300405-060426000

JUL 27 2004

CH2M HILL
Mound, Inc.
1 Mound Road
P.O. Box 3030
Miamisburg, OH
45343-3030

ER/WM-038/04
July 26, 2004

Ms. Margaret L. Marks, Director
Miamisburg Closure Project
U. S. Department of Energy
500 Capstone Circle
Miamisburg, OH 45342

ATTENTION: Paul Lucas

SUBJECT: Contract No. DE-AC24-03OH20152
Statement of Work Requirement 055 - Regulator Reports
PRS 423 SURVEY UNIT DESIGN, FINAL

Dear Ms. Marks:

Sue Smiley from your office authorized the release of the following document for Core Team review:

- PRS 423 Survey Unit Design, Final
- Response to Regulator Comments

These documents were faxed on July 26. If you or members of your staff have any questions regarding the document, or if additional support is needed, please contact me at 937-865-4203.

Sincerely,

David A. Rakel
CERCLA Lead

DAR/jg

Enclosures

cc: David Seely, USEPA, (1) w/attachments
Brian Nickel, OEPA, (4) w/attachments
Ruth Vandegrift, ODH, (1) w/attachments
Mary Wojciechowski, Tetra Tech, (1) w/attach
Sue Smiley, DOE/MCP, (1) w/attachments
Lisa Rawls, MCP, w/o attachments
Val Darnell, CH2M Hill, (1) w/attachments
CERCLA Records, CH2M Hill, (1) w/attachs
ER Records, CH2M Hill, (1) w/attachs
DCC (1) w/attachments
John Fulton, CH2M Hill, w/o attachments
Dave Rakel, CH2M Hill, w/o attachments

Response to Comments

on Group 9 SUD PRS 423, July 23, 2004

OH EPA A Comment 1. The issue of sampling for chemicals in the UGLs came up in the review of the work plan. We all agreed to defer the issue to the VSAP. In the draft VSAP Document Review Comment Form dated 5/7/2004, refer to the resolution of general comment number 5. The comment was "This VSAP should include verification sampling for the chemicals that were identified in Section 3.5 Chemicals of Concern on page 12 of the WP Soil Removal section in the UGL Removal Plan." The resolution stated, "The chemicals of concern will be added."

US EPA Comment 3. Rationale for the selection of COCs should be provided. Specifically the UGL VSAP/SUD should explain why chemicals identified in section 3.5 of the UGL Soil Removal Work Plan are not included or the chemicals should be included.

Response. Table 2 in both the Work Plan and Table 5 of the UGL Action Memorandum show no chemical COCs for PRS 423. During remediation, four isolated areas in PRS 423 appeared to have discoloration and were found to have predominantly Pu238 radiological contamination. These areas were fully removed leaving bedrock surfaces in the trench. No further discoloration was observed on the floor or sidewalls. The one Bias Sample with a description that indicates potential chemical contamination (TPH odor) found to date was located within the boundaries of PRS 424 and will be addressed with that SUD.

OH EPA A Comment 2. On page 4-11 of MARSSIMS, the last sentence on the page under Class I area states: "Note that areas containing contamination in excess of the $DCGL_w$ prior to remediation should be classified as Class 1 areas."

OH EPA B Comment 1. All of the disturbed areas need to be classified as Class 1. 100% walkover survey of all areas accessible. Areas are considered Class 1 to ensure that cross contamination has not occurred during remediation.

US EPA Comment 1. SU classification should be class 1 because (1) there is an exceedance of the CO for Ra-226 (sample No. pv7), (2) the MDA for Th-230 13 or 14 reported results is above the CO, and (3) There is a potential for cross contamination when R bldg is demolished. Therefore based on the information presented, this PRS has some contamination known to be above the DCGL (at pv7) and potential for other areas to have COCs above the DGCL and according to Section 4.4 of MARSSIM should be classified as a class 1 SU.

Response. The SUD has been reclassified as Class 1.

OH EPA A Comment 3. In the number of samples calculation, it appears that the inability to see plutonium in the field was not factored in. Can you explain why? Also,

since Th230 is a COC, the MDA is not below or even close to the cleanup level in the pre-verification samples. How do we know that we do not have Th230 at or above the cleanup objective or even above a hot spot? A fair amount of the MDAs for Th230 are above the hot spot criteria.

OH EPA B Comment 2. For areas inaccessible for walk-over survey, the area factors method should be used to determine the appropriate number of samples.

OH EPA B Comment 4. The MDA for Th230 in prevar samples is insufficient to support decisions at the cleanup objective. Given this information, OEPA recommends that backfilling not occur until verification data analysis supports that an adequate number of samples have been taken,

US EPA Comment 5. Based on the information in Appendix B, the inability of field scanning instruments to detect Pu-238 at the CO was not accounted for when calculating the number of samples.

Response. Area factors and standard approach for the number of samples and grid spacing were considered but due to the "inability" to see Pu-238 and areas which are inaccessible for walk-over survey, the conservative Pu238 fifteen foot triangular grid was selected. Since the trench is only five feet wide, samples will be taken every 15 feet along the bottom of the trench and a 15 foot grid will be used for the sidewalls of the trench.

Based on process history it is improbable that Th-230 would be present without any other associated contamination and PU238 is the major constituent of concern. RASS sampling identified the areas of Pu 238 contamination which was remediated.

It is recognized that the RASS samping MDA for Th230 from gamma spec is higher than the CO but the sampling is not being used as verification. The FSS samples will be analyzed via alpha spec by design, which will provide MDAs for Th230 below CO.

OH EPA B Comment 5. The maps showing the survey units do not provide sufficient detail. Depth of the dig, sidewall, etc., are not appropriately depicted. They do not even show where the verification samples are to be taken.

US EPA Comment 16. The figures in Attachment B are difficult to interpret. Does SU1 and SU2 consist of the bottom and sidewalls of the trench respectively? The figures in Attachment B need to (1) better define the SU boundaries, (2) explain the layout relative to other site features, (3) specify dimensions and (4)show sample locations on the proposed sampling grid.

Response. Dimensions were added to the maps in the revised SUD. Sample locations are shown for the sidewalls (SU2); as stated in the SUD, the sample locations for SU1 will be finalized in the field (See paragraph 6a – Number of Samples).

OH EPA B Comment 6. The sample IDs from the soil analysis report do not match the sample IDs in the rad survey data sheet, explain?

Response. The RSDS used to prepare the draft SUD were draft, unsigned copies. Final approved copies are included with the final SUD providing direct data correlation.

OH EPA B Comment 7. Mound has yet to show scanning MDC for the COCs associated within this PRS.

Response. The comment is correct. Mound is evaluating several options with respect to developing MDCs for its most common radiological contaminants. In a similar comment on the Standard Soil VSAP, OEPA indicated the PRS 66 soil segregation work by Argonne could be used as a source material for this effort. This analysis indicated that, for the PRS 66 isotopes, the Fidler is least sensitive to Pu-238. Since Pu-238 is a COC for PRS 423, the previously agreed value (350 pCi/g) was used.

US EPA Comment 2. The UGL VSAP/SUD should explain how cross contamination due to demolition of R bldg will be prevented. Will samples be collected before or after R bldg is demolished? Will the trench be backfilled before or after R bldg is demolished? What measures will be taken to prevent cross contamination?

Response. PRS 423 is planned to be backfilled prior to demolition of the contaminated portions of the R/SW buildings.

US EPA Comment 4. There is no mention of biased samples. If they are not necessary for this SU then a statement to this effect should be included.

Response. No bias sampling is planned by CH2M HILL for final verification. Bias samples are always within the discretion of the EPA.

US EPA Comment 6. Item 6a says that sample locations will be surveyed at the time of sampling or closely following. Clarify how these locations will be surveyed and whether GPS will be used.

Response. Sample locations will be surveyed in by direct reflex at the time of sampling or closely following. GPS will not be possible because of the hazards of putting an individual in the trench.

US EPA Comment 7. Item 8 should specify the type of QC samples to be collected. Will they be field duplicates? Is extra sample volume needed for matrix spike analyses?

Response. Field duplicates will be collected on a one per 20 sample frequency.

US EPA Comment 8. In item 9 field and laboratory methods are not specifically referenced. For walkover surveys, the specific RAD CON SOP number should be referenced. For laboratory analysis the specific laboratory SOP number from the methods compendium should be referenced.

Response. The specific radcon procedures are MD-80036, Radiological Operations Procedures, Operations 30005, 30007, and 30040. Methods Compendium SOP #'s include: A-012, A-015, Q-002, S-001, S-002,S-028, and S-029.

US EPA Comment 10. Item 10 states that the project engineer will evaluate the need for additional samples. An explanation of how this evaluation will take place should be provided. Will the verification standard deviation be compared to the preverification standard deviation as discussed in Section 8.2.2.1 of MARSSIM?

Response. The project engineer will evaluate the need for additional samples based on sampling results. Section 8.2.2.1 will be used for the evaluation if applicable.

US EPA Comment 9. Item 9 states that analyses will be per the methods compendium and 5400.5 as applicable. Since 5044.5 does not explicitly list analytical methods, the applicability of this document for choosing how to analyze samples should be explained.

US EPA Comment 11. Item 10 states that the bedrock surface may need to be sampled. More information on how this will be done should be provided. Will swipe samples be collected? Will the bedrock surface be scanned? Which release criteria from 5400.5 will be used?

OH EPA B Comment 3. How will multiple isotopes be accounted for when utilizing 5400.5 for samples from bedrock.

Response. Bedrock surfaces will be swiped and gross alpha and beta measurements will be performed and compared to the most restrictive COC in 5400.5. If the location fails to meet the most restrictive criteria then it will be sent to alpha spec for determination of the COC so the applicable, instead of the most restrictive, criteria can be applied.

US EPA Comment 12. Item 10 states that where the trench walls is inaccessible for sampling RASS sample data will be used. It is not clear why a particular sample that was accessible for RASS would be inaccessible for verification. The SUD should explain what conditions have changed to make a previously accessible location inaccessible.

Response, The utilization of RASS sampling for sidewall compliance has been re-evaluated. RASS sampling data will not be used for verification of sidewall compliance to the CO. Due to the safety concerns of placing an individual in the trench, FSS side wall sampling will be accomplished by scraping the sidewall with an excavator bucket and subsequent sampling of the material in the bucket. Samples will be taken on a 15 foot triangular grid.

US EPA Comment 13. The Soil Analysis Reports refer to MD-10438. It is not clear why a method from the methods compendium (MD-80045) was not used to analyze

the sample.

Response. The reference on the soil analysis reports is in error and the correct reference is the methods compendium (MD-80045). The limits associated with the incorrect reference are inapplicable and have been lined-out on the RSDS sheets.

US EPA Comment 14. In attachment B the number of samples for SU1 which was determined to be 15 appears to be crossed out. Please clarify the intent of this notation and actual number of samples to collected for SU1.

Response. The number of samples in SU 1 were evaluated using three methods. Using the standard VSAP spreadsheet, 15 samples were derived. With this method the grid length and height were less than the standard Pu-238 grid spacing of 15 feet. The 15 foot triangular grid applied over the trench geometry resulted in approximately five samples. It was therefore conservatively decided to use a 15 foot linear grid along the trench resulting in 12 samples.

US EPA Comment 15. Attachment B shows the inputs to the grid spacing calculation but does not show the calculated grid spacing.

