FINAL PLAN OF REMEDIAL ACTION

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DRAVO SHIPYARD

Operable Unit II
RDC/Harbor Associates Properties
Wilmington, Delaware

DNREC Projects No. DE-1092 & DE-1096

February 2001

Department of Natural Resources and Environmental Control
Division of Air and Waste Management
Site Investigation and Restoration Branch

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1 INTRODUCTION

In April and June 1998, the Department of Natural Resources and Environmental Control (DNREC or Department) under the authority granted by the Hazardous Substance Cleanup Act, 7 Del. C. Ch. 91 (HSCA) reached an agreement with the Riverfront Development Corporation (RDC) and Harbor Associates to oversee environmental investigation, remediation activities, and redevelopment activities at the former Dravo Shipyard Site located on Madison Street in Wilmington, Delaware (Figures 1 and 2). The former Dravo Naval Shipyard was scheduled to be redeveloped into a catalog outlet shopping mall, an exhibition center, and related facilities by the Riverfront Development Corporation of Delaware and the Harbor Associates, Inc.

The scope of this Final Plan of Remedial Action is the soil and subsoil for the geographic area of the Operable Unit II, plus the groundwater media for Operable Units I, II and III.

This document is the Department's Final Plan of Remedial Action for the Dravo Shipyard property as defined in Figure 2. This Final Plan is issued under provisions of the HSCA and the Regulations Governing Hazardous Substance Cleanup (Regulations). It presents the Department's assessment of the potential unacceptable health and environmental risks posed by the Dravo Shipyard Site and plans for further action.

The Final Plan of Remedial Action also includes a comparison of the remedial alternatives with respect to but not limited to: current and potential land use, natural resource use, proximity of human populations, use of surrounding properties, specific environmental issues, protection of public health, welfare, and the environment, and compliance with applicable laws and regulations.

The Department provided the public with notice and opportunity to comment on the Proposed Plan in accordance with Section 12 of the Regulations. At the conclusion of the comment period, after review and consideration of the comments received, the Department issues this Final Plan of Remedial Action, designating the selected remedial action.

2 SITE DESCRIPTION AND HISTORY

2.1 Site Description

The former Dravo Shipyard consists of approximately 120 acres, and is located southwest of the City of Wilmington business district (Figure 1). Approximately 48 acres of the Dravo Shipyard encompasses the areas that are under agreement to be investigated under the Voluntary Cleanup Agreements between the DNREC and RDC, and the DNREC and Harbor Associates. The Harbor Associates property encompasses approximately 33 acres and is located on the western and southern portion of the former Dravo Shipyard Site. The RDC property encompasses approximately 14.5 acres and is located on the eastern portion of the former Dravo Shipyard Site. Contained within the former Dravo Shipyard Site is an underground utility vault system that runs along Madison Street, with arterials to the former naval shipyard buildings. The utility vaults are not currently in use. The total area described under this Final Plan of Remedial Action for the Dravo Shipyard Operable Unit II constitutes approximately 18 acres of land and the groundwater

media from Operable Units I, II and III (approximately 48 acres) (Figure 1). The area of investigation is detailed in Figure 2.

2.2 Site History

The entire redevelopment area was historically the site of shipbuilding and other heavy industrial activities. Much of the area was reclaimed from marshland by filling with slag and other industrial waste products. Because of its previous industrial use soil in the area has been impacted by environmental contaminants including total petroleum hydrocarbons (TPH), heavy metals (lead, arsenic), polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs).

3 INVESTIGATION RESULTS

A total of three environmental investigations have been performed on the site project area. In July and November 1997, the DNREC performed two Brownfield Preliminary Assessment IIs. Soils throughout the property were found to contain significant amounts of organic and inorganic contaminants from historical operations at levels well above screening benchmarks. Primary contaminants of concern were found to be polynuclear aromatic hydrocarbons (PAHs) and lead. Results indicated that relatively widespread PAH contamination of the shallow and deep soils in the project area. Toxic Characteristics Leaching Procedures (TCLP) analysis indicated that one surface soil sample exceeded the regulatory level for lead as a hazardous waste.

EA Engineering performed the Remedial Investigation (RI) for the Operable Unit II (OU2) area September through December 1998 under contract with the RDC and Harbor Associates. Soil samples were collected in a 100 foot grid pattern from the geographic OU 2 area and from the location of the Bioretention swale extension in 50 linear foot fashion (Figure 3). Soil samples were screened initially by the Department of Natural Resources and Environmental Control's Site Investigation and Restoration Branch (DNREC-SIRB) mobile lab for carcinogenic polynuclear aromatic hydrocarbons (C-PAH) using Ohmicron immunoassay kits and for Total metals, including arsenic, cadmium, chromium, lead, and mercury using an X-ray fluorescence instrument (XRF). Additional volatile and semivolatile screenings were performed by the DNREC-SIRB and the DNREC-Division of Water Resources Environmental Services Laboratory (DNREC – ESS). Groundwater samples were collected from the DNREC installed groundwater monitoring wells and the EA installed wells per HSCA protocol's and analyzed by EA Laboratories in Sparks, Maryland (Figure 4). Six ground water samples were collected from the monitoring wells.

A total of 109 soil samples were collected during the test pitting activities and Bioretention swale sampling (Appendix A). As a result of the mobile laboratory screening, a total of 27 soil samples were submitted to EA Laboratories in Sparks, Maryland, for analysis of select parts of the United States Environmental Protection Agency (USEPA) Target Analyte List (Inorganics) and Target Compound List (Organics) (TAL/TCL) (Appendix B). Samples were selected by EA and the DNREC on the basis of moderate or high screening results.

According to the screening analysis performed at the DNREC mobile laboratory, the contaminants of concern detected were Carcinogenic Polycyclic Aromatic Hydrocarbons (C-PAH) and arsenic. Lead and polychlorinated biphenyls (PCBs) did not exceed the DNREC's

unlimited reuse criterion (Table 1). The site specific reuse criterion developed for the site categorized soils on the basis of contaminant content detected in screening and fixed laboratory analysis. The soils are grouped according to level of contaminant, such as metals, semi-volatile and volatile organics, into categories of use or reuse.

Category A has been determined to be those soils suitable for unlimited reuse or residential use.

Category B soils are suitable for industrial/commercial reuse within the project area. This category of soils requires a minimum of one foot clean fill and geotextile marker fabric of a minimum quality of Amoco ACF 4508 or its equivalent as determined by the DNREC to be placed over the 'B' soils.

Category C soils may be reused on the site, but must be covered by building foundations or asphalt/concrete and additional soils.

Category Z soils must be disposed of off site. Of the 27 samples submitted for confirmatory analysis.

No samples exceeded the DNREC's commercial/industrial reuse criterion (Category C)

The analytical results for the ground water beneath the site revealed uniform contamination of iron and manganese in the wells and one exceedence of aluminum in MW-5 (Appendix C). The ground water results also detected concentrations of arsenic above the carcinogenic DNREC Uniform Risk-Based Remediation Standards, but all levels were below the non-carcinogenic value for arsenic.

4 REMEDIAL ACTION OBJECTIVES

According to HSCA regulation 8.4(1), during a remedial investigation, remedial action objectives must be established. For the Dravo Shipyard/Harbor Associates Site, remedial action objectives were designed based on the following factors:

- The site is currently zoned as commercial and industrial land. Numerous vacant lots and former industrial buildings are present.
- The future site use is expected to be paved roadway, asphalt parking lots, shopping centers, and very limited open space.
- The site is adjacent to the Christina River.
- Surrounding land uses are mixed, including warehousing, commercial, and residential.
- Soil at the site has been impacted by various chemical constituents. Based on the nature and extent of the contaminants, PAHs and arsenic have been chosen as the primary contaminants of concern.

- The ground water at the site has been impacted with select metals, including arsenic, aluminum, iron, and manganese.

- The primary exposure pathways are inhalation, potential ingestion of ground water from the site, direct contact and incidental ingestion with/of impacted soil, and erosional transport to the Christina River.

4.1 Qualitative Remedial Objectives

Based on the above factors, the following qualitative remedial action objectives were developed:

- Control potential human contact (dermal, inhalation, and ingestion) with contaminated soil.

- Control potential human contact (ingestion) with contaminated ground water.

- Control potential contaminated soil erosion into the Christina River.

4.2 Quantitative Remedial Objectives

Based on the above qualitative remedial action objectives, the following quantitative remedial action objectives for the soil and subsoil environmental media were developed:

- Prevent human contact with soil having an arsenic concentration greater than 3 mg/Kg.

- Prevent human contact with soil having a lead concentration greater than 400 mg/Kg.

- Prevent human contact with soil having a C-PAH concentration greater than 1 mg/Kg.

- Prevent human contact with soil having a PCB concentration greater than 0.5 mg/Kg.

- Prevent human contact with soil having a benzene-toluene-ethyl benzene-xylene (BTEX) concentration greater than 10 mg/Kg.

- Prevent human contact with soil having a C5 through C8 Aliphatic Hydrocarbons concentration greater than 100 mg/Kg.

- Prevent human contact with soil having a C9 through C12 Aliphatic Hydrocarbons concentration greater than 1000 mg/Kg.

- Prevent human contact with soil having a C9 through C18 Aliphatic Hydrocarbons concentration greater than 1000 mg/Kg.

- Prevent human contact with soil having a C19 through C36 Aliphatic Hydrocarbons concentration greater than 2500 mg/Kg.

- Prevent human contact with soil having a C9 through C10 Aromatic Hydrocarbons concentration greater than 100 mg/Kg.

- Prevent human ingestion at the site of ground water containing metal contaminant concentrations greater than the DNREC Uniform Risk-Based Remediation Standards.

- Prevent release of contaminated sediment from the second phase of the Bioretention swale into the Christina River in exceedence of the DNREC Uniform Risk Based Remediation Standards for protection of the environment.

The quantitative remedial action objectives were based on the DNREC "Remediation Standards Guidance Under the Delaware Hazardous Substance Cleanup Act" (February 1998). These objectives are protective of potential human and environmental receptors.

5 PROPOSED REMEDIAL ACTION PLAN

5.1 Potential Remedial Alternatives

To accomplish the described remedial action objectives, three potential remedial alternatives were reviewed for the soil and subsoil environmental media for the project area. These are listed below and discussed further in the following section:

Alternative 1: No further action. Contaminants identified during the Remedial Investigation/Feasibility Study (RI/FS) are not remediated. The proposed redevelopment project would occur based upon local zoning requirements. Under this option no further remediation of contaminants would be required

Alternative 2: Containment of affected materials in compliance with the DNREC HSCA Regulations. Under this alternative, soil to be excavated for the redevelopment project will be handled in accordance with the DNREC established soil reuse categories. In addition to the categories for selective re-use of contaminated soils at the site, the following shall also apply:

- Provide deed restrictions for all project involved parcels for non-residential use,
- Require notification and approval from DNREC prior to any future intrusive activity in the project area and,
- Placement of a Groundwater Management Zone (GMZ) at the site to prevent future use of the groundwater beneath the site.
- Development of an Operation and Maintenance Plan (O&M) to maintain the containment system.

Alternative 3: Complete removal of materials that exceed the DNREC unlimited reuse criterion. Under this alternative, approximately 80 percent of soil in the site area would be excavated to a depth averaging 10 feet below grade, and be transported through Wilmington for off-site disposal. An equal amount of clean fill would be transported back for use in this redevelopment project. The excavated soil would represent all soils found to exceed the

DNREC Unlimited Reuse Criterion (Level A) determined through soil screening analysis and confirmatory laboratory analysis. Extensive dewatering would occur under this option, as the affected soils extend below present water table levels.

6 PROPOSED AND FINAL REMEDIAL ACTION PLAN

The remedial alternatives were evaluated in accordance with the criteria set forth in the HSCA Regulations. Based on these criteria, Alternative 1 (no further action) was a viable alternative because it will neither protect human health or the environment nor comply with current laws. Alternatives 2 and 3 (containment and complete off-site disposal of all soils) were considered viable alternatives. Alternative 3 (off-site disposal) will cause short-term exposures to the public due to hauling large quantities of contaminated soil off-site. Further, there is little to no apparent increased protectiveness with Alternative 3 as compared with Alternative 2, but there is a substantial increase in cost with Alternative 3.

Therefore, the most appropriate remedial action was Alternative 2 (containment of impacted soil). Alternative 2 provided a cost effective means of meeting all the remedial objectives while satisfying the evaluation criteria. Alternative 2 also removed the potential exposure pathway of human contact with impacted soil by isolating the source.

7 PUBLIC PARTICIPATION

The Department actively solicited public comments or suggestions on the Proposed Plan and welcomed opportunities to answers questions. The public hearing was held on Wednesday, September 15, 1999 at the City/County Building, 800 N. French Street, Wilmington, at 6:00 p.m. A Secretary's Order # 2000-A-0005 was finalized on January 31, 2000. For additional information, contact Ann Breslin at (302) 395-2600.

