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Sampling and Analysis Plan for the M-Area Inactive Process Sewer Lines (081-M) Operable Unit (U)

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DISCLAIMER

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and
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LIST OF ABBREVIATIONS AND ACRONYMS

bgs	below ground surface
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CM	contaminant migration
COC	constituent of concern
CRDL	Contract Required Detection Limit
D	Definitive Level
DQD	Decision Quality Data
DQOs	Data Quality Objectives
ft	feet
IC	Institutional Control
IDW	Investigation Derived Waste
in.	inch
LLC	Limited Liability Company
m	meter
MCL	maximum contaminant level
MH	Manhole
mL	milliliter
MIPS	M-Area Inactive Process Sewer
MIPSL	M-Area Inactive Process Sewer Line
NBN	no building number
OU	Operable Unit
PCE	Tetrachloroethylene
ppmv	parts per million by volume
QA	Quality Assurance
QC	Quality Control
QAPP	Quality Assurance Program Plan
RCRA	Resource Conservation and Recovery Act
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RG	Remedial Goal
RGO	Remedial Goal Objectives
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
SVE	Soil Vapor Extraction
TCE	Trichloroethylene
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
VOA	volatile organic analysis
VOCs	volatile organic compounds

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1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) was prepared in accordance with the United States Environmental Protection Agency (USEPA) *Uniform Federal Policy for Quality Assurance Project Plans* (USEPA, et al, 2005) and the *Area Completion Projects Programmatic Quality Assurance Project Plan for Environmental Data Collection and Management* (SRNS 2012). Project or task specific information for the *M-Area Inactive Process Sewer Line (MIPSL) (081-M) Operable Unit (OU) (U)* is documented in this SAP and refers to the program level Quality Assurance Program Plan (QAPP) (SRNS 2012) for the program level quality objectives, standard operating procedures, and quality assurance/quality control (QA/QC) procedures.

1.1 MIPSL OU Location

The MIPSL OU is located in M Area, in the northwest portion of the SRS in Aiken County, South Carolina in an area currently designated for industrial use (Figure 1).

1.2 Statement of Broad Objective for the Sampling

The primary objective of this SAP is to strategically collect samples that assist in evaluating the effectiveness of the current soil vapor extraction (SVE) remediation method in reaching the MIPSL OU remedial goal (RG) of preventing Tetrachloroethylene (PCE) and Trichloroethylene (TCE) in the vadose zone soil from leaching to groundwater above maximum contaminant levels (MCLs).

2.0 SAMPLING UNIT BACKGROUND

2.1 Sampling Area Physical and Geographical Description

MIPSL is listed in Appendix C of the Federal Facility Agreement as a Resource Conservation and Recovery Act/Comprehensive Environmental Response, Compensation, and Liability Act (RCRA/CERCLA) OU.

The topography of the area is relatively flat, ranging in elevation from about 113- to 119-meters (m [370- to 390-feet {ft}]) above mean sea level, and slopes to the south. The area is covered with scattered concrete or gravel pavement with areas of grassy vegetation.

The MIPSL OU comprises portions of the M-Area Settling Basin Inactive Process Sewer to Manhole 1 (MH-1) (M-Area Inactive Process Sewer [MIPS] Building Number 081-M) [including the Southern Portions of the 313-M Inactive Clay Process Sewer Lines to Tims Branch, no building number {NBN} and the Southern Portions of the 320-M Inactive Clay Process Sewer Lines from the Building Slab to the Former Security Fence, NBN {313-MIPS}]). Figure 2 illustrates the location of the 313-MIPS and MHs.

2.2 Operational History

From 1958 until 1985, several M-Area facilities (313-M, 320-M, and 321-M) manufactured reactor fuel and target assemblies. Included were three production buildings (313-M, 320-M, and 321-M), two support laboratories (320-M and 322-M), and two test reactors (305-A and 777-10A), and liquid effluent treatment facilities (341-M, 341-1M, and 341-8M). M-Area operated from 1952 until 1995.

Originally, the MIPSL included the entire network of process sewer lines from Buildings 313-M, 320-M, 321-M, and 322-M that discharged to the A-014 Outfall and the M-Area Settling Basin. The lines consist of approximately 914 m (3,000 ft) of vitrified clay pipe ranging in diameter from 2.3 to 76.2 centimeters (cm [1 to 30 inches {in.}]), with pipe depths ranging from about 2.1- to 2.7-m (7- to 9-ft) below ground surface (bgs).

2.3 Previous Investigations/Regulatory Actions

The overall strategy for addressing the MIPSL OU was to 1) characterize the waste unit, delineating nature and extent of contamination and identifying the media of concern; 2) perform a baseline risk assessment (BRA) to evaluate the media of concern, constituents of concern (COCs), and exposure pathways and characterize potential risks; and 3) evaluate and perform a final action to remediate, as needed, the identified media of concern.

A detailed facility description is given in the RCRA Facility Investigation/Remedial Investigation (RFI/RI) work plan, RFI/RI report with BRA, and Corrective Measures Study/Feasibility Study (WRSC 2005). TCE and PCE were determined to be contaminant migration (CM) COCs. A structured analysis of remedial alternatives appropriate for COCs was conducted, and alternatives were developed that could meet the remedial action objective of preventing migration of TCE and PCE contamination in soil to groundwater at a concentration above MCLs.

A Record of Decision (ROD) detailing the selected remedial alternative as Phased SVE, Enhanced with Soil Fracturing and Institutional Controls at the MIPSL OU was issued in December of 2006 (WSRC 2006). This alternative was selected because it effectively removes volatile organic compounds (VOCs) from the vadose zone and protects groundwater by depleting the source. No chemicals are used. Soil fracturing is used to increase the permeability of the formation, thereby increasing the effectiveness of SVE. System air emissions do not require treatment and are vented to the atmosphere. Institutional controls are used to limit access to the area and include grouting of the MHs for access control.

