

SAMPLING AND ANALYSIS PLAN GUIDANCE AND TEMPLATE

VERSION 4, General Projects

R9QA/009.1

May 2014

This Sampling and Analysis Plan (SAP) guidance and template is intended to assist organizations in documenting the procedural and analytical requirements for one-time, or time-limited, projects involving the collection of water, soil, sediment, or other samples taken to characterize areas of potential environmental contamination. It combines the basic elements of a Quality Assurance Project Plan (QAPP) and a Field Sampling Plan (FSP). It will meet the requirements for any U.S. Environmental Protection Agency (EPA) Region 9 funded projects which involve taking environmental measurements.

The format is designed for use in projects generating a limited number of samples collected over a relatively short period of time. This template is not appropriate for on-going monitoring events, for remediation, or removal activities. Exceptions to all of these requirements will be considered on a case-by-case basis, but they should be discussed with the Region 9 QA Office before the SAP is submitted for approval. This template can be used by state, municipal and local agencies, contractor, non-profit organizations, and by EPA staff.

This guidance provides item-by-item instructions for each section. If appropriate, the language from any section may be used as written, or modified to reflect project- and sampling-specific requirements. Not all sections will apply to all organizations or to all projects.

Some sections, such as those describing sampling procedures, contain example language which can be used with or without modification. If these procedures do not meet project needs, they should be replaced by a description of the organization's sampling procedures. If available, copies of standard operation procedures (SOPs) for sampling may be included with the SAP. Other alternatives should be discussed with QA Office staff.

An electronic version of the template is available and can be used to prepare the SAP. The format of the template is as follows:

All instructions and tutorial information, shown in **shaded *italic*** type, should be deleted from the final SAP.

Suggested text, which may be included as written in the SAP, is presented in normal type. This text can be used, modified, or deleted depending on the nature of the project. For example, if the project only involves groundwater sampling, the discussion of sampling other matrices should be deleted. If there is more than one option, choose the appropriate one and delete the others.

Applicable SOPs can be included as an appendix to the final SAP and referenced in the appropriate section(s) of the SAP.

An underlined blank area (_____) in the template indicates that text should be added. Examples or choices may be in [brackets] and *italic* type following the blank space. If appropriate, select one and delete the others. Use as much space as necessary to completely address each section. Remove the underlining from the added text.

If a given section does not apply, it is recommended that it be kept in the SAP with the statement “Not applicable” or “Does not apply” under the section heading. This avoids the writer having to renumber sections. If sections that are not relevant to the project are removed altogether, the remaining sections will need to be renumbered.

Example forms are provided in Attachment 1. These forms should be deleted from the final SAP.

Please call the U.S. EPA Region 9 Quality Assurance Office for assistance in completing the SAP. Contact Dr. Eugenia McNaughton at 415-972-3411, or Ms. Gail Morison at 415-972-3807.

Sampling and Analysis Plan for

[Title of Project]_____

[Name and Address of Organization Here]_____

Date

[Name of Organization] Project Manager _____

[Name of Organization] QA Manager _____

For EPA use:

Approved by EPA Project Manager:

Date:

Expedited Review? Yes

No

Received by QA Office:

Date:

Reviewed by:

Date:

Approved:

Date:

Region 9 Quality Assurance Manager

TABLE OF CONTENTS

1.0 INTRODUCTION	7
1.1 Site Name or Sampling Area	7
1.2 Site or Sampling Area Location	7
1.3 Responsible Agency	7
1.4 Project Organization	7
2.0 BACKGROUND	9
2.1 Site or Sampling Area Description	9
2.2 Operational History	9
2.3 Previous Investigations/Regulatory Involvement	10
2.4 Geological Information	10
2.5 Environmental and/or Human Impact	10
3.0 PROJECT DATA QUALITY OBJECTIVES	12
3.1 Project Objectives and Problem Definition	12
3.2 Data Quality Objectives (DQOs)	12
3.3 Data Quality Indicators (DQIs) and Measurement Quality Objectives (MQOs)	13
3.4 Data Review and Validation	15
3.5 Data Management	16
3.6 Assessment Oversight	16
4.0 SAMPLING RATIONALE	19
4.1 Soil Sampling	19
4.2 Sediment Sampling	19
4.3 Water Sampling	20
4.4 Other Sampling	20
5.0 REQUEST FOR ANALYSES	23
5.1 Analyses Narrative	23
5.2 Analytical Laboratory	23
6.0 FIELD METHODS AND PROCEDURES	29
6.1 Field Equipment	29
6.1.1 List of Equipment Needed	29
6.1.2 Calibration of Field Equipment	29
6.2 Field Screening	29
6.3 Soil	30
6.3.1 Surface Soil Sampling	30
6.3.2 Subsurface Soil Sampling	31
6.4 Sediment Sampling	33
6.5 Water Sampling	33
6.5.1 Surface Water Sampling	33
6.5.2 Groundwater Sampling	35
6.6 Other	39
6.7 Decontamination Procedures	39

7.0	SAMPLE CONTAINERS, PRESERVATION, PACKAGING AND SHIPPING	43
7.1	Soil Samples	43
7.2	Sediment Samples	44
7.3	Water Samples	44
7.4	Other Samples	45
7.5	Packaging and Shipping	46
8.0	DISPOSAL OF RESIDUAL MATERIALS	48
9.0	SAMPLE DOCUMENTATION AND SHIPMENT	51
9.1	Field Notes	51
9.1.1	Field Logbooks	51
9.1.2	Photographs	52
9.2	Labeling	52
9.3	Sample Chain-Of-Custody Forms and Custody Seals	53
10.0	QUALITY CONTROL	54
10.1	Field Quality Control Samples	54
10.1.1	Assessment of Field Contamination (Blanks)	54
10.1.2	Assessment of Field Variability (Field Duplicate or Co-located Samples)	58
10.2	Background Samples	60
10.3	Field Screening, Confirmation and Split Samples	60
10.3.1	Field Screening Samples	60
10.3.2	Confirmation Samples	61
10.3.3	Split Samples	61
10.4	Laboratory Quality Control Samples	62
11.0	FIELD VARIANCES	64
12.0	FIELD HEALTH AND SAFETY PROCEDURES	65

ATTACHMENT 1 - EXAMPLE FORMS

Table 1-1: Key Project Personnel Contact Information and Responsibilities

Table 2-1: Contaminants of Concern – Previous Investigations, Matrix = Soil

Table 3-1: Contaminants of Concern, Laboratory and Action Levels, Matrix = Soil

Table 4-1: Sampling Design and Rationale, Matrix = Soil

Table 4-2: Sampling Design and Rationale, Matrix = Groundwater

Table 5-1: Analytical Services, Matrix = Soil

Table 5-2: Analytical Services, Matrix = Groundwater

Table 5-3: Analytical Method, Containers, Preservation, and Holding Times Requirements, Matrix = Soil

Table 5-4: Analytical Method, Containers, Preservation, and Holding Times Requirements, Matrix = Groundwater

Table 6-1: Field and Sampling Equipment

Table 6-2: Field Equipment/Instrument Calibration, Maintenance, Testing, and Inspection

1.0 INTRODUCTION

*This section should include a **brief** description of the project, the problem to be investigated, and the scope of sampling effort. These topics will be covered in depth later so do not include a detailed discussion here.*

1.1 Site Name or Sampling Area

Provide the most commonly used name of the site or sampling area. Also include the name or abbreviation (e.g., “the Site”), if any, that will be used throughout the plan.

1.2 Site or Sampling Area Location

Provide a general description of the region, state or tribal area in which the site or sampling area is located. Include the street address, city, state, and postal code, if appropriate. Detailed sampling location information should be provided later in Section 2.

1.3 Responsible Agency

Provide a description of the organization conducting the sampling.

1.4 Project Organization

Fill in the information requested in Table 1-1, modifying it to the specific project and deleting what is not relevant. Provide the name, phone number, and email address of the person(s) and/or contractor(s) working on the sampling project as listed in the table. A brief description of the roles and responsibilities for each key position should be included, either in the table (as shown) or within the text of this section. An Organization Chart should be included showing the lines of communication.

It should be noted that it is the responsibility of the Quality Assurance (QA) Officer to oversee the implementation of the Sampling and Analysis Plan (or QA Project Plan if one has been prepared), including whether specified quality control (QC) procedures are being followed as described. Ideally, this individual should discuss QA issues with the Project Manager, but should not be involved in the data collection/analysis/interpretation/reporting process except in a review or oversight capacity. If the project is small, another technical person may fulfill this role.

Table 1-1 – Key Project Personnel Contact Information and Responsibilities

Title	Name	Phone Number Email Address	Responsibilities
EPA Project Manager			
EPA Quality Assurance Officer (QAO)			
Grantee Project Manager			
Contractor Project Manager (include Company Name)			
Contractor QAO			
Contractor Field Team Leader			
Laboratory Quality Assurance Officer (include Laboratory Name)			

2.0 BACKGROUND

This section provides an overview of the location, previous investigations, and the apparent problem(s) associated with the site or sampling area.

2.1 Site or Sampling Area Description

At a minimum, two maps of the area should be provided: the first should place the area within its geographic region (i.e., State); the second, on a smaller scale, should mark the sampling site or sampling areas within the local area. Additional maps may be provided, as necessary, for clarity. Maps should include a North arrow, a surface and/or ground water directional flow arrow (if appropriate), buildings or former buildings, spill areas, etc. If longitude or latitude information is available, such as from a Global Positioning System (GPS), provide it.

Fill in the blanks.

The site or sampling area occupies _____ [e.g., acres or square feet] in a _____ [e.g., urban, commercial, industrial, residential, agricultural, or undeveloped] area. The site or sampling area is bordered on the north by _____, on the west by _____, on the south by _____, and on the east by _____. The specific location of the site or sampling area is shown in Figure _____.

Additional information should be provided that describes the historic and current on-site structures and other important site features. These should be shown on one of the figures.

2.2 Operational History

As applicable, describe in as much detail as needed the past and present activities at the site or sampling area. The discussion might include the following information:

- *a description of the owner(s) and/or operator(s) of the site or areas near the site or the sampling area (in chronological order);*
- *a description of past and current operations or activities that may have contributed to suspected contamination;*
- *a description of the processes involved in the operation(s) and the environmentally detrimental substances, if any, used in the processes;*
- *a description of any past and present waste management practices.*

2.3 Previous Investigations/Regulatory Involvement

Summarize all previous sampling efforts at the site or sampling area, including the:

- *sampling date(s);*
- *name of the party(ies) that conducted the sampling;*
- *local, tribal, state or federal government agency for which the sampling was conducted;*
- *a rationale for the sampling;*
- *the type of media sampled (e.g., soil, sediment, water);*
- *laboratory methods that were used;*
- *a discussion of what is known about data quality and usability.*

The summaries should be presented in subsections chronologically. Attach reports or summary tables of results, or include in appendices. See Table 2-1 for an example. Previous sampling locations can be shown on one of the figures or in additional figures.

