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2-402.26

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MAY 04 1998
DOE-0714-98

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U.S. Environmental Protection Agency
Region V-SRF-5J
77 West Jackson Boulevard
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Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
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Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF FINAL PROJECT SPECIFIC PLAN FOR SAMPLING OF SOIL PILE 5 FOR ON-SITE DISPOSAL FACILITY WASTE ACCEPTANCE CRITERIA ATTAINMENT (REVISION 0)

The purpose of this letter is to formally transmit the final Project Specific Plan (PSP) for determining compliance with the On-Site Disposal Facility (OSDF) Waste Acceptance Criteria (WAC) for Soil Pile Number 5 (SP-5), which was formerly known as the Third Street Dirt Pile. This WAC attainment PSP has been developed to prepare for excavation and placement of the SP-5 soil into the OSDF. This PSP was informally forwarded to you on April 2, 1998, for your review and approval following your initial comments. The Department of Energy (DOE) received your approval during the April 8, 1998, Soils Remediation Meeting at the Fernald Environmental Management Project (FEMP). The enclosed plan includes revisions in response to Ohio Environmental Protection Agency (OEPA) verbal comments received during a teleconference on March 31, 1998.

The OEPA comments and/or PSP modifications are summarized as follows:

1) A new Appendix F was added to include two figures illustrating the historical sample locations included in the Appendix E data summary.

2) The reference to the draft Standard Evaluation Procedures (SEP) in Section 1.3.1 regarding the screening for the 18 WAC Contaminant of Concerns (COC) for applicability to SP-5 was removed. However, the additional Site Environmental Database (SED) data tables (e.g., excavated soils) excluded during the

screening process for the SEP development have been reviewed for the 18 WAC COCs. This review confirmed no above-WAC detections for the 13 COCs as stated in the draft SEP.

3) The field radiological screening (using a beta/gamma survey meter) process discussed in Section 2.4.3 was expanded to include both random and biased sampling locations. At all sample locations, soil cores will be collected to the base of the pile for radiological screening purposes with physical sample collection performed for soil exhibiting >100 corrected counts/minute.

4) The "Teflon-Lined Closure" (TLC) in Table 2-1 was defined.

5) Section 3.1.2 was modified to address the coverage of the real-time radiological measurements. Due to the schedule for SP-5, a determination on the aerial coverage for the Radiation Tracking System (RTRAK) and High Purity Germanium (HPGe) cannot be obtained prior to field implementation for this PSP.

6) In order to reduce the laboratory sample counting time for the uranium analysis, Department of Energy, Fernald Environmental Management Project (DOE-FEMP) proposes to raise the detection limit to approximately 100 mg/kg for total uranium which is less than 10% of the 1,030 mg/kg WAC limit. Although the same laboratory Quality Assurance/Quality Control (QA/QC) samples will be analyzed as applies to Analytical Support Level (ASL) B, the total uranium ASL will be E due to the higher detection limit. The technetium-99 will be analyzed at ASL B. The FEMP laboratory will perform all radiological analyses. Table 2-1 in the PSP has been revised with this information. The Data Quality Objective (DQO) SL-048 will be revised to reflect the ASL E analyses for total uranium.

FEMP representatives began sampling and analysis activities the week of April 20, 1998. Upon completion of the sampling and analyses, the results will be tabulated into a short report and submitted to the U. S. Environmental Protection Agency (U.S. EPA) and OEPA for review and approval. The results report will include an evaluation and conclusions section indicating the ultimate destination/disposition of the soils and materials. Provided the results indicate OSDF WAC compliance, it is anticipated the soils and materials will be transported to the OSDF during the upcoming construction season.

If you should have any questions or comments, please contact Robert Janke at (513) 648-3124.

Sincerely,

Johnny Reising

FEMP:Nickel

Johnny W. Reising
Fernald Remedial Action
Project Manager

Enclosure: As Stated

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INFORMATION ONLY

PROJECT SPECIFIC PLAN FOR SAMPLING OF SOIL PILE 5 (SP-5) FOR OSDF WAC ATTAINMENT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

APRIL 1998

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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FINAL

PROJECT SPECIFIC PLAN FOR SAMPLING OF SOIL PILE 5 (SP-5) FOR OSDF WAC ATTAINMENT

Project Number: 50.03.52.03

Date: April 2, 1998

Prepared by: Fluor Daniel Fernald

Prepared for: U.S. Department of Energy
Fernald Field Office

Under Contract DE-AC05-92OR21972

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22000-PSP-0001
REV. 0
FINAL

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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 Soil Pile 5 (SP-5) as required by the draft Sitewide Excavation Plan (SEP) (DOE 1997c). The existing body of data and process knowledge associated with SP-5 serve as the foundation from which the sampling strategy presented in this PSP has been developed. The existing data set includes a combination of Removal Action 17 (RvA17) data, removal site evaluation data, RI/FS data, and process knowledge concerning RvA17 protocols which governed placement of soils into SP-5.

The sampling strategy presented in this PSP includes random physical sampling at various points throughout the pile as well as real-time gamma measurements over the surface of the stockpile. Biased sampling of the pile will also be performed on a limited basis to investigate an elevated total uranium sample (941 mg/kg) collected during a previous sampling event. A second phase of physical sampling is also included in the PSP as a contingency if sample results indicate the presence of soil above the WAC for a constituent of concern (COC). In addition, a secondary objective of this PSP is to assess the amount, physical characteristics, and type of debris staged at the east end of the stockpile and to qualitatively assess the amount of debris imbedded in the stockpiled soils. This information will assist in the planning of excavation activities for the stockpile.

The area currently occupied by SP-5 has been identified as a preferable storage location for the approximately 3,000 yd^3 of above WAC material that will be excavated from the Southern Waste Units beginning on July 1, 1998. The SP-5 site is preferable for the following reasons:

- The area has adequate surface water run-off controls currently in place
- The area is immediately adjacent to the haul road and in close proximity to the planned Operable Unit 1 load out area where above WAC material will be processed for off-site disposal

Development of this PSP and its scheduled implementation for the Spring of 1998 is necessary to support the excavation and placement of the SP-5 soils in the OSDF ahead of the start of excavation activities in the Southern Waste Units.

This PSP fulfills the draft SEP and the draft final WAC Attainment Plan for the OSDF (WACAP) (DOE 1998c) requirements for development of pre-design investigation plans and for documenting the justification for selection of stockpile-specific WAC COCs. The data generated under this PSP will be used in conjunction with the existing data set to: 1) demonstrate SP-5 soils do not exceed the WAC and may be bulk excavated and placed in the OSDF or, 2) develop an excavation approach to segregate potential above-WAC materials.

1.2 BACKGROUND

Soil stockpile SP-5 was established in the late 1980s to provide a construction staging area for soils and rubble containing less than 150 ppm total uranium, which was controlled under the FEMP operating procedures FMPC-2716, *Construction Waste Identification and Disposition* (effective Dec. 1986) and

FMPC-720, *Control of Construction Waste* (effective Nov. 1988). These procedures minimized the potential for highly contaminated materials to be deposited in SP-5 by establishing the following contamination limits for soil and debris to be placed on the stockpile: Category 1 material $\leq$30 pCi/g total uranium (approx. 50 ppm) was considered noncontaminated; and Category 2 material $\geq$30 to < 100 pCi/g total uranium (approx. 150 ppm) was considered contaminated. The soil and debris material placed in the piles is considered "radiologically contaminated" and "non-hazardous." Material exceeding Category 2 limits was packaged for off-site disposal as low-level radioactive waste (LLRW).

FEMP records indicate that the stockpile primarily received soil and construction debris from the following projects during construction: Laboratory Building upgrade, Rotary Kiln, Drum Reconditioning Building, Tank Farm, Derby Slag Area, Plant 1 Pad extension, and Plants 4, 6, and 8 warehouse construction. Soil with rubble was also generated from activities associated with the maintenance of various utilities. The last addition of soil to the pile occurred in 1993 under RvA17 protocols.

A Removal Site Evaluation (RSE) was completed for SP-5 in June of 1990 and led to the issuance of an Action Memorandum by DOE requiring a Removal Action (RvA-17) be implemented to mitigate potential releases of contaminated soil from the pile. The removal action entailed the removal of exposed rubble followed by establishment of a vegetative cover over the pile. Since March 1992, the FEMP stockpiles have been managed under the approved RvA17 work plan. Soil that is regulated as a hazardous waste by the Resource Conservation and Recovery Act (RCRA), contains mixed waste, contains polychlorinated biphenyls (PCBs), or contains high levels of radiological contaminants were specifically prohibited from the stockpiles. In September 1995, the RvA17 work plan was updated to ensure field implementable actions in accordance with remedial decisions documented in the FEMP Records of Decision (RODs). The material dispositioned to all stockpiles is strictly controlled under the current FEMP Site Procedure EW-1019; *Management of At- and below Grade Impacted Material.*

As a result of the regrading and segregation of construction debris which occurred under RvA-17, SP-5 currently consists of two distinct areas, referred to in this PSP as Area 1 and Area 2. Area 1 consists of soil and soil-like material with aggregates no larger than 12 inches in diameter which is classified as OSDF Category 1 material. This area accounts for approximately 85 to 90 percent of the volume of material staged in SP-5 and is the focus of the physical sampling and analysis for WAC attainment defined in this PSP. There are no plans to add any additional soil to this portion of the stockpile.

Area 2 is located at the east end of the stockpile and consists of construction debris primarily comprised of concrete rubble. This construction debris is classified as an OSDF Category 2 Impacted Material. No physical sampling will take place in Area 2. However, a visual assessment of the amount, physical characteristics, and type of debris will be conducted as part of this PSP to support the excavation approach and planning. This area of the pile remains active and will continue to receive construction debris if necessary in accordance with conditions specified in RvA17.

The current sample data set for SP-5 is comprised of total uranium data from an RSE sampling event in 1990, and characterization data (including an extensive list of radionuclides, organic compounds, and metals) from a 1993 sampling event under RvA17 and OU3 RI/FS sampling performed in 1994. Two of these sampling efforts included a random sampling approach using both horizontal and vertical dimensions for sample location selection while the RI/FS sampling included only surface samples (four). Results of the previous sampling events are discussed in Section 1.3.1.

1.3 DETERMINATION OF WAC CONSTITUENTS OF CONCERN (COCS)

Consistent with the provisions for defining stockpile-specific WAC COCs found in the SEP and the WACAP, existing analytical data and historical process knowledge have been used to define the WAC

COCs for SP-5. The process utilized to develop the stockpile-specific COC list presented in Section 1.3.1 has been developed after considering the existing data set and what is known about the origin of soils comprising SP-5.

