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WELL 1433 SAMPLING AND ANALYSIS PLAN

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DOE-FN/EPA
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ATTACHMENT I

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WELL 1433 SAMPLING AND ANALYSIS PLAN

3754

OPERABLE UNIT 2

WORK PLAN ADDENDUM

SAMPLING AND ANALYSIS PLAN FOR BORING/MONITORING WELL 1433 IN THE SOUTH FIELD

Fernald Environmental Management Project

Fernald, Ohio

Remedial Investigation/Feasibility Study

SEPTEMBER 1992

1.0 INTRODUCTION

This Work Plan Addendum describes additional leachate/perched groundwater sampling and analysis to be performed on the northwest portion of the South Field, just east of the Inactive Flyash Pile. Installation and sampling of Monitoring Well 1433, near Boring 1401, will provide additional information on leachate/perched groundwater that is expected to be present at the location shown in Figure 1. In addition, the sampling may provide uranium contamination source information for Monitoring Well 2046. Useful analytical data from Monitoring Well 1433 will be available for inclusion into the OU 2 FS Report.

2.0 BACKGROUND

Samples from Well 2046 have shown some of the highest concentrations of uranium (232 ug/l to 907 ug/l) of the 2000-series wells. The high concentrations coupled with erratic fluctuations in the concentration values lead to the installation of two additional wells (2401 and 2402) up-gradient of Monitoring Well 2046. The purpose of the additional wells was to provide needed sample points to determine the possible source of the uranium present in Monitoring Well 2046. The Operable Unit 5 RI/FS Work Plan Addendum for Additional Monitoring Wells, October 1991, Document Change Request 71, provides a more detailed discussion of the purpose of Wells 2401 and 2402. In summary, Well 2401 and 2402 were installed with first and second rounds of groundwater samples extracted and analyzed for total uranium concentrations. Total uranium results for 2401 were 8.2 ppm and 11.8 ppm. Well 2402 total uranium sample analysis indicated 27 ppm and 22 ppm, respectively. Due to the higher levels of total uranium from Well 2402, contingency Well 2403 was installed. Monitoring Well 2403 total uranium was analyzed at 0.7 ppm.

During December 1991, an attempt was made to install Well 1401. Fill materials consisting of soil, concrete and radioactively-contaminated wood fragments were encountered in 1401 at a depth of six feet. A layer of silty gray clay from a depth of 12 to 15 feet separated the contaminated fill from the unsaturated aquifer sands. A perched water-bearing zone with a thickness of 4.5 feet was observed on top of the silty-clay layer. The attempt to drill and install the well was abandoned and the boring was plugged to eliminate a conduit through which the potentially contaminated perched groundwater could leach into the regional aquifer.

3.0 PROGRAM JUSTIFICATION/OBJECTIVES

As part of the Operable Unit 2 RI/FS characterization during 1991, Monitoring Well 1711 was installed in the Inactive Flyash Pile. However, the water yields in that well have been insufficient to permit development and sampling. Due to the condition present at Well 1711, perched water or leachate from within or below the fill was not sampled. The discovery of perched water in Boring 1401 provides an opportunity to obtain leachate samples from the area near the boundary of the Inactive Flyash Pile and the South Field, as well as gather information on the uranium contamination source for Well 2406.

The proposed installation and sampling of Monitoring Well 1433, near Boring 1401, will provide an opportunity for additional visual characterization as well as the collection and analysis of any perched water/leachate encountered at that location. The proposed installation of a well near Boring 1401 may also assist in determining the source of uranium contamination in Monitor Well 2046.

The analysis of the perched water/leachate samples collected from the well may serve to provide a more comprehensive data set for Operable Unit 2. The data obtained from the perched water samples can be a comparison for the assumptions made during the geochemical fate and transport modeling of the baseline risk assessment. The data collected during this addendum will not be available for inclusion in the Operable Unit 2 RI. However, it may be considered for inclusion in the FS. Table I summarizes the data quality objectives for this Work Plan Addendum.

