookfield property sheet-flows into a field ditch on the west side of the property. However, drainage from the southeast portion of the property drains toward and provides irrigation for the pasture field located southeast of the Brookfield property. Currently, the site is irrigated by the use of three existing wells, two of which would likely be relocated due to the adjacent PGCC west levee improvements.

The removal of borrow material would entail excavating the site to a depth of up to approximately 6 feet. One foot of topsoil would be removed and stockpiled for reuse during reclamation of the site. This borrow material would be used for levee improvements along the PGCC west levee (Phase 3 Project) and NCC south levee (Phase 2 Project). The haul route for this site includes the use of Howsley Road.

Following the removal of borrow material for the levee construction, the site would be graded and returned to rice cultivation. Currently, the site is irrigated from on-site wells. To provide irrigation to the site following the excavation of borrow material, the irrigation canal along the south side of the site would need to be deepened and reconfigured from the Brookfield site westward to the culvert under SR 99/70. Additionally, a field irrigation ditch would need to be constructed within the Brookfield site to provide irrigation water from the adjacent highline canal to the fields.

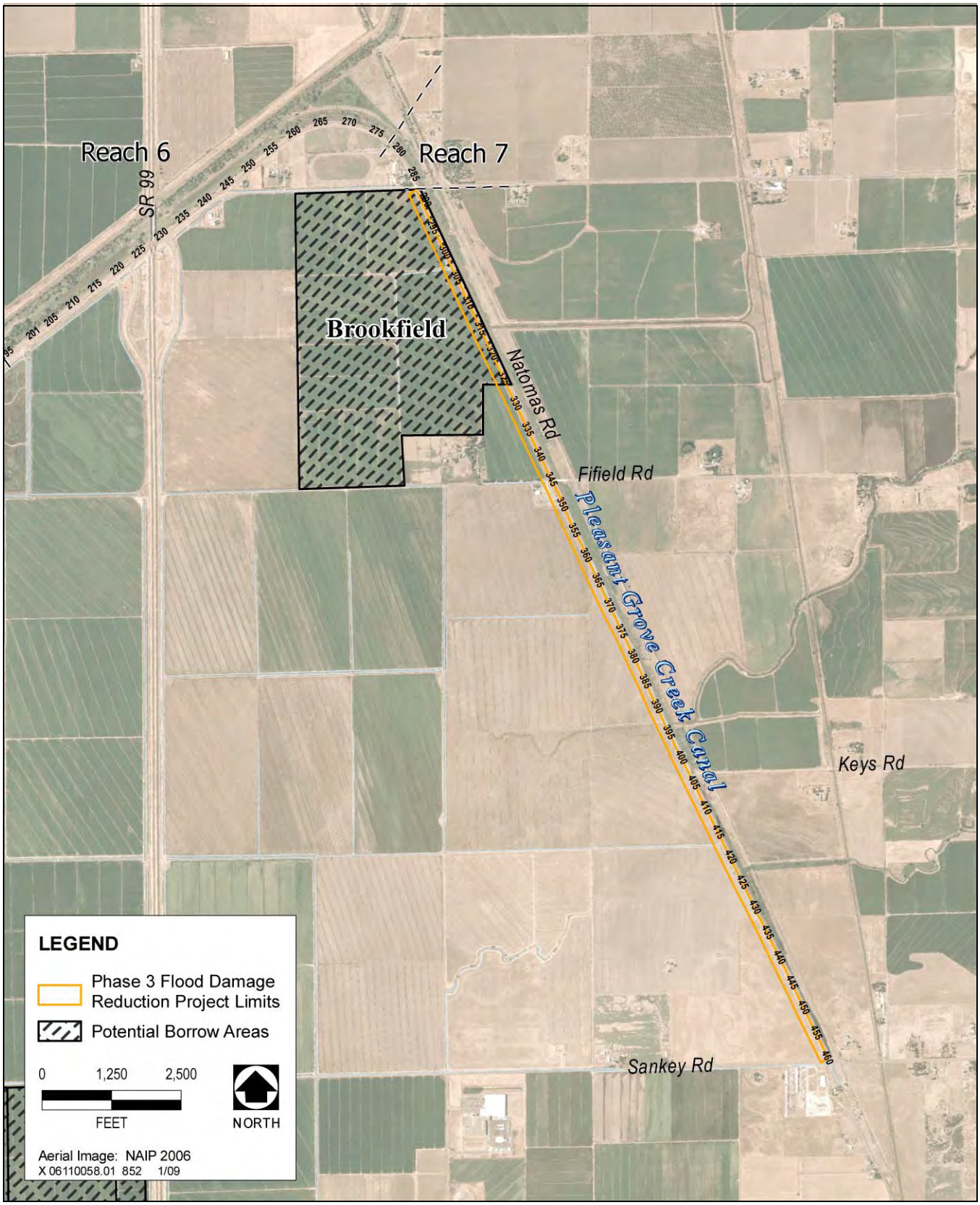
Grading of the site would be performed at a slope that would allow the water to flow back to the drainage canals running along the west and south side of the property. The water from the eastern fields would be drained into a canal along the west side of the pasture land and into the southern drainage canal. The drainage channel along the west and south side of the property would need to be modified to allow the site to drain following borrow excavation. The modifications include widening all canals to an 8-foot bottom width with 3H:1V side slopes. Specific canal improvements could include approximately 4,480 feet of the RD 1000 canal that borders the south end of the site, 3,670 feet of the private north-south drainage ditch along the west edge of the property, the creation of a 900-foot-long drainage ditch along the west edge of the pasture lands, and a 6,350-foot-long section of the drainage canal along SR 99/70 from the RD 1000 canal south. Improvements of the drainage canal along SR 99/70 could require land acquisition of up to 25 acres to account for the additional width of the channel and flatter side slopes.

Table H-16 lists the estimated construction equipment requirements for excavation and reclamation at Brookfield. Hauling to and from the site is included in the destination project construction.

10.3 ELKHORN BORROW AREA

10.3.1 CONSTRUCTION

Construction details for the Elkhorn Borrow Area would be identical to those described above for the Airport north bufferlands. See Section 10.1.1, “Construction,” above.



Source: Base Map: SACOG 2007; Adapted by EDAW in 2008 based on data from HDR and Wood Rodgers

Overview of Proposed Project Features: Pleasant Grove Creek Canal and Brookfield **Exhibit H-6**

Table H-16 Anticipated Equipment Requirements and Duration of Use for Reclamation of Brookfield		
Construction Phase	Equipment Type and Number of Each Type	Duration (Days)
Stripping of topsoil and stockpiling	Scrapers (12)	35
	Water trucks (3)	35
	Graders (3)	35
	Bulldozers (3)	35
Respreading and Grading topsoil	Scrapers (12)	35
	Water trucks (3)	35
	Graders (3)	35
	Bulldozers (3)	35
Cross ripping and land leveling	Bulldozers with rippers (2)	17
	Bulldozers with land planes (2)	5
Revegetation	Fertilizer spreader (1)	8
	Tractor (1)	4
Source: Data provided by Mead & Hunt in 2008 and compiled by EDAW in 2008		

10.3.2 RECLAMATION

Borrow material would be excavated from primarily agricultural lands that are either fallow or produce row or field crops. These sites may also contain scattered rural housing, drainage, and irrigation features, and woodlands (**Plates 17a** and **10**). Excavated soils not used for borrow material, such as the organic surface layer or soils considered unsuitable for levee construction, would be stockpiled and filled on-site following excavation. For areas planned to be returned to agricultural use, approximately 1 foot of topsoil would be removed and stockpiled for reuse during reclamation of the site. The borrow site excavation operations would use water for dust control and to maintain proper moisture content in the borrow material. Sites would be reclaimed for use, and converted back to agriculture.

11 LEVEE RAISE-IN-PLACE ALTERNATIVE

11.1 CUTOFF WALL CONSTRUCTION IN THE EXISTING SACRAMENTO RIVER EAST LEVEE

Preparation for construction of the cutoff wall would begin with using scrapers (or other suitable equipment, depending on the slope) to clear and grub/strip the surface to a depth of 2 inches to remove low-growing vegetation, loose stone, and surface soils. This material would be hauled off-site. The asphalt concrete pavement, Portland cement concrete pavement, and aggregate base from Garden Highway would be pulverized and removed and stockpiled for later reuse. Waste material would be hauled to an off-site location.

Construction of the cutoff wall would include degrading the existing levee to a depth equal to one-third its total height (approximately 6 feet). This would require extensive detouring of traffic off Garden Highway and temporary relocation of driveways and other residential access areas to accommodate construction activities. The depth of the cutoff wall would vary from about 70 feet to about 110 feet, with the method of installation at the contractor's discretion. Material degraded to support cutoff wall construction would be compacted at the landside toe of the levee to support the levee raising operation or utilized in the seepage berms.

11.2 LEVEE RAISING

To obtain a minimum of 3 feet of levee height above the "200-year" design water surface, the levee would be raised in place by 1.4 to 1.5 feet between Station 228+00 and Station 468+00, a distance of approximately 4.5 miles, using imported material meeting USACE requirements for levee fill. Levee raising activities would occur following cutoff wall construction and curing to limit Garden Highway closures and complete residential access relocations. To accommodate the higher levee, Garden Highway would be slightly widened and two existing Garden Highway intersections (West Elverta Road and West Elkhorn Boulevard) would be redesigned and reconstructed. In all locations, the levee would be raised toward the land side and, where the existing landside levee slope is currently steeper than 3H:1V, the levee would be flattened to the land side to achieve a 3H:1V slope.

Table H-17 shows the estimated material quantities for the Sacramento River east levee modifications under the Levee Raise-in-Place Alternative.

Table H-17
Estimated Material Quantities Required for the Levee Raise-in-Place Alternative Improvements to the Sacramento River East Levee in Reaches 5A–9B (Phase 3 Project)

Material Type	Quantity	Source (Average Round-Trip Haul Distance)
Soil type 1—select fill	339,250 cy	2009: Airport north bufferlands (4 miles)
Soil type 2—random fill	569,500 cy	2009: Airport north bufferlands (4 miles)
Reusable fill	66,000 cy	—
Aggregate base [1]	51,000 tons	Commercial source (30 miles)
Asphalt concrete [1]	25,500 tons	Commercial source (30 miles)
Temporary aggregate base [2]	18,500 tons	Commercial source (30 miles)
Temporary asphalt concrete [2]	4,750 tons	Commercial source (30 miles)
Total	**974,750 cy/99,750 tons**	

Notes:
cy = cubic yards
[1] For rebuilding Garden Highway on the reconstructed levee crown south of the setback levee
[2] For temporary relocation of sections of Garden Highway during improvements to the existing levee
Source: Estimates provided by HDR in 2008

REFERENCES

CaSIL. *See* California Spatial Information Library.

California Spatial Information Library. 2006. Base Layers. Available: <http://casil.ucdavis.edu/casil/inlandWaters/>.

FAA. *See* Federal Aviation Administration.

Federal Aviation Administration. 2006 (September 29). *Surface Drainage Design*. FAA Advisory Circular 150/5320-5C.

Rowe, Greg. Senior Environmental Analyst. Planning and Environment, Sacramento County Airport System, Sacramento, CA. September 11, 2008—e-mail to Elizabeth Holland of the U.S. Army Corps of Engineers, Sacramento District, regarding nonrenewal of agricultural leases on Airport property.

NAIP. *See* National Agricultural Imagery Program.

National Agricultural Imagery Program. 2006. Available: <http://datagateway.nrcs.usda.gov/GatewayHome.html>.

SACOG. *See* Sacramento Area Council of Governments.

Sacramento Area Council of Governments. 2007. Regional Street Centerlines. Available: <http://www.sacog.org/mapping/clearinghouse/>.

Sacramento Area Flood Control Agency. 2007a (September). *Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project.* Certified November 2007. State Clearinghouse #2007062016. Sacramento, CA. Prepared by EDAW, Inc., Sacramento, CA.

———. 2007b. *Natomas Levee Improvement Program Bank Protection Project Draft Environmental Impact Report*. Prepared by Jones and Stokes, Sacramento, CA.

Sacramento County Airport System. 2007. *Airport Wildlife Hazard Management Plan.* Sacramento, CA.

SAFCA. *See* Sacramento Area Flood Control Agency.

APPENDIX I

Alternatives Formulation and Screening Details

APPENDIX I
ALTERNATIVES FORMULATION AND SCREENING DETAILS

This appendix to the Natomas Levee Improvement Program (NLIP) Phase 3 Landside Improvements Project (Phase 3 Project) Environmental Impact Statement/Environmental Impact Report (EIS/EIR) contains more detailed information on the alternatives evaluation process summarized in Chapter 2.0, "Alternatives."

1.1 INTRODUCTION

This appendix describes the alternatives that were considered to provide additional flood risk reduction to the Natomas Basin consistent with the project objectives in Chapter 1.0, "Introduction and Statement of Purpose and Need" in this EIS/EIR. The Phase 3 Project builds upon the analyses in the Local Funding EIR, the Phase 2 Project EIR and Supplemental EIR, and the Phase 2 Project EIS. Three alternatives for the Sacramento River east levee were evaluated at an equal level of detail in this EIS/EIR:

- No-Action Alternative,
- Proposed Action (Adjacent Setback Levee), and
- Levee Raise-in-Place Alternative.

Although they provide contrasting advantages and disadvantages, each of the alternatives is considered feasible based on relevant economic, environmental, social, technological, and legal factors. Each of the action alternatives (i.e., the alternatives other than "No-Action") under consideration was formulated to feasibly accomplish most of the basic objectives of the project as discussed in Chapter 1.0, "Introduction and Statement of Purpose and Need," of this EIS/EIR. In particular, the action alternatives both would achieve early compliance to meet requirements for certification of FEMA 100-year flood protection criteria and are compatible with construction of additional components to meet "200-year" flood protection criteria for urban areas.