2.4 Geological Information

For surface and/or ground water sampling: Provide a description of the hydrogeology of the area. Indicate the direction of flow for surface and/or ground water and include a directional flow arrow on the appropriate figure.

For soil sampling: Provide a description of the geology of the area.

For air sampling: Provide prevailing wind direction, temperature, etc.

2.5 Environmental and/or Human Impact

Discuss what is known about the potential and actual impacts of the possible environmental problem at the site on human health or the environment.

3.0 PROJECT DATA QUALITY OBJECTIVES

3.1 Project Objectives and Problem Definition

Describe the purpose of the environmental investigation and how the data will be used. Discuss how the site's history relates to the problem to be investigated, the scope of the sampling effort, and the types of analyses required. Include all measurements to be made on an analyte-specific basis in whatever media (soil, sediment, water, etc.) are to be sampled. This discussion should relate the sampling effort to the specific decisions described below in Section 3.2.

3.2 Data Quality Objectives (DQOs)

Data quality objectives (DQOs) are quantitative and qualitative criteria upon which project decisions are based. DQOs should cover the following items:

- *Describe the problem to be investigated.*
- *Identify what questions the study will attempt to answer, what actions (decisions) may result, and who the primary decision maker is.*
- *Identify the information that needs to be obtained and the measurements that need to be taken to resolve the decision statement(s).*
- *Define study boundaries, and when and where data should be collected.*

The use of "...if...then" statements is recommended. Note that decisions do not have to involve regulatory or legal action. Some examples: "If contaminants of concern are not detected above the action level, then no further action is required." or "If contaminants of concern are found above the action level, then recommendations for further action, such as additional sampling, will be evaluated."

This section should describe decisions to be made based on the data and provide criteria on which these decisions will be made. Inclusion of one or more tables is recommended. See Table 3-1 for reference. A separate table should be prepared for each matrix/media to be sampled. Tables should contain, at a minimum, the main contaminants of concern, their associated action levels and detection limits, and the source of the action level (regulation, health based criteria, water quality standards, etc.) If a contaminant does not have an action level, or will not be used in decision making, the text should discuss how the data for that contaminant will be used.

As projects utilizing this template are limited in scope, defining action levels and measurement quality objectives (MQOs) for field and laboratory measurements should be sufficient. The project manager, or other decision maker identified earlier in the project organization section, must determine what level of uncertainty is acceptable.

More sophisticated DQO discussions involve defining null test hypotheses and confidence intervals. These should be considered depending on project decision making needs, but generally such discussions are not expected to be applicable in limited sampling events. EPA's Guidance for Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4, February 2006) should be consulted for more information.

In addition to meeting defined DQOs, data quality is also evaluated as to its conformance to measurement quality objectives (MQOs), which are discussed in the next section.

3.3 Data Quality Indicators (DQIs) and Measurement Quality Objectives (MQOs)

Data Quality Indicators (DQIs) provide a means to evaluate the quality of data and are normally defined in terms of PARCCS (precision, accuracy, representativeness, completeness, comparability, and sensitivity (method detection limits). Precision, accuracy, and sensitivity are usually covered in method specific criteria (see below). However, the other DQIs (representativeness, completeness, and comparability) should be defined in the plan for the project as a whole.

The values that are to be assigned to the quantitative data quality indicators (accuracy, precision, completeness and sensitivity) and statements concerning the qualitative indicators (representativeness and comparability) are determined by the answers to the question: How sure are you that the values of the data are what the analyses have determined them to be?

Each DQI needs to have defined data quality acceptance criteria (measurement quality objectives (MQOs), as well as a means for assessing whether the criteria were achieved. Whenever possible, it is desirable that the MQOs be expressed in numerical or quantitative terms, along with one or more associated quality control (QC) samples that will serve as a means for assessing the DQI.

All the elements of the sampling event, from the sampling design and collection through laboratory analysis and reporting, affect the quality of the data. Depending on what the contaminants of concern are, what effect they may have on human and environmental health,

and at what level, uncertainty around a data point may need to be legally defensible at one extreme or only providing the answer to the “presence-absence” question at the other.

Measurement quality objectives (MQOs) can be defined in one of three ways: by the analytical methods (often referred to as method performance criteria (MPCs)); by the laboratory; or by the project. Laboratory or project defined MQOs typically result when an analytical method has been modified to meet laboratory capabilities or project needs.

Where applicable, precision and accuracy limits for both laboratory and field measurements may be presented in a table. See Tables 3-2 and 3-3 for examples. A separate table should be prepared for each matrix or media to be sampled. If not presented as tables in the text, MQO tables or laboratory SOPs should be included as appendices and referenced. This is discussed in greater detail in Section 5.2.

Definitions of the PARCCS terms are provided below:

Precision is the degree of mutual agreement between or among independent measurements of a similar property (usually reported as a standard deviation [SD] or relative percent difference [RPD]). This indicator relates to the analysis of duplicate laboratory or field samples. Typically, field precision is assessed by co-located samples, field duplicates, or field splits and laboratory precision is assessed using laboratory duplicates, matrix spike duplicates, or laboratory control sample duplicates.

Accuracy is the degree of agreement of a measurement with a known or true value and includes a combination of the random error (precision) and the systematic error (bias) components of both sampling and analytical operations. Given the nature of projects using the Template, only the bias component is considered. To determine accuracy, a laboratory or field value is compared to a known or true concentration. Accuracy is determined by such QC indicators as: matrix spikes, surrogate spikes, laboratory control samples (blank spikes) and performance samples.

Representativeness is the expression of the degree to which data accurately and precisely represent a characteristic of an environmental condition or a population. It relates both to the area of interest and to the method of taking the individual sample. The idea of representativeness should be incorporated into discussions of sampling design. Representativeness is best assured by a comprehensive statistical sampling design, but it is recognized that this is usually outside the scope of most one-time events. Most one-

time SAPs should focus on issues related to judgmental sampling and why certain areas are included or not included and the steps being taken to avoid either false positives or false negatives.

Completeness is expressed as percent of valid usable data actually obtained compared to the amount that was expected. It may happen that, due to a variety of circumstances, either not all samples scheduled to be collected were collected or else the data from samples cannot be used due to, for example, loss or spillage of samples, instrument failures, technical mistakes, etc.. The minimum percent of completed analyses defined in this section depends on how much information is needed for decision making. Generally, the fewer the number of samples taken per event or the more critical the data are for decision making, the higher the completeness goals. Goals in the 75-90% range are typical.

Comparability expresses the confidence with which one data set can be compared to another. The use of generally accepted and published methods from a recognized source, such as EPA (i.e., methods listed in <http://www.epa.gov/waterscience/methods/method>) or Standard Methods for the Examination of Water and Wastewater allows the data to be compared to similar data sets, facilitating evaluation of trends or changes in a site, a river, groundwater, etc. Comparability also refers to the reporting of data in comparable units.

Sensitivity, usually expressed as method detection limits (MDLs) or quantitation limit for all analytes or compounds of interest for all analyses requested must be included in this section. These limits should be related to any decisions that will be made as a result of the data collection effort. A critical element to be addressed is how these limits relate to any regulatory or action levels that may apply.

3.4 Data Review and Validation

Discuss data review and data validation, including what organizations or individuals will be responsible for what aspects of data review and what the review will include. This section should also discuss how data that do not meet data quality objectives will be designated, flagged, or handled. Possible corrective actions associated with the rejection of data, such as reanalysis or resampling, should be addressed.

Region 9 has adopted a tiered approach to data review. Details on validation are available from the QA Office, but a brief summary follows:

- *Tier 1 involves a general review of the QC data for the project. This is sometimes referred to as a “Summary Forms” review. At a minimum, all data should receive a Tier 1 review.*
- *Tier 2 involves a selected validation of a portion of the data. Which aspect of the project is to be reviewed should be defined in the DQO discussion of the project. The focus might be on a specific area within the sampling area, specific analytes or analyses of concern critical to decision making, or some other factor(s). The review may also look at unusual results noted in the Tier 1 review.*
- *Tier 3 involves validation of all the data collected and reported. This includes a review of the raw data, the laboratory’s standards log books, extractions logs, instrument printouts, chromatograms (if applicable), mass spectra (if applicable), etc. Calibration data, sample analysis data, and quality control data are all evaluated. Typically, this is a “third party review” and is based on strict protocols, such as the National Functional Guidelines (<http://www.epa.gov/superfund/programs/clp/download/fgorg.pdf>).*

It is recommended that if validation will be a part of the data review process, that SOP(s) from the organization which will perform the validation be attached.

3.5 Data Management

Provide a list of the steps that will be taken to ensure that data are transferred accurately from collection to analysis to reporting. Discuss the measures that will be taken to review the data collection processes, including field notes or field data sheets; to obtain and review complete laboratory reports; and to review the data entry system, including its use in reports. A checklist is acceptable.

3.6 Assessment Oversight

Describe the procedures which will be used to implement the QA Program. This includes oversight by the Quality Assurance Manager or the person assigned QA responsibilities. Indicate how often a QA review of the different aspects of the project, including audits of field and laboratory procedures, use of performance samples, review of laboratory and field data,

etc., will take place. Describe what authority the QA Manager or designated QA person has to ensure that identified field and analytical problems will be corrected and the mechanism by which this will be accomplished and documented.

4.0 SAMPLING RATIONALE

For each sampling event, the SAP must describe the sampling locations, the media to be sampled, and the analytes of concern at each location. A rationale should be provided to support these choices. The information may be presented in a table. See Tables 4-1 and 4-2 for examples.

The following subsections, as applicable, must be included for plan approval and should be consistent with the project DQOs. They are subdivided on a media specific basis (soil, sediment, and water). Other media should be added as needed. Appropriate figures should be included showing proposed sampling locations.

Information regarding the collection of field duplicates may be included in these sections or in Section 10.1.2. Provide a rationale for the selection of these locations.

Do not include sampling procedures, preservation, etc., as these topics are covered in later sections.

4.1 Soil Sampling

Provide a general overview of the soil sampling event. Present a rationale for choosing each sampling location at the site or sampling area and the depths at which the samples are to be taken, if relevant. If decisions will be made in the field, provide details concerning the criteria to be used to make these decisions. List the analytes of concern at each location and provide a rationale as to why the specific chemical or group of chemicals was chosen. Include a figure showing sampling locations.

4.2 Sediment Sampling

Provide a general overview of the sediment sampling event. Present a rationale for choosing each sampling location at the site or sampling area and the depths or area of the river, stream or lake at which the samples are to be taken, if relevant. If decisions will be made in the field, provide details concerning the criteria to be used to make these decisions. List the analytes of concern at each location and provide a rationale as to why the specific chemical or group of chemicals was chosen. Include a figure showing sampling locations.