4.0 INSTALLATION/SAMPLING METHODS

Monitoring Well 1433 will be installed near Boring 1401 in the South Field, as shown on Figure 1, using the hollow-stem augering technique. The bottom of the well screen will be installed to a depth of 12 feet or to the top of the silty gray clay layer. All boring and well installation/sampling protocols are specified in the RI/FS QAPP with exception to the well screen, which will be a Channel Pack(TM) screen.

The Channel Pack screen will provide better sampling conditions and sample quality through its capacity to produce higher yield in low producing wells while reducing turbidity in the sample.

The well will be cased down to seven feet, using four-inch (ID) 316 stainless steel. The screen will be set at the bottom of the well and will be a five-foot 40/60, eight-slot Channel Pack screen (316 stainless steel). The well will be backfilled and finished in accordance with the design and installation specifications stated in the RI/FS QAPP, Section 5.0.

The boring will be sampled continuously as stated in the RI/FS QAPP, Section 6.0. Fill/soil samples will be field screened using HNu and GM pancake beta/gamma meters. Additionally, the soil samples will be screened for radioactivity with a SPA-3. The soil sample displaying the highest radiological screening from the unsaturated material above the perched water zone will be analyzed for full radiological parameters as shown on Table 2, TAL 20.03.04A. Soil samples not submitted for analysis will be archived at a secure on-site location. Archived samples will be handled per the RI/FS chain of custody protocols.

Upon completion of the drilling, a composite sample of the drum cuttings will be taken and submitted for total uranium, total thorium and/or toxicity characteristic leaching procedure analysis, as required for the disposition of the wastes.

For development, five well volumes will be purged from the well. If recharge is extremely slow, then development/purging will comprise bailing the well dry on two separate occasions not more than 24 hours apart. Samples of the groundwater/leachate will be collected with a teflon bailer in accordance with the procedure stated in the RI/FS QAPP, Section 6.0. Groundwater/leachate will be analyzed for the full HSL, full radiological, and other groundwater quality parameters listed in Table 3, TAL 20.03.04B. Due to time constraints in obtaining useable data for inclusion into the FS Report, only one round of water/leachate samples will be collected from the Monitoring Well 1433 for the RI/FS. After sampling is complete, the well will be transferred to the long-term site monitoring program.

5.0 REPORT

A report will be prepared by the field geologist upon completion of the installation and sampling activities. The report will include boring logs, well installation details, request for analysis and chain of custody forms, and the geologist's interpretations.

