Addendum H1

Closure Plans

LLBG Trenches 31-34-94

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H1 - LLBG Trenches 31-34-94

H1 Introduction

Addendum H.1 discusses closure activities for the Low-Level Burial Ground (LLBG) Trenches 31-34-94 Operating Unit Group (OUG).

H1.1 Facility Contact Information

The Hanford Facility is owned by the U.S. Government and operated by the U.S. Department of Energy (DOE). The contact information is as follows:

U.S. Department of Energy, Richland Operations Office
P.O. Box 550
Richland, WA 99352
(509) 372-2400

H1.2 Facility Description

The Hanford Facility, located in southeastern Washington State, is owned by the U.S. Government and is managed and operated by DOE. Dangerous waste and mixed waste (containing both dangerous and radioactive components) are generated and managed at the Hanford Facility.

The LLBG Trenches 31-34-94 OUG (hereinafter referred to as LLBG Trenches 31-34-94) are comprised of the following three trenches: LLBG Trenches 31 and 34 in the 200 West Area of the Hanford Facility, and LLBG Trench 94 in the 200 East Area of the Hanford Facility. Previously, LLBG Trenches 31 and 34, and LLBG Trench 94 were managed as separate OUGs; however, due to similar missions and operational capabilities, they are now being combined into one OUG. Trench 94 is not included in this Closure Plan and is not addressed further.

H1.3 Facility History, Function, Location, and Layout

LLBG Trenches 31 and 34 are large rectangular excavations in the southwest corner of the 218-W-5 Burial Ground operated as units for disposal of treated and land disposal restriction (LDR) compliant dangerous and/or mixed waste. LLBG Trenches 31 and 34 are rectangular, and at the top are approximately 137 m (450 ft) long by 91 m (300 ft) wide, and 9 m (30 ft) in depth. LLBG Trenches 31 and 34 began receiving waste for disposal on September 15, 1999. The LLBG Trenches 31 and 34 are constructed with polyethylene liners and a leachate collection system. In addition, two waste storage pads (LLBG Trench 31 Waste Storage and Treatment Pad and LLBG Trench 34 Waste Storage and Treatment Pad) provide storage and/or treatment of waste before disposal (Figure 1).

H1.4 Products and Production Processes

LLBG Trenches 31-34-94 do not produce products and do not have production processes. Therefore, this section is not applicable.

H1.5 Dangerous Waste and Used Oil Management Units

The LLBG Trenches 31-34-94 OUG includes the following dangerous waste management units:

- LLBG Trench 31 Disposal Cell
- LLBG Trench 34 Disposal Cell
- LLBG Trench 94 Disposal Cell (not included in this Closure Plan)

- LLBG Trench 31 Waste Storage and Treatment Pad
- LLBG Trench 34 Waste Storage and Treatment Pad
- FS-1 Outdoor Container Storage Area (Closing Unit)

The LLBG Trenches 31-34-94 OUG does not have used oil management units.

Figure 1. Low-Level Burial Ground Trenches 31-34 Operating and Closing Dangerous Waste Management Units

H1 - LLBG Trenches 31-34-94
H1.A - Appendix A – FS-1 Outdoor Container Storage Area

A1 Introduction

This appendix discusses closure activities for the Low-Level Burial Ground (LLBG) Trenches 31-34-94 Operating Unit Group (OUG) FS-1 Outdoor Container Storage Area dangerous waste management unit (DWMU), hereinafter referred to as FS-1. This DWMU is located along the south side of Trench 34. The U.S. Department of Energy (DOE) has agreed through a Consent Agreement and Final Order with the U.S. Environmental Protection Agency (EPA) to close this DWMU. The closure will be performed in accordance with the included schedule. This closure plan complies with WAC 173-303-610(2) through WAC 173-303-610(6), "Dangerous Waste Regulations," "Closure and Post-Closure," and represents the baseline for closure. Amendments to this closure plan will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

A1.1 Unit Description

FS-1 (Figure A-1 and Figure A-2) was originally designated as a waste storage area in November 2004 for the temporary storage of non-mixed low-level waste (LLW) containers from the 300 Area prior to their disposal into LLBG Trench 34. The temporary storage of LLW was completed in July 2005. From July 2005 to November 2007, no dangerous, mixed, or *Toxic Substances Control Act of 1976* (TSCA) polychlorinated biphenyl (PCB) LLW was stored in FS-1. From November 2007 through September 2008, FS-1 was used for the storage of LLW, mixed low-level waste (MLLW), and TSCA-PCB LLW containers prior to disposal into Trenches 31 and 34. A radiological survey was performed on FS-1 in March 2012 which confirmed no radiological contamination above the expected background levels.

FS-1 is a gravel covered, rectangular area approximately 14 m (15 yd) wide by 69 m (75 yd) long equaling a total storage area of 966 m^2 (1,125 yd^2). The perimeter of the storage area is defined by metal T-posts, with the corner posts holding signage designating the area as FS-1. There are no structures or equipment located at the storage area.

FS-1 does not currently store dangerous, mixed, or TSCA-PCB waste. Future dangerous waste container storage and treatment of dangerous, mixed, or TSCA-PCB waste are not authorized within the FS-1 DWMU and will not be requested after *Resource Conservation and Recovery Act of 1976* (RCRA) closure is complete.

A1.1.1 Maximum Waste Inventory

The maximum inventory of MLLW and TSCA-PCB LLW waste stored on FS-1 over its lifetime included four MLLW containers with an approximate total volume of 12 m^3 (16 yd^3) and seven TSCA-PCB LLW waste containers with an approximate total volume of 5 m^3 (171 yd^3). MLLW and TSCA-PCB LLW waste storage occurred from November 2007 through September 2008. The MLLW stored at FS-1 was either treated to meet land disposal restriction (LDR) requirements prior to being stored in this area, or the waste met the LDR requirements at the time of generation. Details on the waste containers are presented in Section A3.3 of this closure plan.

Figure A-1. FS-1 and Trenches 31 and 34

Figure A-2. FS-1 Outdoor Container Storage Area

A2 Closure Performance Standard

Closure performance standards for FS-1 will be based on requirements found in WAC 173-303-610(2), "Dangerous Waste Regulations," "Closure and Post-Closure," which require closure of the facility in a manner that:

- Minimizes the need for further maintenance

- Controls, minimizes, or eliminates to the extent necessary to protect human health and the environment, post-closure escape of dangerous waste, dangerous constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere

- Returns the land to the appearance and use of surrounding land areas, to the degree possible, given the nature of the previous dangerous waste activity

These performance standards are addressed in Sections A2.1 and A3.9 of this closure plan.

A2.1 Clean Closure Levels

FS-1 will be clean closed. In accordance with WAC 173-303-610(2)(b)(i), the clean closure levels for soil will be the numeric cleanup levels calculated using unrestricted use exposure assumptions according to the "Model Toxics Control Act—Cleanup" (WAC 173-340), hereinafter called MTCA, cleanup regulations (WAC 173-340-700, "Overview of Cleanup Standards," through -760, "Sediment Cleanup Standards," excluding WAC 173-340-745, "Soil Cleanup Standards for Industrial Properties"). These numeric cleanup levels will be calculated according to MTCA Method B unrestricted use standards current at the time of closure.

Sampling and analysis will confirm clean closure for the FS-1 gravel and soil. Should sampling and analysis of FS-1 indicate contamination above the MTCA Method B unrestricted use standards, then the potential for groundwater contamination will be reviewed and discussed with the Washington State Department of Ecology (Ecology). Any required changes to this closure plan resulting from the discussions will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

A3 Closure Activities

As a storage unit, clean closure determination for FS-1 is based on a review of the operational history, operating records, waste management records, and a visual inspection of the area to verify that waste related staining is not present. Based on these reviews, FS-1 is concluded to be in a safe configuration and will be clean closed under RCRA. Subsequently, soil sampling and analysis activities, determined by the results of the records review and visual inspection and developed utilizing EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection* (EPA QA/G-5S), will be conducted via a sampling and analysis plan (SAP) (Section A3.8). The objective of the sampling described in this document is to confirm that the MTCA Level B closure performance standards for soil demonstrating clean closure of FS-1 were met.

Closure activities required to achieve and verify clean closure for soil are as follows:

- Remove all dangerous, mixed, and TSCA-PCB LLW waste inventory (completed; see Section A3.2).
- Review waste container storage, operating, and inspection records (completed; see Section A3.3.).
- Perform a visual inspection of gravel and visible surface soil (completed; see Section A3.3.).
- Perform soil sampling and analysis to confirm that clean closure standards are met.

