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Field Sampling Plan for Groundwater Monitoring of OU 7-13/14

November 2003

Idaho National Engineering and Environmental Laboratory
Bechtel BWXT Idaho, LLC

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Idaho National Engineering and Environmental Laboratory
Idaho Completion Project
Idaho Falls, Idaho 83415

Prepared for the
U.S. Department of Energy
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ABSTRACT

As part of the Idaho National Engineering and Environmental Laboratory Idaho Completion Project's routine monitoring project, monitoring wells near and inside the Radioactive Waste Management Complex are being sampled on a periodic basis. The field sampling plan governs groundwater sampling that will begin the fourth quarter of Fiscal Year 2001. The objective of this investigation is to monitor the groundwater quality and identify any degradation of groundwater quality that may originate at the facility. Data obtained from this effort will be used to support several programs including the Waste Area Group 7 Operable Unit 7-13/14 comprehensive remedial investigatiodfeasibility study, the active low-level waste disposal operation, the Idaho National Engineering and Environmental Laboratory oversight groups, long-term stewardship, and subsurface sciences at the Radioactive Waste Management Complex.

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ACRONYMS

DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
DOT	U.S. Department of Transportation
FFA/CO	federal facility agreement and consent order
FSP	field sampling plan
GDE	guide
HASP	health and safety plan
HDPE	high-density polyethylene
INEEL	Idaho National Engineering and Environmental Laboratory
MCP	management control procedure
OU	operable unit
PE	performance evaluation
QAPjP	*Quality Assurance Project Plan*
RWMC	Radioactive Waste Management Complex
SAP	sampling and analysis plan
SDA	Subsurface Disposal Area
TRU	transuranic
TSA	Transuranic Storage Area
USGS	United States Geological Survey
VOC	volatile organic compound
WAG	waste area group

Field Sampling Plan for Groundwater Monitoring of OU 7-13/14

1. INTRODUCTION

1.1 Purpose

The work described in this field sampling plan (FSP) will be used to support monitoring objectives of Operable Unit (OU) 7-13/14 comprehensive remedial investigatiodfeasibility study and the performance assessment and composite analysis. In addition, it will be used to support the activities of Idaho National Engineering and Environmental Laboratory (INEEL) oversight groups. Data from aquifer monitoring are used by oversight groups and various OUs to determine if contaminants buried in the Subsurface Disposal Area (SDA) are migrating out of the landfill and affecting the quality of the aquifer.

The sampling and analysis plan (SAP) for this work consists of the FSP and the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10 and Inactive Sites* (hereafter referred to as the *Quality Assurance Project Plan* [QAPjP]) (DOE-ID 2002). This FSP has been prepared in accordance with applicable management control procedures (MCPs) (see Section 8) and guidance from the U.S. Environmental Protection Agency document, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988). The FSP governs aquifer sampling within Waste Area Group (WAG) 7 and describes routine field activities. The QAPjP (DOE-ID 2002) describes the processes and programs that ensure that data generated are suitable for their intended use.

1.2 Scope of Work

The scope of this plan is limited to collecting and analyzing aquifer samples directly beneath and in the vicinity of the Radioactive Waste Management Complex (RWMC) (see Figure 1). Monitoring-well locations are detailed in Section 3.

Monitoring wells located near and inside the RWMC are generally sampled on a quarterly basis. The primary objective for aquifer sampling and analysis is to determine if INEEL activities are impacting the aquifer. Monitoring data aid in the understanding of fate and transport of contaminant migration from the RWMC, help fill previously identified data gaps, and support the selection of appropriate remedial alternatives.

1.3 Background

The INEEL is located in the northwestern portion of the Eastern Idaho Snake fiver Plain in southeast Idaho, approximately 55 km (34 mi) west of Idaho Falls, Idaho, and encompasses 890 mi^2 (2,305 km^2). Figure 2 shows the location of the INEEL and the WAG 7 area. Figure 3 shows the INEEL in relation to the Snake fiver Plain Aquifer. Waste Area Group 7 encompasses the RWMC, which is located in the southwest quadrant of the INEEL and includes (1) the SDA, (2) the Transuranic (TRU) Storage Area (TSA), (3) a storage area for TRU waste, and (4) an operations and administration area that provides miscellaneous support operations. Additional INEEL and WAG 7 background and descriptions are detailed in the *Ancillary Basis for Risk Analysis of the Subsurface Disposal Area* (Holdren et al. 2002). Aquifer monitoring results have been used extensively in the preparation of a variety of WAG 7 reports in preparation for the record of decision for key remedial action decisions at and around the SDA.