1.3.1 Selection of WAC COCs for SP-5

The first step in the selection of stockpile-specific COCs for SP-5 was to evaluate the 18 soil contaminants for which a concentration-based WAC has been established (Table 3-1 of draft WACAP) for applicability to the SP-5 soils. To accomplish this evaluation, analytical data from the SP-5 stockpile, as well as the entire former production area, was compiled on the WAC COCs using the Sitewide Environmental Database (SED) and historical paper files. All of the SED data components, including live tables (containing data associated with both excavated and in-place soil) and frozen data subsets, were included in the SED data queries used to evaluate SP-5. The FEMP historical records file on SP-5 (Material Evaluation Form file) contains analytical data that does not reside in the SED. However, this data was extensively reviewed and utilized for the WAC COC selection process for SP-5 soils and is included in the Appendix E data summary. This hard copy data will be input to the SED in the near future. All of the existing analytical data collected from the SP-5 stockpile for the 18 COCs is presented in Table E-1 of Appendix E. The sample locations for the existing analytical data are presented in Appendix F.

The WAC COC screening process entailed the review of analytical data for the 18 COCs from the former production area soil data (Areas 3, 4A, 4B, and 5) using all SED source tables. Of the 18 WAC COCs , only five (total uranium, technetium-99, 4-nitroaniline, bis(2-chloroisopropyl)ether, and trichloroethene) have either been detected in FEMP soils at concentrations above WAC or have analytical detection limits above the WAC. All of the detections of the other 13 WAC constituents are significantly below the WAC limit. Therefore, the five constituents identified above were retained for further consideration as discussed below.

The second step in the COC selection process was to further evaluate the five COCs using both analytical data collected from the SP-5 stockpile as well as historical data from the entire former production area. Since the origin of soils comprising SP-5 has been identified as various construction activities within the former production area, the locations or origins of soil samples above the WAC limit were evaluated for the potential for the associated soils to have been deposited onto SP-5.

Total uranium is retained as a WAC COC for SP-5 based on the pervasive uranium contamination in the soils associated with the former production area including above WAC detections. In addition, the historical data set for the SP-5 soil contains a total uranium detection of 941 ppm which approaches the WAC limit. The existing total uranium data set for SP-5 includes 73 samples with a mean concentration for total uranium of 68.9 ppm; the range is a minimum value < 11 ppm and a maximum value of 941 ppm.

Technetium-99 is retained as a WAC COC for SP-5 based on the location of three potential areas of localized Tc-99 contamination identified within the former production area and the sensitivity associated with the final remediation level (FRL) being equal to the WAC for Tc-99.

Of the five constituents listed above, the three organic compounds (trichloroethene, 4-nitroaniline, and bis(2-chloroisopropyl)ether) were either used on a localized basis (trichloroethene) or have no history of use during site operations (4-nitroaniline and bis(2-chloroisopropyl)ether). The single detection for 4-nitroaniline and trichloroethene, 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 these 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-5 using the EPA Contract Laboratory Program (CLP) Contract Required Detection Limits (CRDLs) of 830 ppb and 330 ppb, 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. However, since the number of detections (all of which were estimated values) reported for 4-nitroaniline and bis(2-chloroisopropyl)ether comprise less than 1 percent of the total number of samples analyzed to date, the number of samples collected under this PSP will be limited.

Trichloroethene has not been retained as a WAC COC for SP-5 due to its very limited presence in FEMP soils and process knowledge/records on the origin of the majority of SP-5 soils. The RI/FS data set for trichloroethene, which has a WAC limit of 128 ppm for soil, consists of a single detection (estimated value of 150 ppm) above the WAC out of a total of 1,086 samples collected sitewide. This single sample was collected from a soil boring located north of the Maintenance Building. No known excavations in this immediate area have occurred which would result in the generation of construction soil which would have been deposited in SP-5.

Based on the information provided above, the following four WAC COCs are selected for this sampling effort:

- Total uranium
- Technetium-99
- bis(2-chloroisopropyl)ether
- 4-nitroaniline

A summary of the historical data set for the selected SP-5 WAC COCs is provided in Table 1-1 below.

TABLE 1-1
Summary of Selected WAC COC Historical Data for SP-5

WAC COC	Historical Data Set (No. of Samples)	Mean Concentration	OSDF WAC
Total Uranium	73[a]	68.9 ppm	1,030 ppm
Technetium-99	362[b]	4.6 pCi/g	29.1 pCi/g
4-nitroaniline	433[b]	< 1.73 ppm[c]	0.044 ppm
bis(2-chloroisopropyl)ether	394[b]	< 0.45 ppm[c]	0.024 ppm

[a] Sample set from previous SP-5 stockpile sampling.
[b] Sample set from Areas 3, 4 and 5 (former production area).
[c] This mean concentration represents the laboratory practical quantitation limit (PQL) ; all results were nondetect except for three samples estimated at low concentrations, well below the PQL.

1.3.2 RCRA Characteristic Waste Determination

Stockpile SP-5 was previously concluded to be non-hazardous under RCRA and therefore no RCRA COCs apply to this investigation. The USEPA and OEPA approved this finding in letters issued January 14 and January 11, 1994, respectively which are included in Appendix D. The 1993 sampling event performed for RvA 17 purposes supported this conclusion through the collection and analysis of approximately 43 samples to assess the RCRA toxicity characteristic of the soil (based on leachability). Additionally, this sampling confirmed that the concentration of other organics and metals which have WAC were also well below the WAC limit (which are based on total concentrations).

1.4 SCOPE

This PSP presents a strategy for collecting supplemental WAC attainment data from soil stockpile SP-5 utilizing a systematic/random approach for selecting sample locations as well as a biased approach in one localized area of the pile. Additionally, field radiological screening will be used on all soil cores/cuttings to select samples that exhibit beta/gamma field readings (see Section 2.4.3). The number of samples planned for collection in this PSP (minimum of 54 samples for total uranium and technetium-99) is based on previous project-specific sampling data from SP-5, RI/FS sampling density in the former production area, and recent stockpile sampling projects. This PSP also includes a contingency for additional sampling if analytical data indicates a WAC exceedance for any of the four WAC COCs. If additional sampling is necessary, a variance form will be completed to define the additional sampling that is required to determine the specific above-WAC area of the pile.

The PSP does not address chemical or radiological characterization of debris within the soil pile. If debris is encountered during soil sample collection it will be excluded from the sample to the extent practical. The sampling efforts will focus on the soil component of the pile, referred to as Area 1 in Figure 2-2.

A preliminary assessment of the construction debris, primarily concrete, staged on the east end of SP-5 will be performed. This area is illustrated in Figure 2-2 as Area 2. The debris will be visually inspected for an estimated volume, type of debris, and individual debris size to support the excavation planning.

Real-time radiological data measurements will be performed over the surface of the SP-5 stockpile to supplement and augment the physical sample results in accordance with the provision in the SEP and WACAP. Prior to physical sampling, the surface of the pile will be monitored to determine patterns of radiological (gamma) activity using a mobile sodium iodide (NaI) detector (RTRAK) or High Purity Germanium (HPGe) detector to determine if the potential for a WAC exceedance exists on the pile's surface. The surface RTRAK/NaI scan will only be performed if the mobile equipment can gain access to the top (generally flat) and/or the sloped sides of the pile safely. In areas where the RTRAK cannot access, HPGe measurements will be employed to the extent practical to attempt to cover the entire Area 1 portion of the pile with real-time measurements. The real-time program is discussed in Section 3.0.

Physical sample collection will be accomplished utilizing Geoprobe® core sampling and manual sampling methods. The samples will be analyzed for total uranium via gamma spectroscopy method and technetium-99 by the gas-proportional counting method at an analytical support level (ASL) E and B, respectively by the FEMP onsite laboratory. The two semivolatile compounds will be analyzed at an offsite laboratory at ASL B. Selected samples will be split with the Ohio Environmental Protection Agency (OEPA) to support the agencies oversight role at the FEMP. All sampling and analysis activities performed by DOE shall be consistent with the requirements of the Sitewide CERCLA Quality Assurance Project Plan (SCQ). The sampling strategy is described in detail beginning in Section 2.2.

1.4.1 Key Project Personnel

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

TABLE 1-2
Key Project Personnel

TITLE	PRIMARY	ALTERNATE
Project Lead	Mark Cherry	Mike Frank
Field Sampling Lead	Mike Frank	Tom Buhrlage
Real-Time Lead	Joan White	Dale Seiller
Quality Assurance Contact	Reinhard Friske	Harold Swiger
Data Management Contact	Susan Marsh	Kym Lockard
Analytical Lead	Bill Westerman	Grace Ruesink
Surveying Lead	Jim Schwing	John Deho/Dean Shanklin
Waste Management	Sue Lorenz	Ken Belgrave
Waste Acceptance Organization	Marc Jewett	Sue Lorenz
Health and Safety	Kevin Tschaenn	Lew Wiedeman

2.0 SAMPLING PROGRAM

2.1 STOCKPILE DESCRIPTION

The SP5 stockpile is located north of Third Street and the Plant 1 Pad within the former production area and consists of approximately 18,700 cubic yards of soil. Concrete and miscellaneous debris is staged on the east end of the pile covering an approximate 45 ft. X 175 ft. area.

Information describing the approximate physical dimensions of the stockpile are provided in Figure 2-1 and summarized below.

- Approximate state planar coordinates for the base of the SP-5 stockpile are as follows:

  Northwest corner: North 482045; East 1348445
  Northeast corner: North 482044; East 1348761
  Southwest corner: North 481851; East 1348479
  Southeast corner: North 481869; East 1348781

  Note: Pile is irregularly shaped; coordinates above may not bound the entire pile contents.

- Height measurements: East end on Centerline -13 ft..
  West end on Centerline - 15.5 ft.

- Volume: Approximately 18,700 yd^3

The stockpile is roughly rectangular in shape with all sides moderately sloped. In addition, these faces support a vegetative cover. The southern face is graded to a slope that will permit access with a vehicle for sampling purposes.