SRS documents land use control inspections in the Five-Year Remedy Review Reports. Operations at the MIPSL OU for the foreseeable future are expected to be remediation oriented (mostly passive SVE) with Site level access controls. Additionally, a Performance Evaluation Report is written annually for MIPSL SVE systems (SRNS 2018).

The groundwater contamination in M Area is being addressed under the RCRA corrective action program for the A/M-Area as documented in the Savannah River Site RCRA Part B Permit and is therefore not a part of this MIPSL OU. Any groundwater contamination resulting from the MIPSL OU is addressed by the requirements of the M-Area and Metallurgical Laboratory Hazardous Waste Management Facilities Groundwater Monitoring and Corrective Action agreements.

2.4 Summary of Existing Data Compared to Risk-Based Thresholds

The summary of RGs for the MIPSL OU are summarized in the Table 1. Final RGs are consistent with an industrial land use scenario. Data obtained as a result of this SAP will be compared to the maximum detects that were used to derive RGs.

3.0 PROJECT DATA QUALITY OBJECTIVES

The Data Quality Objectives (DQO) process is a series of logical steps that guides managers or staff to a plan for the resource-effective acquisition of environmental data. It is both flexible and iterative, and applies to both decision-making (e.g., compliance/non-compliance with a standard) and estimation (e.g., ascertaining the mean concentration level of a contaminant). The DQO process is used to establish performance and acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of the study. Use of the DQO process leads to efficient and effective expenditure of resources; consensus on the type, and quantity of data needed to meet the project goal; and the full documentation of actions taken during the development of the project. The DQO process is a series of seven planning steps based on the scientific method (Sections 3.1.1 to 3.1.7 and Table 2) and is detailed in USEPA Guidance (USEPA 2006).

3.1 MIPSL OU Potential Contamination

3.1.1 State the Problem

While SVE has demonstrated efficient removal of the source term, resistance to removal is likely due to the geology of the Upland Unit, coupled with a higher source term in the area relative to other areas of the unit. The Upland Unit consists of poorly sorted, silty to clayey sand with higher porosity and low permeability. The high porosity is due to the higher fines content; the low permeability of the sand is also due to the higher fines content which limits interconnection of porosity. The higher porosity of the unit tends to increase retention of VOCs.

Analysis of 2018 soil gas data indicates TCE and PCE vapor concentrations demonstrated generally decreasing values. Historical PCE and TCE concentrations have decreased significantly since SVE operations began in 2008 (184.8 parts per million by volume [ppmv] PCE maximum and 32.9 ppmv TCE maximum) at MH-01 to 15.3 ppmv PCE maximum and 5.8 ppmv TCE maximum in 2018. VOC vapor concentrations indicate a localized, declining PCE/TCE source area within the zone of capture of the SVE units.

3.1.2 Identify Goals of the Study

For the MIPSL OU, the CM Remedial Goal Objective (RGO) is that soil concentration of COCs will not impact groundwater above MCLs. The goals of this sampling effort are to measure current

TCE and PCE concentrations in soil below the existing MIPSL pipeline infrastructure and within the remedial zone of influence to determine if RGs have been met.

3.1.3 Identify Information Inputs

3.1.3.1 Soil Samples

Three soil borings (MIPSL01SB1, MIPSL01SB2, MIPSL01SB3) will be advanced near MH-1, one soil boring (MIPSL11SB1) near MH-11, two soil borings (MIPSL12SB1 and MIPSL12SB2) will be advanced near MH-12, and one soil boring (MIPSL13SB1) will be advanced near MH-13 (Figure 3). All soil borings will be advanced to a target depth of 30.48 m (100 ft) and analyzed for constituents listed in Table 3.

3.1.3.2 Sampling and Analysis Procedures

SRS drilling and soil sampling will be performed through accepted procedures found in the SRS 3Q1 Manual, Section 9006, *Soil Boring Investigations* (SRNS 2015). These procedures ensure representative sampling techniques are always followed in the field.

The subcontract laboratory shall be certified for EPA8260B and EPA8081B methods by the South Carolina Department of Health and Environmental Control. The analytical method and laboratory have been audited and approved by United States Department of Energy Consolidated Audit Program. The analyses shall be performed according to Quality Systems for Analytical Services requirements.

3.1.4 Define the Boundaries of the Study

Sampling will be conducted within the boundaries of the MIPSL OU at locations collocated with MIPSL MH-1, MH-11, MH-12, and MH-13.

3.1.5 Develop the Analytical Approach

Soil borings will be advanced to a depth of 30.48-m (100-ft) bgs at seven locations (Table 3). The number of soil borings were selected based on the degree of contamination known at the locations. Three soil borings will be advanced near MH-1, one boring near MH-11, two soil borings near

MH-12, and one boring near MH-13. A photoionization detector will be run continuously as core is retrieved, and samples will be taken every 1.5 m (5 ft) starting at 1.8-m (6-ft) bgs (below the recognized pipeline depth) and when a change in lithology is observed. Samples will be analyzed for TCE and PCE (Table 4).

3.1.6 Specify Performance or Acceptance Criteria

According to USEPA guidance (USEPA 2006), "The USEPA has developed the DQO Process as the Agency's recommended planning process when environmental data are used to select between two or more alternatives or to derive an estimate of contamination. The DQO process is a seven-step method designed to ensure that the appropriate type, quantity, and quality of environmental data are collected for the intended application." SW-846 methods are analytical procedures for sample analyses and are presented in Section 5, Analytical Plan. Section 4 presents DQO worksheets developed for each subunit and/or media and specifies the quantity, type, and quality of data as well as ensuring representative data is collected for each sampling population.