4.3 Water Sampling

Provide a general overview of the water sampling event. For groundwater, describe the wells to be sampled or how the samples will be collected (e.g., hydro punch), including the depths at which the samples are to be taken. For surface water, describe the depth and nature of the samples to be collected (fast or slow moving water, stream traverse, etc.). Present a rationale for choosing each sampling location or sampling area. If decisions will be made in the field, provide details concerning the criteria to be used to make these decisions. List the analytes of concern at each location and provide a rationale as to why the specific chemical or group of chemicals was chosen. Include a figure showing sampling locations.

4.4 Other Sampling

Describe other media, if any, that may be sampled. Present a rationale for choosing each sampling location at the site or sampling areas, and the depths at which the samples will be taken, if relevant. If decisions will be made in the field, provide details concerning the criteria to be used to make these decisions. List the analytes of concern at each location and provide a rationale as to why the specific chemical or group of chemicals was chosen. Include a figure showing sampling locations.

**Table 4-1: Sampling Design and Rationale
Matrix = Soil**

Sampling Location/ID Number	Depth (ft)	Analytical Parameter	Rationale *

* Include rationale for location, depth and analysis.

Table 4-2: Sampling Design and Rationale
Matrix = Groundwater

Sampling Location/ID Number	Analytical Parameter	Rationale *

* Include rationale for location and analysis.

5.0 REQUEST FOR ANALYSES

The following sections should discuss the analytical support for the project: the analyses requested; analytes of concern; turnaround time; available resources; available laboratories; etc. The use of tables is recommended. If samples will be sent to more than one laboratory, it should be clear where each sample is to be sent.

5.1 Analyses Narrative

Complete this subsection concerning the analyses for each matrix. The use of an analytical services table is recommended for each matrix to be sampled. See Tables 5-1 and 5-2 for examples. Each table must include the analytical parameters for each type of sample. Quality Control (QC) samples, such as blanks, duplicates, splits, and laboratory QC, should be included in the column titled "Special Designation." The selected analyses must be consistent with the DQOs and analytes of concern.

Information on container types, sample volumes, preservatives, special handling and analytical holding times for each parameter may be included here or on separate tables. See Tables 5-3 and 5-4 for examples.

Include any special requests, such as fast turn-around time (2 weeks or less), specific QC requirements, or modified sample preparation techniques in this section.

Note: Rationale for the selection of duplicate and laboratory QC sample locations is to be provided in Section 10.0.

5.2 Analytical Laboratory

When an organization contracts for analytical work it has two options. In Option 1, MQOs for laboratory work are defined in the SAP. The MQOs are provided to the laboratory which states whether it is capable of meeting these criteria and that it is willing to do so. In Option 2, the sampling organization reviews the laboratory's information about its QA/QC Program and Criteria and determines whether the laboratory can meet project needs.

If the first approach is taken, the organization writing the SAP should include the relevant QC tables in the SAP. The Region 9 QA Office has MQO tables available for most routine analyses. These tables can be attached to the SAP and referenced in this section. Plan preparers can

request these tables, review them for project appropriateness, and incorporate all or some of them as is or in a modified form into the SAP.

If the second approach is taken, the sampling organization must acknowledge that it understands and agrees to the MQOs defined by the contract laboratory. MQOs or QC criteria for work performed by the laboratory will be found in either the laboratory's QA Plan and/or its SOPs, which must be included with the SAP for EPA QA Office review.

If analytical analyses are arranged through the Region 9 Analytical Services (RAS), this should be stated. Analytical options include the Contract Laboratory Program Analytical Services (CLPAS) (Superfund and Brownfields projects only), the Region 9 Laboratory in Richmond, California, and commercial laboratories under contract to Region 9. The Regional Sample Control Coordinator (RSCC) determines where samples will be sent. The SAP should not contain this information unless the RSCC has indicated in advance where the samples will be sent. If samples will be sent to laboratories through RAS and also to another laboratory with which the sampling organization has established a contract, this section should make it clear which samples go to each laboratory.

Field analyses for pH, conductivity, turbidity, or other field tests should be discussed in the sampling section. Field measurements in a mobile laboratory should be discussed here and listed separately from samples to be sent to a fixed laboratory. Field screening tests (for example, immunoassay tests) should be discussed in the sampling section, but the confirmation tests should be discussed here and the totals included in the tables.

The narrative subsection concerning laboratory analytical requirements should be completed. Appropriate MQO tables or the laboratory QA Plan and relevant SOPs for the methods to be performed must accompany the SAP. Although EPA does not approve or certify laboratories, the QA Office will review the laboratory's QA Plan and provide comments to the SAP's originator concerning whether the laboratory's QA/QC program appears to be adequate to meet project objectives. It is recommended that any issues raised be discussed with the laboratory and resolved before work commences. Note that the more the SAP "defaults" to laboratory capabilities, the greater emphasis will be placed on the adequacy of the laboratory's QA program. If the SAP author generates MQO tables or the equivalent for the project, the laboratory will be required to state clearly whether its program is sufficient to meet the project's analytical objectives.

If samples will be sent through the Regional Analytical Services (RAS) system, the SAP should include, at a minimum, a table containing the compounds of concern and their respective detection limits. (See Section 3.2.)

**Table 5-1: Analytical Services
Matrix = Soil**

Sample Number	Sample Location	Depth (ft)	Special Designation	Analytical Methods			
Total number of Soil Samples, excluding QC:							
Total number of Soil Samples, including QC:							

**Table 5-2: Analytical Services
Matrix = Groundwater**

Sample Number	Sample Location	Special Designation	Analytical Methods			
Total number of samples, excluding QC						
Total number of samples, including QC						

**Table 5-3: Analytical Method, Containers, Preservation,
and Holding Times Requirements
Matrix = Soil**

Analytical Parameter and/or Field Measurements	Analytical Method Number	Containers (number, type, size/volume)	Preservation Requirements (chemical, temperature, light protection)	Maximum Holding Times

**Table 5-4: Analytical Method, Containers, Preservation,
and Holding Times Requirements
Matrix = Groundwater**

Analytical Parameter and/or Field Measurements	Analytical Method Number	Containers (number, type, size/volume)	Preservation Requirements (chemical, temperature, light protection)	Maximum Holding Times

6.0 FIELD METHODS AND PROCEDURES

The sampling discussion should track the samples identified in Section 4.0 and the Analytical Services table(s). Provide a description of sampling procedures. Example procedures are provided below, but if they exist, the organization's procedures should be described instead. If that is the case, attach a copy of the applicable SOP. Some sampling procedures are available from EPA. Contact the QA Office or visit the Region 9 laboratory's web page. A general statement should be made that refers to the sections containing information about sample tracking and shipping (Section 7).

Depending on the nature of the project, some of the following sections may not be applicable. If this is the case, enter "Not Applicable" or other text to indicate that the section does not apply.

6.1 Field Equipment

6.1.1 List of Equipment Needed

List all the equipment to be used in the field to collect samples, including decontamination equipment, if required. Discuss the availability of back-up equipment and spare parts. This information can be presented in a table. See Table 6-1 for an example.

6.1.2 Calibration of Field Equipment

Describe the procedures by which field equipment is prepared for sampling, including calibration standards used, frequency of calibration and maintenance routines. Indicate where the equipment maintenance and calibration record(s) for the project will be kept. See Table 6-2 for an example.

6.2 Field Screening

In some projects, a combination of field screening using a less accurate or less sensitive method and confirmation samples to be analyzed in a fixed laboratory will be used. This section should describe the field methods or reference attached SOPs. Analyses such as XRF or immunoassay kits are two examples.

Describe how samples will be collected, prepared, and analyzed in the field. Include in an appendix any SOPs relating to these methods. Confirmation of screening results should also be

described. The role of the field screening in decision making for the site should be discussed here if it has not been covered previously.

6.3 Soil

6.3.1 Surface Soil Sampling

Use this subsection to describe the surface soil samples that are to be collected within 6-12 inches of the ground surface. Specify the method (e.g., hand trowels) that will be used to collect and transfer the samples to the appropriate containers, or reference the appropriate sections of a Soil Sampling SOP. If SOPs are referenced, they should be included in an appendix.

If exact soil sampling locations will be determined in the field, this should be stated. The criteria used to determine sampling locations should be provided.

Include this paragraph first if exact sampling locations are to be determined in the field; otherwise delete.

Exact soil sampling locations will be determined in the field based on accessibility, visible signs of potential contamination (e.g., stained soils), and topographical features which may indicate the location of hazardous substance disposal (e.g., depressions that may indicate a historic excavation). Soil sample locations will be recorded in the field logbook as sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

It is Region 9 policy that soils collected for volatile analysis be collected in hermetically sealed sampling devices such as EnCore samplers and analyzed within the holding time specified in EPA Method 5035, or immediately preserved by one of the processes specified in EPA Method 5035. Collection in brass tubes, even if preserved, is not acceptable. Hermetically sealed sampling devices are also required for gasoline samples. A rationale should be provided if more than one preservation method is specified. (Note: Preservation with methanol may significantly increase detection limits.)

If surface soil samples are to be analyzed for volatile organic compounds (VOCs), include this paragraph; otherwise delete.

Samples to be analyzed for volatile organic compounds will be collected first. Surface soil samples for VOC analyses will be collected as grab samples (independent, discrete samples) from a depth of 0 to ___ inches below ground surface (bgs). Surface soil samples will be collected using [*specify the type of sampling device*], and will be collected in triplicate. Sample containers will be sealed and placed in a zip lock bag. See Section 7.1 for preservation and shipping procedures.

If surface soil samples are to be analyzed for compounds other than volatiles, include this paragraph; otherwise delete.

Surface soil samples will be collected as grab samples (independent, discrete samples) from a depth of 0 to ___ inches below ground surface (bgs). Surface soil samples will be collected using a stainless steel hand trowel. Samples to be analyzed for _____ [*list all analytical methods for soil samples except volatile organic compounds*] will be placed in a sample-dedicated disposable pail and homogenized with a trowel. Material in the pail will be transferred with a trowel from the pail to the appropriate sample containers. Sample containers will be filled to the top, taking care to prevent soil from remaining in the lid threads prior to being closed to prevent potential contaminant migration to or from the sample. [*Alternatively, samples will be retained in the brass sleeves in which collected until sample preparation begins.*] See Section 7.1 for preservation and shipping procedures.

6.3.2 Subsurface Soil Sampling

Use this subsection for subsurface soil samples that are to be collected 12 inches or more below the surface. Specify the method (e.g., hand augers) that will be used to reach the appropriate depth, state the depth at which samples will be collected and describe the method used to collect and transfer samples to the appropriate containers or reference the appropriate sections of a Soil Sampling SOP. If SOPs are referenced, they should be included in an Appendix.

If exact soil sampling locations will be determined in the field, this should be stated. The criteria used to determine sampling locations should be provided. There should also be a discussion concerning possible problems, such as subsurface refusal.

Include this paragraph first if exact sampling locations are to be determined in the field; otherwise delete.