March 6, 2001
Date

Denise Ferguson-Southard, Director

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Scale: 1 inch = 2,000 feet

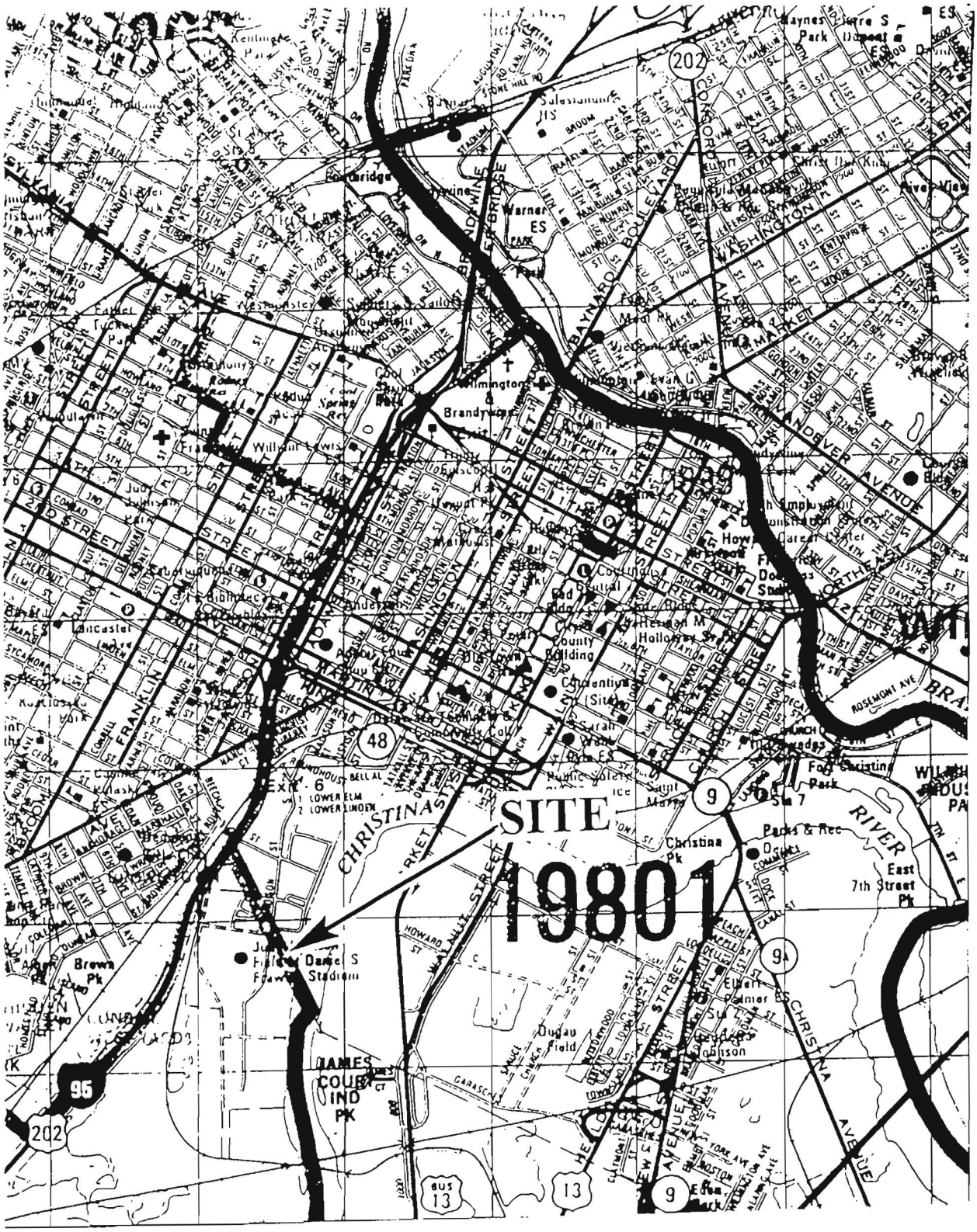

Figure 1 Site location map, Harbor Associates Property, Wilmington, Delaware. (Source: ADC Street Map Book, New Castle County, Delaware, 8th Edition)

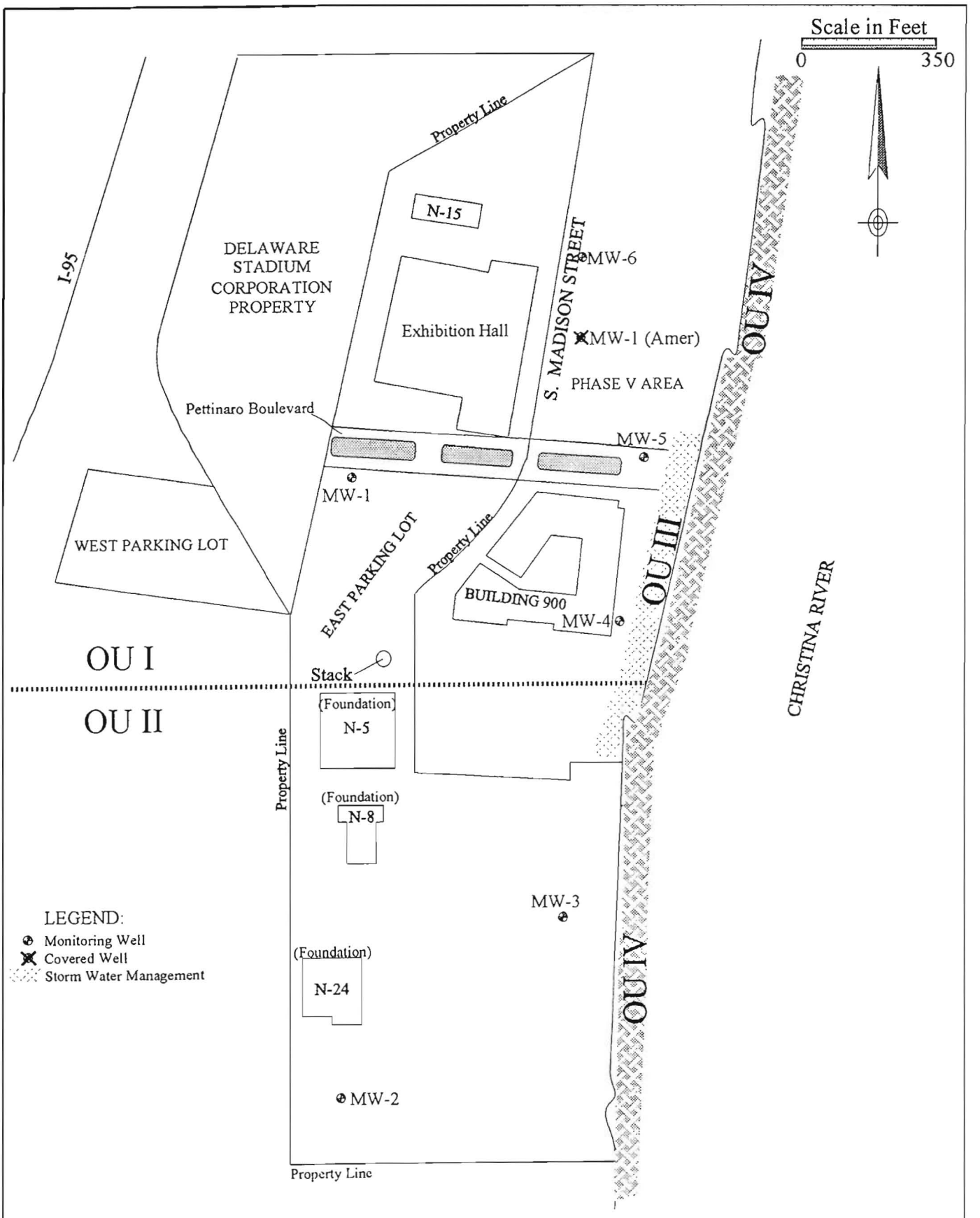

Figure 2. Site map of Harbor Associates and former Amer Properties.

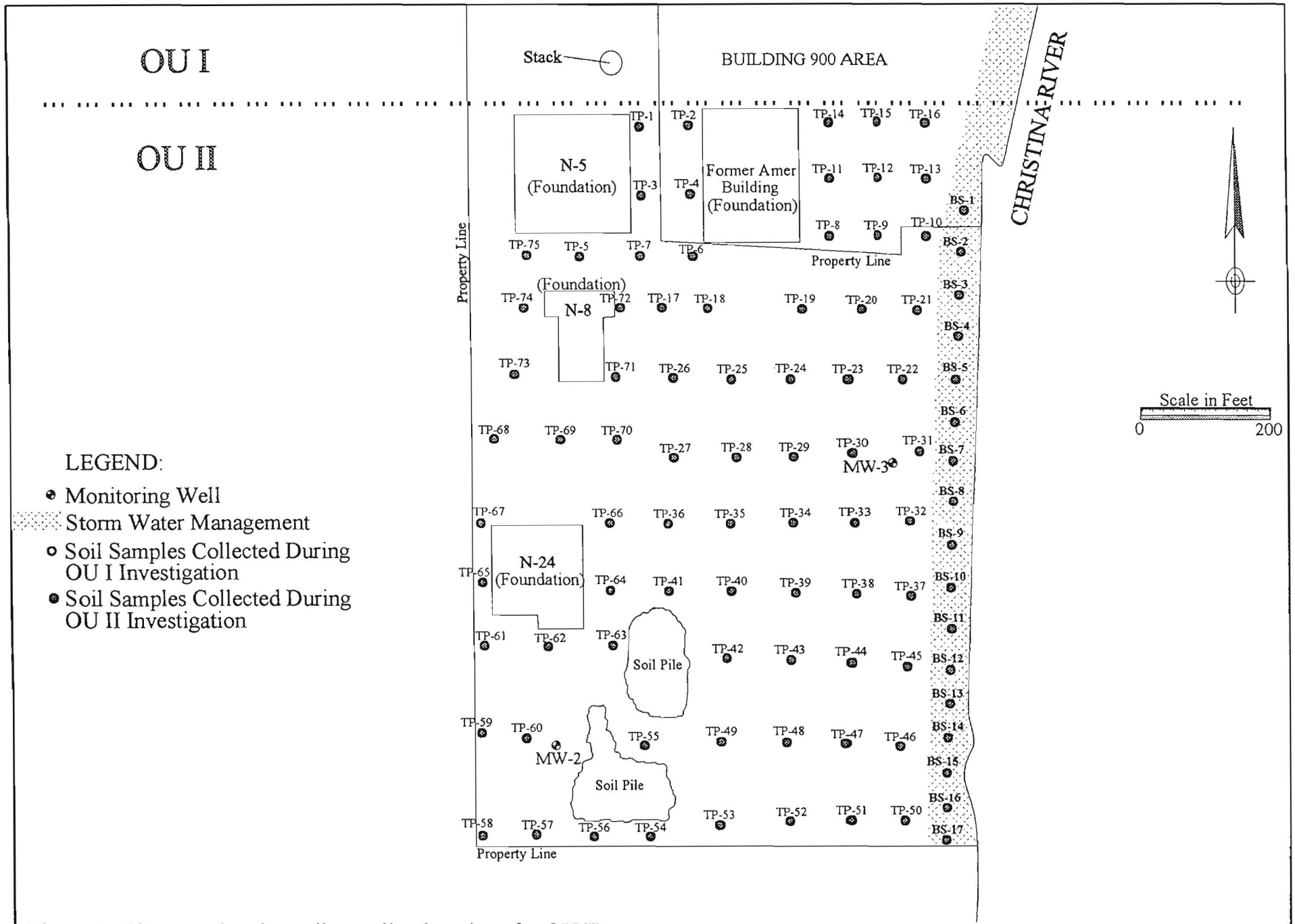

Figure 3. Site map showing soil sampling locations for OU II.

