APPENDIX U

Master Water Study

Sacramento County Water Agency

Master Water Study for the Suncreek Specific Plan

Final Report

October 2008

MWH

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

Note: Results of Scenario 3 are not shown in an appendix because the run did not reach hydraulic balance.

LIST OF ACRONYMS AND ABBREVIATIONS

AAD	Annual Average Demand
ADD	Average Day Demand
AF/year	acre-feet per year
Central Basin	Central Sacramento County Groundwater Basin
CEQA	California Environmental Quality Act
CSA	Central Service Area
CSCGMP	Central Sacramento County Groundwater Management Plan
CWC	California Water Code
DEIR	Draft Environmental Impact Report
EPS	Extend Period Simulation
GET	groundwater extraction and treatment
gpm	gallons per minute
ISO	International Organization of Standardization
MDD	Max Day Demand
MGD	million gallons per day
msl	mean sea level
NSA	North Service Area
PHD	Peak Hour Demand
psi	pounds per square inch
Rancho Cordova	City of Rancho Cordova
SB	Senate Bill
SCGA	Sacramento Central Groundwater Authority
SCWA	Sacramento County Water Agency
SSA	South Service Area
T-main	Transmission Main
Water Forum	Sacramento Area Water Forum
WFA	Water Forum Agreement
WSIP	Water System Infrastructure Plan
WSMP	Water Supply Master Plan
WTP	Water Treatment Plant

SECTION 1. INTRODUCTION

1.1 Study Area

The Suncreek Specific Plan (the Suncreek Plan) is a 1,264-acre area located in the eastern Sacramento County. The Suncreek Plan area is part of the 6,116-acre Sunrise Douglas Community Plan that also includes the Sunridge Specific Plan, the Preserve at Sunridge, and the Waegell Property. Development areas identified within the Suncreek Plan area include Shalako, Investek Financial Corp., Kamilos, Sierra Sunrise, and Sioukas et al. **Figure 1** shows the location of the Suncreek Plan area.

1.2 Study Purpose

The primary purpose of this Master Water Study (Study) is to identify the long-term, interim, and initial water supply sources, facilities, and capital improvements necessary to support development within the Suncreek Plan area while maintaining consistency with Sacramento County Water Agency's (SCWA) operational parameters as described in SCWA's various planning documents.

This Study, in part, will assist SCWA in the review of the Suncreek Specific Plan Draft Environmental Impact Report (DEIR). This Study is not intended to satisfy Senate Bill (SB) 610, where the water retail provider is required to make a determination of water supply sufficiency. Unless a land use authority specifically makes a request for a SB 610 letter from the affected water purveyor, as part of the California Environmental Quality Act (CEQA) process, the purveyor is under no obligation to conduct such a study. In this case, SCWA feels that it is prudent to work with the information obtained through its Water System Infrastructure Plan (WSIP) (**Section 2.1.4**) and supplement it with the information in this study. Combined, the water supply sufficiency determination in a Water Supply Assessment, and the identification of the needed water supply facilities as part of a SB 221 requirement, which provides written verification of available water supply, will be mostly completed.

1.3 Sacramento County Water Agency

The Suncreek Plan area falls within the SCWA Zone 40. Zone 40 is a benefit zone with the purpose of "... the acquisition, construction, maintenance and operation of facilities for the production, conservation, transmittal, distribution and sale of ground or surface water or both for the present and future beneficial use of the lands or inhabitants within the zone." Once the SCWA begins serving water to the area, Zone 41 will serve as the retail water supplier to provides safe and reliable drinking water. Zone 41 revenues are collected by utility charges, connection permit fees, construction water permits, and grants - all of which fund replacement and rehabilitation of water supply capital facilities, replacement design, and day to day operations, maintenance, and administration.

The Zone 40 area is separated into three major service areas: North Service Area (NSA), Central Service Area (CSA), and South Service Area (SSA) as shown in **Figure 2**. The Suncreek Plan area is located in the NSA. The NSA is located in the northern portion of Zone 40 and includes the areas identified as Mather, Sunrise Corridor, Sunrise Douglas, and Rio Del Oro.

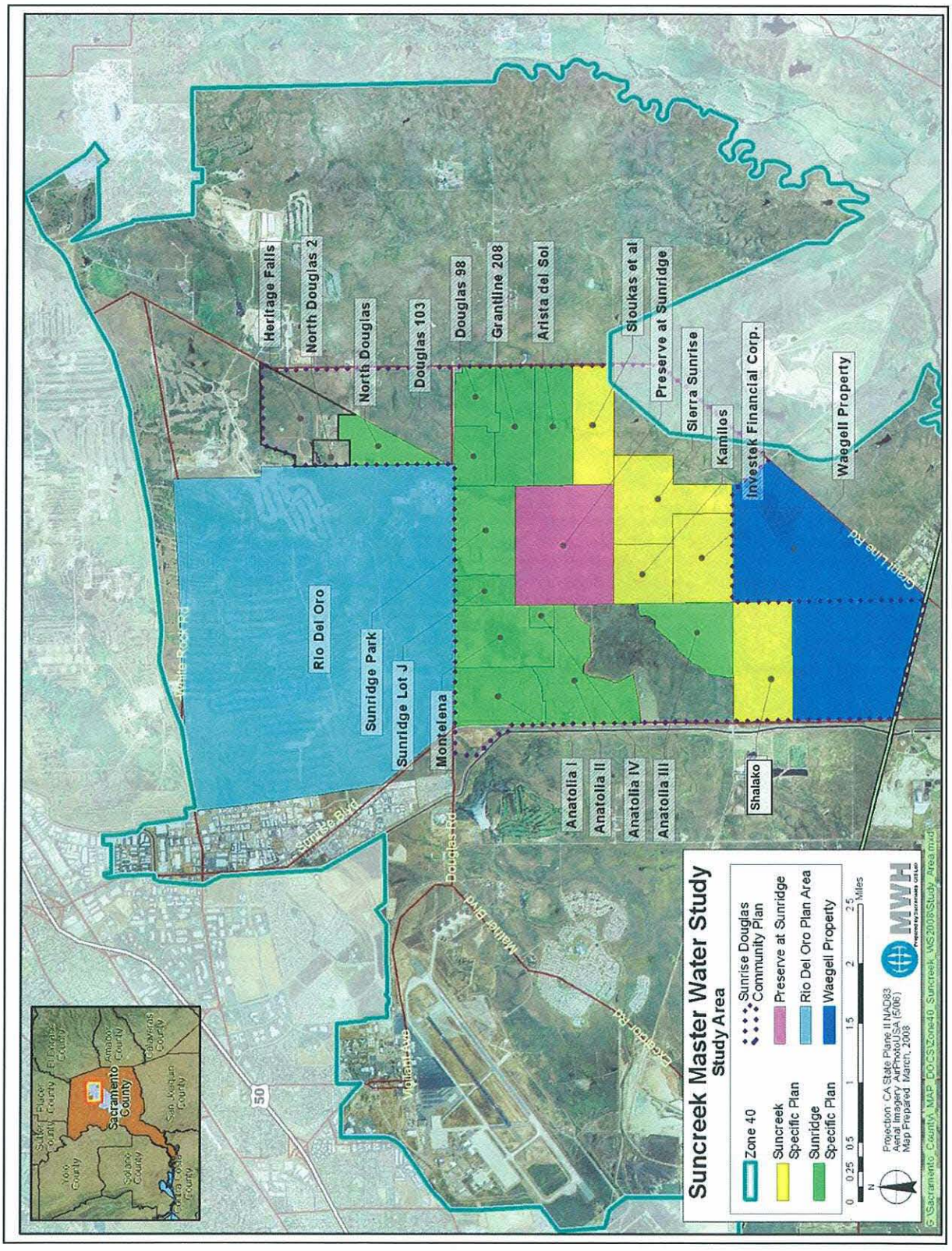

Figure 1. Location of Suncreek Specific Plan Area

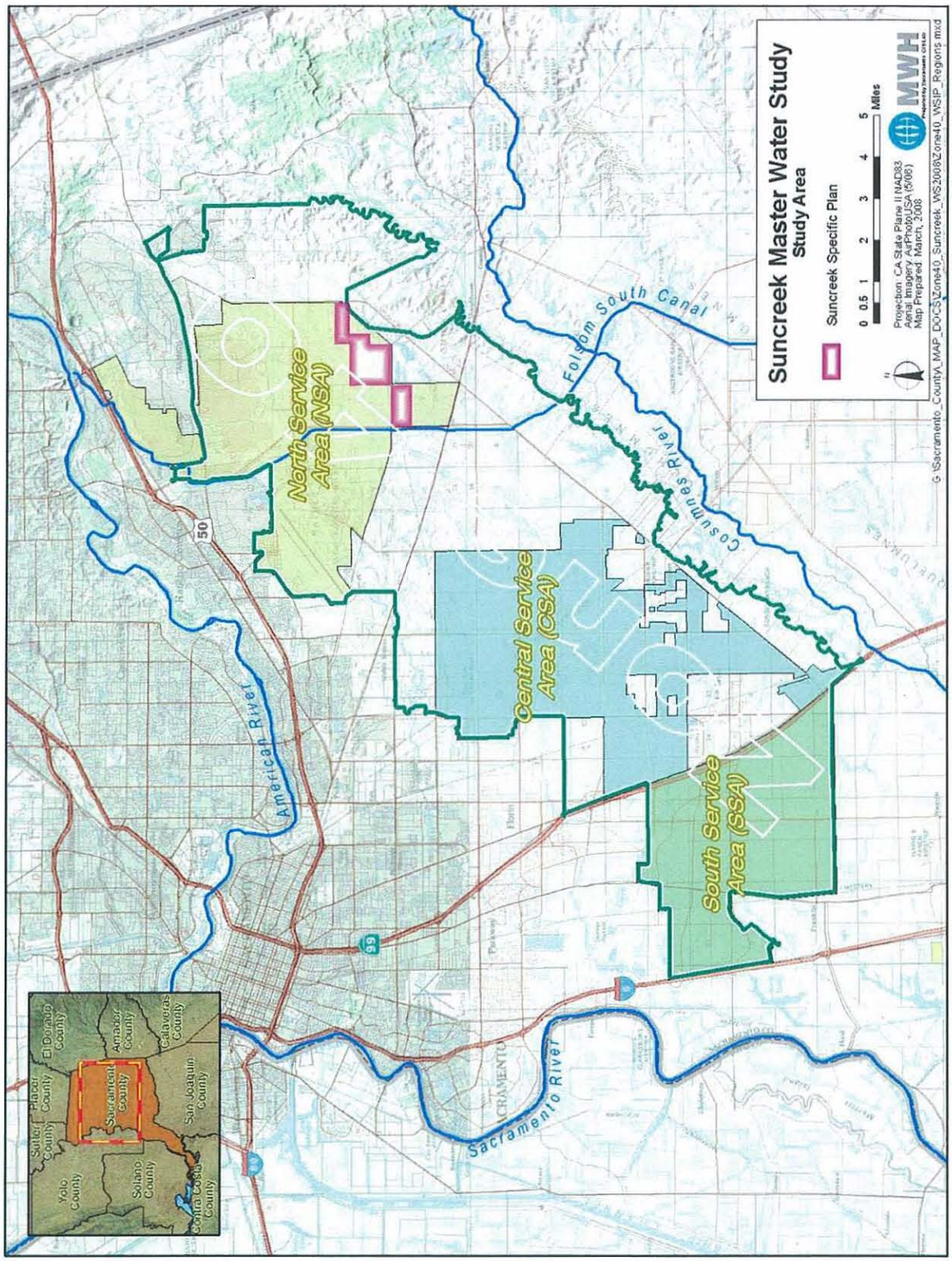

Figure 2. Zone 40 Service Areas

SECTION 2. BACKGROUND AND SETTING

2.1 Previous Planning Efforts

Several previous reports and studies were reviewed in the preparation of this Study. These studies provide the framework and guidance for the water system design and planning in the Suncreek Plan area. These studies include:

- Water Forum Agreement (January 2000)
- Zone 40 Water Supply Master Plan (MWH, February 2005)
- Central Sacramento County Groundwater Management Plan (MWH, February 2006)
- Zone 40 Water System Infrastructure Plan (MWH, April 2006)
- Zone 41 Urban Water Management Plan (MWH, December 2005)
- Non-Potable Water Master Plan for Sunrise Douglas Community Plan Area (Wood Rodgers, February 2007)

2.1.1 Water Forum Agreement (January 2000)

Begun in 1993, the Sacramento Area Water Forum (Water Forum) arose out of collaboration between the City and County of Sacramento (including SCWA) that recognized the need for regional solutions to address long term reliable water supplies for urban growth, agriculture, and environmental and recreational water needs. Regional cooperation was achieved through a consensus-based, stakeholder process involving over 40 representatives that included water purveyors, environmental interests, business interests, and public interest groups. The two co-equal objectives of the Water Forum are:

- To provide a reliable and safe water supply for the region's economic health and planned development through the year 2030
- To preserve the fishery, wildlife, recreational, and aesthetic values of the lower American River

As a signatory to the Water Forum Agreement, Sacramento County/SCWA needs to endorse, and, where appropriate, participate in the each of the seven principles elements of the Water Forum Agreement. All of SCWA's past, current, and future planning is, and will be, consistent with the Water Forum Agreement.

2.1.2 Zone 40 Water Supply Master Plan (MWH, February 2005)

In 2005, SCWA completed the Zone 40 Water Supply Master Plan (WSMP)[1] to provide a flexible program of water management alternatives that can be implemented and revised if necessary, as the availability and feasibility of water supply sources change in the future. It describes the studies conducted and presents findings, conclusions, and recommendations to meet future water demands in Zone 40 through the year 2030, consistent with the Water Forum Agreement (WFA) and the 1993 Sacramento County General Plan. It outlines an extensive regional conjunctive use plan to balance the use of surface water, recycled water, and groundwater to ensure that groundwater levels are adequately maintained throughout the Basin. The WSMP also updates the financing program for construction of surface water diversion and treatment facilities; water conveyance pipelines; groundwater extraction, treatment, storage, and distribution facilities; and recycled water storage and distribution facilities.

The WSMP also documents the unit water demand factors for various land use categories. These unit water demand factors along with the projected land use data will be used to estimate the water demand in the Suncreek Plan area, described in **Section 3**.

2.1.3 Central Sacramento County Groundwater Management Plan (MWH, February 2006)

In November 2006 and following five years of development, the Central Sacramento County Groundwater Management Plan (CSCGMP) was completed by stakeholders in the region and adopted by the Sacramento Central Groundwater Authority (SCGA). The stakeholders represented interests of urban, agricultural, agricultural-residential, business, environmental, and public agencies. The purpose of the CSCGMP is to maintain a safe, sustainable, and high quality groundwater resource for the Central Sacramento County Groundwater Basin (Central Basin). The SCGA is actively working on the actions to meet the objectives prescribed in the CSCGMP. SCWA is signatory and provides the staff to SCGA.

2.1.4 Zone 40 Water System Infrastructure Plan (MWH, April 2006)

In 2006, SCWA completed the Zone 40 WSIP. The WSIP is a SCWA staff-level planning tool that describes and quantifies the facilities necessary to extract, treat, and convey SCWA's water supplies (i.e., surface water, groundwater, replacement water, and recycled water) for the year 2006 through the year 2030. The WSIP is the implementation of the programmatic phasing and capacity requirements for future water supply facilities from the WSMP. The WSIP provides more project-level detail necessary for implementation of water supply alternatives from the WSMP and fills in the gaps of associated smaller infrastructure requirements.

Unlike other planning documents where build-out facilities are typically viewed as the "project" the Zone 40 WSIP describes four phases of demand growth that represents significant milestones in water supply development within Zone 40 and it reflects the anticipated pattern of

[1] The 2005 Zone 40 WSMP reflects changes from the 1987 Zone 40 WSMP in the pattern of growth in water demands, water quality treatment requirements, expansion of the original service area, and in the availability of potential sources of surface water supplies.

development through build-out of the 2030 Zone 40 WSMP (and Water Forum Agreement). These four phases represent existing conditions, first phase of the Vineyard Surface Water Treatment Plant (WTP) (50 million gallons per day (MGD)), second phase of the Vineyard Surface WTP (expanding from 50 MGD to 100 MGD, the ultimate treatment capacity), and build-out conditions. The Zone 40 WSIP also considers the range in operation of the various water supply facilities (i.e., groundwater and surface water) to account for wet and dry hydrologic conditions.

2.1.5 Zone 41 Urban Water Management Plan (MWH, December 2005)

As defined by the California Water Code (CWC) §10617, all urban water suppliers in California are required to prepare a Urban Water Management Plan and complete updates on or before December 31 at least once every five years, in years ending in five and zero. An "urban water supplier" is a supplier, either publicly or privately owned, that provides water to more that 3,000 customers or supplies more than 3,000 acre-feet of water annually on a wholesale or retail basis or both. The UWMP is the foundation document for Water Supply Assessments (Senate Bill 610) CWC §10613 *et seq.* (*Added by* Stats. 2001, c. 643) and Written Verifications of Water Supply (SB 221) CWC §66473.7 (*Added by* Stats. 2001, c. 642), which are required of all new developments in California.

In 2005, SCWA prepared an UWMP for Zone 41. Zone 41 retails and wholesales water within its various service areas in Sacramento County. The Zone 41 UWMP contains information about water supplies, water supply reliability, water conservation, water shortage contingencies, and recycled water usage. The UWMP also incorporates much of the demand and supply information from Zone 40's WSMP and WSIP.

2.1.6 Non-Potable Water Master Plan for Sunrise Douglas Community Plan Area (Wood Rodgers, February 2007)

The primary objective of this study is to evaluate the non-potable water service areas, non-potable water demands, and non-potable distribution system requirements in the Sunrise Douglas Community Plan Area, which includes the Suncreek Plan area, to meet SCWA operating goals. The study will assist SCWA in the review and approval of capital improvements within the Sunrise Douglas Community Plan area.

2.2 Water Supply Setting

2.2.1 Existing Geographical Conditions

The Suncreek Plan area is fairly flat, ranging in elevation from 40 feet to 60 feet above mean sea level. The overall area is largely undeveloped and has historically been used for agriculture, light industrial, and agricultural residential housing (small ranchettes which may include some livestock). Elder Creek runs through the Suncreek Plan area from northeast to southwest.

2.2.2 Existing Water Facilities

Currently, there are no municipal water supply and water distribution facilities located within the Suncreek Plan area. However, transmission pipelines are being installed along Kiefer Blvd, and Jeager Rd for the development of the Sunridge Specific Plan in and for the Anatolia development. The future water transmission and distribution facilities will be developed in accordance with the latest SCWA's standards for water system improvements as identified in the Zone 40 WSIP (transmission facilities) and in the Sacramento County Improvement Standards (distribution facilities).

2.2.3 Groundwater Contamination

Groundwater contamination is a significant constraint in developing and maintaining groundwater production in the NSA. Significant groundwater remediation activities are underway in the Rancho Cordova area as a result of groundwater contamination caused by various military and rocket engine production activities. Since approximately 1998, groundwater contamination resulting from previous operations at Aerojet and Boeing facilities have resulted in the shutdown of SCWA wells located in the Mather and Sunrise Corridor areas and continue to threaten operable wells in both SCWA and adjacent water purveyor service areas. This impact to the groundwater supply will result in more reliance on available surface water supplies or on treated groundwater supplies.

2.2.4 Projected Water Supply Facilities

Section 5 will describe the various water supply scenarios, the required facilities, and the results of the water distribution system modeling.

SECTION 3. LAND USE AND WATER DEMAND PROJECTIONS

Consistent with WSMP, water demand projections based on land use information is SCWA's preferred method of determining water demands for a proposed project. Water demand forecasting using population and per capita demand factors is used only when land use information is not available. The benefit of land use-based water demand factors is that it allows for geographic location of the water demands in terms of computer modeling and setting up demand areas for the model. A land use water demand factor is determined by using actual meter data for each land use category, normalizing the data to what is considered to be a design condition (e.g., hydrologic year, level of water conservation and enforcement, etc.) and then associate each factor with the land use categories. **Table 1** shows SCWA's 2030 unit water demand factors. This section describes the land uses and the associated water demand estimates for the Suncreek Pan area.

Table 1. 2030 Unit Water Demand Factors

Land Use Category	Abbreviation	Average Annual Water Demand Factors (AF/acre/year)
Rural Estates	RE	1.33
Single Family	SF	2.89
Multi-Family - Low Density	MFLD	3.70
Multi-Family - High Density	MFHD	4.12
Commercial	COM	2.75
Industrial	IND	2.71
Industrial – Unutilized	IUN	0.00
Public	PUB	1.04
Public Recreation	REC	3.46
Mixed Land Use	MLU	2.51
Right-of-Way	ROW	0.21
Water System Losses (7.5%)		

Source: MWH, Zone 40 Water Supply Master Plan, Table 2-2, February 2002.
Key:
AF/acre/year = acre-feet per acre per year

3.1 Proposed Land Uses

Proposed land uses for the Suncreek Plan area are based on the latest land use exhibit/diagram under consideration, provided by the Suncreek Plan engineering firm, Mackay & Somps (2007). The land uses consist of a mix of residential, commercial, and wetland preserve designations. Areas outside of the Suncreek Plan area are also included in the water distribution modeling completed for this study based on the best available data including Rancho Cordova and the Sacramento County General Plans and other Community Plans that make up the entirety of the region within Zone 40, while still consistent with the WSIP. Facility sizing for the transmission and storage of water supply to the Suncreek Plan area have been identified in this study.