The NLIP design criteria in terms of maximum water surface elevation and maximum flow at key locations on the Natomas Basin perimeter levee system are identified in **Table I-1** below:

Table I-1
NLIP Design Criteria: Water Surface Elevation and Maximum Flow

Location	1% (100-year) FEMA Criteria Flood [1]		0.5% ("200-year") NLIP Design Criteria Flood [2]	
	Maximum Water Surface Elevation (feet) NGVD29	Maximum Flow (cfs)	Maximum Water Surface Elevation (feet) NGVD29	Maximum Flow (cfs)
Sacramento River at Verona	41.12	117,000	42.57	143,000
Latitude of Verona	NA	528,000	NA	622,000
NCC at PGCC	41.45	NA[3]	42.96	NA[3]
NEMDC near Main Avenue	36.7	14,500	38.61	17,100

Notes: cfs = cubic feet per second; NCC = Natomas Cross Canal; PGCC = Pleasant Grove Creek Canal

[1] Levees overtop without failing; existing levees; existing Folsom Dam

[2] Levees overtop without failing; "200-year" urban levees; Folsom Joint Federal Project

[3] Maximum water surface elevation controlled by high tailwater in Sacramento River

Source: SAFCA 2008

The action alternatives include components that could avoid or substantially lessen one or more of the significant effects. In addition, because the combination of components themselves could cause differing levels of significant effects, the alternatives include criteria for combining components to substantially lessen the impacts from construction of the alternatives.

1.1.1 NEPA/CEQA REQUIREMENTS FOR EVALUATION OF ALTERNATIVES

1.1.1.1 NEPA REQUIREMENTS

The NEPA Council on Environmental Quality Regulations (40 CFR 15012.14) for EIS requirements are briefly described in Chapter 1.0, "Introduction and Statement of Purpose and Need," of the Phase 3 Project EIS/EIR.

1.1.1.2 CEQA REQUIREMENTS

The CEQA requirements for an EIR (as noted in Section 15126.6(a) of the State CEQA Guidelines) are briefly described in Chapter 1.0, "Introduction and Statement of Purpose and Need," of the Phase 3 Project EIS/EIR.

2.1 ALTERNATIVES FORMULATION

SAFCA formulated the Proposed Action and a reasonable range of project alternatives that are intended to achieve the specific project objectives through the following steps:

- identification of the deficiencies in the Natomas levee system that must be addressed to provide "200-year" flood protection;
- identification of the deficiencies that must be addressed to provide at least 100-year flood protection as quickly as possible;
- identification of feasible remedial measures to address the deficiencies;
- determination of the likely environmental impacts of the remedial measures;
- development of a reasonable range of flood damage reduction alternatives for implementing the remedial measures; and
- addition of measures to ensure that each alternative would improve aviation safety associated with hazardous wildlife, minimize impacts to significant cultural resource sites, and enhance habitat values.

Alternatives screening for the overall NLIP has been undertaken by SAFCA in a systematic manner through several environmental documents as described later in this appendix. A description of the flood protection measures that SAFCA considered for developing alternatives is provided below.

2.1.1 TYPES OF FLOOD PROTECTION MEASURES CONSIDERED

Plan formulation in development of water resources projects is an iterative process that involves identifying, evaluating, and comparing measures and preliminary alternatives to develop a reasonable range of final alternative plans for consideration by decision makers and the general public. For the NLIP Landside Improvements Project, engineering measures were developed and considered that alone or in various combinations would address the project purpose.

The engineering measures that were considered for the Phase 3 Project must meet several criteria. First, the design selected must adequately improve performance of the levee so that certification is possible. Generally, the

requirements are to provide enough levee raise so that the levee height is adequate, levee stability meets criteria, and/or to reduce seepage to acceptable levels either through or beneath the levee.

2.1.1.1 LEVEE RAISE

A levee raise is not required in all parts of the Basin. In parts of the Basin, the levee raise is necessary only to meet the "200-year" protection standard required by the State for urbanized areas, such as the Natomas Basin. However, all new levee certifications by the USACE require the removal of vegetation with stems or trunks greater than 2 inches in diameter that is on the slope of the levee, as well as slopes that are stable against failure. This vegetation requirement facilitates visual inspection of the levee to its toes, which is very important to determine the performance of the levee under flood conditions. It also provides a higher level of protection for levee stability, especially due to erosion of its banks.

For the Phase 3 Project, two engineering design methods to meet flood protection criteria compatible with the engineering design selected for the Phase 3 Project are available: 1) raising the existing levees in their current alignments (levee raise-in-place), and 2) constructing a new higher levee adjacent to the existing levee (new adjacent levee).

Levee Raise-in-Place

To raise a levee in place, the existing levee footprint would be widened at its base, on one or both sides, so that it remains stable and supports the weight of the additional material placed on top. In addition, the levee may need to be widened to ensure that the sides are not too steep, and to ensure that the crown width is adequate for continued use, particularly where roadways are located on top of the levee, and that the levee meets the minimum design topwidth standards. This engineering design is commonly referred to as the levee raise-in-place alternative. While the levee footprint (its base) size would not be substantially altered, the requirement to remove vegetation on the levee slopes, would likely require mitigation for loss of riparian habitat. Where the widening occurs below the ordinary high water mark on the water side of the levee, the mitigation requirement would likely include construction of replacement wetlands. Where the widening occurs on the land side and trees that provide habitat or are otherwise protected exist, the mitigation requirement would be to plant replacement woodlands. In some instances, irrigation and drainage ditches and canals exist at the toe of the levee, and would need to be relocated further to the landside.

New Adjacent Levee

For the Proposed Action, the concept of an adjacent levee is that the levee prism would be shifted landward, such that the concerns with vegetation on the water side slope is no longer as great. This design reduces the impact of vegetation removal on the water side, but requires obtaining additional suitable earthen embankment material to build the adjacent levee structure.. The irrigation and drainage ditches and canals that exist at the toe of the levee would need to be relocated further to the landside. The widened levee footprint would also require the acquisition of additional easements and right of way, including right of way for utilities along the alignment, as well as planting replacement woodlands. Proper construction of the adjacent levee foundation requires excavation of an inspection trench beneath the adjacent levee embankment area. If a levee raise is required, the adjacent levee height would be greater than that of the existing levee. If a levee raise is not required, the adjacent levee height would be the same as the existing levee.

The landside toe of the existing levee, within the footprint of the new adjacent levee, would be stripped to a depth of approximately one foot to remove vegetative matter and topsoil material from the adjacent levee foundation.

2.1.1.2 SEEPAGE REMEDIATION

Existing seepage remediation designed and constructed in the perimeter levees of the Natomas Basin has primarily addressed through-seepage. Through-seepage is the movement of water through the levee itself, when high-flow conditions, and/or wind and wave action exist on the water side of the levee. Along the lower portion of the Sacramento River east levee (downstream of Powerline Road), the through-seepage was addressed by construction of a cutoff wall through the levee prism. This feature provides a low permeability barrier to water flow through the levee. In the upper portion of the Sacramento River east levee and along the Natomas Cross Canal south levee, drained and undrained stability berms were constructed. Underseepage occurs below the levee prism, and is caused by the buildup of water pressure in the subsurface levee foundations when high flows are present on the water side of the levees. This pressure can be great enough to force water through the earth. The water finds a pathway of less resistance and exits at the surface. In general, two construction methods can reduce underseepage concerns and be compatible with the Phase 3 Project construction methods.

Cutoff Walls

Cutoff walls use specialized earthen materials (clay, bentonite, and cement) that are mined and processed to provide the required engineering properties. The cutoff walls are typically installed into the center of the levee embankment. Successful construction of cutoff walls requires a 24 hours per day/7 days a week (24/7) construction schedule, so that the cutoff wall material keeps its proper consistency and that it can be completed prior to flood season. Specialized equipment allows the cutoff walls to reach deep into the subsurface foundation layers, sometimes to depths of almost 100 feet below the ground surface. Often the levee crown is “degraded” to allow for construction, meaning that the top of the levee is excavated to create a wider working platform, so that the excavation equipment can operate to install the cutoff wall. An inspection trench, usually 6-feet deep and 12-feet wide at the base with 1H:1V side slopes, is constructed at the base of the levee to allow visible inspection of the levee foundation area. In some instances, relocation of irrigation and drainage ditches and canals may be necessary to construct the levee improvements.

Due to the long history of natural and human-enhanced levee buildup in the Natomas Basin, it is not unusual to find conditions of underseepage to depths greater than the maximum depth of a cutoff wall. In those cases, a seepage berm, with or without relief wells, is also used to protect against underseepage.

Seepage Berms

Seepage berms are wide, shallow features with relatively flat slopes graded to drain landward. They are constructed by using earthen material excavated from borrow sites. In some cases, a 1- to 1.5-foot-thick drainage layer consisting of sand or drainrock encapsulated in geotextile fabric is placed on the ground below the seepage berm. Seepage berms may extend up to 500 feet landside of the toe of the levee or the adjacent levee. In areas of limited space, the seepage berms are constructed with relief wells at the landside toe of the seepage berms.

Construction of a seepage berm can use equipment that minimizes vibration and pressure on the immediate subsurface environment. This construction method is often used where sensitive historical features are buried near the surface, and relief wells are omitted. A seepage berm without relief wells extends the levee footprint farther landside, and depending upon land use, may cause relocation of permanent structures or reduction of farm field size.

Relief Wells

Relief wells are controlled artificial springs that relieve the confined water pressures to safe values, thus preventing the removal of soil via piping or internal erosion caused by the uplift pressures beneath elements of the levee or beneath landward soil next to the levee. Relief wells are usually spaced about 50 to 150 feet apart to allow water to flow without pumping during times of high water table. Piezometers are used as a tool to verify

relief well performance by measuring the hydrostatic pressure between the wells. Because relief wells may only flow on an intermittent basis sometimes several years apart, it is necessary to conduct regular maintenance of relief wells to ensure that they perform properly.

3.1 ALTERNATIVES CONSIDERED, BUT ELIMINATED FROM FURTHER CONSIDERATION

Numerous alternatives have been considered by USACE and SAFCA to provide increased flood risk reduction to the Natomas Basin. Many alternatives have been evaluated and eliminated from further consideration as part of preparing the following previous environmental documents:

- *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (SAFCA 2007a), State Clearinghouse Number 2006072098 (Local Funding EIR);

- *Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project* (SAFCA 2007b), State Clearinghouse Number 2007062016 (Phase 2 Project EIR); and

- *Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project* (USACE 2008) (Phase 2 Project EIS).

The alternatives analyses from these documents are hereby incorporated by reference, and these documents are available to the public at USACE's office at 1325 J Street, Sacramento, California and at SAFCA's office at 1007 7th Street, 7th Floor, Sacramento, California. Three alternatives that could contribute to addressing the Natomas Basin's flood problems and needs were reviewed and eliminated from further consideration in the Local Funding EIR, the Phase 2 Project EIR, and the Phase 2 Project EIS. These eliminated alternatives, the prior discussions of which are hereby incorporated by reference, are summarized as follows:

- **Yolo Bypass Improvements**–This measure would involve lengthening the Fremont Weir and widening the Yolo Bypass to increase the amount of flood water conveyed through the bypass and reduce the amount of flood water conveyed through the Sacramento River channel downstream of the weir. This alternative was eliminated because (1) it would be too costly for SAFCA to implement; (2) even following implementation of this alternative, some levee height increases and substantial seepage, underseepage, and slope stability remediation would still be required for the perimeter levee system requiring, adding to the costs of the bypass alternative; (3) the bypass improvements would lie outside of SAFCA's jurisdiction and would require Federal, state, and local cooperation and funding; and (4) the project objective of restoring 100-year flood protection to the Natomas Basin could not be achieved as quickly as possible using the Proposed Action. (Considered and eliminated in Phase 2 Project EIS.)

- **Reduced Natomas Urban Levee Perimeter**–This alternative would involve construction of a cross levee running east to west across the Natomas Basin along an alignment north of Elkhorn Boulevard to protect existing developed areas in the City and County of Sacramento. This alternative was eliminated because (1) it is inconsistent with current Federal and state authorizations and would strand Federal, state, and local investments already made in improving the Natomas Cross Canal (NCC) south levee and Sacramento River east levee pursuant to past Congressional authorization; (2) it would result in the need to raise State Route (SR) 99/70 or otherwise protect SR 99/70 from flooding; (3) it would divide Reclamation District (RD) 1000 and disrupt several portions of the Natomas Basin irrigation and drainage system and require reconfiguration of these systems; (4) it would present significant barriers to achieving the goals of the Natomas Basin Habitat Conservation Plan (NBHCP); (5) it would have substantially greater costs than other alternatives without achieving any additional flood damage reduction benefit; 6) it would not protect existing residential, commercial and industrial development in the Sutter County portion of the Basin north of the cross levee; and (7) it would leave a portion of the Basin currently planned for development by Sutter County (i.e., *Sutter*

Pointe Specific Plan mixed-use development project) outside the urban levee perimeter and likely cause Sutter County to exercise its rights under SAFCA's joint exercise of powers agreement to prevent the expenditure of Consolidated Capital Assessment District funds on this measure. (Considered and eliminated in Local Funding EIR and Phase 2 Project EIS.)

- **Construction of a New Setback Levee**–This alternative would involve construction of a 5-mile long levee along the northern reaches of the Sacramento River east levee parallel to the existing levee alignment but set back from the existing alignment by 500–1,000 feet. This alternative was eliminated as infeasible because (1) the presence of waterside residences along the existing levee from the southern end of Reach 2 of the Sacramento River east levee (north of Riego Road) in the north to the American River north levee in the south, and the need to maintain access to these residences from Garden Highway; (2) the proximity of the Sacramento River east levee to the Airport, and the need to prevent project features from increasing potential hazards to aviation safety; and (3) the possibility that utility relocations (power poles) and flood damage reduction measures could encroach into surface slopes of runway approach zones. (Considered and eliminated in Phase 2 Project EIR and Phase 2 Project EIS.)