Exact soil sampling locations will be determined in the field based on accessibility, visible signs of potential contamination (e.g., stained soils), and topographical features which may indicate the location of hazardous substance disposal (e.g., depressions that may indicate a historic excavation). Soil sample locations will be recorded in the field logbook as sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

It is Region 9 policy that soils collected for volatile analysis be collected in hermetically sealed sampling devices. See the discussion in Section 6.3.1.

If subsurface soil samples are to be analyzed for volatile organic compounds, include this paragraph; otherwise delete.

Samples to be analyzed for volatile organic compounds (VOCs) will be collected first. Subsurface samples will be collected by boring to the desired sample depth using _____. Once the desired sample depth is reached, soil samples for VOC analyses will be collected as independent, discrete samples. Samples will be collected using [specify the type of sampling device], and will be collected in triplicate. Samples will be sealed and placed in a zip lock bag. See Section 7.1 for preservation and shipping procedures.

If subsurface soil samples are being collected for compounds other than volatiles, include this paragraph; otherwise delete.

Subsurface samples will be collected by boring to the desired sample depth using _____
_____. Once the desired sample depth is reached, the _____
_____ [hand- or power-operated device, such as a shovel, hand auger, trier, hollow-stem auger or split-spoon sampler] will be inserted into the hole and used to collect the sample. Samples will be transferred from the _____ [sampling device] to a sample-dedicated disposable pail and homogenized with a trowel. Material in the pail will be transferred with a trowel from the pail to the appropriate sample containers. Sample containers will be filled to the top taking care to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration to or from the sample. See Section 7.1 for preservation and shipping procedures.

Include this statement for all types of analyses.

Excess set-aside soil from the above sampled interval will then be repacked into the hole.

6.4 Sediment Sampling

Use this subsection if sediment samples are to be collected. Specify the method (e.g., dredges) that will be used to collect the samples and at what depth samples will be collected. Describe how samples will be homogenized and transferred to the appropriate containers. If an SOP will be followed, it should be referenced and included in the appendix.

If exact sediment sampling locations will be determined in the field, this should be stated. Describe where sediment samples will be collected

Exact sediment sampling locations will be determined in the field, based on _____
_____. *[Describe the criteria to be used to determine sampling locations.]* Care will be taken to obtain as representative a sample as possible. The sample will be taken from areas likely to collect sediment deposits, such as slow moving portions of streams or from the bottom of the lake at a minimum depth of ____ feet.

The final paragraph describes sample homogenization, which is particularly important if the sample is to be separated into solid and liquid phases, and how the container is to be filled. Include this paragraph for all sediment sampling. It is assumed that sediment samples will not be analyzed for volatile compounds. However, if sediment is to be analyzed for volatile organic compounds, the samples to be analyzed for volatile compounds should not be homogenized, but rather transferred directly from the sampler into the sample container. If feasible, a hermetically sealed sampling device should be used.

Material in the sampler will be transferred to a sample-dedicated one gallon disposable pail and homogenized with a trowel. Material from the pail will be transferred with a clean trowel from the bucket to the appropriate sample containers. Sample containers will be filled to the top, taking care to prevent soil from remaining in the lid grooves prior to being sealed in order to prevent potential contamination migration to or from the sample containers. See Section 7.2 for preservation and shipping procedures.

6.5 Water Sampling

6.5.1 Surface Water Sampling

Use this subsection if samples are to be collected in rivers, streams, lakes and reservoirs, or from standing water in runoff collection ponds, gullies, drainage ditches, etc. Describe the sampling procedure, including the type of sample (grab or composite - see definitions below), sample bottle preparation, and project-specific directions for taking the sample. State whether samples will be collected for chemical and/or microbiological analyses. Alternatively, reference the appropriate sections of attached SOPs.

Grab: Samples will be collected at one time from one location. The sample should be taken from flowing, not stagnant water, and the sampler should be facing upstream in the middle of the stream. Samples will be collected by hand or with a sample bottle holder. For samples taken at a single depth, the bottle should be uncapped and the cap protected from contamination. The bottle should be plunged into the water, mouth down, and filled 6 to 12 inches below the surface of the water. If it is important to take samples at depths, special samplers (e.g., Niskin or Kemmerer Depth Samplers) may be required.

Time Composite: Samples are collected over a period of time, usually 24 hours. If a composite sample is required, a flow- and time-proportional automatic sampler should be positioned to take samples at the appropriate location in a manner such that the sample can be held at 4°C for the duration of the sampling.

Spatial Composite: Samples are collected from different representative positions in the water body and combined in equal amounts. A Churn Splitter or equivalent device will be used to ensure that the sample is homogeneously mixed before the sample bottles are filled. Volatile organic compound samples will be collected as discrete samples and not composited.

If exact surface water sample locations will be determined in the field, this should be stated. Describe the criteria used to determine where surface water samples will be collected.

Include this paragraph first if exact sampling locations are to be determined in the field; otherwise delete.

Exact surface water sampling locations will be determined in the field based on _____
_____ [describe the criteria to be used to determine sampling locations].

Sample locations will be recorded in the field logbook as sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be provided.

Use this paragraph if samples are to be collected in rivers, streams, lakes and reservoirs, or from standing water in runoff collection ponds, gullies, drainage ditches, etc.

Samples will be collected from _____ [describe the sampling location]. [Describe the sampling procedure (e.g., grab, time composite, spatial composite), sample bottle preparation, and project-specific directions for taking the sample, or reference the appropriate sections of a Water Sampling SOP. If SOPs are referenced, they should be included in an appendix.] See Section 7.3 for preservation and shipping procedures.

6.5.2 Groundwater Sampling

This subsection contains procedures for water level measurements, well purging, and well sampling. Relevant procedures should be described under this heading with any necessary site-specific modifications. Alternatively, reference appropriate SOP(s).

6.5.2.1 Water-Level Measurements

The following language may be used as is or modified to meet project needs.

All field meters will be calibrated according to manufacturer's guidelines and specifications before and after every day of field use. Field meter probes will be decontaminated before and after use at each well.

If well heads are accessible, all wells will be sounded for depth to water from top of casing and total well depth prior to purging. An electronic sounder, accurate to the nearest +/- 0.01 feet, will be used to measure depth to water in each well. When using an electronic sounder, the probe is lowered down the casing to the top of the water column. The graduated markings on the probe wire or tape are used to measure the depth to water from the surveyed point on the rim of the well casing. Typically, the measuring device emits a constant tone when the probe is submerged in standing water and most electronic water level sounders have a visual indicator consisting of a small light bulb or diode that turns on when the probe encounters water. Total well depth will be sounded from the surveyed top of casing by lowering the weighted probe to the bottom of the well. The weighted probe will sink into silt, if present, at the bottom of the well screen. Total well depths will be measured by lowering the weighted probe to the bottom of the well and recording the depth to the nearest 0.1 feet.

Water-level sounding equipment will be decontaminated before and after use in each well. Water levels will be measured in wells which have the least amount of known contamination first. Wells with known or suspected contamination will be measured last.

6.5.2.2 Purging

Describe the method that will be used for well purging (e.g., dedicated well pump, bailer, hand pump), or reference the appropriate sections in a Ground Water SOP. If SOPs are referenced, they should be included in an appendix. Note: A combination of purging methods may be used.

Include this paragraph if dedicated well pumps will be used; otherwise delete.

All wells will be purged prior to sampling. If the well casing volume is known, a minimum of three casing volumes of water will be purged using the dedicated well pump.

Include this paragraph if hand pumps, submersible pumps, bailers, or other sampling methods will be used; otherwise delete.

All wells will be purged prior to sampling. If the well casing volume is known, a minimum of three casing volumes of water will be purged using [*specify sampling method*]. When a submersible pump is used for purging, clean flexible Teflon tubes will be used for groundwater extraction. All tubes will be decontaminated before use in each well. Pumps will be placed 2 to 3 feet from the bottom of the well to permit reasonable draw down while preventing cascading conditions.

The following paragraphs should be included in all sample plans.

Water will be collected into a measured bucket to record the purge volume. Casing volumes will be calculated based on total well depth, standing water level, and casing diameter. One casing volume will be calculated as:

$$V = \pi d^2 h / 77.01$$

where: **V** is the volume of one well casing of water (1ft³ = 7.48 gallons);
d is the inner diameter of the well casing (in inches);
h is the total depth of water in the well (in feet).

It is most important to obtain a representative sample from the well. Stable water quality parameter (temperature, pH and specific conductance) measurements indicate representative sampling is obtainable. Water quality is considered stable if for three consecutive readings:

- temperature range is no more than $\pm 1^{\circ}\text{C}$;
- pH varies by no more than 0.2 pH units;
- specific conductance readings are within 10% of the average.

The water in which measurements were taken will not be used to fill sample bottles.

If the well casing volume is known, measurements will be taken before the start of purging, in the middle of purging, and at the end of purging each casing volume. If the well casing volume is NOT known, measurements will be taken every 2.5 minutes after flow starts. If water quality parameters are not stable after 5 casing volumes or 30 minutes, purging will cease, which will be noted in the logbook, and ground water samples will be taken. The depth to water, water quality measurements and purge volumes will be entered in the logbook.

If a well dewateres during purging and three casing volumes are not purged, that well will be allowed to recharge up to 80% of the static water column and dewatered once more. After water levels have recharged to 80% of the static water column, groundwater samples will be collected.

6.5.2.3 Well Sampling

Describe the method that will be used to collect samples from wells. (This will probably be the same method as was used to purge the wells.) Specify the sequence for sample collection (e.g., bottles for volatile analysis will be filled first, followed by semivolatiles, etc.). State whether samples for metals analysis will be filtered or unfiltered. Include the specific conditions, such as turbidity, that will require samples to be filtered. Alternatively, reference the appropriate sections in the Ground Water SOP and state in which appendix the SOP is located.

The following paragraph should be included in all sample plans. Modify sample numbers and analyses as necessary to suit the subject project.

At each sampling location, all bottles designated for a particular analysis (e.g., volatile organic compounds) will be filled sequentially before bottles designated for the next analysis are filled (e.g., semivolatile organic compounds). If a duplicate sample is to be collected at this location, all bottles designated for a particular analysis for both sample designations will be filled

sequentially before bottles for another analysis are filled. In the filling sequence for duplicate samples, bottles with the two different sample designations will alternate (e.g., volatile organic compounds designation GW-2, volatile organic compounds designation GW-4 (duplicate of GW-2), metals designation GW-2, and metals designation GW-4 (duplicate of GW-2). Groundwater samples will be transferred directly into the appropriate sample containers with preservative, if required, chilled if appropriate, and processed for shipment to the laboratory.

If samples are to be collected for volatiles analysis, include the following paragraph; otherwise delete.

Samples for volatile organic compound analyses will be collected using a low flow sampling device. A [specify type] pump will be used at a flow rate of _____. Vials for volatile organic compound analysis will be filled first to minimize the effect of aeration on the water sample. See Section 7.3 for preservation and shipping procedures.