Evaluation of the smaller distribution facilities is not a part of this study and will be required as each development within the Suncreek Plan area submits improvement plans.

3.2 Water Demand Estimates

This section describes the projected build-out water demands in the Suncreek Plan area, including potable water demand and non-potable demand.

3.2.1 Potable Water Demand

The potable water demand for the Suncreek Plan area was obtained by calculating the gross water demand (potable and non-potable) first and then subtracting the non-potable water demand from the gross water demand.

A gross water demand estimate determines the total quantity of water needed to serve a proposed development. The land use based method was used to estimate the gross water demand in the Suncreek Plan area. The land use based method requires the specific land use and acreage information and the unit water demand factor for each land use classification. The land use classification and acreage information, the unit water demand factors, and the annual average demand for the Suncreek Plan area are summarized in **Table 2**.

The total gross water demand for the Suncreek Plan area is estimated to be approximately 3,208.5 acre feet per year at build out. The non-potable water demand is presented in the following section. The total non-potable water demand in the Suncreek Plan area is estimated to be 825.4 acre feet per year. Therefore, total potable water demand for the Suncreek Plan area is 2,383.1 acre feet per year (3,208.5 minus 825.4).

The quantity of water demand is usually expressed in four forms: Average Annual Demand (AAD), Average Day Demand (ADD), Max Day Demand (MDD), and Peak Hour Demand (PHD). Each one of these forms of water demands serves a specific purpose.

AAD, often expressed as acre-feet per year (AF/year) provides very useful information for SCWA staff in developing their overall water supply for the Suncreek Plan area. ADD, represented in MGD, represents the average daily water demand for a water system. ADD is usually calculated from the annual average demand in order to obtain MDD and PHD. MDD is useful in determining the capacity of the conveyance pipeline to deliver groundwater/surface water to a study area. PHD, often expressed in terms of gallons per minute (gpm) is used to size the water transmission and distribution pipelines, booster pumps, and on-site storage requirements to handle the PHD and ensure that service pressures are satisfied.

Table 3 shows the potable water demands under average day, max day and peak hour conditions in the Suncreek Plan area.

Table 2. Annual Average Gross Water Demand Estimate for Suncreek

Land Use Description [1]	Corresponding Land Use Classification in Zone 40 WSMP	Total Acres	Unit Water Demand Factor [2] (AF/Ac/Yr)	Annual Average Water Demand (AF/Year)
Low Density Residential	Single Family	190	2.89	549.1
Medium Density Residential	Multi-Family Low Density	379	3.7	1,402.3
Compact Density Residential	Multi-Family Low Density	27	3.7	99.9
High Density Residential	Multi-Family High Density	29	4.12	119.5
Commercial Mixed Use	Mixed Use	29	2.51	72.8
Village Center	Commercial	3	2.75	8.3
Public/Quasi Public	Public	7	1.04	7.3
Neighborhood Park	Public Recreation	61	3.46	211.1
Community Park	Public Recreation	35	3.46	121.1
Parkway, Paseos and Trails	Right-of-Way	28	0.21	5.9
Wetland Buffer/Bike Path Corridor	Right-of-Way	30	0	0
Detention Basin	Vacant	31	0	0
Storm Drain Channel	Vacant	9	0	0
Wetland Preserve	Vacant	218	0	0
High School	Public Recreation	46	3.46	159.2
Middle School	Public Recreation	35	3.46	121.1
Elementary School	Public Recreation	31	3.46	107.3
Major Roads	Vacant	97	0	-
Subtotal				**2,984.7**
System Loss (7.5%)				223.9
Total		**1,285**		**3,208.6**

Note:
[1] Land use provided by Mackay & Somps Civil Engineers Inc.
[2] Zone 40 WSMP unit water demand factors.

Key:
AF/Ac/Yr = Acre-feet per acre per year
AF/Year = acre-feet per year
WSMP = Zone 40 Water Supply Master Plan

Table 3. ADD, MDD, and PHD of Potable Water Demands for Suncreek

Annual Average Demand (AF/Year)	Average Day Demand (MGD)	Max Day Demand (MGD) [1]	Peak Hour Demand (gpm) [2]
2,383.1	2.1	4.3	5,907.9

Notes:
[1] Applied a multiplier of 2.0 to ADD to obtain MDD.
[2] Applied a multiplier of 2.0 to MDD to obtain PHD.

Key
ADD = Average Day Demand
AF/Year = acre-feet per year
gpm = gallons per minute
MDD = Max Day Demand
MGD = million gallons per day
PHD = Peak Hour Demand

3.2.2 Non-Potable Water Demand

The Suncreek Plan area is located in the incorporated area of the City of Rancho Cordova (Rancho Cordova). In February 2006, the Rancho Cordova City Council passed Resolution 11-2006 adopting a water recycling program to assist in meeting future water use needs in Rancho

Cordova. Rancho Cordova intends to have new developments install "purple pipe" during the construction phase of the development to provide water for non-potable use, including irrigation needs in public landscapes, such as schools, parks, and streetscapes.

Wood Rodgers, under contract with SCWA, has prepared the Non-potable Water Master Plan for Sunrise Douglas Community Plan Area. The Non-potable Water Master Plan was completed in February 2007 and approved by SCWA on March 6, 2007. The Non-potable Water Master Plan has estimated the non-potable water demands for the Sunridge Specific Plan, Suncreek Specific Plan, the Preserve at Sunridge, and Waegell Property. The non-potable demands identified in the Non-Potable Master Plan for the Suncreek Plan area were used in this Suncreek Master Water Study. **Table 4** shows the AAD, MDD, and PHD of non-potable water demands for the Suncreek Plan area. Note that the peaking factors for non-potable water use are different from those of potable water use because non-potable water is used for irrigation purpose on public landscaping areas (parks, schools, streetscapes, and commercial) over a period time of a day. Please refer to the Non-Potable Water Master Plan for the assumptions and steps to calculate the non-potable PHD for the Suncreek Plan area.

Table 4. Non-Potable Water Demand Estimates for Suncreek Plan Area

Suncreek Development Areas	Average Annual Demand (AF/Year)	Max Day Demand (MGD)	Peak Hour Demand (gpm)
Investek Financial Corp.	115.8	0.26	742
Kamilos	174.8	0.39	794
Sierra Sunrise	247.7	0.55	1,293
Siouka et al	136.9	0.31	970
Shalako	150.2	0.34	1,087
Total	**825.4**	**1.85**	**4,885**

Source: Wood Rodgers, Non-potable Water Master Plan for Sunrise Douglas Community Plan Area, February 2007.

Key:
AF/Year = acre-feet per year
gpm = gallons per minute
MGD = million gallons per day

SECTION 4. WATER SYSTEM OPERATING GOALS

This section describes SCWA's operating goals in the design of transmission mains (T-main) within Zone 40. These T-main operating goals were established to maintain adequate pressures and flow velocities under normal and fire flow operating conditions. These T-main operating goals are included in **Table 5**.

Table 5. Zone 40 Operating Goals for Transmission Mains

Condition	Operating Goals
Maximum operational pipe velocities over the diurnal period.	5 fps
Minimum residual pressure	40 psi
Maximum residual pressure	75 psi
Minimum system pressure during Maximum Day plus Fire flow (including fire hydrant)	20 psi
Maximum head loss per 1,000 of T-main	5.0 feet

Source: MWH, Zone 40 Waster System Infracstructure Plan, Section 5, April 2006.
Note:
This goal should be used as a general guideline for the system. Maintaining the minimum residual system pressure should be the controlling design criteria.
Key:
fps = feet per second
psi = pounds per square inch

The water distribution system must be sized to provide adequate fire flows at minimum residual pressures specified by the International Organization of Standardization (ISO) and local fire departments. The Suncreek Plan area is located in the service area of the Sacramento Metropolitan Fire District. The fire flow requirements used for the Suncreek Plan area are shown in **Table 6**.

Table 6. Fire Flow Requirements

Land Use	Fire Flow Requirement (gpm)	Duration (Hours)
Single Family Residential less than 3,600 square feet	1,500	2
Single Family Residential greater than 3,600 square feet	2,000	2
Commercial	3,000	3

Source: MWH, Zone 40 Waster System Infracstructure Plan, Section 5, April 2006.
Key:
gpm = gallons per minute

This page left blank intentionally.

SECTION 5. WATER INFRASTRUCTURE REQUIREMENTS AND PHASING

As any new development project proceeds in the land use entitlement and construction process, the water supply availability and method of providing water service to the project may change. This section best describes the water system infrastructure requirements and phasing to meet the water demands in the interim and build-out conditions based on the most current information provided by the Suncreek project proponents and understandings of how, when, and where potable water will come from to serve the Suncreek Plan area.

5.1 Facility Requirements and Phasing in the Zone 40 WSIP

The Zone 40 WSIP provides the framework for larger potable water facility requirements for the entire Zone 41 retail and wholesale service area including the Suncreek Plan area located within the Zone 40 benefit area. The facility phasing in the Zone 40 WSIP identifies/proposes two construction phases for the Vineyard Surface WTP. The first construction phase of the Vineyard Surface WTP (50 MGD) is currently under construction and is anticipated to come online in the year 2011. The second phase of the Vineyard Surface WTP (adds another 50 MGD to reach the full 100 MGD build-out treatment capacity) is estimated to be constructed in approximately 2020. **Figure 3** shows the facility requirements for Zone 40's NSA in the build-out condition and the two interim facility configurations necessary to accommodate the construction phases of the Vineyard Surface WTP: WSIP Phase 1 and WSIP Phase 2. WSIP Phase 1 depicts the major facility requirements based on completion of the first phase of the Vineyard Surface WTP; and WSIP phase 2 depicts the major facility requirements based on completion of the second phase of the Vineyard Surface WTP. The Zone 40 NSA includes the existing Mather/Sunrise Corridor areas and future growth areas including areas in the Suncreek Plan, the Sunridge Specific Plan, The Preserve at Sunridge, and Rio del Oro.

The initial development in the Suncreek Plan area is projected to take place in approximately late 2009, before the Vineyard Surface WTP becomes operational. This Study will use the Zone 40 WSIP as a framework to further investigate the water supply sources and water facility requirements to serve the Suncreek Plan area. Such considerations serve to assist SCWA staff in the planning of water supply facilities necessary to ensure reliable water supplies for the Suncreek Plan area until ultimate build-out conditions are met.

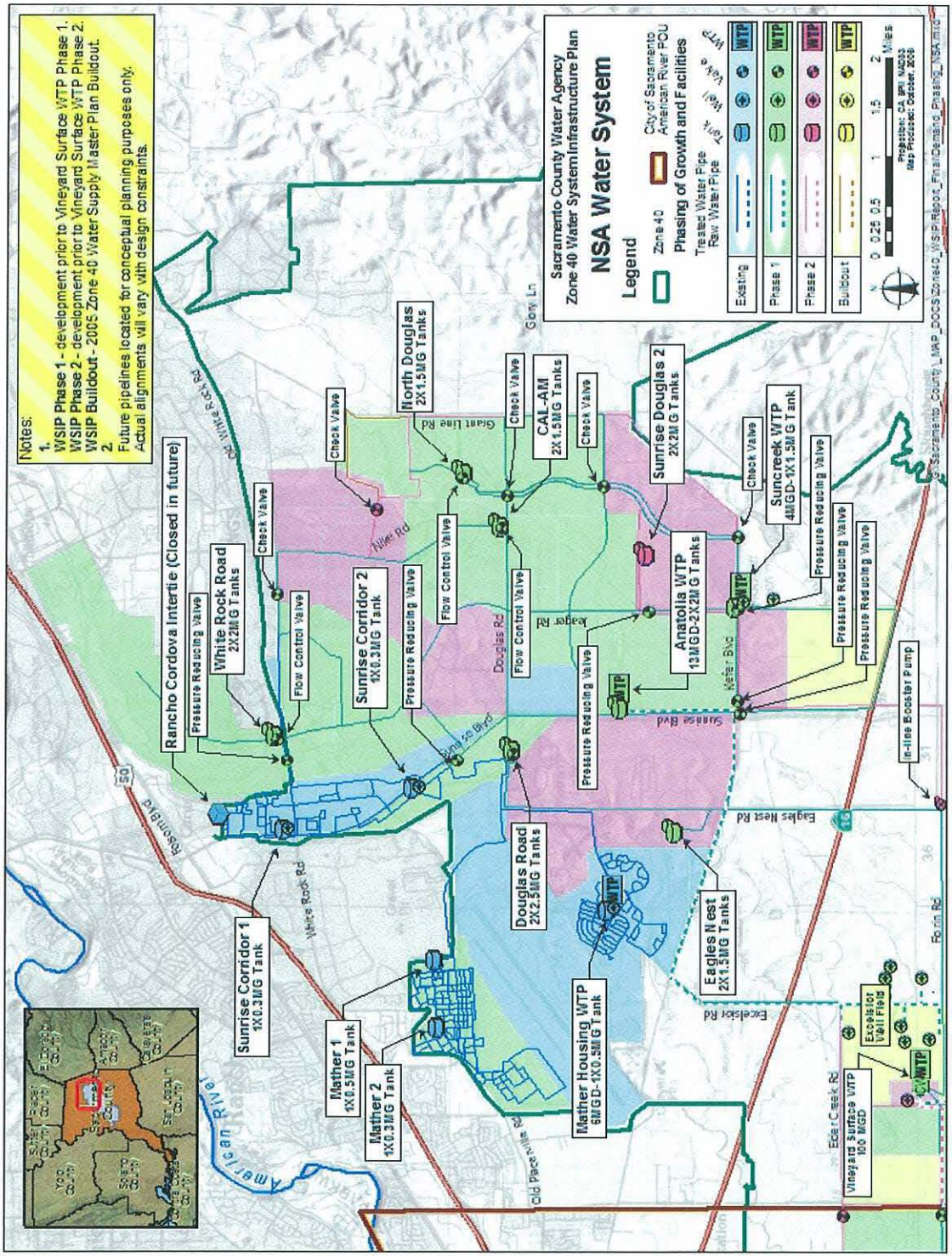

Figure 3. Major Potable Water Supply Facility Requirements for NSA in Zone 40 WSIP

5.2 Overview of Water Supply Sources and Phasing

This section provides an overview of water supply sources and phasing for the Suncreek Plan area. The water supply phasing for the Suncreek Plan area is defined by the potential water supply sources. Three water supply phases have been identified for the Suncreek Plan area.

Water Supply Phase 1 requires connecting to the current NSA water system. Terms of the use of the existing system will need to be negotiated between SCWA and the land owners with an approved allocation from the Excelsior Well Field. SCWA Zone 41 has always taken a "first come first serve" policy except in this area where special agreements were made to accelerate the construction of these facilities that were needed as a result of groundwater contamination. More detail on *Water Supply Phase 1* is presented in **Section 5.2.1**.

Water Supply Phase 2 requires groundwater from the Anatolia WTP, Mather Housing WTP and surface water from the first phase of the Vineyard Surface WTP. More detail on *Water Supply Phase 2* is presented in **Section 5.2.2**.

Water Supply Phase 3 would include all the same facilities for *Water Supply Phase 2*, but also requires completion of the second phase of the Vineyard Surface WTP and the Suncreek WTP. More detail on *Water Supply Phase 3* is presented in **Section 5.2.3**. The Suncreek WTP would be needed to supplement water supplies locally in this phase.

Projected availability of potable water supply sources and phasing for the Suncreek Plan area are shown schematically in **Figure 4**.

Table 7 and **Table 8** show the maximum day water demand and available supply in the NSA, respectively. The demands values are based on Zone 40 WSMP and Zone 40 WSIP and the rate of growth of demand is based on the projected absorption rate (**Table 9**) provided by the Suncreek project proponent.

Non-potable water is also identified as a water supply source for the Suncreek Plan Area. The non-potable water system will be installed at the time of development. In interim conditions when non-potable water is not available, the non-potable water system will be charged with potable water by cross-connecting to the potable water system. In the future, when non-potable water becomes available, these cross connections will be shut off and the non-potable water system will be a separate system fully served with non-potable water. Because it is still unknown when non-potable water will be available, this report will adopt the phasing for the non-potable water system in Wood Rodger's Non-Potable Water Master Plan, in which only two phases were identified for the non-potable water system: Interim Conditions and Ultimate Conditions. In the following sections, the water supply source(s) for each phase will be discussed in greater detail.

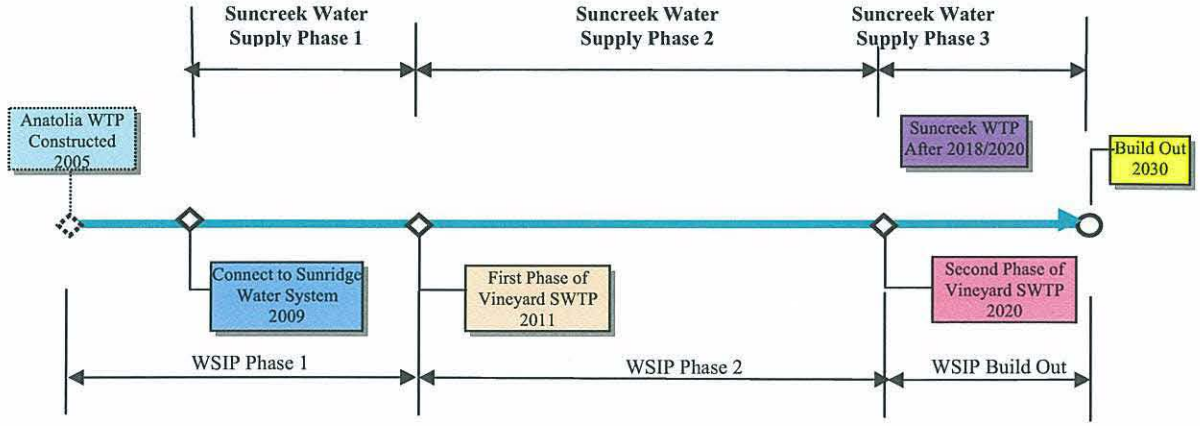

Figure 4. Illustration of Water Supply Sources and Phasing for the Suncreek Plan Area (not to scale, dates are approximate)

Table 7. NSA Water Demand Details-Max Day Demand (MGD)

	Water Supply Phase 1		Water Supply Phase 2									Water Supply Phase 3				
Area	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Suncreek Specific Plan	-	0.03	0.10	0.17	0.31	0.45	0.58	1.08	1.72	2.49	2.84	3.18	3.53	3.87	4.30	4.30
The Rest of NSA	8.70	10.27	12.38	13.36	14.20	14.88	15.56	19.92	24.96	30.87	32.81	34.84	37.02	38.86	40.64	42.18
Total NSA Water Demand	8.70	10.30	12.48	13.53	14.51	15.33	16.15	21.01	26.68	33.36	35.65	38.02	40.55	42.73	44.94	46.48

Key:
MGD = Million Gallons per Day
NSA = North Service Area

Table 8. Estimated NSA Water Supply Availability (MGD)

NSA Water Supply Source	Type	Water Supply Phase 1 (MGD)	Water Supply Phase 2 (MGD)	Water Supply Phase 3 (MGD)
Anatolia WTP	Groundwater	4.30	4.30	4.30
Mather Housing WTP	Groundwater	6.00	6.00	6.00
Suncreek WTP	Groundwater	-	-	4.00
Vineyard Surface WTP (NSA Pipeline)	Surface Water	-	Up to 28.80	Up to 53.00

Notes: (1) Actually mix of water supplies and surface water availability may vary according to hydrologic conditions.
(2) Timing of the expansion of the Anatolia WTP is undetermined.
Key:
MGD = Million Gallons per Day
NSA = North Service Area
WTP = Water Treatment Plant

Table 9. NSA Residential Dwelling Unit Absorption Rate

	Water Supply Phase 1		Water Supply Phase 2									Water Supply Phase 3				
Area	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Suncreek Specific Plan	-	36	120	200	360	520	680	1,260	2,000	2,900	3,300	3,700	4,100	4,500	5,000	5,000
The Rest of NSA	2,475	2,947	3,981	13,778	14,447	15,002	15,529	18,671	22,346	26,659	28,134	29,634	31,114	32,254	33,454	34,754
Total NSA Residential Units	**2,475**	**2,983**	**4,101**	**13,978**	**14,807**	**15,522**	**16,209**	**19,931**	**24,346**	**29,559**	**31,434**	**33,334**	**35,214**	**36,754**	**38,454**	**39,754**

Key:
NSA = North Service Area

This page left blank intentionally.