TABLE 1

Subsurface Soil Characterization for the Proposed Bioswale
Deep Soil Classification
Material to Remain In Place

Location	Sample Elevation	Lead	Arsenic	PAH	PCB	Classification
BS-1d	7.0	A	A	B	A	B
BS-2d	10.0	A	A	B	A	B
BS-3d	9.5	A	A	B	A	B
BS-4d	7.0	A	A	B	A	B
BS-5d	12.0	A	A	A	A	A
BS-6d	7.0	A	A	A	A	A
BS-7d	7.0	A	A	C	A	C
BS-8d	10.0	A	A	B	A	B
BS-9d	9.0	A	A	A	A	A
BS-10d	9.5	A	A	B	A	B
BS-11d	8.0	A	A	C	A	C
BS-12d	8.0	A	A	A	A	A
BS-13d	9.0	A	A	B	A	B
BS-14d	8.0	A	A	B	A	B
BS-15d	11.0	A	A	B	A	B
BS-16d	8.0	A	A	B	A	B
BS-17d	8.0	A	A	A	A	A

Soil Reuse Classification Criteria
mg/kg

Analyte	A	B	C	Z
Lead	<400	400 to 1,500	1,500 to 5,000	>5,000
Arsenic	< 60	60 to 100	100 to 500	>500
PAH	<1.0	1.0 to 25	25 to 300	>300
PCB	<0.5	0.5 to 3.0	3.0 to 8.0	>8.0

APPENDICES

Appendix A

Subsurface Soil Screening - DNREC Laboratory Analytical Results for the OU-II Area
PAH Analyses by Immunoassay
October 1998 - December 1998

Sample ID TP-	Concentration ppm	Qualifier
1	58.3	Hi
2	4.3	
3	8.3	
4	ND	
5	0.3	ND
6	ND	
7	0.3	ND
8	0.2	ND
9	1.9	
10	110.2	Hi
11	ND	
12	0.0	ND
13	ND	
14	ND	
15	4.3	
16	ND	
17	2.5	
18	0.0	ND
19	0.1	ND
20	ND	
21	2.3	
22	ND	
23	0.5	ND
24	0.1	ND
25	0.0	ND
26	ND	
27	1.0	
28	0.7	
29	6.0	
30	24.8	
31	0.1	ND
32	229.1	Hi *
33	0.0	ND *
34	167.2	Hi *
35	97.3	Hi *
36	0.5	
37	2.6	
38	4.4	

Sample ID TP-	Concentration ppm	Qualifier
39	0.0	ND
40	1.1	
41	52.8	Hi *
42	0.01	ND
43	91.9	Hi *
44	0.0	ND
45	2.4	
46	22.4	
47	0.4	ND
48	0.0	ND
49	0.1	ND
50	0.0	ND
51	18.3	*
52	0.0	ND
53	42.1	*
54	0.3	ND
55	5.7	
56	1.4	
57	ND	
58	0.5	
59	0.3	ND
60	0.0	ND
61	0.1	ND
62	0.4	ND
63	2.0	*
64	13.8	
65	0.9	
66	0.1	ND
67	0.1	ND
68	5.4	
69	6.6	
70	4.0	
71	1.1	
72	1.1	*
73	77.5	Hi *
74	0.5	
75	0.2	ND

*submitted for confirmatory analyses

Subsurface Soil Screening - DNREC Laboratory Analytical Results for the OU-II Area
PCB Analyses by Immunoassay
October 1998 - December 1998

Sample ID TP-	Concentration ppm	Qualifier
1	ND	
2	ND	
3	ND	
4	ND	
5	ND	
6	ND	
7	ND	
8	ND	
9	ND	
10	ND	
11	ND	
12	ND	
13	0.0	ND
14	ND	
15	ND	
16	ND	
17	ND	
18	ND	
19	ND	
20	ND	
21	ND	
22	ND	
23	ND	
24	ND	
25	ND	*
26	ND	
27	ND	
28	ND	
29	0.02	ND
30	0.04	ND
31	ND	
32	0.6	
33	0.7	*
34	0.14	ND
35	0.14	ND
36	0.0	ND
37	0.02	ND
38	0.04	ND

Sample ID TP-	Concentration ppm	Qualifier
39	0.04	ND
40	0.04	ND
41	ND	
42	0.0	ND
43	0.02	ND
44	0.0	ND
45	0.1	ND
46	0.06	ND
47	0.08	ND
48	0.04	ND
49	0.02	ND
50	0.02	ND
51	0.02	ND
52	0.06	ND *
53	0.04	ND
54	0.02	ND
55	0.04	ND
56	ND	
57	0.0	ND
58	0.06	ND
59	ND	
60	0.06	ND
61	0.0	ND
62	0.02	ND
63	0.02	ND *
64	0.04	ND
65	0.2	ND
66	ND	
67	0.0	ND
68	ND	
69	0.08	ND
70	0.0	ND
71	0.0	ND
72	ND	
73	0.2	ND
74	0.1	ND
75	0.0	ND

* submitted for confirmatory analyses

Subsurface Soil Screening - DNREC Laboratory Analytical Results for the OU-II Area
Metals Analyses by XRF
October 1998 through December 1998

Concentration in ppm

Elements	TP-1	TP-2	TP-3	TP-4	TP-5	TP-6	TP-7	TP-8	TP-9	TP-10	TP-11	TP-12	TP-13
Calcium	3008	4376	3878	225957	582874	364294	286026	311939	2520	34453	522618	226622	392274
Vanadium	103	52.2	85.2	190	39.2	177	116	92.6	162	91.0	14.3	174	84.2
Manganese	774	342	683	752	261	534	1154	403	758	2275	93.1	256	372
Chromium	65.7	38.1	53.2	118	11.8	117	101	77.5	148	113	47.0	129	89.6
Iron	36353	30668	39368	43605	15110	29128	46050	34439	67162	39103	15709	34022	30132
Cobalt	ND	6.0	ND	23.8	ND	159	ND	ND	10.1	ND	109	65.1	ND
Nickel	27.1	7.0	13.8	90.2	7.2	135	97.9	37.6	18.4	39.8	72.2	112	34.7
Copper	28.5	5.7	23.7	106	69.3	150	78.8	72.5	41.9	68.9	68.2	87.2	118
Arsenic	1.4	8.0	10.0	18.6	ND	18.8	1.6	19.1	9.9	30.1	19.3	31.0	23.1
Selenium	2.9	0.7	ND	ND	ND	5.7	1.5	2.9	ND	ND	3.4	2.4	2.6
Zinc	68.8	30.5	52.7	277	91.7	51.7	59.3	104	98.0	500	67.9	110	144
Lead	20.8	13.7	14.0	403	125	39	46.6	33.7	10.3	213	37.2	31.8	183
Thallium	2.0	3.4	3.2	18.3	ND	ND	ND	13.8	0.3	1.1	17.9	11.6	9.9
Mercury	ND	3.5	ND	ND	ND	ND	ND	7.7	1.8	5.4	4.3	7.4	ND
Silver	ND	0.5	ND	0.9	4.5	ND	3.1	1.6	ND	ND	3.8	0.7	0.6
Cadmium	ND	ND	1.6	2.4	ND	ND	0.3	1.9	1.2	ND	0.7	2.3	3.5
Antimony	0.6	0.8	1.2	ND	5.4	3.1	ND	ND	1.2	1.0	4.4	1.9	3.8
Barium	271	418	378	405	302	770	807	755	513	337	305	814	504

ND = Not Detected

Subsurface Soil Screening - DNREC Laboratory Analytical Results for the OU-II Area
Metals Analyses by XRF
October 1998 through December 1998

Concentration in ppm

Elements	TP-14	TP-15	TP-16	TP-17	TP-18	TP-19	TP-20	TP-21	TP-22	TP-23	TP-24	TP-25	TP-26
Calcium	550821	380433	263548	119503	233848	23777	447675	10801	148683	414371	10293	359186	6307
Vanadium	ND	ND	ND	ND	939	137	103	ND	112	ND	ND	ND	ND
Manganese	127	546	249	668	342	1179	467	362	677	281	207	462	370
Chromium	ND	516	96.0	ND	110	314	ND	185	125	183	ND	ND	ND
Iron	25287	73605	43644	40599	29369	66887	27177	29185	32010	27594	24108	32241	36747
Cobalt	ND	ND	ND	55.8	55.7	190	ND	57.8	194	17.7	102	105	116
Nickel	79.1	37.1	55.5	124	120	28.8	43.2	13.5	37.0	40.4	19.8	110	50.4
Copper	179	118	47.3	51.7	61.7	52.2	93.1	44.9	43.4	80.6	6.5	95.0	45.3
Arsenic	18.3	17.0	18.3	5.4	11.0	3.5	15.9	4.8	12.2	12.6	6.2	22.3	10.4
Selenium	1.0	4.6	ND	1.8	3.2	ND	ND	ND	ND	9.4	ND	3.8	2.1
Zinc	97.3	213	151	65.0	99.5	111	149	88.5	62.3	73.5	54.0	146	88.6
Lead	196	315	112	31.8	27.5	25.7	110	76.3	24.8	113	65.1	177	23.7
Thallium	21.0	15.1	5.9	ND	ND	1.7	ND	ND	3.4	ND	1.9	ND	0.9
Mercury	ND	7.8	1.8	ND	5.5	ND	ND	7.6	ND	0.1	1.2	7.8	ND
Silver	72.9	29.6	41.9	22.9	5.5	7.0	20.2	ND	ND	25.8	ND	37.6	2.9
Cadmium	ND	2.6	10.9	18.7	ND	5.0	1.1	ND	2.0	23.6	ND	ND	2.8
Antimony	ND	ND	ND	ND	ND	ND	14.5	ND	ND	4.0	18.7	22.7	15.9
Barium	722	287	919	454	571	706	ND	241	551	649	297	419	292

ND = Not Detected

Subsurface Soil Screening - DNREC Laboratory Analytical Results for the OU-II Area
Metals Analyses by XRF
October 1998 through December 1998

Concentration in ppm

Elements	TP-27	TP-28	TP-29	TP-30	TP-31	TP-32	TP-33	TP-34	TP-35	TP-36	TP-37	TP-38	TP-39
Calcium	225523	380574	4162	15617	4418	57702	391247	192146	3948	99338	3669	2064	27099
Vanadium	152	84.2	38.6	ND	ND	62.9	25.4	210	70.3	115	61.9	2.8	ND
Manganese	431	575	284	345	193	737	486	657	369	1417	220	316	229
Chromium	138	88.1	69.6	47.7	33.4	86.6	76.8	78.5	52.4	110	31.4	53.7	27.6
Iron	45802	27921	28012	21606	20568	36614	41712	42510	27848	59993	16344	26416	17906
Cobalt	247	165	148	112	42.9	113	95.5	96.3	54.4	28.5	ND	66.6	105
Nickel	138	79.8	16.5	ND	24.6	12.9	36.9	96.7	15.5	56.3	ND	26.6	ND
Copper	121	153	32.9	27.0	9.7	86.0	96.6	109	23.7	137	7.7	49.7	16.7
Arsenic	20.2	23.1	8.8	13.4	3.1	17.2	22.2	9.9	7.8	13.0	8.5	24.6	6.9
Selenium	3.9	7.1	1.2	0.1	ND	ND	ND	3.1	ND	2.3	1.3	0.1	2.2
Zinc	109	252	43.9	72.3	20.9	379	445	200	53.7	684	45.6	41.7	24.4
Lead	90.0	208	31.6	72.9	15.4	306	284	136	38.2	97.0	19.8	337	21.7
Thallium	10.7	ND	1.2	1.4	0.7	ND	3.1	ND	5.8	ND	3.2	ND	ND
Mercury	16.9	ND	0.8	0.5	2.8	7.7	ND	ND	2.1	ND	ND	ND	ND
Silver	ND	ND	ND	1.2	1.4	ND	1.2	0.1	0.6	2.7	0.1	1.3	0.1
Cadmium	ND	3.1	0.9		ND	ND	ND	3.0	0.8	ND	1.1	ND	ND
Antimony	8.4	3.9	ND		ND	3.4	ND	ND	0.1	ND	2.7	4.8	2.1
Barium	1450	696	446	652	602	665	1068	956	620	988	470	517	536

ND = Not Detected

Subsurface Soil Screening - DNREC Laboratory Analytical Results for the OU-II Area
Metals Analyses by XRF
October 1998 through December 1998

Concentration in ppm

Elements	TP-40	TP-41	TP-42	TP-43	TP-44	TP-45	TP-46	TP-47	TP-48	TP-49	TP-50	TP-51	TP-52
Calcium	138878	8110	12824	49130	2981	4023	30936	2268	220051	3614	474283	5011	268217
Vanadium	22.4	80.4	69.3	115	7.5	36.2	ND	ND	138	76.0	ND	49.1	123
Manganese	2030	690	366	680	190	277	1206	326	1181	579	279	395	686
Chromium	41.7	62.1	50.8	127	25.9	21.1	ND	17.6	89.2	45.0	37.5	33.8	105
Iron	34119	32280	27521	41841	24599	18278	26442	22186	58846	35461	16975	21307	67962
Cobalt	ND	10.4	46.7	21.1	88.1	ND	ND	28.5	ND	153	ND	106	143
Nickel	6.0	16.1	12.4	46.3	24.9	8.5	14.2	7.8	62.9	26.9	46.9	ND	103
Copper	29.0	28.8	21.9	140	19.0	52.5	25.7	5.8	64.2	12.1	46.3	20.6	92.4
Arsenic	11.9	3.7	6.6	31.1	0.6	4.4	3.6	0.4	8.3	3.5	9.9	1.5	ND
Selenium	1.4	2.9	ND	2.0	ND	ND	0.1	1.7	ND	0.1	ND	ND	7.9
Zinc	41.9	67.5	45.4	223	46.3	38.7	299	21.2	151	45.1	139	29.8	328
Lead	40.1	25.0	20.4	249	21.7	62.6	40.8	12.0	39.9	20.6	31.2	19.1	76.7
Thallium	4.3	ND	ND	10.6	ND	2.7	3.5	ND	1.2	ND	15.5	ND	ND
Mercury	ND	ND	ND	ND	1.9	0.03	2.1	ND	2.5	ND	34.0	ND	ND
Silver	4.0	ND	0.4	ND	0.3	ND	1.3	1.4	ND	ND	1.4	ND	ND
Cadmium	2.7	2.0	1.9	2.1	ND	0.7	0.2	0.2	2.3	ND	ND	2.5	2.9
Antimony	ND	1.3	ND	5.0	0.8	ND	ND	0.2	1.0	ND	6.4	4.5	ND
Barium	695	703	548	1091	656	796	2672	769	1036	590	371	748	1598

ND = Not Detected

Subsurface Soil Screening - DNREC Laboratory Analytical Results for the OU-II Area
Metals Analyses by XRF
October 1998 through December 1998

