DRAFT SAMPLING AND ANALYSIS PLAN

FOCUSED CHARACTERIZATION FOR RECONFIGURATION OF THE PERIMETER INTRUSION DETECTION ALARM SYSTEM (PIDAS) FENCE

INDIVIDUAL HAZARDOUS SUBSTANCE SITE 172, 117.1 and 197 OPERABLE UNITS 8 AND 13

Rocky Mountain Remediation Services, L.L.C.

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1.0 INTRODUCTION

The purpose of this Sampling and Analysis Plan (SAP), is to delineate the areal extent of contaminated soil that could be excavated or otherwise disturbed at Individual Hazardous Substance Sites (IHSS) 172, 117.1 and 197 in Operable Units (OU) 8 and 13. This focused characterization is being conducted to determine what impacts there will be, if any, to the successful implementation of the PIDAS fence relocation project.

The SAP summarizes the existing data, identifies data gaps, and describes the scope of work required to identify the potential contaminant source(s) contributing to the elevated volatile organic compounds (VOCs) present in IHSSs 172, 117.1 and 197. In addition to identifying possible waste streams from the excavation required as part of the PIDAS fence installation, the data obtained from this SAP will be used to further identify the extent of the groundwater contaminant plume and its possible sources in the vicinity of these IHSSs.

1.1 Background

IHSS 172, central avenue waste spill in OU 8, is located both inside and outside the PA. For this SAP, only the portion of IHSS 172 inside the PA, just west of building 771 and 776, will be considered. This IHSS is an area of low level radioactive contamination that was the result of a leaking drum which contained radioactively contaminated waste oils that was stored on the 903 Pad. During the transfer of the drum from the 903 Pad into the 700 area for storage, the drum was punctured, resulting in the spread of radioactive waste oils along Central Avenue and into the PA.

IHSS 117.1, north chemical storage site, and IHSS 197, scrap metal sites, are both part of Operable Unit (OU) 13, 100 Area. These IHSSs are located to the Northeast of building 552, and west of building 559. The northern portion of these IHSSs - which could affect the PIDAS fence reconfiguration - are located just inside the south fence of the Protected Area. IHSS 117.1 was used as a storage area for disposal of non-radioactive waste and scrap metal, as well as storage for building and construction debris. IHSS 197 was used as a storage site for metal lathe turnings, some of which were contaminated with chlorinated solvents and lathe oils. All of these IHSS areas will be referred to as the PIDAS Area IHSSs for discussion purposes.

Potential radionuclide contamination is suspected within IHSS 172. Initial investigations revealed low levels of radioactivity associated with IHSS 172.

Using EPA guidance (EPA 1992), the compounds listed below are suspected to be present as a separate non-aqueous phase liquid (NAPL) in the soils associated with IHSSs 172, 117.1 and 197:

- Acetone
- Benzene
- Chloromethane
- Chloroform
- Carbon Tetrachloride
- cis-1,2-dichloroethene
- Trichloroethene
- Trichlorofloromethane
- Toluene
- Tetrachloroethene
- m&p-Xylenes
- Total Xylenes

Table 1-2 lists these compounds and their concentrations found in soil gas samples in IHSS 117.1. Table 1-3 lists these compounds and their concentrations found in soil gas samples in IHSS 197.

1.2 General Hydrogeology

The hydrogeologic setting of PIDAS Area IHSSs consists of thin layers of alluvium and colluvium, as well as small amounts of artificial fill material, which overlay weathered claystone bedrock of the Arapahoe or Laramie Formations. The alluvial and colluvial material consists of sandy clay and clayey gravel. Alluvial thickness ranges from 0 to approximately 8 feet. Colluvial material thickness ranges between one to three feet. The weathered claystone bedrock has a mean hydraulic conductivity that is two orders of magnitude less than the alluvium/colluvium found in the PIDAS area IHSSs ($1x10^{-06}$ cm/s in claystone and $1x10^{-04}$ cm/s in Rocky Flats Alluvium and Colluvium). Groundwater flow is northeasterly along the weathered bedrock and alluvial/colluvial interface, with a somewhat stronger vertical gradient present.