Total study error is the additive impact of two main sources of error: 1) sampling error and 2) measurement error, with sampling error being responsible for the vast majority of the total error. "As much as 90% or more of the uncertainty in environmental data sets is due to sampling variability as a direct consequence of the heterogeneity of the environmental matrices" (Crumbling 2001). The method best suited to reduce sampling error is to gather representative samples (Crumbling 2001).

It is incorrect to assume that randomly collected, non-representative samples, plus perfect analytical chemistry will always lead risk managers to correct risk management decisions. To avoid incorrect risk management decisions, it is more important to develop Decision Quality Data (DQD). DQD is defined as "Data of known quality that can logically be demonstrated to be effective for making the specified decision because both the sampling and analytical uncertainties are managed to the degree necessary to meet clearly defined and stated data needs" (Crumbling 2001). Therefore, it is more important for the risk managers to use DQD, emphasizing representative sampling with a specified percentage of definitive data, to make a correct decision and should not be confused by emphasizing analytical data quality which does not necessarily equate to a correct risk management decision.

Because the SRS possesses significant process and historical knowledge and has preliminary data results for the MIPSL OU, this sampling plan will largely control sampling error (the cause of greatest total error) and set tolerable limits on decision errors by gathering data by judgmental, judgmental-stratified, and systematic sampling designs based on process knowledge, existing data, historical information/data, survey data, and institutional knowledge to generate DQD. This is the method SRS will use to control decision errors, since sample collection will be focused in areas of known contamination rather than using a sampling design intended to randomly search for contamination. Judgmental sampling provides a very conservative and certain method for collecting data with a high likelihood for detecting worst-case contaminant concentrations while reducing total study error.

The DQOs for the MIPSL OU represent the type and level of analytical quality needed for characterization at this unit and can be found in Sections 4 and 5 of this SAP.

3.1.7 Develop the Plan for Obtaining the Data (Project Quality Objectives)

Table 2 (DQO Worksheet) summarizes the DQOs for this project. The Project Quality Objectives for this additional characterization SAP are:

1. Geologic core descriptions will provide data to be used to help analyze laboratory data.
2. Laboratory data will be used to support a determination as to whether further remedial action is warranted.
3. All samples will follow preservative guidelines as listed in Table 5.
4. Laboratory data will meet the analytical and contract-required detection limits (CRDLs) listed in Table 4.
5. All (i.e., 100%) of the laboratory analytical will meet QA requirements.

4.0 SAMPLING DESIGN AND RATIONALE

Implementation of this SAP to obtain DQD is documented in the remaining sections of this SAP. The following section describes how the plan is implemented to collect the physical data to meet the criteria developed during the DQO process.

5.0 ANALYTICAL PLAN

This section describes the data quality levels for each type of data being collected. All data collected under this SAP will follow the *Area Completion Projects Quality Assurance Project Plan for Environmental Data Collection* and *Management* (QAPP) (SRNS 2012). The data quality level is determined by the intended use of the data.

5.1 Data Quality Levels for the MIPSL OU

Soil characterization samples will be 100% Definitive level (D) data. 100% Definitive level (D) data is verified data which has achieved the EPA's Screening level Validation category (EPA 540-R-93-071) and meet the following selected aspects of EPA Functional Guideline criteria: Quantitation Limits, Surrogate or Tracer Recoveries, Blanks (Method/Lab/Prep, Trip, Field, Equipment/Rinsate), LCS Recoveries, Matrix Spike Recoveries/Duplicates, Lab Replicates, Field Replicates, Cooler Temps, Chemical Preservation, Holding Times. Requirements for D data are listed in Table 6.

5.2 Field Analytical Sampling Quality Assurance/Quality Control

Field QA/QC will be maintained using QA/QC samples and methods as described below:

1. Field Duplicate (co-located) Samples: Two or more independent samples collected from side-by-side locations at the same point in time and space to be considered identical. These separate samples are intended to represent the same population and are carried through all steps of the sampling and analytical procedures in an identical manner. These samples are used to assess precision of the total method, including sampling, analysis, and site heterogeneity. Field duplicate samples are planned at a combined minimum rate of 5% according to Manual C3, Volume X, *EC&ACP Geochemical Monitoring Procedures*, ER-SOP-043, *Obtaining and*

Managing Environmental Data for Environmental Compliance & Area Completion Projects (U) (SRNS 2014), or typically 1 per 20 samples and analyzed for the same parameters as the associated samples.

2. Equipment Blank: A sample of water free of measurable contaminants poured over or through decontaminated field sampling equipment that is considered ready to collect or process an additional sample. The purpose of this blank is to assess the adequacy of the decontamination process. Also called rinse blank or rinsate blank. Equipment blanks are typically planned at a rate of 1 blank per 40 samples if needed.

3. Field Blank: A blank used to provide information about contaminants that may be introduced during sample collection, storage, and transport; also, a clean sample exposed to sampling conditions, transported to the laboratory, and treated as an environmental sample. Field blanks are optional and may be collected when contamination from external environmental sources is anticipated by the project team. Typically, field blanks, when used, are planned at a rate of 1 blank per 40 samples.

4. Trip Blank: A clean sample of water free of measurable contaminants that is taken to the sampling site and transported to the laboratory for analysis without having been exposed to sampling procedures. Trip blanks are analyzed to assess whether contamination was introduced during sample shipment (typically analyzed for volatile organic compounds only). A blank consists of distilled-deionized water provided by the laboratory to be placed in every cooler with VOC samples typically at the rate of 1 trip blank per cooler.

