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Environmental Restoration Program

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OPERABLE UNIT 6, DECONTAMINATION AND DECOMMISSIONING VERIFICATION WORK PLAN

MOUND PLANT
MIAMISBURG, OHIO

VOLUME II
QUALITY ASSURANCE PROJECT PLAN

July 1992

FINAL
(Revision 1)

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
Technical Support Office
Los Alamos National Laboratory

REFERENCE USE ONLY

OPERABLE UNIT 6, DECONTAMINATION AND DECOMMISSIONING

VERIFICATION WORK PLAN

QUALITY ASSURANCE PROJECT PLAN

U.S. DEPARTMENT OF ENERGY, MOUND PLANT

MIAMISBURG, OHIO

Approved by _____ Date _____

U.S. EPA Region V Remedial Project Manager

Approved by _____ Date _____

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Approved by _____ Date _____

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ACRONYMS

AL	Albuquerque Field Office (DOE)
ANSI	American National Standard Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
CLP	Contract Laboratory Program
D&D	Decontamination and Decommissioning
DDCA	Decontamination and Decommissioning Cleanup Activities
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration (Program)
FIDLER	field instrument for the detection of low-energy radiation
IT	International Technology
LCS	laboratory control sample
NAS	National Academy of Sciences
NWQA	Nonweapons Quality Assurance
O.U.	operable unit
PCB	polychlorinated biphenyl
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RI	remedial investigation
SOP	Standard Operating Procedure
SOW	statement of work
TAL	Target Analyte List
TCL	Target Compound List
TCLP	toxicity characteristic leaching procedure
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
VOC	volatile organic compounds

1. INTRODUCTION

1.1. OVERVIEW

This Quality Assurance Project Plan (QAPP) applies to Operable Unit 6 verification activities performed at the completion of decontamination and decommissioning (D&D) cleanup activities (DDCA). These Operable Unit 6 verification activities are separate from the Mound Plant internal cleanup activities. It is the D&D Program's responsibility to remediate; the goal of the Operable Unit 6 activities is to verify remediation for soils and sediments. Air and groundwater investigations are within the scopes of other operable units, as is discussed in the Operable Unit 6 Verification Work Plan. Verification sampling of standing or impound water within an area assigned to Operable Unit 6 is included in this QAPP. Tasks completed under Operable Unit 6 are also intended to support risk assessment activities.

This QAPP is the controlling document for sampling and analysis activities associated with Operable Unit 6 verification, as defined in the Operable Unit 6 Generic Verification Work Plan section on data quality objectives.

Quality Assurance (QA) is a system of measures taken to ensure that a desired product meets a defined level of quality. This QAPP presents the system of QA to be implemented for Operable Unit 6, D&D, at Mound Plant. The plan provides specific procedures that delineate how field and laboratory data of known and accepted quality will be generated.

This QAPP is formatted to match the Mound Plant Operable Unit 9 Site-Wide QAPP (DOE 1992b). This document is in draft form and is currently in the review process; sections of the document are included by reference. The rationale for this approach is based on the fact that the technical content for many of the QAPP elements for the Operable Unit 9 Site-Wide QAPP (DOE 1992b) is also applicable to the Mound Plant Operable Unit 6 QAPP. In order to avoid duplication and ensure the uniform application of QA/quality control (QC) procedures for all remedial investigation (RI) activities at Mound Plant, the Operable Unit 9 Site-Wide QAPP (DOE 1992b) is referenced here in lieu of repeating the same information. In areas where the Operable Unit 9 Site-Wide QAPP (DOE 1992b) differs from the Operable Unit 6 QAPP, the specific information and/or procedures pertinent to the Operable Unit 6 RI have been identified and addressed.

If changes are made to the Operable Unit 9 Site-Wide QAPP (DOE 1992b), an impact analysis will be done to any current Operable Unit 6 document. That is, if the Operable Unit 6 QAPP is in a review or revision cycle, these changes will be addressed. If changes or differences are identified for an area-specific sampling and analysis activity, a QAPP addendum for the area-specific verification sampling activity will be written and reviewed. Differences between documents are acceptable if properly identified, reviewed, and approved. If EG&G Mound Plant or other procedures are to be used, they will be included in the planning documents and subject to review.

The QAPP describes the QC procedures for sampling activities (sampling procedures in section 4 and sample custody in section 5), for field screening and field measurements (section 6), and for laboratory analyses (section 6). Specific QC steps (defined as QC checks) for these activities are discussed in section 8. The standards of performance (defined as acceptance criteria) for these checks are presented in section 3. QC procedures for calibration of field and laboratory instrumentation are outlined in section 7. The procedures for data reduction, validation, and reporting are included in section 9. As part of the QC program, preventive maintenance procedures for equipment and instrumentation are summarized in section 11. Corrective actions for the planned field and laboratory activities are necessary for a QC program in order to keep the quality of generated data under control. The corrective actions for these activities are provided in section 13.

Quality assessment activities for D&D, governed by this QAPP, include performance and systems audits, evaluation of field and laboratory QC data, and issuance of QA reports to management. Procedures for these activities are described in sections 10, 12, and 14, respectively.

In fulfilling its role of ensuring that the goals of the project are met, the QA program relies on the structure and organization of the project and on the effectiveness of key individuals in carrying out their responsibilities. This report describes the project organization and identifies the individuals who are responsible for assessing the collection and generation of data and for ensuring that these data are of required quality (section 2).

The D&D Program activities at Mound Plant include remediation of site contaminants to buildings and soils and fall under the QA control provided by the Mound Plant QA guidelines for nondefense programs. This Mound QA Program is compliant with U.S. Department of Energy (DOE) Order 5700.6B, "Quality Assurance," as it applies to nuclear facilities (DOE 1986b). QA, as defined by DOE Order 5700.6B,

> involves all those planned and systematic actions necessary to provide adequate confidence that a facility, structure, system, or component will perform satisfactorily and safely in service. The goal of quality assurance is to assure that: research, development, demonstration, scientific investigations, and production activities are performed in a controlled manner; that components, systems, and processes are designed, developed, constructed, tested, operated, and maintained according to engineering standards, quality practices, and Technical Specifications/Operational Safety Requirements; and that resulting technology data are valid and retrievable. Quality assurance includes quality control, which comprises all those actions necessary to control and verify the features and characteristics of a material, process, product, or service to specified requirements.

The Mound Plant QA Program implements DOE Order 5700.6B through Technical Manual MD 10165, "Nonweapons Quality Assurance" (NWQA). The Engineering Department's portion of the NWQA Program is described in Mound Technical Manual MD 10241, "5700.6B Quality Plans for Engineering Department." The Mound Plant D&D group is within the Engineering Department and follows Engineering's requirements and processes. For D&D engineering activities, such as physical cleanup activities, a D&D QA Plan for a specific action is prepared and approved.

On August 21, 1991, DOE Order 5700.6C, Quality Assurance, was issued to supersede Order 5700.6B. The ASME NQA-1, Quality Assurance Program Requirements for Nuclear Facilities, remains as a consensus standard that provides additional interpretative guidance for the development and implementation of quality assurance programs.

Mound Technical Manual MD10165 (EG&G 1991) will be replaced with MD10334, which is intended to meet DOE Order 5700.6C requirements (DOE 1991b).

1.2. ENVIRONMENTAL RESTORATION (ER) PROGRAM DESCRIPTION

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP.

1.3. MOUND PLANT ER PROGRAM

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP.

1.4. PROJECT DESCRIPTION

Section 1.4 in the Operable Unit 9 Site-Wide QAPP (DOE 1992b) does not apply to the Operable Unit 6 investigation.

The Operable Unit 6 Verification Work Plan provides information pertaining to the past investigations performed at Operable Unit 6 areas, the objectives of this investigation, and data requirements, to assist in planning verification activities. The current understanding of existing data needs, site setting, and work plan rationale, including the design of the sample network, is described in the Operable Unit 6 Work Plan and will be discussed in area-specific verification sampling and analysis plans. Attachments to the Operable Unit 9 Site-Wide QAPP (DOE 1992b) contain information on the specific laboratories qualified for the ER program at Mound Plant. Because of the possible use of any of the analytical laboratories, the laboratory-specific data have been removed from the sections of QAPP text and consolidated in attachment sections. The laboratory-specific attachments from the Operable Unit 9 Site-Wide QAPP (DOE 1992b) are adopted for Operable Unit 6 use.

The area-specific documents identify the specific analytes to be used in the analyses and the laboratory selected for the analyses. The work is carried out using the QAPP requirements and controls and the laboratory-specific information in the attachment for that laboratory.

The parameter groups to be analyzed in the field and laboratory for each task of the investigation are listed in Table I.1. The selected laboratory methods will be performed under the U.S. Environmental Protection Agency's (EPA's) Contract Laboratory Program (CLP) requirements where appropriate and with approved and known methodologies when available.

Objectives for data quality are discussed in the following sections of the QAPP. However, analytical levels, as defined by the EPA's "Data Quality Objectives for Remedial Response Activities" (EPA 1987), may be assigned to the planned analyses. These analytical levels were designed by the EPA to serve as guidance for obtaining data of appropriate quality for its intended use. A general description of the typical types of analyses performed, the types of data used, the limitations, and a generic description of data quality are provided for each analytical level (I, II, III, IV, and V) in the EPA guidance. These levels are listed in Table I.2. The details of intended usage for the activity are discussed in the Operable Unit 6 Work Plan. These analytical levels have been applied to each set of parameters to be analyzed and are presented in Table I.1. The primary sampling and analysis activities are those for establishing the verification of cleanup and providing defensible data to establish the conditions of those areas.

1.5. QAPP SCOPE

This QAPP and the Operable Unit 6 Verification Work Plan become the controlling documents for work at the start of the verification planning process after the decision is made that verification is appropriate. The activities covered by these documents include the development of the sampling methodology, the preparation of the area-specific sampling and analyses plans, sampling, analysis, data validation, and preparation and review of the verification reports for the soils, sediments, and any standing waters that are part of the verification sampling and analysis process.

Operable Unit 6 addresses 12 areas with radioactively contaminated soils that are part of the Mound Plant D&D Program. These soils contain radioactive contaminants in concentrations greater than the cleanup standards used by the Mound Plant D&D Program. The scope of this operable unit is limited to verifying cleanup (hazardous and radioactive contaminants) of soils following remedial activities by the Mound Plant D&D Program and, where necessary in support of a risk assessment, to obtaining additional data required to characterize residual contaminants following cleanup.