5.2.1 Phase 1 Water Supply Sources

The *Water Supply Phase 1* water supply for the entire NSA area, including the Suncreek Plan area, is treated groundwater from the Anatolia WTP and the Mather Housing WTP. It was thought that the connection could have served as a "jump-start" for initial development in the Suncreek Plan area and provide necessary fire flows during the construction phase. **Table 7** shows MDD in the NSA including Suncreek Plan area and **Table 8** shows the total water supplies through *Water Supply Phase 1* period.

In 2005, the Anatolia WTP was constructed to provide treated groundwater to support the development of the Sunridge Specific Plan. Due to local groundwater contamination, the Anatolia WTP treats raw groundwater extracted from an off-site well field, the Excelsior Well Field. The Anatolia WTP will have an ultimate capacity of 13 MGD with seven wells (six service wells and one stand-by). Currently three wells (two service wells and one back-up well) have been installed and the Anatolia WTP has the treatment capacity of 4.3 MGD. The location of the Excelsior Well Field and the Anatolia WTP are shown in **Figure 3**.

5.2.2 Phase 2 Water Supply Sources

In this water supply phase, it is assumed that both the first construction phase of the Vineyard Surface WTP (50 MGD) and the NSA pipeline operational. The Vineyard Surface WTP becomes the primary water supply source in *Water Supply Phase 2* for the Suncreek Plan area. Treated water from the Vineyard Surface WTP will be used conjunctively with treated groundwater from the Anatolia WTP and the Mather Housing WTP. The actual mix of surface water and groundwater would depend on hydrologic conditions.

The Vineyard Surface WTP is identified as a critical water supply element in the WSMP and the WSIP to implement SCWA's conjunctive use objectives; to maximize the use of surface water in wet and normal years allowing the groundwater basin to recharge naturally providing sufficient groundwater supplies in dry years when surface water availability may be limited. The NSA pipeline plays a critical role in this water supply phase as this pipeline conveys the treated surface water from the Vineyard Surface WTP to the NSA. Water delivered through the NSA pipeline feeds two terminal storage tanks (Douglas Road Tanks). Water is then pumped out from these storage tanks to meet operating pressure requirements in the NSA. The NSA pipeline is approximately 8 miles long with diameters ranging from 42 inches to 66 inches and will provide up to 28.8 MGD (20,000 gpm) to all of the NSA, depending on hydrologic conditions. **Table 7** indicates that NSA water demand in approximately year 2011 would be 12.48 MGD, including the Suncreek Plan area. **Table 8** shows the water supply available from Mather Housing WTP, Anatolia WTP, and the NSA pipeline. Also, additional transmission pipelines will be constructed to deliver more treated surface water to the Sunrise Douglas 2 Tanks which serve the southeast portion of the NSA. These Sunrise Douglas 2 Tanks and associated pipelines would be needed in the later stage of *Water Supply Phase 2*. The Sunrise Douglas 2 Tanks will be constructed in the Suncreek Plan area, but will serve as a regional facility, along with other regional facilities constructed in previous phases. The actual mix of surface water and groundwater would depend on hydrologic conditions.

5.2.2.1 Anatolia WTP and Excelsior Well Field Expansion Option

The major water supply source in *Water Supply Phase 2* is assumed to be the Vineyard Surface WTP through the NSA pipeline. In order to have the NSA pipeline on-line in conjunction with completion of Vineyard Surface WTP, it is assumed that SCWA will be able to complete the environmental documentation, financing with support from the developers, design, and construction by approximately 2012. Another possible water supply source for the NSA area is the expansion of the Anatolia WTP and corresponding Excelsior Well Field. SCWA currently has no set timeframe to upgrade the Anatolia WTP and Excelsior Well Field to its ultimate capacity of 13 MGD and 7 wells. If, however, there is a delay in the NSA pipeline; SCWA may consider an earlier expansion of the Anatolia WTP and Excelsior Well Field in order to satisfy demands in the NSA area prior to the completion of the NSA pipeline.

5.2.3 Phase 3 Water Supply Sources

As development continues across Zone 40, the Vineyard Surface WTP will be expanded from 50 MGD to 100 MGD in approximately 2020. Also as identified in the WSIP, the Suncreek WTP would be needed to meet local demands at build-out.

Modeling results showed some low water pressures just prior to the expansion of the Vineyard Surface WTP (approximately between 2018 and 2020). One option to meet minimum pressure requirements is to build the Suncreek WTP. In this Study, it is assumed that Suncreek WTP would need to be built in 2018 to alleviate the low pressures. The Suncreek Plan proponents have stated that lands have been set aside in the Suncreek Plan area for a Suncreek WTP and well field. A capacity of 1,500 gpm is assumed for a groundwater well for modeling purposes. The actual number of new groundwater wells is dependent upon the hydrogeologic characteristics obtained through field tests for potential well sites. Three groundwater wells (including a back-up well) are proposed to provide the remaining raw water capacity for the Suncreek WTP. Suncreek WTP would have treatment capacity of 4.0 MGD.

After Vineyard Surface WTP is expanded, it in conjunction with the Anatolia WTP, the Mather Housing WTP, and the Suncreek WTP will provide all the water supply to the NSA as part of Zone 40 conjunctive use operations. The NSA pipeline will have been sized to accommodate the additional water from the Vineyard expansion. The actual mix of surface water and groundwater would depend on hydrologic conditions.

5.2.3.1 Anatolia WTP and Excelsior Well Field Expansion Option

An alternative to the Suncreek WTP is also expansion of the Anatolia WTP and Excelsior Well Field as stated in **Section 5.2.2.1**. SCWA does not have a timeframe for this expansion, but it may consider it, instead of constructing the Suncreek WTP.

5.3 Facilities Requirements for Potable Water System

This section describes the potable water facility phasing corresponding to each of the water supply phases described in the previous section. This section is intended to facilitate SCWA staff in identifying the necessary infrastructure requirements and their phasing in order to provide a reliable water supply to the Suncreek Plan Area during the development process. **Table 10** summarizes the necessary major potable water facilities to serve the development in the Suncreek Plan area in each water supply phase**. Figure 5** through **Figure 7** graphically depict the water infrastructure phasing for all water supply phases for the Suncreek Plan area. The locations of the facilities are approximate

5.3.1 Water Supply Phase 1 Facility Requirements

In *Water Supply Phase 1*, T-mains will be constructed in the Suncreek Plan area connecting to the existing water system in Sunridge to provide water supply for initial development. The proposed T-mains in this phase include 16" T-mains in Sunrise Blvd and Jaeger Road south of Kiefer Blvd, and a 24" T-main in Kiefer Blvd east of Jaeger Road. See **Figure 5** for the *Water Supply Phase 1* facility requirements. Other joint facilities such as wells, storage, raw water conveyance, and groundwater treatment capacity may be needed along with other Sunrise Douglas Community Plan developers based on the requirements listed under *Water Supply Phase 1* above. Any additional facilities will need to be investigated further at the time when connection to the existing water system is made.

5.3.2 Water Supply Phase 2 Facility Requirements

In *Water Supply Phase 2*, the major water facilities that will be constructed in the Suncreek Plan area are two 24" T-mains in parallel in Americanos Blvd and a 16" t-main in Chrysanthy Blvd east of Americanos Blvd. The two paralleled 24" T-mains will separate two pressure zones along Americanos Blvd. **Section 5.3.4** will further discuss the pressure zone delineation in the Suncreek Plan area.

In addition to the facilities constructed in the Suncreek Plan area, the other regional water facilities (not the responsibility of the Suncreek Plan area except through payment of Zone 40 Development and User Fees) that will be constructed include: 1) the initial 50 MGD phase of the Vineyard Surface WTP (note: the construction of a dedicated conveyance pipeline to deliver the treated water from the Vineyard Surface WTP to the NSA may be deferred unless sufficient funding sources are identified or a third party constructs the NSA pipeline and dedicates the facility to SCWA), 2) the Douglas Road terminal storage tanks to store and distribute the water to the NSA, and 3) necessary booster pumps and valves to accommodate the various pressure zones and wholesale areas in the NSA as explained in **Section 5.3.4** below. Other major facilities include the 30" T-main in the future road along the boundary between the Suncreek Plan area and the Preserve at Sunridge, two 2-MG tanks (Sunrise Douglas 2) and the booster pump station, and the 30" T-main that conveys part of the treated water from the Vineyard Surface WTP to fill these storage tanks. These regional facilities will also help meet peak hour

and fire flow demands in the Suncreek Plan area. More details about these regional facilities are included in the WSIP. See **Figure 6** for the *Water Supply Phase 2* facility requirements.

5.3.3 Water Supply Phase 3 Facility Requirements

In *Water Supply Phase 3* the water supply facility requirements include, expansion of the Vineyard Surface WTP to 100 MGD, 16" T-main in Grant Line Road, the construction of the 4-MGD Suncreek WTP, there groundwater wells (on and/or off-site) to provide a portion of raw water to the Suncreek WTP, and a raw water pipeline conveyance system to: 1) possibly divert excess raw groundwater from the 30" Exclesior Well Field raw water pipeline to the Suncreek WTP for treatment, and 2) convey the raw groundwater from wells constructed in the Suncreek Plan area. See **Figure 7** for the *Water Supply Phase 3* facility requirements.

5.3.4 Pressure Zones

The WSIP has described in great detail the pressure zone delineations in the NSA as shown in **Figure 8**. The pressure zones have been developed due to the elevation differential to ensure the system pressures maintained within the SCWA's desired operating pressure range. As **Figure 8** indicates, three pressure zones are identified in the Suncreek Plan area: Pressure Zone 1 (ground elevations range from 150~200 feet msl), Zone 3 (ground elevations range from 115~150), and Zone 6 (ground elevations range from 200~250 feet msl). The operation and the flow movement path for each pressure zone are documented in the WSIP, and will not be duplicated in this Study.

Table 10. Major Potable Water Facility Requirements and Phasing for Suncreek

Phase	Water Supply Sources	Facility Requirements	Description
Water Supply Phase 1	Connect to Sunridge Water System	(1) 16" T-main in Sunrise Blvd and Jaeger Road south of Kiefer Blvd	Introduce treated water from the existing water system in Sunridge to the initial development in the Suncreek Plan area.
		(2) 24" T-main in Kiefer Blvd from Jaeger Road to Americanos Blvd	Deliver treated water to customers in the study area.
Water Supply Phase 2	Vineyard Surface WTP (50 MGD)	(1) Regional NSA transmission pipeline and Douglas Road terminal tanks	Convey, store and distribute the treated water from the Vineyard Surface WTP to the NSA.
		(2) 16" T-main in Chrysanthy Blvd east of Americanos Blvd.	Deliver treated water to customers in the Suncreek Plan area.
		(3) Regional NSA transmission pipeline and Sunrise Douglas 2 Tanks (2 x 2-MG).	Convey, store, and distribute the treated water from the Vineyard Surface WTP to the NSA.
Water Supply Phase 3	Suncreek WTP	(4) 30" in the future road along the boundary between the study area and the Preserve at Sunridge	Deliver treated water to customers in the Suncreek Plan area.
		(1) 4 MGD Suncreek WTP, 1.5-MG storage tank and pump station (three booster pumps with design flow of 2,500 gpm and 165 ft design head	Raw water treatment, store and distribute treated water.
		(2) 3 groundwater wells	Provide a portion of the raw water for treatment in the Suncreek WTP.
		(3) 12" raw water pipeline that splits off the 30" Excelsior raw water pipeline at Sunrise Blvd and Kiefer Blvd and ends in the Suncreek WTP along Kiefer Blvd	Provide a portion of the raw water for treatment in the Suncreek WTP.
		(4) 2-24" T-mains in Americanos Blvd.	Deliver treated water to customers in Suncreek Plan area.
	Vineyard Surface WTP (100 MGD)	(1) 16" T-main in Grant Line Road	Deliver treated water to customers in the Suncreek Plan area.

Key:
MG = million gallons
MGD = million gallons per day
NSA = North Service Area
WTP = Water Treatment Plant

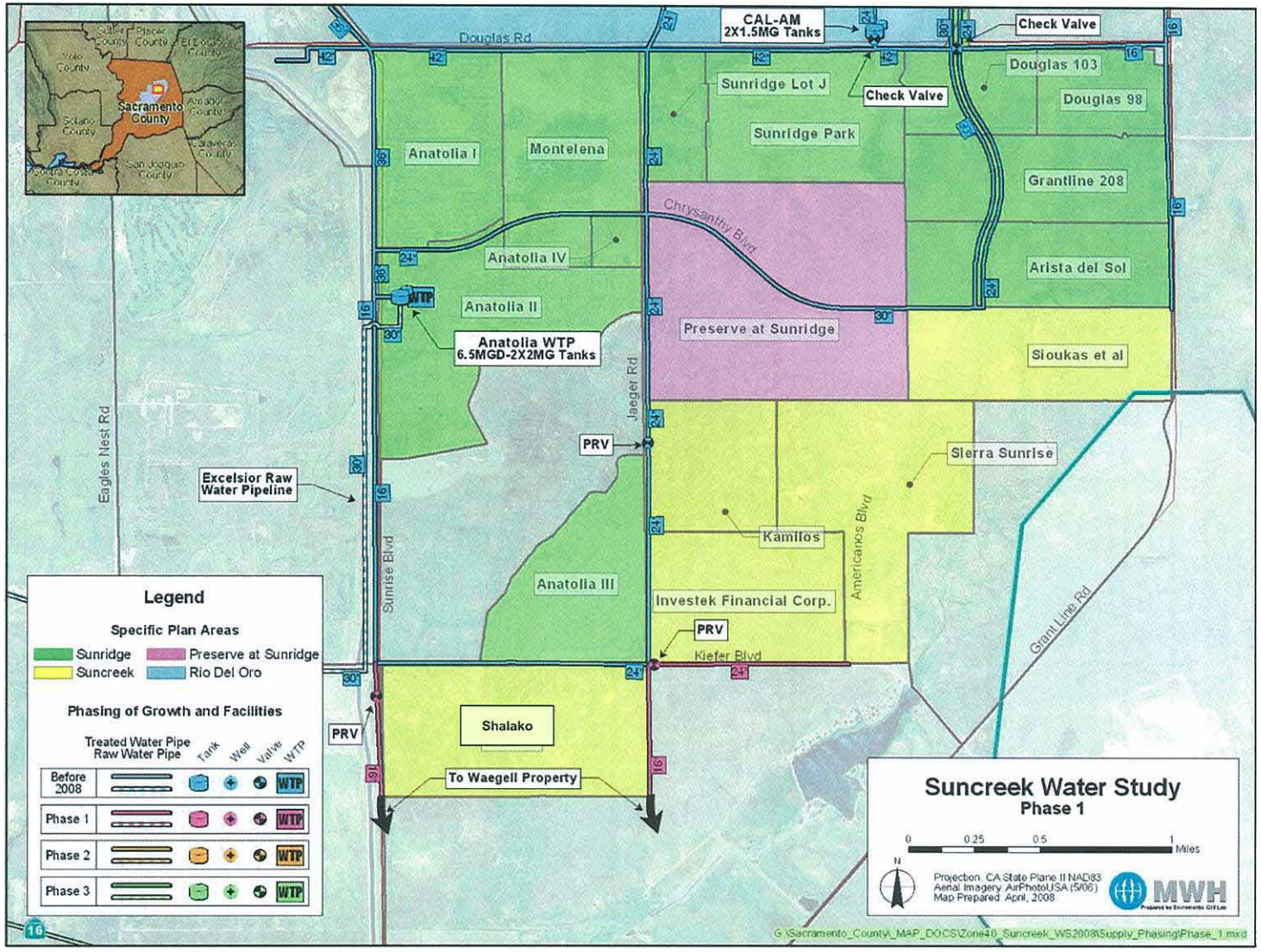

Figure 5. Backbone Potable Water System for Suncreek, Water Supply Phase 1

Notes: Future facilities located for conceptual planning purposes only. Actual alignments will vary with design constraints.

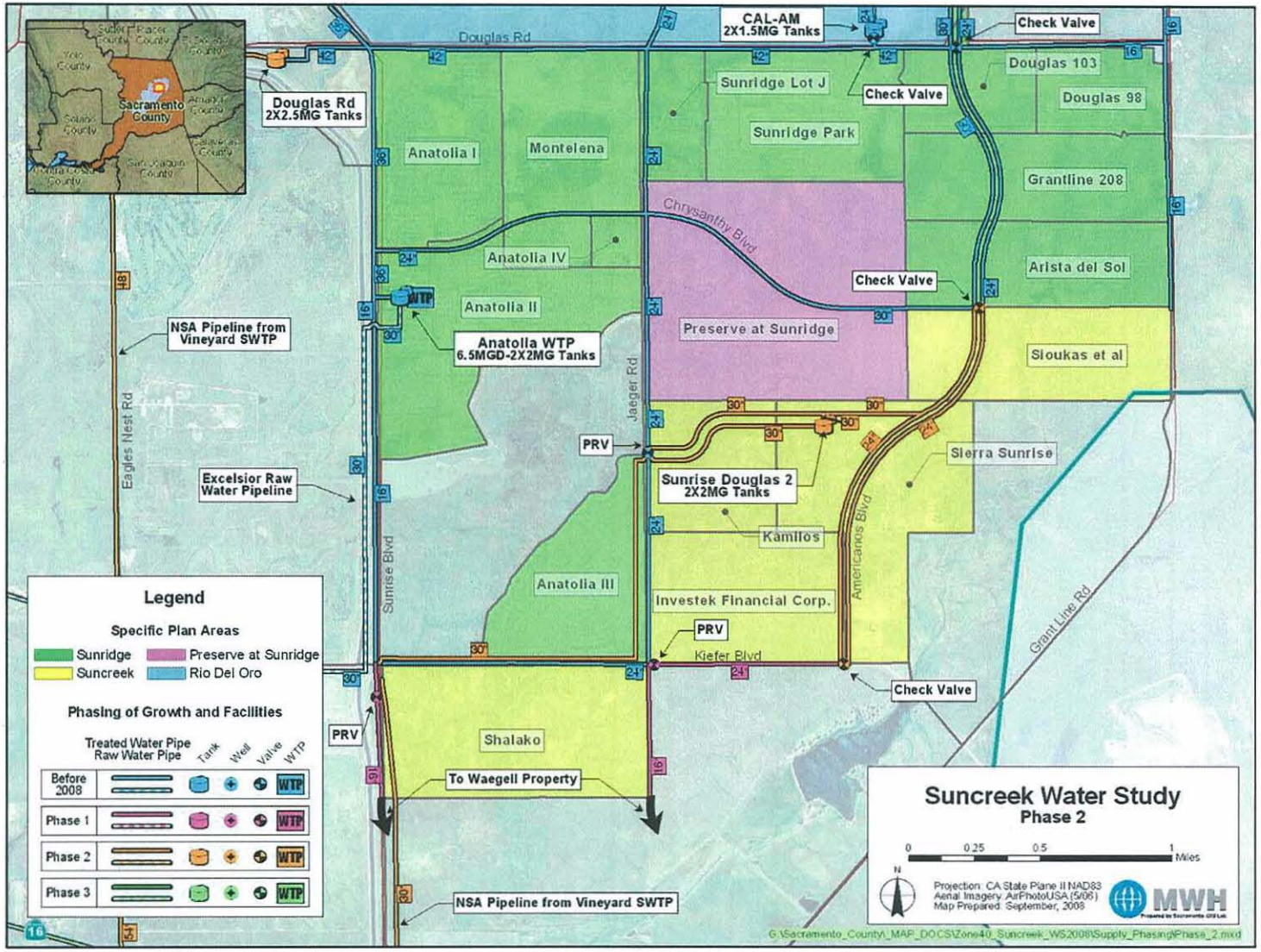

Figure 6. Backbone Potable Water System for Suncreek, Water Supply Phase 2

Notes: Future facilities located for conceptual planning purposes only. Actual alignments will vary with design constraints.

