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U.S. Department of Energy
Idaho Operations Office

Groundwater Monitoring Plan for the Waste Area Group 5 Remedial Action

INEEL
Home of Science and Engineering Solutions
Idaho National Engineering and Environmental Laboratory

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Prepared for the
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ABSTRACT

This Groundwater Monitoring Plan outlines the collection and analysis of samples in support of the Waste Area Group 5 remedial action, as defined in the *Final Record of Decision for Power Burst Facility and Auxiliary Reactor Area*. The Record of Decision requires that surveillance monitoring of the groundwater underlying the Auxiliary Reactor Area and Power Burst Facility be conducted annually at Waste Area Group 5 at least until the first 5-year review, which is scheduled for the summer of 2005. At that time, the analytical data will be reviewed and a joint decision will be made with the Agencies as to whether the data warrant continuation of the monitoring effort.

Groundwater samples will be collected from eight monitoring wells and one production well interspersed throughout the Waste Area Group 5 boundaries. The samples will be submitted for a suite of analyses selected based upon the contaminants known to be present in the Operable Unit 5-12 soil above the Snake River Plain Aquifer. Analytical data will be reported annually with any discernible statistical trends described.

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ACRONYMS

ARA	Auxiliary Reactor Area
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
COC	chain-of-custody
CSA	CERCLA storage area
CWSU	CERCLA waste storage unit
DOE-ID	U.S. Department of Energy Idaho Operations Office
DOT	U.S. Department of Transportation
DQO	data quality objective
DR	decision rule
DS	decision statement
EPA	U.S. Environmental Protection Agency
FTL	field team leader
GDE	guide
GFPC	gas-flow proportional counting
HASP	Health and Safety Plan
HDPE	high-density polyethylene
IAG	interface agreement
ICP	Idaho Completion Project
ID	identification
IDAPA	Idaho Administrative Procedures Act
INEEL	Idaho National Engineering and Environmental Laboratory
LSC	liquid scintillation counting

MCL	maximum contaminant level
MCP	management control procedure
OU	operable unit
PBF	Power Burst Facility
PPE	personal protective equipment
PQL	practical quantitation limit
PSQ	principal study question
QA	quality assurance
QA/QC	quality assurance/quality control
QAPjP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
SAP	sampling and analysis plan
SL-1	Stationary Low-Power Reactor No. 1
SPERT	Special Power Excursion Reactor Test
SRPA	Snake River Plain Aquifer
TPR	technical procedure
VOC	volatile organic compound
WAC	waste acceptance criteria
WAG	waste area group
WGS	Waste Generator Services
WROC	Waste Reduction Operations Complex

Groundwater Monitoring Plan for Waste Area Group 5 Remedial Action

1. OVERVIEW

The Groundwater Monitoring Plan for the Idaho National Engineering and Environmental Laboratory (INEEL) Waste Area Group (WAG) 5 post-Record of Decision (ROD) monitoring effort is comprised of two parts:

- The Groundwater Monitoring Plan describing the sampling activities
- Quality Assurance Project Plan (QAPjP).

These plans have been prepared pursuant to the *National Oil and Hazardous Substances Contingency Plan* (U.S. Environmental Protection Agency [EPA] 1990), guidance from the EPA on the preparation of sampling and analysis plans (SAPs), and in accordance with Management Control Procedure (MCP) -9439, "Preparation for Environmental Sampling Activities at the INEEL." The Groundwater Monitoring Plan describes the field sampling activities that will be performed, while the QAPjP provides details on the processes and programs that will be used to ensure that the data generated are suitable for their intended uses. The governing QAPjP for this sampling effort will be the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Inactive Sites* (U.S. Department of Energy Idaho Operations Office [DOE-ID] 2002a). This document is incorporated herein by reference. Work control processes will follow formal practices in accordance with the communicated agreement between the appropriate site area directors and the Idaho Completion Project (ICP) project manager.

1.1 Groundwater Monitoring Plan

The purpose of this Groundwater Monitoring Plan is to guide the collection and analysis of samples required to support the groundwater monitoring efforts in accordance with the *Record of Decision for the Power Burst Facility and Auxiliary Reactor Area* (DOE-ID 2000a), hereinafter referred to as the ROD. In accordance with the ROD (DOE-ID 2000a), groundwater monitoring will be conducted to reduce the uncertainties associated with previous sampling efforts and to provide trend data to assess the possibility that an unidentified source of lead contamination is affecting the aquifer. Specifically, samples will be collected to monitor the Snake River Plain Aquifer (SRPA) underlying the WAG 5 site to confirm that surface contaminants at the sites have not adversely affected the groundwater.

Other components of the WAG 5 ROD (DOE-ID 2000a) include three remedial actions to mitigate the risks associated with seven specific sites. The first remedial action addresses a collection of five individual sites (Auxiliary Reactor Area [ARA] -01, ARA-12, ARA-23, ARA-25, and Power Burst Facility [PBF] -16) where contaminated soil is the only source medium. The second remedial action will mitigate residual contamination in a sanitary waste system (ARA-02). The principal threat identified in WAG 5, addressed by the third remedial action, is posed by the contents of an underground storage tank (ARA-16).

In addition, management of stored and investigation-derived waste and groundwater monitoring are components of the selected remedy. Sampling to determine compliance with the remedial action objectives for Phase I will be covered by the *Field Sampling Plan for the Waste Area Group 5 Remedial Action, Phase I* (DOE-ID 2000b). Phase II sampling is outlined in the *Field Sampling Plan for the Waste Area Group 5 Remedial Action, Phase II* (DOE-ID 2003).

1.1.1 Other Documentation

A Health and Safety Plan (HASP) has been prepared for this project. The HASP—*Health and Safety Plan for Operable Unit 5-12 Remedial Design/Remedial Action Projects* (INEEL 2003)—covers the activities associated with remediation of the remaining contaminated soil sites as well as activities associated with WAG 5 groundwater monitoring. The HASP includes an Auditable Safety Analysis in accordance with the *Hazard Classification for Remedial Activities at Eleven OU 5-12 Sites: ARA-01, ARA-02, ARA-07, ARA-08, ARA-12, ARA-13, ARA-16, ARA-21, ARA-23, ARA-25, and PBF-16* (INEEL 2000).

The "Interface Agreement between the Idaho Completion Project, Waste Area Group 5, Waste Area Group 10, and D&D&D and the Power Burst Facility/Waste Reduction Operations Complex" (Interface Agreement [IAG] -157) addresses activities related to the WAG 5 ROD (DOE-ID 2000a) and remedial design/remedial action, as carried out within the Power Burst Facility/Waste Reduction Operations Complex area. In addition, the "Interface Agreement between the Environmental Restoration Program, Waste Area Groups 4, 5, 10, and D&D&D and the Central Facilities Area" (IAG-156) is specific to activities carried out at ARA, which comes under the purview of the Central Facilities Area (CFA) site area director.

1.2 Project Organization and Responsibility

The organizational structure for this work reflects the resources and expertise required to plan and perform the work, while minimizing risks to worker health and safety. The project HASP (INEEL 2003) provides the job titles of the individuals who will be filling the key managerial roles and lines of responsibility and communication.

2. SITE BACKGROUND

2.1 Site Description

Located 51 km (32 mi) west of Idaho Falls, Idaho, the INEEL is a government-owned/contractor-operated facility managed by the DOE-ID (Figure 2-1). Occupying 2,305 km^2 (890 mi^2) of the northeastern portion of the Eastern Snake River Plain, the INEEL encompasses portions of five Idaho counties: (1) Butte, (2) Jefferson, (3) Bonneville, (4) Clark, and (5) Bingham.

Waste Area Group 5 is in the south-central portion of the INEEL and is comprised of ARA (Figure 2-2) and PBF (Figure 2-3). The ARA consists of four separate operational areas designated as ARA-I, ARA-II, ARA-III, and ARA-IV. Once known as the Special Power Excursion Reactor Test (SPERT) facilities, PBF consists of five separate operational areas: (1) the PBF Control Area, (2) the PBF Reactor Area (SPERT-I), (3) the Waste Engineering Development Facility (SPERT-II), (4) the Waste Experimental Reduction Facility (SPERT-III), and (5) the Mixed Waste Storage Facility (SPERT-IV). Collectively, the Waste Experimental Reduction Facility, Waste Engineering Development Facility, and the Mixed Waste Storage Facility are known as the Waste Reduction Operations Complex (WROC). The following section discusses the groundwater sampling required under this Groundwater Monitoring Plan.

2.2 Nature and Extent of Contamination

The nature and extent of groundwater contamination at WAG 5 were evaluated during the *Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (Holdren et al. 1999) through analysis of samples collected from eight groundwater monitoring wells and the SPERT-I production well. The PBF-MON-AQ-001, PBF-MON-AQ-003, PBF-MON-AQ-004, and PBF-MON-AQ-005 groundwater monitoring wells—abbreviated as PBF-001, PBF-003, PBF-004, and PBF-005, respectively—are located in the vicinity of the PBF. The ARA-MON-AQ-001, ARA-MON-AQ-002, ARA-MON-AQ-003A, and ARA-MON-AQ-004 groundwater monitoring wells—abbreviated as ARA-001, ARA-002, ARA-003A, and ARA-004, respectively—are located in the vicinity of the ARA facilities. Data from the April and July 1995 and the August 1997 sampling campaigns were used to describe the nature and extent of contamination. (Note: The PBF-004 and PBF-005 wells were not sampled in April and July 1995, and the SPERT-I production well was included in the August 1997 sampling.) Samples were analyzed for organic, inorganic, and radiological constituents. Analytical results from these sampling events and relevant standards are summarized for the three sampling campaigns in Tables 4-1, 4-2, and 4-3 of the *Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (Holdren et al. 1999). These analytical results are available in the administrative record.

The well locations and groundwater gradient in the WAG 5 area are shown in Figure 2-4. As part of the *Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (Holdren et al. 1999) and the WAG 5 hydraulic gradient evaluation, the WAG 5 groundwater monitoring network was reviewed to determine whether the well locations were suitable for assessing the nature and extent of groundwater contamination. A discussion concerning the evaluation of the hydraulic gradient is available in Section 2.2.4.3 of the *Final Work Plan for Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (DOE-ID 1997). Of particular concern was the potential for groundwater contamination from the Warm Waste Injection Well (PBF-05) and the Corrosive Waste Injection Well (PBF-15) at the PBF Reactor Area and the Stationary Low-Power Reactor No. 1 (SL-1) Burial Ground east of ARA-II. The review concluded that the ARA-MON-AQ-004 monitoring well is appropriately located for detecting potential groundwater contamination from the SL-1 Burial Ground. However, the network was not adequate for detecting potential contamination from the PBF injection wells. The PBF injection wells were vadose zone injection wells with discharge depths of 33.5 m (110 ft) and 35 m (116 ft), respectively—approximately 104 m (340 ft) above the water table. The

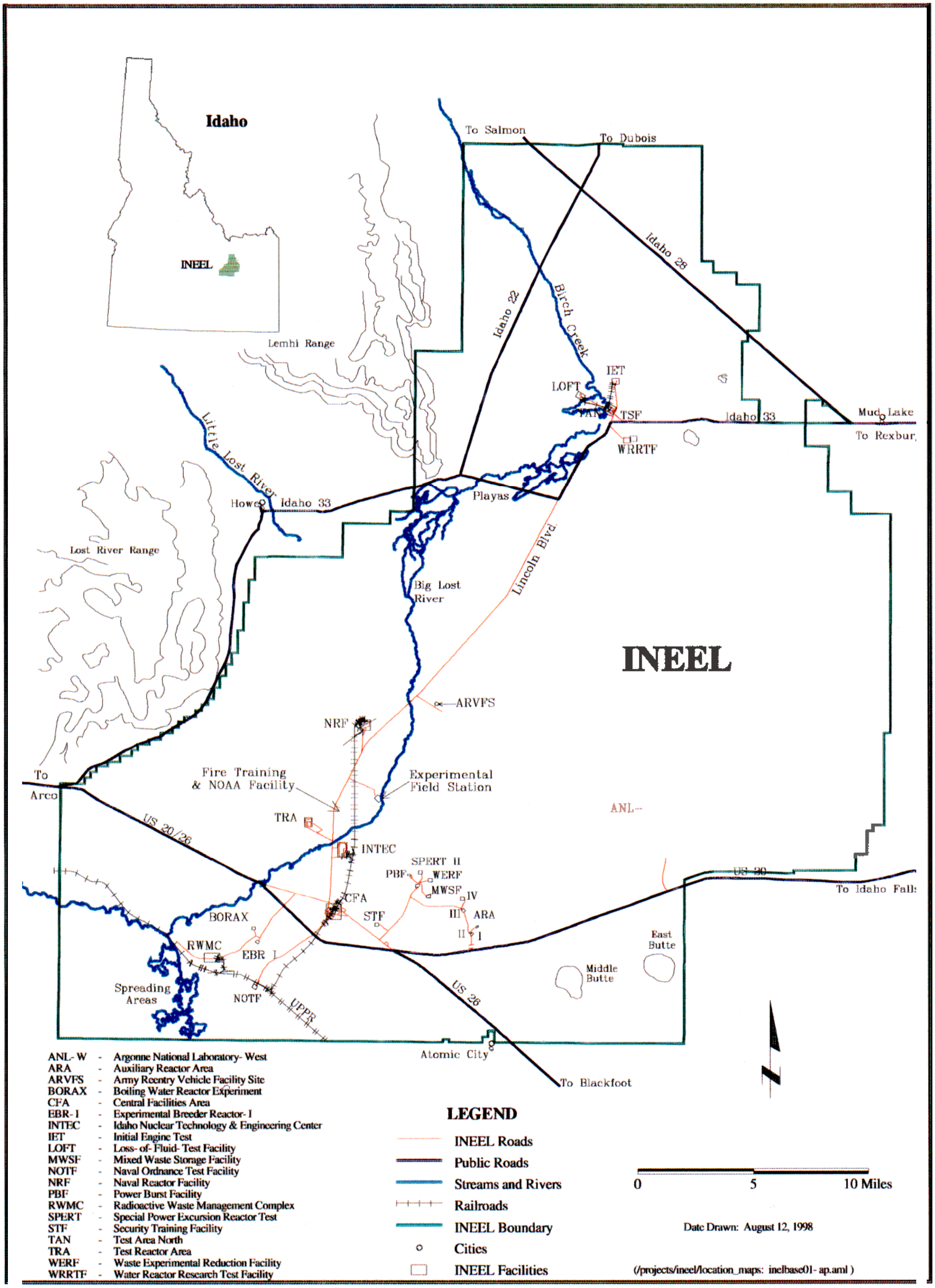

Figure 2-1. Idaho National Engineering and Environmental Laboratory.

