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EM 200-1-2
29 February 2016

Environmental Quality

TECHNICAL PROJECT PLANNING PROCESS

ENGINEER MANUAL

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DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

EM 200-1-2

CEMP-RT

Manual
No. 200-1-2

29 February 2016

Environmental Quality
Technical Project Planning Process

1. Purpose.

a. This Engineer Manual (EM) describes the Technical Project Planning (TPP) process for identifying project objectives and designing data collection programs at hazardous, toxic, and radioactive waste sites. The TPP process helps ensure that the requisite type, quality, and quantity of data are obtained to satisfy project objectives that lead to informed decisions and site closeout. The TPP process can be used from investigation through closeout at small, simple sites as well as large, complex sites. The TPP process is a critical component of the U.S. Army Corps of Engineers (USACE) quality management system that meets the American National Standard for planning the collection and evaluation of environmental data. This EM is intended for use by USACE project managers and both technical and contractor personnel for implementation of Engineer Regulation (ER) 5-1-11.

b. The foundation of Corps of Engineers environmental work is the Environmental Operating Principles as specified in ER 200-1-5. These seven tenets serve as guides and must be applied in all Corps business lines as we strive to achieve a sustainable environment.

2. Applicability. This EM applies to all HQUSACE elements and USACE commands responsible for munitions response actions, hazardous, toxic, and radioactive waste projects.

3. Distribution. Approved for public release, distribution is unlimited.

4. Discussion. The four-phase TPP process is a comprehensive and systematic planning process that will accelerate progress to site closeout within all project constraints, Project objectives are identified and documented early during Phase I of the TPP process to establish the focus required to achieve site closeout for the customer. Phases II and III provide a framework to develop data collection options for the customer's consideration during Phase IV. The project-specific

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This Engineer Manual supersedes EM 200-1-2, dated 31 August 1998.

data quality requirements established throughout the TPP process are then documented as data quality objectives during Phase IV. Many other documentation tools within this EM also encourage detailed data collection planning and contribute to maintaining institutional site knowledge.

FOR THE COMMANDER:

6 Appendices
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CHAPTER 1

Define Current Project (Phase I)

1.1. Purpose.

a. This Engineer Manual (EM) describes the Technical Project Planning (TPP) process for identifying project objectives and designing data collection programs at hazardous, toxic, and radioactive waste (HTRW) sites and munitions response (MR) sites. The TPP process helps ensure that the requisite type, quality, and quantity of data are obtained to satisfy project objectives that lead to informed decisions and site closeout. The TPP process can be used from investigation through closeout at small, simple sites as well as large, complex sites. The TPP process is a critical component of the U.S. Army Corps of Engineers (USACE) quality management system that meets the American National Standard (ANSI/ASQC E4) for planning the collection and evaluation of environmental data. This EM is intended for use by USACE project managers and both technical and contractor personnel for implementation of Engineer Regulation (ER) 5-1-11.

b. The foundation of Corps of Engineers environmental work is the Environmental Operating Principles as specified in ER 200-1-5. These seven tenets serve as guides and must be applied in all Corps business lines as we strive to achieve a sustainable environment.

1.2. Applicability. This EM applies to all HQUSACE elements and USACE commands responsible for hazardous, toxic, and radioactive waste projects.

1.3. Distribution Statement. Approved for public release, distribution is unlimited.

1.4. References. References are listed in Appendix A.

1.5. Introduction. The TPP process is a comprehensive planning process for identifying project objectives and designing data collection programs at HTRW sites and munitions response sites (MRSs). Good project planning reduces project uncertainty and improves project decisions. The TPP process is integral to the Project Management Business Process (PMBP), the corporate management approach for managing all USACE programs and projects (ER 5-1-11); including military munitions response actions as presented in EM 200-1-15.

1.5.1. The four-phase TPP process helps to ensure that the requisite type, quality, and quantity of data are obtained to satisfy project objectives (see paragraph 1.7.2) that lead to informed decisions and ultimately site closure.[1] Phases I, II, and III provide the foundation for Data Quality Objective (DQO) development, which is finalized in

1 For the purposes of this document “site” may have the same meaning as “project”. A site is a distinct area of an installation containing one or more releases or threatened releases of hazardous substances treated as a discrete entity or consolidated grouping for response purposes. Active installations may have more than one site. FUDS projects are the same as sites. (USD (AT&L) 2012).

Phase IV. The process includes gathering existing knowledge regarding potential site contaminants for HTRW sites, and/or munitions and explosives of concern (MEC) and munitions constituents (MC) for MRSs (see below text box) and identifying the long- and short-term issues that require resolution to achieve site closure. The process involves defining an adaptive project strategy and approach that can be used to achieve site closure and reuse as efficiently and effectively as possible. It focuses on developing a shared definition of site closeout and land use, including beneficial resources (e.g. groundwater), between the project manager (PM), other project team members, stakeholders and regulators; and designing project activities towards completing an environmental response and closing out the site. Site closeout is a vision for returning the land to active reuse and its associated strategy; it may include further government activities such as land use restrictions, five year reviews or other inspection and long term monitoring activities.

MEC distinguishes specific categories of military munitions that may pose unique explosives safety risks; (a) Unexploded Ordnance (UXO), as defined in 10 U.S.C. 2710(e)(9); (b) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710(e)(2); or (c) Munitions constituents (e.g., TNT, RDX) present in high enough concentration to pose an explosive hazard.

MC in concentrations that do not pose an explosive hazard are addressed in the same manner as HTRW.

1.5.2. Minimum elements as addressed in the Uniform Federal Policy for Implementing Environmental Quality Systems: Evaluating, Assessing and Documenting Environmental Data Collection/Use and Technology Programs (DoD 2005a) are addressed through the application of TPP, including:

a. Establishment of a team-based approach to planning,

b. Description of the project goal, objectives, and questions and issues to be addressed,

c. Identification of project schedule, resources (including budget), milestones, and any applicable requirements (e.g., regulatory requirements, contractual requirements),

d. Matching of the data collection and analysis process to project objectives,

e. Identification of collection and analysis requirements, and

f. Description of the generation, evaluation, and assessment of collected data.

1.5.3. The guidance for other described processes (EPA QA/G4 and DTIC ADA 395303) 2006a, DOD 2005a, b) are not mutually exclusive of one another, nor with the USACE approach described in this document. Details of one process that may be useful to a project team could be used with another; for example the Uniform Federal Policy for Quality Assurance Project Plans (UFP QAPP) (DOD 2005b) cross references Data Needs planning tables from this manual, and conversely, this manual references

that document for QAPP development details not found here. Appendix C of this document presents a crosswalk between systematic planning as presented in the UFP QAPP and the TPP process; Appendix D presents a crosswalk between the UFP QAPP documentation worksheets and TPP worksheets for documentation.

1.5.4. The TPP process should be used throughout the lifecycle of any project and when planning the next executable stage of site activities where work is already ongoing. It may be initiated at any phase (e.g., investigation; design; remediation; operations and maintenance; long term monitoring, five-year review). The level of effort may vary depending on project phase and the type of decisions to be made, e.g., less effort for an SI, but more intense effort for an RI. The TPP process should be used iteratively; that is, used as a data feedback loop that allows project objectives and data collection programs to be continually evaluated as site knowledge increases and project uncertainty decreases, it is commonly not a linear process and some TPP phases may take place concurrently or in quick succession. This iterative approach to managing projects is described in "Improving Environmental Site Remediation Through Performance-Based Environmental Management" (ITRC 2007). Although the scope of activities may involve only one executable stage of a project's lifecycle, the planning process for each stage should include an evaluation of how this planning process will facilitate progression of the site towards closeout and reuse.

1.5.5. Phase I (see Figure 1-1) activities bring together decision makers and technical personnel to identify the project scope and document both the short- and long-term project objectives that will need to be satisfied to bring the site to closeout. The Phase I efforts involve preparing a team information package, developing an initial Conceptual Site Model (CSM) (or updating an existing CSM), determining an overall site approach, and defining the current project for a site. Phase I is the first step in DQO development and includes site identification and problem definition. Phase I activities are designed to address broad scale decisions and conflicts at the beginning of the project. These efforts will ultimately accelerate project execution. Preparation of DQO statements are discussed in Chapter 4 (Phase IV).

1.6. Prepare Team Information Package. Preparation of a team information package should be a result of the initial Phase I activities. A team information package is an informal collection of existing site information that is compiled for reference by the entire team. These pieces should be summarized in the Project Management Plan, and as such is a living document that is updated as conditions change or additional site information is collected. Common components of a team information package include these items:

a. List of individuals who constitute the multi-disciplinary project team for the site;

b. Customer's concept of site closeout;

c. Customer's schedule and budget requirements;

d. Regulator's concept of site closeout;

e. Other Stakeholder perspectives;

f. All correspondence to and from regulators, including an index of the project file or administrative record, if available; and

g. Existing site data, reports, illustrations, or drawings (that are available and pertinent).

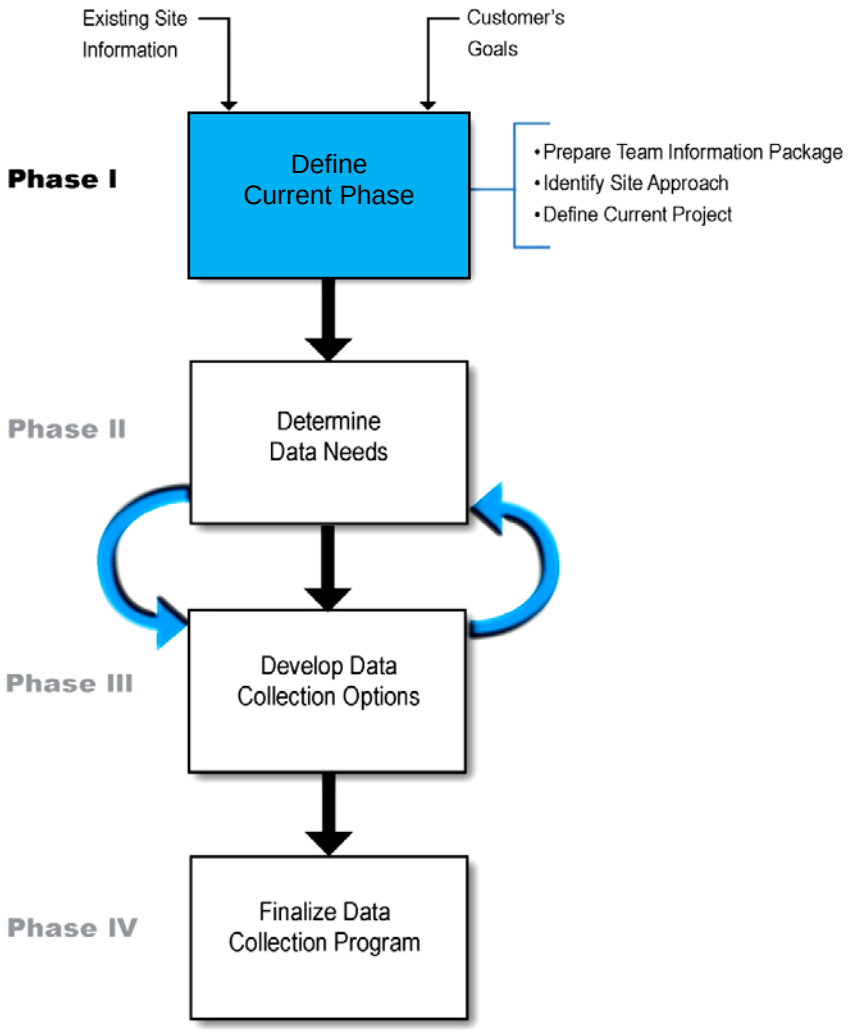

Figure 1-1. Phase I of Four-Phase Technical Project Planning Process

1.6.1. Identify Project Planning Team.

a. The TPP process requires a multi-disciplinary team of personnel to represent the planning perspectives of decision-making, data use, and data implementation. The project manager (PM) is responsible for ensuring that all perspectives are represented within the multi-disciplinary team of personnel. The PM should rely on the functional chiefs or department heads for assigning qualified members to project teams, keeping

commitments made in management plans, and ensuring technical processes produce the desired results (ER 5-1-11).

b. In general, several disciplines of technical personnel will collaborate to represent each of the data users and data implementers. For instance, a geophysicist, industrial hygienist, or chemist may support the risk, MEC hazard, compliance, or remedy data users, while also contributing to the sampling or analysis data implementer perspective. On small, relatively simple sites, personnel implementing the TPP process may perform multiple roles and support multiple perspectives.

> The project planning team concept emphasizes the need to have all appropriate technical disciplines, or someone/people representing a given discipline(s), assigned for each project. Even on small, relatively simple sites, the team should at least obtain input from each technical discipline during the project planning activities.

1.6.1.1. Decision Makers.

a. Key decision makers on projects are typically the customer and/or managers associated with a site. The customer, PM, regulators, and stakeholders each have specific interests in the outcome of site-related activities. Decision maker input should be included during all project planning activities, but is most critical during Phases I and IV. The concerns of decision makers should be introduced as early in the planning process as possible, but direct input is required during Phases I and IV.

b. The most important responsibility of the decision makers is to participate in the team's efforts to identify and document issues that require resolution to achieve site closure, i.e., the project objectives, during Phase I. Other responsibilities of the decision makers include contributing to the team's efforts to do the following:

(1) Define site closeout;

(2) Gather existing site information;

(3) Assist in identifying specific data needs required to make decisions;

(4) Assist the entire team in defining acceptable levels of uncertainty;

(5) Identify project constraints; and

(6) Document the current executable stage.

1.6.1.1.1. Customer. The customer is the person responsible for insuring work is completed at the site, range or facility and who represents the Federal agency or sponsor funding the project. The PM and technical personnel must always recognize and respect the customer as the primary decision maker for all site decisions and activities. Therefore, the customer is a key member of every team. The PM should

encourage the customer to participate throughout the project planning activities and understand relevant uncertainties associated with each project. It should be noted that the customer may represent several layers of a management chain in their Service or organization and may not have actual signature authority for site decisions.

1.6.1.1.2. Project Manager.

a. Within the project planning process, the PM is the decision maker responsible for leading the team's planning efforts, progressing towards site closeout, and meeting the customer's expectations.

b. Even in those instances where technical elements, contractors, or stake-holders significantly contribute to a project, the PM remains responsible for maximizing the use of the Technical Project Planning process. The PM's leadership role in the project planning process is most apparent during Phases I and IV. During Phases II and III, the PM should function more in a support role by responding to information needs of the technical personnel who are representing data user and data implementer perspectives.

c. The TPP process supports a PM's implementation of the following requirements of Engineer Regulation 5-1-11.

(1) PM is primary point of contact with the customer;

(2) PM manages project risks, project resources, data, commitments;

(3) PM provides leadership to a multi-discipline project team in accordance with the project-specific management plan developed by the PM, customer, and other team members;

(4) PM is responsible and accountable for successful completion and delivery of assigned project to customer within established costs, schedules, and quality parameters; and

(5) PM provides leadership to the multi-disciplinary project team with responsibility for assuring that a project stays focused on the customer's needs and expectations; and that the team takes effective, coordinated actions to deliver the completed project.

1.6.1.1.3. Regulators. Except for Non-NPL FUDS projects where USACE is the decision maker, federal, state, and local regulators are the decision makers who may have jurisdictional authority to directly affect site closeout. Regulators may specify standards, criteria, and guidance to be followed during site characterization and remediation. Regulators may also establish schedules under Federal Facility Agreements that can stipulate penalties for missed milestone dates. Regulators with possible jurisdictional authority should be included in project planning efforts to ensure efficient progress to site closeout. In particular, regulator input is critical during Phase I and portions of Phase IV. As deemed appropriate by the customer, regulators may also contribute during Phase II and Phase III of TPP activities.

1.6.1.1.4. Stakeholders. Stakeholders with interests in site activities and site closeout could include current property owners, Restoration Advisory Boards, and any number of other individuals or special interest groups (e.g., local land use planning authorities; city, state, and federal officials; the public). Concerns and ideas of stakeholders should be considered during TPP to contribute to efficient progress to site closeout, especially if these parties have the ability to affect site closure strategies and their successful implementation. Phase I of the TPP includes a deliberate effort to determine and consider community interests and the perspectives of stakeholders. A Phase IV activity encourages the preparation and distribution of fact sheets, when appropriate, for communicating the data collection program to interested parties including stakeholders. As deemed appropriate by the customer, various stakeholders may also participate during Phase II and Phase III efforts. Engineer Pamphlet (EP) 200-2-1 titled Public Participation Requirements for Defense Environmental Restoration Program provides information on public participation and should be consulted for further details regarding engagement of stakeholders and the public.

1.6.1.2. Data Users.

a. Data users are technical and other personnel responsible for engineering and scientific evaluations that are the basis for decisions. Engineering and scientific evaluations may also be necessary to inform the development of legal evaluations, analysis, and determinations by the Office of Counsel as provided below in subparagraph (4). Progress to site closeout requires collaborative involvement of many technical disciplines to represent these data user perspectives:

(1) Risk Data User (evaluates potential risks to human health and the environment; evaluates potential hazard posed by MEC and MC);

(2) Compliance Data User (evaluates, monitors, and coordinates with the Office of Counsel to ensure legal and regulatory compliance);

(3) Remedy Data User (identifies, designs, constructs, operates, and maintains site remediation systems, or remedies); and

(4) Responsibility Data User (otherwise known as the Office of Counsel shall focus on the customer's liability and apportionment of responsibility with other potentially responsible parties).

b. A given team member may lend expertise to, and represent more than one type of data use. Some of the technical disciplines for data users include chemists; engineers (i.e., chemical, civil, cost, environmental, electrical, geotechnical, and mechanical); geologists; geophysicists; industrial hygienists; regulatory specialists; risk assessment specialists; environmental resource specialists; and unexploded ordnance (UXO) safety specialists. Others supporting the data user include various scientific and office of counsel personnel. The nature and complexity of a project dictate the skills, technical disciplines, and personnel needed. Data user personnel on a given project participate throughout the project planning process, with their primary efforts occurring during Phase I and Phase II.

1.6.1.3. Data Implementers.

a. Data implementers are the technical personnel responsible for identifying sampling and analysis methods to satisfy the data users' data needs. Several technical disciplines may work together to adequately represent these data implementers during the planning process:

(1) Sampling Data Implementer (identifies appropriate sampling protocols); and

(2) Analysis Data Implementer (identifies appropriate analytical protocols).

b. Data implementers participate throughout the project planning process with their primary responsibilities occurring during Phase I and Phase III.

1.6.1.4. Team Selection.

a. For each site, the team should include the decision makers and the necessary technical personnel to represent all of the data users and data implementers. In some situations, the PM will need to go beyond in-house resources to obtain the technical personnel experienced or available for all aspects of the work. Technical support from other offices or contractors may be required to ensure all TPP team perspectives are represented for each site. The PM should consider at least the following when identifying technical resources needed for a project planning team:

(1) Technical specialists from various functional elements (e.g., planning, engineering, geophysics, geology, UXO safety, risk/hazard assessors, occupational safety and health, construction, operations, counsel, contracting) may be appropriate participants for a portion of the project planning activities;

(2) Real estate personnel should contribute when site efforts involve property not controlled by the customer; and

(3) The customer may want to assign some of their technical personnel to the team.

> After the team has identified the project scope by the end of Phase I, the PM should re-examine the size and capabilities of the project planning team and review both in-house and contractor support that will be required. Additional information on team selection for MMRP projects can be found in EM 200-1-15, and ER 200-3-1.

b. Under the leadership of the PM, all project planning efforts should be performed by in-house personnel or some combination of in-house and contractor personnel. Once roles and responsibilities are defined, the PM should determine and document the acquisition strategy(ies) for procuring any necessary contractor support. The documentation should include the rationale supporting the acquisition strategy(ies) and the project tasks, including the contractor's roles for further project planning that have not yet been assigned to either in-house or contractor personnel. Some

acquisition strategies (e.g., performance based) may require a larger role on the part of the contractor in project planning than others; this will be dependent on the phase the project is in when the work is contracted.

1.6.2. Identify Customer Goals.

a. Identifying customer goals is a critical and deliberate activity within the TPP process to ensure that the customer's expectations are understood from the start of the planning efforts. The team should be aware that customer goals may be defined by future land use at the site, regulatory compliance, the customer's schedule requirements, the customer's site budget, as well as other factors. The customer's goals should be identified for each site and then documented in the team information package. In order to meet or exceed the customer's expectations, the PM must then ensure that desired project activities, schedules, and budgets are consistent, and in accordance with all applicable regulations.

It is ultimately the PM's responsibility to understand and monitor the customer's goals and changing needs as additional site information becomes available. The PM is responsible for assessing these changing needs and their effect on project planning and execution.

1.6.2.1. Develop Site Closeout Statement. Site closeout is completing the "exit, or closeout strategy", or achieving the final condition of a site, based on the needs of the customer. Achieving site closure may include ongoing government activities such as operations/maintenance, land use restrictions and five year reviews. Development of the Site Closeout Strategy is discussed in Chapter 5 and is not the same as the site closeout statement. The Site Closeout Statement defines the path for all of the future project planning activities; and should be refined as more knowledge about the site is gained through investigation activities. The Closeout Strategy defines the activities that brings the Closeout Statement to fruition and typically is not developed during Phase I activities. Sites in early investigative phases will likely have a less refined or certain closeout statement than one nearing implementation of the selected remedy. The development of an effective site closeout statement involves the following considerations.

1.6.2.1.1. Future Land Use. Future land use assumptions allow site activities to be focused on developing practical and cost effective remedial alternatives consistent with the reasonably anticipated future land use (EPA 1995a). Although a customer may not have specific future use plans for a site, the PDT should at least narrow the range of potential future uses considered for a site and document them in the site closeout statement. In all instances, initial discussions with the customer should address anticipated future uses of a site and seek the customer, or land-owner's, concurrence regarding future use scenarios (e.g., residential development, landfill construction) that may be eliminated. It is important to recognize that future land use assumptions may be different at sites where a federal agency is seeking transfer of a property, or does

not, maintain control of the affected real estate. Final selection of a reasonable future land use will also require discussions with the customer, regulators, and stakeholders (i.e., local land use planning authorities; city, state, and federal officials; the public; and current property owners), as appropriate.

1.6.2.1.2. Regulatory Compliance. A site's current regulatory status (e.g., site/facility listed on National Priority List; Resource Conservation and Recovery Act (RCRA) permitted facility) is also critical to understanding a customer's concept of site closeout. The PM and technical personnel should determine if the customer is aware of any applicable regulatory programs or requirements and obtain copies of related regulatory correspondence such as a Federal Facility Agreement or a RCRA permit.

1.6.2.1.3. Interim Site Closeout Goals. If useful to the project team, an interim site closeout goal (e.g., operable unit closeout; installation of a remedial system; operation and maintenance of a system, installation of land use controls (LUCS)) may be identified. These interim closeout goals are only useful, however, if they are defined within the overall context of the customer's concept of final site closeout conditions.

1.6.2.2. Schedule Requirements. Effective project planning requires that the team knows all of the PM's short- and long-term schedule milestones to site closeout. The site approach must incorporate and fulfill the customer's schedule requirements and any changes to their requirements throughout the project activities.

1.6.2.3. Site Budget. Budget constraints must also be considered in project planning. In particular, the team needs to understand the customer's desired investment, phasing of funding availability, and the customer's perception of anticipated costs over time. The site approach must be developed within the customer's budget constraints. However, limitations on the scope of activities and potential impacts to site closeout should be communicated to the customer. If a customer's site budget changes, the changes need to be documented and then communicated to the project team.

1.6.2.4. Complete Site Closeout Statement.

a. Once input from the customer has been obtained on site closure, a final site closeout statement should be documented for reference throughout the life of the project. This site closure statement should be created with input from the entire PDT. A good definition of site closeout will focus efforts from the current site status and condition through any necessary remediation or removal activities, operation and maintenance, or long term monitoring/management efforts. It should allow the team to envision the environmental conditions and documentation requirements necessary for closeout. In some cases, more than one alternative may be identified as possible scenarios for site closeout. In that case, the site closeout statement may document all possible scenarios and refine them as necessary as more information is gathered about the site or as other factors impact site reuse options. Site closeout statements should

also be revised if the customer's vision for the site changes. A well prepared site closeout statement will increase project efficiency by ensuring:

(1) Constraints of schedule and budget are clearly articulated;

(2) The team can visualize the physical appearance of the site at closeout;

(3) Uncertainties in site closeout options can be identified and resolution strategies created;

(4) Team members can identify what actions are required to achieve site closeout;

(5) Phasing and timing constraints associated with site closeout are understood;

(6) The customers' intent for operation and maintenance and monitoring are clear; and

(7) When updated information regarding site conditions suggest that site closure may not be achievable using the current site closure strategy.

b. As site knowledge increases and the site progresses past investigation stages toward site closeout, the project team should develop the site closeout statement into a "closeout strategy". This is described in more detail in Chapter 5 of this document and in Interstate Technology and Regulatory Council (ITRC) 2007.

1.6.3. Gather Existing Site Information. Identify existing site information and gather the most pertinent data. Appendix D provides a worksheet for listing any preliminary site information needs identified during this project planning activity. Existing site information should be compiled and included within the team information package and also become part of the permanent project file. Not all of the following activities described below will be conducted as it is dependent upon the stage of site activities, availability of site information from electronic sources and/or existing project files and the team's experience at the site.

1.6.3.1. Conduct Preliminary Site Visit. Depending on site access, technical personnel should conduct a preliminary site visit to identify all potential sources of site information. Current and historical photographs of site conditions and operations should be obtained. It may also be beneficial to videotape the site and specific features. Preliminary site visits may be used to obtain site maps or drawings that depict critical site features (e.g., historical land use, buildings, tanks, topography, range and maneuver areas, range fans, firing points, surface water bodies, property lines, site access, existing well locations, disposal/storage/staging areas, and treatment systems) if not already available to the team. In addition, site features relevant to the types of sampling activities should be recorded. These would include presence and type of pavement, overhead utilities, buildings, indications of subsurface utilities, vegetation, slope and other site features that could prevent equipment access and pose constraints regarding sampling or team access.

1.6.3.2. Gather Site Data and Reports.

a. So that redundant data are not collected, determine and gather all existing site data and reports for reference and use by the team. Some of the most pertinent data includes:

(1) Site maps;

(2) Site and aerial photographs;

(3) Historical ownership and site use information;

(4) Regulatory status of the site and facility;

(5) Information regarding past munitions use;

(6) Facility or site-related geology;

(7) Hydrogeology, hydrology, climatology, ecology, and demographic information;

(8) Current and future land use information about areas adjacent to the site;

(9) Results and reports of previous site studies or investigations;

(10) Data quality control data (e.g., method blanks and duplicates), data usability information or evaluations, and any supporting data packages (partial or complete); and

(11) Known or potential influences of other nearby sites.

b. In addition to the above information, sites with potential MEC should obtain the following information, if available:

(1) Ground and aerial photographs with detail military photogrammetric analysis;

(2) Geophysical or light detection and ranging (LIDAR) data;

(3) Information and maps with location of ranges, firing points, impact areas, targets, maneuver areas, burial pits;

(4) Possible training activities and types of MEC used; and

(5) MC associated with potential MEC.

1.6.3.3. Obtain Operations Records. Obtain historical operations records about the facility or site to understand site features and possible sources of contamination. The method of release based on site use should also be developed to help provide further understanding of the heterogeneity in distribution of chemicals of potential concern which assist in determining appropriate decision units for managing contaminants. The method of release, or the release mechanism, is also a consideration for sites containing MEC (e.g., fired, hand emplaced, detonated), which can provide information on MEC distribution and depth.

1.6.3.4. Collect Background Literature. Collect background literature and obtain other general information (e.g., regional geology and hydrogeology; upstream and downstream National Pollutant Discharge Elimination System effluent information; and local newspaper accounts) for use by the team as necessary. Investigations on other nearby sites can often be a source of relevant data.

1.6.3.5. Conduct Site History Interviews. Discussions with former and current employees about previous operations and waste handling should be planned with input from the responsibility data user. Employees and personnel interviewed may include individuals involved with site operations, range use, permitting, previous investigations, or environmental and engineering personnel associated with the facility or site. This should include all users of the property, current and past, with the potential for contaminant releases or potential for MEC. It is also crucial for the responsibility user to be involved to assure proper documentation is prepared and any related substantiation is considered.

1.7. Identify Site Approach.

a. Efforts to identify a site approach involve development of an overall strategy for managing a site from its current condition to the desired site closeout condition. These TPP efforts are critical because evolving schedule, financial, political, and other constraints affect site activities from site identification through site closeout. Without a planned site approach, the following situations can occur:

(1) Data collection plans are modified as a short-term solution to urgent constraints, but may not yield data of the sufficient type, quality, or quantity to enable site or project decisions to be made at required times; and

(2) A team will not be able to determine the impacts of modifying current project plans in the context of the entire site. This can result in site closeout delays when subsequent site activities deviate from those originally envisioned.

b. By performing the following project planning activities, the team can identify a site approach and be better prepared to manage and consider the effects of outside constraints and proposed changes to data collection programs. In addition, by communicating and documenting proposed activities and decisions to be made, the team will have a common understanding of requirements when considering the data collection or work design, strategies, and the end use of products with respect to:

(1) Addressing the concerns of customers, suppliers, and relevant technical experts for products, services, and activities, thus minimizing the possibility of repeating work because of inappropriate or inadequate project implementation;

(2) Facilitating the application of promising innovative technology by reconciling technology capabilities with site-specific considerations;

(3) Identifying contractual mechanisms that facilitate the use of dynamic work (see paragraph 3.2.2.2.5 and ITRC 2007) and performance based strategies; and

(4) Identifying and planning contingencies for innovative technologies and approaches

c. A Phase I Planning Memo (worksheet provided in Appendix D), or a series of specific project planning memoranda, should be prepared to document these critical elements of a site approach:

(1) Preliminary Conceptual Site Model;

(2) Project Objectives (worksheet provided in Appendix D);

(3) Stakeholder Perspectives;

(4) Probable Remedies;

(5) Executable Stages to Site Closeout; and

(6) Work strategy and decision logic that leads to Site Closeout.

1.7.1. Evaluate Site Information and Data. The PM should rely on individual technical personnel to evaluate the quality, reliability, and usability of existing site information and data. Their evaluation should result in the development of a preliminary CSM and the identification of site boundaries and potential regulatory points of compliance.

1.7.1.1. Review Site Information and Data. Individual team members should be tasked to review all of the existing site information and data for the site. Of particular interest during this review are the site's physical characteristics; location and characteristics of potential MEC; the physical and chemical characteristics of the potential contaminants of interest; the likely transport pathways; and receptors and exposure pathways. As these team members begin their review efforts, the PM should clearly communicate the allotted time for conducting this preliminary review of the existing information and data. More exhaustive review and use of the data will begin during Phase II of the project planning process as technical personnel begin to determine the additional data needed at a site. These review efforts should only be preliminary and must be focused to help the team identify the site approach and the current project as described within Phase I of the project planning process.

1.7.1.1.1. Site Physical Characteristics. Those responsible for preliminary data review should become familiar with the physical characteristics of the site (e.g., topographic relief, geologic and hydrogeologic features) and evaluate possible access limitations; proximity of source areas to the ground surface, groundwater, and surface water features; and proximity of a site's source area(s) to other known or potential source areas. For sites with potential MEC, the data review will include information regarding the location of MEC, aerial extent, density, and depth. Visual conceptualization of this information may involve site visits and review of site information (e.g., historic records searches, topographic maps, aerial photographs, geologic cross-sections, well installation logs, soil boring logs, soil classification data,

water quality information, geophysical data, and previous site sampling or investigation reports).

1.7.1.1.2. Physical and Chemical Characteristics of Contaminants of Interest. A preliminary data review and understanding of historical use should be used to determine known and likely contaminants of interest. The team should consider the physical and chemical characteristics of contaminants of interest. Knowledge of the chemical characteristics will provide insight into their behavior in the environment and their affinity to, or solubility in, media at the site. Information such as solubility, retardation constants, Henry's Law constants, vapor pressure, and molecular weight can be used in conjunction with an understanding of the site's physical features to understand behavior of chemicals (e.g., transport, degradation, persistence) in site media. Variation in detected contamination concentrations should also be noted to preclude invalid assumptions about site contaminant homogeneity.

1.7.1.1.3 Characteristics of MEC and Training Activities. At sites with suspected MEC, the preliminary data review must consider the type of munitions that may have been used at the site and their characteristics (e.g. sensitivity, explosive filler). The type of range activities that took place there can also provide information on MEC distribution. This information is necessary to determine safety hazards that may constrain investigative activities and also to determine further data needs regarding MEC.

1.7.1.1.4 Transport Pathways. Potential transport pathways should be evaluated. This evaluation will use information regarding known and suspected source areas, potential release mechanisms, site characteristics, data from previous studies, and chemical and/or physical characteristics, to predict possible contaminant or MEC transport within various media in the environment. Typical transport pathways could include air emissions, soil erosion, storm water runoff, sediment deposition, leaching into groundwater and groundwater recharge into surface water. Typical transport pathways for MEC include erosion, frost heave, storm water runoff, and tidal influence. At this point in the project planning process, review personnel may find it useful to identify contaminant transport models which might be appropriate for evaluating transport features at a site.

1.7.1.2. Develop Conceptual Site Model.

a. The CSM is a description of a site and its environment that is based on existing knowledge. The CSM serves as a planning instrument, a modeling and data interpretation aid, and a communication device among the team.

b. The preliminary review efforts must be sufficient for technical personnel to develop a preliminary CSM for a site that will be modified as more data is collected to better characterize the site. A CSM is narrative or pictorial information that is known about the site. It includes a description of the sources of MEC, MC or HTRW; site boundaries; complete, potentially complete, or incomplete exposure pathways; current

or reasonable proposed use of the property, potential receptors, site compliance conditions, potential removal or remedial actions, or potential contributions to a site by other potentially responsible parties; and the biological, physical, and chemical processes that affect contaminant or MEC transport. It is a critical tool in project planning, and should be used throughout the project lifecycle and iteratively revised. The CSM is a means to summarize and display what is known about the site and provides a platform upon which to develop a common understanding of the site amongst project team members as well as other stakeholders.

c. USACE EM 200-1-12, Conceptual Site Models for Environmental and Munitions Projects is the USACE guide for developing CSMs. This document recommends categorizing information necessary to develop the CSM into five different profiles:

(1) Facility Profile—describes man-made features and potential sources at or near the site.

(2) Physical Profile—describes factors that may affect release, fate and transport, and access.

(3) Release Profile—describes the movement and extent of contaminants and/or MEC in the environment.

(4) Land Use and Exposure Profile—provides information used to identify and evaluate the applicable exposure scenarios, receptors, and receptor locations.

CSM development is an ***iterative process*** that reflects the progress of activities at a site from initial assessment through site closeout. The CSM is refined as more data is gathered and the team's understanding of the site evolves to help focus objectives throughout the life of the project.