Response: The only inputs to the sample calculation form are the standard deviations, survey unit area, PRS number, and Survey Unit number. The grid length and height shown are the calculated grid spacing numbers.

Final Survey Unit Design

Project: **Under Ground Lines, PRS 423**

Review & Approval

Project Engineer: Dennis Lammlein _____

Reviewer: James Fontaine _____

Reviewer: Christine Lee _____

document	Title
AM	*UGL Action Memorandum, September 2003*
WP	*Underground Lines Removal, ETL-MND-106-00, January 2004*
VSAP	*Standard VSAP Draft Final, Rev. 0, June 2004*

Final SUD Worksheet

Step No.	Description	Fill in the blanks....
1	Summarize historic **information** relevant to SU	PRS 423 addresses the concrete encased 8" vitrified clay pipe starting at H-Building wall, running through Manhole HW-22, and continuing to Manhole HW-20 where PRS 423 terminates. Potential Release Sites 423 through 428 are underground line segments that served to carry radioactively contaminated wastes from H Building (environmental laboratories, laundry, change rooms) operations to the Waste Disposal (WD) Building.
2	Summarize historic **data** relevant to SUD	Historic sampling data (prior to RA) located within this PRS did not show any results above the CO. RASS sampling during the removal action are depicted and listed in Attachment A. The results are also contained in Common on 'ER' K:\Shared\Lammlein\SUDs & Supporting Files\PRS243\prs423rass.xlw as well as Attachment A.
3a	COCs & basis	Actinium-227, CO 4.6 pCi/g Americium-241, CO 63 pCi/g Cesium-137, CO 3.8 pCi/g Cobalt-60, CO 0.7 pCi/g Plutonium-238, CO 55 pCi/g(1) Radium-226, CO 2.9 pCi/g Thorium-228, CO 2.6 pCi/g Thorium-230, CO 2.8 pCi/g Thorium-232, CO 2.1 pCi/g CO is 10^{-5} RBGV + background or HI=1 value except as noted (1) Value of 55 pCi/g was based on Core Team decision. Basis: Reference UGL Action Memorandum, September 2003; Table 2 of the UGLs Removal Plan; and Mound Plant Potential Release Site Package PRS 423, 424, 425, 426, 427, 428. During remediation, four isolated areas in PRS 423 appeared to have discoloration and were found to have predominantly Pu238 radiological contamination. These areas were fully removed leaving bedrock surfaces in the trench. No further discoloration was observed on the floor or sidewalls.
3b	Chemical basis for std dev, AM COCs/New COCs	No Chemical COCs
4	Classify Areas	Class / Scan Coverage guidelines 1 / 100% 2 / 10-90% 3 / judgmental
5	Subdivide areas into SUs	Area is divided into two Survey Units, see Attachment B. SU1 is the trench bottom itself and is 86 square meters. SU2 is the trench side wall areas and is 344 square meters.

6a	Calculations / Rad	See Attachment B.
	a. Calculate the (s) for each COC listed above	See Attachment B.
	b. Number of Samples	Calculated 15 samples in each SU. Since SU1 is approximately five feet wide samples will be taken at 15 foot intervals from a random starting point to be selected by a drop off a rock in the field. Sample locations will be surveyed by direct reflex at the time of sampling or closely following. SU1 wil have approximately 12 samples. SU2 is composed of both side walls and has an area of 344 square meters. A 15 foot grid started at a randomly selected starting point yielded 16 samples. Note: The utilization of RASS sampling for sidewall compliance has been re-evaluated. RASS sampling data will not be used for verification of sidewall compliance to the CO. Due to the safety concerns of placing an individual in the trench, FSS side wall sampling will be accomplished by scraping the sidewall with an excavator bucket and subsequent sampling of the material in the bucket. Samples will be taken on a 15 foot triangular grid.
6b	Calculations/Chem, Std dev,Number of Samples	No Chemical COCs
7	Grid spacing	15 foot triangular grid
8	QA/QC	1/20 via field duplicate in accordance with Mound Methods Compendium. Q-002 Chain-of-Custody Procedures S-001 General Instructions for Field Personnel S-002 Soil Sampling With a Spade and Scoop S-028 Sample Control and Documentation S-029 Guide to Handling, Packaging, and Shipping of Samples and Method Q-002
9	Analyses	Per Mound Methods Compendium and 5400.5 as applicable. A-012 Isotopic Uranium, Isotopic Plutonium, and Isotopic Thorium by Alpha Spectrometry A-015 Gamma Spectrometry MD-80036 OP 30005, 30007, and 30040 Bedrock surfaces will be swiped and gross alpha and beta measurements will be performed and compared to the most restrictive COC in 5400.5. If the location fails to meet the most restrictive criteria then it will be sent to alpha spec for determination of the COC so the applicable, instead of the most restrictive, criteria can be applied.
10	Not otherwise covered.../ comments	Site policy requires performance of onsite soil screening (NaI or germanium on verification samples slated for offsite analysis and evaluation of the results prior to shipment. This analysis will generally be performed on a spli of the verification sample containerized in an EPA dish (approximately 500

mL) but may be performed on the actual verification sample as long as containerization requirements are maintained for the offsite lab. Count time of the analysis will be sufficient to meet the cleanup objectives (COs) of the contaminants of concern (COCs) requiring verification.

If there is an insufficient volume of soil to fill an EPA dish within a 1m x 1m square centered on the proposed sample location, due to bedrock or obstruction (such as a structure, foundation, or utility bank which is not to be removed), then soil analysis will not be performed. In lieu of a soil analysis result, RadCon will survey the surface per 5400.5 and provide documentation thereof in an RSDS. The RSDS(s) will be included as documentation. Any final sample location that does not meet the surface release criteria will be submitted to the Core Team for concurrence prior to the area being backfilled.

Accessibility for sampling is a constraining factor. Sampling of the trench walls is impeded due to trench wall accessibility by both personnel and equipment. Side wall sampling will be performed via excavator sampling. Accessibility to the trench floor by personnel is impeded due to the width of the trench not being sufficient to use a man-box for access. Where sufficient volume of soil exists and is accessible with an excavator a soil sample will be taken otherwise a surface survey (swipe and direct) will be performed utilizing methods available from atop the trench.

No bias sampling is planned by CH2M HILL for final verification. Bias samples are always within the discretion of the EPA.

REFERENCES

1: Work Plan for Environmental Restoration of the DOE Mound Site, The Mound 2000 Approach, February 1999, Final, Revision 0
2: PP-1059A, Issue 11, Integrated Work Control Program
3: PP-1060A, Issue 5, Quality Assurance Program Plan
4: MD-80036, Issue 36, Radiological Operations Procedures
5: MD-80043, Issue 14, Radiological Work Requirements
6: Miamisburg Environmental Management Project, Storm Water Pollution Prevention Plan, OPA980099, Issue 0, December 1, 1998
7:MD-10167, Radioactive Waste Procedures, Operations 420: Waste Stream Characterization and 428: Waste Radionuclide Identification and Quantification
8: MD-70523, Management of Hazardous Waste, Trash, and Recyclable Materials, Operation 001: Waste Verification Sampling and Analysis

Th-232		Pu-238		Am-241	
Activity (pCi/g)	MDA	Activity (pCi/g)	MDA	Activity (pCi/g)	MDA
0.24	0.24	10.04	24.92		
0.4	0.4	0	25.06		
0.2	0.3	3.94	22.23		
0.03	0.46	2.5	25.63		
0.02	0.02	0.01	1.23	0	0
0.32	0.13	0	13.03	0	0.06
0.31	0.09	0	19.37	0.02	0.06
0.34	0.17	0	15.59	0	0.07
0.22	0.27	0	17.23	0.02	0.07
0.24	0.22	6.18	13.89	0.05	0.07
0.37	0.09	0	17.9	0	0.06
0.42	0.12	2.64	12.88	0	0.06
0.3	0.2	0	13.84	0.01	0.05
0.38	0.13	1.35	12.53	0	0.06
0.43	0.08	0	33	0.11	0.07
0.35	0.13	4.69	13.33	0.03	0.06
0.3	0.13	0	12.57	0	0.06
0.62	0.12	0	23.21	0	0.09

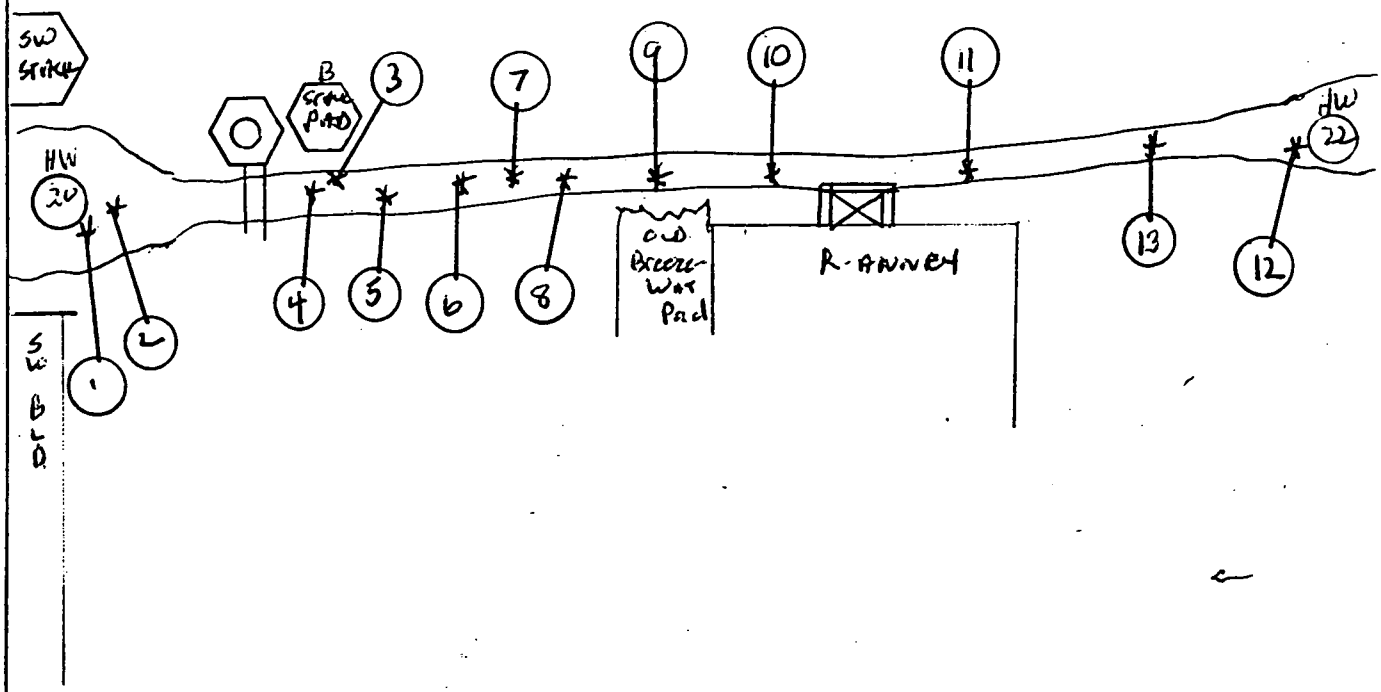
RadCon ID	Lab ID	Co-60 Activity (pCi/g)	MDA	Cs-137 Activity (pCi/g)	MDA	Pb-210 Activity (pCi/g)	MDA	Ra-226 Activity (pCi/g)	MDA	Ac-227 Activity (pCi/g)	MDA	Th-230 Activity (pCi/g)	MDA
pr1	gl10356			0	0.11			1.23	1.33	0	0.39		
pr2	gl01447			0.02	0.07			1.49	1.25	0	0.45		
pr3	gl01448			0.04	0.1			0.68	1.3	0	0.47		
pr4	gl01446			0.03	0.01			1.22	1.17	0.16	0.36		
pr5	gl01515	0	0	0	0	0.03	0.05	0.09	0.06	0	0.02	0.01	0.48
pr6	gl01517	0	0.08	0	0.04	0.52	0.47	0.85	0.6	0.02	0.19	0	4.9
pr7	gl01520	0	0.03	0	0.03	0.68	0.61	0.42	0.58	0.08	0.18	0	6.04
pr9	gl01522	0.05	0.05	0.03	0.04	0.78	0.59	1.03	0.69	0	0.27	0	5.72
pr10	gl01556	0	0.09	0	0.06	0.5	0.68	0.98	0.89	0.22	0.24	1.56	6.48
pv1	gl01465	0	0.06	0	0.05	0	0.71	0	0.9	0	0.25	0	6.54
pv2	gl01514	0	0.03	0	0.03	0.46	0.69	0.15	0.54	0	0.17	0	5.97
pv3	gl01516	0.02	0.05	0	0.05	0.44	0.48	0.6	0.73	0	0.22	0	5.87
pv4	gl01519	0.01	0.06	0	0.04	0.03	0.6	0.6	0.72	0	0.21	0	6.17
pv5	gl01521	0.01	0.05	0.01	0.04	0	0.64	1.15	0.59	0.06	0.2	2.32	4.48
pv6	gl01547	0.01	0.03	0.01	0.03	0.21	0.71	0.6	0.67	0.21	0.21	0	7.5
pv7	gl01576	0.01	0.06	0	0.05	0.29	0.62	3.77	0.77	0.02	0.22	2.31	4.97
pv8	gl01577	0	0.04	0	0.05	0.31	0.59	1.42	0.62	0	0.22	0	5.78
pv9	gl01594	0.01	0.04	0	0.04	0	0.96	0.98	0.7	0.22	0.19	0	8.08