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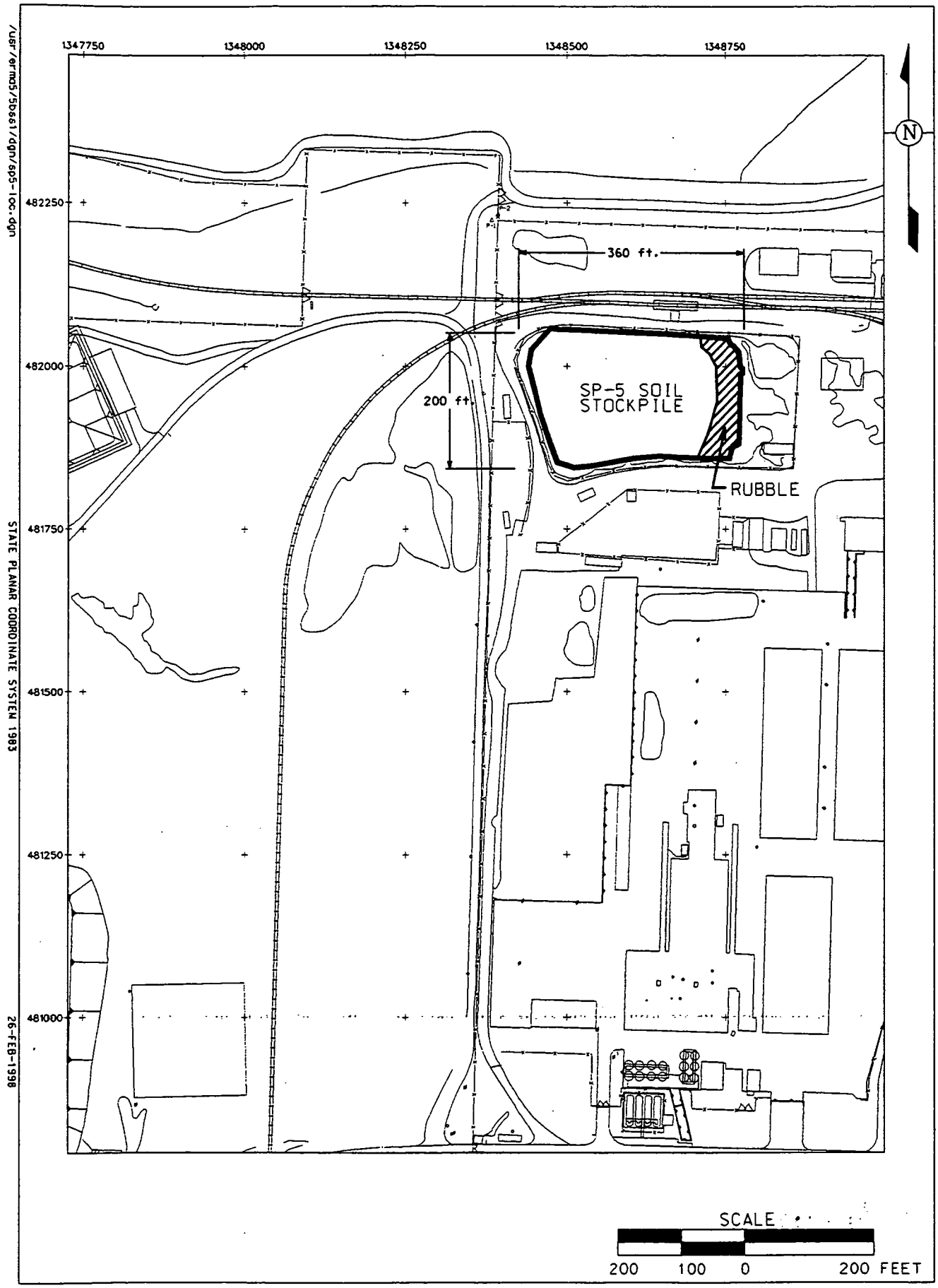

FIGURE 2-1. SP-5 STOCKPILE LOCATION

2.2 DETERMINATION OF NUMBER OF SAMPLES

In accordance with the draft SEP and draft WACAP for the OSDF, the number of samples determined to adequately characterize the SP-5 stockpile is collectively based on the current data set, the 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, a minimum of 54 samples will be collected from SP-5 with additional samples collected in a biased sampling area, or from the random boring locations, based on field beta/gamma readings if necessary (see Section 2.3). If real-time radiological (gamma) instruments (NaI and HPGe) detect total uranium at a level above 721 ppm or 947 ppm, respectively, during the soil pile surface scan, then a physical sample(s) will be collected as described in Section 3.1.4.

All 54 samples (minimum) will be analyzed for total uranium and technetium-99. Twelve of the 54 samples are designated for analysis of the two semivolatile COCs, 4-nitroaniline and bis(2-chloroisopropyl)ether, since the possibility of detection is remote.

The SEP requires that the sample number determination be based on the average RI/FS sampling density in the vicinity of the soil stockpile of interest. The RI/FS density for the SP-5 area is one sample per 10,909 ft^2. The minimum 54 samples designated for SP-5 under this PSP translates to one sample per 1,341 $ft.^2$ for total uranium; the combined sample sets (previous data and planned) represents one sample per 593 $ft.^2$.

2.3 SELECTION OF SAMPLE LOCATIONS

Sample locations and depths are based on both a combination systematic grid/random approach for the majority of the SP-5 stockpile area in addition to biased sampling both at the random boring locations and in one localized area. This localized area has a previous total uranium result with a concentration well above the remainder of the 73 samples from the historical data set. The total number of samples to be collected through this integrated sampling strategy is a minimum of 54, with other samples potentially being collected from the soil cores, depending on field beta/gamma readings using a Geiger-Mueller detector. A contingency is also described in Section 3.1.4 for the collection of surface soil samples based on NaI and HPGe detector system scanning results.

2.3.1 Systematic Grid/Random Locations

A systematic approach was used to establish a sample grid over the stockpile surface. The grid pattern consists of 3 blocks x 6 blocks for a total of 18 grid blocks of approximately equal size. A random sample location (northing and easting coordinate) was selected within each block as shown on Figure 2-2. At each of the 18 randomly selected sampling locations, three depth intervals were randomly selected for sampling (3 x 18 = 54 samples). Alternate random depths were also selected in case of refusal at some boring locations. The random sample depth intervals are presented in Table B.1 of Appendix B and are expressed as a fraction of the total pile depth at each sample location. All borings will be advanced to the base of the pile for the purposes or field radiological screening. Biased samples may also be collected from these boring locations based on direct field beta/gamma readings of the soil cores as described in Section 2.4.3.

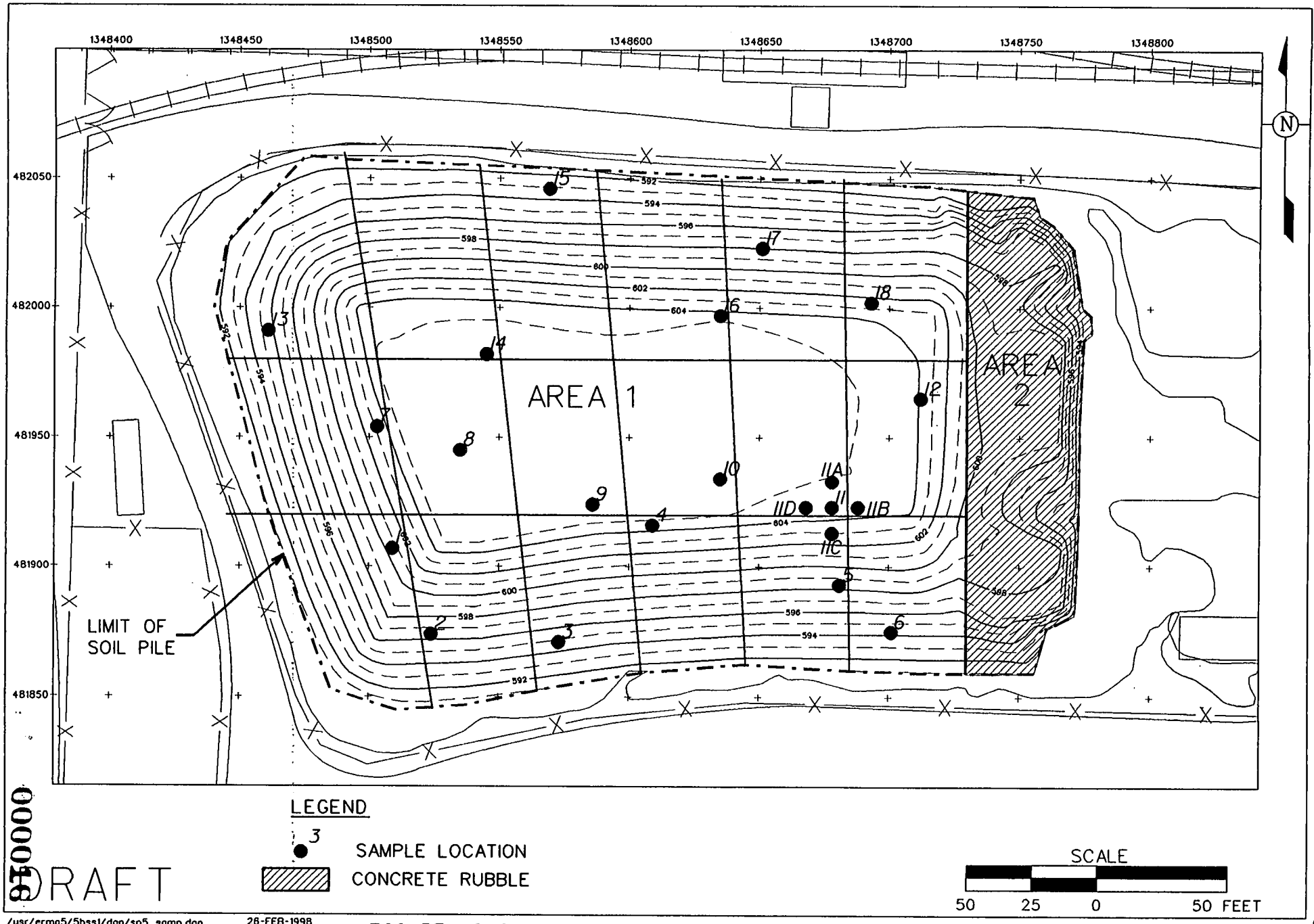

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FIGURE 2-2. SOIL STOCKPILE 5 SAMPLING LOCATIONS

Due to the stockpile's terrain, the final sample location may be positioned within a four-foot radius of the sample locations included in Table B.1. The final locations will be re-surveyed to document the final coordinates.

2.3.2 Biased Sample Locations

One total uranium sample from a 1990 sampling event indicated a concentration of 941 ppm whereas the remaining 73 samples in the complete data set range from 11 to 297 ppm for total uranium. The general location of this sample point will be investigated to further assess the total uranium levels. The original sample point was 12 feet below the pile's surface.

Five borings, identified as points 11 through 11D in Figure 2-2, will be placed in the vicinity of the previous sample point. Four borings will be placed around the point on a 10-foot center. One boring will be completed directly over the previous elevated point. The soil from these borings, which will penetrate the full depth of the pile if possible, will be scanned with a beta/gamma survey meter. Depth intervals yielding the highest corrected counts/minute (ccpm) readings will be analyzed for total uranium for WAC attainment. The sample selection method is further detailed in Section 2.4.

2.4 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 (primarily on the top of the stockpile). Hand augering or direct-push liner sampling will be conducted in all other areas (e.g., side slopes of pile). 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.