Table I.1. Summary DQO Analytical Levels for Potential Analytes for Operable Unit 6 Verification

Task	Purpose	Media	Field Parameters	Laboratory Parameters	Analytical Level[a]
Soils Verification	Verification of the attainment of cleanup and risk assessment goals		- Location		I
			- Soil type		I
			- Stratigraphic data		I
				- VOCs	IV
				- TAL inorganics	IV
				- TCL pesticides/PCBs	IV
				- Bismuth	IV
				- Fluoride	IV
				- Semivolatile organic compounds	IV
				- USATHAMA explosives[b]	V
				- Chloride	IV
				- Nitrate/nitrite	IV
				- Sulfate	IV
				- Isotopic plutonium (238, 239/240)	V
				- Isotopic thorium (227, 228, 230, 232)	V
				- Isotopic uranium (234/235, 238)	V
				- Tritium	V
				- Strontium-90	V
				- Actinium-227[c]	V
				- Gamma spectrometry	V
				- Specific gravity	III
				- Particle size distribution	III
				- Moisture content	II
				- Organic content	II
				- pH	III

Table I.1. (page 2 of 3)

Task	Purpose	Media	Field Parameters	Laboratory Parameters	Analytical Level[a]
Surface Water and Sediment Verification	Verification of attainment of cleanup and risk assessment goals	Sediments	- Location		I
			- Volume (depth, area)		I
			- Stratigraphic data		I
				- VOCs	IV
				- TCL pesticides/PCBs	IV
				- Semivolatile organic compounds	IV
				- TAL inorganics	IV
				- Bismuth	IV
				- Fluoride	IV
				- Lithium	IV
				- Molybdenum	IV
				- Isotopic plutonium (238, 239/240)	V
				- Isotopic thorium (227, 228, 230, 232)	V
				- Isotopic uranium (234/235, 238)	V
				- Strontium-90	V
				- Actinium-227[c]	V
				- Gamma spectrometry	V
				- Tritium	V
				- USATHAMA explosives[b]	V
				- Nitrate/nitrite	IV
				- Chloride	IV
				- Sulfate	IV
				- Particle size distribution	III
				- Specific gravity	III
				- pH	III
				- Total organic carbon	III
				- Moisture content	III
				- Organic content	III

Table I.1. (page 3 of 3)

Task	Purpose	Media	Field Parameters	Laboratory Parameters	Analytical Level[a]
		Water (impounded)	- Temperature		II
			- pH		II
				- VOCs	IV
				- TAL inorganics	IV
				- Bismuth	IV
				- Fluoride	IV
				- Semivolatile organic compounds	IV
				- TCL pesticides/PCBs	IV
				- USATHAMA explosives[b]	IV
				- Chloride	IV
				- Nitrate/nitrite	IV
				- Sulfate	IV
				- Isotopic plutonium (238, 239/240)	V
				- Isotopic thorium (227, 228, 230, 232)	V
				- Isotopic uranium (234/235, 238)	V
				- Radium-226	V
				- Tritium	V
				- Americium-241	V
				- Strontium-90	V
				- Actinium 227[c]	V
				- Gamma spectrometry	V
				- Total dissolved solids	III
				- Total suspended solids	III
				- Ammonia	III
				- Nutrients (TKN, TP)	III
				- Total organic carbon	III

[a]Health and Safety is measured as required by the health and safety plan for the activity.
[b]Explosives include the 11 USATHAMA explosives: HMX; RDX; 1,3,5-TNB; 1,3-DNB; NB; Tetryl; 2A,4,6-DNT; 2,4,6-TNT; 2,6-DNT; 2,4-DNT; and PETN. Onsite screening for plutonium-238 and thorium-232 is performed using a FIDLER detection system calibrated to detect these isotopes.
[c]by calculation
PCBs - polychlorinated biphenyls
TAL - Target Analyte List, includes dissolved and/or total metals and cyanide
TCL - Target Compound List
VOC - volatile organic compound

Table I.2. Summary of Analytical Levels Appropriate to Data Uses

Data Uses	Analytical Level[a]	Type of Analysis	Limitations	Data Quality
Site characterization, monitoring during implementation	Level 1	Total organic/ inorganic vapor detection using portable instruments Field test kits and screening	Instruments respond to naturally occurring compounds	If instruments calibrated and data interpreted correctly, can provide indication of contamination
Site characterization, evaluation of alternatives, engineering design, monitoring during implementation	Level II	Variety of organics by GC, inorganics by AA, XRF Tentative identification, analyte-specific Detection limits vary from low ppm to low ppb	Tentative identification Techniques/ instruments limited mostly to volatiles, metals	Dependent on quality assurance/quality control steps employed Data typically reported in concentration ranges
Risk assessment, site characterization, evaluation of alternatives, engineering design, monitoring during implementation	Level III	Organics/inorganics, using EPA procedures other than CLP, can be analyte-specific RCRA characteristic tests Gross alpha and beta[a]	Tentative identification in some cases Can provide data of same quality as Level IV	Similar detection limits to CLP Less rigorous quality assurance/quality control
Risk assessment, evaluation of alternatives, engineering design	Level IV	TCL organics/TAL inorganics by GC/MS, AA, ICP Low ppb detection limit	Tentative identification of non-TCL parameters Some time may be required for validation of packages	Goal is data of known quality Rigorous quality assurance/quality control
Risk assessment	Level V	Nonconventional parameters Method-specific detection limits Modification of existing methods Radiochemical analyses, gamma spectrometry, and non-CLP parameters	May require method development modification Mechanism to obtain services requires special lead time	Method-specific

[a]These analytical levels have been specifically identified by the EPA Region V.

AA - atomic absorption
CLP - Contract Laboratory Program
EPA - Environmental Protection Agency
GC - gas chromatography
ICP - inductively coupled plasma
MS - mass spectrometry
ppb - parts per billion
ppm - parts per million
RCRA - Resource Conservation and Recovery Act
TAL - Target Analyte List
TCL - Target Compound List
XRF - X-ray fluorescence
Reference: EPA 1987.

No page 8

Table I.2. Summary of Analytical Levels Appropriate to Data Uses

Data Uses	Analytical Level	Type of Analysis	Limitations	Data Quality
Verification and monitoring during implementation	Level I	Total organic/inorganic vapor detection using portable instruments Field test kits	Instruments respond to naturally occurring compounds	If instruments calibrated and data interpreted correctly, can provide indication of contamination
Verification and risk assessment	Level III	Organics/Inorganics using EPA procedures other than CLP can be analyte-specific RCRA characteristic tests	Tentative identification is some cases Can provide data of same quality as Level IV	Similar detection limits to CLP Less rigorous QA/QC
Verification and risk assessment	Level IV	TCL organics/ inorganics by GC/MS; AA; ICP Low ppb detection limit	Tentative identification of non-TCL parameters Some time may be required for validation of packages	Goal is data of known quality Rigorous QA/QC
Risk assessment	Level V	Nonconventional parameters Method specific detection limits Modification of existing methods	May require method development modification Mechanism to obtain services requires special lead time	Method specific

Ref: EPA 1987b
AA - atomic absorption
CLP - Contract Laboratory Program
EPA - Environmental Protection Agency
GC - gas chromatography
ICP - Inductively coupled plasma
MS - mass spectrometry
ppm - parts per million
ppb - parts per billion
QA/QC - quality assurance/quality control
RCRA - Resource Conservation and Recovery Act
TCL - Target Compound List
XRF - X-ray fluorescence

2. PROJECT ORGANIZATION AND RESPONSIBILITY

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), is applicable to the Operable Unit 6 QAPP, except for the amendments and/or additions indicated under the following section headings. All references to "Operable Unit 9" under this section and all associated subsections in the Operable Unit 9 Site-Wide QAPP (DOE 1992b) are replaced with "Operable Unit 6" for this QAPP. Figure 2.1 provides the Operable Unit 6 organizational chart.

2.1. OPERATIONAL RESPONSIBILITIES

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP. DOE Headquarters holds the top level oversight responsibilities for the activities.

2.2. FIELD TEAM RESPONSIBILITIES

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP.

2.3. LABORATORY RESPONSIBILITIES

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP.

Responsibilities for the analytical laboratories qualified for this activity are given in the laboratory specifications attachments to the Operable Unit 9 Site-Wide QAPP (DOE 1992b), which also apply to the Operable Unit 6 activities. These QA requirements are contractually controlled through the organizational interfaces.

2.4. QUALITY ASSURANCE RESPONSIBILITIES

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP.

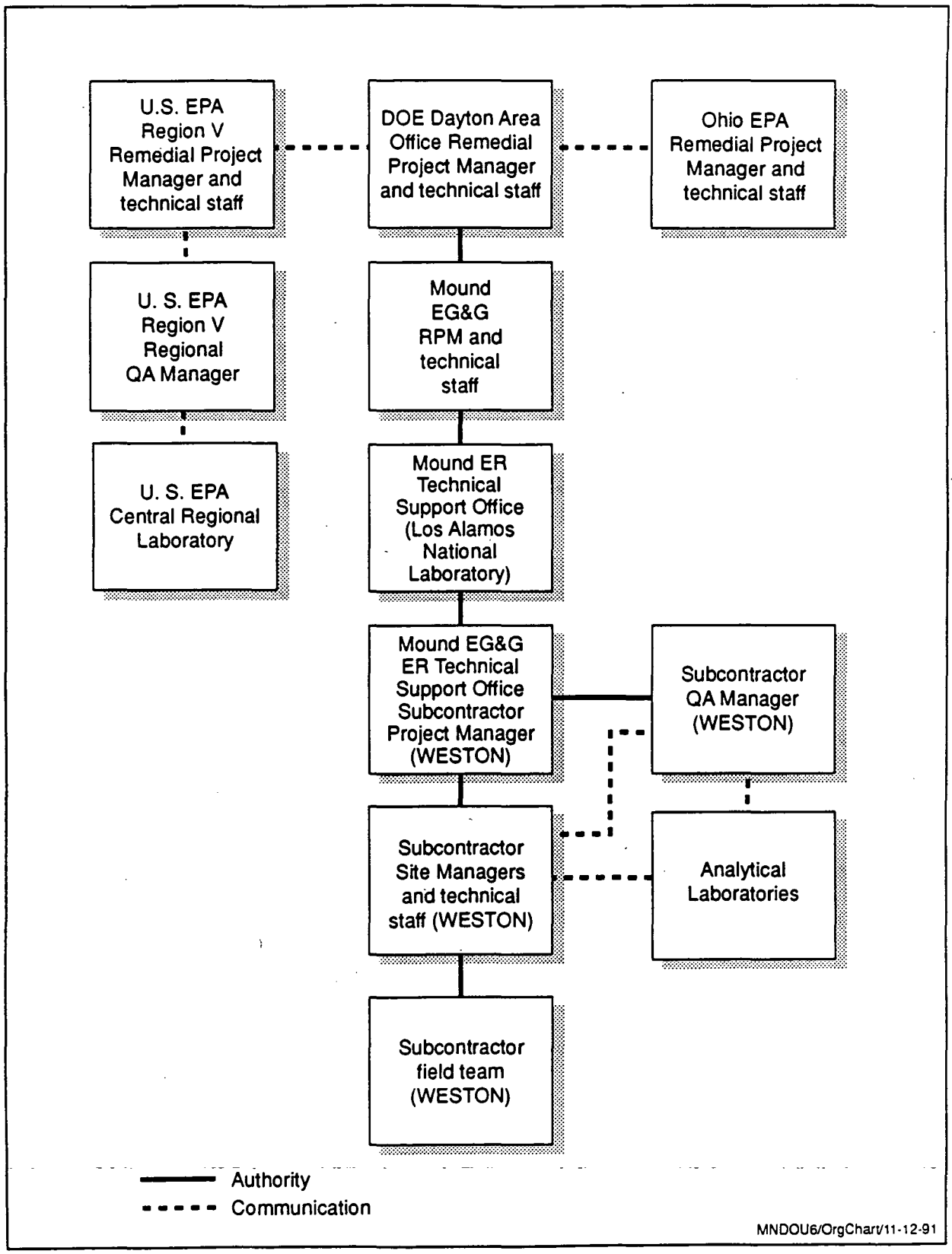


Figure 2.1. Operable Unit 6 organizational chart.

3. QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA IN TERMS OF PRECISION, ACCURACY, COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), is applicable to the Operable Unit 6 QAPP except for the amendments and/or additions indicated below.

- Table III.1 - Summary of Quality Control Procedures for Field Screening and Field Measurements

  No air sampling will be performed at Operable Unit 6, D&D, except for worker health and safety. Table III.1 for Operable Unit 6 activities is presented in this document.

- Table III.2 - Summary of Quality Control Procedures for Field Activities and Laboratory Measurements: Surface Water and Soil/Sediment Samples.

  Operable Unit 6, D&D, soil samples will not be analyzed for physical parameters, except as listed in Table I.1. Lithologic identification may be required to distinguish between fill material and soil during soil verification activities or for some other purpose. This identification or analysis and its intended use are described in the area-specific Sampling and Analysis Plans. If process knowledge or prior data indicate that analysis needs to be done, this will be identified in the area-specific sampling and analysis plan and receive regulatory review.

  Table III.2, as modified for Operable Unit 6 activities, is presented in this document.

- Table III.3 - Laboratory Control Limits for Matrix Spikes, Matrix Spike Duplicates, and Surrogate Spikes: Surface Water/Sediment Samples

  Table III.3 provides the matrix spike, matrix spike duplicate, and surrogate spike advisory limits to be used in Operable Unit 6 laboratory activities.

- A chemicals of concern list has been developed for use in Operable Unit 9 activities and is given in the Work Plan for that operable unit (DOE 1992a). To supplement this list, a separate list of chemicals of concern associated with Operable Unit 6 has been prepared for verification activities. This list is Table IV.2 in the Verification Work Plan and includes the chemicals previously identified above and estimated below the laboratory-stated detection limits in D&D program areas. These two tables and any additional analyses done in D&D areas will help define the analytes list for verification, which will be included in the area-specific Sampling and Analysis Plans for verification activities.

Table III.1. Summary of Quality Control Procedures for Field Screening and Field Measurements

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
SOP 2.2	pH	Calibration with two buffer solutions (pH 4 and 7 or 7 and 10) (for accuracy)	Before and after a well purge	± 0.1 units of true value	Recalibrate; check pH meter; replace probe and meter if necessary.
		Calibration check with one buffer solution (for accuracy)	Once per well, after alkalinity analysis	± 0.1 units of true value	Recalibrate.
SOP 2.2	Temperature	Duplicate sample (for precision)	One per ten or fewer field samples collected	± 1°C	Evaluate data usability.
		Calibration (for accuracy)	NA	± 2°C (manufacturer's specification)	NA
		Calibration (for accuracy)	One per day	± 10% of expected value	Recalibrate; check probe and meter; replace if necessary.
SOP 6.1	Combustible gas level	Calibration (1 standard) (for accuracy)	Once per day	± 10% of true value	Recalibrate.
		Duplicate standard (for precision)	Once per day	± 20% of initial calibration	Remeasure.

NA - Not Applicable

Table III.1. (page 2 of 3)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
SOP 6.2	Organic vapor level (PID)	Initial calibration (for accuracy)	Once per day	± 10% of true value	Recalibrate.
		Duplicate standard (for precision)	Once per day	± 20% of initial calibration	Remeasure.
SOP 6.7	Low-energy gamma radiation	Source check (for accuracy)	Once per day	± 3xSD	Check instrument settings (voltage, gain, etc.); remeasure source.
		Background check (for accuracy)	Once per day	± 3xSD	Clean detector and nearby surfaces; ventilate room; recheck.
		Voltage plateau (for accuracy)	Once per week	Voltage should be 1100 to 1300V	Check voltage setting and re-plateau beginning at 900V. If still outside range, replace probe and check again. Do not exceed 1400V.
		Replicate measurement (for precision)	Once every 10 measurements	± 4xSD	Identify and correct problem; remeasure.

NA - Not Applicable

Table III.1. (page 3 of 3)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
SOP 6.4	Alpha surface contamination	Source check (for accuracy)	Once per day or after instrument adjustments or repairs	± 10% of expected value	Check instrument settings (gain, voltage, etc.) recheck; replace if still out.
		Background count (10 minutes) (for accuracy)	Once per day	≤2 cpm	Clean detector and nearby surfaces; check for light leaks; replace probe if necessary.
		Replicate measurement (for precision)	once every 10 measurements	± 4xSD	Identify and correct problem, remeasure.
SOP 6.15	Gamma-Ray Fields	Source check (for accuracy)	Once per day	± 10% of known value	Check instrument settings, recheck; replace if still outside criteria.
		Background check (for accuracy)	Once per day	± 10% of previous value	Check instrument settings, recheck; replace if still outside criteria.

NA - Not Applicable

Table III.2. Summary of Quality Control Procedures For Field Activities and Laboratory Measurements: Surface Water and Soil/Sediment Samples

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
NAS 1962[a]	Isotopic uranium				
NAS 1965[a]	Isotopic plutonium	Field quality control			
NAS 1960[b]	Isotopic thorium	----------			
ASTM D2460-70[c]	Radium-226	Duplicate	1 every 10 or fewer field samples (water)	+ 4 x SD[e,f,t]	Evaluate data for useability.
EML Am-01[4]	Americium-241		1 every 10 or fewer field samples (soil)	NA	Evaluate variability.
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.
		Laboratory quality control			
		Background (1000 minutes)	Once per week	For background subtraction; minimum detectable activity	Identify and correct problem; recount
		Pulse check	Once per day	Peak counts at 5 meV ± 3 x SD	Identify and correct problem; recheck.
		Method blank	1 per 20 samples of a similar matrix	≤ 2 x LLD	Identify and correct problem. Reanalyze blank.

NA - Not Applicable

Table III.2. (page 2 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
NAS, 1962[a] NAS, 1965[a] NAS, 1960[b] ASTM D2460-70[c] EML Am-01[4] (continued)	Isotopic uranium Isotopic plutonium Isotopic thorium Radium-226	Method spike	1 per 20 samples of a similar matrix	± 3 x SD[e] normalized deviations	Identify and correct problem; evaluate associated sample results for useability.
		Matrix spike	1 per 20 samples of a similar matrix	± 3 x SD[e] normalized deviations	Evaluate data for useability.
		Replicate sample	1 per 20 samples of a similar matrix	+ 4 x SD[e,f] normalized range	Evaluate data for useability.
E906.0[9]	Tritium	Field quality control ---------- Duplicate	1 every 10 or fewer field samples (water) 1 every 10 or fewer field samples (soil)	+ 4 x SD[e,f,t] Not applicable	Evaluate data for useability. Evaluate variability.
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.
		Laboratory quality control ---------- Background	Once per day	+ 3 x SD, limit-gross contamination; background subtracts	Identify and correct problem.
		Source check	Once per day	± 3 x SD	Identify and correct problem.

NA - Not Applicable

Table III.2. (page 3 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
E906.0[g] (continued)	Tritium	Method blank	1 every 20 or fewer samples of a similar matrix	≤ 2 x LLD	Identify and correct problem; reanalyze blank.
		Method spike	1 every 20 or fewer field samples of a similar matrix	± 3 x SD[e] normalized deviations	Identify and correct problem; associated sample results for useability.
		Matrix spike	1 every 20 or fewer field samples of a similar matrix	± 3 x SD[e] normalized deviation	Identify and correct problem; evaluate associated sample results for useability.
		Replicate sample	1 every 20 or fewer field samples of a similar matrix	+ 4 x SD[e,j] normalized range	Identify and correct problem; associated sample results for useability.
Nuclear Data, Inc., 1986[h]	Gamma radiation	Field quality control			
		Duplicate	1 every 10 or fewer field samples (water)	+ 4 x SD[e,f,t]	Evaluate data for useability.
			1 every 10 or fewer field samples (soil)	Not applicable	Evaluate variability.
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.
		Laboratory quality control			
		Background (10 minutes)	Once per day	No identifiable peaks; ± 20% error	Identify and correct problem; recount.

NA - Not Applicable

Table III.2. (page 4 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Nuclear Data, Inc., 1986[h] (continued)	Gamma radiation	Background (1000 minutes)	Once per month	NA; Stored for background subtraction	NA
		Source check	Once per day	± 3 x SD	Identify and correct problem; recount.
		Mixed standard	Initial setup and as necessary	Full range energy, linearity and efficiency calibration ± 5% of known standard	NA
		Replicate sample[l]	1 every 20 or fewer samples of a similar matrix	+ 4 x SD[e,f] normalized range	Identify and correct problem; evaluate associated sample results for useability.
NAS 1960[1] Martin 1979[2] PHS 1965[3]	Strontium-90	Field Quality Control ----------			
		Duplicate	1 every 10 or fewer field samples (water)	+ 4 x SD [e,f,t]	Evaluate data for useability.
			1 every 10 or fewer field samples (soil)	Not applicable	Evaluate variability.
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.
		Laboratory Quality Control ----------			
		Method blank	Once per day	≤ 2xLLD	Identify and correct problem; reanalyze,
		Background check	Once per week	+ 3xSD, limit-gross contamination	Identify and correct problem; recheck.
		Instrument reliability	Once per day	+ 3xSD	Identify and correct problem; recheck.

NA - Not Applicable

Table III.2. (page 5 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
NAS 1960[1] Martin 1979[2] PHS 1965[3] (continued)	Strontium-90	Method spike	1 per 20 samples of a similar matrix	± 3xSD Normalized deviations	Identify and correct problem; evaluate associated sample results for useability.
		Matrix spike	1 per 20 samples of a similar matrix	± 3xSD Normalized deviations	Evaluate data for useability.
		Replicate sample	1 per 20 samples of a similar matrix	+ 4xSD Normalized range	Evaluate data for useability.
		Plateau	Once per year	NA	NA
		Efficiency determination	Once per year	NA	NA
CLP SOW[l]	Organochlorine pesticides/PCBs (TCL)[k]	Field quality control			
		Duplicate	1 every 10 or fewer field samples (water) 1 every 10 or fewer field samples (soil)	≤ 35% RPD[l] Not applicable	Evaluate data for useability. Evaluate variability.
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[l]	Evaluate potential sources; evaluate associated data for useability.
		Laboratory quality control			
		Method blank	1 per 20 samples analyzed of a given matrix or fewer, see CLP SOW	≤ CRQL; surrogate retention times per CLP SOW	Investigate source; Reextract and reanalyze associated samples. See CLP SOW.
		Sulfur cleanup blank	When portion of samples require sulfur clean up	≤ CRQL; surrogate retention times per CLP SOW	Investigate source; reextract and reanalyze associated samples. See CLP SOW.

NA - Not Applicable

Table III.2. (page 6 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
CLP SOW[j] (continued)	Organochlorine pesticides/PCBs (TCL)[k]	Instrument blank	CLP SOW	CLP SOW	See CLP SOW.
		Matrix spike	1 per 20 samples of a given matrix in a case or fewer; see CLP SOW	See Table III.3; surrogate retention times per CLP SOW	Evaluate data for useability.
		Matrix spike duplicate	1 per 20 samples of a given matrix in a case or fewer; see CLP SOW	See Table III.3; surrogate retention times per CLP SOW	Evaluate data for useability.
		Surrogate spike	All lab and field samples	See Table III.3	Evaluate data for useability.
		Calibration (initial and continuing)	CLP SOW	CLP SOW	Recalibrate, see CLP SOW.
		GC/MS confirmation	Any sample with a detection from the TCL list for pesticides/PCBs	CLP SOW	See CLP SOW.
		Retention times and Retention time window	CLP SOW	CLP SOW	See CLP SOW.