Attachment A

RADIOLOGICAL SURVEY DATA SHEET

LOCATION: (BLDG. / ROOM / AREA) PRS 423	SURVEY NO. 04-ER-2083
PURPOSE: Characterization and pre-remediation soil samples taken during excavation of underground lines.	RWP NO. 1511
	DATE: 5/20/04 thru 6/17/04
	TIME: N/A

MAP / DRAWING



NOTES:

Map is not to scale and sample locations are approximate
Manholes # HW 20 & HW 22 have been removed.

→ See page 2 of 15 for cross reference of sample number & lab ID#

LEGEND:
= mrem/hr (γ) whole body
#E = mrem/hr (β+η+γ) extremity on contact
K = factor of 1000
— · — · · = radiological boundary

△# = mrem/hr neutron

= air sample number

(#) = ~~swipe number~~ Sample number

(#/α) or /β = direct contamination measurement in dpm/100 cm²

INSTRUMENTS USED

Instrument	Serial Number	Cal. Due Date
	N	
	A	

[redacted] HP# 5988 Date 7-6-04

Counted by (Signature) SEE HP# Date

Counted by (Print Name) ATTACHED

Reviewed/Appro[redacted] HP# 7725 Date 7/21/04

Reviewed/Approved by: (Print Name) [redacted]

Survey No. 04-ER-2083

RADIOLOGICAL SURVEY DATA SHEET (cont.)

Removable Contamination				
Swipes (dpm/100cm²)				
Sample #	β/γ	Alpha	Tritium	LAB ID. #
1				GLO 1356
2				1411
3				1447
4				1448
5				1430
6				1442
7				1444
8				1446
9				1515
10				1517
11				1520
12				1522
13				1556
14				
15				
16				
17				
18		N		
19		A		
20				
21				
22				
23				
24				N
25				A
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				

Removable Contamination				
Swipes (dpm/100cm²)				
Sample #	β/γ	Alpha	Tritium	
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53		N	A	
54				
55				
56				
57				
58				
59				
60				
61				
62				
63				
64				
65				
66				
67				
68				
69				
70				

COMMENTS: N/A

NOTES:

1. See MD-80036 10002 for calculations of WB, extremity and skin dose rates.
2. To request RO Count Room analysis for β/γ, alpha or tritium, leave column blank. Mark column N/A if not needed. If count room printout of re are attached, write "see attached" in column.
3. Annotate special sample type (e.g., soil, water), special identifiers or otherwise in Comments. If not needed, mark N/A.

ML-9620 (4-98)

04-ER-2083 3 of 4/15 H

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01356
File ID: PD100264.s0
Priority: Yes

Description\Location
PRS423 Sand at Manhole of Pipe
Pink + Pre-remediation sample #1

Collector: 7793
Date Received: 5/20/04
Date Collected: 5/20/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60				45,000
Cs-137	*	0	0.11	45,000
Pb-210				45,000
Ra-226	*	1.23	1.33	800 CB
Ac-227 (D)	*	0	0.39	40
Th-230				800
Th-232 (D)		0.24	0.24	130
Pu-238	*	10.04	24.92	500
Am-241				500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~ CB

Σ DOT _____ nCi/g Σ Respirator _____

Σ Respirator <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4

Σ DOT 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Pre-remediation / characterization sample. Soil went to rail spur.

Date: 5/20/04 Counted By: 2257 Analyzed By: 7559 Initials [redacted]

See original RSOS 04-ER-2031

COPY

#1

04-EA-2083

4/15

#

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01411
File ID: PD500065.s0
Priority: Yes

Description\Location
S-52604-01
Pink

Collector: 7787
Date Received: 5/26/04
Date Collected: 5/26/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60				45,000
Cs-137	*	0.04	0.05	45,000
Pb-210				45,000 CB
Ra-226	*	1.2	1.39	800
Ac-227 (D)	*	0.19	0.38	40
Th-230				800
Th-232 (D)		1.13	0.16	130
Pu-238		63.01	42.12	500
Am-241		0.82	0.16	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~ CB
U-238d	1.79	0.86	

Σ_{DOT} nCi/g $\Sigma_{Respirator}$

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

• Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Grab sample - soil discolored, Averaged over hauler load - sent to rail spur.

Date: 5/26/04 Counted By: 5288 Analyzed By: 7559 Initials [redacted]

SEE ORIGINAL RSDS # 04-EA-2040

#2

COPY

04-ER-2083

5/15

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01447
File ID: PD100295.S0
Priority: Yes

Description\Location
PRS423 Pre-remedition #2
Pink

Collector: 5983
Date Received: 6/2/04
Date Collected: 6/2/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60				45,000
Cs-137	*	0.02	0.07	45,000 CB
Pb-210				45,000
Ra-226		1.49	1.25	800
Ac-227 (D)	*	0	0.45	140
Th-230				800
Th-232 (D)		0.4	0.4	130
Pu-238	*	0	25.06	500
Am-241				500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~ CB

Σ_{DOT} nCi/g $\Sigma_{Respirator}$

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

• Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Pre-remediation / characterization sample taken just east of electrical bank manhole.

Date: 6/3/04 Counted By: 5268 Analyzed By: 7559 Initials [redacted]

#3

04-EA-2083 6/16

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01448
File ID: PD100296.S0
Priority: Yes

Description\Location
PRS423 Pre-Remedtion #3
Pink

Collector: 5983
Date Received: 6/2/04
Date Collected: 6/2/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60				45,000
Cs-137	*	0.04	0.1	45,000
Pb-210				45,000
Ra-226	*	0.68	1.3	800
Ac-227 (D)	*	0	0.47	40
Th-230				800
Th-232 (D)	*	0.2	0.3	130
Pu-238	*	3.94	22.23	500
Am-241				500

CB

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~

CB

Σ_{DOT} nCi/g $\Sigma_{Respirator}$

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Pre-remediation / Characterization sample taken next to B-stack pad.

Date: 6/3/04 Counted By: 7559 Analyzed By: 7559 Initials [redacted]

#4

04-ER-2083 7/15

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01430
File ID: PD100284.S0
Priority: Yes

Description\Location
S-52704-1
PINK

Collector: 5983
Date Received: 5/27/04
Date Collected: 5/27/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60				45,000
Cs-137	*	0.03	0.07	45,000
Pb-210				45,000
Ra-226		2.26	1.31	800
Ac-227 (D)	*	0	0.38	40
Th-230				800
Th-232 (D)		0.65	0.21	130
Pu-238	*	9.5	27.31	500
Am-241				500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~

Σ_{DOT} _____ nCi/g $\Sigma_{Respirator}$ _____

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4

Σ_{DOT} 2nCi/g limit, total activity.

(D). Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: PRS-423 Bias Sample : Characterization grab sample

Date: 6/1/04 Counted By: 7559 Analyzed By: 7559 Initials [redacted]

SEE ORIGINAL RSDS # 04-ER-2042

#5

COPY

04-ER 2083

8/15

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01442
File ID: MG102907.S0
Priority: Yes

Description\Location
S-60104-01
LONG

Collector: 5983
Date Received: 6/1/04
Date Collected: 6/1/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60	*	0	0.07	45,000
Cs-137	*	0	0.04	45,000
Pb-210	*	0	0.68	45,000 CB
Ra-226	*	0.36	0.77	800
Ac-227 (D)	*	0	0.24	40
Th-230	*	0	5.61	800
Th-232 (D)		0.5	0.15	130
Pu-238	*	0	15.23	500
Am-241	*	0	0.06	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~ CB

Σ_{DOT} 0.02 nCi/g $\Sigma_{Respirator}$ 0.05

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Characterization Sample - 8'-10' by 8 - stack pack
Composite sample from several buckets.

Date: 6/1/04 Counted By: 5268 Analyzed By: 7559 Initials [redacted]

SEE ORIGINAL RSOS # 04-ER-2045

#6

COPY

04-ER-2083 9/15

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01444
File ID: MG102908.S0
Priority: Yes

Description\Location
S-60204-1
LONG

Collector: 5983
Date Received: 6/2/04
Date Collected: 6/2/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60	*	0	0.06	45,000
Cs-137	*	0	0.05	45,000
Pb-210	*	0	0.62	45,000
Ra-226		0.8	0.61	800
Ac-227 (D)	*	0	0.21	40
Th-230	*	1	4.58	800
Th-232 (D)		0.339	0.11	130
Pu-238	*	0	13.31	500
Am-241	*	0	0.06	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~

Σ_{DOT} 0.02 nCi/g $\Sigma_{Respirator}$ 0.04

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Composite sample, characterization going to rail spur PRS-423

Date: 6/2/04 Counted By: 5268 Analyzed By: 7559 Initials [redacted]

SEE ORIGINAL RSOS # 04-ER-2046

COPY

Pre-remediation #45 PRS 423

04-ER-2083

10/15

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01446
File ID: PD100294.S0
Priority: Yes

Description\Location
S-60204-4
~~Pink~~ Long Count

Collector: 5983
Date Received: 6/2/04
Date Collected: 6/2/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60				45,000
Cs-137		0.03	0.01	45,000
Pb-210				45,000
Ra-226		1.22	1.17	800
Ac-227 (D)	*	0.16	0.36	40
Th-230				800
Th-232 (D)	*	0.03	0.46	130
Pu-238	*	2.5	25.63	500
Am-241				500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~

Σ_{DOT} _____ nCi/g $\Sigma_{Respirator}$ _____

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

• Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Pre-remediation PRS-423 Located North of R/SW building

Date: 6/3/04 Counted By: 5268 Analyzed By: 7559 Initials [redacted]

See original 04-ER-2046 #8

COPY

04-EA-2083 W/13

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01515
File ID: MG102912.S0
Priority: Yes

Description\Location
PRS423 060704-03
LONG

Collector: 5983
Date Received: 06/07/04
Date Collected: 06/07/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60		0	0	45,000
Cs-137		0	0	45,000
Pb-210	*	0.03	0.05	45,000 CB
Ra-226		0.09	0.06	800
Ac-227 (D)	*	0	0.02	40
Th-230	*	0.01	0.48	800
Th-232 (D)		0.02	0.02	130
Pu-238	*	0.01	1.23	500
Am-241		0	0	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~ CB

Σ_{DOT} 0.00 nCi/g $\Sigma_{Respirator}$ 0.00

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4.