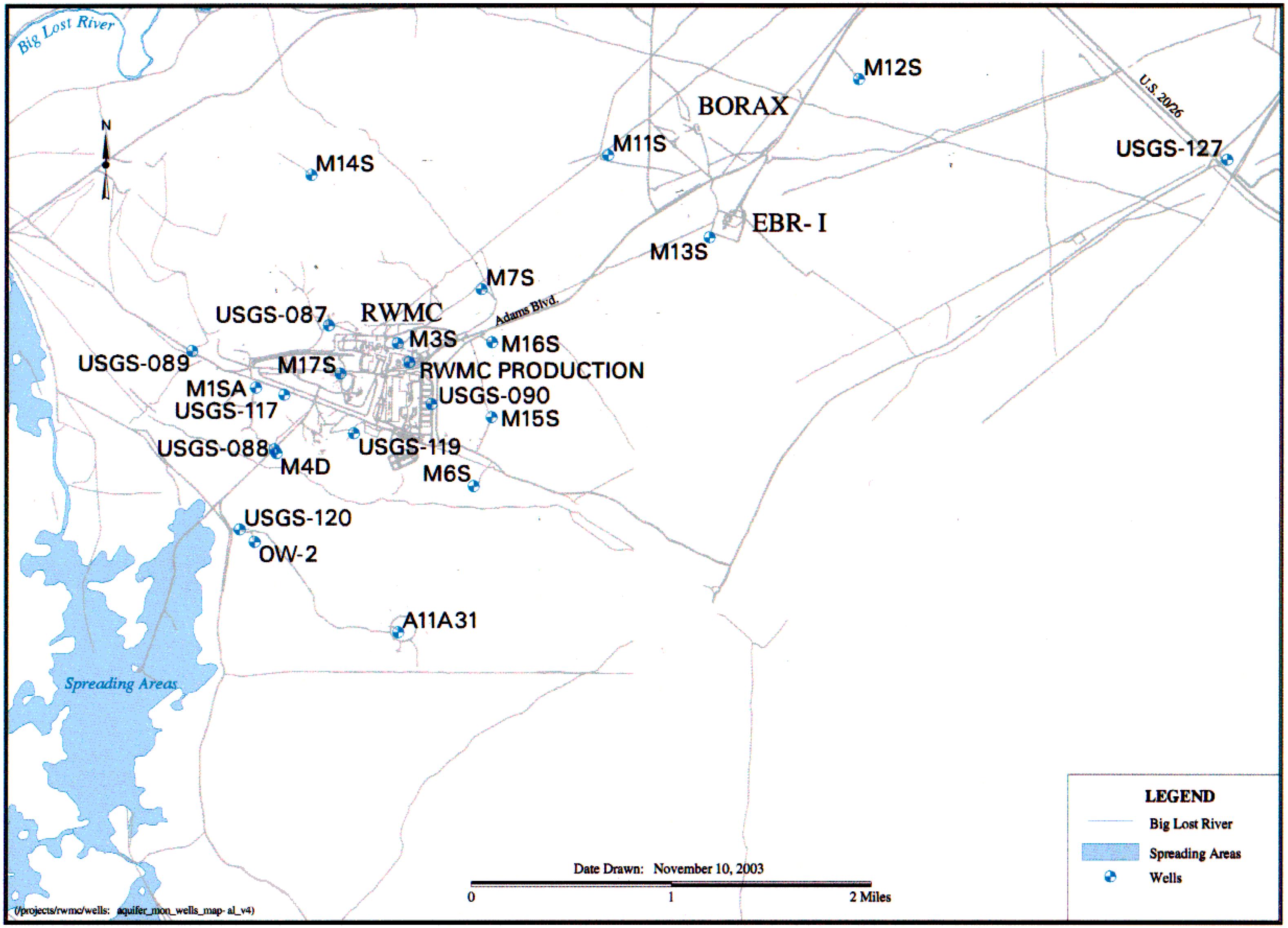

Figure 1. Location of aquifer wells to be sampled under this field sampling plan.

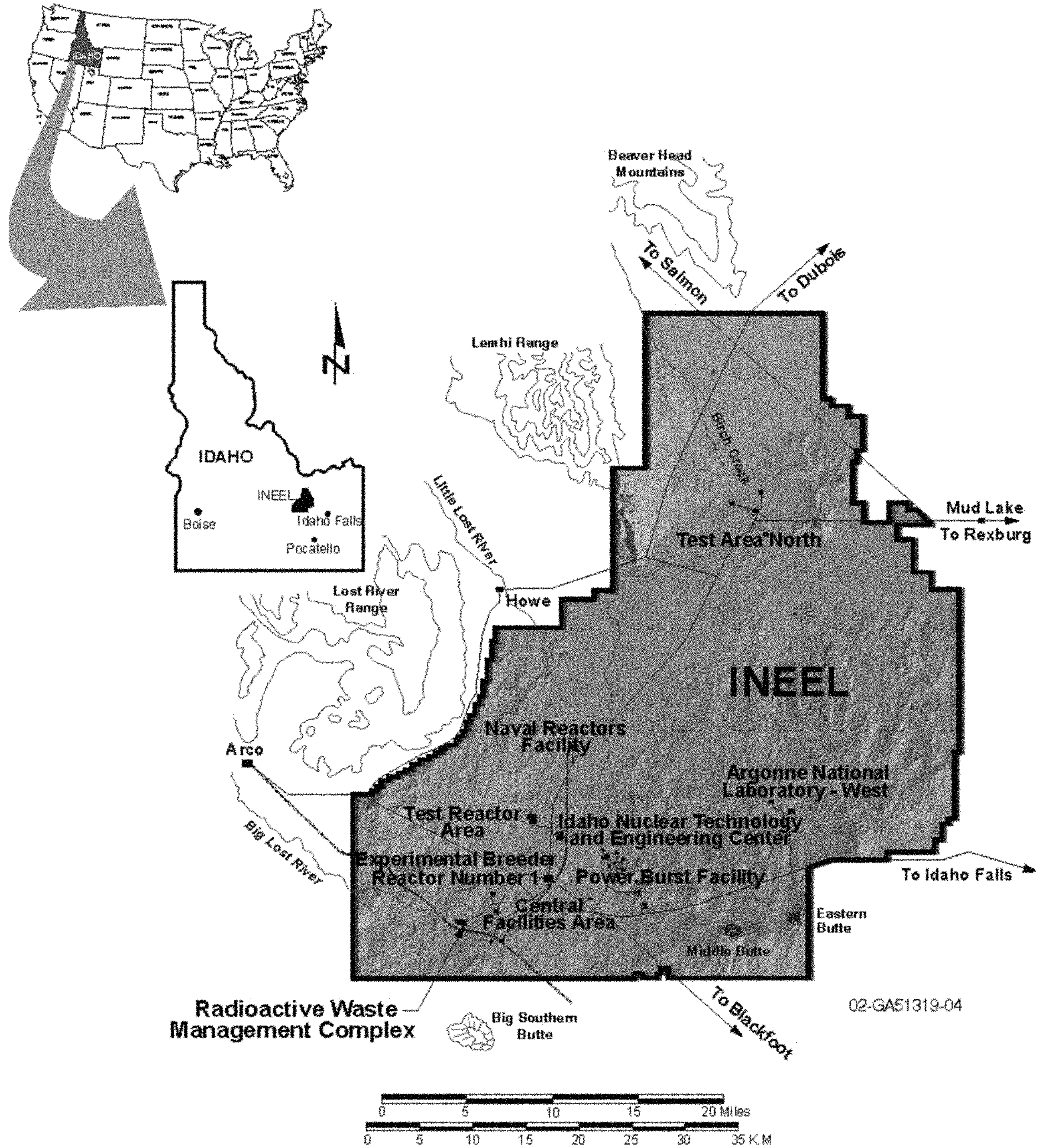

Figure 2. Location of the Radioactive Waste Management Complex at the Idaho National Engineering and Environmental Laboratory.