NA - Not Applicable

Table III.2. (page 7 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
CLP SOW[i] Modification D	Volatile organic compounds	Field quality control			
		Trip blank	1 per shipping container to Lab	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.
		Duplicate	1 every 10 or fewer field samples (water)	≤ 35% RPD[l]	Evaluate data for useability.
			1 every 10 or fewer field samples (soil)	Not applicable	Evaluate variability.
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.
		Sample bank blank[*]	1 every 20 or fewer field samples	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.
		Ambient blank	1 every 20 or fewer field samples	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.
		Laboratory quality control			
		Method blank	Once per 12-hour period	≤ 5 x CRQL of [l] ≤ CRQL others	Investigate source; reextract and reanalyze associated samples.
		Matrix spike	1 per 20 samples of a given matrix in a case or fewer; see CLP SOW	See Table III.3	Evaluate data for useability.
		Matrix spike duplicate	1 per 20 samples of a given matrix in a case or fewer; see CLP SOW	See Table III.3	Evaluate data for useability.

NA - Not Applicable

Table III.2. (page 8 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
CLP SOW[1] Modification D (continued)	Volatile organic compounds	System monitoring compounds	All lab and field samples	See Table III.3	See CLP SOW.
		Instrument performance check	Daily or each 12-hour period, whichever is more frequent	CLP SOW	Retune; Reanalyze associated samples.
		Calibration	CLP SOW	CLP SOW	Recalibrate before sample analysis.
		Retention time window	CLP SOW	± 0.06 relative retention time units (sample and standard)	See CLP SOW.
		Qualitative verification	When a detection occurs in a sample	CLP SOW	See CLP SOW.
		Calibration check	With every calibration	CLP SOW	Recalibrate.
		Internal standard	Every standard and sample	CLP SOW	See CLP SOW.
		Continuing calibration check	Once each 12-hour period	CLP SOW	Identify source and correct. Recalibrate if source not found and corrected.

NA - Not Applicable

Table III.2. (page 9 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
SW8010[m] SW8020[m]	Halogenated and aromatic volatile organic compounds	Field quality control ----------			
		Trip blank	1 per shipping container to lab	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.
SW8030[m]	Acrylonitrile, Acetonitrile				
		Duplicate	1 every 10 or fewer field samples (water)	≤ 35% RPD[t]	Evaluate data for useability.
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.
		Sample bank blank*	1 every 20 or fewer field samples	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.
		Ambient blank	1 every 20 or fewer field samples	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.
		Laboratory quality control ----------			
		Method blank	1 per 20 samples analyzed of a given matrix	<PQL	Identify and correct source. Reanalyze blank and associated samples.
		Calibration	5 points; when calibration check criteria exceeded	≤ 20% RSD for calibration factors	Recalibrate.
		Calibration check	Once per 10 samples analyzed	± 15% from initial response factor	Recalibrate.

NA - Not Applicable

Table III.2. (page 10 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
SW8010[m] SW8020[m] SW8030[m] (continued)	Halogenated and aromatic volatile organic compounds Acrylonitrile, Acetonitrile	Matrix spike	1 per 20 samples of a given matrix	See Table III.3	Evaluate data for useability.
		Matrix spike duplicate	1 per 20 samples of a given matrix	See Table III.3	Evaluate data for useability.
		Surrogate spikes	All field and lab samples	See Table III.3	Check calculations, surrogate and standard solutions, and instrument. If problem not identified then reanalyze sample.
		Retention time window	When new column installed and as needed	± 3 x SD of three retention times for each analyte as per SW846	Identify source, correct problem.
		Laboratory control sample (LCS)	1 per 20 samples analyzed	Vendor specification	Identify and correct problem prior to further sample analyses, reanalyze.
CLP SOW[l] Modification D	Semivolatile organic compounds	Field quality control			
		Duplicate	1 every 10 or fewer field samples (water)	≤ 55% RPD[t]	Evaluate data for useability.
			1 every 10 or fewer field samples (soil)	Not applicable	Evaluate variability.
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[t]	Evaluate potential sources; Evaluate associated data for useability.

NA - Not Applicable

Table III.2. (page 11 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
CLP SOW[1] Modification D (continued)	Semivolatile organic compounds	Laboratory quality control			
		Method blank	1 per 20 samples analyzed of a given matrix or fewer; see CLP SOW	≤ 5 x CRQL phthalate esters ≤ CRQL others	Investigate source; reextract and reanalyze associated samples.
		Matrix spike	1 per 20 sample of a given matrix or fewer; see CLP SOW	See Table III.3	Evaluate data for useability.
		Matrix spike duplicate	1 per 20 samples of a given matrix or fewer; see CLP SOW	See Table III.3	Evaluate data for useability.
		Surrogate spike	All lab and field samples	See Table III.3	See CLP SOW.
		Instrument performance check	Daily or each 12-hour period, whichever is more frequent	CLP SOW	Retune; reanalyze associated samples.
		Calibration	CLP SOW	CLP SOW	Recalibrate before sample analysis.
		Calibration check	With every calibration	CLP SOW	Recalibrate.
		Internal standard	Every standard and sample	CLP SOW	See CLP SOW.

NA - Not Applicable

Table III.2. (page 12 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
CLP SOW[i] Modification D (continued)	Semivolatile organic compounds	Continuing calibration check	Once each 12-hour period	CLP SOW	Identify source and correct. Recalibrate if source not found and corrected.
		Retention time window	CLP SOW	± 0.06 relative retention time units (sample and standard)	See CLP SOW.
		Qualification verification	When a detection occurs in a sample	CLP SOW	See CLP SOW.
CLP SOW[n] Modification A	Metals and cyanide or calcium, potassium, sodium, magnesium, iron, and manganese	Field quality control			
		Duplicate	1 every 10 or fewer field samples (water)	≤ 25% RPD[f]	Evaluate data for useability.
			1 every 10 or fewer field samples (soil)	Not applicable	Evaluate variability.
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[l]	Evaluate potential sources; Evaluate associated data for useability.
		Laboratory quality control			
		Initial and continuing calibration blanks (ICB, CCB)	After every ICV and CCV or 10% or every 2 hours, whichever is more frequent	≤ CRDL	Correct problem; recalibrate; reanalyze preceding 10 samples or all since last good blank.

NA - Not Applicable

Table III.2. (page 13 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
CLP SOW[n] Modification A (continued)	Metals and cyanide or calcium, potassium, sodium, magnesium, iron, and manganese	Preparation blank (PB)	One per sample delivery group or batch, whichever is more frequent	≤ CRDL	If sample results < 10 x CRDL, but > CRDL, redigest and reanalyze.
		Laboratory control sample (LCS)	1 per group of samples in a delivery group or batch, whichever is more frequent	80-120% Recovery	Correct problem; redigest and reanalyze associated samples.
		Initial calibration verification std. (ICV)	CLP SOW	CLP SOW	See CLP SOW.
		Continuing calibration verification std. (CCV)	CLP SOW	CLP SOW	See CLP SOW.
		Linear range check standard (CRI, CRA)	CLP SOW	Not established	None.
		Interference check sample (ICS)	Sample twice per 8-hour shift, or at beginning and end of analysis run, whichever is more frequent	± 20% of true value	Correct problem; recalibrate reanalyze samples since last good ICS.

NA - Not Applicable

Table III.2. (page 14 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
CLP SOW[n] Modification A (continued)	Metals and cyanide or calcium, potassium, sodium, magnesium, iron, and manganese	ICP Serial dilution (L)	1 per group of samples of a given matrix, concentration, or each delivery group, whichever is more frequent	If result > 50 x IDL: ± 10% difference	Evaluate data for useability.
		Spike sample (S)	1 per group of samples of a given matrix, concentration, or sample delivery group, whichever is more frequent.	75-125% Recovery	Evaluate date for useability.
		Sample dup. (D) (sample replicate)	1 per group of samples of a given matrix, concentration, or sample delivery group, whichever is more frequent.	If result ≥ 5 x CRDL: ± 20% RPD If result ≤ 5 x CRDL: ± CRDL	Evaluate data for useability.
		Method std. addition GFAA[p] only (MSA)	CLP SOW	CLP SOW	See CLP SOW.
		Linear range analysis (LRA) for ICP	CLP SOW	CLP SOW	Reanalyze.

NA - Not Applicable

Table III.2. (page 15 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
CLP SOW[n] Modification A (continued)	Metals and cyanide or calcium, potassium, sodium, magnesium, iron, and manganese	Interelement corrections for ICP	Once per year or or when instrument adjusted	CLP SOW	CLP SOW.
E325.1[q]/SW9250[m]	Chloride, (Cl)	Field quality control			
E353.2[q]	Nitrate-Nitrite (NO_3-NO_2)	----------			
E375.2[q]	Sulfate (SO_4)				
E351.3[q]	Total nitrogen, (N)	Duplicate	1 every 10 or fewer field samples (water)	≤ 25% RPD[f]	Evaluate data for useability.
E365.1[q]	Total phosphorus (P)				
E354.1[q]	Nitrite		1 every 10 or fewer field samples (soil)	Not applicable	Evaluate variability.
E340.2[q]	Fluoride				
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[l]	Evaluate potential sources; Evaluate associated data for useability.
		Laboratory quality control			

		Method blank	1 per 20 samples analyzed	<PQL	Correct problem; reanalyze.
		Calibration (3 points) and Reagent Blank	When instrument conditions change or when calibration check criteria exceeded	Correlation coefficient ≥ 0.995 or plot curve for nonlinear analytes	Recalibrate

NA - Not Applicable

Table III.2. (page 16 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
E325.1[q]/SW9250[m]	Chloride, (Cl)	Calibration check	Prior to sample analysis and one per 20 samples analyzed	± 15% of initial calibration response	Identify and correct problem; recalibrate.
E353.2[q]	Nitrate-Nitrite (NO_3-NO_2)				
E375.2[q]	Sulfate (SO_4)				
E351.3[q]	Total nitrogen, (N)				
E365.1[q]	Total phosphorus (P)				
E354.1[q]	Nitrite				
E340.2[q] (continued)	Fluoride	Matrix spike	1 per 20 samples of a given matrix	75-125% Recovery	Evaluate data for useability.
		Matrix spike duplicate	1 per 20 samples of a given matrix	≤ 20% RPD	Evaluate data for useability.
		Laboratory Control Sample (chloride, nitrate)	1 for each calibration	Vendor specification	Evaluate data for useability.
E160.1[q]	Total dissolved solids (TDS)	Field quality control			
E160.2[q]	Total suspended solids (TSS)	Duplicate	1 every 10 or fewer field samples (water)	≤ 25% RPD[t]	Evaluate data for useability.
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[t]	Evaluate associated data for useability.
		Laboratory quality control			
		Method blank	1 per 20 samples of a given matrix	<PQL	Identify and correct problem. Reanalyze blank.