A3.1 Health and Safety Requirements

Closure will be performed in a manner to ensure the safety of personnel and the surrounding environment. Qualified personnel will perform any necessary closure activities in compliance with established safety and environmental procedures. Personnel will be equipped with appropriate personal protective equipment. Qualified personnel will be trained in applicable safety and environmental procedures in

accordance with the Solid Waste Operations Complex Central Waste Complex (CWC)-Waste Retrieval and Processing (WRAP), Addendum G, *Personnel Training*, and have appropriate training and experience in sampling activities. Field operations will be performed in accordance with applicable health and safety requirements.

The Permittees have instituted training or qualification programs to meet training requirements imposed by regulations, DOE orders, and national standards such as those published by the American National Standards Institute/American Society of Mechanical Engineers. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. Field personnel typically have completed the following training before starting work:

- Occupational Safety and Health Administration 40-Hour Hazardous Waste Worker Training
- 8-Hour Hazardous Waste Worker Refresher Training (as required)
- Hanford General Employee Training

Project-specific safety training addressed explicitly to the project and the day's activity will include the following:

- Training will provide the knowledge and skills needed for sampling personnel to perform work safely and in accordance with quality assurance (QA) requirements.
- Samplers are required to be qualified in the type of sampling being performed in the field.

In addition, pre-job briefings will be performed to evaluate activities and associated hazards by considering many factors, including the following:

- Objective of the activities
- Individual tasks to be performed
- Hazards associated with the planned tasks
- Environment in which the job will be performed
- Facility where the job will be performed
- Equipment and material required
- Safety protocols applicable to the job
- Training requirements for individuals assigned to perform the work
- Level of management control
- Proximity of emergency contacts

Training records are maintained for each employee in an electronic training record database. The Permittees training organization maintains the training records system.

A3.2 Removal of Wastes and Waste Residues

No MLLW or TSCA-PCB LLW waste is currently stored at FS-1. MLLW was removed in September 2008, and TSCA-PCB LLW was removed in January 2008. FS-1 will no longer be used for dangerous, mixed, or TSCA-PCB waste storage.

A3.3 FS-1 Outdoor Storage Area Operating Records Review and Visual Inspection

To support the development of this closure plan and the included SAP, a review of the FS-1 RCRA operating records was completed (Table A-1). The records review included the following RCRA operating record documents: facility daily operating logbooks (including spill information), waste management records, and weekly dangerous waste inspection checklists. The RCRA operating record documents that were reviewed focused on the time frame during active MLLW or TSCA-PCB LLW storage. The records review included the time period of November 2007 through September 2008. The records review, completed on July 31, 2013, indicated no documented releases of MLLW or TSCA-PCB LLW waste to FS-1.

Table A-1. RCRA Facility Operating Records Review Summary

Document Title	Document Type	Facility	Start Date	End Date	Items of Concern Noted
FS-1 Daily Operating Logbook Review	Logbook	FS-1	07/10/2007	04/16/2009	No
Checklist 2 – LLBG Weekly RCRA Inspections for Trenches 31 and 34 in 218-W-5 (Trench 34)	Weekly Inspection	FS-1	01/01/2007	09/23/2008	Yes*

* The container noted as an item of concern was not a dangerous waste container. No evidence of leaking was noted. See Attachment A for details.

LLBG = low-level burial ground

RCRA = *Resource Conservation and Recovery Act of 1976*

Waste management records for MLLW and TSCA-PCB LLW containers stored in FS-1 were reviewed to determine the target analytes to be included in the closure plan SAP. The waste management records review indicated that all target analytes in MLLW and TSCA-PCB LLW previously stored in FS-1 were LDR compliant (either treated to meet LDR requirements or were below the LDR-regulated levels at the time of generation) prior to storage in FS-1 (Table A-2).

A visual inspection was completed on July 31, 2013 to identify any dangerous waste related staining in FS-1. No waste related staining was identified during the visual inspection; therefore, only confirmation sampling and analysis to verify clean closure will be performed.

Supporting documentation for the RCRA operating records review and visual inspection are documented in Attachment A and include the FS-1 Daily Operating Log Book Review sheet, the LLBG Trench 34/FS-1 Weekly Dangerous Waste Inspection Checklist Review, LLBG 218-W-5, FS1 Outdoor Container Storage Area visual inspection sheet, and any additional supporting information.

Table A-2. Waste Container Data

Container ID	Facility ID	Storage Unit	Waste Package Type	Package Volume (m^2)	Waste Type	Moved In Date	Moved Out Date	Assigned Waste Code	LDR Status
MW07700211	LLBG 218W5	FS1	DOT METAL BOX	2.72	MLLW	11/29/2007	11/29/2007	D005, D006, D007, D008, D009, D011, D035, F001, F002, F003	TREATED TO MEET LDR STANDARDS
MW07700604	LLBG 218W5	FS1	DOT METAL BOX	2.72	MLLW	11/29/2007	11/29/2007	D007, D008, D009, D035, F002, F003, F005	TREATED TO MEET LDR STANDARDS
MW07700 6551	LLBG 218W5	FS1	DOT METAL BOX	6.38	MLLW	11/29/2007	11/29/2007	D007, D008, D009, D011, D026, D035, D037, F001, F002, F003, F004, F005, P029, P030, P098, P106, P120, U002, U031, U108, U123, U133, U154, U159, U162, U210, U239	TREATED TO MEET LDR STANDARDS

Table A-2. Waste Container Data

Container ID	Facility ID	Storage Unit	Waste Package Type	Package Volume (m^2)	Waste Type	Moved In Date	Moved Out Date	Assigned Waste Code	LDR Status
0020830	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	MLLW	12/10/2007	09/10/2008	WT02	LDR COMPLIANT AT THE POINT OF GENERATION
0015656	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA
0015684	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA
0015687	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA
0015717	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA
0015760	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA
0017284	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA
PNL-00-139	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA

DOT = U.S. department of transportation
ID = identification
LDR = land disposal restriction
LLBG = low-level burial ground
LLW = low-level waste
MLLW = mixed low-level waste
NA = not applicable
TSCA = *Toxic Substances Control Act of 1976*

A3.4 Unit Components, Parts, and Ancillary Equipment

The FS-1 DWMU does not have any unit components, parts, or ancillary equipment.

A3.5 Inspection of Units Before Decontamination

Decontamination activities are not planned for FS-1.

A3.6 Decontamination

Decontamination activities are not planned for FS-1.

A3.7 Identifying and Managing Contaminated Environmental Media

The records review and visual inspection outlined in Section A3.3 did not identify any documented releases of MLLW or TSCA-PCB LLW or the presence of potentially contaminated environmental media. Environmental media removal is not anticipated.

A3.8 Confirming Clean Closure

The FS-1 will be clean closed. A review of applicable RCRA operating record documents was completed to determine the release history of the area. Records review included facility daily operating logbooks (including spill information) and weekly dangerous waste inspection checklists as outlined in Section A3.3. In addition to the records review, a visual inspection of the area was performed to identify any dangerous waste-related staining of the gravel or visible surface soil.

All MLLW and TSCA-PCB LLW waste has been previously removed, and there have been no documented spills or releases of MLLW and TSCA-PCB LLW. Post-closure escape of MLLW, TSCA-PCB LLW, and any associated constituents, leachate, contaminated run-off, and dangerous waste decomposition products to the ground, surface water, groundwater, or air is not anticipated.

FS-1 is adjacent to the LLBG Trench 34 DWMU. Sampling of FS-1 will be conducted to confirm that soil unrestricted use cleanup standards (MTCA B) have been achieved. Once analytical results confirm clean closure levels of target analytes, a determination will be made to leave the gravel surface of FS-1 in place.

A3.9 Sampling and Analysis and Constituents to Be Analyzed

A3.9.1 Sampling and Analysis Plan

Sampling and analysis of the FS-1 gravel and soil will be conducted to confirm that clean closure levels have been achieved. All sampling and analysis will be performed in accordance with the sampling and quality standards established in this closure SAP. The closure SAP details sampling and analysis procedures in accordance with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B*; the American Society for Testing and Materials (ASTM) *Annual Book of ASTM Standards*; and applicable EPA guidance. Sampling and analysis activities will meet applicable requirements of SW-846, ASTM standards, EPA-approved methods, and *Hanford Analytical Services Quality Assurance Requirements Documents (HASQARD)* (DOE/RL-96-68).