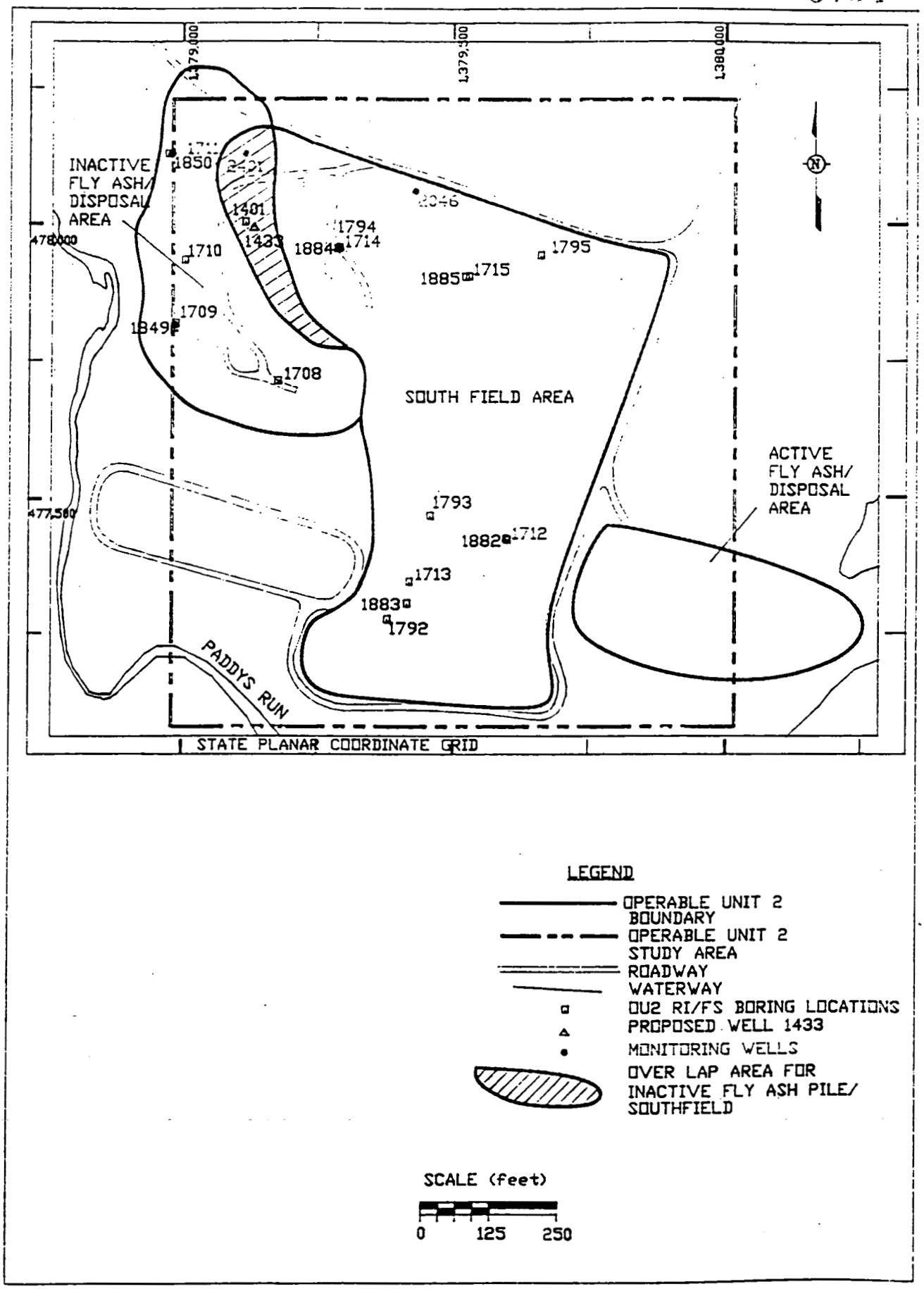

FIGURE 1. RI/FS WELL/BORING LOCATIONS IN THE SOUTHFIELD/INACTIVE FLY ASH AREA

TABLE I

DATA QUALITY OBJECTIVES FOR THE SAMPLING AND ANALYSIS PLAN FOR A 1000-SERIES BORING/MONITORING WELL IN THE SOUTH FIELD OPERABLE UNIT 2

Activity	Install a 1000-series boring/monitoring well in the South Field near Boring 1401 and visually characterize the fill/soils.	Collect samples of the perched groundwater/ leachate and analyze for Full HSL, Full Radiological and General Groundwater Quality.
Objectives	Provide additional visual characterization of the fill/soils and determine the location and extent of perched water-bearing zones in the South Field.	Characterize the perched water/leachate. Provide data for comparison with assumptions made during the geochemical fate and transport modeling of the baseline risk assessment and refine source-term parameters to be used during the FS.
Prioritized data uses	Characterization of fill materials.	The priority data use is site characterization. Additionally, the data will be compared to values used for geochemical fate and transport modeling in support of the risk assessment.

Appropriate analytical level	Visual characterization, and field screening: Level I; Full HSL: Level IV; Full Radiological: Level V; General Groundwater Quality: Level III.
Constituents of concern	In soil/fill: Full Radiological (Table 2, TASL 20.03.04A) In perched water/leachate: Full HSL, Full Radiological, and General Groundwater Quality (Table 3, TAL 20.03.04B).
Level of concern	See Appendix A Preliminary Remediation Goals for Perched Water Zones.
Required detection limits	Specified in the RI/FS QAPP, dated March 1988, Section 4.0.

