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PROJECT SPECIFIC PLAN FOR SAMPLING OF REMOVAL ACTION 17 STOCKPILES 1, 2, AND 4 FOR OSDF WAC ATTAINMENT

SOIL CHARACTERIZATION AND EXCAVATION PROJECT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

MARCH 1999

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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LIST OF ACRONYMS AND ABBREVIATIONS

ASL	analytical support level
ccpm	corrected counts per minute
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	constituents of concern
DQO	Data Quality Objective
EP Tox	Extraction Procedure Toxicity
FACTS	Fernald Analytical Customer Tracking System
GPC	Gas Proportional Count
GPS	Global Positioning System
HPGe	high-purity germanium
ICP/MS	Inductively Coupled Plasma/Mass Spectroscopy
IDW	Investigation Derived Waste
mg/kg	milligram per kilogram
mg/L	milligrams/liter
MTL	Material Tracking Location
NaI	sodium iodide
OSDF	On-Site Disposal Facility
pCi/g	picocurie per gram
PID	photoionization detector
PQL	practical quantitation limit
PSP	Project Specific Plan
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RSS	Radiation Scanning System
RTRAK	Real Time Radiation Tracking System
RWP	Radiological Work Permit
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SP-1	Removal Action 17 Stockpile #1
SP-2	Removal Action 17 Stockpile #2
SP-4	Removal Action 17 Stockpile #4
SVOC	semi-volatile organic compound
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
μg/kg	micrograms per kilogram
UST	Underground Storage Tank
V/FCN	Variance/Field Change Notice
VOC	volatile organic compound
WAC	waste acceptance criteria
WAO	Waste Acceptance Organization

1.0 INTRODUCTION

1.1 PURPOSE

This project specific plan (PSP) has been developed to evaluate attainment of the waste acceptance criteria (WAC) for the On-Site Disposal Facility (OSDF) for soil contained in Removal Action 17 Stockpile #1 (SP-1), Removal Action 17 Stockpile #2 (SP-2), and Removal Action 17 Stockpile #4 (SP-4) as required by the Sitewide Excavation Plan (SEP, DOE 1998a) and the WAC Attainment Plan for the OSDF (DOE 1998b). The locations of these stockpiles are illustrated on Figure 1-1. The sampling strategy presented in this PSP includes random and biased physical sampling throughout the stockpiles and real-time gamma measurements over the surface of the stockpiles.

SP-1, SP-2, and SP-4 are currently planned to be excavated between April 2000 and December 2000. WAC attainment characterization is necessary at this time to allow data to be evaluated and the excavation approaches for each of the stockpiles to be designed. SP-2 may be excavated as early as September 1999 for use in testing the Segmented Gate System, a technology that will segregate above-WAC soil from below-WAC soil using real-time gamma detectors. This test would be the subject of a separate plan.

This PSP fulfills the requirements of the SEP and the WAC Attainment Plan for the OSDF for development of predesign investigation plans and for documenting the justification for selection of stockpile-specific WAC constituents of concern (COCs). The data generated under this PSP will be used to 1) demonstrate that soil meeting the OSDF WAC may be bulk excavated and placed in the OSDF, 2) identify areas of soil which exceed the OSDF WAC, if any, and 3) apply an excavation approach to the stockpiles.

1.2 STOCKPILE HISTORY AND DETERMINATION OF WAC COCs

Each of the stockpiles were created with material from different sources. Because of this, the histories and determinations of WAC COCs are presented separately for each stockpile.

1.2.1 SP-1

1.2.1.1 History

SP-1 (Material Tracking Location [MTL] W800051) is located in the northern portion of the Former Production Area, south of the OSDF Haul Road, west of the Decontamination Pad, and east of SP-4 (see Figure 1-1). It consists of approximately 1,500 cubic yards of soil and 500 cubic yards of debris. SP-1 is divided into two distinct areas, the western portion and the eastern portion. The western portion was created in 1997 by the consolidation of soil generated during OSDF Haul Road construction. This portion will not be sampled at this time and will remain open to accept future excess soil. The western portion will be sampled for OSDF WAC attainment at a later date. The eastern portion of SP-1 is a radiologically controlled area and was created by the consolidation of excess soil and debris generated by the following projects:

- Plant 1 Pad Upgrade (Phases A and B)
- Addition to Plant 5 Derby Slag Operation
- Lab addition
- Plants 4, 6, and 8 Warehouses construction
- Maintenance Building Warehouse construction
- Plant 8 addition
- Underground utilities maintenance projects
- Investigation Derived Waste (IDW) drum waste consolidation.

Soil generation by these activities began in 1988 and SP-1 was officially designated in 1991 as part of Removal Action 17. Most of these construction activities took place in or near the Former Production Area. The precise origin of the IDW that was consolidated in SP-1 is not known; however, it is known that the IDW came from both inside and outside the Former Production Area. SP-1 is currently active; following this sampling event, only the west side of SP-1 will be available for material placement.

1.2.1.2 Determination of WAC COCs

1.2.1.2.1 Existing Data

The existing data on SP-1 was collected in 1994 from soil that was removed during the construction of the Maintenance Building Warehouse. Thirteen samples were collected and analyzed for radionuclides, total metals, and by the toxicity characteristic leaching procedure (TCLP) for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and herbicides. All TCLP results were either nondetects or were below the TCLP regulatory limit, total metal results were less

than 20 times the TCLP limit, and total uranium concentrations ranged from 11.5 to 98.8 milligrams per kilogram (mg/kg).

1.2.1.2.2 COCs

The OSDF WAC Attainment Plan requires that all 18 WAC COCs and Resource Conservation and Recovery Act (RCRA) toxicity characteristic COCs be considered when sampling is conducted on stockpiles with material of unknown origin, such as the IDW material. The following discussion evaluates these constituents and proposes the final list of WAC attainment COCs for SP-1.

Radionuclides

Radionuclide WAC COCs for the OSDF are total uranium, technetium-99, neptunium-237, and strontium-90. Total uranium and technetium-99 have been detected above the WAC in many areas of the site, and therefore are WAC COCs for SP-1. The OSDF WAC limits for neptunium-237 and strontium-90, however, are much higher than detected concentrations at the site. The WAC for neptunium-237 is 3.12×10^9 picocuries per gram (pCi/g), while the highest soil activity measured on site for neptunium-237 is 37.2 pCi/g. Similarly, the WAC for strontium-90 is 5.67×10^{10} pCi/g, while the highest soil activity measured on site for strontium-90 is 47.6 pCi/g. Therefore, neptunium-237 and strontium-90 will not be WAC COCs for SP-1.

Organics

OSDF WAC were established for 12 organic compounds, including VOCs, SVOCs, and pesticides. One VOC (chloroethane) and one pesticide (toxaphene) have WAC limits that are significantly higher than the highest concentrations detected on site (2,600 mg/kg maximum detected concentration versus a 3.92×10^5 WAC limit for chloroethane and 10 mg/kg maximum detected concentration versus a 1.06×10^5 WAC limit for toxaphene). These compounds are not expected to be present in SP-1 at levels that approach the established WAC. However, because the origin of the IDW material in SP-1 is not known, the other VOCs and pesticide will be WAC COCs for the stockpile and analysis of chloroethane and toxaphene will not result in added laboratory costs. Therefore, they will be included in the list of WAC COCs for SP-1.

Of the three SVOCs, carbazole has a WAC limit significantly higher than the highest concentrations detected on site. The highest on-site concentration of carbazole is 89 mg/kg, while the WAC limit is

7.27 x 10^4 mg/kg. The other two SVOCs, bis(2-chloroisopropyl)ether and 4-nitroaniline, have no history of use during site operations. The single detection for 4-nitroaniline and the two positive detections of bis(2-chloroisopropyl)ether are all estimated values based on the results being near or below the practical quantitation limit (PQL). During previous laboratory analyses, the laboratories' PQL for 4-nitroaniline and bis(2-chloroisopropyl)ether was well above the WAC established for these two compounds. Therefore, 4-nitroaniline and bis(2-chloroisopropyl)ether will be retained as WAC COCs for SP-1 using the EPA Contract Laboratory Program Contract Required Detection Limits of 830 μg/kg and 330 μg/kg, respectively, as default WAC attainment values since it is not feasible with current analytical methods to achieve detection limits at the WAC established for these two constituents. Because carbazole is not expected at levels that approach the established WAC and because the number of estimated detections reported for bis(2-chloroisopropyl)ether and 4-nitroaniline comprise less than 1 percent of the total number of samples analyzed to date, the number of samples analyzed for these SVOCs under this PSP will be limited.

The following is the list of organic WAC COCs for SP-1:

- alpha-chlordane
- bromodichloromethane
- 1,1-dichloroethene
- tetrachloroethene
- vinyl chloride
- bis(2-chloroisopropyl)ether
- toxaphene
- chloroethane
- 1,2-dichloroethene
- trichloroethene
- carbazole
- 4-nitroaniline

Metals

OSDF WAC were established for total boron and mercury; WAC were not established for any other non-radionuclide metals. Boron and mercury have not been detected on site at concentrations near the OSDF WAC limits. The highest on-site concentration of total boron is 36 mg/kg, while the WAC is 1,040 mg/kg and the highest on-site concentration of total mercury is 130.9 mg/kg, while the WAC is 56,600 mg/kg. Because the highest site concentrations are at least two orders of magnitude lower than the OSDF WAC limits, these metals will not be WAC COCs for SP-1.

Characteristic Hazardous Constituents

Construction of the Maintenance Building Warehouse, which contributed soil to SP-1, took place near the potential RCRA characteristic area located north of the Maintenance Building. This area was

identified as potentially characteristic because of elevated concentrations of trichloroethene and lead. Although soil samples from this area that were collected from SP-1 passed TCLP analysis, more recent predesign characterization results indicate that this area does contain soil contaminated with trichloroethene at levels significantly above the TCLP limit. In addition, the origin of the IDW material is unknown. Therefore, TCLP testing for the full toxicity characteristic list will be included in the WAC attainment sampling for SP-1.

The WAC COCs for SP-1 are summarized in Table 1-1.

1.2.2 SP-2

1.2.2.1 History

SP-2 (MTL W800052) is located in the northwest corner of the Former Production Area, east of the Solid Waste Landfill and north of Stockpile 7 (see Figure 1-1). It consists of approximately 2,000 cubic yards of soil and 300 cubic yards of debris. SP-2 was created by the consolidation of excess soil and debris generated by the following projects:

- Building 78 Construction Project
- East Street Road Construction Project
- Storm Sewer Repair Project and Utilities Upgrade Project in Plant 8 area
- Plant 5 Duplex Office Installation Project
- K-65 Area Storm Water Run-Off Control Project
- Storm Sewer Repair Project and Utilities Upgrade Project in the K-65 Area.

Research indicates that these projects were completed between 1988 and 1993. The first four projects were completed in the Former Production Area; the last two projects were completed in the K-65 Area. SP-2 is not currently active; no additional material may be placed in the stockpile.

1.2.2.2 Determination of WAC COCs

The material placed into SP-2 originated from the Former Production Area and the K-65 area. The following discussion on existing sample data from the stockpile looks at these two site areas and at data collected directly from material placed in SP-2.

1.2.2.2.1 Existing Data

Production Area

Reviewing analytical data for the entire Former Production Area, only five of the 18 OSDF WAC constituents were detected at concentrations above WAC or have analytical detection limits above the WAC:

- total uranium
- technetium-99
- bis(2-chloroisopropyl)ether
- 4-nitroaniline
- trichloroethene.

K-65 Area

Reviewing analytical data for the K-65 area (Remediation Area 7), only 4 of the 18 WAC constituents were detected at concentrations above WAC or have analytical detection limits above the WAC:

- total uranium
- technetium-99
- bis(2-chloroisopropyl)ether
- 4-nitroaniline.