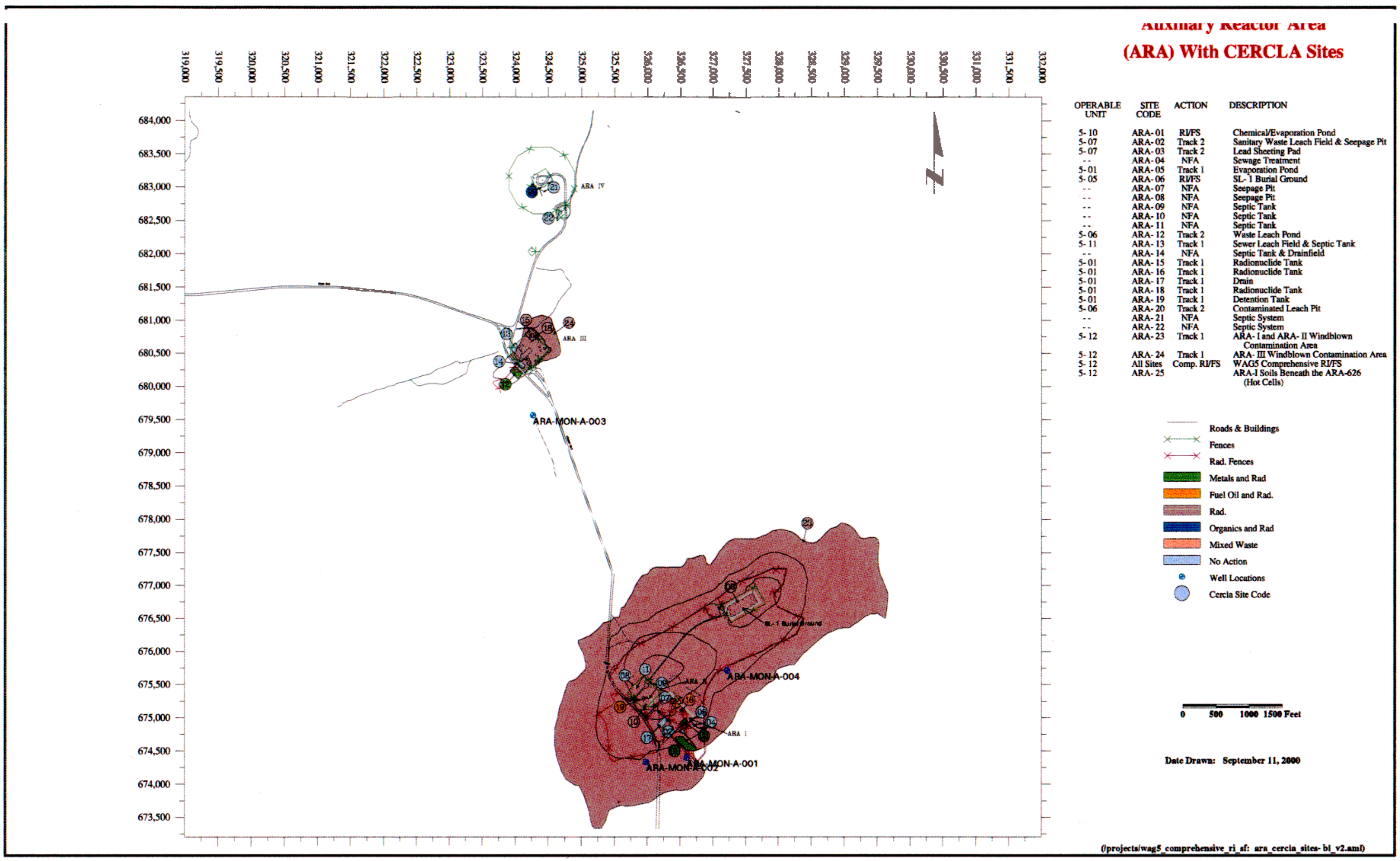

Figure 2-2. Auxiliary Reactor Area.

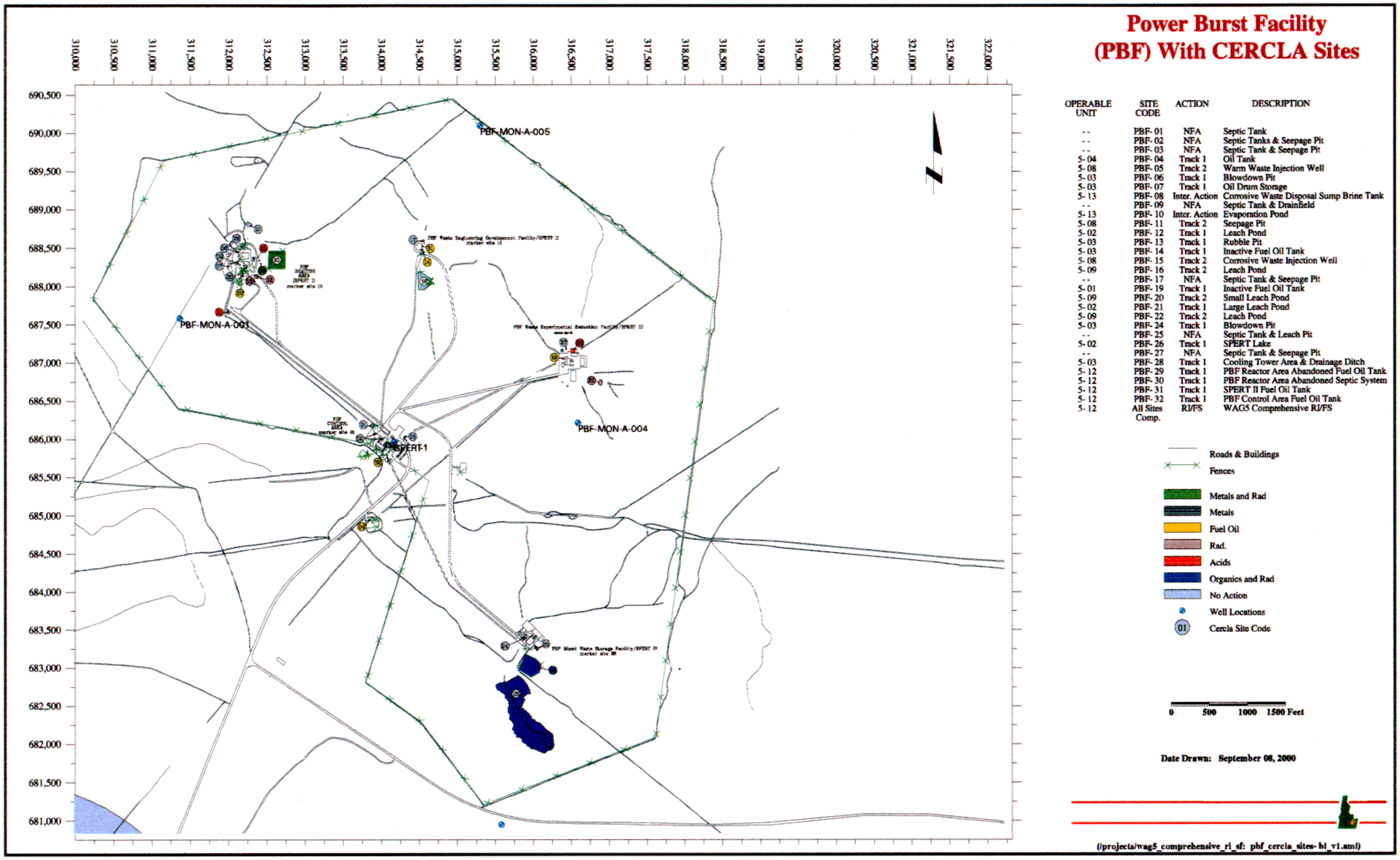

Figure 2-3. Power Burst Facility.

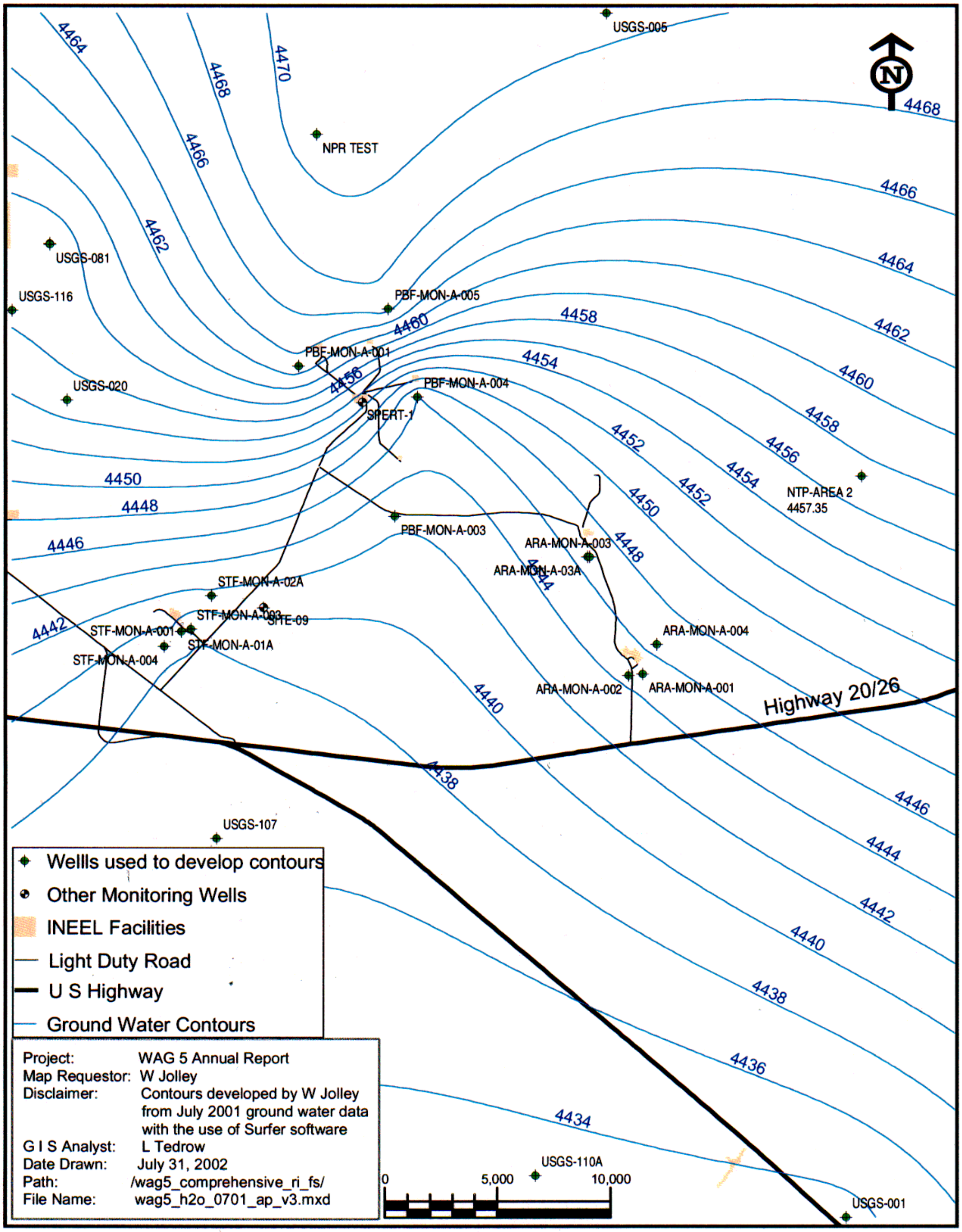

Figure 2-4. Well locations and groundwater gradient in the Waste Area Group 5 area.

PBF-MON-AQ-001 well was located based on the estimated regional gradient to monitor the effects of the shallow injection wells on the local groundwater. However, information obtained after the well was constructed indicated that the well is not downgradient from the PBF Reactor Area and is not an adequate monitoring point for the two injection wells. Another monitoring well, PBF-MON-AQ-003, is too distant to adequately monitor downgradient contamination from the injection wells. Therefore, the SPERT-I production well was incorporated into the monitoring network to aid in assessing the nature and extent of contamination. Based on review of the existing monitoring network, including the addition of the SPERT-I production well to the network, adequate coverage of the groundwater underlying WAG 5 will be provided.

The results from the groundwater sampling were compared against risk-based concentrations developed by the EPA (1997) and the State of Idaho (Fromm 1996), maximum contaminant levels (MCLs) (EPA 1996), and Idaho groundwater quality standards (Idaho Administrative Procedures Act [IDAPA] 58.01.11.200). Of the analyses performed, beryllium, iron, arsenic, and lead were detected in at least one groundwater sample at concentrations exceeding either the risk-based concentrations or MCL. As discussed in Section 4.3 of the *Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (Holdren et al. 1999), concentrations of these contaminants in the aquifer are not attributed to sources at WAG 5.