The soil contaminants of concern include chlorinated VOCs and radionuclides. Of specific concern in IHSS 117.1 and 197, is the detection of CCl_4 in the subsurface. When spilled at the surface, CCL_4, referred to as a Dense Non-Aqueous Phase Liquid (DNAPL), will travel vertically downward until a layer of lower permeable material is encountered. DNAPLs characteristically collect in or along depressions above low permeability materials. It is suspected that the differences in permeability between the weathered claystone bedrock and the overlying alluvial/colluvial material in IHSS 117.1, provides a suitable hydrogeologic setting for DNAPLs to collect. The higher permeability of surface deposits, as well as possible variations of erosional surfaces at depth, may explain why much higher concentrations of CCl_4 are found in this portion of IHSS 117.1, compared to other similar hydrogeologic settings in the IA.

2.0 SAMPLING AND DATA QUALITY OBJECTIVES

The primary objective of this SAP is to provide confirmation of possible VOC and radiological contamination in the area where the PIDAS fence is being proposed for installation. The data collected under this SAP will confirm the presence of contaminated soil within and directly upgradient of the suspected contaminated groundwater plume. Identification of these possible contamination areas prior to excavation /configuration of the PIDAS fence, will reduce the cost, assist in planning the volume of excavated soil, determine the best methods to perform the excavation, and minimize conflicts with any future remediation of the soils and/or groundwater in the vicinity of the PIDAS fence reconfiguration.

2.1 Data Quality Objectives

Data Quality Objectives (DQO) are established to optimize sample collection with respect to accomplishing the ultimate remediation objectives; stated differently, the DQO methodology will ensure collection of as few samples as possible (to minimize cost), while collecting enough samples to decide with a stated level of scientific confidence whether the project objectives have been accomplished. The method is consistent with the latest EPA guidance (EPA, 1994, "EOA QA/G-4"). For this project, the DQO is to acquire adequate data to provide confirmation of contaminated soil, and to provide recommendations for possible relocation of the PIDAS installation, due to conflicts that may result from remediation requirements for these IHSSs.

2.2 Data Adequacy

Previous subsurface investigations in the IA have been non-intrusive only. This involved collection of surface soil and soil gas samples only. No borehole or other deep intrusive activities

have been conducted. On the basis of existing data, the high concentrations of CCL_4 present in soil gas in IHSS 117.1 will be confirmed. The subsurface soils in the vicinity of the soil gas contamination will be evaluated to estimate the downgradient extent of any possible groundwater contaminant plume.

3.0 SAMPLE COLLECTION AND ANALYSES

3.1 Sampling and Analyses

Samples will be collected using a pushed hydraulic sampling tool (Geoprobe), which will utilize continuous 2-foot sample intervals from the surface to approximately 2 feet into bedrock, or to a sufficient depth to confirm weathered bedrock. Depths are estimated to average between 3 to 10 feet.

After the samples are screened for radiological contamination, they will be placed in sealed transparent containers. The samples will be inspected visually for evidence of liquid phase VOCs. They will be inspected under natural light for phase separated liquids and under an ultraviolet light (black light) for florescence which indicates liquid phase VOCs. The soil samples inside the sealed containers will be warmed to approximately 20°C to allow any VOCs present in the soil samples to volatilize in the sealed container's head space. The head space in the sealed container will then be evaluated with an organic vapor analyzer (OVA). Samples with OVA readings of 10 or greater parts per million will be considered contaminated with VOCs. The samples will then be placed in plastic bags for storage. Soil Gas Sampling and Field Analysis (5-21000-ER-OPS-GT.09) procedures will be utilized during the soil sampling. In order to get more representative sample results, every third VOC headspace sample will be screened using general chemistry methods.

In addition to VOCs, a sample will then be collected and composited for analysis of radionuclides, gross α and β activity, as well as Pu_{239} and Uranium isotopes $U_{234/235}$, U_{238}.