TABLE 2

SAMPLING AND ANALYSIS PLAN FOR BORING/MONITORING WELL 1433 IN THE SOUTHFIELD - TARGET ANALYTE LIST FOR SOIL SAMPLES

TAL 20.03.04 A

RADIOLOGICAL PARAMETERS

FEMP RI/FS - FULL RADIOLOGICAL - ANALYTICAL PARAMETERS

1	Cesium 137
2	Gross alpha
3	Gross beta
4	Neptunium 237
5	Plutonium 238
6	Plutonium 239/240
7	Radium 226
8	Radium 228
9	Ruthenium 106
10	Strontium 90
11	Technetium 99
12	Thorium 228
13	Thorium 230
14	Thorium 232
15	Total Thorium
16	Total Uranium
17	Uranium 234
18	Uranium 235/236
19	Uranium 238

TABLE 3

SAMPLING AND ANALYSIS PLAN FOR BORING/MONITORING WELL 1433 IN THE SOUTHFIELD - TARGET ANALYTE LIST FOR GROUNDWATER/LEACHATE

TAL 20.03.04 B

FEMP RI/FS - FULL HSL - ANALYTICAL PARAMETERS

INORGANICS

1	Aluminum
2	Antimony
3	Arsenic
4	Barium
5	Beryllium
6	Cadmium
7	Calcium
8	Chromium (Total)
9	Cobalt
10	Copper
11	Cyanide
12	Iron
13	Lead
14	Magnesium
15	Manganese
16	Mercury
17	Molybdenum
18	Nickel
19	Potassium
20	Selenium
21	Silicon
22	Silver
23	Sodium
24	Thallium
25	Vanadium
26	Zinc

VOLATILE ORGANICS

1	1,1-Dichloroethane
2	1,1-Dichloroethene
3	1,1,1-Trichloroethane
4	1,1,2-Trichloroethane
5	1,1,2,2-Tetrachloroethane
6	1,2-Dichloroethane
7	1,2-Dichloroethene (total)
8	1,2-Dichloroethylene
9	1,2-Dichloropropane
10	2-Butanone
11	2-Hexanone
12	4-Methyl-2-pentanone
13	Acetone
14	Benzene
15	Bromodichloromethane
16	Bromoform
17	Bromomethane
18	Carbon disulfide
19	Carbon tetrachloride
20	Chlorobenzene
21	Chloroethane
22	Chloroform
23	Chloromethane
24	cis-1,3-Dichloropropene
25	Dibromochloromethane
26	Ethylbenzene
27	Methylene chloride
28	Styrene
29	Tetrachloroethene
30	Toluene
31	Total xylenes
32	trans-1,3-Dichloropropene
33	Trichloroethene
34	Vinyl acetate
35	Vinyl chloride

SEMIVOLATILE ORGANICS

1	1,2-Dichlorobenzene
2	1,2,4-Trichlorobenzene
3	1,3-Dichlorobenzene
4	1,4-Dichlorobenzene
5	2-Chloronaphthalene
6	2-Chlorophenol
7	2-Methylnaphthalene
8	2-Methylphenol
9	2-Nitroaniline
10	2-Nitrophenol
11	2,4-Dichlorophenol
12	2,4-Dimethylphenol
13	2,4-Dinitrophenol
14	2,4-Dinitrotoluene
15	2,4,5-Trichlorophenol
16	2,4,6-Trichlorophenol
17	2,6-Dinitrotoluene
18	3-Nitroaniline
19	3,3'-Dichlorobenzidine
20	4-Bromophenyl phenylether
21	4-Chloro-3-methylphenol
22	4-Chloroaniline
23	4-Chlorophenyl-phenyl ether
24	4-Methylphenol
25	4-Nitroaniline
26	4-Nitrophenol
27	4,6-Dinitro-2-methylphenol
28	Acenaphthene
29	Acenaphthylene
30	Anthracene
31	Benzoic acid
32	Benzo(a)anthracene
33	Benzo(a)pyrene
34	Benzo(b)fluoranthene
35	Benzo(g,h,i)perylene
36	Benzo(k)fluoranthene
37	Benzyl alcohol
38	bis(2-Chloroethoxy)methane
39	bis(2-Chloroethyl)ether
40	bis(2-Chloroisopropyl) ether
41	bis(2-Ethylhexyl)phthalate
42	Butyl benzyl phthalate
43	Carbazole
44	Chrysene
45	Dibenzofuran
46	Dibenzo(a,h)anthracene
47	Diethylphthalate
48	Dimethylphthalate
49	Di-n-butyl phthalate
50	Di-n-octyl phthalate
51	Fluoranthene
52	Fluorene
53	Hexachlorobenzene
54	Hexachlorobutadiene
55	Hexachlorocyclopentadiene
56	Hexachloroethane
57	Indeno(1,2,3-cd)pyrene
58	Isophorone
59	Naphthalene
60	Nitrobenzene
61	N-Nitroso-di-n-propylamine
62	N-Nitrosodiphenylamine
63	Pentachlorophenol
64	Phenanthrene
65	Phenol
66	Pyrene