The results from three WAG 5 groundwater-sampling campaigns (i.e., April and July 1995 and August 1997) and output from GWSCREEN fate and transport modeling were interpreted in the *Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (Holdren et al. 1999). The detected and modeled concentrations of lead were compared to the 15-μg/L standard. Five wells in WAG 5 had at least one groundwater sample with detected lead concentrations exceeding 15 μg/L. The results of the GWSCREEN modeling indicate that the known concentrations of lead in WAG 5 soil are not causing elevated lead concentrations in the groundwater. This modeling, discussed in Section 5 of the *Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (Holdren et al. 1999), indicates that the maximum groundwater concentration from known WAG 5 lead sources is approximately 1 μg/L, with this estimated peak concentration predicted to occur at greater than 19,000 years in the future.

The most likely cause of the apparently elevated lead concentrations is related to sampling and analysis. Naturally occurring lead and well construction materials were felt not to be likely sources of lead in the aquifer. However, recent maintenance activities at several of the WAG 5 wells have shown evidence of severe galvanic corrosion occurring as a result of using dissimilar metals when the wells were originally constructed. The galvanized piping used to connect the pumps currently is being changed over to stainless steel. The galvanic corrosion could be a contributing factor to the elevated lead concentrations and, most certainly, the elevated iron concentrations.

Sample preparation, such as filtering and sample digestion, also can influence analytical results. The potential exists for particulate matter from the well to be included in the water sample. The occasional incorporation of particles into the groundwater samples may generate the few, relatively high lead results that occur amid a larger number of typically lower values. With a larger data set, the apparent outlier values could be discriminated from the bulk of the data. Furthermore, samples for lead analyses are digested, which means that the water sample is treated with a strong acid before analysis to ensure that all of the particulate matter is broken down. Sample digestion may be the cause of the occasional spikes of high lead concentrations in WAG 5 and INEEL data sets because particulates (either soil particles or flakes of well material) may occasionally be collected into the sample bottles. For that reason, future samples for lead analysis should be filtered.

Evaluation of the four contaminants determined that beryllium, iron, and arsenic did not pose an unacceptable risk. However, the detected and modeled concentrations of lead were compared to the 15-µg/L action level defined by the EPA (1996), with five wells in WAG 5 having at least one groundwater sample with detected lead concentrations exceeding this level. It is believed that the apparently elevated lead concentrations are attributed to sampling and analysis rather than actual contamination in the groundwater. To ensure that no activities at WAG 5, either historical or current, are contributing to these levels, a minimum of 5 years of monitoring data will be collected to assess whether there are any trends in the data that indicate otherwise.

The April 1995 sampling effort provided beryllium concentrations greater than the risk-based concentration of 0.02 µg/L, but below the MCL and Idaho groundwater quality standard of 4 µg/L. These results are questionable, because the beryllium concentrations in accompanying unfiltered samples from the same wells were all below the detection level of 0.7 µg/L. Typically, total or unfiltered metal results are expected to equal or exceed concurrently collected filtered samples. Furthermore, beryllium was not detected in the subsequent sampling of the same wells in July 1995.

Iron concentrations exceeded the Idaho groundwater quality standard for iron, based on aesthetics. Again, results have been inconsistent with a great possibility that galvanic corrosion has lead to the elevated concentrations. Given that the galvanized riser pipe will be replaced by stainless steel, future sampling rounds will help determine whether this was indeed the cause of higher iron levels.

Finally, arsenic also has been detected in groundwater samples from WAG 5 at concentrations exceeding the carcinogenic risk-based concentration of 0.05 µg/L, but below the noncarcinogenic risk-based concentration of 11 µg/L and the current MCL and Idaho standard of 50 µg/L. The arsenic concentrations are also below the new MCL and Idaho standard of 10 µg/L scheduled to take effect on January 23, 2006.

2.3 Project Description

Because the potential for groundwater contamination associated with sources within WAG 5 is low, groundwater monitoring was discontinued after 1997. This decision was based on data from the analysis of samples collected from eight wells in WAG 5 in 1995 and 1997 and the results of the groundwater modeling conducted in the *Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (Holdren et al. 1999). Surveillance monitoring of the groundwater beneath the PBF and ARA facilities resumed in 2000 as a component of the selected remedy for WAG 5, as specified in the ROD (DOE-ID 2000a). Groundwater monitoring is not required to satisfy WAG 5 remedial action objectives or cleanup goals, but is being conducted in accordance with the ROD (DOE-ID 2000a) to reduce the uncertainties associated with the previous sampling and to provide trend data to assess the possibility that an unidentified source of lead contamination is affecting the aquifer. Samples also are being collected for additional analyses beyond the lead to provide data in support of the 5-year review for WAG 5 and also in support of the Sitewide Monitoring Program that will come under the purview of long-term stewardship. Samples were collected within a year of the date of ROD signature and with sampling continuing on an annual basis at least until the first 5-year review for the ROD (DOE-ID 2000a) scheduled for the summer of 2005, when the need for continued groundwater monitoring will be assessed. In addition, additional groundwater elevation measurements are being collected on an annual basis to supplement the existing data and document groundwater flow directions and how the flow direction changes over time, if at all.

3. SAMPLING OBJECTIVES

This section identifies the data needs required for conducting the proposed sampling in support of the groundwater monitoring activities. Data needs and data quality objectives (DQOs) are defined in the following subsections.

3.1 Data Needs

Data needs have been determined through the evaluation of existing data and the projection of data requirements anticipated for analysis of samples collected during WAG 5 groundwater monitoring. Section 12.2 of the ROD (DOE-ID 2000a) requires a minimum of 5 years of groundwater monitoring to reduce the uncertainties associated with previous results obtained from the analysis of WAG 5 groundwater. The results from previous groundwater sampling and contaminants of potential concern for groundwater, derived from the *Site Screening for Waste Area Group 5* report (Holdren 1996), were evaluated in determining the required analyses to satisfy the DQOs. The DQOs have been developed following the process outlined in the *Guidance for the Data Quality Objectives Process* (EPA 1994).

3.1.1 Problem Statement

The objective of DQO Step 1 is to use relevant information to clearly and concisely state the problem to be resolved. There are two basic parts to the problem. First, groundwater-sampling results indicate that INEEL operations at WAG 5 may have impacted the SRPA, causing lead concentrations in groundwater that exceed the EPA action level and Idaho groundwater quality standard for lead of 15 µg/L (EPA 1996; IDAPA 58.01.11.200) to possibly occur in groundwater at WAG 5. Second, do present contaminants in WAG 5 soil adversely affect the aquifer such that EPA groundwater quality standards or risk-based concentrations will not be met? The problem statements associated with this DQO process step are:

- **Problem Statement 1—Lead Monitoring**: Reduce the uncertainties associated with whether lead concentrations in the aquifer underlying WAG 5 exceed the EPA action level.

- **Problem Statement 2—Groundwater Monitoring**: Reduce the uncertainty associated with whether present contaminants in WAG 5 soil will affect the aquifer such that EPA groundwater quality standards or risk-based concentrations will not be met.

3.1.2 Decision Identification

The goal of DQO Step 2 is to define the questions that the study will attempt to resolve and to identify the alternative actions that may be taken based on the outcome of the study. The study questions and their corresponding alternative actions then will be joined to form decision statements. The principal study questions (PSQs) for WAG 5 groundwater monitoring are as follows:

- PSQ #1—Do the lead concentrations present in the SRPA underlying the WAG 5 site exceed the EPA action level and Idaho groundwater quality standard for lead of 15 µg/L (EPA 1996; IDAPA 58.01.11.200)?

- PSQ #2—Does the trend of lead concentrations indicate the possibility that an unidentified source of lead contamination may be affecting the SRPA?

- PSQ #3—Are contaminants present in the SRPA underlying WAG 5 that may indicate the present contaminants in soils at WAG 5 are causing the EPA groundwater quality standards or risk-based concentrations to be exceeded?

- PSQ #4—If contaminants are present in the SRPA underlying WAG 5, is a trend apparent that indicates that EPA groundwater quality standards or risk-based concentrations may be exceeded at some point in the future?

- PSQ #5—If contaminants are present in the SRPA underlying WAG 5, what are the possible sources of contamination?

Alternative actions are those actions resulting from the resolution of the stated PSQs. The types of alternative actions considered would depend on the answers to the PSQs. Given the PSQs developed for WAG 5 groundwater monitoring, the associated decision statements (DSs) are as follows:

- DS #1—Determine whether lead concentrations present in the SRPA underlying the WAG 5 site exceed the EPA action level and Idaho groundwater quality standard for lead of 15 µg/L (EPA 1996; IDAPA 16.01.11.200)

- DS #2—Determine whether the trend of lead concentrations indicates the possibility that an unidentified source of lead contamination may be affecting the SRPA

- DS #3—Determine if other contaminants are present in the SRPA underlying WAG 5 that may indicate the present contaminants in soils at WAG 5 are causing the EPA groundwater quality standards or risk-based concentrations to be exceeded

- DS #4—Determine whether the trend of other contaminants (beyond the beryllium, iron, arsenic, and lead already identified) present in the SRPA underlying WAG 5 indicates that EPA groundwater quality standards or risk-based concentrations may be exceeded at some point in the future

- DS #5—Determine the direction of groundwater flow in order to identify possible sources of contamination should contaminants exceeding EPA groundwater quality standards or risk-based concentrations be detected in the SRPA.

3.1.3 Identify Inputs to the Decision

The purpose of DQO Step 3 is to identify the type of data needed to resolve each of the decision statements identified in DQO Step 2. These data already may exist or may be derived from computational or surveying/sampling and analysis methods. Analytical performance requirements (e.g., practical quantitation limits [PQLs], precision, and accuracy) also are provided in this step for any new data that will be collected.

3.1.3.1 Information Required to Resolve Decision Statements. Table 3-1 specifies the information (data) required to resolve each of the decision statements identified in Section 3.1.2 and identifies whether these data already exist. For the data that are identified as existing, the source references for the data have been provided with a qualitative assessment as to whether the data are of sufficient quality to resolve the corresponding decision statement. The qualitative assessment of the existing data was based on the evaluation of the corresponding quality control (QC) data (e.g., spikes, duplicates, and blanks), detection limits, data collection methods, etc.

Table 3-1. Required information and reference sources.

DS #	Measurement Variable	Required Data	Do Data Exist?	Source Reference	Sufficient Quality?	Additional Information Required?
1	Lead concentrations	Laboratory measurements of potential contaminants	Yes	RI/FS	No	Yes
2	Lead concentrations	Laboratory measurements of potential contaminants	No	—	—	Yes
3	Radiological activity and chemical concentrations	Laboratory measurements of potential contaminants	Yes	RI/FS	No	Yes
4	Radiological activity and chemical concentrations	Laboratory measurements of potential contaminants	No	—	—	Yes
5	Groundwater elevations	Field measurements of groundwater levels	Yes	RI/FS	No	Yes

DS = decision statement
RI/FS = remedial investigation/feasibility study

3.1.3.2 Basis for Setting the Action Level. The action level is the threshold value that provides the criterion for choosing between alternative actions. For Decision Statements 1 and 2, the potential contaminant is lead. For Decision Statements 3 and 4, the potential contaminants include volatile organic compounds (VOCs), metals, anions, and radionuclides. For Decision Statement 5, groundwater elevation measurements will be collected to determine the SRPA flow in the vicinity of WAG 5. For Decision Statements 1 through 4, the bases for setting the actions levels for the contaminants are the EPA drinking water standards and the risk-based concentration tables obtained from EPA Region III (EPA 2000) and the State of Idaho (Fromm 1996). The numerical values for the action levels are provided in DQO Step 5.

3.1.3.3 Computational and Survey/Analytical Methods. Table 3-2 identifies the decision statements where existing data either do not exist or are of insufficient quality to resolve the decision statements. For these decision statements, Table 3-2 presents computational and/or surveying/sampling methods that could be used to obtain the required data. For Decision Statements 1 and 3, analytical data will be collected to determine the concentrations of contaminants in the SRPA underlying WAG 5. For Decision Statements 2 and 4, the statistical trend of the contaminants will be determined to ascertain whether the potential exists for exceeding specified action levels in the future. In addition, for Decision Statement 5, water elevations will be measured for evaluation of groundwater elevation contours and flow direction.

Table 3-2. Information required for resolution of decision statements.

DS #	Measurement Variable	Required Data	Computational Methods	Survey/Analytical Methods
1	Lead	Lead concentrations in groundwater	Compare lead concentrations to regulatory levels.	Analytical laboratory determination of lead concentrations in groundwater
2	Lead	Lead concentrations in groundwater	Obtain statistical trend of lead concentrations over time.	Analytical laboratory determination of lead concentrations in groundwater
3	Radiochemical and chemical	Radiochemical and chemical concentrations in groundwater	Compare radiochemical and chemical concentrations to regulatory levels.	Analytical laboratory determination of radiochemical and chemical concentrations in groundwater
4	Radiochemical and chemical	Radiochemical and chemical concentrations in groundwater	Obtain statistical trend of radiochemical and chemical concentrations over time.	Analytical laboratory determination of radiochemical and chemical concentrations in groundwater
5	Water levels	Groundwater elevations	Flow direction over time.	Field measurements of groundwater levels

DS = decision statement

3.1.3.4 Analytical Performance Requirements. Table 3-3 defines the analytical performance requirements for the data that need to be collected to resolve each of the decision statements. These performance requirements include PQL, precision, and accuracy requirements for each of the potential contaminants.

3.1.4 Study Boundaries

The primary objective of DQO Step 4 is to identify the population of interest, define the spatial and temporal boundaries that apply to each decision statement, define the scale of decision-making, and identify any practical constraints (hindrances or obstacles) that must be taken into consideration in the sampling design. Implementing this step ensures that the sampling design will result in the collection of data that accurately reflect the true condition of the site under investigation.