SP-2 Data

Existing analytical data on SP-2 is from samples collected from the 12 temporary soil stockpiles generated within the Production Area during the Building 78 construction project and East Street road construction project. Fifty-six soil samples were analyzed for various combinations of radionuclides and TCLP for VOCs, SVOCs, and metals. All TCLP results were either nondetects or below the TCLP regulatory limit and total uranium concentrations ranged from less than 11 (nondetect) to 154 mg/kg.

No samples were found to have been collected from the other material that was placed in SP-2. In addition, no samples were collected directly from SP-2.

1.2.2.2.2 COCs

Unlike SP-1 and SP-4, SP-2 does not contain material with an unknown origin. Based on the existing data for the material in SP-2, the constituents to be evaluated for the final list of WAC COCs are total

uranium, technetium-99, bis(2-chloroisopropyl)ether, 4-nitroaniline, trichloroethene, and TCLP analysis.

Radionuclides

Total uranium and technetium-99 have been detected above the WAC in both the Production Area and the K-65 Area, and therefore are WAC COCs for SP-2.

Organics

Bis(2-chloroisopropyl)ether and 4-nitroaniline are retained as WAC COCs for SP-2 but with limited analysis as described in Section 1.2.1.2.2.

Trichloroethene was detected above the WAC only once out of 1,086 samples collected sitewide. This sample was collected from a soil boring located north of the Maintenance Building. The material deposited in SP-2 did not originate from this area. Therefore, trichloroethene is also removed from the list of WAC COCs for SP-2.

Characteristic Hazardous Constituents

A portion of the East Street Road Construction Project took place near a potential RCRA characteristic area containing soil with elevated lead concentrations (the Scrap Metal Pile area). Ten of the twelve temporary stockpiles that were created during the Building 78 Construction Project and East Street Road Construction Project were sampled and analyzed for TCLP metals. Lead concentrations were more than one order of magnitude below the TCLP limit of 5.0 mg/L.

The Storm Sewer Repair Project and Utilities Upgrade Project in Plant 8 area and the Plant 5 Duplex Office Installation Project were not conducted near any potential RCRA characteristic areas.

Although potential RCRA characteristic material (chromium and lead) was previously located on the bank of Paddys Run to the west of the K-65 Silos, 25 samples recently collected during WAC attainment sampling for Area 7 demonstrate that lead and chromium are not present at characteristic concentrations (20 times the TCLP limit). The maximum concentration reported for chromium is 20.4 mg/kg and the maximum concentration for lead is 34.7 mg/kg; the 20-times concentration for both

constituents is 100 mg/kg. Therefore, due to the existing data on SP-2 and process knowledge of the stockpile, TCLP testing will not be conducted on samples collected from SP-2.

The WAC COCs for SP-2 are summarized in Table 1-1.

1.2.3 SP-4

1.2.3.1 History

SP-4 (MTL W800054) is located in the northern portion of the Former Production Area, south of the OSDF Haul Road, and west of SP-1 (see Figure 1-1). It consists of approximately 2,200 cubic yards of soil and 400 cubic yards of debris. SP-4 was created by the consolidation of excess soil and debris generated during sitewide underground storage tank (UST) removals and from sitewide fuel spill cleanups.

Soil generation by these activities began in 1990. Most of the UST removal activities took place in or near the Former Production Area. The precise origin of the soil from sitewide spill cleanups is not known. SP-4 is currently an active stockpile; however, no additional material will be added following sample collection.

1.2.3.2 Determination of WAC COCs

1.2.3.2.1 Existing Data

Analytical results for samples collected from soil excavated during the removal of USTs are summarized in Table 2-2 of the SEP. The results indicate that WAC COCs in material placed into SP-4, with the exception of one sample from the excavation of UST #17, are below the OSDF WAC limits. The sample from the UST #17 excavation exceeded the RCRA characteristic limit for chromium [sample result from the Extraction Procedure Toxicity (EP Tox) method was 12.9 mg/L versus the EP Tox limit of 5.0 mg/L].

Ten samples were collected from SP-4 in 1993 and analyzed for various combinations of radionuclides, organics, and metals. Results indicate that the concentration of total uranium is less than 11 mg/kg (nondetect in all analyzed samples), total mercury concentrations meet the WAC and are less than 20 times the TCLP limit in all cases, and the two organic WAC COCs analyzed (trichloroethene and tetrachloroethene) are nondetects that are less than 20 times the TCLP limit. Ten additional samples

were collected from SP-4 in 1995 and analyzed for VOCs. Results for trichloroethene and tetrachloroethene (the only two WAC COCs analyzed) are nondetects that are less than 20 times the TCLP limit.

1.2.3.2.2 COCs

The OSDF WAC Attainment Plan requires that all 18 WAC COCs and RCRA toxicity characteristic COCs be considered when sampling is conducted on stockpiles with material of unknown origin, such as the soil from sitewide spill cleanups. The following discussion evaluates these constituents and proposes the final list of WAC attainment COCs for SP-4.

Radionuclides

Radionuclide WAC COCs for the OSDF are total uranium, technetium-99, neptunium-237, and strontium-90. Total uranium and technetium-99 have been detected above the WAC in many areas of the site, and therefore are WAC COCs for SP-4. Neptunium-237 and strontium-90 are eliminated as WAC COCs for SP-4 for the same reason they were eliminated for SP-1 (see Section 1.2.1.2.2).

Organics

Because the origin of the spill cleanup material in SP-4 is not known, SP-4 will have the same list of organic WAC COCs as SP-1 (see Section 1.2.1.2.2).

Metals

OSDF WAC were established for boron and mercury. Boron and mercury are eliminated as WAC COCs for SP-4 for the same reason they were eliminated for SP-1 (see Section 1.2.1.2.2).

Characteristic Hazardous Constituents

Because the precise origin of the soil from sitewide spill cleanups is not known, and because the EP Tox chromium result from UST #17 exceeds the toxicity characteristic limit, there is the possibility that characteristic hazardous soil is present in SP-4. Therefore, TCLP analysis for the full toxicity characteristic list will be conducted on samples collected from SP-4.

The WAC COCs for SP-4 are summarized in Table 1-1.

1.3 SCOPE

Under this PSP, real-time and physical sampling will be performed on SP-1, SP-2, and SP-4 to identify and bound soil with contaminant concentrations above the OSDF WAC. Following review of the sample results, additional samples may be collected beyond those identified in this PSP if the extent of above-WAC material has not been adequately bound. In this situation, a variance to this PSP will be written. Sampling activities carried out under this PSP will be performed in accordance with the Sitewide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ), the SEP, the WAC Attainment Plan for the OSDF, and Data Quality Objective (DQO) SL-048, Rev. 5 (see Appendix A).

Design of the excavations for SP-1, SP-2, and SP-4 is not included in the scope of this PSP.

1.4 KEY PROJECT PERSONNEL

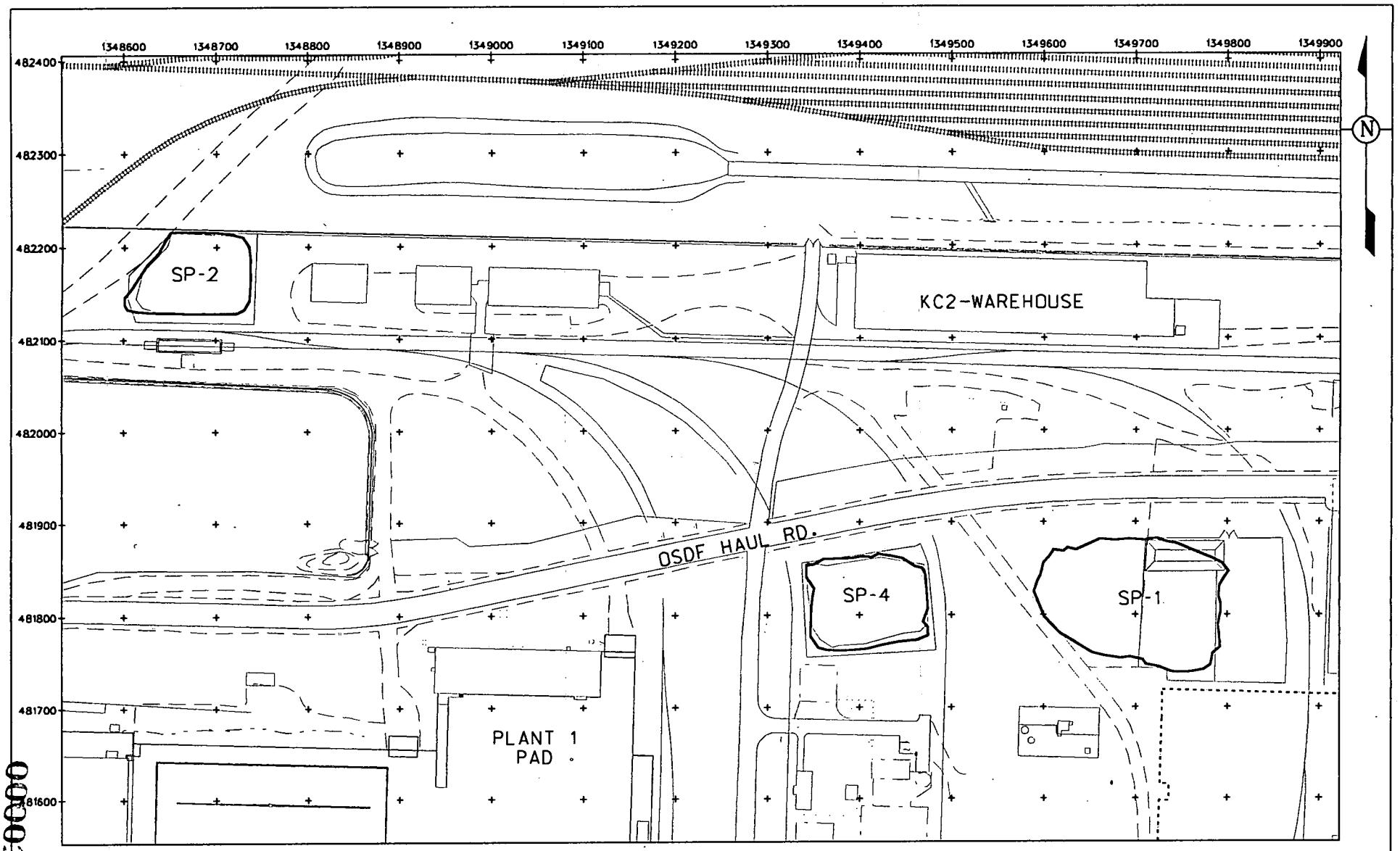
The team members responsible for coordination of work in accordance with this PSP are listed in Table 1-2.

