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THE ESTATE OF LESTER NOLAN LANDFILL SITE

FINAL PLAN OF REMEDIAL ACTION

July, 1997

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

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Estate of Lester Nolan Landfill Site
Final Plan of Remedial Action

1. INTRODUCTION

The Department of Natural Resources and Environmental Control (DNREC or Department) issues the Final Plan of Remedial Action under the provisions of the Delaware Hazardous Substance Cleanup Act (HSCA) and the Delaware Regulations Governing Hazardous Substance Cleanup (Regulations). The Final Plan presents to the public the Department's final selection of remedial activities to occur at the Estate of Lester Nolan Landfill site, Wilmington, Delaware.

2. BACKGROUND

In October 1995, The Department under the authority granted by the Hazardous Substance Cleanup Act (7 Del. C., Chapter 91) reached an agreement with the executor of the estate of Lester A. Nolan, Michael A. Dribin, Esquire to perform a Remedial Investigation/Focused Feasibility Study (RI/FFS) of the soil, sediment, surface water and groundwater at the Estate of Lester Nolan Landfill site (hereinafter ("the site").

The property is located north and east of the intersection of New Castle Avenue and New York Avenue, just north of Route 495, in Wilmington, Delaware (Figures 1 & 2). The RI/FFS was conducted consistent with the Delaware Regulations Governing Hazardous Substance Cleanup (HSCA), Delaware Standard Operating Procedures (SOP) for Chemical Analytical Programs (CAP), the Guidance Document and other Departmental policies or procedures.

The data generated during the RI confirmed the findings of previous studies of the site. The laboratory analytical results submitted to the Department for lead, total petroleum hydrocarbons (TPH), volatile organic compounds (VOC's), semi-volatile organic compounds (SVOC's), polychlorinated biphenyls (PCB's) and asbestos are summarized in Tables 1-5. Contaminants found to exceed Risk-Based Concentration values included:

1) Lead	1,240 to 57,400 mg/Kg (ppm)
2) Aroclor 1260	1,700 mg/Kg (ppm)
3) Benzo(a)pyrene	0.78 to 1.1 mg/Kg (ppm)

Based on the hydrogeologic and analytical data collected during the RI, the following conclusions were drawn regarding the landfill at the Estate of Lester Nolan:

- The East and West landfills contain solid waste and asbestos;
- Surficial soil in the East and West landfills has been impacted by lead and petroleum hydrocarbons;
- An isolated area of surficial soil west of the West landfill has been impacted by lead and petroleum hydrocarbons; and
- Throughout most of the East and West landfills, lead and petroleum hydrocarbon concentrations decrease rapidly with depth. Isolated hot spots exist at depth in both landfills.

3. PROPOSED REMEDIAL ACTION

Remedial Action is defined in the Regulations as "the containment, contaminant mass or toxicity reduction, isolation, treatment, removal, cleanup, or monitoring of hazardous substances released to the environment, or the taking of such other actions as may be necessary to prevent, minimize or mitigate harm or risk to the public health, welfare, or the environment which may be a result from a release or an imminent threat of a release of hazardous substances".

The proposed remedy for this site consists of the following:

A Closure cover system option consisting of either:

- A geomembrane (40mil minimum), protective geotextile and geocomposite drainage layer underlying a vegetated top soil cover; or
- A flexible pavement section with a geomembrane (40 mil minimum), separation/filter geotextile installed below an underlying aggregate subbase (See Figure 3).

4. PROPOSED PLAN AND PUBLIC PARTICIPATION

The Department drafted a Proposed Plan of Remedial Action for the site and recommended that the above mentioned remedial action take place at the site The Department provided public notice in the News Journal and Delaware State News on June 13, 1997 (See Figure 4). During the comment period, the Department received no objections to the Proposed Plan (See Table 6). Therefore, the Final Plan of Remedial Action is issued designating the selected remedy and stipulations concerning current and future activities.