Two additional alternatives were considered for the Phase 3 Project, but eliminated from further consideration. These alternatives, as well as the rationale for eliminating them from further consideration, are described in the following subsections.

3.1.1 NO-ACTION ALTERNATIVE—AIRPORT COMPARTMENT LEVEE

The Phase 2 Project EIS evaluated and eliminated from further consideration the No-Action Alternative—Airport Compartment Levee Alternative. The prior discussion of which is hereby incorporated by reference, is summarized as follows.

With no authorization for the Phase 3 Project, which is part of the overall NLIP, SAFCA would not provide the Natomas Basin with at least a 100-year level of flood protection by the end of 2010 and would not be able to facilitate achieving a "200-year" level of protection by the end of 2012. Federal and state floodplain regulations would effectively prevent new development in most of the Natomas Basin. The Airport would either be compelled to operate within its existing footprint, abandoning its current plans for expansion and modernization, or, alternatively, the Airport may construct its own limited flood damage reduction structure (i.e., a ring levee) to protect existing facilities and its expansion area. As of December 31, 2007, the leases for rice production on fields north of the Airport expired and were not renewed; hence, rice production has been discontinued on these fields to reduce wildlife hazards to aviation safety. These leases will not be renewed.

Table I-2 summarizes the impacts identified in the Phase 2 Project EIS associated with implementation of the Airport Compartment Levee. The Phase 2 Project EIS concluded that significant impacts could occur. However, because there are no detailed design plans for this alternative, it is not possible to accurately determine exactly what environmental impacts could occur, therefore, one could also conclude that the potential impacts are too speculative for meaningful consideration.

Table I-2
Summary of Impacts: No-Action Alternative—Airport Compartment Levee

Issue Area	Impacts
Agricultural Resources	A substantial conversion of Important Farmland to nonagricultural uses would likely occur in the footprint of the flood protection features, given that the Airport is surrounded by agricultural land, much of which is Important Farmland. However, the amount of such conversion is uncertain because no concept plan for an Airport flood damage reduction system has been developed, and the footprint size and location are unknown. This impact could be significant.

Table I-2 Summary of Impacts: No-Action Alternative—Airport Compartment Levee	
Issue Area	Impacts
Topography, Geology, and Soils	Construction-related activities would result in localized soil erosion effects . This impact would be significant.
Hydrology and Hydraulics	The Basin's existing residential, commercial, and industrial structures and their contents would continue to remain subject to a relatively high risk of flooding. Substantial alteration of local drainage systems around the Airport and of drainage patterns would result. This impact would be significant unless a substantial redesign of local drainage systems were included in the design of the Airport flood protection system.
Water Quality	Construction-related activities would result in adverse effects to water quality. Construction activity would involve ground disturbance and the potential for contaminants to enter local waterways either from direct spills, or from stormwater runoff. These impacts could be significant.
Fisheries	Construction-related activities would result in adverse effects on water quality in agricultural canals. These effects could, in turn, result in localized water quality degradation in receiving water bodies (e.g., the Sacramento River) and affect habitats and the physical health of individual fish and species populations in those water bodies. This impact could be significant.
Sensitive Aquatic Habitats	Construction of a compartment levee would require the fill of portions of several agricultural canals in the Airport vicinity, which may be jurisdictional waters of the United States. This impact would be significant. Because there is no conceptual design for a compartment levee, the amount of fill of potentially jurisdictional waters cannot be estimated.
Vegetation and Wildlife	Numerous elements of the irrigation and drainage system in the west-central portion of the Natomas Basin would likely be severed and would need to be rerouted with construction of a compartment levee. Ditches and canals in the basin serve as critical corridors for movement of aquatic species, and this movement could be significantly disrupted by construction of an Airport flood protection system.
Special Status Terrestrial Species	The compartment levee, as well as construction-related activities would likely affect habitat for some special-status plants in ditches and canals. A concept plan for such a flood protection system has not been developed, therefore, the likelihood and extent of such an impact is not predictable and cannot be estimated. The construction footprint might include areas where elderberry shrubs are present and would have to be relocated. The compartment levee would likely cross several irrigation and/or drainage canals in the west-central portion of the Natomas Basin that may provide habitat for giant garter snake, adversely affecting the habitat and potentially resulting in take of individual snakes. This impact would be significant.
Cultural Resources	The compartment levee would significantly alter elements of RD 1000. It is possible that historic-era resources of significance could be encountered during construction. Known prehistoric site CA-Sac-16/H south of the Airport would likely be adversely affected. Construction-related activities could encounter previously undiscovered cultural resources and potentially encounter human remains. These impacts would be significant.
Paleontological Resources	Construction-related activities could damage unique paleontological resources. This impact could be significant.
Transportation and Circulation	Construction-related activities could cause temporary traffic delays, temporarily increase emergency service response times, and interfere with emergency service access. These impacts would be significant.
Air Quality	Construction-related activities would result in the temporary and short-term generation of ROG, NO_X, and PM_{10} emissions. Construction-related activities would likely result in the temporary, short-term generation of diesel exhaust emissions. These impacts would be significant.

Table I-2 Summary of Impacts: No-Action Alternative—Airport Compartment Levee	
Issue Area	Impacts
Noise	Construction-related activities would generate temporary and intermittent noise that could be near individual noise-sensitive locations. This potential impact could be significant; however, because concept design for such a levee has not been developed, it is not possible to estimate the potential magnitude or location of an impact.
Recreation	It is unlikely that any recreational uses would be affected, because there are no recreational facilities in the vicinity of the Airport. There would be no impact.
Visual Resources	The presence and movement of heavy construction equipment, construction-generated dust, and the presence of the compartment levee in the landscape would likely temporarily and permanently degrade the existing visual character and/or quality of the Natomas landscape. This impact would be significant.
Utilities and Service Systems	Significant temporary interruptions of irrigation supply could occur if construction activities result in damage to irrigation infrastructure or otherwise render the infrastructure inoperable at a time when it is needed (e.g., reconnections to water supply sources are not completed by the time crop irrigation must begin). This impact would be significant.
Hazards and Hazardous Materials	It is assumed that construction would not cause any significant hazards associated with the transport and handling of hazardous materials because the applicable regulations would be followed. Previously unknown or undocumented hazardous materials could be present in construction areas (including borrow sites). Excavation at or near areas of currently unrecorded soil and/or groundwater contamination could result in the exposure of construction workers, the general public, and the environment to hazardous materials. This impact could be significant.
Wildfire Hazards	Physical and weather conditions could combine to lead to a high risk of fire hazard, and construction equipment or construction practices could ignite fires that may result in wildland fires and expose people or structures to a significant risk of loss, injury, or death under some circumstances. This potential impact would be significant.
Notes: RD = Reclamation District; ROG = Reactive Organic Gases; NO_x = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less Source: USACE 2008; data compiled by EDAW in 2008.	

For the reasons provided in the Phase 2 Project EIS (listed below), this alternative is not carried forward for further evaluation in this EIS/EIR:

- construction of a separate levee around the Airport would be under the responsibility and jurisdiction of another agency (Sacramento County Airport System), over which SAFCA would have no jurisdiction, and would require a lengthy process that is completely separate from the Proposed Action;
- the timeline for that process is unknown and there are no design plans that would enable an accurate evaluation of potential environmental impacts; and
- the action would require a separate CEQA and potentially NEPA environmental process and analysis.

In addition to those reasons provided in the Phase 2 Project EIS, the Airport Compartment Levee would not meet any of the goals and objectives of the project; the residents, residences, and businesses within the Natomas Basin would not receive flood protection; implementation of the Airport Compartment Levee would only protect the Airport; and SCAS has not proposed such a project and therefore, is not considered "reasonably foreseeable."

3.1.2 CULTURAL RESOURCES IMPACT REDUCTION ALTERNATIVE

The Proposed Action includes construction primarily of deep cutoff walls in the Sacramento River east levee Reaches 5A–9B, which would require excavation and placement of slurry at great depths along these reaches. The Sacramento River east levee has the potential to contain buried and undiscovered cultural resources that are difficult to detect by inspecting the ground surface. The Proposed Action, therefore, has the potential to result in significant and unavoidable impacts to known prehistoric resources, previously unidentified cultural resources, and interred human remains, as described in this EIS/EIR, in Section 4.10, "Cultural Resources." Unlike other resources, the magnitude of potential impacts on previously undiscovered cultural resources and interred human remains is harder to discern because there are few feasible ways to investigate the presence of these resources within the footprint of deep cutoff walls proposed for construction along the Sacrament River east levee. Deep cutoff walls require excavation into strata that are currently beneath existing levees. Because of the potential magnitude of these impacts, this section analyzes an alternative means of remediating seepage along the Sacramento River east levee to determine if it is possible to reduce impacts on cultural resources. This alternative consists of construction of a 500-foot-wide seepage berm on the land side of the levee instead of construction of deep cut-off walls. This analysis concludes that while a berm may reduce impacts on any resources identified adjacent to the Sacramento River east levee, it dramatically increases the potential for impacts on undiscovered cultural deposits as well as other resources, and thus is eliminated.

Construction of a 500-foot-wide seepage berm rather than primarily deep cutoff walls in these reaches would avoid the deep ground disturbing work associated with cultural resource impacts while still achieving flood damage reduction objectives. Construction of a 500-foot-wide seepage berm would more than double the borrow material requirement for the Sacramento River east levee Reaches 5A–9B component of the Proposed Action from approximately 1.8 million cubic yards (cy) to 3.8 million cy.

This section compares the potential impacts of this alternative with the impacts of the Proposed Action. The technical analysis for this section was performed by creation of a GIS polygon that would span the approximate footprint of the 500-foot-wide seepage berm in Reaches 5A–9B. This polygon excluded properties where it is currently infeasible to acquire access or fee title for construction of a berm for the Phase 3 Project. The impacts associated with this footprint were compared with the impacts associated with the construction of cutoff walls in these reaches. This section thus provides an overall comparison of the relative impacts and environmental merits of the Proposed Action and an alternative designed to minimize impacts on cultural resources.

3.1.2.1 HYDROLOGY AND HYDRAULICS

Because the 500-foot-wide seepage berm would be constructed on the land side of the Sacramento River, it would not change the hydrology of the channel or increase exposure of people or structures to a significant risk of flooding relative to the Proposed Action. The footprint of the berm would not increase the impact to the Elkhorn Canal relative to the Proposed Action, although the canal would have to be relocated further away from the Sacramento River east levee. However, the Cultural Resources Impact Reduction Alternative expanded footprint would cause more disruptions to privately maintained local canals, increasing the alteration of local drainage impact compared to the Proposed Action, resulting in greater impact.

The 500-foot-wide seepage berm would replace approximately 20,000 linear feet of cutoff walls in Reaches 5–9B. This would reduce possible restrictions on the flow of groundwater away from or toward the Sacramento River, which could affect local groundwater levels. However, the impact of the Proposed Action on local well yields is already considered to be less than significant in the Phase 3 Project EIS/EIR.

3.1.2.2 WATER QUALITY

Because construction activities would be similar for the 500-foot-wide seepage berm as for the Proposed Action, temporary impacts on water quality from stormwater runoff, erosion, or spills would also be the same. Because

the same Garden Highway drainage system would be required with or without the berm, possible effects on Sacramento River water quality from Garden Highway runoff during storms would also be the same. Impacts could be reduced to a less-than-significant level with implementation of the same mitigation measures and best management practices as described for the Proposed Action in the Phase 3 Project EIS/EIR, Section 4.5, "Water Quality." Impacts under the Cultural Resources Impact Reduction Alternative and Proposed Action would therefore be similar.

3.1.2.3 FISHERIES AND SENSITIVE AQUATIC HABITATS

Impacts to fisheries caused by discharge of fill and hazardous compounds during construction of the 500-foot-wide seepage berm could be reduced to a less-than-significant level with implementation of the same mitigation measures and best management practices as described for the Proposed Action in the Phase 3 Project EIS/EIR, Section 4.6, "Fisheries." Construction of the berm would impact an additional 17.13 acres of riparian habitat, 7.58 acres of seasonal wetlands, and 0.88 acre of freshwater marsh. To the extent that these features are subject to USACE jurisdiction under Section 404 of the Clean Water Act, they would be subject to the mitigation described in the Phase 3 Project EIS/EIR, Section 4.7, "Sensitive Aquatic Habitats." It is anticipated that impacts on these resources, after mitigation implementation, would be less than significant. However, the magnitude of impacts to sensitive aquatic habitats requiring management and mitigation would be substantially greater than for the Proposed Action. Therefore the Cultural Resources Impact Reduction Alternative would result in substantially more impacts to these resources than under the Proposed Action.

3.1.2.4 VEGETATION AND WILDLIFE AND SPECIAL-STATUS TERRESTRIAL SPECIES

Relative to the Proposed Action, the Cultural Resources Impact Reduction Alternative would result in greater impacts on special-status terrestrial species and vegetation. The construction of the 500-foot-wide seepage berm would result in converting 185 acres of croplands to perennial grasslands. This would still provide foraging habitat for Swainson's hawk but includes an additional loss of 47 acres of high quality foraging habitat (alfalfa) than the Proposed Action. This alternative would also remove an additional 14 acres of woodland habitat (potential nesting habitat) than the Proposed Action. Implementing the same mitigation measures in the Proposed Action for impacts to foraging and nesting habitat could reduce the impacts to a less-than-significant level. The impacts of the Cultural Resources Impact Reduction Alternative to Swainson's hawk nesting and foraging habitat would be greater than under the Proposed Action.