A3.9.2 Target Analytes

Waste management records for MLLW and TSCA-PCB LLW containers previously stored at FS-1 were reviewed. The waste management records identified the federal and state waste codes required for disposal of MLLW and TSCA-PCB LLW. The identified waste codes were the basis for the list of target analytes for analysis in this SAP. Table A-3 details the waste codes listed for the FS-1 waste containers and the target analyte associated with that waste code.

Table A-3. Target Analyte List

Target Analyte (Waste Code)	CAS Number	Target Analyte (Waste Code)	CAS Number
Barium (D005)	7440-39-3	Ethyl ether (F003)	60-29-7
Cadmium (D006)	7440-43-9	Methanol (F003) (U154)	67-56-1
Chromium (Hexavalent) (D007)	18540-29-9	Methyl isobutyl ketone (F003)	108-10-1
Lead (D008)	7439-92-1	Xylene (F003) (U239)	1330-20-7
Mercury (D009)	7439-97-6	o-Cresol (F004)	95-48-7
Silver (D011)	7440-22-4	Benzene, nitro (F004)	98-95-3
Cresol (D026)	N/A	Benzene (F005)	71-43-1
Methyl ethyl ketone (MEK) (D035) (F005) (U159)	78-93-3	Pyridine (F005)	110-86-1
Pentachlorophenol (D037)	87-86-5	2-nitropropane (F005)	79-46-9
Carbon tetrachloride (F001) (F002)	56-23-5	Carbon disulfide (F005)	75-15-0
Trichloroethylene (F001) (F002)	79-01-6	Isobutanol (F005)	78-83-1
1,1,1-Trichloroethane (F001) (F002)	71-55-6	2-ethoxyethanol (F005)	110-80-5
Methylene chloride (F001) (F002)	75-09-2	Toluene (F005)	108-88-3
Tetrachloroethylene (F001) (F002) (U210)	127-18-4	1-Butanol (I) (U031)	71-36-3
Chlorinated fluorocarbons (F001) (F002)	N/A	1,4-Diethyleneoxide (U108)	123-91-1
Chlorobenzene (F002)	108-90-7	Formic Acid (U123)	64-18-6
Ortho-dichlorobenzene (F002)	95-50-1	Hydrazine (R,T) (U133)[a]	302-01-2
1,1,2-trichloroethane (F002)	79-00-5	Methyl methacrylate (I,T) (U162)	80-62-6
1,1,2-trichloro-1,2,2-trifluoroethane (F002)	73-13-1	Copper Cyanide (P029)[b]	544-92-3
Acetone (F003) (U002)	67-64-1	Cyanides (P030)	N/A
N-butyl alcohol (F003)	71-36-3	Potassium cyanide (P098)[b]	151-50-8
Cyclohexanone (F003)	108-94-1	Sodium cyanide (P106)[b]	143-33-9

Table A-3. Target Analyte List

Target Analyte (Waste Code)	CAS Number	Target Analyte (Waste Code)	CAS Number
Ethyl acetate (F003)	141-78-6	Vanadium oxide (P120)	1314-62-1
Ethyl benzene (F003)	100-41-4	Polychlorinated biphenyls (PCBs) (Aroclors)	N/A

a. Due to the reactive and volatile nature of hydrazine, quantitation is difficult and its presence in soil samples from waste stored in 2008 is unlikely, therefore; samples will not be analyzed for hydrazine.

b. Analyzed as total cyanide.

CAS = Chemical Abstracts Service

N/A = not applicable

A3.9.3 FS-1 SAP Schedule

Confirmation closure sampling and analysis will be performed in accordance with the closure plan schedule in Section A4.

A3.9.4 FS-1 Project Management

The Permittees are responsible for planning, coordinating, sampling, preparing, packaging, and shipping samples to the laboratory.

A3.9.5 Sampling Design

Sample locations will be determined using an area-wide grid sampling method run in the Visual Sample Plan (VSP) software. The FS-1 global positioning system (GPS) latitude and longitude coordinates were entered into VSP to determine the locations and number of samples required to achieve a 95 percent confidence interval. Using a rectangular grid method, the VSP software determined that 20 samples are required to achieve a 95 percent confidence interval. The 20 samples will be taken from the node locations indicated by the VSP software and will be assigned sample location identifications and sample numbers using the Hanford Environmental Information System (HEIS). The first node location was chosen at random by the VSP software, and the subsequent nine sample locations were assigned by the VSP software using a rectangular grid sampling method. Supporting documentation for the VSP software sampling designations are documented in Attachment B. Grid sampling is further defined in the following paragraph. Facility records confirmed that no documented MLLW or TSCA-PCB LLW have been released to FS-1, and no waste related staining is present; therefore, judgmental sampling will not be performed.

Grid Sampling. In grid sampling, samples are collected at regularly spaced intervals over space or time. An initial location or time is chosen at random, and the remaining sampling locations are defined so that locations are at regular intervals over an area (grid). Grid sampling is used to search for hot spots and to infer means, percentiles, or other parameters. It is useful for estimating spatial patterns or trends over time. This design provides a practical method for designating sample locations and ensures uniform coverage of a site, unit, or process.

A3.9.6 Sampling Methods and Handling

Grab sample matrix will consist of gravel and soil collected in pre-cleaned sample containers taken at a depth of 0 to 15.24 cm (0 to 6 in.) below ground surface. For the purpose of this SAP, ground surface is defined as the exposed surface layer once loose gravel has been moved aside. To gather the most representative sample, loose gravel will be moved aside to expose the surface soil and compacted gravel. Once the compacted gravel and soil are sampled, the sampled media will be screened to remove material larger than approximately 2 mm (0.08 in.) in diameter. Grab samples will be collected into containers at the chosen node sample locations. To ensure sample and data usability, sampling will be performed in accordance with established sampling practices, procedures, and requirements pertaining to sample collection, collection equipment, and sample handling.

Sample container, preservation, and holding time requirements are specified in Table A-4 for soil samples. These requirements are in accordance with the analytical method specified. The final container type and volumes will be identified on the sampling authorization form and the chain-of-custody form.

Table A-4. Sample Preservation, Container, and Holding Time for Soil Samples

Method	Analysis/Analytes	Preservation Requirement	Holding Time	Bottle Type	Minimum Sample Size
EPA 6010	Metals	Cool ~4°C	6 months	G/P	20 g
EPA 7471	Mercury by Cold Vapor Atomic Absorption	None	28 days	G/P	15 g
EPA 8082	Polychlorinated Biphenyl	None	1 year	aG	250 g
EPA 8260	Volatile Organic Analytes	Cool ~4°C	14 days	G	5 × 40 g
EPA 8270	Semivolatile Organic Compound	Cool ~4°C	14/40 days	aG	250 g
EPA 300.0	Anions	Cool ~4°C	48 hours/28 days	G/P	120 g
EPA 9012	Cyanide	None	14 days	G/P	120 g
EPA 9056A	Anions	None	48 hours/28 days	G/P	250 g
EPA 9010/9012/ 9013/9014	Cyanide	None	14 days	G/P	15 g
EPA 200.8	Metals by ICP-MS	None	6 months	G/P	10 g

Notes:

For EPA Method 300.0, see EPA-600/4-79-020, *Methods for Chemical Analysis of Water and Wastes.*

For the four-digit EPA methods, see SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B.*

48 hours/28 days = 48 hours for nitrate, nitrite, and phosphate; others, 28 days
aG = amber glass
G = glass
ICP-MS = inductively coupled plasma-mass spectrometry
P = plastic

To prevent potential contamination of the samples, care will be taken to use decontaminated equipment for each sampling activity.

Level I EPA pre-cleaned sample containers will be used for samples collected for chemical analysis. Container sizes may vary depending on laboratory-specific volumes/requirements for meeting analytical detection limits.

The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook. A custody seal (e.g., evidence tape) will be affixed to each sample container and/or sample collection package in such a way as to indicate potential tampering.

Each sample container will be labeled with the following information on firmly affixed, water resistant labels:

- Sampling Authorization Form and form number
- HEIS number
- Sample collection date and time
- Sampler identification
- Analysis required
- Preservation method (if applicable)

In addition, sample records must include the following information:

- Analysis required
- Sample location
- Matrix (e.g., water or soil)

Sample custody will be maintained in accordance with existing Hanford Site protocols to ensure maintenance of sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained.

All waste (including unexpected waste) generated by sampling activities will be managed in accordance with applicable regulations.

A3.9.7 Analytical Methods

All analyses and testing will be performed consistent with this closure plan, laboratory analytical procedures, and HASQARD (DOE/RL-96-68). The approved laboratory must achieve the lowest practical quantitation limits (PQLs) consistent with the selected analytical method to confirm clean closure levels. If a target analyte is detected at or above clean closure level but less than the PQL of the analytical method, Ecology will be notified and alternatives will be discussed to demonstrate clean closure levels.