If some samples for metals (or other) analysis are to be filtered, depending upon sample turbidity, include the following paragraph; otherwise delete.

After well purging and prior to collecting groundwater samples for metals analyses, the turbidity of the groundwater extracted from each well will be measured using a portable turbidity meter. A small quantity of groundwater will be collected from the well, transferred to a disposable vial and a turbidity measurement will be taken. The results of the turbidity measurement will be recorded in the field logbook. The water used to measure turbidity will be discarded after use. If the turbidity of the groundwater from a well is above 5 Nephelometric Turbidity Units (NTUs), both a filtered and unfiltered sample will be collected. A 5-micron filter will be used to remove larger particles that have been entrained in the water sample. A clean, unused filter will be used for each filtered sample collected. Groundwater samples will be transferred from the filter directly into the appropriate sample containers with a preservative and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the filter to the sample container. After the filtered sample has been collected, the Teflon tube and filter will be removed and an unfiltered sample will be collected. A sample number appended with an "FI" will represent a sample filtered with a 5-micron filter. See Section 7.3 for preservation and shipping procedures.

If samples are to be filtered for metals (or other) analysis regardless of sample turbidity, include the following paragraph; otherwise delete.

Samples designated for metals analysis will be filtered. A 5-micron filter will be used to remove larger particles that have been entrained in the water sample. A clean, unused filter will be used for each filtered sample collected. Groundwater samples will be transferred from the filter directly into the appropriate sample containers to which preservative has been added and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the filter to the sample container. After the filtered sample has been collected, the Teflon tube and filter will be removed and an unfiltered sample will be collected. A sample number appended with an "FI" will represent a sample filtered with a 5-micron filter. See Section 7.3 for preservation and shipping procedures.

6.6 Other

Describe the collection of other media, if any.

6.7 Decontamination Procedures

Specify the decontamination procedures that will be followed if non-dedicated sampling equipment is used. Alternatively, reference the appropriate sections in the organization's Decontamination SOP and state in which appendix the SOP is located.

The decontamination procedures that will be followed are in accordance with approved procedures. Decontamination of sampling equipment must be conducted consistently as to assure the quality of samples collected. All equipment that comes into contact with potentially contaminated soil or water will be decontaminated. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal. Decontamination will occur prior to and after each use of a piece of equipment. All sampling devices used, including trowels and augers, will be steam-cleaned or decontaminated according to EPA Region 9 recommended procedures.

The following, to be carried out in sequence, is an EPA Region 9 recommended procedure for the decontamination of sampling equipment

Use the following decontamination procedures; edit as necessary.

- Non-phosphate detergent and tap water wash, using a brush if necessary
- Tap-water rinse
- 0.1 N nitric acid rinse *[For inorganic analyses, include an acid rinse; otherwise, delete.]*

- Deionized/distilled water rinse
- Pesticide-grade solvent (reagent grade hexane) rinse in a decontamination bucket [*For organic analyses, include a solvent rinse; otherwise, delete.*]
- Deionized/distilled water rinse (twice)

Equipment will be decontaminated in a predesignated area on pallets or plastic sheeting, and clean bulky equipment will be stored on plastic sheeting in uncontaminated areas. Cleaned small equipment will be stored in plastic bags. Materials to be stored more than a few hours will also be covered.

NOTE: If a different decontamination procedure is used; a rationale for using the different approach should be provided.

Table 6-1: Field and Sampling Equipment

Description of Equipment	Material (if applicable)	Dedicated (Yes/No)

7.0 SAMPLE CONTAINERS, PRESERVATION, PACKAGING AND SHIPPING

This section describes the types of containers to be used and the procedures for preserving, packaging and shipping samples. Information concerning the number /type of sample containers, volumes, and preservatives may have been presented in tabular form previously. The organization responsible for adding preservatives should be named.

The number and type of sample containers, volumes, and preservatives are listed in [specify table(s)]. The containers are pre-cleaned and will not be rinsed prior to sample collection. Preservatives, if required, will be added by _____ [name of agency/organization doing the sampling] to the containers prior to shipment of the samples to the laboratory.

7.1 Soil Samples

Include the following paragraphs, as appropriate; otherwise delete. Modify if necessary.

VOLATILE ORGANIC COMPOUNDS: Soil samples to be analyzed for volatile organic compounds will be stored in their sealed _____ samplers for no more than two days prior to analysis. Samples will be chilled to 4°C immediately upon collection.

Include the following sentences if samples will be frozen or preserved; otherwise delete.

Frozen Encore-sampler samples will be stored for no more than 4 days prior to analysis. If samples are preserved by ejecting into either methanol or sodium bisulfate solution the holding time is two weeks.

OTHER ORGANIC COMPOUNDS: Soil samples for _____ [include all requested analysis(es)] will be homogenized and transferred from the sample-dedicated homogenization pail into 8-ounce wide-mouth glass jars using a trowel. A separate container will be collected for each laboratory. [Alternatively, samples will be retained in the brass sleeve in which collected until sample preparation begins.] The samples will be chilled to 4°C immediately upon collection.

METALS: Surface soil samples to be analyzed for metals will be homogenized and transferred from the sample-dedicated homogenization pail into 8-oz, wide-mouth glass jars. A separate

container will be collected for each laboratory. Samples will not be chilled. Subsurface samples will be retained in their original brass sleeves or other container unless transferred to bottles.

7.2 Sediment Samples

Include the following paragraphs, as appropriate; otherwise delete. Modify if necessary.

VOLATILE ORGANIC COMPOUNDS: Sediment samples to be analyzed for volatile organic compounds will be stored in their sealed _____ samplers for no more than two days prior to analysis. Samples will be chilled to 4°C immediately upon collection.

Include the following sentences if samples will be frozen or preserved; otherwise delete.

Frozen Encore-sampler samples will be stored for no more than 4 days prior to analysis. If samples are preserved by ejecting into either methanol or sodium bisulfate solution the holding time is two weeks.

OTHER ORGANIC COMPOUNDS: Soil samples for _____ *[include all requested analysis(es)]* will be homogenized and transferred from the sample-dedicated homogenization pail into 8-ounce wide-mouth glass jars using a trowel. A separate container will be collected for each laboratory. The samples will be chilled to 4°C immediately upon collection.

METALS: Sediment samples, with rocks and debris removed, which are to be analyzed for metals will be homogenized and transferred from the sample-dedicated homogenization pail into 8-oz, wide-mouth glass jars. A separate container will be collected for each laboratory. Samples will not be chilled.

7.3 Water Samples

Include the following paragraphs, as appropriate; otherwise delete. Modify if necessary.

VOLATILE ORGANIC COMPOUNDS: Low concentration water samples to be analyzed for volatile organic compounds will be collected in 40-ml glass vials. 1:1 hydrochloric acid (HCl) will be added to the vial prior to sample collection. During purging, a test vial will be filled with sample at each sample location and the pH will be measured using a pH meter or pH paper to ensure that sufficient acid is present to result in a pH of less than 2. If the pH is greater than 2,

additional HCl will be added to the sample vials. Another vial will be pH tested to ensure the pH is less than 2. The tested vial(s) will be discarded. The sample vials will be filled so that there is no headspace. The vials will be inverted and checked for air bubbles to ensure zero headspace. If a bubble appears, the vial will be discarded and a new sample will be collected. The samples will be chilled to 4°C immediately upon collection. Three vials of each water sample are required for each laboratory.

METALS: Water samples collected for metals analysis will be collected in 1-liter polyethylene bottles. The samples will be preserved by adding nitric acid (HNO₃) to the sample bottle. The bottle will be capped and lightly shaken to mix in the acid. A small quantity of sample will be poured into the bottle cap where the pH will be measured using pH paper. The pH must be ≤ 2 . The sample in the cap will be discarded, and the pH of the sample will be adjusted further if necessary. The samples will be chilled to 4°C immediately upon collection. One bottle of each water sample is required for each laboratory.

GENERAL CHEMISTRY (WATER QUALITY) PARAMETERS: Water samples collected for *[specify the parameters requiring preservation]* will be collected in *[specify size of container]* polyethylene bottles. The *[specify analysis]* samples will be preserved by adding *[describe preservative appropriate to each sample type]* to the sample bottle. The bottle will be capped and lightly shaken to mix in the preservative. A small quantity of sample will be poured into the bottle cap where the pH will be measured using pH paper. The pH must be within the appropriate range. The sample in the cap will be discarded, and the pH of the sample will be adjusted further if necessary. Samples will be chilled to 4°C immediately upon collection. Samples from each location that require the same preservative will be placed in the same bottle, if being analyzed by the same laboratory.

_____ *[Include all requested analysis(es), e.g., Anions, Pesticides, Semivolatile Organic Compounds. A separate paragraph should be included for each bottle type.]* Low concentration water samples to be analyzed for _____ *[specify analysis(es)]* will be collected in _____ *[specify bottle type]*. No preservative is required for these samples. The samples will be chilled to 4°C immediately upon collection. Two bottles of each water sample are required for each laboratory.

7.4 Other Samples

If samples of other media (e.g., soil gas) are to be collected, specify the analyses that will be performed and the containers and preservatives required, if any.

7.5 Packaging and Shipping

The following provides a generic explanation and description of how to pack and ship samples. It may be incorporated as is, if appropriate, or modified to meet any project-specific conditions.

All sample containers will be placed in a strong-outside shipping container (a steel-belted cooler). The following outlines the packaging procedures that will be followed for low concentration samples.

1. When ice is used, pack it in zip-locked, double plastic bags. Seal the drain plug of the cooler with fiberglass tape to prevent melting ice from leaking out of the cooler.
2. The bottom of the cooler should be lined with bubble wrap to prevent breakage during shipment.
3. Check screw caps for tightness and, if not full, mark the sample volume level of liquid samples on the outside of the sample bottles with indelible ink.
4. Secure bottle/container tops with clear tape and custody seal all container tops.
5. Affix sample labels onto the containers with clear tape.
6. Wrap all glass sample containers in bubble wrap to prevent breakage.
7. Seal all sample containers in heavy duty plastic zip-lock bags. Write the sample numbers on the outside of the plastic bags with indelible ink.
8. Place samples in a sturdy cooler(s) lined with a large plastic trash bag. Enclose the appropriate COC(s) in a zip-lock plastic bag affixed to the underside of the cooler lid.
9. Fill empty space in the cooler with bubble wrap or Styrofoam peanuts to prevent movement and breakage during shipment. Vermiculite should also be placed in the cooler to absorb spills if they occur.

10. Ice used to cool samples will be double sealed in two zip lock plastic bags and placed on top and around the samples to chill them to the correct temperature.
11. Each ice chest will be securely taped shut with fiberglass strapping tape, and custody seals will be affixed to the front, right and back of each cooler.