5. Split Samples: Two or more representative portions from a sample in the field, analyzed by at least two different laboratories and/or methods. Prior to splitting, a sample is mixed (except volatiles, oil and grease, or when otherwise determined) to minimize sample heterogeneity. These are quality control samples used to assess precision, variability, and data comparability between laboratories. Split samples are planned at a combined minimum rate of 5% or typically 1 per 20 samples and analyzed for the same parameters as the associated samples.

5.3 Sample Matrix Table

Table 6 is a Sampling Matrix table that includes all the detailed information for all samples planned to be collected. The exact number of samples may change based on field conditions.

5.4 Sample Location Map

Figure 3 illustrates the proposed locations of samples to be collected.

6.0 FIELD IMPLEMENTATION

6.1 List of Sampling/Collection Equipment

This section provides examples of the type of sampling/collection equipment needed to execute the sampling. All samples will be taken with the appropriate/ approved equipment as noted within the QAPP and sampling protocol procedures referenced within the SAP.

Examples of sampling/collection equipment include the following:

- Rotosonic core in plastic bags
- Disposable plastic soil plug syringes
- Scale
- Sample bottles with preservatives
- Coolers

6.2 Investigation Derived Waste

Investigation Derived Waste (IDW) will be managed according to the site-specific IDW management plan developed for the project.

7.0 REFERENCES

Crumbling, Deana M. et. al, 2001. *Managing Uncertainty in Environmental Decisions*, Environmental Science & Technology, 2001, American Chemical Society, October 1, 2001, pages 405A-409A

SRNS, 2012. *Area Completion Projects Programmatic Quality Assurance Project Plan for Environmental Data Collection and Management*, ERD-AG-2005-00001, Revision 5, Savannah River Site, Aiken, SC

SRNS, 2014. *EC&ACP Geochemical Monitoring Procedures*: *Obtaining and Managing Environmental Data for Environmental Compliance & Area Completion Projects (U),* Manual C3, Volume X, ER-SOP-043, Revision 4, September, Savannah River Site, Aiken, SC

SRNS, 2015. *Environmental Requirements and Program Documents: Soil Boring Investigations*, SRS Manual 3Q1, Procedure 9006, Revision 3, November, Savannah River Site, Aiken, SC

SRNS, 2018. *Performance Evaluation Report of 2018 for the M-Area Inactive Process Sewer Lines (MIPSL) (081-M) Operable Unit (OU) (U), January Through December 2017,* SRNS-RP-2018-00161, Revision 0, Savannah River Site, Aiken, SC.

USDOD, 2005. *Uniform Federal Policy for Quality Assurance Project Plans*, EPA:-505-B-04-900A, Version 1 Final, March

USDOE, 2005. *Uniform Federal Policy for Quality Assurance Project Plans*, EPA:-505-B-04-900A, Version 1 Final, March

USEPA, 2005. *Uniform Federal Policy for Quality Assurance Project Plans*, EPA:-505-B-04-900A, Version 1 Final, March

USEPA, 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4, EPA/240/B-06/001, February.

USEPA, Various Updates. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846,* Third Edition Basic Manual with Update

WSRC, 2005. *RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan, RFI/RI Report with Baseline Risk Assessment, and Corrective Measures Study/Feasibility Study (CMS/FS) for the M-Area Inactive Process Sewer Lines (081-M) (U)*, WSRC-RP-2004-4214, Revision 1.1, Savannah River Site, Aiken, SC

WSRC, 2006. *Record of Decision Remedial Alternative Selection for the M-Area Inactive Process Sewer Lines Operable Unit (081-M) (U),* WSRC-RP-2006-4001, Revision 1, Savannah River Site, Aiken, SC.