(5) Ecological Profile—describes the natural habitats of the site and ecological receptors in those areas.

d. A preliminary CSM is used by a team as a simple model of the relationships between chemicals, and/or MEC and MC potentially located at a site and access to them by site receptors. As more information is gained through data collection the CSM is refined through the course of the project to reflect site knowledge and uncertainties. For example, the preliminary CSM is useful to identify data gaps to focus site data collection efforts, but a refined CSM in later project stages would document results of a remedial investigation (RI) and assist in finalizing a remedial strategy and long term management actions.

e. It should be evident that each distinct source area, interaction, and receptor will form a separate exposure pathway. A typical site will have numerous exposure pathways that will require further evaluation by the team. As the team works to identify the site approach and current project scope, the technical personnel should evaluate what is known about potentially complete and incomplete exposure pathways at a site. An exposure pathway requires that the following elements are present (U.S.

Environmental Protection Agency (USEPA), 1989: a source and mechanism for chemical release; an environmental transport/exposure medium; a receptor exposure point; and a receptor and a likely route of exposure at the exposure point. If any of the four elements are missing, the pathway is not complete and likely needs no further evaluation. Those exposure pathways known, or suspected, to be complete need to be represented for the team to efficiently proceed with Phase I of the project planning activities.

1.7.1.2.1 Identify Site Boundaries. During the preparation of the CSM, the boundaries of the site should be determined. The site boundary for a study may not be the same as the boundary of the property where the site is located. It may be contained within the property or extend beyond the property. Regulatory points of compliance (if any) should also be determined to the extent possible. Points of compliance may be aligned with site or property boundaries. For groundwater, points of compliance may include a surface water discharge point or a drinking water well for example.

1.7.1.2.2 Designate Media of Potential Concern. As part of the preliminary CSM, the media of potential concern should be apparent. Those site media directly affected by site contaminants or munitions, as well as the transport media and any exposure media, should each be designated as media of potential concern at a site. Knowledge of at least some of the potential media of concern at a site will help the team remain focused throughout the balance of Phase I activities.

1.7.2. Identify and Document Project Objectives.

a. Project objectives are the short- and long-term site issues to be addressed and resolved at a site to achieve site closure as defined by the team. As discussed in Section 1.6.2.1, the Site Closeout Statement documents the overarching goal(s) for the site, project objectives serve as the means to achieve site closeout. Satisfying or resolving the project objectives, based on the underlying regulations or site decisions, are the purpose of all site activities. Project objectives must be documented to focus the team's thinking toward a specific set of concerns that can be addressed through the planning and completion of an executable stage(s) at a site. The objectives should be written in such a way that measurable success criteria (cost, schedule, technical, and quality) are apparent. As most project objectives are a consequence of the governing statutes and regulations, identifying and documenting the objectives for a site should be relatively straightforward. However, customer and regulator concurrence on the objectives is critical. Appendix D provides a worksheet for documenting and managing project objectives during the planning process.

b. Effective planning can only be accomplished when the regulatory requirements are known and understood by the team. Regulatory requirements serve to establish a framework for site activities. Any legally binding agreements (e.g., Interagency Agreements, site orders, permits); applicable or relevant and appropriate requirements; and mandatory schedule compliance dates should be identified and reviewed by the Office of Counsel to establish the direction of proposed site activities. Within the

context of the Technical Project Planning process, the legal and regulatory requirements applicable to a site should be clearly identified as project objectives. Project objectives identified by the team should include only the specific and detailed objectives that must be satisfied in order to progress toward and ultimately reach site closeout.

c. A project planning team will likely identify and document multiple basic project objectives associated with the current executable stage of site activities as well as several optimum project objectives associated with future executable stages. Optimum project objectives will typically be more general than the specific details documented within basic project objectives for a site.

1.7.2.1. Regulatory Framework.

a. The primary legal framework under which most HTRW and MR site activities will be conducted will be the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, commonly referred to as Superfund), as amended by the Superfund Amendments and Reauthorization Act, and/or the Resource Conservation and Recovery Act (RCRA). Although CERCLA and RCRA contain similarities, data and documentation requirements are different. It is imperative that the team consult with the Office of Counsel to understand which of these laws, or which other laws (e.g., Underground Storage Tank, Toxic Substances Control Act, or State RCRA), will govern site activities to ensure that appropriate requirements are considered.

b. The team shall consult with the Office of Counsel to understand the procedural requirements of the governing laws and applicable promulgated regulations . Just a few specific examples of the detailed project objectives imposed by some portions of CERCLA include the following:

(1) Eliminate from further consideration those releases that pose no significant threat to public health or the environment, 40 CFR 300.420(c)(I);

(2) Determine the general characteristics of the waste, including quantities, state, concentration, toxicity, propensity to bioaccumulate, persistence, and mobility, 40 CFR 300.430(d)(2)(iii);

(3) Determine applicable or relevant and appropriate requirements, 40 CFR 300.400(g); and

(4) Evaluate the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site, 40 CFR 300.430(e)(9)(iii)(D).

c. Some states also have authority over (i.e., can implement and enforce) certain federal requirements, such as hazardous waste management under RCRA. In those instances when state programs have more stringent requirements than the federal program, state-specific project objectives should be defined and documented to ensure

the appropriate regulations are satisfied. Legal counsel personnel must be consulted to determine the extent of state authority.

d. The MMRP, which is implemented under the Defense Environmental Restoration Program (DERP), follows the processes outlined in CERCLA and the National Contingency Plan (NCP). While the DoD prefers to conduct the MMRP under CERCLA, some installations may be required to address an MRS under the RCRA Corrective Action process.

e. In those instances when a state has implementation and enforcement authority for the site's regulatory program(s), the team will need to determine the standards, criteria, and guidance that are required by the applicable state program. In these situations, the team should define and document the project objectives to ensure the state's requirements are satisfied for the applicable program.

1.7.2.2. Other Regulatory Programs.

a. Other regulatory requirements that may need to be met include federal, state, or local regulations, and performance criteria or standards to be met during the current or future executable stages. These other regulatory requirements can dictate that data be collected to perform engineering, scientific, or legal evaluations.

b. Project objectives associated with other regulatory programs are also found in the CFR or other regulatory statutes. A few examples of specific project objectives that are detailed in various secondary regulatory statutes include:

(1) Clean Air Act: Determine the specific requirements for handling asbestos during demolition of structures containing asbestos, 40 CFR 61.145(a);

(2) Clean Water Act: Determine required effluent standards for polychlorinated biphenyls for site remedial action waste wate*r*, 40 CFR 129.105; and

(3) Safe Drinking Water Act: Determine maximum contaminant levels for inorganic contaminants in groundwater, 40 CFR 141.11.

c. As with the primary regulatory framework, states may have authority over other federal regulatory programs. Therefore, the team needs to be aware of the potential for additional project objectives beyond federal requirements.

1.7.2.3. Other Project Objectives.

a. Project objectives beyond the primary regulatory framework and other regulatory programs must also be identified and documented to ensure that all issues and requirements are addressed for a project.

If the TPP process is initiated during the execution of an ongoing project, it is essential for the team to identify and document project-specific objectives to focus subsequent activities.

b. If a customer wants site activities that supplement those associated with the administrative requirements of the regulatory framework or other regulatory programs, the PM and technical personnel should manage the customer needs by designating specific project objectives for the supplemental activities.

c. Some data users may also determine that specific project objectives are needed for some aspects of the work. For example:

(1) Site-specific needs for ecological or human health risk assessment, not addressed in sufficient detail by current regulatory programs or guidance, may necessitate that additional project objectives be identified and documented;

(2) Remedy-specific project objectives may be appropriate and useful for evaluating the suitability of natural attenuation at a site due to the site-specific parameters that would need to be investigated and considered in the design;

(3) Industry-wide initiatives to identify, collect, and evaluate cost and performance data related to the construction, operation, maintenance, and monitoring of a remedial technology; and

(4) Legal counsel efforts to develop a customer's position and litigate apportionment with other potentially responsible parties at a site (ER 200-3-1) and requirements for data that may need to be met on site. These legal considerations may result in unique project objectives for each element of responsibility determination. For example, position development for a customer may require a detailed search of ownership records or waste disposal data associated with another entity.

1.7.3 Identify Executable Stages to Site Closeout.

a. All possible executable stages to site closeout should be identified by the team. The scope of an executable stage can be thought of as the site activities scheduled to occur between milestones along the critical path timeline of site activities. Executable stages should be designated from the unfulfilled administrative requirements of the primary regulatory framework (e.g., CERCLA, RCRA) and other regulatory programs as necessary (e.g., Clean Water Act, Clean Air Act). Agreements, permits, and orders should also be reviewed as they may include requirements for particular work items or data compilations, as well as consultation and schedule obligations. The team must also identify the project objectives that correspond to each executable stage through site closeout.

b. Depending on the size and complexity of the site, several executable stages may be necessary and appropriate to proceed from the current site status and condition to site closeout. Only after all executable stages for a site have been identified can the team identify the current project for completing the first executable stage of site activities.

1.7.4. Seek Regulator and Stakeholder Input. The customer, with support of the PM and the technical or legal personnel as required, should solicit input from both the regulators and stakeholders during the project planning process to ensure their needs and concerns are understood. Both the site approach and current project should consider regulator and stakeholder needs that exist at a site. Stakeholder input may be more difficult to obtain but should be sought to the extent possible.

> Even if a customer only requests services for a single executable stage, it is appropriate to identify all executable stages and corresponding project objectives through site closeout. With knowledge of at least some future project objectives, the team may be able to offer the customer some significant cost savings by meeting data needs of subsequent executable stages when their collection can be cost effective and a good business decision for the customer.

1.7.4.1. Regulator Input. After determining the regulatory framework, other applicable regulatory requirements, and all related project objectives, the needs or concerns of the regulators should be obtained regarding these decisions and the related project objectives. Regulators, as possible decision makers who affect progress to site closeout, must be consulted to gain their participation in the project planning process and to understand and consider their expectations relative to a site. Efforts to obtain regulator input should not be taken lightly or overlooked. Well planned and timely meetings with the regulators early in the process will contribute to the success of the planned project and the efficiency of progress to site closeout.

1.7.4.2. Determine Community Stakeholder Concerns. Determine the status of any current or former community interest associated with the site. Community interest input can contribute to project success and efficient progress to site closeout.

1.7.5. Define Probable Remedies.

a. If a site is still in an investigation stage, probable remedies should be defined so the overall site approach is consistent with the most likely remedial alternative should remedial actions be necessary. Whenever possible, the team should consider specific remediation technologies (e.g., soil vapor extraction, landfill cover, MEC removal action) that may be applicable to a site if remediation is necessary. However, in some instances, the team will only be able to consider a general type or category of remedial technologies (e.g., containment, collection and removal, soil treatment) when available site information and environmental data is limited.

b. When defining probable remedies for a site, the team should consider both presumptive remedies, innovative technologies as well as green and sustainable remediation practices that may be suitable for site conditions.

1.7.5.1. Presumptive Remedies.

a. Presumptive remedies are preferred technologies for common categories of sites, based on remedy selection and implementation experience. The team will find that a suitable presumptive remedy can do the following:

(1) Accelerate the planning process;

(2) Provide consistency in remedy selection;

(3) Reduce the remediation schedule and expenditures; and

(4) Achieve earlier site closeout.

b. Note that the team's consideration of a presumptive remedy should not preclude their consideration of an innovative technology, should an innovative technology prove to be as effective or superior to a presumptive remedy.

1.7.5.2. Innovative Technologies. As stated in Section 300.430(a)(1)(iii)(E) of the National Contingency Plan, USEPA expects to consider the use of innovative technology when such technology offers the potential for comparable or superior treatment performance or implementability, fewer or lesser adverse impacts than other available approaches, or lower costs for similar levels of performance than demonstrated technologies. Therefore, it is important that utilization of innovative technologies be considered for both site characterization and remediation during planning efforts. Numerous sources of innovative technology are available and a team should seek input from several technical sources regarding application experience with specific innovative technologies that may be viable for a site.

1.7.5.3. Green and Sustainable Remediation (GSR) Practices.

a. Pursuant to the DERP Manual (USD (AT&L) 2012), GSR expands on DoD's current environmental practices and employs strategies for environmental restoration that:

(1) Use natural resources and energy efficiently;

(2) Reduce negative impacts on the environment;

(3) Minimize or eliminate pollution at its source; and

(4) Reduce waste to the greatest extent possible.

b. In all phases of remediation, including planning and site investigation, the DERP Manual instructs DoD Components to consider and implement GSR

opportunities “when feasible” and ensure the use of GSR remediation practices “where practicable based on economic and social benefits as well as costs”. The Army document Detailed Approach for Performing Green and Sustainable Remediation (GSR) Evaluations in Army Environmental Remediation (Army 2012) includes a methodology as well as specific instructions to consider and implement GSR opportunities per the DERP Manual.

1.8. Define Current Project.

a. After developing the overall approach for managing a site from its current condition to the desired site closeout condition, a team can work to define the current project for a site. By identifying the current project, a team can formulate a detailed strategy for completing the current executable stage of site activities. Definition of a current project will also focus team efforts during TPP Phases II, III, and IV.

b. Due to the inherent complexity of identifying the current project, the PM and technical personnel must obtain input from the customer, regulators, and other stakeholders as appropriate. The PM should consider leading some working team meetings as a means of promoting concurrence among the decision makers.

1.8.1. Recognize Site Constraints, Uncertainties, and Dependencies. Existing site information should be reviewed to identify site constraints and dependencies that may affect project planning, execution and the overall site approach. Once the project objectives are defined, decision uncertainty can also be developed with respect to these objectives in the context of achieving site closeout. As uncertainties are identified they should optimally be described in terms that allow it to be resolved and prioritized so that meaningful answers can be obtained. In particular, problems or constraints discovered during preceding work at the site should be identified. These efforts should at least include consideration of administrative, technical, legal and regulatory issues.

1.8.1.1. Administrative Constraints and Dependencies.

a. The PM should identify any constraints, including funding, or dependencies associated with differences between the anticipated level and duration of efforts required to satisfy the project objectives and the availability of various technical personnel on the team. Project execution options should be developed in line with funding obligations and within all funding limitations.

b. The team should consider whether site investigations or subsequent remedial actions will require access agreements, real estate easements, or acquisition of property. In instances where offsite contamination is known or suspected, the team will want to carefully research real estate acquisition needs. The team should recognize that site constraints and dependencies may be associated with the legal documents used for real estate access agreements, temporary easements, and property acquisition. For example, specific-use purposes established within a temporary permit

should be recognized as site constraints and dependencies during project planning efforts.

c. In those instances when other potentially responsible parties may be involved, the PM must specifically request that legal counsel personnel identify which work may be performed at a site. Legal counsel will direct the team through any legal determinations of liability, defenses, and allocation requirements per ER 200-3-1 .

d. For some sites, there is uncertainty about the future land use. These uncertainties should be discussed in light of project activity. Attempts should be made to incorporate these uncertainties in project design, as appropriate.

1.8.1.2. Technical Constraints, Uncertainties and Dependencies.

a. Each member of the team should consider technical aspects of site activities that could affect project execution. Unanticipated technical constraints and dependencies may result in ineffective data collection programs, misrepresentation of site conditions, and actions that are unsuccessful or even unnecessary.

b. The team should be proactive in its efforts to identify any ordnance and explosive and occupational health and safety issues or concerns that present constraint or dependency relationships related to a site (ER 385-1-92). For example, site investigation and remediation activities will require both medical monitoring and health and safety planning prior to all site activities. Occupational health and safety standards must also be addressed in design of site remediation systems to ensure worker safety during both construction and operation and maintenance activities at a site.

Involve occupational health and safety personnel and on MEC projects, involve UXO safety personnel to assure that any related technical constraints are identified and to properly develop and implement site safety and health plans for site activities.

c. Examples of other technical considerations that may enable the team to identify site constraints or dependencies include the following.

(1) Physical considerations would include geographic location; site geology and topography; regional climatology; locations of buildings, structures, pavements, underground or overhead utilities, and streams or ponds; slope stability within a trench or excavation; site access or security restrictions; vegetation; on-going site activities; and neighboring property uses.

(2) Temporal considerations may present several climate-related constraints at a site that experiences significant seasonal variations in weather conditions. For example, extensive surface water sampling would be difficult if typical winter weather results in frozen streams or ponds; subsurface MEC investigation or removal is more difficult in winter if the ground is frozen or snow covered; biota sampling during a

habitat-stressed low flow condition would not be representative of typical site conditions.

(3) Constraints related to spatial considerations range from issues such as deep groundwater sampling cannot be performed until a deep well is installed, to identifying the presence and location of MEC prior to intrusive site activities within areas known or suspected to have MEC.

(4) Chemical considerations would include the presence of radioactivity; presence or history of chemical agent testing or disposal; presence of volatile organic chemicals; known or suspected accumulation of methane in a landfill; and oxygen deficiency or hydrogen cyanide accumulation in sanitary and storm sewers.

(5) Field sampling considerations would include efforts to prevent cross-contamination or the creation of a new contaminant transport pathway; compliance with height or lighting restrictions within flight line areas; sampling effectiveness limited by depth or subsurface geology; vehicle access needs when using some direct push techniques; installation of temporary electrical service to support a mobile laboratory; and the need to earn regulator agreement for using appropriate field screening and field analytical methods.

(6) Analytical considerations might include the potential for matrix interferences; sample shipment measures required to meet holding times; laboratory services needed to perform the desired analytical protocols; and the data validation procedures to be employed.

(7) Timely and proper management of investigation derived wastes must be a constraint and dependency consideration on every site that involves intrusive sampling or remediation activities.

d. Examples of technical considerations that could lead to the identification of project uncertainties are listed below. Often, these uncertainties are not discovered until the field effort has begun. However, the team should evaluate the likelihood of these uncertainties occurring and include methods for resolving these issues that will not impact the overall project schedule:

(1) Contaminant and media heterogeneity in space and time. Review of the initial CSM should provide some information regarding the expected heterogeneity of contaminants in the medias of concern. However, sampling should be designed to verify the assumptions made in the CSM. QC sampling in the forms of precision samples, field replicates can often help provide clarity on spatial uncertainty. Temporal uncertainties can occur based on seasonal or other pathway changes.

(2) Whether risk/hazard pathways are complete. The initial CSM provides the first picture of what pathways are complete. However, there may be uncertainties regarding if other pathways are complete. In addition other pathways may be identified as likely based on results of field sampling and investigation.

(3) Success of field investigation and remedial techniques. Initial selection of techniques may not work in terms of achieving project objectives. As examples, drilling techniques may not achieve the depth required, or the selected remedial technology may not perform as expected. Performance metrics should be established for these techniques so that it can be identified if they are not performing as required.

1.8.1.3. Legal and Regulatory Milestones and Requirements. Legal counsel and a regulatory specialist, either on the team as compliance data users, or supporting the team, should identify site constraints and dependencies related to legal and regulatory milestones and requirements. The most significant regulatory constraints and dependencies will typically involve the primary regulatory process for a site; the applicable or relevant and appropriate requirements; and any agreement, permit, orders, or record of a notice of violation. Schedules and compliance dates established within RCRA permits, and other types of compliance agreements; as well as state-specific regulations and guidance; must also be considered when identifying a site's regulatory milestones and requirements. The team must be sure to review any agreements, permits, or orders as they may include requirements for particular work items or technical evaluations, as well as consultation and schedule obligations.

1.8.2. Define Courses of Action for Achieving Site Closeout.

a. At this step in the project planning process, the team may find a brainstorming meeting very useful for defining options for achieving site closeout. Questions to be discussed could include:

(1) Does this project have linkages with other planned, on-going, or completed projects on site? If so, what are those linkages and how do they impact site closeout approach?

(2) How may a dynamic work strategy be implemented using real-time techniques to address data gaps?

(3) Within the defined executable stages, what is the logical sequence of activities to address data gaps in an efficient manner?

(4) Is there a way to compress activities or combine executable stages required to achieve site closeout strategy?

b. Although the discussions that follow provide examples of typical project execution options, it is important to recognize that several options to achieve site closeout may be combined into a single executable stage. For example, it may be beneficial to simultaneously start investigation and remediation activities at a site. In these instances, two options for achieving site closeout (i.e., investigation and removal action activities) are combined into a single executable stage of site activities. Efforts to define project execution options should consider at least these following typical project execution options.

1.8.2.1. Operable Units, Exposure Areas. Munitions Response Areas and Munitions Response Sites. Designation of operable units, exposure areas and munitions response areas (MRA) or MRSs at a project location can be very useful for managing a complex site. Operable units are typically associated with suspected source areas or affected media at a site. Exposure areas are typically areas at or adjacent to a site that include a related group of exposure pathways, involve a common receptor, and can be easily identified on the preliminary CSM. An MRA is any area on a defense site or a FUDS that is known or suspected to contain MEC, such as former ranges and munitions burial areas. An MRS is a discrete location within an MRA that is known to require a munitions response. The team's designation of operable units or exposure areas or MRSs will typically promote more focused site activities and accelerate progress to site closeout for both the operable units or exposure areas and an entire site.

1.8.2.2. Expedited Removal. Given that significant volumes of data now exist at many sites, expedited removal is another execution option that warrants serious consideration. Removal actions (time critical or non-time critical) and interim remedial actions, or interim corrective measures, can be taken anytime (but typically prior to signature of the decision document) during the CERCLA or RCRA process. Removal activities include source reduction or removal (e.g., removal of contaminated soil or MEC); access control (e.g., capping, fencing); provision for an alternative water supply; or even temporary relocation of residents. Regulator participation in both considering and planning removal actions, interim remedial actions, and interim corrective actions is critical during project planning efforts. Additional guidance on conducting removal actions under the MMRP are contained within EM 200-1-15.

1.8.2.3. Phasing (Series or Parallel).

a. A common project execution option to be considered by the team is phasing site activities concurrently or consecutively. Each stage of project execution, whether planned in series or parallel, corresponds to several specific project objectives selected for each executable stage. Multiple phases can also be combined or conducted in parallel if the team believes that it can satisfy the project objectives of multiple project phases during a single executable stage. Parallel phasing of project activities involves planning for concurrent activities at a site. For example, a team may consider a removal action concurrent with remedial investigation sampling.

b. When considering phasing options for the site the team should consider the types of decisions that would be used to determine different courses of action and document the decision logic; this is also known as a Dynamic Work Strategy and is described in paragraph 3.2.2.2.5; flowcharts are very useful for this documentation and examples are presented in Appendix D and for MR sites in EM 200-1-15.

1.8.2.4. Field Screening and Field Analytical Methods.

a. Field screening and field analytical methods can be a useful tool to characterize site contaminants while reducing analytical costs. The team could plan to conduct

some field screening activities concurrent with project planning efforts during Phases I, II, or III to refine their understanding of a site prior to design of a data collection program for the current executable stage of site activities.

b. The Triad approach is one execution option that merits consideration during the planning process. This is also known as the Expedited Site Characterization approach (ASTM Standard D6235-04). Use of a Triad approach utilizes in-field decision making, dynamic work plans, and real-time data acquisition and interpretation. Triad expects a multi-disciplinary team to plan a data collection program and then the same key personnel implement the program in the field. Dynamic field work approaches can only be successful if the entire team agrees with the plans and the plans include when and how communications will occur between field personnel and the customer, regulators, and stakeholders, as appropriate. Additional information on the Triad approach is available at: http://www.triadcentral.org/

All options for achieving site closeout should be designed using the Technical Project Planning process and cannot be conducted without complete documentation of the planning efforts. In addition, it is likely that more than one type of approach can be combined to maximize project effectiveness.

1.8.3. Document Current Executable Stage.

a. Within the project planning process, the current project that the team focuses on consists of at least the first executable stage of site activities and the corresponding project objectives. In order to select project objectives for the current project, each project objective must first be correlated with an executable stage of planned site activities (see Project Objectives Worksheet provided in Appendix D). Project objectives should be listed in chronological order and then grouped in relation to desired executable stages of site activities. The team should designate project objectives for each executable stage by grouping them so that they can be achieved within site constraints and dependencies. By grouping project objectives relative to executable stages of site activities, the team will understand the sequence and timing of project objectives to be satisfied through site closeout.

b. Once the team has selected project objectives for the first executable stage, they have completed identification of the current project and can document the current executable stage by listing the corresponding project objectives as the basic project objectives. The team should document the current executable stage by renumbering all project objectives to represent the planned sequence as well as clearly differentiate between those project objectives associated with current and future executable stages at the site. The project objectives associated with future executable stages are classified as the optimum project objectives. Project objectives that do not lead to site closeout are classified as unassociated, unless clarified and then adequately related to either the current or future executable stages.

c. In all instances, obtaining the customer's and regulators' concurrence on all project objectives is critical before proceeding with planning activities.

d. Efforts to document the current executable stage of site activities may be iterative. As a team works to sequence and group the project objectives, it may need to further refine the project objectives and possibly identify additional project-specific objectives to ensure that all issues are addressed during the project.

> The current executable stage of site activities may involve satisfying many project objectives. Future executable stages will typically involve satisfying optimum project objectives that are more general than those documented as basic project objectives for a site.

1.9. Complete Phase I Activities.

1.9.1. Finalize Acquisition Strategy.

a. If an acquisition strategy is not yet in place to obtain technical support for further efforts it should be finalized while completing Phase I of the planning process. Although the acquisition strategy must be finalized to proceed with the TPP, the acquisition strategy should also be reviewed, refined, and modified as appropriate during the life of the project.

b. The PM should update the acquisition strategy identifying the most suitable contracting option for performing the TPP activities based on the scope; schedule; manpower constraints; availability and accessibility of in-house or contractor resources during subsequent project activities at a site; and other technical considerations related to the site. At this step in the project planning process, the PM should be able to confirm that the acquisition strategy(ies) is appropriate or revise it as necessary. Note that the PM should also refer to other guidance for specific information regarding the procedures for developing, implementing, and revising the acquisition strategy(ies).

1.9.2. Initiate Scope of Work or Performance Work Statement.

a. If TPP activities were conducted using in-house resources and further work will be contracted, the PM should rely on support from technical personnel to initiate contracting materials such as a scope of work (SOW) or performance work statement (PWS), or work plan components, as appropriate. In general, PMs should consult applicable SOW or PWS guidance and rely on input from technical personnel. The decision to use a SOW or PWS will depend on the contracting approach and whether it is based on a prescriptive process or a performance based process. A SOW will be developed for a prescriptive approach, which is built on a predetermined specific solution and lays out a step by step process to achieve that solution. A PWS will be developed for a performance based approach, which is built upon a desired outcome and objectives but does not specifically define the best solution or the process to reach the solution.

b. Typical sections to initiate during completion of Phase I TPP activities include:

(1) Site Background (e.g., site location and history; previous studies and results; regulatory history and authorities);

(2) Project Planning Overview, Site Closeout Statement, and Objectives (e.g., site approach, current project description, project objectives for the current executable stage); and

(3) Project Management (e.g., schedules, submittals).

c. For further guidance on preparing SOW's and PWS's, refer to the following guidance documents:

(1) Performance-Based Acquisition of Environmental Restoration Services (Office of the Deputy Under Secretary of Defense for Installations and Environment, July 2007),

(2) U.S. Army Environmental Command Performance-Based Acquisition Handbook (USAEC, May 2010), and

(3) Engineering Pamphlet (EP) 200-1-15 Environmental Quality – Standard Scopes of Work for HTRW Risk Assessments.

1.9.3. Prepare Phase I Planning Memo.

a. At this step in the project planning process, a Phase I Planning Memo should be prepared to document the team's findings and decisions during Phase I (see Appendix D for a Phase I Planning Memo worksheet). The Project Planning Memo should be used to update the Project Management Plan (PMP). If the UFP QAPP is being used, a copy of the Planning Memo should be placed with the QAPP. The PM and technical personnel should reference portions of the previously prepared team information package, preliminary CSM, and listed project objectives as components of the Planning Memo. The Planning Memo should clearly document the current project and associated project objectives within the context of the overall site approach for the current executable stage of site activities. The Planning Memo should clearly indicate the customer's goals (i.e., concept of site closeout, schedule requirements, and site budget), as well as site constraints and dependencies.

b. In accordance with the applicable quality management plan, the PM should have independent technical or management personnel review the Phase I Planning Memo to ensure it is effective and complete.

The PM should distribute a Planning Memo to all team members after completing Phase I activities. A well developed Planning Memo can be used to document project planning objectives and focus the team's efforts throughout TPP Phases II, III, and IV. The Phase I Planning Memo should be a stand-alone document attached to the site-related Project Management Plan. A complete Phase I Planning Memo can help to ensure that institutional site knowledge is transferred to new people involved with a site.

1.9.4. Develop Preliminary Site Strategy/Decision Logic. Another product of Phase I of the TPP is documentation of the preliminary site strategy. The site strategy is attached to the Phase I Planning Memo. The overall site strategy to bring the site to closure should be documented as well as strategy for the current project. At this stage in the planning process the strategy will be conceptual, but as planning progresses through later phases, details regarding sampling and analysis (e.g., investigation and/or remedial) strategies will be included as the strategy is iteratively updated. A narrative may be sufficient for simple sites, but for most sites a decision logic flow chart is recommended. See examples of decision logic flow charts in Appendix F. In addition, EM 200-1-15 provides example decision logic flow charts for MR site characterization, removal actions, and MC investigations.

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CHAPTER 2

Determine Data Needs (Phase II)

2.1. Introduction.

a. Phase II (see Figure 2-1) of the TPP process is designed to ensure that all data needed to satisfy a site's project objectives are identified and documented. This chapter offers guidance to data users for the detailed level of planning required to determine and document data needed for the current project and subsequent executable stages; which will lead to the achievement of final project goals, and ultimately to site closure. Data users will find guidance in this chapter to help them document their data quality and representativeness requirements for the intended use(s) of each data need, which is a fundamental step in development of DQO statements within Phase IV of the TPP process (see Chapter 4).

b. Data users must also continue to use their experience, input from other individuals, and other technical resources to determine data needs for each site. In addition, project planning is an iterative process, as uncertainty is reduced on some elements, data needs may need to be re-evaluated to ensure effective use of project resources. Feedback between Phase II and III should be expected and planned for as early as possible.

Data needs determined should include:

a. Site information data needed about the site (e.g., As-built drawings; past site history; weather information; water and electric supply sources; utility conflicts; ecological and human receptors; size of site; site access limitations; and munitions use and range type for [MR projects];
b. Environmental data needed from a site (obtained on-site or by laboratory analysis of samples from the site); and/or
c. Munitions Data needed from an MRS (obtained on-site through geophysical and/or intrusive investigation or through statistical analysis of anomaly data).

2.2. Determine Data Needs.

Determining data needs is an iterative process. As presented in this manual, several technical disciplines must collaborate to define what is required to satisfy the project objectives.

2.2.1. Review Phase I Planning Memo.

The PM should distribute the Phase I Planning Memo and any project objective worksheets to technical personnel involved in Phase II. Data users' efforts to determine data needs should begin with their review of the Phase I Planning Memo. Review of Phase I information is particularly critical for those personnel not involved in Phase I efforts and for the entire team when some time has passed since Phase I efforts were completed.

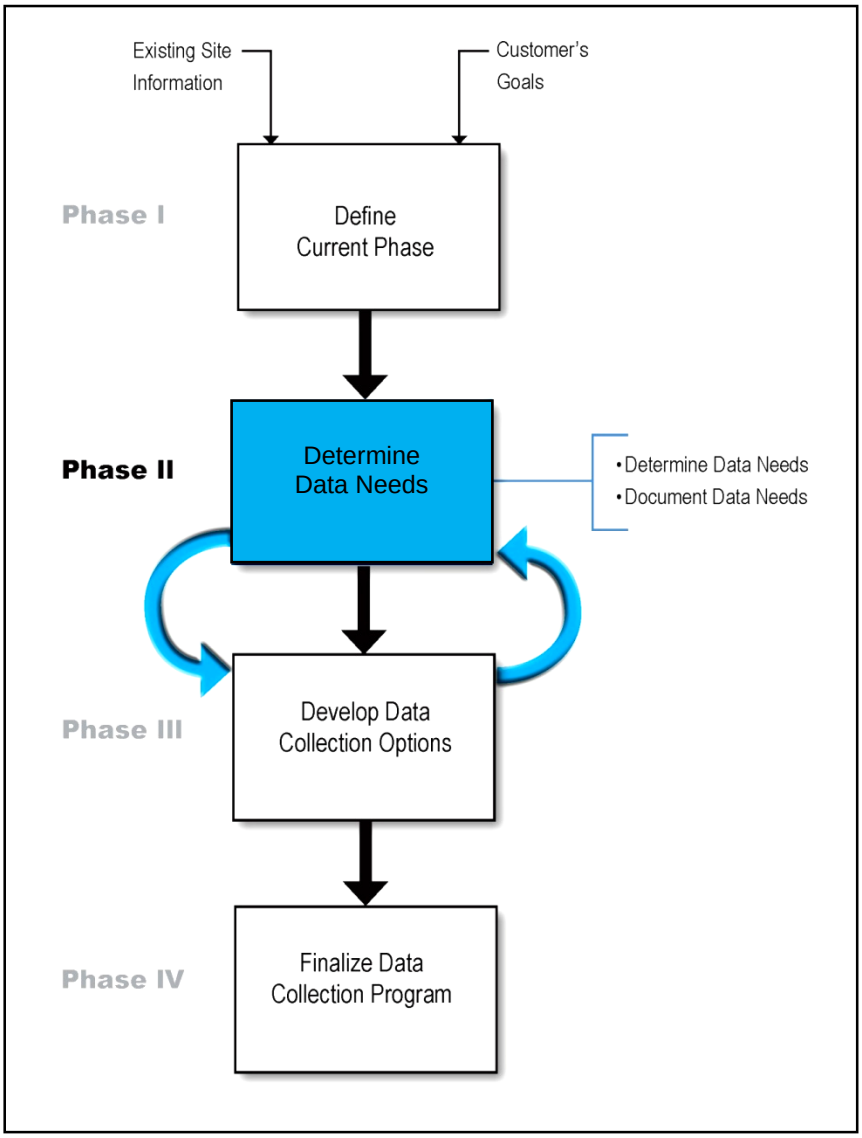

Figure 2-1. Phase II of Four-Phase TPP Process

2.2.2. Establish Data Users' Roles.

a. Project objectives identified during Phase I should be reviewed to ensure technical personnel understand each of them. Technical personnel must also be aware of, and identify both the project objectives associated with the current project and project objectives associated with future executable stages, and the site closeout statement. Efforts to establish data users' roles will help focus all technical personnel on their responsibilities and what is required to satisfy the site's project objectives.