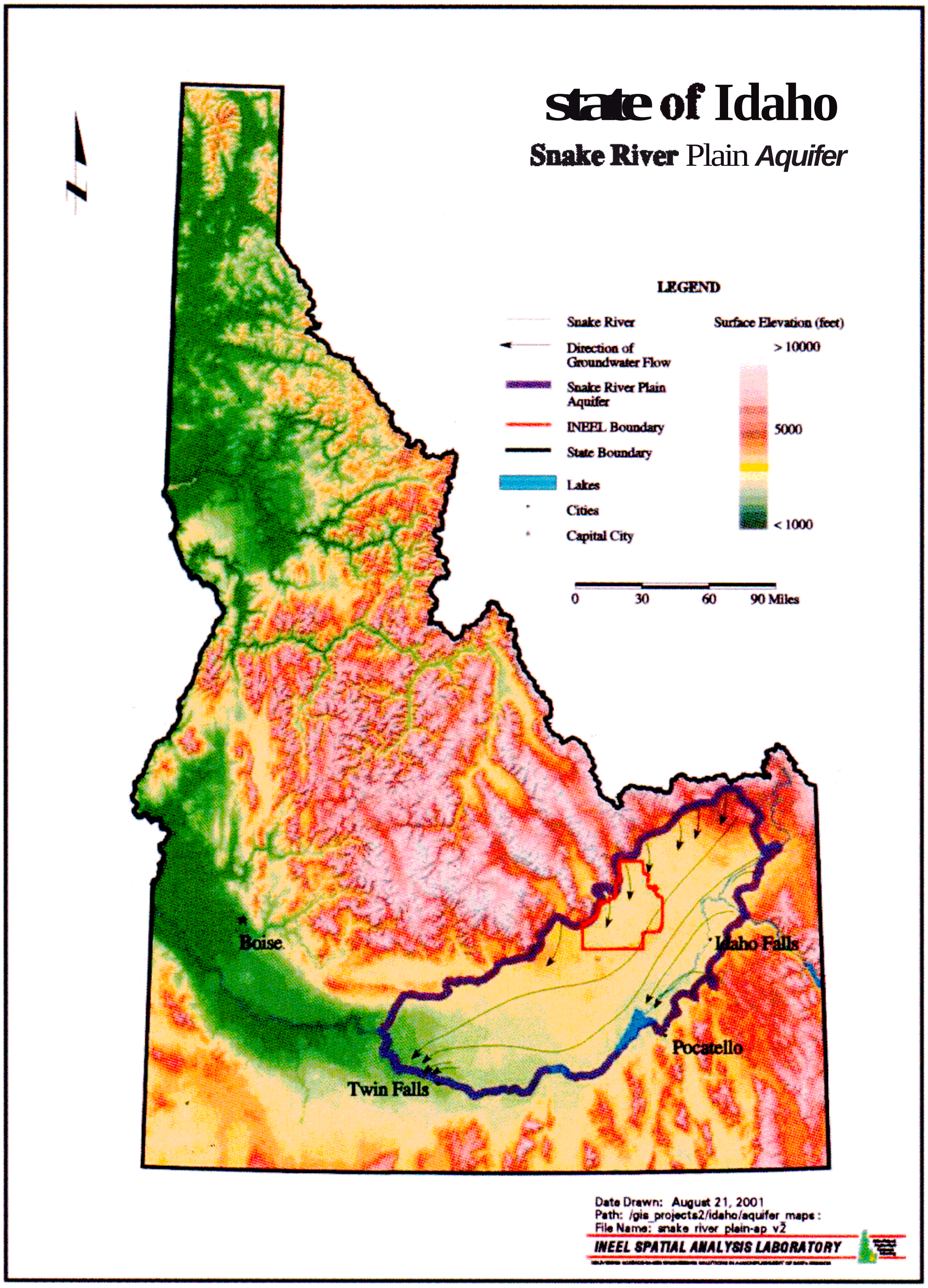

Figure 3. Location of the Idaho National Engineering and Environmental Laboratory in relation to the Idaho Snake River Plain Aquifer.

In addition, the results were summarized in the first annual report for the RWMC (Olson et al. 2003) and used to support both OU 7-13/14 and the waste management programs. In general, results from aquifer monitoring are well below the maximum contaminant levels for radioactive and most hazardous constituents, with the exception of some elevated volatile organic compounds (VOCs) including carbon tetrachloride, chloroform, and trichloroethene. Comprehensive INEEL historical and geological information relevant to the RWMC is provided in the *Ancillary Basis for Risk Analysis of the Subsurface Disposal Area* (Holdren et al. 2002).

1.4 Radioactive Waste Management Complex Facility Description

The RWMC is located in the southwestern corner of the INEEL (as depicted in Figure 2) and occupies 70 ha (174 acres). The RWMC fence defines the facility boundaries. In 1952, the Atomic Energy Commission selected the RWMC as a waste disposal site for solid low-level radioactive waste. In addition to waste generated at the INEEL, waste from other U.S. Department of Energy (DOE) facilities is stored and disposed of at the RWMC.

The SDA (shown in Figure 4) comprises all property from the center of the RWMC westward and is surrounded by a soil berm and drainage channel. The Site was initially established in July 1952 as the Nuclear Reactor Testing Station Burial Ground on 5 ha (13 acres). The facility was expanded incrementally over the years to cover 39.3 ha (97.14 acres). Radioactive and hazardous waste has been disposed of in the SDA, and there is an active disposal area within the SDA, which still receives low-level radioactive waste. Historically, both TRU and low-level waste were buried in pits, trenches, soil vaults, and one aboveground pad since 1952. Some of the waste contains nonradioactive hazardous materials such as mercury, beryllium, asbestos, zirconium fines, solidified acids and bases, solvents and degreasing agents, and sodium and potassium salts.

The TSA is a 22.6-ha (56-acre) facility located in the eastern portion of the RWMC. The TSA was established in 1970 as an interim storage facility when subsurface disposal of waste containing TRU concentrations greater than 100 nCi/g in the SDA was discontinued. Operations at the TSA include waste segregation, examination, and certification in addition to interim storage.

The operations and administration area contains administrative offices, security and gatehouse operations, radiological control support, maintenance buildings, equipment storage, and miscellaneous support facilities. A more detailed summary of RWMC operations is provided in the *Ancillary Basis for Risk Analysis of the Subsurface Disposal Area* (Holdren et al. 2002).

The current mission of the RWMC is to provide waste management for the present and future needs of the INEEL and of assigned DOE off-Site generators of low-level and TRU waste and to retrieve, examine, and certify stored TRU waste for ultimate shipment to the DOE Waste Isolation Pilot Plant near Carlsbad. New Mexico.

The primary source of contamination is disposed of waste ranging from contaminated clothing and contaminated equipment to sludge. Primary release mechanisms to groundwater include migration and seepage from the SDA, corrosion, diffusion from the waste, and surface washoff (Holdren et al. 2002). Secondary contaminant sources include contaminated overburden, backfill and surface sediments, and the asphalt pad. Secondary release mechanisms to the aquifer include volatilization and leaching. Continued infiltration ultimately may result in the transport of contaminants to the aquifer, and then the contaminants may migrate downgradient as shown in Figure 5 (Holdren et al. 1999).