8.0 DISPOSAL OF RESIDUAL MATERIALS

This section should describe the type(s) of investigation-derived wastes (IDW) that will be generated during this sampling event. IDW may not be generated in all sampling events, in which case this section would not apply. Use the language below or reference the appropriate sections in a “Disposal of Residual Materials SOP” and state in which appendix the SOP is located. Depending upon site-specific conditions and applicable federal, state, and local regulations, other provisions for IDW disposal may be required. If any analyses of IDW are required, these should be discussed. If IDW are to be placed in drums, labeling for the drums should be discussed in this section.

In the process of collecting environmental samples, the sampling team will generate different types of potentially contaminated IDW that include the following:

- Used personal protective equipment (PPE)
- Disposable sampling equipment
- Decontamination fluids
- Soil cuttings from soil borings [Include this bullet when sampling soils; otherwise delete.]
- Purged groundwater and excess groundwater collected for sample container filling [Include this bullet when sampling groundwater; otherwise delete.]

The EPA's National Contingency Plan (NCP) requires that management of IDW generated during sampling comply with all applicable or relevant and appropriate requirements (ARARs) to the extent practicable. The sampling plan will follow the *Office of Emergency and Remedial Response (OERR) Directive 9345.3-02* (May 1991), which provides the guidance for the management of IDW. In addition, other legal and practical considerations that may affect the handling of IDW will be considered.

Listed below are the procedures that should be followed for handling the IDW. The procedures have enough flexibility to allow the sampling team to use its professional judgment as to the proper method for the disposal of each type of IDW generated at each sampling location.

The following bullet is generally appropriate for site or sampling areas with low levels of contamination or for routine monitoring. If higher levels of contamination exist at the site or

sampling area, other disposal methods (such as the drumming of wastes) should be used to dispose of used PPE and disposable sampling equipment.

- Used PPE and disposable equipment will be double bagged and placed in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill. Any PPE and disposable equipment that is to be disposed of which can still be reused will be rendered inoperable before disposal in the refuse dumpster.

Include this bullet if sampling for both metals and organics; otherwise delete.

- Decontamination fluids that will be generated in the sampling event will consist of dilute nitric acid, pesticide-grade solvent, deionized water, residual contaminants, and water with non-phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal at the site or sampling area. The water (and water with detergent) will be poured onto the ground or into a storm drain. Pesticide-grade solvents will be allowed to evaporate from the decontamination bucket. The nitric acid will be diluted and/or neutralized with sodium hydroxide and tested with pH paper before pouring onto the ground or into a storm drain.

Include this bullet if sampling for metals but not organics; otherwise delete.

- Decontamination fluids that will be generated in the sampling event will consist of nitric acid, deionized water, residual contaminants, and water with non-phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal at the site or sampling area. The water (and water with detergent) will be poured onto the ground or into a storm drain. The nitric acid will be diluted and/or neutralized with sodium hydroxide and tested with pH paper before pouring onto the ground or into a storm drain.

Include this bullet if sampling for organics but not metals; otherwise delete.

- Decontamination fluids that will be generated in the sampling event will consist of pesticide-grade solvent, deionized water, residual contaminants, and water with non-phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal at the site or sampling area. The water (and water with detergent) will be poured onto the ground or into a storm drain. Pesticide-grade solvents will be allowed to evaporate from the decontamination bucket.

Include this bullet if sampling soils; otherwise delete.

- Soil cuttings generated during the subsurface sampling will be disposed of in an appropriate manner.

Include this bullet if sampling groundwater; otherwise delete.

- Purged groundwater will be _____

Depending upon the degree of groundwater contamination, site-specific conditions, and applicable federal, state, and local regulations, disposal methods will vary. Disposal methods can also vary for purge water from different wells sampled during the same sampling event.

9.0 SAMPLE DOCUMENTATION AND SHIPMENT

9.1 Field Notes

This section should discuss record keeping in the field. This may be through a combination of logbooks, preprinted forms, photographs, or other documentation. Information to be maintained is provided below.

9.1.1 Field Logbooks

Use field logbooks to document where, when, how, and from whom any vital project information was obtained. Logbook entries should be complete and accurate enough to permit reconstruction of field activities. Maintain a separate logbook for each sampling event or project. Logbooks should have consecutively numbered pages. All entries should be legible, written in black ink, and signed by the individual making the entries. Use factual, objective language.

At a minimum, the following information will be recorded during the collection of each sample:

Edit this list as relevant.

- Sample location and description
- Site or sampling area sketch showing sample location and measured distances
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or grab
- Type of sample (soil, sediment or water)
- Type of sampling equipment used
- Field instrument readings and calibration
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)
- Preliminary sample descriptions (e.g., for soils: clay loam, very wet; for water: clear water with strong ammonia-like odor)
- Sample preservation
- Lot numbers of the sample containers, sample identification numbers and any explanatory codes, and chain-of-custody form numbers
- Shipping arrangements (overnight air bill number)

- Name(s) of recipient laboratory(ies)

In addition to the sampling information, the following specific information will also be recorded in the field logbook for each day of sampling:

Edit this list as relevant.

- Team members and their responsibilities
- Time of arrival/entry on site and time of site departure
- Other personnel on site
- Summary of any meetings or discussions with tribal, contractor, or federal agency personnel
- Deviations from sampling plans, site safety plans, and QAPP procedures
- Changes in personnel and responsibilities with reasons for the changes
- Levels of safety protection
- Calibration readings for any equipment used and equipment model and serial number

9.1.2 Photographs

If photographs will be taken, the following language may be used as is or modified as appropriate.

Photographs will be taken at the sampling locations and at other areas of interest on the site or sampling area. They will serve to verify information entered in the field logbook. For each photograph taken, the following information will be written in the logbook or recorded in a separate field photography log:

- Time, date, location, and weather conditions
- Description of the subject photographed
- Name of person taking the photograph

9.2 Labeling

The following paragraph provides a generic explanation and description of the use of labels. It may be incorporated as is, if appropriate, or modified to meet any project-specific conditions.

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. A copy of the sample label is included in Appendix ____. The samples will have pre-assigned, identifiable, and unique numbers. At a minimum, the sample labels will contain the following information: station location, date of collection, analytical parameter(s), and method of preservation. Every sample, including samples collected from a single location but going to separate laboratories, will be assigned a unique sample number.

9.3 Sample Chain-Of-Custody Forms and Custody Seals

The following paragraphs provide a generic explanation and description of the use of chain-of-custody forms and custody seals. They may be incorporated as is, if they are appropriate, or modified to meet any project-specific conditions.

All sample shipments for analyses will be accompanied by a chain-of-custody record. A copy of the form is found in Appendix ____. Form(s) will be completed and sent with the samples for each laboratory and each shipment (i.e., each day). If multiple coolers are sent to a single laboratory on a single day, form(s) will be completed and sent with the samples for each cooler.

The chain-of-custody form will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are shipped, the custody of the samples will be the responsibility of _____ [name of agency/ organization conducting sampling]. The sampling team leader or designee will sign the chain-of-custody form in the "relinquished by" box and note date, time, and air bill number.

A self-adhesive custody seal will be placed across the lid of each sample. A copy of the seal is found in Appendix _____. For VOC samples, the seal will be wrapped around the cap. The shipping containers in which samples are stored (usually a sturdy picnic cooler or ice chest) will be sealed with self-adhesive custody seals any time they are not in someone's possession or view before shipping. All custody seals will be signed and dated.

10.0 QUALITY CONTROL

The following sections should discuss the quality control samples that are being collected to support the sampling activity. This includes field QC samples, confirmation samples, background samples, laboratory QC samples, and split samples. Wherever possible, the locations at which the samples will be collected should be identified and a rationale provided for the choice of location. Frequency of collection should be discussed.

10.1 Field Quality Control Samples

Field quality control samples are intended to help evaluate conditions resulting from field activities and are intended to accomplish two primary goals, assessment of field contamination and assessment of sampling variability. The former looks for substances introduced in the field due to environmental or sampling equipment and are assessed using blanks of different types. The latter includes variability due to sampling technique and instrument performance as well as variability possibly caused by the heterogeneity of the matrix being sampled and is assessed using replicate sample collection. The following subsections cover field QC.

10.1.1 Assessment of Field Contamination (Blanks)

Field contamination is usually assessed through the collection of different types of blanks. Equipment blanks are obtained by passing distilled or deionized water, as appropriate, over or through the decontaminated equipment used for sampling. They provide the best overall means of assessing contamination arising from the equipment, ambient conditions, sample containers, transit, and the laboratory. Field blanks are sample containers filled in the field. They help assess contamination from ambient conditions, sample containers, transit, and the laboratory. Trip blanks are prepared by the laboratory and shipped to and from the field. They help assess contamination from shipping and the laboratory and are for volatile organic compounds only. Region 9 recommends that equipment blanks be collected, where appropriate (e.g., where neither disposable nor dedicated equipment is used). Field blanks are next in priority, followed by trip blanks. Only one type of blank must be collected per event, not all three.

A maximum of one blank sample per matrix per day should be collected, but at a rate not to exceed one blank per 10 samples. The 1:10 ratio overrides the one per day requirement. If equipment rinsate blanks are collected, field blanks and trip blanks are not required under normal circumstances.

10.1.1.1 Equipment Blanks

In general, equipment (rinsate) blanks should be collected when reusable, non-disposable sampling equipment (e.g., trowels, hand augers, and non-dedicated groundwater sampling pumps) are being used for the sampling event. Equipment blanks can be collected for soil, sediment, surface water and ground water samples. A minimum of one equipment blank is prepared each day for each matrix when equipment is decontaminated in the field. These blanks are submitted “blind” to the laboratory, packaged like other samples and assigned its own unique identification number. Note that for samples which may contain VOCs, water for blanks should be purged prior to use to ensure that it is organic free. High Performance Liquid Chromatography (HPLC) water, which is often used for equipment and field blanks, can contain VOCs if it is not purged.

Include this paragraph if blanks will be analyzed for both metals and organic compounds; otherwise delete.

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring High Performance Liquid Chromatography (HPLC) organic-free (for organics) or deionized water (for inorganics) over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be analyzed for _____. *[Include names of target analytes, e.g., metals, total petroleum hydrocarbons, volatile organic compounds, etc.]*

Include this paragraph if blanks will be analyzed only for organic compounds; otherwise delete.

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring High Performance Liquid Chromatography (HPLC) organic-free water over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be analyzed for _____. *[Include names of target analytes, e.g., volatile organic compounds, total petroleum hydrocarbons, etc.]*

Include this paragraph if blanks will be analyzed only for metals; otherwise delete.

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring deionized water over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing deionized water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be analyzed for metals.

Always include this paragraph.

The equipment rinsate blanks will be preserved, packaged, and sealed in the manner described for the environmental samples. A separate sample number and station number will be assigned to each sample, and it will be submitted blind to the laboratory.