Analytical methods and performance requirements associated with the target analytes are outlined in Table A-5.

A3.9.8 Quality Control

Quality control (QC) procedures must be followed in the field and laboratory to ensure that reliable data are obtained. Field QC samples will be collected to evaluate the potential for cross-contamination and provide information pertinent to field sampling variability. Field QC sampling will include collection of full trip blank, field transfer blank, equipment rinsate blank, field duplicate, and field split samples. Laboratory QC samples estimate the precision and bias of the analytical data. Field and laboratory QC samples are summarized in Table A-6.

Table A-5. Soil Analytical Performance Requirements

CAS Number	Analyte	Analytical Method	Closure Performance Standard[a] (mg/kg)		Practical Quantitation Limit[e] (mg/kg)	Accuracy Req't (% Recovery)[b]	Precision Req't (RPD)[b]
			Carcinogen	Non-Carcinogen			
7440-39-3	Barium	SW-846 Method 6010	N/A	16,000	2.0	±30	≤30
7440-43-9	Cadmium	SW-846 Method 6010	N/A	80	0.5	±30	≤30
18540-29-9	Chromium (Hexavalent)	SW-846 Method 6010	N/A	240	1.0	±30	≤30
7439-92-1	Lead	SW-846 Method 6010	N/A	250	5.0	±30	≤30
7439-97-6	Mercury	SW-846 Method 7471 or 200.8	N/A	24	0.2	±30	≤30
7440-22-4	Silver	SW-846 Method 6010	N/A	400	1.0	±30	≤30
71-43-2	Benzene	SW-846 Method 8260	18.2	320	0.005	N/A[c]	≤20
56-23-5	Carbon tetrachloride	SW-846 Method 8260	14.3	320	0.005	N/A[c]	≤20
108-39-4	*m*-cresol	SW-846 Method 8270	N/A	4000	0.66	N/A[c]	≤20
95-48-7	*o*-cresol	SW-846 Method 8270	N/A	4000	0.33	N/A[c]	≤20
106-44-5	*p*-cresol	SW-846 Method 8270	N/A	400	0.33	N/A[c]	≤20
78-93-3	Methyl Ethyl Ketone (MEK) (2- Butanone)	SW-846 Method 8260	N/A	48,000	0.01	N/A[c]	N/A[c]
98-95-3	Benzene, nitro	SW-846 Method 8270	N/A	160	0.33	N/A[c]	N/A[c]
87-86-5	Pentachlorophenol	SW-846 Method 8260	8.33	2,400	0.33	N/A[c]	N/A[c]
110-86-1	Pyridine	SW-846 Method 8260	N/A	80	0.005	N/A[c]	N/A[c]
79-01-6	Trichloroethylene	SW-846 Method 8260	21.7	40	0.005	N/A[c]	N/A[c]
71-55-6	1,1,1-Trichloroethane	SW-846 Method 8260	N/A	165,000	0.005	N/A[c]	N/A[c]

Table A-5. Soil Analytical Performance Requirements

CAS Number	Analyte	Analytical Method	Closure Performance Standard[a] (mg/kg)		Practical Quantitation Limit[e] (mg/kg)	Accuracy Req't (% Recovery)[b]	Precision Req't (RPD)[b]
			Carcinogen	Non-Carcinogen			
76-13-1	Chlorinated fluorocarbons (1,1,2-Trichloro-1,2,2-trifluoroethane)	SW-846 Method 8260	N/A	2,400,000	0.01	N/A[c]	N/A[c]
75-09-2	Methylene chloride	SW-846 Method 8260	133	4,800	0.005	N/A[c]	N/A[c]
127-18-4	Tetrachloroethylene	SW-846 Method 8260	1.85	800	0.005	N/A[c]	N/A[c]
108-90-7	Chlorobenzene	SW-846 Method 8260	N/A	1,600	0.005	N/A[c]	N/A[c]
95-50-1	Ortho-dichlorobenzene	SW-846 Method 8270	N/A	7,200	0.33	N/A[c]	N/A[c]
79-00-5	1,1,2-trichloroethane	SW-846 Method 8260	17.5	320	0.005	N/A[c]	N/A[c]
67-64-1	Acetone	SW-846 Method 8260	N/A	72,000	0.02	N/A[c]	≤20
71-36-3	N-butyl alcohol (I-Butanol)	SW-846 Method 8260	N/A	8,000	0.1	N/A[c]	N/A[c]
108-94-1	Cyclohexanone	SW-846 Method 8270	N/A	400,000	200	N/A[c]	N/A[c]
141-78-6	Ethyl acetate	SW-846 Method 8015	N/A	72,000	5.0	N/A[c]	N/A[c]
100-41-4	Ethyl benzene	SW-846 Method 8260	N/A	8,000	0.005	N/A[c]	N/A[c]
60-29-7	Ethyl ether	SW-846 Method 8260	N/A	16,000	0.005	N/A[c]	N/A[c]
67-56-1	Methanol	SW-846 Method 8260	N/A	40000	1.0	N/A[c]	N/A[c]
108-10-1	Methyl isobutyl ketone (MIBK) (4-Methyl-2-Pentanone)	SW-846 Method 8260	N/A	6,400	0.01	N/A[c]	N/A[c]
108-38-3	m-Xylene	SW-846 Method 8260`	N/A	16,000	0.005	N/A[c]	N/A[c]
95-47-6	o-Xylene	SW-846 Method 8260	N/A	16,000	0.005	N/A[c]	N/A[c]
106-42-3	p-Xylene	SW-846 Method 8260	N/A	16,000	0.005	N/A[c]	N/A[c]
79-46-9	2-Nitropropane	SW-846 Method 8260	0.105	N/A	1	N/A[c]	N/A[c]
75-15-0	Carbon disulfide	SW-846 Method 8260	N/A	8,000	0.005	N/A[c]	N/A[c]
78-83-1	Isobutanol	SW-846 Method 8260	N/A	24,000	0.5	N/A[c]	N/A[c]

Table A-5. Soil Analytical Performance Requirements

CAS Number	Analyte	Analytical Method	Closure Performance Standard[a] (mg/kg)		Practical Quantitation Limit[e] (mg/kg)	Accuracy Req't (% Recovery)[b]	Precision Req't (RPD)[b]
			Carcinogen	Non-Carcinogen			
110-80-5	2-Ethoxyethanol	SW-846 Method 8270	N/A	3,2000	200	N/A[c]	N/A[c]
108-88-3	Toluene	SW-846 Method 8260	N/A	6,400	0.005	N/A[c]	N/A[c]
123-91-1	1,4-Diethyleneoxide (1,4-Dioxane)	SW-846 Method 8260	10	2,400	0.5	N/A[c]	N/A[c]
64-18-6	Formic Acid (U123)	Modified 9056A or Modified 300.0	N/A	160,000	NA	N/A[c]	N/A[c]
302-01-2	Hydrazine (U133)[d]	SW 846 Method 8260	0.333	N/A	NA	N/A[c]	≤20
80-62-6	Methyl methacrylate (I,T) (U162)	SW 846 Method 8260	N/A	112,000	0.010	N/A[c]	≤20
57-12-5	Cyanide	SW-846 Method 9010/9012/9013/ 9014	N/A	48	0.5	±30	≤30
1314-62-1	Vanadium oxide (vanadium pentoxide)	SW-846 Method 6010/200.8	N/A	720	NA	N/A[c]	N/A[c]
1336-36-3	Polychlorinated biphenyl	SW-846 Method 8082	0.5	1.6	0.16	N/A[c]	N/A[c]

a. Closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to "Model Toxics Control Act—Cleanup" (MTCA) regulations (WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards;" -747, "Deriving Soil Concentrations for Groundwater Protection;" and -7490, "Terrestrial Ecological Evaluation Procedures," through -7494, "Priority Contaminants of Ecological Concern"). These numeric cleanup levels will be calculated according to MTCA Method B (unrestricted use standards).

b. Accuracy criteria for associated batch matrix spike percent recoveries. Evaluation based on statistical control of laboratory control samples is also performed. Precision criteria for batch laboratory replicate matrix spike analyses or replicate sample analyses.

c. Determined by the laboratory based on historical data or statistically derived control limits. Limits are reported with the data. Where specific acceptance criteria are listed, those acceptance criteria may be used in place of statistically derived acceptance criteria.

d. Due to the reactive and volatile nature of hydrazine, quantitation is difficult and its presence in soil samples from waste stored in 2008 is unlikely; therefore, samples will not be analyzed for hydrazine.

e. For these analytical performance requirements, the required detection limit and practical quantitation limit are identical.