5. DECLARATION

The Final Plan of Remedial Action for the Estate of Lester Nolan site is protective of human health, welfare, and the environment and is consistent with the requirements of the Delaware Hazardous Substance Cleanup Act.

Nicholas A. DiPasquale 8/11/97

Nicholas A. DiPasquale, Director
Division of Air & Waste Management

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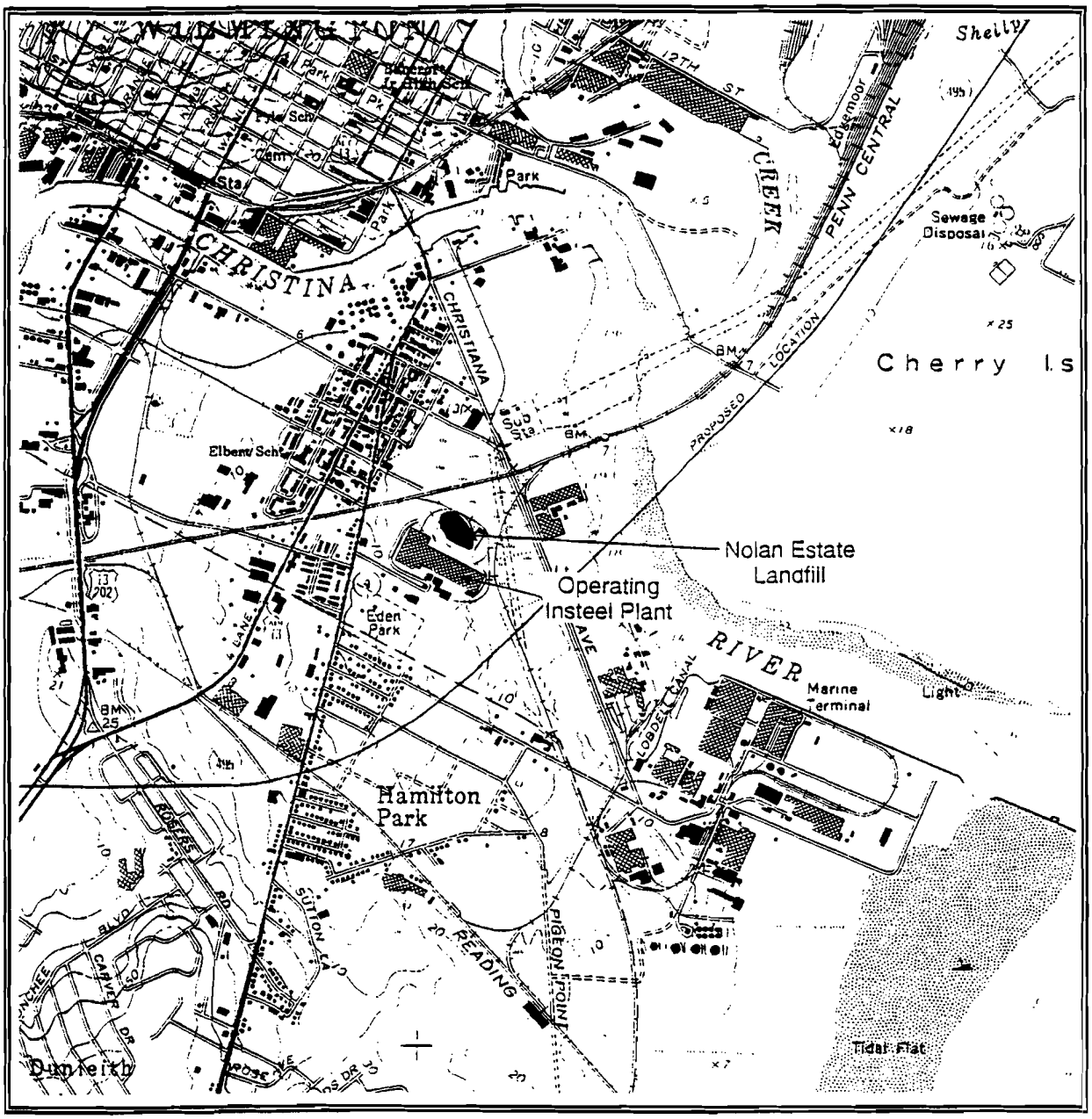