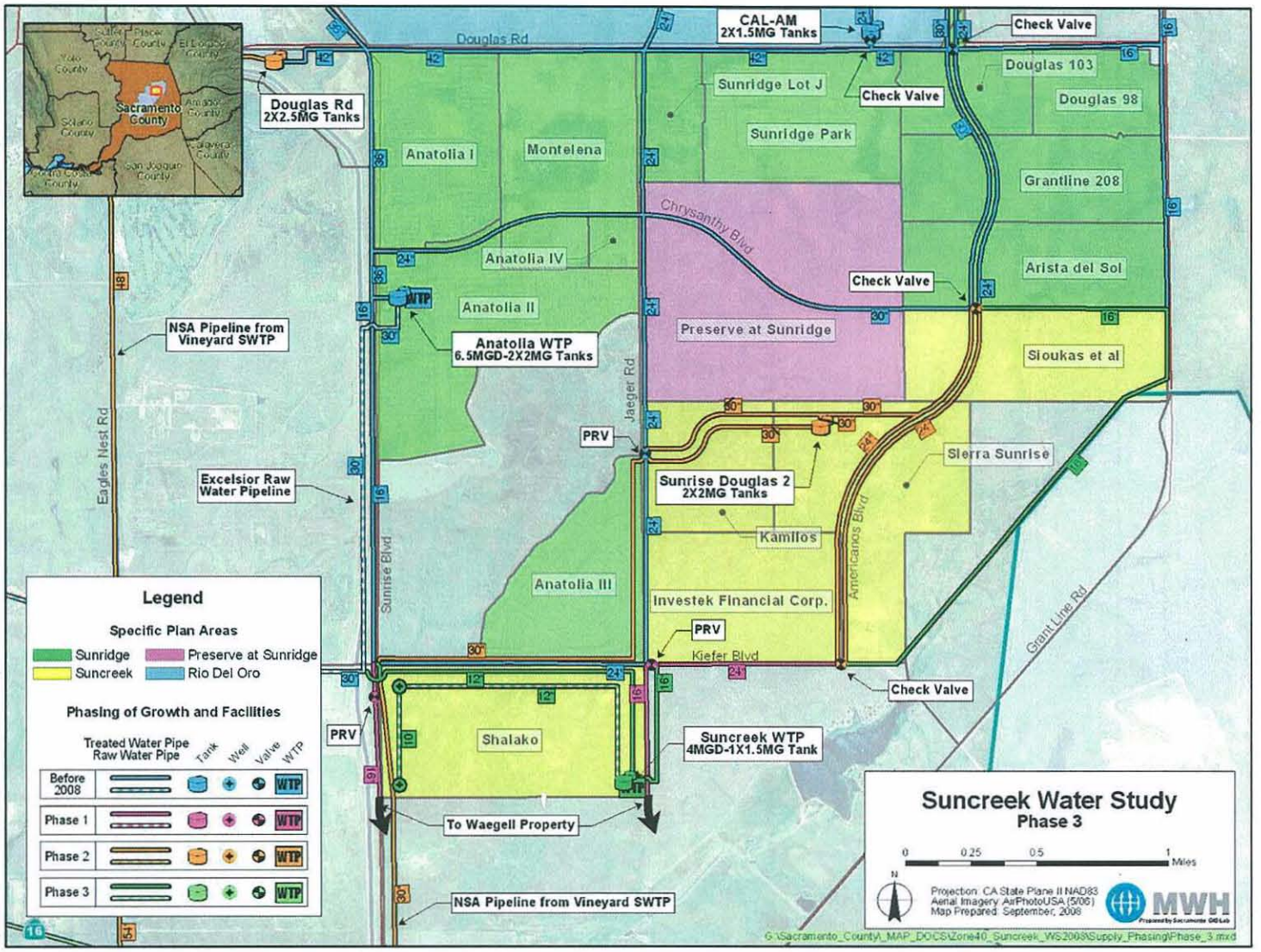

Figure 7. Backbone Potable Water System for Suncreek, Water Supply Phase 3

Notes: Future facilities located for conceptual planning purposes only. Actual alignments will vary with design constraints.

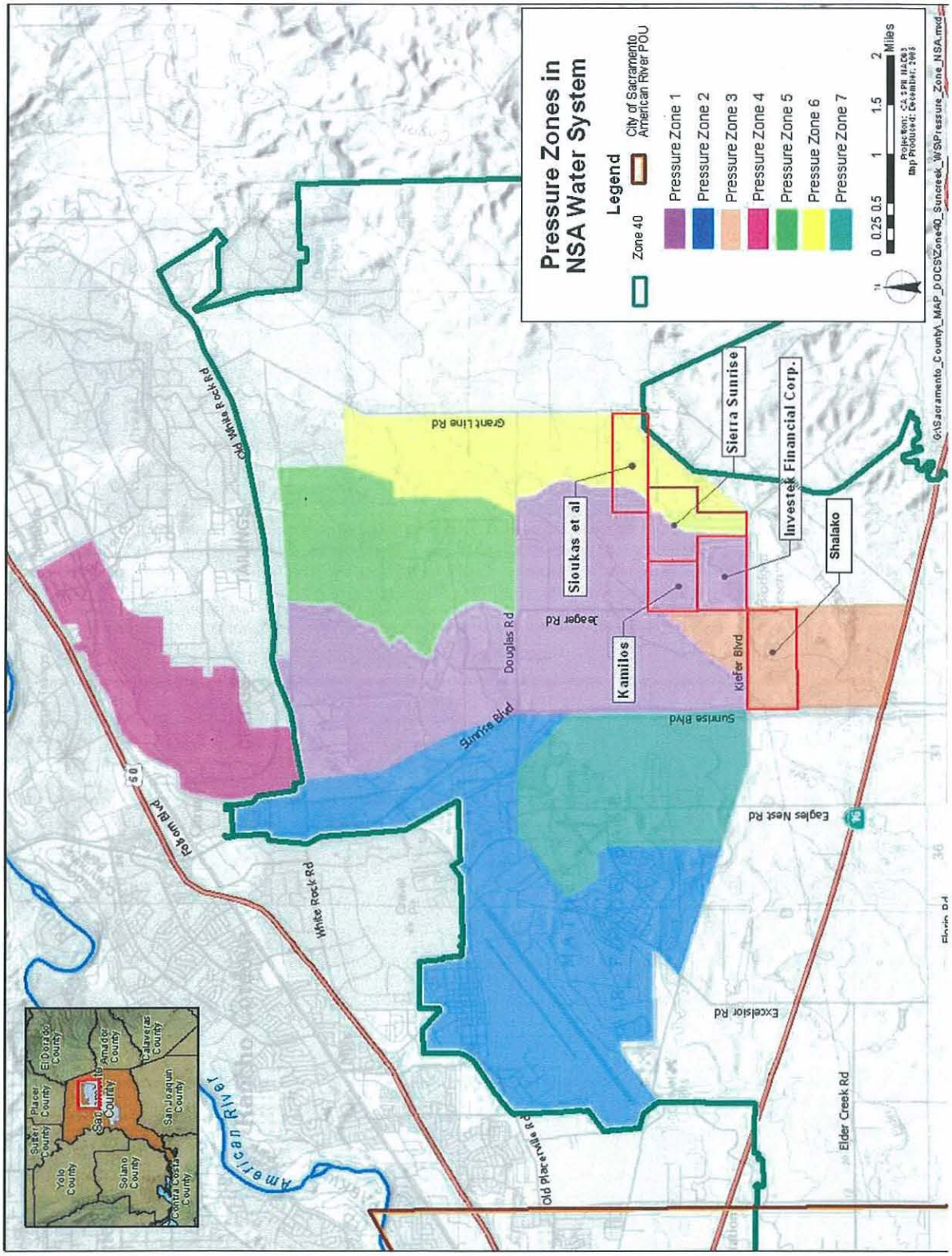

Figure 8. Pressure Zones Delineation in Zone 40 NSA

5.4 Non-Potable Water System Requirements

This section describes the major non-potable water facilities requirements in the Suncreek Plan area. The Rancho Cordova City Council resolved (Resolution 11-2006 that the City shall impose a condition of approval for minor subdivision, major subdivision, nonresidential development and other discretionary land use approval to install a "purple pipe" non-potable water system. Non-potable water will be used to meet the irrigation demand of those public landscaping like parks, schools, streetscapes, etc. Wood Rodgers, under contract with SCWA, developed the Non-Potable Water Master Plan for Sunrise Douglas Community Plan Area[2] to assist SCWA in the review and approval of capital improvements within the Sunrise Douglas Community Plan Area. The findings in the Non-Potable Water Master Plan have been considered in this Study.

Although the non-potable water system will be installed concurrently with the potable water system, the source of non-potable water is still under investigation. The source of non-potable water may be remediated groundwater from groundwater extraction and treatment (GET) facilities or recycled water, but it will most likely be remediated groundwater. SCWA is investigating the optimization of remediated water to meet widespread non-potable demands in eastern Sacramento County, including the Suncreek Plan area. However, any increased use of non-potable water is undetermined at this time, and thus only non-potable water use identified in Non-Potable Water Master Plan has been considered.

In the interim, the non-potable water system will be cross connected with the potable water system. Cross-connections between the potable and non-potable water systems will be installed and remain open during the initial phases of development. The backbone non-potable water pipeline layout, the cross-connections, and pressure zone separation for the Suncreek Plan area in these interim phases are shown in **Figures H-1** and **H-2** of **Appendix H.** The pressure zone separation in the non-potable water system is consistent with the pressure zone separation in the potable water system.

Once non-potable water is available, the cross-connections will be removed. The potable and non-potable water systems will then become two independent systems. A storage tank is assumed at Rancho Cordova Parkway near Douglas Road to receive the non-potable water. The water then is pumped out from the tank to serve the non-potable water customers in the Sunrise Douglas Community Plan Area. The non-potable water system has been designed to allow minimum changes when switching over to a stand-alone system. The backbone non-potable water system in build-out condition is shown in **Figure H-3** of **Appendix H**.

[2] Wood Rogers, Non-Potable Water Master Plan Sunrise Douglas Community Plan Area, February 2007

SECTION 6. WATER DISTRIBUTION MODELING RESULTS

Water distribution computer modeling completed for this Study includes a number of scenarios to verify that the SCWA operating goals are met in the proposed water distribution system in the Suncreek Plan area. The base water distribution model used in this study is the regional water distribution model developed for the WSIP. The modeling tool used was H20Net. Additional project level detail was obtained from the Suncreek Plan proponents and the regional model was enhanced with a high resolution of detail pertaining to facilities and operations in the Suncreek Plan area.

6.1 Modeling Scenarios

The modeling scenarios evaluated in this Study are shown in **Figure 9**. The scenarios include:

Scenario 1 –Verifies if the Suncreek Plan area and the entire NSA could be served with water from the Anatolia WTP and Mather Housing WTP prior to the construction of the accelerated NSA pipeline, which would deliver surface water.

Scenario 2 – Evaluate the proposed water distribution system immediately after the construction of the accelerated NSA pipeline (approximately 2011) to verify if the Suncreek Project demands could be met primarily by the NSA pipeline surface water.

Scenario 3 – Evaluate the proposed water distribution system immediately before the completion of Phase 2 of Vineyard Surface WTP (approximately 2020.) This run would verify if increased demands could be met just prior to the availability of more surface water in the NSA pipeline.

Scenario 4 – Evaluate the proposed water distribution system at build-out of the Suncreek Project (approximately 2024) and include surface water in the NSA pipeline from Phase 2 of Vineyard Surface WTP and a Suncreek WTP.

Scenario 5 – This intermediate scenario will help determine when SCWA would need to construct the Suncreek WTP between Phase 1 and Phase 2 of Vineyard Surface WTP. An approximate timing for the construction of the Suncreek WTP will be estimated by interpolating the demands and supplies between Phase 1 and Phase 2 of Vineyard Surface WTP.

Scenario 6 – Evaluate the proposed water distribution system at built-out of Suncreek Plan area and built-out of the NSA.

Fire Flow Scenarios – Verify that fire flow capacities are adequate throughout the proposed water distribution system in the Suncreek Plan area for all water supply phases.

6.2 Modeling Assumptions

The following are assumptions used in the water distribution model:

- A Hazen William's "C" factor of 130 was used for new pipes and 125 used for existing pipes.
- A 72-hour Extend Period Simulation (EPS) was used to represent the system operations under various Suncreek Specific Plan water supply phases.
- Maximum Day Demands and a diurnal curve for Maximum Day Demands were assigned to demand nodes for modeling scenarios 1- 4. The assumed Max Day diurnal curve is shown in **Figure 10**, which was also used in the WSIP.
- Maximum Day Demands plus fire flows are applied to fire flow scenarios.
- The sizes of T-main and other major facilities were determined from the WSIP regional model.

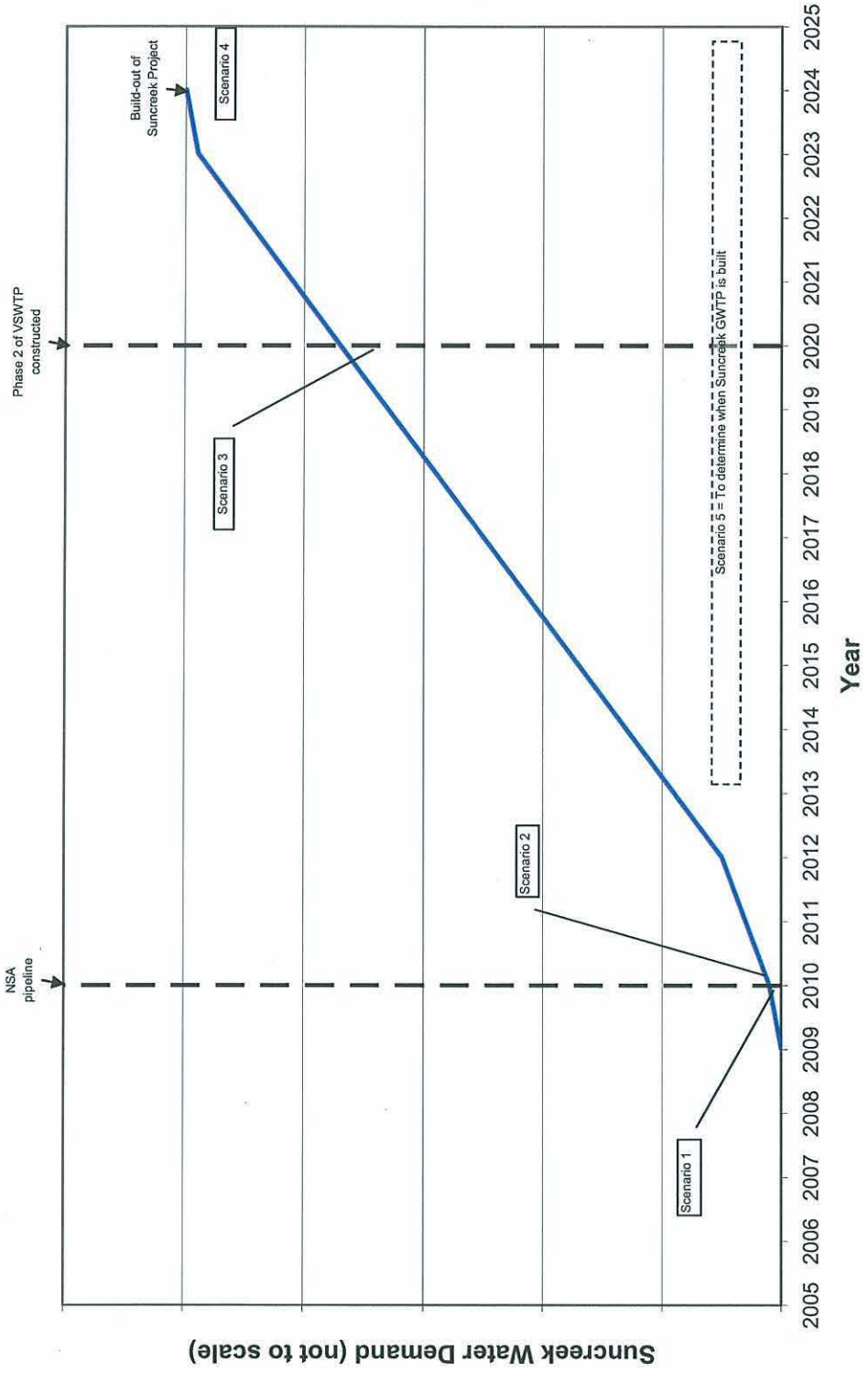

Figure 9. Suncreek Modeling Scenarios 1-5

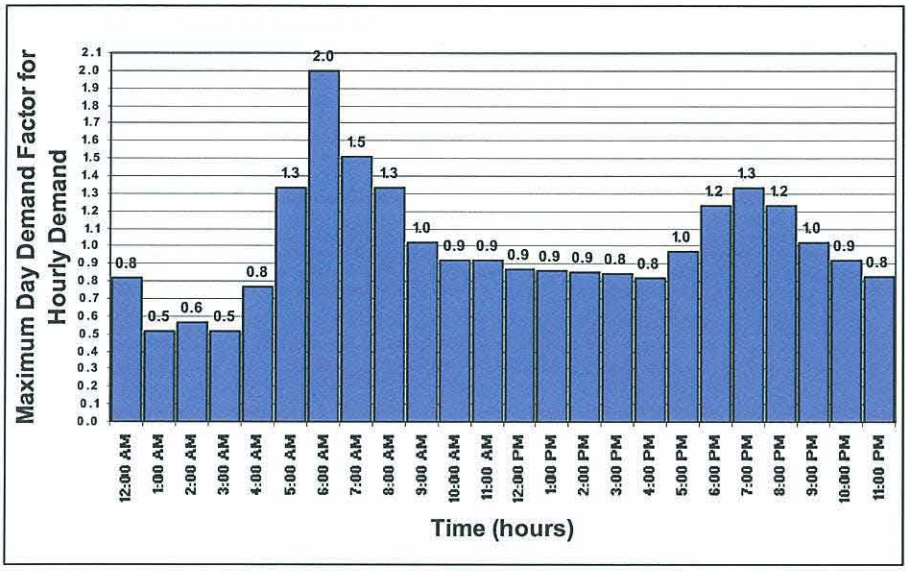

Figure 10. Assumed Max Day Demand Diurnal Curve

6.3 Modeling Results

This section presents the discussion of modeling results for all the modeling scenarios described previously. **Appendix A** shows model demand nodes and pipes from the water distribution model. The modeling results for operating conditions for all water supply phases (except for Scenarios 3 which was not able to meet hydraulic balance), including under fire flow conditions, are shown in **Appendices B** through **G.** The following is a summary of the model scenarios:

- In Scenario 1 (approximately 2010), the available water demand and supply information showed that the available water supply from Anatolia WTP and Mather Housing WTP will be sufficient to satisfy the demand in NSA.

- Scenario 2 (approximately 2011) showed that Vineyard Surface WTP and NSA pipeline, in addition to Anatolia WTP and Mather Housing WTP will be sufficient to satisfy the demand in NSA.

- Scenario 3 (approximately 2020) shows that the increased demands could not be met prior to the expansion of Vineyard Surface WTP. The model could not meet hydraulic balance due to pressure issues. Therefore, Suncreek WTP may be required to meet the increased demand at 2020. The addition of the Suncreek WTP was examined in Scenario 5. Results of Scenario 3 are not shown in an appendix.

- In Scenario 4 (approximately 2024), the proposed build-out of the Suncreek Plan area, the modeling results showed that the available water supply will meet the demand in NSA including Suncreek Plan area at built-out demand levels.

- In Scenario 5 (approximately 2020), Suncreek WTP was added to Scenario 3. Scenario 5 showed that the added water supply from Suncreek WTP, in addition to Anatolia WTP,

Mather Housing WTP, and surface water from Vineyard Surface WTP prior to the 100 MGD expansion will meet the demand of NSA and the Suncreek Plan area.

- In Scenario 6 (approximately 2024), the proposed build-out of the NSA area, the modeling results shows that the available water supply will meet the demand in NSA including Suncreek Plan area .

The modeling results indicate that the proposed water supplies and the proposed T-main network are able to meet the demand growth in the Suncreek Plan area and also satisfy SCWA's operating goals. Note in **Appendices B** through **G** there are occasions where the system pressures are slightly above the 75 pounds per square inch (psi) maximum operating goal in T-mains. However, these pressures can be considered acceptable given that they are localized and often occur immediately downstream of the booster pump station during off peak hours. It is also noted that in some pipelines the velocities are slightly low because of limited demand in certain areas during the early phases of the Suncreek Plan area.

The residual pressures under fire flow conditions in the Suncreek Plan area also meet and exceed the fire flow residual pressure requirements of 20 psi. However, the residual pressures presented obtained in this Study should not be used as the boundary conditions for fire flow analyses for individual subdivisions in the future. This is mainly because residual pressures vary across the entire Zone 40 area. SCWA desires to continue to use a consistent yet conservative 40 psi residual pressure as the boundary condition for future fire flow analyses for individual subdivisions.

This page left blank intentionally.

SECTION 7. NEXT STEPS

The primary objective of this Study was to evaluate the water supply and large water distribution system requirements and facilities phasing for the Suncreek Plan area. This Study will also assist SCWA in the review of the Suncreek Specific Plan DEIR. Upon approval of the Suncreek Specific Plan by the Sacramento County Board of Supervisors, individual development applications will be requested (or conditioned) to prepare SB 610, SB 221, and supplemental water supply studies that complement this report in terms of identifying the reliability and sustainability of the water supply portfolio used in this report, the existing facilities lands and rights-of-way that are in place for the individual developments, and to size the local distribution mains (not addressed in this report) that will serve individual homes, respectively.

This page left blank intentionally.