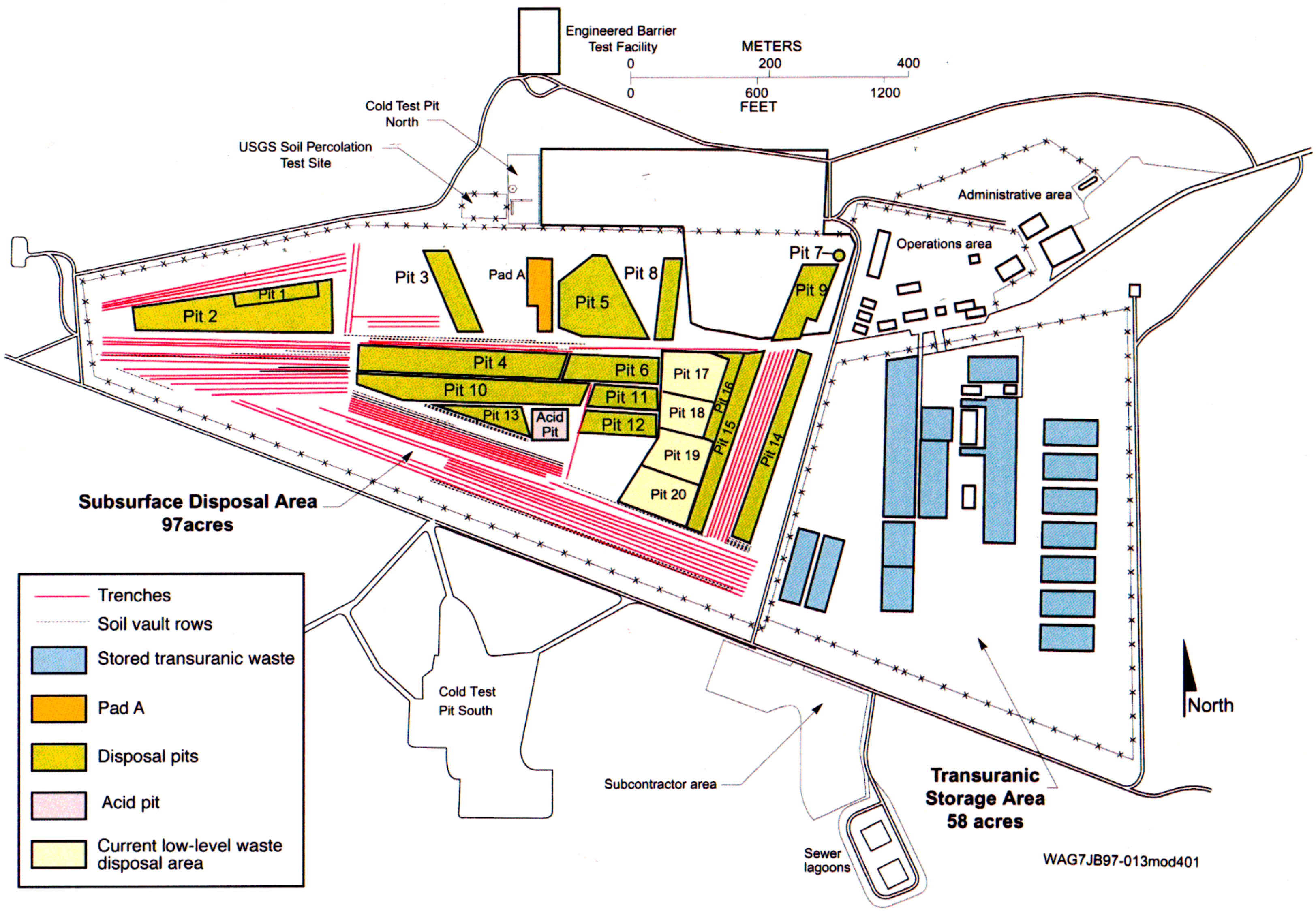

Figure 4. Subsurface Disposal Area at the Radioactive Waste Management Complex.