TABLE 1-1
WAC COCs FOR SP-1, SP-2, AND SP-4

SP-1	SP-2	SP-4
total uranium	total uranium	total uranium
technetium-99	technetium-99	technetium-99
alpha-chlordane	bis(2-chloroisopropyl)ether	alpha-chlordane
toxaphene	4-nitroaniline	toxaphene
bromodichloromethane		bromodichloromethane
chloroethane		chloroethane
1,1-dichloroethene		1,1-dichloroethene
1,2-dichloroethene		1,2-dichloroethene
tetrachloroethene		tetrachloroethene
trichloroethene		trichloroethene
vinyl chloride		vinyl chloride
carbazole		carbazole
bis(2-chloroisopropyl)ether		bis(2-chloroisopropyl)ether
4-nitroaniline		4-nitroaniline
TCLP (VOCs, SVOCs, pesticides, herbicides, metals)		TCLP (VOCs, SVOCs, pesticides, herbicides, metals)

TABLE 1-2
KEY PERSONNEL

Title	Primary	Alternate
DOE Contact	Rob Janke	Kathi Nickel
Area 3 Project Manager	Rich Abitz	Jyh-Dong Chiou
Area 3 Characterization Lead	Christine Messerly	Rich Abitz
Real-Time Characterization Lead	Dave Allen	Joan White
Field Sampling Lead	Mike Frank	Tom Buhrlage
Surveying Lead	Jim Schwing	Jim Capannari
WAO Stockpile Contact	Dale Weber	Linda Barlow
FEMP Sample Management Office Contact	Bill Westerman	Jenny Vance
Data Validation Contact	Jenine Rogers	Jim Cross
Quality Assurance Contact	Reinhard Friske	Ervin O'Bryan
Health and Safety Contact	Debbie Grant	Lewis Wiedeman



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STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 1-1. LOCATION OF STOCKPILES SP-1, SP-2, AND SP-4

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2.0 SAMPLING STRATEGY

2.1 DETERMINATION OF NUMBER OF SAMPLES

In accordance with the SEP and OSDF WAC Attainment Plan, the number of samples determined to adequately characterize SP-1, SP-2, and SP-4 is collectively based on the current data set, the Remedial Investigation/Feasibility Study (RI/FS) sampling density in the Former Production Area, process knowledge of the pile, and sampling density in previous soil stockpile sampling projects. Based on these requirements, 10 samples will be collected from each stockpile.

Based on previous stockpile sampling projects, an analytical frequency has been established for the WAC COCs. All the random samples from each stockpile will be analyzed for total uranium and technetium-99. Fifty percent of the samples from SP-1 and SP-4 (five from each stockpile) will be analyzed for VOCs, pesticides, and full TCLP. Ten percent of the samples from SP-1, SP-2, and SP-4 (one from each stockpile) will be analyzed for SVOCs. The sample locations for the non-radiological analyses were randomly selected.

The sample density for SP-1, SP-2, and SP-4 translates to an average of 1 sample per 200 cubic yards, which is a higher density relative to the WAC attainment sampling activities performed for the Area 1, Phase I West Impacted Soil Stockpile (1 sample per 420 cubic yards) and SP-5 (1 sample per 350 cubic yards).

2.2 SELECTION OF SAMPLE LOCATIONS

Sample locations and depths are based on both a combination of systematic grid/random approach and biased sampling at the random boring locations. The total number of samples to be collected through this integrated sampling strategy is a minimum of 30 samples for all three stockpiles, with other samples potentially being collected from the soil cores, depending on field beta/gamma readings. A contingency for the collection of additional surface soil samples based on sodium iodide (NaI) scanning and the high-purity germanium (HPGe) detector system has also been developed (see Section 3.0).

A systematic approach was used to establish a sample grid over the stockpile surface. The grid pattern was based on surface area and consists of 10 grid blocks of approximately equal size for each stockpile. A random sample location (northing and easting coordinate) was selected within each block as shown

on Figures 2-1 through 2-3. At each of the sampling locations, depth intervals were randomly selected for sampling. Alternate random depths were also selected in case of refusal at some boring locations. The random sample depth intervals are presented in Appendix C. If a boring has to be relocated prior to sampling, the sample depth interval(s) will be recalculated based on the pile height at the new location. Sampling locations will be surveyed (northing, easting, and height) and that information will be recorded.

2.3 SAMPLE COLLECTION METHODS

Samples will be collected using the Geoprobe® Model 5400 in accordance with procedure EQT-06, *Geoprobe® Model 5400 – Operation and Maintenance*, or using manual methods as specified in procedure SMPL-01, *Solids Sampling*. The Geoprobe® sampling system will be used for sample locations that will support the safe operation of the Geoprobe® vehicle. Hand augering or direct-push liner sampling will be conducted in all other areas. At each sampling location, the surface vegetation within a 6-inch radius of the sample point will be removed using a stainless steel trowel or by hand with clean nitrile gloves while taking care to minimize the removal of any soil.

Random soil samples should be collected from the 1-foot intervals identified in Appendix C. Locations identified for VOC, SVOC, pesticide, and full TCLP analysis may require two 1-foot depth intervals to collect the necessary soil volume. If additional volume is still necessary, another core will have to be drilled and collected. The sample depth intervals should be recorded on the field documentation.

All borings will be completed to the base of the pile for field radiological screening purposes. If refusal or resistance is encountered during the soil borings, up to two additional borings within a 3-foot radius of the original point should be attempted in order to collect the specified samples. If this is necessary, borings should not be moved across grid lines. If there is no recovery at the sample interval specified in Appendix C, the interval directly above or below may be used without a variance to this PSP. All encounters with subsurface debris should be noted in the field log in order to characterize the pile for debris content. Disposition of excess soil and decontamination water will be determined by the Field Sampling Lead and the Waste Acceptance Organization (WAO) Excavation Project Lead.

2.3.1 Geoprobe® Methods

A Geoprobe® Macro-Core sampler will be advanced in approximately 12-48 inch increments to collect the target depth intervals for the soil samples specified in Appendix C. The Macro-Core collects a 1.5-inch diameter soil core. Multiple cores may be collected at each sampling location (not to exceed 1 foot apart) to obtain sufficient sample volume for analysis if complete sample recovery is not obtained. Borehole collapse will be monitored during core sampling to ensure minor sidewall slough is accounted for during coring and sample collection. If significant borehole collapse occurs, a closed-tube piston-type core sampler (Macro-Core) will be employed which is closed during advancement to the sample interval, then opened to collect the discrete interval of interest. Both core sampling methods will utilize a disposable plastic liner insert in which the soil core is recovered.

2.3.2 Manual Sampling Methods

If Geoprobe® accessibility is not possible, soil samples will be collected using a hand auger (typically 3-inch diameter) or other methods in accordance with SMPL-01, *Solids Sampling*. The hand auger will be advanced in approximately 6-inch increments down to the target depth intervals for the soil samples specified in Appendix C. As with core sampling, multiple holes at one sampling location (not to exceed 1 foot apart) may have to be augered to obtain sufficient volume for laboratory analysis. Borehole collapse will be monitored during core sampling to ensure sidewall slough is accounted for during augering and sample collection. The borehole will be manually collapsed following sample collection to eliminate the possibility of injury to workers. For surface samples, a direct-push liner (6-inch length) may be used to collect the samples from the 0-6 inch interval. Surface samples may be required as a result of real-time radiological scanning, as discussed in Section 3.0.

2.3.3 Biased Sample Selection

Each boring location will be radiologically screened using a beta/gamma (Geiger-Mueller) survey meter. The entire length of the soil core, or the cuttings in the case of augering, will be surveyed to determine the intervals with beta/gamma readings above 450 corrected counts per minute (ccpm). The identified intervals will be sampled and analyzed for total uranium only. If the entire soil core is found to be less than 450 ccpm, then no high-biased sample will be collected from that boring. Archive samples will be collected from the 6-inch intervals above and below any sample intervals that are above 450 ccpm. If the interval above or below is already designated for sampling, then no additional archive sample is necessary in that direction. In the event that biased sample intervals are above the total

uranium WAC, the archive samples may be submitted for analysis in an attempt to vertically bound the contamination. Any concrete and debris will be removed from the samples to the extent practical prior to screening.

2.3.4 Soil Sample Processing and Analysis

The Geoprobe® soil cores will be laid out on clean plastic, and the appropriate sample intervals, as defined in Appendix C or identified in the radiological screening, will be separated from the core to obtain the necessary samples. Any debris (e.g., wood, concrete, metal) contained in a sample interval will be removed from the sample in the field. For hand augering sampling locations, the soil cuttings collected from the target sample interval will be placed in a clean tray prior to transfer to a sample container. Sample volume and analysis information is summarized in Table 2-1.

Samples being analyzed for radiological constituents and TCLP metals will be sent to the on-site laboratory for analysis. The VOC, SVOC, pesticide, TCLP VOC, and TCLP SVOC/pesticide/herbicide samples will be sent to the Sample Processing Laboratory, where they will be prepared for shipment to an approved off-site laboratory in accordance with S.P. 766-S-1000, *Shipping Samples to Off-Site Laboratories*. One alpha/beta screening sample will be collected and analyzed on site for each location with samples being sent off site for analysis. The laboratories will analyze the samples for the appropriate Target Analyte List (TAL), as identified in Appendix B.

2.4 SAMPLE IDENTIFICATION

All physical soil samples collected for laboratory analysis will be assigned a unique sample identifier, as listed in Appendix C. This identifier will consist of a prefix designating the area name (SP1, SP2, or SP4), followed by the sample point number (1 through 10), followed by the sample depth (1 through x with "1" representing the 0-1 foot interval, "2" representing the 1-2 foot interval, etc.), followed by a letter designating the type of sample ("R" for radionuclides, "L" for VOCs, "S" for SVOCs, "P" for pesticides, "TL" for TCLP VOC, "TS" for TCLP SVOC, pesticide, and herbicide, "TM" for TCLP metals, and "AB" for alpha/beta). For example:

> SP4-2-3-P is the sample collected at sample point 2 in SP-4 at a depth of 2-3 feet and is being analyzed for pesticides.

Biased samples collected as a result of beta/gamma surveys will have a "B" inserted before the depth identifier. For example:

> SP4-2-B3-R is the biased sample collected at sample point 2 in SP-4 at a depth of 2-3 feet and is being analyzed for radionuclides.

Any archive samples collected will be assigned a "V" suffix to (e.g,, SP4-2-B3-R-V) to designate an archive. Trip blanks will be labeled with the area name and the suffix "TB". For example, SP4-TB2 is the second trip blank from SP-4.

If a boring location requires multiple borings due to subsurface refusal, or if a boring is moved after attempting the original location, the boring grid identifier will be designated with an alphabetic suffix (e.g., 7A, 7B, etc.) Therefore, a sample collected during the second attempt at sample point 2 at SP-4 would be SP-4-2B-3-R.

2.5 EQUIPMENT DECONTAMINATION

Sampling equipment will be decontaminated before transport to the sampling site. Additionally, equipment that comes into contact with sample media at the target sample interval must be decontaminated. The decontamination of equipment that comes into contact with the sample will include the core sampler cutting shoe, hand auger buckets, and other sample collection tools. All decontamination will be Level II decontamination as specified in SMPL-01, *Solids Sampling*. The core barrel portion of the core sampler will be wiped down between sample intervals and locations to remove visible soil or material. Decontamination of the core barrel will not be necessary because the core barrel will not come into contact with the sample when using a liner insert.