Figure 1

Site Location Map

Base Map is from ADC's Street Map of New Castle County

Estate of Lester Nolan

Wilmington, Delaware

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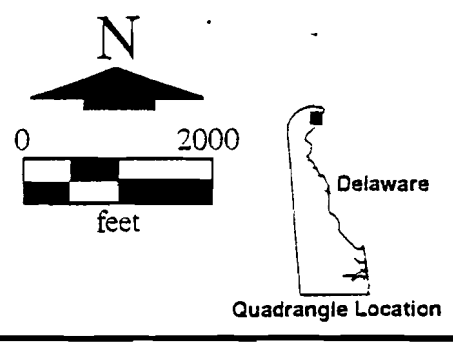
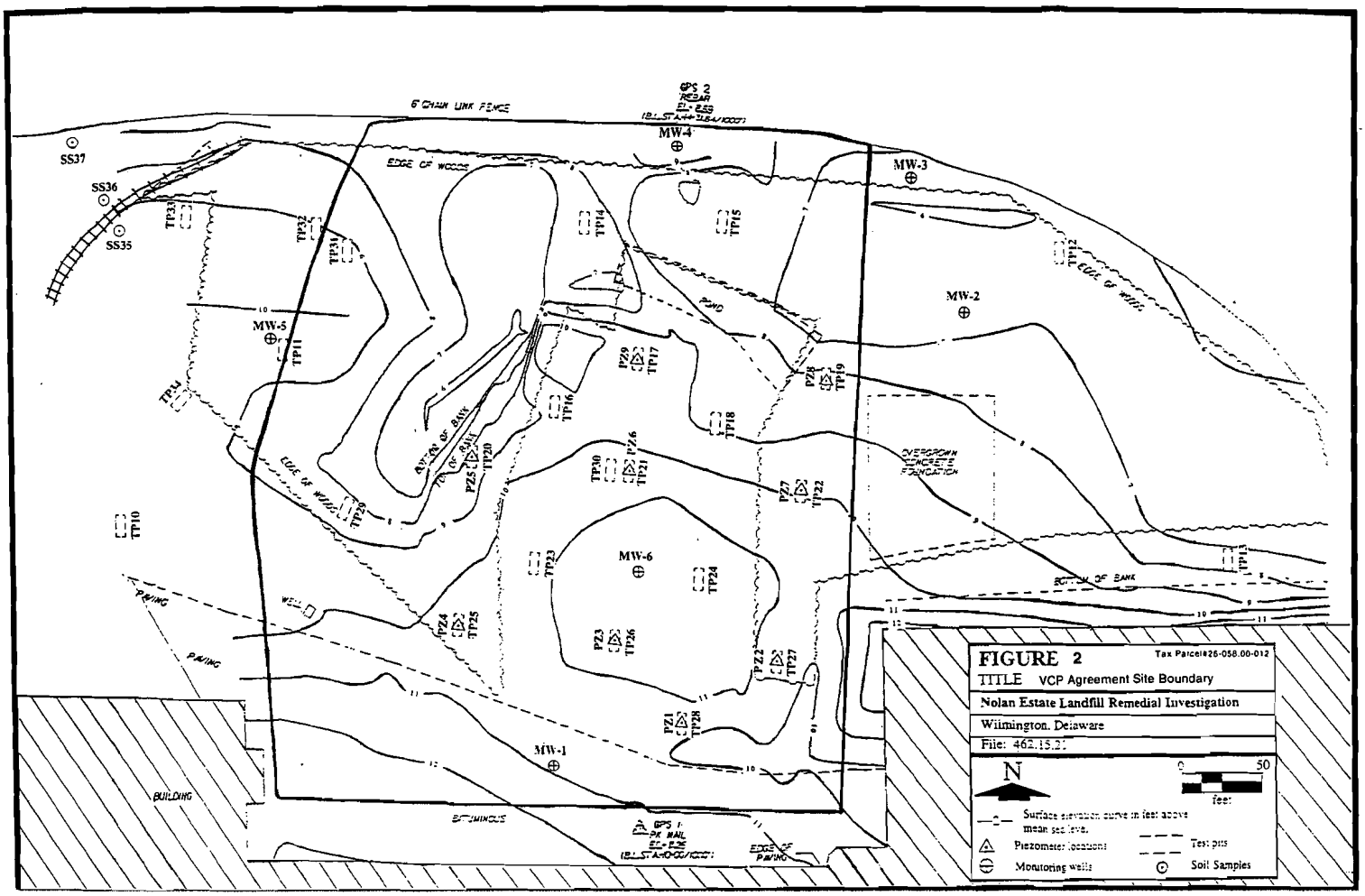
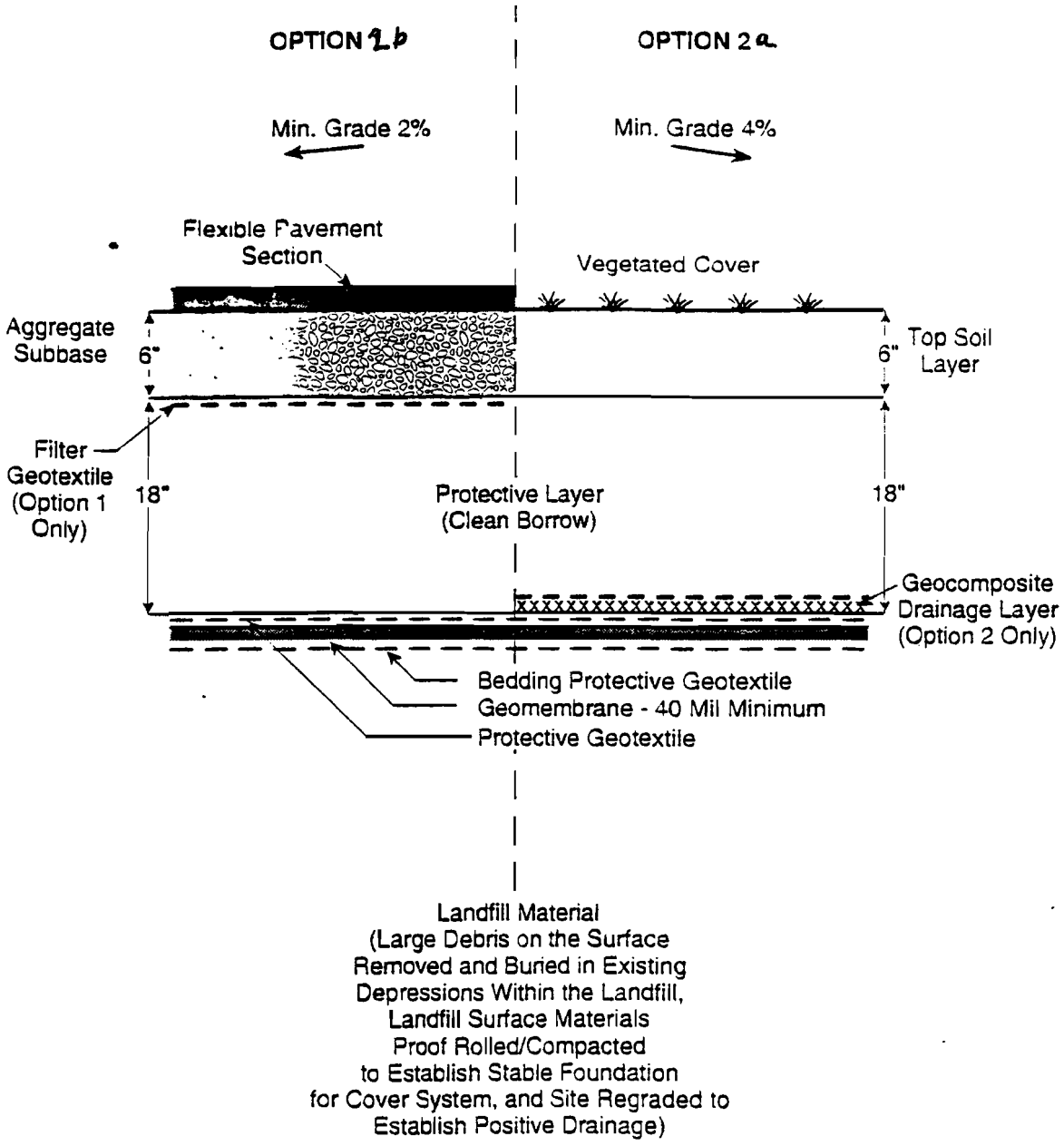