N/A = not applicable
NA = information not available

Table A-6. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated
Field Quality Control		
Full trip blank (FTB)	One per 20 samples per media sampled.	Contamination from containers or transportation.
Equipment rinsate blank (EB)	As needed. If only disposable equipment is used, then an equipment blank is not required. Otherwise, one per 20 samples per media[a].	Adequacy of sampling equipment decontamination and contamination from non-dedicated equipment.
Field duplicate (DUP)	One per batch[h], 20 samples maximum of each media sampled (soil samples[b]).	Precision, including sampling and analytical variability.
Field Split Samples (SPLIT)	As needed. When needed, the minimum is one per analytical method, per media sampled, for analyses performed where detection limit and precision and accuracy criteria have been defined in the Performance Requirements tables.	Precision, including sampling, analytical, and inter-laboratory.
Laboratory Quality Control[h]		
Method Blanks	1 per batch[h]	Laboratory contamination
Lab Duplicates	[c]	Laboratory reproducibility and precision
Matrix Spikes	[c]	Matrix effect/laboratory accuracy
Matrix Spike Duplicates	[c]	Laboratory reproducibility, accuracy, and precision
Surrogates	[c]	Recovery/yield
Tracers	[c]	Recovery/yield
Laboratory Control Samples	1 per batch[h]	Evaluate laboratory accuracy
Performance Evaluation Programs[d]	Annual	Evaluate laboratory accuracy
Double-Blind Standards	Quarterly[e]	Evaluate laboratory accuracy
Audit/Assessment	Annually[f] or every 3 years[g]	Evaluate overall laboratory performance and operations

Table A-6. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated

a. Whenever a new type of non-dedicated equipment is used, an equipment blank shall be collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination procedure for the non-dedicated equipment.

b. Soil grab samples are exempted from duplicate sampling.

c. As defined in the laboratory contract or quality assurance plan and/or analysis procedures.

d. Nationally recognized program, such as DOE Mixed Analyte Performance Evaluation Program or Environmental Resource Associates.

e. Soil matrix double-blind standards are submitted by request of Analytical Services.

f. DOE Quality Systems for Analytical Services requires annual audit of commercial laboratories.

g. DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Documents (HASQARD)*, does not define a frequency for assessment of onsite laboratories. Three year evaluated supplier list requirement is typically applied.

h. Batching across projects is allowing for similar matrices.

DOE = U.S. Department of Energy

A3.9.9 Data Validation and Usability

Analytical results will be received from the laboratory, loaded into a database (e.g., HEIS), and verified. A data quality assessment (DQA) may be performed, if requested, on the final data. At the direction of the Project Manager (or designee), analytical data packages will be subject to final technical review by qualified personnel before submittal to the regulatory agencies or inclusion in reports.

Field paperwork, analytical data packages, and electronic files from the laboratory information management system will be reviewed to ensure that analytical and QC data from the laboratories are complete, reported correctly, and within applicable limits. Laboratory documents will be rechecked to verify the condition of the samples upon receipt at the laboratory and determine if problems arose during analysis that may have affected the data. When issues arise with samples before the analytical data are processed, resolution of those issues will be initiated.

The format and requirements for data validation activities are based upon the most current version of OSWER 9240.1-48, *National Functional Guidelines for Superfund Organic Methods Data Review* (USEPA-540-R-08-01), and OSWER 9240.1-51, *National Functional Guidelines for Inorganic Superfund Data Review* (USEPA-540-R-10-011). A total of 5 percent of the results will undergo Level C validation, as defined by the validation guidelines.

The DQA process compares completed field activities to those in corresponding documents and provides an evaluation of the resulting data. The purpose of the DQA is to determine whether quantitative data are of the correct type and are of adequate quality and quantity to meet the project data quality objectives. The assessment will be consistent with the EPA DQA process (EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide* [EPA QA/G-9R], and EPA/240/B-06/003, *Data Quality Assessment: Statistical Methods for Practitioners* [EPA QA/G-9S]).

A3.9.10 Documents and Records

The Project Manager is responsible for ensuring that the current version of the SAP is being used and for providing any updates to field personnel. Version control is maintained by the administrative document

control process. Changes to the SAP affecting the data needs will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b) to DOE and the lead regulatory agency.

Logbooks are required for field activities. A logbook must be identified with a unique project name and number. The individual(s) responsible for logbooks will be identified in the front of the logbook, and only authorized persons may make entries in logbooks. Logbooks will be signed by the field manager, supervisor, cognizant scientist/engineer, or other responsible individual. Logbooks will be permanently bound, waterproof, and ruled with sequentially numbered pages. Pages will not be removed from logbooks for any reason. Entries will be made in indelible ink. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

The project manager is responsible for ensuring that a project file is properly maintained. The project file will contain the records or references to their storage locations. The following items will be included in the project file, as appropriate:

- Field logbooks or operational records
- Data forms
- GPS data
- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective action reports
- Interim progress reports
- Final reports
- Laboratory data packages
- Verification and validation reports

The laboratory is responsible for maintaining, and having available upon request, the following items:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information

Records may be stored in either electronic or hardcopy format. Documentation and records, regardless of medium or format, are controlled in accordance with internal work requirements and processes to ensure the accuracy and retrievability of stored records. Records required by the Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*) will be managed in accordance with the requirements therein.

A3.9.11 Revisions to the Sampling and Analysis Plan and Constituents to Be Analyzed

If changes to the SAP are necessary due to unexpected events during closure that will affect sampling, a revision to this SAP will be submitted no later than 30 days after the unexpected event as a permit modification as required in WAC 173-303-610(3)(b)(iii) and WAC 173-303-830, “Dangerous Waste Regulations,” “Permit Changes.”

A3.10 Role of the Independent Registered Professional Engineer

An independent, qualified, registered professional engineer will be retained to provide certification of the closure, as required by WAC 173-303-610(6). The resulting engineering report will be retained in the operating record.

A3.11 Closure Certification

In accordance with WAC 173-303-610(6), within 60 days of completion of FS-1 closure, certification that FS-1 has been closed in accordance with the specifications in this closure plan will be submitted to Ecology by registered mail. The certification will be signed by the owner or operator and by an independent qualified registered professional engineer.

A3.12 Conditions That Will Be Achieved When Closure Is Complete

Upon confirmation of clean closure levels through sampling and analysis, FS-1 will remain in an "as-is" state with the gravel remaining in place. The area surrounding FS-1 is an industrial setting and will continue to be used due to the active RCRA compliant landfill operations in the immediate vicinity; therefore, no removal of gravel is necessary, and the land will not be restored to its pre-operational appearance. The storage area marking will be removed once the closure activities are completed. A permit modification request will be submitted after clean closure has been confirmed to remove FS-1 from the sitewide permit active DWMUs.

After operations of the LLBG Trenches 31-34 have ceased, a RCRA compliant engineered cover will be placed over the trenches.

A4 Closure Schedule and Time Frame

Confirmation sampling and analysis activities will be completed no more than 180 days after approval of the permit modification incorporating this closure plan. Should unexpected circumstances arise and an extension to the 180-day closure activity expiration date be deemed necessary, a Class 1 permit modification request will be submitted to Ecology for approval at least 30 days prior to the 180-day expiration date in accordance with WAC 173-303-610(4)(c) and WAC 173-303-830, Appendix I. The extension request would also demonstrate that all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, have been and will be taken. Closure certification will be submitted to Ecology within 60 days following completion of closure activities at FS-1as outlined in Section A3.11 (Figure A-3).

A5 Closure Costs

An annual report outlining updated projections of anticipated closure costs for the Hanford Facility treatment, storage, and disposal units having final status is not required per Permit Condition II.H.