2.6 SAMPLE HANDLING AND SHIPPING

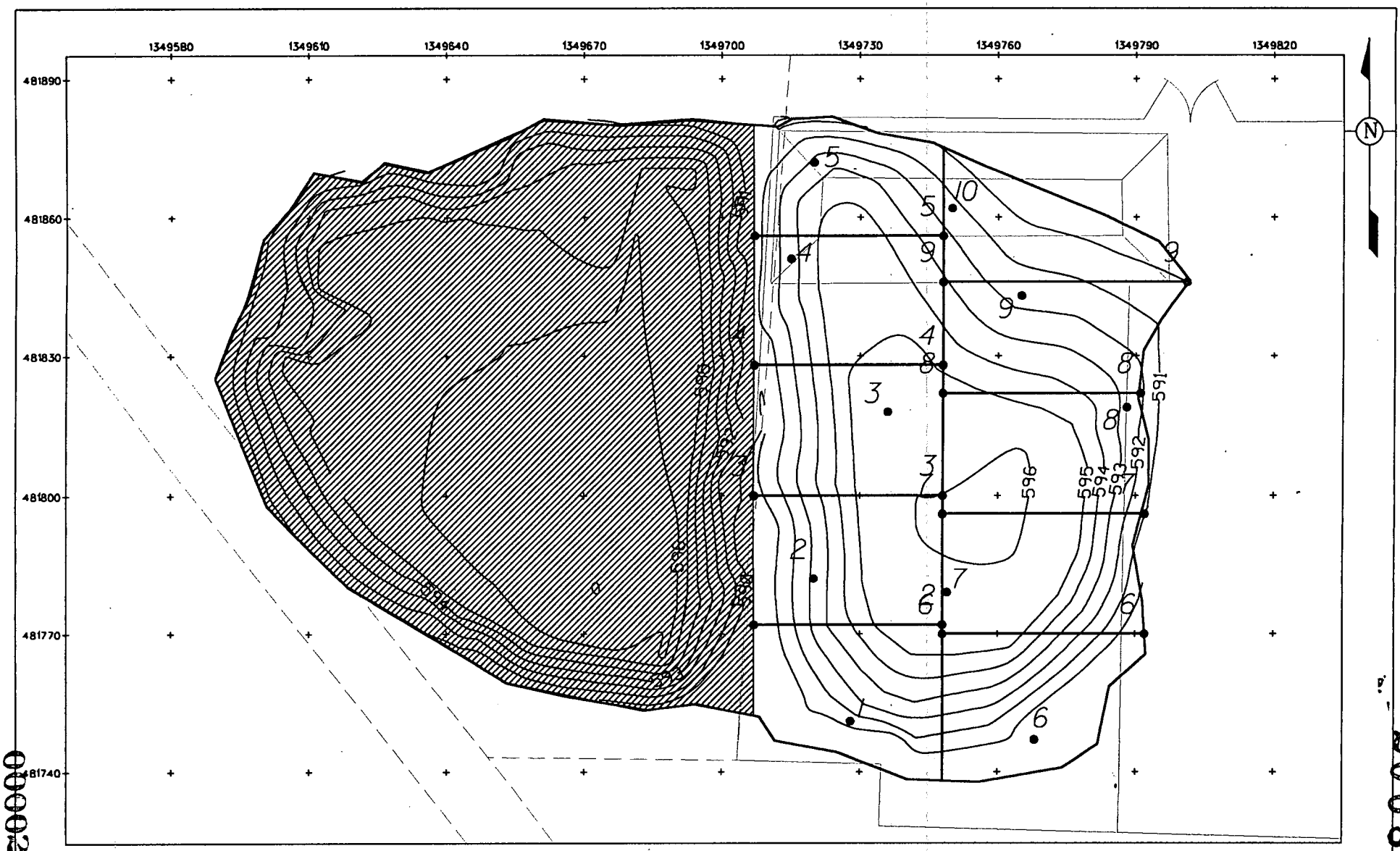
Samples will be processed in accordance with SMPL-01, *Solids Sampling*, to ensure that samples are documented properly and custody and sample integrity are maintained. All samples will be transported from the field to the on-site Sample Processing Laboratory.

TABLE 2-1
SAMPLING AND ANALYTICAL REQUIREMENTS

Analyte	Sample Matrix	Lab	ASL	Preserve	Holding Time	Container	Sample Mass
Total Uranium Technetium-99 (TALs A and B)	Solid	On-site	B	None	12 months	250-mL widemouth glass	40g
Total VOCs (TAL C)	Solid	Off-site	B	Cool to 2°-6°C	14 days	60-mL widemouth glass with Teflon liner	fill container to top (no head space)
Total SVOCs (TAL D)	Solid	Off-site	B	Cool to 2°-6°C	14 days	60-mL widemouth glass with Teflon liner	90g
Total Pesticides (TAL E)	Solid	Off-site	B	Cool to 2°-6°C	14 days	60-mL widemouth glass with Teflon liner	90g
TCLP VOCs (TAL F)	Solid	Off-site	B	Cool to 2°-6°C	14 days	60-mL amber glass with Teflon-lined closure	100g/300g QC (fill to top; no head space)
TCLP SVOCs/ Pesticides/ Herbicides (TAL G)	Solid	Off-site	B	Cool to 2°-6°C	14 days	60-mL glass with Teflon-lined closure	300g/900g QC
TCLP Metals (TAL H)	Solid	On-site	B	Cool to 2°-6°C	12 months	250-mL glass with Teflon-lined closure	100g/200g QC
Alpha/Beta Screen	Solid	On-site	N/A	None	None	Any container	10g
Trip Blank	Liquid	Off-site	N/A	Cool to 2°-°C; pH <2 by HCl or H_2SO_4	14 days	3 - 40mL glass	fill to top
Archive	Solid	N/A	N/A	None	12 months	250-mL widemouth glass	N/A

Notes: The alpha/beta screen is only required for samples destined for off-site laboratories (i.e., those undergoing TAL C through TAL G analysis).

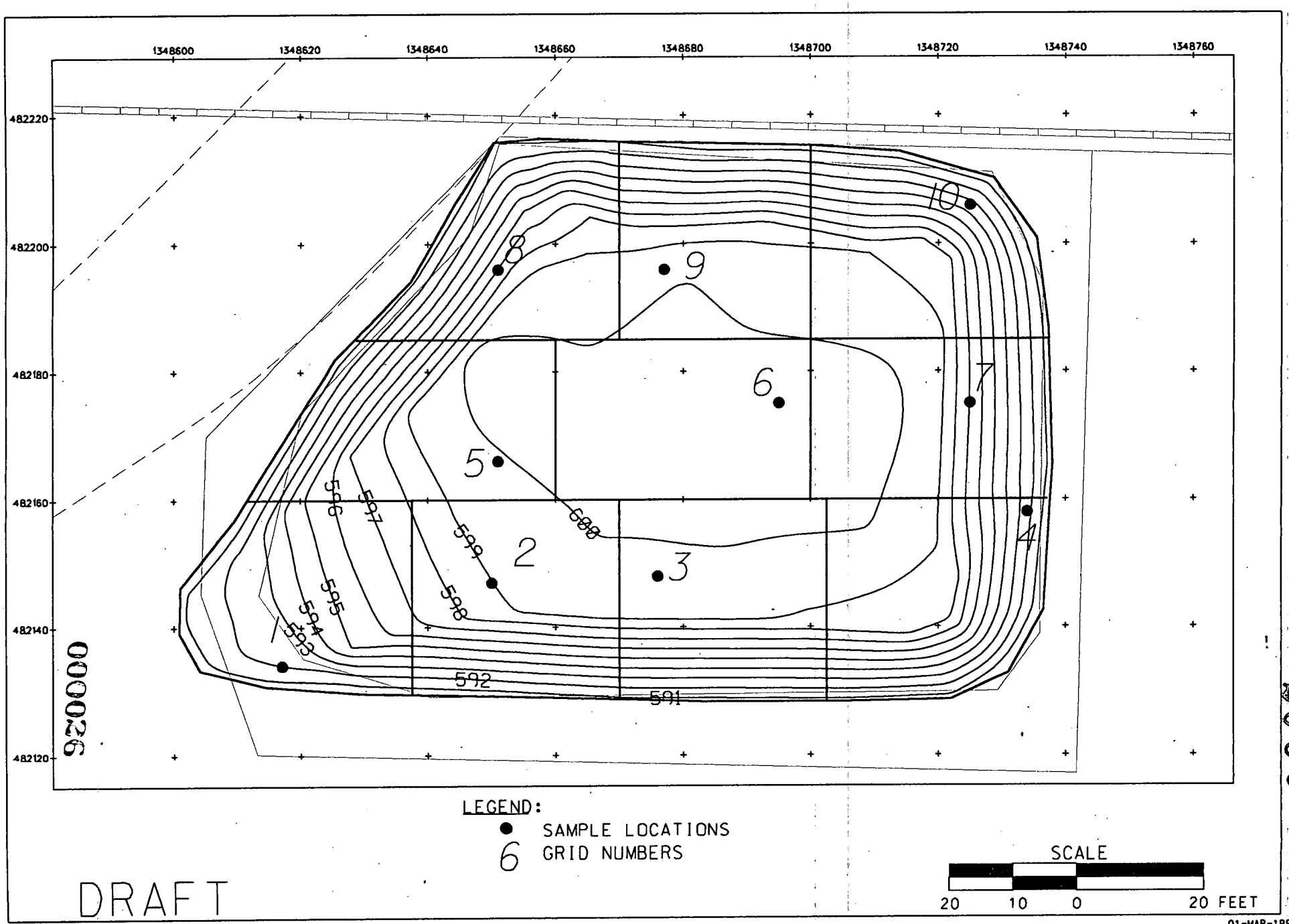
Off-site samples should be recorded on a separate Chain-of-Custody form from the on-site samples.



v:\e5cj31\dgn\mapshor\sdpthsarea3-04.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 2-1. SP-1 SAMPLING LOCATIONS

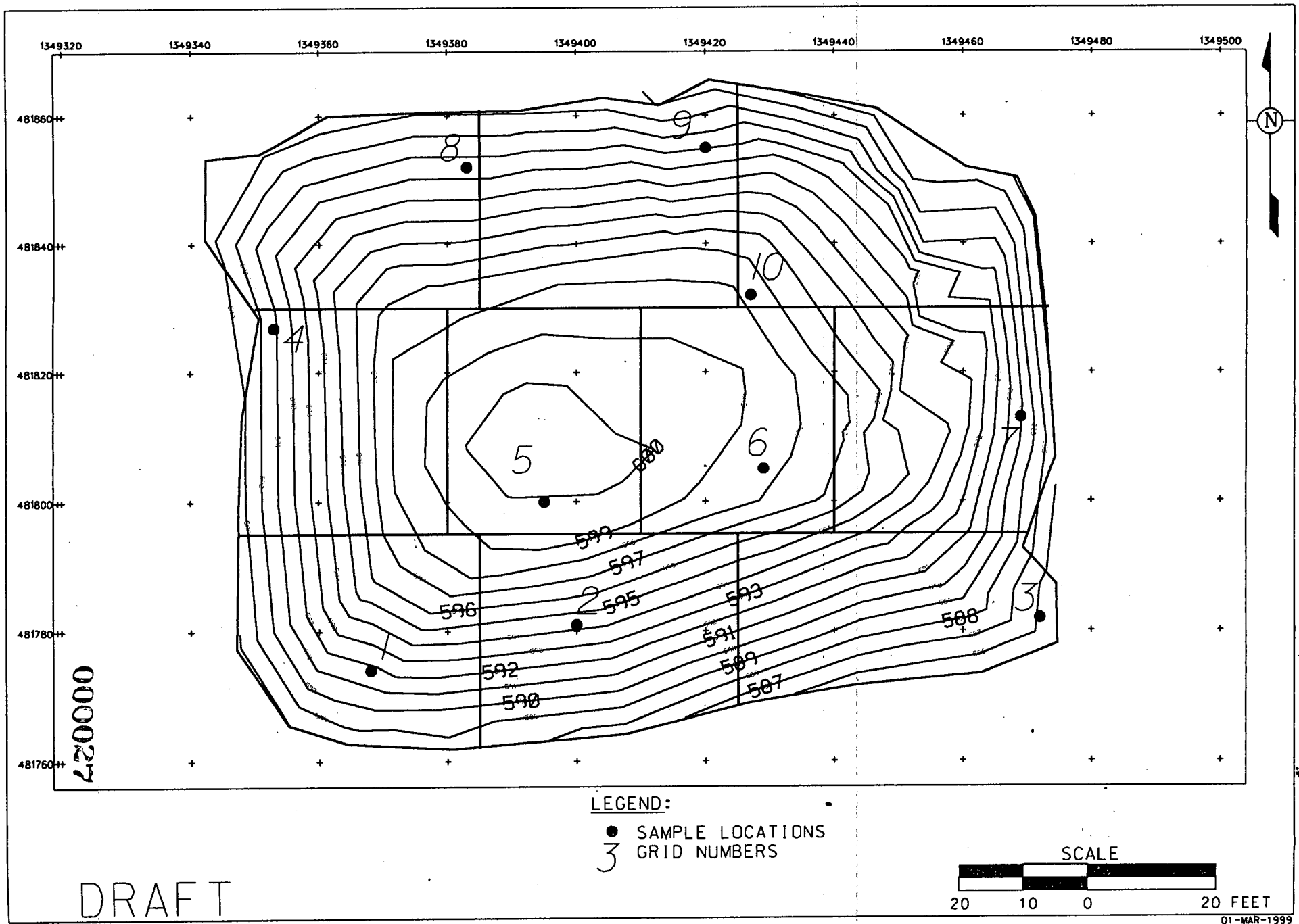
01-MAR-1999



v:\e5cj31\dgn\mapshor\dpthsarea3-06.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 2-2. SP-2 SAMPLING LOCATIONS

01-MAR-1999



vi#5cj31#dgn#map#hor#dptharea3-05.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 2-3. SP-4 SAMPLING LOCATIONS

3.0 REAL-TIME RADIOLOGICAL SCANNING

The real-time total uranium WAC investigation of surface soil in SP-1, SP-2, and SP-4 will be performed using the mobile NaI detector, referred to as the Radiation Tracking System (RTRAK) or the Radiation Scanning System (RSS) and the HPGe portable detectors to cover as much of the stockpile surface as practical. The final aerial coverage will be documented and reported upon completion of the real-time measurement program.