APPENDIX A
Demand Nodes and Pipes IDs in the Model

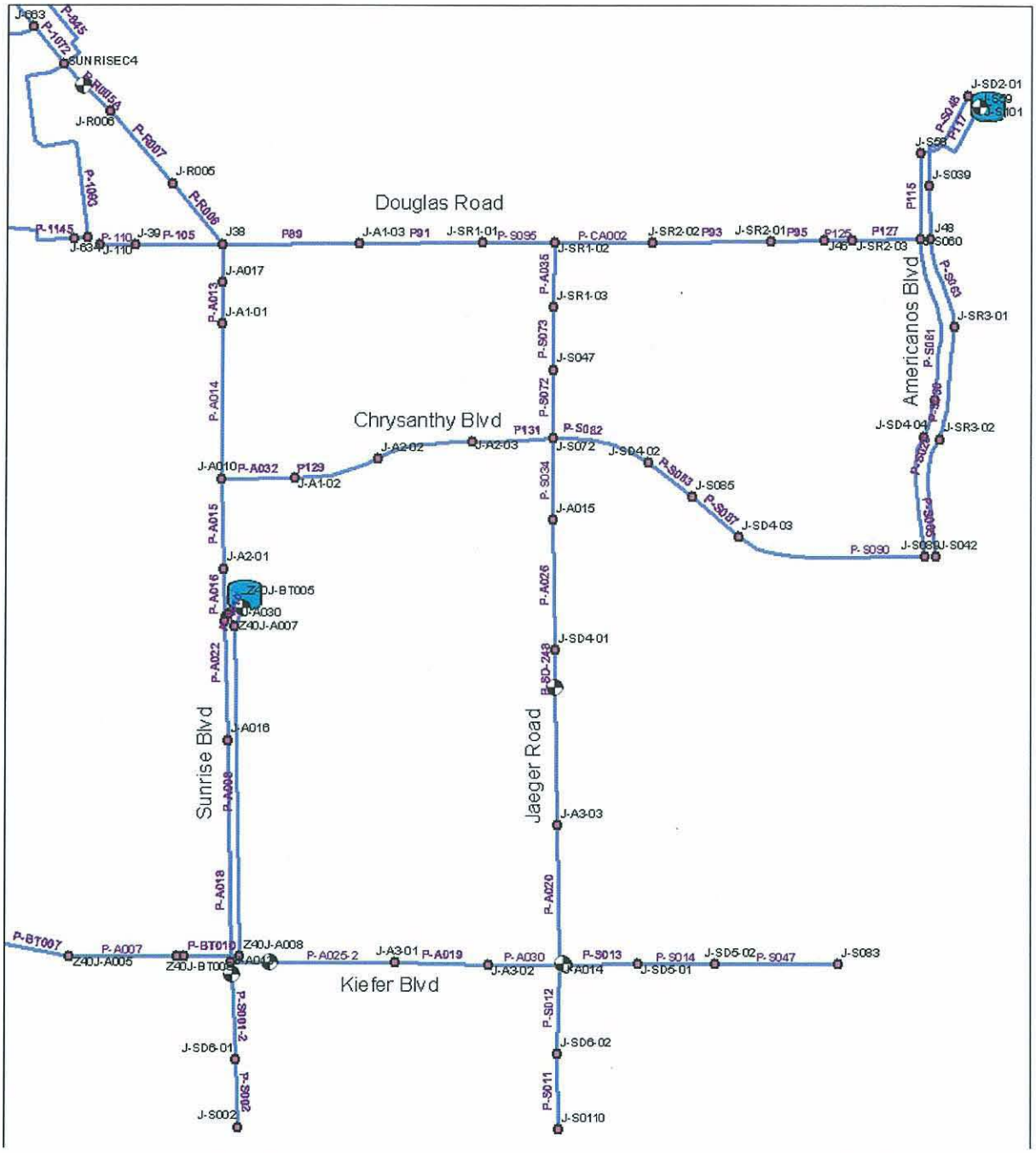

Figure A-1. Nodes and Pipes IDs in the Water Supply Phase 1 Model

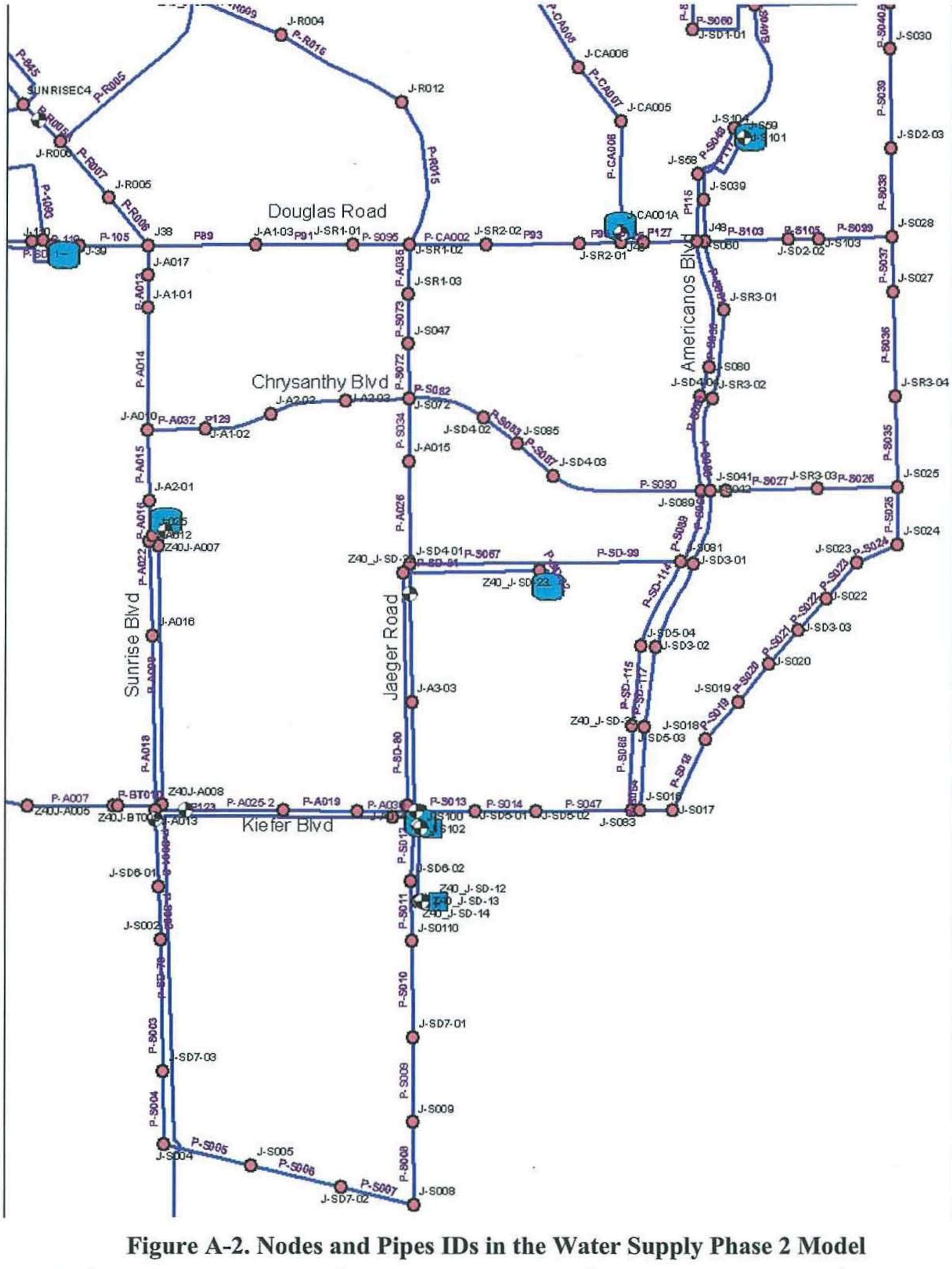

Figure A-2. Nodes and Pipes IDs in the Water Supply Phase 2 Model

Note: The Suncreek WTP is shown, but not used in Water Supply Phase 2.

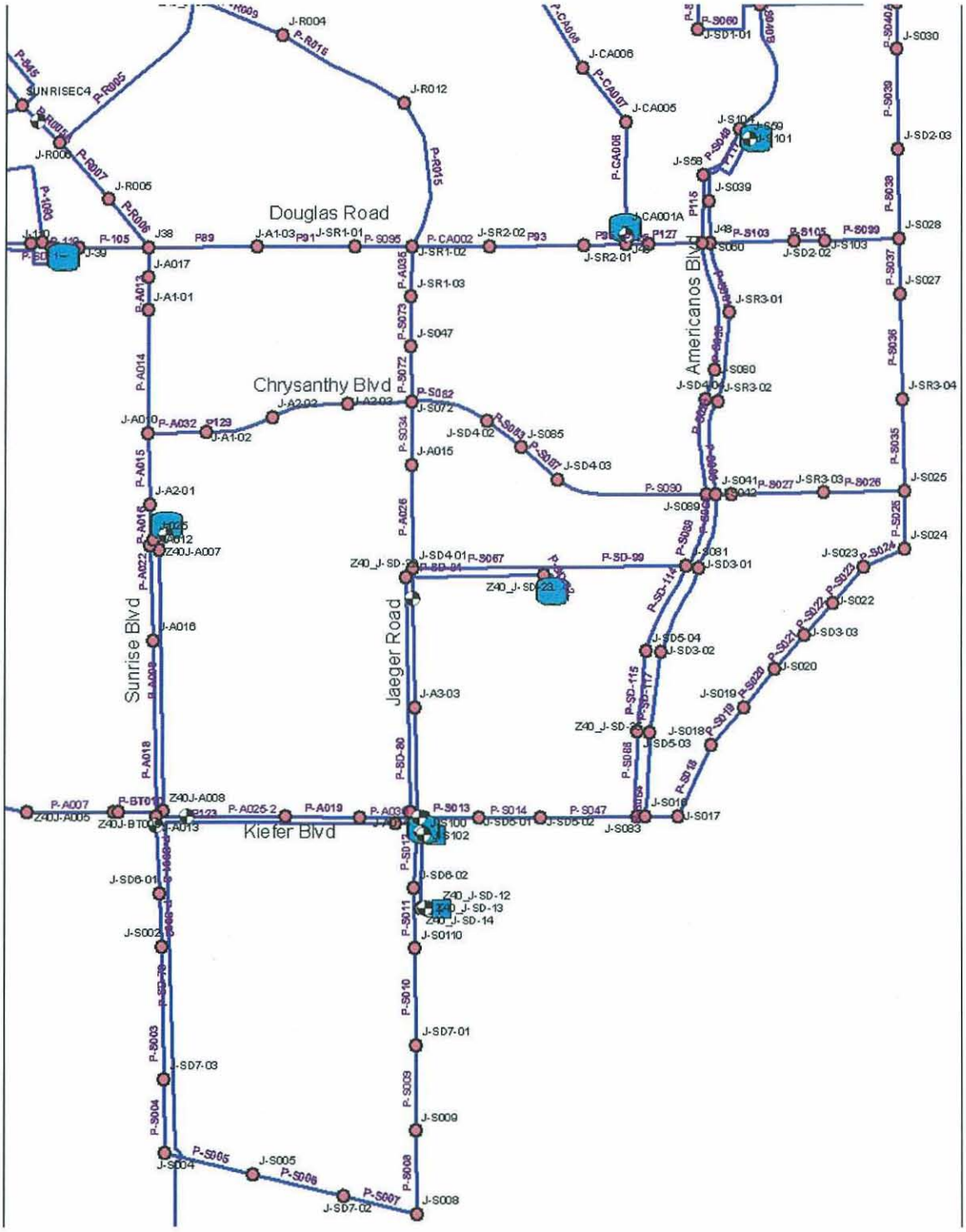

Figure A-3. Nodes and Pipes IDs in the Water Supply Phase 3 Model

Note: The Suncreek WTP would be located in southeast corner of Shalako, not at the corner of Kiefer Blvd. and Jaeger Road as shown.

This page left blank intentionally.

APPENDIX B
Modeling Results Scenario 1

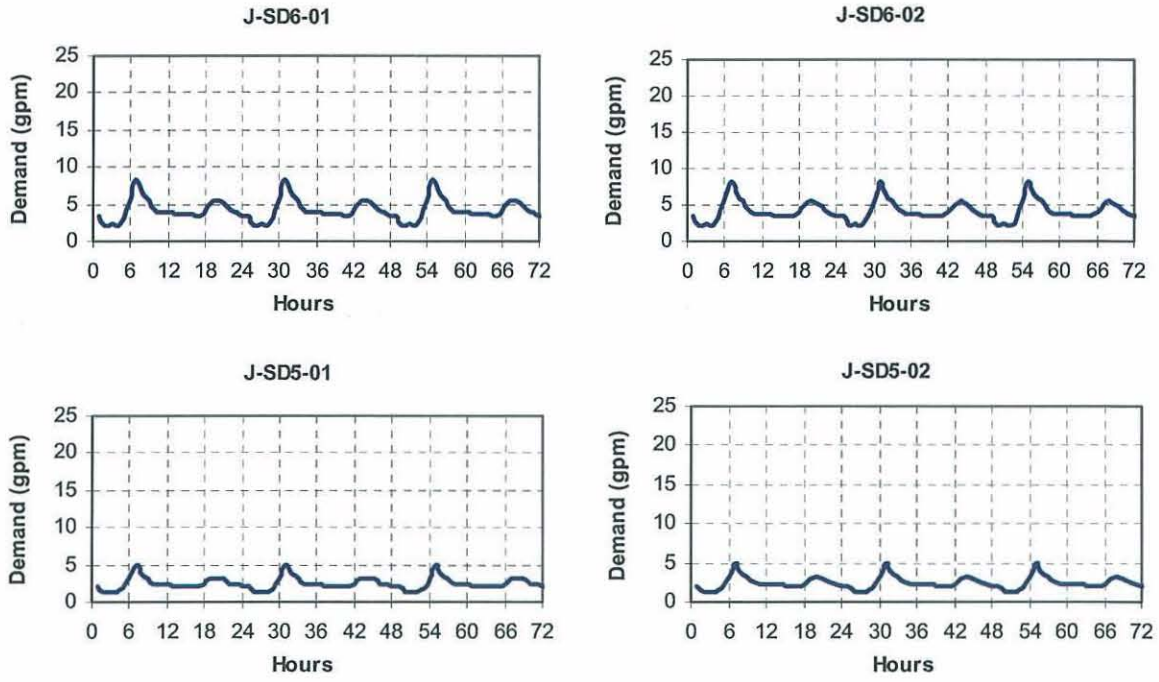

Figure B-1. Suncreek Nodes Demand Curves - Max Day, Water Supply Scenario 1

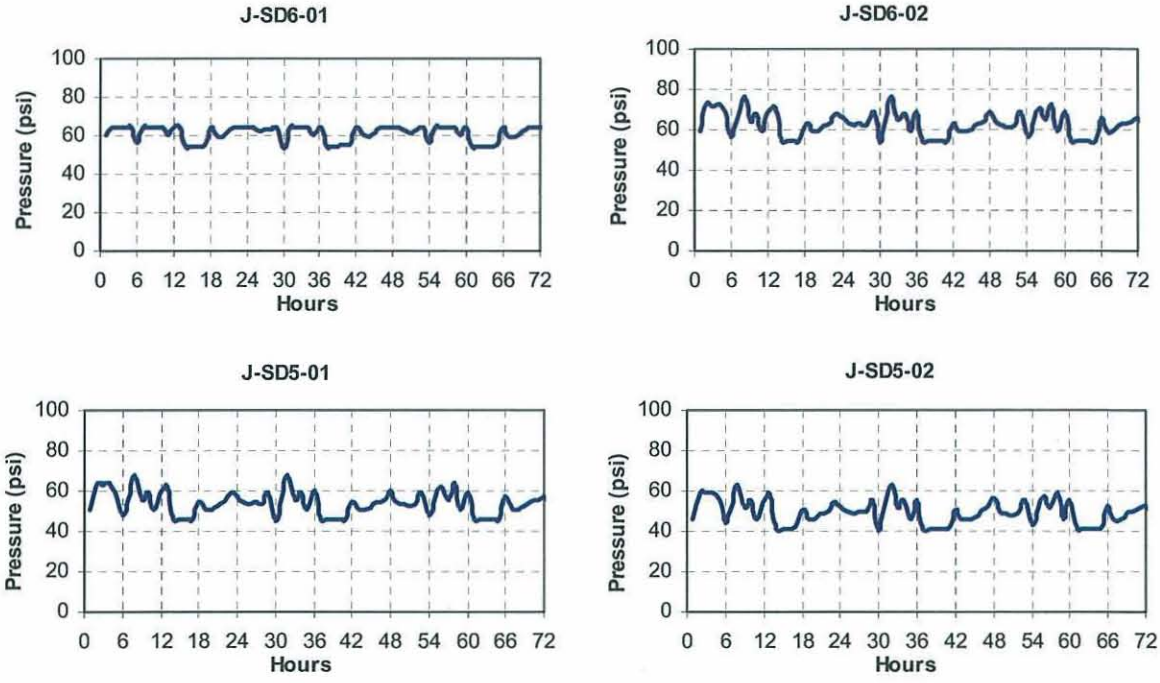

Figure B-2. Suncreek Nodes Pressure Curves - Max Day, Water Supply Scenario 1

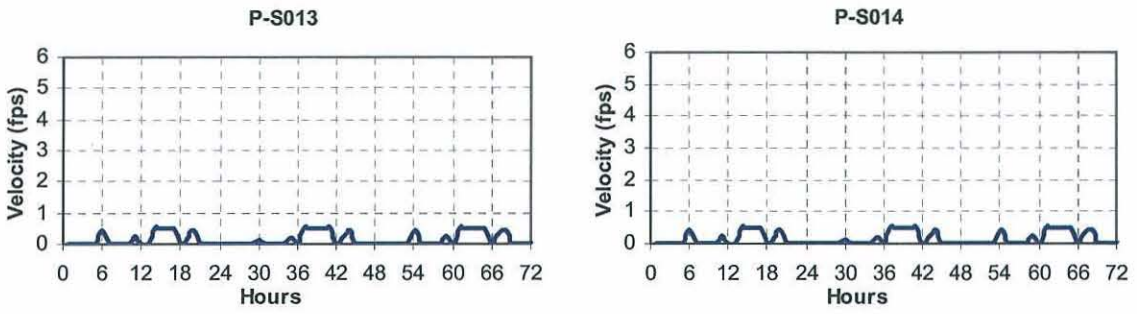

Figure B-3. Velocity Curves for Pipes in Suncreek – Max Day, Water Supply Scenario 1

Table B-1. Node Pressure Ranges Under Max Day Condition, Water Supply Scenario 1

ID	Max.Value (psi)	Max.Time (hrs)	Min.Value (psi)	Min.Time (hrs)	Average (psi)	Difference (psi)
J-SD6-01	63.9	1:00	53.3	5:00	60.9	10.6
J-SD6-02	76	31:00:00	53.2	29:00:00	62.3	22.7
J-SD5-01	67.3	31:00:00	44.6	29:00:00	53.6	22.7
J-SD5-02	63	31:00:00	40.2	29:00:00	49.3	22.7

Key:
hrs = hours
psi = pounds per square inch

Table B-2. Velocity Range in Pipes Under Max Day Condition, Water Supply Scenario 2

ID	Max.Value (ft/s)	Max.Time (hrs)	Min.Value (ft/s)	Min.Time (hrs)	Average (ft/s)	Difference (ft/s)
P-S014	0.5	12:00	0	3:00	0.1	0.5
P-S047	0.5	12:00	0	3:00	0.1	0.5
P-S013	0.5	12:00	0	3:00	0.1	0.5
P-S012	0	6:00:00	0	3:00	0	0
P-S011	0	21:00:00	0	61:00:00	0	0
P-S002	0	22:00	0	8:00:00	0	0
P-S001-2	0	6:00:00	0	49:00:00	0	0

Key:
t/s = feet per second
hrs = hours

APPENDIX C
Modeling Results Scenario 2

This page left blank intentionally.