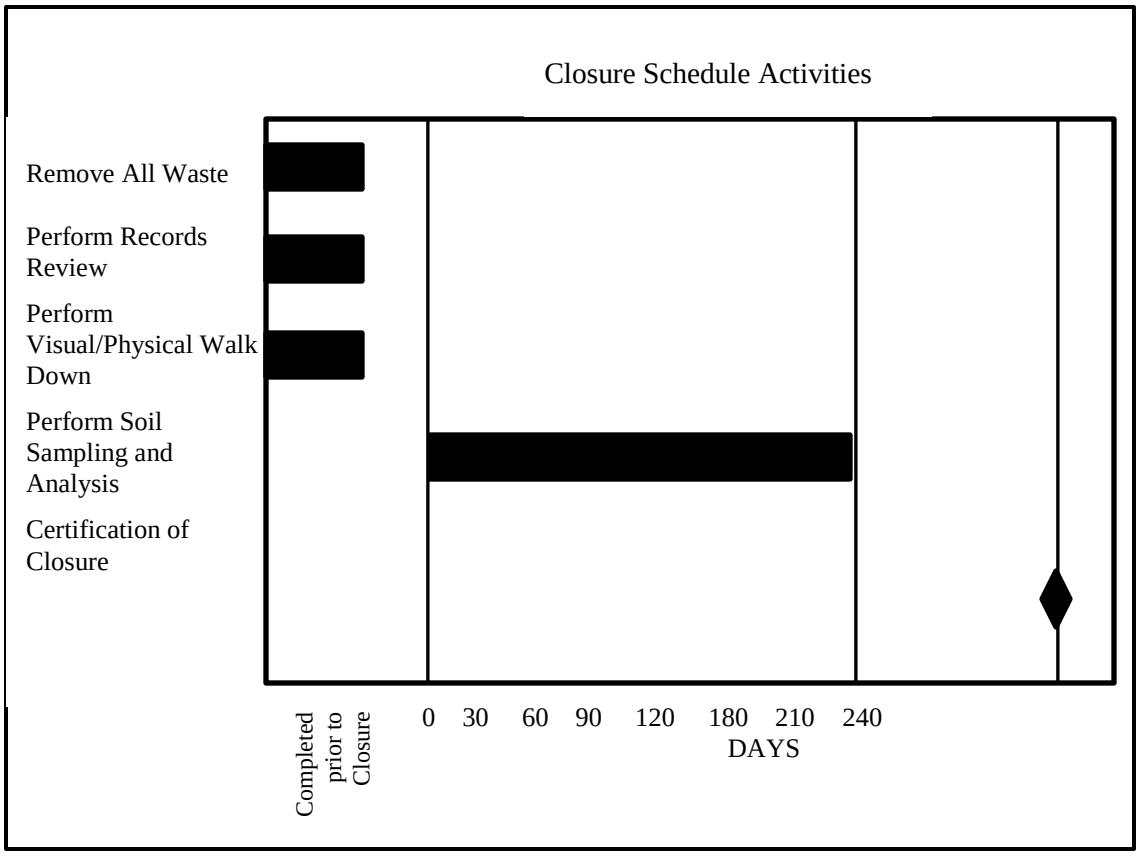

Figure A-3. FS-1 Outdoor Container Storage Area Closure Schedule Activities

Attachment A

Records Review and Visual Inspection Supporting Documentation

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LLBG 218-W-5, FS1 Outdoor Container Storage Area

Purpose:

A visual inspection walkdown of the 218-W-5 FS1 outdoor container storage area was performed to determine if there is any evidence of spills and/or leaks from waste packages containing dangerous that were stored at this location during the period of November 2007 through September 2008. The inspection was to identify and document by photographing any waste related staining of the storage area surface (i.e., gravel and soil), and to denote any remaining waste related items.

The inspection was performed on July 31, 2013 by Dean Nester, Waste Disposition Project Manager (CHPRC), and Lana Strickling, Low-Level Burial Grounds Environmental Compliance Officer (CHPRC).

Results:

No staining of any kind was identified on the storage area surface. Only a few small pieces of debris material were observed and photographed:

- Unused drum wicks – approximately 6
- Dried caulking material – approximately 4-6 small pieces
- Piece of wood - ~ 10" x 1"

Housekeeping will be performed on the area prior to closure and the debris material will be removed.

Signature/Date:

Dean Nester: 7/31/2013

Lana Strickling: Lana Strickling 7/31/13

FS-1 Daily Operating Log Book Review

Date of Log Book Review:	7/31/13
Reviewer's Name:	Lana Strickling
Daily Operating Log Book Document No: Retrieval Project Daily Operating Log Book)	HNF-N-450 85 (Solid Waste Storage & Disposal/Waste
Log Book Timeframe (Month/Year to Month/Year):	7/10/07 – 2/6/08
Items of Concern Noted (Circle) If "YES", complete entire checklist. If "NO", skip to Reviewer's signature and date.	YES☐ NO☑
Items of Concern: Attach copies of log book pages noting concern.	
Log Book Page# Referencing Spill:	
Dates of Corrective Actions: Attach copies of log book pages noting corrective actions.	
Log Book Page# Referencing Corrective Action:	
Reviewer's Signature and Date:	Lana Strickling 7/31/13

Instructions:

Review Daily Operating Log for any references to unplanned spills, releases or discharges associated with dangerous waste containers. Anomalies that would not affect closure of the unit such as missing labels, open containers, or dented containers, do not need to be documented.

If items of concern are noted, check "YES" and complete the entire checklist. If no items of concern are noted, check "NO" and skip to the signature and date field. Note that if no items of concern are noted for the entire year, the "Log Book Time Frame" can be January 1, 20xx to December 31, 20xx.

If unplanned spills, releases or discharges are referenced in the Daily Operating Log, document the item of concern as "spill", "stain", "ruptured container", etc. Also note the date of the corrective action.

Attach copies of the Daily Operating Log page(s) noting the items of concern and corrective actions.

Complete all review fields as applicable.

Sign and date form and deliver to Stephanie Johansen.

FS-1 Daily Operating Log Book Review

Date of Log Book Review:	8/12/13
Reviewer's Name:	Joel Williams
Daily Operating Log Book Document No:	HNF-N-450-91; HNF-N-450-94
Log Book Timeframe (Month/Year to Month/Year):	02/07/08 – 8/26/08; 08/27/08 – 04/16/09
Items of Concern Noted (Circle)	YES☐ NO☑

If "YES", complete entire checklist.
If "NO", skip to Reviewer's signature and date.

Items of Concern:
Attach copies of log book pages noting concern.

Log Book Page# Referencing Spill:

Dates of Corrective Actions:
Attach copies of log book pages noting corrective actions.

Log Book Page#
Referencing Corrective Action:

Reviewer's Signature and Date: Joel Williams 8-20-2013

Instructions:

Review Daily Operating Log for any references to unplanned spills, releases or discharges associated with dangerous waste containers. Anomalies that would not affect closure of the unit such as missing labels, open containers, or dented containers, do not need to be documented.

If items of concern are noted, check "YES" and complete the entire checklist. If no items of concern are noted, check "NO" and skip to the signature and date field. Note that if no items of concern are noted for the entire year, the "Log Book Time Frame" can be January 1, 20xx to December 31, 20xx.

If unplanned spills, releases or discharges are referenced in the Daily Operating Log, document the item of concern as "spill", "stain", "ruptured container", etc. Also note the date of the corrective action.

Attach copies of the Daily Operating Log page(s) noting the items of concern and corrective actions.

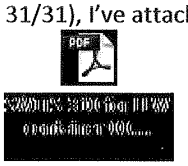
Complete all review fields as applicable.

Sign and date form and deliver to Stephanie Johansen.

Strickling, Lana R

From: Tuott, Lee C
Sent: Thursday, August 01, 2013 8:02 AM
To: Horn, Sarah R; Williams, Joel F Jr; Seaver, Jennie R
Cc: Nester, Dean E; Strickling, Lana R; Dixon, Brian J; Johansen, Stephanie K; Engelmann, Richard H; Cawrse, Allan E; Ruck, Fred A III; Toebe, Wayne E; Swenson, Raymond T; Tarter, Kimberly D; Martin, Paul W - CHPRC
Subject: RE: COMPLETED REVIEW OF TRENCH 34/FS-1 RECORDS

To facilitate "closeout" for this container from a RCRA perspective (and to support future closure evaluation at Trench 31/31), I've attached the SWITS 310 report that identifies the container is a LLW (and not a dangerous waste).



Lee Tuott
WRAP & IDF Environmental Compliance Officer, CHPRC
509.376.1045 (office); 509.713.0065 (cell)
email: lee_c_tuott@rl.gov

From: Horn, Sarah R
Sent: Thursday, August 01, 2013 7:51 AM
To: Williams, Joel F Jr; Seaver, Jennie R
Cc: Nester, Dean E; Strickling, Lana R; Dixon, Brian J; Johansen, Stephanie K; Engelmann, Richard H; Cawrse, Allan E; Ruck, Fred A III; Toebe, Wayne E; Swenson, Raymond T; Tuott, Lee C; Tarter, Kimberly D; Martin, Paul W - CHPRC
Subject: RE: COMPLETED REVIEW OF TRENCH 34/FS-1 RECORDS

Jennie,
I confirmed the container number on the weekly inspection that Joel provided does not match any of the dangerous waste containers so we should be just fine.