Real-time data gathered during this activity will be reported on an Excavation Monitoring Form (FS-F-5195). This form contains relevant information pertaining to the real-time data collection, characterization review of the data, and WAO acceptance of the characterization. The instructions for using this form area printed on the form. The Real-Time Field Lead, the Characterization Lead, and WAO representatives or designees will complete this form for each real-time measurement. The original forms will be placed in the WAO files.

3.1 RTRAK/RSS SCANNING COVERAGE

Real-time NaI detector system coverage using the RTRAK/RSS will be limited to the safely accessible surfaces and will be as extensive as possible without jeopardizing worker safety. The real-time field team, supervisor, and project health and safety representative will jointly determine which areas are accessible based on field conditions at the time of measurements.

The NaI detector acquisition time will be set to 4 seconds and the data will be collected at a speed of one mile per hour. The onboard Global Positioning System (GPS) will be used to obtain positioning information with each detector measurement. The RTRAK/RSS scan data will be reviewed to determine if any single measurement exceeds 721 mg/kg total uranium, the trigger level established for NaI WAC measurements. If this trigger is exceeded, a surface soil sample will be collected as discussed in Sections 2.3.2 and 3.4.

A minimum of two Troxler® or Infrared Moisture Meter soil moisture readings will be collected in the area covered by the RTRAK/RSS. These moisture readings are necessary because measurements from HPGe and RTRAK/RSS detectors need to be adjusted to take into account the soil moisture. If a moisture reading cannot be taken, a physical core sample will be collected for moisture testing. If

collected, the moisture core samples will follow the same sample identification system as outlined in Section 3.3.

3.2 HPGe DETECTOR MEASUREMENTS

The HPGe portable detector systems will be used to obtain gamma measurements in those areas that cannot be safely accessed by the RTRAK/RSS but are accessible to the HPGe detector (e.g., steep side slopes). The objective of the HPGe measurements is to cover the areas of the pile that were not scanned by RTRAK/RSS, with the goal of covering as much of the surface of each pile as possible using real-time methods.

The HPGe detector system acquisition time will be set to 300 seconds (5 minutes). The detector height will be set at 1 meter above ground surface. All HPGe locations will be surveyed and marked. Each HPGe measurement will be identified as specified in Section 3.3. One Troxler® or Infrared Moisture Meter soil moisture reading will be collected in each grid block covered by the HPGe measurements. If a moisture reading cannot be taken, a physical core sample will be collected for moisture testing. If collected, the moisture core samples will follow the same sample identification system as outlined in Section 3.3.

One duplicate measurement will be taken for every 20 HPGe measurements collected for this project. The duplicate will immediately follow the original reading and will be conducted using the same detector with the same height and count time.

The HPGe data will be reviewed to determine if any single measurement exceeds 400 mg/kg total uranium, the trigger level established for HPGe WAC measurements at a 1-meter height. If this trigger is exceeded, a surface soil sample will be collected as discussed in Sections 2.3.2 and 3.4.

3.3 HPGe MEASUREMENT IDENTIFICATION

Each HPGe measurement will have a unique identifier. This identifier will consist of a prefix designating the area name (SP1, SP2, or SP4), followed by a grid block number (1 through 10), followed by the sample number within the area (1 through x), followed by a letter designating the type of sample ("G" for gamma). A "D" will be used to designate the duplicate measurements. For example:

SP4-2-1-G-D is the first HPGe reading taken in the second grid block of SP-4 and is a duplicate measurement.

3.4 SAMPLE COLLECTION BASED ON RTRAK AND HPGe MEASUREMENTS

If RTRAK/RSS or HPGe measurements identify an area of surface soil above one of the trigger levels discussed in Sections 3.1 and 3.2, a surface soil sample (0-6 inches) will be collected from a location within the measurement read area that exhibits the highest gross beta/gamma reading based on a portable survey meter/probe. This surface soil sample will be analyzed for total uranium (TAL B). If the RTRAK/RSS and/or HPGe measurements do not identify any areas with total uranium above the trigger levels, no real-time based physical surface samples will be collected.

4.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

4.1 FIELD QUALITY CONTROL SAMPLES, ANALYTICAL REQUIREMENTS, AND DATA VALIDATION

In accordance with the requirements of DQO SL-048, Rev. 5, the field quality control, analytical, and data validation requirements are as follows:

- All laboratory analyses will be performed at analytical support level (ASL) B.
- One trip blank will be taken each day that VOC samples are collected or 1 per 20 VOC samples that are collected, whichever is more frequent. In addition, a matrix spike and matrix spike duplicate sample will be collected for each VOC release or 1 per 20 VOC samples that are collected, whichever is more frequent.
- All field data will be validated. All analytical data will require a certificate of analysis and 10 percent of the analytical data will also require the associated quality assurance/quality control results. A minimum of 10 percent of the analytical data from each laboratory will be validated to ASL B.
- Real-time measurements will be performed at ASL A.
- One in 20 HPGe measurements will require a duplicate.

4.2 PROJECT-SPECIFIC PROCEDURES AND MANUALS

To assure consistency and data integrity, field activities in support of this PSP will follow the requirements and responsibilities outlined in controlled procedures and manufacturer operational manuals. Applicable procedures and manuals include:

- SMPL-01, *Solids Sampling*
- SMPL-21, *Collection of Field Quality Control Samples*
- EQT-05, *Geodimeter® 4000 Survey System - Operation, Maintenance, and Calibration*
- EQT-06, *Geoprobe® Model 5400 Operation and Maintenance Manual*
- EQT-22, *Characterization of Gamma Sensitive Detectors*
- EQT-23, *Operation of ADCAM Series Analyzers with Gamma Sensitive Detectors*
- EQT-30, *Operation of the Radiation Tracking Vehicle Sodium Iodide Detection System*

- EQT-32, *Troxler® 3440 Series Surface Moisture/Density Gauge -- Calibration, Operation, and Maintenance*
- EQT-33, *Real-Time Differential Global Positioning System Operation*
- EQT-34, *Operation of the Radiation Scanning System (RSS)*
- EQT-39, *ZeHex Infrared Moisture Meter*
- S.P. 766-S-1000, *Shipping Samples to Off-Site Laboratories*
- *Sitewide CERCLA Quality Assurance Project Plan (SCQ)*

4.3 PROJECT REQUIREMENTS FOR INDEPENDENT ASSESSMENTS

Project management has ultimate responsibility for the quality of the work processes and the results of the sampling activities covered by this PSP. The Quality Assurance (QA) organization will conduct independent assessments of the work process and operations to assure the quality of performance. Assessment will encompass technical and procedural requirements of this PSP and the SCQ. Independent assessments will be performed by conducting a surveillance. Surveillances will be planned and documented according to Section 12.3 of the SCQ.

4.4 IMPLEMENTATION OF FIELD CHANGES

If field conditions require changes or variances, the Field Sampling Lead must obtain written or verbal approval (electronic mail is acceptable) from the Characterization Lead, QA, and WAO before the changes may be implemented. If the change involves real-time scanning, the Real-Time Lead must also give written or verbal approval before the change can be implemented. Changes to the PSP will be noted in the applicable Field Activity Logs and on a Variance/Field Change Notice (V/FCN). QA must receive the completed V/FCN, which includes the signatures of the Characterization Lead, Sampling Lead, Project Manager, WAO, QA, and Real-Time Lead within seven working days of implementation of the change.

5.0 HEALTH AND SAFETY

The Health and Safety Lead, Field Sampling Leads, and team members will assess the safety of performing sampling activities on the surfaces of SP-1, SP-2, and SP-4. This will include vehicle positioning limitations, fall hazards, and vehicle stability if Geoprobe® or real-time scanning work is performed on the side slopes of the piles.

Technicians will conform to precautionary surveys performed by personnel representing the Radiological Control, Safety, and Industrial Hygiene organizations. All work on this project will be performed in accordance with applicable Environmental Monitoring procedures, RM-0020 (Radiological Control Requirements Manual), RM-0021 (Safety Performance Requirements Manual), Fluor Daniel Fernald work permit, Radiological Work Permit (RWP), penetration permits, and other applicable permits. Concurrence with applicable safety permits (indicated by the signature of each field team member assigned to this project) is required by each team member in the performance of their assigned duties. Periodic photoionization detector (PID) monitoring of the top of the borehole and the ambient air will be performed during sampling activities.

The Field Sampling Lead will ensure that each technician performing sampling related to this project has been trained to the relevant sampling procedures including safety precautions. Technicians who do not sign project safety and technical briefing forms will not participate in the execution of sampling activities related to the completion of assigned project responsibilities. A copy of applicable safety permits/surveys issued for worker safety and health will be posted at each stockpile during sampling activities.

A safety briefing will be conducted prior to the initiation of field activities. All emergencies shall be reported immediately to the site communication center at 648-6511 or contact "control" on the radio.

6.0 DATA MANAGEMENT

A data management process will be implemented so information collected during the investigation will be properly managed to satisfy data end use requirements after completion of the field activities. As specified in Section 5.1 of the SCQ, sampling teams will describe daily activities on Field Activity Log, which should be sufficient for accurate reconstruction of the events at a later date without reliance on memory. Sample Collection Logs will be completed according to protocol specified in Appendix B of the SCQ and in applicable procedures. These forms will be maintained in loose-leaf form and uniquely numbered following the field sampling event. At least weekly, a copy of all field logs will be sent to the Characterization Lead.

Real-time data will be reported on an Excavation Monitoring Form. All field measurements, observations, and sample collection information associated with physical sample collection will be recorded, as applicable, on the Sample Collection Log, the Field Activity Log, and the Chain of Custody/Request for Analysis Form as required. The method of sample collection will be specified in the Field Activity Log. Borehole Abandonment Logs will not be required. The PSP number (20200-PSP-0003) should be on all documentation associated with these sampling activities.

Samples will be assigned a unique sample identifier, as explained in Section 2.4 and 3.3 and listed in Appendix C. This unique sample identifier will appear on the Sample Collection Log and Chain of Custody/Request for Analysis and will be used to identify the samples during analysis, data entry, and data management.

Technicians will review all field data for completeness and accuracy and then forward the data package to the Data Validation Contact for final review. The field data package will be filed in the records of the Environmental Management Project.