NA - Not Applicable

Table III.2. (page 17 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
E160.1[q]	Total dissolved solids (TDS)				
E160.2[q] (continued)	Total suspended solids (TSS)	Replicate sample	1 per 20 samples analyzed	≤ 20% RPD	Reanalyze a replicate sample; report both results.
		Laboratory control sample (LCS)	1 per 20 samples analyzed	Vendor specification	Identify and correct problem.
E415.1[q]/E415.2[q]	Total organic carbon (TOC)	Field quality control			
		Duplicate	1 every 10 or fewer field samples (water)	≤ 35% RPD[t]	Evaluate data for useability.
			1 every 10 or fewer field samples (soil)	Not applicable	Evaluate data for useability.
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[t]	Evaluate associated data for useability.
		Laboratory quality control			
		Method blank	1 per 20 samples of a given matrix	<PQL	Correct problem; reanalyze blank.
		Calibration	When instrument conditions change or when calibration check criteria exceeded	Second reading must be within 25% of initial	Recalibrate.
		Calibration check	1 per 20 samples analyzed	± 15% of initial calibration response	Recalibrate.
		Matrix spike (MS)	1 per 20 samples of a given matrix	75-125% Recovery	Evaluate data for useability.

NA - Not Applicable

Table III.2. (page 18 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
E415.1[q]/E415.2[q] (continued)	Total organic carbon (TOC)	Matrix spike duplicate (MSD)	1 per 20 samples of a given matrix	≤ 20% RPD	Evaluate data for useability.
		Replicate sample	4 analyses for every sample	≤ 20% RPD	Reanalyze sample.
USATHAMA[e]	Explosives	Field quality control			
		Duplicate	1 every 10 or fewer field samples (water)	≤ 35% RPD[l]	Evaluate data for useability.
			1 every 10 or fewer field samples (soil)	Not applicable	Evaluate variability.
		Equipment (rinsate) blank[d]	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[l]	Evaluate potential sources; Evaluate associated data for useability.
		Laboratory quality control			
		Method blank	1 per 20 samples of a given matrix	< PQL	Reanalyze blank.
		Calibration	(5 pt.) when calibration check limit criteria exceeded	≤ 15% RSD of average RF	Recalibrate.

NA - Not Applicable

Table III.2. (page 19 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
USATHAMA[5] (continued)	Explosives	Matrix spike (MS)	1 per 20 samples of a given matrix	See Table III.3	Evaluate data for useability.
		Matrix spike duplicate (MSD)	1 per 20 samples of a given matrix	See Table III.3	Evaluate data for useability.
		Retention time window	With every calibration check	Column and Compound Specific	Identify source, correct problem; reanalyze samples since last good calibration check.
		Calibration check	Prior to sample analysis and 1 per 10 samples analyzed	± 25% of peak height of initial 10 x TRL calibration standard	Recalibrate.

NA - Not Applicable

Table III.2. (page 20 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
ASTM D-2974[r]	Organic content and moisture content	Method blank (CEC) analyzed	1 per 20 samples	as per SW846	Identify source; correct problem, reanalyze blank.
SW9045[m]	Soil pH				
ASTM D-4253[r]		Sample replicate	1 per 20 samples analyzed	≤ 20 RPD	Correct problem; reanalyze a replicate sample.
502.2[u]	Volatile organic compounds[v]	Field Quality Control			
		Duplicate	1 every 10 or fewer field samples (water)	≤ 25% RPD[t]	Evaluate data for useability.
		Trip blank	1 per shipping container to laboratory	≤ 10 x level in associated samples[t]	Evaluate potential sources; evaluate associated data for useability.
		Equipment (rinsate) blank	1 every 10 or fewer field samples collected.	≤ 10 x level in associated samples[t]	Evaluate potential sources; evaluate associated data for useability.
		Sample bank blank	1 every 10 or fewer field samples collected.	≤ 10 x level in associated samples[t]	Evaluate potential sources; evaluate associated data for useability.
		Ambient blank	1 every 10 or fewer field samples collected.	≤ 10 x level in associated samples[t]	Evaluate potential sources; evaluate associated data for useability.

NA - Not Applicable

Table III.2. (page 21 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
502.2[u] (continued)	Volatile organic compounds[v]	Laboratory Quality Control			
		Laboratory reagent blank (method blank)	1 every 10 samples analyzed of a given matrix	≤ PQL	Identify and correct problem; reanalyze blank and associated samples.
		Laboratory fortified blank (blank spike)	1 every 20 samples analyzed of a given matrix	80-120%; 20% RSD	Identify and correct problem prior to further sample analysis.
		Calibration	5 points; when calibration check criteria exceeded	≤ 10 % RSD for calibration factors	Recalibrate.
		Calibration check	Once every day or every 10 samples, whichever is more frequent.	± 20% RPD from initial response factor	Recalibrate.
		Matrix spike	1 every 10 samples of a given matrix	**See Table III.3**	Evaluate data for useability.
		Matrix spike duplicate	1 every 10 samples of a given matrix	**See Table III.3**	Evaluate data for useability.
		Surrogate spike	Every field and laboratory sample	**See Table III.3**; method 502.2	Evaluate data for useability.
		Check standard	Once every 10 or fewer samples analyzed	60-140% recovery	Reanalyze failed analyte.

NA - Not Applicable

Table III.2. (page 22 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
502.2[u] (continued)	Volatile Organic Compounds[v]	Low level check	Once per week	60-140% recovery	Identify and correct problem; reanalyze check for the failed analytes.
		Laboratory control sample	Once every 20 or fewer sample analyzed.	80-120%; SD ≤ 30% of result.	Reanalyze LCS for failed analytes.
		Retention time windows	When new column installed and as needed	±0.1 minutes	Identify source, correct problem.
		Secondary column confirmation	Every positive detection ≥ PQL	NA	Evaluate positive identification of analyte.
CLP SOW [n,x] Modification B	Metals, CN[v]	Field quality control			
		Duplicate	1 every 10 or fewer field samples (water)	≤ 25% RPD[t]	Evaluate data for useability.
		Equipment (rinsate) blank	1 every 10 or fewer field samples (water)	≤ 10 x level in associated samples[t]	Evaluate potential sources, evaluate associated data for useability.
		Laboratory quality control			
		Initial and continuing calibration blanks (ICB, CCB) - ICP, mercury, cyanide	After every ICV and CCV or 10% or every 2 hours, whichever is more frequent	≥ IDL	Correct problem; recalibrate; reanalyze preceding 10 samples or all since last good blank.

NA - Not Applicable

Table III.2. (page 23 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
CLP SOW [n,x] Modification B (continued)	Metals, CN[v]	- graphite AA	One every 5 samples	≥ IDL	Correct problem; recalibrate; reanalyze preceding 5 samples or all since last good blank.
		Preparation blank (PB)	One every sample delivery group or batch of 10 samples, whichever is more frequent.	≤ CRDL	If sample results < 10 x CRDL, but > CRDL, redigest and reanalyze.
		Laboratory control sample (LCS)	One every sample delivery group or batch of 10 samples, whichever is more frequent.	85-115% recovery	Correct problem; redigest and reanalyze associated samples.
		Initial calibration verification std. (ICV) and continuing calibration verification std. (CCV)			
		- ICP, mercury, cyanide	Per CLP SOW	Per CLP SOW	See CLP SOW.
		- Graphite AA	Initially ICV, and CCV every 5 samples	90-110% recovery	See CLP SOW.
		Linear range check standard (CRI, CRA)	Per CLP SOW	Not established	None.

NA - Not Applicable

Table III.2. (page 24 of 25)

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
CLP SOW [n,x] Modification B (continued)	Metals, CN[v]	Interference check sample (ICS)	Per CLP SOW	Per CLP SOW	See CLP SOW.
		ICP Serial dilution (L)	Per CLP SOW	Per CLP SOW	See CLP SOW.
		Spike sample (S)	One every group of samples of similar matrix, concentration, sample delivery group or batch of 10 samples, whichever is more frequent	85-115% recovery 80-120% recovery Hg, Cn	Evaluate data for useability.
		Sample duplicate (D) (sample replicate)	One every group of samples of similar matrix, concentration, sample delivery group, or batch of 10 samples, whichever is more frequent.	10% RPD or < IDL difference. 15% RPD Hg, Cn.	Evaluate data for useability.
		Method std. addition (MSA), GFAA only	Per CLP SOW	Per CLP SOW	See CLP SOW.
		Linear range analysis (LRA) for ICP	Per CLP SOW	Per CLP SOW	See CLP SOW.
		Interelement corrections for ICP	Once per year or when instrument is adjusted	CLP SOW	See CLP SOW

NA - Not Applicable

Table III.2. (page 25 of 25)

*A sample bank blank monitors for VOCs potentially present in the surrounding environment where samples are commonly handled before shipment. The blank is prepared with organic-free deionized water in sample vials, capped with no bubbles, and placed in the desired location during sample handling.

[a]"The Radiochemistry of Plutonium," G.H. Coleman, NAS-NS-3058, National Academy of Sciences, September 1965, and "The Radiochemistry of Uranium," NAS-NS-3050, National Academy of Sciences, March 1962.

[b]"The Radiochemistry of Thorium," E.K. Hyde, NAS-NS-3004, National Academy of Sciences, January 1960.

[c]"Standard Test Methods for Radium in Water," ASTM, latest version.

[d]To be prepared for sampling locations without dedicated sampling equipment.

[e]Procedures according to "Environmental Radioactivity Laboratory Intercomparison Studies Program," U.S. EPA, EPA-600/4-81-004.

[f]"Improved Evaluation of Environmental Radiochemical Inorganic Solid Matrix Replicate Precision: Normalized Range Analysis Revisited," J.W. Dillard and R.E. Gladd, 36th Annual Conference on Bioassay, Analytical, and Environmental Radiochemistry, Oakridge, TN., 1990.

[g]"Prescribed Procedures for Measurement of Radioactivity in Drinking Water," U.S. EPA, EPA-600/4-80-032, latest version.

[h]ND 9900 VAX/VMS Spectroscopy Application Package User's Manual (09-0196), Nuclear Data, Inc., Schauumberg, IL. August 1986.

[i]Counted twice on different detectors.

[j]USEPA Contract Laboratory Program Statement of Work for Organic Analysis, Document No. OLM01.8, August 1991.

[k]Target Compound List.

[l]For methylene chloride, acetone, toluene, or 2-butanone.

[m]"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, U.S.EPA, November 1986 or most recent version.

[n]USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, Document No. ILM01.0, March 1990.

[o]Target Analyte List.

[p]Graphite furnace atomic absorption.

[q]"Methods for Chemical Analysis of Water and Wastes," U.S. EPA, EPA-600/4-79-020, revised March 1983.

[r]Soil and Rock; Dimension Stone, Geosynthetics Vol. 4.08. 1991 Annual Book of ASTM Standards Section 4 "Construction."

[s]USATHAMA Methods for Ion Nitroexplosives in Water by HPLC, and Nitroexplosives in Soils by HPLC.

[t]All field quality control samples associated with a batch of samples will be evaluated as a unit. This criterion is designed for evaluating an isolated quality control sample and does not take into account the interdependencies of quality control results. Corrective actions will be taken at all levels of detection in the blank samples associated with field sampling. The criterion applies only if there is a positive detection of the same compound in associated samples. All data will be evaluated on a case-by-case basis; therefore, this criterion may not be applicable at times (e.g., reported levels near detection limit).