6' CHAIN LINK FENCE
EDGE OF WOODS
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
SS35
SS36
SS37
TP10
TP11
TP12
TP13
TP14
TP15
TP16
TP17
TP18
TP19
TP20
TP21
TP22
TP23
TP24
TP25
TP26
TP27
TP28
TP29
TP30
TP31
TP32
TP33
PZ1
PZ2
PZ3
PZ4
PZ5
PZ6
PZ7
PZ8
PZ9
POND
TOP OF BANK
BOTTOM OF BANK
EDGE OF WOODS
OVERGROWN CONCRETE FOUNDATION
PAVING
WELL
BUILDING
BITUMINOUS
EDGE OF PAVING
FIGURE 2
Tax Parcel#26-058.00-012
TITLE VCP Agreement Site Boundary
Nolan Estate Landfill Remedial Investigation
Wilmington, Delaware
File: 462.15.21
N
0
50
feet
Surface elevation curve in feet above mean sea level.
Piezometer locations
Test pits
Monitoring wells
Soil Samples



97P-0160 2/7/97

FIGURE 3 COVER SYSTEM CROSS SECTION OPTIONS 1 AND 2

Figure 4
News Journal Newspaper Legal Notice

PROPOSED PLAN OF REMEDIAL ACTION FOR THE ESTATE OF LESTER NOLAN LANDFILL SITE

The Delaware Department of Natural Resources and Environmental Control (DNREC) Announces The Release of the Proposed Plan of Remedial Action for the Estate of Lester Nolan Landfill site, located in Wilmington, Delaware, under the authority of the Hazardous Substance Cleanup Act (HSCA).

A Remedial Investigation (RI) was conducted at this property in 1995. This investigation revealed the presence of lead, petroleum hydrocarbons, PCBs and asbestos in the sites surface and sub-surface soil.

The Proposed Plan for the Estate of Lester Nolan Landfill site, calls for the implementation of a closure cover system. This system can occur under one of two options: 1) a vegetated top soil cover or 2) a flexible pavement section with an underlying aggregate subbase. Either option would be acceptable under this Proposed Plan.

A copy of the Proposed Plan of Remedial Action for the Estate of Lester Nolan Landfill site is available at the following location:

DNREC's New Castle Office
715 Grantham Lane
New Castle, De. 19720
(302)323-4540

DNREC invites written comments on this Plan. Members of the public may also request a public hearing on the Proposed Plan of Remedial Action pursuant to 7 Del. C § 9112. The comment period begins on June 16, 1997 and ends at 4:30 p.m. on July 7, 1997.