All soil samples should be collected from a discrete 12-inch depth interval and recorded as such on the field documentation. The random depth intervals presented in Table B-1 of Appendix B represent the top of the six-inch sample interval for total uranium and technetium-99. The next six-inch interval should be used for the semivolatile sample where specified in Table B-1. The depths in Table B-1 are expressed as a fraction of the total pile depth at each location. The planned depth intervals (in terms of feet) will be determined prior to implementation of field sampling using the total pile depth at each boring location based on a land survey.

All borings will be completed to the base of the pile for field radiological screening purposes and possible collection of biased samples (see Section 2.4.3). If refusal or resistance is encountered during the soil borings, up to two additional borings within a one-foot radius of the original point should be attempted in order to collect the specified samples. As a secondary objective of the PSP, all encounters with subsurface debris should be noted in the field log in order to characterize the pile for debris content.

2.4.1 Geoprobe® Methods

A Geoprobe® Macro-core sampler will be advanced in approximately 12-42 inch increments to collect the target depth intervals for the soil samples specified in Appendix B. The Macro-core collects a 1.5-inch diameter soil core. Multiple cores may be collected at each sampling location (not to exceed

one 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 an expendable plastic liner insert in which the soil core is recovered.

2.4.2 Manual Sampling Methods

If Geoprobe® accessibility is not possible (e.g., side slopes), soil samples will be collected using a hand auger (typically 3-inch diameter) in accordance with SMPL-01, *Solids Sampling*. The hand auger will be advanced in approximately six-inch increments down to the target depth intervals for the soil samples specified in Appendix B. As with core sampling, multiple holes at one sampling location (not to exceed one foot apart) may have to be augered to obtain sufficient volume for laboratory analyses, particularly for split sampling intervals. 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 (six-inch length) may be used to collect the sample from the 0-6 inch interval. Surface samples may be required as a result of real-time radiological surveys as discussed in Section 3.0.

2.4.3 Biased Sample Selection at Boring Locations

At the five biased soil boring locations (points 11 through 11D), sample selection will be based solely on the beta/gamma survey meter readings of the soil core or soil cuttings. Also, the random boring locations will be radiologically screeened using the same process with possible collection of additional high-biased samples. Each boring will be completed to the base of the soil pile (original grade) unless refusal due to debris is encountered on repeated attempts. Soil borings will be completed using the Geoprobe Macro-core where possible; otherwise manual augering will be attempted. If refusal is encountered during advancement of the boring, two additional attempts should be made within one foot of the original biased boring location. All biased samples that are collected will be analyzed for total uranium.

The soil core, or cuttings in the case of augering, will be surveyed to determine the highest beta/gamma reading of the entire boring. The beta/gamma survey must be done in a low-background area (e.g., vehicle or building) to be an effective method of sample selection. Additionally, any concrete and debris will be removed from the samples to the extent practical prior to screening. The highest beta/gamma (minimum of $\geq$100 ccpm) soil interval will be sampled by selecting a six-inch to 12-inch interval encompassing the highest reading area (the minimum interval to collect sufficient mass for analysis). If the entire soil interval is found to be $<$100 ccpm then no high-biased sample will be collected. The Field Sampling Lead may designate soil intervals for archival in the case of several elevated readings.

2.4.4 Soil Sample Processing and Analysis

The Geoprobe® soil core(s) will be laid on clean plastic and the appropriate sample increments, as defined in Appendix B, will be separated from the core to obtain the necessary samples. Any debris (i.e., wood, concrete, metal) contained in a sample interval will excluded from the sample in the field. If one core provides the volume of soil necessary for the laboratory analysis (including split samples),

the sample will be placed directly into a sample container(s) and sealed. For manual sampling locations, the soil cuttings collected from the target sample interval will be placed in a clean tray prior to transfer to the sample container. Sample volume and analysis information is summarized in Table 2-1.

If the sample is selected to be split with the OEPA, then the soil core(s) or cuttings will be homogenized (except for semivolatile analytes) and split according to Section 6.6 of SMPL-21, *Collection of Field Quality Control Samples*, one portion for DOE analysis, the other for OEPA analysis.

Table 2-1
Sampling and Analytical Requirements

Analyte	Sample Matrix	Sample Type	Preser-vative	Lab	ASL	Holding Time	Container
Total Uranium[a] & Tc-99[b] (TAL A)	Solid	Grab	None	On-site	E[c] B (Tc-99)	6 Months	500 mL glass or plastic container
Total Uranium (TALB)	Solid	Grab	None	On-site	E[c]	6 Months	500 mL glass or plastic container
SVOCs (TAL C)	Solid	Grab	Cool, 4C	Off-site	B	14 days	250 mL glass w/ teflon lid
Alpha/Beta Screen (only when SVOC are collected)*	Solid	Grab	None	On-site	B	6 months	120 mL plastic (50 grams)

[a]Gamma Spectroscopy
[b]Gas Proportional Method
[c] ASL E due to higher detection limit (approx. 100 mg/kg); same lab QA/QC as ASL B applies to the ASL E.
Note: *Additional sample volume will be required at select locations to provide split samples for the OEPA. Screening samples (120 mL container w/ 50 grams) for alpha/beta screening will be required for each OEPA sample interval collected.

2.5 SAMPLE IDENTIFICATION

All physical soil samples collected for laboratory analysis will be assigned a unique sample identifier (customer number), as listed in Appendix B. The field team will record the sample identifiers used by the EPA and correlate them to the split sample submitted to the offsite laboratory. Fernald Analytical Customer Tracking System (FACTS) identification numbers will be utilized by the laboratory to track

the sample through the analytical and data review process. All FEMP soil samples collected for laboratory analysis will be assigned a unique sample identifier, as follows:

SP5-x-y-R (or S)

Where:

SP5 = Sample collected from the SP-5 Soil Stockpile

x = Location number (grid block) of boring in the stockpile (e.g., 1, 2, 3, etc.)(see Figure 2-2)

y = Depth of sample collected. A "1" represents the first random interval, "2" represents the second interval, and so on.

R = Radiological Analyte(s); "AB" will be used for any alpha/beta screening samples collected.

S = Semivolatile Analytes

Therefore, sample identification number SP5-12-3-R is from boring location 12 on the SP-5 soil pile, collected at the third random depth interval and will be analyzed for radiological constituents.

If a sample is collected as a result of an HPGe or RTRAK detection (see Section 3.1.4), then the following identifier will be used: *SP5-xUz-R* where *x* = the grid block and *z* = the number of samples collected in the grid based on the HPGe detection (i.e., 1 for first, 2 for second, etc.).

All sample identification numbers for planned samples are shown in Appendix B, Table B-1.

2.6 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 a 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.

2.7 SAMPLE HANDLING AND SHIPPING

Samples will be processed in accordance with SMPL-01, *Solids Sampling*, for ensuring that samples are documented properly and custody and sample integrity are maintained. All samples will be transported from the field to the sample processing laboratory within the on-site laboratory.

3.0 REAL-TIME RADIOLOGICAL SCANNING/MEASUREMENTS

3.1 REAL-TIME METHODS & SUMMARY

The real-time total uranium WAC investigation of exposed SP-5 surface soil (Area 1 in Figure 2-2) will be performed using the mobile NaI detector, referred to as the Radiation Tracking System (RTRAK) and the HPGe portable detectors to cover as much of the stockpile's surface as practical. The accessible portion of the pile, for either RTRAK or HPGe, could not be determined prior to the development of this PSP due to schedule constraints. The final aerial coverage will be documented and reported upon completion of the real-time measurement program.

3.1.1 RTRAK Scanning Coverage

Real-time NaI detector system coverage using the RTRAK will be limited to the safely accessible surfaces and will be as extensive as possible without jeopardizing worker safety. The accessible areas are considered to be the top planar surface, the southern side slope, and possibly the western side slope. 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 data will be collected at a speed of 1.0 mile per hour. The onboard Global Positioning System (GPS) will be used to obtain positioning information with each detector measurement. The RTRAK scan data will be reviewed to determine if any single measurement event exceeds 721 ppm total uranium, the minimum trigger level established for WAC. Real-time based physical sampling will only be performed if any exceedances of 721 ppm are detected as discussed in Section 3.1.4.

A minimum of two Troxler® soil moisture reading will be collected in the area covered by the RTRAK. If a moisture reading cannot be taken a physical core sample will be collected. The moisture core samples will follow the same sample identification system as outlined in Section 3.1.3.

3.1.2 HPGe Detector Measurements

The HPGe portable detector systems will be used to obtain gamma measurements in those areas that can be accessed safely with these detector systems where the RTRAK scan was not possible (e.g., steep side slopes). The objective of the HPGe measurements is to cover the remaining areas of the pile omitted by the RTRAK in order to cover the entire Area 1 (See Figure 2-2) of the pile as possible using real-time methods.

HPGe detector system acquisition time will be set to 300 seconds (5 minutes). The detector height will be set at one meter above ground surface. All HPGe measurement locations will be surveyed and marked. Each HPGe measurement will be identified as specified in Section 3.1.3. One Troxler® soil moisture reading will be collected in each grid block covered by the HPGe measurements where necessary. If a moisture reading cannot be taken a physical core sample will be collected. The moisture core samples will follow the same sample identification system as outlined in Section 3.1.3.

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 using the same height and count time.

The HPGe data will be reviewed to determine if a total uranium level of 947 ppm, the established trigger level for HPGE WAC measurements, was detected at any measurement point. If this trigger is exceeded, a surface soil sample will be collected as discussed in Section 3.1.4.

3.1.3 HPGe Measurement Identification

The HPGe measurement numbering form will be comprised of a prefix designating the area name (SP-5), followed by letters designating the purpose ("WAC"), followed by a grid block number (1 through x), followed by the sample number within in 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:

> *SP5WAC-2-1-G-D* is the first gamma reading taken in the second grid block identified in Figure 2-2 and is a duplicate measurement.

3.1.4 Sample Collection Based on RTRAK and HPGe Measurements

If RTRAK (NaI) or HPGe measurements identify an area of surface soil above one of the trigger levels discussed previously, 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 readings using a portable survey meter/probe. If the trigger level for total uranium is not detected with the RTRAK or HPGe, then no physical samples will be collected. Refer to Section 2.5 for sample identification information.

3.1.5 Background Radon Monitoring

An HPGe or a NaI detector will be used as a continuous background radon monitor for each day the RTRAK or HPGe systems are used. The background radon monitor will collect background data before the start of daily activities, will continue counting during field team breaks, and will conclude after the last RTRAK or HPGe reading is collected. The monitor will be located on top of or at the base of the soil pile, set up at one meter height and will be programmed to produce a single result for every 15 minute count.

