Appendix E

Sample Collection Procedures

This page intentionally left blank

1.0 Sampling Methods

Monitoring well samples will be collected according to Standard Operating Procedure 9.1, "Low-Flow Ground Water Sampling with Dedicated Pumps". A sample preparation area will be established adjacent to the well location. The work surface will be covered with plastic sheeting to minimize the potential spread of contamination. The following equipment will be staged in the sample-preparation area:

- A spill kit,
- Personal protective equipment,
- Sample containers,
- A decontamination station,
- Bailers,
- A wastewater drum,
- Custody seals, and
- Chain-of-custody forms.

The groundwater samples will be collected following EPA guidance for low-flow groundwater sampling (EPA 1996), including monitoring for specific conductance (SC), pH, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity until all are within the stabilization goals for three consecutive readings. The stabilization goals are:

- SC, ORP, DO, and turbidity: ± 10 percent.
- pH: ± 0.2.

Well purging and groundwater sample collection will be performed with dedicated bladder pumps or similar pumps suitable for low-flow purging. Sampling containers, field filtration, preservation methods (if any), and holding times will be as specified in Table E–1. All purge water and decontamination water generated during sampling will be disposed of through the campus wastewater treatment plant.

2.0 Sample Documentation

The usability of the data will depend on the data's quality. Following proper procedures for both sample collection and sample analysis reduces sampling and analytical error. To ensure sample integrity, samples will be handled using complete chain-of-custody documentation and preserved using proper sample preservation techniques, holding times, and shipment methods. Obtaining valid and comparable data also requires adequate quality assurance and quality control procedures and documentation.

Table E−1. Analytical Parameters for Groundwater Samples

Parameter	Method Reference	Container	Sample Handling/ Preservation	Reporting Limit[a]	Holding Time
Metals					
Aluminum	SW-846, Method 6020A[b]	250-milliliter polyethylene plastic	Filter[i], nitric acid, pH<2	50 µg/L	180 days
Chromium (total)				1 µg/L	
Molybdenum				1 µg/L	
Nickel				2 µg/L	
Selenium				3 µg/L	
Silver				1 µg/L	
Zinc				10 µg/L	
Mercury	SW-846, Method 7470[b]	250-milliliter polyethylene plastic	Filter[i], nitric acid, pH<2	0.2 µg/L	28 days
Hexavalent Chromium	SW-846, Method 7199[b]	250-milliliter polyethylene plastic	Filter[i], 4°C	1 µg/L	24 hours
Radionuclides					
Americium-241	EML HASL 300[c]	2-liter polyethylene plastic, glass	Filter[i], nitric acid, pH<2	1 pCi/L	180 days
Cesium-137	EPA Method 901.1[d]	1-liter polyethylene plastic, glass	Filter[i], nitric acid, pH<2	5 pCi/L	180 days
Strontium-90	EPA Method 905.0[e]	2-liter polyethylene plastic, glass	Filter[i], nitric acid, pH<2	1 pCi/L	180 days
Carbon-14	EPA EERF C-01[f]	1-liter polyethylene plastic, glass	none	7 pCi/L	180 days
Radium-226	EPA Method 903.1[g]	1-liter polyethylene plastic, glass	Filter[i], nitric acid, pH<2	1 pCi/L	180 days
General					
Nitrate (as Nitrogen)	EPA Method 300.0[h]	250-milliliter polyethylene plastic	4°C	10 mg/L	48 hours
Formaldehyde	SW-846, Method 8315[b]	1-liter amber glass	4°C	50 µg/L	72 hours
Organics					
Alpha-Chlordane	SW-846, Method 8081[b]	1-liter amber glass (2 each)	4°C	1.0 µg/L	7 days to extraction, 40 days to analysis
Gamma-Chlordane				1.0 µg/L	
Dieldrin				0.1 µg/L	

Notes:
[a] As shown, reporting limits are at or below MCLs for all constituents and are below the previously defined background levels for all inorganics except for mercury, americium-241, cesium-137 and carbon-14. The background values for these four constituents were based on one half of the lowest background detection limits; therefore the specified reporting limits are sufficiently low for comparison with background. .
[b] From the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA 2007).
[c] From *The Procedures Manual of the Environmental Measurements Laboratory* (DOE 1997).
[d] *Gamma Emitting Radionuclides* from *Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA 1980).
[e] *Radioactive Strontium* from *Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA 1980).
[f] EPA, *Eastern Environmental Radiation Facility* (EERF).
[g] *Radium-226 - Radon Emanation Technique* from *Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA 1980).
[h] *Determination of Inorganic Anions by Ion Chromatography* (EPA 1993).
[i] Glass fiber, 0.45 micron filter
µg/L = micrograms per liter
EPA = U.S. Environmental Protection Agency
mg/L = milligrams per liter
pCi/L = picocuries per liter

The components of the sample documentation and custody system will include:

- The chain-of-custody,
- The field logbook,
- Sample numbers,
- Sample labels, and
- Custody seals.

2.1 Chain-of-Custody

Members of the sample team will complete chain-of-custody forms to track sample custody and to specify the requested analyses.

2.2 Field Logbook

Descriptions and observations made during field sampling activities will be documented in the field logbook. In addition, boring logs with lithologic classifications will be prepared from the field geologists' interpretation of the soil core recovered from well installation. The following will be recorded in the field logbook:

- The project name and number,
- The site location,
- The purpose of the sampling,
- A description of field activities,
- The names of sampling personnel,
- The date and time of entries,
- The date and time the sample was collected,
- The sample location and identification (ID) number,
- The sampling method,
- Field observations,
- The results of field measurements, and
- The results of field instrument calibrations.

2.2.1 Sample ID Numbers

All samples will be assigned a unique sample ID number (i.e., sample designation), using the following format:

GWDOEXXXX

Where

GWDOE	=	the groundwater sample associated with the DOE area; and
XXXX	=	the chronological sample number (e.g., 0017, 0018, 0019).

2.2.2 Sample Labels

Sample labels will be attached to individual sample containers and will contain the following information:

- The project number,
- The sample ID number,
- The date and time the sample was collected,
- The sampler's initials, and
- Requested analyses.

2.2.3 Custody Seals

Custody seals will be used to detect tampering and will be placed over the lid of the container and annotated with the following information:

- The project number,
- The sample ID number, and
- The date and time the sample was collected.

2.3 Data Validation and Compilation

The analytical laboratory will be contracted to deliver a detailed analytical report, including calibration data and raw data from the analysis of primary samples and quality control samples, sufficient for the reconstruction of all sample results. The project chemist or a designee who meets the qualifications requirements stated in the Quality Assurance Project Plan (QAPP) (DOE 2010) will validate the analytical results in accordance with data validation procedures defined in the QAPP. Once validated, the data will be transferred to the project database in accordance with procedures described in the QAPP.