The Data Management organization will perform data entry into the Sitewide Environmental Database (SED). Field logs will be maintained in loose-leaf form during the field recording activities. Analytical data from the off-site laboratory will be reviewed by the Project Lead prior to entry or transfer of the data to the SED from the Fernald Analytical Customer Tracking System (FACTS) database. The analytical data validation requirements are outlined in Section 4.1.

REFERENCES

U.S. Department of Energy, 1998a, "Sitewide Excavation Plan," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

U.S. Department of Energy, 1998b, "Waste Acceptance Criteria Attainment Plan for the On-Site Disposal Facility," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

U.S. Department of Energy, 1998c "Project Specific Plan for Sampling of Soil Pile 5 (SP-5) for OSDF WAC Attainment," Revision 0, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

U.S. Department of Energy, 1998d, "Project Specific Plan for WAC Attainment Sampling of Area 7 Soils," Revision 0, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

U.S. Department of Energy, 1998e, "Waste Acceptance Criteria (WAC) Attainment Report for the Area 1, Phase I Impacted Soil Stockpile," Draft, Revision A, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, OH.

APPENDIX A

DATA QUALITY OBJECTIVE SL-048, REV. 5

Control Number 2068

Fernald Environmental Management Project

Data Quality Objectives

Title: Delineating the Extent of Constituents of Concern During Remediation Sampling

Number: SL-048

Revision: 5

Effective Date: 2/26/99

Contact Name: Eric Kroger

Approval: _____ **Date:** 2/25/99
James E. Chambers
DQO Coordinator

Approval: _____ **Date:** 2/26/99
J.D. Chiou
SCEP Project Director

Rev. #	0	1	2	3	4	5	6
Effective Date:	9/19/97	10/3/97	4/15/98	6/17/98	7/14/98	2/26/99	

DATA QUALITY OBJECTIVES
Delineating the Extent of Constituents of Concern During Remediation Sampling

Members of Data Quality Objectives (DQO) Scoping Team

The members of the DQO team include a project lead, a project engineer, a field lead, a statistician, a lead chemist, a sampling supervisor, and a data management lead.

Conceptual Model of the Site

Media is considered contaminated if the concentration of a constituent of concern (COC) exceeds the final remediation levels (FRLs). The extent of specific media contamination was estimated and published in the Operable Unit 5 Feasibility Study (FS). These estimates were based on kriging analysis of available data for media collected during the Remedial Investigation (RI) effort and other FEMP environmental characterization studies. Maps outlining contaminated media boundaries were generated for the Operable Unit 5 FS by overlaying the results of the kriging analysis data with isoconcentration maps of the other constituents of concern (COCs), as presented in the Operable Unit 5 RI report, and further modified by spatial analysis of maps reflecting the most current media characterization data. A sequential remediation plan has been presented that subdivides the FEMP into seven construction areas. During the course of remediation, areas of specific media may require additional characterization so remediation can be carried out as thoroughly and efficiently as possible. As a result, additional sampling may be necessary to accurately delineate a volume of specific media as exceeding a target level, such as the FRL or the Waste Attainment Criterion (WAC). Each individual Project-Specific Plan (PSP) will identify and describe the particular media to be sampled. This DQO covers all physical sampling activities associated with Pre-design Investigations, precertification sampling, WAC attainment sampling or regulatory monitoring that is required during site remediation.

1.0 Statement of Problem

If the extent (depth and/or area) of the media COC contamination is unknown, then it must be defined with respect to the appropriate target level (FRL, WAC, or other specified media concentration).

2.0 Identify the Decision

Delineate the horizontal and/or vertical extent of media COC contamination in an area with respect to the appropriate target level.

3.0 Inputs That Affect the Decision

Informational Inputs - Historical data, process history knowledge, the modeled extent of COC contamination, and the origins of contamination will be required to

establish a sampling plan to delineate the extent of COC contamination. The desired precision of the delineation must be weighed against the cost of collecting and analyzing additional samples in order to determine the optimal sampling density. The project-specific plan will identify the optimal sampling density.

Action Levels - COCs must be delineated with respect to a specific action level, such as FRLs and On-Site Disposal Facility (OSDF) WAC concentrations. Specific media FRLs are established in the OU2 and OU5 RODs, and the WAC concentrations are published in the OU5 ROD. Media COCs may also require delineation with respect to other action levels that act as remediation drivers, such as Benchmark Toxicity Values (BTVs).

4.0 The Boundaries of the Situation

Temporal Boundaries - Sampling must be completed within a time frame sufficient to meet the remediation schedule. Time frames must allow for the scheduling of sampling and analytical activities, the collection of samples, analysis of samples and the processing of analytical data when received.

Scale of Decision Making - The decision made based upon the data collected in this investigation will be the extent of COC contamination at or above the appropriate action level. This delineation will result in media contaminant concentration information being incorporated into engineering design, and the attainment of established remediation goals.

Parameters of Interest - The parameters of interest are the COCs that have been determined to require additional delineation before remediation design can be finalized with the optimal degree of accuracy.

5.0 Decision Rule

If existing data provide an unacceptable level of uncertainty in the COC delineation model, then additional sampling will take place to decrease the model uncertainty. When deciding what additional data is needed, the costs of additional sampling and analysis must be weighed against the benefit of reduced uncertainty in the delineation model, which will eventually be used for assigning excavation, or for other purposes.

6.0 Limits on Decision Errors

In order to be useful, data must be collected with sufficient areal and depth coverage, and at sufficient density to ensure an accurate delineation of COC concentrations. Analytical sensitivity and reproducibility must be sufficient to differentiate the COC concentrations below their respective target levels.

Types of Decision Errors and Consequences

Decision Error 1 - This decision error occurs when the decision maker determines that the extent of media contaminated with COCs above action levels is not as extensive as it actually is. This error can result in a remediation design that fails to incorporate media contaminated with COC(s) above the action level(s). This could result in the re-mobilization of excavation equipment and delays in the remediation schedule. Also, this could result in media contaminated above action levels remaining after remediation is considered complete, posing a potential threat to human health and the environment.

Decision Error 2 - This decision error occurs when the decision maker determines that the extent of media contaminated above COC action levels is more extensive than it actually is. This error could result in more excavation than necessary, and this excess volume of materials being transferred to the OSDF, or an off-site disposal facility if contamination levels exceed the OSDF WAC.

True State of Nature for the Decision Errors - The true state of nature for Decision Error 1 is that the maximum extent of contamination above the FRL is more extensive than was determined. The true state of nature for Decision Error 2 is that the maximum extent of contamination above the FRL is not as extensive as was determined. Decision Error 1 is the more severe error.

7.0 Optimizing Design for Useable Data

7.1 Sample Collection

A sampling and analytical testing program will delineate the extent of COC contamination in a given area with respect to the action level of interest. Existing data, process knowledge, modeled concentration data, and the origins of contamination will be considered when determining the lateral and vertical extent of sample collection. The cost of collecting and analyzing additional samples will be weighed against the benefit of reduced uncertainty in the delineation model. This will determine the sampling density. Individual PSPs will identify the locations and depths to be sampled, the sampling density necessary to obtain the desired accuracy of the delineation, and if samples will be analyzed by the on-site or off-site laboratory. The PSP will also identify the sampling increments to be selectively analyzed for concentrations of the COC(s) of interest, along with field work requirements. Analytical requirements will be listed in the PSP. The chosen analytical methodologies are able to achieve a detection limit capable of resolving the COC action level. Sampling of groundwater monitoring wells may require different purge requirements than those stated in the SCQ (i.e., dry well definitions or small purge volumes). In order to accommodate sampling of wells that go dry prior to completing the purge of the necessary well volume, attempts to sample the

monitoring wells will be made 24 hours after purging the well dry. If, after the 24 hour period, the well does not yield the required volume, the analytes will be collected in the order stated in the applicable PSP until the well goes dry. Any remaining analytes will not be collected. In some instances, after the 24 hour wait the well may not yield any water. For these cases, the well will be considered dry and will not be sampled.

7.2 COC Delineation

The media COC delineation will use all data collected under the PSP, and if deemed appropriate by the Project Lead, may also include existing data obtained from physical samples, and if applicable, information obtained through real-time screening. The delineation may be accomplished through modeling (e.g. kriging) of the COC concentration data with a confidence limit specific to project needs that will reduce the potential for Decision Error 1. A very conservative approach to delineation may also be utilized where the boundaries of the contaminated media are extended to the first known vertical and horizontal sample locations that reveal concentrations below the desired action level.

7.3 QC Considerations

Laboratory work will follow the requirements specified in the SCQ. If analysis is to be carried out by an off-site laboratory, it will be a Fluor Daniel Fernald approved full service laboratory. Laboratory quality control measures include a media prep blank, a laboratory control sample (LCS), matrix duplicates and matrix spike. Typical Field QC samples are not required for ASL B analysis. However the PSPs may specify appropriate field QC samples for the media type with respect to the ASL in accordance with the SCQ, such as field blanks, trip blanks, and container blanks. All field QC samples will be analyzed at the associated field sample ASL. Data will be validated per project requirements, which must meet the requirements specified in the SCQ. Project-specific validation requirements will be listed in the PSP.

Per the Sitewide Excavation Plan, the following ASL and data validation requirements apply to all **soil and soil field QC samples** collected in association with this DQO:

- If samples are analyzed for Pre-design Investigations and/or Precertification, 100% of the data will be analyzed per ASL B requirements. For each laboratory used for a project, 90% of the data will require only a Certificate of Analysis, the other 10% will require the Certificate of Analysis and all associated QA/QC results, and will be validated to ASL B. Per Appendix H of the SEP, the minimum detection level (MDL) for these analyses will be established at approximately 10% of the action level (the action level for precertification is the

FRL; the action level for pre-design investigations can be several different action levels, including the FRL, the WAC, RCRA levels, ALARA levels, etc.). If this MDL is different from the SCQ-specified MDL, the ASL will default to ASL E, though other analytical requirements will remain as specified for ASL B.

- If samples are analyzed for WAC Attainment and/or RCRA Characteristic Areas Delineation, 100% of the data will be analyzed and reported to ASL B with 10% validated. The ASL B package will include a Certificate of Analysis along with all associated QA/QC results. Total uranium analyses using a higher detection limit than is required for ASL B (10 mg/kg) may be appropriate for WAC attainment purposes since the WAC limit for total uranium is 1,030 mg/kg. In this case, an ASL E designation will apply to the analysis and reporting to be performed under the following conditions:
    - all of the ASL B laboratory QA/QC methods and reporting criteria will apply with the exception of the total uranium detection limit
    - the detection limit will be ≤10% of the WAC limit (e.g., ≤103 mg/kg for total uranium).
- If delineation data are also to be used for certification, the data must meet the data quality objectives specified in the Certification DQO (SL-043).
- Validation will include field validation of field packages for ASL B or ASL D data.

All data will undergo an evaluation by the Project Team, including a comparison for consistency with historical data. Deviations from QC considerations resulting from evaluating inputs to the decision from Section 3, must be justified in the PSP such that the objectives of the decision rule in Section 5 are met.

7.4 Independent Assessment

Independent assessment shall be performed by the FEMP QA organization by conducting surveillances. Surveillances will be planned and documented in accordance with Section 12.3 of the SCQ.

7.5 Data Management

Upon receipt from the laboratory, all results will be entered into the SED as qualified data using standard data entry protocol. The required ASL B, D or E data will undergo analytical validation by the FEMP validation team, as required (see Section 7.3). The Project Manager will be responsible to determine data usability as it pertains to supporting the DQO decision of determining delineation of media

COC's.