3.1.2.5 CULTURAL RESOURCES

Construction of a 500-foot-wide seepage berm would avoid direct excavation into deep foundation strata that are potentially sensitive for unidentified cultural resources and interred human remains. However, construction of this berm would more than double the borrow material requirement for the Sacramento River east levee Reaches 5A–9B component of the project from approximately 1.8 million cy to 3.8 million cy. Most of the borrow material required for construction of the 500-foot-wide berm would come from borrow sites along the western side of the Natomas Basin, which are also potentially sensitive for cultural resources. Borrow removal would occur by use of large pieces of heavy equipment, removing soil in large lifts with the potential to impact deposits before they are discovered. Because these locations are also sensitive for undiscovered cultural resources, the relative volume of disturbance for the berm alternative as compared to the deep cutoff wall, is the best indicator for the probability of damaging significant cultural resources, especially previously undiscovered deposits.

Overall the deep cutoff wall would disturb approximately 240 cubic feet per linear foot of improvement. By comparison the berm would require disturbance of approximately 1,272 cubic feet per linear foot (when borrow requirements and inspection trenches or short cutoff walls are considered together). Thus the berm would disturb approximately 5 times the volume of native soil as the deep cutoff wall. By this measure, the berm thus has a much greater potential to impact cultural resources, and thus fails to provide a means of avoiding impacts to cultural resources, especially previously undiscovered cultural deposits.

3.1.2.6 PALEONTOLOGICAL RESOURCES

The geologic formations in the area adjacent to the Sacramento River east levee where proposed cutoff walls would be constructed under the Proposed Action are not formations that are paleontologically sensitive. Therefore, construction of the 500-foot-wide berm would not disturb any paleontological resources. However, depending on the location of additional borrow sites needed for the 500-foot-wide seepage berm construction, there would be a potential that fossils could be disturbed by borrow excavation. Excavations deeper than 10 feet for borrow excavation in the Riverbank Formation or the Modesto Formation could encounter and possibly damage unique paleontological resources. This impact would be potentially greater than would occur under the Proposed Action because the borrow material used under the Cultural Resources Impact Reduction Alternative would more than double that used under the Proposed Action.

3.1.2.7 TRANSPORTATION AND CIRCULATION

Construction of a 500-foot-wide seepage berm would more than double the borrow material requirement for the Sacramento River east levee Reaches 5A–9B component of the Proposed Action from approximately 1.8 million cy to 3.8 million cy. Most borrow hauling would use off-road haul routes from the Airport north bufferlands or from borrow sites in Reaches 7–9B, and thus would not result in greater impacts to transit corridors. Truck hauling on Elkhorn Boulevard could significantly increase under the Cultural Resources Impact Reduction Alternative compared to the Proposed Action, causing more severe impacts to local traffic during the construction season.

3.1.2.8 AIR QUALITY

Construction of a 500-foot-wide seepage berm would more than double the borrow material required from approximately 1.8 million cy to 3.8 million cy. This would result in more intense construction activity and increased associated emissions of ozone precursors (reactive organic gases and nitrogen oxides) and respirable particulate matter (PM_{10}) than would occur under the Proposed Action. Although the exact quantitative difference has not been calculated, the greater borrow requirements with a commensurate increase in operation of equipment and trucks provide a good proxy that clearly predicts more severe air quality impacts. The same level of mitigation would be required; however, the severity of impacts under the Cultural Resources Impact Reduction Alternative would increase over levels associated with the Proposed Action.

3.1.2.9 NOISE

The construction of a 500-foot-wide seepage berm would require greater quantities of construction equipment, and increased haul truck trips and borrow site activity. Construction activity associated with the Cultural Resources Reduction Alternative is predicted to generate intermittent noise levels of 89 decibels (dB) equivalent noise levels (L_{eq}) at a distance of 50 feet. Based on the amount of borrow material required to construct the 500-foot-wide berm, haul truck trips would generate an hourly noise level of 67 dB L_{eq} at a distance of 50 feet. Noise impacts associated with the construction of the alternative seepage berm would remain significant and unavoidable, but would be generally similar to impacts described for the Proposed Action in the Phase 3 Project EIS/EIR, Section 4.14, “Noise.” However, construction of a seepage berm would not require construction 7-days a week, 24-hours a day, while construction of the deep cutoff walls would be take place around the clock; therefore, this impact would be avoided under the Cultural Resources Impact Reduction Alternative, resulting in less impact than under the Proposed Action.

3.1.2.10 RECREATION

Impacts caused by construction of a 500-foot-wide seepage berm would be the approximately the same as the Proposed Action because construction of a large improvement adjacent to the Sacramento River east levee would likely result in some disruption of the use of the Garden Highway and bike paths, as would the Proposed Action.

The Garden Highway provides access to boat launch ramps and docks, and the bike path provides a transit connection to Sacramento and a recreational opportunity. Implementation of the seepage berm would encroach upon Teal Bend Golf Course, resulting in temporary disruption and closure of the golf course and the need to redesign portions of or all of the golf course to accommodate the 500-foot-wide seepage berm. For this reason, impacts under the Cultural Resources Impact Reduction Alternative on recreational resources would be greater than those described for the Proposed Action in the Phase 3 Project EIS/EIR, Section 4.15, "Recreation." Therefore, the impacts on recreation between the Cultural Resources Impact Reduction Alternative and the Proposed Action would be similar.

3.1.2.11 VISUAL RESOURCES

Construction of the 500-foot-wide seepage berm would alter views along the land side of the Sacramento River east levee by extending the adjacent levee into the adjacent agricultural lands and requiring removal of more trees on the land side of the levee. Approximately 24 acres of valley oak woodland would be removed for this alternative, as opposed to approximately 10 acres under the Proposed Action. The visual character of the area along the Sacramento River east levee would be altered, including the views from the Teal Bend Golf Club. These visual changes would be substantially greater under the Cultural Resources Impact Reduction Alternative than those that would occur under the Proposed Action.

3.1.2.12 UTILITIES AND SERVICE SYSTEMS

Substantially greater interruption of irrigation would result with construction of a 500-foot-wide seepage berm under the Cultural Resources Impact Reduction Alternative, than under the Proposed Action. Major irrigation and drainage infrastructure would be relocated, including the Natomas Central Mutual Water Company's (NCMWC's) Elkhorn Pumping Plant, Elkhorn Canal, and Elkhorn Reservoir. Additional buried irrigation lines may exist that would need to be removed or reconnected.

Construction of a large berm along the Sacramento River east levee Reaches 5A–9B would require relocation of a greater number of electric conduits, telephone conduits, conductors, irrigation pipes, and underground utilities than the Proposed Action. Project construction activities, including grading and excavation, would also have a greater potential to damage identified and unidentified utility equipment and facilities because of the larger footprint.

Construction would require several houses to be demolished, and materials including asphalt, concrete, pipe, and gravel would be removed to landfills or recycling facilities. More waste associated with grubbing and clearing would be produced as a result of a 500-foot-wide berm; however, it would not exceed regional landfill capacities. Overall, impacts associated with utilities and service systems and displacement would be substantially greater under the Cultural Resources Impact Reduction Alternative than under the Proposed Action.

3.1.2.13 HAZARDS AND HAZARDOUS MATERIALS

Construction and maintenance activities associated with the 500-foot-wide seepage berm would require the use of potentially hazardous materials (fuels, oils, lubricants, and cleaners). Compliance with the applicable regulations would reduce the potential for accidental release. This impact would be less than significant under the Cultural Resources Impact Reduction Alternative and thus similar to the Proposed Action.

Construction could result in exposure of construction workers to known and unknown hazardous materials within the project site. This impact is potentially significant under this alternative, and is similar to the Proposed Action.

Project activities on the NEMDC would be the same for both the Cultural Resources Impact Reduction Alternative and the Proposed Action. These activities have the potential to result in exposure to both known and

previously unknown hazardous materials within one-quarter mile of a school during construction activities; therefore, this impact would be the same under both alternatives.

Both the Cultural Resources Impact Reduction Alternative and the Proposed Action could require night lighting and security lighting. However the seepage berm would not require construction on a "24/7" basis, unlike the Proposed Action, which would involve construction of cutoff walls in Reaches 5A–9B. Therefore, impacts to Airport safety might be less than under the Proposed Action because 24/7 night lighting would not be used under the Cultural Resources Impact Reduction Alternative.

3.1.2.14 WILDFIRE HAZARDS

Although no Very High Fire Hazard Severity Zones are located in the project area, and the majority of Sutter and Sacramento Counties are located in either a "nonflammable" or "moderate" zone for wildland fires, the project components would be constructed in locations where physical and weather conditions may combine to lead to a high risk of fire hazard. Construction equipment or construction practices could ignite fires that may result in wildland fires and expose people or structures to a significant risk of loss, injury, or death under some circumstances. This potential impact is considered significant, and would be similar for the Cultural Resources Impact Reduction Alternative and the Proposed Action.

3.1.2.15 SUMMARY

Table I-3 compares impacts for the Proposed Action and the Cultural Resources Impact Reduction Alternative. Impacts to cultural resources and aviation safety hazards would be reduced by the construction of a 500-foot-wide berm. Of the 16 issue areas analyzed, impacts on ten of the issue areas would be more severe with the Cultural Resources Impact Reduction Alternative. Approximately four impacts are generally similar. One impact would be reduced ("24/7" noise associated with construction of deep cut-off walls) and one impact potentially less impacted by construction of a seepage berm. Because the Cultural Resources Impact Reduction Alternative would result in a net increase in the number, intensity, and severity of environmental impacts compared to the Proposed Action, and because implementation of the 500-foot-wide seepage berm would result in the permanent displacement of residences and temporary closure, disruption, and redesign of portions or all of the Teal Bend Golf Club, it has been eliminated from further consideration, and thus has not been carried forward for detailed analysis in this EIS/EIR.

Table I-3
Comparison of Impacts: Proposed Action and Cultural Resources Impact Reduction Alternative

Issue Area	Proposed Action	Cultural Resources Impact Reduction Alternative (500-Foot-Wide Seepage Berm)
Hydrology and Hydraulics	Significant	Greater impacts to local drainage infrastructure
Water Quality	Significant	Similar
Fisheries	Significant	Similar
Sensitive Aquatic Habitats	Significant	Greater impacts to potentially jurisdictional features (loss of an additional 17.13 acres of riparian habitat, 7.58 acres of seasonal wetlands, and 0.88 acre of freshwater marsh)
Vegetation and Wildlife	Significant	Greater impacts to woodlands (additional loss of 14 acres of woodland habitat)

Table I-3
Comparison of Impacts: Proposed Action and Cultural Resources Impact Reduction Alternative

Issue Area	Proposed Action	Cultural Resources Impact Reduction Alternative (500-Foot-Wide Seepage Berm)
Special Status Terrestrial Species	Significant	Greater impacts to Swainson's hawk foraging and nesting habitat (loss of an additional 185 acres of Swainson's hawk foraging habitat [47 acres of high quality foraging alfalfa crop habitat and 14 acres of Swainson's hawk nesting habitat—woodlands])
Cultural Resources	Significant and unavoidable Greater impacts to undiscovered cultural resources and interred human remains from deep cut-off wall construction	Potentially greater impacts to undiscovered cultural resources and interred human remains resulting from increased borrow materials usage (from 1.8 million cy to 3.8 million cy) for 500-foot-wide seepage berm
Paleontological Resources	Significant	Potentially greater impacts associated with greater borrow material excavation (from 1.8 million cy to 3.8 million cy)
Transportation and Circulation	Significant and unavoidable	Potentially greater impacts to traffic. Increase borrow use would more than double haul route usage and potentially significantly increase truck traffic on Elkhorn Boulevard
Air Quality	Significant and unavoidable	Greater severity of significant and unavoidable impacts with greater borrow material excavation (from 1.8 million cy to 3.8 million cy)
Noise	Significant and unavoidable	Similar, with exception of 24/7 construction associated with cut-off wall construction (lesser)
Recreation	Significant	Greater due to temporary closure and disruption of the Teal Bend Golf Club and likely need to redesign all or portions of the golf course Since it is likely infeasible to construct a seepage berm within the golf course, requiring the proposal for cut-off walls in this area to remain unaffected, the impact would remain similar within the golf course
Visual Resources	Significant and unavoidable	Greater impacts to oak woodlands and existing views from removal of trees from the loss of 14 acres of woodland habitat
Utilities and Service Systems	Significant	Greater temporary impacts and relocations of existing irrigation infrastructure and utilities Greater impacts resulting from permanent relocation of residences within the footprint of the 500-foot-wide berm
Hazards and Hazardous Materials	Significant	Potentially less impacts from fewer requirements for night lighting, potentially resulting in less aviation hazard
Wildfire Hazards	Significant	Similar

Source: Compiled by EDAW in 2008

3.1.3 ALTERNATIVES CONSIDERED IN PREVIOUS ENVIRONMENTAL ANALYSES AND INCORPORATED BY REFERENCE IN THE PHASE 3 EIS/EIR

This section describes the alternatives analysis performed in previous documents from which the Phase 3 Project EIS/EIR is tiered. The alternatives analyses from the documents listed below are incorporated by reference, herein. This material is summarized here to demonstrate the scope of analysis that has already been performed, and thus to also show which alternatives have been previously foreclosed by analysis.

Incorporation by reference is encouraged by both NEPA (40 CFR 1500.4, 1502.21) and CEQA (Section 15150). Both NEPA and CEQA require brief citation and summary of the referenced material and the public availability of this material. CEQA also requires citation of the state identification number of the previous EIR or EIRs cited (Section 15150). Printed copies of relevant documents are available to the public at SAFCA's office at 1007 7th Street, 7th Floor, Sacramento, California.

- *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (SAFCA 2007a), State Clearinghouse Number 2006072098;
- *Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project* (SAFCA 2007b), State Clearinghouse Number 2007062016; and
- *Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project* (USACE 2008).