Comments and/or requests for a public hearing may be submitted in writing to Paul Will by the close of business (4:30 p.m.) on July 7, 1997 at the above address. For additional information contact Lisa Fish at (302)323-4540.

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Table 1
Remedial Investigation
Estate of Lester Nolan
Wilmington, Delaware
Soil Analytical Data
Lead and Total Petroleum Hydrocarbons

Sample ID	Date	Unit	Depth (ft)	Lead (mg/Kg)	TPH (mg/Kg)
TP10-S001	10/13/95	BRN	2.5	516	132 K
TP10-S002	10/13/95	COL	8.5	9.4	ND (62)
TP11-S001	10/13/95	BRN	4	1,580	50,600 K
TP11-S002	10/13/95	COL	8.5	1,240	117,000 K
TP12-S001	10/13/95	BRN	1-3	51.6	363 K
TP12-S101	10/13/95	BRN	1-3	90.3	214 K
TP13-S001	10/13/95	BLK	3	75.6	366 K
TP14-S001	10/13/95	BRN	1	53.5	163 K
TP14-S002	10/13/95	BLK	2.5	50.4	147 K
TP15-S001	10/13/95	BLK	2	79.6	110 K
TP15-S102	10/13/95	BLK	2	87.2	143 K
TP16-S001	10/11/95	BLK	1.5	18,200	36,700
TP16-S002	10/11/95	BLK	3.5	12,900	28,600
TP17-S001	10/11/95	BRN	2	5,410	12,300
TP17-S002	10/11/95	BLK	5	26.1 U	156 K
TP17-S003	10/11/95	COL	9	41.2 U	ND (67)
TP18-S001	10/11/95	BRN	1-2	57,400	17,900
TP18-S002	10/11/95	BLK	4	4,290	16,300
TP19-S001	10/11/95	BRN	1	33.4 U	ND (55)
TP19-S002	10/11/95	BLK	4	18.1 U	306 K
TP19-S003	10/11/95	COL	8	69.2 U	34
TP20-S001	10/12/95	BRN	1	30,500	6,500 L
TP20-S002	10/12/95	BLK	7	522	290 K
TP20-S003	10/12/95	COL	9.5	2.4 U	64 L
TP21-S001	10/12/95	BRN	1	14,000	38,600 L
TP21-S002	10/12/95	BLK	5.5	179 U	774 L
TP21-S102	10/12/95	BLK	5.5	469	4,000 L
TP22-S001	10/11/95	BRN	1	37.9 U	ND (56)
TP22-S002	10/11/95	BLK	8	36.3 U	183
TP23-S002	10/12/95	BLK	3.5	4,550	12,000
TP24-S001	10/12/95	BLK	2.5	5,140	101,000
TP24-S002	10/12/95	BLK	4	3,960	98,300
TP25-S001	10/12/95	BRN	1	4,180	1,290
TP25-S002	10/12/95	BLK	6.5	194 U	696
TP26-S001	10/12/95	BRN	1.5	7,200	35,900 L
TP27-S001	10/12/95	BRN	2	24.9 U	646 L
TP28-S002	10/12/95	BLK	5	15.3 U	6,600 L
TP28-S003	10/12/95	COL	8.5	29.5 U	69 L
TP29-S001	3/19/96	BLK	3.5	289	18,300
TP31-S001	3/19/96	BRN	0.5	5,930	1,300
TP31-S002	3/19/96	BLK	6	141	341
TP33-S001	3/19/96	NA	2	5,900	22,100
TP34-S001	3/19/96	BRN	6.5	91	ND (60)
TP34-S002	3/19/96	COL	8.5	29.3	ND (60)
SS35-S001	4/24/96	BLK	2	8,160	6,640
SS36-S001	5/2/96	BLK	2.5	32.7	60
SS37-S001	5/2/96	BLK	3	31.7	ND (66)
Selected Nolan Estate Surface Soil Screening Level				1,000	nca
Selected Nolan Estate Subsurface Soil Screening Level				nca	nca

nca - No criteria available
ND - not detected; detection limit shown in parenthesis
Bold type indicates the results exceed Screening Levels
K - Value biased high, actual value expected to be lower
L - Value biased low, actual value expected to be higher
U - Compound detected below action limit
BRN - Brown Sand Unit
BLK - Black Sand Unit
COL - [illegible]