[u]"Manual for the Certification of Laboratories Analyzing Drinking Water," EPA/570/9-90/008. Revision 2.0 to Method 502.2. U.S. EPA.

[v]For analysis of residential well samples.

[x]Arsenic, selenium, cadmium, lead, antimony, and thallium will be analyzed by graphite furnace atomic absorption. Zeeman background correction will be used. Deuterium background correction may be used for lead and antimony instead of Zeeman background correction.

[1]"The Radiochemistry of Barium, Calcium, and Strontium," D.N. Sunderman and D.W. Townley, NAS-NS-3010. National Academy of Sciences, January 1960.

[2]"Determination of Strontium-89 and -90 in Soil with Total Sample Decomposition," D.B. Martin, Analytical Chemistry, October 1979.

[3]"Procedures for Determination of Stable Elements and Radionuclides in Environmental Samples," Public Health Service Publication 999-RH-10, January 1965.

[4]"EML Procedures Manual," HASL-300, Environmental Measurements Laboratory, U.S. Department of Energy, 27th Edition.

Table III.3. Laboratory Control Limits for Matrix Spikes, Matrix Spike Duplicates, and Surrogate Spikes: Surface Water and Soil/Sediment Samples

ANALYTICAL METHOD	SPIKING COMPOUNDS	SPIKE CONCENTRATION		ADVISORY LIMITS			
		Water	Soil	Percent Recovery (%)[g]		Relative Percent Difference (%)	
		(µg/L)	(µg/kg)[f]	Water	Soil	Water	Soil
SW8010 and SW8020	Matrix Spike[a]						
	Bromodichloromethane	*	*	42-172	60-140	≤15	≤30
Halogenated	Bromoform	*	*	13-159	60-140	≤15	≤30
and Aromatic	Carbon tetrachloride	*	*	43-143	60-140	≤15	≤30
Volatile	Chloroform	*	*	49-133	60-140	≤15	≤30
Organic	Dibromochloromethane	*	*	24-191	60-140	≤15	≤30
Compounds	1,4-Dichlorobenzene	*	*	42-143	60-140	≤15	≤30
	1,2-Dichloroethane	*	*	51-147	60-140	≤15	≤30
	1,1-Dichloroethene	*	*	28-167	60-140	≤15	≤30
	1,1,1-Trichloroethane	*	*	41-138	60-140	≤15	≤30
	Trichloroethene	*	*	35-146	60-140	≤15	≤30
	Vinyl chloride	*	*	28-163	60-140	≤15	≤30
	Benzene	*	*	39-150	60-140	≤15	≤30
	Surrogates						
	Bromochloromethane	30	30	59-117[b]	70-130	≤15	≤30
	Fluorobenzene	30	30	48-120[b]	70-130	≤15	≤30
	o-Chlorofluorobenzene	30	30	44-124[b]	70-130	≤15	≤30
SW8030	Matrix Spike[a]						
	Acrylonitrile	*	NA	70-135	NA	≤ 15	NA

NA - Not Applicable

Table III.3. (page 2 of 5)

ANALYTICAL METHOD	SPIKING COMPOUNDS	SPIKE CONCENTRATION		ADVISORY LIMITS			
		Water	Soil	Percent Recovery (%)[g]		Relative Percent Difference (%)	
		(µg/L)	(µg/kg)[f]	Water	Soil	Water	Soil
CLP SOW Pesticides/ PCBs	Matrix Spike						
	Lindane	*	*	56-123	46-127	≤15	≤50
	Heptachlor	*	*	40-131	35-130	≤20	≤31
	Aldrin	*	*	40-120	34-132	≤22	≤43
	Dieldrin	*	*	52-126	31-134	≤18	≤38
	Endrin	*	*	56-121	42-139	≤21	≤45
	4,4'-DDT	*	*	38-127	23-134	≤27	≤50
	Surrogate						
	Tetrachloro-m-xylene	per CLP SOW	per CLP SOW	60-150	60-150	NA	NA
	Decachlorobiphenyl	per CLP SOW	per CLP SOW	60-150	60-150	NA	NA
CLP SOW Volatile Organic Compounds	Matrix Spike						
	1,1-DCE	*	*	61-145	59-172	≤14	≤22
	Trichloroethene	*	*	71-120	62-137	≤14	≤24
	Benzene	*	*	76-127	66-142	≤11	≤21
	Toluene	*	*	76-125	59-139	≤13	≤21
	Chlorobenzene	*	*	75-130	60-133	≤13	≤21
	Surrogates						
	Toluene-d8	per CLP SOW	per CLP SOW	88-110	84-138	NA	NA
	4-Bromo-fluorobenzene	per CLP SOW	per CLP SOW	86-115	59-113	NA	NA
	1,2-Dichloroethane-d4	per CLP SOW	per CLP SOW	76-114	70-121	NA	NA

NA - Not Applicable

Table III.3. (page 3 of 5)

ANALYTICAL METHOD	SPIKING COMPOUNDS	SPIKE CONCENTRATION		ADVISORY LIMITS			
		Water	Soil	Percent Recovery (%)[g]		Relative Percent Difference (%)	
		(µg/L)	(µg/kg)[f]	Water	Soil	Water	Soil
CLP SOW Semivolatile Organic Compounds	Matrix Spike						
	Phenol	*	*	12-110	26-90	≤42	≤35
	2-Chlorophenol	*	*	27-123	25-102	≤40	≤50
	1,4-Dichlorobenzene	*	*	36-97	28-104	≤28	≤27
	N-nitroso-di-n-propyl-amine	*	*	41-116	41-126	≤38	≤38
	1,2,4-Trichlorobenzene	*	*	39-98	38-107	≤28	≤23
	4-Chloro-3-methylphenol	*	*	23-97	26-103	≤42	≤33
	Acenaphthene	*	*	46-118	31-137	≤31	≤19
	4-Nitrophenol	*	*	10-80	11-114	≤50	≤50
	2,4-Dinitrotoluene	*	*	24-96	28-89	≤38	≤47
	Pentachlorophenol	*	*	9-103	17-109	≤50	≤47
	Pyrene	*	*	26-127	35-142	≤31	≤36
	Surrogates						
	Nitrobenzene-d5	per CLP SOW	per CLP SOW	35-114	23-120	NA	NA
	2-Fluorobiphenyl	per CLP SOW	per CLP SOW	43-116	30-115	NA	NA
	p-Terphenyl-d14	per CLP SOW	per CLP SOW	33-141	18-137	NA	NA
	Phenol-d5	per CLP SOW	per CLP SOW	10-110	24-113	NA	NA
	2-Fluorophenol	per CLP SOW	per CLP SOW	21-110	25-121	NA	NA
	2,4,6-Tribromophenol	per CLP SOW	per CLP SOW	10-123	19-122	NA	NA
	2-Chlorophenol-d4	per CLP SOW	per CLP SOW	33-110	20-130	NA	NA
	1,2-Dicholorobenzene-d4	per CLP SOW	per CLP SOW	16-110	20-130	NA	NA

NA - Not Applicable

Table III.3. (page 4 of 5)

ANALYTICAL METHOD	SPIKING COMPOUNDS	SPIKE CONCENTRATION		ADVISORY LIMITS			
		Water	Soil	Percent Recovery (%)[g]		Relative Percent Difference (%)	
		(µg/L)	(µg/kg)[f]	Water	Soil	Water	Soil
502.2	Blank Spike/Matrix Spike						
Volatile	1,1,1-Trichloroethane	0.1-5	NA	80-120	NA	20%	NA
Organic	1,1,2,2-Tectrachloroethane	0.1-5	NA	80-120	NA	20%	NA
Compounds	1,1-Dichloroethene	0.1-5	NA	80-120	NA	20%	NA
	1,2-Dichloroethane	0.1-5	NA	80-120	NA	20%	NA
	Benzene	0.1-5	NA	80-120	NA	20%	NA
	Bromodichloromethane	0.1-5	NA	80-120	NA	20%	NA
	Bromoform	0.1-5	NA	80-120	NA	20%	NA
	Chlorobenzene	0.1-5	NA	80-120	NA	20%	NA
	Cis-1,3-Dichloropropene	0.1-5	NA	80-120	NA	20%	NA
	Ethylbenzene	0.1-5	NA	80-120	NA	20%	NA
	Tetrachloroethene	0.1-5	NA	80-120	NA	20%	NA
	Toluene	0.1-5	NA	80-120	NA	20%	NA
	Trans-1,2-Dichloroethene	0.1-5	NA	80-120	NA	20%	NA
	Trans-1,3-Dichloropropene	0.1-5	NA	80-120	NA	20%	NA
	Trichlororethene	0.1-5	NA	80-120	NA	20%	NA
	Xylenes (total)	0.1-5	NA	80-120	NA	20%	NA

	Surrogates						

	Fluorobenzene	10	NA	80-120*	NA	20%	NA
	1-Chloro-2-Bromopropane	10	NA	80-120*	NA	20%	NA

NA - Not Applicable

*Recoveries may vary depending upon sample matrix. These recoveries are based on using reagent water.

Table III.3. (page 5 of 5)

ANALYTICAL METHOD	SPIKING COMPOUNDS	SPIKE CONCENTRATION		ADVISORY LIMITS			
				Percent Recovery (%)[g]		Relative Percent Difference (%)	
		Water (µg/L)	Soil (µg/kg)[c]	Water	Soil	Water	Soil
USATHAMA Explosives	Blank Spike[d] (low concentration)						
	RDX	11.6	4.4	62-87	40-160[e]	32[f]	40[e,f]
	1,3,5-TNB	28	2.6	85-100'	40-160[e]	19	30
	2,4,6-TNT	5.8	2.6	78-102	40-160[e]	29	40
	2,6-DNT	1.0	2.6	66-102	40-160[e]	45	60
	2,4-DNT	0.8	0.6	74-99	40-160[e]	31	40
	Blank Spike (high concentration)						
	RDX	58	22	49-71	40-160	19	30
	1,3,5-TNB	140	13	85-108	40-160	20	30
	2,4,6-TNT	29	13	83-104	40-160	19	30
	2,6-DNT	5.0	13	74-96	40-160	19	30
	2,4-DNT	4.0	3.0	77-100	40-160	20	30

[a]Percent recovery limits for water are those established in SW846. The control limits for soil matrix spikes and surrogates and for precision are **project-established advisory limits** until enough data points are generated to develop control charts.

[b]Footnote deleted in previous revision.

[c]Spike amount is for low concentration soils.

[d]Control limits for sample matrix spikes have not been determined.

[e]Control limits have not been established for solid matrices. These limits are **project-established advisory limits** for data evaluation purposes and not for validation and will be used until control charts have been developed.

[f]Precision is expressed for this analysis as the difference between the highest percent recovery and lowest percent recovery, as defined in the USATHAMA Quality Assurance Manual (USATHAMA 1990).

[g]Matrix spike recoveries are advisory limits only.

*Sample will be spiked at a concentration at least 25% above the sample concentration, unless the concentration is less than the detection limit, where the spike concentration will be 2 to 5 times the method detection limit.