Concentration in ppm

Elements	TP-53	TP-54	TP-55	TP-56	TP-57	TP-58	TP-59	TP-60	TP-61	TP-62	TP-63	TP-64	TP-65
Calcium	619664	272654	22226	7175	614785	694745	485558	696603	580729	473391	286539	46255	604007
Vanadium	15.3	194	63.5	106	ND	ND	9.1	0.5	3.8	75.6	46.6	143	44.1
Manganese	397	924	688	763	216	350	353	223	181	989	1617	1989	180
Chromium	10.0	88.2	60.2	63.0	ND	ND	ND	3.3	7.2	43.5	89.6	87.5	38.8
Iron	13358	44885	30534	48669	11746	3956	5671	6500	9363	28074	57681	52786	10360
Cobalt	96.0	ND	58.4	ND	ND	ND	21.4	95.7	20.0	90.7	ND	105	94.9
Nickel	ND	35.9	5.0	ND	2.5	8.4	ND	ND	46.8	53.3	41.2	1.3	15.2
Copper	70.0	93.5	13.5	31.1	69.6	26.9	27.4	5.8	63.9	54.4	91.0	30.0	48.3
Arsenic	ND	21.2	8.7	4.3	28.5	ND	10.9	4.9	ND	10.7	20.2	10.8	4.1
Selenium	2.4	2.0	0.5	ND	ND	1.3	ND	ND	4.7	ND	ND	ND	ND
Zinc	46.9	178	69.9	62.4	288	69.6	64.3	123	33.6	186	429	232	12.7
Lead	39.9	55.9	42.9	21.9	241	15.0	ND	6.2	34.2	171	132	48.5	14.2
Thallium	ND	ND	1.8	ND	21.7	16.7	ND	ND	ND	ND	3.8	3.9	4.4
Mercury	ND	ND	0.7	ND	0.8	ND	1.4	ND	7.1	ND	ND	ND	ND
Silver	ND	0.1	1.2	0.1	6.6	4.1	0.6	0.3	3.4	2.4	0.6	1.6	ND
Cadmium	1.5	3.5	ND	0.3	4.6	ND	0.7	1.5	4.6	ND	ND	ND	5.7
Antimony	1.8	6.4	2.4	2.7	5.5	0.4	1.3	8.8	ND	1.0	2.4	7.7	8.2
Barium	321	786	685	569	1057	138	20.7	177	327	835	1099	771	219

ND = Not Detected

Subsurface Soil Screening - DNREC Laboratory Analytical Results for the OU-II Area
Metals Analyses by XRF
October 1998 through December 1998

Concentration in ppm

Elements	TP-66	TP-67	TP-68	TP-69	TP-70	TP-71	TP-72	TP-73	TP-74	TP-75
Calcium	17457	233455	311919	162680	63830	4427	13246	191731	441479	147723
Vanadium	74.5	118	39.3	108	98.3	78.8	123	237	32.0	48.6
Manganese	626	218	811	755	377	406	611	1066	506	1111
Chromium	67.8	61.4	103	54.5	64.9	64.3	70.3	157	54.0	387
Iron	51987	26710	46356	37271	33503	30582	37302	55017	18778	55629
Cobalt	45.8	64.7	75.9	48.5	ND	ND	103	ND	ND	187
Nickel	23.7	67.8	ND	41.5	5.9	ND	17.8	53.9	1.2	30.4
Copper	26.1	79.6	88.3	91.5	43.6	32.8	38.9	108	74.1	49.2
Arsenic	ND	20.5	17.6	12.3	16.2	8.0	5.7	9.4	11.4	14.4
Selenium	ND	1.9	ND	ND	ND	ND	0.6	ND	ND	0.9
Zinc	84.9	76.7	180	207	112	31.6	71.0	511	120	205
Lead	31.7	49.3	87.3	90.4	59.0	12.1	17.5	109	129	57.5
Thallium	4.8	6.6	ND	2.4		0.9	ND	16.6	ND	ND
Mercury	9.6	ND	ND	ND	ND	ND	0.5	7.2	ND	ND
Silver	1.1	ND	ND	1.3	ND	ND	0.1	ND	ND	2.9
Cadmium	0.2	ND	3.7	2.2	3.8	0.8	ND	ND	1.4	0.8
Antimony	2.3	2.2	5.8	ND	3.1	0.4	2.1	2.8	1.4	6.1
Barium	738	591	654	855	621	132	563	1137	701	897

ND = Not Detected

Subsurface Soil Confirmatory Analytical Results for the OU-II Area
SVOC by EPA Method 8270C
October 1998 - December 1998

Concentration, µg/Kg

Constituent	TP-32	TP-33	TP-34	TP-35	TP-41	TP-43
Phenol	<390	<450	<500	<370	<380	<390
bis(2-Chloroethyl)ether	<390	<450	<500	<370	<380	<390
2-Chlorophenol	<390	<450	<500	<370	<380	<390
1,3-Dichlorobenzene	<390	<450	<500	<370	<380	<390
1-4,Dichlorobenzene	<390	<450	<500	<370	<380	<390
1,2-Dichlorobenzene	<390	<450	<500	<370	<380	<390
2-Methylphenol	<390	<450	<500	<370	<380	<390
2,2'-oxybis(1-Chloropropane)	<390	<450	<500	<370	<380	<390
4-Methylphenol	<390	<450	<500	<370	<380	<390
N-Nitrosodi-n-propylamine	<390	<450	<500	<370	<380	<390
Hexachloroethane	<390	<450	<500	<370	<380	<390
Nitrobenzene	<390	<450	<500	<370	<380	<390
Isophorone	<390	<450	<500	<370	<380	<390
2-Nitrophenol	<390	<450	<500	<370	<380	<390
2,4-Dimethylphenol	<390	<450	<500	<370	<380	<390
bis(2-Chloroethoxy)methane	<390	<450	<500	<370	<380	<390
2,4-Dichlorophenol	<390	<450	<500	<370	<380	<390
1,2,4-Trichlorobenzene	<390	<450	<500	<370	<380	<390
Naphthalene	<390	<450	<500	<370	<380	<390
4-Chloroaniline	<390	<450	<500	<370	<380	<390
Hexachlorobutadiene	<390	<450	<500	<370	<380	<390
4-Chloro-3-methylphenol	<390	<450	<500	<370	<380	<390
2-Methylnaphthalene	<390	<450	<500	<370	<380	<390
Hexachlorocyclopentadiene	<390	<450	<500	<370	<380	<390
2,4,6-Trichlorophenol	<390	<450	<500	<370	<380	<390
2,4,5-Trichlorophenol	<1900	<2300	<2500	<1800	<1900	<2000
2-Chloronaphthalene	<390	<450	<500	<370	<380	<390
2-Nitroaniline	<1900	<2300	<2500	<1800	<1900	<2000
Dimethylphthalate	<390	<450	<500	<370	<380	<390
2,6-Dinitrotoluene	<390	<450	<500	<370	<380	<390
Acenaphthylene	<390	<450	<500	<370	<380	<390
3-Nitroaniline	<1900	<2300	<2500	<1800	<1900	<2000
Acenaphthene	<390	<450	<500	<370	<380	<390
2,4-Dinitrophenol	<1900	<2300	<2500	<1800	<1900	<2000
4-Nitrophenol	<1900	<2300	<2500	<1800	<1900	<2000
Dibenzofuran	<390	<450	<500	<370	<380	<390
2,4-Dinitrotoluene	<390	<450	<500	<370	<380	<390
Diethylphthalate	<390	<450	<500	<370	<380	<390

J = Estimated Value, Below Laboratory Detection Limit
< = Below Laboratory Detection Limit

Subsurface Soil Confirmatory Analytical Results for the OU-II Area
SVOC by EPA Method 8270C
October 1998 - December 1998

Concentration, µg/Kg

Constituent	TP-32	TP-33	TP-34	TP-35	TP-41	TP-43
4-Chlorophenyl phenylether	<390	<450	<500	<370	<380	<390
Fluorene	<390	<450	<500	<370	<380	<390
4-Nitroaniline	<1900	<2300	<2500	<1800	<1900	<2000
4,6-Dinitro-2-methylphenol	<1900	<2300	<2500	<1800	<1900	<2000
N-Nitrosodiphenylamine	<390	<450	<500	<370	<380	<390
4-Bromophenyl phenylether	<390	<450	<500	<370	<380	<390
Hexachlorobenzene	<390	<450	<500	<370	<380	<390
Pentachlorophenol	<1900	<2300	<2500	<1800	<1900	<2000
Phenanthrene	790	<450	730	<370	150 J	88 J
Anthracene	200 J	<450	160 J	<370	<380	<390
Carbazole	<390	<450	<500	<370	<380	<390
Di-n-butyl phthalate	<390	<450	<500	<370	<380	<390
Fluroanthene	1200	140 J	1100	100 J	140 J	320 J
Pyrene	1900	130 J	1200	85 J	160 J	270 J
Butylbenzylphthalate	<390	<450	<500	<370	<380	<390
3,3'-Dichlorobenzidine	<390	<450	<500	<370	<380	<390
Benzo(a)anthracene	860	<450	560	<370	<380	180 J
Bis(2-Ethylhexyl)phthalate	150 J	4500	2600	2000	92 J	2800
Chrysene	1100	120 J	630	<370	97 J	220 J
Di-n-octyl phthalate	<390	<450	<500	<370	<380	<390
Benzo(b)fluorathene	880	<450	530	<370	<380	260 J
Benzo(k)fluoranthene	680	<450	470 J	<370	<380	180 J
Benzo(a)pyrene	920	<450	510	<370	<380	200 J
Indeno(1,2,3-cd)pyrene	420	<450	260 J	<370	<380	220 J
Dibenz(a,h)anthracene	180 J	<450	160 J	<370	<380	<390
Benzo(g,h,i)perylene	410	<450	250 J	<370	<380	230 J
TENTATIVELY IDENTIFIED COMPOUNDS						
2-Cyclohexen-1-one					180 JN	
Unknown, Total	2490 J	400 BJ	570 BJ	240 BJ	470 BJ	220 BJ
C15H12 Isomer	210 J					
C17H12 Isomer	1770 J					
C18H12 Isomer	240 J					
C19H14 Isomer	320 J					
C20H12 Isomer	840 J					
Total TICs	5,870 J	400 BJ	570 BJ	240 BJ	650 BJN	220 BJ
Total PAHs (including TICs)	15,410 J	790 BJ	7,130 BJ	425 BJ	1,017 BJN	2,388 BJ

J = Estimated Value, Below Laboratory Detection Limit
< = Below Laboratory Detection Limit
B = Possible/Probable Method Blank Contamination
N = Presumptive Evidence of a Compound. Identification based on a mass spectral library search.

Subsurface Soil Confirmatory Analytical Results for the OU-II Area
SVOC by EPA Method 8270C
October 1998 - December 1998

Concentration, µg/Kg

Constituent	TP-51	TP-53	TP-63	TP-72	Field Dup	TP-73
Phenol	<390	<450	<410	<410	<410	<780
bis(2-Chloroethyl)ether	<390	<450	<410	<410	<410	<780
2-Chlorophenol	<390	<450	<410	<410	<410	<780
1,3-Dichlorobenzene	<390	<450	<410	<410	<410	<780
1-4,Dichlorobenzene	<390	<450	<410	<410	<410	<780
1,2-Dichlorobenzene	<390	<450	<410	<410	<410	<780
2-Methylphenol	<390	<450	<410	<410	<410	<780
2,2'-oxybis(1-Chloropropane)	<390	<450	<410	<410	<410	<780
4-Methylphenol	<390	<450	<410	<410	<410	<780
N-Nitrosodi-n-propylamine	<390	<450	<410	<410	<410	<780
Hexachloroethane	<390	<450	<410	<410	<410	<780
Nitrobenzene	<390	<450	<410	<410	<410	<780
Isophorone	<390	<450	<410	<410	<410	<780
2-Nitrophenol	<390	<450	<410	<410	<410	<780
2,4-Dimethylphenol	<390	<450	<410	<410	<410	<780
bis(2-Chloroethoxy)methane	<390	<450	<410	<410	<410	<780
2,4-Dichlorophenol	<390	<450	<410	<410	<410	<780
1,2,4-Trichlorobenzene	<390	<450	<410	<410	<410	<780
Naphthalene	<390	430 J	550	<410	<410	<780
4-Chloroaniline	<390	<450	<410	<410	<410	<780
Hexachlorobutadiene	<390	<450	<410	<410	<410	<780
4-Chloro-3-methylphenol	<390	<450	<410	<410	<410	<780
2-Methylnaphthalene	<390	230 J	86 J	<410	<410	<780
Hexachlorocyclopentadiene	<390	<450	<410	<410	<410	<780
2,4,6-Trichlorophenol	<390	<450	<410	<410	<410	<780
2,4,5-Trichlorophenol	<1900	<2300	<2100	<2000	<2000	<3900
2-Chloronaphthalene	<390	<450	<410	<410	<410	<780
2-Nitroaniline	<1900	<2300	<2100	<2000	<2000	<3900
Dimethylphthalate	<390	<450	<410	<410	<410	<780
2,6-Dinitrotoluene	<390	<450	<410	<410	<410	<780
Acenaphthylene	<390	<450	<410	<410	<410	<780
3-Nitroaniline	<1900	<2300	<2100	<2000	<2000	<3900
Acenaphthene	<390	<450	<410	<410	<410	<780
2,4-Dinitrophenol	<1900	<2300	<2100	<2000	<2000	<3900
4-Nitrophenol	<1900	<2300	<2100	<2000	<2000	<3900
Dibenzofuran	<390	93 J	<410	<410	<410	<780
2,4-Dinitrotoluene	<390	<450	<410	<410	<410	<780
Diethylphthalate	<390	<450	<410	<410	<410	<780
4-Chlorophenyl phenylether	<390	<450	<410	<410	<410	<780
Fluorene	<390	<450	<410	<410	<410	<780
4-Nitroaniline	<1900	<2300	<2100	<2000	<2000	<3900