Many site management decisions are made over a project's lifecycle through various executable stages; for example whether to perform an investigation or whether to remediate a certain area of the site. Data needs should be determined with consideration given to the type of decision those needs will support. Data users should collaborate to develop areas and depth of environmental media over which decisions will be applied.

b. In most cases, the project manager (PM) should meet with the data users to discuss the preliminary conceptual site model and provide leadership as they discuss what is required to satisfy each project objective. While convened, the team should confirm that they share a common understanding of the preliminary conceptual site model and which data users have a role in determining the data needed to satisfy each project objective.

c. The PM should also reinforce the premise that data users must work to identify and distinguish basic data needs of the current project, optimal data needs that are cost-effective and prudent to fulfill during the current project for a future executable phase, and any data needs specifically requested by others, but not needed by the data users to fulfill project objectives and progress towards site closeout.

d. Data needs that are not associated with identified project objectives may be identified during the planning process as a result of data users realizing that some data needs, suggested or imposed by others, are not required to satisfy the project objectives for current or future executable stages. In some cases, data users will learn that the intended use of the mandated data is actually appropriate, but simply lacked a sufficiently documented project objective. In other cases, data users may realize that the unassociated data needs imposed by others represent differences in professional opinion, or technical judgment as to what data is needed to satisfy a project objective.

Consideration of risk, compliance, remedy, and responsibility data users and their needs will ensure planning is sufficiently detailed to identify the range of data typically required for satisfying project objectives and progressing to site closeout.

e. The following subparagraphs describe perspectives that different types of data users bring to TPP Phase II planning activities. Projects will not always require personnel from individual disciplines be present at TPP meetings. It should be noted team members may address different data needs and data uses related to the project not necessarily within their discipline. The variety of expertise and number of personnel required for project planning activities will depend on the project's complexity and scope.

2.2.2.1. Risk/Hazard Data User. Risk data users at HTRW sites evaluate human health and ecological risks due to potential chemical exposures at a site. At sites with MEC, risk data users will include the MEC Hazard Data User; those with the responsibility to evaluate hazard of direct physical injury resulting from the blast, heat, or fragmentation from MEC, or acute chemical effects of MEC and MC. Technical personnel who collaborate to determine risk-related (for HTRW or MC) and hazard-related (for MEC) data needs typically have the following roles at a site:

The threats presented by MEC, MC and HTRW are different, and in this document are differentiated by the terms "hazard" and "risk." MEC (which includes MC present in high enough concentrations to pose an explosive hazard) presents a hazard of direct physical injury resulting from the blast, heat, fragmentation, or acute chemical effects of a munition or munition component. MC and HTRW are environmental contaminants and present a risk to human health and the environment through exposures. The degree of risk posed by MC and HTRW is usually proportional to the toxicity of the contaminants, as well as the amount and duration of exposure. A single site may have threats of MEC hazards and/or MC and HTRW risks that must be considered.

a. Evaluate potential risk-based screening levels to ensure appropriate quantitation limits are established for environmental analyses;

b. Perform preliminary determination of MEC hazard or chemical risk to support the decision as to whether further action is warranted;

c. Prepare a baseline risk assessment or quantitative/qualitative evaluation of risk to support a determination of the degree of risk and whether remediation is required;

d. Complete the MEC Hazard Assessment (HA) to evaluate the baseline explosive hazards to human receptors based on current or anticipated future use, and/or to evaluate remedial action alternatives;

e. Develop remedial action objectives and cleanup levels, as well as detailed analyses of risk/hazard reduction provided by remedial alternatives;

f. Provide input into development of decision units (i.e., depth and lateral areas over which remedial action or other management actions are applied);

g. Evaluate suitability of site controls for mitigating risks/hazards associated with remediation and/or long term management;

h. Verify safety of working conditions for personnel during treatment system construction, removal/remedial action, and operation and maintenance efforts; and

i. Evaluate monitoring data to determine the site no longer poses risk/hazard and long-term site monitoring can be discontinued.

2.2.2.2. Compliance Data User. In consultation with the Office of Counsel, compliance data users evaluate and monitor satisfaction of legal and regulatory

requirements at a site. Personnel who collaborate to determine legal or regulatory-related data needs typically have the following roles at a site:

a. Determine a site's regulatory compliance with each applicable or relevant and appropriate requirement (ARAR) and later compliance with ARARs;

b. Properly manage remediation and investigation derived wastes;

c. Contribute to development of remedial action objectives, as well as evaluate remedial alternatives for compliance with each ARAR;

d. Determine whether site conditions may support an ARAR waiver;

e. Verify that implementation of remedial actions will be, or are compliant with, each ARAR;

f. Complete procedural requirements under the law governing the response actions (usually CERCLA or RCRA);

g. Ensure adherence to the obligations of any agreements, permits, or orders controlling the response actions;

h. Determine whether certain comments, requests, or demands from non-federal entities (including regulators), require adherence;

i. Predict legal or regulatory issues that will drive response and other regulatory actions; and

j. Ensure compliance with specific sampling requirements of federal and state programs.

2.2.2.3. Remedy Data User. Remedy data users identify possible alternatives for response actions and design all response action components. The role of the remedy data users involves evaluating the feasibility, implementability, or effectiveness of remedies at a site. Remedy data users must also consider potential process interferences and the secondary technologies required to successfully implement a remedial technology at a site. Technical personnel who collaborate to determine remedy-related data needs typically have the following roles at a site:

a. Perform preliminary determination of chemical and physical characteristics and extent of the wastes or hazards to begin to determine potential site remedies;

b. Identify and screen technologies potentially suitable for mitigating site risks/hazards to acceptable levels, as well as perform the detailed analysis necessary to support remedy selection;

c. Prepare engineering design and construction plans for response actions, including alternative analysis;

d. Optimize operation and maintenance activities and long-term monitoring;

e. Evaluate effectiveness of long term maintenance and land use controls; and Gather cost and performance data needed for life-cycle assessments, evaluation of the technology on similar sites, and incorporation of lessons learned on future designs.

2.2.2.4. Responsibility Data User. Responsibility data users, otherwise known as the Office of Counsel, attempt to define what federal or non-federal entity has responsibility for the site's conditions in the event that any response actions are required. Responsibility-related data needs are typically related to determining federal liability at a site, developing a legally defensible position, creating a cost allocation strategy, defining settlement terms with other potentially responsible parties, or presenting or defending in legal proceedings related to responsibility. Some responsibility data needs have elements in common with other data users (e.g., site history and characterization). Responsibility data users are involved on relatively few projects and within few TPP phases. Most responsibility determinations occur early in a site's life cycle, prior to investigation or remediation (i.e., during identification of site eligibility such as in development of an Inventory Project Report [INPR] for a formerly used defense site). Several elements of a responsibility evaluation (i.e., liability determinations, cost allocations) are unique to data needs related to determining responsibility.

2.2.3. Evaluate Use of Existing Data.

a. Before defining new data needs for a project, data users and data implementors should evaluate the usability of existing data to determine whether additional data are required. Experience has shown that some existing data may be suitable for qualitative and for quantitative uses. Detailed usability reviews can determine existing data quality and potential need(s) for additional data to satisfy the project objectives. Some existing data may be secondary data; the UFP QAPP (DoD 2005b) defines "secondary data" as data not originally collected for the purpose for which they are now being used (additionally its level of Quality Assurance/Quality Control (QA/QC) may be unknown). The UFP QAPP provides considerations for evaluating its usability. Appendix D includes a worksheet for evaluating existing data.

> Review of existing data is a fundamental and critical activity in the TPP process that must occur prior to determining the additional data needed at a site. However, prior to eliminating any data needs from further consideration, the team should be sure that the data user(s) concur that existing data is usable for the intended use(s).

b. The question of whether and how existing data can be used (e.g., in a risk assessment calculation, MEC HA analysis, remedial decision, remedial design, or to support project closeout) will require specific evaluations of their usability for each intended use. Technical personnel must remember that some existing data may be of an unacceptable quality for one use, but of an acceptable quality for another unrelated use at the site.

2.2.4. Define Data Needs. During this project planning activity, technical personnel representing each data user perspective define the data needed to satisfy the project objectives. To identify and organize the data needed, technical personnel should take every advantage of tools such as the preliminary conceptual site model; decision logic illustrated through decision trees or flowcharts; and process diagrams (see Appendix F).

> Efforts to define data needs must focus on establishing data need requirements for each media type, including sampling/investigation areas and depths; chemical concentrations of interest, munitions items of interest; and the number of samples or grid/transect acreage and level of investigation for MEC that is necessary to satisfy the project objectives.

These tools can provide a logical basis and offer technical personnel a visual prompt for reviewing available site information and defining additional data needs. Other potential tools include data need checklists provided in other technical references. However, data need checklists should not be used as standard lists of data to collect, but as checklists to prompt data users to identify the site-specific data needed to satisfy project objectives at a site. While defining data needs, data users should:

a. Consider the consequences of unacceptable decisions or decision errors throughout completion of the work at the site;

b. Consider how much data is required;

c. Consider data collection approaches, including expedited site characterization and field screening approaches;

d. Consider the cost of additional data collection in dollars and time; and then

e. Decide how data needs can be balanced within project cost and schedule constraints.

2.2.4.1. Probabilistic/Non-Probabilistic Decisions.

a. As data users define data needs and the number of samples or level of investigation required, they must recognize that data needs may need to be satisfied using probabilistic (i.e., statistically-based) or non-probabilistic decision methods. Whether a statistical sampling design might be required depends on the intended data uses and the project objectives. The UFP QAPP (DoD 2005b) encourages a graded approach to project planning and notes that "…whether formal DQOs should be developed using the process described in EPA QA/G-4 will depend on the critical nature of the environmental decisions to be made as determined by the project team."

b. EPA's seven step DQO process is described in EPA QA/G-4 (USEPA 2006a). When a data user defines a probabilistic-type project objective or data need during Phase II, the data user should use Steps 5 and 6 of this process to determine the number of samples or level of investigation required for the intended data use.

EM 200-1-16 provides guidance for developing statistically-based decision rules and statistically defining acceptable error. EM 200-1-15 provides guidance on statistical sampling for MMRP sites, including MEC and MC. Probabilistic and non-probabilistic decisions will vary depending on whether the user is defining data needs for environmental contamination or for MEC. Decisions for environmental contamination on either HTRW sites or MRSs (i.e., MC not at explosive concentrations) will be similar, such as developing a probabilistic sampling design. Decisions for characterizing MEC on MRSs may also use a probabilistic sampling design; however, the statistically-based decision rules and statistically defined acceptable error will be unique from environmental contamination.

Although probabilistic sampling designs can be powerful tools, obtaining concurrence among decision makers regarding probabilistic decisions may be difficult. Application of probabilistic methods can only be accomplished when these three conditions exist:

a. A precise study question is defined;
b. The customer and lead regulator are successful in establishing tolerable limits on decision errors; and
c. The support of a qualified environmental statistician is available to work on the project.

c. When probabilistic methods are either inappropriate or cannot be employed for a data need because the three conditions do not exist, data collection planning can be judgmentally based on the expertise of the technical personnel representing the applicable data user.

2.2.4.2. Level of Investigation. Each data user is responsible for identifying the level of investigation, or decision logic, required for each data need based on the intended data use(s) and the project objectives.

a. When non-probabilistic or judgmental sampling is appropriate, the level of investigation may be designated by guidance or technical literature specific to the use of the data. In some cases, the level of investigation needed to satisfy an objective (e.g., determining if contaminants or MEC are present) may be based on experienced judgment of the technical personnel.

b. In some instances, data needs should be fulfilled using probabilistic or random investigation methods where quantitative information (e.g., number of environmental samples, amount of geophysical investigation needed to identify concentrated munitions areas, or amount of investigation required to determine if there is less than a certain amount of UXO on a site) is required to make the related site decisions. For example, project objectives that have specific data needs (e.g., determining if the contaminant levels detected are sufficiently different from the background levels of the constituent at the site; or determining the probability of encountering MEC at a site) may provide a

suitable opportunity to use a statistical basis to establish the number of samples to be collected or to establish the density of grids or transects for obtaining geophysical data. In any case, it is important that data users recognize that use of statistical techniques as the basis for designing environmental sampling or MEC investigation plans can reduce the number of unnecessary data collected in the field, and improve the data representativeness by quantifying the statistical uncertainty of the investigation design. Inappropriate application of statistics for probabilistic data needs can also result in either the collection of too much or too little data.

c. When necessary, in accordance with recommendations with EM 200-1-4, risk assessment personnel should consider how data will be used to determine exposure point concentrations and insure that the number of samples is adequate to avoid adding undue uncertainty to the project by overestimating or underestimating concentrations of chemicals at the site. In accordance with EM 200-1-15, hazard assessment personnel should consider how data collected will meet the project-specific requirements for identifying areas with concentrated munitions use at a specified confidence level, achieving the required accuracy for the delineation of areas with concentrated munitions use, and determining the MEC density within and outside of areas with concentrated munitions use. The remedy data user typically uses engineering judgment or other performance criteria as a means to designate the level of investigation required to support a remedy-related data need.

d. Decisions to use classical statistics methods and/or geostatistical methods must also be based on the intended data use(s), and known or anticipated variability of the data in the environment. This is the case because objectives requiring the characterization of randomly distributed variables or data are suited for classical, statistically based (systematic or random) sampling and where understanding the spatial distribution of a parameter is important, statistics applications and spatially related or regionalized variables that have continuity from point to point are better characterized through the use of geostatistics.

2.2.4.2.1. Applications of Classical Statistics. Classical statistics tools (e.g., random, stratified random, or systematic random sampling designs) can be used to determine the level of investigation required to support various probabilistic decisions. Classical statistics can be used to determine the number of samples required to define representative concentration values (e.g., background soil concentrations) or evaluate trends (e.g., waste pile sampling, chemical concentrations in soils) over an area of interest. Classical statistics are most appropriate for mean concentrations; however, other methods may be more appropriate or suitable for comparing populations or identifying a hot spot. Classical statistics methods can be used to determine the number of samples needed from each medium (or each stratum within a medium) to provide sufficient data to evaluate contaminant variability that can impact decisions. Classical statistics can also be used for determining the level of investigation for MEC sites, such as determining the amount of geophysical investigation (e.g.,. transect spacing and acres of transects) required to achieve statistical confidence in identifying

areas with concentrated munitions use. EM 200-1-15 discusses statistical tools for characterizing UXO at MRSs, such as Visual Sample Plan (VSP) and UXO Estimator. VSP is a software tool for selecting the amount and location of environmental samples (including environmental samples for HTRW and MC, as well as for MEC) so that the results of statistical tests performed on the data collected via the sampling plan have the required confidence for decision making. VSP can be used to conduct Step 7 of the DQO process to develop a sampling plan. UXO Estimator is a software tool designed to develop a field sampling plan for MRSs and to analyze field data after it has been collected. EM 200-1-15 provides additional details on the appropriate use of each these tools.

2.2.4.2.2 Applications of Geostatistics.

a. Geostatistics are a specific branch of statistics that quantifies the spatial correlation of a parameter and can use this correlation relationship to estimate, average and quantify spatial variability, and to interpolate values between measurement locations. Appropriate supporting sampling designs and can involve classical (or simple) random, stratified random, or systematic random sampling designs. Geostatistical analysis can also incorporate information generated using some judgmental sampling results. Geostatistics are useful for assessing distribution and variability in concentrations for treatment or remediation decisions and for some projects may be used to calculate the reasonable maximum exposure for risk assessments. It can also be used to produce probability estimates of a variable of interest. Data users and data implementors should consider the use of geostatistical methods since they can provide support to the development of data collection programs and result in cost savings.

b. EM 200-1-16, Appendix R, presents further guidance and case studies in environmental statistics and geostatistics. Spatial Analysis and Decision Assistant (SADA) software may useful for teams in Phase II and III planning phases as well as later in the project. EPA QA-G5S (EPA 2002) presents information for utilizing various types of sampling designs. For Munitions Response projects, VSP provides tools for the geostatistical analysis of geophysical anomaly density data collected on transects and/or grids. EM 200-1-15 provides additional details on the use of the geostatistical analysis tools within VSP.

2.2.4.3. Data Collection Considerations.

a. While defining data needs, each data user should re-evaluate earlier considerations regarding the approach for collecting site data. As discussed in Paragraph 1.8.2.4, the team may choose to conduct some field analytical activities concurrent with Phase I, II, or III TPP activities to refine their understanding of a site. Use of the TPP process typically expects data users to first establish a site's physical setting before field investigations are conducted as discussed in Chapter 1.

b. When data users have identified appropriate opportunities to use field analytic or dynamic work strategy approaches, they should advise the PM and data implementors which data needs are candidates for using either approach. In those instances where field analytic or dynamic work strategies will be used, it will even be more critical for the data users to provide the decision logic information that can be incorporated into the corresponding dynamic work plan for the site. Data users should also provide a description or decision flowchart of the rationale to be used for making field decisions contingent on the results of previous data collection.

c. Data users must also recognize that data needs identified during this activity should include site information, munitions data, and environmental data, as applicable. Appendix D provides a site information worksheet and several data need worksheets that are recommended for documenting the data needs of the data users.

d. When defining each data need, data users are responsible for communicating whether a data need contributes to satisfying a current project objective (a basic data need), or is a data need that would be cost-effective and prudent to fulfill during the current project but fulfills an objective associated with a future executable stage (an optimal data need), or whether it is a data need specifically requested by someone other than the data users, and is not associated with any project objectives that lead to site closeout. (Paragraph 3.3 further describes the data collection options.)

2.2.4.4. Risk/Hazard Data Needs.

a. Using the preliminary conceptual site model developed during Phase I, the risk/hazard data users should conceptualize and identify the data needed to address each of the pathways that will be part of the risk assessment or MEC hazard assessment for the site. In assessing risks and hazards to human and environmental receptors, a relationship must be shown between potential populations (for both current and future site use) with access to the chemicals or to the MEC detected/found onsite.

b. Future land use pathways (if different from current pathways) will require data to support transport models suited for evaluating spatial and temporal behavior of the chemical(s) or transport of MEC at the site over time. Therefore, the risk/hazard data user must determine the most appropriate models to satisfy the project objectives since data requirements vary by model.

2.2.4.5 Compliance Data Needs.

a. Compliance data users shall coordinate with the Office of Counsel to compare site conditions or activities with legal and regulatory requirements and standards to establish the governing laws and regulations and to determine what is required for site compliance. They must also compare possible site conditions or activities that are regulated (e.g., treatment, storage, and disposal) with applicable regulatory standards. Potentially applicable regulatory standards are defined by the primary regulatory program and may specify chemical analysis requirements and point(s) of compliance

(location and level of investigation) used to assess compliance and support the site closure decision process. Compliance data user efforts to define compliance data needs should involve:

(1) Review of the project objectives identified from the primary governing statutes (i.e., CERCLA Sections 104, 120, 121; RCRA Sections 3004u and 3008h) and the applicable regulations;

(2) Identification of activities or conditions that give rise to certain standards, requirements, or criteria that must be satisfied (e.g., treatment, storage, and disposal; drinking water contamination; surface water discharge);

(3) Consideration of potentially affected media (i.e., air, surface water, sediment, soil, groundwater);

(4) Identification of chemical-, action-, and location-specific ARARs;

(5) Identification of point(s) of compliance (e.g., drinking water aquifer, effluent discharge, stack emissions, MRS boundary);

(6) Compilation of documents, reports, data, correspondence, etc., that demonstrate satisfaction of procedural requirements arising from laws, regulations, agreements, permits, or orders.

b. Compliance data needs will be both qualitative and subjective (point of compliance), as well as quantitative (environmental data needs).

2.2.4.6. Remedy Data Needs.

a. Remedy data users define data needed to identify, screen, and analyze possible response action alternatives at a site. The efforts to define remedy data needs will depend on the phase of a site's progress to site closeout. Remedy data needs become more complex as the alternative evaluation process proceeds from technology identification to remedy selection and design, and finally operation and maintenance.

b. During the early stages of a site's progress to site closeout, technical personnel should begin to consider possible general technologies that may be applicable to the site (e.g., containment; excavation and disposal; surface/subsurface MEC clearance; in-situ treatment; land use controls). This general technology consideration should strive to include technologies with inherently GSR characteristics, e.g. disposal technologies that allow for beneficial reuse of the treated media, treatment technologies that utilize on-going natural processes (i.e., phytoremediation and monitored natural attenuation) and approaches that utilize existing infrastructure. Site information type data needs are typically sufficient to support these evaluations (e.g., contaminant characteristics, likely degree of heterogeneity of contaminant distribution, physical characteristics of the site, and physical features of the site). The next level of evaluation includes identification of common technologies (e.g., soil washing, incineration, capping, Digital Geophysical Mapping (DGM) vs. analog geophysical investigation for MRSs) that relate to the general technology type(s) previously identified for a site. The remedy data needs for

technology screening are typically environmental type data needs (e.g., soil moisture content, pneumatic permeability, and cation exchange capacity). For MRSs, technology screening is typically based on physical data needs (e.g., soil type, depth, site accessibility, type and density of MEC). Based on technology screening results, only a few alternatives for remedy selection and design are further considered. While constructing, excavating, operating, maintaining, and monitoring a remedy, ongoing efforts will be expended by the remedy data users to obtain cost, performance, and GSR metrics (e.g. energy use, greenhouse gas emissions, water use, and waste minimization) information for optimizing the remedial action implementation and for consideration of similar sites in the future. The remedy data needs to support these later evaluations will be more complex and require both site information and environmental data (e.g., treatability studies, soil compaction, and available water sources) (EPA 1995b).

Personnel responsible for remedy design should contribute to TPP efforts beginning with the earliest stages of site assessment and investigation. Personnel responsible for construction activities should begin to contribute to planning efforts when site remedy selection and design activities begin.

2.2.4.7. Responsibility Data Needs.

a. The technical and legal counsel personnel responsible for defining responsibility data needs will not only be concerned with determining the legal basis for a response action, but also with defining responsibility at a site. Responsibility data users must rely on legal counsel to identify the phase of execution and specific position and negotiation strategies that will affect the identification of responsibility data needs.

b. For example, one emphasis would be to obtain data for determining a site's eligibility under the Formerly Used Defense Site program and identifying the potential for another potentially responsible party (PRP) (ER 200-3-1). In this case, responsibility data would need to be collected toward the goal of settling with the other PRP. In another instance, responsibility data needs would involve collecting past disposal records for position development purposes that ultimately contribute to developing a cost allocation formula during negotiations with other PRPs.

c. Background and historical site information will make up much of the responsibility data needed to develop a negotiation position. This includes articles of incorporation; facility ownership records; contract documents; lease agreements; historic process and operations information; historic munitions usage; federal and industry information on standard practices related to the chemicals of concern; manifests; disposal logs; and aerial photos. The site characterization data can focus the historical research toward the use and disposal of specific chemicals or munitions at

specific locations based on observed contamination. Historical information should guide site characterization work by narrowing the list of analyses and/or general sampling locations.

2.3. Document Data Needs.

a. Personnel representing various data uses are responsible for communicating their data needs so that those needs can be incorporated within data collection options developed during Phase III activities. Communicating or documenting data needs are critical activities that lead to successful project execution. Documenting data needs, as discussed here, is the recommended means for technical personnel to communicate their data needs.

b. This manual offers several options for documenting data needs given the wide range of data needs and data uses. Appendix D offers a site information worksheet and a series of data need worksheets for documenting data needs of the risk, compliance, remedy, and responsibility data users. Appendix D includes a crosswalk between the TPP Worksheets and the UFP QAPP Worksheets. The TPP worksheets require more detail regarding data needs than the UFP QAPP worksheets. Use of standardized data need worksheets will allow quick and easy quality assurance/quality control review of the data need planning.

c. The critical aspects of documenting data needs can be reduced to the following.

(1) What data is needed (e.g., hazard, contaminant or characteristic of interest, and media)?

(2) Who needs the data (i.e., risk/hazard, compliance, remedy, or responsibility data user)?

(3) What is the intended data use(s) (e.g., contaminant fate and transport; baseline risk/hazard assessment; remedial or removal design; operation and maintenance plan; GSR evaluation) to satisfy project objectives?

(4) What is the area and depth over which an environmental decision will be made (i.e., what is the decision unit)?

(5) What number of samples or level of investigation are required to satisfy the intended use(s), including whether the number of samples or level of investigation is fixed, somehow contingent upon field results, or is the minimum anticipated by the dynamic decision logic approach defined by the data user?

(6) What is the reference concentration of interest or other performance criteria (e.g., action level, compliance standard, decision level, design tolerance)?

(7) What is the level of investigation required to determine areas of concentrated munitions use and the UXO density both inside and outside the area with concentrated munitions use?

(8) Where is the area of interest or desired sampling location(s) and depth(s)?

2.4. Complete Phase II Activities.

a. The technical personnel should review the data need worksheets to ensure that each project objective has been considered and related data need considerations have been made by each applicable data user. In accordance with the applicable quality management plan, the PM should also have independent technical resources review the data need worksheets. (The data need worksheet examples provided in Appendix D may be useful during independent review efforts.) In any case, all projects will be periodically evaluated by the team to ensure baseline requirements of scope, schedule, and cost are being met (ER 5-1-11).

b. If it appears that some project objectives have no associated data needs, the PM should meet with the technical personnel and confirm that no additional data is needed to support the particular project objectives. The PM or technical personnel should document in the project file how specific project objectives will be achieved in absence of additional data. The PM should also meet with the technical personnel to understand any instances when no data needs associated with future executable stages have been identified during Phase II activities.

c. The PM should review any site information worksheets or lists of site information data needs that have been identified by the data users. It is the PM's responsibility, working with the technical personnel, to decide how and when site information needs will be fulfilled (e.g., discussions with the customer, site visits, incorporated within appropriate scope of work or work plan sections).

d. The PM should then distribute copies of all data need worksheets and any attached illustrations to all appropriate team members. Once completed, the PM should inform regulatory and other stakeholders of the proposed approach before further efforts in collection design are made.

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CHAPTER 3

Develop Data Collection Options (Phase III)

3.1. Introduction.

a. This chapter offers guidance to sampling and analysis data implementers for their detailed planning efforts. Phase III (see Figure 3-1) of the TPP process is designed for planning sampling and analysis approaches that will satisfy the data needs identified during Phase II. Phase II and III efforts insure that every piece of data planned for collection has an associated data use and that the appropriate type and quantity of data is planned for collection. This information is later used in Phase IV to develop DQO statements. Data collection options are also developed during Phase III to ensure the customer has adequate information during Phase IV for business decisions related to a project's data collection program.

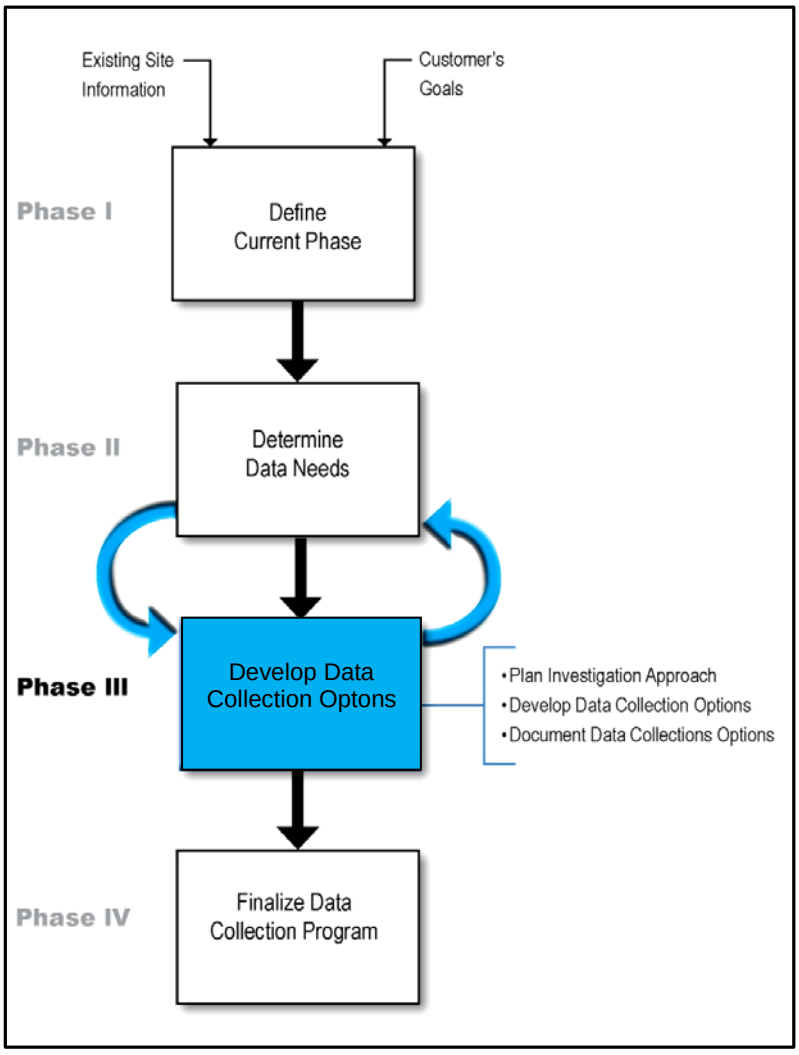

Figure 3-1. Phase III of Four-Phase Technical Project Planning Process

b. Data implementers will find guidance in this chapter to help them document both the appropriate sampling and analysis methods and the data collection options. Although this chapter supports efforts to plan sampling and analysis and field investigation approaches, it is not an exhaustive reference or resource.

> The PM and technical personnel will find that Phase III activities are iterative with Phase II activities as data needs tend to be clarified and refined. Therefore, data implementers will find communication with the data users to be invaluable during this phase of TPP activities.

3.2. Plan Investigation Approach. Planning the most appropriate investigation, sampling and analysis approaches for a site is an iterative process. In this case, the term sampling and analysis is inclusive of all investigation for both HTRW and munitions sites. Sampling and analysis for HTRW sites typically refer to collection of environmental samples and the analysis for specific contaminants of concerns. Sampling and analysis for munitions sites typically include geophysical investigation within grids or transects to identify potential MEC in the subsurface and intrusive investigations to sample for MEC. As presented in this manual, many technical personnel must collaborate to determine suitable investigation, sampling and analysis methods and develop data collection options for a site.

3.2.1. Review Phase I and Phase II Information. The project manager should distribute copies of the Phase I Planning Memo and any corresponding project objective worksheets, and Phase II data need worksheets to all team members involved in Phase III. Efforts to plan sampling and analysis approaches should begin with review of the information from earlier TPP activities. Review of Phase I and Phase II information is particularly critical for those personnel not involved in those efforts, and for the entire team when some time has passed since Phase I and Phase II efforts were completed.

3.2.1.1. Review Phase I Planning Memo.

a. Review of the Phase I Planning Memo and any project objective worksheets will refresh technical personnel of the site approach, project objectives, current project focus, and any site constraints and dependencies.

b. The PM should insure that the Phase I Planning Memo is updated by appending new information and modifying existing information as necessary. Constraint information including the finalized acquisition strategy, budget, and information may require modification. This updated information could impact planned activities, for example, schedule and site physical constraints may now preclude use of a proposed sampling method, while new budget and regulatory constraints may dictate the selection of analytical options. The Phase I Memo may also contain or reference useful site background information including analytical or geophysical data from previous studies, site physical characteristics, aerial photographs, topographic maps, site cross-sections, site boring logs, anomaly investigation results etc. that will be useful during Phase III

activities. The preliminary conceptual site model prepared during Phase I can also acquaint data implementers with the physical and chemical features of a site in relation to possible sampling and investigation strategies.

3.2.1.2. Review Phase II Data Needs.

a. Data implementers should review the range of data needs identified during Phase II by the data users. Documentation prepared at the end of Phase II should communicate the intended data uses, the required number of samples, the contaminant concentrations of interest, and the necessary sampling areas or locations and depths. The Phase II documentation should also designate basic data needs; those that are associated with the current executable stage, and designate optimal data needs; those that are associated with a project objective of a future executable stage that leads to site close out. Those data needs that are not associated with any project objective leading to site closeout should also be documented. Data implementers should also document any opportunities for use of field analytical methods and dynamic site characterization approaches, such as the Triad Approach presented in Chapter 1.

b. As data implementers review the Phase II data needs, they should begin to recognize both similar and unique data needs to ensure that all of the data needs are understood. Although data implementers may have been consulted during Phase II by data users, data need worksheets or other Phase II documentation may introduce new or refined data needs developed by each data user perspective. Data implementers will probably find it necessary to contact data users when trying to interpret data needs or to obtain additional information regarding data quality requirements.

3.2.2. Plan Sampling and Analysis Approaches.

a. The sampling data implementer (team member responsible for identifying sampling and investigation approaches) should generally lead efforts to first sort and then combine the data needs prior to developing and documenting sampling strategies. In some cases there may also be an analysis data implementer (team member responsible for identifying analytical approaches); this team member should then proceed to develop and document field and laboratory analysis strategies. And finally, technical personnel representing both the sampling and analysis data implementer should refine their plans within cost and schedule constraints of the project. Data implementers may find Step 7 of the U.S. Environmental Protection Agency's Data Quality Objective Process useful during these efforts (EPA 2006a).

b. While planning sampling and analysis approaches, data implementers are expected to consider both analytical and field sources of error to ensure the data will be useable for the intended data use(s). Detailed planning can minimize and significantly reduce potential sources of error. Proper management of sources of error requires the use of the most current accepted methods for sampling, investigating, and analyzing all types of media (see EM 200-1-6, EM 200-1-3 for environmental contamination and EM 200-1-15 for MEC).

Data implementers must address site-specific investigation, or sampling and analysis requirements rather than merely planning to implement activities that were developed for a previous project or similar site.

3.2.2.1. Sort and Combine Data Needs. Data implementer should first sort and then combine data needs by media and location. It is important to identify overlapping data needs at a particular location and unique data needs from common locations at a site. Similar data needs should be combined to the extent possible to ensure sampling and analysis efforts are minimized. Efforts of the data implementer to carefully sort and combine data needs can make a project very successful and efficient. When sorting and combining data needs, it is intended that some of the efforts include the following.

3.2.2.1.1. Balancing Sensitivity Requirements. In many cases it may be necessary for data implementer to apply the most stringent or lowest concentrations of interest requirements to drive the selection of analytical methods. Typically, data used to characterize risk/hazard must meet more stringent sensitivity requirements than data used to evaluate, design, implement, and operate remedial technologies. The degree of confidence required by the data user and the PM to manage project uncertainty plays a role in determining method sensitivity, as well as data collection techniques. These requirements are typically driven by the need for low uncertainty of concentrations near the risk-based action level. Methods for detecting MEC would require more certain results as compared to method requirements for locating an underground storage tanks. For example, the positioning accuracy required to locate small munitions such as 37mm projectiles are more sensitive to errors in data positioning than the positioning accuracy needed to locate an underground storage tank.

a. An example of overlapping data needs is a risk data need for groundwater contaminant concentrations from an existing drinking water well and a remedy data need for groundwater contaminant concentrations from the same vicinity. Both data needs could be satisfied simultaneously as long as the analytical sensitivity meets the more stringent of the two requirements. In this case, the risk data need requirements for lower analytical quantitation limits is likely the most stringent requirement. However, if additional groundwater contaminant concentration information was required from adjacent wells for only the remedy perspective, the more stringent risk sensitivity requirements should not be applied.

b. For MRSs, a potential overlapping data need might be the data needs to define the concentration of both HTRW and MC at an MRS. Both the HTRW and MC data needs might be able to be satisfied with the same samples; however, the most stringent analytical sensitivity requirements must be used to ensure the data needs for both HTRW and MC are met.