3.2 Soil Boring Locations

Geoprobe sample points will be located in the IHSSs based on surface soil/soil gas sample data for a particular location, as well as the proposed location for the PIDAS fence. The gradient controlling the flow of the DNAPLs is believed to be approximately the same as the groundwater gradient which is approximately the same as the ground surface slope.

Based on preliminary locations for the PIDAS fence, soil borings will be placed in a line along the northern portion of IHSS 117.1 and 197 concomitant with the southern extension of the PIDAS fence. Additional borings will be placed along the road, both inside and outside IHSS 172.

3.3 Soil Boring Surveying and Abandonment

The borings will be marked with uniquely numbered flags immediately after completion. The numbering on the flags will correlate with the sample analyses. Boring locations will be surveyed using the Global Positioning System (GPS) which provides digital information that will be placed into the Rocky Flats Environmental Data System (RFEDS). The digital information will be used to produce computer-generated maps of the soil boring locations. The GPS survey will be conducted in accordance with the manuals provided by the manufacturer of the surveying equipment, Ashtech, Inc.

The borings will be abandoned in accordance with procedure Plugging and Abandonment of Boreholes (5-21000-ER-OPS-GT.05) and modified as follows: boreholes will be backfilled with powdered or granular bentonite from ground surface and not tremmied.

4.0 SAMPLE DESIGNATION

The location and depth interval of all subsurface materials, either solid or liquid, recovered from the PIDAS IHSS area during the course of this investigation will be recorded in the field log book. RFEDS location codes will be indexed to appropriate sample location designations in the field log book and on a sketch map of the area. Soil core and other material that is subject to only field screening will be identified by the sample location code and depth interval where the sample is obtained. A block of location codes will be obtained from the RFEDS USM. The block will be of sufficient size to include the entire number of possible locations scheduled and an additional twenty percent for potential additional locations will be obtained.

5.0 SAMPLING EQUIPMENT AND PROCEDURES

Sampling will be conducted through the use of the Geoprobe, equipped for core recovery and liquid sampling. The core recovery equipment will be operated in accordance with procedures presented in GT.02, Subsection 5.3.5 and as modified by GT.39, Push Subsurface Soil Sample.

5.1 Sample Handling and Analysis

Core samples will be subject to field screening by visual techniques using natural and ultraviolet light, and by OVA instruments operated in accordance with procedures GT.09, Soil Gas Sampling and Field Analysis, Subsections 5.1 and 5.2, and FO.15 Photoionization Detectors and Flame Ionization Detectors. However, calibration verification will only be performed daily and not after every 20 samples. Headspace analysis will be performed utilizing sealed containers.

5.2 Documentation

A field notebook will be created and maintained for the project by the project manager or their designee. This will be used in conjunction with the appropriate field data forms required by the operating procedures (Table 3-1) governing the field activities occurring during this project. It is not necessary to duplicate items recorded on field data forms in the field notebook, but if additional clarification of entries on the forms is required, they should be recorded in the field notebook. The field notebook should include time and date information concerning the field activities and a sketch map of actual sample locations. Information not specifically required by the field data forms should be recorded in the field notebook. Soil cores will be logged in accordance with procedure 5-21000-ER-OPS-GT.01, Logging Alluvial and Bedrock Material. The logging will be conducted with sufficient detail in the field that detailed logging will not be performed as described in sections 6.1 and 6.2 except for Subsection 6.2.1. Soil core observations will be recorded on Form GT.1A, Rocky Flats Plant Borehole Log, and not on Form GT.1B, Preliminary Well-Site Field Log. Soil core will be screened for VOCs and radioactive contaminants. A portion or portions from different intervals of the same core run will be used for ambient temperature headspace (ATH) readings per GT.09, and the remaining sections of core will be placed into Ziploc bags before placement in a core box for future reference. Samples for ATH will be labeled with location code and depth interval. Soil samples will not have to be photographed.