3.1.3.1 ALTERNATIVES CONSIDERED IN THE ENVIRONMENTAL IMPACT REPORT FOR LOCAL FUNDING MECHANISMS FOR COMPREHENSIVE FLOOD CONTROL IMPROVEMENTS FOR THE SACRAMENTO AREA (SAFCA 2007A)

The Proposed Action is funded, in part, by funding sources developed as a result of the creation of new assessment districts. SAFCA analyzed the environmental effects of this action to create new assessment districts in the *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (SAFCA 2007a), or the "Local Funding EIR." The project objective used to screen alternatives for this project was the identification and creation of a source of funding that would allow SAFCA to provide 100-year flood for developed areas for SAFCA's developed areas, and to lay groundwork for creation of 200-year flood protection over time (SAFCA 2007a: 7-2).

- **Proposed Project.** The proposed project alternative consisted of creation of an assessment district and a development fee program to fund improvements along the portions of Sacramento and American Rivers within SAFCA's jurisdiction. This alternative was determined to provide sufficient funds for project objectives (SAFCA 2007a: 3-1).
- **No Project (Alternative 1).** In this alternative, SAFCA considered the impact of neither creating nor seeking new funding mechanisms for flood damage reduction. This would limit flood damage reduction projects to current efforts to provide 100-year flood protection along the American River and the South Sacramento Streams Group and thus would not meet project objectives (SAFCA 2007a: 7-2).
- **No New Public Funding; Private Levees in Natomas (Alternative 2).** This alternative assumed the same conditions as the No-Project Alternative but looked at the probable effect of private levee construction for residential development projects (SAFCA 2007a: 7-2). This alternative was eliminated because it would increase projected flood damages without a commensurate reduction in flood risk (SAFCA 2007a: 7-7).
- **Natomas 100-Year Protection (Alternative 3).** SAFCA analyzed the impacts associated with creation of one new assessment district which would provide only 100-year flood protection to the Natomas Basin, and would

use funding raised through existing Capital Assessment District Number 3 to provide the local share of the cost of completing improvements to provide 100-year flood protection to the lower American River and South Sacramento Streams Group areas (SAFCA 2007a: 7-2). This alternative was eliminated because it would fail to provide groundwork for the creation of 200-year protection over time (SAFCA 2007a: 7-8).

- **Reduced Natomas Levee Perimeter (Alternative 4).** Under this alternative, SAFCA considered construction of a new levee across the Natomas Basin in lieu of improving the south levee of the NCC and the upper reach of the east levee of the Sacramento River. This alternative would have reduced the project footprint and would have excluded the northern undeveloped portion of the Basin both from flood protection and the assessment districts to be created (SAFCA 2007a: 7-2). This alternative was eliminated because it would have a much larger footprint than proposed improvements in the Natomas Basin (SAFCA 2007a: 7-11), and it would be subject to potential veto by RD-1000 (SAFCA 2007a: 7-12).

This document analyzed the ability of these alternatives to meet the project objectives and determined that only the proposed project would meet project goals (SAFCA 2007a: 7-14). In addition, the Local Funding EIR analyzed the environmental effects of the various alternatives and concluded that Alternative 3 was the environmentally superior alternative. Alternative 3 would have eliminated or reduced a range of significant effects associated with creation of a new assessment district. However it was not selected because it would not meet the important project objective of laying the groundwork for "200-year" flood protection. The proposed project alternative was selected because it would meet all of the project objectives.

3.1.3.2 ALTERNATIVES CONSIDERED IN THE ENVIRONMENTAL IMPACT REPORT FOR THE NATOMAS LEVEE IMPROVEMENT PROGRAM, LANDSIDE IMPROVEMENTS PROJECT (SAFCA 2007B)

In this document, SAFCA analyzed construction of flood damage reduction measures required to protect the Natomas Basin at a program level, and a project level for the Phase 2 Project (SAFCA 2007b). This range of alternatives for the program presented in this Phase 2 Project EIR is incorporated by reference. The project objectives used to screen alternatives consisted of developing 100-year flood protection in the Natomas Basin as quickly as possible, developing "200-year" flood protection over time, and ensuring that new development in Sacramento's floodplains does not substantially increase the risk of flooding (SAFCA 2007b: 6-2). Project-specific objectives included reducing hazards to aviation safety in the vicinity of the Sacramento International Airport, and enhancing habitat values in the Natomas Basin for giant garter snake, Swainson's hawk, and other special-status species (SAFCA 2007b: 6-2).

- **Construct an Adjacent Setback Levee along the Sacramento River East Levee.** This alternative was analyzed as the proposed project, carried forward in the EIR as Alternative 1. This project consisted of constructing an adjacent setback levee on the Sacramento River east levee. Other improvements include levee raising and seepage remediation on the Sacramento River east levee, the NCC south levee, and the Pleasant Grove Creek Canal (PGCC) west levee. Other project components included improvements to major irrigation and drainage infrastructure, habitat creation and management, and right-of-way acquisition (SAFCA 2007b: 6-6, 6-7). This alternative was determined to meet project objectives (SAFCA 2007a: 6-7).

- **Raise Levee in Place with a 1,000-Foot Levee Setback in the Upper 1.4 Miles along the Sacramento River East Levee.** This alternative would have provided a location for a substantial amount of tree planting on the water side of the levee, contributing to the offsetting mitigation for the loss of trees that may need to be removed along the existing levee to meet USACE criteria. This alternative was eliminated because it was unlikely that the new setback levee would provide 100-year flood protection per USACE criteria (SAFCA 2007a: 6-11).

- **Construct an Adjacent Setback Levee with a 500-Foot Levee Setback in the Upper 1.4 Miles along the Sacramento River East Levee.** This alternative was evaluated because it would provide the opportunity for partially offsetting the loss of landside tree groves through the establishment of new riparian plantings in the

levee setback area as well as woodland plantings on the land side of the adjacent setback levee. This alternative was eliminated because it would require substantially greater quantities of borrow material with greater impacts on important farmland and transportation and circulation (SAFCA 2007b: 6-19, 6-20).

- **No-Project Alternative—No Flood Control Improvements in Natomas.** Consideration of a no-project alternative is required under CEQA. Under this alternative, it was assumed that the Natomas Basin flood damage reduction system would not be improved. This alternative was eliminated because it would not meet project objectives (SAFCA 2007b: 6-14).

- **No SAFCA Levee Improvements—Private Levees in Natomas.** This alternative was analyzed assuming no SAFCA project providing flood protection in the Basin, thus causing private developers to separately fund individual flood protection in the form of private compartment levees that would protect new developments. This was eliminated because it would only partially meet the first objective of providing 100-year flood protection and it would potentially lead to increased fragmentation of habitat for special-status species (SAFCA 2007b: 6-15).

The proposed project was identified as the environmentally superior alternative after all alternatives were compared relative to their foreseeable effects (SAFCA 2007b: 6-25). The proposed project was selected for implementation.

4.1 ALTERNATIVES CARRIED FORWARD FOR EVALUATION IN THE PHASE 3 PROJECT EIS/EIR

The following alternatives are carried forward for detailed analysis in this EIS/EIR and are described in Chapter 2.0, "Alternatives:"

- **No-Action Alternative**—Under NEPA, the expected future without-project conditions; under CEQA, the existing condition at the time the notice of preparation was published (July 18, 2008).

- **Proposed Action**—Construction of an adjacent setback levee along the Sacramento River east levee (combined with improvements to the PGCC west levee and the NEMDC west levee from Elkhorn Boulevard to Northgate Boulevard).

- **Levee Raise-in-Place Alternative**—Raising of the Sacramento River East Levee in place (combined with improvements to the PGCC west levee and the NEMDC west levee from Elkhorn Boulevard to Northgate Boulevard).

The Proposed Action and one action alternative (the Levee Raise-in-Place Alternative) were developed for consideration for the Phase 3 Project with a focus on improvements to the Sacramento River east levee (Reaches 5A–9B). Phase 3 Project improvements to the PGCC west levee, the NEMDC west levee, and landscape and irrigation/drainage system modifications would be similar under the Proposed Action and the Levee Raise-in-Place Alternative.

Development of the Proposed Action and the Levee Raise-in-Place Alternative included substantial planning based on consideration of effects on wetlands and other waters of the United States, woodlands, giant garter snake habitat, and other habitats. Accordingly, levee improvements were designed to avoid or minimize such effects where practicable and feasible. However, several agricultural canals or portions of canals and small seasonal wetlands exist near the levee toe along the Sacramento River east levee, PGCC west levee, and NEMDC west levee. These would require filling under either the Proposed Action or the Levee Raise-in-Place Alternative because their proximity to the existing levees places them within the expanded landside levee footprint or adjacent maintenance access under the Proposed Action and the Levee Raise-in-Place Alternative. Similarly, portions of several woodland groves extend into the proposed footprint of the flood damage reduction features

along the land side of the Sacramento River east levee under the Proposed Action and the Levee Raise-in-Place Alternative and would need to be removed and/or relocated. Consequently, effects on wetlands and other waters of the United States and on other habitats along the land side of the levees are very similar for the Proposed Action and the Levee Raise-in-Place Alternative, and the same compensation strategies are proposed for unavoidable effects.

The Levee Raise-in-Place Alternative differs from the Proposed Action in that it would result in the (1) removal of waterside trees along the Sacramento River east levee to conform with USACE guidance regarding levee encroachments, and (2) loss of waters of the United States due to the implementation of erosion control improvements along the waterside toe of Sacramento River east levee. These effects would require a different compensation strategy than for the Proposed Action because, under the Proposed Action, these actions would not occur on the waterside of the levee.

In terms of flood reduction system design, the Proposed Action and the Levee Raise-in-Place Alternative differ in terms of how they would achieve the required levee height increases along the Sacramento River east levee. Therefore, the differences between the Proposed Action and the Levee Raise-in-Place Alternative, including effects on habitats, are the result of these Sacramento River east levee design differences. These effects are more fully described in Chapter 4.0, “Environmental Consequences and Mitigation Measures,” of this EIS/EIR.

REFERENCES

Sacramento Area Flood Control Agency. 2008 (June 17). *Supplemental Report for the Design Water Surface Profile for the Natomas Levee Improvement Program*. Prepared by MBK Engineers, Sacramento, CA.

———. 2007a (February). *Final Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area.* State Clearinghouse #2006072098. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

———. 2007b (November). *Final Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project.* State Clearinghouse #2007062016. Sacramento, CA. Prepared by EDAW, Sacramento, CA.

SAFCA. *See* Sacramento Area Flood Control Agency.

USACE. *See* U.S. Army Corps of Engineers.

U.S. Army Corps of Engineers. 2008 (November). *Final Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA*. Prepared by EDAW, Sacramento, CA.

APPENDIX J

NEPA and/or CEQA Standards and Checklist Applicable to the Elkhorn Borrow Area

APPENDIX J
NEPA AND/OR CEQA STANDARDS AND CHECKLIST APPLICABLE TO THE ELKHORN BORROW AREA

This section reviews the standards that apply to preparation of NEPA and/or CEQA documents, and provides USACE and SAFCA with a tool for determining whether subsequent project-related activities within the Elkhorn Borrow Area described in Chapter 2.0, "Alternatives," of this EIS/EIR will require further environmental documentation under either NEPA or CEQA, and if so, the appropriate level of documentation for satisfying NEPA and/or CEQA.

SAFCA has developed this checklist concept as a tool to maximize flexibility for screening and selecting specific borrow sites within the Elkhorn Borrow Area for use during Phase 3 Project construction and, potentially subsequent project phases. While SAFCA has identified several properties within the Elkhorn borrow Area from which borrow may be removed. Ongoing investigations will be required to determine the most suitable location(s) for excavating borrow. Therefore, there is insufficient information to make a final selection of specific properties in this Phase 3 EIS/EIR. Accordingly, this checklist will be used to inform USACE and/or SAFCA to determine if specific borrow sites within the Elkhorn Borrow Area have been analyzed at a sufficient level of detail in this EIS/EIR, under NEPA and/or CEQA, or if further environmental review is required. If further environmental review and analysis is required, this checklist will help guide USACE and SAFCA in determining the appropriate level of NEPA and/or CEQA compliance.

Under NEPA, a supplemental environmental impact statement (supplemental EIS) is required when changes in the proposed action are "relevant to environmental concerns," (40 Code of Federal Regulations [CFR] Section 1502.9[1][i]), or when there are "significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts" (40 CFR Section 1502.9[1][ii]). In general, this means that a supplemental EIS is required if new and potentially significant impacts that were not previously disclosed or identified in a public NEPA document are identified in association with a subsequent activity. Courts have further interpreted this requirement to indicate that when new mitigation measure(s) are identified that would reduce some of the impacts of a Federal action subject to NEPA, an SEIS is required if that measure itself would result in new significant impacts that were not previously disclosed in the EIS (*National Wildlife Federation v. Marsh* 721 F.2d 767, [11th Cir.] 1983).

USACE NEPA regulations incorporate the Council on Environmental Quality standard to determine when a supplemental EIS is required (33 CFR Section 230.13):

> Environmental Impact Statement (EIS). (b) Supplements. A supplement to the draft or final EIS should be prepared whenever required as discussed in 40 CFR 1502.09(c).

The USACE NEPA regulations, however, provide that "District commanders may also publish periodic factsheets and/or other supplemental information documents on long-term or complex EISs to keep the public informed on the status of the proposed action" (33 CFR Section 230.13[d]). USACE will use this standard to screen subsequent activities, if they are subject to NEPA.

1. TIERING FROM PROGRAM-LEVEL ANALYSIS UNDER CEQA

The following rules from CEQA and the State CEQA Guidelines provide for screening subsequent project activities in a program through the use of a checklist to determine if the project activities have received sufficient CEQA review, or if another CEQA compliance document is required. CEQA and the State CEQA Guidelines specify the criteria for determining whether additional environmental review is required and, if so, what form of additional environmental document is appropriate.

- Where a program EIR has been prepared for a series of related actions and activities (in this case, the 2007 Landside EIR [SAFCA 2007] and this Phase 3 EIS/EIR), the lead agency may use a checklist to determine whether subsequent site-specific activities, such as the use of a specific property as a borrow site, were covered in the prior EIR(s) (State CEQA Guidelines Section 15168[c][4]; see also State CEQA Guidelines Sections 15152[d] and [f]).