4.0 PRELIMINARY ASSESSMENT OF CONSTRUCTION DEBRIS

The construction debris staged at the east end of the SP-5 stockpile and within the pile consists primarily of concrete construction debris mixed with a very small volume of piping, wood and other debris. Section 2.5 of the WACAP requires debris meet certain physical criteria such as size, shape, debris type, and other characteristics for acceptance into the OSDF. A preliminary, in-place assessment of the surface construction debris will be performed under this PSP including the information detailed below. The final inspection of all debris for OSDF acceptance will be performed during or following actual excavation of the stockpiled soils and debris.

The following information will be recorded in a field log as a preliminary assessment of the surface debris:

1) The dimensions of the debris staging area including the approximate depth at various points and volume.
2) The type of debris (concrete, wood, piping, etc.) and approximate volume of each.

3) The range of debris size (thickness and length).
4) The presence, if any, and detailed description of any process-type materials visually observed on the debris. If found, radiological readings (gross beta/gamma) should also be taken and recorded.

For subsurface debris encountered during probing or augering, record the depth of the debris below the pile's surface, the type of debris if it can be determined by equipment resistance or sound (e.g., during probing with Geoprobe), and a description of the material if present in any core samples.

5.0 LABORATORY SAMPLE PREPARATION

Physical samples collected for laboratory analysis will be prepared in a consistent manner. Semivolatile samples will be prepared and analyzed in accordance with CLP and contract requirements by an offsite laboratory. For the total uranium and technetium-99 analysis, the FEMP onsite laboratory will, at a minimum, meet the following guidelines for sample preparation:

1) All sample material (including any organic matter) will be removed from the sample container, weighed, and recorded. The analyst performing this step will describe the appearance of the sample.
2) All sample material will be dried at 105° to 112° C for a minimum of 8 hours to constant weight.
3) The percent moisture content of the sample will be calculated and recorded.
4) The entire sample will then be ground until all the material passes through a 1 millimeter sieve.
5) The sample will then be mixed by hand or machine.
6) The necessary aliquot will be removed for analysis and the remaining sampled material archived.

6.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

Sampling events will follow Quality Assurance/Quality Control (QA/QC) protocol as established in Section 4 of the SCQ.

6.1 FIELD QUALITY CONTROL SAMPLES, ANALYTICAL REQUIREMENTS AND DATA VALIDATION

No field quality control samples will be collected under this sampling program. All sampling and laboratory analyses will be performed at Analytical Support Level (ASL) B or E as specified in Table 2-1. Ten percent of the data will be validated to ASL B (technetium-99 and semivolatiles) or ASL E (total uranium); the ten percent will include samples collected from the random boring locations SP5-3 and SP5-9 (total of six samples). Alternate locations, in case of no sample recovery, are SP5-7 and SP5-17.

The following DQO has been identified as applicable to this project: SL-048, Rev. 1, "Delineating the Extent of Constituents of Concern in Pre-Design Investigations and Remediation Sampling (WAC)." An uncontrolled copy of the supporting DQO is located in Appendix A.

6.2 PROJECT-SPECIFIC PROCEDURES AND MANUALS

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

SMPL-01, *Solids Sampling*
SMPL-21, *Collection of Field Quality Control* 766-S-1000
EQT-06, *Geoprobe® Model 5400 - Operation, Maintenance, and Calibration*
EQT-05, *Geodimeter® 4000 Survey System - Operation, Maintenance, and Calibration.*
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].*
Sitewide CERCLA Quality Assurance Plan (SCQ)

6.3 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 FEMP 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 assessment will be performed by conducting surveillance. As a minimum, one surveillance will be conducted during implementation of this PSP, consisting of monitoring/observing on-going project activity and work areas to verify conformance to specified requirements. Surveillance will be planned and documented according to Section 12.3 of the SCQ.

6.4 IMPLEMENTATION OF FIELD CHANGES

If field conditions require changes or variances, the Field Sampling Lead must obtain written approval (electronic mail is acceptable) from the Project Lead and QA before the changes may be implemented. Changes to the PSP will be noted in the applicable field activity logs and on a Variance Request/Field Change Notice Form (VR/FCN). QA must receive the completed VR/FCN, which includes the signatures of the Project Sampling Lead, Project Lead, and the QA Representative, within 7 working days of the granting of the verbal approval.

7.0 DISPOSITION OF WASTES

During completion of sampling activities, technicians will generate contact and decontamination waste. Following completion of sampling, the technicians will place contact wastes into properly labeled bags and dispose of it according to appropriate FEMP waste management policies. Excess soil and debris generated from the soil pile will be placed back into the borehole it originated from. Decontamination water will be discharged based on direction from the SCEP waste management contact via the FEMP Wastewater Discharge Request Form.

8.0 HEALTH AND SAFETY

The Health & Safety Lead, Field Sampling Leads, and team members will assess the safety of performing sampling activities on the surface of the SP-5 stockpile. This will include vehicle positioning limitations, fall hazards, and vehicle stability if Geoprobe work is performed on the side slopes.

Technicians will conform to precautionary surveys performed by personnel representing the Radiological Control, Safety, and Industrial Hygiene organizations. Concurrence with applicable safety permits (indicated by the signature of each field team member assigned to this project) is expected by each team member in the performance of their assigned duties.

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 sample location area.

9.0 DATA MANAGEMENT

A data management process will be implemented so information collected during the investigation will be properly managed following completion of the field activities. As specified in Section 5.1 of the SCQ, sampling teams will describe daily activities on the Field Activity Log sufficient for the sampling team to reconstruct a particular situation without reliance on memory. Sample Collection Logs will be completed according to instructions specified in Appendix B of the SCQ.

All field measurements, observations, and sample collection information 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. Samples will be assigned a unique sample identifier, as listed in Appendix B. Refer to Section 2.5 for a description of the sample identifiers to be used. This unique sample identifier will appear on the Chain of Custody/Request for Analysis and will be used to identify the sample 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 Quality organization for final review. The field data package will be filed in the records of the Environmental Monitoring project under project number 50.03.52.03.

The Data Management organization will perform data entry into the Site-wide Environmental Database. Field logs will 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 into the SED from the FACTS database. The analytical data validation requirements are outlined in Section 6.1.

APPENDIX A

DATA QUALITY OBJECTIVE
SL-048

**Note: The attached DQO are for informational purposes only.
Refer to controlled copies for most current revision.**

Control Number DQO-0038

Fernald Environmental Management Project

Data Quality Objectives

Title: Delineating the Extent of Constituents of Concern in Pre-design Investigation and Remediation Sampling

Number: SL-048

Revision: 1

Final Draft: October 3, 1997

CONTROLLED COPY

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Approval: for Joan White Date: 10/03/97
Project Lead

Rev. #	0	1	2	3	4	5	6
Effective Date:	9/19/97						

DATA QUALITY OBJECTIVES
Delineating the Extent of Constituents of Concern in Pre-design Investigation and 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.

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) and As Low As Reasonably Achievable (ALARA) levels.

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. For real-time methodologies, the field data will be used to bias the physical sampling necessary for COC delineation.

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 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. The frequency of field QC sampling is as follows: Duplicate samples will be taken at a minimum of one per 20 samples. Rinsates will be performed at a minimum of one per 20 on all field equipment that is re-used. Trip blanks will be taken at a minimum of one per shipping container when analyzing for volatile organic compounds (VOCs). For VOCs, container blanks will be taken at a minimum of one per Area and Phase per container type (i.e. stainless steel core liner/plastic core liner/Geoprobe tube) when using uncertified containers. Field blanks are not necessary for soil metal analysis, as it is unlikely in ambient field conditions to have metals cross contamination, however, the probability of cross contamination with liquid samples and semi-volatile organic compounds is much higher, therefore for liquid samples and samples that will be analyzed for semi-volatile organic compounds (SVOCs) field blanks will be taken at a minimum of one per 20 samples. ASL and validation requirements are as follows:

- Real-time data will be analyzed to ASL A, and no field QC samples are required.
- If physical samples are analyzed for Pre-design Investigations and/or Pre-certification delineations, 100% of the data will be analyzed per ASL B requirements. 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.
- 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. The ASL B package will include a Certificate of Analysis along with all associated QA/QC results. In addition, 10% of the data will be validated to ASL B.
- If delineation data are also to be used for Certification, all data will be analyzed and reported to ASL D, and 10% will be validated to ASL D. In addition, the data must meet the data quality objectives specified in the Certification DQO.

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 data will undergo analytical validation by the FEMP validation team. A minimum of ten percent (10%) of field data will be validated by the FEMP QA validation team. 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-21, *Collection of Field Quality Control Samples*
- EQT-06, *Geoprobe® Model 5400 Operation and Maintenance*
- EQT-23, *Operation of ADCAM Series Analyzers with Gamma Sensitive Detectors*
- EQT-30, *Operation of Radiation Tracking Vehicle Sodium Iodide Detection System*

Data Quality Objectives
Delineating the Extent of Media Constituents of Concern

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,A ☐ OTHER ☐

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

---

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

Air ☐ Biological ☐ Groundwater ☒ Sediment ☒ Soil ☒

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

---

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.

---

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 X RTRAK / HPGe / XRF	SCQ Section: Not Applicable
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	SCQ Section:

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. 1

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, EQT-06

---

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.
+ Taken at the discretion of the Project Manager (if warranted by field conditions)
++ One per Area and Phase 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

SAMPLE LOCATIONS & IDENTIFIERS

TABLE B-1 - Soil Stockpile 5 Sample Locations, Depths, and Analytes

Sample Identifier	Northing Coordinate	Easting Coordinate	Target Analyte List	Relative Fraction for Sample Depths*						Total Pile Depth at Boring Location
				D1	D2	D3	D4*	D5*	D6*	
SP5-1-y-R	481907	1348509	A	0.44	0.64	0.86	0.11	0.36	0.91	TBD
SP5-2-y-R	481874	1348524	A	0.21	0.62	0.76	0.07	0.32	0.72	TBD
SP5-3-y-R (and -S)	481866	1348573	A & C	0.02	0.39	0.66	0.19	0.44	0.81	TBD
SP5-4-y-R	481916	1348609	A	0.10	0.41	0.95	0.02	0.31	0.99	TBD
SP5-5-y-R	481893	1348681	A	0.13	0.34	0.93	0.49	0.84	0.98	TBD
SP5-6-y-R	481870	1348701	A	0.15	0.46	0.86	0.20	0.37	0.62	TBD
SP5-7-y-R (and -S)	481954	1348503	A & C	0.10	0.41	0.84	0.16	0.31	0.77	TBD
SP5-8-y-R	481945	1348535	A	0.24	0.73	0.91	0.11	0.46	0.85	TBD
SP5-9-y-R (and -S)	481924	1348586	A & C	0.28	0.36	0.94	0.66	0.75	0.82	TBD
SP5-10-y-R	481934	1348635	A	0.02	0.15	0.79	0.26	0.61	0.98	TBD
SP5-11-y-R	481923	1348678	A	0.03	0.46	0.62	0.08	0.15	0.95	TBD
SP5-11A-y-R	481933	1348678	B	Sample selection based on highest gross beta/gamma field reading (≥ 100 ccpm)						TBD
SP5-11B-y-R	481923	1348688	B							TBD
SP5-11C-y-R	481913	1348678	B							TBD
SP5-11D-y-R	481923	1348668	B							TBD
SP5-12-y-R	481965	1348712	A	0.14	0.25	0.56	0.25	0.66	0.87	TBD
SP5-13-y-R	481991	1348461	A	0.17	0.31	0.69	0.20	0.48	0.88	TBD
SP5-14-y-R	481982	1348545	A	0.24	0.54	0.65	0.21	0.46	0.97	TBD
SP5-15-y-R	482051	1348569	A	0.36	0.59	0.87	0.06	0.56	0.70	TBD
SP5-16-y-R	481997	1348635	A	0.22	0.37	0.59	0.13	0.77	0.92	TBD
SP5-17-y-R (and -S)	482023	1348651	A & C	0.33	0.42	0.72	0.16	0.49	0.84	TBD
SP5-18-y-R	482002	1348693	A	0.15	0.37	0.64	0.01	0.46	0.76	TBD