7.6 Applicable Procedures

Sample collection will be described in the PSP with a listing of applicable procedures. Typical related plans and procedures are the following:

- Sitewide Excavation Plan (SEP)
- Sitewide CERCLA Quality Assurance Project Plan (SCQ).
- SMPL-01, *Solids Sampling*
- SMPL-02, *Liquids and Sludge Sampling*
- SMPL-21, *Collection of Field Quality Control Samples*
- EQT-06, *Geoprobe® Model 5400 Operation and Maintenance*
- EQT-23, *Operation of High Purity Germanium Detectors*
- EQT-30, *Operation of Radiation Tracking Vehicle Sodium Iodide Detection System*

Data Quality Objectives
Delineating the Extent of Constituents of Concern During Remediation Sampling

1A. Task/Description: Delineating the extent of contamination above the FRLs

1.B. Project Phase: (Put an X in the appropriate selection.)

RI ☐ FS ☐ RD ☒ RA ☐ R_vA ☐ OTHER ☐

1.C. DQO No.: SL-048, Rev. 5 DQO Reference No.:_____

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2. Media Characterization: (Put an X in the appropriate selection.)

Air ☐ Biological ☐ Groundwater ☒ Sediment ☒ Soil ☒

Waste ☒ Wastewater ☐ Surface water ☐ Other (specify) _____

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3. Data Use with Analytical Support Level (A-E): (Put an X in the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization A☐ B☒ C☐ D☒ E☒	Risk Assessment A☐ B☐ C☐ D☐ E☐
Evaluation of Alternatives A☐ B☐ C☐ D☐ E☐	Engineering Design A☐ B☒ C☐ D☒ E☒
Monitoring during remediation A☒ B☒ C☐ D☒ E☒	Other A☐ B☐ C☐ D☐ E☐

4.A. Drivers: Remedial Action Work Plans, Applicable or Relevant and Appropriate Requirements (ARARs) and the OU2 and/or OU5 Record of Decision (ROD).

4.B. Objective: Delineate the extent of media contaminated with a COC (or COCs) with respect to the action level(s) of interest.

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5. Site Information (Description):

6.A. Data Types with appropriate Analytical Support Level Equipment Selection and SCQ Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the SCQ Section.)

1. pH	[X] *	2. Uranium	[X] *	3. BTX	[ ]
Temperature	[X] *	Full Radiological	[X] *	TPH	[ ]
Specific Conductance	[X] *	Metals	[X] *	Oil/Grease	[ ]
Dissolved Oxygen	[X] *	Cyanide	[ ]		
Technetium-99	[X] *	Silica	[ ]		

4. Cations	[ ]	5. VOA	[X] *	6. Other (specify)
Anions	[ ]	BNA	[X] *	
TOC	[ ]	Pesticides	[X] *	
TCLP	[X] *	PCB	[X] *	
CEC	[ ]	COD	[ ]	

*If constituent is identified for delineation in the individual PSP.

6.B. Equipment Selection and SCQ Reference:

Equipment Selection	Refer to SCQ Section
ASL A _____	SCQ Section: _____
ASL B X _____	SCQ Section: App. G Tables G-1&G-3
ASL C _____	SCQ Section: _____
ASL D X _____	SCQ Section: App. G Tables G-1&G-3
ASL E X (See sect. 7.3, pg. 6)	SCQ Section: App. G Tables G-1&G-3

7.A. Sampling Methods: (Put an X in the appropriate selection.)

Biased [X] Composite [ ] Environmental [X] Grab [X] Grid [X]

Intrusive [X] Non-Intrusive [ ] Phased [ ] Source [ ]

DQO Number: SL-048, Rev. 5

7.B. Sample Work Plan Reference: This DQO is being written prior to the PSPs.

Background samples: OU5 RI

7.C. Sample Collection Reference:

Sample Collection Reference: SMPL-01, SMPL-02, EQT-06

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8. Quality Control Samples: (Place an "X" in the appropriate selection box.)

8.A. Field Quality Control Samples:

Trip Blanks	[X] *	Container Blanks	[X] + +
Field Blanks	[X] +	Duplicate Samples	[X] * * *
Equipment Rinsate Samples	[X] * * *	Split Samples	[X] * *
Preservative Blanks	[ ]	Performance Evaluation Samples	[ ]
Other (specify)			

* For volatile organics only
** Split samples will be collected where required by EPA or OEPA.
*** If specified in PSP.
\+ Collected at the discretion of the Project Manager (if warranted by field conditions)
\+ \+ One per Area and Phase Area per container type (i.e. stainless steel core liner/plastic core liner/Geoprobe tube).

8.B. Laboratory Quality Control Samples:

Method Blank	[X]	Matrix Duplicate/Replicate	[X]
Matrix Spike	[X]	Surrogate Spikes	[ ]
Tracer Spike	[ ]		

Other (specify) Per SCQ

9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.

APPENDIX B

TARGET ANALYTE LISTS

APPENDIX B

TARGET ANALYTE LISTS

TAL 20200-PSP-0003-A

Soil Analysis - ICP/MS and GPC		
1	ASL B	Total Uranium
2	ASL B	Technetium-99

TAL 20200-PSP-0003-B

Soil Analysis - ICP/MS		
1	ASL B	Total Uranium

TAL 20200-PSP-0003-C

Soil Analysis - Total VOCs		
1	ASL B	Bromodichloromethane
2	ASL B	Chloroethane
3	ASL B	1,1-Dichloroethene
4	ASL B	1,2-Dichloroethene
5	ASL B	Tetrachloroethene
6	ASL B	Trichloroethene
7	ASL B	Vinyl Chloride

TAL 20200-PSP-0003-D

Soil Analysis - Total SVOCs		
1	ASL B	Bis(2-isochloroisopropyl)ether
2	ASL B	Carbazole
3	ASL B	4-Nitroaniline

TAL 20200-PSP-0003-E

Soil Analysis - Total Pesticides		
1	ASL B	Alpha-chlordane
2	ASL B	Toxaphene

TAL 20200-PSP-0003-F

Soil Analysis - TCLP VOCs		
1	ASL B	Benzene
2	ASL B	Carbon Tetrachloride
3	ASL B	Chlorobenzene
4	ASL B	Chloroform
5	ASL B	1,1-Dichloroethene
6	ASL B	1,2-Dichloroethene
7	ASL B	Methyl Ethyl Ketone
8	ASL B	Tetrachloroethene
9	ASL B	Trichloroethene
10	ASL B	Vinyl Chloride

TAL 20200-PSP-0003-G

Soil Analysis - TCLP SVOCs, Pesticides, Herbicides		
1	ASL B	Chlordane
2	ASL B	o-Cresol
3	ASL B	m-Cresol
4	ASL B	p-Cresol
5	ASL B	2,4-D
6	ASL B	1,4-Dichlorobenzene
7	ASL B	2,4-Dinitrotoluene
8	ASL B	Endrin
9	ASL B	Heptachlor
10	ASL B	Heptachlor Epoxide
11	ASL B	Hexachlorobenzene
12	ASL B	Hexachlorobutadiene
13	ASL B	Hexachloroethane
14	ASL B	Lindane
15	ASL B	Methoxychlor
16	ASL B	Nitrobenzene
17	ASL B	Pentachlorophenol
18	ASL B	Pyridine
19	ASL B	Toxaphene
20	ASL B	2,4,5-Trichlorophenol
21	ASL B	2,4,6-Trichlorophenol
22	ASL B	2,4,5-TP (Silvex)

TAL 20200-PSP-0003-H

Soil Analysis - TCLP Metals		
1	ASL B	Arsenic
2	ASL B	Barium
3	ASL B	Cadmium
4	ASL B	Chromium
5	ASL B	Lead
6	ASL B	Mercury
7	ASL B	Selenium
8	ASL B	Silver

APPENDIX C

RANDOM PHYSICAL SOIL SAMPLES TO BE COLLECTED FOR THE SAMPLING OF REMOVAL ACTION 17 STOCKPILES 1, 2, AND 4 FOR OSDF WAC ATTAINMENT

APPENDIX C

RANDOM PHYSICAL SOIL SAMPLES TO BE COLLECTED FOR THE SAMPLING OF REMOVAL ACTION 17 STOCKPILES 1, 2, AND 4 FOR OSDF WAC ATTAINMENT

Sample ID	Northing	Easting	Boring Depth	Primary Relative Sample Depth Fraction	Sample Depth (feet)[1]	Alternate Relative Sample Depth Fraction[2]	Alternate Sample Depth (feet)	Analysis
STOCKPILE 1								
SP1-1-1-R	481751	1349728	1.9'	0.43	0'-1.0'	0.69	0.9-1.9'	TAL A
SP1-1-1-L	481751	1349728	1.9'	0.43	0'-1.0'	0.69	0.9-1.9'	TAL C
SP1-1-1-P	481751	1349728	1.9'	0.43	0'-1.0'	0.69	0.9-1.9'	TAL E
SP1-1-1-TL	481751	1349728	1.9'	0.43	0'-1.0'	0.69	0.9-1.9'	TAL F
SP1-1-1-TS	481751	1349728	1.9'	0.43	0'-1.0'	0.69	0.9-1.9'	TAL G
SP1-1-1-TM	481751	1349728	1.9'	0.43	0'-1.0'	0.69	0.9-1.9'	TAL H
SP1-1-1-AB	481751	1349728	1.9'	0.43	0'-1.0'	0.69	0.9-1.9'	AB Screen
SP1-2-2-R	481782	1349720	2.5'	0.59	1.0'-2.0'	0.41	1.0'-2.0'	TAL A
SP1-2-2-L	481782	1349720	2.5'	0.59	1.0'-2.0'	0.41	1.0'-2.0'	TAL C
SP1-2-2-P	481782	1349720	2.5'	0.59	1.0'-2.0'	0.41	1.0'-2.0'	TAL E
SP1-2-2-TL	481782	1349720	2.5'	0.59	1.0'-2.0'	0.41	1.0'-2.0'	TAL F
SP1-2-2-TS	481782	1349720	2.5'	0.59	1.0'-2.0'	0.41	1.0'-2.0'	TAL G
SP1-2-2-TM	481782	1349720	2.5'	0.59	1.0'-2.0'	0.41	1.0'-2.0'	TAL H
SP1-2-2-AB	481782	1349720	2.5'	0.59	1.0'-2.0'	0.41	1.0'-2.0'	AB Screen
SP1-3-1-R	481818	1349736	4.8'	0.18	0'-1.0'	0.59	2.0'-3.0'	TAL A
SP1-3-1-L	481818	1349736	4.8'	0.18	0'-1.0'	0.59	2.0'-3.0'	TAL C
SP1-3-1-P	481818	1349736	4.8'	0.18	0'-1.0'	0.59	2.0'-3.0'	TAL E
SP1-3-1-TL	481818	1349736	4.8'	0.18	0'-1.0'	0.59	2.0'-3.0'	TAL F
SP1-3-1-TS	481818	1349736	4.8'	0.18	0'-1.0'	0.59	2.0'-3.0'	TAL G
SP1-3-1-TM	481818	1349736	4.8'	0.18	0'-1.0'	0.59	2.0'-3.0'	TAL H
SP1-3-1-AB	481818	1349736	4.8'	0.18	0'-1.0'	0.59	2.0'-3.0'	AB Screen
SP1-4-1-R	481851	1349715	2.2'	0.14	0'-1.0'	0.58	1.0'-2.0'	TAL A

APPENDIX C

RANDOM PHYSICAL SOIL SAMPLES TO BE COLLECTED FOR THE SAMPLING OF REMOVAL ACTION 17 STOCKPILES 1, 2, AND 4 FOR OSDF WAC ATTAINMENT (continued)