Table 2
Remedial Investigation
Estate of Lester Nolan
Wilmington, Delaware
Soil Analytical Results

Date Sampled Depth (ft)	TP11-S001 10/13/95 4	TP16-S001 10/11/95 1.5	TP18-S001 10/11/95 1.2	TP18-S002 10/11/95 4	SS18-S001 2/15/96 0.5-1.5	SS26-S001 2/15/96 0.5-1.5	Selected Nolan Estate Surface Soil Screening Level	Selected Nolan Estate Subsurface Soil Screening Level
Total Metals (mg/Kg)								
Antimony	ND (10.7)	ND (12)	ND (11.3)	ND (12.9)	NA	NA	820	nca
Arsenic	12.8	22.9	12.9	11.7	NA	NA	610	15
Beryllium	**2.8**	0.57 B	0.81 B	0.31 B	NA	NA	1.3	180
Cadmium	ND (1.3)	2.0	1.3	ND (1.5)	NA	NA	1,000	6
Chromium	**25.4**	37.4	30.3	**21.5**	NA	NA	10,000 |	19 |
Copper	198	580	932	561	NA	NA	82,000	nca
Lead	**2,590***	**16,200***	**32,500***	**6,990***	NA	NA	1,000	nca
Mercury	36.1	0.45	0.27	0.15 B	NA	NA	610	3
Nickel	**35.3**	76.3	110	**72.7**	NA	NA	41,000	21
Selenium	ND (0.27)	ND (0.29)	ND (0.27)	ND (0.27)	NA	NA	10,000	3
Silver	ND (2.3)	ND (2.6)	ND (2.4)	ND (2.8)	NA	NA	10,000	nca
Thallium	ND (0.27)	ND (0.29)	ND (0.27)	ND (0.27)	NA	NA	nca	0.4
Zinc	5,790	7,690	10,800	3,770	NA	NA	610,000	42,000
SPLP (mg/L)	**(Synthetic Precipitation Leaching Procedure - pH of 4)**							
Lead	ND (0.100)	ND (0.100)	ND (0.100)	ND (0.100)	NA	NA	nca	nca
TCLP (mg/L)	**(Toxicity Characteristic Leaching Procedure - pH of 2)**							TCLP Regulatory Levels (10/95)
Metals								
Arsenic	ND (1.00)	ND (1.00)	ND (1.00)	ND (1.00)	ND (1.00)	ND (1.00)	NA	5.0
Barium	0.710	1.79	0.895	0.700	1.14	2.05	NA	100.0
Cadmium	ND (0.025)	0.045	0.085	ND (0.025)	0.0650	0.100	NA	1.0
Chromium	ND (0.050)	ND (0.050)	ND (0.050)	0.135	ND (0.050)	ND (0.050)	NA	5.0
Lead	**26.6**	**64.9**	**190.0**	**74.4**	**79.5**	**136**	NA	5.0
Mercury	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	NA	0.2
Selenium	ND (0.250)	ND (0.250)	ND (0.250)	ND (0.250)	ND (0.25)	ND (0.25)	NA	1.0
Silver	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	NA	5.0
Zinc	18.2	56.0	409	30.3	NA	NA	NA	NA
VOCs	NA	NA	NA	NA	ND	ND	NA	NRL
SVOCs	NA	NA	NA	NA	ND	ND	NA	NRL
PEST/HERB	NA	NA	NA	NA	ND	ND	NA	NRL

nca - No criteria available
ND - not detected; detection limit shown in parenthesis
NA - Not Applicable
Bold type indicates the results exceed Screening Levels
B - Result falls between the IDL and the CRDL
| - Reporting level for hexavalent chromium
* - Lead was analyzed two times in the sample, initial results shown on Table 1