Joel,
Thanks for getting those done so quickly!

Sarah

From: Williams, Joel F Jr
Sent: Thursday, August 01, 2013 7:39 AM
To: Seaver, Jennie R
Cc: Horn, Sarah R; Nester, Dean E; Strickling, Lana R; Dixon, Brian J; Johansen, Stephanie K; Engelmann, Richard H; Cawrse, Allan E; Ruck, Fred A III; Toebe, Wayne E; Swenson, Raymond T; Tuott, Lee C; Tarter, Kimberly D; Martin, Paul W - CHPRC
Subject: COMPLETED REVIEW OF TRENCH 34/FS-1 RECORDS

Jennie

Attached is a pdf copy of my completed and signed off review of LLBG Trench 34/FS-1 weekly inspection records from January 1, 2007 through September 23, 2008. This was the time period provided to me to review.

<< File: JFW Signed Review Records for TR 34 FS-1 7-31-2013.pdf >>
I just have one comment...I found a record during this time period (4-2-2008) that mentions that a container was found to have a pin hole. The record does not mention any leakage and does state that the container was repackaged. I have attached the record and email on this container. I realize that this does not meet the criteria of a leak for closure but I want to send this to you just in case.

<< File: LLBG Wky Insp Sheet 4-2-2008 and Email 7-31-2013.pdf >>
If you have any questions, please call me on 376-4782 or 528-7641.

Thanks for your time and patience.

Joel F. Williams Jr.
CHPRC Regulatory Inspection Lead
Environmental Protection
CH2M Hill PRC

LLBG Trench 34/FS-1 Weekly Dangerous Waste Inspection Checklist Review

Title of Weekly Waste Inspection Form:	SW-040-041 Inspect Low-Level Burial Grounds, Checklist 2 - LLBG Weekly RCRA Inspections for Trenches 31 and 34 in 218-W-5 (Trench 34)
Date of Review:	July 31, 2013
Reviewer's Name:	Joel F. Williams Jr.
Waste Management Unit:	Trench 34/FS-1
Time Frame of Weekly Inspections:	January 1, 2007 through September 23, 2008
Items of Concern Noted (Circle) If "YES", complete entire checklist. If "NO", skip to Reviewer's signature and date.	YES☐ NO☒
Items of Concerns: Attach copies of log book pages noting concern.	
Dates of Corrective Actions: Attach copies of log book pages noting concern.	
Reviewer's Signature and Date:	Joel F. Williams 7-31-2013

Instructions:

Review Weekly Waste Inspection checklists for any references to unplanned spills, releases or discharges associated with dangerous waste containers. Anomalies that would not affect closure of the unit such as missing labels, open containers, or dented containers, do not need to be documented.

If items of concern are noted, check "YES" and complete the entire checklist. If no items of concern are noted, check "NO" and skip to the signature and date field. Note that if no items of concern are noted for an extended period of time, the "Time Frame of Weekly Inspections" can be January 1, 20xx to December 31, 20xx or even several years if no items of concern are noted.

If unplanned spills, releases or discharges are referenced on the inspection checklist, document the item of concern as "spill", "stain", "ruptured container", etc. Also note the date of the corrective action.

Attach copies of weekly waste inspection checklists noting the items of concern and corrective actions.

Complete all review fields as applicable.

SW-040-041	Inspect Low-Level Burial Grounds	H-0

Checklist 2 - LLBG Weekly RCRA Inspection for Trenches 31 & 34 in 218-W-5

Burial Ground (circle one): 218-W-5 Trench 31 Trench 34 1300 **Time/Date:** 4/2/08

#	Yes	No	N/A	Container Inspection Items
(1)		✓		Container integrity is not compromised by punctures, dents, penetrating scratches, loose lids, bulging, excessive corrosion or other damage/deterioration (where possible to inspect). [TSR 5.6.12.e]
2	✓			Containers are closed , are stored in a manner which will not rupture the containers or cause them to leak , and show no evidence of spillage or leakage, such as moisture on the sides or underneath (where possible to inspect). [TSR 1.2]
3	✓			Container marking/labeling is intact, unobscured, legible, and in good condition (where possible to inspect).
4	✓			Areas between and within 33 ft of waste zones are free of transient combustibles such as, paper, rags, trash, scrap wood, etc. [TSR 5.6.7.b&c]
5	✓			Aisle space between rows of containers appears to be at least 30 inches.
6	✓			Wind blown vegetation has been removed.
7	✓			Fire break defensible space (within 30 ft of waste containers) is clear of all ground fuels, dead rooted vegetation, and combustible materials. [TSR 5.6.7, Fire Breaks]
8	✓			Fire break defensible space (within 30 ft of waste containers) is clear of live vegetation. [TSR 5.6.7, Fire Breaks]
9	✓			Are trench walls and floor intact (not deteriorated, damaged or eroded)?
10	✓			Is asphalt pad intact (not deteriorated, damaged or eroded)?
11	✓			Is trench entrance ramp intact (not deteriorated, damaged or eroded)?
12	✓			Clean interim soil covers bulk waste. *If answer is NO, Notify team lead.* For Trench 34 Only
13	✓			Interim soil cover not eroded by wind or water. *If answer is NO, Notify team lead.* For Trench 34 Only
14	✓			Subsidence areas or sinkholes in interim soil cover are not observed. *If answer is NO, Notify team lead.* For Trench 34 Only

Comments/Observations: (1) Found pos/sl/c puncture on Dram.# ~~0001248~~ plan 0001248, SW30-02-308-01, Notify Teamhead and SBTA, pat Tape over the pinhole, Drum entered into ACMP. See open Item # 07-058, 07-055. Close out #07-058, weed spray is no longer needed. PSF 4/3/08

Add as new open item to LLBG RCRA open item list PSF 4/3/08

Operator (print/sign): B.G. Valerio 4/2/08 **Date/time:** 1520

Team Lead (print/sign): Brad L. Slettene **Date:** 4/3/08

Williams, Joel F Jr

From: Tarter, Kimberly D
Sent: Wednesday, July 31, 2013 9:05 AM
To: Williams, Joel F Jr
Subject: FW: 08-026

FYI

From: Matarazzo, Laci D
Sent: Wednesday, July 31, 2013 9:05 AM
To: Tarter, Kimberly D
Subject: RE: 08-026

Open Item List

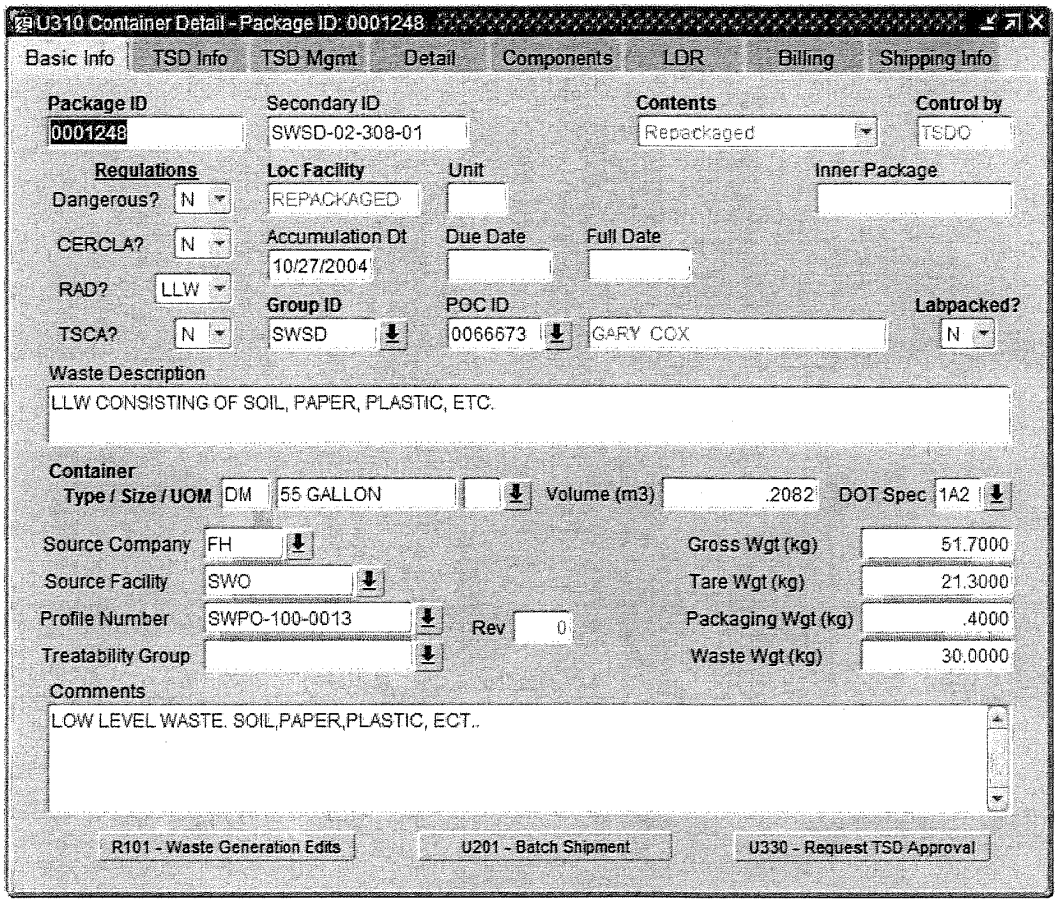
Log #	R/N	C/L/S	Bldg/Item #	Tr #	Initiator	Item #	Inspected	Description/Status	Complete	Closed	Corr Action	H&SI Area
08-026	R	L	218-W-5, T34		BS Valerio		4/3/2008	Found possible puncture on Drum #0001248, SWSD-02-308-01.	X	5/22/2008	Possible puncture on Drum #0001248, SWSD-02-308-01. Notify Team Lead and SBTA, put tape over the pinhole. Drum entered into ACMP. (BS) 04/02/2008. Drum was overpacked and put into ACMP. (BS) 05/22/2008.	