3.2.2.1.2. Meeting Sampling Depth Requirements. Data implementers may recognize similar data needs in a particular area of a site or even overlapping data

needs in a common environmental media and depth. In those instances where some data needs directly overlap each other in location and depths, data implementer should be sure to meet the particular sampling depth requirements of any data users with unique sampling or investigation depth needs.

3.2.2.1.3. Evaluating Data Need Trade-Offs.

a. Data need trade-off situations may be discovered where an alternate adjacent sampling location may be acceptable and representative for several data user needs instead of merely collecting data from several individual but adjacent sampling locations. After consultation with data users, they may agree to reduce the number of samples or level of investigation, or increase their concentrations of interest on some data needs to help meet project cost or schedule constraints. Such trade-offs may enable the data implementer to decrease the overall uncertainty of site decisions by using the available funds for conducting other required field or analytical work at a site.

b. Sensitivity requirements for the risk assessment data use may be balanced by combining sampling and analysis strategies into “collaborative datasets” where field sampling methods and fixed laboratory data analytical results are used together to support risk assessment or risk-based decisions. Still another data need trade-off may involve the use of composite sampling where it can be appropriate for the intended data use(s) (EPA 1995c). Both of these strategies proved successful for use in risk assessment/risk management in case studies of actual projects prepared by the ITRC (ITRC 2008). The document emphasized that alternate data collection strategies must be properly planned with involvement of the data user (in this case the risk assessor) to ensure success and data usability. Such trade-offs may help to meet project budget constraints while decreasing the uncertainty of some site decisions.

Although the greatest cost savings can be achieved when the data needs of several data users overlap (*e.g.,* contaminants of concern, soil chemical or physical characteristics, distribution of MEC and MC), overlooking a unique data need from a common site location could result in costly remobilization to the site to re-sample or re-investigate the location. An example of this is overlapping HTRW sites and MRSs (*e.g.,* environmental contamination and MEC). Another common opportunity for cost savings is ensuring that management decisions regarding investigation and remediation derived wastes can be made using the analytical or field results from corresponding matrix locations.

3.2.2.2. Develop and Document Sampling Strategies. Developing the sampling strategy requires a thorough understanding of a site, and all the information generated during Phases I and II. In particular, the sampling data implementer should understand the team’s preliminary conceptual site model and use it to develop sampling strategies for a site. Data implementers should be sure to follow any state-specific guidance on sampling design that is applicable to a site. In addition, data implementers should identify and consider any green and sustainable practices that could be included in the

sampling strategies developed for the site. Based on initial efforts to work with this information, the sampling data implementer may consider involving some of the other technical personnel to determine the best sampling strategy to meet the data needs, develop the data collection options, and apply field screening or field analytical and expedited site characterization approaches whenever appropriate.

3.2.2.2.1. Sampling Strategy Constraints.

a. The total sampling time and costs should be estimated based on site access considerations, ability to implement the strategy due to physical constraints such as vegetative overgrowth, proximity of multiple sampling locations, potential locations of MEC, seasonal weather conditions, mobilization/ demobilization efforts, equipment decontamination measures, sample management activities, concurrent site operations, and the total number of samples and/or acres for investigation associated with each data collection event. The sampling data implementer should work to ensure that the entire field sampling activity can be conducted within the time allotted on the project schedule and within the project's budget constraints.

b. Because it is often necessary to investigate properties adjacent to the study site, the team should be proactive to obtain an access agreement and be sensitive to minimizing disruption to the properties of adjacent owners. It can also be very time consuming to get appropriate site access agreements in place. Therefore, a common strategy is to develop a data collection design that involves only a one-time off-site sampling or investigation effort, rather than multiple or periodic events that may require a costly real estate acquisition.

c. Contingencies should be developed in the event that physical or technical issues arise in the field and prevent collection of specific data when the loss of that potential data may represent an unacceptable data gap. There should also be some discussion of what uncertainties may be revealed and how these uncertainties will be managed. Such factors should be documented in the project or sampling decision logic (See Appendix D for examples).

d. For each sample collection design alternative, the sampling data implementer should select the optimal number of samples or level of investigation (*e.g.,* acres of grids/transects or anomalies to investigate) and the most resource-effective data collection design that satisfies all of corresponding data needs. Design approaches for designating locations to investigate include both probabilistic and non-probabilistic methods and must correspond to the type of decision to be made as discussed in Paragraph 2.2.4.1.

When evaluating sample collection designs, the sampling data implementer must remember to include appropriate quality assurance/quality control measures.

3.2.2.2.2. Probabilistic (Random) Sampling. If a statistically based decision rule with decision error quantification is required to lead the project to site close-out, probabilistic sampling must be performed (see also Paragraph 2.2.4.1). Such circumstances may include final decision-making, compliance with a standard or those investigations when litigation with another potentially responsible party is anticipated. By combining an efficient probabilistic sampling design with a statistical hypothesis test, data implementers can optimize resources (*e.g.,* personnel, equipment, funding, site access, temporal constraints) and provide data of an acceptable quality for the intended data use(s). Planning for statistical analysis before sample collection is crucial so data support the intended data use(s). Other guidance should be used for establishing tolerable limits on decision errors and statistically determining the number of samples to be collected based on the hypothesis test and random data collection design (EPA 2002, USACE 2006). Visual Sample Plan (VSP) software may also be a useful tool for planning sampling designs, it was developed by the Department of Energy to automate the statistical sampling design process.

3.2.2.2.3. Non-Probabilistic (Judgemental) Sampling. Non-probabilistic or judgmental (also called purposive) sampling locations are selected by the data user based on site knowledge of how contaminants were potentially released, their distribution and the intended data use. Judgemental sampling designs include quota, snowball, convenience, volunteer, haphazard and expert judgement types of designs. Judgemental sampling designs may be cost effective for some projects, but it is not possible to quantify decision errors related to the number of samples, and the sample is only as good as the conceptual model used to define the target population.

3.2.2.2.4. Field Analysis. Field analytical methods can be useful tools for satisfying some data need requirements while reducing costs and uncertainty. Data implementers could also plan to conduct some field analytical activities during these Phase III efforts to refine the team's understanding of the site prior to designing a data collection program for the current executable stage of site activities. Further discussion about the use of field screening methods is provided in Paragraph 3.2.2.3.1.

3.2.2.2.5. Static and Dynamic Approaches.

a. Static and dynamic execution options should be considered and re-visited at this step in the project planning process. A static approach follows a narrowly defined sampling plan with a defined scope for a particular project phase, without allowances for real time decision making or variations in data collection or analysis approaches (*e.g.,* a set number of samples collected or anomalies investigated regardless of observations or data collected in the field). A dynamic approach utilizes in-field decision making, dynamic work plans (*i.e.,* "if-then" decision logic that is utilized in the field), and real-time data acquisition and interpretation. As introduced in Chapter 1, an example of a dynamic approach is the use of the Triad approach. For a more details on the Triad approach see http://triadcentral.org. For MR projects, static approaches might be implemented on relatively simple sites (*e.g.,* MEC surface removal action), while

dynamic approaches are typically used for projects with multiple phases (*e.g.,* MEC Remedial Investigation). EM 200-1-15 provides more detailed discussions on sampling plans for investigating and characterizing MEC and MC at MRSs.

b. In instances where the data users and data implementers believe dynamic techniques are appropriate, the overall project decision logic developed to define courses of action to achieve site closeout activities should be further developed for use by the team to define decision logic for field activities. The decision logic (may also be referred to as the dynamic work strategy) may be iteratively refined to allow for field modifications, but it is essential that it be developed in advance of field activities. By having established decision logic and providing on-site decision making authority, field work can be modified and uncertainty reduced whenever conditions deviate from what was planned or anticipated. Appendix F includes examples of decision logic diagrams that could be used in planning the dynamic approach.

c. If at this step in the TPP process the team believes some dynamic techniques should be applied at a site, the team should review Phase I TPP activities to ensure the technique is appropriate within the site approach and the current project. As the team proceeds with integrating a dynamic technique, the technical personnel should also review Phase II TPP activities to identify and redefine the data needs that could be adequately fulfilled using this approach.

3.2.2.3. Develop and Document Analysis Strategies.

a. The analysis data implementer should evaluate the testing requirements, media to be sampled, and chemical and physical characteristics of the contaminants to select the analytical strategy. By involving the appropriate laboratory personnel during these efforts, the analysis data implementer will be more successful in identifying and communicating project specific analytical requirements. For sites containing MEC, the analysis data implementer should involve the project geophysicist, and should evaluate characteristics of the geophysical data (*e.g.,* geophysical response of the target munitions, anomaly density, background geophysical response) and physical characteristics of the site (*e.g.,* soil type, munitions types, depth, and orientation).

b. The analysis data implementer must incorporate a comprehensive and multifaceted approach to quality assurance/quality control in order to achieve and document that data quality requirements have been attained for the intended data usage; see the DoD Quality Systems Manual (and also the UFP QAPP (IDQFP 2005). They should also refer to Engineer Manual 200-1-6 and for MEC, EM 200-1-15, concerning compliance monitoring activities that may be applied to ensure adequate data quality management is achieved on a project. Documentation worksheets for further planning and preparation of quality assurance project plans (QAPPs) may be found in the UFP QAPP; select worksheets from this that overlap with project planning activities have been adapted for use in the document and are given in Appendix D.

c. The anticipated analytical costs and turnaround time associated with each analytical method and the related quality assurance/quality control requirements must be considered. In all cases, the costs and turnaround times should be compared to the project's analytical budget and schedule, and the analytical strategies adjusted to fit within the project constraints.

d. The generation of screening (many times field analytic) data versus definitive (usually fix-based laboratory) data should always be considered. Comparability between screening versus definitive data is discussed in greater detail in the UFP QAPP (IDQFP 2005). Whenever appropriate or potentially viable, performance based measurement systems should also be evaluated. By being less prescriptive about the laboratory analysis to be performed, performance based measurement systems can be tailored for application at a site and can enable optimization of cost and schedule expenditures.

3.2.2.3.1. Screening Data.

a. Field screening activities can be used during the planning process (*e.g.,* during a site visit) to refine sampling, investigative, and analysis approaches or to provide additional site characterization data to data users. Various types of field screening analyses should be considered to gather preliminary information, reduce errors associated with spatial heterogeneity, or to prepare preliminary maps as guides for further sampling. Field analyses can be conducted to determine worker protection levels; extent of contamination or hot spots; presence of underground contamination; presence of MEC; and the potential applicability of presumptive remedies or innovative technologies. For many sites, field analyses can also provide useful data for a risk/hazard assessment because they can be used quantitatively if confirmed with definitive data. In general, field screening data intended for quantitative use should be confirmed with at least 10 percent replicate samples analyzed using definitive methods.

b. Effective planning for the use of field measurement technologies involves consideration of at least the following factors:

(1) Knowledge of site contaminants or MEC and what may be encountered that could affect performance of the field measurement technology;

(2) Determining whether the measurement sensitivity is sufficient for the contaminant concentration(s) of interest or MEC;

(3) Understanding exactly what the field analysis technology measures;

(4) Understanding the factors controlling the performance of the field analysis technology; and

(5) Establishing a site-specific correlation between the screening and definitive measurement techniques which includes correlation between non-detect, middle range and high-detect samples.

Data users must be consulted for their concurrence regarding the use of field screening methods to meet their intended data uses. Collaboration between the analysis and sampling data implementers is crucial when the team plans to use field screening and field analytical methods. The team also needs to establish how field decisions will be made and communicated across the team.

3.2.2.3.2. Definitive Data.

a. Definitive data are generated using rigorous, analyte-specific methods where analyte identifications and quantitations are confirmed, and quality assurance/quality control requirements are satisfied. Definitive data can be generated from standardized analytical methods (*e.g.,* EPA reference methods) or non-standardized methods in which the analytical or total measurement error has been determined. The potential analytical methods should be selected based upon the intended data use(s). Analytical method selection should be based on the chemicals of concern, the anticipated range of concentrations for the individual chemical contaminants and the media type and complexity. Other critical, site-specific considerations include regulatory agency method preferences and quantitation limit requirements; chemical quantitation and identification requirements; cleanup capabilities; quality assurance/quality control requirements; and turnaround time needed. There may also be a need for future proof of data results for compliance, responsibility, or cost allocation disputes.

b. The Department of Defense Quality Systems Manual for Environmental Laboratories (DoD QSM) provides requirements and guidance on the establishment and management of quality systems for environmental testing laboratories that intend to perform work for DoD. This information establishes a baseline for laboratory quality systems as well as method performance. However, project-specific requirements identified by the customer supersede any requirements listed in the QSM. The requirements are meant to be the default, to be used when project-specific direction based on DQOs is not available.

The analysis data implementer should not hesitate to obtain clarification from the data users to ensure the analytical methods will meet Phase II data needs.

3.2.2.4. Refine Plans Within Project Constraints.

a. Data implementers should generate order-of-magnitude cost estimates to determine if the proposed investigation scheme can be executed within the budget constraints. Data implementers may find that the level of investigation (*e.g.,* number of samples, amount of geophysical investigation), sampling methods, or analysis methods needs to be changed to remain within budget constraints. Archiving samples for subsequent analysis may also contribute to balancing the sampling design within project constraints.

b. Data implementers should also evaluate effects of schedule and any temporal constraints that apply to site activities. An extremely short schedule may require some data collection events to be concurrent rather than phased activities. The level of effort associated with the entire data collection plan could exceed the scheduled duration of field activities. Temporal conditions may be such that some data needs could only be fulfilled during a seasonally dry or warm period of time.

3.3. Develop Data Collection Options. After planning field investigation activities, data implementers should work with data users to group the data needs into data collection options for consideration during Phase IV activities. Data collection options provide a simple mechanism to document the basic data needed for the current project; and optimum data that is cost-effective and prudent to collect for future executable stages; and any in excess of the data needed by data users and is not associated with project objectives leading to site closeout.

3.3.1. Basic Data Collection Option.

a. This basic data collection option is the data set needed to satisfy the current project objectives (*e.g.,* remedial investigation data). The data collection efforts would produce data that generally meets all the data quality requirements of the data users for only the current project.

b. If data quality requirements cannot be met for the data users, the technical personnel need to clearly communicate this information to the PM. For example, the PM should be advised if planning compromises have been incorporated by the technical personnel when existing sampling or analysis methods cannot achieve action levels or concentrations of interest required by the data users. If all the data needs for the current project cannot be obtained within budget or schedule constraints, technical personnel should prioritize the data needs within this group, but not eliminate data needs at this step in the planning process.

3.3.2. Optimum Data Collection Option.

a. This data collection option highlights opportunities to collect data needed to satisfy project objectives associated with future executable stages at the site, during the current project. This grouping includes the portion of data needed for future executable stages that would be cost-effective and prudent to obtain during the current project. This optimum data collection option includes only those future data needs that technical personnel believe are good current investments toward future executable stages at a site.

b. A typical optimum data collection option would be to include the feasibility study and remedial design data that can be cost-effectively obtained during the remedial investigation at a site. Even if the current project budget cannot afford data collection for future executable stages, data implementers should still develop this data collection option to be considered by the customer during Phase IV.

Although collection of data associated with future project objectives should always be pursued in the current stage; its recommendation may be deemed inappropriate if the data needed to satisfy current project objectives already exceeds project cost and schedule constraints.

3.3.3. Data Identified as Unnecessary to Fulfill Project Objectives.

a. This unique group of data needs is those that data users believe are not associated, or not necessary to fulfill project objective leading to site closeout. These could be considered as excessive for the purposes of satisfying both current and future project objectives. The data needs classified as “not associated” will be those specifically requested, imposed, or mandated by others and not necessary to satisfy agreed upon project objectives.

b. Examples of such data would include planning to have full suite laboratory analysis of all samples when full suite analysis of select samples would meet the project objectives; or planning to install additional groundwater monitoring wells when the data users can use the existing monitoring wells for meeting the project objectives; or planning to investigate more anomalies during a MEC investigation than is statistically necessary for site characterization.

c. All data needs within the excessive data collection option exceed the data needs or data quality requirements of the data users for the current and future executable phases of the project. Data needs that cannot be collected within cost or schedule constraints of the project but are necessary to fulfill current and future project objectives should not be mischaracterized as unassociated with project objectives.

3.4. Document Data Collection Options.

a. Data implementers are responsible for communicating data collection options for further consideration during Phase IV. Data implementers’ efforts to document sampling and analysis requirements for current and future project objectives are critical for the success of TPP activities and continued progress to site closeout. Data implementers should consider recording the appropriate sampling and analysis methods and the data collection options using the sampling and analysis planning worksheet and the summary table of data collection options provided in Appendix D or similar methods. Use of standardized worksheets and tables will allow quick and easy quality assurance/quality control review of the data collection and analysis plans.

b. Critical aspects of documenting the appropriate sampling and analysis methods and data collection options are as follows:

(1) What data needs are being met;

(2) What project objectives will be satisfied;

(3) How many samples or how much geophysical data (*e.g.,* amount of acres of grids or transects for MR projects) need to be collected;

(4) Where do the samples or the geophysical data (for MR projects) need to be collected;

(5) How many anomalies need to be intrusively investigated (for MR projects);

(6) What sample collection methods need to be used (*e.g.,* discrete or composite samples; sampling equipment and technique; quality assurance/quality control samples);

(7) What types of geophysical methods need to be used (*e.g.,* analog vs. DGM sensors for MR projects);

(8) What sample analysis methods need to be used (e.g., sample preparation; laboratory analysis; method detection limit and quantitation limit; laboratory quality assurance/quality control); and

(9) What technical limitations, cost benefits, and imposed requirements are associated with each applicable data collection option.

c. Data implementers should also develop order-of-magnitude costs for preliminary estimates and prepare draft figures representing planned sampling locations or areas. The data collection tables, preliminary cost estimates, and draft figures will be used during Phase IV activities.

> Sampling and analysis planning worksheets offer a concise yet complete means of communicating the sampling and analysis methods to obtain data that satisfies the data requirements associated with the intended data uses. Well prepared sampling and analysis worksheets can be inserted directly into appropriate scope of work, PWS, work plan section, or QAPP.

3.5. Complete Phase III Activities.

a. The technical personnel should review the sampling and analysis planning worksheets to ensure that all data needs were appropriately associated with current or future project objectives. In accordance with the applicable quality management plan, the PM should also have independent technical resources review the sampling and analysis planning worksheets. (An example of a sampling and analysis planning worksheet is provided in Appendix D and may be useful during independent review efforts.) In any case, all projects will be periodically evaluated by the team to ensure baseline requirements of scope, schedule, and cost are being met (ER 5-1-11). If it appears that some data needs were omitted or overlooked, the PM should meet with the data implementers to correct the apparent omission. After the technical personnel complete quality control confirmation that the data collection tables are complete, they

should document in the project file if any data needs were not grouped within the data collection options to be considered during Phase IV.

b. The PM should review any site information worksheets or lists of site information data needs that were identified by the data implementers. It is the PM's responsibility, working with the technical personnel, to decide how and when the additional site information data needs will be fulfilled (*e.g.,* discussions with the customer, site visits, incorporated within appropriate scope of work, PWS, or work plan sections).

c. At the conclusion of Phase III, the PM should distribute copies of all sampling and analysis planning worksheets and attach related illustrations to all appropriate team members.

CHAPTER 4

Finalize Data Collection Program (Phase IV)

4.1. Introduction. During Phase IV (see Figure 4-1) of the TPP process the customer, PM, and appropriate technical personnel discuss data collection options and finalize a data collection program that best meets the customer's short- and long-term goals for a site. This chapter also offers guidance for documenting the data collection program with a project specific DQO statement for each data need, final scope of work or work plan, detailed cost estimates, and fact sheet(s). DQOs may also be called project quality objectives, (see paragraph 4.3.1).

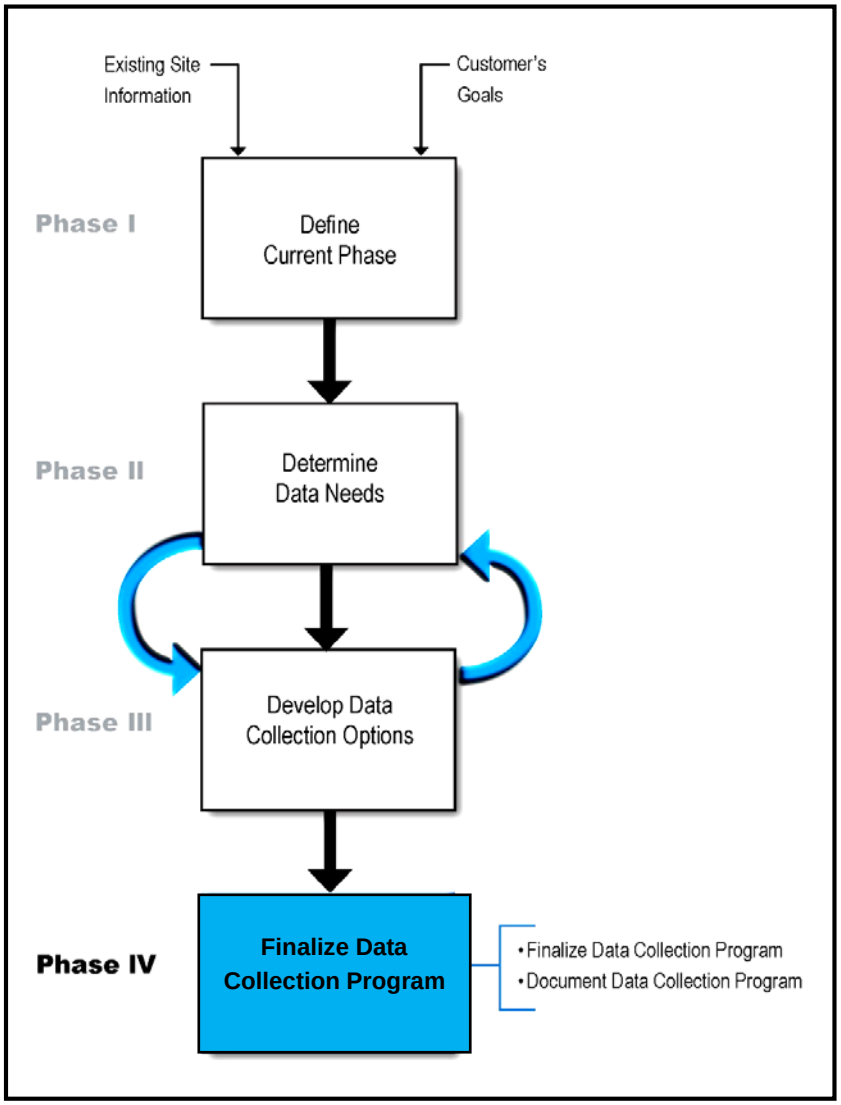

Figure 4-1. Phase IV of Four-Phase TPP Process

Communication and interaction with both the customer and the regulator are strongly encouraged during Phase IV efforts.

This chapter and the entire TPP process supports efforts to prepare project specific DQOs that meet the definition as provided within the U.S. Environmental Protection Agency's DQO Process (EPA 2006a) and the UFP QAPP Manual (IDQTF 2005b).

4.2. Finalize Data Collection Program.

a. The PM, key data users and data implementers, regulatory stakeholders and customer should work together to design the data collection program. In many instances, the customer and PM will also decide to involve the other stakeholders, as appropriate, to design the data collection program. Design of the data collection program will be based on the customer's preferred combination of meeting current project objectives, obtaining data cost-effectively for future executable stages, and including any excess data not associated with project objectives that the customer chooses to retain.

b. Finalizing the data collection program requires review of the customer's goals, the project objectives, the intended data uses, the data collection options, and key risk management considerations (e.g., feasibility, cost, schedule, uncertainty, and political concerns).

4.2.1. Prepare Customer Communications.

a. If the customer was not directly involved in determining the data needs (Phase II) and developing the data collection options (Phase III), then summary information should be provided. The PM should revisit the Phase I Planning Memo to insure its information is current. The PM should consider utilizing input from both the data users and data implementers to ensure the summary information is precise about both the data needed and the data collection options available. Illustrations representing the site or data collection activities and the site decision logic will be useful when communicating the data collection options and recommendations to the customer. Example decision logic flowcharts are presented in Appendix F.

b. In some instances, a summary table of data collection options and a series of sampling and analysis planning worksheets, would provide sufficient detail. (Appendix D provides a summary table of data collection options and an example.) However, in most cases, it is more appropriate to add a simple overview description that summarizes the important attributes and characteristics of each option. A well prepared overview supplements a summary table of data collection options and describes potential effects of design decisions on quality, schedule, and cost. It is also recommended that resource conservation and protection afforded through the use of green and sustainable practices be described in the overview as well. Not only will this assist the customer in understanding the benefits and limitations of various data collection options, but it will also provide the basis of subsequent design discussions or presentations.

The PM and technical personnel should communicate to the customer the uncertainty; cost and technical benefits; and regulatory perspective associated within each data collection option.

4.2.2. Encourage Customer Participation.

a. Efforts to design the data collection program should include obtaining input from the customer. The customer should always be invited and encouraged to participate in design of the data collection program for their site. Regardless of a customer's level of technical expertise related to the site work, the customer's participation at this time will facilitate a design that provides maximum customer satisfaction within the schedule, budget, technical, and regulatory constraints associated with a site. The PM or an assigned technical team member should lead the team through this sequence of activities to obtain the customer's input and to support the customer's considerations.

(1) The PM and technical personnel should recommend to the customer the basic data collection option that satisfies data needs associated with the current executable stage. They should also present all elements of the optimal data collection option; the option which satisfies project objectives for both the current and future executable stages.

(2) The uncertainty, costs, and benefits associated with each of the data collection options should be explained and discussed. Primary considerations should include schedule, budget, project objectives and their role in leading the site to closeout, technical constraints, how each data collection option increases confidence in the site conceptual model, regulatory perspective, and site or program precedents.

(3) The PM and technical personnel should present and explain any data needs that arose during the planning process that are not associated with project objectives that lead to site closeout but may be desired by an external or regulatory stakeholder. Technical personnel should be prepared to be responsive to the customer's questions regarding technical details and rationale; cost and schedule implications; and site precedent concerns related to each element of the excessive data collection option. Sampling and analysis strategies to satisfy data needs that do not lead to site closeout should only be included in the data collection program when explicitly desired by the customer.

(4) The team should finalize design of the data collection program by combining the customer preferred components of the various data collection options, as appropriate.

b. When designing the data collection program with customer input, technical personnel must be sure that the customer understands the effects of any reductions in the level of investigation or adjustments to the field methods has on project uncertainty. Although the customer may initially be satisfied with resulting schedule and cost

reductions, the increased uncertainty of the findings may not satisfy the intended data uses or related project objectives. It is the responsibility of both the PM and the technical personnel to remind the customer of any regulatory requirements, technical constraints, and stakeholder perspectives that should be factored into the customer's decisions.

c. In some instances, the PM may ask that data users and data implementers re-examine portions of their Phase II and III efforts to fully understand and communicate consequences of refining the data collection program. In other instances, the project objectives corresponding with the current project may need to be revised, or the number of project objectives may need to be reduced or increased depending upon a customer's interests and needs while finalizing design of a data collection program. Changes to grouping of the project objectives should involve some revision to the Phase I Planning Memo or the applicable project objective worksheet. Since there is no one correct answer for what belongs in a site's data collection program, a team will typically iterate back into Phase II and Phase III while finalizing design of a data collection program.

4.2.3. Suggest Regulator Participation.

a. Although it is recommended that regulatory stakeholders be included early in the project planning process, it is highly recommended that they have an opportunity to provide input in Phase IV. Regulator involvement at this time during the project planning process will enhance acceptance of the final design. Regulator participation in the TPP activities can reduce the number of technical comments received from the regulators, reduce the time expended to plan and execute work, and increase opportunities for the entire team to be flexible and creative in resolving site problems.

b. After discussions with the customer, but prior to final scoping, regulators should be included in a consensus decision process. However, it is always the customer's decision as to whether or when regulators participate in the TPP process.

c. In order to achieve regulator acceptance of the data collection program, their input and concerns should be considered. Depending upon the customer's preference and experience with the regulators, the customer may be better served by meeting with the regulators after DQOs have been written and provided to the regulators for their review and comment. In any case, regulator desired refinements to the data collection program should ultimately be incorporated only when explicitly agreed to by the customer.

The Phase I Planning Memo, project objective worksheets, data need worksheets, and sampling and analysis planning worksheets can be very useful to the PM, customer, and technical personnel when working with regulators during consensus decision efforts.

4.2.4. Consider Participation of Others. In many cases, stakeholder interests and concerns can have a significant effect on decisions made by both the customer and regulator at a site. If stakeholders are actively interested in site activities, some level of their participation is likely appropriate during this step in the TPP process. The team may want to offer stakeholders an opportunity to provide written comments regarding site plans. Or the team may consider using some community or public relations techniques and offer a special forum for stakeholders to learn more about the rationale for the planned site activities. The concerns and issues of stakeholders can typically be addressed and managed through a comment and response exchange or by conducting a special meeting tailored to their understanding of the site. However, it remains the customer's decision as to whether, when, and how stakeholders participate in this TPP activity.

4.3. Document Data Collection Program. The PM and technical personnel must document the decisions made during the TPP efforts to contribute to institutional knowledge at a site, and for presentation directly in related sampling and analysis plans and work plans. Documentation should include project-specific DQOs, the final scope of work, a detailed cost estimate, and a fact sheet(s) when appropriate.

4.3.1. Prepare Data Quality Objectives.

a. The preparation of DQO statements is a culmination of many of the planning activities presented in this manual. Similar guidance for preparing formal DQOs is provided in EPA QA/G-4, "Guidance on Systematic Planning Using the Data Quality Objectives Process" (EPA 2006a) and in American Society of Testing Materials D 5792-02 (ASTM 2006). Appendix C presents a detailed Crosswalk from EPA's 7-Step DQO Process to the TPP process. The DQOs become the formal documentation of the data quality requirements. Appendix E provides a DQO worksheet for documenting the nine data quality requirements of a DQO. Effective use of DQOs yield data of known quality, documentation of the planning process, and a benchmark to determine whether the data meet specified objectives. Whether formal DQOs using all seven steps outlined in QA/G-4 need to be developed depends on whether the overall decision or project objective is critical and requires definition of the amount of acceptable error, (see paragraph 2.2.4.1). Appendix E provides a DQO attainment verification worksheet.

b. The UFP QAPP (IDQTF 2005b) provides a means of documenting systematic planning outcomes into worksheets that are included in development of quality assurance project plans (QAPPs) (see Appendix F for a crosswalk between TPP planning worksheets and the UFP QAPP worksheets). The UFP QAPP document references DQOs but instead of actually documenting DQOs as an outcome of the planning process it documents "Project Quality Objectives (PQOs)". As described in the UFP QAPP, PQOs answer questions such as "Who will use the data?", "What will the data be used for?" "What types of data are needed?" DQOs answer these questions as well but are too often presented in a generic manner. Using a systematic planning process such as the one presented in this manual and in other documents; the UFP

QAPP and EPA's QA/G-4, does lead to quality objectives that are indeed project-specific. Teams are encouraged to consider using the term "PQO" instead of "DQO" if they believe the project and their customer will benefit.

4.3.1.1. Definition of a DQO. DQOs (and PQOs) are generally described as qualitative and quantitative statements derived from a systematic planning process that clarify study objectives, define the appropriate type of data, and specify the tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions DQOs (or PQOs) are used as the basis for establishing the quality and quantity of data needed to support decisions.

4.3.1.2. DQOs Produced as a Result of the TPP Process. Such DQOs meet EPA's definition of a DQO; however, depending on the project may not statistically specify the tolerable levels of potential decision errors (see paragraph 2.2.4.1). The DQOs documented during this TPP activity should be project-specific statements that describe the intended data use(s), the data need requirements, and the means to achieve them. DQOs documented as a result of the TPP process should be comprehensive and include each of the following data quality requirements.

a. Intended Data Use(s): Project objective(s) satisfied.

b. Data Need Requirements:

(1) Data use(i.e., risk/hazard, compliance, remedy, or responsibility) satisfied;

(2) Contaminant, physical hazard, or characteristic of interest identified;

(3) Media of interest or location of MEC (e.g. sediment; surface or subsurface soil) identified;

(4) Required areas for investigation and depths identified;

(5) Required amount of investigation (e.g. fixed or dynamic estimate of the number of samples for HTRW sites, or acres of grids/transects and number of anomalies excavated for MRSs); and

(6) Reference concentration of interest or other performance criteria (e.g. action level, compliance standard, decision level, design tolerance for HTRW sites, and confidence level, MEC density for MRSs) identified.

c. Appropriate Sampling and Analysis Methods:

(1) Sampling method (e.g., discrete, composite or multi-increment sample; sampling equipment and technique; quality assurance/quality control samples; geophysical equipment and data collection; transects or grids; intrusive anomaly investigation) identified; and

(2) Analytical method (e.g., sample preparation, laboratory analysis method detection limit and quantitation limit, laboratory quality assurance/quality control) identified.

4.3.1.3. Team Preparation of DQOs.

a. A DQO statement should be prepared for each data need within a data collection program. This manual recommends that key data users and data implementers share the responsibility of preparing the DQO statements to ensure each is correct and complete. Technical personnel should find this effort to involve merely compiling the information from the project objective worksheets, the source data need worksheets, and the sampling and analysis planning worksheets (see Appendix F for worksheets and tables).

b. As described in the UFP QAPP Manual (IDTQF 2005b), after DQOs have been developed, the measurement performance criteria that should be satisfied can be developed and documented in the QAPP. Measurement Performance Criteria, also called Measurement Quality Objectives (MQOs), are designed to produce the type, quality, and quantity of data that can be used to support site decision making. MQOs are quantitative measures of performance against selected measures, called data quality indicators. Data quality indicators are established using the performance or acceptance criteria defined in the DQOs and generally include precision, bias, representativeness, completeness, comparability and sensitivity.

c. Information on MQOs for MMRP projects can be found within EM 200-1-15. Geophysical Systems Verification (GSV), including both an Instrument Verification Strip and a blind seeding program within production areas (*i.e.,* MRSs) are a critical component to geophysical investigations and document the instrument functionality both prior to and during geophysical data collection to ensure the geophysical data is of sufficient quality to meet the project's data quality objectives. Additional details on the implementation of the GSV process can be found in EM 200-1-15.

4.3.2. Prepare Final Scope of Work or Work Plan. The PM should consult applicable scope of work (SOW), PWS and work plan guidance, and rely on technical personnel, to prepare and finalize the SOW/PWS or work plan for the project. In accordance with applicable guidance, the SOW/PWS or work plan must include at least the project objectives, site-specific DQOs, and the related technical requirements.