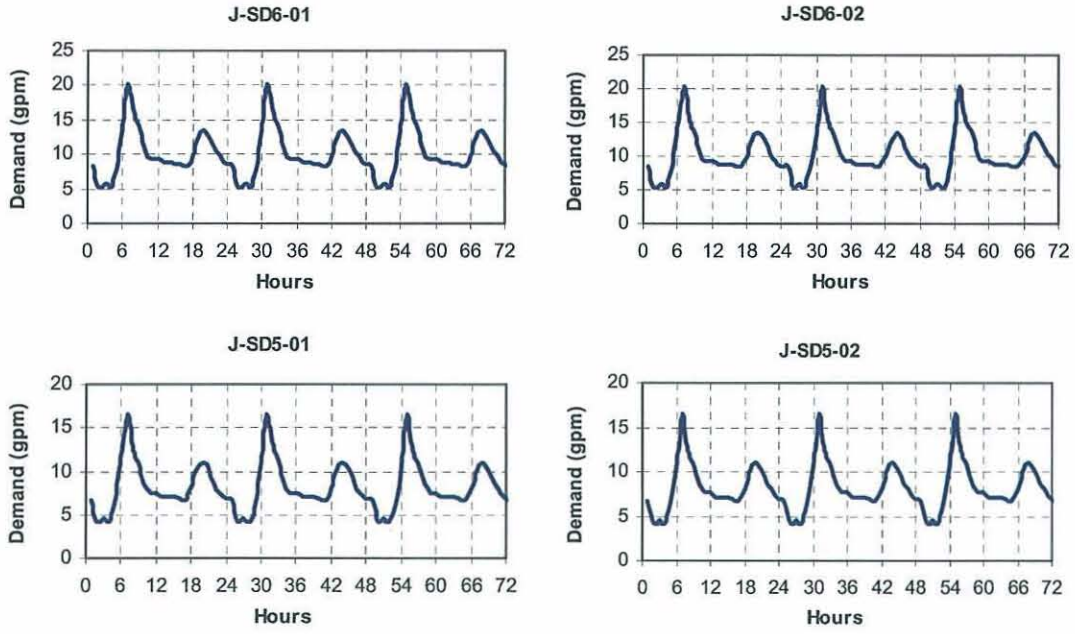

Figure C-1. Suncreek Nodes Demand Curves - Max Day, Water Supply Scenario 2

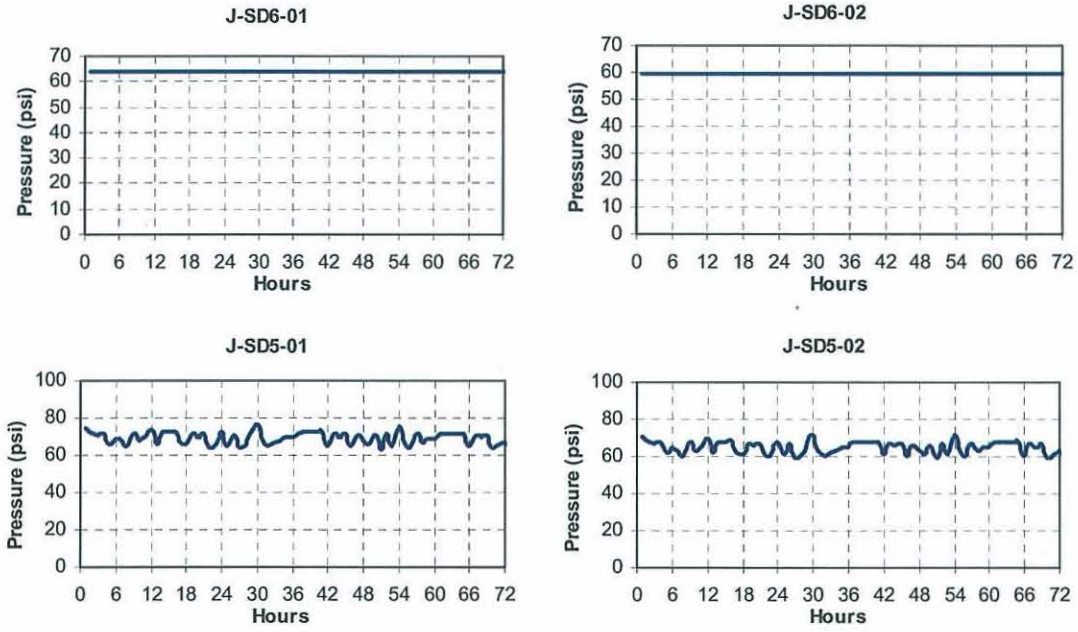

Figure C-2. Suncreek Nodes Pressure Curves - Max Day, Water Supply Scenario 2

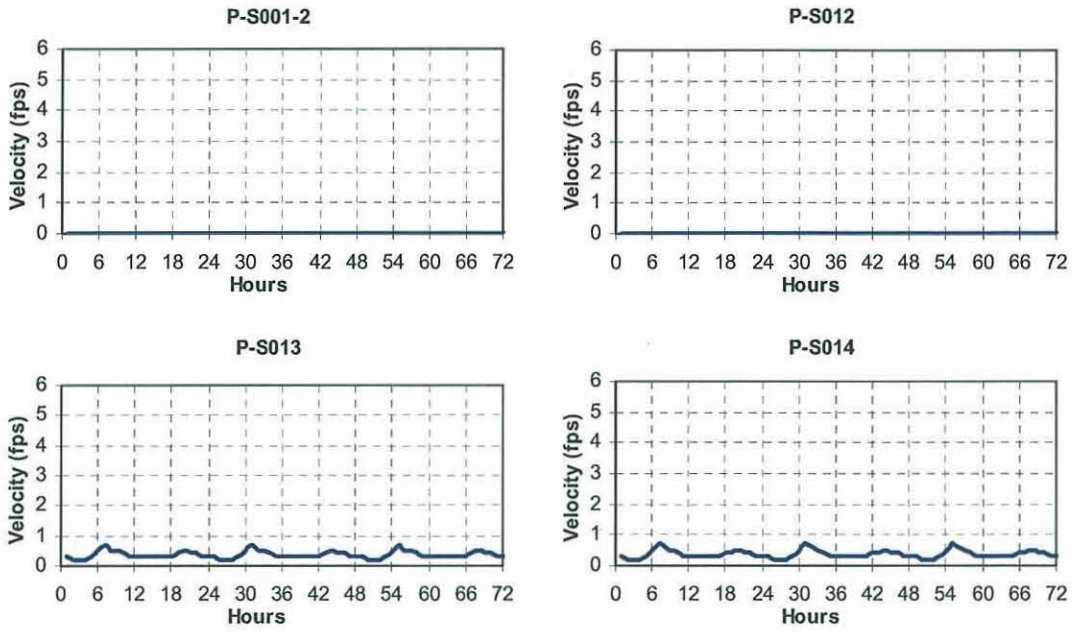

Figure C-3. Velocity Curves for Pipes in Suncreek – Max Day, Water Supply Scenario 2

Table C-1. Node Pressure Ranges Under Max Day Condition, Water Supply Scenario 2

ID	Max.Value (psi)	Max.Time (hrs)	Min.Value (psi)	Min.Time (hrs)	Average (psi)	Difference (psi)
J-SD6-01	63.9	1:00	63.9	6:00	63.9	0
J-SD6-02	59.1	1:00:00	59.1	6:00:00	59.1	0
J-SD5-01	76	29:00:00	63.1	50:00:00	69	12.8
J-SD5-02	71.6	29:00:00	58.8	50:00:00	64.6	12.8

Key:
hrs = hours
psi = pounds per square inch

Table C-2. Velocity Range in Pipes Under Max Day Condition, Water Supply Scenario 2

ID	Max.Value (ft/s)	Max.Time (hrs)	Min.Value (ft/s)	Min.Time (hrs)	Average (ft/s)	Difference (ft/s)
P-S014	0.7	6:00	0.2	1:00	0.4	0.5
P-S047	0.7	6:00	0.2	1:00	0.4	0.6
P-S013	0.7	6:00	0.2	1:00	0.4	0.5
P-S012	0	6:00:00	0	3:00	0	0
P-S011	0	17:00:00	0	16:00:00	0	0
P-S002	0	7:00	0	2:00:00	0	0
P-S001-2	0	30:00:00	0	1:00:00	0	0

Key:
t/s = feet per second
hrs = hours

APPENDIX D
Modeling Results Scenario 4

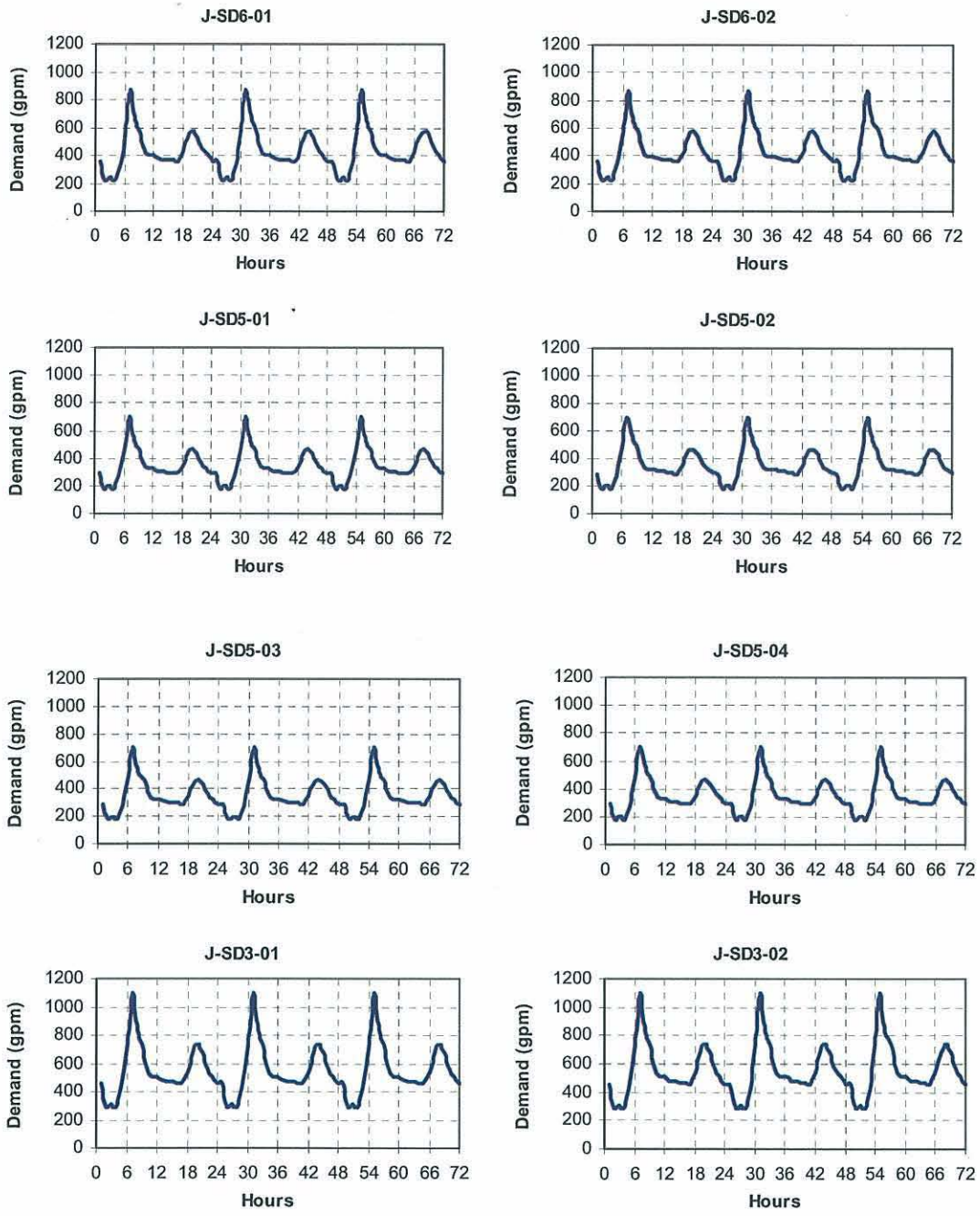

Figure D-1. Suncreek Nodes Demand Curves - Max Day, Water Supply Scenario 4

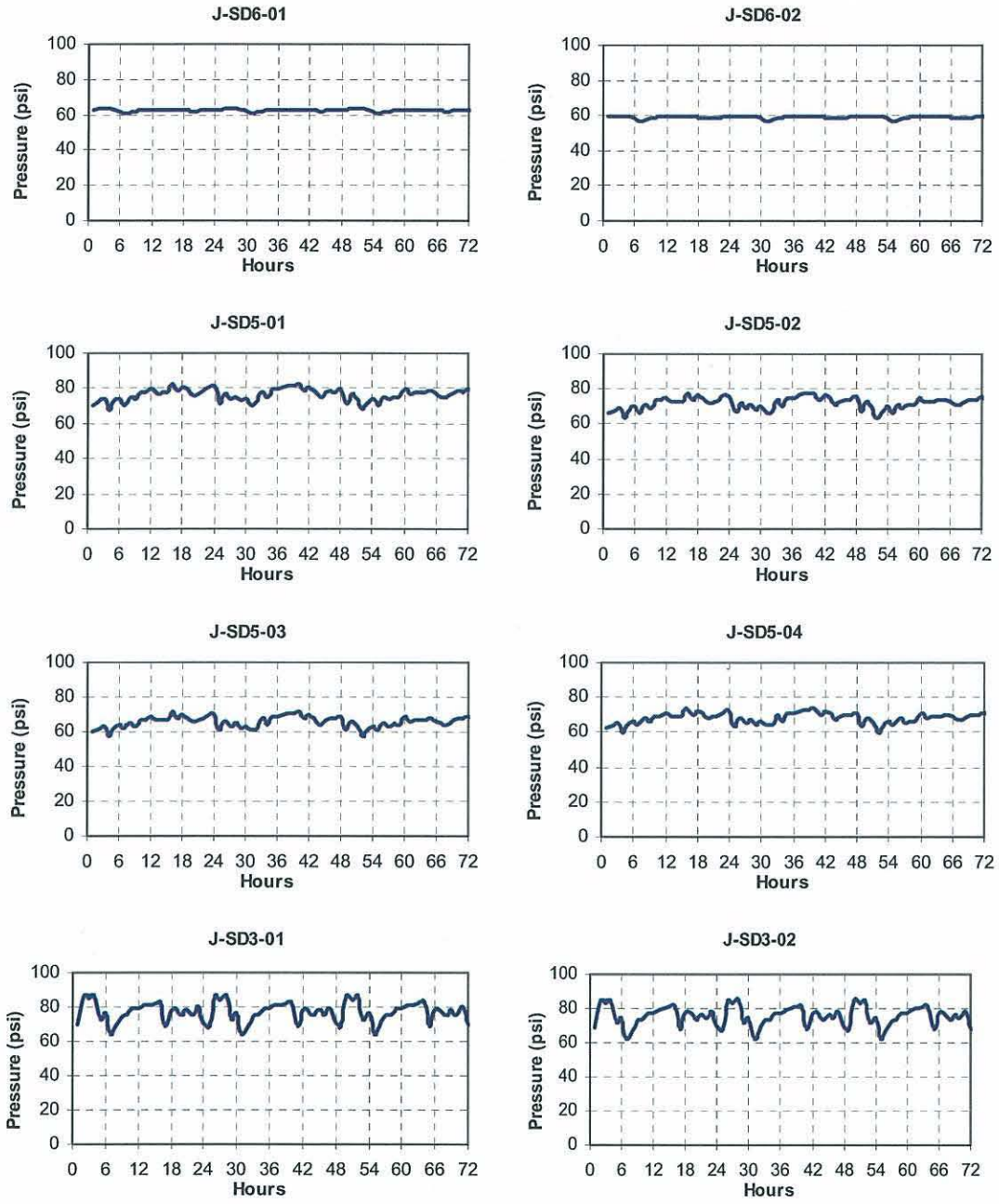

Figure D-2. Suncreek Nodes Pressure Curves - Max Day, Water Supply Scenario 4

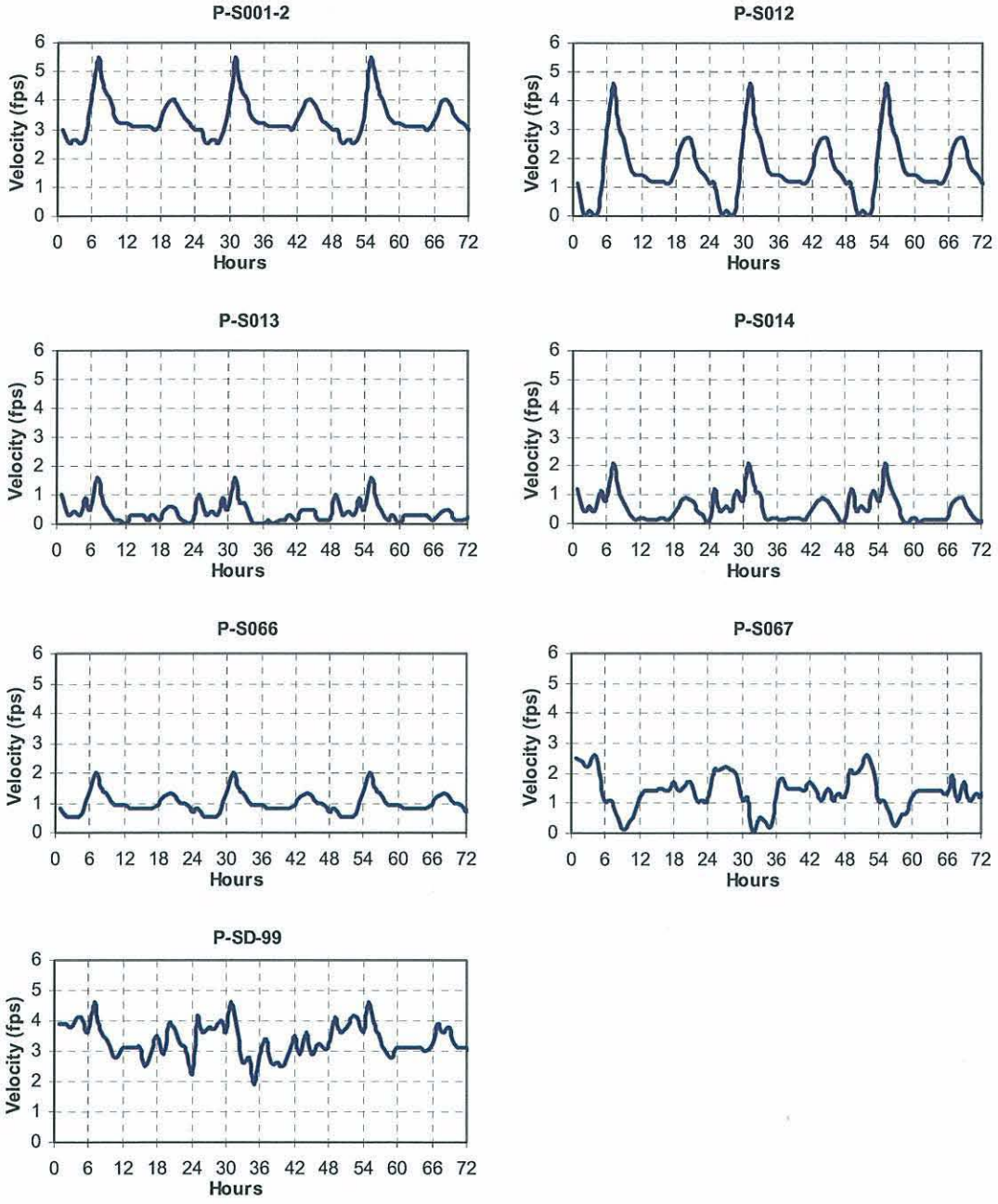

Figure D-3. Velocity Curves for Pipes in Suncreek – Max Day, Water Supply Scenario 4

Table D-1. Node Pressure Ranges Under Max Day Condition, Water Supply Scenario 4

ID	Max.Value (psi)	Max.Time (hrs)	Min.Value (psi)	Min.Time (hrs)	Average (psi)	Difference (psi)
J-SD6-01	63	1:00	60.1	6:00	62.3	2.9
J-SD6-02	59.1	1:00:00	56.2	6:00	58.6	3
J-SD5-02	77.5	39:00:00	63.3	3:00	71.8	14.1
J-SD5-01	81.8	39:00:00	67.7	3:00	76.1	14.1
J-SD5-03	71	39:00:00	56.9	3:00	65.6	14.1
J-SD5-04	73.2	39:00:00	59.2	3:00	67.9	14.1
J-SD3-01	86.5	3:00	63.6	54:00:00	76.7	22.9
J-SD3-02	85.2	3:00:00	62.1	54:00:00	75.4	23.1
J-SD3-03	72.1	3:00:00	48.6	54:00:00	62.2	23.5

Key:
hrs = hours
psi = pounds per square inch

Table D-2. Velocity Range in Pipes Under Max Day Condition, Water Supply Scenario 4

ID	Max.Value (ft/s)	Max.Time (hrs)	Min.Value (ft/s)	Min.Time (hrs)	Average (ft/s)	Difference (ft/s)
P-S014	2.1	6:00:00	0	71:00:00	0.5	2.1
P-S047	2.6	6:00	0.1	64:00:00	0.8	2.5
P-S013	1.6	6:00:00	0	22:00	0.4	1.5
P-S012	4.6	6:00:00	0	3:00	1.6	4.6
P-S011	3.2	6:00:00	0.2	26:00:00	1	3.1
P-S002	4.1	6:00:00	2.2	1:00	2.7	1.9
P-S001-2	5.5	6:00	2.5	1:00	3.4	2.9
P-SD-115	3.1	6:00:00	0.3	64:00:00	1	2.8
P-S086	2.6	6:00	0.1	64:00:00	0.8	2.5
P-SD-114	3.5	6:00	0.5	64:00:00	1.3	3
P-S089	5.6	3:00	2.1	32:00:00	4	3.5
P-SD-116	1.2	30:00:00	0.3	25:00:00	0.6	0.9
P-S066	2	30:00:00	0.5	25:00:00	1	1.5
P-SD-117	0.4	6:00	0	23:00	0.2	0.4
P-S064	0.4	30:00:00	0	23:00	0.2	0.4