PESTICIDES / PCBs

1	4,4'-DDD
2	4,4'-DDE
3	4,4'-DDT
4	Aldrin
5	alpha-BHC
6	alpha-Chlordane
7	Aroclor 1016
8	Aroclor 1221
9	Aroclor 1232
10	Aroclor 1242
11	Aroclor 1248
12	Aroclor 1254
13	Aroclor 1260
14	beta-BHC
15	delta-BHC
16	Dieldrin
17	Endosulfan sulfate
18	Endosulfan-I
19	Endosulfan-II
20	Endrin
21	Endrin aldehyde
22	Endrin ketone
23	gamma-BHC
24	gamma-Chlordane
25	Heptachlor
26	Heptachlor epoxide
27	Methoxychlor
28	Toxaphene

FEMP RI/FS - GENERAL GROUNDWATER QUALITY - ANALYTICAL PARAMETERS

MISCELLANEOUS

1	Ammonia
2	Chloride
3	Fluoride
4	Nitrate
5	Phenols
6	Phosphorus (total)
7	Sulfate
8	Sulfide
9	Total Organic Carbon (TOC)
10	Total Organic Halogens (TOX)
11	Total Organic Nitrogen (TON)

FEMP RI/FS - FULL RADIOLOGICAL - ANALYTICAL PARAMETERS

1	Cesium 137
2	Gross alpha
3	Gross beta
4	Neptunium 237
5	Plutonium 238
6	Plutonium 239/240
7	Radium 226
8	Radium 228
9	Ruthenium 106
10	Strontium 90
11	Technetium 99
12	Thorium 228
13	Thorium 230
14	Thorium 232
15	Total Thorium
16	Total Uranium
17	Uranium 234
18	Uranium 235/236
19	Uranium 238

APPENDIX A

TABLE 2-3
PRELIMINARY REMEDIATION GOALS - PERCHED WATER ZONES

Site: Fernald Environmental Management Project
Location: Fernald, Ohio
Medium: Perched Water

Land Use: Resident Farmer
Transport Routes: Leaching to Groundwater

Chemical	Risk-Based PRGs Based on Regulating as Leachate[a]			ARAR-Based PRGs Based on Regulating as Leachate[a]		Other Considerations	
	HI=0.20 RfD-Based PRG[b]	10-5 CSF-Based PRG[c]	10-6 CSF-Based PRG[c]	MCL-Based Limit[d]	TCLP Regulatory Limit[e]	Background Concentration[f]	Contract Required Detection Limit[g]
RADIONUCLIDES (pCi/L)							
Ac-227		60	6				
Cs-137		700	70	10200			102
Pb-210		30	3	100			
Np-237		80	8	100			1
Pa-231		110	11				
Pu-238		70	7	200			2
Pu-239		70	7	200			
Pu-240		70	7	200			
Pu-239/240		70	7	200			2
Ra-226		200	20				5
Ra-228		200	20			5.2 (max)	5
Rn-220		300	30				
Rn-222		2000	200	30000			
Sr-90		100	10	800			8
Tc-99		16000	1600	91400			914

TABLE 2-3
(Continued)