6.0 PROJECT ORGANIZATION

The RMRS Sitewide Actions group will be tasked with managing and implementing the PIDAS IHSS investigation. Other organizations assisting with the implementation of this project include RMRS Health and Safety and RMRS Quality Assurance.

7.0 REFERENCES

DOE 1994, *Final Phase III RFI/RI, Rocky Flats Plant, 881 Hillside Area (Operable Unit 1),* U.S. Department of Energy, Rocky Flats Plant, Golden, Colorado, November 1993.

DOE 1995, *Final Corrective Measures Study / Feasibility Study, Rocky Flats Environmental Technology Site, 881 Hillside Area (Operable Unit 1),* U.S. Department of Energy, Rocky Flats Plant, Golden, Colorado, February 1995.

EPA 1992, *Dense Nonaqueous Phase Liquids -- A Workshop Summary,* EPA/600/R-92/030, Office of Research and Development, February 1992.

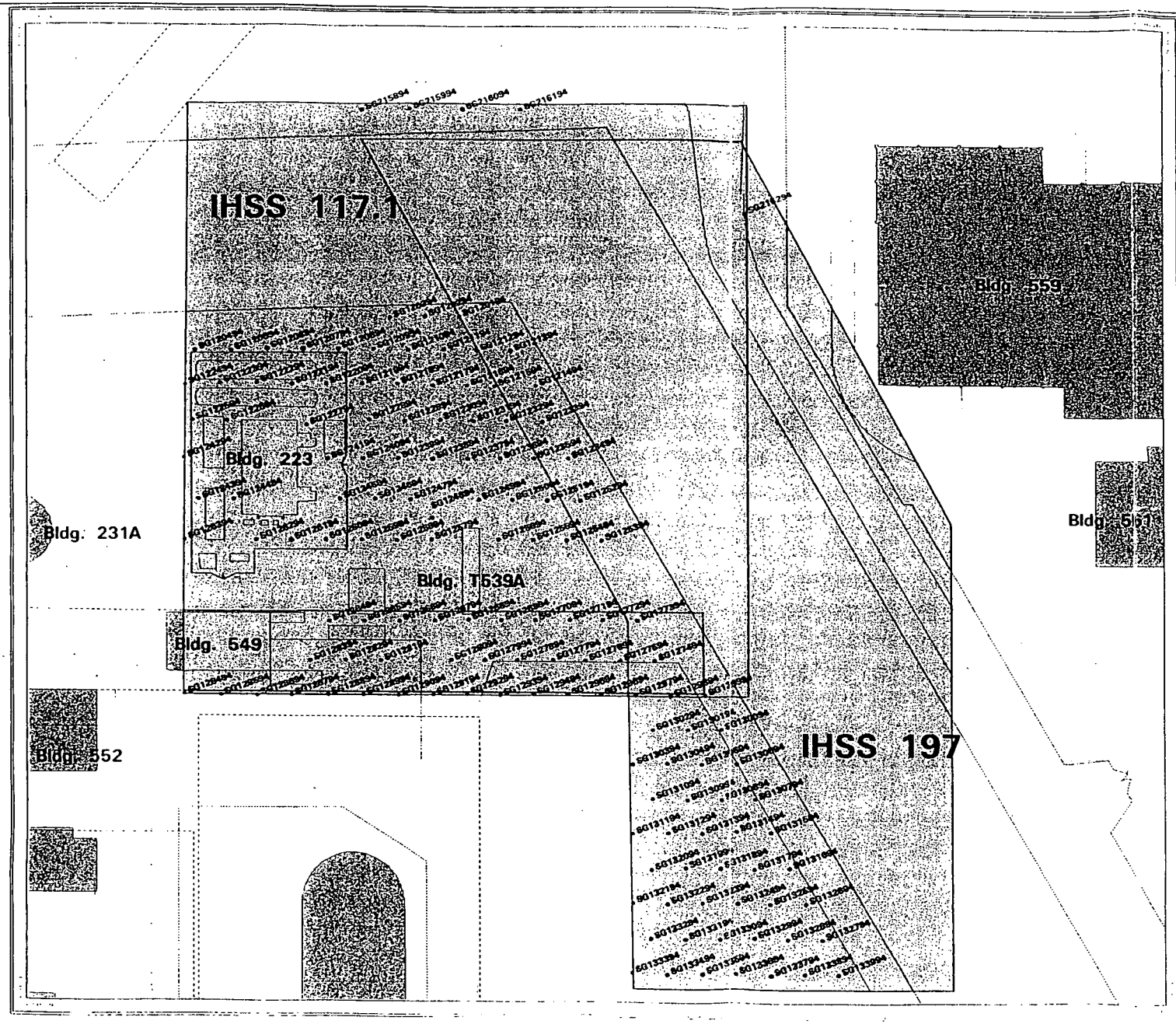

FIGURE 1-1

OU13 IHSS GROUP 117.1 & 197
SOIL-GAS SAMPLE LOCATIONS

EXPLANATION

- Soil-Gas Sample Location
- Sample Location Abandoned
- OU13 IHSS
- Buildings or other structures
- OU13 IHSS boundary
- Building footprint (where overlaps IHSS)
- Fences
- Paved roads
- Dirt roads

20 0 40 80ft

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:

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MAP ID: ou13

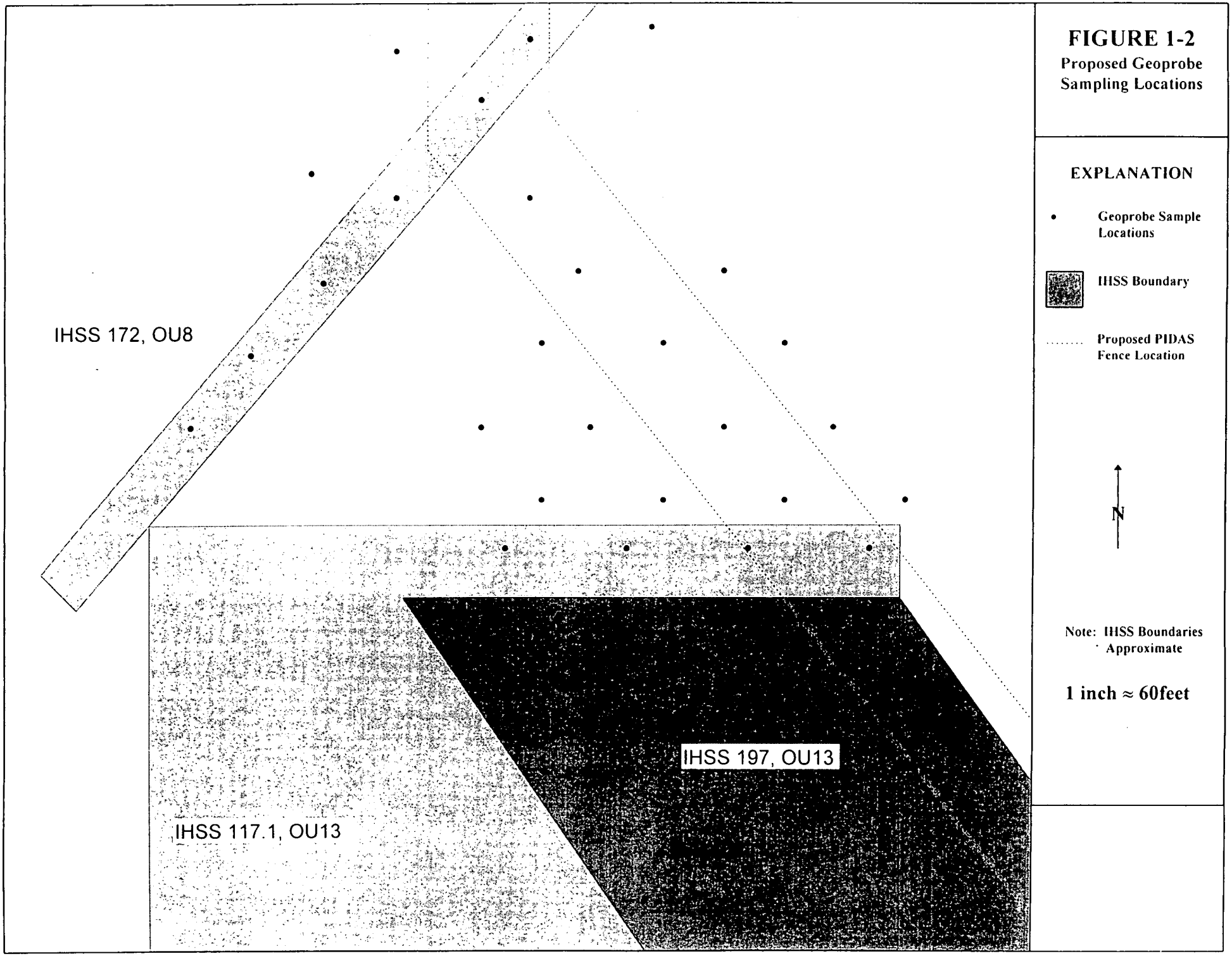
IHSS 172, OU8
IHSS 197, OU13
IHSS 117.1, OU13
FIGURE 1-2
Proposed Geoprobe Sampling Locations
EXPLANATION
Geoprobe Sample Locations
IHSS Boundary
Proposed PIDAS Fence Location
N
Note: IHSS Boundaries Approximate
1 inch ≈ 60feet