- If the lead agency determines that none of the conditions specified in State CEQA Guidelines Section 15162, discussed below, that trigger the need for a subsequent EIR or negative declaration have occurred and no new effects could occur or no new mitigation is required, the lead agency may approve the activity. No additional environmental document is required. (State CEQA Guidelines Section 15168[c]][2]).

- Pursuant to State CEQA Guidelines Section 15162, if the lead agency determines that any of the following conditions have occurred, either a supplemental or subsequent EIR shall be prepared:

    - Substantial changes to the project, substantial changes in circumstances, or new information show either new significant effects or a substantial increase in the severity of previously identified significant effects; or

    - New information shows that mitigation measures or alternatives which were previously identified as infeasible, and would substantially reduce the severity of one or more significant effects, are now found to be feasible, but the project proponent declines to adopt them; or

    - New information shows that considerably different mitigation emasures or alternatives from those analyzed in the prior EIR(s) would substantially reduce the severity of one or more significant effects, are now found to be feasible, but the project proponent declines to adopt them.

- If any of the State CEQA Guidelines Section 15162 conditions described above are present, but only minor changes or revisions to a previous EIR are required, the lead agency may prepare a supplement to the EIR. The supplemental EIR shall focus only on those changes or revisions that are necessary to make the previous study adequate and shall be circulated as a draft and final supplemental EIR (State CEQA Guidelines Section 15163).

- If the lead agency determines that a subsequent activity requires some minor technical changes or revisions to a previously completed EIR or negative declaration, but none of the conditions described below require either a supplemental or a subsequent EIR, the lead agency may prepare an addendum to the EIR or negative declaration and attach the addendum to the final EIR or adopted negative declaration. No public circulation is required (State CEQA Guidelines Section 15164).

- In some circumstances,, a subsequent negative declaration may be warranted (see State CEQA Guidelines Section 15152[g]).

2. CEQA CHECKLIST FOR SCREENING SUBSEQUENT SELECTION OF BORROW SITES

This checklist will be used to review impacts applicable to specific properties within the Elkhorn Borrow Area, once they are proposed for use, for the purpose of determining whether and what additional CEQA environmental review is required. The checklist involves a three-step process for determining whether a specific borrow site has been sufficiently analyzed, or if the use of the borrow site would require preparation of a new CEQA compliance document. The checklist also can provide guidance to USACE for determining the appropriate NEPA compliance document, if needed.

First, SAFCA will review the impacts that were identified as "less than significant" in the checklist below and fill out the checklist accordingly. If the use of the borrow site would contribute to these impacts, SAFCA will determine whether the contribution of borrow site operations would result in a significant impact. If a new significant impact would result, a supplemental or subsequent EIR will be required and prepared.

Next, for impacts that the checklist shows previously analyzed and disclosed as "significant," and for which SAFCA identified and adopted mitigation measures that would reduce those impacts to less-than-significant levels, SAFCA will determine whether the borrow site operations would contribute to those impacts. If the borrow site operations contribute to those impacts, but implementation of the mitigation measures and environmental commitments identified in the 2007 Landside EIR (SAFCA 2007) and this Phase 3 EIS/EIR, which were previously adopted and incorporated into the project, would mitigate that contribution to a less-than-significant level, the borrow site's contribution to those impacts will not trigger the need to prepare a new CEQA compliance document. If the use of the borrow site would cuase these impacts to become significant impacts even after implementation of identified mitigation, SAFCA will prepare the appropriate CEQA compliance document, as described above.

SAFCA will also use the checklist to determine if the borrow site operations would contribute to identified significant and unavoidable impacts. If the borrow site operations cause or contribute to any of the previously analyzed and disclosed significant or potentially significant and unavoidable impacts, SAFCA will determine if the borrow site's contribution was included when calculating the severity of the impact. If the borrow site's contribution to that impact was included in the impacts previously analyzed in this Phase 3 EIS/EIR or the 2007 Landside EIR (SAFCA 2007), no new CEQA compliance document will be required. If the borrow site's contribution was not included in the impacts analyzed in this Phase 3 EIS/EIR or the 2007 Landside EIR (SAFCA 2007), a new EIR, EIR addendum, or potentially a mitigated negative declaration will be required and prepared.

Finally, SAFCA will use the checklist to determine if the use of the borrow site would result in new impacts that were not previously disclosed in this Phase 3 EIS/EIR or the 2007 Landside EIR (SAFCA 2007), or would affect resources that were not identified when analyzing previously disclosed impacts. If so, SAFCA will prepare the appropriate CEQA compliance document, as described above.

<table>
<tr><th colspan="2">Elkhorn Borrow Area Checklist</th></tr>
<tr><td colspan="2">ENVIRONMENTAL SETTING

Designated borrow site APN(s):_____</td></tr>
<tr><td>Land use types within designated borrow site
Does the site include:
☐ Developed land
☐ Agricultural land
☐ Orchards
☐ Grassland
☐ Non-Riparian Woodlands
☐ Riparian Woodland/Scrub
☐ Williamson Act Land (in a preserve or under contract)</td><td>Information from surveys:
Does the site include:
☐ Cultural Resources
☐ Wetlands
☐ Special-Status Species
☐ Suitable Habitat for Special-Status Species
☐ Recognized Environmental Conditions</td></tr>
</table>