J = Estimated Value, Below Laboratory Detection Limit
< = Below Laboratory Detection Limit

Subsurface Soil Confirmatory Analytical Results for the OU-II Area
SVOC by EPA Method 8270C
October 1998 - December 1998

Concentration, µg/Kg

Constituent	TP-51	TP-53	TP-63	TP-72	Field Dup	TP-73
4,6-Dinitro-2-methylphenol	<1900	<2300	<2100	<2000	<2000	<3900
N-Nitrosodiphenylamine	<390	<450	<410	<410	<410	<780
4-Bromophenyl phenylether	<390	<450	<410	<410	<410	<780
Hexachlorobenzene	<390	<450	<410	<410	<410	<780
Pentachlorophenol	<1900	<2300	<2100	<2000	<2000	<3900
Phenanthrene	95 J	700	570	<410	<410	<780
Anthracene	<390	<450	<410	<410	<410	<780
Carbazole	<390	<450	<410	<410	<410	<780
Di-n-butyl phthalate	<390	<450	<410	<410	<410	<780
Fluroanthene	97 J	320 J	570	<410	<410	<780
Pyrene	<390	240 J	840	<410	<410	200 JD
Butylbenzylphthalate	<390	<450	<410	<410	<410	<780
3,3'-Dichlorobenzidine	<390	<450	<410	<410	<410	<780
Benzo(a)anthracene	<390	120 J	390 J	<410	<410	<780
Bis(2-Ethylhexyl)phthalate	80 JB	100 JB	140 JB	330 JB	<410	5500 D
Chrysene	98 J	350 J	530	<410	<410	<780
Di-n-octyl phthalate	<390	<450	<410	<410	<410	<780
Benzo(b)fluorathene	88 J	170 J	400 J	<410	<410	<780
Benzo(k)fluoranthene	<390	150 J	390 J	<410	<410	<780
Benzo(a)pyrene	<390	100 J	360 J	<410	<410	<780
Indeno(1,2,3-cd)pyrene	<390	<450	170 J	<410	<410	<780
Dibenz(a,h)anthracene	<390	<450	<410	<410	<410	<780
Benzo(g,h,i)perylene	<390	<450	160 J	<410	<410	<780
TENTATIVELY IDENTIFIED COMPOUNDS						
2-Pentanone, 4-hydroxyl-4-methyl		240 AJN	180 AJN			
2-Cyclohexen-1-ol		330 JN	340 JN			
2-Cyclohexen-1-one		400 JN	360 JN			
Cyclotetrasiloxane, octameth		260 JN				
Dimethylnaphthalene isomer		200 J				
C15H12 PAH isomer		1200 J				
C16H14 isomer		210 J				
Unknown, Total	390 J	3030 J	1070 J	220 J	2390 J	
Total TICs	390 J	5,870 AJN	1,950 AJN	220 J	2,390 J	0 DJ
Total PAHs (including TICs)	768	7,783	6,266	220	2,390	200

J = Estimated Value, Below Laboratory Detection Limit
< = Below Laboratory Detection Limit
D = All Compound Concentrations Reported From Secondary Dilution Analysis
B = Possible/Probable Method Blank Contamination
A = Indicates that a TIC is a suspected aldol-condensation product
N = Presumptive Evidence of a Compound. Identification based on a mass spectral library search.

Subsurface Soil Confirmatory Analytical Results for the OU-II Area
PCB by EPA Method 8080
October 1998 - December 1998
Concentration, µg/Kg

Constituent	TP-25	Field Dup	TP-33	TP-52	TP-63
PCB-1016	<57	<51	<45	<62	<41
PCB-1221	<110	<100	<89	<120	<82
PCB-1232	<57	<51	<45	<62	<41
PCB-1242	<57	<51	<45	<62	<41
PCB-1248	<57	<51	<45	<62	<41
PCB-1254	<57	<51	<45	<62	<41
PCB-1260	<57	<51	<45	<62	<41

< = Below Laboratory Detection Limit

Subsurface Soil Confirmatory Analytical Results for the OU-II Area
TAL Metals
October 1998 - December 1998

Concentration in mg/kg

Elements	TP-4	TP-14	TP-25	Field Dup	TP-32	TP-43	TP-52
Aluminum	4160	4110	3660	4020	10700	5210	5850
Antimony	1.0 B	2.6	1.3 B	1.9	1.0 B	0.65 B	1.2 B
Arsenic	3.3	7.5	2.8 B	2.4 B	2.4	4.9	2.7 B
Barium	67.6	115	88.9	67.2	72.3	52.8	49.1 B
Beryllium	0.26 B	0.32 B	0.11 B	0.23 B	0.50 B	0.37 B	0.30 B
Cadmium	<0.08	<0.11	<0.10	<0.09	<0.07	0.18 B	<0.11
Calcium	97000	224000	337000	159000	10200	8990	322000
Chromium	10.1	5.4	3.7	6.4	16.3	9.2	7.5
Cobalt	5.9 B	5.2 B	2.4 B	3.9 B	5.6 B	9.2 B	3.8 B
Copper	13.3	81.2	8.1 B	15.4	20	23.5	8.7 B
Iron	8630	7420	8160	4350	15100	9020	4190
Lead	130	103	16	29.9	99	61.7	4.4
Magnesium	1400	3130	7970	1820	1940	947 B	5380
Manganese	209	73.8	467	67.6	237	139	92.7
Mercury	<0.06	0.2	<0.09	<0.08	0.16	0.05 B	<0.08
Nickel	8.7 B	8.1 B	4.7 B	6.6 B	11.1	16.7	5.6 B
Potassium	835 B	376 B	316 B	378 B	642 B	276 B	720 B
Selenium	1.2 B	2.2	1.7	1.7	1.1 B	2.5	1.4 B
Silver	<0.19	<0.25	<0.24	<0.21	<0.17	0.22 B	<0.25
Sodium	894 B	2580	1300 B	1120 B	297 B	510 B	2510
Thallium	<0.27	<0.37	<0.33	<0.30	<0.24	<0.24	<0.36
Vanadium	18.6	18.5	8.2 B	13.8 B	24	14.7	15.7 B
Zinc	59.4	52.3	13.1	29.2	112	72.7	9.6

< = Below Laboratory Detection Limit
B = Possible/Probable Method Blank Contamination

Subsurface Soil Characterization for the OU-II Area

Location	Sample Elevation	Lead	Arsenic	PAH	PCB	Classification
TP-1	1-7.5	A	A	C	A	C
TP-2	4-8	A	A	B	A	B
TP-3	3-4.5	A	A	B	A	B
TP-4	5.5-11	A	A	A	A	A
TP-5	2-10	A	A	A	A	A
TP-6	4.5-10	A	A	A	A	A
TP-7	4-10.5	A	A	A	A	A
TP-8	5-10.5	A	A	A	A	A
TP-9	8-9	A	A	B	A	B
TP-10	0-7	A	A	C	A	C
TP-11	4.5-11	A	A	A	A	A
TP-12	3-12	A	A		A	
TP-13	4-10	A	A	A	A	A
TP-14	2-12.5	A	A	A	A	A
TP-15	2-10	A	A	B	A	B
TP-16	1.5-12	A	A	A	A	A
TP-17	6-10	A	A	B	A	B
TP-18	7-10	A	A	A	A	A
TP-19	4-11.5	A	A	A	A	A
TP-20	4-11.5	A	A	A	A	A
TP-21	6-11	A	A	B	A	B
TP-22	4-11	A	A	A	A	A
TP-23	3.5-8	A	A	A	A	A
TP-24	4-8	A	A	A	A	A
TP-25	6-8.5	A	A	A	A	A
TP-26	7-9	A	A	A	A	A
TP-27	5-9	A	A	A	A	A
TP-28	5-10	A	A	A	A	A
TP-29	0-8	A	A	B	A	B
TP-30	4-8	A	A	B	A	B
TP-31	6-8	A	A	A	A	A
TP-32	1-7	A	A	B	A	B
TP-33	4.5-8	A	A	A	A	A
TP-34	4.5-8.5	A	A	B	A	B
TP-35	7-9	A	A	A	A	A
TP-36	4-12	A	A	A	A	A

Soil Reuse Classification Criteria
mg/kg

Analyte	A	B	C	Z
Lead	<400	400 to 1,500	1,500 to 5,000	>5,000
Arsenic	< 60	60 to 100	100 to 500	>500
PAH	<1.0	1.0 to 25	25 to 300	>300
PCB	<0.5	0.5 to 3.0	3.0 to 8.0	>8.0

Subsurface Soil Characterization for the OU-II Area

Location	Sample Elevation	Lead	Arsenic	PAH	PCB	Classification
TP-37	6.0	A	A	B	A	B
TP-38	6-7	A	A	B	A	B
TP-39	3.5-6.5	A	A	A	A	A
TP-40	3-6	A	A	B	A	B
TP-41	4.5-9	A	A	A	A	A
TP-42	5-10	A	A	A	A	A
TP-43	5-8	A	A	B	A	B
TP-44	4-7.5	A	A	A	A	A
TP-45	6-7	A	A	B	A	B
TP-46	6.5-9	A	A	B	A	B
TP-47	3.5-7.5	A	A	A	A	A
TP-48	5-9	A	A	A	A	A
TP-49	6.5-7.5	A	A	A	A	A
TP-50	4-9	A	A	A	A	A
TP-51	3-9.5	A	A	A	A	A
TP-52	7-10	A	A	A	A	A
TP-53	7-10	A	A	B	A	B
TP-54	7-10	A	A	A	A	A
TP-55	7-11	A	A	B	A	B
TP-56	5.5-8.5	A	A	B	A	B
TP-57	5.5-8.5	A	A	A	A	A
TP-58	3.5-6.5	A	A	A	A	A
TP-59	3.5-6.5	A	A	A	A	A
TP-60	6-9	A	A	A	A	A
TP-61	4-6	A	A	A	A	A
TP-62	3-9	A	A	A	A	A
TP-63	3-12	A	A	B	A	B
TP-64	4.5-8	A	A	B	A	B
TP-65	4-9	A	A	A	A	A
TP-66	5-9	A	A	A	A	A
TP-67	4-7.5	A	A	A	A	A
TP-68	2.5-10	A	A	B	A	B
TP-69	2.5-12	A	A	B	A	B
TP-70	5.5-9	A	A	B	A	B
TP-71	6-8	A	A	B	A	B
TP-72	3-9	A	A	A	A	A
TP-73	4-9	A	A	A	A	A
TP-74	3-7	A	A	A	A	A
TP-75	2-5.5	A	A	A	A	A

Soil Reuse Classification Criteria

mg/kg

Analyte	A	B	C	Z
Lead	<400	400 to 1,500	1,500 to 5,000	>5,000
Arsenic	< 60	60 to 100	100 to 500	>500
PAH	<1.0	1.0 to 25	25 to 300	>300
PCB	<0.5	0.5 to 3.0	3.0 to 8.0	>8.0

Subsurface Soil Characterization for the Proposed Bioswale
Soil Screening - DNREC Laboratory Analytical Results
PAH Analyses by Immunoassay
December 1998

Sample ID BS-	Concentration ppm	Qualifier	
1s	104.9	Hi	*
1d	12.5		
2s	109.5	Hi	
2d	1.8		
3s	29.3		
3d	0.9		
4s	9.8		
4d	15.4		
5s	11.4		
5d	0.1	ND	
6s	33.9		
6d	0.4		
7s	70.0	Hi	*
7d	99.3	Hi	*
8s	10.9		
8d	16.5		
9s	6.2		
9d	65.1	Hi	*
10s	17.0		
10d	1.7		
11s	9.9		
11d	43.8		
12s	11.2		
12d	0.5		
13s	31.2		
13d	126.6	Hi	*
14s	70.0	Hi	*
14d	9.1		
15s	9.4		
15d	86.1	Hi	*
16s	53.7	Hi	
16d	3.6		
17s	4.5		
17d	ND		*

ND = Not Detected
* submitted for confirmatory analyses

Subsurface Soil Characterization for the Proposed Bioswale
Soil Screening - DNREC Laboratory Analytical Results
PCB Analyses by Immunoassay
December 1998

Sample ID BS-	Concentration ppm	Qualifier
1s	0.00	ND
1d	0.44	*
2s	0.00	ND
2d	0.00	ND
3s	0.16	ND
3d	0.12	ND
4s	0.02	ND
4d	0.10	ND
5s	0.08	ND
5d	0.08	ND
6s	0.20	ND
6d	0.16	ND
7s	0.42	*
7d	ND	
8s	ND	
8d	ND	
9s	ND	
9d	0.02	ND
10s	0.00	ND
10d	0.04	ND
11s	ND	
11d	ND	
12s	0.00	ND
12d	ND	
13s	ND	
13d	ND	
14s	ND	
14d	ND	
15s	ND	
15d	0.00	ND
16s	ND	
16d	ND	
17s	ND	
17d	0.08	ND *