Chemical	Risk-Based PRGs Based on Regulating as Leachate[a]			ARAR-Based PRGs Based on Regulating as Leachate[a]		Other Considerations	
	HI=0.20 RfD-Based PRG[b]	10-5 CSF-Based PRG[c]	10-6 CSF-Based PRG[c]	MCL-Based Limit[d]	TCLP Regulatory Limit[e]	Background Concentration[f]	Contract Required Detection Limit[g]
Th-228		300	30	1400		1.24	14
Th-230		900	90	1000		2.5	10
Th-232		900	90	200			2
U-234		100	10			2.89	
U-235		200	20				
U-238		200	20	700		2.04	
INORGANICS (mg/L)							
Aluminum						0.18(*)	0.2
Antimony	0.3						0.06
Arsenic	0.7			5	5	0.003 (max)	0.01
Barium	37			200	100	0.132	0.2
Beryllium	4	0.01	0.00			0.001(*)	0.005
Boron	66						
Cadmium	0.4			0.50	1	0.003(*)	0.005
Chromium	3.7			10	5	0.076	0.01
Cobalt	1.9						0.05
Copper						0.046	0.025

TABLE 2-3
(Continued)

Chemical	Risk-Based PRGs Based on Regulating as Leachate[a]			ARAR-Based PRGs Based on Regulating as Leachate[a]		Other Considerations	
	HI=0.20 RfD-Based PRG[b]	10-5 CSF-Based PRG[c]	10-6 CSF-Based PRG[c]	MCL-Based Limit[d]	TCLP Regulatory Limit[e]	Background Concentration[f]	Contract Required Detection Limit[g]
Iron						1.8	0.1
Lead	0.5			0.50	5	0.005(*)	0.005
Magnesium						56.8	5
Manganese	73.0					0.2	0.015
Mercury	0.2			0.20	0.2		0.0002
Molybdenum	3						
Nickel	15					0.103	0.04
Selenium	4			5	1		0.005
Silver	2			5	5	0.05	0.01
Thallium	0.1						0.01
Uranium	2			2		0.0061	
Vanadium	5					0.023(*)	0.05
Zinc	150					0.039(*)	0.02
Cyanide	15						0.01
ORGANICS (mg/L)							
1,1,2-Trichloro-1,2,2-trifluoroethane					2190.0		
1,1,2,2-Tetrachloroethane		0.18	0.02				0.005

TABLE 2-3
(Continued)

Chemical	Risk-Based PRGs Based on Regulating as Leachate[a]			ARAR-Based PRGs Based on Regulating as Leachate[a]		Other Considerations	
	HI=0.20 RfD-Based PRG[b]	10-5 CSF-Based PRG[c]	10-6 CSF-Based PRG[c]	MCL-Based Limit[d]	TCLP Regulatory Limit[e]	Background Concentration[f]	Contract Required Detection Limit[g]
1,1,1-Trichloroethane	66			20			0.005
1,1-Dichloroethane	73						0.005
1,1-Dichloroethene	7	0.06	0.01	0.70	0.7		0.005
1,2-Dichloroethane		0.40	0.04	0.50	0.5		0.005
1,2-cis-Dichloroethene	7.3			7			
1,2-trans-Dichloroethene	15			10			0.005
2,4-Dimethylphenol	15						0.01
2-Butanone	37				200		0.01
2-Methylnaphthalene							0.01
2-Methylphenol							0.01
4-Methyl-2-pentanone	37						0.01
4-Methylphenol							0.01
Acenaphthene	44						0.01
Acetone	73					0.13	0.01
Anthracene	219						0.01
Aroclor-1242		0.005	0.0005	0.05			0.0005
Aroclor-1248		0.005	0.0005	0.05			0.0005
Aroclor-1254		0.005	0.0005	0.05			0.001

TABLE 2-3
(Continued)