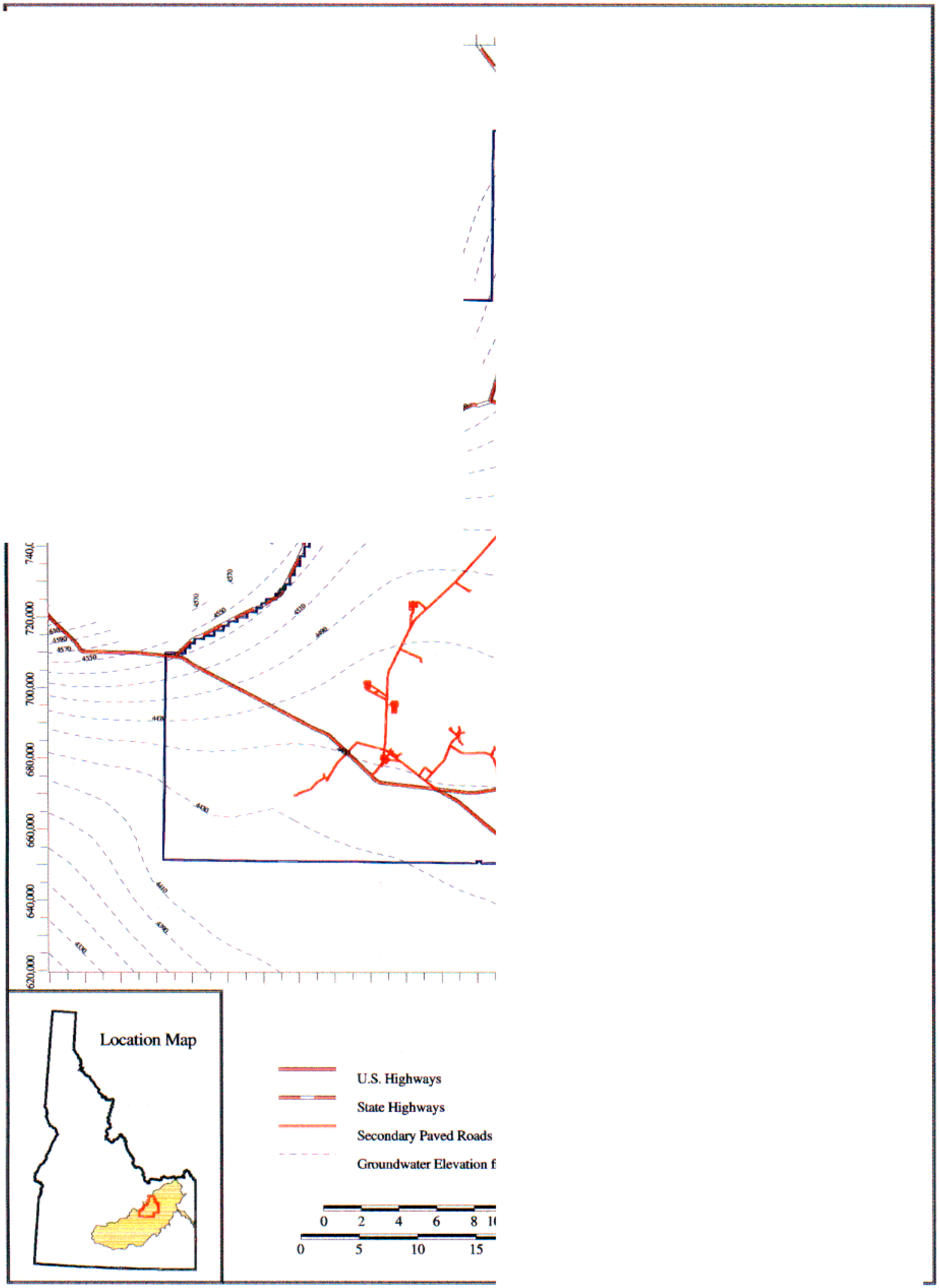

Figure 5. Map of the Idaho National Engineering and Environmental Laboratory showing generalized groundwater flow lines of the Snake River Plain Aquifer.

Groundwater flow near the RWMC is complicated because of the fractured basalt matrix, periodic recharge from the spreading areas located to the south and west of the RWMC, and the presence of a low-permeability region that apparently exists immediately south and southwest of the SDA (Wylie and Hubbell 1994). Significant annual recharge can change the direction of local groundwater flow.

1.5 Groundwater-Monitoring Data

The hydrogeology of the INEEL has been studied by the United States Geological Survey (USGS) and others for over 50 years. Groundwater studies specific to the SDA at the RWMC have been conducted since 1971, and routine contaminant monitoring has been conducted in the area since 1992. Quarterly groundwater-monitoring samples are analyzed for VOCs, metals, nitrates, and radionuclides.

Carbon tetrachloride, tritium, nitrates, and chromium have been frequently detected above background concentrations in the aquifer beneath the RWMC, with increasing trends in some wells. Carbon-14 is sporadically detected, with no apparent trends. All RWMC wells are still monitored for these contaminants. A comprehensive discussion of monitoring results is provided in the *Ancillary Basis for Risk Analysis of the Subsurface Disposal Area* (Holdren et al. 2002) and in Olson et al. (2003).

2. SAMPLING OBJECTIVES

The OU 7-13/14 groundwater-monitoring program has evolved over several years and continues to evolve driven by requests from the Agencies, stakeholder concerns, and evolving programmatic needs. Results of the seven-step data-quality-objective process are outlined in the QAPjP (DOE-ID 2002). Results of the seven steps are discussed in the following list:

- State the problem: Radioactive and hazardous waste has been disposed of in unlined pits and trenches and has the potential to leach from the SDA into the vadose zone and groundwater.

- Identify the decision: Groundwater monitoring is needed to determine if risk-producing contaminants of concern from the SDA are affecting the quality of the eastern Snake River Plain Aquifer. The monitoring must be robust enough to distinguish sporadic detections from contaminant trends.

- Identify the inputs to the decision: Upgradient and downgradient contaminant concentrations are needed from quarterly aquifer samples. Primary information needs include where should the wells be located, which contaminants should be measured, and how often should samples be collected. Analytes of interest to OU 7-13/14 are: (1) risk drivers as defined by the *Ancillary Basis for Risk Analysis of the Subsurface Disposal Area* (Am-241, C-14, I-129, Nb-94, Np-237, Sr-90, Tc-99, U-233, U-234, U-235, U-236, U-238, carbon tetrachloride, methylene chloride, nitrates, and tetrachloroethene)(see Holdren et al. 2002, Table 7-1), (2) contaminants known to be present in the SDA but may not show up as risk drivers (e.g., tritium or chromium), and (3) select geochemical parameters, which might indicate or influence contaminant migration. Target analytes in routine quarterly monitoring and quality assurance and control samples are itemized in the SAP tables in Appendix B. Quarterly sampling is needed to obtain data at a frequency that is adequate to provide early detections as well as to evaluate whether there are trends within a timely manner.

- Define the study boundaries: The study boundary for quarterly monitoring is a 5-mi radius around the center of the SDA.

- Develop a decision rule: All positive detections of radionuclides (>3σ and greater than the minimum detectable activity) are reported in the quarterly monitoring report to the Agencies. Samples containing detectable Pu-238, Pu-239/240, Am-241, or Np-237 will be reanalyzed. Organic contaminants above the quantitation limit and inorganic contaminants above background are reported in the quarterly reports. Background levels for the Snake River Plain Aquifer were established in 1992 by the USGS from samples collected upgradient and downgradient of the INEEL (Knobel, Orr, and Cecil 1992).

- Specify acceptable limits on decision errors: Reportable detections are not an immediate call for remedial action or cleanup but are rather a signal for continued monitoring and observation. Repeated detections and increasing trends over time are brought to the attention of the Agencies and discussed to determine whether action is warranted.

- Optimize the design: Quarterly sampling of select wells in the 5-mi radius of the RWMC is conducted (see Section 3). Samples are analyzed for contaminants of concern to the OU 7-13/14 risk analysis process (see third item above), and an effort is made to confirm detections of Am-241, Pu-238, Pu-239/240, or Np-237, which are of heightened interest to the public and the Agencies.

3. SAMPLING LOCATION AND FREQUENCY

Aquifer samples will be collected quarterly from the following RWMC area wells: M1SA, M3S, M4D, M6S, M7S, M11S, M12S, M13S, M14S, M15S, M16S, M17S, USGS-127, OW-2, and A11A31 (see Figure 1). All except M17S are outside of the SDA. Appendix A contains the well logs for the INEEL monitoring wells, and well depths, well screen intervals, and other information about the wells are presented in Table 1. Not included are the eight area wells installed and routinely sampled by USGS, which also are used to assess contaminant trends.

Additional wells may be brought into the program as needs dictate, and existing wells may be removed if necessary. Well M10S was removed from the WAG 7 sampling network because of problems with the well. Two attempts were made to replace M10S (S1835 and S1838). Well S1835 was drilled using muds and additives, which could not be cleared from the well. Well S1838 became unusable when some equipment became irretrievably lodged in it. Neither of the wells has been added to the WAG 7 groundwater monitoring network at this time. If the muds and additives can be cleared from S1835 and the well yields adequate sample for analysis, it may be sampled. Well S1838 may be used for vapor monitoring.