ND = Not Detected
* submitted for confirmatory analyses

Subsurface Soil Characterization for the Proposed Bioswale
Soil Screening - DNREC Laboratory Analytical Results
Metals Analyses by XRF
December 1998

Concentration in ppm

Elements	BS-1s	BS-1d	BS-2s	BS-2d	BS-3s	BS-3d	BS-4s	BS-4d	BS-5s	BS-5d	BS-6s	BS-6d
Calcium	11867	19535	59161	77435	20715	48306	2738	3125	7278	9242	2120	4089
Vanadium	23.2	100	182	146	132	87.2	43.8	70.8	39.6	109	5.6	66.7
Manganese	263	807	660	528	478	369	187	145	394	540	184	383
Chromium	33.0	117	78.0	138	128	65.3	19.9	28.0	61.2	71.3	8.9	40.9
Iron	21577	34483	38855	46914	37920	31017	16767	20303	29930	36250	11321	22103
Cobalt	49.5	ND	ND	ND	ND	ND	54.6	1.5	ND	ND	7.3	ND
Nickel	ND	43.8	8.7	36.3	ND	ND	0.6	25.5	ND	ND	ND	16.7
Copper	20.8	106	43.7	362	87.0	49.6	10.1	18.3	143	11.6	4.2	11.9
Arsenic	7.4	15.1	11.7	26.0	13.0	ND	4.3	1.1	13.5	9.1	3.3	4.9
Selenium	ND	2.8	ND	2.1	0.9	ND	0.3	ND	0.9	0.6	ND	ND
Zinc	68.5	597	114	223	268	96.4	37.2	62.1	93.2	74.1	15.6	27.3
Lead	33.3	258	67.4	399	151	50.4	31.1	34.4	257	15.4	10.7	14.4
Thallium	3.5	8.6	ND	11.1	ND	ND	0.9	3.8	5.0	ND	4.8	3.9
Mercury	0.8	3.9	ND	2.3	ND	10.7	ND	6.5	5.1	14.4	0.7	3.2
Silver	ND	ND	ND	ND	ND	ND	ND	ND	0.9	ND	1.1	ND
Cadmium	0.7	2.3	0.3	2.0	1.2	1.4	0.5	ND	0.6	ND	0.9	ND
Antimony	ND	3.6	1.9	3.0	3.4	0.7	1.8	5.6	3.0	2.2	ND	1.4
Barium	580	586	566	611	556	263	477	200	567	574	531	715
SiO5	96.5	94.3	90.0	87.3	94.0	92.0	98.0	97.6	96.1	95.3	98.6	97.3

ND = Not Detected

Subsurface Soil Characterization for the Proposed Bioswale
Soil Screening - DNREC Laboratory Analytical Results
Metals Analyses by XRF
December 1998

Concentration in ppm

Elements	BS-7s	BS-7d	BS-8s	BS-8d	BS-9s	BS-9d	BS-10s	BS-10d	BS-11s	BS-11d	BS-12s	BS-12d
Calcium	4512	3608	3672	6157	5559	3436	4381	3593	3207	3667	3419	4935
Vanadium	49.8	36.4	42.1	158	5.9	132	52.2	82.3	52.9	82.7	28.3	127
Manganese	451	188	189	347	220	344	328	186	413	195	232	363
Chromium	78.0	20.9	16.9	58.6	22.0	56.9	30.4	41.1	94.5	37.7	1.8	106
Iron	25536	20528	15720	29434	18686	37297	23024	28567	26280	20411	18570	39854
Cobalt	37.6	83.5	42.7	2.3	ND	2.3	ND	ND	44.5	ND	23.7	ND
Nickel	ND	ND	20.4	13.5	17.3	14.3	ND	7.1	6.6	ND	ND	ND
Copper	177	13.2	7.9	30.7	13.8	16.4	17.2	12.8	272	14.6	25.2	27.2
Arsenic	17.9	0.8	3.3	7.7	6.6	3.4	11.3	6.7	15.2	6.7	0.8	0.1
Selenium	ND	0.4	2.2	ND	0.4	ND	ND	ND	ND	ND	ND	2.9
Zinc	100	39.1	36.3	39.3	67.8	48.7	100	49.4	173	39.8	78.7	58.8
Lead	299	16.6	13.7	26.3	28.2	10.9	77.1	10.3	365	21.1	27.4	14.2
Thallium	7.5	ND	3.4	2.6	1.1	3.9	11.7	ND	7.2	ND	0.8	ND
Mercury	8.1	ND	ND	ND	ND	ND	5.3	ND	9.9	ND	1.3	ND
Silver	0.9	ND	ND	ND	0.9	1.6	ND	0.9	ND	0.8	1.8	1.0
Cadmium	0.2	ND	ND	0.6	ND	0.2	0.2	ND	1.3	0.02	ND	ND
Antimony	2.5	2.2	ND	ND	ND	0.4	ND	3.9	3.2	1.7	ND	1.3
Barium	588	631	855	497	735	416	676	327	549	700	616	291
SiO5	96.8	97.5	97.9	96.3	97.5	95.8	97.1	96.7	96.9	97.5	97.7	95.4

ND = Not Detected

Subsurface Soil Characterization for the Proposed Bioswale
Soil Screening - DNREC Laboratory Analytical Results
Metals Analyses by XRF
December 1998

Concentration in ppm

Elements	BS-13s	BS-13d	BS-14s	BS-14d	BS-15s	BS-15d	BS-16s	BS-16d	BS-17s	BS-17d
Calcium	4177	5854	2235	3103	3139	4180	46079	5206	27732	643988
Vanadium	9.5	78.8	34.1	19.7	11.8	94.3	104	52.8	33.9	58.8
Manganese	249	363	249	392	151	243	276	302	418	367
Chromium	22.8	43.9	20.2	6.4	22.1	59.5	19.1	6.3	18.7	7.2
Iron	19259	27501	18270	26018	15886	29780	24070	18757	23200	7158
Cobalt	ND	ND	8.3	ND	10.2	ND	ND	12.3	ND	ND
Nickel	9.6	ND	ND	18.3	19.9	ND	ND	3.8	7.3	38.0
Copper	12.4	3.4	18.8	27.7	12.5	12.8	15.0	13.9	9.4	7.4
Arsenic	3.1	5.9	4.7	0.8	0.3	5.5	3.0	1.3	2.8	19.5
Selenium	ND	ND	ND	ND	0.5	0.3	1.2	ND	ND	3.4
Zinc	73.9	46.3	76.2	28.1	28.0	52.8	74.5	15.8	65.2	14.4
Lead	24.8	18.4	25.9	19.2	22.8	15.6	54.2	21.3	33.8	12.4
Thallium	5.1	2.9	0.1	ND	4.8	4.8	7.3	1.1	9.8	5.4
Mercury		7.4	1.1	ND	4.3	5.6	0.8	0.6	6.0	ND
Silver		ND	0.5	ND	0.5	ND	0.8	ND	2.5	3.2
Cadmium		ND	1.8	1.6	0.5	1.8	0.4	0.7	1.3	ND
Antimony		1.4	ND	1.4	ND	4.6	3.1	0.9	3.3	3.1
Barium		324	430	525	477	630	864	817	640	140
SiO5		96.6	97.9	97.0	98.0	96.5	92.8	97.5	94.8	34.8

ND = Not Detected

Subsurface Soil Characterization for the Proposed Bioswale
Confirmatory Analytical Results
SVOC by EPA Method 8270
December 1998

Concentration, µg/Kg

Constituent	BS-1s	BS-7s	Field Dup	BS-7d	BS-9d	BS-13d	BS-14s	BS-15d
Phenol	<360	<360	<360	<780	<390	<400	<360	<370
bis(2-Chloroethyl)ether	<360	<360	<360	<780	<390	<400	<360	<370
2-Chlorophenol	<360	<360	<360	<780	<390	<400	<360	<370
1,3-Dichlorobenzene	<360	<360	<360	<780	<390	<400	<360	<370
1-4,Dichlorobenzene	<360	<360	<360	<780	<390	<400	<360	<370
1,2-Dichlorobenzene	<360	<360	<360	<780	<390	<400	<360	<370
2-Methylphenol	<360	<360	<360	<780	<390	<400	<360	<370
2,2'-oxybis(1-Chloropropane)	<360	<360	<360	<780	<390	<400	<360	<370
4-Methylphenol	<360	<360	<360	<780	<390	<400	<360	<370
N-Nitrosodi-n-propylamine	<360	<360	<360	<780	<390	<400	<360	<370
Hexachloroethane	<360	<360	<360	<780	<390	<400	<360	<370
Nitrobenzene	<360	<360	<360	<780	<390	<400	<360	<370
Isophorone	<360	<360	<360	<780	<390	<400	<360	<370
2-Nitrophenol	<360	<360	<360	<780	<390	<400	<360	<370
2,4-Dimethylphenol	<360	<360	<360	<780	<390	<400	<360	<370
bis(2-Chloroethoxy)methane	<360	<360	<360	<780	<390	<400	<360	<370
2,4-Dichlorophenol	<360	<360	<360	<780	<390	<400	<360	<370
1,2,4-Trichlorobenzene	<360	<360	<360	<780	<390	<400	<360	<370
Naphthalene	<360	530	110 J	<780	<390	<400	<360	210 J
4-Chloroaniline	<360	<360	<360	<780	<390	<400	<360	<370
Hexachlorobutadiene	<360	<360	<360	<780	<390	<400	<360	<370
4-Chloro-3-methylphenol	<360	<360	<360	<780	<390	<400	<360	<370
2-Methylnaphthalene	<360	230 J	<360	550 JD	<390	<400	<360	<370
Hexachlorocyclopentadiene	<360	<360	<360	<780	<390	<400	<360	<370
2,4,6-Trichlorophenol	<360	<360	<360	<780	<390	<400	<360	<370
2,4,5-Trichlorophenol	<1800	<1800	<1800	<3900	<1900	<2000	<1800	<1900
2-Chloronaphthalene	<360	<360	<360	<780	<390	<400	<360	<370
2-Nitroaniline	<1800	<1800	<1800	<3900	<1900	<2000	<1800	<1900
Dimethylphthalate	<360	<360	<360	<780	<390	<400	<360	<370
2,6-Dinitrotoluene	<360	<360	<360	<780	<390	<400	<360	<370
Acenaphthylene	<360	140 J	77 J	<780	<390	<400	<360	<370
3-Nitroaniline	<1800	<1800	<1800	<3900	<1900	<2000	<1800	<1900
Acenaphthene	<360	510	370	2200 D	<390	410	<360	330 J
2,4-Dinitrophenol	<1800	<1800	<1800	<3900	<1900	<2000	<1800	<1900
4-Nitrophenol	<1800	<1800	<1800	<3900	<1900	<2000	<1800	<1900
Dibenzofuran	<360	370	520	1600 D	<390	270 J	<360	220 J
2,4-Dinitrotoluene	<360	<360	<360	<780	<390	<400	<360	<370
Diethylphthalate	<360	<360	<360	<780	<390	<400	<360	<370
4-Chlorophenyl phenylether	<360	<360	<360	<780	<390	<400	<360	<370
Fluorene	<360	520	920	2700 D	<390	680	<360	<370
4-Nitroaniline	<1800	<1800	<1800	<3900	<1900	<2000	<1800	<1900
4,6-Dinitro-2-methylphenol	<1800	<1800	<1800	<3900	<1900	<2000	<1800	<1900
N-Nitrosodiphenylamine	<360	<360	<360	<780	<390	<400	<360	<370

J = Estimated Value, Below Laboratory Detection Limit
D = All compound concentrations reported from a secondary dilution analysis
< = Below Laboratory Detection Limit

Subsurface Soil Characterization for the Proposed Bioswale
Confirmatory Analytical Results
SVOC by EPA Method 8270
December 1998