Sample ID	Northing	Easting	Boring Depth	Primary Relative Sample Depth Fraction	Sample Depth (feet)[1]	Alternate Relative Sample Depth Fraction[2]	Alternate Sample Depth (feet)	Analysis
SP1-4-1-L	481851	1349715	2.2'	0.14	0'-1.0'	0.58	1.0'-2.0'	TAL C
SP1-4-1-P	481851	1349715	2.2'	0.14	0'-1.0'	0.58	1.0'-2.0'	TAL E
SP1-4-1-TL	481851	1349715	2.2'	0.14	0'-1.0'	0.58	1.0'-2.0'	TAL F
SP1-4-1-TS	481851	1349715	2.2'	0.14	0'-1.0'	0.58	1.0'-2.0'	TAL G
SP1-4-1-TM	481851	1349715	2.2'	0.14	0'-1.0'	0.58	1.0'-2.0'	TAL H
SP1-4-1-AB	481851	1349715	2.2'	0.14	0'-1.0'	0.58	1.0'-2.0'	AB Screen
SP1-5-1-R	481872	1349720	1.9'	0.37	0'-1.0'	0.71	1.0'-1.9'	TAL A
SP1-5-1-S	481872	1349720	1.9'	0.37	0'-1.0'	0.71	1.0'-1.9'	TAL D
SP1-5-1-AB	481872	1349720	1.9'	0.37	0'-1.0'	0.71	1.0'-1.9'	AB Screen
SP1-6-1-R	481747	1349768	1.0'	0.60	0'-1.0'	0.65	0'-1.0'	TAL A
SP1-7-5-R	481779	1349749	5.8'	0.82	4.0'-5.0'	0.47	2.0'-3.0'	TAL A
SP1-8-1-R	481819	1349788	0.6'	0.64	0'-0.6'	0.17	0'-0.6'	TAL A
SP1-9-1-R	481843	1349765	0.7'	0.55	0'-0.7'	0.98	0'-0.7'	TAL A
SP1-9-1-L	481843	1349765	0.7'	0.55	0'-0.7'	0.98	0'-0.7'	TAL C
SP1-9-1-P	481843	1349765	0.7'	0.55	0'-0.7'	0.98	0'-0.7'	TAL E
SP1-9-1-TL	481843	1349765	0.7'	0.55	0'-0.7'	0.98	0'-0.7'	TAL F
SP1-9-1-TS	481843	1349765	0.7'	0.55	0'-0.7'	0.98	0'-0.7'	TAL G
SP1-9-1-TM	481843	1349765	0.7'	0.55	0'-0.7'	0.98	0'-0.7'	TAL H
SP1-9-1-AB	481843	1349765	0.7'	0.55	0'-0.7'	0.98	0'-0.7'	AB Screen
SP1-10-1-R	481862	1349750	1.5'	0.98	0'-1.0'	0.28	0'-1.0'	TAL A
STOCKPILE 2								
SP2-1-1-R	482134	1348617	1.5'	0.03	0'-1.0'	0.36	0'-1.0'	TAL A

APPENDIX C

RANDOM PHYSICAL SOIL SAMPLES TO BE COLLECTED FOR THE SAMPLING OF REMOVAL ACTION 17 STOCKPILES 1, 2, AND 4 FOR OSDF WAC ATTAINMENT (continued)

Sample ID	Northing	Easting	Boring Depth	Primary Relative Sample Depth Fraction	Sample Depth (feet)[1]	Alternate Relative Sample Depth Fraction[2]	Alternate Sample Depth (feet)	Analysis
SP2-1-1-S	482134	1348617	1.5'	0.03	0'-1.0'	0.36	0'-1.0'	TAL D
SP2-1-1-AB	482134	1348617	1.5'	0.03	0'-1.0'	0.36	0'-1.0'	AB Screen
SP2-2-5-R	482147	1348650	8.5'	0.58	4.0'-5.0'	0.09	0'-1.0'	TAL A
SP2-3-8-R	482148	1348676	9.0'	0.84	7.0'-8.0'	0.81	7.0'-8.0'	TAL A
SP2-4-1-R	482158	1348734	1.8'	0.43	0'-1.0'	0.55	0'-1.0'	TAL A
SP2-5-9-R	482166	1348652	9.2'	0.88	8.0'-9.0'	0.86	7.0'-8.0'	TAL A
SP2-6-9-R	482175	1348695	10.1'	0.70	7.0'-8.0'	0.78	7.0'-8.0'	TAL A
SP2-7-6-R	482175	1348725	6.4'	0.81	5.0'-6.0'	0.15	0'-1.0'	TAL A
SP2-8-4-R	482196	1348651	6.3'	0.59	3.0'-4.0'	0.94	5.0'-6.0'	TAL A
SP2-9-4-R	482196	1348677	9.2'	0.40	3.0'-4.0'	0.66	6.0'-7.0'	TAL A
SP2-10-1-R	482206	1348725	2.9'	0.18	0'-1.0'	0.09	0'-1.0'	TAL A
STOCKPILE 4								
SP4-1-3-R	481774	1349368	3.1'	0.84	2.0'-3.0'	0.12	0'-1.0'	TAL A
SP4-1-3-L	481774	1349368	3.1'	0.84	2.0'-3.0'	0.12	0'-1.0'	TAL C
SP4-1-3-P	481774	1349368	3.1'	0.84	2.0'-3.0'	0.12	0'-1.0'	TAL E
SP4-1-3-TL	481774	1349368	3.1'	0.84	2.0'-3.0'	0.12	0'-1.0'	TAL F
SP4-1-3-TS	481774	1349368	3.1'	0.84	2.0'-3.0'	0.12	0'-1.0'	TAL G
SP4-1-3-TM	481774	1349368	3.1'	0.84	2.0'-3.0'	0.12	0'-1.0'	TAL H
SP4-1-3-AB	481774	1349368	3.1'	0.84	2.0'-3.0'	0.12	0'-1.0'	AB Screen
SP4-2-5-R	481781	1349400	6.5'	0.74	4.0'-5.0'	0.19	1.0'-2.0'	TAL A
SP4-3-1-R	481782	1349472	0.7'	0.02	0'-0.7'	0.50	0'-0.7'	TAL A
SP4-3-1-L	481782	1349472	0.7'	0.02	0'-0.7'	0.50	0'-0.7'	TAL C

APPENDIX C

RANDOM PHYSICAL SOIL SAMPLES TO BE COLLECTED FOR THE SAMPLING OF REMOVAL ACTION 17 STOCKPILES 1, 2, AND 4 FOR OSDF WAC ATTAINMENT (continued)

Sample ID	Northing	Easting	Boring Depth	Primary Relative Sample Depth Fraction	Sample Depth (feet)[1]	Alternate Relative Sample Depth Fraction[2]	Alternate Sample Depth (feet)	Analysis
SP4-3-1-P	481782	1349472	0.7'	0.02	0'-0.7'	0.50	0'-0.7'	TAL E
SP4-3-1-TL	481782	1349472	0.7'	0.02	0'-0.7'	0.50	0'-0.7'	TAL F
SP4-3-1-TS	481782	1349472	0.7'	0.02	0'-0.7'	0.50	0'-0.7'	TAL G
SP4-3-1-TM	481782	1349472	0.7'	0.02	0'-0.7'	0.50	0'-0.7'	TAL H
SP4-3-1-AB	481782	1349472	0.7'	0.02	0'-0.7'	0.50	0'-0.7'	AB Screen
SP4-4-1-R	481827	1349353	1.9'	0.14	0'-1.0'	0.97	1.0'-1.9'	TAL A
SP4-4-1-L	481827	1349353	1.9'	0.14	0'-1.0'	0.97	1.0'-1.9'	TAL C
SP4-4-1-P	481827	1349353	1.9'	0.14	0'-1.0'	0.97	1.0'-1.9'	TAL E
SP4-4-1-TL	481827	1349353	1.9'	0.14	0'-1.0'	0.97	1.0'-1.9'	TAL F
SP4-4-1-TS	481827	1349353	1.9'	0.14	0'-1.0'	0.97	1.0'-1.9'	TAL G
SP4-4-1-TM	481827	1349353	1.9'	0.14	0'-1.0'	0.97	1.0'-1.9'	TAL H
SP4-4-1-AB	481827	1349353	1.9'	0.14	0'-1.0'	0.97	1.0'-1.9'	AB Screen
SP4-5-3-R	481800	1349395	11.9'	0.18	2.0'-3.0'	0.23	2.0'-3.0'	TAL A
SP4-6-3-R	481805	1349429	11.4'	0.19	2.0'-3.0'	0.80	9.0'-10.0'	TAL A
SP4-6-3-L	481805	1349429	11.4'	0.19	2.0'-3.0'	0.80	9.0'-10.0'	TAL C
SP4-6-3-P	481805	1349429	11.4'	0.19	2.0'-3.0'	0.80	9.0'-10.0'	TAL E
SP4-6-3-TL	481805	1349429	11.4'	0.19	2.0'-3.0'	0.80	9.0'-10.0'	TAL F
SP4-6-3-TS	481805	1349429	11.4'	0.19	2.0'-3.0'	0.80	9.0'-10.0'	TAL G
SP4-6-3-TM	481805	1349429	11.4'	0.19	2.0'-3.0'	0.80	9.0'-10.0'	TAL H
SP4-6-3-AB	481805	1349429	11.4'	0.19	2.0'-3.0'	0.80	9.0'-10.0'	AB Screen
SP4-7-3-R	481813	1349469	3.0'	0.79	2.0'-3.0'	0.96	2.0'-3.0'	TAL A
SP4-7-3-S	481813	1349469	3.0'	0.79	2.0'-3.0'	0.96	2.0'-3.0'	TAL D

APPENDIX C

RANDOM PHYSICAL SOIL SAMPLES TO BE COLLECTED FOR THE SAMPLING OF REMOVAL ACTION 17 STOCKPILES 1, 2, AND 4 FOR OSDF WAC ATTAINMENT (continued)

Sample ID	Northing	Easting	Boring Depth	Primary Relative Sample Depth Fraction	Sample Depth (feet)[1]	Alternate Relative Sample Depth Fraction[2]	Alternate Sample Depth (feet)	Analysis
SP4-7-3-AB	481813	1349469	3.0'	0.79	2.0'-3.0'	0.96	2.0'-3.0'	AB Screen
SP4-8-1-R	481852	1349383	2.7'	0.20	0'-1.0'	0.07	0'-1.0'	TAL A
SP4-9-1-R	481855	1349420	3.4'	0.01	0'-1.0'	0.09	0'-1.0'	TAL A
SP4-9-1-L	481855	1349420	3.4'	0.01	0'-1.0'	0.09	0'-1.0'	TAL C
SP4-9-1-P	481855	1349420	3.4'	0.01	0'-1.0'	0.09	0'-1.0'	TAL E
SP4-9-1-TL	481855	1349420	3.4'	0.01	0'-1.0'	0.09	0'-1.0'	TAL F
SP4-9-1-TS	481855	1349420	3.4'	0.01	0'-1.0'	0.09	0'-1.0'	TAL G
SP4-9-1-TM	481855	1349420	3.4'	0.01	0'-1.0'	0.09	0'-1.0'	TAL H
SP4-9-1-AB	481855	1349420	3.4'	0.01	0'-1.0'	0.09	0'-1.0'	AB Screen
SP4-10-10-R	481832	1349427	10.4'	0.92	9.0'-10.0'	0.33	3.0'-4.0'	TAL A

[1] The sample depth in feet is calculated for the boring located at the coordinates given in this table. If the boring is moved greater than 3 feet due to accessibility or refusal, a new depth in feet will be calculated based on the same random percentage and the height of the pile at the new location.

[2] The alternate relative fraction for sample depth is used only if the sample cannot be collected at the primary relative depth fraction due to poor sample recovery.

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