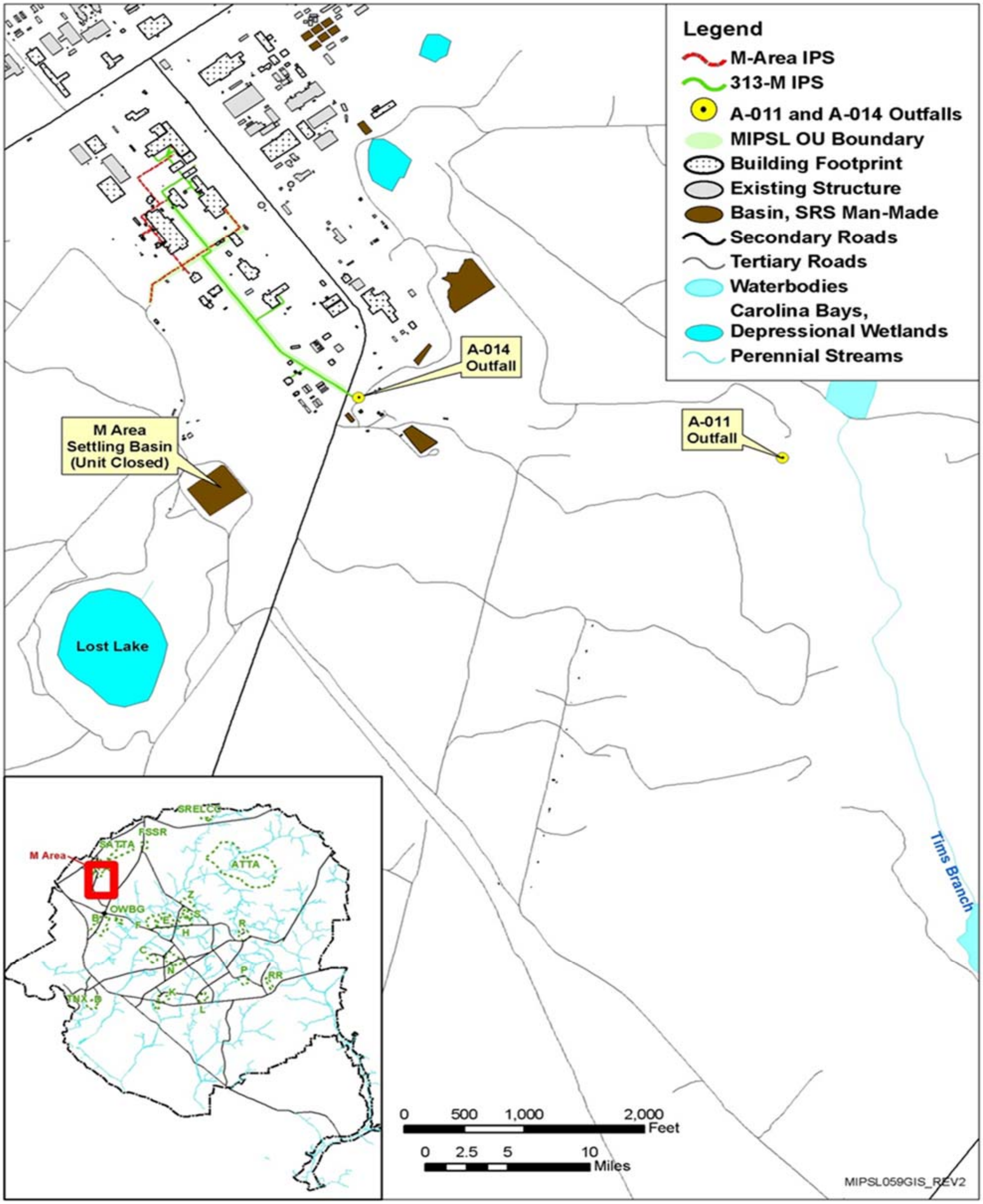

Figure 1. Location of the MIPSL OU

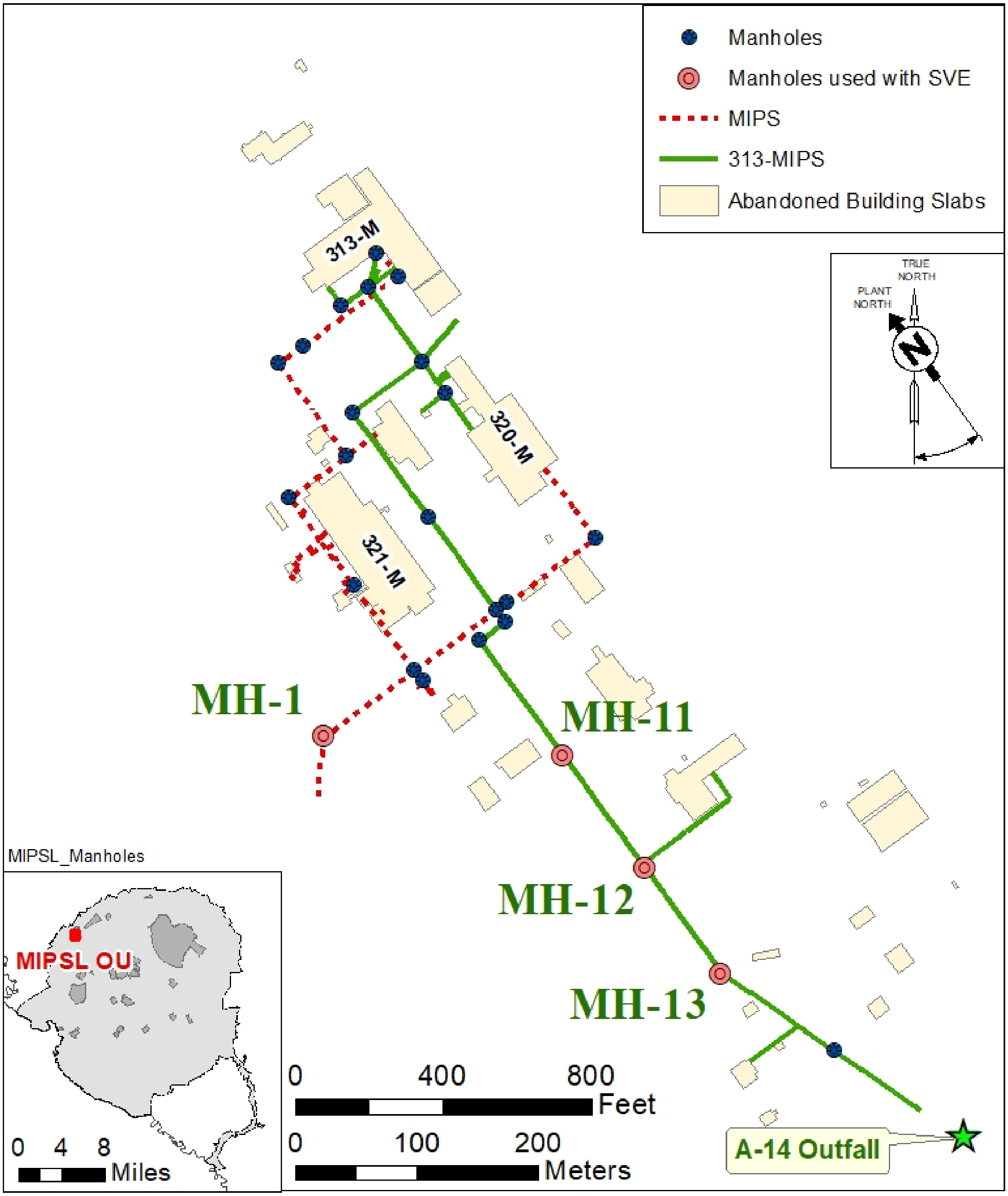

Figure 2. Location of the 313-MIPS and Manholes

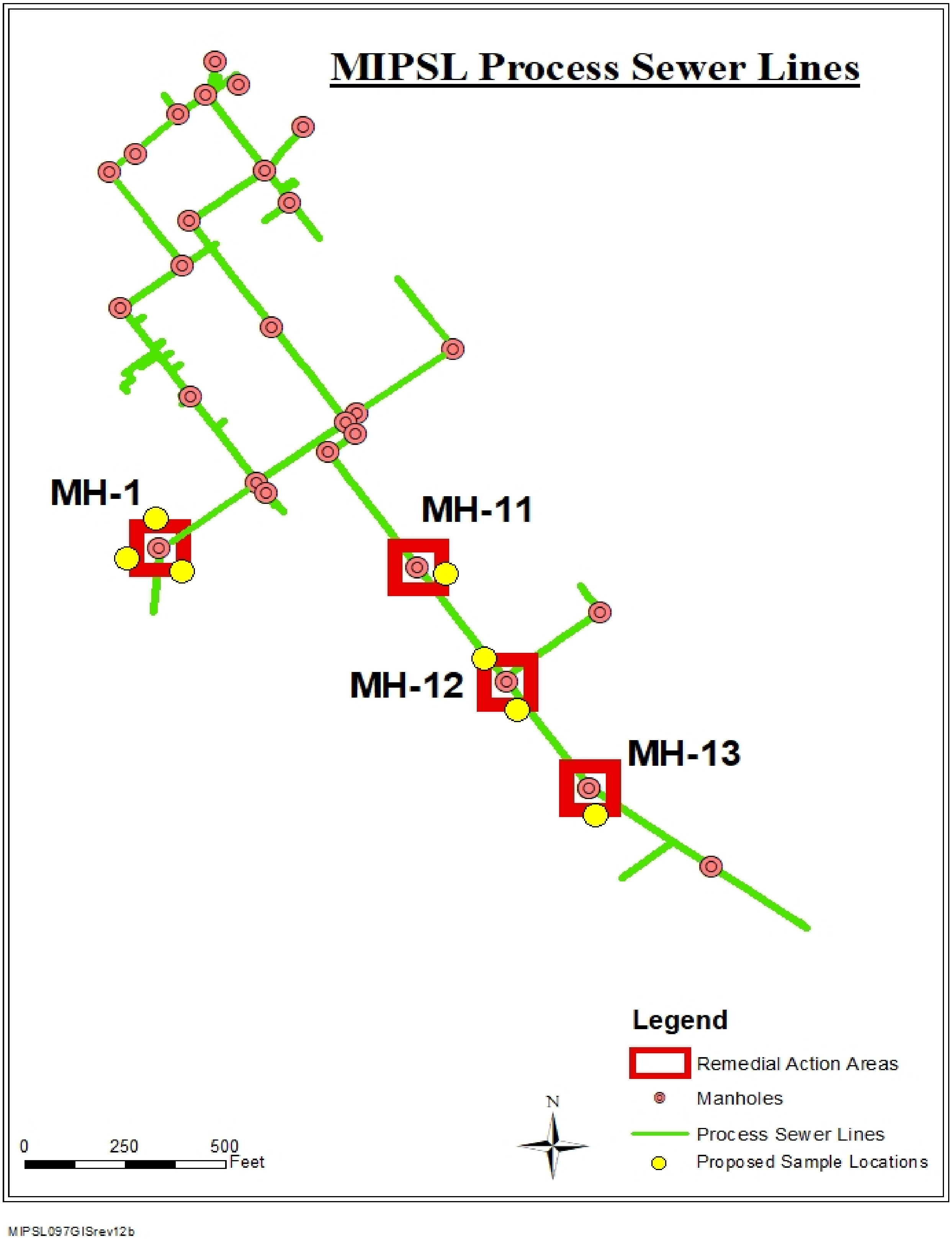

Figure 3. Proposed Sample Locations for the MIPSL OU, 2018

Table 1. Summary of Remedial Goals for the MIPSL OU

Refined COC			Risk-based RGOs	
	Units	Maximum Detected Value	CM RGO	Final RG
TCE	mg/kg	7.67E-01	3.07E-01	3.07E-01
PCE	mg/kg	4.11E-01	4.08E-02	4.08E-02

Table 2. Data Quality Objectives Worksheet for Soil Media

Pathway (Media)	Probable Conditions	Exposure Pathway and/or Release Mechanisms	Data Needs and DQOs	Field Activities	Parameters
Subsurface Soil	Discharge of contamination from the MIPSL to subsurface soils.	Contaminant migration to groundwater.	Compare measured concentrations of contaminants in soil to RGs established in the ROD.	Soil samples taken every 1.5 m (5 ft) and when a change in lithology is observed.	Definitive Data Quality Level TCE and PCE.