3.1.4.1 Geographic Boundaries. Limiting the geographic boundaries of the study area ensures that the investigation does not expand beyond the original scope of the task. This study will focus on the SRPA beneath WAG 5. Based on review of the hydraulic data and groundwater contour maps, the selected wells will allow for evaluation of the potential migration of groundwater contaminants.

3.1.4.2 Temporal Boundaries. The temporal boundary refers to the timeframe to which each decision statement applies (e.g., number of years) and when (e.g., season, time of day, and weather conditions) the data should optimally be collected. Temporal boundaries are important when contaminant concentration changes over time are significant. Though historical data collected at other sites at the INEEL indicate that contaminant concentrations are unaffected by seasonal factors, WAG 5 groundwater-

Table 3-3. Analytical performance requirements.

DS #	Analyte List	Survey/ Analytical Method	Preliminary Action Level	PQL	Precision Requirement	Accuracy Requirement
1, 2	Lead	SW-846	EPA and IDAPA regulatory levels	See QAPjP	± 30%	70–130
3, 4	VOCs	SW-846	EPA and IDAPA regulatory levels	See QAPjP	± 30%	70–130
	Metals	SW-846				
	Anions	EPA-300.0				
	Tritium	LSC				
	I-129	LSC or GFPC				
	Alpha emitters	Gross alpha				
	Beta emitters	Gross beta				
	Gamma emitters	Gamma spec.				
	Alpha isotopes	Alpha spec.				
	Sr-90	GFPC				
	Tc-99	GFPC				
5	Groundwater elevations	Measuring tape	N/A	N/A	± 0.1 ft	N/A

DS = decision statement
EPA = U.S. Environmental Protection Agency
GFPC = gas-flow proportional counting
IDAPA = Idaho Administrative Procedures Act
LSC = liquid scintillation counting
N/A = not applicable
PQL = practical quantitation limit
QAPjP = Quality Assurance Project Plan
VOC = volatile organic compound

monitoring samples will be collected at approximately the same time of year (i.e., October/November timeframe). This will be done in an effort to negate any effect that changes in groundwater levels due to snow melt and run-off may have on the data collected. Samples will be collected annually at least until the first 5-year review. At that time, groundwater monitoring data will be reviewed with the Agencies, and a determination will be made as to whether the data warrant continuation of the annual sampling. The modeling results discussed in Section 2.2 indicate that a peak lead concentration of 1 μg/L would occur at greater than 19,000 years in the future. Given this long timeframe and the recent evidence of galvanic corrosion occurring in the WAG 5 wells, 5 years of monitoring should suffice to draw conclusions as to the future trend of any contaminants. As previously stated, the need for continued monitoring will be addressed during the first 5-year review scheduled for the summer of 2005. Given that sufficient data are collected to demonstrate that lead levels are constant or decreasing and that no other contaminants pose a potential threat to the groundwater, the monitoring frequency may be modified or discontinued.

3.1.4.3 Scale of Decision-Making. The scale of decision-making is defined by joining the population of interest and the geographic and temporal boundaries of the area under investigation. For WAG 5 groundwater monitoring, the scale of decision-making is the same as the geographic boundary defined in Section 3.1.4.1.

3.1.4.4 Practical Constraints. Practical constraints may include physical barriers, difficult sample matrices, high radiation areas, or any other condition that will need to be taken into consideration in the design and scheduling of the sampling program. For WAG 5 groundwater monitoring, there are no practical constraints to be considered.

3.1.5 Develop a Decision Rule

The purpose of DQO Step 5 initially is to define the statistical parameter of interest (i.e., mean, 95% upper confidence level) that will be used for comparison against the action level. Table 3-4 summarizes the decision rules (DRs) for the five decision statements provided in Section 3.1.2. These decision rules summarize the attributes the decision-maker needs to know about the sample population and how this knowledge will guide the selection of a course of action to solve the problem.

3.1.6 Decision Error Limits

Because analytical data can only estimate the true condition of the site under investigation, decisions that are made based on measurement data could potentially be in error (i.e., decision error). For this reason, the primary objective of DQO Step 6 is to determine which decision statements (if any) require a statistically based sample design. The purpose of determining the decision error limits is to specify the decision-maker's tolerable limits on decision errors, which are used to establish performance goals for the data collection design.

Tolerable error limits assist in the development of sampling designs to ensure that the spatial variability and sampling frequency are within specified limits. However, the sampling design for the WAG 5 groundwater monitoring is determined by the current monitoring wells' locations. The selection of these wells is based on professional judgment rather than statistics. Therefore, error limits are not used to determine sampling locations or frequency.

For those decision statements to be resolved using a nonstatistical design (i.e., Decision Statements 1, 3, and 5), there is no need to define the "gray region" or the tolerable limits on the decision error, since these only apply to statistical designs. While a statistical sampling design is not applicable to trend analysis as required for resolution of Decision Statements 2 and 4, a level of significance needs to be established over which it can be determined whether a significant trend does exist. For the WAG 5 groundwater monitoring, a 95% significance level will be used to determine whether a trend in the data exists. Given the level of significance, the following null hypothesis was developed:

Null Hypothesis—A significant positive trend in the data exists.

3.1.7 Optimize the Design

The objective of DQO Step 7 is to present alternative data collection designs that meet the minimum data quality requirements, as specified in DQO Steps 1 through 6. Then, a selection process is used to identify the most resource-effective data collection design that satisfies all of the data quality requirements.

Table 3-4. Decision rules.

DS #	DR #	Decision Rule
1	1	If the concentration for a well sample exceeds the defined regulatory level for lead, then appropriate notifications will be made to the Agencies with monitoring continuing until the first 5-year review.
2	2	If the statistical trend for lead in any wells indicates that defined regulatory levels may be exceeded at some point in the future, then monitoring may be continued after the first 5-year review, as determined by concurrence with the Agencies. At that time, it will be determined whether more aggressive action may be necessary with concurrence of the Agencies. Conversely, if the trend indicates that regulatory levels will not be exceeded, then the monitoring frequency may be modified or discontinued.
3	3	If the concentrations for a well sample exceed the defined regulatory level for any radiochemical or chemical analyte, then appropriate notifications will be made to the Agencies with monitoring continuing until the first 5-year review.
4	4	If the statistical trend for a radiochemical or chemical analyte in any wells indicates that defined regulatory levels may be exceeded at some point in the future, then monitoring may be continued after the first 5-year review, as determined by concurrence with the Agencies. At that time, it will be determined whether more aggressive action may be necessary with concurrence of the Agencies. Conversely, if the trend indicates that regulatory levels will not be exceeded, then the monitoring frequency may be modified or discontinued.
5	5	If the statistical trend for a radiochemical or chemical analyte in any wells indicates that defined regulatory levels may be exceeded at some point in the future, then monitoring and groundwater elevation measurements may be continued after the first 5-year review, as determined by concurrence with the Agencies. Conversely, if the trend indicates regulatory levels will not be exceeded, the monitoring frequency may be modified or discontinued.

DR = decision rule
DS = decision statement

The following subsections present the selected technology and sampling methods for resolving each decision statement, along with a summary of the proposed implementation design. The basis for the selected implementation design also is provided.

3.1.7.1 Groundwater Monitoring. Monitoring will be performed from groundwater monitoring wells on an annual basis. Samples will be sent to off-Site laboratories for analysis with full quality assurance/quality control (QA/QC) protocols. Field measurements will be used to determine groundwater elevations. Monitoring will be continued as a minimum up to the time of the first 5-year review, which is scheduled for the summer of 2005.

3.1.7.2 Trend Analysis. Various statistical tests exist to determine whether a significant temporal trend exists in a given data set. For simple linear regression, the statistical test of whether the slope is significantly different from zero is equivalent to testing if the correlation coefficient is significantly different from zero. To perform the test, the correlation coefficient is first calculated (Equation 3-1). This correlation coefficient is then used to calculate the t-statistic (Equation 3-2), which is then compared to the critical value for $t_{1-\alpha/2}$ to determine whether there is a significant correlation between the two variables (in this case, an analyte's concentration versus time). Historical and current data sets will be combined to perform the trend analysis.

$$r = \frac{\sum_{i=1}^{n} X_i Y_i - \frac{\sum_{i=1}^{n} X_i \sum_{i=1}^{n} Y_i}{n}}{\left(\left(\sum_{i=1}^{n} X_i^2 - \frac{\left(\sum_{i=1}^{n} X_i\right)^2}{n}\right)\left(\sum_{i=1}^{n} Y_i^2 - \frac{\left(\sum_{i=1}^{n} Y_i\right)^2}{n}\right)\right)^{1/2}} \qquad (3\text{-}1)$$

where

r	=	correlation coefficient for a given analyte
X_i	=	the year of sample collection
Y_i	=	individual concentrations for a given analyte.

$$t = \frac{r}{\sqrt{\frac{1-r^2}{n-2}}} \qquad (3\text{-}2)$$

where

t	=	the calculated t-test statistic
r	=	correlation coefficient for a given analyte calculated in Equation 3-1
n	=	the number of data points.

If the calculated t is greater than $t_{n-2,\,1-\alpha}$ as obtained from a table of statistical t-values, then the null hypothesis is rejected and it can be concluded that there is no significant positive statistical trend in the data. Conversely, if the câlculated t is less than $t_{n-2,\,1-\alpha}$ as obtained from a table of statistical t-values, then the null hypothesis is not rejected and it can be concluded that there is a significant positive statistical trend in the data.

3.2 Quality Assurance Objectives for Measurement

The quality assurance (QA) objectives for measurement will meet or surpass the minimum requirements for data quality indicators established in the QAPjP (DOE-ID 2002a). This reference provides minimum requirements for the following measurement quality indicators: precision, accuracy, representativeness, completeness, and comparability. Precision, accuracy, and completeness will be calculated in accordance with the QAPjP (DOE-ID 2002a).

3.2.1 Precision

Precision is a measure of the reproducibility of measurements under a given set of conditions. In the field, precision is affected by sample collection procedures and by the natural heterogeneity encountered in the environment. Overall precision (field and laboratory) can be evaluated by the use of duplicate samples collected in the field. Greater precision typically is required for analytes with very low action levels that are close to background concentrations.

Laboratory precision will be based on the use of laboratory-generated duplicate samples or matrix spike/matrix spike duplicate samples. Evaluation of laboratory precision will be performed during the method data validation process.

Field precision will be based on the analysis of collected field duplicate or split samples. For samples collected for laboratory analyses, a field duplicate will be collected at a minimum frequency of one in 20 environmental samples.

3.2.2 Accuracy

Accuracy is a measure of bias in a measurement system. Laboratory accuracy is demonstrated using laboratory control samples, blind QC samples, and matrix spikes. Evaluation of laboratory accuracy will be performed during the method data validation process. Sample handling, field contamination, and the sample matrix in the field affect overall accuracy. By evaluating results from field blanks, trip blanks, and equipment rinsates, false positive or high-biased sample results will be assessed.

Field accuracy will only be determined for samples collected for laboratory analysis. The field screening instrumentation can only analyze the soil and is not set up for the analysis of water samples. Therefore, accuracy of field instrumentation will be ensured through the use of appropriate calibration procedures and standards.

3.2.3 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which the sampling and analysis data accurately and precisely represent the characteristic of a population parameter being measured at a given sampling point or for a process or environmental condition. Representativeness will be evaluated by determining whether measurements are made and physical samples are collected in such a manner that the resulting data appropriately measure the media and phenomenon measured or studied. The comparison of all field and laboratory analytical data sets obtained throughout this remedial action will be used to ensure representativeness.

3.2.4 Detection Limits

Detection limits will meet or exceed the risk-based or decision-based concentrations for the contaminants of concern. Detection limits will be as specified in the Sample and Analysis Management (formerly the Sample Management Office) laboratory Master Task Agreement Statements of Work, Task Order Statements of Work, and as described in the QAPjP (DOE-ID 2002a).

3.2.5 Completeness

Completeness is a measure of the quantity of usable data collected during the field sampling activities. The QAPjP (DOE-ID 2002a) requires that an overall completeness goal of 90% be achieved for noncritical samples. If critical parameters or samples are identified, a 100% completeness goal is specified. Critical data points are those sample locations or parameters for which valid data must be obtained in order for the sampling event to be considered complete. Given that this is a monitoring project, all field screening and laboratory data will be considered noncritical with a 90% completeness goal.

3.2.6 Comparability

Comparability is a qualitative characteristic that refers to the confidence with which one data set can be compared to another. At a minimum, comparable data must be obtained using unbiased sampling designs. If sampling designs are not unbiased, the reasons for selecting another design should be well documented. Data comparability will be assessed through the comparison of all data sets collected during this study for the following parameters:

- Data sets will contain the same variables of interest
- Units will be expressed in common metrics
- Similar analytical procedures and QA will be used to collect data
- Time of measurements of variables will be similar
- Measuring devices will have similar detection limits
- Samples within data sets will be selected in a similar manner
- Number of observations will be of the same order of magnitude.

3.2.7 Data Validation

Method data validation is the process whereby analytical data are reviewed against set criteria to ensure that the results conform to the requirements of the analytical method and any other specified requirements.

All laboratory-generated analytical data will be validated to Level B in accordance with INEEL Guide (GDE) -7003, "Levels of Analytical Method Data Validation." Field-generated data will not be validated. Quality of the field-generated data will be ensured through adherence to established operating procedures and use of equipment calibration, as appropriate.

4. SAMPLING LOCATION AND FREQUENCY

The material presented in this section is intended to support the DQOs summarized in Section 3.

4.1 Quality Assurance/Quality Control Samples

The QA samples will be included to satisfy the QA requirements for the field operations in accordance with the QAPjP (DOE-ID 2002a). The duplicate, blank, and calibration QA/QC samples will be analyzed, as outlined in Section 3.