Laci

From: Tarter, Kimberly D
Sent: Wednesday, July 31, 2013 9:01 AM
To: Matarazzo, Laci D
Subject: 08-026
Importance: High

Hi Laci,
The only one I don't have is 08-026. Can you please look for this one?

Thanks,



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Attachment B

Visual Sampling Plan Supporting Documentation

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Systematic sampling locations for comparing a median with a fixed threshold (nonparametric - MARSSIM)

Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

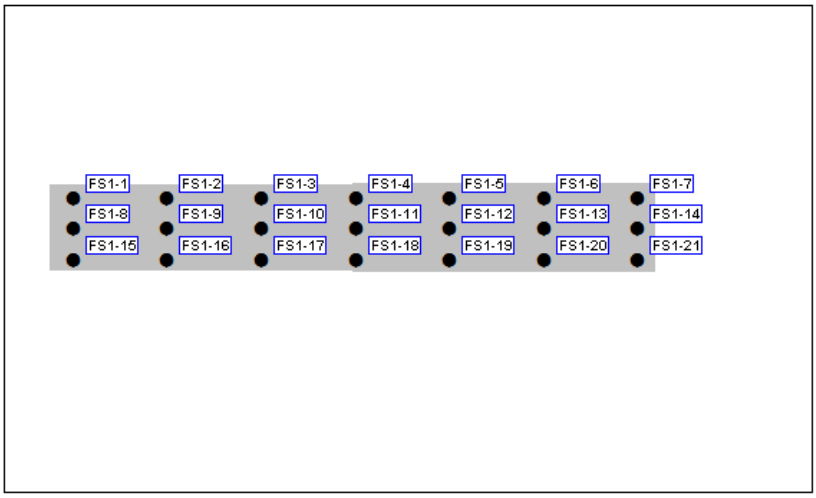
SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	20
Number of samples on map [a]	21
Number of selected sample areas [b]	1
Specified sampling area [c]	0.00 ft^2
Size of grid / Area of grid cell [d]	4.10637e-005 x 0.000123191 feet / 5.05869e-009 ft^2
Grid pattern	Rectangular

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.

[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.

[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.



Area: FS1					
X Coord	**Y Coord**	**Label**	**Value**	**Type**	**Historical**
119.639816	46.559647	FS1-15		Systematic	
119.639939	46.559647	FS1-16		Systematic	
119.640062	46.559647	FS1-17		Systematic	
119.640185	46.559647	FS1-18		Systematic	
119.640309	46.559647	FS1-19		Systematic	
119.640432	46.559647	FS1-20		Systematic	
119.640555	46.559647	FS1-21		Systematic	
119.639816	46.559688	FS1-8		Systematic	
119.639939	46.559688	FS1-9		Systematic	
119.640062	46.559688	FS1-10		Systematic	
119.640185	46.559688	FS1-11		Systematic	
119.640309	46.559688	FS1-12		Systematic	
119.640432	46.559688	FS1-13		Systematic	
119.640555	46.559688	FS1-14		Systematic	
119.639816	46.559729	FS1-1		Systematic	
119.639939	46.559729	FS1-2		Systematic	
119.640062	46.559729	FS1-3		Systematic	
119.640185	46.559729	FS1-4		Systematic	
119.640309	46.559729	FS1-5		Systematic	
119.640432	46.559729	FS1-6		Systematic	
119.640555	46.559729	FS1-7		Systematic	

Primary Sampling Objective
The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The

working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median(mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach
A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs
The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty,z)$ (see PNNL-13450 for details),
n is the number of samples,
S_{total} is the estimated standard deviation of the measured values including analytical error,
Δ is the width of the gray region,
α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,
β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,
$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,
$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

The values of these inputs that result in the calculated number of sampling locations are:

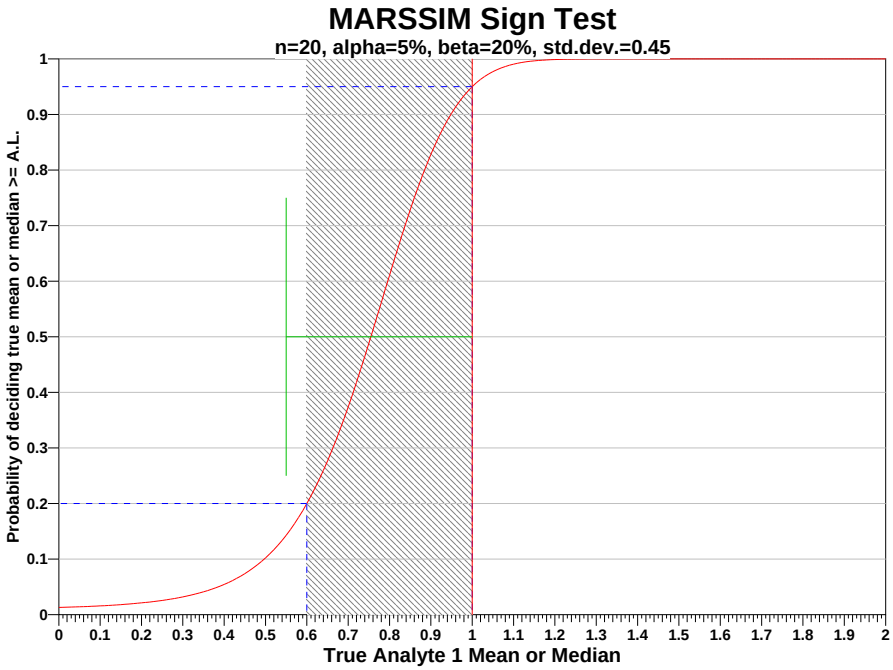
Analyte	n[a]	Parameter					
		S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]
Analyte 1	20	0.45	0.4	0.05	0.2	1.64485	0.841621

[a] The final number of samples has been increased by the MARSSIM Overage of 20%.
[b] This value is automatically calculated by VSP based upon the user defined value of α.

[c] This value is automatically calculated by VSP based upon the user defined value of β.

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median(mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed blue line is positioned at 1-α on the vertical axis; the lower horizontal dashed blue line is positioned at β on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at 1-α. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions

The assumptions associated with the formulas for computing the number of samples are:

1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2, is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis

The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%), probability of mistakenly concluding that μ < action level. The following table shows the results of this analysis.

Number of Samples							
AL=1		α=5		α=10		α=15	
		s=0.9	s=0.45	s=0.9	s=0.45	s=0.9	s=0.45
LBGR=90	β=15	1103	280	825	209	659	167
	β=20	948	240	692	176	542	138
	β=25	826	209	587	149	449	114
LBGR=80	β=15	280	75	209	56	167	45
	β=20	240	64	176	47	138	36
	β=25	209	56	149	40	114	30
LBGR=70	β=15	128	36	95	27	77	22
	β=20	110	32	81	23	63	18
	β=25	95	27	69	20	52	15

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Recommended Data Analysis Activities
Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

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