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

• Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Pre-remediation Characterization sample taken north of old breezway & R-annex.

Date: 06/08/04 Counted By: 7559 Analyzed By: 7559 Initials [redacted]

SEE ORIGINAL RSOS # 04-E R-2049 ~~#6 #5 #6~~ #9

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04-ER-2083 12/15

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01517
File ID: MG102914
Priority: Yes

Description\Location
PRS423 060804-02
LONG

Collector: 5983
Date Received: 06/08/04
Date Collected: 06/08/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60	*	0	0.08	45,000
Cs-137	*	0	0.04	45,000
Pb-210		0.52	0.47	45,000
Ra-226		0.85	0.6	800 CB
Ac-227 (D)	*	0.02	0.19	40
Th-230	*	0	4.9	800
Th-232 (D)		0.32	0.13	130
Pu-238	*	0	13.03	500
Am-241	*	0	0.06	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~ CB

Σ_{DOT} 0.02 nCi/g $\Sigma_{Respirator}$ 0.04

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4.

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: North of N.W. Corner of R Annex

Date: 06/08/04 Counted By: 5268 Analyzed By: 7559 Initials [redacted]

SEE Original RSDS 04-ER-2050 ~~#6 #7~~ 3rd updt #10

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04-ER-2083 13/15

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01520
File ID: MG500525.s0
Priority: Yes

Description\Location
PRS423 060804-04
LONG

Collector: 5983
Date Received: 06/08/04
Date Collected: 06/08/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60	*	0	0.03	45,000
Cs-137	*	0	0.03	45,000
Pb-210		0.68	0.61	45,000
Ra-226	*	0.42	0.58	800
Ac-227 (D)	*	0.08	0.18	40
Th-230	*	0	6.04	800
Th-232 (D)		0.31	0.09	130
Pu-238	*	0	19.37	500
Am-241	*	0.02	0.06	500

CB

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~ CB

Σ_{DOT} 0.03 nCi/g $\Sigma_{Respirator}$ 0.05

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4.

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: North of R-Ranney just East of stantions. Soil sent to rail spur.

Date: 06/08/04 Counted By: 7559 Analyzed By: 7559 Initials [redacted]

SEE ORIGINAL - 04-ER-2050 #11

COPY

04-ER-2083 14/15

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01522
File ID: MG102918.s0
Priority: Yes

Description\Location
PRS423 060904-01
LONG

Collector: 5983
Date Received: 06/09/04
Date Collected: 06/09/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60		0.05	0.05	45,000
Cs-137	*	0.03	0.04	45,000
Pb-210		0.78	0.59	45,000
Ra-226		1.03	0.69	800
Ac-227 (D)	*	0	0.27	40
Th-230	*	0	5.74	800
Th-232 (D)		0.34	0.17	130
Pu-238	*	0	15.59	500
Am-241	*	0	0.07	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~

Σ_{DOT} 0.02 nCi/g $\Sigma_{Respirator}$ 0.05

Instrument type: High Purity Germanium

Σ Respirator <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4.

Σ DOT 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Comments: Pre-Remediation/Characterization at pipe level after Manhole #22 Removed.

Date: 06/10/04 Counted By: 7559 Analyzed By: 7559 Initials [redacted]

~~#9~~ 12

04-ER-2083 15/15

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01556
File ID: MG102923.s0
Priority: Yes

Description\Location
PRS-423 061404-01
Long Count

Collector: 7787
Date Received: 6/14/04
Date Collected: 6/14/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60	*	0	0.09	45,000
Cs-137	*	0	0.06	45,000
Pb-210	*	0.5	0.68	45,000
Ra-226		0.98	0.89	800
Ac-227 (D)	*	0.22	0.24	40
Th-230	*	1.56	6.48	800
Th-232 (D)	*	0.22	0.27	130
Pu-238	*	0	17.23	500
Am-241	*	0.02	0.07	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~

Σ_{DOT} 0.03 nCi/g $\Sigma_{Respirator}$ 0.05

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Pre-remediation / characterization sample. Aprox. 20' N.W. of R-Annex. Non-effective soil stuyed by trench.

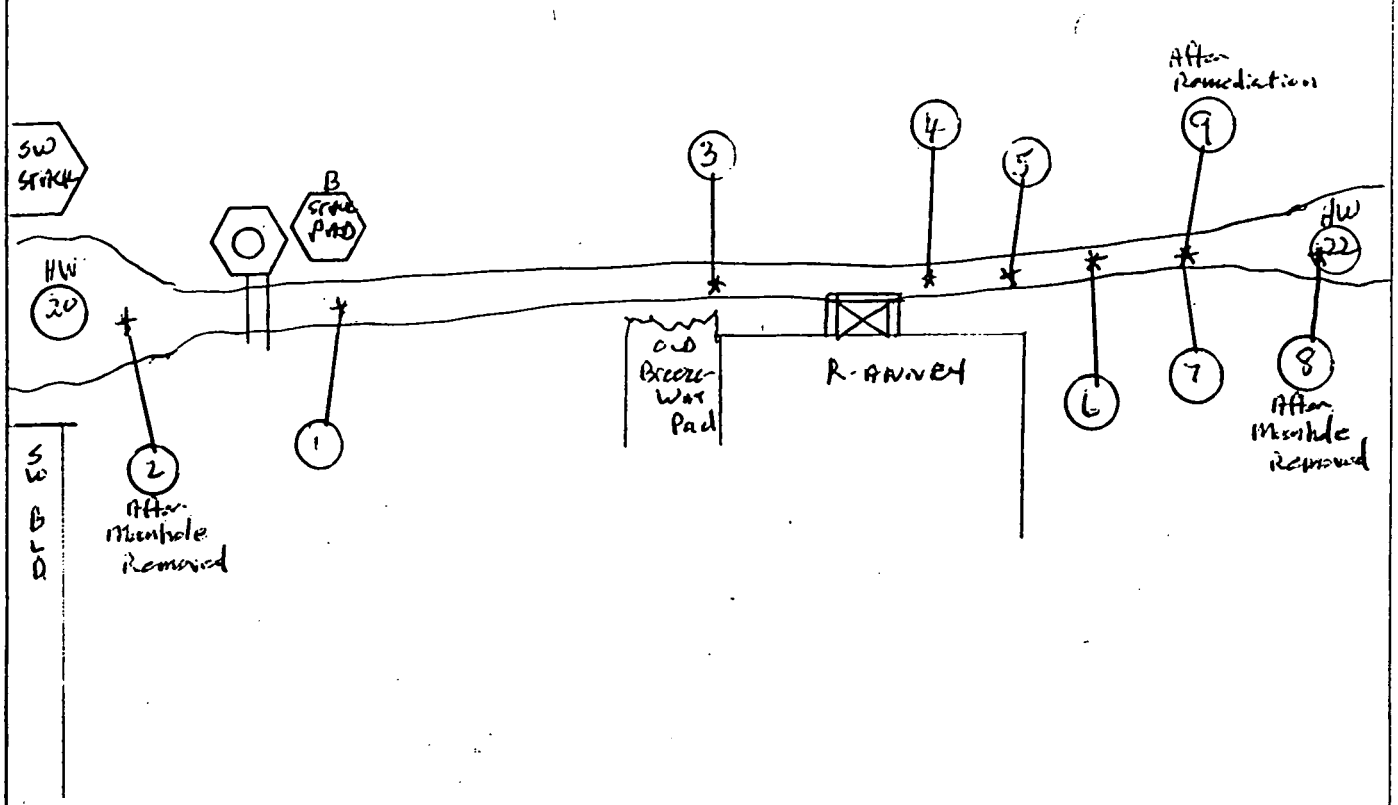
Date: 6/14/04 Counted By: 5268 Analyzed By: 7559 Initials [redacted]

#10 #13

RADIOLOGICAL SURVEY DATA SHEET

LOCATION: (BLDG. / ROOM / AREA) PRS-423	SURVEY NO. 04-ER-2082
PURPOSE: Pre-Verification soil samples.	RWP NO. 1511
	DATE: 5/24/04 thru 6/30/04
	TIME: N/A

MAP / DRAWING



NOTES:

Map is not to scale and sample locations are approximate

Manholes # HW 20 & # HW 22 have been removed.

→ See page 2 of 11 for cross reference of sample number & lab ID#

LEGEND:
= mrem/hr (γ) whole body
#E = mrem/hr (β+η+γ) extremity on contact
K = factor of 1000
— · — · — = radiological boundary

△# = mrem/hr neutron

= air sample number

(#) = ~~swipe number~~ Sample number

(#/α) = or /β = direct contamination measurement in dpm/100 cm²

INSTRUMENTS USED

Instrument	Serial Number	Cal Due Date
	N/A	

[redacted]	HP# [redacted]	Date 7-6-04
Counted by (Signature) SEE	HP#	Date
Counted by (Print Name) ATTACHED		
Reviewed/Appro[redacted]	HP# 7725	Date 7-21-04
Reviewed/Approved by (Print Name) [redacted]		

Survey No. 04-ER- 2082

RADIOLOGICAL SURVEY DATA SHEET (cont.)

Removable Contamination				
Swipes (dpm/100cm²)				
Sample #	β/γ	Alpha	Tritium	LAB ID. #
1				GLO 1465
2				GLO 1514
3				GLO 1516
4				GLO 1519
5				GLO 1521
6				GLO 1547
7				GLO 1576
8				GLO 1577
9				GLO 1594
10				
11				
12				
13				
14				
15				
16				
17				
18		N		
19		A		
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				

Removable Contamination				
Swipes (dpm/100cm²)				
Sample #	β/γ	Alpha	Tritium	
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52			N	
53			A	
54				
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56				
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69				
70				

COMMENTS:

NOTES:

1. See MD-80036 10002 for calculations of WB, extremity and skin dose rates.
2. To request RO Count Room analysis for β/γ, alpha or tritium, leave column blank. Mark column N/A if not needed. If count room printout of ras are attached, write "see attached" in column.
3. Annotate special sample type (e.g., soil, water), special identifiers or otherwise in Comments. If not needed, mark N/A.