4.3.3. Prepare Detailed Cost Estimate. As appropriate, the PM should coordinate the efforts of various technical personnel to prepare detailed cost estimates for all components of the data collection program. For contracted services, an Independent Government Estimate is required. The PM will find that estimates are usually best prepared immediately after data collection program design, while technical personnel can easily recall data collection program details. Technical personnel will need to reference other guidance and resources in order to prepare the detailed information and cost estimates for the planned site activities (ER 1100-3-1301)

4.3.4. Prepare Fact Sheet(s).

a. The PM and team's TPP efforts may involve providing the customer with community relations or public affairs assistance to communicate information about the data collection program. Although preparation of DQOs, the project SOW or PWS or work plan, and a detailed cost estimate are successful methods of communicating some of the pertinent information to parties involved in site planning and implementation activities, preparation of a fact sheet(s) for presentation to regulators and other interested parties may be necessary or helpful.

b. In instances where a fact sheet will be prepared for presentation, the team should carefully plan the fact sheet for the receiving audience. Objectives of typical fact sheets include:

(1) Prepare customer to brief superiors, regulators, other potentially responsible parties, or other stakeholders;

(2) Negotiate with regulators with, or on behalf, of the customer;

(3) Inform interested citizens or other parties (e.g.; introduce public to a site; obtain public participation in planning process; establish public concurrence with planned activities; or address public resistance or concerns as a handout at a public meeting or as a direct mail brochure); and

(4) Provide an outline of key project planning information to include within a site's community relations plan.

c. The team should consider the potential communication value of some of the following TPP products when planning to prepare a fact sheet:

(1) Site history and site background information excerpts from the Phase I Planning Memo, if confirmed to be accurate;

(2) Project objective worksheets prepared during Phase I;

(3) Conceptual site model figures or descriptions, including planned sampling locations or area for investigation;

(4) Data need worksheets prepared during Phase II;

(5) Sampling and analysis planning tables prepared during Phase III;

(6) Site-specific summary tables of data collection options prepared during Phase III;

(7) GSR practices considered and incorporated;

(8) DQOs ; and

(9) Final SOW or PWS or work plan.

4.4. Complete Phase IV Activities. The PM should distribute copies of all data collection program components (e.g., Phase I Planning Memo, project objective worksheets; data need worksheets; sampling and analysis planning worksheets; summary tables of data collection options; DQOs; final SOW or PWS or work plan; detailed cost estimates; and fact sheets) to the customer and technical personnel, as appropriate. (The customer should decide what TPP components, if any, will be provided to the regulators or stakeholders.) These items will aid preparation and review of subsequent sampling and analysis plans and work plans related to the current project activities.

The PM should also retain all the TPP products for the project in the project file for future reference. Many of the products of project planning should also be attached to the management plan for the project (e.g., Phase I Planning Memo, sampling and analysis planning worksheets; DQO statements; final SOW/PWS; work plans, and related cost estimates). The planning memo and worksheets and the DQOs should be attached to the QAPP.

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CHAPTER 5

Beyond Planning for Data Collection
Implementation of Data Collection Program and Closeout Strategy

5.1. Introduction. This EM offers the TPP process as a systematic planning process for identifying project objectives and designing data collection programs. This chapter provides some discussion about implementing, assessing and utilizing data collection programs that have been designed using TPP process and also discusses the role such project planning plays in the overall project lifecycle.

5.2. Implementation of Data Collection Program.

a. At the completion of Phase IV, sampling and analysis plans and work plans should be finalized and field work should begin. It may also be beneficial for contractors and laboratory personnel, responsible for implementing the plans, to meet with some members of the team to discuss any questions and refer to the related planning products.

b. When issues arise during execution of the site activities, the team should be consulted and the products should be reviewed to quickly resolve many issues and provide related background planning information (e.g., project objectives worksheet, data needs worksheet, sampling and analysis planning worksheets).

5.3. Amendments to Data Collection Program.

a. Amendments to project plans are sometimes unavoidable due to any number of the following circumstances:

(1) External events (e.g., change in regulations);

(2) Improvement in technologies (e.g., sampling, analysis, remediation);

(3) Inadequate or poorly defined requirements;

(4) Discovery of incorrect technical assumptions; and

(5) Flaws in the initial plan or design.

b. When project plans need to be amended, the PM should obtain input from the appropriate technical disciplines to ensure that any additional data collection is done as effectively and efficiently as possible. In some instances, it may be beneficial to reconvene key team members to consider what project planning products should be further reviewed or revised as a result of changed circumstances.

5.4. Verification of Data Quality Objective Attainment. Efforts to evaluate and verify attainment of DQO statements enable data users to understand any data usability limitations associated with project data. Efforts to verify DQO attainment can be thought

of as follow-up planning activities that should be conducted before other data quality assessments are performed. Appendix E provides additional guidance regarding verification of DQO attainment and a related worksheet.

5.5. Assessments of TPP Efforts.

a. After completing data collection activities at a site, the team should perform an evaluation of the effectiveness of the TPP planning and implementation efforts. Assessments and evaluations should be done to improve future TPP planning efforts and to prevent recurring problems.

b. One assessment should be regarding the expenditures of cost and time for implementing the project planning process, and the resulting benefits. Of particular interest is an evaluation of how cost and schedule savings, attributed to use of the systematic planning process or concepts, compare to the approximate expenditures of cost and time to assemble a team and use the process.

5.6. Planning Subsequent Data Collection Programs and Closeout Strategy.

a. Using the site decision logic the PM will determine whether further data collection is required to bring the site to closure. When beginning to plan the next executable stage of site activities, the current team or a subsequent team should begin at Phase I by updating the conceptual model of the site, the site approach/decision logic and identifying the next current project. For example, if a Site Inspection was completed under CERCLA the next executable stage may be a Remedial Investigation; or if the project is further in the project lifecycle and has a remedy in place the next stage which might involve data collection may be a five year review or an optimization study. The team must update the CSM as more information is obtained and as site conditions may change due to removal or remedial actions. The EPA document "Environmental Cleanup Best Management Practices: Effective Use of the Project Life Cycle Conceptual Site Model" (EPA 2011) contains useful considerations for updating and utilizing the CSM throughout the project lifecycle. The TPP process is iterative and should be initiated at each executable stage until site closeout is achieved for the customer.

b. To facilitate moving the site towards closure, products of the project planning process can be used to create a Site Closeout Strategy. When the site is at a phase where remedial alternatives are being developed and evaluated, for example the Feasibility Study (FS) or Corrective Measures Study (CMS) phase, a preliminary Closeout Strategy should be developed by the team. A Closeout Strategy presents the decision logic, actions and measures to complete closure. A Closeout Strategy may be developed at any time during the project lifecycle and should include regulator input; it is especially valuable to develop the Closeout Strategy before the site's decision document has been finalized. Products of the TPP process will be updated and refined during development of the Closeout Strategy; the Site Closeout Statement, the Site

Decision Logic and the site CSM; and become important components of it. At the stage of remedial alternatives development and analysis, the Closeout Strategy will be conceptual in nature, it is refined when a remedial alternative is selected, and should be revisited when the remedy is being implemented, and when operations/maintenance have begun. In each of these phases (FS or CMS, design, remedy implementation, and/or remedial operation) the development and refinement of the Closeout Strategy should include consideration and potential incorporation of GSR practices. "Detailed Approach for Performing Green and Sustainable Remediation (GSR) Evaluations in Army Environmental Remediation" (Army 2012), includes GSR Best Management Practices that are potentially applicable in the development and refinement of the Closeout Strategy in the FS, Remedial Action Work Plan/Design, and Remedial Operation phases. ITRC, in their Performance-Based Environmental Management document (ITRC 2007) present more details regarding Closeout Strategy development (ITRC uses the term Exit Strategy). EP 1110-1-18 provides examples of MMRP decision logic and closeout strategies. An example decision logic from EP 1110-1-18 is included in Appendix F. EM 200-1-5 includes decision logic diagrams for MEC and MC remedial investigations and remedial actions. Site closure for HTRW and MR sites both follow the CERCLA or RCRA process; however, the associated technologies and remedial actions to accomplish site closeout will vary.

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APPENDIX A

References

A.1. Required Publications.

10 U.S.C. 2710

40 CFR Parts 61, 129, 131,136, 141, 161, 261, 300

DoD Manual 4715.20
Defense Environmental Restoration Program (DERP) Management Manual, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L))

DoD
Performance-Based Acquisition of Environmental Restoration Services, Office of the Deputy Under Secretary of Defense for Installations and Environment, July 2007.
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DoD Quality Systems Manual for Environmental Laboratories, DoD Environmental Data Quality Workgroup (EDQW), July 2013.
http://www.denix.osd.mil/edqw/upload/QSM-Version-5-0-FINAL.pdf

Uniform Federal Policy for Quality Assurance Project Plans Optimized UFP-QAPP Worksheets, Intergovernmental Data Quality Task Force. March 2012.
http://www2.epa.gov/sites/production/files/documents/ufp_qapp_worksheets.pdf

DTIC ADA 395303
Uniform Federal Policy for Implementing Environmental Quality Systems: Evaluating, Assessing and Documenting Environmental Data Collection and Use Programs, Intergovernmental Data Quality Task Force, 2005a.

DTIC ADA 427785
Uniform Federal Policy for Quality Assurance Project Plans, Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs, Part 1: UFP-QAPP Manual, EPA-505-B-04-900A, Intergovernmental Data Quality Task Force, 2005b.

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http://clu-in.org/greenremediation/docs/ACSIM_GSR_Fnl_Rpt_V1_Main_with_App.pdf

U.S. Army Environmental Command Performance-Based Acquisition Handbook, USAEC, May 2010.

ER 5-1-11
U.S. Army Corps of Engineers Business Process

ER 200-1-5
Policy for Implementation and Integrated Application of U.S. Army Corps of Engineers Environmental Operating Principles and Doctrine

ER 200-3-1
Formerly Used Defense Sites (FUDS) Program Policy

ER 385-1-92
Safety and Occupational Health Requirements for Hazardous, Toxic and Radioactive Waste Activities

EM 200-1-6
Chemical Quality Assurance for Hazardous, Toxic, and Radioactive Waste Projects

EM 200-1-10
Guidance for Evaluating Performance-Based Chemical Data

EM 200-1-12
Conceptual Site Models for Environmental and Munitions Projects

EM 200-1-15
Technical Guidance for Military Munitions Response Actions

EM 200-1-16
Environmental Statistics

EM 385-1-1
Safety and Health Requirements Manual

EP 200-1-15
Standard Scopes of Work for HTRW Risk Assessments

EP 200-3-1
Public Participation Requirements for Defense Environmental Restoration Program

EPA-9355.0-04B
Remedial Design/Remedial Action Handbook, June 1995b.

EPA-230-R-95-005
Observational Economy Series Volume 1: Composite Sampling, August 1995c.

EPA/240B-06/001
EPA QA/G-4, Guidance on Systematic Planning Using the Data Quality Objectives Process, U.S. Environmental Protection Agency, February 2006a.

EPA /240/B-06/002
EPA QA/G-9R, Data Quality Assessment: A Reviewer's Guide, February 2006b.

EPA/240/R-02/005
EPA QA/G5-S, Guidance on Choosing a Sampling Design for Environmental Data Collection, December 2002.

EPA/540/1-89/002
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Remedial Design/Remedial Action Handbook

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Environmental Cleanup Best Management Practices: Effective Use of the Project Life Cycle Conceptual Site Model.

EPA 600/R-96/084
EPA QA/G-9, Guidance for Data Quality Assessment - Practical Methods for Data Analysis.

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Standard Guide for Developing Conceptual Site Models for Contaminated Sites, American Society for Testing Materials.

D6235-04
Standard Practice for Expedited Site Characterization of Vadose Zone and Ground Water Contamination at Hazardous Waste Contaminated Sites. American Society for Testing Materials.

D5792-02(2006)
Standard Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives, American Society for Testing Materials.

ANSI/ASQ E4
Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs, American National Standards Institute/American Society for Quality Control.

A.2 Related Publications.

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FR 41000-41015 , Volume 54, October 4, 1989
National Priorities List for Uncontrolled Hazardous Waste Sites, Final Rule.

Department of Defense, 2013
DoD Environmental Field Sampling Handbook.
http://denix.osd.mil/edqw/upload/DoD-Environmental-Field-Sampling-Handbook.pdf

AR 5-1
Army Management Philosophy.

AR 200-1
Environmental Protection and Enhancement.

ER 200-1-4
Formerly Utilized Site Remedial Action Program (FUSRAP) Site Designation, Remediation Scope, and Recovering Costs.

ER 200-1-7
Chemical Data Quality Management for HTRW Remedial Activities.

ER 1110-1-12
Quality Management.

ER 1110-3-1301
Cost Engineering Policy and General Requirements for Hazardous, Toxic, and Radioactive Waste Cost Estimates.

ER 1180-1-6
Construction Quality Management.

EP 1110-1-19
Technical Requirements for Specifications to Report HTRW Environmental Restoration Cost and Performance.

EP 1110-1-21
Air Pathway Analysis for the Design of HTRW Remedial Action Projects.

EM 200-1-1
Validation of Analytical Chemistry Laboratories.

EM 200-1-4
Risk Assessment Handbook; Volume I: Human Health Evaluation; Volume II: Environmental Evaluation.

EM 200-1-5
Design, Installation and Utilization of Fixed-Fence line Sample Collection and Monitoring Systems.

EM 200-1-7
Performance Evaluation System.

EM 200-1-10
Guidance for Evaluating Performance-Based Chemical Data.

EM 1110-1-502
Technical Guidelines for Hazardous and Toxic Waste Treatment and Cleanup Activities.

EM 1110-1-4007
Engineering and Design - Safety and Health Aspects of HTRW Remediation Technologies

EM 1110-35-1
Management Guidelines for Working with Radioactive and Mixed Waste.

EPA 1986
OSWER Directive 9205.00-5, RCRA Facility Assessment Guidance.

EPA 1987
OSWER Directive 9345.1-02, Expanded Site Inspection.

EPA 1989
EPA/540/SW-89-031, RCRA Facility Investigation Guidance.

EPA 1989
EPA/540/G-89/004, OSWER Directive 9355.3-01, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.

EPA 1991
EPA-540/6-91/013, OSWER Directive 9345.0-01A, Guidance for Performing Preliminary Assessments Under CERCLA.

EPA 1992
EPA/540/R-92/021, Guidance for Performing Site Inspections Under CERCLA.

EPA 1993
EPA 540-F-93-047, Presumptive Remedies: Policy and Procedures.

EPA 1994
OSWER Directive 9902.3-2A RCRA Corrective Action Plan.

EPA 2001
EPA 540-R-01-007, OSWER 9355.7-03B-P, Comprehensive Five-Year Review Guidance.

EPA 2011
OSWER Directive 9320.2-22, Close Out Procedures for National Priorities List Sites.

APPENDIX B

Outline of TPP Activities

Table B-1 provides an outline of the Technical Project Planning process activities described in this manual.

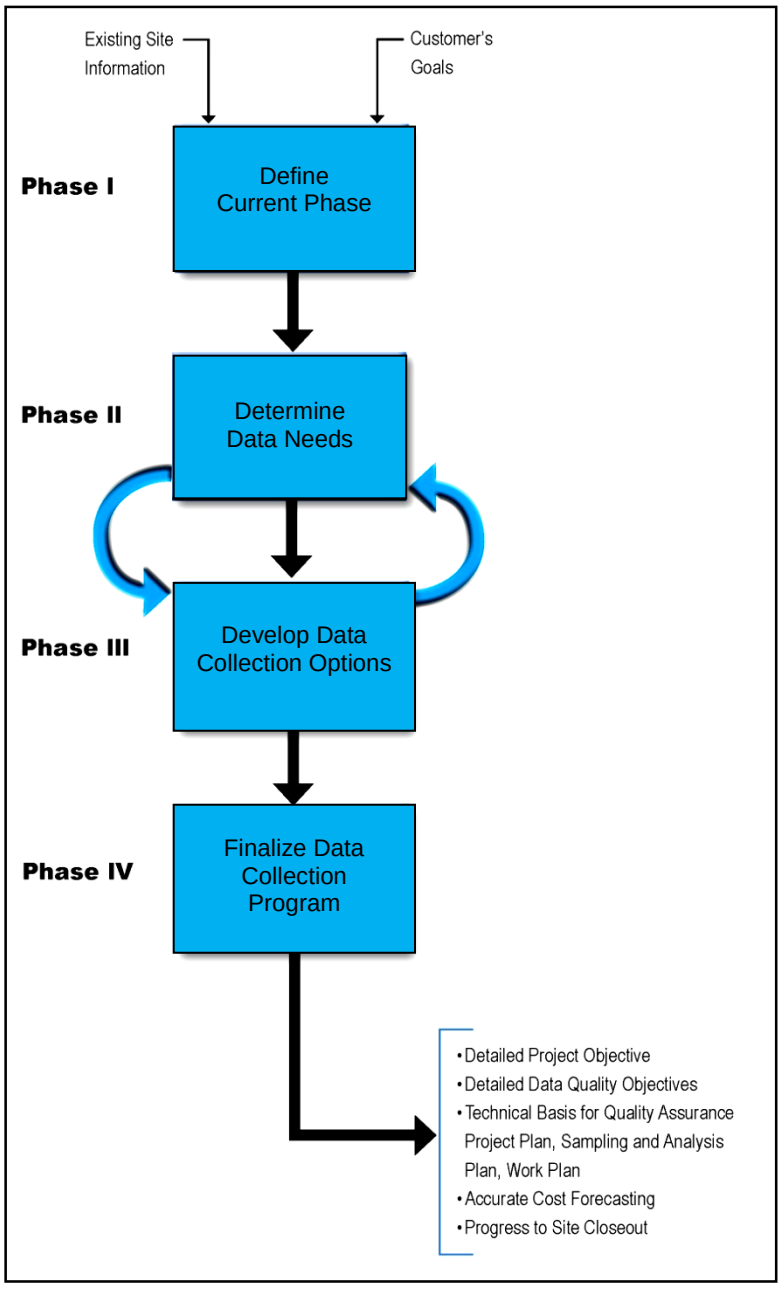

Figure B-1. Technical Project Planning Process

Chapters 1 through 4 describe how to conduct Phase I through Phase IV of the TPP process, respectively.

Chapter 5 provides information regarding implementation and assessment of data collection programs that have been designed using the TPP process and using the TPP process in the latter stages of the project lifecycle.

The preparation of data quality objective (DQO) statements is just one of the outcomes of the TPP process. Similar guidance for preparing DQOs is provided in the U.S. Environmental Protection Agency's (EPA's) "Guidance on Systematic Planning Using the Data Quality Objectives Process, February 2006". (Appendix C presents a detailed crosswalk from EPA's 7-Step DQO Process to the TPP process.)

Appendix D provides several worksheets and tables for documenting TPP information, decisions, and plans and provides a crosswalk of the TPP worksheets to the UFP QAPP worksheets. The Appendix F tools are intended to help a team design and document a data collection program throughout their use of the TPP process.

Appendix E provides additional guidance regarding verification of DQO attainment and a related worksheet. Efforts to verify DQO attainment can be thought of as follow-up TPP activities that should be conducted before other data quality assessments are performed.

Table B-1

Outline of TPP Activities

Phase	Activity	Sub-Activities/Considerations
Phase I 1.6 Prepare Team Information Package *Team Information Package = an informal collection of existing site information that is compiled for reference by the entire team*	1.6.1 Identify Project Planning Team (p 1-4 to 1-8)	1.6.1.1 Decision Makers 1.6.1.2 Data Users 1.6.1.3 Data Implementors 1.6.1.4 Team Selection
	1.6.2 Identify Customer Goals (p 1-9 to 1-11)	1.6.2.1 Develop Site Closeout Statement 1.6.2.2 Schedule Requirements 1.6.2.3. Site Budget 1.6.2.4 Complete Site Closeout Statement
	1.6.3 Gather Existing Site Information (p 1-11 to 1-13)	1.6.3.1 Conduct Preliminary Site Visit 1.6.3.2 Gather Site Data and Reports 1.6.3.3 Obtain Operations Records 1.6.3.4 Collect Background Literature 1.6.3.5 Conduct Site History Interviews
Phase I 1.7 Identify Site Approach *Site Approach = an overall strategy for managing a site from its current condition to the desired site closeout condition*	1.7.1 Evaluate Site Information and Data (p 1-14 to 1-17)	1.7.1.1 Review Site Information and Data 1.7.1.2 Develop Conceptual Site Model
	1.7.2 Identify and Document Project Objectives (p 1-17 to 1-20)	1.7.2.1 Regulatory Framework 1.7.2.2 Other Regulatory Programs 1.7.2.3 Other Project Objectives
	1.7.3 Identify Executable Stages to Site Closeout (p 1-20 to 1-21)	
	1.7.4 Seek Regulator and Stakeholder Input (p 1-21)	1.7.4.1 Regulator Input 1.7.4.2 Determine Community Stakeholder Concerns
	1.7.5 Define Probable Remedies (p 1-21 to 1-22)	1.7.5.1 Presumptive Remedies 1.7.5.2 Innovative Technologies
Phase I 1.8 Define Current Project *Current Project = a detailed strategy for completing the current executable stage(s) of site activities including finalization of project objectives*	1.8.1 Recognize Site Constraints, Uncertainties, and Dependencies (p 1-23 to 1-26)	1.8.1.1 Administrative Constraints and Dependencies 1.8.1.2 Technical Constraints, Uncertainties and Dependencies 1.8.1.3 Legal and Regulatory Milestones and Requirements
	1.8.2 Define Courses of Action for Achieving Site Closeout (p 1-26 to 1-28)	1.8.2.1 Operable Units, Exposure Areas and Munitions Response Areas and Sites 1.8.2.2 Expedited Removal 1.8.2.3 Phasing (Series or Parallel) 1.8.2.4 Field Screening and Field Analytical Methods

Phase	Activity	Sub-Activities/Considerations
Phase I 1.8 (Cont'd) Define Current Project	1.8.3 Document Current Executable Stage (p 1-28 to 1-29)	The team should document the current executable stage by renumbering all project objectives to represent the planned sequence, as well as clearly differentiate between the basic project objectives associated with current project and the optimum project objectives associated with future executable stages at a site.
Phase I 1.9 Complete Phase I Activities	1.9.1 Finalize Acquisition Strategy (p 1-29)	
	1.9.2 Initiate Scope of Work or Performance Work Statement (p 1-29 to 1-30)	
	1.9.3 Prepare Phase I Planning Memo (p 1-30 to 1-31)	A complete Phase I MFR contributes to institutional site knowledge about a site and should be a stand-alone document attached to the site-related Project Management Plan.
	1.9.4 Develop Preliminary Site Strategy/Decision Logic (p. 1-31)	
Phase II 2.2 Determine Data Needs *Data need = site information or environmental data that is required to satisfy a project objective(s)*	2.2.1 Review Phase I Planning Memo (p 2-1)	Review of Phase I information is particularly important for those personnel not involved in Phase I efforts and for the entire team when some time has passed since Phase I efforts were completed.
	2.2.2 Establish Data Users' Roles (p 2-2 to 2-6)	2.2.2.1 Risk/Hazard Data User 2.2.2.2 Compliance Data User 2.2.2.3 Remedy Data User 2.2.2.4 Responsibility Data User
	2.2.3 Evaluate Use of Existing Data (p 2-6)	The review of existing data is a fundamental and critical TPP activity that must occur prior to determining the additional data needed at a site to satisfy the project objectives.
	2.2.4 Define Data Needs (p 2-7 to 2-13)	2.2.4.1 Probabilistic/Non-Probabilistic Decisions 2.2.4.2 Level of Investigation 2.2.4.3 Data Collection Considerations 2.2.4.4 Risk/Hazard Data Needs 2.2.4.5 Compliance Data Needs 2.2.4.6 Remedy Data Needs 2.2.4.7 Responsibility Data Needs

Phase	Activity	Sub-Activities/Considerations
Phase II 2.3 Document Data Needs	2.3.c. (p 2-14)	What data is needed to satisfy which project objective(s)? Who needs the data? What is the intended data use(s)? What number of samples are required to satisfy the intended use(s)? What is reference concentration of interest or other performance criteria? Where is area of interest or desired sampling location(s) and depth(s)?
Phase II 2.4 Complete Phase II Activities	2.4. a to d (p 2-15)	Review Data Need Worksheets Review Lists of Site Information Needs Distribute Data Need Worksheets
Phase III 3.2 Plan Investigation Approach	3.2.1 Review Phase I and Phase II Information (p 3-2 to 3-3)	3.2.1.1 Review Phase I Planning Memo 3.2.1.2 Review Phase II Data Needs
	3.2.2 Plan Sampling and Analysis Approaches (p 3-3 to 3-11)	3.2.2.1 Sort and Combine Data Needs 3.2.2.2 Develop and Document Sampling Strategies 3.2.2.3 Develop and Document Analysis Strategies 3.2.2.4 Refine Plans Within Project Constraints
Phase III 3.3 Develop Data Collection Options *Data collection options = basic, optimum, and unassociated. Data collection options are labels for data collection plans that satisfy the basic project objectives related to the current executable phase; minimize future costs by collecting data for subsequent executable phases (optimum project objectives); and clearly isolate any data that is imposed or mandated by others in excess of the data needed by data users (unassociated), respectively*	3.3.1 Basic Data Collection Option (p 3-11)	A basic data collection option is the data set needed to satisfy the current project objectives (e.g., remedial investigation data). The data collection efforts would produce data that meets all the data quality requirements of the data users for only the current project.
	3.3.2 Optimum Data Collection Option (p 3-11)	The optimum data collection option highlights opportunities to collect data needed to satisfy future project objectives during the current project. This grouping includes the portion of data needed for future executable stages that would be cost-effective and prudent to obtain during the current project.
	3.3.3 Data Identified as Unassociated with Project Objectives (p 3-12)	This unique group of data needs are those data needs that data users believe are no associated with fulfilling any current or future project objective. The data needs classified as unassociated are those specifically requested, imposed, or mandated by others, but not needed by data users.

Phase	Activity	Sub-Activities/Considerations
Phase III 3.4 Document Data Collection Options	3.4. a to c (p 3-12 to 3-13)	What data needs are being met? What project objectives will be satisfied? How many samples need to be collected? Where do the samples need to be collected? What sample collection methods need to be used? What sample analysis methods need to be used? What technical limitations, cost benefits, and imposed requirements are associated with each type of applicable data collection option?
Phase III 3.5 Complete Phase III Activities	3.5. a to c (p 3-13 to 3-14)	Review Data Collection Tables Review Lists of Site Information Needs Distribute Data Collection Tables
Phase IV 4.2 Finalize Data Collection Program *Data collection program = plans for obtaining site information and environmental data needed by data users for satisfying project objectives and supporting site decision making efforts*	4.2.1 Prepare Customer Communications (p 4-2)	Customer briefing should communicate to a customer uncertainty, cost and technical benefits, and regulatory perspective associated with each data collection option.
	4.2.2 Encourage Customer Participation (p 4-3 to 4-4)	Efforts to design the data collection program should include obtaining input from the customer. The customer should always be invited and encouraged to participate in design of the data collection program for their site.
	4.2.3 Suggest Regulator Participation (p 4-4)	After discussions with the customer, but prior to final scoping, the regulator should be included in a consensus decision process. However, it is always the customer's decision as to whether or when the regulator is asked to participate in the TPP process.
	4.2.4 Consider Participation of Others (p 4-5)	In many cases, other stakeholder interests and concerns can have a significant effect on decisions made by both the customer and regulator at a site. If stakeholders are actively interested in site activities, some level of their participation is likely appropriate during this step in the TPP process.
Phase IV 4.3 Document Data Collection Program	4.3.1 Prepare Data Quality Objective Statements (p 4-5 to 4-7)	4.3.1.1 Definition of a DQO 4.3.1.2 DQOs Produced as a Result of the TPP Process 4.3.1.3 Team Preparation of DQOs

Phase	Activity	Sub-Activities/Considerations
Phase IV 4.3 (Cont'd) Document Data Collection Program	4.3.2 Prepare Final Scope of Work or Work Plan (p 4-7)	In accordance with applicable guidance, the SOW, PWS and work plan includes project objectives, site-specific DQO statements, and related technical requirements.
	4.3.3 Prepare Detailed Cost Estimate (p 4-7 to 4-8)	The PM will generally find that cost estimates are best prepared immediately after data collection program design, while technical personnel can easily recall details of the data collection program.
	4.3.4 Prepare Fact Sheet(s) (p 4-8 to 4-9)	In instances where a fact sheet will be prepared for presentation, the customer, PM, legal, and technical personnel should carefully plan the fact sheet for the receiving audience.
Phase IV 4.4 Complete Phase IV Activities	4.4 Complete Phase IV Activities (p 4-9)	The PM should distribute copies of all data collection program components to the customer and technical personnel, as appropriate. Many of the TPP products should also be attached to the PMP.

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APPENDIX C

Crosswalk to EPA's DQO Process

C.1. Comparison of TPP Process to EPA's DQO Process. U.S. Environmental Protection Agency's (EPA's) Data Quality Objective (DQO) Process (EPA 2006a) and the Technical Project Planning (TPP) process are both planning tools intended to ensure data are of the type, quantity, and quality needed for decision making at hazardous, toxic, and radioactive waste sites. Figure C-1 represents similarities between EPA's DQO Process and the TPP process

In general, the DQO Process is a decision quality objective process that enables a team to quantify tolerable decision error within a sample design. The DQO Process supports a team's efforts to develop the basis for probabilistic decisions at a site. Outputs throughout the DQO process are the decision performance criteria that will be used to develop a data collection program.

The TPP process is a comprehensive and systematic project planning process to design a data collection program. Preparation of probabilistic and nonprobabilistic DQO statements is the culmination of many of the TPP activities. DQO statements are just one of the outcomes of the TPP efforts.

C.2. Crosswalk Between EPA's DQO Process and the TPP Process. Table C-1 offers a detailed crosswalk from each portion of EPA's DQO Process to the corresponding activity within the TPP process.

C.3. Use of EPA's Process During TPP Activities. When using the TPP process, technical personnel can refer to Table C-1 to determine which portion(s) of EPA's DQO Process guidance corresponds to a specific TPP activity. In those instances when a data user defines a probabilistic-type data need during Phase II (see Paragraph 2.2.4.1), the data user should use Steps 5 and 6 of the DQO Process to determine the number of samples or level of investigation required for the intended data use. During Phase III, data implementers will find Step 7 of EPA's DQO Process useful when optimizing sampling plans for the data needed for probabilistic decisions. After using Steps 5 through 7 of EPA's Process, use of the TPP process should be completed to ensure appropriate sampling and analysis methods are identified to obtain the data needed, data collection options are considered, and detailed DQO statements are produced.

C.4. UFP QAPP and the TPP Process. The UFP-QAPP Manual discusses the use of a generic Systematic Planning Process in developing DQOs. Figure C-2 presents a figure from the UFP-QAPP manual that diagrams the systematic planning process. This figure demonstrates an example of how the UFP QAPP crosswalks to TPP activities. Data collection options are developed in Phase III and finalized in Phase IV.

C.5. Definitions of DQOs. As defined by EPA, DQOs are qualitative and quantitative statements derived from the DQO Process that clarify study objectives, define the appropriate type of data, and specify the tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions.[1] As discussed in Paragraph 4.3.1, DQOs produced as a result of the TPP process meet EPA's definition of a DQO. The DQOs documented during Phase IV of the TPP process should be project-specific statements that describe the intended data use(s), the data need requirements, and the means to achieve acceptable data quality for the intended use(s). DQOs documented as a result of the TPP process should be comprehensive and include each of the nine data quality requirements listed in Paragraph 4.3.1.1.