Impacts Identified as "Less Than Significant"		
Issue Area	Impact	Would the use of the borrow site result in any of the identified impacts, and if so would the impact be considered less than significant without mitigation?
Land Use, Socioeconomics, and Population and Housing	Impact 4.2-a: Inconsistency with Airport Master Plan, Airport Land Use Compatibility Plan, and Airport Wildlife Hazard Management Plans	Not Applicable ☐ Yes ☐ No ☐
Hydrology and Hydraulics	Impact 4.4-a: Hydraulic Impacts on Other Areas and Exposure to Flood Risk	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.4-c: Effects on Groundwater	Not Applicable ☐ Yes ☐ No ☐
Cultural Resources	Impact 4.10-b: Potential Changes to Other Known Historic-Era Resources from Ground Disturbance or Other Construction-Related Activities	Not Applicable ☐ Yes ☐ No ☐
Air Quality	Impact 4.13-b: General Conformity with the Applicable Air Quality Plan	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.13-c: Long-Term Changes in Emissions of ROG, NO_X, and PM_{10} Associated with Project Implementation	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.13-d: Exposure of Sensitive Receptors to Toxic Air Emissions	Not Applicable ☐ Yes ☐ No ☐
Noise	Impact 4.14-d: Long-Term Increases in Project-Generated Noise	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.14-e: Exposure of People Working in the Project Area to Excessive Airport Noise Levels	Not Applicable ☐ Yes ☐ No ☐
Utilities and Service Systems	Impact 4.17-c: Increases in Solid Waste Generation	Not Applicable ☐ Yes ☐ No ☐
Hazards and Hazardous Materials	Impact 4.18-a: Accidental Spills of Hazardous Materials	Not Applicable ☐ Yes ☐ No ☐
Airport Safety	Impact 4.19-b: Potential for Higher Frequency of Collisions between Aircraft and Wildlife at Sacramento International Airport	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Less than Significant" after Mitigation Implementation			
Issue Area	Impact	Mitigation Measure	Would the use of the borrow site result in significant impacts, and would the application of identified mitigation reduce the impact to a less-than-significant level?
Land Use, Socioeconomics, and Population and Housing	Impact 4.2-b: Inconsistency with the Natomas Basin Habitat Conservation Plan	Mitigation Measure 4.2-b: Implement Mitigation Measure 4.9-h, "Ensure that Project Encroachment Does Not Jeopardize Successful Implementation of the NBHCP and Implement Mitigation Measures 4.7-a, 4.8-a, and 4.9-a through 4.9-g"	Not Applicable ☐ Yes ☐ No ☐
Geology and Soils	Impact 4.3-a: Potential Temporary and Permanent Localized Soil Erosion during Construction and Operation	Mitigation Measure 4.3-a(1): Implement Mitigation Measure 4.5-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply With National Pollutant Discharge Elimination System Permit Conditions" Mitigation Measure 4.3-a(2): Secure and Implement the Conditions of the California Surface Mining and Reclamation Act Permit	Not Applicable ☐ Yes ☐ No ☐
Hydrology and Hydraulics	Impact 4.4-b: Alteration of Local Drainage	Mitigation Measure 4.4-b: Coordinate with Landowners and Drainage Infrastructure Operators, Prepare Final Drainage Studies as Needed, and Implement Proper Project Design	Not Applicable ☐ Yes ☐ No ☐
Water Quality	Impact 4.5-a: Temporary Impacts on Water Quality from Stormwater Runoff, Erosion, or Spills	Mitigation Measure 4.5-a: Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Less than Significant" after Mitigation Implementation			
Issue Area	Impact	Mitigation Measure	Would the use of the borrow site result in significant impacts, and would the application of identified mitigation reduce the impact to a less-than-significant level?
Fish and Aquatic Habitat	Impact 4.6-a: Loss of Fish or Aquatic Habitat through Increased Sedimentation and Turbidity or Releases of Contaminants	Mitigation Measure 4.6-a: Implement Mitigation Measure 4.5-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions"; and Mitigation Measure 4.5-c, "Implement Best Management Practices and Comply with NPDES Permit Conditions for a Point-Source Discharge"	Not Applicable ☐ Yes ☐ No ☐
Sensitive Aquatic Habitats	Impact 4.7-a: Impacts on Jurisdictional Waters of the United States	Mitigation Measure 4.7-a: Minimize Effects on Jurisdictional Waters of the United States, Complete Detailed Design of Habitat Creation Components and Management Agreements to Ensure Compensation of Waters Filled, and Comply with Section 404, Section 401, Section 10, and Section 1602, Permit Processes	Not Applicable ☐ Yes ☐ No ☐
Vegetation and Wildlife	Impact 4.8-a: Loss of Woodland Habitats	Mitigation Measure 4.8-a: Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Loss of Habitat, Implement all Management Agreements, and Comply with the DFG Section 1602 Permit Process	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.8-b: Impacts on Wildlife Corridors	Mitigation Measure 4.8-b: Implement Mitigation Measure 4.8-a, "Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Loss of Quantity and Quality of Habitat, Implement all Agreements, and Comply with the DFG Section 1602 Permit Process," and	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Less than Significant" after Mitigation Implementation			
Issue Area	Impact	Mitigation Measure	Would the use of the borrow site result in significant impacts, and would the application of identified mitigation reduce the impact to a less-than-significant level?
		Mitigation Measure 4.9-c, "Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Develop Detailed Design of Managed Marsh and New Canals and Management Agreements to Ensure Adequate Compensation for Loss of Habitat, Implement all Management Agreements, and Obtain Incidental Take Authorization"	
Special-Status Terrestrial Species	Impact 4.9-a: Impacts on Special-Status Plants Species	Mitigation Measure 4.9-a: Conduct Focused Surveys for Special-Status Plants, Minimize Effects, and Develop Detailed Design of Created Habitat and Management Agreements to Ensure Compensation for Loss of Habitat, and Implement all Management Agreements	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.9-b: Impacts on Valley Elderberry Longhorn Beetle	Mitigation Measure 4.9-b: Conduct Focused Surveys for Elderberry Shrubs as Needed, Complete Detailed Design of Woodland/Elderberry Habitat and Management Agreements to Ensure Adequate Compensation for Loss of Shrubs, Implement all Management Agreements, and Obtain Incidental Take Authorization	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.9-c: Impacts on Giant Garter Snake Related to Construction Activities	Mitigation Measure 4.9-c: Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Develop Detailed Design of Managed Marsh and New Canals and Management Agreements to Ensure Adequate Compensation for Loss of Habitat, Implement all Management Agreements, and Obtain Incidental Take Authorization	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Less than Significant" after Mitigation Implementation			
Issue Area	Impact	Mitigation Measure	Would the use of the borrow site result in significant impacts, and would the application of identified mitigation reduce the impact to a less-than-significant level?
	Impact 4.9-e: Impacts on Northwestern Pond Turtle	Mitigation Measure 4.9-e: Conduct Focused Surveys for Northwestern Pond Turtles and Relocate Turtles, if Needed	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.9-g: Impacts on Burrowing Owl	Mitigation Measure 4.9-g: Minimize Potential Impacts on Burrowing Owls and Relocate Owls as Needed	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.9-h: Impacts on Successful Implementation of the NBHCP	Mitigation Measure 4.9-h: Ensure that Project Encroachment Does Not Jeopardize Successful Implementation of the NBHCP and Implement Mitigation Measures 4.7-a, 4.8-a, and 4.9-a through 4.9-g	Not Applicable ☐ Yes ☐ No ☐
Paleontological Resources	Impact 4.11-a: Disturbance of Unknown Unique Paleontological Resources during Earthmoving Activities	Mitigation Measure 4.11-a: Conduct Construction Personnel Training and, if Paleontological Resources Are Found, Stop Work Near the Find and Implement Mitigation in Coordination with a Professional Paleontologist	Not Applicable ☐ Yes ☐ No ☐
Transportation and Circulation	Impact 4.12-b: Temporary Increase in Traffic Hazards on Local Roadways	Mitigation Measure 4.12-b: Prepare and Implement a Traffic Safety and Control Plan and Implement Measures to Avoid and Minimize Traffic Hazards on Local Roadways during and after Construction	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.12-c: Temporary Disruption of Emergency Service Response Times and Access	Mitigation Measure 4.12-c: Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers	Not Applicable ☐ Yes ☐ No ☐
Recreation	Impact 4.15-a: Long-Term Disruption of Recreational Activities and Facilities	Mitigation Measure 4.15-a: Prepare and Implement a Bicycle Detour Plan for Ueda Trail, Provide Construction Period Information on Recreational Facility Closures and Detours, Provide Detours for Bicycle Facilities, and Repair Damage to Recreational Facilities	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Less than Significant" after Mitigation Implementation			
Issue Area	Impact	Mitigation Measure	Would the use of the borrow site result in significant impacts, and would the application of identified mitigation reduce the impact to a less-than-significant level?
	Impact 4.15-b: Temporary Changes in Recreational Opportunities during Project Construction Activities	Mitigation Measure 4.15-b: Provide Construction Period Information on Recreational Facility Closures and Detours and: Provide Detours for Access Routes to Boat Launch Ramps and Marinas	Not Applicable ☐ Yes ☐ No ☐
Utilities and Service Systems	Impact 4.17-a: Potential Temporary Disruption of Irrigation Water Supply	Mitigation Measure 4.17-a: Coordinate with Irrigation Water Supply Users Before and During All Irrigation Infrastructure Modifications and Minimize Interruptions of Supply	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.17-b: Potential Disruption of Utility Service	Mitigation Measure 4.17-b: Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training with Respect to Accidental Utility Damage	Not Applicable ☐ Yes ☐ No ☐
Hazards and Hazardous Materials	Impact 4.18-b: Exposure to Hazardous Materials Encountered at Project Sites	Mitigation Measure 4.18-b(1): Complete Recommendations Included in Phase I and/or II ESAs and Implement Required Measures Mitigation Measure 4.18-b(2): Complete Investigations Related to the Extent to Which Soil and/or Groundwater May Have Been Contaminated in Areas Not Covered by the Phase I and II ESAs and Implement Required Measures	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.18-c: Interference with an Adopted Emergency Evacuation Plan	Mitigation Measure 4.18-c: Notify State and Local Emergency Management Agencies about Project Construction and Coordinate SR 99/70 Detours with these Agencies to Ensure That Any Need for Emergency Use Is Not Significantly Impaired	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Less than Significant" after Mitigation Implementation			
Issue Area	Impact	Mitigation Measure	Would the use of the borrow site result in significant impacts, and would the application of identified mitigation reduce the impact to a less-than-significant level?
	Impact 4.18-d: Hazardous Emissions or Handling of Hazardous or Acutely Hazardous Materials, Substances, or Waste within One-Quarter Mile of an Existing or Proposed School	Mitigation Measure 4.18-d: Notify the Twin Rivers Unified School District and Applicable School with Jurisdiction within One-Quarter Mile of Project Construction Activities.	Not Applicable ☐ Yes ☐ No ☐
Airport Safety	Impact 4.19-a: Temporary Aircraft Safety Hazards Resulting from Project Construction Activities within or near the Airport Critical Zone	Mitigation Measure 4.19-a: Coordinate Work in the Critical Zone with Airport Operations and Restrict Night Lighting within and near the Runway Approaches	Not Applicable ☐ Yes ☐ No ☐
Wildfire Hazards	Impact 4.20-a: Potential Exposure to Wildland Fires	Mitigation Measure 4.20-a: Prepare and Implement a Fire Management Plan to Minimize Potential for Wildland Fires	Not Applicable ☐ Yes ☐ No ☐
Environmental Justice	Impact 4.21-a: Potential to Have a Disproportionate High Adverse Environmental Impact on any Minority or Low-Income Populations	Mitigation Measure 4.21-a: Increase the Direct Benefits of the Project for the Ancestors of the Native American Tribes	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Significant and Unavoidable"			
Issue Area	Impact	Mitigation Measure	After implementation of mitigation (if available), would the level of severity/intensity be equal to or less than as described in the Phase 3 Project EIS/EIR? Was the borrow sites' contribution to this impact identified in a previous document (if relevant)?
Agricultural Resources	Impact 4.1-a: Conversion of Important Farmland to Nonagricultural Uses	Mitigation Measure 4.1-a: Minimize Important Farmland Conversion to the Extent Practicable and Feasible	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.1-b: Conflict with Lands under Williamson Act Contracts	Mitigation Measure 4.1-b: Minimize Impacts on Agricultural Preserve Land and Williamson Act-Contracted Land; Comply with Government Code Sections 51290-51293; and Coordinate with Landowners and Agricultural Operators	Not Applicable ☐ Yes ☐ No ☐
Land Use, Socioeconomics, and Population and Housing	Impact 4.2-c: Potential to Physically Divide or Disrupt an Established Community	Mitigation Measure 4.2-c: Notify Residents and Businesses of Project Construction and Road Closure Schedule, Provide Assistance for Temporary Relocation of Residents, Negotiate with Businesses, and Provide Security for Vacated Residence and Businesses; and Implement Mitigation Measure 4.12-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips," and Mitigation Measure 4.12-c, "Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers"	Not Applicable ☐ Yes ☐ No ☐
Special-Status Terrestrial Species	Impact 4.9-f: Impacts on Swainson's Hawk and Other Special-Status Birds	Mitigation Measure 4.9-f: Minimize Potential Impacts on Swainson's Hawk and Other Special-Status Birds Foraging and Nesting Habitat, Monitor Active Nests during Construction, Develop and Implement a Management Plan in Consultation with DFG, Obtain Incidental Take Authorization, and Implement Mitigation Measure 4.8-a, "Minimize Effects on Woodland	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Significant and Unavoidable"			
Issue Area	Impact	Mitigation Measure	After implementation of mitigation (if available), would the level of severity/intensity be equal to or less than as described in the Phase 3 Project EIS/EIR? Was the borrow sites' contribution to this impact identified in a previous document (if relevant)?
		Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Loss of Quantity and Quality of Habitat, Implement all Agreements, and Comply with the DFG Section 1602 Permit Process"	
Cultural Resources	Impact 4.10-c: Potential Damage or Disturbance to Known Prehistoric Resources from Ground-Disturbance or Other Construction-Related Activities	Mitigation Measure 4.10-c: Avoid Ground Disturbance Near Eligible and Listed Resources to the Extent Feasible, Prepare a Finding of Effect, and Resolve Any Adverse Effects through Preparation of an HPTP	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.10-d: Potential Damage to or Destruction of Previously Undiscovered Cultural Resources from Ground-Disturbance or Other Construction-Related Activities	Mitigation Measure 4.10-d: Train Construction Workers Before Construction, Monitor Construction Activities, Stop Potentially Damaging Activities, Evaluate Discovery(ies), Resolve Adverse Effects on Eligible Resources, if Encountered, and Conduct Additional Backhoe and Canine Forensic Investigations as Appropriate	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.10-e: Potential Discovery of Human Remains during Construction	Mitigation Measure 4.10-e: Stop Work Within An Appropriate Radius Around the Find, Notify the Applicable County Coroner and Most Likely Descendant, and Treat Remains in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, SAFCA, and the SHPO	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Significant and Unavoidable"			
Issue Area	Impact	Mitigation Measure	After implementation of mitigation (if available), would the level of severity/intensity be equal to or less than as described in the Phase 3 Project EIS/EIR? Was the borrow sites' contribution to this impact identified in a previous document (if relevant)?
Transportation and Circulation	Impact 4.12-a: Temporary Increase in Traffic on Local Roadways	Mitigation Measure 4.12-a: Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips	Not Applicable ☐ Yes ☐ No ☐
Air Quality	Impact 4.13-a: Temporary Emissions of ROG, NO_X, and PM_{10} during Construction	Mitigation Measure 4.13-a: Implement Applicable District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO_X, and PM_{10} during Construction	Not Applicable ☐ Yes ☐ No ☐
Noise	Impact 4.14-a: Generation of Temporary, Short-Term Construction Noise	Mitigation Measure 4.14-a: Implement Noise-Reducing Construction Practices, Prepare a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.14-b: Exposure of Sensitive Receptors to or Generation of Excessive Groundborne Vibration	Mitigation Measure 4.14-b: Implement Measures to Avoid Construction-Related Vibration Effects at the Pumping Plant No. 2 Site	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.14-c: Temporary, Short-Term Exposure of Residents to Increased Traffic Noise Levels from Hauling Activity	Mitigation Measure 4.14-c: Implement Noise-Reduction Measures to Reduce the Temporary, Short-Term Impacts of Haul Truck Traffic Noise	Not Applicable ☐ Yes ☐ No ☐
Visual Resources	Impact 4.16-a: Alteration of Scenic Vistas, Scenic Resources, and Existing Visual Character of the Project Area	Mitigation Measure 4.16-a: Screen Residential Areas from Construction Storage and Staging Areas; Provide Screening of Construction Sites on the Levee for Residential Areas	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Significant and Unavoidable"			
Issue Area	Impact	Mitigation Measure	After implementation of mitigation (if available), would the level of severity/intensity be equal to or less than as described in the Phase 3 Project EIS/EIR? Was the borrow sites' contribution to this impact identified in a previous document (if relevant)?
	Impact 4.16-b: New Sources of Light and Glare that Adversely Affect Views	Mitigation Measure 4.16-b: Implement Mitigation Measure 4.16-a, "Screen Residential Areas from Construction Storage and Staging Areas; Provide Screening of Construction Sites on the Levee for Residential Areas," and Mitigation Measure 4.19-a, "Coordinate Work in the Critical Zone with Airport Operations and Restrict Night Lighting within and near the Runway Approaches;" and Direct Lighting Away from Adjacent Properties.	Not Applicable ☐ Yes ☐ No ☐

CHECKLIST SUMMARY

Are there new significant impacts in addition to those discussed above? If yes, describe using an attachment to this checklist.	Yes ☐ No ☐
Are there significant impacts discussed above that are substantially more severe than discussed in the Phase 3 Project EIS/EIR? If yes, explain on an attachment to this checklist.	Yes ☐ No ☐
Are there significant impacts discussed in the 2007 Landside EIR (program level) that are substantially more severe than previously disclosed? If yes, explain on an attachment to this checklist.	
Are additional mitigation measures or alternatives? Are they feasible or considerably different from the previously adopted mitigation measures? If yes, explain on an attachment to this checklist.	Yes ☐ No ☐
Is additional environmental documentation required? If yes, specify type of environmental compliance document required:	
• EIR Addendum	Yes ☐ No ☐
• Mitigation Negative Declaration	Yes ☐ No ☐
• Supplemental EIR	Yes ☐ No ☐
• Subsequent EIR	Yes ☐ No ☐
• Supplemental EIS	Yes ☐ No ☐

3. REFERENCES

Sacramento Area Flood Control Agency. 2007a (February). 2007c (November). *Final Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project.* State Clearinghouse #2007062016. Prepared by EDAW, Sacramento, CA.

APPENDIX K

Documents Incorporated By Reference

(Cover and Title Pages Only)

Final Environmental Impact Report on

Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area

Responses to Comments and Revisions to the Draft EIR

Programmatic Evaluation of the Proposed Funding Mechanisms

Project-Level Evaluation of Natomas Cross Canal South Levee Phase 1 Improvements

State Clearinghouse # 2006072098

Prepared for:

SAFCA
Sacramento Area Flood Control Agency

February 2007

EDAW | AECOM

Final Environmental Impact Report on

Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area

Responses to Comments and Revisions to the Draft EIR

Programmatic Evaluation of the Proposed Funding Mechanisms

Project-Level Evaluation of Natomas Cross Canal South Levee Phase 1 Improvements

State Clearinghouse # 2006072098

Prepared for:

Sacramento Area Flood Control Agency
1007 Seventh Street, 7th Floor
Sacramento, CA 95814

Contact:

John A. Bassett
Director of Engineering
Phone (916) 874-7606
Fax (916) 874-8289

Prepared by:

EDAW
2022 J Street
Sacramento, CA 95814

Contact:

Roberta Childers
Project Manager
Phone (916) 414-5800

February 2007

EDAW | AECOM

06110058.01
2/2/07

Draft Environmental Impact Report on

Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area

Volume I: Programmatic Evaluation of the Proposed Funding Mechanisms

Volume II: Project-Level Evaluation of Natomas Cross Canal South Levee Phase 1 Improvements

State Clearinghouse # 2006072098

Prepared for:

SAFCA
Sacramento Area Flood Control Agency

November 2006

EDAW | AECOM

Draft Environmental Impact Report on

Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area

Volume I: Programmatic Evaluation of the Proposed Funding Mechanisms

Volume II: Project-Level Evaluation of Natomas Cross Canal South Levee Phase 1 Improvements

State Clearinghouse # 2006072098

Prepared for:

Sacramento Area Flood Control Agency
1007 Seventh Street, 7th Floor
Sacramento, CA 95814

Contact:

John A. Bassett
Director of Engineering
Phone (916) 874-7606
Fax (916) 874-8289

Prepared by:

EDAW
2022 J Street
Sacramento, CA 95814

Contact:

Roberta Childers
Project Manager
Phone (916) 414-5800

November 2006

EDAW | AECOM

06110058.01
11/14/06

Draft Environmental Impact Report on

Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area

Volume II: Project-Level Evaluation of Natomas Cross Canal South Levee Phase 1 Improvements