NA - Not Applicable

4. SAMPLING PROCEDURES

The Operable Unit 6, D&D, verification will follow SOPs in performing environmental sampling and other field activities. The sampling program for Operable Unit 6 involves the collection of soil, sediment, and surface water samples. Surface water samples may be collected if they support the objectives of the verification sampling. Additional activities to be performed include drilling, logging, and health and safety screening. All Operable Unit 6 sampling activities will be discussed in detail in the Operable Unit 6 area-specific verification sampling and analysis plans and the Operable Unit 6 Verification Work Plan. However, the procedures for these activities are summarized in this section as part of the QAPP for the investigations. The SOPs that will be followed were developed for the Mound Plant ER Program and are discussed in section 4 and Appendix A of the Operable Unit 9 Site-Wide QAPP (DOE 1992b). Only those SOPs applicable to Operable Unit 6 activities are referenced in the following paragraphs. It should be noted that the Mound Plant ER Program SOPs have been revised in response to comments from both the EPA Region V and the Ohio EPA.

4.1. GENERAL PROCEDURES FOR SAMPLING

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP. Exception is taken for those procedures not listed in Table IV.1 in this Operable Unit 6 QAPP. Samples will be identified as described in Table IV.2 of this document. Each operable unit will have a unique area identifier or identifiers. This identifier, once assigned, will not be changed. Table IV.3 in the Operable Unit 9 Site-Wide QAPP (DOE 1992b) is adopted for Operable Unit 6 use with the exception that no groundwater samples will be collected. This table appears in its modified form in this QAPP. A table summarizing the planned samples and estimated quality assurance/quality control samples will be developed as part of each area-specific verification sampling and analysis plan. Table IV.4, as developed for the Operable Unit 9 Site-Wide QAPP (DOE 1992b), is applicable to Operable Unit 6 and is included in this document to establish soil sediment controls. Figure 4.1 illustrates the sampling procedures for Operable Unit 6 field activities.

4.2. WATER SAMPLING

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP with the exception that no groundwater samples will be taken. Water samples will only be included if the water is standing within an area to be verified.

Table IV.1. Mound Plant ER Program SOPs Applicable to Operable Unit 6

Section 1 - General		Effective Date	Revision Number	Purpose
1.1	General Instructions for Field Personnel	March 1992	2	To provide field personnel with instructions regarding activities to be performed before, during, and after field investigations.
1.3	Sample Control and Documentation	March 1992	1	To define the steps necessary for sample control and identification, data recording, and chain-of-custody documentation.
1.4	Sample Containers and Preservation	March 1992	2	To provide guidance in the selection and preservation of suitable containers for samples, container cleaning, required sample volumes, sample collection, times, and the recommended holding preservation techniques for water, wastes, sediments, sludges, and soil samples.
1.5	Guide to the Handling, Packaging, and Shipping of Samples	May 1991	1	To provide a general guide for packaging and shipping samples of environmental and hazardous materials to the laboratory. In addition, instructions are provided to select the correct category for packaging and shipping samples of unknown contents.
1.6	General Equipment Decontamination	March 1992	2	To describe methods for the decontamination of field equipment potentially contaminated during sample collection.
1.8	Personnel Decontamination --Level D Protection	March 1992	1	To describe the equipment and procedures required for the decontamination of persons who have performed field activities in Level D protective clothing.
1.9	Personnel Decontamination --Level C Protection	March 1992	1	To describe the equipment and procedures required for the decontamination of persons who have performed field activities in Level C protective clothing.
1.15	Guide to Waste Management	December 1991	1	To provide a general guide for the management of investigation-derived materials at the Mound Plant.

Table IV.1. (page 2 of 3)

Section 2 - Water Sampling	Effective Date	Revision Number	Purpose
2.2 Field Measurements on Ground and Surface Water Samples	March 1992	2	To obtain reliable and accurate measurements of the field chemistry of water quality samples.
2.8 Sampling for Volatile Organics	January 1991	0	To outline procedures for collecting a representative groundwater sample and transporting it from its original environment to the laboratory for analysis of trace volatile organics.
2.9 Surface Water Sampling	June 1991	1	To define guidelines followed by field personnel in sampling surface water bodies and documenting all aspects of surface water sample collection.
Section 4 - Drilling and Logging			
4.1 Soil Boring	March 1992	2	To ensure acceptable, consistent soil-boring procedures for all pertinent aspects of hazardous waste investigations.
4.2 Rock Boring	March 1992	1	To ensure acceptable, consistent rock boring procedures for all pertinent aspects of hazardous waste investigations.
Section 5 - Soil Sampling			
5.1 Soil and Rock Borehole Logging and Sampling	March 1992	1	To describe the physical nature of consolidated or unconsolidated subsurface earthen materials encountered during auger, rotary, or other drilling or trenching activities and collect samples of the earthen materials for further evaluation.
5.2 Soil Sampling with a Spade and Scoop	March 1992	3	To describe a method for collecting a soil sample less than 4 ft below the land surface.
5.3 Subsurface Solid Sampling with Hand Auger and Thin-Wall Sampler	March 1992	2	To define a method of collecting subsurface solid samples with a hand auger and thin-wall tube sampler.
5.8 Soil Sampling with a Stainless Steel Surface Soil Sampler	October 1991	1	To define procedures for collecting surface soil samples to determine the chemical and physical soil properties.

Table IV.1. (page 3 of 3)

Section 5 - Soil Sampling	Effective Date	Revision Number	Purpose
5.9 Sediment Sampling Procedures for Streams, Rivers, and Ponds	March 1992	0	To describe the methods for collecting deposited sediment samples in streams, rivers, and ponds.
Section 6 - Health and Safety			
6.1. Health and Safety Monitoring of Combustible Gas Levels	March 1992	1	To describe the equipment and proper method for monitoring combustible gas levels in order to determine when an explosion hazard exists in the work environment.
6.2. Health and Safety Monitoring of Organic Vapors with a Photoionization Detector	March 1992	1	To describe the equipment and proper method for environmental monitoring of toxic gases and vapors using a portable photoionization detector (PID).
6.4 Total Alpha Surface Contamination Measurements	January 1991	0	To provide guidance for determining levels of total surface alpha contamination on equipment, vehicles, and personnel that have been in contact with material that was potentially contaminated with alpha-emitting radionuclides.
6.7 Near Surface and Soil Sample Screening for Low-Energy Gamma Radiation Using the FIDLER	January 1991	0	To describe the procedure in which a field instrument for the detection of low-energy radiation (FIDLER) is used to monitor surfaces and soil samples for the presence of low-energy gamma radiations that accompany some alpha emissions.
6.15 Measurement of Gamma-Ray Fields Using a Sodium Iodide (NaI) Detector	January 1991	0	To describe the procedure for making count-rate measurements of a gamma-ray field with a sodium iodide (NaI) detector

Table IV.2. Operable Unit 6 Verification Sample Identification Plan

FIELD AND QUALITY CONTROL SAMPLES:

Sample	Identification Scheme
Field Sample	MND*XX*-*YYYY*-0*ZZZ*
Trip Blank	MND*XX*-*YYYY*-2*ZZZ*
Sample Bank Blank/Ambient Blank	MND*XX*-*YYYY*-3*ZZZ*
Duplicate	MND*XX*-*YYYY*-1*ZZZ*
Equipment Blank	MND*XX*-*YYYY*-4*ZZZ*
Bottle Lot Blanks	MND*XX*-*YYYY*-6*ZZZ*

Notes:

MND = Mound Plant
XX = sample area identifier
YYYY = sample location number
ZZZZ = sample round or sample depth

The first Z is the sample indication shown above; the second Z is the media indication, as follows:

soil - Z0ZZ
sediment - Z1ZZ
water - Z2ZZ

Field quality control samples will be assigned a sample location number and sample round of the last sample of the associated sample batch.

To date, the following area identifiers have been assigned to D&D areas:

Area 1,	*XX* = 08
Area 4/4a,	*XX* = 09
Area 11,	*XX* = 10
Area 14,	*XX* = 11
Area 16,	*XX* = 12
Area 17,	*XX* = 13
Area 19,	*XX* = 14
Area D,	*XX* = 15

Table IV.3. Sample Containers, Volumes, Preservation, and Holding Times: Surface Water Samples

Parameters	Analytical Method	Container[a]	Minimum Volume	Preservation	Holding Time[b]
Purgeable Halocarbons	SW5030/SW8010	Glass vial with Teflon-lined septum (No headspace)	Two 40 mL vials	Cool 4°C	14 days
Purgeable Aromatic Compounds	SW5030/SW8020	Glass vial with Teflon-lined septum (No headspace)	Two 40 mL vials	HCl to pH <2 Cool 4°C	14 days
Acrylonitrile, Acetonitrile	SW5030/SW8030	Glass vial with Teflon-lined septum (no headspace)	Two 40-mL vials	Cool 4°C	14 days
Volatile Organic Compounds	CLP SOW and 502.2	Glass vial with Teflon-lined septum (No headspace)	Two 40 mL vials	HCl to pH <2 Cool 4°C	14 days
Semivolatile Organic Compounds	CLP SOW	Amber glass bottle with Teflon-lined lid	Two 1000 mL bottles	Cool 4°C	7 days extraction/40 days analysis[c]
Pesticides/PCBs	CLP SOW	Amber glass bottle with Teflon-lined lid	Two 1000 mL bottles	Cool 4°C	7 days extraction/40 days analysis[c]

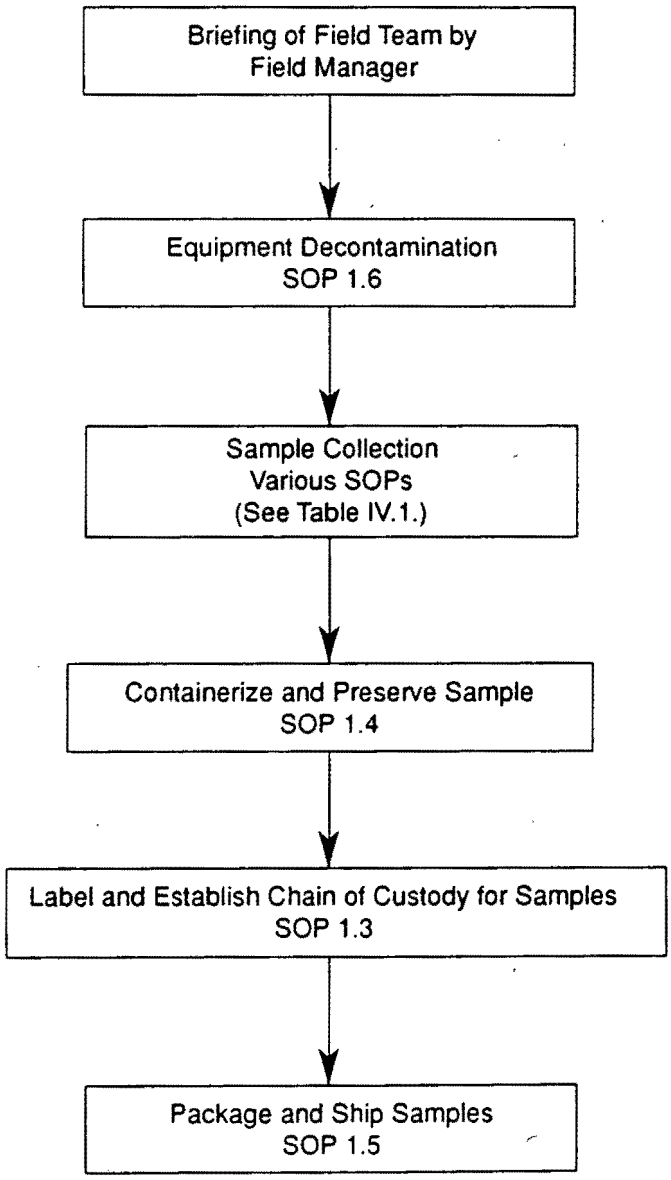
Table IV.3. (page 2 of 3)