Concentration, µg/Kg

Constituent	BS-1s	BS-7s	Field Dup	BS-7d	BS-9d	BS-13d	BS-14s	BS-15d
4-Bromophenyl phenylether	<360	<360	<360	<780	<390	<400	<360	<370
Hexachlorobenzene	<360	<360	<360	<780	<390	<400	<360	<370
Pentachlorophenol	<1800	<1800	<1800	<3900	<1900	<2000	<1800	<1900
Phenanthrene	540	1300	3000	8500 D	120 J	3000	200 J	1400
Anthracene	87 J	290 J	480	870 D	<390	400 J	420	200 J
Carbazole	<360	190 J	230 J	530 JD	<390	<400	160 J	160 J
Di-n-butyl phthalate	<360	<360	<360	<780	<390	<400	<360	<370
Fluroanthene	860	2700	3300	6900 D	<390	4200	320 J	940
Pyrene	670	2700	2200	4300 D	100 J	3500	250 J	530
Butylbenzylphthalate	<360	<360	<360	<780	<390	<400	<360	<370
3,3'-Dichlorobenzidine	<360	<360	<360	<780	<390	<400	<360	<370
Benzo(a)anthracene	380	1300	900	1400 D	<390	1300	170 J	170 J
Bis(2-Ethylhexyl)phthalate	<360	<360	<360	<780	<390	<400	<360	<370
Chrysene	460	1500	1000	1100 D	<390	1300	220 J	160 J
Di-n-octyl phthalate	<360	<360	<360	<780	<390	<400	<360	<370
Benzo(b)fluorathene	400	1700	630	680 JD	<390	950	170 J	94 J
Benzo(k)fluoranthene	370	1300	630	570 JD	<390	980	150 J	<370
Benzo(a)pyrene	400	1200	470	570 JD	<390	750	140 J	<370
Indeno(1,2,3-cd)pyrene	240 J	640	280 J	260 JD	<390	330 J	91 J	<370
Dibenz(a,h)anthracene	<360	270 J	130 J	<780	<390	150 J	<360	<370
Benzo(g,h,i)perylene	220 J	580	250 J	180 JD	<390	300 J	93 J	<370
TENTATIVELY IDENTIFIED COMPOUNDS								
Dibenzothiophene			210 JN	620 JN		180 JN		
C20H12 PAH	270 J	990 J	780 J	350 J		790 J		
2-Cyclohexen-1-one	170 JN							160 N
Unknown, Total	690 J	800 J	820 J	1310 J	170 J	350 J	2840 J	710 J
4H-Cyclopenta[def]phenanthrene		310 JN	620 JN	1500 JN		690 JN		190 N
9,10-Anthracenedione		210 JN						
Cyclopenta(def)phenanthrenon		220 JN						
Benzo(b)naphtho(2,3-d)furan		210 JN				190 JN		
C17H12 PAH		2360 J	1390 J	1170 J		1760 J		
7H-Benz[de]anthracen-7-one		290 JN						
C16H10S		300 J	210 J			190 J		
C18H12 PAH		570 J				260 J		
1-Methylnaphthalene		140 JN		270 JN				
C15H12 PAH			560 J	1260 J		480 J		
2-Phenylnaphthalene				520 JN		250 JN		
Total TICs	1,130 JN	6,400 JN	4,590	7,000 JD	170 J	5,140 JN	2,840 J	1,060 N
Total PAHs (including TICs)	5,587 JN	24,370 JN	20,087	39,910 JDN	390 J	23,660 JN	5,224 J	5,314 N

J = Estimated Value, Below Laboratory Detection Limit
< = Below Laboratory Detection Limit
D = All compound concentrations reported from a secondary dilution analysis
N = Presumptive Evidence of a Compound. Identification based on a mass spectral library search.

Subsurface Soil Characterization for the Proposed Bioswale
Confirmatory Analytical Results
PCB by EPA Method 8080
December 1998
Concentration, µg/Kg

Constituent	BS-1d	BS-7s	Field Dup	BS-17d
PCB-1016	<38	<36	<36	<62
PCB-1221	<76	<72	<71	<120
PCB-1232	<38	<36	<36	<62
PCB-1242	<38	<36	<36	<62
PCB-1248	<38	<36	<36	<62
PCB-1254	<38	<36	<36	<62
PCB-1260	<38	<36	<36	<62

< = Below the laboratory detection limit

Subsurface Soil Characterization for the Proposed Bioswale
Confirmatory Analytical Results
TAL Metals
December 1998

Concentration in mg/kg

Elements	BS-1d	BS-2d	BS-5s	BS-7s	Field Dup	BS-11s
Aluminum	8070	7470	5640	4380	6200	4200
Antimony	0.25 B	0.93 B	<0.21	0.27 B	0.20 B	<0.20
Arsenic	3.9	8.2	1.9 B	2.1	2.2	1.3 B
Barium	72.1	75.2	42.4	40.9	44.8	36.3 B
Beryllium	0.47 B	0.58 B	0.43 B	0.38 B	0.34 B	0.26 B
Cadmium	<0.22	<0.28	<0.21	<0.20	<0.20	<0.20
Calcium	2800	8710	505	471	681	175 B
Chromium	14	23.2	11.8	12.2	20.9	13.1
Cobalt	6.8 B	8.4 B	4.2 B	3.9 B	3.4 B	2.9 B
Copper	18.1	30.7	22.4	51.3	44.4	36.9
Iron	11600	13600	8720	8370	8750	6100
Lead	84.5	111	60.1	126	93.4	61.8
Magnesium	774	2580	540	444	421	336
Manganese	162	107	180	123	96	73.2
Mercury	0.53	0.26	0.26	<0.05	1.3	2.6
Nickel	12	17.2	7.5 B	6.3 B	6.7 B	3.9 B
Potassium	257	1110	268	243	210	193 B
Selenium	0.78 B	1.7	<0.63	<0.60	<0.59	<0.59
Silver	<0.22	<0.28	<0.21	<0.20	<0.20	<0.20
Sodium	172 B	250 B	92.9 B	82.5 B	87.9 B	89.6 B
Thallium	<0.23	0.33 B	<0.20	0.23 B	<0.21	<0.21
Vanadium	15.6	24.2	13.2	13.9	11.8	8.6 B
Zinc	89.2	81.7	28.6	18.4	37.4	74.7

< = not detected above the laboratory detection limit
B = Value is less than the Reporting Limit, but greater than the method detection limit

Appendix B

EPA United States Environmental Protection Agency Superfund

Contract Laboratory Program

Target Compounds and Analytes

CLP laboratories use CLP analytical methods for the isolation, detection, and quantitation of specific target compounds and analytes.

The CLP Target Compound and Target Analyte Lists were originally derived from the EPA Priority Pollutant List. In the years since the inception of the CLP, compounds and analytes have been added to and deleted from this list, based on advances in analytical methods, evaluation of method performance data, and the needs of the Superfund program.

The target compounds and analytes are listed below. Please note that water and soil/sediment quantitation limits apply to the Multi-Media, Multi-Concentration Organic and Multi-Media, Multi-Concentration Inorganic CLP services, while drinking water/groundwater quantitation limits can be obtained through the Low Concentration Organic Service only.

- Target Compound List (TCL) Volatile Compounds
- Target Compound List (TCL) Semivolatile Compounds
- Target Compound List (TCL) Pesticides/Aroclors (PCBs)
- Target Analyte List (TAL) Metals and Cyanide

In addition to the quantitation and detection limits, links have been provided for certain compounds/analytes to the Agency for Toxic Substance and Disease Registry's (ATSDR) ToxFAQs Internet site. Data from this site are derived from ATSDR's public health statements and represent the most up to date information at the time of listing. The information is intended to inform the reader about these substances with special emphasis placed on their known effects on human health, while at the same time, acknowledging that there are limitations that exist about long term health outcomes for many of these substances.

More detailed information regarding the human health effects associated with Target Compound List and Target Analyte List substances can be obtained by directly accessing the ATSDR Homepage on the Internet at http://atsdr1.atsdr.cdc.gov:8080.

EXITING EPA *DISCLAIMER: The following links are pointers to other hosts and locations on the Internet. This information is provided as a service; however, the U.S. Environmental Protection Agency does not endorse, approve, or otherwise support the non-EPA sites.*

TARGET COMPOUND LIST (TCL)
VOLATILE COMPOUNDS AND THEIR QUANTITATION LIMITS

COMPOUND	CONTRACT REQUIRED DETECTION LIMITS FOR:			DESCRIPTION
	Drinking/ Ground Water (ug/l)	Water (ug/l)	Soil (ug/kg)	
Chloromethane	1	10	10	ATSDR

				EXITING EPA
Bromomethane	1	10	10	EXITING EPA
Vinyl Chloride	1	10	10	EXITING EPA
Chloroethane	1	10	10	EXITING EPA
Methylene Chloride	2	10	10	EXITING EPA
Acetone	5	10	10	EXITING EPA
Carbon Disulfide	1	10	10	
1,1-Dichloroethene	1	10	10	EXITING EPA
1,1-Dichloroethane	1	10	10	EXITING EPA
1,2-Dichloroethene (total)	NA	10	10	EXITING EPA
cis-1,2-Dichloroethene	1	NA	NA	EXITING EPA
trans-1,2-Dichloroethene	1	NA	NA	EXITING EPA
Chloroform	1	10	10	EXITING EPA
1,2-Dichloroethane	1	10	10	EXITING EPA
2-Butanone	5	10	10	EXITING EPA
Bromochloromethane	1	NA	NA	
1,1,1-Trichloroethane	1	10	10	EXITING EPA
Carbon Tetrachloride	1	10	10	EXITING EPA
Bromodichloromethane	1	10	10	EXITING EPA
1,2-Dichloropropane	1	10	10	

				EXITING EPA
cis-1,3-Dichloropropene	1	10	10	EXITING EPA
Trichloroethene	1	10	10	EXITING EPA
Dibromochloromethane	1	10	10	
1,1,2-Trichloroethane	1	10	10	
Benzene	1	10	10	EXITING EPA
trans-1,3-Dichloropropene	1	10	10	EXITING EPA
Bromoform	1	10	10	EXITING EPA
4-Methyl-2-pentanone	5	10	10	
2-Hexanone	5	10	10	EXITING EPA
Tetrachloroethene	1	10	10	EXITING EPA
1,2-Dibromoethane	1	NA	NA	EXITING EPA
Toluene	1	10	10	EXITING EPA
1,1,2,2-Tetrachloroethane	1	10	10	EXITING EPA
Chlorobenzene	1	10	10	EXITING EPA
Ethylbenzene	1	10	10	EXITING EPA
Styrene	1	10	10	EXITING EPA
Xylenes (Total)	1	10	10	EXITING EPA
1,2-Dibromo-3-chloropropane	1	NA	NA	EXITING EPA
1,3-Dichlorobenzene	1	NA	NA	
1,4-Dichlorobenzene	1	NA	NA	
1,2-Dichlorobenzene	1	NA	NA	
1,2,4-Trichlorobenzene	1	NA	NA	

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TARGET COMPOUND LIST (TCL)
SEMIVOLATILES COMPOUNDS AND THEIR QUANTITATION LIMITS

COMPOUND	CONTRACT REQUIRED DETECTION LIMITS FOR:			DESCRIPTION
	Drinking/ Ground Water (ug/l)	Water (ug/l)	Soil (ug/kg)	
Phenol	5	10	330	EXITING EPA
bis(2-Chloroethyl) ether	5	10	330	
2-Chlorophenol	5	10	330	
1,3-Dichlorobenzene	NA	10	330	
1,4-Dichlorobenzene	NA	10	330	EXITING EPA
1,2-Dichlorobenzene	NA	10	330	
2-Methylphenol	5	10	330	
2,2'-oxybis(1-Chloropropane)	5	10	330	
4-Methylphenol	5	10	330	
N-Nitroso-di-n-propylamine	5	10	330	
Hexachloroethane	5	10	330	
Nitrobenzene	5	10	330	EXITING EPA
Isophorone	5	10	330	EXITING EPA
2-Nitrophenol	5	10	330	EXITING EPA
2,4-Dimethylphenol	5	10	330	
bis(2-Chloroethoxy) methane	5	10	330	
2,4-Dichlorophenol	5	10	330	
1,2,4-Trichlorobenzene	NA	10	330	
Naphthalene	5	10	330	EXITING EPA
4-Chloroaniline	5	10	330	
Hexachlorobutadiene	5	10	330	EXITING EPA
4-Chloro-3-methylphenol	5	10	330	
2-Methylnaphthalene	5	10	330	
Hexachlorocyclopentadiene	5	10	330	
2,4,6-Trichlorophenol	5	10	330	EXITING EPA
2,4,5-Trichlorophenol	20	25	830	
2-Chloronapthalene	5	10	330	
2-Nitroaniline	20	25	830	
Dimethylphthlate	5	10	330	
Acenaphthylene	5	10	330	

				EXITING EPA
2,6-Dinitrotoluene	5	10	330	
3-Nitroaniline	20	25	830	
Acenaphthene	5	10	330	EXITING EPA
2,4-Dinitrophenol	20	25	830	
4-Nitrophenol	20	25	830	EXITING EPA
Dibenzofuran	5	10	330	
2,4-Dinitrotoluene	5	10	330	
Diethylphthalate	5	10	330	
4-Chlorophenyl-phenyl ether	5	10	330	
Fluorene	5	10	330	EXITING EPA
4-Nitroaniline	20	25	830	
4,6-Dinitro-2-methylphenol	20	25	830	
N-Nitrosodiphenylamine	5	10	330	EXITING EPA
4-Bromophenyl-phenyl ether	5	10	330	
Hexachlorobenzene	5	10	330	
Pentachlorophenol	20	25	830	EXITING EPA
Phenanthrene	5	10	330	EXITING EPA
Anthracene	5	10	330	EXITING EPA
Carbazole	NA	10	330	
Di-n-butylphthalate	5	10	330	EXITING EPA
Fluoranthene	5	10	330	EXITING EPA
Pyrene	5	10	330	EXITING EPA
Butylbenzylphthalate	5	10	330	
3,3'-Dichlorobenzidine	5	10	330	
Benzo(a)anthracene	5	10	330	EXITING EPA
Chrysene	5	10	330	EXITING EPA
bis-(2-Ethylhexyl)phthalate	5	10	330	EXITING EPA
Di-n-octylphthalate	5	10	330	