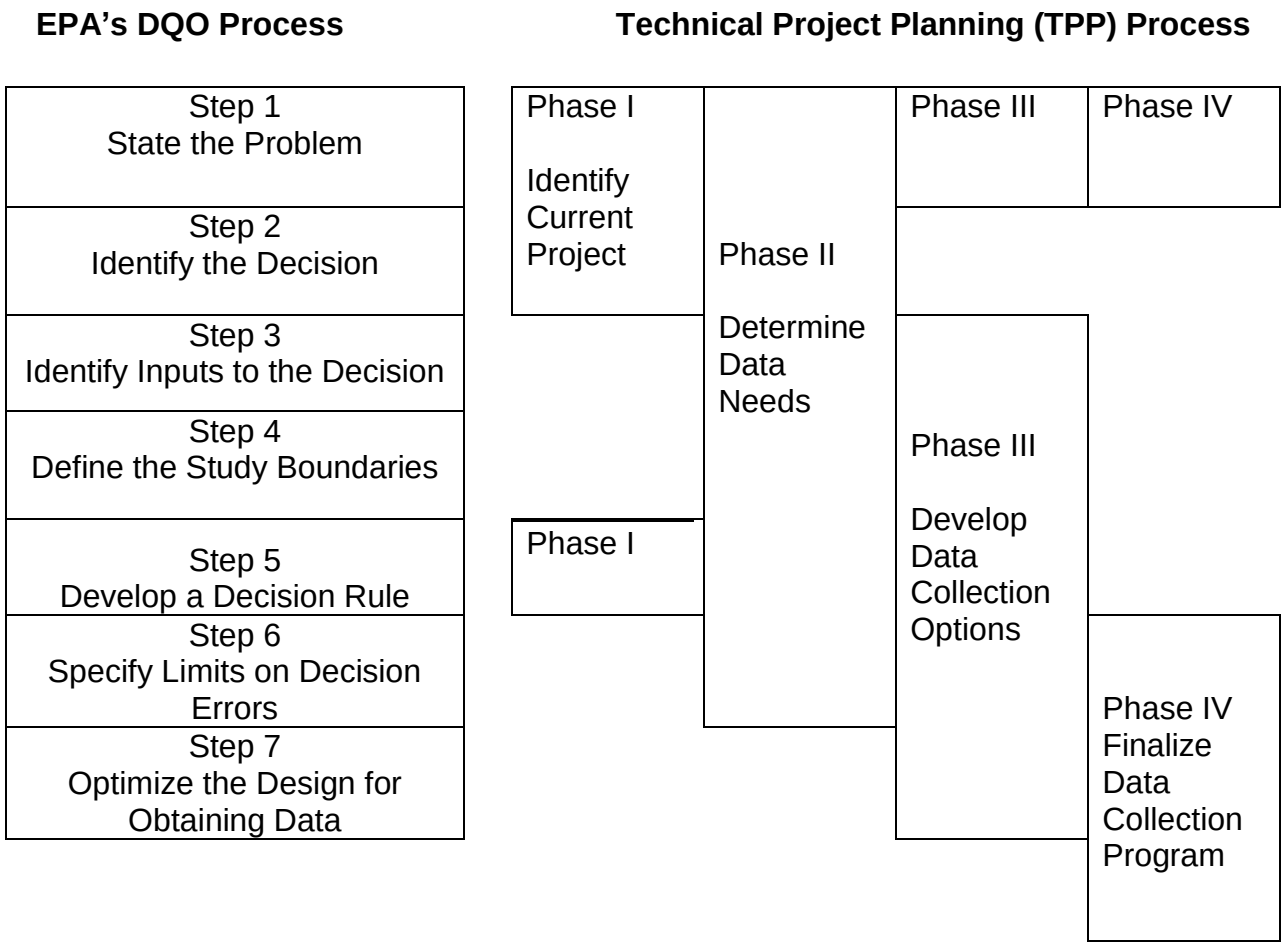

Figure C-1. Alignment Between EPA's DQO Process and the TPP Process

Table C-1. Crosswalk from EPA's DQO Process to the TPP Process

EPA'S DQO Process[a]		Technical Project Planning (TPP) Process[b]	
DQO Step	**Activity[c]**	**Activity**	**TPP Phase(s)**
Step 1 **State the Problem**	1.2 "Establish the planning team and identify the team's decision makers;"	Identify Project Planning Team (Section 1.6..1) Team Selection (Section 1.6.1.4) Decision Makers (Section 1.6.1.1)	Phase I
	1.2 "describe the problem, develop a conceptual model of the environmental hazard to be investigated, and identify the general type of data needed;"	Gather Existing Site Information (Section 1.6.3) Evaluate Site Information and Data (Section 1.7.1.) Develop Conceptual Site Model (1.7.1.2) Identify and Document Project Objectives (Section 1.7.2) Seek Regulator and Stakeholder Input (Section 1.7.4)	Phase I
	1.2 "discuss alternative approaches to investigation and solving the problem"	Identify Site Approach (Section 1.7) Identify Executable Stages to Site Closeout (Section 1.7.3) Define Probable Remedies (Section 1.7.5) Define Courses of Action for Achieving Site Closeout (Section 1.8.2)	Phase I
Step 2 **Identify the Decision**	2.2 "identify the principal study question and define alternative actions that may be taken based upon the range of possible outcomes that result from answering the principal study question."	Identify and Document Project Objectives (Section 1.7.2) Document Current Executable Stage (Section 1.8.3) Define Courses of Action for Achieving Site Closeout (Section 1.4.1) Develop Preliminary Site Strategy/Decision Logic (Section 1.5.4)	Phase I
	2.2 "use the principal study question and alternative qctions to make either a decision statement or estimation statement (whichever is relevant to the particular problem);	Establish Data Users' Roles (Section 2.2.2 and subsections) Define Data Needs (Section 2.2.4 and subsections)	Phase II
	2.2 "organize multiple decisions into an order of sequence or priority, and organize multiple estimation problems according to their influence on each other and their contribution to the overall study goals."	Data Collection Considerations (Section 2.2.4.3) Sort and Combine Data Needs (Section 3.2.2.1)	Phase II Phase III

EPA'S DQO Process[a]		Technical Project Planning (TPP) Process[b]	
DQO Step	**Activity[c]**	**Activity**	**TPP Phase**
Step 3 **Identify Inputs to the Decision**	3.2 "identify and confirm the information basis for specifying performance or acceptance criteria;"	Define Data Needs (Section 2.1.4 and subsections) Data Need Worksheets (Appendix D) Sort and Combine Data Needs (Section 3.1.2.1)	Phase II Phase III
	3.2 "Identify and list the sources for the information needed to resolve the decision statement."	Define Data Needs (Section 2.1.4)	Phase II
	3.2 "Next, qualitatively evaluate whether any existing data are appropriate for the study."	Evaluate Use of Existing Data (Section 2.1.3)	Phase II
	3.2 "identify and confirm the availability of appropriate sampling and analyses methods ."	Plan Sampling and Analysis Approaches (Section 3.1.2)	Phase III
Step 4 **Define the Study Boundaries**	4.2 "define the target population ,"	Evaluate Site Information and Data (Section 1.2.1) Develop Conceptual Site Model (Section 1.2.1.2) Identify and Document Project Objectives (Section 1.2.2) Define Data Needs (Section 2.1.4) Document Data Needs (Section 2.2) Data Need Worksheets (Appendix D)	Phase I Phase II
	4.2 "determine the spatial and temporal boundaries,"	Evaluate Site Information and Data (Section 1.2.1) Develop Conceptual Site model (Section 1.2.1.2) Define Data Needs (Section 2.1.4) Document Data Needs (Section 2.2)	Phase I Phase II
	4.2 "identify practical constraints"	Recognize Site Constraints, Uncertainties and Dependencies (Section 1.3.1) Refine Plans Within Project Constraints (Section 3.1.2.4)	Phase II Phase III
	4.2 "define the scale of inference (i.e., decision unit or scale of estimation)."	Define Data Needs (Section 2.1.4)	Phase II

EPA'S DQO Process		Technical Project Planning (TPP) Process	
DQO Step	**Activity[a]**	**Activity**	**TPP Phase**
Step 5 Develop a Decision Rule	5.2 "for decision problems, choose an Action Level (using information identified in Step 3)that sets the boundary between one outcome of the decision process and an alternative, and verify that there exist sampling and analysis methods that have detection limits below the Action level;"	Define Data Needs (Section 2.1.4) Data Need Worksheets (Appendix F) Plan Sampling and Analysis Approaches (Section 3.1.2) Develop Data Collection Options (Section 3.2)	Phase II Phase III
	5.2 "for decision problems, construct the theroretical "If..then..else…" decision rule by combining the true value of the selected population parameter; the Action level; the scale of decision making (Step 4), and the alternative actions (Step 2);	Define Data Needs (Section 2.1.4) Decision Logic Examples (Appendix H)	Phase II
	5.2 "for estimation problems, develop the specification of the estimator by combining the true value of the selected population parameter with the scale of estimation and other boundaries"	Define Data Needs (Section 2.1.4)	Phase II

EPA'S DQO Process		Technical Project Planning (TPP) Process	
DQO Step	**Activity[a]**	**Activity**	**TPP Phase**
Step 6 Specify Limits on Decision Errors	6.2 "Decision-making problems generally are addressed by performing statistical hypothesis tests on the collected data. As will be discussed in Section 6.2.1, a decision is made on whether the data provide sufficient evidence to allow a baseline condition ("null hypothesis") to be rejected in favor of a specified alternative condition ("alternative hypothesis"). The limited nature and underlying variability of the collected data can occasionally result in either a "false rejection" of the baseline condition (i.e., rejecting the null hypothesis when, in fact, it is true) or a "false acceptance" of the baseline condition (i.e., failing to reject the null hypothesis when, in fact, it is false)."	Define Data Needs (Section 2.1.4) Plan Sampling and Analysis Approaches (Section 3.1.2)	Phase II Phase III
	6.2 " Estimation problems involve using the collected data to estimate some unknown population parameter together with some reported measure of uncertainty in the estimate, such as a standard error or confidence interval. As discussed in Section 6.2.2, conclusions will be made on the magnitude of the variability of the estimate, either in absolute terms or relative to the value of the estimate. As some uncertainty in the estimate is inevitable, a maximum level of uncertainty is generally adopted as representing an acceptable level."	Define Data Needs (Section 2.1.4) Plan Sampling and Analysis Approaches (Section 3.1.2)	Phase II Phase III

EPA'S DQO Process[a]		Technical Project Planning (TPP) Process[b]	
DQO Step	**Activity[c]**	**Activity**	**TPP Phase**
	7.2 "Gathering [*sic*] information that you will need in developing an acceptable and efficient sampling and analysis design;."	Verification of DQO Attainment (Appendix E)	Phase IV
Step 7 Optimize the Design for Obtaining Data	7.2 "Identifying [*sic*] constraints that will impact the sampling and analysis design;"	Sort and Combine Data Needs (Section 3.1.2.1)	Phase III
	7.3 "Providing [*sic*] details on the sampling and analysis methods you will use to generate the data;"	Plan Sampling and Analysis Approaches (Section 3.1.2) Develop Data Collection Options (Section 3.2)	Phase III
	7.4 "Identifying [*sic*] one or more candidate designs from with to select;"	Plan Sampling and Analysis Approaches (Section 3.1.2)	Phase III
	7.2 "Determining [*sic*] an "optimal" amount of information to collect for the potentioal design using statistical and cost considerations;"	Plan Sampling and Analysis Approaches (Section 3.1.2) Develop Data Collection Options (Section 3.2) Document Data Collection Options (Section 3.3)	Phase III
	"Preparing [*sic*] a resource-effective information collection plan that will meet your needs and requirements."	Prepare Data Quality Objective Statements (Section 4.2.1, p 4-5) Prepare Final Scope of Work or Work Plan (Section 4.2.2, p 4-7)Prepare Fact Sheet(s) (Section 4.2.4)	Phase IV
		Project Objectives Worksheet Site Information Worksheet Data Need Worksheets Sampling and Analysis Planning Worksheet Summary Table of Data Collection Options DQO Worksheet	Appendix D
		DQO Attainment Worksheet	Appendix E

[a] EPA QA/G-4, February 2006a [1]

[b] EM 200-1-2

[c] The activity number convention has been applied to EPA's DQO Process for the convenience of this crosswalk table.

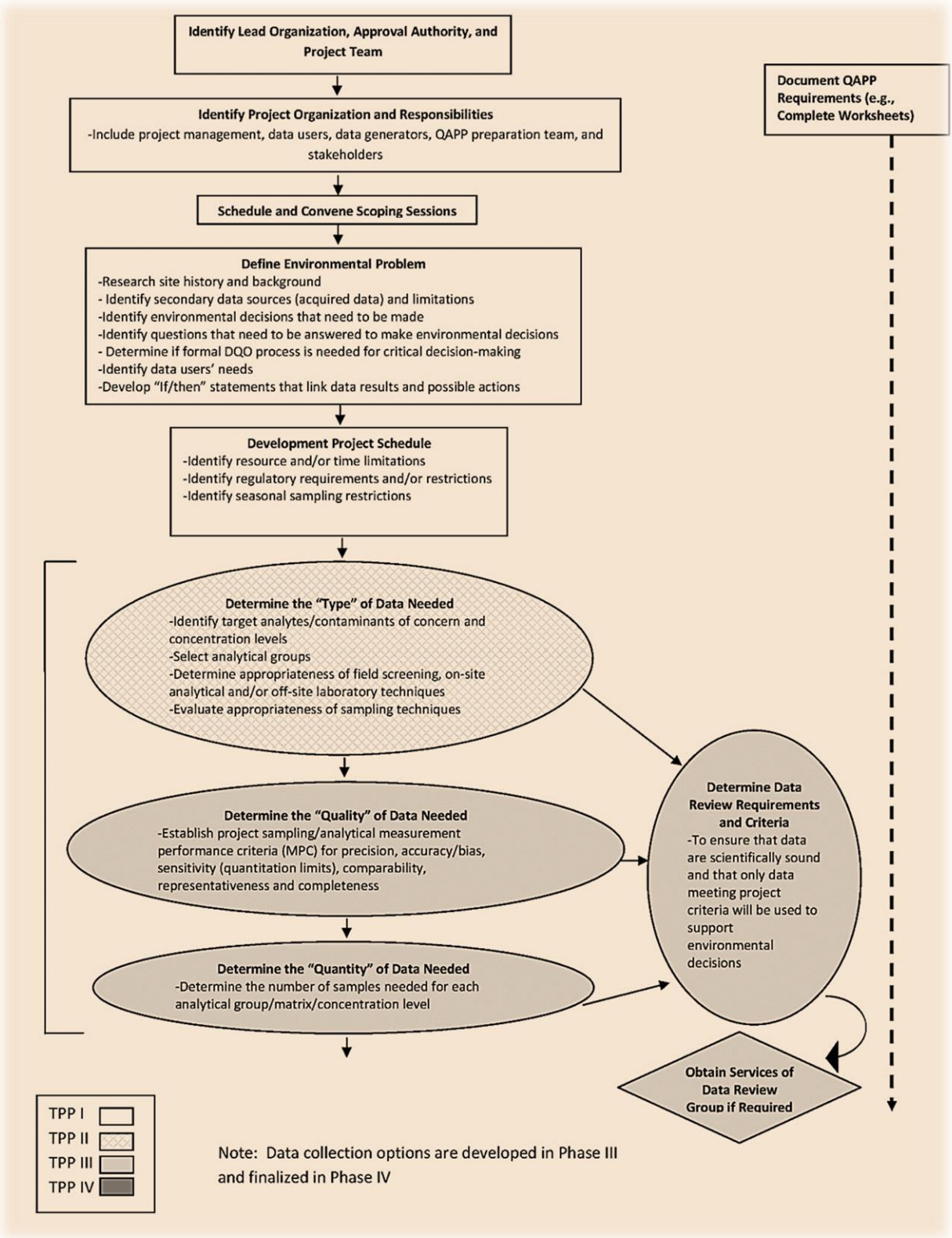

Figure C-2: Systematic Planning Process Example (from the UFP-QAPP Manual)

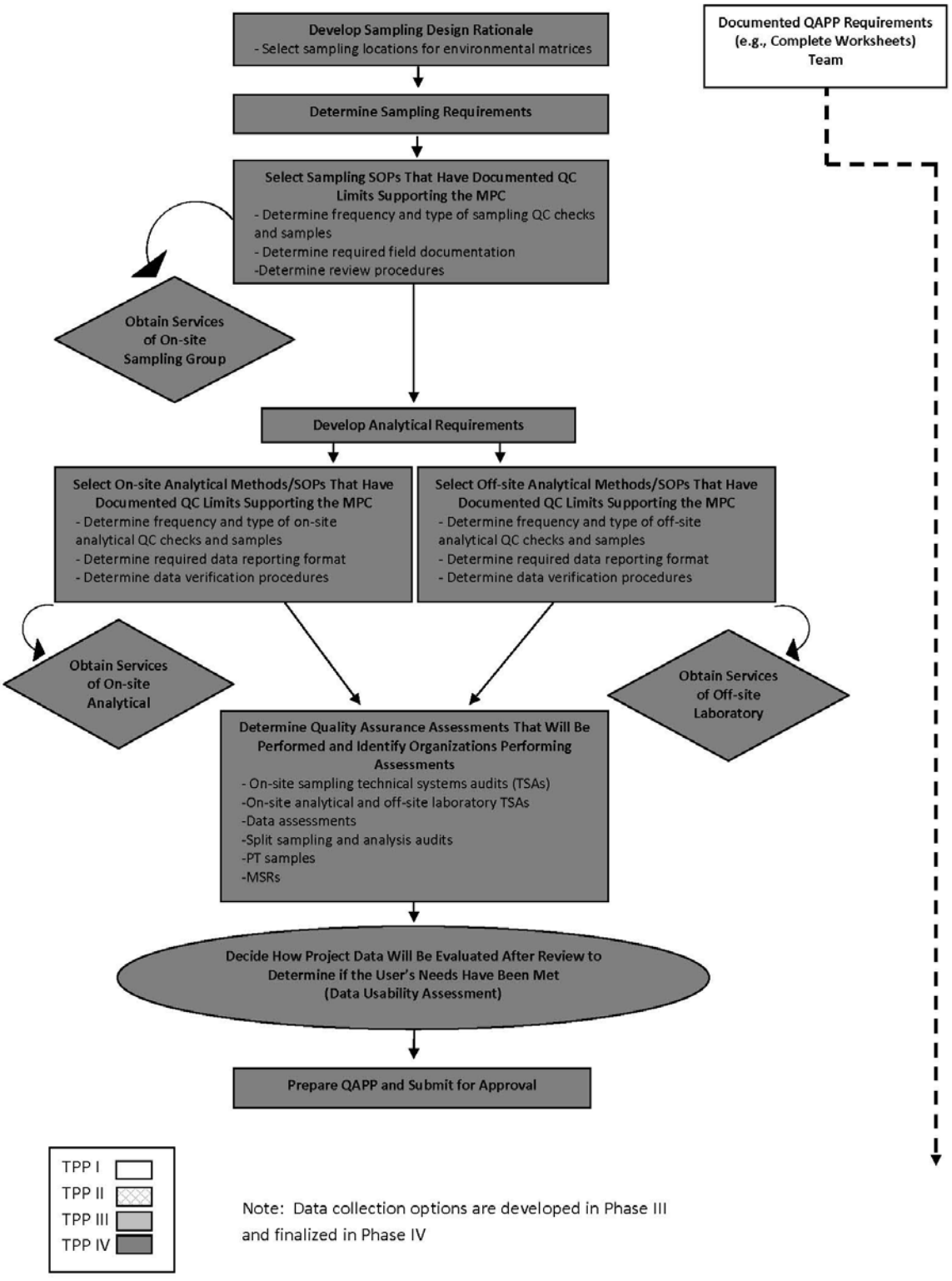

Figure C-2: Systematic Planning Process Example Cont. (from the UFP-QAPP Manual)

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Appendix D

Worksheets for Documentation

D.1. Introduction. This appendix provides several worksheets and tables for documenting Technical Project Planning (TPP) information, decisions, and plans. These tools are intended to help a team design and document a data collection program throughout their TPP efforts.

Users will find that each worksheet provides a very practical method of implementing the TPP process and documenting the critical information required for a successful project. At a minimum, use of these tools will enhance team communication and contribute to maintaining institutional site knowledge.

These tools are just one method to achieve implementation of the concepts discussed in this manual. Technical personnel may choose to develop or refine some of the tools presented herein to fit their specific needs. Other worksheet formats can be found in the Workbook for Uniform Federal Policy for Quality Assurance Project Plans, Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs, Part 2A: UFP-QAPP Workbook (DoD 2005) and the UFP QAPP optimized worksheets in Uniform Federal Policy for Quality Assurance Project Plans Optimized UFP-QAPP Worksheets. The latter document presents the worksheets in a fillable form and is available at http://www2.epa.gov/sites/production/files/documents/ufp_qapp_worksheets.pdf. A cross-reference table can be found below. Depending on customer or project needs/requirements the UFP QAPP tables may substitute or supplement this manual's worksheets.

> Project teams should consider developing electronic files that integrate project objectives; data needs; sampling and analysis planning; and data collection options. Integrated electronic files could then be easily transmitted to various project team members and printed as oversized tables (e.g., 11 inches by 17 inches and larger) for specific projects or sites.

Use of standardized worksheets and tables will allow quick and easy quality assurance/quality control review of the work efforts and data collection program plans.

D.2. Worksheets Provided. The following worksheets are provided for use by teams using the TPP process; a cross-walk between this manual's worksheets and the UFP QAPP worksheets are also provided. Some projects may require the use of the UFP QAPP worksheets for the project QAPP and to document the outcome of systematic planning. However those project teams may still find the worksheets in this appendix useful; especially for documenting the site closeout statement; associated project objectives and data needs for various project perspectives.

TPP and UFP QAPP Worksheet Cross-References		
TPP Step	Appendix D Page Number	UFP QAPP Worksheet #
Project Objectives Worksheet	D-3 to D-4	# 10
Site Information Worksheet	D-5 to D-6	#10, 13, 16
Phase I Planning Memo Worksheet	D-7 to D-13	# 1,3,5,10, 13
Data Need Worksheet-Risk Data User	D-14 to F-16	#5, 11, 13, 14, 15
Data Need Worksheet-MEC Hazard Data User	D-17 to D-20	#5, 11, 13, 15
Data Need Worksheet-Compliance Data User	D-21 to D-24	#5, 11, 13, 15, 17
Data Need Worksheet-Remedy Data User	D-25 to D-28	#5, 11, 13, 15,17
Data Need Worksheet-Responsibility Data User	D-29 to D-32	#5, 11, 13, 15, 17
Sampling and Analysis Planning Worksheet	D-33 to D-37	#11, 12, 15, 18, 19, 20, 21, 23
MEC Sampling and Analysis Planning Worksheet	D-38 to D-40	#11, 12, 15, 18, 19, 20, 21, 23
Summary Table of Data Collection Options	D-41 to D-43	#11, 12, 15, 18, 19, 20, 21, 23
Data Quality Objective Worksheet	D-44	#11, 12, 15, 18, 19, 21, 23

PROJECT OBJECTIVES WORKSHEET

PAGE ____ of _____

SITE: _____

PROJECT: _____

Project Objective[a]					Data User(s)	Project Objective Classification[d]
Number	Executable Stage[b]		Description	Source[c]		
	Current	Future				
					____ Risk ____ Compliance ____ Remedy ____ Responsibility	____ Basic ____ Optimum ____ Unassociated
					____ Risk ____ Compliance ____ Remedy ____ Responsibility	____ Basic ____ Optimum ____ Unassociated
					____ Risk ____ Compliance ____ Remedy ____ Responsibility	____ Basic ____ Optimum ____ Unassociated

[a] Refer to EM 200-1-2, Paragraph 1.7.2

[b] Refer to EM 200-1-2, Paragraph 1.7.3.

[c] For example, CERCLA ____, State Regulation _____, FFA Section _____, RCRA Permit, Meeting with Customer or Regulator.

[d] Classification of project objectives can only occur after the current project has been identified. Refer to EM 200-1-2, Paragraph 1.8.3.

PROJECT OBJECTIVES WORKSHEET (examples)

PAGE ____ of _____

SITE: _____

PROJECT: _____

Project Objective[a]						
	Executable Stage[b]					
Number	Current	Future	Description	Source[c]	Data User(s)	Project Objective Classification[d]
1	X		Eliminate from further consideration those releases that pose no significant threat to public health or the environment.	CERCLA 40 CFR 300.420 (c)(i)	XX Risk ____ Compliance ____ Remedy ____ Responsibility	XX Basic ____ Optimum ____ Unassociated
2	X		Evaluate and quantify the likely contribution of ABCS Manufacturing's contribution to the surface water and groundwater conditions that were identified during previous investigations.	Legal Counsel Action #218-4401	____ Risk ____ Compliance ____ Remedy XX Responsibility	XX Basic ____ Optimum ____tUnassociated
3		X	Determine if excavated soil will require disposal as a hazardous waste.	RCRA 40 CFR 261.24	____ Risk XX Compliance XX Remedy ____ Responsibility	____ Basic XX Optimum ____ Unassociated
4		X	Classify groundwater in accordance with rules 3745-300-10 and 3745-300-07 of the State Administrative Code (Title 3745, Chapter 300).	State Admin. Code	____ Risk XX Compliance ____ Remedy ____ Responsibility	____ Basic XX Optimum ____ Unassociated
5		X	Obtain cost and performance data related to life-cycle assessment of treatment wall remedial action at the site.	EPA's Innovative Technologies Advocate	____ Risk ____ Compliance XX Remedy ____ Responsibility	____ Basic XX Optimum ____ Unassociated
6			Investigate and remediate potentially contaminated soil below existing roadway prior to widening of roadway.	Requested by State Dept. of Health Regulator	____ Risk ____ Compliance ____ Remedy ____ Responsibility	____ Basic ____ Optimum XX Unassociated

Several more specific project objectives are typically needed for a project than the few examples provided above.

SITE INFORMATION WORKSHEET

PAGE ____ of _____

SITE: _____

PROJECT: _____

	Site Information Needed[a]	Potential Source(s) of Site Information	User of Site Information[b]	Suggested Means to Obtain Site Information	Deadline for Obtaining Site Information
1					
2					
3					
4					
5					
6					

[a] Refer to EM 200-1-2, Paragraphs 1.6.3 and 2.3.
[b] Indicate a specific TPP team member (e.g., Risk Data User, Customer, Regulator, Sampling Data Implementor).

SITE INFORMATION WORKSHEET (examples)

PAGE ____ of _____

SITE: _____

PROJECT: _____

	Site Information Needed	Potential Source(s) of Site Information	User of Site Information	Suggested Means to Obtain Site Information	Deadline for Obtaining Site Information
1	Determine if any threatened or endangered species are known to be present at the site.	State Department of Health	Risk Data User	Written correspondence	Need concurrent with evaluating investigation data.
2	Obtain PA/SI report and all related analytical results.	Customer	All Data Users	Site visit	Before Phase II efforts begin.
3	Aerial photographs between 1952 and the present.	Aerial Surveyor	Remedy and Responsibility Data Users	Telephone call	Needed during Phase II efforts.
4	Wind speed and duration; and solar intensity and duration to determine renewable energy potential for remedy.	Renewable Energy Database	Remedy Data User	National Renewable Energy Laboratory website	During feasibility study evaluations.
5	Local geologic and hydrogeologic information and boring logs from within 2 miles of the site.	State Board of Geology	Hydrogeologist supporting	Visit State offices or website	During feasibility study evaluations.

US Army Corps of Engineers®

Phase I Planning Memo Worksheet

Author(s) _____ Reviewer _____
Latest Revision Date _____ Review Date _____

Location:_____
Site:_____
Project: _____
(Attach Phase I Planning Memo to PMP)

PROJECT OBJECTIVES EM 200-1-2, Paragraph 1.7.2
(The TPP team should begin to complete several Project Objective Worksheets at this time.)

TPP TEAM EM 200-1-2, Paragraph 1.6.1

Decision Makers	Data User	Data Implementer
Customer: Project Manager: Regulator(s): Stakeholders:	Risk: Compliance: Remedy: Responsibility:	Sampling: Analysis:

CUSTOMER'S GOALS		EM 200-1-2, Paragraph 1.6.2
Future Land Use(s) @ Site	Regulatory Compliance Status and Issues	Interim Site Closeout Goal (if applicable)
Site Closeout Statement		
Customer's Schedule Requirements		
Customer's Site Budget		

IDENTIFY SITE APPROACH	
EXISTING SITE INFORMATION AND DATA EM 200-1-2, Paragraphs 1.6.3 and 1.7.1	
Synopsis of Existing Information	Site Documents and/or Information Repository (ies)
PRELIMINARY CONCEPTUAL SITE MODEL EM 200-1-2, Paragraph 1.7.1.2	
EXECUTABLE STAGES TO SITE CLOSEOUT EM 200-1-2, Paragraph 1.7.3	

IDENTIFY SITE APPROACH (CONTINUED)		
REGULATOR AND STAKEHOLDER PERSPECTIVES		EM 200-1-2, Paragraph 1.7.4
Regulators	Community Interests	Others
PROBABLE REMEDIES		EM 200-1-2, Paragraph 1.7.5

DEFINE CURRENT PROJECT	
SITE CONSTRAINTS, UNCERTAINTIES AND DEPENDENCIES	EM200-1-2, Paragraph 1.8.1
-Administrative	
-Technical Constraints and Dependencies	
-Project Uncertainties	
-Legal and Regulatory Milestones and Requirements	
CURRENT EXECUTABLE STAGE	EM 200-1-2, Paragraph 1.8.3

(Also list project objective numbers and attach Project Objectives Worksheet with descriptions)		
Basic (current project)	Optimum (future projects)	Unassociated (issues not associated with a project objective that leads to site closeout)
PRELIMINARY SITE STRATEGY/DECISION LOGIC		EM 200-1-1, Paragraph 1.9.4

Technical Project Planning		
EXAMPLE Phase I Planning Memo Worksheet		
Author(s): Name Project Team		Reviewer: Name
Latest Revision Date: March 16, 2008		Review Date: March 24, 2008
Location: City, State		
Site(s): MRS Name, County, State		
Project: MRS Name		
(Attach Phase I Memo to Project Management Plan)		
TPP TEAM		
Decision Maker	Data User	Data Implementer
Customer USACE, Name Program or Project Manager; or Name External Customer	Risk/Hazard: Names of risk and hazard assessors[1]	Sampling: Name of person(s) responsible for identifying sampling approaches1
Project Manager PM – USACE District, DPM – USACE District	Compliance: Name of person addressing compliance issues1	
Team Leaders Name –Project Manager or Technical Lead	Remedy: Name of person(s) addressing response actions and alternatives1	Analysis: Name of person(s) responsible for identifying analysis approaches1
Regulators State Department of Environmental Protection	Responsibility: Name of person addressing federal liability	
Stakeholders State National Wildlife Refuge – U.S. Fish and Wildlife Service (USFWS)		
CUSTOMER'S GOALS		
Future Land Use(s) at Site	Issues and Regulatory Compliance Status	Interim Closeout Goal (if applicable)
National Wildlife Refuge	Potential for metals and explosives in soil as well as munitions and explosives of concern (MEC)	
Site Closeout Statement		
Safe access for refuge workers and continued management as a wildlife refuge.		
Customer's Schedule Requirements		
No field activities from May thru August		
Customer's Site Budget		
Budget for performance of RI is $150,000; budget for other phases not determined.		
IDENTIFY SITE APPROACH		
EXISTING SITE INFORMATION AND DATA		
Synopsis of Existing Information	Site Information Repository	
Site was used as a training range from 1942 to 1945; currently used as a wildlife refuge, see also:2003 Archive Search Report (ASR) 2004 Supplemental ASR 1988 Inventory Project Report Graphic preliminary conceptual site model	Records are located at USACE District. Additional Copies of Administrative Record are located at (Name) Public Library and Wildlife Refuge	

[1] Person(s) may be government or contractor employees as appropriate

PRELIMINARY CONCEPTUAL SITE MODEL		
Preliminary CSM is based upon information from the ASR reports: Possible MEC and MC in areas accessible only to refuge workers. Potential for MC in soils and surface water in area managed for waterfowl reproduction. Potential for MEC and MC in areas accessible to public and visiting students is limited.		
POTENTIAL POINTS OF COMPLIANCE		
No potential ARARs identified for MEC, therefore no potential points of compliance identified. Surface discharge to Stony creek located onsite is potential point of compliance for potential MC in groundwater.		
EXECUTABLE STAGES TO SITE CLOSEOUT		
Site Inspection (SI)		
Remedial Investigation / Feasibility Study		
Proposed Plan		
ROD / Decision Document		
Remedial Design		
Remedial Action		
Removal Action (if necessary)		
Long Term Management (if necessary)		
REGULATOR AND STAKEHOLDER PERSPECTIVES		
Regulators:	Community Interests:	Refuge Interest:
State ARARs met Requests regular status updates	Minimal impairment of Refuge as an outdoor classroom	Breeding and nesting requirements of local endangered species unimpaired by investigation.
Probable Remedies		
Detonation or removal of suspect MEC found during the investigation.		
Removal of residual MEC from the site, treatment of MC via removal, onsite treatment and engineering/institutional controls as appropriate to reduce the risk to future users.		
DEFINE CURRENT PROJECT		
SITE CONSTRAINTS, UNCERTAINTIES AND DEPENDENCIES		
Administrative Constraints and Dependencies		
RI needs to be completed as soon as possible to meet program needs.		
Special Use Permit need to be in place prior to sampling.		
Technical Constraints and Dependencies		
Need MEC avoidance for sampling. Need to work with USFWS personnel for access.		
Need to abide by Health and Safety Plan.		
USFWS will provide transport to site and guidance for sample locations.		
Legal and Regulatory Milestones and Requirements		
No agreements or permits in place between USACE or Owner and Regulatory Personnel.		
Regulatory evaluation of RI workplan and reporting of RI results and recommendations.		
CURRENT EXECUTABLE STAGE		
RI		
Basic Project Objectives (For Current Projects)	Optimum Project Objectives (For Future Projects)	Objectives Not Associated with Site Closeout
Determine nature/extent of MEC Hazard.	Determine implementability of blow-in-place as treatment technology.	Investigate viral outbreak in Refuge waterfowl.
Determine nature/extent of MC risk.	Determine whether any excavated soil may require disposal as a hazardous waste.	

DATA NEED WORKSHEET- RISK DATA USER

PAGE ____ of _____

SITE: _____ DATA USER NAME(s):_____

PROJECT: _____

Data Need[a]		Project Objective(s)[b] & Data Need Group	Data Use(s)[c]			Number of Samples[d]			Risk Action Level(s)[e]		Exposure Area(s) / Sample Location(s) and Depth[f]
Contaminant of Concern, or Characteristic of Interest	Media		Current or Future Use	Receptor Group(s)	Receptor's Exposure Route(s)	CL (%)	P (%)	MDRD (%)	Human Health	Ecological	

DATA NEED WORKSHEET- RISK PERSPECTIVE (examples)

Data Need[a]		Project Objective(s) [b] & Data Need Group	Data Use(s)[c]			Number of Samples[d]			Risk Action Level(s)[e]		Exposure Area(s) / Sample Location(s) and Depth[f]
Contaminant of Concern, or Characteristic of Interest	Media		Current or Future Use	Receptor Group(s)	Receptor's Exposure Route(s)	CL* (%)	P* (%)	MDRD* (%)	Human Health	Ecological	
Vinyl Chloride	GW	1 Basic	Current Use	Industrial Workers	Incidental Ingestion, Dermal, & Inhalation	2			N/A	N/A	The 2 worst case downgradient wells found @ PA/SI
Vinyl Chloride	GW	2 Basic	Future Use	Resident	Incidental Ingestion, Dermal, & Inhalation	2			0.019 ug/L (RBC)	N/A	The 2 worst case downgradient wells found @ PA/SI
Lead and Cadmium	Soil	1 Basic	Current Use	Industrial Workers	Ingestion & Dermal	CL = 80% P = 90% MDRD = 20%			1,000 and 1,000 mg/kg	N/A	within area outlined on attached figure and @ 0" to 24"
Lead and Cadmium	Soil	2 Basic	Future Use	Resident	Ingestion & Dermal	CL = 90% P = 95% MDRD = 20%			400 and 39 mg/kg	0.1 and 2.5 mg/kg	within area outlined on attached figure and @ 0" to 24"
Total Organic Carbon	Soil	2 Basic	Future Use	GW Model	(fate & transport)	2			+/- 0.1%		w/i screen interval of the 2 new wells on attached figure
Hydraulic Conductivity	GW	2 Basic	Future Use	GW Model, aquifer viability and classification	(fate & transport)	2			(rising head slug test using data logger and transducers)		At the 2 new wells shown on the attached figure

DATA NEED WORKSHEET- RISK DATA USER
(Instructions)

[a] Data Need
List each specific environmental data need that is required to satisfy a project objective(s) identified during Phase I. Site information worksheet should be used for site information needs. Limit requests for "full suite" analysis to select locations or areas, and only when necessary to satisfy a project objective. A unique data need number (e.g., risk-1) should be assigned to each data need.

[b] Project Objective(s) & Data Need Group
Correlate each data need with the project objective(s) that the data will be used to help satisfy. Data needs listed without a corresponding project objective number(s) and data need group (i.e., basic, optimum, excessive) should not be included in the data collection program. (Project objectives are discussed in Paragraph 1.7.2, documented using the Project Objective Worksheet, and sequentially numbered for record keeping.)

[c] Data Use(s)
Communicate the intended use(s) of the data. (Multiple worksheet lines should be used to represent each exposure scenario when sample numbers; risk action levels; sample areas or locations; or the applicable project objectives differ.)

[d] Number of Samples
Define the number of samples based on the accepted practices of the intended data use(s). Worksheet entry should represent minimum number of samples required to provide acceptable data quality for the intended data use(s). Note that number of samples may be a fixed number or a dynamic estimate based on intended data use and whether Triad or multi-incremental sampling methods are being employed.

*Other guidance resources should be referenced to consider best use of classical statistics and geostatistics if probabilistic methods are appropriate for establishing the number of samples required. Desired Confidence Limit (CL), Power (P), and Minimum Detectable Relative Difference (MDRD) should be provided when probabilistic decisions are involved. Refer to Paragraph 2.2.4.1 regarding probabilistic/ nonprobabilistic decisions and efforts for developing the rationale for designating the appropriate number of samples.

[e] Risk Action Level(s)
Specify risk action levels for each data need, it may also be useful to cite the source of the action level. (Entries in this column help ensure that laboratory quantitation limits are appropriate so the resulting data can represent detectable results below these concentration(s) of interest for decision making.)