04-ER- 1002 OT ER 6/8 3/11

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01465
File ID: MG102910.S0
Priority: Yes

Description\Location
PRS ~~423~~ 423 S-60304-04
Long Count

Collector: 7787
Date Received: 06/02/04
Date Collected: 06/02/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60	*	0	0.06	45,000
Cs-137	*	0	0.05	45,000
Pb-210	*	0	0.71	45,000
Ra-226	*	0	0.9	800
Ac-227 (D)	*	0	0.25	40
Th-230	*	0	6.54	800
Th-232 (D)		0.24	0.22	130
Pu-238	*	6.18	13.89	500
Am-241	*	0.05	0.07	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~

Σ_{DOT} 0.02 nCi/g $\Sigma_{Respirator}$ 0.05

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4.

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

COPY

Comments: Pre-verification sample. Soil went to rail Spur. PRS ~~424~~ 423

Date: 06/03/04 Counted By: 7559 Analyzed By: 7559 Initial [redacted]

#1 SEE ULTIMATE ASOS & 04-ER-2048

04-EA-2082

4/11

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01514
File ID: MG301207
Priority: Yes

Description\Location
PRS423 S-060704-02
LONG

Collector: 5983
Date Received: 06/07/04
Date Collected: 06/07/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60	*	0	0.03	45,000
Cs-137	*	0	0.03	45,000
Pb-210	*	0.46	0.69	45,000
Ra-226	*	0.15	0.54	800
Ac-227 (D)	*	0	0.17	40
Th-230	*	0	5.97	800
Th-232 (D)		0.37	0.09	130
Pu-238	*	0	17.9	500
Am-241	*	0	0.06	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~

Σ_{DOT} 0.03 nCi/g $\Sigma_{Respirator}$ 0.05

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4.

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Pre-verification sample. Soil went to rail spur. Taken where HW 20 was located

Date: 06/08/04 Counted By: 7559 Analyzed By: 7559 Initials [redacted]

SEE RSOS ORIGINAL 04-EA-2049 #7

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04-ER-2082

5/11

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01516
File ID: MG102913.s0
Priority: Yes

Description\Location
PRS423 060804-01
LONG

Collector: 5983
Date Received: 06/08/04
Date Collected: 06/08/04

Radionuclide		Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~
Co-60	*	0.02	0.05	~~45,000~~
Cs-137	*	0	0.05	~~45,000~~
Pb-210	*	0.44	0.48	~~45,000~~
Ra-226	*	0.6	0.73	~~800~~
Ac-227 (D)	*	0	0.22	~~40~~
Th-230	*	0	5.87	~~800~~ CB
Th-232 (D)		0.42	0.12	~~130~~
Pu-238	*	2.62	12.88	~~500~~
Am-241	*	0	0.06	~~500~~

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~ CB

Σ_{DOT} 0.02 nCi/g $\Sigma_{Respirator}$ 0.04

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4.

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Pre-Verification Sample. North at N.W. Corner of R-Battery

Date: 06/08/04 Counted By: 5268 Analyzed By: 7559 Initials [redacted]

SEE original - RSDS 04-ER-2050 ~~#2 37 #2 #3~~ pg 2 of 4

COPY

04-ER-2082 6/11

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01519
File ID: MG102916.s0
Priority: Yes

Description\Location
PRS423 060804-03
LONG

Collector: 5983
Date Received: 06/08/04
Date Collected: 06/08/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60	*	0.01	0.06	45,000
Cs-137	*	0	0.04	45,000
Pb-210	*	0.03	0.6	45,000
Ra-226	*	0.6	0.72	800
Ac-227 (D)	*	0	0.21	40
Th-230	*	0	6.17	800
Th-232 (D)		0.3	0.2	130 CE
Pu-238	*	0	13.84	500
Am-241	*	0.01	0.05	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~ CE

Σ_{DOT} 0.02 nCi/g $\Sigma_{Respirator}$ 0.04

Σ Respirator <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4.

Σ DOT 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Pre-verification sample. North of R-annex near stantions.

Date: 06/08/04 Counted By: 5268 Analyzed By: 7559 Initials [redacted]

SEE ORIG FAIL - 04-ER-2050 ~~12/03/04~~ 7/01

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04-ER-2092

7/11

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01521
File ID: MG102917.s0
Priority: Yes

Description\Location
PRS423 060904-02
LONG

Collector: 5983
Date Received: 06/09/04
Date Collected: 06/09/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60	*	0.01	0.05	45,000
Cs-137	*	0.01	0.04	45,000
Pb-210	*	0	0.64	45,000
Ra-226		1.15	0.59	800
Ac-227 (D)	*	0.06	0.2	40
Th-230	*	2.32	4.48	800
Th-232 (D)		0.38	0.13	130
Pu-238	*	1.35	12.53	500
Am-241	*	0	0.06	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~

Σ_{DOT} 0.02 nCi/g $\Sigma_{Respirator}$ 0.04

Instrument type: High Purity Germanium

Σ Respirator <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4.

Σ DOT 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Comments: Pre-verification - North of RAHWEX - East of Stantions [redacted]

Date: 06/10/04 Counted By: 7559 Analyzed By: 7559 Initials [redacted]

#5

04-ER-2082 8/11

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01547
File ID: 6SC00251.s0
Priority: Yes

Description\Location
PRS423 061004-01
Long Count

Collector: 7787
Date Received: 06/10/04
Date Collected: 06/10/04

Radionuclide		Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~
Co-60	*	0.01	0.03	45,000
Cs-137	*	0.01	0.03	45,000
Pb-210	*	0.21	0.71	45,000
Ra-226	*	0.6	0.67	800
Ac-227 (D)		0.21	0.21	40
Th-230	*	0	7.5	800
Th-232 (D)		0.43	0.08	130 CB
Pu-238	*	0	33	500
Am-241		0.11	0.07	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~ CB
U-238d	1.13	0.46	

Σ_{DOT} 0.04 nCi/g $\Sigma_{Respirator}$ 0.09

Instrument type: High Purity Germanium

Σ Respirator <1 indicates soil levels below limit.
Values = or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4.

Σ DOT 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.
* Indicates activity < MDA. MDA used in limits calculation

Comments: Pre-verification sample. North of N.E. Corner of R-Annex

Date: 06/14/04 Counted By: 7559 Analyzed By: 7559 Initials [redacted]

#16

04-ER-2082 9/11

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01576
File ID: MG102933
Priority: Yes

Description\Location
PRS 423-061604-03
LONG

Collector: 5983
Date Received: 6/16/04
Date Collected: 6/16/04

Radionuclide		Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~
Co-60	*	0.01	0.06	~~45,000~~
Cs-137	*	0	0.05	~~45,000~~
Pb-210	*	0.29	0.62	~~45,000~~
✓Ra-226		3.77	0.77	~~800~~
Ac-227 (D)	*	0.02	0.22	~~40~~
Th-230	*	2.31	4.97	~~800~~
Th-232 (D)		0.35	0.13	~~130~~
Pu-238	*	4.69	13.33	~~500~~ CB
Am-241	*	0.03	0.06	~~500~~

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~ CB

Σ_{DOT} 0.02 nCi/g $\Sigma_{Respirator}$ 0.05

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: Pre-verification on PRS-423 - 25' N.E. of R-Annex and West of HW 22.

Date: 6/16/04 Counted By: 5288 Analyzed By: 5288 Initials [redacted]

#7

04-ER-2082 10/11

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01577
File ID: MG102934
Priority: Yes

Description\Location
PRS 423-061604-04
LONG

Collector: 5983
Date Received: 6/16/04
Date Collected: 6/16/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60	*	0	0.04	45,000
Cs-137	*	0	0.05	45,000
Pb-210	*	0.31	0.59	45,000
Ra-226		1.42	0.62	800
Ac-227 (D)	*	0	0.22	40
Th-230	*	0	5.78	800
Th-232 (D)		0.3	0.13	130
Pu-238	*	0	12.57	500
Am-241	*	0	0.06	500

CB

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~

CB

Σ_{DOT} 0.02 nCi/g $\Sigma_{Respirator}$ 0.04

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Instrument type: High Purity Germanium

Comments: PRS 423 - Pre-verification sample taken where HW 18 was located.

Date: 6/16/04 Counted By: 5288 Analyzed By: 5288 Initials [redacted]

* 8

04-ER-2032 11/11 27

SOIL ANALYSIS REPORT

Field Sample ID:
Lab Sample ID: GL01594
File ID: MG301211.S0
Priority: Yes

Description\Location
PRS423 061704-05
LONG

Collector: 7787
Date Received: 06/17/04
Date Collected: 06/17/04

Radionuclide		Activity (pCi/g)	MDA	MD-10438 Limit (pCi/g)
Co-60	*	0.01	0.04	45,000
Cs-137	*	0	0.04	45,000
Pb-210	*	0	0.96	45,000
Ra-226		0.98	0.7	800
Ac-227 (D)		0.22	0.19	40
Th-230	*	0	8.08	800
Th-232 (D)		0.62	0.12	130 CB
Pu-238	*	0	23.21	500
Am-241	*	0	0.09	500

Other Nuclides

Radionuclide	Activity (pCi/g)	MDA	~~MD-10438 Limit (pCi/g)~~ CB

Σ_{DOT} 0.03 nCi/g $\Sigma_{Respirator}$ 0.07

Instrument type: High Purity Germanium

$\Sigma_{Respirator}$ <1 indicates soil levels below limit.
Values > or = 1 indicate soil levels exceed limit. Limits based on MD-10438 table 4.

Σ_{DOT} 2nCi/g limit, total activity.

(D) Denotes identification by daughter emissions.
Sample is Assumed to be in secular equilibrium.

* Indicates activity < MDA. MDA used in limits calculation

Comments: Pre-Verification sample. PRS-423. Re-sample after high sample found. Soil remediated and this sample taken. 25' N.E. of R-Annex by fire line

Date: 06/21/04 Counted By: 5288 Analyzed By: 7559 Initials [redacted]

#9

Attachment B

1

Sample Standard Deviation (s)	Radionuclide	Cleanup Objective	Units
0.09	AC-227-D	4.6	(pCi/g)
0.03	Am-241	63	(pCi/g)
	Ce-141	38	(pCi/g)
0.01	Cs-137-D	3.8	(pCi/g)
0.01	Co-60	0.7	(pCi/g)
	Cu-244	92	(pCi/g)
	Pb-210-D	7.4	(pCi/g)
	Np-237-D	10.4	(pCi/g)
	Nb-95	2.5	(pCi/g)
2.94	Pu-238	55	(pCi/g)
	Pu-239/240	62	(pCi/g)
	Pa-231-D	4	(pCi/g)
0.83	Ra-226-D	2.9	(pCi/g)
	Ra-228	2.1	(pCi/g)
	Th-228-D	2.6	(pCi/g)
0.95	Th-230-D	2.8	(pCi/g)
0.14	Th-232-D	2.1	(pCi/g)
	U-235-D	4.8	(pCi/g)
	U-234	106.1	(pCi/g)
	U-234-D	2	(pCi/g)
	U-235	16.11	(pCi/g)
	U-235-D	3.2	(pCi/g)
	U-238	121.2	(pCi/g)
	U-238-D	2.2	(pCi/g)
	Bi-207	1.2	(pCi/g)
	Bi-210m	8.3	(pCi/g)
	Tc-99	2140	(pCi/g)
	Sr-90	94.72	(pCi/g)