Table 1. Specific Radioactive Waste Management Complex well information

Well	Installation Date"	Screened Interval	Total Depth (ft)	Casing Diameter (in.)	Depth to Water[b] (ft bls)	Estimated Purge Volume[d] (gal)	Flow Rate" (gpm)
M1SA	October 1992	608–638	678	6	587.78[b]	221	6[b]
M3S	October 1992	602.8–632.8	660	6	591.35[b]	179	9[b]
M4D	October 1992	798–828	838	6	599.9'	1,004	18[c]
M6S	October 1992	642–668	696.5	6	642.37[c]	113	18[c]
M7S	October 1992	598–628	638	6	581.09[c]	250	10[c]
M10S-R	March 2003	597–637	648	6	597	198	<1
M11S	May 1998	559–569 604–624	624	6	568.52[c]	244	9'
M12S	May 1998	528–538 548–568	572	6	538.4'	148	12[c]
M13S	May 1998	593.1–603.1 623.1–643.1	645.5	6	603.35[c]	186	9'
M14S	May 1998	583.6–604.6 624.6–634.6	645	6	608.3[c]	161	12[c]
M15S	2000	600–620	653	6	597.05[b]	100	6[b]
M16S	2000	578–598	663	6	580.1[c]	321	6'
M17S	2000	598–628	665	6	588.26'	177	30[c]
ow-2	1993	None	985	6	622.64[c]	1,596	9'
A11A31	1993	635–675	683	4	645.25[c]	56	7'
USGS-127	2000	496–596	596	6	510.99[c]	374	36[c]

a. Well installation data are from the Hydrogeologic Data Repository Information database.

b. Depth-to-water and flow-rate data represent the May 2003 sampling event.

c. Depth-to-water and flow-rate data represent the August 2003 sampling event.

d. Purge volumes are based on calculating the water column (i.e., subtracting depth-to-water from depth-to-bottom of the well casing). These data are based on three well volumes.

e. Flow rates may vary during purging

f. There is no screened interval. Well OW-2 was drilled in basalt with the casing to 184 m (603 ft) below land surface and the open hole from 184 to 300 m (603 to 985 ft) below land surface.

4. SAMPLE DESIGNATION

A systematic 10-character sample designation code will be assigned to each sample by the Sampling and Analysis Management Office and will be unique to each sample. The Sampling and Analysis Management Office ensures that no two samples are assigned the same identification code.

The first three characters identify the project and where the sample was collected for the WAG project. The next three characters designate the sequential sample location for the project. The following two characters designate the sample type (i.e., original or duplicate). The last two characters designate the analysis code, including the analysis and container type. For example, the number "RISK3801RH" from the OU 7-13/14 groundwater-monitoring project will indicate the following information:

- **"RIS"** designates the sample as originating from WAG 7 in support of groundwater sampling
- "K38" designates the sequential sample number
- "01" designates the sample type (i.e., 01 = original sample and 02 = field duplicate)
- "RH" designates the sample analysis as radiological suite 1

The SAP tables in Appendix B identify the analyses.

5. SAMPLING PROCEDURES AND EQUIPMENT

Before sampling at the RWMC, the shift supervisor will be notified that sampling will be going on around the facility. Sampling is considered part of routine operations and does not have to be on the plan of the day, except for sampling of M17S within the SDA. A radiological control technician is required to accompany the samplers at the SDA. A prejob briefing is held before the sampling project in accordance with MCP-3003, "Performing Pre-Job Briefings and Documenting Feedback." The rest of this section identifies the appropriate procedures and equipment to be used for the planned groundwater monitoring. Referenced procedures have been approved by the RWMC operational safety board and the nuclear facility manager.

5.1 Groundwater Monitoring

5.1.1 Groundwater Elevations

The water level in each well will be measured before purging using either an electronic measuring tape (Solinst brand or equivalent) or a steel tape measure, as described in Guide (GDE)-128, "Measuring Groundwater Levels." Measurement of all groundwater levels will be recorded in the logbook to an accuracy of 0.01 ft. The use of automated data loggers for measuring groundwater levels will be implemented as funding becomes available.

5.1.2 Well Purging

All wells will be purged before sample collection following well purging procedures defined in GDE-127, "Sampling Groundwater." During the purging operation, specific conductance, pH, and temperature will be measured using a calibrated Hydrolab or equivalent (Hydrolab 1998). Calibration will be performed according to Technical Procedure-6539, "Calibrating and Using the Hydrolab Datasonde Water Quality Microprobe," to ensure that sensors are functioning properly. If there are temperature extremes, the field team leader may determine that calibration should be performed more frequently.

Just after purging begins, specific conductance, pH, dissolved oxygen, temperature, and flow rate will be measured, and readings will be recorded at regular intervals thereafter. The flow rate will be noted in the sample logbook. The well will be purged a minimum of three well-casing volumes until the pH, temperature, and specific conductance of the purge water have stabilized or until a maximum of five well-casing volumes have been removed. Purge water is determined to be stable when parameters for three consecutive samples are within the following limits:

- pH: ± 0.1
- Temperature: ± 0.5°C (33°F)
- Specific conductance: ± 10 μmhos/cm.

Note: Dissolved oxygen is a highly unstable water parameter that is easily compromised by fluctuations in the pumping rate. Unlike the parameters above, dissolved oxygen does not have to be stable before sample collection.

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. If the well is pumped dry, samples will be collected as soon as the well has recovered enough water to fill the required sample bottles.

5.1.3 Groundwater Sampling

Before sampling, all required documentation and safety equipment will be assembled including radios, fire extinguishers, personal protective equipment, containers, and sampling accessories. A prejob briefing will be conducted by the field team leader in accordance with MCP-3003, "Performing Pre-Job Briefings and Documenting Feedback." All sampling personnel will be familiar with this FSP, the QAPjP (DOE-ID 2002), and the most current version of the *Health and Safety Plan for the Long-Term Stewardship Sitewide Groundwater Monitoring* (Gurney 2003).

Groundwater samples will be collected in accordance with applicable sections of GDE-127. The SAP tables of Appendix B identify the target analytes, and Table 2 outlines the typical requirements for containers, preservation methods, sample volumes, and holding times associated with the planned analyses. Contract-required detection limits are specified in the QAPjP (DOE-ID 2002). These requirements could change as laboratory contracts change.

Table 2. Specific sample requirements for planned groundwater analyses.