TABLE 1-1

Summary of VOC Concentrations in Soil Gas, IHSS 117.1

Sample Location.	Volatile Organic Compound (VOC)	Maximum Detected Concentrations (ug/L)
SG120394	CCl_4	2.700
SG215994	CLF	6.200
	CCl_4	930.000
	TCE	10.000
SG120394	PCE	1.200
SG120294	PCE	2.200
SG120194	PCE	18.000
SG121994	TCE	2.800
SG121894	TCE	1.600
	TCFM	1.400
SG121794	TCFM	1.800
SG121594	ACETONE	1.100
	PCE	3.100
SG124594	ACETONE	1.300
	TCFM	9.600
SG125094	ACETONE	6.100
	BZ	3.400
	PCE	2200.000*J
	TCE	19.000
	TCFM	47.000
SG125994	PCE	1.500
SG126794	CLM	1.200
SG127194	TCFM	2.000
SG128194	BZME	10.000
SG128094	ACETONE	1.700
SG128494	BZME	1.200
SG128594	TCFM	4.300
SG128694	BZ	1.100
SG128894	BZ	1.100
SG128994	BZ	1.400
SG129094	BZME	1.500
SG129194	TCFM	3.900
SG129394	TCFM	2.800

Data Qualifiers: U = not detected at or above method detection limit, B=appeared in method blank, E = estimated value, and J = estimated value.

Legend:

ACETONE = Acetone
BZ = Benzene
BZME = Toluene
CLF = Chloroform
CLM = Chloromethane
CCl_4 = Carbon Tetrachloride
DCE12C = cis-1,2-dichloroethene
PCE = Tetrachloroethene
TCE = Trichloroethene
TCFM = Trichlorofloromethane
XYLMP = m&p-Xylenes
XYLS = Total Xylenes

TABLE 1-2

Summary of VOC Concentrations in Soil Gas, IHSS 197

Sample Location	Volatile Organic Compound (VOC)	Maximum Detected Concentrations (ug/L)
SG121494	PCE	1.500
SG129794	BZME	1.000
	TCFM	7.000
SG130294	BZ	1.100
	BZME	1.400
SG130184	PCE	2.200
SG130494	TCFM	1.100
SG130594	PCE	4.800
	TCE	1.100
SG131094	DCE12C	1.600
	TCFM	1.100
SG130994	DCE12C	3.400
SG132194	BZME	5.100
SG133094	BZ	1.200
	BZME	22.000
SG133394	BZME	1.400

Data Qualifiers: U=not detected at or above method detection limit, B=appeared in method blank, E=estimated value, and J=estimated value.