Notes* D1 through D3 are the primary random depths for samples.
D4 through D6 are alternate depths in case of poor sample recovery at any of the primary depths.
Locations SP5-11 through SP5-11D are biased locations based on a previous high total uranium result.
The random depth fractions represent the beginning (top) of the six-inch sample interval.
TAL A: Total U and Tc-99; TAL B: Total U; TAL C: 4-nitroaniline and bis(2-chloroisopropyl) ether (semivolatile compounds)

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1428

APPENDIX C

TARGET ANALYTE LISTS

SP-5 SOIL STOCKPILE
TARGET ANALYTE LISTS

TAL 50.03.52.03-A

Analyte	Method
Total Uranium	Gamma Spectroscopy (ASL E)
Technetium-99	Gas Proportional Counting (ASL B)

TAL 50.03.52.03-B

ASL E

Analyte	Method
Total Uranium	Gamma Spectroscopy

TAL 50.03.52.03-C

ASL B

Analyte	Method
4-nitroaniline	SW846/Method 8270-B
bis(2-chloroisopropyl) ether	SW846/Method 8270-B

APPENDIX D

AGENCY LETTERS ON RCRA DETERMINATION

H-1937 1428

AK

-5097

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

JAN 14 1994

REPLY TO THE ATTENTION OF:

HRE-8J

Mr. Jack R. Craig
United States Department of Energy
Feed Materials Production Center
P.O. Box 398705
Cincinnati, Ohio 45239-8705

RE: Approval of Soil and Rubble Pile Cover

Dear Mr. Craig:

The United States Environmental Protection Agency (U.S. EPA) has completed its review of the United States Department of Energy's (U.S. DOE) Soil and Rubble Pile Cover Document. This document describes U.S. DOE's approach for sample collection, analysis, data evaluation, and recommendation for interim management of the soil and rubble pile north of 3rd Street. Although this pile is not a hazardous waste as defined by the Resource Conservation and Recovery Act, it is a solid waste. Also, the pile contains levels of radioactivity below the threshold established in Removal Action 17.

U.S. EPA concurs with U.S. DOE's proposal to remove visible rubble, and grade and seed the pile as an interim action, until final action is determined in the Operable Unit 5 Record of Decision. However, as discussed in previous meetings between the agencies, the pile material is <u>not</u> to be used as backfill.

Please contact me at (312) 886-0992 if you have any questions.

Sincerely,

James A. Saric
Remedial Project Manager

cc: Graham Mitchell, OEPA-SWDO
Pat Whitfield, U.S. DOE-HDQ
Jim Thiesing, FERMCO
Paul Clay, FERMCO

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H-1772
AR

OhioEPA
State of Ohio Environmental Protection Agency
Southwest District Office
South Main Street
Dayton, Ohio 45402-2086
(513) 285-6357
FAX (513) 285-6404

George V. Voinovich
Governor

January 11, 1994

Mr. Jack R. Craig
Project Manager
U.S. DOE FEMP
P. O. Box 398705
Cincinnati, Ohio 45239-8705

Dear Mr. Craig:

The purpose of this letter is to conditionally approve the proposed soil and rubble cover for the pile located north of Third Street. The conditions for approval are that DOE address the comments listed below.

1. The soil and rubble pile should be called a low level RAD waste and a solid waste. It is not a RCRA hazardous waste.

2. The soil and rubble pile should not be used as backfill anywhere else on site. After completion of the regrading and seeding, DOE should post this area to prevent its potential use as backfill.

If you have any questions please contact Tom Schneider or me.

Sincerely,

Graham E. Mitchell
Project Manager

GEM/bjb

cc: Jenifer Kwasniewski, DERR
Jean Michaels, PRC
Lisa August, GeoTrans
Robert Owen, ODH
Jim Saric, U.S. EPA
Ken Alkema, FERMCO
Tom Schneider, SWDO

Printed on recycled paper

APPENDIX E

SP-5 ANALYTICAL DATA SUMMARY

TABLE E-1 - SP-5 SAMPLE RESULTS FOR OSDF WAC CONSTITUENTS OF CONCERN

OSDF WAC COC	Sample ID	Depth Interval (ft)	Result	Units[1]	Qualifier[2]	WAC Limit
Total Uranium	SP-1	0-0.5	<11	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-2	0-0.5	16	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-A2	3-3.5	30	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-3	0-0.5	<11	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-A3	6-6.5	<11	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-4	0-0.5	55	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-5	2-2.5	44	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-6	4-4.5	15	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-7	1-1.5	<18	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-A7	1-1.5	18	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-8	3-3.5	58	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-A9	3-3.5	70	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-A10	5-5.5	39	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-14	6-6.5	112	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-15	0-0.5	<11	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-16	5-5.5	<11	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-18	3-3.5	109	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-20	1-1.5	15	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-A20	10-10.5	29	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-21	0-0.5	23	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-22	2-2.5	58	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-A23	1-1.5	54	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-25	3-3.5	31	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-26	1-1.5	34	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-27	6-6.5	<11	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-28	4-4.5	<11	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-29	9-9.5	<11	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-31	2-2.5	180	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-32	0-0.5	54	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-33	2-2.5	148	mg/kg	NV	1,030 mg/kg

TABLE E-1 - SP-5 SAMPLE RESULTS FOR OSDF WAC CONSTITUENTS OF CONCERN

OSDF WAC COC	Sample ID	Depth Interval (ft)	Result	Units[1]	Qualifier[2]	WAC Limit
Total Uranium	SP-34	3-3.5	109	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-35	0-0.5	86	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-44	0-0.5	96	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-36	0-0.5	12	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-37	0-0.5	99	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-38	0-0.5	83	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-39	0-0.5	<11	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-40	1-1.5	<11	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-40	1-1.5	<0.025	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-41	1-1.5	27	mg/kg	NV	1,030 mg/kg
Total Uranium	SP-43	2-2.5	12	mg/kg	NV	1,030 mg/kg
Total Uranium	2E-3	3-3.5	91	mg/kg	NV	1,030 mg/kg
Total Uranium	4E-4	4-4.5	33	mg/kg	NV	1,030 mg/kg
Total Uranium	6E-5	5-5.5	60	mg/kg	NV	1,030 mg/kg
Total Uranium	8E-9	9-9.5	96	mg/kg	NV	1,030 mg/kg
Total Uranium	10E-13	13-13.5	<11	mg/kg	NV	1,030 mg/kg
Total Uranium	12E-9	9-9.5	169	mg/kg	NV	1,030 mg/kg
Total Uranium	14E-13	13-13.5	51	mg/kg	NV	1,030 mg/kg
Total Uranium	15E-12	12-12.5	50	mg/kg	NV	1,030 mg/kg
Total Uranium	16E-12	12-12.5	941	mg/kg	NV	1,030 mg/kg
Total Uranium	17E-6	6-6.5	119	mg/kg	NV	1,030 mg/kg
Total Uranium	18E-4	4-4.5	29	mg/kg	NV	1,030 mg/kg
Total Uranium	19E-20	20-20.5	241	mg/kg	NV	1,030 mg/kg
Total Uranium	20E-13	13-13.5	130	mg/kg	NV	1,030 mg/kg
Total Uranium	1W-2	2-2.5	53	mg/kg	NV	1,030 mg/kg
Total Uranium	5W-5	5-5.5	72	mg/kg	NV	1,030 mg/kg
Total Uranium	7W-9	9-9.5	48	mg/kg	NV	1,030 mg/kg
Total Uranium	9W-4	4-4.5	113	mg/kg	NV	1,030 mg/kg
Total Uranium	11W-4	4-4.5	42	mg/kg	NV	1,030 mg/kg
Total Uranium	13W-6	6-6.5	42	mg/kg	NV	1,030 mg/kg

TABLE E-1 - SP-5 SAMPLE RESULTS FOR OSDF WAC CONSTITUENTS OF CONCERN

OSDF WAC COC	Sample ID	Depth Interval (ft)	Result	Units[1]	Qualifier[2]	WAC Limit
Total Uranium	5W-4	4-4.5	53	mg/kg	NV	1,030 mg/kg
Total Uranium	17W-20	20-20.5	70	mg/kg	NV	1,030 mg/kg
Total Uranium	19W-16	16-16.5	36	mg/kg	NV	1,030 mg/kg
Total Uranium	20W-20	20-20.5	52	mg/kg	NV	1,030 mg/kg
Total Uranium	G13-023-R	0-0.2	70.10	mg/kg	NV	1,030 mg/kg
Total Uranium	G13-024-R	0-0.1	21.44	mg/kg	-	1,030 mg/kg
Total Uranium	G13-025-R	0-0.2	14.10	mg/kg	NV	1,030 mg/kg
Total Uranium	G13-022-R	0-0.1	23.50	mg/kg	NV	1,030 mg/kg
Total Uranium	61478	0-0.5	48.0	mg/kg	NV	1,030 mg/kg
Total Uranium	61488	0-0.5	24.9	mg/kg	NV	1,030 mg/kg
Total Uranium	61495	0-0.5	15.0	mg/kg	NV	1,030 mg/kg
Total Uranium	5946	0-0.5	49.2	mg/kg	-	1,030 mg/kg
Total Uranium	61471	0-0.5	296.8	mg/kg	NV	1,030 mg/kg
Tetrachloroethene	SP-1	0-0.5	<0.025	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-2	0-0.5	<0.025	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-A2	3-3.5	<0.025	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-3	0-0.5	<0.025	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-A3	6-6.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-4	0-0.5	<0.025	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-5	2-2.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-6	4-4.5	0.043	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-7	1-1.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-A7	1-1.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-8	3-3.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-9	10-10.5	<0.025	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-A9	3-3.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-10	0-0.2	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-A10	5-5.5	<0.025	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-14	6-6.5	<0.025	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-15	0-0.5	<0.025	mg/L	NV	128 mg/kg