Analytical Parameter	Container Volume	Container Type	Preservative	Holding Time
Volatile organics by gas chromatographyl mass spectrometry	120 mL	3–40-mL glass vials	4°C (39°F) and H_2SO_4 to pH < 2, no headspace	14 days
Volatile organics by gas chromatographyl mass spectrometry (quality assurance and quality control samples)	360 mL	9–40-mL glass vials	4°C (39°F) and H_2SO_4 to pH < 2, no headspace	14 days
Metals"	2 L	2–1,000-mL HDPE bottles	HNO_3 to pH < 2	180 days
Metals-filtered	2 L	2–1,000-mL HDPE bottles	HNO_3 to pH < 2	180 days
Anions[b]	1 L	1–1,000-mL HDPE bottles	4°C (39°F)	28 days, except NO_3, NO_2, and PO_4, are 48 hours
Bicarbonate	500 mL	1–500-mL HDPE bottles	4°C (39°F)	14 days
Am-241, C1-36, Np-237, Tc-99, Gross alpha, gross beta, gamma spectroscopy," plutonium isotopes, and uranium isotopes	5 gal	2–2.55-gal cubetainer	HNO_3 to pH < 2	180 days
C-14, tritium, and 1-129	1 gal	1-gal cubetainer	None	180 days, except 1-129 is 28 days
1-129 low detection limit[d]	8 L	2–4-L HDPE bottles	None	28 days

a. Samples are analyzed for Contract Laboratory Program metal analytes

b. Anion analytes include bromide, chloride, fluoride, nitrate/nitrite-N, orthophosphates, and sulfates.

c. Gamma spectroscopy analytes are specified in the Statement of Work for the laboratory. The analyte list includes the following: Sb-125, Ce-144, Cs-134, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, Mn-54, Ru-106, Ag-108m, Ag-1 lom, Zn-65, and any analytes where the results are $>2\sigma$ and greater than the minimum detectable activity.

d. Low-level detection limit for 1-129 is 0.1 pCi/L

HDPE = high-density polyethylene

All sampling equipment to be exposed to the water sample will be cleaned in accordance with appropriate procedures. The dedicated submersible pump and sampling manifolds will not require decontamination. Following sampling, all nondedicated equipment that was exposed to the well water will be decontaminated in accordance with GDE-140 before storage.

Sample bottles for groundwater samples will be filled to approximately 90–95% of capacity to allow for content expansion or preservation unless it is stated that the sample should have no head space; then the sample bottle is prepreserved and filled completely. Samples to be analyzed for metals will be both unfiltered and filtered through a 0.45-μm filter. Samples requiring acidification will be acidified to a pH <2 using ultra pure nitric acid.

5.2 Sampling Quality Assurance and Quality Control

For each routine groundwater-sampling event, there are up to four types of field quality control samples, plus performance evaluation (PE) samples. The field blanks, trip blanks, and rinsates are aimed specifically at identifying whether contamination was introduced during the sampling process, while the duplicates address a combination of the field and laboratory error, and the PE samples specifically target the laboratory's ability to quantify radiological activity in a sample. Because the PE samples are designed to test the laboratory's performance, their identity must be concealed from the laboratory. To ensure anonymity of the PE samples, they will be assigned a fictitious well name and depth to be used on the chain-of-custody forms and labels. Duplicate samples are used in part to quantify laboratory error. Additional information may be found in the current revision of the QAPjP (DOE-ID 2002) and Plan-862, "Performance Evaluation Sample Program Plan." Each type of sample is described below:

- Field blank: Radiological field blanks consist of deionized or ultra pure resi-analyzed water, some of which is poured into the prepared bottle at each sample site. When the last well sample is collected, the field-blank bottle is full. All other field-blank samples are collected at one location. The purpose of the field blank is to check cross-contamination during sample collection and shipment (one field blank per 20 samples or 1 per day, whichever is less). In the event of unexpected field sample contamination, field blanks will be used to check chemical preservation techniques and to assess whether contamination could have been introduced at the sampling location. The water used for field blanks, except for VOC field blanks, will be obtained from the water supply at Site or town laboratories. The water used for VOC field blanks will be ultrapure resi-analyzed water.

- Trip blank (for VOCs only): Organic-free water in a vial is sent from the laboratory to accompany VOC water samples during sampling and shipment processes. This blank is used for checking for cross-contamination during sample handling, shipment, and storage (one per VOC cooler). The trip blank sample will be prepared in an INEEL laboratory before the start of the sampling event using ultrapure resi-analyzed water and will remain unopened throughout the sampling event. Trip blanks will be prepared only for VOC sampling events and used to monitor VOC contamination in the event of unexpected field sample contamination.

- Equipment rinsate: Sample is obtained by rinsing sample collection equipment with analyte-free water, following decontamination, to evaluate field decontamination procedures (one rinsate per 20 samples or 1 per day, whichever is less). Equipment rinsate samples will be collected at the sample port manifold before decontamination, per sampling event, and before the next use. In the event of unexpected field sample contamination, equipment rinsates will be used to determine whether contamination is from the sampling equipment.

- Duplicate: Collocated sample is collected to evaluate cumulative measurement precision associated with field and laboratory operations (one duplicate per 20 samples or 1 per day, whichever is less).

- Radiological PE samples: Two performance-evaluation samples for radionuclides will be prepared and submitted as double blind with each set of quarterly samples. The performance-evaluation samples will be specially prepared by either the DOE Radiological and Environmental Sciences Laboratory or a certified and approved performance-evaluation sample vendor subcontracted through the INEEL Sample and Analysis Management Office. The radiological performance-evaluation samples will assess the laboratory's ability to correctly distinguish a nondetection from a detection and to accurately quantify radiological activity in a sample. The samples will remain closed during the entire sampling event. The bottles will be opened only in the laboratory during initial sample preparation and for final analysis. In the event of unexpected field sample contamination, the sealed performance-evaluation samples will be used to determine whether the contamination was introduced at the laboratory.

- Organic and inorganic PE samples: PE samples for organic and inorganic analyses are obtained through Environmental Resource Associates. Environmental Resource Associates is accredited by the National Voluntary Laboratory Accreditation Program as part of the National Institute of Standards and Technology, Technology Services Division, as a supplier of environmental proficiency testing and quality control standards. National Voluntary Laboratory Accreditation Program provides third-party accreditation to testing and calibration laboratories. Project samplers send sample containers identical to those used in the field to Environmental Resource Associates, and the double blind PE samples are sent under chain of custody to the project samplers for inclusion with the field samples. Reference values for the samples are sent under separate cover to INEEL Sample and Analysis Management.

5.3 Corrective Action

Corrective actions will be required whenever an issue is identified, which requires management attention. Issues include failures, malfunctions, deficiencies, defective items, nonconformances, or conditions or actions that may cause adverse operational, environmental, safety and health, or quality assurance consequences. Corrective actions will follow MCP-598, "Corrective Action System," and issues will be tracked in the Issue Communication and Resolution Environment system.

6. SAMPLE HANDLING AND ANALYSIS

After groundwater samples are collected from the well and preserved, the gloved sampling technician will wipe the sample containers to remove any residual water and will relinquish the samples to the designated sample custodian. The sample custodian will be responsible for ensuring that (1) clear tape is placed over sample container labels, (2) lids are secured, (3) parafilm is placed around lids (excluding volatile organic analysis samples), and (4) samples are properly packaged before shipment. The MCP-1192, "Chain-of-Custody and Sample Labeling for ER and D&D&D Projects," and GDE-141, "Handling and Shipping Samples," contain additional sample-custody information.