2

Type I Error	0.05	
$Z_{1\text{-alpha}}$	1.645	
Type II Error	0.2	
$Z_{1\text{-beta}}$	0.842	
Effective	0.45	*(s)*
Sign p	0.864334	

3 Calculate the Total Effective (s)

4

Estimate (N) - Sign Test

DCGL	1
LBGR	0.50
Delta	0.50
(s)	0.45
Rel Shift	1.105
(N)	15.00

12 linear sample 15' apart

5

Sample Grid Spacing

SU Area	86	m^2
Grid Length	2.2	m
Grid Height	1.9	m

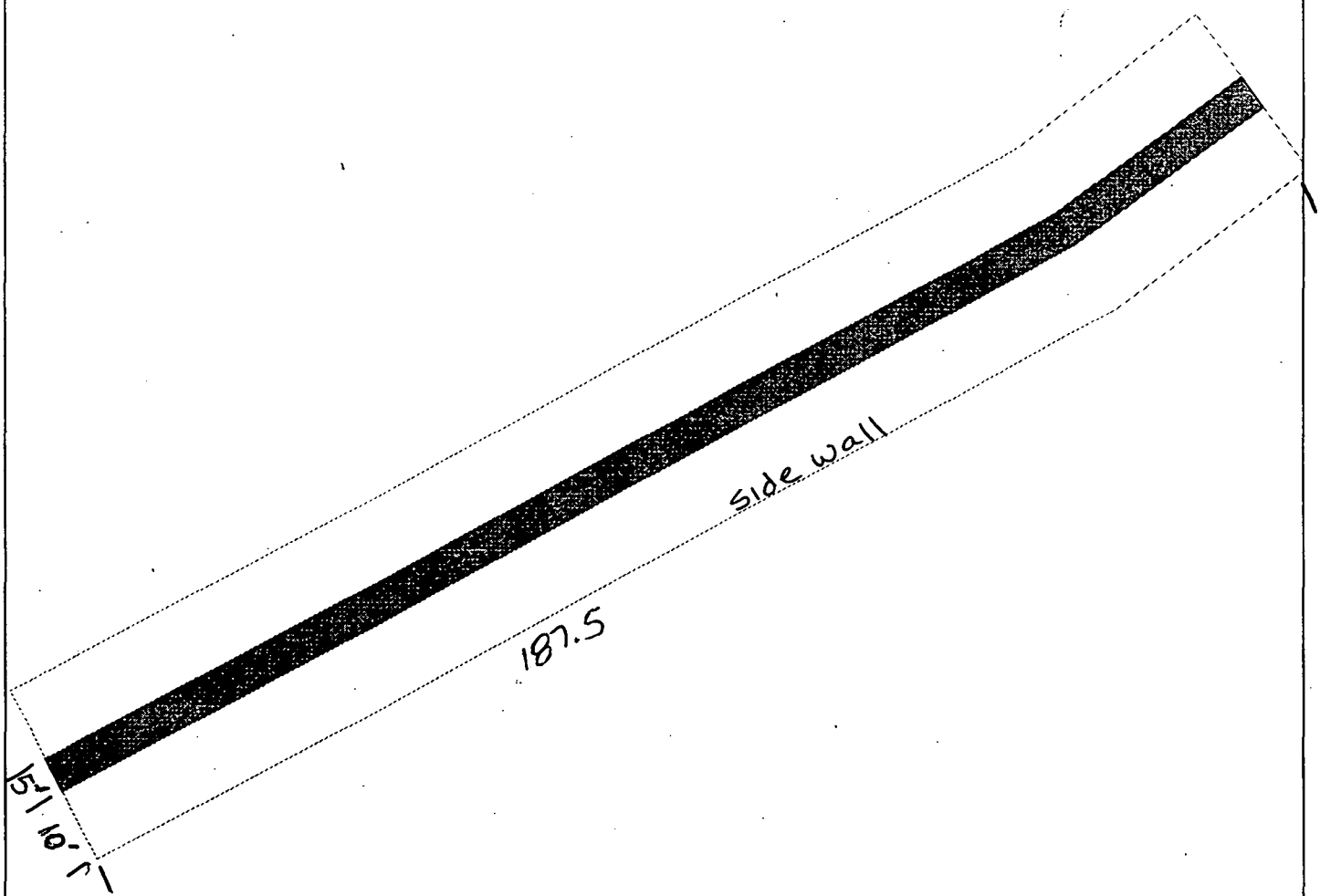
PRS 423

Survey Unit 1

Sample Plan
Phase 1

SU-1

PRS 423
Trench Bottom



Sample locations to be 15' Apart from a field Randomly Selected (rock Drop) location

Number of Samples = 12

1

Sample Standard Deviation (s)	Radionuclide	Cleanup Objective	Units
0.09	Ac-227+D	4.6	(pCi/g)
0.03	Am-241	63	(pCi/g)
	Ce-141	38	(pCi/g)
0.01	Cs-137+D	3.8	(pCi/g)
0.01	Co-60	0.7	(pCi/g)
	Cm-244	92	(pCi/g)
	Pb-210+D	7.4	(pCi/g)
	Np-237+D	10.4	(pCi/g)
	Nb-95	2.5	(pCi/g)
2.94	Pu-238	55	(pCi/g)
	Pu-239/240	62	(pCi/g)
	Pa-231+D	4	(pCi/g)
0.83	Ra-226+D	2.9	(pCi/g)
	Ra-228	2.1	(pCi/g)
	Th-228+D	2.6	(pCi/g)
0.95	Th-230+D	2.8	(pCi/g)
0.14	Th-232+D	2.1	(pCi/g)
	U-233+D	4.8	(pCi/g)
	U-234	106.1	(pCi/g)
	U-234+D	2	(pCi/g)
	U-235	16.11	(pCi/g)
	U-235+D	3.2	(pCi/g)
	U-238	121.2	(pCi/g)
	U-238+D	2.2	(pCi/g)
	Bi-207	1.2	(pCi/g)
	Bi-210m	3.3	(pCi/g)
	Tc-99	214.0	(pCi/g)
	Sr-90	94.72	(pCi/g)

2

Type I Error	0.05	
$Z_{1\text{-alpha}}$	1.645	
Type II Error	0.2	
$Z_{1\text{-beta}}$	0.842	
Effective	0.45	*(s)*
Sign p	0.864334	

3 Calculate the Total Effective (s)

4

Estimate (N) - Sign Test

DCGL	1
LBGR	0.50
Delta	0.50
(s)	0.45
Rel Shift	1.105
(N)	15.00

5

Sample Grid Spacing

SU Area	344	m^2
Grid Length	4.5	m
Grid Height	3.9	m

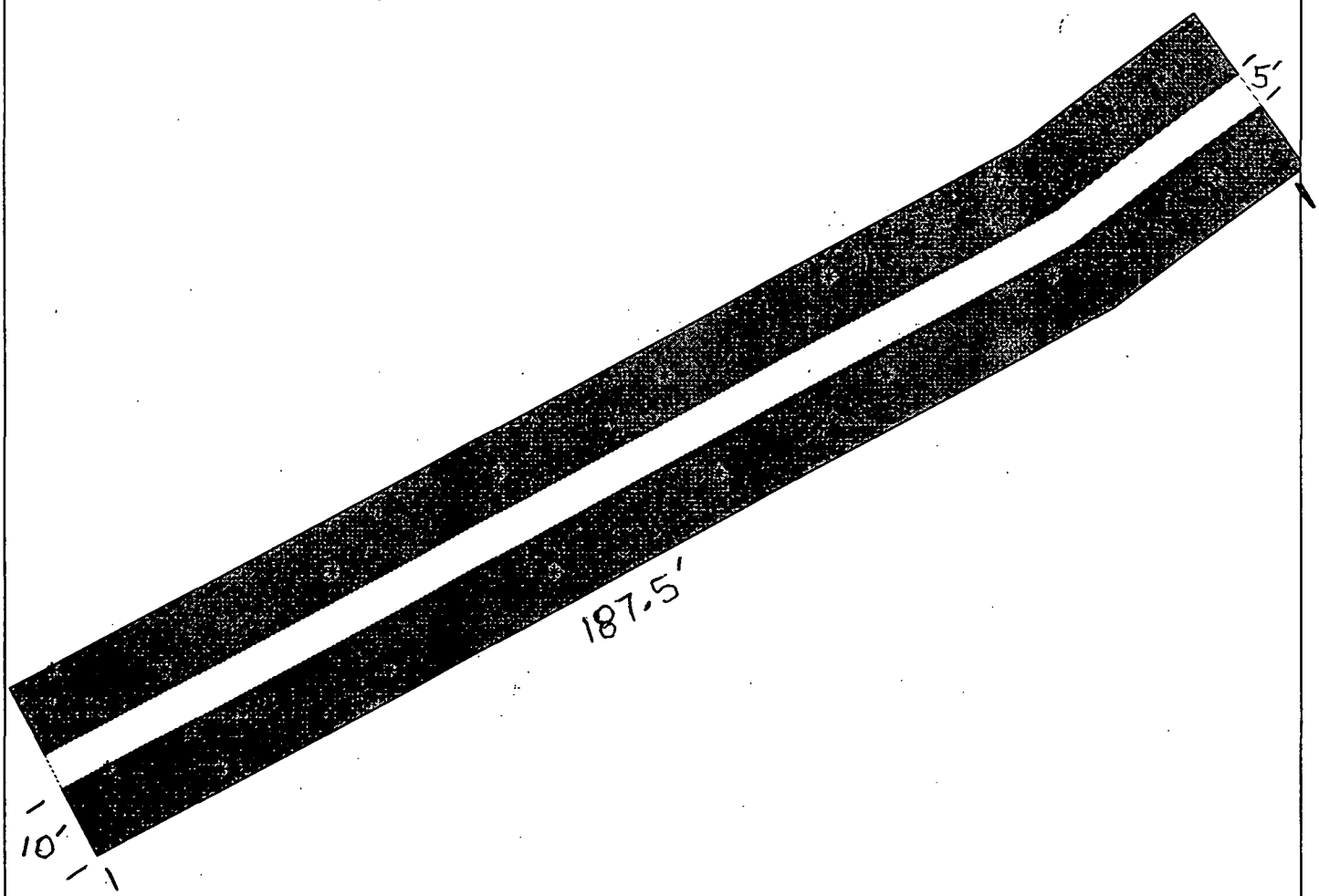
PRS 423

Survey Unit 2

Sample Plan
Phase 1

SU-2

PRS 423 Trench
Side walls



Area 1

X Coord	Y Coord	Label	Value	Type	Historical
1464830.20	599200.60		0	Hotspot	False
1464807.70	599187.61		0	Hotspot	False
1464837.70	599187.61		0	Hotspot	False
1464785.20	599174.62		0	Hotspot	False
1464815.20	599174.62		0	Hotspot	False
1464762.70	599161.63		0	Hotspot	False
1464792.70	599161.63		0	Hotspot	False
1464740.20	599148.64		0	Hotspot	False
1464770.20	599148.64		0	Hotspot	False
1464717.70	599135.65		0	Hotspot	False
1464747.70	599135.65		0	Hotspot	False
1464680.20	599122.66		0	Hotspot	False
1464695.20	599122.66		0	Hotspot	False
1464725.20	599122.66		0	Hotspot	False
1464687.70	599109.67		0	Hotspot	False
1464702.70	599109.67		0	Hotspot	False