Key:
ft/s = feet per second
hrs = hours

APPENDIX E
Modeling Results Scenario 5

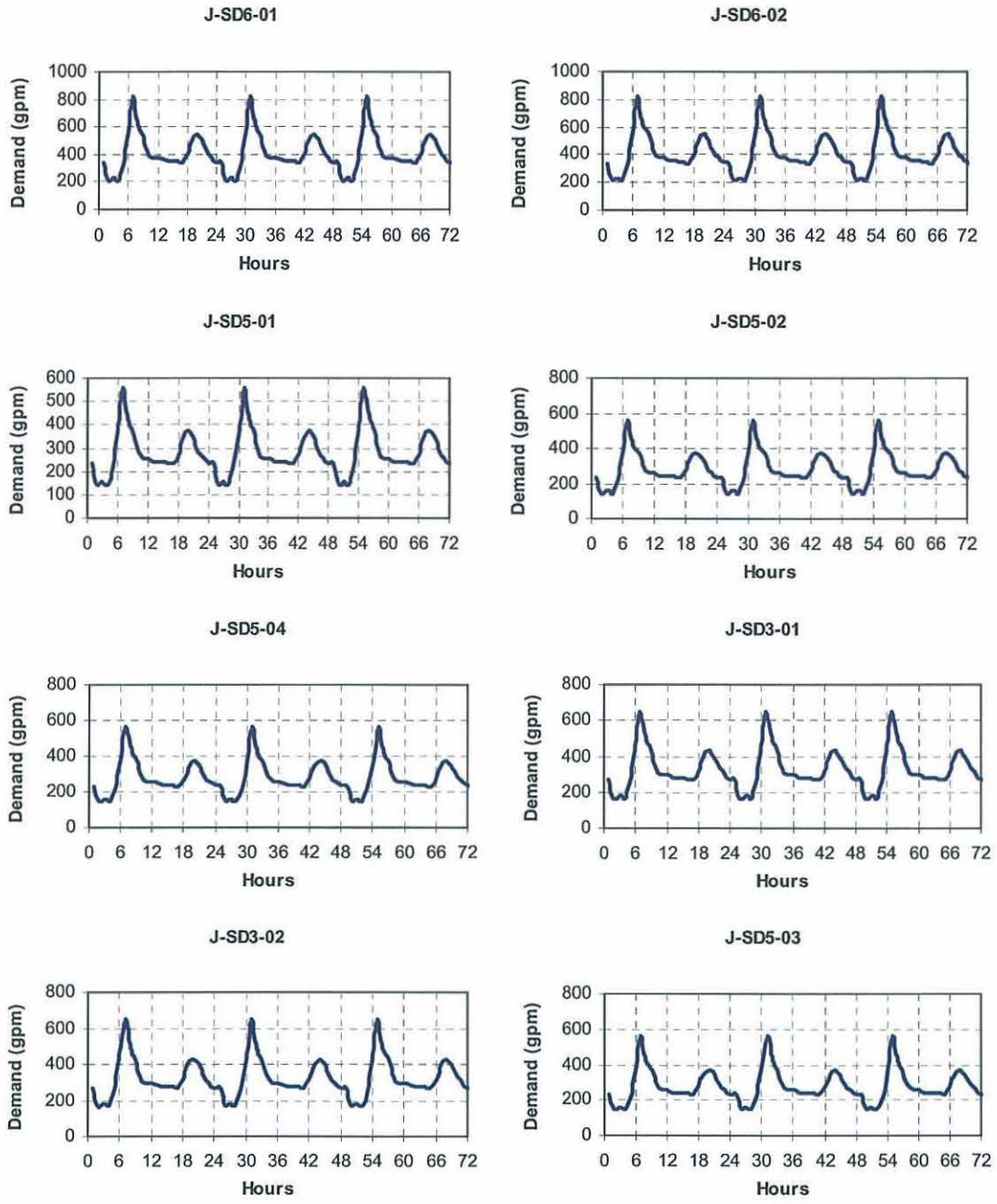

Figure E-1. Suncreek Nodes Demand Curves - Max Day, Water Supply Scenario 5

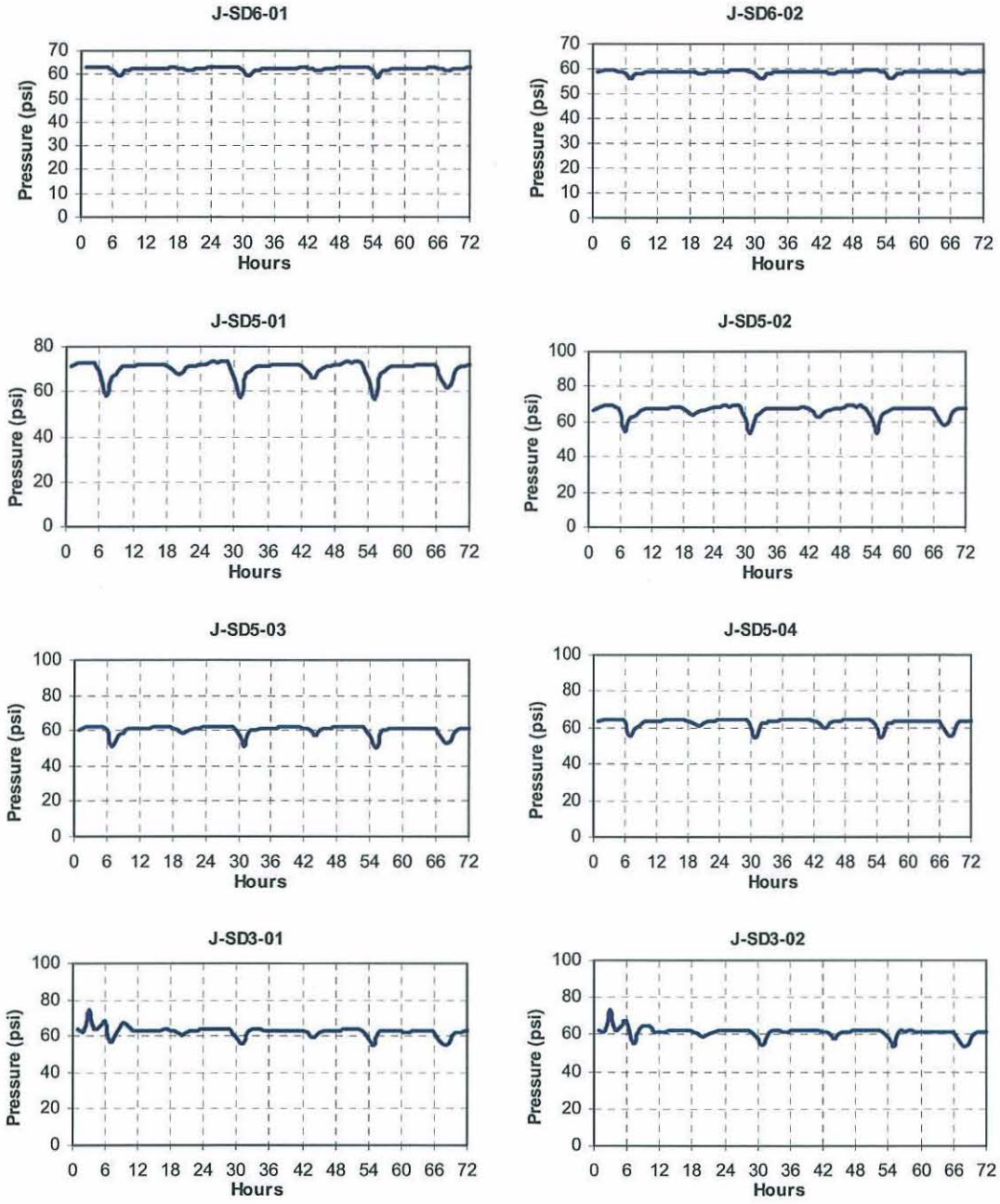

Figure E-2. Suncreek Nodes Pressure Curves - Max Day, Water Supply Scenario 5

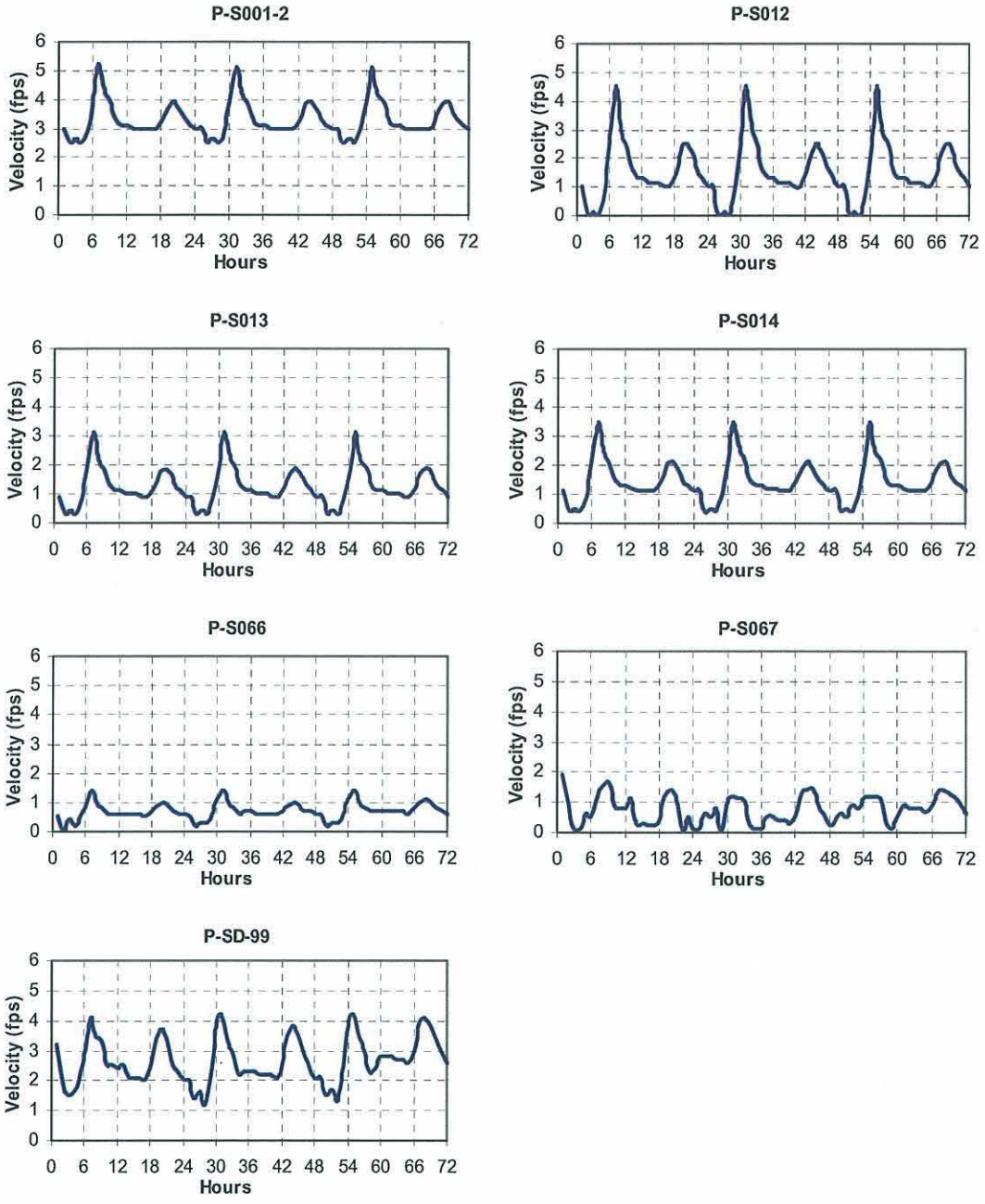

Figure E-3. Velocity Curves for Pipes in Suncreek – Max Day, Water Supply Scenario 5

Table E-1. Node Pressure Ranges Under Max Day Condition, Water Supply Scenario 5

ID	Max.Value (psi)	Max.Time (hrs)	Min.Value (psi)	Min.Time (hrs)	Average (psi)	Difference (psi)
J-SD6-01	63	1:00	59.1	54:00:00	62.3	3.9
J-SD6-02	59.1	1:00	56.3	54:00:00	58.6	2.9
J-SD5-02	68.9	27:00:00	53.4	54:00:00	65.9	15.5
J-SD5-01	73.2	27:00:00	56.8	54:00:00	70.1	16.4
J-SD5-03	62.5	27:00:00	50.3	54:00:00	60.2	12.2
J-SD5-04	64.7	27:00:00	54.2	54:00:00	62.8	10.5
J-SD3-01	74.5	2:00	54.5	67:00:00	62.5	20
J-SD3-02	73.2	2:00	53.1	67:00:00	61.1	20.1

Key:
hrs = hours
psi = pounds per square inch

Table E-2. Velocity Range in Pipes under Max Day Condition, Water Supply Scenario 5

ID	Max.Value (ft/s)	Max.Time (hrs)	Min.Value (ft/s)	Min.Time (hrs)	Average (ft/s)	Difference (ft/s)
P-S014	3.5	30:00:00	0.4	49:00:00	1.4	3.1
P-S047	3.9	30:00:00	0.5	49:00:00	1.6	3.4
P-S013	3.1	30:00:00	0.3	49:00:00	1.2	2.8
P-S012	4.5	54:00:00	0	25:00:00	1.5	4.5
P-S011	3.2	54:00:00	0.2	2:00	0.9	3
P-S002	3.9	6:00	2.1	1:00	2.6	1.7
P-S001-2	5.2	6:00	2.5	1:00	3.3	2.7
P-SD-115	4.3	30:00:00	0.6	27:00:00	1.8	3.7
P-S086	3.9	30:00:00	0.5	27:00:00	1.6	3.4
P-SD-114	4.7	30:00:00	0.7	27:00:00	2	4
P-S089	3.4	67:00:00	1.2	27:00:00	2.1	2.3
P-SD-116	0.9	54:00:00	0	3:00	0.5	0.9
P-S066	1.4	54:00:00	0	1:00	0.7	1.4
P-SD-117	0.5	53:00:00	0	25:00:00	0.2	0.5
P-S064	0.5	53:00:00	0	25:00:00	0.2	0.5