4.2 Sampling Frequency

Each of the wells will be sampled on an annual basis until the first 5-year review for the ROD (DOE-ID 2000a) in the summer of 2005. Based on the results of the 5-year review, the DOE-ID, EPA, and Idaho Department of Environmental Quality will determine whether continued groundwater monitoring will be required at WAG 5.

4.3 Sampling Locations

Based on review of the hydraulic data and groundwater contour map (Figure 2-4) during the *Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (Holdren et al. 1999), it was determined that a sufficient number of wells were installed to allow evaluation of the potential migration of groundwater contaminants. Of particular concern was the area downgradient of the PBF corrosive waste and warm-waste shallow injection wells. In review of the contour map, it appears that the SPERT-I production well is located downgradient of the injection wells and will provide relatively near-source data regarding the impact these disposal wells have on water quality beneath WAG 5. The monitoring wells underlying PBF along with those located at PBF are interspersed throughout the areas across the gradient, providing adequate coverage of the SRPA underlying WAG 5. Table 4-1 provides a summary of the well construction details for each well.

Table 4-1. Summary of well information for Waste Area Group 5 groundwater monitoring wells.

Well Name	Total Depth (ft)	Monitoring Point Elevation (ft)	Screened Interval(s) Below Land Surface (ft)	Screen Type
ARA-Mon-A-001	650	5,037.00	620–640	Wire-wrapped
ARA-Mon-A-002	629	5,039.90	600–620	Wire-wrapped
ARA-Mon-A-03A	655	5,052.70	624–644	Wire-wrapped
ARA-Mon-A-004	665	6,057.00	625–645	Wire-wrapped
PBF-Mon-A-001	495	4,908.17	454–484	Wire-wrapped
PBF-Mon-A-003	605	4,961.13	545–575	Wire-wrapped
PBF-Mon-A-004	545	4,942.42	522–542	Wire-wrapped
PBF-Mon-A-005	545	4,977.98	516–536	Wire-wrapped
SPERT-I	653	N/A	482–492	Perforated
			522–542	Perforated
			552–582	Perforated
			597–617	Perforated
			632–652	Perforated

ARA = Auxiliary Reactor Area
N/A = not applicable
PBF = Power Burst Facility
SPERT = Special Power Excursion Reactor Test

5. SAMPLING DESIGNATION

5.1 Sample Identification Code

A systematic character identification (ID) code will be used to uniquely identify all laboratory samples. Uniqueness is required for maintaining consistency and preventing the same ID code from being assigned to more than one sample.

The first designator of the code, **5**, refers to the sample originating from WAG 5. The second and third designators, **GM**, refer to the sample being collected in support of the groundwater monitoring. The fourth character designates the year during which sample collection will occur (0 for 2000, 1 for 2001, etc.). The next two numbers designate the sequential sample number for the project. A two-character set (i.e., 01, 02) then will be used to designate field duplicate samples. The last two characters refer to a particular analysis and bottle type. Refer to the SAP tables in Appendix A for specific bottle code designations.

For example, a groundwater monitoring sample collected in support of determining the metal concentrations of a target analyte list might be designated as 5GM00101LA, where (from left to right):

- **5** designates the sample as originating from WAG 5
- **GM** designates the sample as being collected in support of the groundwater monitoring
- **0** designates the sample as being collected during the year 2000
- **01** designates the sequential sample number
- **01** designates the type of sample (01 = original, 02 = field duplicate)
- **LA** designates metals target analyte list analysis.

A SAP table/database will be used to record all pertinent information associated with each sample ID code.

5.2 Sampling and Analysis Plan Table/Database

5.2.1 Sampling and Analysis Plan Table

A SAP table format was developed to simplify the presentation of the sampling scheme for project personnel. The following sections describe the information recorded in the SAP table/database, which is presented in Appendix A.

5.2.2 Sample Description

The sample description fields contain information relating to individual sample characteristics.

5.2.2.1 Sampling Activity. The sampling activity field contains the first six characters of the assigned sample number. The sample number in its entirety will be used to link information from other sources (field data, analytical data, etc.) to the information in the SAP table for data reporting, sample tracking, and completeness reporting. The analytical laboratory also will use the sample number to track and report analytical results.

5.2.2.2 Sample Type. Data in this field will be selected from the following:

REG	for a regular sample
QC	for a QC sample.

5.2.2.3 Media. Data in this field will be selected from the following:

GW	for groundwater samples
WATER	for QA/QC water samples.

5.2.2.4 Collection Type. Data in this field will be selected from the following:

GRAB	for grab sample collection
RNST	for rinsate QA/QC samples
DUP	for field duplicate samples
FBLK	for field blank QA/QC samples
TBLK	for trip blank QA/QC samples.

5.2.2.5 Planned Date. This date is related to the planned sample collection start date.

5.2.3 Sample Location Fields

This group of fields pinpoints the exact location for the sample in three-dimensional space, starting with the general AREA, narrowing the focus to an exact location geographically, and then specifying the DEPTH in the depth field.

5.2.3.1 Area. The AREA field identifies the general sample collection area. This field should contain the standard identifier for the INEEL area being sampled. For this investigation, samples are being collected from the ARA and PBF sites, and the AREA field identifier will correspond to one of those two sites.

5.2.3.2 Location. The LOCATION field may contain geographical coordinates, x-y coordinates, building numbers, or other location-identifying details, as well as program-specific information such as borehole or well number. Data in this field normally will be subordinated to the AREA. This information is included on the labels generated by Sample and Analysis Management (formerly the Sample Management Office) to aid sampling personnel.

5.2.3.3 Type of Location. The TYPE OF LOCATION field supplies descriptive information concerning the exact sample location. Information in this field may overlap that in the location field, but it is intended to add detail to the location.

5.2.3.4 Depth. The DEPTH of a sample location is the distance in feet from surface level or a range in feet from the surface.

5.2.4 Analysis Types

5.2.4.1 AT1–AT20. These fields indicate analysis types (radiological, chemical, hydrological, etc.). Space is provided at the bottom of the form to clearly identify each type. A standard abbreviation also will be provided, if possible.

6. SAMPLING PROCEDURES AND EQUIPMENT

The following sections describe the sampling procedures and equipment to be used for the planned sampling and analyses described in this Groundwater Monitoring Plan. A prejob briefing will be held before commencement of any sampling activities to review the requirements of the Groundwater Monitoring Plan and the project HASP (INEEL 2003) and to ensure that all supporting documentation has been completed.

6.1 Sampling Requirements

Requirements for the WAG 5 groundwater monitoring sampling are outlined below.

6.1.1 Groundwater Elevations

Groundwater elevations will be measured using either an electronic measuring tape or a steel tape measure, as described in Technical Procedure (TPR) -6566, "Measuring Groundwater Levels," or its equivalent. In order to mitigate the effects on the measurement of groundwater elevations caused by fluctuations due to barometric pressure and seasonal variances, all groundwater elevation measurements will be collected within a 24-hour period.

6.1.2 Well Purging

With the exception of the SPERT-I production well, all wells will be purged before sample collection using either the dedicated well pumps or a submersible pump. During the purging operation, a Hydrolab or equivalent will be used to measure specific conductance, pH, dissolved oxygen, temperature, and oxidation-reduction potential. Before a sample for water quality analysis can be collected, three consecutive Hydrolab readings must be within the following limits:

- pH: ± 0.1
- Temperature: ± 0.5°C
- Specific conductance: ± 1% of the reading

Table 6-1 provides relevant information for purging three well casing volumes, as described in TPR-6570, "Sampling Groundwater." The as-built well diagrams are provided in Appendix B.

6.1.3 Groundwater Sampling

Before sampling, all nondedicated sampling equipment that comes in contact with the sample water will be cleaned following the procedures outlined in TPR-6575, "Decontaminating Sample Equipment in the Field."

Sampling of the SPERT-I production well will need to be coordinated with the facility manager, because the well pump does not run continuously. Sampling will need to be performed when the facility is using the well. Sampling will occur at the wellhead after the pump has been operating for a minimum of 1 hour. No purging of the well will be necessary. It should be noted that the SPERT-I production well might produce somewhat skewed data because of its long, perforated screened intervals and much higher pumping rate.

Table 6-1. Well and purge volume information for the standard purge method.

Well	Casing Radius (in.)	Depth to Water in Casing (ft)[a]	Well Depth (ft)	Estimated Purge Volume (gal)[b]
ARA-Mon-A-001	2.5	592	650	295
ARA-Mon-A-002	2.5	595	629	173
ARA-Mon-A-03A	2.5	605	655	255
ARA-Mon-A-004	2.5	620	665	229
PBF-Mon-A-001	2.5	448	495	239
PBF-Mon-A-003	2.5	519	605	438
PBF-Mon-A-004	2.5	497	545	244
SPERT-I	7.0	456	653	N/A[c]
PBF-Mon-A-005	2.5	514	545	158

a. Water depths are based upon the average of measurements made in 1996 and 1997.

b. Purge volume is calculated in accordance with TPR-6570, "Sampling Groundwater," for a maximum of five well volumes.

c. The SPERT-I production well will not require purging, as the well will be in continuous use when sampling.

ARA = Auxiliary Reactor Area
PBF = Power Burst Facility
SPERT = Special Power Excursion Reactor Test
TPR = technical procedure

All WAG 5 wells have a dedicated pump. These wells will have the water level measured and samples collected from a sampling port on the existing well pump following purging and stabilization of the purge parameters. Each well will be purged a minimum of three well-casing volumes with purging continued until the pH, temperature, specific conductance, and oxidation-reduction potential of the purge water have stabilized or until five well-casing volumes have been removed. If parameters are still not stable after five volumes have been removed, samples will be collected and appropriate notations will be recorded in the logbook. All selected wells will be sampled for VOCs, metals, anions, tritium, I-129, gross alpha/beta, and gamma spectroscopic analyses. Samples for metals analysis will be filtered through a 0.45-um filter prior to preservation and placement in the laboratory sample container. If the gross alpha concentration for any well sample exceeds 5 pCi/L, samples from that well will also be analyzed for plutonium and uranium isotopes, as well as Am-241. Likewise, should the gross beta concentration for any well sample exceed 5 pCi/L, samples from that well will also be analyzed for Sr-90 and Tc-99. The requirements for containers, preservation methods, sample volumes, and holding times for the applicable analyses are provided in Table 6-2.

Sample bottles for liquid inorganic analyses will be filled to approximately 90 to 95% of capacity to allow for content expansion or preservation. A separate aliquot of the same volume for VOC samples will be collected to determine the correct amount of preservative and will be tested for pH. The 40-mL glass volatile organic analysis vials will be filled completely with no headspace or air bubbles. Sulfuric acid (H_2SO_4) preservative will be introduced into the volatile organic analysis vials before sample collection.

Table 6-2. Specific sample requirements.

Analytical Parameter	Container Size	Container Type	Preservative	Analytical Method	Holding Time
VOCs	3 × 40 mL	Amber glass vials	4°C, H_2SO_4 to pH<2	SW-846 8260B	14 days
Metals	1,800 mL	HDPE	HNO_3 to pH<2	ILM-04.0	6 months, 28 days for Hg
Anions	500 mL	HDPE	4°C	EPA-300.0	48 hrs for NO_2, NO_3 and PO_4, 28 days for all others
Tritium	125 mL	HDPE	None	LSC	6 months
I-129	1,000 mL	Amber glass	None	LSC or GFPC	6 months
Gross alpha/beta	1,000 mL	HDPE	HNO_3 to pH<2	GFPC	6 months
Gamma spec.	1,800 mL	HDPE	HNO_3 to pH<2	Gamma spec.	6 months
Alpha isotopes	2,000 mL	HDPE	HNO_3 to pH<2	Alpha spec.	6 months
U isotopes					
Pu isotopes					
Am-241					
Sr-90/Tc-99	2,000 mL	HDPE	HNO_3 to pH<2	GFPC	6 months

GFPC = gas-flow proportional counting
HDPE = high-density polyethylene
LSC = liquid scintillation counting
VOC = volatile organic compound

6.1.4 Shipping Screening

All samples destined for off-Site laboratory analysis will be submitted to the Radiation Measurements Laboratory located at the Test Reactor Area at the INEEL for a 20-minute gamma screen before shipment. Gamma screening can be done using the same sample as that obtained for gamma spectroscopic analysis, if such a sample is collected and is in the proper container. For those sites where the radionuclide contamination is fairly well characterized or nonexistent, radiological control screening methods will suffice for shipping.

6.2 Handling and Disposition of Remediation Waste

Remediation waste will be generated during the sampling activities, as described herein. The disposition and handling of waste for this project will be consistent with the *Waste Certification Plan for the Environmental Restoration Program* (Jones 1997). Samples will be handled in accordance with MCP-3480, "Environmental Instructions for Facilities, Processes, Materials, and Equipment." All waste streams generated from the sampling activity will be characterized in accordance with MCP-62, "Waste

Generator Services—Low-Level Waste Management," and will be handled, stored, and disposed of accordingly.

Waste will be generated as a result of the sampling activities conducted during this project. Types of waste expected to be generated include the following:

- Personal protective equipment (PPE)
- Purge water
- Liquid decontamination residue
- Solid decontamination residue
- Plastic sheeting
- Unused/unaltered sample material
- Sample containers
- Miscellaneous waste types
- Contaminated equipment.

Waste may be hazardous. As sampling continues, additional waste streams may be identified. All new waste streams, as well as those identified above, are required to have the waste identified and characterized. A hazardous waste determination must be completed and presented to the appropriate waste management organization (e.g., Waste Generator Services [WGS]) for approval by that organization at the time of generation.