Chemical	Risk-Based PRGs Based on Regulating as Leachate[a]			ARAR-Based PRGs Based on Regulating as Leachate[a]		Other Considerations	
	HI=0.20 RfD-Based PRG[b]	10-5 CSF-Based PRG[c]	10-6 CSF-Based PRG[c]	MCL-Based Limit[d]	TCLP Regulatory Limit[e]	Background Concentration[f]	Contract Required Detection Limit[g]
Aroclor-1260		0.005	0.0005	0.05			0.001
Benzene		1.26	0.13	0.50			0.005
Benzo(a)anthracene[h]							0.01
Benzo(a)pyrene		0.003	0.0003				0.01
Benzo(b)fluoranthene[h]							0.01
Benzo(g,h,i)perylene[h]							0.01
Benzo(k)fluoranthene[h]							0.01
Benzoic Acid	2900						0.05
Benzyl Alcohol	220						0.01
Bis(2-ethylhexyl)phthalate	15	2.61	0.26				0.01
Butyl benzyl phthalate	150						0.01
Carbon Disulfide	73.0						0.005
Carbon Tetrachloride	0.5	0.28	0.03	0.50	0.5		0.005
Chlordane	0.0	0.03	0.003	0.20	0.03		0.0005
Chlorobenzene	15				100		0.005
Chloroethane							0.01
Chloroform	7	5.98	0.60	10	6		0.005
Chrysene[h]							0.01

TABLE 2-3
(Continued)

Chemical	Risk-Based PRGs Based on Regulating as Leachate[a]			ARAR-Based PRGs Based on Regulating as Leachate[a]		Other Considerations	
	HI=0.20 RfD-Based PRG[b]	10-5 CSF-Based PRG[c]	10-6 CSF-Based PRG[c]	MCL-Based Limit[d]	TCLP Regulatory Limit[e]	Background Concentration[f]	Contract Required Detection Limit[g]
DDT	0.4	0.11	0.01				0.0001
Di-n-butyl Phthalate	73.0						0.01
Di-n-octyl Phthalate	15						0.01
Dibenzo(a,h)anthracene[h]							0.01
Dibenzofuran							0.01
Ethyl Parathion							0.0001
Ethylbenzene	7			70			0.005
Fluoranthene	29						0.01
Fluorene	29						0.01
beta-Hexachlorocyclohexane		0.02	0.002				0.00005
Indeno(1,2,3-cd)pyrene[h]							0.01
Methyl Parathion	2						
Methylene Chloride	44	5	0.5			0.041	0.005
N-nitrosodiphenylamine		7	0.7				0.01
Naphthalene	3						0.01
Pentachlorophenol	22	0.30	0.03	0.10	100		0.05
Phenanthrene							0.01
Phenol	440						0.01

TABLE 2-3
(Continued)

Chemical	Risk-Based PRGs Based on Regulating as Leachate[a]			ARAR-Based PRGs Based on Regulating as Leachate[a]		Other Considerations	
	HI=0.20 RfD-Based PRG[b]	10-5 CSF-Based PRG[c]	10-6 CSF-Based PRG[c]	MCL-Based Limit[d]	TCLP Regulatory Limit[e]	Background Concentration[f]	Contract Required Detection Limit[g]
Pyrene	22						0.01
Tetrachloroethene	7	0.7	0.07	0.50	0.7		0.005
Toluene	150			100			0.005
Trichloroethene		3.3	0.3	0.50			0.005
Vinyl Chloride		0.02	0.002	0.20	0.2		0.01
Xylenes (total)	1500			1000			0.005

(a) In the shallow water-bearing zones, PRGs are developed based on the potential for chemicals in those zones to leach into the bedrock aquifer or a receiving surface water body, thus equating water in the shallow zones to "leachate." Leachate is regulated by the U.S. EPA under 40CFR261 with the use of the toxicity characteristic leaching procedure (TCLP). TCLP regulatory levels are based on the acceptable drinking water concentrations multiplied by a dilution attenuation factor (DAF), which accounts for the degree of attenuation and dilution that a compound is expected to undergo during transport to the drinking water aquifer or receiving stream (U.S. EPA 1986c; 51FR21650).

(b) Based on HI-based groundwater PRG and a DAF of 100.

(c) Based on cancer risk-based groundwater PRG and a DAF of 100.

(d) Based on MCL times DAF of 100.

(e) From 40CFR261, 55FR11798.

(f) In most cases, concentrations represent upper 95% tolerance interval from USGS (Shacklett 1984) and Myrick et al. (1983). In cases where data were not available to calculate UTL, mean value is reported.

(g) From CLP Statement of Work, U.S. EPA OLM01.08.

(h) Risk-based level developed using cancer slope factor for benzo(a)pyrene.