General Statistics

Data File	K:\SHARED\Lammlein\SUDs & Supporting Fi	Variable:	Ac-227
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	18	Shapiro-Wilk Test Statisitic	0.673511
Number of Unique Samples	7	Shapiro-Wilk 5% Critical Value	0.897
Minimum	0	Data not normal at 5% significance level	
Maximum	0.22		
Mean	0.055	95% UCL (Assuming Normal Distribution)	
Median	0	Student's-t UCL	0.089856
Standard Deviation	0.085009		
Variance	0.007226		
Coefficient of Variation	1.545612		
Skewness	1.306913		
Gamma Statistics Not Available			
Lognormal Statistics Not Available			
		95% Non-parametric UCLs	
		CLT UCL	0.087957
		Adj-CLT UCL (Adjusted for skewness)	0.094553
		Mod-t UCL (Adjusted for skewness)	0.090885
		Jackknife UCL	0.089856
		Standard Bootstrap UCL	0.087356
		Bootstrap-t UCL	0.10358
R		Hall's Bootstrap UCL	0.083218
Data		Percentile Bootstrap UCL	0.089444
		BCA Bootstrap UCL	0.082222
Use 95		95% Ch	0.142338
		97.5% Chebyshev (Mean, Sd) UCL	0.180129
		99% Chebyshev (Mean, Sd) UCL	0.254363

General Statistics

Data File	K:\SHARED\Lammlein\SUDs & Supporting Fi	Variable:	Am-241
Raw Statistics		Normal Distribution Test	
Number of observations	16	Shapiro-Wilk Test Statisitic	0.686071
Number of Missing Data	4	Shapiro-Wilk 5% Critical Value	0.859
Number of Valid Samples	12	Data not normal at 5% significance level	
Number of Unique Samples	6		
Minimum	0	95% UCL (Assuming Normal Distribution)	
Maximum	0.11	Student's-t UCL	0.036835
Mean	0.02		
Median	0.005		
Standard Deviation	0.032474		
Variance	0.001055		
Coefficient of Variation	1.623688		
Skewness	2.255401		
Gamma Statistics Not Available			
Lognormal Statistics Not Available			
		95% Non-parametric UCLs	
		CLT UCL	0.035419
		Adj-CLT UCL (Adjusted for skewness)	0.041941
		Mod-t UCL (Adjusted for skewness)	0.037853
		Jackknife UCL	0.036835
		Standard Bootstrap UCL	0.034668
		Bootstrap-t UCL	0.060349
R		Hall's Bootstrap UCL	0.098711
Data		Percentile Bootstrap UCL	0.036667
		BCA Bootstrap UCL	0.046667
Use 95		95% Ch	0.060862
		97.5% Chebyshev (Mean, Sd) UCL	0.078543
		99% Chebyshev (Mean, Sd) UCL	0.113274

General Statistics

Data File	K:\SHARED\Lammlein\SUDs & Supporting Fi	Variable:	Cs-137
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	15	Shapiro-Wilk Test Statisitic	0.718551
Number of Unique Samples	5	Shapiro-Wilk 5% Critical Value	0.881
Minimum	0	Data not normal at 5% significance level	
Maximum	0.04		
Mean	0.009333	95% UCL (Assuming Normal Distribution)	
Median	0	Student's-t UCL	0.015641
Standard Deviation	0.01387		
Variance	0.000192		
Coefficient of Variation	1.486087		
Skewness	1.247563		
Gamma Statistics Not Available			
Lognormal Statistics Not Available			
		95% Non-parametric UCLs	
		CLT UCL	0.015224
		Adj-CLT UCL (Adjusted for skewness)	0.016457
		Mod-t UCL (Adjusted for skewness)	0.015833
		Jackknife UCL	0.015641
		Standard Bootstrap UCL	0.015065
		Bootstrap-t UCL	0.018042
R		Hall's Bootstrap UCL	0.014979
Data		Percentile Bootstrap UCL	0.015333
		BCA Bootstrap UCL	0.017333
Use 95		95% Ch	0.024944
		97.5% Chebyshev (Mean, Sd) UCL	0.031698
		99% Chebyshev (Mean, Sd) UCL	0.044966

General Statistics

Data File	K:\SHARED\Lammlein\SUDs & Supporting Fi	Variable:	Co-60
Raw Statistics		Normal Distribution Test	
Number of observations	18	Shapiro-Wilk Test Statisitic	0.653281
Number of Missing Data	4	Shapiro-Wilk 5% Critical Value	0.874
Number of Valid Samples	14	Data not normal at 5% significance level	
Number of Unique Samples	4		
Minimum	0	95% UCL (Assuming Normal Distribution)	
Maximum	0.05	Student's-t UCL	0.014964
Mean	0.008571		
Median	0.005		
Standard Deviation	0.013506		
Variance	0.000182		
Coefficient of Variation	1.575724		
Skewness	2.484356		
Gamma Statistics Not Available			
Lognormal Statistics Not Available			
		95% Non-parametric UCLs	
		CLT UCL	0.014509
		Adj-CLT UCL (Adjusted for skewness)	0.01707
		Mod-t UCL (Adjusted for skewness)	0.015363
		Jackknife UCL	0.014964
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
R		Hall's Bootstrap UCL	N/R
Data		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
Use 95		95% Ch	0.024306
		97.5% Chebyshev (Mean, Sd) UCL	0.031114
		99% Chebyshev (Mean, Sd) UCL	0.044487

General Statistics

Data File	K:\SHARED\Lammlein\SUDs & Supporting Fi	Variable:	Pu-238

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	16	Shapiro-Wilk Test Statisitic	0.733412
Number of Unique Samples	9	Shapiro-Wilk 5% Critical Value	0.887
Minimum	0	Data not normal at 5% significance level	
Maximum	10.04		
Mean	1.959375	95% UCL (Assuming Normal Distribution)	
Median	0.005	Student's-t UCL	3.250227
Standard Deviation	2.945386		
Variance	8.6753		
Coefficient of Variation	1.503227		
Skewness	1.680561		

Gamma Statistics Not Available

Lognormal Statistics Not Available

95% Non-parametric UCLs	
CLT UCL	3.170557
Adj-CLT UCL (Adjusted for skewness)	3.501122
Mod-t UCL (Adjusted for skewness)	3.301789
Jackknife UCL	3.250227
Standard Bootstrap UCL	3.080599
Bootstrap-t UCL	3.809612
Hall's Bootstrap UCL	3.907188
Percentile Bootstrap UCL	3.2275
BCA Bootstrap UCL	2.96625
95% Ch	5.169035
97.5% Chebyshev (Mean, Sd) UCL	6.557858
99% Chebyshev (Mean, Sd) UCL	9.285931

R
Data
Use 95

General Statistics

Data File	K:\SHARED\Lammlein\SUDs & Supporting Fi	Variable:	Ra-226
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	18	Shapiro-Wilk Test Statisitic	0.77237
Number of Unique Samples	15	Shapiro-Wilk 5% Critical Value	0.897
Minimum	0	Data not normal at 5% significance level	
Maximum	3.77		
Mean	0.958889	95% UCL (Assuming Normal Distribution)	
Median	0.915	Student's-t UCL	1.298705
Standard Deviation	0.828762		
Variance	0.686846		
Coefficient of Variation	0.864294		
Skewness	2.33933		
Gamma Statistics Not Available			
Lognormal Statistics Not Available			
		95% Non-parametric UCLs	
		CLT UCL	1.280196
		Adj-CLT UCL (Adjusted for skewness)	1.395284
		Mod-t UCL (Adjusted for skewness)	1.316657
		Jackknife UCL	1.298705
		Standard Bootstrap UCL	1.268903
		Bootstrap-t UCL	1.478462
R		Hall's Bootstrap UCL	2.894052
Data		Percentile Bootstrap UCL	1.282778
		BCA Bootstrap UCL	1.538889
Use 95		95% Ch	1.81036
		97.5% Chebyshev (Mean, Sd) UCL	2.178793
		99% Chebyshev (Mean, Sd) UCL	2.902507

General Statistics

Data File	K:\SHARED\Lammlein\SUDs & Supporting Fi	Variable:	Th-230
Raw Statistics		Normal Distribution Test	
Number of observations	16	Shapiro-Wilk Test Statisitic	0.581855
Number of Missing Data	4	Shapiro-Wilk 5% Critical Value	0.859
Number of Valid Samples	12	Data not normal at 5% significance level	
Number of Unique Samples	5		
Minimum	0	95% UCL (Assuming Normal Distribution)	
Maximum	2.32	Student's-t UCL	1.009702
Mean	0.516667		
Median	0		
Standard Deviation	0.951022		
Variance	0.904442		
Coefficient of Variation	1.840687		
Skewness	1.462863		
Gamma Statistics Not Available			
Lognormal Statistics Not Available			
		95% Non-parametric UCLs	
		CLT UCL	0.968239
		Adj-CLT UCL (Adjusted for skewness)	1.092117
		Mod-t UCL (Adjusted for skewness)	1.029025
		Jackknife UCL	1.009702
		Standard Bootstrap UCL	0.94928
		Bootstrap-t UCL	1.330635
R		Hall's Bootstrap UCL	0.862988
Data		Percentile Bootstrap UCL	0.97
		BCA Bootstrap UCL	1.23
Use 95		95% Ch	1.713343
		97.5% Chebyshev (Mean, Sd) UCL	2.231146
		99% Chebyshev (Mean, Sd) UCL	3.248269

General Statistics

Data File	K:\SHARED\Lammlein\SUDs & Supporting Fi	Variable:	Th-232

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	18	Shapiro-Wilk Test Statisitic	0.938926
Number of Unique Samples	16	Shapiro-Wilk 5% Critical Value	0.897
Minimum	0.02	Data are normal at 5% significance level	
Maximum	0.62		
Mean	0.305	95% UCL (Assuming Normal Distribution)	
Median	0.315	Student	0.362477
Standard Deviation	0.140178		
Variance	0.01965	Gamma Distribution Test	
Coefficient of Variation	0.459602	A-D Test Statistic	1.66028
Skewness	-0.236548	A-D 5% Critical Value	0.749614
		K-S Test Statistic	0.241863
Gamma Statistics		K-S 5% Critical Value	0.205749
k hat	2.439596	Data do not follow gamma distribution	
k star (bias corrected)	2.070034	at 5% significance level	
Theta hat	0.125021		
Theta star	0.147341	95% UCLs (Assuming Gamma Distribution)	
nu hat	87.82546	Approximate Gamma UCL	0.408528
nu star	74.52122	Adjusted Gamma UCL	0.420356
Approx.Chi Square Value (.05)	55.63632		
Adjusted Level of Significance	0.03574	Lognormal Distribution Test	
Adjusted Chi Square Value	54.07075	Shapiro-Wilk Test Statisitic	0.678426
		Shapiro-Wilk 5% Critical Value	0.897
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-3.912023		
Maximum of log data	-0.478036	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-1.406178	95% H-UCL	0.616537
Standard Deviation of log data	0.883068	95% Chebyshev (MVUE) UCL	0.700053
Variance of log data	0.779808	97.5% Chebyshev (MVUE) UCL	0.850753
		99% Chebyshev (MVUE) UCL	1.146772
		95% Non-parametric UCLs	
		CLT UCL	0.359347
		Adj-CLT UCL (Adjusted for skewness)	0.357378
		Mod-t UCL (Adjusted for skewness)	0.36217
		Jackknife UCL	0.362477
		Standard Bootstrap UCL	0.358027
		Bootstrap-t UCL	0.36126
R		Hall's Bootstrap UCL	0.363253
Da		Percentile Bootstrap UCL	0.361111
		BCA Bootstrap UCL	0.343333
Use Stu		95% Chebyshev (Mean, Sd) UCL	0.44902
		97.5% Chebyshev (Mean, Sd) UCL	0.511337
		99% Chebyshev (Mean, Sd) UCL	0.633748