Key:
ft/s = feet per second
hrs = hours

APPENDIX F
Modeling Results Scenario 6

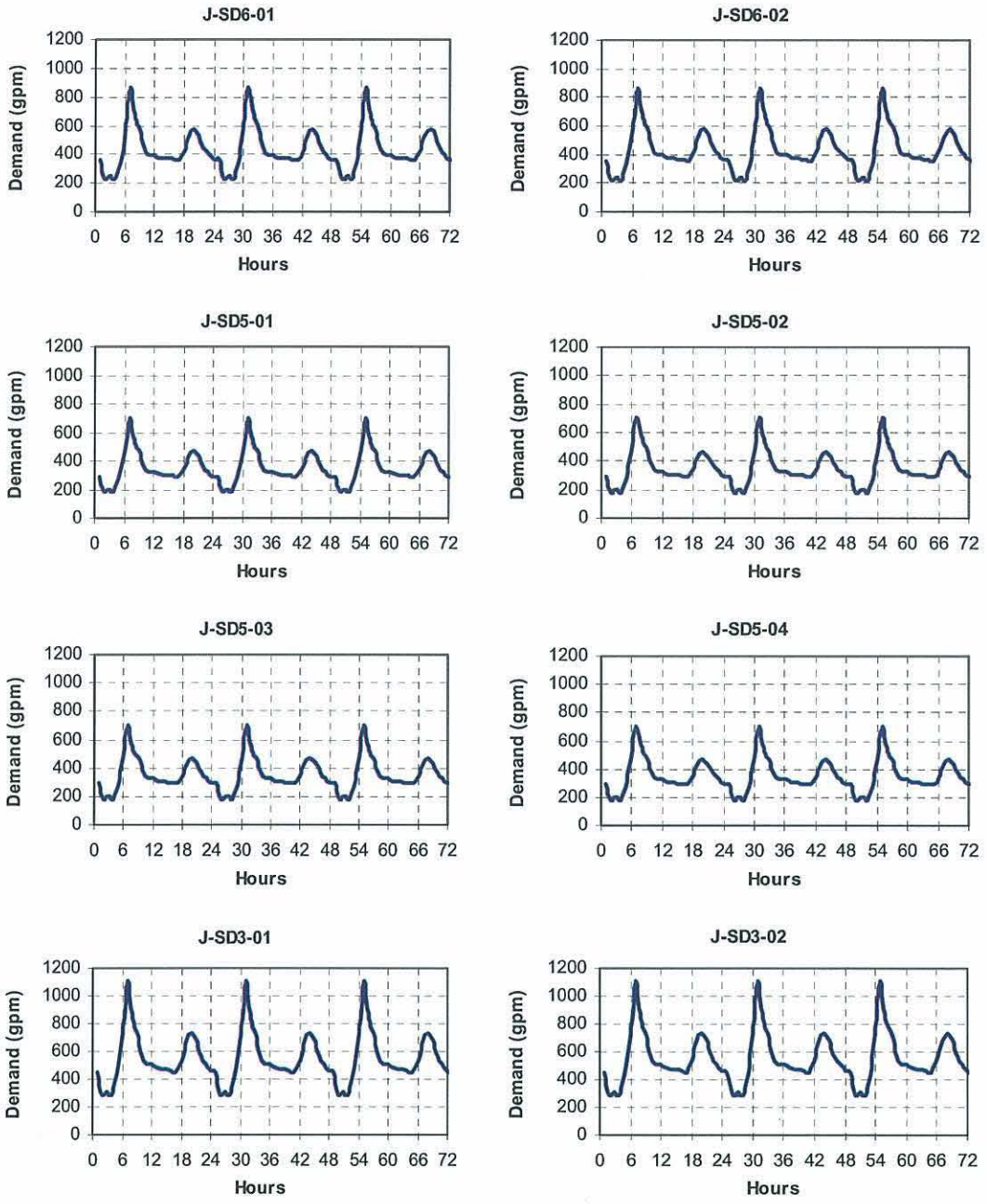

Figure F-1. Suncreek Nodes Demand Curves - Max Day, Water Supply Scenario 6

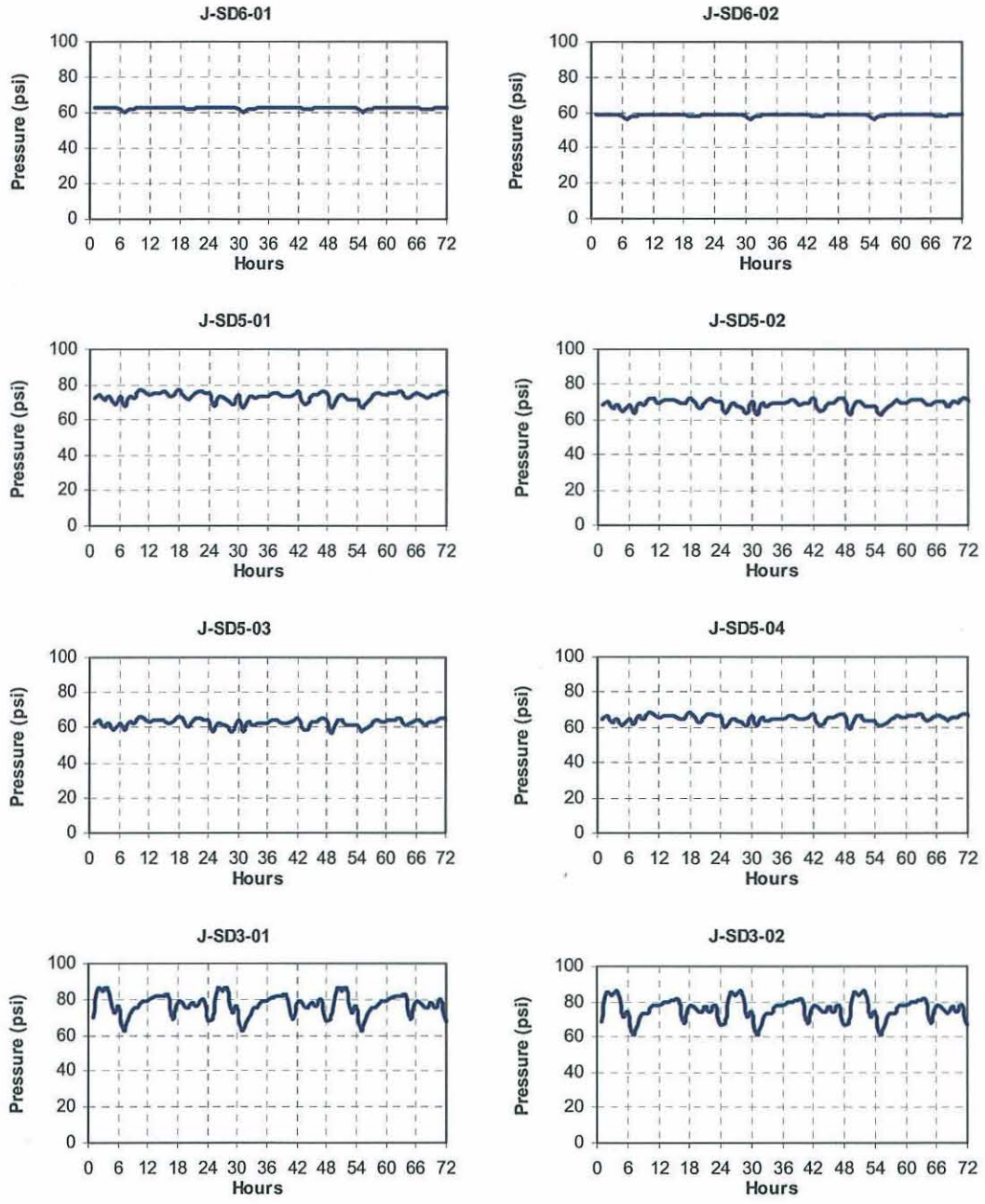

Figure F-2. Suncreek Nodes Pressure Curves - Max Day, Water Supply Scenario 6

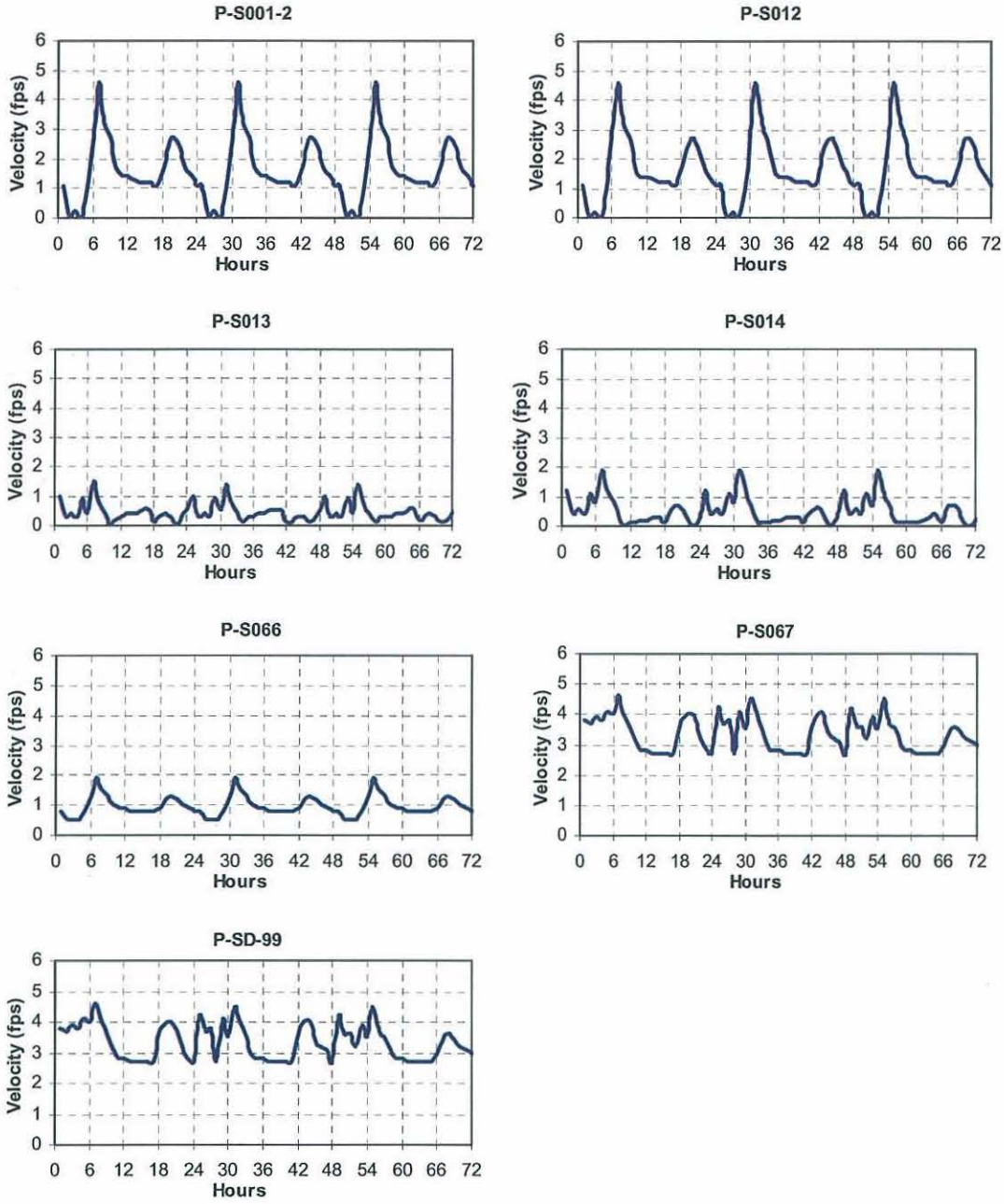

Figure F-3. Velocity Curves for Pipes in Suncreek – Max Day, Water Supply Scenario 6

Table F-1. Node Pressure Ranges Under Max Day Condition, Water Supply Scenario 6

ID	Max.Value (psi)	Max.Time (hrs)	Min.Value (psi)	Min.Time (hrs)	Average (psi)	Difference (psi)
J-SD6-01	63	0.04	60.1	0.25	62.3	2.9
J-SD6-02	59.1	0.04	56.2	0.25	58.6	3
J-SD3-01	86.5	0.13	63.6	2.25	76.7	22.9
J-SD3-02	85.2	0.13	62.1	2.25	75.4	23.1
J-SD3-03	72.1	0.13	48.6	2.25	62.2	23.5
J-SD5-01	81.8	1.63	67.7	0.125	76.1	14.1
J-SD5-02	77.5	1.63	63.3	0.125	71.8	14.1
J-SD5-03	71	1.63	56.9	0.125	65.6	14.1
J-SD5-04	73.2	1.63	59.2	0.125	67.9	14.1

Key:
hrs = hours
psi = pounds per square inch

Table F-2. Velocity Range in Pipes Under Max Day Condition, Water Supply Scenario 6

ID	Max.Value (ft/s)	Max.Time (hrs)	Min.Value (ft/s)	Min.Time (hrs)	Average (ft/s)	Difference (ft/s)
P-S014	2.1	6:00	0	71:00:00	0.5	2.1
P-S047	2.6	6:00:00	0.1	16:00	0.8	2.5
P-S013	1.6	6:00	0	22:00:00	0.4	1.5
P-S012	4.6	6:00	0	3:00:00	1.6	4.6
P-S011	3.2	6:00	0.2	26:00:00	1	3.1
P-S002	4.1	6:00	2.2	1:00	2.7	1.9
P-S001-2	5.5	6:00	2.5	1:00	3.4	2.9
P-SD-115	3.1	6:00	0.3	64:00:00	1	2.8
P-S086	2.6	6:00:00	0.1	16:00	0.8	2.5
P-SD-114	3.5	6:00	0.5	64:00:00	1.3	3
P-S089	5.6	3:00	2.1	8:00	4	3.5
P-SD-116	1.2	30:00:00	0.3	25:00:00	0.6	0.9
P-S066	2	30:00:00	0.5	1:00	1	1.5
P-SD-117	0.4	30:00:00	0	23:00	0.2	0.4
P-S064	0.4	6:00	0	23:00:00	0.2	0.4

Key:
ft/s = feet per second
hrs = hours

APPENDIX G
Modeling Results Fire Flows Scenarios

Table G-1. Fire Flow – Time - 12:00 Hours

Scenario	ID	Demand (gpm)	Head (ft)	Pressure (psi)
S2	J-SD6-01	3,017.50	273.1	57.7
S2	J-SD6-02	3,017.50	290.9	65.4
S2	J-SD3-02	3,002.90	325.2	60.8
S4	J-SD6-01	3,375.60	272.1	57.2
S4	J-SD6-02	3,375.60	267.3	55.2
S4	J-SD5-02	3,303.90	328.4	68.6
S4	J-SD5-03	3,303.90	331.5	63.5
S5	J-SD6-01	3,357.20	268.8	55.8
S5	J-SD6-02	3,357.20	267.6	55.3
S5	J-SD5-02	3,243.50	312.6	61.8
S5	J-SD5-03	3,243.50	319	58.1
S6	J-SD6-01	3,375.60	272.8	57.5
S6	J-SD6-02	3,375.60	267.3	55.2
S6	J-SD5-02	3,303.90	325.2	67.2
S6	J-SD5-03	3,303.90	327.2	61.6

Key:
ft = feet
gpm = gallons per minute
psi = pounds per square inch

This page left blank intentionally.

APPENDIX H

Non-Potable Water Distribution System for Sunrise Douglas Community Plan Area

(Source: Wood Rodgers, Non-Potable Water Master Plan Sunrise Douglas Community Plan Area, February 2007)

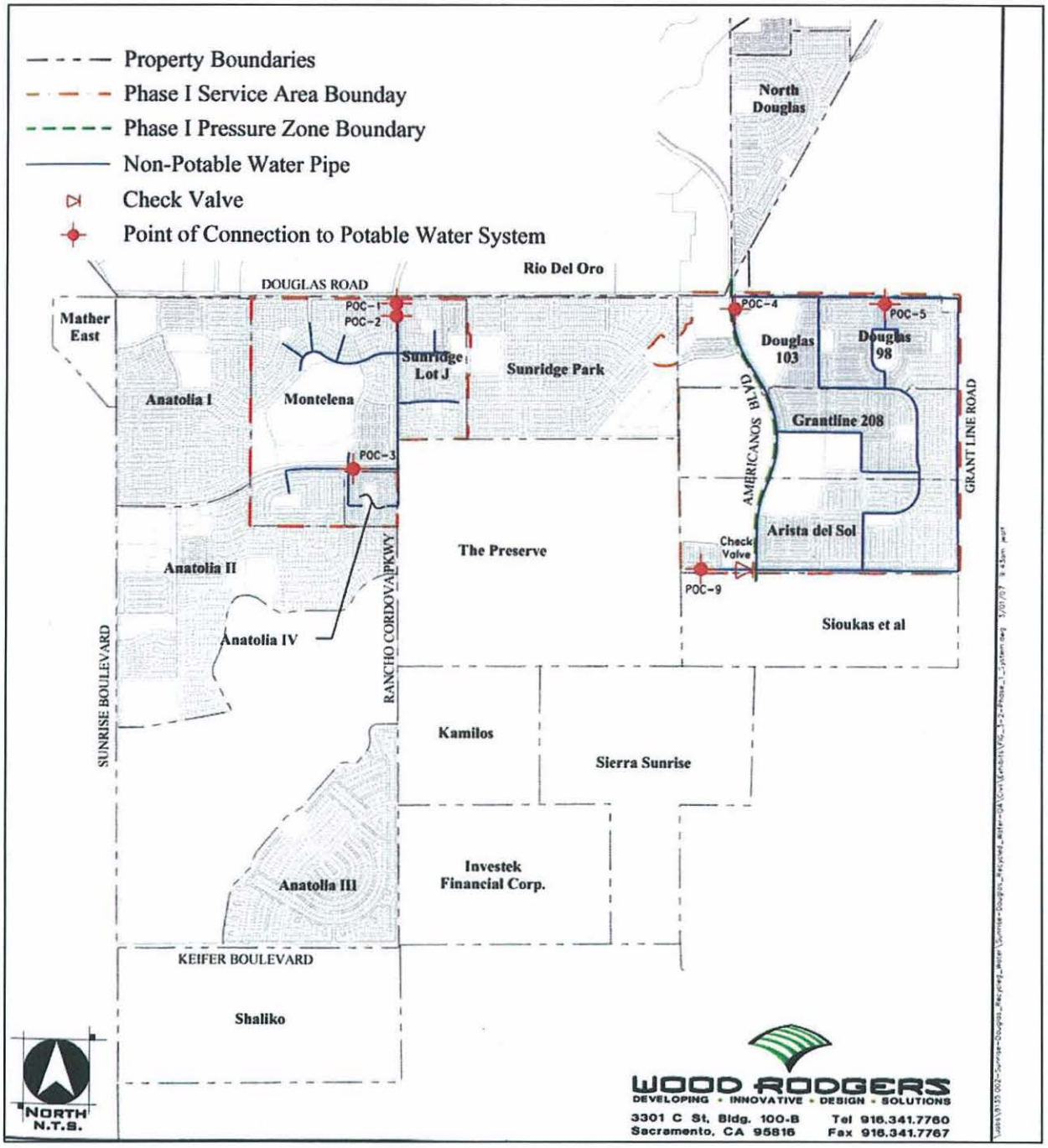

Figure H-1. Phase 1 Non-Potable Water System (Wood Rodgers, 2007)

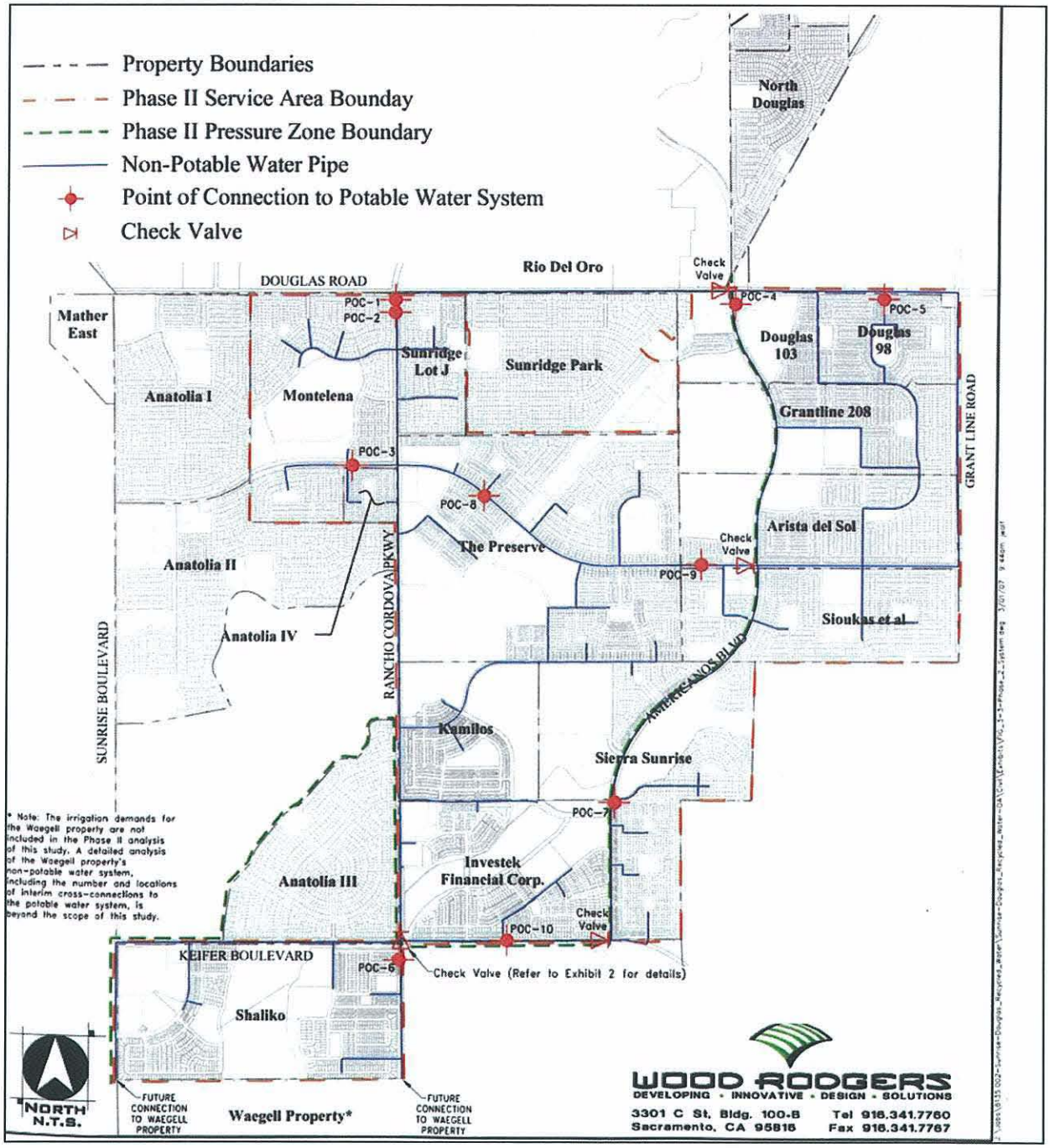

Figure H-2. Phase II Non-Potable Water System (Wood Rodgers, 2007)

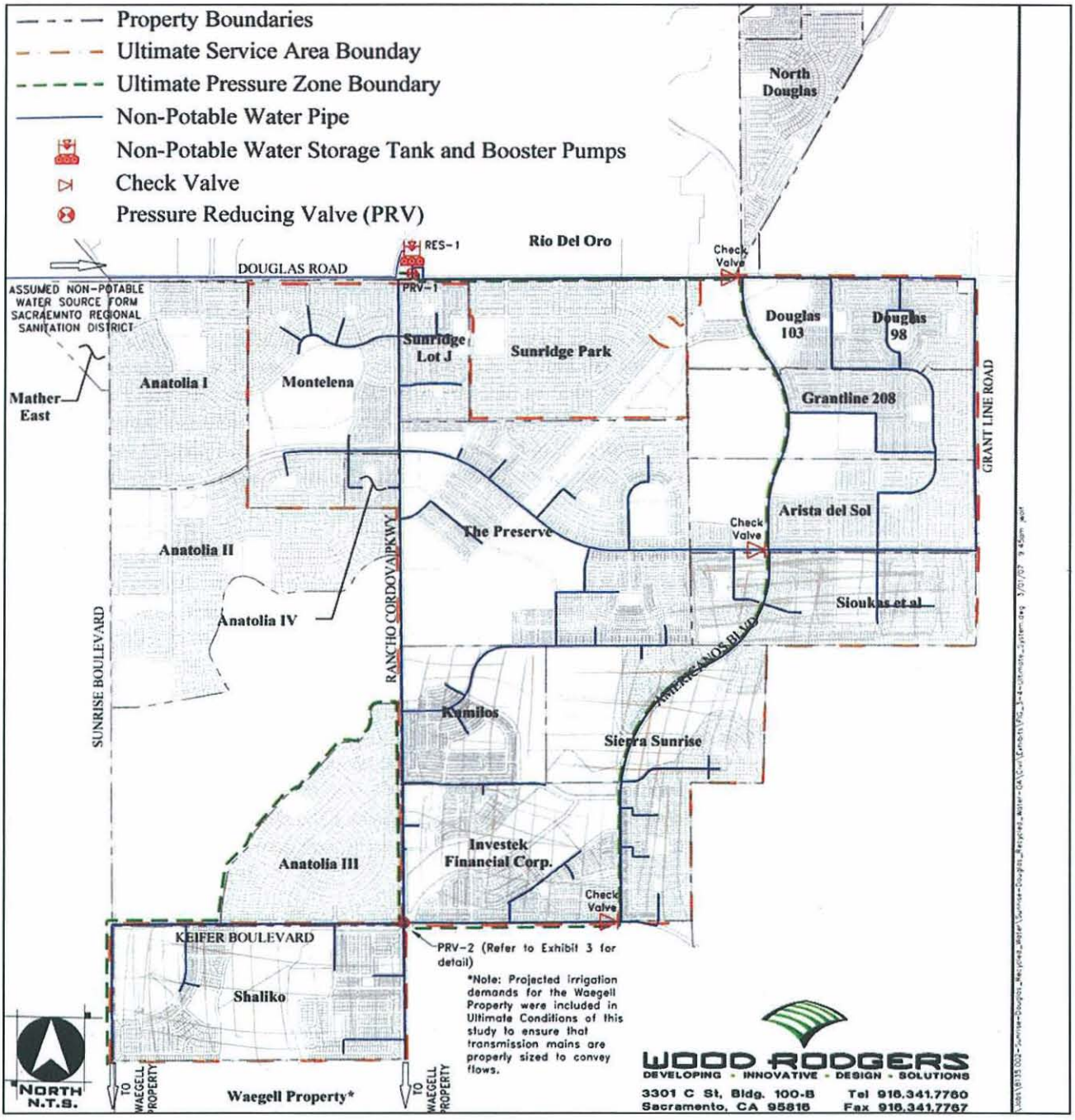

Figure H-3. Ultimate Non-Potable Water System (Wood Rodgers, 2007)

This page left blank intentionally.