Legend:

ACETONE = Acetone
BZ = Benzene
BZME = Toluene
CLF = Chloroform
CLM = Chloromethane
CCl_4 = Carbon Tetrachloride
DCE12C = cis-1,2-dichloroethene
PCE = Tetrachloroethene
TCE = Trichloroethene
TCFM = Trichlorofloromethane
XYLMP = m&p-Xylenes
XYLS = Total Xylenes

TABLE 1-3

Field and Administrative Standard Operating Procedures

IDENTIFICATION NUMBER	PROCEDURE TITLE
5-21000-OPS-FO.3	General Equipment Decontamination
5-21000-OPS-FO.6	Handling of Personal Protective Equipment
5-21000-OPS-FO.7	Handling of Decontaminated Water and Waste Water
5-21000-OPS-FO.10	Receiving, Labeling, and Handling Environmental Materials Containers
5-21000-OPS-FO.11	Field Communications
5-21000-OPS-FO.12	Decontamination Facility Operations
5-21000-OPS-FO.14	Field Data Management
5-21000-OPS-FO.15	Photoionization Detectors and Flame Ionization Detectors
5-21000-OPS-FO.16	Field Radiological Measurements
5-21000-ER-OPS-GT.01	Logging Alluvial and Bedrock Material
5-21000-ER-OPS-GT.02	Drilling and Sampling Using Hollow Stem Auger Techniques
5-21000-ER-OPS-GT.05	Plugging and Abandonment Boreholes
5-21000-ER-OPS-GT.09	Soil Gas Sampling and Field Analysis
4-S64-ER-OPS-GT.39	Push Subsurface Soil Sampling
1-50000-ADM-12.01	Control of Measuring and Test Equipment

Table 1-4

PIDAS Fence Cost Estimate

	Protected Area Reconfiguration Project			
		WP #		
		COST ESTIMATE		
		19-Feb-96		
	PROJECT			
	Sampling and analysis of area where PIDAS fence will cross IHSSs 117.1 and 172 using the GeoProbe rig.			
		Unit/Duration	***Unit Cost***	***Project Costs***
	Summary Tasks Description	***(hr)****	***($/hr)****	***TOTAL***
General				
	IWCP, Permitting, Health and Safety Review, Job Site Training, and Field Mobilization	30	$85	$2,550
Geo-Probe Sampling Crew				
	Driller/Rig Operator	50	$85	$4,250
	H&S Tech & Driller's Helper	50	$85	$4,250
	Sample Tech/Logger	50	$85	$4,250
	RCT Support	20	$100	$2,000
	Decon Tech	20	$85	$1,700
Materials and Other Direct Costs				
	PPE (3 people)	1 week	$500/wk	$500
	Organic Vapor Analyzer Rental	1 week	$450/wk	$450
	Operating Cost (gasoline, decon supplies, etc)	50	$7	$350
	Miscellanous	1 week	$200/wk	$200
Sample Analysis		**No. of Samples**	**$/sample**	
	OVA Headspace	16	$15	$240
	Select VOA Sweep, code 0213	8	$312	$2,496
	Gross Alpha/Beta, code 0048	24	$179	$4,296
	Radionuclides (Pu/Am), code 0052/0	8	$627	$5,016
Contingency @ 25% Project Cost				$8,137
			TOTAL	**$40,685**
* Unless noted otherwise				
	ASSUMPTIONS:			
1 -	Initial sampling will be limited 5 to 8 sample sites			
2 -	Project duration assumed to be 5 working days at 10 hours per day			
3 -	Composite samples will be collected for wet lab analysis			
4 -	Analytical costs are based on onsite lab prices.			
5 -	RCT needed only 2 days per week			
6 -	Contingency is estimated at 25% of the total project cost			
7 -	Field Sampling Plan development costs are excluded in this estimate			