The waste associated with the sampling activities will be managed in a manner that complies with the established applicable or relevant and appropriate requirements (ARARs), protects human health and the environment, and achieves minimization of remediation waste to the extent possible. The ARARs applicable to the storage of waste are defined in accordance with the ROD (DOE-ID 2000a). The basic provisions of the ARARs provide for appropriate waste containerization and compliant storage of the remediation waste for an interim storage period. Protection of human health and the environment is achieved through implementation of the ARARs and through implementation of the waste management approach described herein.

6.2.1 Waste Minimization

Waste minimization techniques will be incorporated into planning and daily work practices to improve worker safety and efficiency. In addition, such techniques will aid in reducing the project environmental and financial liability. Specific waste minimization practices to be implemented during the project will include, but not be limited to, the following:

- Excluding materials that could become hazardous waste in the decontamination process (if any)
- Controlling transfer between clean and contaminated zones
- Designing containment such that contamination spread is minimized

- Collecting all samples necessary at one time, such that additional waste is not generated due to re-sampling.

The *U.S. Department of Energy Idaho Operations Office Idaho National Engineering and Environmental Laboratory Interim Pollution Prevention Plan* (DOE-ID 2000c) addresses the efforts to be expended and the reports required to track waste generated by projects. This plan directs that the volume of waste generated by INEEL operations will be reduced as much as possible.

Industrial waste does not require segregation by type; therefore, containers will be identified as industrial waste and will be maintained outside the controlled area for separate collection. Contaminated waste has the potential to be hazardous. This waste will require segregation as either incinerable (e.g., wipes and PPE) or nonincinerable (e.g., polyvinyl tubing), in anticipation of subsequent waste management. Containers for collection of contaminated waste will be clearly labeled to identify waste type and will be maintained inside the controlled area, as defined in the project HASP (INEEL 2003), until removal for subsequent management.

6.2.2 Laboratory Samples

All laboratory and sample waste will be managed in accordance with the Sample and Analysis Management (formerly the Sample Management Office) Master Task Agreements, as part of the contract for the subcontracted laboratory. The laboratory will dispose of any unused sample material. The laboratories are responsible for any waste generated as a result of analyzing the samples. In the event that unused sample material must be returned from the laboratory, only the unused, unaltered samples in the original sample containers will be accepted from the laboratory. These samples will be returned to the waste stream from which they originated. If the laboratory must return altered sample material (e.g., analytical residue), the laboratory will specifically define the types of chemical additives used in the analytical process and assist in making a hazardous waste determination. This information will be provided to the project field team leader (FTL) and environmental compliance coordinator. Management of this waste also will require separation from the other unaltered samples being returned.

6.2.3 Packaging and Labeling

Containers used to store and transport hazardous waste must meet the requirements of 40 *Code of Federal Regulations* (CFR) 264, Subpart I, "Use and Management of Containers." The *Idaho National Engineering and Environmental Laboratory Waste Acceptance Criteria* (DOE-ID 2002b), hereinafter referred to as the INEEL Waste Acceptance Criteria (WAC), contains additional details concerning packaging and container conditions. Appropriate containers for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) waste include 208-L (55-gal) drums and other suitable containers that meet U.S. Department of Transportation (DOT) regulations on packaging (49 CFR 171, 173, 178, and 179) or Sections 4.4, 4.5, and 4.6 of the INEEL WAC (DOE-ID 2002b). The WGS will be consulted to ensure that the packaging is acceptable to the receiving facility.

Waste containers will be labeled with standard hazardous waste labels. The following information will be included on the labels:

- Unique bar code serial number
- Name of generating facility (i.e., Operable Unit [OU] 5-12)
- Phone number of generator contact

- Listed or characteristic waste code(s)
- Waste package gross weight
- Maximum radiation level on contact and at 1 m (3 ft) in the air
- Waste stream or material identification number, as assigned by the receiving facility
- Prior to shipping, other labels and markings as required by 49 CFR 172, Subparts D and E.

Any of the above information that is not known when the waste is labeled may be added when the information is known.

The unique bar code serial number is used for tracking and consists of a five-digit number followed by a single alpha designator. The alpha designator indicates which facility generated the bar code. Presently, only WROC generates the bar codes, and their alpha designator is "K." These bar codes will be furnished by WROC in lots of 50. A new bar code will be affixed to each container when waste is first placed in the container.

Any waste shipped off the INEEL from WAG 5 must be labeled in accordance with applicable DOT labels and markings (49 CFR 172, Subparts D and E). In addition, waste labels must be visible, legibly printed or stenciled, and placed so that a full set of labels and markings are visible. See Sections 4.4, 4.5, or 4.6 of the INEEL WAC (DOE-ID 2002b) for additional labeling information.

6.2.4 Storage and Inspection

Waste may be stored in the CERCLA waste storage unit (CWSU), PBF-ARA-1-CARGO-A, already established at ARA-I. Solid waste, segregated as potentially hazardous and/or mixed and placed in 208-L (55-gal) drums, will be stored in the CWSU. Waste stored in the CWSU will be stored in compliance with the *CERCLA Waste Storage Area Plan for PBF-ARA-1-CARGO-A* (INEEL 1999). This plan will be modified, as necessary, to accommodate waste proposed for storage in the CWSU. If required due to space limitations, a new CERCLA storage area (CSA) may need to be established as the sampling progresses. Determination of the CSA location will be coordinated with and approved by the appropriate ARA or PBF personnel. Waste placed in wooden storage boxes (1.2 × 1.2 × 2.4 m [4 × 4 × 8 ft] and 0.6 × 1.2 × 2.4 m [2 × 4 × 8 ft]), or other suitable containers, will be stored outside in a roped-off area that will be maintained as a CSA. Waste segregated as low-level radioactive only (e.g., soil) will be stored in a radioactive materials area near the CSA. The radioactive materials area will be established at the same time as the CSA.

To meet the substantive requirements of 40 CFR 264, Subpart I ("Use and Management of Containers"), the Resource Conservation and Recovery Act (RCRA) ARARs inspection of the CWSU and/or CSA will be conducted as part of the weekly waste container inspection. The purposes of the weekly container inspection are to look for containers that are leaking and/or that are deteriorating due to corrosion or other factors, to ensure that the containment system has not deteriorated due to corrosion, and to verify that labels are in place and legible. Inspections of the containers and the CWSU/CSA are conducted to meet the guidance contained in MCP-3475, "Temporary Storage of CERCLA-Generated Waste at the INEEL." Once the inspections have been completed, they will be documented on a weekly inspection form. The checklists used to guide the inspection will be maintained in the CWSU/CSA.

6.2.5 Personal Protective Equipment

The PPE requiring disposal may include, but not be limited to, the following: gloves, respirator cartridges, shoe covers, and coveralls. The PPE will be disposed of in accordance with the requirements set forth in the INEEL WAC (DOE-ID 2002b) and the *Waste Certification Plan for the Environmental Restoration Program* (Jones 1997).

6.2.6 Hazardous Waste Determinations

All waste generated will be characterized, as required by 40 CFR 262.11, "Hazardous Waste Determination." Hazardous waste determinations will be prepared for all waste streams in accordance with the requirements set forth in MCP-62, "Waste Generator Services—Low-Level Waste Management." Completed hazardous waste determinations will be maintained for all waste streams as part of the project file held by WGS. The hazardous waste determinations may use two approaches to determine whether a waste is characteristic:

- Process knowledge may be used if there is sufficient existing information to characterize the waste. Process knowledge may include direct knowledge of the source of the contamination and/or existing validated analytical data.

- Analysis of representative samples of the waste stream may be performed by either specialized RCRA protocols or standard protocols for sampling and laboratory analysis that are not specialized RCRA methods and other equivalent regulatory approved methods. In addition, process knowledge may influence the amount of sampling and analysis required to perform characterization.

Land disposal restrictions for hazardous waste are addressed in 40 CFR 268, "Land Disposal Restrictions." The INEEL-specific requirements for treatment, storage, and disposal are addressed in the INEEL WAC (DOE-ID 2002b). After the hazardous waste determinations are completed, the INEEL Interim Waste Tracking System profile number is assigned and the appropriate information is entered into the tracking system.

6.2.7 Waste Disposition

At the conclusion of the investigations (or when deemed necessary), industrial waste will be disposed of in the INEEL landfill, following the protocols and completing the forms identified by the INEEL WAC (DOE-ID 2002b). To achieve this waste management activity, industrial waste will be turned over to CFA Operations personnel for management under existing facility waste streams and in accordance with standing facility procedures. When sufficient quantities of waste have been accumulated to ship to one of the INEEL waste management units or off the INEEL to a commercial waste management facility, WGS will be contacted and the appropriate forms will be completed and submitted for approval, as required. The waste generator interface will provide assistance in packaging and transporting the waste.

Waste that is determined to be RCRA-hazardous is not intended to be stored in a permitted treatment, storage, and disposal facility. However, if this becomes necessary, it will be labeled as CERCLA to facilitate eventual management in accordance with CERCLA treatment, storage, or disposal that may become available. Should further characterization of the contaminated waste be necessary, services will be requested from Environmental Monitoring and Sample and Analysis Management (formerly the Sample Management Office). Requesting these services requires completion of Form 435.26, "SMO/WGS Services Request Form." For final disposition of RCRA-hazardous waste, WGS will be contacted to determine whether the waste qualifies for disposal under terms of the Master Task Agreement F98-180611 Hazardous Waste or its successor.

All low-level radioactive and mixed waste will be handled and disposed of in accordance with the requirements set forth in the INEEL WAC (DOE-ID 2002b). Care should be taken to ensure that all containers used to store waste or sampling equipment are in a "like-new" condition. Following completion of sampling, the individual waste streams destined for disposal at the Radioactive Waste Management Complex or WROC will be approved and prepared for disposal in accordance with the requirements of the INEEL WAC (DOE-ID 2002b).

Management of contaminated waste, generated at a subcontract laboratory during conductance of analytical testing, will be the responsibility of the subcontract laboratory. However, overall management of the samples must be in accordance with the requirements of MCP-3480, "Environmental Instructions for Facilities, Processes, Materials and Equipment." Specifically, this MCP requires that the facility environmental, safety, and health manager provide written approval before the return of any media, and that written documentation of sample disposition be developed and maintained. To initiate the return of this waste to the INEEL, the subcontract laboratory will notify Bechtel BWXT Idaho, LLC in the form of a written report identifying the known volume and characteristics of each waste type, including shipping and packaging details. Final authorization for the return of waste will be provided in writing from Bechtel BWXT Idaho, LLC to the subcontract laboratory. In the event that laboratory waste is returned, WGS will be contacted, and they will determine the disposition of the waste.

6.2.8 Recordkeeping and Reporting

Records and reports related to waste management are required to be maintained as indicated by MCP-3475, "Temporary Storage of CERCLA-Generated Waste at the INEEL." Some of these may be completed by others, but must be available either at the ARA/PBF or in the WAG 5 project files. These records will include, but not be limited to, the following:

- Hazardous waste determinations, characterization information, and statements of process knowledge (by others)
- CWSU and CSA inspection reports and log-in, log-out history
- Training records
- Documentation with respect to all spills.

6.3 Project-Specific Waste Streams

Several distinct waste stream types anticipated to be generated during this project have been identified. Some of these waste types will be clean, but many will be contaminated with radionuclides. Subsequent to generation, any or all of the waste may be reclassified; therefore, the intended waste management strategies for each are outlined in the following subsections. The following subsections describe the expected waste that will require compliant storage and/or disposal, including the intended management strategy from the time of generation until final disposition. Field and laboratory personnel will be responsible for segregating the waste. The anticipated quantities also have been approximated; however, they are to be considered a rough order-of-magnitude because, in some cases, the type of contamination present cannot be determined before sampling and analysis. Estimated waste volumes are based on historical sampling activities conducted in support of other CERCLA actions conducted at the INEEL in addition to calculated volumes based upon drawings and discussions with ICP personnel.

6.3.1 Personal Protective Equipment

The PPE in the form of coveralls, leather and rubber gloves, and anticontamination clothing may be generated for the sampling activities. The anticipated quantity of PPE to be generated, and requiring disposal as a result of the sampling activities, is 0.76 m^3 (1 yd^3) classified as clean for each annual sampling event.

6.3.2 Purge Water

Purge water will be generated during the sampling of groundwater monitoring wells at WAG 5. Estimated purge water volumes are provided in Table 6-1. Previous monitoring results have shown that the water from the wells at WAG 5 occasionally has shown low concentrations of beryllium, arsenic, iron, and lead. The beryllium and arsenic concentrations have been below the EPA MCLs. While iron concentrations have occasionally exceeded the Idaho groundwater quality standard of 300 μg/L, this standard is based on aesthetics rather than risk. The lead action level has occasionally been exceeded; however, these data are inconsistent, thus adding question to their validity. Based upon previous sampling results, the WAG 5 groundwater is not considered hazardous; therefore, purge water will be discharged directly to the ground. If subsequent sampling rounds show otherwise for a particular well, purge water will be containerized for any future sampling of the well in question.

6.3.3 Plastic Sheeting

Plastic sheeting may be used at the wells to act as an environmental barrier to contamination and to provide a laydown site for staging equipment and tooling. Based upon historical use of plastic sheeting at environmental remediation sites, the anticipated volume to be generated, and requiring disposal as a result of the sampling activities, is 0.76 m^3 (1 yd^3) classified as clean for each annual sampling event.

6.3.4 Unused/Unaltered Sample Material

Unused/unaltered sample material will be generated from the sampling activities in the form of waters not required for sampling and analysis. In most cases, the analytical laboratory will be responsible for disposal of the unused/unaltered sample material and any waste generated as a result of analyzing the samples. In the event that unused sample material must be returned from the laboratory, only the unused, unaltered samples in the original sample containers will be accepted from the laboratory. These samples will be consolidated and sent to a final disposal site.