Final Survey Unit Design

Project: **Under Ground Lines, PRS 423**

Review & Approval

Project Engineer: Dennis Lammlein _____

Reviewer: James Fontaine _____

Reviewer: Christine Lee _____

~~**document**~~	~~**title**~~
document	**Title**
AM	*UGL Action Memorandum, September 2003*
WP	*Underground Lines Removal, ETL-MND-106-00, January 2004*
VSAP	*Standard VSAP Draft Final, Rev. 0, June 2004*

~~Preliminary~~Final SUD Worksheet

Step No.	Description	Fill in the blanks....
1	Summarize historic **information** relevant to SU	PRS 423 addresses the concrete encased 8" vitrified clay pipe starting at H-Building wall, running through Manhole HW-22, and continuing to Manhole HW-20 where PRS 423 terminates. Potential Release Sites 423 through 428 are underground line segments that served to carry radioactively contaminated wastes from H Building (environmental laboratories, laundry, change rooms) operations to the Waste Disposal (WD) Building.
2	Summarize historic **data** relevant to SUD	Historic sampling data (prior to RA) located within this PRS did not show any results above the CO. RASS sampling during the removal action are depicted and listed in Attachment A. The results are also contained in Common on 'ER' K:\Shared\Lammlein\SUDs & Supporting Files\PRS243\prs423rass.xlw as well as Attachment A.
~~3a~~	~~COCs & basis~~	~~Actinium-227, CO 4.6 pCi/g~~ ~~Americium-241, CO 63 pCi/g~~ ~~Cesium-137, CO 3.8 pCi/g~~ ~~Cobalt-60, CO 0.7 pCi/g~~ ~~Plutonium-238, CO 55 pCi/g(1)~~ ~~Radium-226, CO 2.9 pCi/g~~ ~~Thorium-228, CO 2.6 pCi/g~~ ~~Thorium-230, CO 2.8 pCi/g~~ ~~Thorium-232, CO 2.1 pCi/g~~ ~~CO is 10^{-5} RBGV + background or HI=1 value except as noted~~ ~~Value of 55 pCi/g was based on Core Team decision.~~ ~~Basis: Reference UGL Action Memorandum, September 2003 and Mound Plant Potential Release Site Package PRS 423, 424, 425, 426, 427, 428.~~
3a	COCs & basis	Actinium-227, CO 4.6 pCi/g Americium-241, CO 63 pCi/g Cesium-137, CO 3.8 pCi/g Cobalt-60, CO 0.7 pCi/g Plutonium-238, CO 55 pCi/g(1) Radium-226, CO 2.9 pCi/g Thorium-228, CO 2.6 pCi/g Thorium-230, CO 2.8 pCi/g Thorium-232, CO 2.1 pCi/g CO is 10^{-5} RBGV + background or HI=1 value except as noted (1) Value of 55 pCi/g was based on Core Team decision. Basis: Reference UGL Action Memorandum, September 2003; Table 2 of the UGLs Removal Plan; and Mound Plant Potential Release Site Package PRS 423, 424, 425, 426, 427, 428. During remediation, four isolated areas in PRS 423 appeared to have discoloration and were found to have predominantly Pu238 radiological contamination. These areas were fully removed leaving bedrock surfaces in the trench. No further discoloration was observed on the floor or sidewalls.

3b	Chemical basis for std dev, AM COCs/New COCs	No Chemical COCs	
4	Classify Areas	Class	Scan Coverage guidelines
		1	100%
		2	10-90%
		3	judgmental
~~5~~	~~Subdivide areas into SUs~~	~~Area is divided into two Survey Units, see Attachment B.~~ ~~SU1 is the trench itself and is 62.4 square meters. Note: refer to section 3.5.1 of VSAP.~~ ~~SU2 is the surface work zone area and is 202.4 square meters.~~	
5	Subdivide areas into SUs	Area is divided into two Survey Units, see Attachment B. SU1 is the trench bottom itself and is 86 square meters. SU2 is the trench side wall areas and is 344 square meters.	
~~6a~~	~~Calculations / Rad~~ ~~a. Calculate the (s) for each COC listed above~~ ~~b. Number of Samples~~	~~See Attachment B.~~ ~~See Attachment B.~~ ~~Calculated 15 samples in each SU. Since SU1 is <100 square meters samples will be taken at 15 foot intervals from a random starting point to be selected by a drop off a rock in the field. Sample locations will be surveyed at the time of or sampling or closely following.~~	
6a	Calculations / Rad a. Calculate the (s) for each COC listed above b. Number of Samples	See Attachment B. See Attachment B. Calculated 15 samples in each SU. Since SU1 is approximately five feet wide samples will be taken at 15 foot intervals from a random starting point to be selected by a drop off a rock in the field. Sample locations will be surveyed by direct reflex at the time of sampling or closely following. SU1 wil have approximately 12 samples. SU2 is composed of both side walls and has an area of 344 square meters. A 15 foot grid started at a randomly selected starting point yielded 16 samples. Note: The utilization of RASS sampling for sidewall compliance has been re-evaluated. RASS sampling data will not be used for verification of sidewall compliance to the CO. Due to the safety concerns of placing an individual in the trench, FSS side wall sampling will be accomplished by scraping the sidewall with an excavator bucket and subsequent sampling of the material in the bucket. Samples will be taken on a 15 foot triangular grid.	

6b	Calculations/Chem, Std dev,Number of Samples	No Chemical COCs
~~7~~	~~Grid spacing~~	~~From spreadsheet~~
7	Grid spacing	15 foot triangular grid
~~8~~	~~QA/QC~~	~~1/10~~
8	QA/QC	1/20 via field duplicate in accordance with Mound Methods Compendium. Q-002 Chain-of-Custody Procedures S-001 General Instructions for Field Personnel S-002 Soil Sampling With a Spade and Scoop S-028 Sample Control and Documentation S-029 Guide to Handling, Packaging, and Shipping of Samples and Method Q-002
~~9~~	~~Analyses~~	~~Per Mound Methods Compendium and 5400.5 as applicable.~~
9	Analyses	Per Mound Methods Compendium and 5400.5 as applicable. A-012 Isotopic Uranium, Isotopic Plutonium, and Isotopic Thorium by Alpha Spectrometry A-015 Gamma Spectrometry MD-80036 OP 30005, 30007, and 30040 Bedrock surfaces will be swiped and gross alpha and beta measurements will be performed and compared to the most restrictive COC in 5400.5. If the location fails to meet the most restrictive criteria then it will be sent to alpha spec for determination of the COC so the applicable, instead of the most restrictive, criteria can be applied.
~~10~~	~~Not otherwise covered.../ comments~~	~~Survey Unit Design: The project engineer in conjunction with RadCon wil evaluate the need for additional samples for the final SUD, determine the location and frequency of final SUD samples, monitors the results to confirm assumptions made in the preliminary SUD, and prepare and implement the final SUD (verification sampling event).~~ ~~Site policy requires performance of onsite soil screening (NaI or germanium on verification samples slated for offsite analysis and evaluation of the results prior to shipment. This analysis will generally be performed on a cpli of the verification sample containerized in an EPA dish (approximately 500 mL) but may be performed on the actual verification sample as long as containerization requirements are maintained for the offsite lab. Count time of the analysis will be sufficient to meet the cleanup objectives (COs) of the contaminants of concern (COCs) requiring verification.~~ ~~If there is an insufficient volume of soil to fill an EPA dish within a 1m x 1m square centered on the proposed sample location, due to bedrock or obstruction (such as a structure, foundation, or utility bank which is not to be removed), then soil analysis will not be performed. In lieu of a soil analysis~~

		~~result, RadCon will survey the surface per 5400.5 and provide documentation thereof in an RSDS. The RSDS(s) will be included as documentation. Any final sample location that does not meet the surface release criteria will be submitted to the Core Team for concurrence prior to the area being backfilled.~~ ~~Accessibility for sampling is a constraining factor. Sampling of the trench walls is impeded due to trench wall accessibility by both personnel and equipment. RASS data will be used to demonstrate that the walls are sufficiently remediated. Accessibility to the trench floor by personnel is impeded due to the width of the trench not being sufficient to use a man-box for access. Where sufficient volume of soil exists and is accessible with an excavator a soil sample will be taken otherwise a surface survey will be performed utilizing methods available from atop the trench.~~
10	Not otherwise covered.../ comments	Site policy requires performance of onsite soil screening (NaI or germanium on verification samples slated for offsite analysis and evaluation of the results prior to shipment. This analysis will generally be performed on a spli of the verification sample containerized in an EPA dish (approximately 500 mL) but may be performed on the actual verification sample as long as containerization requirements are maintained for the offsite lab. Count time of the analysis will be sufficient to meet the cleanup objectives (COs) of the contaminants of concern (COCs) requiring verification. If there is an insufficient volume of soil to fill an EPA dish within a 1m x 1m square centered on the proposed sample location, due to bedrock or obstruction (such as a structure, foundation, or utility bank which is not to be removed), then soil analysis will not be performed. In lieu of a soil analysis result, RadCon will survey the surface per 5400.5 and provide documentation thereof in an RSDS. The RSDS(s) will be included as documentation. Any final sample location that does not meet the surface release criteria will be submitted to the Core Team for concurrence prior to the area being backfilled. Accessibility for sampling is a constraining factor. Sampling of the trench walls is impeded due to trench wall accessibility by both personnel and equipment. Side wall sampling will be performed via excavator sampling. Accessibility to the trench floor by personnel is impeded due to the width of the trench not being sufficient to use a man-box for access. Where sufficient volume of soil exists and is accessible with an excavator a soil sample will be taken otherwise a surface survey (swipe and direct) will be performed utilizing methods available from atop the trench. No bias sampling is planned by CH2M HILL for final verification. Bias samples are always within the discretion of the EPA.

~~REFERENCES~~

~~1: Work Plan for Environmental Restoration of the DOE Mound Site, The Mound 2000 Approach, February 1999, Final, Revision 0~~
~~2: PP-1059A, Issue 11, Integrated Work Control Program~~
~~3: PP-1060A, Issue 5, Quality Assurance Program Plan~~
~~4: MD-80036, Issue 36, Radiological Operations Procedures~~
~~5: MD-80043, Issue 14, Radiological Work Requirements~~
~~6: Miamisburg Environmental Management Project, Storm Water Pollution Prevention Plan, OPA980099, Issue 0, December 1, 1998~~
~~7:MD-10167, Radioactive Waste Procedures, Operations 420: Waste Stream Characterization and 428: Waste Radionuclide Identification and Quantification~~
~~8: MD-70523, Management of Hazardous Waste, Trash, and Recyclable Materials, Operation 001: Waste Verification Sampling and Analysis~~