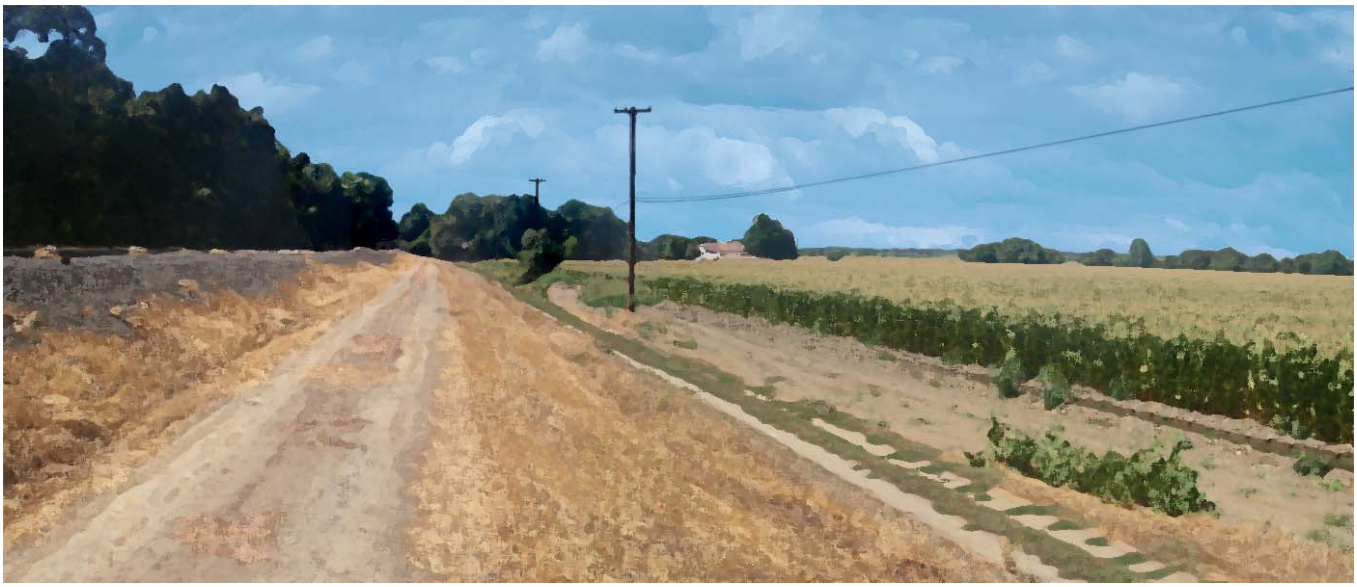
November 2006

EDAW | AECOM

06110058.01
11/14/06

Draft Environmental Impact Report on the

Natomas Levee Improvement Program
Landside Improvements Project



State Clearinghouse # 2007062016

Prepared for:

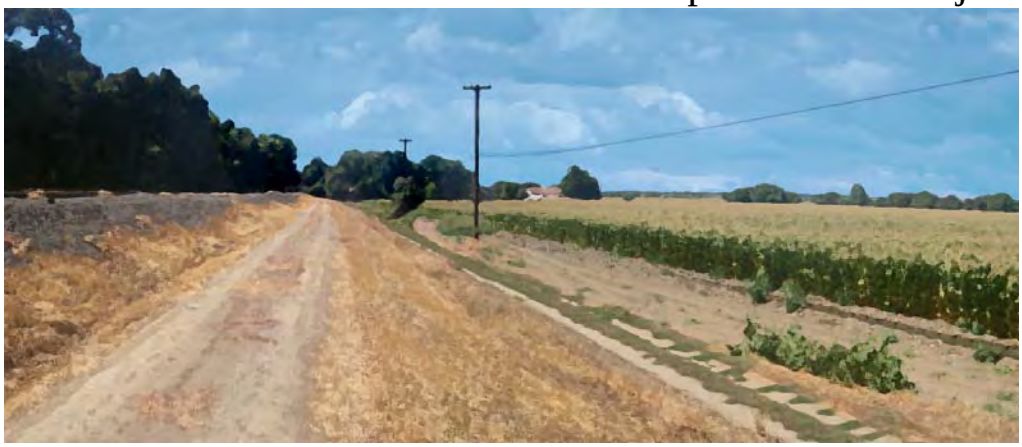
SAFCA
Sacramento
Area Flood
Control
Agency

September 2007

EDAW | AECOM

Draft Environmental Impact Report on the

Natomas Levee Improvement Program Landside Improvements Project



State Clearinghouse # 2007062016

Prepared for:

Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Contact:

John A. Bassett
Director of Engineering
Phone (916) 874-7606
Fax (916) 874-8289

Prepared by:

EDAW
2022 J Street
Sacramento, CA 95811

Contact:

Roberta Childers
Project Manager
Phone (916) 414-5800

September 2007

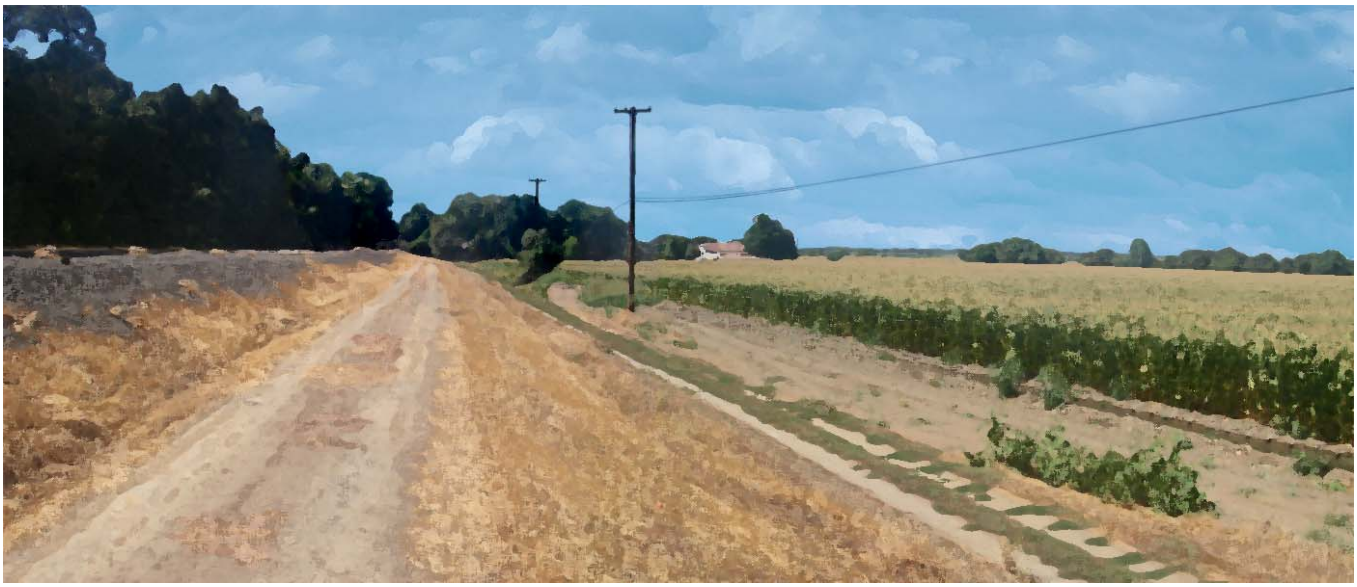
EDAW | AECOM

06110058.01
09.14.07

Final Environmental Impact Report on the

Natomas Levee Improvement Program Landside Improvements Project

Responses to Comments and Revisions to the Draft EIR



State Clearinghouse # 2007062016

Prepared for:

SAFCA
Sacramento Area Flood Control Agency

November 2007

EDAW | AECOM

Final Environmental Impact Report on the

Natomas Levee Improvement Program Landside Improvements Project

Responses to Comments and Revisions to the Draft EIR

State Clearinghouse # 2007062016

Prepared for:

Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Contact:

John A. Bassett
Director of Engineering
Phone (916) 874-7606
Fax (916) 874-8289

Prepared by:

EDAW
2022 J Street
Sacramento, CA 95811

November 2007

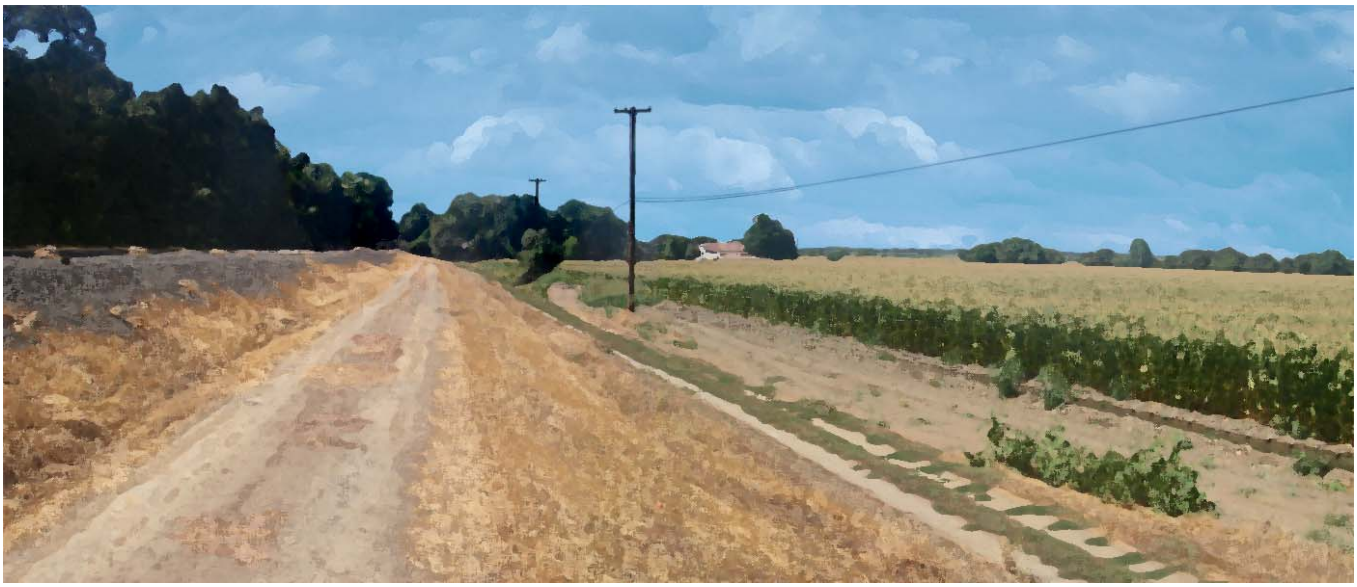
EDAW | AECOM

06110058.01
11.19.07

Draft

Supplement to the Environmental Impact Report on the

Natomas Levee Improvement Program
Landside Improvements Project—Phase 2 Project



State Clearinghouse # 2007062016

Prepared for:

SAFCA
Sacramento
Area Flood
Control
Agency

November 2008

EDAW | AECOM

Draft

Supplement to the Environmental Impact Report on the

Natomas Levee Improvement Program
Landside Improvements Project—Phase 2 Project

State Clearinghouse # 2007062016

Prepared for:

Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Contact:

John A. Bassett
Director of Engineering
Phone (916) 874-7606
Fax (916) 874-8289

Prepared by:

EDAW
2022 J Street
Sacramento, CA 95811

Contact:

David Rader
Project Manager
Phone (916) 266-4908

November 2008

EDAW | AECOM

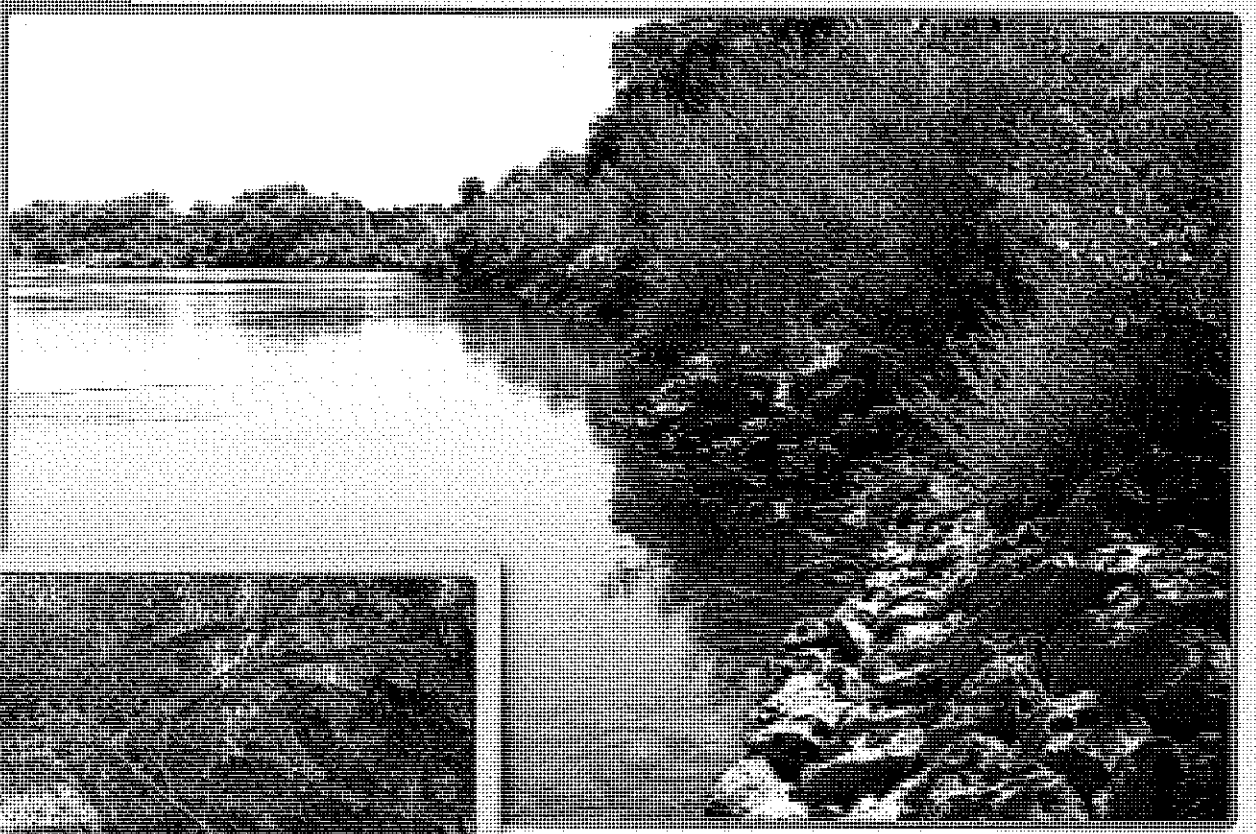
06110058.01
11.12.08

Natomas Levee Improvement Program Bank Protection Project

Draft Environmental Impact Report

State Clearinghouse # 2007062017

September 2007



Prepared for:

Sacramento Area Flood Control Agency

Prepared by:

Jones & Stokes