Benzo(b)fluoranthene	5	10	330	EXITING EPA
Benzo(k)fluoranthene	5	10	330	EXITING EPA
Benzo(a)pyrene	5	10	330	EXITING EPA
Indeno(1,2,3-cd)pyrene	5	10	330	EXITING EPA
Dibenz(a,h)anthracene	5	10	330	EXITING EPA
Benzo(g,h,i)perylene	5	10	330	EXITING EPA

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TARGET COMPOUND LIST (TCL)
PESTICIDES/AROCLORS (PCBS) AND THEIR QUANTITATION LIMITS

COMPOUND	CONTRACT REQUIRED DETECTION LIMITS FOR:			DESCRIPTION
	Drinking/ Ground Water (ug/l)	Water (ug/l)	Soil (ug/kg)	
alpha-BHC	0.01	0.05	1.7	EXITING EPA
beta-BHC	0.01	0.05	1.7	EXITING EPA
delta-BHC	0.01	0.05	1.7	EXITING EPA
gamma-BHC (Lindane)	0.01	0.05	1.7	EXITING EPA
Heptachlor	0.01	0.05	1.7	EXITING EPA
Aldrin	0.01	0.05	1.7	EXITING EPA
Heptachlor epoxide	0.01	0.05	1.7	EXITING EPA
Endosulfan I	0.01	0.05	1.7	EXITING EPA

Dieldrin	0.02	0.10	3.3	EXITING EPA
4,4'-DDE	0.02	0.10	3.3	EXITING EPA
Endrin	0.02	0.10	3.3	EXITING EPA
Endosulfan II	0.02	0.10	3.3	EXITING EPA
4,4'-DDD	0.02	0.10	3.3	EXITING EPA
Endosulfan sulfate	0.02	0.10	3.3	EXITING EPA
4,4'-DDT	0.02	0.10	3.3	EXITING EPA
Methoxychlor	0.10	0.50	17.0	EXITING EPA
Endrin ketone	0.02	0.10	3.3	EXITING EPA
Endrin aldehyde	0.02	0.10	3.3	EXITING EPA
alpha-Chlordane	0.01	0.05	1.7	EXITING EPA
gamma-Chlordane	0.01	0.05	1.7	EXITING EPA
Toxaphene	1.0	5.0	170.0	EXITING EPA
Aroclor-1016	0.20	1.0	33.0	EXITING EPA
Aroclor-1221	0.40	2.0	67.0	EXITING EPA
Aroclor-1232	0.20	1.0	33.0	EXITING EPA
Aroclor-1242	0.20	1.0	33.0	EXITING EPA
Aroclor-1248	0.20	1.0	33.0	

				EXITING EPA
Aroclor-1254	0.20	1.0	33.0	EXITING EPA
Aroclor-1260	0.20	1.0	33.0	EXITING EPA

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TARGET ANALYTE LIST (TAL)
METALS/CYANIDE AND THEIR DETECTION LIMITS*

ANALYTES	CONTRACT REQUIRED DETECTION LIMITS FOR: WATER (ug/l)	DESCRIPTION
Aluminum	200	EXITING EPA
Antimony	60	EXITING EPA
Arsenic	10	EXITING EPA
Barium	200	EXITING EPA
Berylium	5	EXITING EPA
Cadmium	5	EXITING EPA
Calcium	5000	
Chromium	10	EXITING EPA
Cobalt	50	EXITING EPA
Copper	25	EXITING EPA
Iron	100	
Lead	3	EXITING EPA
Magnesium	5000	
Manganese	15	
Mercury	0.2	EXITING EPA

Nickel	40	EXITING EPA
Potassium	5000	
Selenium	5	EXITING EPA
Silver	10	EXITING EPA
Sodium	5000	
Thallium	10	EXITING EPA
Vanadium	50	EXITING EPA
Zinc	20	EXITING EPA
Cyanide	10	EXITING EPA

*TAL Metal detection limits are expressed as instrument detection limits obtained in pure water. Detection limits for soils are adjusted for the amount of sample analyzed and percent moisture.

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Appendix C

Ground-Water Characterization
EA Laboratory Analytical Results
SVOC by EPA Method 8270C
January 1999

Concentration, µg/L

Constituent	URS Surface Water*	URS Ground Water**	MW-1	MW-2	MW-3	MW-4	MW-5	MW-5 (Dup)	MW-6
4-Chlorophenyl phenylether	NC	NC	<10	<10	<10	<10	<10	<10	<10
Fluorene	4	150	<10	<10	<10	<10	<10	<10	4 J
4-Nitroaniline	NC	11	<50	<50	<50	<50	<50	<50	<50
4,6-Dinitro-2-methylphenol	NC	NC	<50	<50	<50	<50	<50	<50	<50
N-Nitrosodiphenylamine	25	14	<10	<10	<10	<10	<10	<10	<10
4-Bromophenyl phenylether	2	210	<10	<10	<10	<10	<10	<10	<10
Hexachlorobenzene	NC	1/0.01	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	20	1/0.6	<50	<50	<50	<50	<50	<50	<50
Phenanthrene	6	120	<10	<10	<10	<10	<10	<10	4 J
Anthracene	0.001	1100	<10	<10	<10	<10	<10	<10	<10
Carbazole	NC	3	<10	<10	<10	<10	<10	<10	<10
Di-n-butyl phthalate	NC	NC	<10	<10	<10	<10	<10	<10	<10
Fluroanthene	6	150	<10	<10	<10	<10	<10	<10	<10
Pyrene	NC	110	<10	<10	<10	<10	<10	<10	<10
Butylbenzylphthalate	19	730	<10	<10	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidine	NC	1	<10	<10	<10	<10	<10	<10	<10
Benzo(a)anthracene	0.03	1	<10	<10	<10	<10	<10	<10	<10
Bis(2-Ethylhexyl)phthalate	32	6/5	<10	<10	<10	<10	<10	3 J	<10
Chrysene	NC	9	<10	<10	<10	<10	<10	<10	<10
Di-n-octyl phthalate	708	73	<10	<10	<10	<10	<10	<10	<10
Benzo(b)fluorathene	NC	1	<10	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	NC	1	<10	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene	0.01	0.2/0.01	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene	NC	1	<10	<10	<10	<10	<10	<10	<10
Dibenz(a,h)anthracene	NC	0.1	<10	<10	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene	NC	NC	<10	<10	<10	<10	<10	<10	<10
TENTATIVELY IDENTIFIED COMPOUNDS									
2-Pentanone, 4-hydroxy-4-met			11 ABJN	10 ABJN		5 ABJN	5 ABJN	5 ABJN	7 ABJN
Unknown, Total			6 BJ	4 BJ		10 J	9 BJ	11 BJ	34 BJ
C6H12O2 Isomer						6 J		12 J	9 J
Cyclohexane, ethyl-									5 JN
Total TICs			17	14 BJ	0	21	14	28	55 BJ
Total PAHs (including TICs)			17	31 BJ	0	21	14	28	64 BJ

J = Estimated Value, Below Laboratory Detection Limit
< = Below Laboratory Detection Limit
A = A TIC is a suspected aldol-condensation product
B = Possible/Probable Method Blank Contamination
N = Presumptive Evidence of a Compound. Identification based on a mass spectral library search.
*Delaware Uniform Risk-Based Remediation Standards, URS for Protection of Environment, Surface Water, February 1998
**Delaware Uniform Risk-Based Remediation Standards, URS for Protection of Human Health, Ground Water, February 1998
NC = No Criteria
Concentrations exceeding the URS are shaded.

Ground-Water Characterization
EA Laboratory Analytical Results
SVOC by EPA Method 8270C
January 1999

Concentration, µg/L

Constituent	URS Surface Water*	URS Ground Water**	MW-1	MW-2	MW-3	MW-4	MW-5	MW-5 (Dup)	MW-6
Phenol	NC	4000	<10	<10	<10	<10	<10	<10	<10
bis(2-Chloroethyl)ether	NC	0.01	<10	<10	<10	<10	<10	<10	<10
2-Chlorophenol	NC	40	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	71	600/540	<10	<10	<10	<10	<10	<10	<10
1-4,Dichlorobenzene	15	75/0.4	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	14	600/64	<10	<10	<10	<10	<10	<10	<10
2-Methylphenol	72	180	<10	<10	<10	<10	<10	<10	<10
2,2'-oxybis(1-Chloropropane)	NC	NC	<10	<10	<10	<10	<10	<10	<10
4-Methylphenol	NC	18	<10	<10	<10	<10	<10	<10	<10
N-Nitrosodi-n-propylamine	NC	0.1	<10	<10	<10	<10	<10	<10	<10
Hexachloroethane	12	1/0.1	<10	<10	<10	<10	<10	<10	<10
Nitrobenzene	NC	0.3	<10	<10	<10	<10	<10	<10	<10
Isophorone	NC	100/71	<10	<10	<10	<10	<10	<10	<10
2-Nitrophenol	NC	NC	<10	<10	<10	<10	<10	<10	<10
2,4-Dimethylphenol	NC	73	<10	<10	<10	<10	<10	<10	<10
bis(2-Chloroethoxy)methane	NC	NC	<10	<10	<10	<10	<10	<10	<10
2,4-Dichlorophenol	NC	20	<10	<10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	110	70	<10	<10	<10	<10	<10	<10	<10
Naphthalene	23	20	<10	3 J	<10	<10	<10	<10	<10
4-Chloroaniline	NC	15	<10	<10	<10	<10	<10	<10	<10
Hexachlorobutadiene	NC	1/0.1	<10	<10	<10	<10	<10	<10	<10
4-Chloro-3-methylphenol	NC	NC	<10	<10	<10	<10	<10	<10	<10
2-Methylnaphthalene	NC	NC	<10	<10	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	NC	50/0.1	<10	<10	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	NC	6	<10	<10	<10	<10	<10	<10	<10
2,4,5-Trichlorophenol	NC	370	<50	<50	<50	<50	<50	<50	<50
2-Chloronaphthalene	NC	290	<10	<10	<10	<10	<10	<10	<10
2-Nitroaniline	NC	11	<50	<50	<50	<50	<50	<50	<50
Dimethylphthalate	NC	37000	<10	<10	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	NC	4	<10	<10	<10	<10	<10	<10	<10
Acenaphthylene	NC	NC	<10	<10	<10	<10	<10	<10	<10
3-Nitroaniline	NC	11	<50	<50	<50	<50	<50	<50	<50
Acenaphthene	NC	220	<10	14	<10	<10	<10	<10	10 J
2,4-Dinitrophenol	NC	7	<50	<50	<50	<50	<50	<50	<50
4-Nitrophenol	NC	60	<50	<50	<50	<50	<50	<50	<50
Dibenzofuran	20	15	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	NC	7	<10	<10	<10	<10	<10	<10	<10
Diethylphthalate	220	5000	<10	<10	<10	<10	<10	<10	<10

J = Estimated Value, Below Laboratory Detection Limit
< = Below Laboratory Detection Limit
*Delaware Uniform Risk-Based Remediation Standards, URS for Protection of Environment, Surface Water, February 1998
**Delaware Uniform Risk-Based Remediation Standards, URS for Protection of Human Health, Ground Water, February 1998
NC = No Criteria
Concentrations exceeding the URS are shaded.

Ground-Water Characterization
EA Laboratory Analytical Results
TAL Metals
January 1999

Concentration, µg/L

Metals	URS Surface Water*	URS Ground Water**	MW-1	MW-2	MW-3	MW-4	MW-5	MW-5 (Dup)	MW-6
Aluminum	NC	200	124	60	104	188	231	195	179
Antimony	104	6	1.5	<1.0	1.6	2.3	2.1	2.4	1.7
Arsenic	360	50	2.7	10.6	4	4.9	16.1	19.4	23.1
Barium	4	2000	59	56.3	165	86.9	24.6	22.9	213
Beryllium	5	4	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium	3.9	5	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60
Calcium	NC	NC	68600	13400	66900	157000	160000	157000	126000
Chromium	1,736	100	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Cobalt	NC	220	<7.0	<7.0	<7.0	<7.0	9.5	<7.0	<7.0
Copper	18	1000	7.8	<5.0	<5.0	12.5	8.3	7.4	5.3
Iron	1000	300	12300	63700	11600	1480	2120	2220	17900
Lead	82	15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Magnesium	NC	NC	25900	14400	7060	17400	19700	19200	29800
Manganese	80	50	432	627	954	352	577	599	3820
Mercury	2	2	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nickel	1,418	100	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Potassium	NC	NC	11200	2880	2110	7600	11200	10400	5740
Selenium	20	50	4.7	5.1	2.7	5.6	3.4	4.3	2.7
Silver	4	100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Sodium	NC	NC	46300	63700	11400	15800	10900	10500	18400
Thallium	18	2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vanadium	19	26	<3.0	<3.0	<3.0	<3.0	6.8	<3.0	<3.0
Zinc	117	2000	220	<12.0	<12.0	55.4	179	207	<12.0

< = Below Laboratory Detection Limit
*Delaware Uniform Risk-Based Remediation Standards, URS for Protection of Environment, Surface Water, February 1998
**Delaware Uniform Risk-Based Remediation Standards, URS for Protection of Human Health, Ground Water, February 1998
URS value for Arsenic is the non-carcinogenic value
NC = No Criteria
Concentrations exceeding the URS are shaded