Parameters	Analytical Method	Container[a]	Minimum Volume	Preservation	Holding Time[b]
Metals or Lanthanides	CLP SOW Modifications A, B, or C	Polyethylene bottle	1000 mL	HNO_3 to pH <2, Cool 4°C	6 months, 28 days (Mercury)
Cyanide	CLP SOW	Polyethylene bottle	1500 mL	NaOH to pH >12 Cool 4°C	14 days
Nitrate-Nitrite	E353.2	Polyethylene bottle	500 mL	H_2SO_4 to pH <2 Cool 4°C	28 days
Fluoride	E340.2	Polyethylene bottle	500 mL	Cool 4°C	28 days
Ammonia	E350.1 or 350.3	Polyethylene bottle	500 mL	Cool 4°C H_2SO_4 to pH <2	28 days
Nitrite	E354.1	Polyethylene bottle	150 mL	Cool 4°C	48 hours
Sulfate Chloride	E375.2 E325.1	Polyethylene bottle	500 mL	Cool 4°C	28 days
Total Nitrogen Total Phosphorus	E351.3 E365.1	Polyethylene bottle	1000 mL	H_2SO_4 to pH < 2, Cool 4°C	28 days
Total Dissolved Solids	E160.1	Polyethylene bottle	1000 mL	Cool 4°C	7 days

Table IV.3. (page 3 of 3)

Parameters	Analytical Method	Container[a]	Minimum Volume	Preservation	Holding Time[b]
Total Suspended Solids	E160.2	Polyethylene bottle	1000 mL	Cool 4°C	7 days
Explosives	USATHAMA	Amber glass bottle with Teflon-lined lid	1 liter	Cool 4°C	7 days extraction/ 30 days analysis[c]
Radionuclides	Nuclear Data, Inc.	Plastic cubetainer	2x4 liter	HNO_3 to pH < 2 (15 mL 1 N HNO_3 per liter)	NA
Gamma Spectrometry	1986				
Plutonium Isotopes	NAS 1965				
Thorium Isotopes	NAS 1960				
Radium-226	ASTM D2460-70				
Uranium Isotopes	NAS 1962				
Strontium-90	NAS 1960				
Tritium	E906.0	Glass bottle	250 mL	None	None

NOTE: Holding times for CLP analyses are based on "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses," EPA, February 1, 1988 and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses," EPA, July 1,1988.
[a]Sample containers will be certified cleaned by the manufacturer according to EPA standards.
[b]From date of collection.
[c]From date of extraction.



MNDOU6/Procedures/2-7-92

Figure 4.1. Sampling procedures flow chart.

Table IV.4. Sample Containers, Volumes, Preservation, and Holding Times: Soil/Sediment Samples

Parameters	Analytical Method	Container[a]	Minimum Volume/Weight	Preservation	Holding Time[b]
Volatile Organic Compounds	CLP SOW	Glass vial with Teflon-lined septum	120 mL (no headspace)	Cool 4°C	14 days
Semivolatile Organic Compounds	CLP SOW	Amber glass jar with Teflon-lined lid	100 grams	Cool 4°C	7 days extraction/ 40 days analysis[c]
Pesticides/PCBs	CLP SOW	Amber glass jar with Teflon-lined lid	100 grams	Cool 4°C	7 days extraction/ 40 days analysis[b]
Soil pH	SW9045	Wide-mouth polyethylene bottle	50 grams	NA	48 hours
Metals	CLP SOW	Wide-mouth poly-ethylene bottle	100 grams	Cool 4°C	6 months 28 days (mercury)
Cyanide	CLP SOW	Wide-mouth poly-ethylene bottle	100 grams	Cool 4°C	14 days
Fluoride	E340.2	Wide-mouth polyethylene bottle	50 grams	Cool 4°C	28 days
Nitrate-Nitrite, Chloride	E353.2, SW9250	Wide-mouth poly-ethylene bottle	100 grams	Cool 4°C	28 days

Table IV.4. (page 2 of 2)

Parameters	Analytical Method	Container[a]	Minimum Volume/Weight	Preservation	Holding Time[b]
Cation Exchange Capacity	SW9081	Wide-mouth poly-ethylene bottle	100 grams	Cool 4°C	NA
Grain Size Distribution	ASTM D422-63	1-gallon wide-mouth plastic jar	5 lbs.	NA	NA
Specific Gravity	ASTM D854-83			NA	NA
Hydraulic Conductivity	ASTM D2434-68				
Relative Density	ASTM D4254-83				
Maximum Density	ASTM D4253-83				
Moisture Content	ASTM D2974-87	Wide-mouth ethylene bottle	500 grams	Airtight Cool 4°C	7 days
Organic Content	USATHAMA				
Explosives		125-mL wide-mouth amber glass jar with Teflon-lined lid	100 grams	Cool 4°C	7 days extraction/ 30 days analysis[c]
Radionuclides					
Gamma Spectrometry	Nuclear Data, Inc. 1986	Wide-mouth nalgene bottle	750 ~~650~~-grams	None	NA
Tritium	E906.0				
Plutonium Isotopes	NAS 1965				
Thorium Isotopes	NAS 1960				
Uranium Isotopes	NAS 9162				
Strontium-90	NAS 1960				

NOTE: Holding times for CLP analyses are based on "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses," EPA, February 1, 1988 and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses," EPA, July 1, 1988.

[a]Sample containers will be certified cleaned by the manufacturer according to EPA standards.

[b]From date of collection.

[c]From date of extraction.

4.3. SOIL/SEDIMENT SAMPLING

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP.

4.4. OTHER FIELD ACTIVITIES

An exception is taken to this section of the Operable Unit 9 Site-Wide QAPP (DOE 1992b). Activities for Operable Unit 9 concern groundwater measurements and monitoring wells that are not part of Operable Unit 6 activities. If activities are added to the Operable Unit 6 work scope, these activities will be fully addressed in area-specific verification sampling and analysis plans. If changes include information required in a QAPP, a QAPP addendum will be written for the activity or will be included in an Operable Unit 6 QAPP revision, subject to regulatory review. Procedures required that have not been previously reviewed will become part of QAPP or QAPP addendum appendix sections.

4.5. SUMMARY OF SAMPLING ACTIVITIES

Summary tables will be prepared for specific verification activities as part of the planning. These will follow the format of the Summary of Sampling and Analysis Program table in section 4 of the Operable Unit 9 Site-Wide QAPP (DOE 1992b).

The attachments to the Operable Unit 9 Site-Wide QAPP (DOE 1992b) present laboratory-specific information including analytical methods, laboratory custody, internal data reduction, and validation. Equipment maintenance and procedures to assess precision and accuracy are adopted for use in Operable Unit 6. Analyte lists may be limited to those selected in the area-specific Sampling and Analysis Plans.

5. SAMPLE CUSTODY

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), is applicable to the Operable Unit 6 QAPP, with the exception that the following file format will be used for files maintained in the WESTON Albuquerque office:

0.0 PROJECT FILE INDEX
1.0 CONTRACT DOCUMENTS
- 1.1 PROPOSAL AND PRE-AWARD DOCUMENTS
- 1.2 PRIME CONTRACT DOCUMENTS
  - Cost Proposal/SOW/TOCE
- 1.3 CONTRACT MODIFICATION COR
- 1.4 PROJECT CLOSEOUT DOCUMENTS

2.0 SUBCONTRACT DOCUMENTS
- 2.1 AGREEMENTS
- 2.2 REPORTS

3.0 FINANCIAL
- 3.1 PLANNING
- 3.2 MONITORING AND CONTROL
  - Weekly Details, Project Master Files, Pre-bills
- 3.3 INVOICES

4.0 CORRESPONDENCE (Chronological)
- 4.1 CLIENT
- 4.2 INTERNAL
  - Phone Conversations, Memos
- 4.3 SUBCONTRACTOR
- 4.4 OTHER

5.0 PROJECT STATUS CONTROL
- 5.1 MONTHLY REPORTS
- 5.2 MEETING MINUTES
- 5.3 MEETING NOTES

6.0 QUALITY CONTROL/QUALITY ASSURANCE AND HEALTH AND SAFETY
- 6.1 PROCEDURES (SOPS)
- 6.2 AUDIT REPORTS

7.0 TECHNICAL INFORMATION (WESTON)
- 7.1 FIELD DATA
  - Field Notebooks, Chain-of-Custody Records, Sampling Records, Well Construction Records, Land Survey Data, Geologic Logs, Geophysical Data, Trip Reports
- 7.2 ANALYTICAL DATA BASE RESULTS
  - Raw Data, Data Base Output, Laboratory Input, Digital Records
- 7.3 CALCULATIONS/EVALUATIONS
- 7.4 GRAPHICS
  - Photos, Maps, Overheads

8.0 DELIVERABLES
- 8.1 REVIEW COMMENTS AND RESPONSES
- 8.2 PRELIMINARY DRAFTS
- 8.3 WORKING DRAFTS
- 8.4 DRAFTS
- 8.5 REPORT QUALITY MILESTONES

9.0 REFERENCE MATERIALS/TECHNICAL INFORMATION (NON-WESTON)
- 9.1 ANALYTICAL
- 9.2 CALCULATIONS/EVALUATIONS
- 9.3 DOCUMENTS/REPORTS
- 9.4 FIELD DATA
- 9.5 GRAPHICS
  - Photos, Maps, Overheads
- 9.6 NEWSPAPER ARTICLES
- 9.7 PROPERTY ISSUES
- 9.8 REGULATORY INFORMATION
  - Consent Decree, Permits

6. ANALYTICAL PROCEDURES

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP except for the amendment indicated below.

- All references to groundwater are deleted for the Operable Unit 6 QAPP.

Exceptions are taken for those analyses not listed in Table I.1 of this document, where the DQOs and field and laboratory parameters are specified, or described fully in an area-specific Sampling and Analysis Plan for verification.

7. CALIBRATION PROCEDURES AND FREQUENCY

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP for instruments in use for Operable Unit 6 activities.

8. INTERNAL QUALITY CONTROL CHECKS

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP.

9. DATA REDUCTION, VALIDATION AND REPORTING

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), is applicable to the Operable Unit 6 QAPP. Data delivery and analysis turnaround times are included in laboratory contracts as applicable.

10. PERFORMANCE AND SYSTEMS AUDITS

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), is applicable to the Operable Unit 6 QAPP.

11. PREVENTIVE MAINTENANCE

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP except for references to equipment not used in Operable Unit 6 activities.

12. SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION ACCURACY AND COMPLETENESS

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), is applicable to the Operable Unit 6 QAPP.

13. CORRECTIVE ACTION PROTOCOLS

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), Section 13, Corrective Action Protocols, applies to the Operable Unit 6 QAPP.

14. QUALITY ASSURANCE REPORTS TO MANAGEMENT

This section, as presented in the Operable Unit 9 Site-Wide QAPP (DOE 1992b), applies to the Operable Unit 6 QAPP.

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