[f] Exposure Area(s)/Sample Location(s) and Depth
Specify the area or physical location(s) that would need to be sampled to provide the data required for the intended data use(s). Specific sampling locations should only be designated when they are the known critical locations for the intended use. Site maps should be attached as appropriate to help delineate the appropriate sampling area or location(s), as well as sampling depth(s) where applicable. (This information will be used by data implementors to ensure the required data is obtained, and to identify opportunities to co-locate sampling efforts and develop data collection options.)

DATA NEED WORKSHEET – MEC HAZARD DATA USER

SITE: _____ DATA USER NAME(S): _____

PROJECT: _____ MUNITION RESPONSE SITE(S):_____

Conceptual Site Model MEC Source Information[a]				Project Objectives[b]	Data Need[c]		Data Use Receptor Information[d]	
Range Type/Function	Expected Munitions	Expected MEC Category	Maximum Expected Depth (inches)		MEC Location	Investigation Area (including Acreage)	Land Use (current/future)	Interaction: Receptor Activity

DATA NEED WORKSHEET – MEC HAZARD DATA USER

SITE: _____ DATA USER NAME(S): _____

PROJECT: _____ MUNITION RESPONSE SITE(S):_____

Conceptual Site Model MEC Source Information[a]				Project Objectives[b]*	Data Need[c] Anomaly Characteristics and Density		Data Use Receptor Information[d]	
Range Type/ Function	Expected Munitions	Expected MEC Category	Maximum Expected Depth (inches)		MEC Location	Investigation Area (including Acreage)	Land Use (current/future)	Interaction: Receptor Activity
Hand Grenade Range/ Throwing Area	MK2 HE and M2 Practice	DMM	12	Nature and Extent of MEC -Horizontal extent -Vertical Extent -Density Estimation	Surface	1 acre	Farming/Farming	Plowing or tilling
Hand Grenade Range/ Target Area	MK2 HE and M2 Practice	UXO	12	In addition to above Objectives -Depth submerged	Fully submerged in pond. On the surface of surrounding soil	4 acres	Farming, Livestock watering pond/ Farming, Livestock watering pond	Pond drainage/ excavation
Air-to-Ground Rocket Range	2.75 Inch Rockets	UXO	24	Nature and Extent of MEC -Horizontal extent -Vertical Extent -Density Estimation	Surface and Subsurface soil	Target Area (470 acres)	Residential/ Residential	Soil excavation, Residential Construction

Range Type/ Function	Expected Munitions	Expected MEC Category	Maximum Expected Depth (inches)	Project Objectives[b]*	MEC Location	Investigation Area (including Acreage)	Land Use (current/future)	Interaction: Receptor Activity
Small Arms Range	.45 cal and .50 cal	DMM (Unfired SAA cartridges	6	Nature & Extent of MEC -Horizontal extent -Vertical Extent -Density Estimation	Surface soil	Firing Point (5 acres)	Wildlife Management/ Wildlife Management	Vegetation Removal
Artillery Range/ Target Area	37 mm Projectile	UXO	12	Nature and Extent of MEC -Horizontal extent -Vertical Extent -Density Estimation	Surface and Subsurface	Target Area (50 acres)	Farming/ Farming	Plowing or tilling
Artillery Range/ Firing Point	37 mm Projectile	UXO/DMM	12	Nature and Extent of MEC -Horizontal extent -Vertical Extent -Density Estimation	Surface and Subsurface	Target Area (50 acres)	Farming/ Farming	Plowing or tilling
Artillery Range/ Buffer Zone	37 mm Projectile	UXO	12	Nature and Extent of MEC -Horizontal extent -Vertical Extent -Density Estimation	Surface and Subsurface	Target Area (50 acres)	Farming/ Farming	Plowing or tilling
60 mm Mortar Range	60 mm Mortar	DMM – (Unfired - fuzed or unfuzed)	Surface (all or any portion exposed above ground surface	Nature and Extent of MEC -Horizontal extent -Vertical Extent -Density Estimation	Surface Soil	Firing Point (47 acres)	Residential/ Residential	Residential Construction

*Nature and Extent of MEC will be a primary Project Objective, others are also likely, see Section 1.2 of EM 200-1-2.

DATA NEED WORKSHEET – MEC HAZARD DATA USER

(instructions)

[a] MEC Source Information
Identify the expected munitions based on past site/range use and the release mechanism that contributed to MEC being at the MRS. Next, identify the expected contamination (e.g., UXO, low-order detonation, etc.) and the expected depth(s) of concern.

[b] Project Objectives
For the MEC Hazard User, project objectives will be dependent on the project phase; determination of presence or absence (during the SI stage) or nature and extent (during the RI stage) of MEC in site media, as identified during Phase I.

[c] Data Need
List each specific data need that is required to satisfy a project objective(s) identified during Phase I. Site information worksheet should be used for site information needs. For MEC sites, data needs may include location/depth of MEC, and the amount of geophysical and UXO investigation to meet statistical confidence levels that areas with concentrated munitions use (e.g., target areas) have been found on a site. An additional data need may be to determine that there is less than a certain UXO density in areas outside of target areas to minimize residual hazard and limit the amount of further work required within those areas.

[d] Data Use Receptor Information
Correlate each data need with the appropriate data use receptor activity (e.g., farming) and MRS. Identify the source type (i.e., firing point, target area, OB/OD, etc) and the associated MRS(s), including the areal extent, expressed in acres. As clearance objectives depend on land use, specify current and reasonably expected future land use.

DATA NEED WORKSHEET- COMPLIANCE DATA USER

PAGE ____ of _____

SITE:_____ DATA USER NAME(s):_____

PROJECT: _____

Data Need[a]		Project Objective(s) [b] & Data Need Group	Data Use[c]		Number of Samples[d]	Compliance Reference Concentration [e]	Remediation Areas/Sample Locations(s) and Depth[f]
Contaminant of Concern, or Characteristic of Interest	Media		Regulatory Program or Statute, and Citation	Specific Use			

DATA NEED WORKSHEET- COMPLIANCE DATA USER (examples)

Data Need[a]		Project Objective(s) [b] & Data Need Group	Data Use[c]		Number of Samples[d]	Compliance Reference Concentration [e]	Remediation Areas/Sample Locations(s) and Depth[f]
Contaminant of Concern, or Characteristic of Interest	Media		Regulatory Program or Statute, and Citation	Specific Use			
Chromium, Cr	Soil	4 Basic	RCRA 40 CFR 261.24	Determine if IDW is hazardous waste.	1 composite sample per roll-off container	5.0 mg/L (TCLP Cr)	Representative sample of waste stream (soil)
Total Chromium, Cr	GW	4 Basic	RCRA 40 CFR 261.24	Determine if IDW is hazardous waste	1 sample per drum	5.0 mg/L (TCLP Cr)	Representative sample of waste stream (purge water
Chromium, Cr III	Water	6 Optimum	CWA 40 CFR 131	Determine if treatment plant effluent requires pre-treatment prior to discharge to surface water	1 sample (time frame is TBD)	180 ug/l	Groundwater treatment plant effluent at point source discharge location
Chromium, CR VI	Water	6 Opitimum	CWA 40 CFR 131	Determine if treatment plant effluent requires pre-treatment prior to discharge to surface water	1 sample (time frame is TBD)	10 ug/L	Groundwater treatment plant effluent at point source discharge location
Chromium, Cr	GW	7 Optimum	SDWA 40 CFR 141	Do GW concentrations exceed MCL?	1 per well	0.1. mg/L	Required at point of use tap, but sampling at monitoring wells is adequate.

DATA NEED WORKSHEET- COMPLIANCE DATA USER

(instructions)

[a] Data Need
List each specific environmental data need that is required to satisfy a project objective(s) identified during Phase I. Site information worksheet should be used for site information needs. Limit requests for "full suite" analysis to select locations or areas, and only when necessary to satisfy a project objective. A unique data need number (e.g., compliance-1) should be assigned to each data need.

[b] Project Objective(s) & Data Need Group
Correlate each data need with the project objective(s) that the data will be used to help satisfy. Data needs listed without a corresponding project objective number(s) and data need group (i.e., basic, optimum, excessive) should not be included in the data collection program. (Project objectives are discussed in Paragraph 1.7.2, documented using the Project Objective Worksheet, and sequentially numbered for record keeping.)

[c] Data Use(s)
Communicate the intended use(s) of the data. (Multiple worksheet lines should be used to represent each applicable regulatory statute when sample numbers; reference concentration; sample areas or locations; or the applicable project objectives differ.)

[d] Number of Samples
Define the number of samples based on the accepted practices of the intended data use(s). Worksheet entry should represent minimum number of samples required to provide acceptable data quality for the intended data use(s). Note that the number of samples may be a fixed number or a dynamic estimate based on intended data use and whether ESC methods are being employed. Other guidance resources should be referenced to consider the best use of classical statistics and geostatistics if probabilistic methods are appropriate for establishing the number of samples required. (Refer to Paragraph 2.2.4.1 and its subsections for discussions regarding probabilistic/nonprobabilistic decisions and efforts for developing the rationale for designating the appropriate number of samples.)

[e] Compliance Reference Concentration
Specify the reference concentration of interest for each data need. Entries in this column help ensure that laboratory quantitation limits are appropriate so the resulting data can represent detectable results below these concentration(s) of interest for decision making.

[f] Remediation Areas/Sample Location(s) and Depth
Specify the point(s) of compliance or physical location(s) that would need to be sampled to provide the data required for the intended data use(s). Specific sampling locations should only be designated when they are the known critical locations for the intended use. Site maps should be attached as appropriate to help delineate the appropriate sampling area or location(s), as well as sampling depth(s) where applicable. This information will be used by data implementors to ensure the required data is obtained, and to identify opportunities to co-locate sampling efforts and develop data collection options.

DATA NEED WORKSHEET- REMEDY DATA USER

PAGE ____ of _____

SITE:_____ DATA USER NAME(s):_____

PROJECT: _____

Data Need[a]		Project Objective(s) [b] & Data Need Group	Data Use[c]		Number of Samples[d]	Concentration of Interest or Sensitivity of Measurement(s)[e]	Remediation Area(s) / Sample Locations(s) and Depth[f]
Contaminant of Concern, or Characteristic of Interest	Media		Remedy Method(s) of Interest	Criteria to be Considered			

DATA NEED WORKSHEET- REMEDY DATA USER (examples)

Data Need[a]		Project Objective(s) [b] & Data Need Group	Data Use[c]		Number of Samples[d]	Concentration of Interest or Sensitivity of Measurement(s)[e]	Remediation Area(s) / Sample Locations(s) and Depth[f]
Contaminant of Concern, or Characteristic of Interest	Media		Remedy Method(s) of Interest	Criteria to be Considered			
Vinyl Chloride	Air	7 Optimum	air stripping	effectiveness control	3 over 3 day operating period	2.0 gm/hr	At stack emissions after air stripper.
Depth to Bedrock	Soil	8 & 9 Optimum	slurry wall treatment wall	implementability & conceptual cost estimate	1 location every 100' 1 location every 25'	measurements should be within +/- 1'	Along planned alignments of slurry wall and treatment wall as shown on attached figure
hydraulic conductivity, grain size distribution, and porosity	GW	10 Optimum	treatment wall	effectiveness, implementability & conceptual cost estimate	5	ASTM, ASTM, +/- 0.1%	Preferred locations distributed along middle of planned alignment of treatment wall
Lead and Cadmium	Soil	11 Optimum	offsite disposal	Removal action estimate of transportation and disposal costs	composite 1 per 100 cubic yards of stockpiled soils	TCLP	Random, composite samples from within each stockpiled soil pile (i.e., BV2, BV4, BV7-9, and BV12) on the attached figure.
pH, total dissolved solids, and total organic carbon	SW	12 & 13 Optimum	onsite water treatment by electrochemical precipitation or ion exchange	effectiveness, implementability, cost, and O&M	5	pH w/I +/- .5, TDS and TOC w/i +/- .5 mg/l	Surface water samples half-way down water column; 2 in the center of basin 15, and 3 along the edges.

DATA NEED WORKSHEET- REMEDY DATA USER

(instructions)

[a] Data Need
List each specific environmental data need that is required to satisfy a project objective(s) identified during Phase I. (Site information worksheet should be used for site information needs.) Limit requests for "full suite" analysis to select locations or areas, and only when necessary to satisfy a project objective. A unique data need number (e.g., rem-1) should be assigned to each data need.

[b] Project Objective(s) & Data Need Group
Correlate each data need with the project objective(s) that the data will be used to help satisfy. Data needs listed without a corresponding project objective number(s) and data need group (i.e., basic, optimum, excessive) should not be included in the data collection program. Project objectives are discussed in Paragraph 1.7.2, documented using the Project Objective Worksheet, and sequentially numbered for record keeping.

[c] Data Use(s)
Communicate the intended use(s) of the data. Multiple worksheet lines should be used to represent each remedy being evaluated, designed, or operated when sample numbers; reference concentration; sample areas or locations; or the applicable project objectives differ.

[d] Number of Samples
Define the number of samples based on the accepted practices of the intended data use(s). Worksheet entry should represent minimum number of samples required to provide acceptable data quality for the intended data use(s). Note that number of samples may be a fixed number or a dynamic estimate based on intended data use and whether ESC methods are being employed. Other guidance resources should be referenced to consider best use of classical statistics and geostatistics if probabilistic methods are appropriate for establishing the number of samples required. Refer to Paragraph 2.2.4.1 regarding probabilistic/nonprobabilistic decisions and efforts for developing the rationale for designating appropriate number of samples.

[e] Concentration of Interest or Sensitivity of Measurement(s)
Specify concentration of interest, or required sensitivity of measurement, for each data need. Measurement sensitivity could be noted as ± 50 feet for a preliminary estimate of the areal extent of a surface cap, or ± 5 mg/L of benzene in groundwater for an evaluation of potential remedy methods. (These entries help ensure that appropriate sampling and analysis methods are used to produce data of adequate quality for use.)

[f] Remediation Area(s)/Sample Location(s) and Depth
Specify area or physical location(s) that need to be sampled to provide data required for the intended data use(s). Specific sampling locations should only be designated when they are critical locations for the intended use. Site maps should be attached as appropriate to help delineate the appropriate sampling area or location(s), as well as sampling depth(s) where applicable. This information will be used by data implementors to ensure the required data is obtained, and to identify opportunities to co-locate sampling efforts and develop data collection options.

DATA NEED WORKSHEET- RESPONSIBILITY DATA USER

PAGE ____ of _____

SITE:_____ DATA USER NAME(s):_____

PROJECT: _____

Data Need[a]		Project Objective(s) [b] & Data Need Group	Data Use[c]		Number of Samples[d]	Concentration of Interest or Sensitivity of Measurement(s)[e]	Responsibility Area(s) / Sample Location(s) and Depth[f]
Contaminant of Concern, or Characteristic of Interest	Media		Related Historical Information/Criteria	Phase of Responsibility Determination			

DATA NEED WORKSHEET- RESPONSIBILITY DATA USER (examples)

Data Need[a]		Project Objective(s) [b] & Data Need Group	Data Use[c]		Number of Samples[d]	Concentration of Interest or Sensitivity of Measurement(s) [e]	Responsibility Area(s) / Sample Locations(s) and Depth[f]
Contaminant of Concern, or Characteristic of Interest	Media		Related Historical Information/Criteria	Phase of Responsibility Determination			
All Metals	SW	21 Basic	Upgradient industries discharge to stream that traverses site	Investigating prospect of other PRPs at site	6		2 where stream enters site, 2 immediately downgradient of source area and 2 where stream discharges from site.
All metals	GW	21 Basic	Upgradient sites may contribute to GW conditions entering site	Investigating prospect of other PRPs at site	3		Refer to attached figure for preferred sampling areas upgradient of the site.
TCE	GW	21 Basic	Upgradient sites may contribute to GW conditions entering site	Investigating prospect of other PRPs at site	3	5.0 ug/L	Refer to attached figure for preferred sampling areas upgradient of the site.
BTEX	GW	22 Optimum	Adjacent service stations= contribution to site	Cost allocation analysis	4	B = 1.51 ug/L T = 1,600 ug/L E = 800 ug/L X = 16,000 ug/L	Existing wells GB1s, GB4s, GB5s, and GB6s should be sampled.

DATA NEED WORKSHEET- RESPONSIBILITY DATA USER

(instructions)

[a] Data Need
List each specific environmental data need that is required to satisfy a project objective(s) identified during Phase I. (Site information worksheet should be used for site information needs.) Limit requests for "full suite" analysis to select locations or areas, and only when necessary to satisfy a project objective. A unique data need number (e.g., res-1) should be assigned to each data need.

[b] Project Objective(s) & Data Need Group
Correlate each data need with the project objective(s) that the data will be used to help satisfy. Data needs listed without a corresponding project objective number(s) and data need group (i.e., basic, optimum, excessive) should not be included in the data collection program. (Project objectives are discussed in Paragraph 1.7.2, documented using the Project Objective Worksheet, and sequentially numbered for record keeping.)

[c] Data Use(s)
Communicate the intended use(s) of the data. (Multiple worksheet lines should be used to represent each responsibility consideration being evaluated when sample numbers; reference concentration; sample areas or locations; or the applicable project objectives differ.)

[d] Number of Samples
Define the number of samples based on the accepted practices of the intended data use(s). Worksheet entry should represent minimum number of samples required to provide acceptable data quality for the intended data use(s). Note that the number of samples may be a fixed number or a dynamic estimate based on intended data use and whether ESC methods are being employed. Other guidance resources should be referenced to consider the best use of classical statistics and geostatistics if probabilistic methods are appropriate for establishing the number of samples required. Refer to Paragraph 2.2.4.1 for discussions regarding probabilistic/nonprobabilistic decisions and efforts for developing the rationale for designating the appropriate number of samples.

[e] Concentration of Interest or Sensitivity of Measurement(s)
Specify the concentration of interest, or the required sensitivity of the measurement, for each data need. Entries in this column help ensure that the appropriate methods are use and the resulting data will be of adequate quality for the intended data use.

[f] Responsibility Area(s)/Sample Location(s) and Depth
Specify the area or physical location(s) that would need to be sampled to provide the data required for the intended data use(s). Specific sampling locations should only be designated when they are the known critical locations for the intended use. Site maps should be attached as appropriate to help delineate the appropriate sampling area or location(s), as well as sampling depth(s) where applicable. This information will be used by data implementors to ensure the required data is obtained, and to identify opportunities to co-locate sampling efforts and develop data collection options.

SAMPLING AND ANALYSIS PLANNING WORKSHEET

PAGE ____ of ____

SITE:_____ DATA IMPLEMENTORS:
Sampling:_____

PROJECT:_____ Analysis:_____

Project Objective(s)[a]				
Data Need Designation(s)[a]				
Medium[a]				
Contaminant of Concern[a]				
Sampling Information[b]	Method			
	Area or Location of Interest			
	Depth(s)			
Sampling Design and Rationale for design				
Sampling SOPs				
Concentration of Interest[c]	Risk			
	Compliance			
	Remedy			
	Responsibility			
Analysis Information[d]	Analyte(s)			
	Preparation Method			
	Analysis Method			
	Method Detection Limit (MDL)			
	Quantitation Limit (Low Standard)			
	Reporting Limit			
	Analysis SOP			

Number of Samples[e]	Matrix			
	QC Duplicates			
	QA Duplicates			
	Field Blanks			
	Trip Blanks			
	MS/MSD			
	Other			

SAMPLING AND ANALYSIS PLANNING WORKSHEET (examples)

SITE:_____ DATA IMPLEMENTORS:
Sampling: _____
PROJECT: _____ Analysis:_____

Project Objective(s)[a]		3	5	6
Data Need Designation(s)[a]		RI-3, C-2,RM-2	RM-4	RI-6, C-3
Medium[a]		GW	Soil	GW
Contaminant of Concern[a]		TCE	--	Lead
Sampling Information[b]	Method	Low Flow	split spoon w/ Shelby attachment	Low Flow
	Area or Location of Interest	See Figure 1	See Figure 2	See Figure 1
	Depth(s)	1st aquifer	18' – 20' and 26'-28' bls	perched aquifer
Concentration of Interest[c]	Risk	10 ppb	--	15 ppb
	Compliance	20 ppb	--	15 ppb
	Remedy	25 ppb	+/- 5%	--
	Responsibility	--	--	--
Analysis Information[d]	Analyte(s)	VOCs	Moisture Content	Lead
	Preparation Method	SW-846 3520C	--	SW-846 3020A
	Analysis Method	SW-846 8260B	ASTM D2216-80	SW-846 7421
	Method Detection Limit (MDL)	0.05 ug/L	--	1.0 ug/L
	Quantitation Limit (Low Standard)	5.0 ug/L	--	--
Number of Samples[e]	Reporting Limit	5.0 ug/L	--	5.0 ug/L
	Matrix	4	24	5
	QC Duplicates	1	2	1
	QA Duplicates	1	2	1
	Field Blanks	0	1	0
	Trip Blanks	1	1	0
	MS/MSD	1	2	1
	Other	None	None	None

SAMPLING AND ANALYSIS PLANNING WORKSHEET

(instructions)

[a] Worksheet entries for project objective(s), data need designation(s), medium, and contaminant of interest should correlate directly to data need worksheets prepared during Phase II of the TPP efforts.

[b] Sampling Information
Data needs of all data users should first be sorted and combined as much as possible while still fulfilling all unique data need requirements. Figures or maps will generally need to be attached to designate necessary sampling areas or locations.

[c] Concentration of Interest
List the concentration of interest for each data user as a means to identify the most appropriate MDL(s). Data implementors are cautioned to only apply the most stringent data quality requirements to those locations designated by the data users based on the intended data use.

[d] Analysis Information
Analyte: A discrete chemical component of a sample to be identified or measured through analysis.

Prep Method: Method used to extract or digest analyte of interest from sample prior to analysis.

Analysis Method: Method used to determine concentration of analyte of interest in a sample.

Method Detection Limit: The minimum concentration of an analyte that can be measured within a given matrix and reported with a 99 percent confidence that the analyte concentration is greater than zero. MDLs shall be estimated for each target analyte using the procedures presented in 40 CFR, Part 136, Appendix B, or equivalent statistical approach.

Quantitation Limit: The minimum concentration of an analyte in a specific matrix that can be identified and quantified within specified limits of precision and accuracy. The quantitation limit should be defined as the low calibration standard from the initial calibration curve.

Reporting Limit: Project specific threshold limit below which a numerical value for data is reported as less than or non-detect.

[e] Number of Samples
The number of matrix samples should be based on those required by the data users and not just a summation of their needs. Data implementors should refer to EM 200-1-3 for guidance regarding the appropriate number of QA/QC duplicate samples, blanks, and MS/MSD samples. The need to collect additional samples classified as Aother≅ should be noted on the table. If the number of matrix samples is a dynamic estimate based on intended data use, then the corresponding decision rationale should be attached as developed by the data user employing ESC methods at the site.

TPP teams should consider developing integrated electronic worksheets or oversized tables (e.g., 11 inches by 17 inches and larger) for specific projects or sites.

MEC SAMPLE PLANNING WORKSHEET

SITE: _____ DATA USER NAME(S): _____

PROJECT: _____

MRA:	
MRS ID(s):	
Munitions Type(s):	
Maximum Depth:	
Map Reference:	

MRS	Munitions Types	Sampling Purpose	Sampling Method	Sampling Area Boundary	Sampling Pattern	MEC Density	Confidence Level	Lane or Transect Spacing (m)	Rationale/ Tools

MEC SAMPLE PLANNING WORKSHEET
(examples)

MRA: Weapons Training
MRS ID(s): MRS-01
Munitions Type(s): 60 mm Mortar
Maximum Depth: 24 inches
Map Reference: Figure 2

Sampling Purpose	Sampling Method	Sampling Area Boundary	Sampling Pattern	Lane or Transect Spacing (m)	Rationale
Search for Target Area	Geophysical Survey	MRS Boundaries indicated on Figure 2	Transect	35m transects – perpendicular to apparent line of fire	From VSP – 80% probability of traversing and detecting
Confirm Target Area	Geophysical Survey	35m x 35m Centered on target area evidence	Transect	5m transects – perpendicular to search transects	Detailed survey of area between search transects
Delineate Target Area Boundaries	Geophysical Survey	20m Buffer around outermost locations of target area evidence	Transect	10m transects – perpendicular to apparent line of fire	Meet PQO to define boundary to +/-10m
Confirm location of burial	Geophysical Survey	Dependent on site reconnaissance results	Grid	0.75m lanes	0.25m overlap in adjacent lanes

MEC SAMPLE PLANNING WORKSHEET
(instructions)

Enter the MRA/MRS information, the type(s) of munitions used at the site, the maximum expected depth of MEC and the appropriate map reference (Site information worksheet should be used for site information needs).

Clearly delineate the purpose of this sampling requirement, the field method to be used and the boundary of the area to be sampled.

SUMMARY TABLE OF DATA COLLECTION OPTIONS[a]

SITE _____

PROJECT _____

DATE _____

DATA IMPLEMENTORS
Sampling _____

Analysis _____

Data Collection Option[b]	Number of Samples[c]						Order-of-Magnitude Cost (dollars)	Comments[d]
	Air	Surface Water	Sediment	Soil	Ground Water	Other		
Unassociated								
Optimum								
Basic								

SUMMARY TABLE OF DATA COLLECTION OPTIONS[a]
(example)

Data Collection Option[b]	Number of Samples[c]						Order-of-Magnitude Cost (dollars)	Comments[d]
	Air	Surface Water	Sediment	Soil	Ground Water	Other		
Unassociated					4 (State Regulator expects 9 new wells)	12 (soil gas study desired by Customer)	$111,000 and $230,000	Use of existing groundwater wells and the additional 5 wells included in the Basic option should be sufficient for long-term monitoring of closed site (project objective 8). Soil gas study around perimeter of landfill is not a regulated requirement for closed site.
Optimum				15		Topograph-ic survey of cap while surveying new wells	$15,000 and $4,500	Collection of 15 soil samples from new well boreholes will be used for establishing deep soil background conditions for OU4 at the facility. (Savings of nearly $65,000 and 45 days.) Baseline topographic survey will be required within 2 years of site closure. This can be done during the current project, saving $3,500, and ensure compliance with closure monitoring requirements.
Basic		14	28	17	5		$790,000	Option meets schedule and cost constraints of project. However, … 1. The data needed to satisfy Project Objective 9, the lowest priority Project Objective associated with the current project, will not be met. 2. Some field screening results are proposed for use in the Baseline Risk Assessment.

SUMMARY TABLE OF DATA COLLECTION OPTIONS
(instructions)

[a] Development of all three types of data collection options may not be possible or appropriate on some sites. For example, if no data needs were requested, imposed, or mandated above the data need or data quality requirements of the data users are involved, then the excessive≅ data collection option is not necessary. Although development of an optimum data collection option should always be pursued, recommendation of an optimum data collection option may be deemed inappropriate if the data needed to satisfy the current project objectives already exceeds project cost and schedule constraints.

[b] Data Collection Option
Refer to Paragraphs 3.3 and 3.4 for discussions regarding the development and documentation of data collection options, respectively.

[c] Number of Samples
Indicate the total number of samples for each medium, including QA/QC samples, and attach Sampling and Analysis Planning Worksheets for each data collection option summarized above.

[d] Comments
Provide brief descriptions of the imposed requirements grouped in the excessive data collection option; the cost and schedule benefits associated with the optimum data collection option; and the limitations, if any, associated with the basic data collection option.

DATA QUALITY OBJECTIVE WORKSHEET

PAGE ____ of _____

SITE: _____

PROJECT: _____

DQO STATEMENT NUMBER: _____

DQO Element Number[a]	DQO Element Description[a]	Site-Specific DQO Statement
Intended Data Use(s):		
1	Project Objective(s) Satisfied	
Data Need Requirements:		
2	Data User Perspective(s)	
3	Contaminant or Characteristic of Interest	
4	Media of Interest	
5	Required Sampling Locations or Areas and Depths	
6	Number of Samples Required	
7	Reference Concentration of Interest or Other Performance Criteria	
Appropriate Sampling and Analysis Methods:		
8	Sampling Method	
9	Analytical Method	

[a] Refer to EM 200-1-2, Paragraph 4.3.1

APPENDIX E

Verification of DQO Attainment

E.1. Verifying DQO Attainment.

a. Verifying the attainment of the data quality objective (DQO) statements should be done using the steps below. Details regarding data validation and data usability assessment of chemical data may be found in EM 200-1-10, Guidance for Evaluating Performance-Based Data, and of geophysical data in IGD 14-1 Technical Guidance for Military Munitions Response Actions:

(1) Data is evaluated to determine whether it meets measurement quality objectives;

(2) Data is evaluated to determine whether it meets useability requirements, this step should include those who will be using the data;

(3) Verification of DQO attainment must be completed before the data are used by the data users;

(4) All data quality requirements of a DQO statement should be verified; and

(5) Verification of DQO attainment is typically required to ensure contract compliance.

b. The DQO Attainment Verification worksheet provided in this appendix would be useful for verifying DQO attainment when the DQO statements were originally developed using the TPP process. The U.S. Environmental Protection Agency's (EPA's) Guidance for Data Quality Assessment should also be referenced when verifying DQO attainment (EPA 2006b). EPA's guidance is particularly suited for verifying DQO attainment when probabilistic decisions are involved.

E.2. Corrective Action Considerations. Appropriate corrective actions should be taken whenever data obtained are inadequate for the intended use(s). After completing an assessment of the effects of a missed DQO, the source or cause for missing the DQO should be investigated and understood by the team. When possible and necessary, re-sampling, and/or re-analysis, should then be performed at the expense of the responsible party (e.g., government, contractor, laboratory).

DQO ATTAINMENT VERIFICATION WORKSHEET

PAGE ____ of _____

SITE: _____

PROJECT: _____

DQO STATEMENT NUMBER: _____

DQO Element Number [a]	DQO Element Description	Site-Specific DQO Statement	Attained?	Required Corrective Action?
Intended Data Use(s)				
1	Project Objectives Satisfied		Yes _____ No _____	
Data Need Requirements				
2	Data User		Yes _____ No _____	
3	Contaminant, Physical Hazard, Characteristic of Interest, or MEC of Interest		Yes _____ No _____	
4	Media of interest and/or Location of MEC		Yes _____ No _____	
5	Required Areas for Investigation and Depths Identified		Yes _____ No _____	
6	Required Amount of Investigation		Yes _____ No _____	
7	Reference Concentration of Interest or Other Performance Criteria		Yes _____ No_____	
Appropriate Sampling and Analysis Methods				
8	Sampling Method		Yes _____ No _____	
9	Analytical Method		Yes _____ No _____	

[a] Refer to Paragraph 4.3.1.
[b] DQO statement should be taken directly from originating DQO worksheet or corresponding SOW/PWS.