10.1.1.2 Field Blanks

Field blanks are collected when dedicated equipment is used and decontamination is not necessary. A minimum of one field blank is prepared each day sampling occurs in the field, but equipment is not decontaminated. These blanks are submitted “blind” to the laboratory, packaged like other samples and each with its own unique identification number. Note that for samples which may contain VOCs, water for blanks should be purged prior to use to ensure that it is organic free. HPLC water, which is often used for equipment and field blanks, can contain VOCs if it is not purged.

Include this paragraph if blanks will be analyzed for both metals and organic compounds; otherwise delete.

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling due to ambient conditions or from sample containers. Field blank samples will be obtained by pouring High Performance Liquid Chromatography (HPLC) organic-free water (for organics) and/or deionized water (for inorganics) into a sampling container at the sampling point. The field blanks that are collected will be analyzed for _____. *[Include names of target analytes, e.g., metals, volatile organic compounds, etc.]*

Include this paragraph if blanks will be analyzed only for organic compounds; otherwise delete.

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling due to ambient conditions or from sample containers. Field blank

samples will be obtained by pouring High Performance Liquid Chromatography (HPLC) organic-free water into a sampling container at the sampling point. The field blanks that are collected will be analyzed for _____. *[Include names of target analytes, e.g., volatile organic compounds, total petroleum hydrocarbons, etc.]*

Include this paragraph if blanks will be analyzed only for metals; otherwise delete.

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling due to contamination from sample containers. Field blank samples will be obtained by pouring deionized water into a sampling container at the sampling point. The field blanks that are collected will be analyzed for metals.

Always include this paragraph.

The field blanks will be preserved, packaged, and sealed in the manner described for the environmental samples. A separate sample number and station number will be assigned to each sample, and it will be submitted blind to the laboratory.

10.1.1.3 Trip Blanks

Trip blanks are required only if no other type of blank will be collected. Trip blanks are only relevant to volatile organic compound (VOC) sampling efforts. If trip blanks are required, one is submitted to the laboratory for analysis with every shipment of samples for VOC analysis. These blanks are submitted “blind” to the laboratory, packaged like other samples and each is assigned its own unique identification number. Note that for samples which may contain VOCs, water for blanks should be purged prior to use to ensure that it is organic free. HPLC water, which is often used for trip blanks, can contain VOCs if it is not purged.

Trip blanks will be prepared to evaluate if the shipping and handling procedures are introducing contaminants into the samples, and if cross contamination in the form of VOC migration has occurred between the collected samples. A minimum of one trip blank will be submitted to the laboratory for analysis with every shipment of samples for VOC analysis. Trip blanks are 40-mL vials that have been filled with HPLC-grade water that has been purged so it is VOC free and shipped with the empty sampling containers to the site or sampling area prior to sampling. The sealed trip blanks are not opened in the field and are shipped to the laboratory in the same cooler with the samples collected for volatile analyses. The trip blanks will be preserved, packaged, and sealed in the manner described for the environmental samples. A separate sample number

and station number will be assigned to each trip sample and it will be submitted blind to the laboratory.

10.1.1.4 Temperature Blanks

Include this paragraph with all plans.

For each cooler that is shipped or transported to an analytical laboratory a 40-mL VOA vial will be included that is marked “temperature blank.” This blank will be used by the sample custodian to check the temperature of samples upon receipt.

10.1.2 Assessment of Field Variability (Field Duplicate or Co-located Samples)

Duplicate samples are collected simultaneously with a standard sample from the same source under identical conditions but are placed into separate sample containers. Field duplicates will consist of a homogenized sample divided in two or else a co-located sample. Each duplicate portion should be assigned its own sample number so that it will be blind to the laboratory. A duplicate sample is treated independently of its counterpart to enable assessment of laboratory performance through comparison of the results. At least 10% of samples collected per event should be field duplicates. At least one duplicate should be collected for each sample matrix, but collection can be stretched out over more than one day (e.g., if it takes more than one day to reach 10 samples). Every group of analytes for which a standard sample is analyzed will also include the analyses of one or more duplicate samples. Duplicate samples should be collected from areas of known or suspected contamination. Since the objective is to assess variability due to sampling technique and possible sample heterogeneity, source variability is a good reason to collect co-located samples, not to avoid their collection.

Duplicate soils samples will be collected at sample locations _____. *[Identify soil sample locations from which duplicate or collocated samples will be collected.] Duplicate samples will be collected from these locations because _____. [Include a rationale for collecting duplicate samples from these locations; e.g., “samples from these locations are suspected to exhibit moderate concentrations of contaminants” or “previous sampling events have detected moderate levels of contamination at the site or sampling area at these locations.”]*

Include this paragraph if collecting soil samples and analyzing for compounds other than volatiles; otherwise delete.

Soil samples to be analyzed for _____ *[list all analytical methods for this sampling event except for volatiles]* will be homogenized with a trowel in a sample-dedicated one gallon disposable pail. Homogenized material from the bucket will then be transferred to the appropriate wide-mouth glass jars for both the regular and duplicate samples. All jars designated for a particular analysis (e.g., semivolatile organic compounds) will be filled sequentially before jars designated for another analysis are filled (e.g., metals).

Include this paragraph if collecting soil samples and analyzing for volatiles; otherwise delete.

Soil samples for volatile organic compound analyses will not be homogenized. Equivalent samples from a co-located location will be collected identically to the original samples, assigned unique sample numbers and sent blind to the laboratory.

Include these paragraphs if collecting sediment samples. If volatile organic compound analysis will be performed on sediment samples, modify the above paragraph for soil sample volatile analyses by changing “soil” to “sediment.”

Duplicate sediment samples will be collected at sample locations _____. *[Identify sediment sample locations from which duplicate or co-located samples for duplicate analysis will be obtained.]* Duplicate samples will be collected from these locations because _____. *[Include a rationale for collecting duplicate samples from these locations.]*

Sediment samples will be homogenized with a trowel in a sample-dedicated 1-gallon disposable pail. Homogenized material from the bucket will then be transferred to the appropriate wide-mouth glass jars for both the regular and duplicate samples. All jars designated for a particular analysis (e.g., semivolatile organic compounds) will be filled sequentially before jars designated for another analysis are filled (e.g., metals).

Include this paragraph if collecting water samples; otherwise delete.

Duplicate water samples will be collected for water sample numbers _____ *[water sample numbers which will be split for duplicate analysis]*. Duplicate samples will be collected from these locations because _____. *[Include a rationale for collecting duplicate samples from these locations.]*

When collecting duplicate water samples, bottles with the two different sample identification numbers will alternate in the filling sequence (e.g., a typical filling sequence might be, VOCs

designation GW-2, VOCs designation GW-4 (duplicate of GW-2); metals, designation GW-2, metals, designation GW-4, (duplicate of GW-2) etc.). Note that bottles for one type of analysis will be filled before bottles for the next analysis are filled. Volatiles will always be filled first.

Always include this paragraph.

Duplicate samples will be preserved, packaged, and sealed in the same manner as other samples of the same matrix. A separate sample number and station number will be assigned to each duplicate, and it will be submitted blind to the laboratory.

10.2 Background Samples

Background samples are collected in situations where the possibility exists that there are native or ambient levels of one or more target analytes present or where one aim of the sampling event is to differentiate between on-site and off-site contributions to contamination. One or more locations are chosen which should be free of contamination from the site or sampling location itself, but have similar geology, hydrogeology, or other characteristics to the proposed sampling locations that may have been impacted by site activities. For example, an area adjacent to but removed from the site, upstream from the sampling points, or up gradient or cross gradient from the groundwater under the site. Not all sampling events require background samples.

Specify the sample locations that have been designated as background. Include a rationale for collecting background samples from these locations and describe or reference the sampling and analytical procedures which will be followed to collect these samples.

10.3 Field Screening, Confirmation and Split Samples

For projects where field screening methods are used (typically defined as testing using field test kits, immunoassay kits, or soil gas measurements or equivalent, but not usually defined as the use of a mobile laboratory which generates data equivalent to a fixed laboratory), two aspects of the tests should be described. First, the QC which will be run in conjunction with the field screening method itself, and, second, any fixed laboratory confirmation tests which will be conducted. QC acceptance criteria for these tests should be defined in these sections rather than in the DQO section.

10.3.1 Field Screening Samples

For projects where field screening methods are used, describe the QC samples which will be run in the field to ensure that the screening method is working properly. This usually consists of a combination of field duplicates and background samples. The discussion should specify acceptance criteria and corrective action to be taken if results are not within defined limits. Discuss confirmation tests below.

10.3.2 Confirmation Samples

If the planned sampling event includes a combination of field screening and fixed laboratory confirmation, this section should describe the frequency with which the confirmation samples will be collected and the criteria which will be used to select confirmation locations. These will both be dependent on the use of the data in decision making. It is recommended that the selection process be at a minimum of 10% and that selection criteria include checks for both false positives (i.e., the field detections are invalid or the concentrations are not accurate) and false negatives (i.e., the analyte was not detected in the field). Because many field screening techniques are less sensitive than laboratory methods, false negative screening is especially important unless the field method is below the action level for any decision making. It is recommended that some “hits” be chosen and that other locations be chosen randomly.

Describe confirmation sampling. Discuss the frequency with which samples will be confirmed and how location will be chosen. Define acceptance criteria for the confirmation results and corrective actions to be taken if samples are not confirmed.

10.3.3 Split Samples

Split Samples are defined differently by different organizations, but for the purpose of this guidance, Region 9’s QA Office considers split samples as ones that are divided among two or more laboratories for the purpose of providing an inter-laboratory or inter-organization comparison. Usually one organization (for example, a responsible party) collects the samples and provides sufficient material to the other organization (for example, EPA) to enable it to perform independent analyses. It is expected that the sampling party will have prepared a sampling plan which the QA Office has reviewed and approved that describes the sampling locations and a rationale for their choice, sampling methods, and analyses.

Describe the purpose of the split sampling. Include references to the approved sampling plan prepared by the party collecting the samples. Provide a rationale for the sample locations at which split samples will be obtained and how these locations are representative of the sampling

event as a whole. Describe how results are to be compared and define criteria by which agreement will be measured. Discuss corrective action to be taken if results are found to not be in agreement.

10.4 Laboratory Quality Control Samples

Laboratory quality control (QC) samples are analyzed as part of standard laboratory practice. The laboratory monitors the precision and accuracy of the results of its analytical procedures through analysis of QC samples. Typically, laboratory QC samples consist of matrix spike/matrix spike duplicate (MS/MSD) samples for organic analyses, and matrix spike and duplicate samples (MS/DS) for inorganic analyses. The term “matrix” refers to use of the actual media collected in the field (e.g., routine soil and water samples).

Laboratory QC samples are collected in the field, but prepared by the laboratory. They are not a separate sample, but an aliquot (subset) of an existing field sample. Do not include laboratory QC checks, such as calibration standards or surrogates. These were discussed in previous sections and should be included in MQO tables or the laboratory QA Manual/SOPs.