6.1 Field Sample Screening Analysis

Groundwater samples have been collected periodically from the RWMC perimeter wells since October 1992. Based on the monitoring results since 1992 (see Section 4 of Holdren et al. 2002) and process knowledge, it is reasonable to expect that RWMC perimeter well samples will be well below the U.S. Department of Transportation (DOT) classification of radioactive material and will not require a field sample gamma radiation screen or an off-Site laboratory shipping screen. Gamma screening will be required for samples collected from Well M17S located inside the SDA until a determination is made otherwise. Purge water requirements for Well M17S are discussed in Section 8.

6.2 Sample Shipping and Laboratory Analysis

Samples will be transported in accordance with the regulations issued by the DOT (49 CFR 171 through 173, 175 through 178, 2003) and the U.S. Environmental Protection Agency sample handling, packaging, and shipping methods (40 CFR 261,2003). All samples will be packaged and transported in a manner that protects the integrity of the sample and prevents sample leakage. Packaging procedures will vary depending on results of the radiological screening, the suspected sample concentrations, and the DOT hazard classification.

The temperature of one sample cooler per cooler shipment will be observed upon arrival at the analytical laboratory. This cooler will be opened and a thermometer placed inside. When the thermometer equilibrates, the temperature will be recorded in a logbook. Laboratory personnel will communicate the temperature to field personnel to ensure adequate coolant is used during subsequent sample shipments as required.

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, chain-of-custody forms, and sample container labels. Section 7.2 outlines the sample handling and discusses chain of custody, radioactivity screening, and sample packaging for shipment to the analytical laboratories. The analytical results from these sampling efforts will be documented in a series of technical memoranda that are prepared on an annual basis.

7.1 Documentation

The field team leader will be responsible for controlling and maintaining all field documents and records and for ensuring that all required documents are submitted to the Environmental Restoration Administrative Records and Document Control Center. All entries will be made in permanent ink. All errors will be corrected by drawing a single line through the error and 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 identification 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 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, which are provided for each sampling event, will be generated from the SAP database to ensure unique sample numbers.

These forms are used to facilitate sample container documentation and organization of field activities, and they contain information regarding the following:

- Media
- Analysis type
- Container size and type
- Sample preservation
- Holdtimes.

7.1.3 Field Logbooks

Logbooks will be used to record information necessary to reconstruct the sampling event and to interpret 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/Shipping Logbook. The field teams will document sample information in the logbook. The logbook will contain information such as:

- Physical measurements (if applicable)
- List of quality control samples
- Shipping information (e.g., collection dates, shipping dates, cooler identification number, destination, chain-of-custody number, and name of shipper)
- All relevant team activities
- Problems encountered
- Visitor log
- List of site contracts.

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

7.1.3.2 Field Instrument Calibration and Standardization Logbook. Calibration data will be maintained in the logbook for each piece of equipment requiring periodic calibration or standardization. The logbook will contain log sheets to record the date, time, method of calibration, and instrument identification number.

7.2 Sample Handling and Shipping

All samples will be handled in accordance with MCP-9364, "Handling, Storing, and Shipping Samples." Qualified and approved analytical and testing laboratories will be used to analyze the groundwater samples.

7.2.1 Sample Containers

Analytical samples for laboratory analyses will be collected in precleaned bottles and packaged in accordance with Section 2.3.2.1, "Sample Containers," in the QAPjP (DOE-ID 2002).

7.2.2 Sample Preservation

Preservation of water samples will be performed in accordance with MCP-9228. The temperature will be checked periodically before shipment to certify adequate preservation for those samples requiring temperatures at 4°C (39°F) for preservation. Ice chests (coolers) containing frozen reusable ice will be used to chill samples, if required, in the field after sample collection.

7.2.3 Chain-of-Custody Procedures

Samplers will follow the chain-of-custody procedures outlined in MCP-1192, "Chain-of-Custody and Sample Labeling for ER and D&D&D Projects." Sample bottles will be stored in a secured area, which is accessible only to the field team members.

7.2.4 Transportation of Samples

Samples will be shipped in accordance with the regulations issued by the DOT (49 CFR 171 through 173, 175 through 178, 2003) and **U.S.** Environmental Protection Agency sample handling, packaging, and shipping methods (40 CFR 261.4[d], 2003). All samples will be packaged in accordance with the requirements set forth in MCP-3480 and PRD-5030.

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

7.2.4.2 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 and Receiving Department will be followed. Shipment within the INEEL boundaries will conform to DOT requirements, as stated in 49 *Code of Federal Regulations,* "Transportation." Off-Site sample shipment will be coordinated with Packaging and Transportation Department personnel, as necessary, and will conform to all applicable DOT requirements.

7.3 Document Revision Requests

Revisions to this document will follow MCP-233, "Process for Developing, Releasing, and Distributing ER Documents (Supplement to MCP-135 and MCP-9395)".

8. HANDLING AND DISPOSITION OF INVESTIGATION-DERIVED WASTE

Containerization of purge water is not required for groundwater outside the SDA, but purge water may not be discharged to the ground within the SDA. Thus, purge water from all wells, except M17S, is discharged to the ground. Purge water from M17S, located inside the SDA, must be initially contained at the wellhead during sampling and transported out of the fenced RWMC area prior to discharge in accordance with MCP-425, "Surveys of Materials for Unrestricted Release and Control of Movement of Contaminated Materials," and the appropriate INEEL waste determination and disposition form.

Waste also will include personal protective equipment and miscellaneous sampling materials (e.g., paper towels, plastic bags, and gloves). Based on previous sampling at the RWMC wells, it is not anticipated that any miscellaneous sampling materials will become contaminated. If contaminated, the waste will be bagged, secured with duct tape, and labeled in accordance with instructions from the radiological control technician. The waste can be stored in the RWMC cargo container pending laboratory analyses if necessary. It is expected that the waste will be handled as conditional industrial waste to comply with the waste disposal and disposition form. Free release will be conducted in compliance with MCP-425.

Cold (nonradiological) waste is sent to the Central Facilities Area landfill or another INEEL-designated solid-waste landfill. Low-level radioactive waste is stored in the WAG 7 Environmental Response, Compensation, and Liability Act storage area in accordance with MCP-3475, "Temporary Storage of CERCLA-Generated Waste at the INEEL." The waste will be evaluated for additional characterization and managed as low-level waste. Final disposition will be coordinated with Waste Generator Services.

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