Table 3. Sampling Matrix Table

Sample Count	Sample Station	Sample Number	Sample Type	Sample[1] Media	Top Depth	Bottom Depth
1	MIPSL01SB1	1	REG	Soil	6	10
2	MIPSL01SB1	2	REG	Soil	12	17
3	MIPSL01SB1	3	REG	Soil	18	22
4	MIPSL01SB1	4	REG	Soil	23	27
5	MIPSL01SB1	5	REG	Soil	28	32
6	MIPSL01SB1	6	REG	Soil	33	37
7	MIPSL01SB1	7	REG	Soil	38	42
8	MIPSL01SB1	8	REG	Soil	43	47
9	MIPSL01SB1	8FD	FD	Soil	43	47
10	MIPSL01SB1	9	REG	Soil	48	52
11	MIPSL01SB1	10	REG	Soil	53	57
12	MIPSL01SB1	11	REG	Soil	58	62
13	MIPSL01SB1	12	REG	Soil	63	67
14	MIPSL01SB1	13	REG	Soil	68	72
15	MIPSL01SB1	14	REG	Soil	73	77
16	MIPSL01SB1	15	REG	Soil	73	77
17	MIPSL01SB1	15SPL	SPL	Soil	78	82
18	MIPSL01SB1	16	REG	Soil	83	87
19	MIPSL01SB1	17	REG	Soil	88	92
20	MIPSL01SB1	18	REG	Soil	93	97
21	MIPSL01SB1	19	REG	Soil	98	102
22	MIPSL01SB2	20	REG	Soil	6	10
23	MIPSL01SB2	21	REG	Soil	12	17
24	MIPSL01SB2	22	REG	Soil	18	22
25	MIPSL01SB2	23	REG	Soil	23	27
26	MIPSL01SB2	24	REG	Soil	28	32
27	MIPSL01SB2	25	REG	Soil	33	37
28	MIPSL01SB2	26	REG	Soil	38	42
29	MIPSL01SB2	27	REG	Soil	43	47
30	MIPSL01SB2	28	REG	Soil	48	52

Table 3. Sampling Matrix Table *(Continued)*

Sample Count	Sample Station	Sample Number	Sample Type	Sample[1] Media	Top Depth	Bottom Depth
31	MIPSL01SB2	28FD	FD	Soil	48	52
32	MIPSL01SB2	29	REG	Soil	53	57
33	MIPSL01SB2	30	REG	Soil	58	62
34	MIPSL01SB2	31	REG	Soil	63	67
35	MIPSL01SB2	32	REG	Soil	68	72
36	MIPSL01SB2	33	REG	Soil	73	77
37	MIPSL01SB2	34	REG	Soil	78	78
38	MIPSL01SB2	34SPL	SPL	Soil	78	82
39	MIPSL01SB2	35	REG	Soil	83	87
40	MIPSL01SB2	36	REG	Soil	88	92
41	MIPSL01SB2	37	REG	Soil	93	97
42	MIPSL01SB2	38	REG	Soil	98	102
43	MIPSL01SB3	39	REG	Soil	6	10
44	MIPSL01SB3	40	REG	Soil	12	17
45	MIPSL01SB3	41	REG	Soil	18	22
46	MIPSL01SB3	42	REG	Soil	23	27
47	MIPSL01SB3	43	REG	Soil	28	32
48	MIPSL01SB3	44	REG	Soil	33	37
49	MIPSL01SB3	45	REG	Soil	38	42
50	MIPSL01SB3	46	REG	Soil	43	47
51	MIPSL01SB3	47	REG	Soil	48	52
52	MIPSL01SB3	48	REG	Soil	53	52
53	MIPSL01SB3	48FD	FD	Soil	53	57
54	MIPSL01SB3	49	REG	Soil	58	62
55	MIPSL01SB3	50	REG	Soil	63	67
56	MIPSL01SB3	51	REG	Soil	68	72
57	MIPSL01SB3	52	REG	Soil	73	77
58	MIPSL01SB3	53	REG	Soil	78	78
59	MIPSL01SB3	54	REG	Soil	83	87
60	MIPSL01SB3	55SPL	SPL	Soil	83	87

Table 3. Sampling Matrix Table *(Continued)*

Sample Count	Sample Station	Sample Number	Sample Type	Sample[1] Media	Top Depth	Bottom Depth
61	MIPSL01SB3	56	REG	Soil	88	92
62	MIPSL01SB3	57	REG	Soil	93	97
63	MIPSL01SB3	58	REG	Soil	98	102
64	MIPSL11SB1	59	REG	Soil	6	10
65	MIPSL11SB1	60	REG	Soil	12	17
66	MIPSL11SB1	60FD	FD	Soil	12	17
67	MIPSL11SB1	61	REG	Soil	18	22
68	MIPSL11SB1	62	REG	Soil	23	27
69	MIPSL11SB1	63	REG	Soil	28	32
70	MIPSL11SB1	64	REG	Soil	33	37
71	MIPSL11SB1	65	REG	Soil	38	42
72	MIPSL11SB1	65SPL	SPL	Soil	38	42
73	MIPSL11SB1	66	REG	Soil	43	47
78	MIPSL11SB1	67	REG	Soil	48	52
75	MIPSL11SB1	68	REG	Soil	53	57
76	MIPSL11SB1	69	REG	Soil	58	62
77	MIPSL11SB1	70	REG	Soil	63	67
78	MIPSL11SB1	71	REG	Soil	68	72
79	MIPSL11SB1	72	REG	Soil	73	77
80	MIPSL11SB1	73	REG	Soil	78	82
81	MIPSL11SB1	74	REG	Soil	83	87
82	MIPSL11SB1	75	REG	Soil	88	92
83	MIPSL11SB1	76	REG	Soil	93	97
84	MIPSL11SB1	77	REG	Soil	98	102
85	MIPSL12SB1	78	REG	Soil	6	10
86	MIPSL12SB1	79	REG	Soil	12	17
87	MIPSL12SB1	80	REG	Soil	18	18
88	MIPSL12SB1	80SPL	SPL	Soil	18	22
89	MIPSL12SB1	81	REG	Soil	23	27
90	MIPSL12SB1	82	REG	Soil	28	32