Include the following language if soil samples are to be collected for other than volatiles; otherwise delete.

A routinely collected soil sample (a full 8-oz sample jar or two 120-mL sample vials) contains sufficient volume for both routine sample analysis and additional laboratory QC analyses. Therefore, a separate soil sample for laboratory QC purposes will not be collected.

Include the following language if soil samples are to be collected for volatiles; otherwise delete.

Soil samples for volatile organic compound analyses for laboratory QC purposes will be obtained by collecting double the number of equivalent Encore samples from a co-located location in the same way as the original samples.

Include the following language if water samples are to be collected; otherwise delete.

For water samples, double volumes of samples are supplied to the laboratory for its use for QC purposes. Two sets of water sample containers are filled and all containers are labeled with a single sample number. *[For volatile samples, this would result in 6 vials being collected instead of 3, for pesticides and semivolatile samples this would be 4 liters instead of 2, etc.]*

The laboratory should be alerted as to which sample is to be used for QC analysis by a notation on the sample container label and the chain-of-custody record or packing list.

At a minimum, one laboratory QC sample is required per 14 days or one per 20 samples (including blanks and duplicates), whichever is greater. If the sample event lasts longer than 14 days or involves collection of more than 20 samples per matrix, additional QC samples will be designated.

For this sampling event, samples collected at the following locations will be the designated laboratory QC samples:

If a matrix is not being sampled, delete the reference to that matrix.

- For soil, samples _____ *[List soil sample locations and numbers designated for QA/QC.]*
- For sediment, samples _____ *[List sediment sample locations and numbers designated for QA/QC.]*
- For water, samples _____ *[List water sample locations and numbers designated for QA/QC.]*

Add a paragraph explaining why these sample locations were chosen for QA/QC samples. QA/QC samples should be samples expected to contain moderate levels of contamination. A rationale should justify the selection of QA/QC samples based on previously-detected contamination at the site or sampling area, historic site or sampling area operations, expected contaminant deposition/migration, etc.

11.0 FIELD VARIANCES

It is not uncommon to find that, on the actual sampling date, conditions are different from expectations such that changes must be made to the SAP once the samplers are in the field. The following paragraph provides a means for documenting those deviations, or variances. Adopt the paragraph as is, or modify it to project-specific conditions.

As conditions in the field may vary, it may become necessary to implement minor modifications to sampling as presented in this plan. When appropriate, the QA Office will be notified and a verbal approval will be obtained before implementing the changes. Modifications to the approved plan will be documented in the sampling project report.

12.0 FIELD HEALTH AND SAFETY PROCEDURES

Describe any agency-, program- or project-specific health and safety procedures that must be followed in the field, including safety equipment and clothing that may be required, explanation of potential hazards that may be encountered, and location and route to the nearest hospital or medical treatment facility. A copy of the organization health and safety plan may be included in the Appendix and referenced in this section.

ATTACHMENT 1

EXAMPLE FORMS

EXAMPLE

Table 1-1: Key Project Personnel Contact Information and Responsibilities

Title	Name	Phone Number Email Address	Responsibilities
EPA Project Manager			
EPA Quality Assurance Officer (QAO)	Eugenia McNaughton, Ph.D.	(415) 972-3411 mчнаughton.eugenia@epa.gov	Provide technical assistance Approve sampling plans
Grantee Project Manager			
Contractor Project Manager (include Company Name)			
Contractor QAO			
Contractor Field Team Leader			
Laboratory Quality Assurance Officer (include Laboratory Name)			

EXAMPLE

**Table 3-1: Contaminants of Concern, Laboratory and Action Levels
Matrix = Soil**

Analytical Parameter (Contaminants of Concern)	Laboratory Reporting or Quantitation Limits	Action Levels		
		EPA Residential PRGs	DTSC Residential CHHSLs	RWQCB Residential ESLs
Volatile Organic Compounds by Method 8260 (ug/Kg)				
Benzene	10	640	NA	440
Tetrachloroethylene (PCE)	10	480	NA	87
Toluene	10	520000	NA	3300
Metals by Method 6010/7470 (mg/Kg)				
Arsenic	1	0.07	0.07	Background
Chromium	2	210	0	1000
Lead	2	150	150	150

EPA = US Environmental Protection Agency
 DTSC = Calif. Department of Toxic Substances Control
 RWQCB = Regional Water Quality Control Board
 PRGs = Preliminary Remediation Goal (2004)
 CHHSLs = California Human Health Screening Levels
 ESLs = Environmental Screening Levels
 NA = Not available or Not applicable
 ug/Kg = micrograms per kilogram
 mg/Kg = milligrams per kilogram

EXAMPLE

**Table 4-1: Sampling Design and Rationale
Matrix = Soil**

Sampling Location/ID Number	Depth (ft)	Analytical Parameter	Rationale *
SB1	0-1.5	TPH-g/d, metals	Assess environmental conditions at the former UST and former fuel pump island locations. Volatiles will not be collected from the shallow soil due to probable weathering effects.
	2-4, 6-8	TPH-g/d, VOA & metals	
SB2	0-1.5	TPH-g/d, metals	Assess the potential presence of contaminants in undocumented fill materials at the Site. Volatiles will not be collected from the shallow soil due to probable weathering effects.
	2-4, 6-8	TPH-g/d, VOA & metals	

* Include rationale for location, depth and analysis.

TPH –g/d = total petroleum hydrocarbons as gasoline and diesel
VOA = volatile organic analyses

EXAMPLE

**Table 4-2: Sampling Design and Rationale
Matrix = Groundwater**

Sampling Location/ID Number	Analytical Parameter	Rationale *
SB1	TPH-g/d, VOA, metals	Assess the potential migration of contaminants to the groundwater at the former UST and former fuel pump island locations.
SB2	TPH-g/d, VOA, metals	Assess the potential migration of contaminants to the groundwater from the fill materials located on the Site.

* Include rationale for location and analysis.

TPH -g/d = total petroleum hydrocarbons as gasoline and diesel
VOA = volatile organic analyses

EXAMPLE

**Table 5-1: Analytical Services
Matrix = Soil**

Sample Number	Sample Location	Depth (ft)	Special Designation	Analytical Methods			
				SW846 Method 8015B (TPH as gasoline)	SW846 Method 8015B (TPH as diesel)	SW846 Method 8260B (volatiles)	SW846 Method 6010/7470 (metals)
SB-01-05	SB1	0-1.5		X	X		X
SB-01-24	SB1	2-4	MS/MSD	X	X	X	X
SB-01-68	SB1	6-8		X	X	X	X
SB-02-05	SB2	0-1.5		X	X		X
SB-02-24	SB2	2-4		X	X	X	X
SB-02-68	SB2	6-8		X	X	X	X
SB-01-10	SB2	6-8	Duplicate of SB-02-68	X	X	X	X
Total number of Soil Samples, excluding QC:				6	6	4	6
Total number of Soil Samples, including QC:				7	7	5	7

TPH = total petroleum hydrocarbons
MS/MSD = matrix spike/ matrix spike duplicate

EXAMPLE

**Table 5-2: Analytical Services
Matrix = Groundwater**

Sample Number	Sample Location	Special Designation	Analytical Methods			
			SW846 Method 8015B (TPH as gasoline)	SW846 Method 8015B (TPH as diesel)	SW846 Method 8260B (volatiles)	SW846 Method 6010/7470 (metals)
SB-01	SB1	MS/MSD	X	X	X	X
SB-02	SB2		X	X	X	X
SB-03	SB2	Duplicate of SB-02-68	X	X	X	X
Total number of Soil Samples, excluding QC:			2	2	2	2
Total number of Soil Samples, including QC:			3	3	3	3

TPH = total petroleum hydrocarbons
MS/MSD = matrix spike/ matrix spike duplicate

EXAMPLE

**Table 5-3: Analytical Method, Containers, Preservation, and Holding Times Requirements
Matrix = Soil**

Analytical Parameter and/or Field Measurements	Analytical Method Number	Containers (number, type, size/volume)	Preservation Requirements (chemical, temperature, light protection)	Maximum Holding Times
Volatiles	SW-846 Method 8260B	Two EnCore® Samplers	Chill with ice to 4°C	48 hours
Metals	SW-846 Method 6010/7470	4 oz glass jar	Chill with ice to 4°C	<180 days/<28 days for Hg

**Table 5-4: Analytical Method, Containers, Preservation, and Holding Times Requirements
Matrix = Groundwater**

Analytical Parameter and/or Field Measurements	Analytical Method Number	Containers (number, type, size/volume)	Preservation Requirements (chemical, temperature, light protection)	Maximum Holding Times
Volatiles	SW-846 Method 8260B	3 x 40-ml VOA	Chill with ice to 4°C pH<2 with HCl	14 days
Metals	SW-846 Method 6010/7470	1 L HDPE	Chill with ice to 4°C pH<2 with HNO ₃	6 months

VOA = volatile organic analysis
 HDPE = high density polyethylene
 Hg = mercury
 HCl = hydrochloric acid
 HNO₃ = nitric acid

EXAMPLE

Table 6-1: Field and Sampling Equipment

Description of Equipment	Material (if applicable)	Dedicated (Yes/No)
Sampling sleeves	Acetate or equivalent	Yes
Hand auger	Hardened steel	No
EnCore® samplers	Plastic	Yes
Sampling trowel	Plastic or stainless steel	Yes
Bailer	Plastic or stainless steel	Yes
Conductivity meter	NA	No
Peristaltic pump with dedicated tubing	Tygon or HDPE tubing	No

NA = not applicable

HDPE = high density polyethylene

EXAMPLE

Table 6-2: Field Equipment/Instrument Calibration, Maintenance, Testing, and Inspection

Analytical Parameter	Field Equipment/ Instrument	Calibration Activity	Maintenance & Testing/ Inspection Activity	Frequency	Acceptance Criteria	Corrective Action
Temperature (sensor)	Multimeter Manufacturer X, Model Y	Annual check of endpoints of desired temperature range (0°C to 40°C) versus NIST thermometer	See manufacturer's manual	Annually	±0.2°C of true value at both endpoints (i.e., manufacturer's listed accuracy for the sensor)	Remove from use if doesn't pass calibration criteria
pH (electrode)	Multimeter Manufacturer X, Model Y	Initial: two-point calibration bracketing expected range (using 7.0 and either 4.0 or 10.0 pH buffer, depending on field conditions); followed by one-point check with 7.0 pH buffer Post: single-point check with 7.0 pH buffer	See manufacturer's manual	Initial: beginning of each day Post: end of each day	Initial: two-point calibration done electronically; one-point check (using 7.0 pH buffer) ±0.1 pH unit of true value Post:) ±0.5 pH unit of true value with both 7.0 pH and other "bracketing" buffer (and either 4.0 or 10.0 pH)	Recalibrate Qualify data