TABLE E-1 - SP-5 SAMPLE RESULTS FOR OSDF WAC CONSTITUENTS OF CONCERN

OSDF WAC COC	Sample ID	Depth Interval (ft)	Result	Units[1]	Qualifier[2]	WAC Limit
Tetrachloroethene	SP-16	5-5.5	<0.025	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-18	3-3.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-20	1-1.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-41 (dup SP-20)	1-1.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-A20	10-10.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-21	0-0.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-2	2-2.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-A23	1-1.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-24	1-1.5	<0.025	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-25	3-3.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-26	1-1.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-27	6-6.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-28	4-4.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-29	9-9.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-31	0-0.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-32	0-0.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-44 (dup. SP-35)	0-0.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-36	0-0.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-37	0-0.5	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-38	0-0.5	<0.025	mg/L	NV	128 mg/kg
Tetrachloroethene	SP-39	0-0.2	<0.08	mg/L	NV	128 mg/kg
Tetrachloroethene	G13-022-V	0-0.1	0.011	mg/kg	UJ	128 mg/kg
Tetrachloroethene	G13-023-V	0-0.2	0.011	mg/kg	UJ	128 mg/kg
Tetrachloroethene	61507	1.5-2	0.006	mg/kg	U	128 mg/kg
Tetrachloroethene	61477	1.5-2	0.005	mg/kg	U	128 mg/kg
Tetrachloroethene	61505	1.5-2	0.006	mg/kg	U	128 mg/kg
Tetrachloroethene	61484	1.5-2	0.006	mg/kg	U	128 mg/kg
Mercury	SP-1	0-0.5	<0.0002	mg/L	NV	5.66×10^4 mg/kg

TABLE E-1 - SP-5 SAMPLE RESULTS FOR OSDF WAC CONSTITUENTS OF CONCERN

OSDF WAC COC	Sample ID	Depth Interval (ft)	Result	Units[1]	Qualifier[2]	WAC Limit
Mercury	SP-2	0-0.5	<0.0002	mg/L	NV	5.66×10^4 mg/kg
Mercury	SP-A2	3-3.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-3	0-0.5	<0.0002	mg/L	NV	5.66×10^4 mg/kg
Mercury	SP-A3	6-6.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-4	0-0.5	0.0003	mg/L	NV	5.66×10^4 mg/kg
Mercury	SP-5	2-2.5	<0.0002	mg/L	NV	5.66×10^4 mg/kg
Mercury	SP-6	4-4.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-7	1-1.5	<0.0002	mg/L	NV	5.66×10^4 mg/kg
Mercury	SP-A7	1-1.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-8	3-3.5	<0.0002	mg/L	NV	5.66×10^4 mg/kg
Mercury	SP-9	10-10.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-A9	3-3.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-10	0-0.2	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-A10	5-5.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-14	6-6.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-15	0-0.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-16	5-5.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-18	3-3.5	<0.0002	mg/L	NV	5.66×10^4 mg/kg
Mercury	SP-20	1-1.5	<0.0002	mg/L	NV	5.66×10^4 mg/kg
Mercury	SP-41	1-1.5	<0.0002	mg/L	NV	5.66×10^4 mg/kg
Mercury	SP-A20	10-10.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-21	0-0.5	<0.0002	mg/L	NV	5.66×10^4 mg/kg
Mercury	SP-22	2-2.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-A23	1-1.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-24	1-1.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-25	3-3.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-26	1-1.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-27	6-6.5	1.92	mg/kg	NV	5.66×10^4 mg/kg

TABLE E-1 - SP-5 SAMPLE RESULTS FOR OSDF WAC CONSTITUENTS OF CONCERN

OSDF WAC COC	Sample ID	Depth Interval (ft)	Result	Units[1]	Qualifier[2]	WAC Limit
Mercury	SP-28	4-4.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-29	9-9.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-31	2-2.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-32	0-0.5	0.60	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-33	2-2.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-34	3-3.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-35	0-0.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-44	0-0.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-36	0-0.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-37	0-0.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-38	0-0.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-39	0-0.2	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-40	1-1.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	SP-43	2-2.5	<0.2	mg/kg	NV	5.66×10^4 mg/kg
Mercury	61472	0-0.5	4.6	mg/kg	-	5.66×10^4 mg/kg
Mercury	61506	0-0.5	0.1	mg/kg	U	5.66×10^4 mg/kg
Mercury	61479	0-0.5	0.1	mg/kg	U	5.66×10^4 mg/kg
Mercury	61504	0-0.5	0.1	mg/kg	U	5.66×10^4 mg/kg
Neptunium-237	G13-023-R	0-0.2	0.33	pCi/g	UJ	3.12×10^9 pCi/g
Neptunium-237	G13-024-R	0-0.1	0.11	pCi/g	UJ	3.12×10^9 pCi/g
Neptunium-237	G13-025-R	0-0.2	0.0	pCi/g	UJ	3.12×10^9 pCi/g
Neptunium-237	G13-022-R	0-0.1	0.0	pCi/g	NV	3.12×10^9 pCi/g
Neptunium-237	5946	0-0.5	0.6	pCi/g	U	3.12×10^9 pCi/g
Strontium-90	G13-023-R	0-0.2	0.0	pCi/g	NV	5.67×10^{10} pCi/g
Strontium-90	G13-024-R	0-0.1	0.15	pCi/g	UJ	5.67×10^{10} pCi/g
Strontium-90	G13-025-R	0-0.2	0.0	pCi/g	NV	5.67×10^{10} pCi/g
Strontium-90	G13-022-R	0-0.1	0.14	pCi/g	NV	5.67×10^{10} pCi/g
Strontium-90	5946	0-0.5	2.5	pCi/g	-	5.67×10^{10} pCi/g

TABLE E-1 - SP-5 SAMPLE RESULTS FOR OSDF WAC CONSTITUENTS OF CONCERN

OSDF WAC COC	Sample ID	Depth Interval (ft)	Result	Units[1]	Qualifier[2]	WAC Limit
Technetium-99	G13-023-R	0-0.2	1.13	pCi/g	NV	29.1 pCi/g
Technetium-99	G13-024-R	0-0.1	1.25	pCi/g	-	29.1 pCi/g
Technetium-99	G13-025-R	0-0.2	1.58	pCi/g	NV	29.1 pCi/g
Technetium-99	G13-022-R	0-0.1	2.56	pCi/g	-	29.1 pCi/g
Technetium-99	5946	0-0.5	1.0	pCi/g	UJ	29.1 pCi/g
1,1 Dichloroethene	G13-022-V	0-0.1	0.011	mg/kg	UJ	11.4 mg/kg
1,1 Dichloroethene	G13-023-V	0-0.2	0.011	mg/kg	UJ	11.4 mg/kg
1,1 Dichloroethene	61484	1.5-2	0.006	mg/kg	U	11.4 mg/kg
1,1 Dichloroethene	61507	1.5-2	0.006	mg/kg	U	11.4 mg/kg
1,1 Dichloroethene	61505	1.5-2	0.006	mg/kg	U	11.4 mg/kg
1,1 Dichloroethene	61477	1.5-2	0.005	mg/kg	U	11.4 mg/kg
1,2 Dichloroethene	G13-022-V	0-0.1	0.011	mg/kg	UJ	11.4 mg/kg
1,2 Dichloroethene	G13-023-V	0-0.2	0.011	mg/kg	UJ	11.4 mg/kg
1,2 Dichloroethene	61505	1.5-2	0.006	mg/kg	U	11.4 mg/kg
1,2 Dichloroethene	61507	1.5-2	0.006	mg/kg	U	11.4 mg/kg
1,2 Dichloroethene	61477	1.5-2	0.005	mg/kg	U	11.4 mg/kg
1,2 Dichloroethene	61484	1.5-2	0.006	mg/kg	U	11.4 mg/kg
Bromodichloromethane	G13-022-V	0-0.1	0.011	mg/kg	UJ	9.03×10^{-1} mg/kg
Bromodichloromethane	G13-023-V	0-0.2	0.011	mg/kg	UJ	9.03×10^{-1} mg/kg
Bromodichloromethane	61484	1.5-2	0.006	mg/kg	U	9.03×10^{-1} mg/kg
Bromodichloromethane	61477	1.5-2	0.005	mg/kg	U	9.03×10^{-1} mg/kg
Bromodichloromethane	61505	1.5-2	0.006	mg/kg	U	9.03×10^{-1} mg/kg
Bromodichloromethane	61507	1.5-2	0.006	mg/kg	U	9.03×10^{-1} mg/kg
Chloroethane	G13-022-V	0-0.1	0.011	mg/kg	UJ	3.92×10^{5} mg/kg
Chloroethane	G13-023-V	0-0.2	0.011	mg/kg	UJ	3.92×10^{5} mg/kg
Chloroethane	61505	1.5-2	0.012	mg/kg	U	3.92×10^{5} mg/kg
Chloroethane	61484	1.5-2	0.012	mg/kg	U	3.92×10^{5} mg/kg
Chloroethane	61507	1.5-2	0.011	mg/kg	U	3.92×10^{5} mg/kg