6.3.5 Sample Containers

Sample containers will become a waste stream following analysis. As with unused/unaltered sample material, the analytical laboratory will be responsible for disposal of the sample containers. In the event that unused sample material must be returned from the laboratory, the samples will be consolidated for disposal and the sample containers, by virtue of the empty container rule, will be disposed of as clean waste.

6.3.6 Miscellaneous Waste

Miscellaneous waste such as trash, labels, rags, and other miscellaneous debris may be generated during the project. The anticipated quantity of miscellaneous waste to be generated, and requiring disposal as a result of the sampling activities, is 1.53 m^3 (2 yd^3) classified as clean. Clean miscellaneous waste will be moved to the CFA landfill.

7. DOCUMENTATION MANAGEMENT AND SAMPLE CONTROL

Section 7.1 summarizes document management and sample control. Documentation includes field logbooks used to record field data and sampling procedures. Section 7.2 outlines the sample handling and discusses chain-of-custody (COC) and radioactivity screening for shipment to the analytical laboratory. The analytical results from this sampling effort will be documented in the semiannual operating/shutdown cycle reports.

7.1 Documentation

The FTL is responsible for controlling and maintaining all field documents and records and for ensuring that all required documents are submitted to the ICP Administrative Records and Document Control. All entries will be made in permanent ink. All errors will be corrected by drawing a single line through the error and by entering the correct information. All corrections will be initialed and dated.

7.1.1 Sample Container Labels

Waterproof, gummed labels generated from the SAP database will display information such as the sample ID number, the name of the project, sample location, and analysis type. In the field, labels will be completed and placed on the containers before collecting the sample. Information concerning sample date, time, preservative used, field measurements of hazards, and the sampler's initials will be filled out during field sampling.

7.1.2 Field Guidance Forms

Field guidance forms, provided for each sample location, will be generated from the SAP database to ensure unique sample numbers. These forms, which are used to facilitate sample container documentation and organization of field activities, contain information regarding the following:

- Media
- Sample ID numbers
- Sample location
- Aliquot ID
- Analysis type
- Container size and type
- Sample preservation.

7.1.3 Field Logbooks

In accordance with Administrative Records and Document Control format, field logbooks will be used to record information necessary to interpret the analytical data. All field logbooks will be controlled and managed according to MCP-1194, "Logbook Practices for ER and D&D&D Projects."

7.1.3.1 Sample Logbooks. Field teams will use sample logbooks. Each sample logbook will contain information such as:

- Physical measurements (if applicable)
- All QC samples
- Sample date, time, and location
- Shipping information (e.g., shipping dates, cooler ID number, destination, COC number, name of shipper).

7.1.3.2 Field Team Leader's Daily Logbook. An operational logbook maintained by the FTL will contain a daily summary of the following:

- All the project field activities
- Problems encountered
- Visitor log
- List of site contacts.

This logbook will be signed and dated at the end of each day's sampling activities.

7.1.3.3 Field Instrument Calibration/Standardization Logbook. A logbook containing records of calibration data will be maintained for each piece of equipment requiring periodic calibration or standardization. This logbook will contain log sheets to record the date, time, method of calibration, and instrument ID number.

7.2 Sample Handling

Analytical samples for laboratory analyses will be collected in precleaned containers and packaged according to American Society for Testing and Materials or EPA-recommended procedures. The QA samples will be included to satisfy the QA requirements for the field operation, as outlined in the QAPjP (DOE-ID 2002a). Only qualified (Sample and Analysis Management-approved) analytical and testing laboratories will analyze these samples.

7.2.1 Sample Preservation

Preservation of water samples will be performed immediately upon sample collection. If required for preservation, acid may be added to the bottles before sampling. For samples requiring controlled temperatures of 4°C (39°F) for preservation, the temperature will be checked periodically before shipment to certify adequate preservation. Ice chests (coolers) containing frozen, reusable ice will be used to chill the samples (if required) in the field after sample collection.

7.2.2 Chain-of-Custody Procedures

The COC procedures will be followed in accordance with MCP-3480, "Environmental Instructions for Facilities, Processes, Materials, and Equipment," and the QAPjP (DOE-ID 2002a). Sample bottles will be stored in a secured area accessible only to the field team members.

7.2.3 Transportation of Samples

Samples will be shipped in accordance with the regulations issued by the DOT (49 CFR Parts 171 through 178) and EPA sample handling, packaging, and shipping methods (40 CFR 262 Subpart C and 40 CFR 263). All samples will be packaged in accordance with the requirements set forth in MCP-3480, "Environmental Instructions for Facilities, Processes, Materials, and Equipment."

7.2.3.1 Custody Seals. Custody seals will be placed on all shipping containers in such a way as to ensure that tampering or unauthorized opening does not compromise sample integrity. Clear plastic tape will be placed over the seals to ensure that the seals are not damaged during shipment.

7.2.3.2 On-Site and Off-Site Shipping. An on-Site shipment is any transfer of material within the perimeter of the INEEL. Site-specific requirements for transporting samples within Site boundaries and those required by the shipping/receiving department will be followed. Shipment within the INEEL boundaries will conform to DOT requirements, as stated in 49 CFR Parts 171–178. All shipments will be coordinated with WGS, as necessary, and conform to the applicable packaging and transportation MCPs. Radiological Control personnel will screen all samples to be removed from the task site for radiological contaminants before shipment.

7.3 Document Revision Requests

Revisions to this document will follow the requirements set forth in MCP-233, "Process for Developing, Processing, and Distributing ER Documents (Supplemental to MCP-135 & MCP-9395)."

8. REFERENCES

40 CFR 262, Subpart C, 2002, "Pre-Transport Requirements," *Code of Federal Regulations*, Office of the Federal Register, February 2002.

40 CFR 262.11, 2002, "Hazardous Waste Determination," *Code of Federal Regulations*, Office of the Federal Register, February 2002.

40 CFR 263, 2002, "Standards Applicable to Transporters of Hazardous Waste," *Code of Federal Regulations*, Office of the Federal Register, February 2002.

40 CFR 264, Subpart I, 2002, "Use and Management of Containers," *Code of Federal Regulations*, Office of the Federal Register, April 2002.

40 CFR 268, 2002, "Land Disposal Restrictions," *Code of Federal Regulations*, Office of the Federal Register, November 2002.

49 CFR 171, 2002, "General Information, Regulations, and Conditions," *Code of Federal Regulations*, Office of the Federal Register, October 2002.

49 CFR 172, Subpart D, 2002, "Marking," *Code of Federal Regulations*, Office of the Federal Register, November 2002.

49 CFR 172, Subpart E, 2002, "Labeling," *Code of Federal Regulations*, Office of the Federal Register, November 2002.

49 CFR 173, 2002, "Shippers—General Requirements for Shipments and Packagings," *Code of Federal Regulations*, Office of the Federal Register, October 2002.

49 CFR 175, 2002, "Carriage by Aircraft," *Code of Federal Regulations,* Office of the Federal Register, November 2002.

49 CFR 176, 2002, "Carriage by Vessel," *Code of Federal Regulations,* Office of the Federal Register, November 2002.

49 CFR 178, 2002, "Specifications for Packagings," *Code of Federal Regulations*, Office of the Federal Register, October 2002.

49 CFR 179, 2002, "Specifications for Tank Cars," *Code of Federal Regulations*, Office of the Federal Register, October 2002.

DOE-ID, 1997, *Final Work Plan for Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study*, DOE/ID-10555, Revision 0, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, May 1997.

DOE-ID, 2000a, *Record of Decision for the Power Burst Facility and Auxiliary Reactor Area*, DOE/ID-10700, Revision 0, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, February 2000.

DOE-ID, 2000b, *Field Sampling Plan for the Waste Area Group 5 Remedial Action, Phase I*, DOE/ID-10758, Revision 0, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, June 2000.

DOE-ID, 2000c, *U.S. Department of Energy Idaho Operations Office Idaho National Engineering and Environmental Laboratory Interim Pollution Prevention Plan*, DOE/ID-10333, Revision 0, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, October 2000.

DOE-ID, 2002a, *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Inactive Sites*, DOE/ID-10587, Revision 7, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, September 2002.

DOE-ID, 2002b, *Idaho National Engineering and Environmental Laboratory Waste Acceptance Criteria*, DOE/ID-01-10381, Revision 16, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, December 2002.

DOE-ID, 2003, *Field Sampling Plan for the Waste Area Group 5, Remedial Action, Phase II,* DOE/ID-10808, Revision 1, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, April 2003.

EPA, 1990, *National Oil and Hazardous Substances Contingency Plan*, Federal Register, Volume 55, U.S. Environmental Protection Agency.

EPA, 1994, *Guidance for the Data Quality Objectives Process*, EPA QA/G-r, EPA/600/R-96/055, U.S. Environmental Protection Agency, 1994.

EPA, 1996, *Drinking Water Regulations and Health Advisories*, EPA 822-B-96-002, U.S. Environmental Protection Agency, Office of Water, 1996.

EPA, 1997, *Risk-Based Concentration Table*, U.S. Environmental Protection Agency, Region III, 1997.

EPA, 2000, *Risk-Based Concentration Table*, U.S. Environmental Protection Agency, Region III, 2000.

Form 435.26, 2001, "SMO/WGS Services Request Form," Revision 13, March 2001.

Fromm, J., 1996, Idaho Department of Health and Welfare, Division of Environmental Quality, Letter to Waste Area Group Managers and Technical Support Staff, Lockheed Martin Idaho Technologies Company, "Radionuclide Risk-Based Concentration Tables," January 3, 1996.

GDE-7003, 2002, "Levels of Analytical Method Data Validation," Revision 1, Environmental Restoration, December 2002.

Holdren, K. J., 1996, *Site Screening for Waste Area Group 5*, INEL-96/0196, Revision 0, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho, October 1996.

Holdren, K. J., et al., 1999, *Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study*, DOE/ID-10607, Revision 0, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, January 1999.

IDAPA 58.01.11.200, "Groundwater Quality Standards," Idaho Administrative Procedures Act.

IAG-157, 2002, "Interface Agreement between the Environmental Restoration Program, Waste Area Group 5, Waste Area Group 10, and D&D&D and the Power Burst Facility/Waste Reduction Operations Complex," Revision 0, Environmental Restoration, November 2002.

IAG-156, 2002, "Interface Agreement between the Environmental Restoration Program, Waste Area Groups 4, 5, 10, and D&D&D and the Central Facilities Area," Revision 0, Environmental Restoration, October 2002.

INEEL, 1999, *CERCLA Waste Storage Area Plan for PBF-ARA-1-CARGO-A*, INEEL/EXT-98-00556, Revision 0, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho, August 1999.

INEEL, 2000, *Hazard Classification for Remedial Activities at Eleven OU 5-12 Sites: ARA-01, ARA-02, ARA-07, ARA-08, ARA-12, ARA-13, ARA-16, ARA-21, ARA-23, ARA-25, and PBF-16*, INEEL/EXT-2000-00532, Revision 0, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho, June 2000.

INEEL, 2003, *Health and Safety Plan for Operable Unit 5-12 Remedial Design/Remedial Action Projects*, INEEL/EXT-2000-00515, Revision 2, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho, April 2003.

Jones, R. K., 1997, *Waste Certification Plan for the Environmental Restoration Program*, INEL-96/0043, Revision 1, Lockheed Martin Idaho Technologies Company, Idaho Falls, Idaho, October 1997.

MCP-62, 2003, "Waste Generator Services—Low-Level Waste Management," Revision 5, *Manual 17–Waste Management*, January 2003.

MCP-233, 2002, "Process for Developing, Releasing, and Distributing ER Documents (Supplemental to MCP-135 & MCP-9395)," Revision 4, *Environmental Restoration Work Processes Manual*, June 2002.

MCP-1194, 2003, "Logbook Practices for ER and D&D&D Projects," Revision 0, Environmental Restoration, February 2003.

MCP-3475, 2002, "Temporary Storage of CERCLA-Generated Waste at the INEEL," Revision 2, *Manual 8–Environmental Protection and Compliance*, April 2002.

MCP-3480, 2002, "Environmental Instructions for Facilities, Processes, Materials, and Equipment," Revision 8, *Manual 8–Environmental Protection and Compliance*, April 2002.

MCP-9439, 2002, "Preparation for Environmental Sampling Activities at the INEEL," Revision 1, *Manual 8–Environmental Protection and Compliance*, October 2002.

TPR-6566, 2003, "Measuring Groundwater Levels," Revision 2, *Environmental Monitoring and Compliance Monitoring Handbook*, February 2003.

TPR-6570, 2003, "Sampling Groundwater," Revision 3, *Environmental Monitoring and Compliance Monitoring Handbook*, February 2003.

TPR-6575, 2001, "Decontaminating Sampling Equipment in the Field," Revision 0, *Environmental Monitoring and Compliance Monitoring Handbook*, May 2001.

Appendix A

Sampling and Analysis Plan Tables

Plan Table Number: WAG5POSTROD2000

SAP Number:

Date 08/02/2000 Plan Table Revision: 1.0 Project: WAG 5 POST ROD MONITORING 2000 Project Manager: WEBBER, F. L. SMO Contact: MCGRIFF, T. W.