APPENDIX F

Examples of Decision Logic and Dynamic Approach

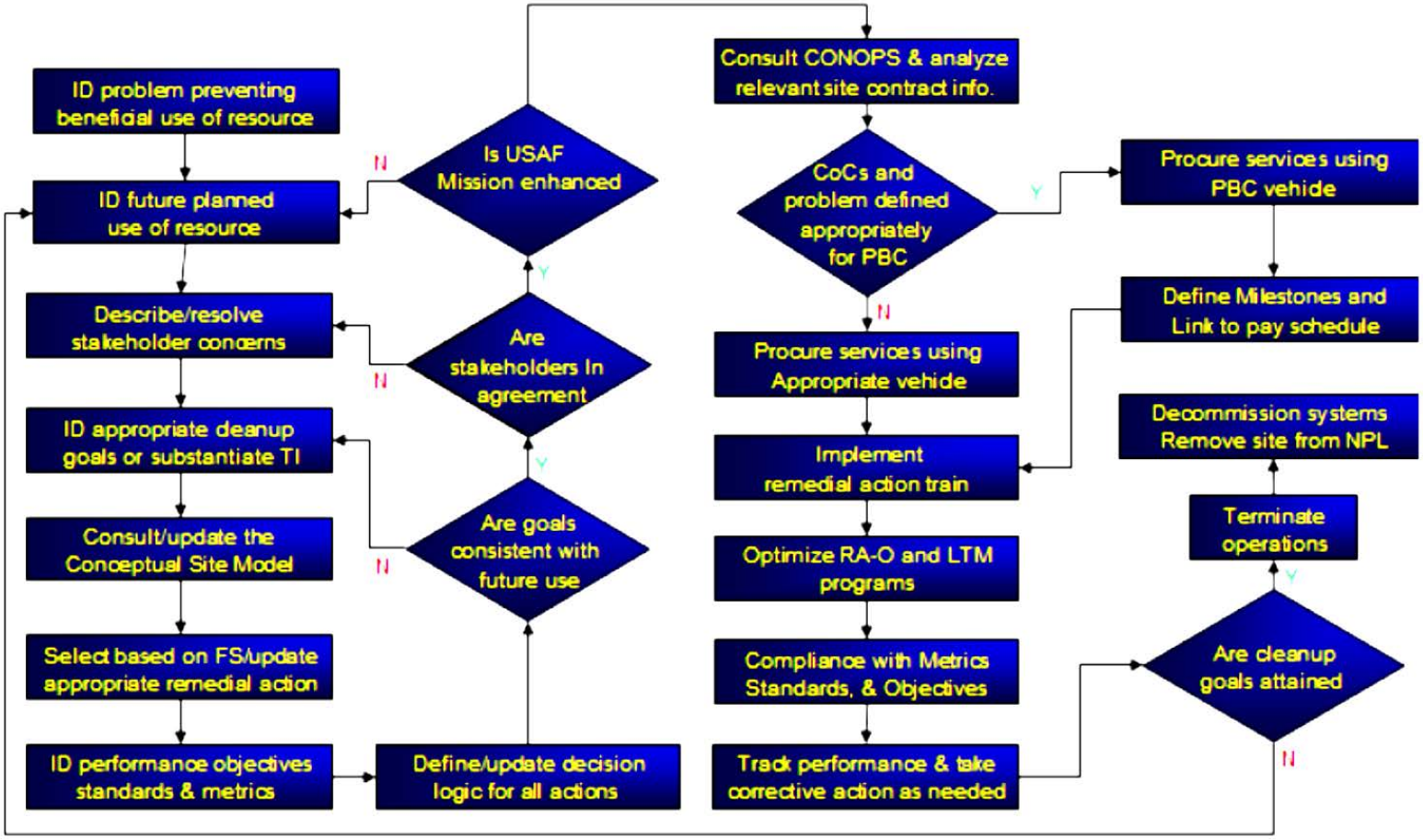

Figure F-1. Example Facility-Wide Decision Logic and Closeout Strategy (ITRC 2007)
Reprinted by permission from ITRC

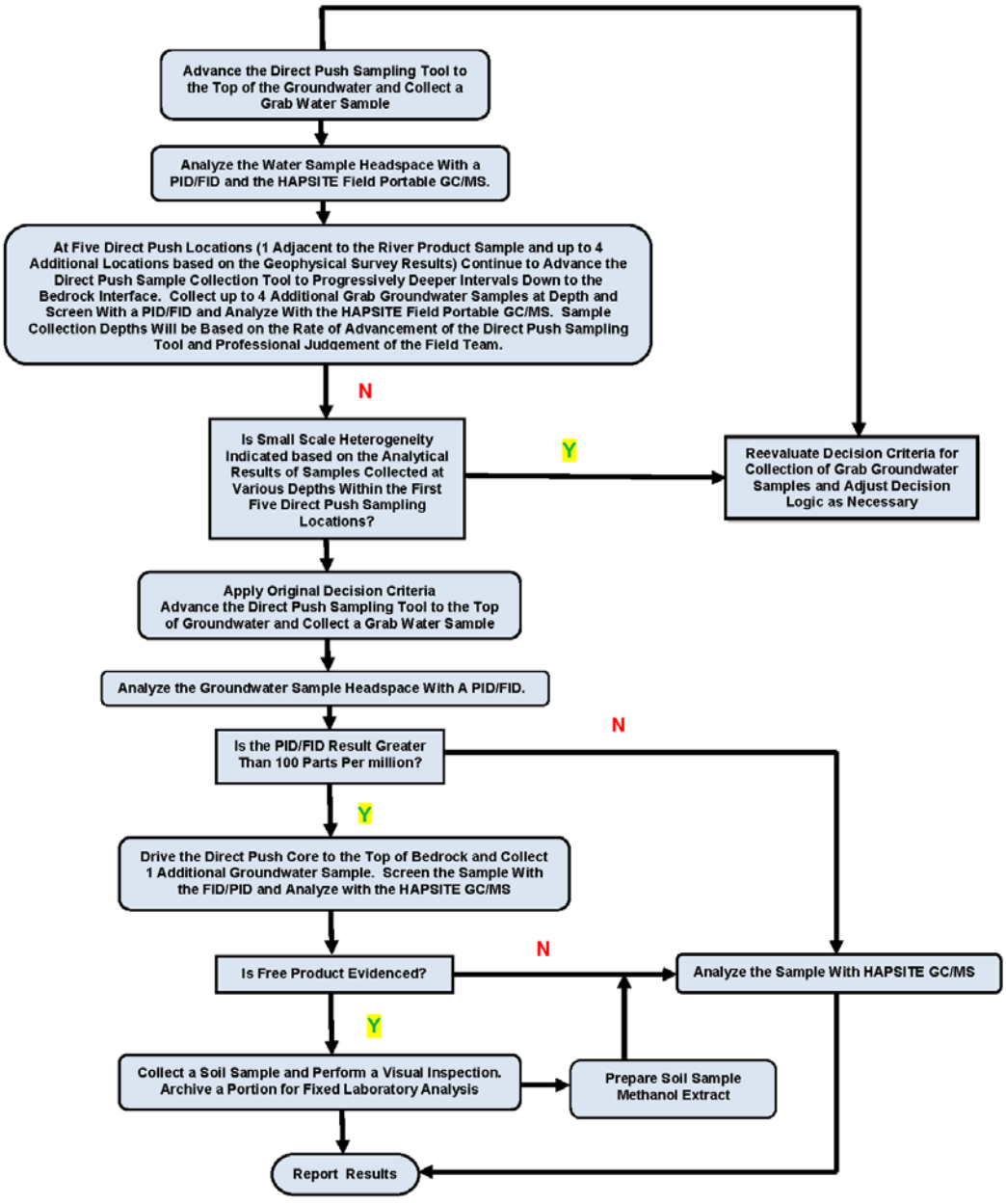

Figure F-2. Example Site Characterization Decision Logic (ITRC 2007)
Reprinted with permission from the ITRC

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Example Decision Logic for Soil Excavation Project (Remedial Design & Construction)

Removal Decision Matrix for Shallow Disposal (Contamination above MTCA Method B/Field Kit Action Level at depth)

Scenario#	0 to 24"	12 to 24"	24 to 36"	36 to 48"	48 to 60"	60 to 72"	Action
1	No	n/a	n/a	n/a	n/a	n/a	Confirmation Sampling
2	Yes	No	n/a	n/a	n/a	n/a	Find contamination in 0-12" sample, field sample 12-24" sample. Find no contamination in 12-24" sample above MTCA: Remove 0-12" of soil. Confirmation Sampling. No Further Action.
3	Yes	Yes	No	n/a	n/a	n/a	Find contamination in 0-12" sample, field sample 12-24" sample. Find contamination in 12-24" sample, field sample 24-36" sample. Find no contamination in 24-36" sample above MTCA: Remove 0-24" of soil. Confirmation Sampling. No Further Action.
4	Yes	Yes	Yes	No	n/a	n/a	Find contamination in 0-12" sample, field sample 12-24" sample. Find contamination in 12-24" sample, field sample 24-36" sample. Find contamination in 24-36" sample, field sample 36-48" sample. Find np contamination in 36-48" sample above MTCA: Remove 0-36" of soil. Confirmation Sampling. No Further Action.
5	Yes	Yes	Yes	Yes	No	n/a	Find contamination in 0-12" sample, field sample 12-24" sample. Find contamination in 12-24" sample, field sample 24-36" sample. Find contamination in 24-36" sample, field sample 36-48" sample. Find contamination in 36-48" sample, field sample 48-60" sample. Find no contamination in 48-60" sample above MTCA: Remove 0-48" of soil. Confirmation Sampling. No Further Action.
6	Yes	Yes	Yes	Yes	Yes	n/a	Find contamination in 0-12" sample, field sample 12-24" sample. Find contamination in 12-24" sample, field sample 24-36" sample. Find contamination in 24-36" sample, field sample 36-48" sample. Find contamination in 36-48" sample, field sample 48-60" sample. Find contamination in 48-60" sample, field sample 60-72" sample. Find no contamination in 60-72" sample above MTCA: Remove 0-60" of soil. Confirmation Sampling. No Further Action.

Notes:
MTCA: Washington State Model Toxics Control Act Method & Levels
n/a: Not applicable
Field analysis for contaminants of concern performed using.... See report for more details.

Reference:
Remedial Action Management Plan Wenatchee Tree Fruit Research Center Test Plot Remediation, August 1997, U.S. Army Corps of Engineers

Figure F-3. Example Decision Logic for Remedial Action (ITRC 2007)
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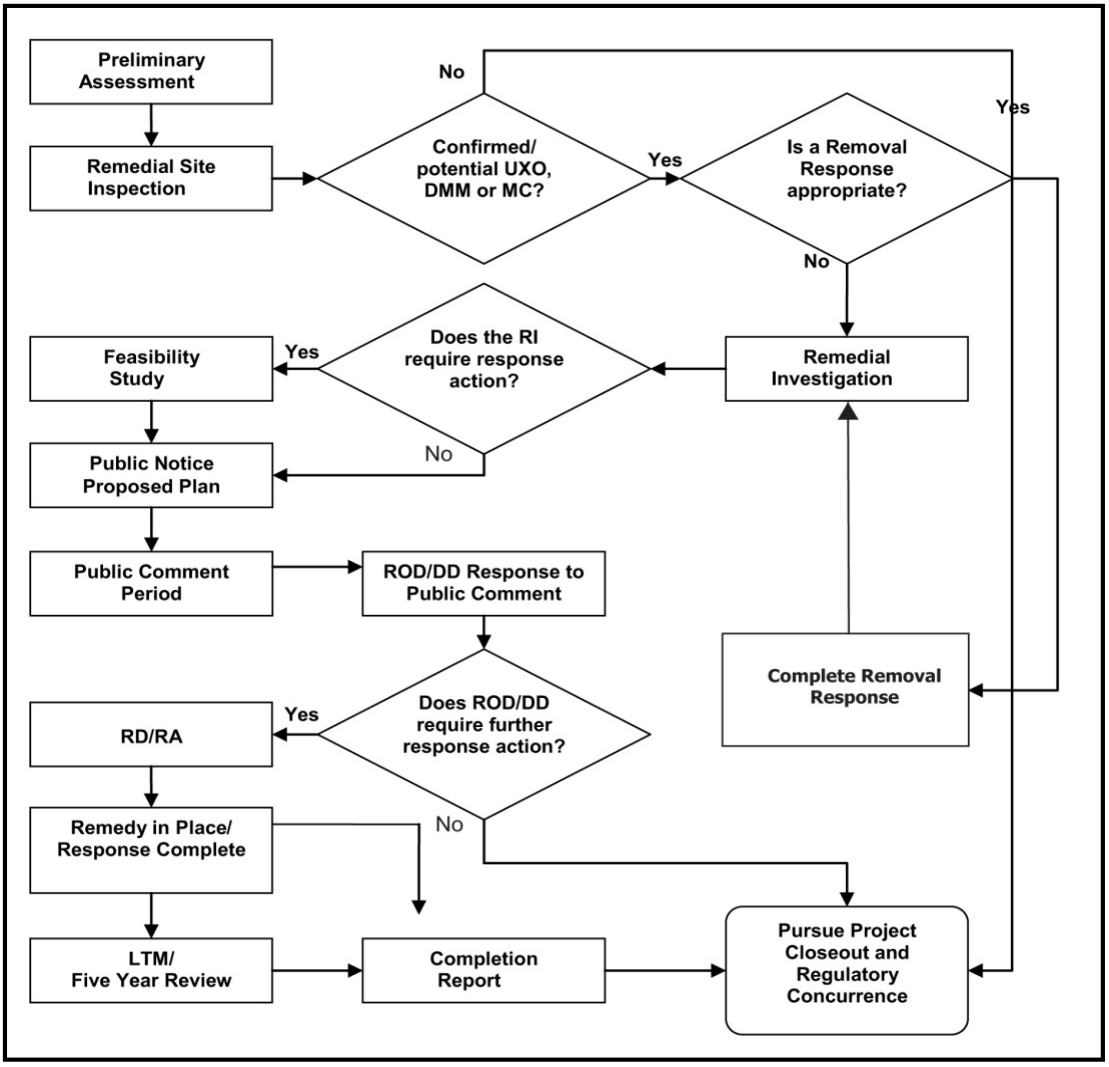

Figure F-4. Example MMRP Site Closeout Strategy from EP 1110-1-18

GLOSSARY

Section I. Abbreviations and Acronyms

ANSI	American National Standards Institute
AR	Army Regulation
ARAR	applicable or relevant and appropriate requirement
ASQC	American Society for Quality Control
ASTM	American Society of Testing Materials
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980 (commonly referred to as ASuperfund)
CFR	Code of Federal Regulations
CL	confidence limit
CSM	conceptual site model
CWA	Clean Water Act of 1972
DERP	Defense Environmental Restoration Program
DGM	Digital Geophysical Mapping
DMM	Discarded Military Munitions
DoD	U.S. Department of Defense
DQO	data quality objective
EM	Engineer Manual
ER	Engineer Regulation
EP	Engineer Pamphlet
EPA	U.S. Environmental Protection Agency
ESC	expedited site characterization
FFA	Federal Facility Agreement
FR	Federal Register
FUDS	Formerly Used Defense Sites
GW	groundwater
HTRW	hazardous, toxic and radioactive waste
HQUSACE	Headquarters, U.S. Army Corps of Engineers
IDW	investigation derived waste
ITRC	Interstate Technology and Regulatory Council
LUC	Land Use Control
MC	Munitions Constituents
MCL	maximum contaminant level
MDL	method detection limit
MDRD	minimum detectable relative difference
MEC	Munitions and Explosives of Concern
MEC HA	MEC Hazard Assessment
MMRP	Military Munitions Response Program
MQO	Measurement Quality Objective
MR	Munitions Response
MRA	Munitions Response Area

MRS	Munitions Response Site
MS/MSD	Matrix Spike/Matrix Spike Duplicate
N/A	not applicable
NCP	National Contingency Plan
O&M	operation and maintenance
OSWER	Office of Solid Waste and Emergency Response
P	power
PA/SI	Preliminary Assessment/Site Investigation
PM	Project Manager
PMP	Project Management Plan
PQO	Project Quality Objective
PRP	potentially responsible party
PWS	Performance Work Statement
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SDWA	Safe Drinking Water Act
SI	Site Inspection
SOW	scope of work
SW	surface water
TBD	to be determined
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
TOC	total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
UXO	Unexploded Ordnance
VSP	Visual Sample Plan

Section II. Special Abbreviations and Terms

Analysis Data Implementer

Chemists, OE safety specialists, geophysicists, biologists, industrial hygienists, and other technical specialists who contribute to the analysis data implementer perspective are responsible for identifying suitable analytical methods and requirements necessary to satisfy data needs within the data collection program. Analysis data implementers participate throughout the TPP process with their primary responsibilities occurring during Phase I and Phase III.

Areas of Interest

Site areas or locations of particular interest to individual team members based on their perspective (e.g., the segment of a stream used for recreation represents an area of interest to the risk data user; the discharge pipe and stream outfall from a water

treatment plant represent areas of interest to the compliance data user). Areas of interest are established during Phase I, refined during Phase II, and considered throughout the TPP process.

Compliance Data User

Legal counsel, regulatory specialists, industrial hygienists, and other technical personnel who contribute to the compliance data user perspective are responsible for identifying the data needs associated with evaluating and monitoring the legal and regulatory compliance of a site or site activities. The compliance data user participates throughout the TPP process with his/her primary responsibilities occurring during Phase I and Phase II.

Conceptual Site Model

A conceptual site model is a written or pictorial representation of the environmental system at a site and the biological, physical, and chemical processes that affect MEC, MC and contaminant transport. The CSM is a means to summarize and display what is known about the site and provides a platform upon which to develop a common understanding of the site amongst project team members. Development of HTRW and MEC CSMs are described in EM 200-1-12. The TPP team should develop a preliminary CSM during Phase I activities as a simple model of the relationships between chemicals detected and/or MEC or suspected at a site and potential exposure pathways to site receptors; the CSM should be iteratively updated throughout the project's lifecycle. A preliminary CSM could also be developed or updated for the purposes of evaluating site compliance conditions; evaluating remedial alternatives; or evaluating potential contributions to a site by other PRPs. Each data user perspective will reference the site's CSM during Phase II efforts to identify data needs.

Customer

The customer is a party, organization, or sponsor that depends upon the professional services, expertise, and advice of a project manager and technical personnel. Within the TPP process, a customer is the decision maker who is funding the project and responsible for achieving site closeout. Typical USACE customers include U.S. Department of Defense agencies, the U.S. Environmental Protection Agency in some instances, and Support for Others (internal and external USACE customers). The customer is a key member of every TPP team and should be encouraged to participate throughout the TPP process. The customer's primary decision making and input occurs during Phases I and IV.

Data Collection Options

Data collection options represent different groups of data needs and their associated sampling and analysis methods. Data collection options provide a simple mechanism to document the "basic" data needed for the current project; "optimum" data that is cost-effective and prudent to collect for future executable stages; and any data that is "not associated" with project objectives that lead to site closeout that someone besides the data users may have suggested or imposed on the project team. Data collection

options are considered during Phases I and II, developed and documented during Phase III, and used by the team during Phase IV to design the data collection program for a site.

Data Collection Program
The principal goal and outcome of the TPP process is the development and design of a data collection program that is to be subsequently implemented at a site. The team designs a data collection program throughout the TPP process which culminates in the documentation of the data collection program during Phase IV.

Data Implementer
Technical personnel (e.g., OE safety specialists, geophysicists, chemists, engineers, geologists, scientists) who contribute to the data implementer perspective are responsible for identifying sampling and analysis methods suitable for satisfying the data users' data needs. Data implementers are generally referred to as either a sampling or analysis type of data implementer. Both sampling and analysis types of data implementers participate throughout the planning process with their primary responsibilities occurring during Phase I and Phase III.

Data Need Worksheet
Several data user-specific data need worksheets are provided in Appendix F for documenting data needs. The data need worksheets can be used in part to determine data needs. Data need worksheets, or other similar forms, can be prepared by each data user perspective to specify environmental data needs. Data need worksheets are prepared by data users during Phase II and subsequently used by data implementers during Phase III.

Data Quality
Data quality is a simple term used to represent several complex characteristics of a data need. A data user's quality requirements include these characteristics related to each data need:

a. Contaminant, physical hazard or characteristic of interest;

b. Media of interest or location of MEC;

c. Required sampling/investigation areas or locations, and depths;

d. Number of samples, acres of grids/transects, number of anomalies investigated required (e.g., fixed number or dynamic estimate; probabilistic or non-probabilistic basis);

e. Reference concentration of interest or other performance criteria (e.g., action level, compliance standard, decision level, design tolerance, confidence level);

f. Sampling method [e.g., discrete or composite sample; sampling equipment and technique; quality assurance/quality control (QA/QC) samples; geophysical equipment and data collection; transects or grids; intrusive anomaly investigation]; and

g. Analytical method (e.g., sample preparation, laboratory analysis method and quantitation limit, laboratory QA/QC).

Data quality requirements can only be established by the data user ultimately using the data. Data users establish data quality requirements based on a level of uncertainty scientifically acceptable for the intended data use(s) and accepted practices within a particular field (e.g., science, engineering, legal).

Most characteristics of data quality requirements for a data need are defined by the data user when identifying each data need during Phase II. During Phase III, data implementers define the remaining data quality requirements for each data need when they determine appropriate sampling and analysis methods. During Phase IV, data quality requirements become a large part of the planning information documented in a data quality objective statement for each data need.

Data Quality Objectives

DQO statements are the culmination of many TPP activities. DQOs become formal documentation of the data quality requirements. Effective use of DQOs yield data of known quality, documentation of the planning process, and a benchmark to determine if data meet specified objectives. DQOs produced as a result of the TPP process meet EPA's definition of a DQO and should be project-specific statements that describe the intended data use(s), the data need requirements, and the means to achieve them. DQOs documented as a result of the TPP process should include the following nine data quality requirements:

a. Project objective(s) satisfied;

b. Data users (i.e., risk, compliance, remedy, or responsibility) satisfied;

c. Contaminant, physical hazard or characteristic of interest identified;

d. Media of interest or location of MEC identified;

e. Required sampling areas or locations for investigation, and depths identified;

f. Number of samples, acres of grids/transects, and number of anomalies investigated required (e.g., fixed number or dynamic estimate; probabilistic or non-probabilistic basis);

g. Reference concentration of interest or other performance criteria (e.g., action level, compliance standard, decision level, design tolerance, confidence level, MEC density) identified;

h. Sampling method [e.g., discrete or composite sample; sampling equipment and technique; quality assurance/quality control (QA/QC) samples; geophysical equipment and data collection; transects or grids; intrusive anomaly investigation] identified; and

i. Analytical method (e.g., sample preparation, laboratory analysis method detection limit and quantitation limit, laboratory QA/QC) identified.

Data Quality Objectives Worksheet
The DQO worksheet provided in Appendix F is a tool useful for documenting the nine data quality requirements of a DQO produced during the TPP process.

Data User
Data users are technical and other personnel responsible for engineering, scientific, and legal evaluations that are the basis for site decisions. Progress to site closeout typically requires the collaborative involvement of many technical disciplines to represent data user perspectives of risk, compliance, remedy, and responsibility. Data users are responsible for determining data needs required to satisfy the project objectives. Data users participate throughout the TPP process with their primary responsibilities occurring during Phase I and Phase II.

Decision Maker
Decision makers (i.e., customer, PM, regulators, and stakeholders) each have specific interests in the outcome of site-related activities. The most important responsibility of each decision maker is to participate in the team's efforts to identify and document project objectives during Phase I. As deemed appropriate by the customer, the regulators and stakeholders may also contribute to TPP activities during Phases II through IV.

Defense Sites
Locations that are or were owned by, leased to, or otherwise possessed or used by the Department of Defense. The term does not include any operational range, operation storage or manufacturing facility, or facility that is used for or was permitted for the treatment or disposal of military munitions. (10 USC 2710(e)(1))

Definitive Data
Definitive data are analytical data of known quality, concentration, and level of uncertainty. The levels of quality and uncertainty of the analytical data are consistent with the requirements for the decision to be made. Suitable for final decision-making. See also Screening data.

Discarded Military Munitions
Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include UXO, military munitions that are being held for further use or planned, disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations. (10 USC 2710(e)(2))

Dynamic Work Plan
A dynamic work plan is a work plan that includes some decision logic in advance of field activities, including sampling that is directly contingent on the findings of earlier sampling. Dynamic work plans empower field personnel to decide on-site to modify field efforts as site conditions are better understood during data collection efforts.

Dynamic work plans can only be successful if the entire team agrees with the plans and the plans include when and how communications will occur between field personnel and the customer, regulators, and stakeholders, as appropriate. Dynamic work plans are most commonly used when Triad or other expedited site characterization approaches are being employed and field personnel are using real-time data acquisition and interpretation methods.

Environmental Data

Environmental data are site-specific environmental-type data (e.g., chemical, biological, physical) that must be obtained from the field or by laboratory analysis of a sample collected in the field. Environmental data, as referred to in this manual, should not be mistaken for ”site information”. Environmental data needs are identified by data users during Phase II and are typically listed on data need worksheets provided in Appendix F.

Executable Stage

During Phase I the team identifies all possible executable stages to site closeout for each unique site. Depending on the size and complexity of the site, several executable stages may be necessary and appropriate to proceed from site investigation to site closeout. Scoping executable stages is based on an overall site approach and a current project focus that reflect the effects of project constraints, project dependencies, and options for project execution.

Field Screening/Field Analytical

Field screening and field analytical methods can be a useful tool to characterize site contaminants while reducing analytical costs. The team could plan to conduct some field screening activities concurrent with Phase I, II, or III TPP efforts to refine their understanding of a site prior to design of a data collection program for the current executable stage of site activities.

Land Use Control

LUCs are legal, physical, or administrative mechanisms that restrict the use of, or limit access to, real property to manage risks to human health and the environment. Physical mechanisms encompass a variety of engineered remedies to contain or reduce contamination and/or physical barriers to limit access to real property, such as fences or signs.

Measurement Quality Objective

Specific data quality criteria for a project, developed during generation of the sampling and analysis plan, which are tailored to be specific to the data generation requirements.

Media

Air, surface water, sediment, soil, and groundwater are the most common types of environmental media at a site. Media can be any naturally occurring environmental material that can be affected by contamination at a site.

Military Munitions
Military munitions are all ammunition products and components produced for or used by armed forces for national defense and security, including ammunition products or components under the control of the DoD, the U.S. Coast Guard, the U.S. Department of Energy, and the National Guard. The term military munitions includes confined gaseous, liquid, and solid propellants; explosives; pyrotechnics; chemical and riot control agents; smokes and incendiaries, including bulk explosives and chemical warfare agents; chemical munitions; rockets; guided and ballistic missiles; bombs; warheads; mortar rounds; artillery ammunition; small arms ammunition; grenades; mines; torpedoes; depth charges; cluster munitions and dispensers; demolition charges; and devices and components of the above.

The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components other than nonnuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 USC 2011 et seq.), as amended, have been completed. (10 USC 101(e)(4)(A) through (C))

Munitions and Explosives of Concern
Munitions and explosives of concern distinguishes specific categories of military munitions that may pose unique explosives safety risks; (a) Unexploded Ordnance (UXO), as defined in 10 U.S.C. 2710(e)(9); (b) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710(e)(2); or (c) Munitions constituents (e.g., TNT, RDX) present in high enough concentration to pose an explosive hazard.

Munitions and Explosives of Concern Hazard Assessment
The MEC HA was developed as a tool to assist site managers and regulators in evaluating explosive safety hazards to people at munitions response sites consistent with CERCLA. Project teams can use the methodology to evaluate baseline explosive hazards to people based on current or reasonably anticipated land use activities. The methodology can also be used to evaluate relative reduction of explosive hazards to people through CERCLA removal or remedial actions.

Munitions Constituents
Any materials originating from UXO, DMM, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. (10 USC 2710(e)(4))

Munitions Response
Response actions, including investigation, removal, and remedial actions to address the explosives safety, human health, or environmental risk presented by UXO, DMM, MC.

Munitions Response Area
Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. A munitions response area is comprised of one or more munitions response sites.

Munitions Response Site
A discrete location within an MRA that is known to require a munitions response.

Performance Work Statement
Describes the requirements the contractor must meet in performance of the contract and consists of two main elements: 1) a statement of the required serves in terms of performance objectives; and 2) performance standards by which progress towards the performance objectives will be measured.

Phase I Planning Memo
The Phase I Planning Memo is a document that should be prepared at the end of Phase I. Appendix F provides a worksheet for preparing a Phase I Memo during Phase I of the TPP process. A Phase I Planning Memo should clearly document the current project and associated project objectives, within the context of the overall site approach, for the current executable stage of site activities. The Planning Memo should clearly indicate the customer's goals (i.e., concept of site closeout, schedule requirements, and site budget), as well as site constraints and dependencies. The PM is responsible for distributing the Phase I Planning Memo to all team members at the end of Phase I. If a customer's site budget or schedule changes, the changes should be documented and then communicated to the entire team using technical memorandums or addendums to the Phase I Planning Memo. In accordance with the applicable quality management plan, the PM should have independent technical or management personnel review the Phase I Planning Memo to ensure it is effective and complete.

Point of Compliance (or Compliance Point)
A compliance point is the location, identified by the compliance data user perspective where a specific data need exists due to an applicable or relevant and appropriate requirement. Typical points of compliance include the outfall of a permitted water treatment facility or the atmospheric discharge point of an air treatment system.

Presumptive Remedies
Presumptive remedies are preferred technologies for common categories of sites, based on remedy selection and implementation experience. A suitable presumptive remedy can accelerate the planning process; provide consistency in remedy selection; reduce the remediation schedule and expenditures; and achieve earlier site closeout.

Project Quality Objective
Qualitative and quantitative statements derived from a Systematic Planning Process (e.g., EPA QA/G-4 DQO process) that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors. PQOs will be used

as the basis for establishing the quality and quantity of data needed to support decisions. (see also Data Quality Objective)

Project Manager
Within the TPP process, the PM is the decision maker responsible for leading the team's TPP efforts, progressing towards site closeout, and meeting the customer's expectations. The PM's leadership role in the TPP process is most apparent during Phases I and IV. During Phases II and III, the PM should function more in a support role by responding to information needs of the technical personnel who are representing data user and data implementer perspectives.

Project Objectives
Project objectives are the short- and long-term site issues to be addressed and resolved at a site. Satisfying or resolving the project objectives, based on the underlying regulations or site decisions, are the purpose of all site activities. Identifying and documenting the project objectives for a site during Phase I can be relatively straightforward since most project objectives are a consequence of the governing statutes and applicable regulations.

Project Objectives Worksheet
The project objectives worksheet provided in Appendix F is a tool useful for documenting and managing project objectives throughout the TPP process.

Project Planning Team (Team)
The TPP process requires a multi-disciplinary team of personnel to represent the planning perspectives of decision-making, data use, and data implementation. The PM is responsible for ensuring that all TPP perspectives are represented within a multi-disciplinary team of personnel. On small, relatively simple sites, personnel implementing the TPP process may perform multiple roles and support multiple perspectives. In general, several disciplines of technical and legal personnel will collaborate to represent each of data user and data implementer perspective for a site. The team is identified during Phase I and works together throughout the TPP process and execution of the work.

Regulators
Federal, state, and local regulators are decision makers who may have jurisdictional authority to directly affect site closeout. Regulators may specify standards, criteria, and guidance to be followed during site characterization and remediation. Regulators may also establish schedules under agreements that may stipulate penalties for missed milestone dates. Regulators with possible jurisdictional authority should be included in TPP efforts to ensure efficient progress to site closeout. In particular, regulator input is prudent during Phase I and portions of Phase IV. As deemed appropriate by the customer, regulators may also be welcomed to contribute during Phase II and Phase III of TPP activities.

Remedy Data User
Design and construction engineers, hydrogeologists, technicians, and other technical personnel who contribute to the remedy data user perspective are responsible for identifying the data needs associated with the remedy or specific remedy components for site closeout based on the remedy stage of the site and the executable phase of the project. The remedy data user participates throughout the TPP process with his/her primary responsibilities occurring during Phase I and Phase II.

Resource Conservation and Recovery Act
RCRA is the federal statute that governs the management of all hazardous waste from cradle to grave. RCRA covers requirements regarding identification, management, and cleanup of waste, including (1) identification of when a waste is solid or hazardous; (2) management of waste—transportation, storage, treatment, and disposal; and (3) corrective action, including investigation and cleanup, of old solid waste management units (DoD, 2000).

Responsibility Data User
Legal counsel, attorneys, and legal perspective personnel who contribute to the responsibility data user perspective are responsible for identifying data needs associated with potential litigation of the appropriate apportionment of responsibility for site investigation and closeout activities. The responsibility data user participates throughout the TPP process with his/her primary responsibilities occurring during Phase I and Phase II.

Risk/Hazard Data User (Includes MEC Hazard Data User)
Risk assessors; OE safety specialists, industrial hygienists; chemists; geologists; scientists; occupational health and safety specialists; and other technical personnel who contribute to the risk data user perspective are responsible for identifying the data needs associated with evaluating current and future risk or MEC hazard (human health or ecological; for MEC primarily human safety) associated with site conditions, site investigation activities, and site remediation conditions. The risk data user participates throughout the TPP process with his/her primary responsibilities occurring during Phase I and Phase II.

Sampling and Analysis Planning Worksheet
The sampling and analysis planning worksheet is a tool that can be used to document data collection plans, but not directly useful for the purpose of identifying sampling and analysis methods for site activities. The sampling and analysis planning worksheet is intended to provide data implementers a method to organize and communicate the recommended sampling and analysis methods to obtain the data needed within each data collection option (i.e., basic, optimum, and excessive). Sampling and analysis planning worksheets are prepared by data implementers during Phase III and are used during Phase IV design of the data collection program. A sampling and analysis planning worksheet is provided in Appendix F.

Sampling Data Implementer
Engineers, geologists, chemists, OE safety specialists, geophysicists and other technical specialists who contribute to the sampling data implementer perspective are responsible for identifying suitable sampling methods and requirements necessary to satisfy data needs within the data collection program. The sampling data implementer participates throughout the TPP process with his/her primary responsibilities occurring during Phase I and Phase III.

Scope of Work
A scope of work (SOW) is a narrative description of work to be performed by a contractor. Several SOW sections are typically used as an acquisition instrument with information sufficient to enable offerors to submit proposals and the resultant contractor to perform at levels that meet the government's needs. A SOW includes criteria such as required work products, work quality standards, budget parameters, schedule or delivery requirements, and specific performance requirements.

Screening Data
Screening data are analytical data of known quality, concentration, and level of uncertainty. The levels of quality and uncertainty of the analytical data are consistent with the requirements for the decision to be made. Screening data are of sufficient quality to support an intermediate or preliminary decision but must eventually be supported by definitive data before a project is complete.

Sensitivity Limits
Sensitivity limits are the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. Analysis and sampling data implementers work together during Phase III to evaluate sensitivity limits to ensure that appropriate sampling and analysis methods are selected to obtain the data needed by the data users. Data implementers can use the sampling and analysis planning worksheet provided in Appendix F when selecting the methods and setting method detection limits and quantitation limits.

Site Approach
A site approach is an overall strategy for managing a site from its current condition to the desired site closeout condition. Identification of a site approach during Phase I enables a team to be better prepared to manage and consider the effects of outside constraints and proposed changes to data collection programs. Critical elements of a site approach include a preliminary conceptual site model, the project objectives, other stakeholder perspectives, the probable remedies, and some definition of executable stages to site closeout.

Site Closeout
Site closeout is achieving the ”walk away goal”, the desired end-state, or the final condition of a site, as envisioned by the customer. The efforts to define site closeout involve understanding the customer’s vision for the site and translating his/her vision

into a descriptive statement that can be used by the team. The scope and meaning of site closeout is defined by the team during Phase I and then provides focus to all personnel during execution of the TPP activities and subsequent site activities.

Site Information Data

Site information data is specific site information that is not obtained as the result of environmental field work. Site information data needs are typically noncontaminant-related site information obtained from the site's owner (e.g., “as-built” drawings, geological information), technical or site-specific literature (e.g., precipitation and temperature trends; current and future zoning; material or equipment availability; site operations information) or an engineering-type site visit (e.g., topographic survey; utility conflicts and service connections; site access). Preliminary site information data needs are generally identified during Phase I with additional site information data needs identified by data users during Phase II. Appendix F provides a Site Information Worksheet useful during TPP efforts. It is the PM’s responsibility, working with the technical personnel, to decide how and when site information data needs will be fulfilled.

Site Information Worksheet

The Site Information Worksheet is provided in Appendix F for documenting and managing site information needs throughout the TPP process.

Stakeholders

Stakeholders with interests in site activities and site closeout could include current property owners, restoration advisory boards, and any number of other individuals or special interest groups. The TPP process advocates that concerns and ideas of stakeholders be considered during TPP efforts to contribute to efficient progress to site closeout. Phase I of the TPP process includes a deliberate effort to determine and consider community interests and the perspectives of stakeholders. A Phase IV activity encourages the team to prepare and distribute fact sheets, when appropriate, for communicating the data collection program to interested parties including stakeholders. As deemed appropriate by the customer, various stakeholders may also be welcomed to contribute during Phase II and Phase III of TPP activities.

Summary Table of Data Collection Options

A summary table of data collection options is provided in Appendix F as a tool useful for documenting an overview or summary of data collection options. The summary table of data collection options is not directly useful for identifying basic, optimum, and excessive types of applicable data collection options for a site. It provides data implementers a tool and method to communicate the fundamental aspects of each data collection option (i.e., number of samples, level of effort, order-of-magnitude cost, and related considerations). The team will use the summary table when considering the data collection program tables and designing the data collection program for a site during Phase IV of the TPP process. A summary table of data collection options is prepared by data implementers at the end of Phase III.

Team Information Package
A team information package is an informal collection of existing site information that is compiled early during Phase I for reference by the entire team. Common components of a team information package include existing site data, reports, illustrations, or drawings; the customer's concept of site closeout; the customer's schedule and budget requirements; all correspondence from regulators; an index of the project file and/or administrative record, if available; and a list of the individuals on the TPP team for a site. The PM typically distributes the team information package to the team early during Phase I efforts.

Technical Project Planning Process
This manual presents the TPP process for designing data collection programs at HTRW and MMRP sites. The TPP process helps ensure that the requisite type, quality, and quantity of data are obtained to satisfy project objectives that lead to informed decisions and site closeout. The four- phase TPP process is a comprehensive and systematic planning process that will accelerate progress to site closeout within all project constraints. The TPP process can be used from investigation through closeout at small, simple sites, as well as large, complex sites. The TPP process is a critical component of the USACE quality management system. Appendix D provides an outline of the activities within the TPP process.

Triad
Triad is a methodology that utilizes in-field decision making, dynamic work plans, and real-time data acquisition and interpretation. It has also been referred to as Expedited Site Characterization. Although Triad uses systematic planning as its foundation, the entire TPP process be used to develop the data collection program that will be fulfilled using Triad. Triad should be considered as an execution option during Phase I, and planned for throughout Phases II, III, and IV when deemed appropriate for site activities.

Unexploded Ordnance (UXO)
Military munitions that A) have been primed, fuzed, armed, or otherwise prepared for action; B) have been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and C) remain unexploded whether by malfunction, design, or any other cause. (10 USC 101(e)(5))