Table 3. Sampling Matrix Table *(Continued)*

Sample Count	Sample Station	Sample Number	Sample Type	Sample[1] Media	Top Depth	Bottom Depth
91	MIPSL12SB1	83	REG	Soil	33	37
92	MIPSL12SB1	84	REG	Soil	38	42
93	MIPSL12SB1	85	REG	Soil	43	47
94	MIPSL12SB1	85FD	FD	Soil	43	47
95	MIPSL12SB1	86	REG	Soil	48	52
96	MIPSL12SB1	87	REG	Soil	53	57
97	MIPSL12SB1	88	REG	Soil	58	62
98	MIPSL12SB1	89	REG	Soil	63	67
99	MIPSL12SB1	90	REG	Soil	68	72
100	MIPSL12SB1	91	REG	Soil	73	77
101	MIPSL12SB1	92	REG	Soil	78	82
102	MIPSL12SB1	93	REG	Soil	83	87
103	MIPSL12SB1	94	REG	Soil	88	92
104	MIPSL12SB1	95	REG	Soil	93	97
105	MIPSL12SB1	96	REG	Soil	98	102
106	MIPSL12SB2	97	REG	Soil	6	10
107	MIPSL12SB2	98	REG	Soil	12	17
108	MIPSL12SB2	99	REG	Soil	18	18
109	MIPSL12SB2	100	REG	Soil	23	27
110	MIPSL12SB2	100SPL	SPL	Soil	23	27
111	MIPSL12SB2	101	REG	Soil	28	32
112	MIPSL12SB2	102	REG	Soil	33	37
113	MIPSL12SB2	103	REG	Soil	38	42
114	MIPSL12SB2	104	REG	Soil	43	47
115	MIPSL12SB2	105	REG	Soil	48	52
116	MIPSL12SB2	105FD	FD	Soil	48	52
117	MIPSL12SB2	106	REG	Soil	53	57
118	MIPSL12SB2	107	REG	Soil	58	62
119	MIPSL12SB2	108	REG	Soil	63	67
120	MIPSL12SB2	109	REG	Soil	68	72

Table 3. Sampling Matrix Table *(Continued/End)*

Sample Count	Sample Station	Sample Number	Sample Type	Sample[1] Media	Top Depth	Bottom Depth
121	MIPSL12SB2	110	REG	Soil	73	77
122	MIPSL12SB2	111	REG	Soil	78	82
123	MIPSL12SB2	112	REG	Soil	83	87
124	MIPSL12SB2	113	REG	Soil	88	92
125	MIPSL12SB2	114	REG	Soil	93	97
126	MIPSL12SB2	115	REG	Soil	98	102
127	MIPSL13SB1	116	REG	Soil	6	10
128	MIPSL13SB1	117	REG	Soil	12	17
129	MIPSL13SB1	118	REG	Soil	18	18
130	MIPSL13SB1	119	REG	Soil	23	27
131	MIPSL13SB1	119FD	FD	Soil	28	28
132	MIPSL13SB1	120	REG	Soil	28	32
133	MIPSL13SB1	122	REG	Soil	33	37
134	MIPSL13SB1	123	REG	Soil	38	42
135	MIPSL13SB1	124	REG	Soil	43	47
136	MIPSL13SB1	125	REG	Soil	48	52
137	MIPSL13SB1	126	REG	Soil	48	52
138	MIPSL13SB1	127	REG	Soil	53	57
139	MIPSL13SB1	128	REG	Soil	58	62
140	MIPSL13SB1	129	REG	Soil	63	67
141	MIPSL13SB1	130	REG	Soil	73	77
142	MIPSL13SB1	130SPL	SPL	Soil	73	77
143	MIPSL13SB1	131	REG	Soil	78	82
144	MIPSL13SB1	132	REG	Soil	83	87
145	MIPSL13SB1	133	REG	Soil	88	92
146	MIPSL13SB1	134	REG	Soil	93	97
147	MIPSL13SB1	135	REG	Soil	98	102

Regular (REG) Samples 126
Field Duplicate 7

Split Sample 7
Trip Blanks 1 per cooler
[1] Samples will be collected every 5 ft

Table 4. Laboratory Analytical Specifications for Target Compound List Analytes for Soil Media

Analyte	Analyte ID	Preparation[B] Method	EPA[B] Method	CRDL[A] *(mg/kg)*
Analyte List				
Volatiles				
Trichloroethylene (TCE)	79-01-6	5035A	EPA8260B	0.00137
Tetrachloroethylene (PCE)	127-18-4	5035A	EPA8260B	0.00142

A) CRDL is the Contract Required Detection Limit and is not always attainable.
B) Extraction and preparation methods differ depending upon media, concentration, instrument, laboratory, and analytical method. Preparation methods will also influence detection limits.

Table 5. Preservatives, Holding Times, and Sample Containers

Parameter	Preservatives	Holding Time	Containers
	Solid	Solid	Solid
Volatile Organic Compounds (VOCs) Including: 8260 – VOCs	Low-level soil: Add approximately 5 g soil to 40 mL VOA vial preserved with 1 g of $NaHSO_4$/5 mL water	Low/High Level: 14 days	3x40 (or 60) mL glass VOA vial (with stir bar for low-level soil), PTFE septa cap

g = gram
L = liter
mL = milliliter
VOA = volatile organic analysis

Table 6. Field Quality Control/Quality Assurance Sampling Requirements

Data Quality Levels	Field Quality Control/Quality Assurance Samples	Frequency of Field Quality Control/Quality Assurance Samples
Definitive (D)	Co-located Field Duplicate	Minimum 5%[1]
	Trip Blank	1 per cooler
	Equipment Blank	1 per 40 samples[2]
	Field Blank	Optional; 1 per 40 samples[3]
	Split Sample	Minimum 5%

Data Quality Levels
D Data USEPA Definitive Level Data

Footnotes:
1.) Minimum frequency established per ER-SOP-043
2.) Typical frequency
3.) Recommended based on project needs; typical frequency