Sample Description						Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										AN	RI	RN	EA	LL	R8	VG													
5GM001	REG	GROUND WATER	GRAB		10/15/00	WAG 5	WELL	ARA MON 1	630	1	1	1	1	1	1	1													
5GM002	REG/QC	GROUND WATER	DUP		10/15/00	WAG 5	WELL	ARA MON 2	610	2	2	2	2	2	2	2													
5GM003	REG	GROUND WATER	GRAB		10/15/00	WAG 5	WELL	ARA MON 3A	634	1	1	1	1	1	1	1													
5GM004	REG	GROUND WATER	GRAB		10/15/00	WAG 5	WELL	ARA MON 4	634	1	1	1	1	1	1	1													
5GM005	REG	GROUND WATER	GRAB		10/15/00	WAG 5	WELL	PBF MON 1	469	1	1	1	1	1	1	1													
5GM006	REG	GROUND WATER	GRAB		10/15/00	WAG 5	WELL	PBF MON 3	469	1	1	1	1	1	1	1													
5GM007	REG	GROUND WATER	GRAB		10/15/00	WAG 5	WELL	PBF MON 4	469	1	1	1	1	1	1	1													
5GM008	REG	GROUND WATER	GRAB		10/15/00	WAG 5	WELL	PBF MON 5	469	1	1	1	1	1	1	1													
5GM009	REG	GROUND WATER	GRAB		10/15/00	WAG 5	WELL	SPERT-I	N/A	1	1	1	1	1	1	1													
5GM010	QC	WATER	FBLK		10/15/00	WAG 5	FIELD BLANK	QC	N/A	1	1	1	1	1	1	1													
5GM011	QC	WATER	RNST		10/15/00	WAG 5	EQUIPMNT RINSTE	QC	N/A	1	1	1	1	1	1	1													
5GM012	QC	WATER	TBLK		10/15/00	WAG 5	TRIP BLANK	QC	N/A							1													

The sampling activity displayed on this table represents the first six characters of the sample identification number.

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT1: Anions

AT2: Iodine-129

AT3: Radiochemistry - Suite 2

AT4: Tc-99

AT5: Total Metals (TAL) - Filtered

AT6: Tritium

AT7: VOCs by GC/MS

AT8:

AT9:

AT10:

AT11:

AT12:

AT13:

AT14:

AT15:

AT16:

AT17:

AT18:

AT19:

AT20:

Comments:

Analysis Suites:

Radiochemistry - Suite 2: Gross Alpha, Gross Beta, Gamma Spec

Contingencies:

RN - If Gross Alpha > 5pCi/L Am-241, Pu-Iso, U-Iso

RN - If Gross Beta >5pCi/L Tc-99, Sr-90

Tc-99 If gross beta >5pCi/L

Plan Table Number: WAG5POSTROD2001

SAP Number:

Date: 11/01/2001 Plan Table Revision: 2.0 Project: WAG 5 POST ROD MONITORING 2001 Project Manager: VANDEL, D. S. SMO Contact: ELDER, T. E.

Sample Description						Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
										AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AN	RI	RH	L1	R8	AV	AZ													
5GM101	REG	GROUND WATER	GRAB		11/05/01	WAG 5	WELL	ARA MON 1	630	1	1	1	1	1	1														
5GM102	REG/QC	GROUND WATER	DUP		11/05/01	WAG 5	WELL	ARA MON 2	610	2	2	2	2	2	2														
5GM103	REG	GROUND WATER	GRAB		11/05/01	WAG 5	WELL	ARA MON 3A	634	1	1	1	1	1	1														
5GM104	REG	GROUND WATER	GRAB		11/05/01	WAG 5	WELL	ARA MON 4	634	1	1	1	1	1	1														
5GM105	REG	GROUND WATER	GRAB		11/05/01	WAG 5	WELL	PBF MON 1	469	1	1	1	1	1	1														
5GM106	REG	GROUND WATER	GRAB		11/05/01	WAG 5	WELL	PBF MON 3	469	1	1	1	1	1	1														
5GM107	REG	GROUND WATER	GRAB		11/05/01	WAG 5	WELL	PBF MON 4	469	1	1	1	1	1	1														
5GM108	REG	GROUND WATER	GRAB		11/05/01	WAG 5	WELL	PBF MON 5	469	1	1	1	1	1		1													
5GM109	REG	GROUND WATER	GRAB		11/05/01	WAG 5	WELL	SPERT-I	N/A	1	1	1	1	1	1														
5GM110	QC	WATER	FBLK		11/05/01	WAG 5	FIELD BLANK	QC	N/A	1	1	1	1	1	1														
5GM111	QC	WATER	RNST		11/05/01	WAG 5	EQUIPMNT RINSTE	QC	N/A	1	1	1	1	1	1														
5GM112	QC	WATER	TBLK		11/05/01	WAG 5	TRIP BLANK	QC	N/A						1														

The sampling activity displayed on this table represents the first six characters of the sample identification number. The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT1: Anions
AT2: Iodine-129
AT3: Radiochemistry - Suite 1
AT4: Total Metals (TCLP TAL)
AT5: Tritium
AT6: VOCs (Appendix IX TAL)
AT7: VOCs (Appendix IX TAL) - MS/MSD
AT8:
AT9:
AT10:

AT11:
AT12:
AT13:
AT14:
AT15:
AT16:
AT17:
AT18:
AT19:
AT20:

Comments:

Analysis Suites:

Radiochemistry - Suite 1: Gross Alpha, Gross Beta, Gamma Spec

Contingencies:

RH - If Gross Alpha >5pCi/l Am-241, Pu-Iso, U-Iso

RH - If Gross Beta >5 pCi/L Tc-99, Sr-90

Sampling and Analysis Plan Table for Chemical and Radiological Analysis

Plan Table Number: WAG5POSTROD2002

SAP Number:

Date: 08/02/2000 Plan Table Revision: 1.0 Project: WAG 5 POST ROD MONITORING 2002 Project Manager: WEBBER, F. L. SMO Contact: MCGRIFF, T. W.

Sample Description						Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										AN	RI	RN	EA	LL	R8	VG													
5GM201	REG	GROUND WATER	GRAB		10/15/02	WAG 5	WELL	ARA MON 1	630	1	1	1	1	1	1	1													
5GM202	REG/QC	GROUND WATER	DUP		10/15/02	WAG 5	WELL	ARA MON 2	610	2	2	2	2	2	2	2													
5GM203	REG	GROUND WATER	GRAB		10/15/02	WAG 5	WELL	ARA MON 3A	634	1	1	1	1	1	1	1													
5GM204	REG	GROUND WATER	GRAB		10/15/02	WAG 5	WELL	ARA MON 4	634	1	1	1	1	1	1	1													
5GM205	REG	GROUND WATER	GRAB		10/15/02	WAG 5	WELL	PBF MON 1	469	1	1	1	1	1	1	1													
5GM206	REG	GROUND WATER	GRAB		10/15/02	WAG 5	WELL	PBF MON 3	469	1	1	1	1	1	1	1													
5GM207	REG	GROUND WATER	GRAB		10/15/02	WAG 5	WELL	PBF MON 4	469	1	1	1	1	1	1	1													
5GM208	REG	GROUND WATER	GRAB		10/15/02	WAG 5	WELL	PBF MON 5	469	1	1	1	1	1	1	1													
5GM209	REG	GROUND WATER	GRAB		10/15/02	WAG 5	WELL	SPERT-I	N/A	1	1	1	1	1	1	1													
5GM210	QC	WATER	FBLK		10/15/02	WAG 5	FIELD BLANK	QC	N/A	1	1	1	1	1	1	1													
5GM211	QC	WATER	RNST		10/15/02	WAG 5	EQUIPMNT RINSTE	QC	N/A	1	1	1	1	1	1	1													
5GM212	QC	WATER	TBLK		10/15/02	WAG 5	TRIP BLANK	QC	N/A							1													

The sampling activity displayed on this table represents the first six characters of the sample identification number.

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT1: Anions
AT2: Iodine-129
AT3: Radiochemistry - Suite 2
AT4: Tc-99
AT5: Total Metals (TAL) - Filtered
AT6: Tritium
AT7: VOCs by GC/MS
AT8:
AT9:
AT10:

AT11:
AT12:
AT13:
AT14:
AT15:
AT16:
AT17:
AT18:
AT19:
AT20:

Comments:

Analysis Suites:

Radiochemistry - Suite 2: Gross Alpha, Gross Beta, Gamma Spec

Contingencies:

RN - If Gross Alpha > 5pCi/L Am-241, Pu-Iso, U-Iso
RN - If Gross Beta >5pCi/L Tc-99, Sr-90
Tc-99 If gross beta >5pCi/L

Sampling and Analysis Plan Table for Chemical and Radiological Analysis

Plan Table Number: WAG5POSTROD2003

SAP Number:

Date: 08/02/2000 Plan Table Revision: 1.0 Project: WAG 5 POST ROD MONITORING 2003 Project Manager: WEBBER, F. L. SMO Contact: MCGRIFF, T. W.

Sample Description						Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
										AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AN	RI	RN	EA	LL	R8	VG													
5GM301	REG	GROUND WATER	GRAB		10/15/03	WAG 5	WELL	ARA MON 1	630	1	1	1	1	1	1	1													
5GM302	REG/QC	GROUND WATER	DUP		10/15/03	WAG 5	WELL	ARA MON 2	610	2	2	2	2	2	2	2													
5GM303	REG	GROUND WATER	GRAB		10/15/03	WAG 5	WELL	ARA MON 3A	634	1	1	1	1	1	1	1													
5GM304	REG	GROUND WATER	GRAB		10/15/03	WAG 5	WELL	ARA MON 4	634	1	1	1	1	1	1	1													
5GM305	REG	GROUND WATER	GRAB		10/15/03	WAG 5	WELL	PBF MON 1	469	1	1	1	1	1	1	1													
5GM306	REG	GROUND WATER	GRAB		10/15/03	WAG 5	WELL	PBF MON 3	469	1	1	1	1	1	1	1													
5GM307	REG	GROUND WATER	GRAB		10/15/03	WAG 5	WELL	PBF MON 4	469	1	1	1	1	1	1	1													
5GM308	REG	GROUND WATER	GRAB		10/15/03	WAG 5	WELL	PBF MON 5	469	1	1	1	1	1	1	1													
5GM309	REG	GROUND WATER	GRAB		10/15/03	WAG 5	WELL	SPERT-I	N/A	1	1	1	1	1	1	1													
5GM310	QC	WATER	FBLK		10/15/03	WAG 5	FIELD BLANK	QC	N/A	1	1	1	1	1	1	1													
5GM311	QC	WATER	RNST		10/15/03	WAG 5	EQUIPMNT RINSTE	QC	N/A	1	1	1	1	1	1	1													
5GM312	QC	WATER	TBLK		10/15/03	WAG 5	TRIP BLANK	QC	N/A							1													

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AT1: Anions
AT2: Iodine-129
AT3: Radiochemistry - Suite 2
AT4: Tc-99
AT5: Total Metals (TAL) - Filtered
AT6: Tritium
AT7: VOCs by GC/MS
AT8:
AT9:
AT10:

AT11:
AT12:
AT13:
AT14:
AT15:
AT16:
AT17:
AT18:
AT19:
AT20:

Comments:

Analysis Suites:

Radiochemistry - Suite 2: Gross Alpha, Gross Beta, Gamma Spec

Contingencies:

RN - If Gross Alpha > 5pCi/L Am-241, Pu-Iso, U-Iso
RN - If Gross Beta >5pCi/L Tc-99, Sr-90
Tc-99 If gross beta >5pCi/L

Plan Table Number: WAG5POSTROD2004

SAP Number:

Date: 08/02/2000 Plan Table Revision: 1.0 Project: WAG 5 POST ROD MONITORING 2004 Project Manager: WEBBER, F. L. SMO Contact: MCGRIFF, T. W.

Sample Description						Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										AN	RI	RN	EA	LL	RB	VG													
5GM401	REG	GROUND WATER	GRAB		10/15/04	WAG 5	WELL	ARA MON 1	630	1	1	1	1	1	1	1													
5GM402	REG/QC	GROUND WATER	DUP		10/15/04	WAG 5	WELL	ARA MON 2	610	2	2	2	2	2	2	2													
5GM403	REG	GROUND WATER	GRAB		10/15/04	WAG 5	WELL	ARA MON 3A	634	1	1	1	1	1	1	1													
5GM404	REG	GROUND WATER	GRAB		10/15/04	WAG 5	WELL	ARA MON 4	634	1	1	1	1	1	1	1													
5GM405	REG	GROUND WATER	GRAB		10/15/04	WAG 5	WELL	PBF MON 1	469	1	1	1	1	1	1	1													
5GM406	REG	GROUND WATER	GRAB		10/15/04	WAG 5	WELL	PBF MON 3	469	1	1	1	1	1	1	1													
5GM407	REG	GROUND WATER	GRAB		10/15/04	WAG 5	WELL	PBF MON 4	469	1	1	1	1	1	1	1													
5GM408	REG	GROUND WATER	GRAB		10/15/04	WAG 5	WELL	PBF MON 5	469	1	1	1	1	1	1	1													
5GM409	REG	GROUND WATER	GRAB		10/15/04	WAG 5	WELL	SPERT-I	N/A	1	1	1	1	1	1	1													
5GM410	QC	WATER	FBLK		10/15/04	WAG 5	FIELD BLANK	QC	N/A	1	1	1	1	1	1	1													
5GM411	QC	WATER	RNST		10/15/04	WAG 5	EQUIPMNT RINSTE	QC	N/A	1	1	1	1	1	1	1													
5GM412	QC	WATER	TBLK		10/15/04	WAG 5	TRIP BLANK	QC	N/A							1													

The sampling activity displayed on this table represents the first six characters of the sample identification number.

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT1: Anions
AT2: Iodine-129
AT3: Radiochemistry - Suite 2
AT4: Tc-99
AT5: Total Metals (TAL) - Filtered
AT6: Tritium
AT7: VOCs by GC/MS
AT8:
AT9:
AT10:

AT11:
AT12:
AT13:
AT14:
AT15:
AT16:
AT17:
AT18:
AT19:
AT20:

Comments:

Analysis Suites:

Radiochemistry - Suite 2: Gross Alpha, Gross Beta, Gamma Spec

Contingencies:

RN - If Gross Alpha > 5pCi/L Am-241, Pu-Iso, U-Iso
RN - If Gross Beta >5pCi/L Tc-99, Sr-90
Tc-99 If gross beta >5pCi/L