TABLE E-1 - SP-5 SAMPLE RESULTS FOR OSDF WAC CONSTITUENTS OF CONCERN

OSDF WAC COC	Sample ID	Depth Interval (ft)	Result	Units[1]	Qualifier[2]	WAC Limit
Chloroethane	61477	1.5-2	0.011	mg/kg	U	3.92×10^{5} mg/kg
Trichloroethene	G13-022-V	0-0.1	0.011	mg/kg	UJ	128 mg/kg
Trichloroethene	G13-023-V	0-0.2	0.011	mg/kg	UJ	128 mg/kg
Trichloroethene	61507	1.5-2	0.006	mg/kg	U	128 mg/kg
Trichloroethene	61484	1.5-2	0.006	mg/kg	U	128 mg/kg
Trichloroethene	61477	1.5-2	0.005	mg/kg	U	128 mg/kg
Trichloroethene	61505	1.5-2	0.006	mg/kg	U	128 mg/kg
Vinyl chloride	G13-022-V	0-0.1	0.011	mg/kg	UJ	1.51 mg/kg
Vinyl chloride	G13-023-V	0-0.2	0.011	mg/kg	UJ	1.51 mg/kg
Vinyl chloride	61477	1.5-2	0.010	mg/kg	U	1.51 mg/kg
Vinyl chloride	61507	1.5-2	0.011	mg/kg	U	1.51 mg/kg
Vinyl chloride	61484	1.5-2	0.012	mg/kg	U	1.51 mg/kg
Vinyl chloride	61505	1.5-2	0.012	mg/kg	U	1.51 mg/kg
4-Nitroaniline	G13-022-S	0-0.1	0.880	mg/kg	UJ	4.42×10^{-2} mg/kg
4-Nitroaniline	G13-025-S	0-0.2	0.900	mg/kg	UJ	4.42×10^{-2} mg/kg
4-Nitroaniline	61507	1.5-2	1.90	mg/kg	U	4.42×10^{-2} mg/kg
4-Nitroaniline	61505	1.5-2	1.90	mg/kg	U	4.42×10^{-2} mg/kg
4-Nitroaniline	61484	1.5-2	2.00	mg/kg	U	4.42×10^{-2} mg/kg
4-Nitroaniline	61477	1.5-2	1.70	mg/kg	U	4.42×10^{-2} mg/kg
Carbazole	G13-022-S	0-0.1	0.350	mg/kg	UJ	7.27×10^{4} mg/kg
Carbazole	G13-025-S	0-0.2	0.099	mg/kg	J	7.27×10^{4} mg/kg
alpha-Chlordane	61479	0-0.5	0.094	mg/kg	U	2.89 mg/kg
alpha-Chlordane	61506	0-0.5	0.088	mg/kg	U	2.89 mg/kg
alpha-Chlordane	61472	0-0.5	0.092	mg/kg	U	2.89 mg/kg
alpha-Chlordane	61504	0-0.5	0.096	mg/kg	U	2.89 mg/kg
bis(2-chloroisopropyl)ether	61484	1.5-2	0.410	mg/kg	U	2.44×10^{2} mg/kg
bis(2-chloroisopropyl)ether	61477	1.5-2	0.350	mg/kg	U	2.44×10^{-2} mg/kg
bis(2-chloroisopropyl)ether	61505	1.5-2	0.400	mg/kg	U	2.44×10^{-2} mg/kg

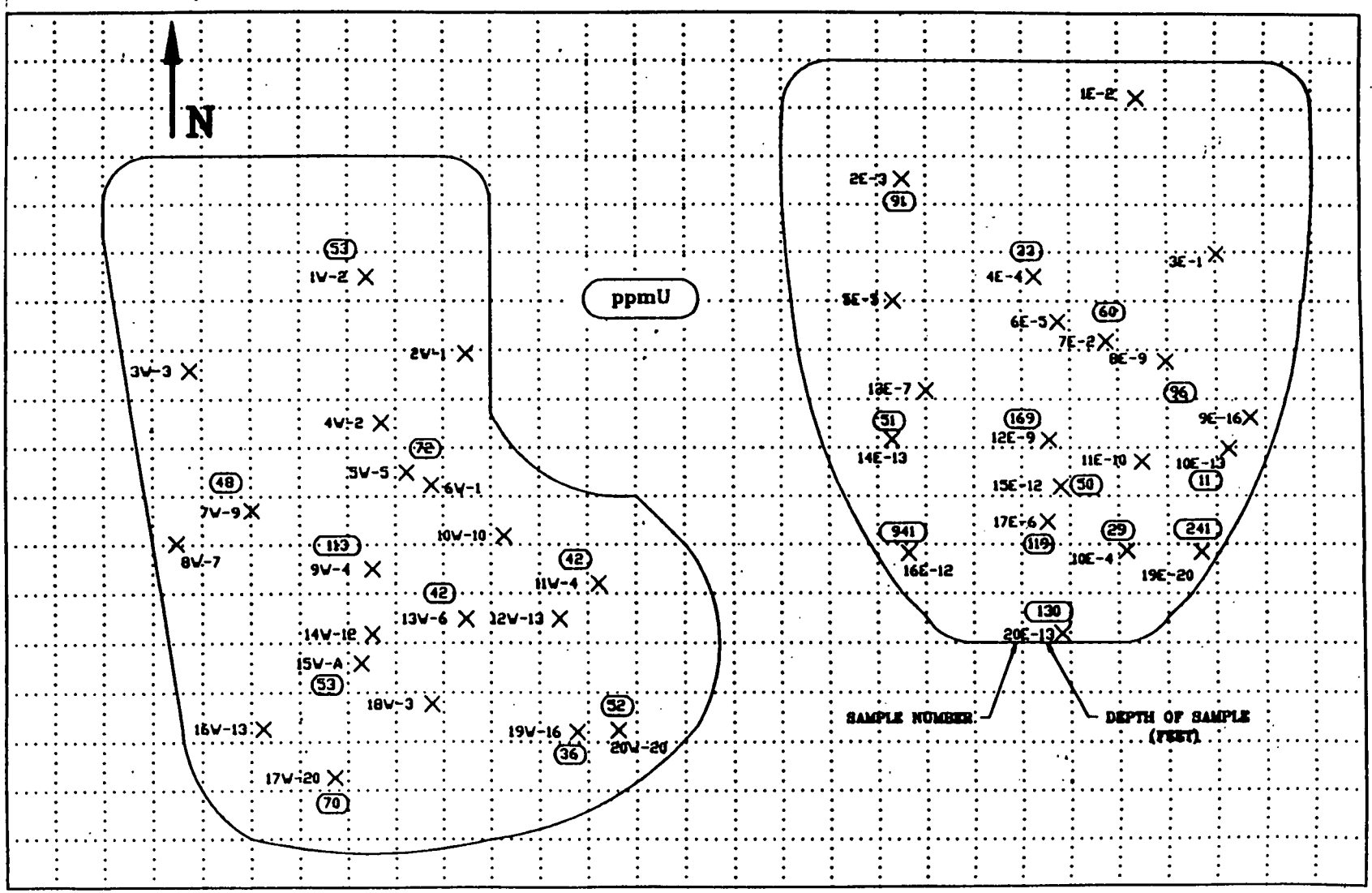
OSDF WAC COC	Sample ID	Depth Interval (ft)	Result	Units[1]	Qualifier[2]	WAC Limit
bis(2-chloroisopropyl)ether	61507	1.5-2	0.390	mg/kg	U	2.44×10^{-2} mg/kg
Toxaphene	61506	0-0.5	0.180	mg/kg	U	1.06×10^{5} mg/kg
Toxaphene	61479	0-0.5	0.190	mg/kg	U	1.06×10^{5} mg/kg
Toxaphene	61504	0-0.5	0.190	mg/kg	U	1.06×10^{5} mg/kg
Toxaphene	61472	0-0.5	0.180	mg/kg	U	1.06×10^{5} mg/kg

[1] Sample results in units of mg/L were obtained via TCLP analysis.

[2] NV- Not Validated
U- Undetected
J- Estimated Value

APPENDIX F

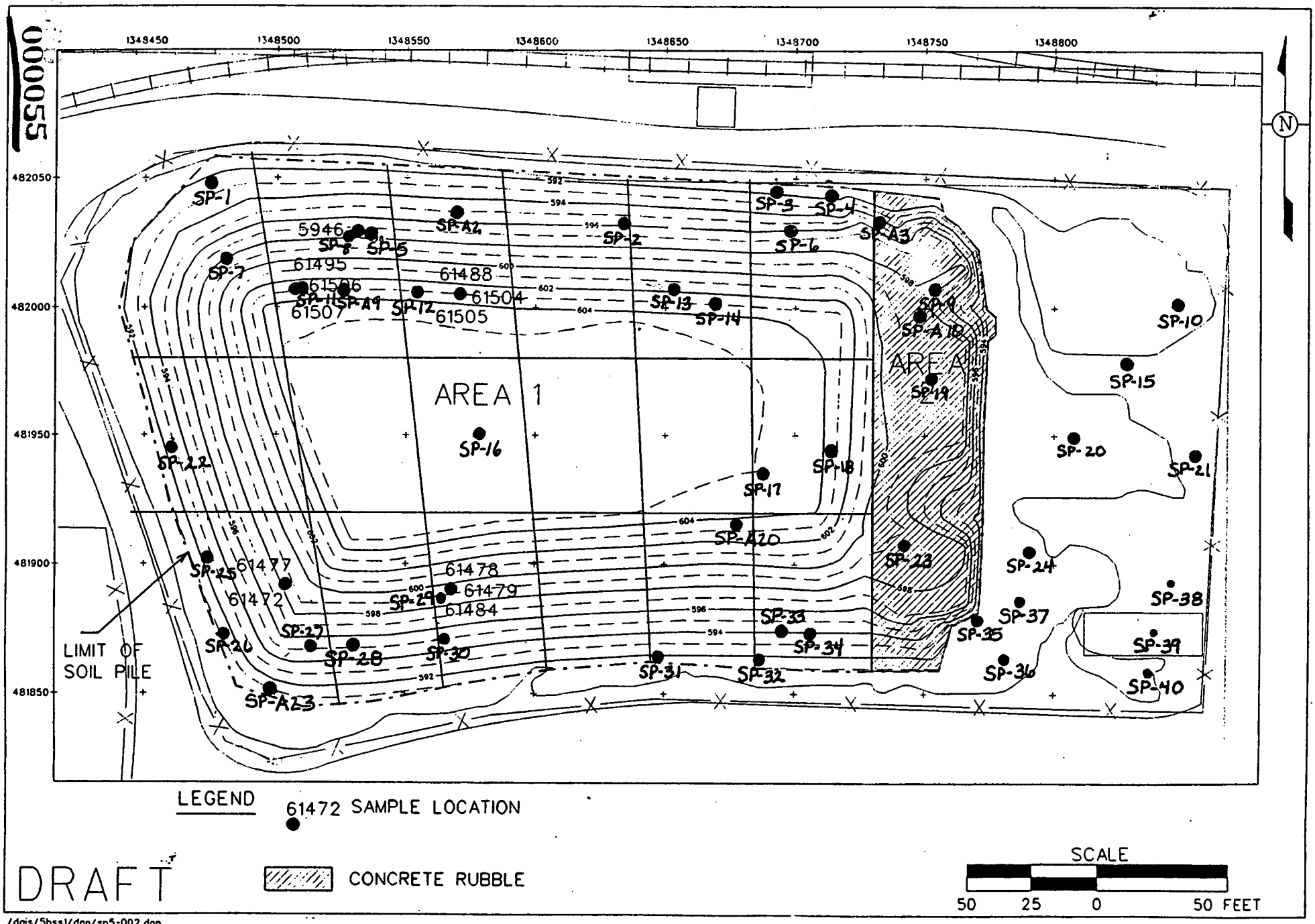
SAMPLE LOCATIONS FROM PREVIOUS SAMPLING INVESTIGATIONS



SAMPLING POINTS FOR THE THIRD STREET DIRT PILES

= 10 FEET X 10 FEET

Figure F-1 1991 Removal Site Evaluation Sample Locations



/dgis/5bssl/dgn/sp5-002.dgn
STATE PLANAR COORDINATE SYSTEM 1983

Figure 5-2: RI/FS and Removal Action Sample Locations