Table 3
Remedial Investigation
Estate of Lester Nolan
Wilmington, Delaware
Soil Analytical Results

Date Sampled	SS16-S001 2/15/96	SS18-S001 2/15/96	SS18-S101 2/15/96	SS25-S001 2/15/96	SS26-S001 2/15/96	Selected Nolan Estate Surface Soil Screening Level
Metals (mg/Kg)						
Aluminum	3,500	4,310	4,130	2,100	4,510	15-6
Antimony	ND (11.1)	ND (11.2)	ND (11.0)	ND (12.0)	ND (12.0)	820
Arsenic	22.2 B	13.9 B	15.3 B	8.0	21.0 B	610
Barium	69.9	65.3	67.6	42.7 B	64.9	140,000
Beryllium	0.26 B	0.53 B	0.52 B	ND (0.09)	0.57 B	1.30
Cadmium	4.2	13.9	10.0	1.7	5.1	1,000
Calcium	131,000	72,900	69,500	19,200	68,300	nca
Chromium	31.1	38.1	33.0	22.6	49.7	10,000+
Cobalt	5.3 B	11.5 B	7.1 B	4.0 B	6.0 B	120,000
Copper	468	697	546	229	591	82,000
Iron	44,300	51,200	46,000	29,800	61,400	610,000
Lead	24,600	17,100	18,500	3,620	22,500	1,000
Magnesium	6,320	7,310	8,640	1,170 B	3,810	nca
Manganese	345	402	363	252	552	10,000
Mercury	0.33	0.64	0.46	0.25	0.44	610
Nickel	79.7	83.6	73.4	25.5	80.6	41,000
Potassium	281 B	308 B	327 B	162 B	496 B	nca
Selenium	ND (0.28)	ND (0.25)	ND (0.29)	ND (0.29)	ND (0.26)	10,300
Silver	ND (2.5)	ND (2.5)	ND (2.5)	ND (2.6)	ND (2.6)	10,000
Sodium	597 B	535 B	528 B	63.0 B	1,400 B	nca
Thallium	ND (0.28)	ND (0.25)	ND (0.29)	ND (0.29)	ND (0.26)	nca
Vanadium	12.1 B	13.3	13.1	17.2	17.7	14,000
Zinc	6,120	21,300	16,400	2,350	11,100	610,000
Cyanide	ND (1.4)	ND (1.4)	ND (1.4)	ND (1.4)	ND (1.4)	41,000
VOCs (mg/Kg)						
VOC Compounds	ND	ND	ND	ND	ND	nca
SVOCs (mg/Kg)						
Acenaphthene	ND (1.80)	ND (1.80)	ND (1.80)	0.086 J	ND (1.90)	10,000
Dibenzofuran	ND (1.80)	ND (1.80)	ND (1.80)	0.048 J	ND (1.90)	8,200
Fluorene	ND (1.80)	ND (1.80)	ND (1.80)	0.066 J	ND (1.90)	10,000
Phenanthrene	0.340 J	0.310 J	ND (1.80)	1.200	0.200 J	nca
Anthracene	ND (1.80)	ND (1.80)	ND (1.80)	0.250 J	ND (1.90)	10,000
Carbazole	ND (1.80)	ND (1.80)	ND (1.80)	0.200 J	ND (1.90)	290
Di-n-Butylphthalate	ND (1.80)	ND (1.80)	ND (1.80)	0.100 J	ND (1.90)	1,000
Fluoranthene	0.470 J	0.330 J	0.200 J	2.300	0.190 J	10,000
Pyrene	0.810 J	0.550 J	0.340 J	2.200	0.880 J	10,000
Butylbenzylphthalate	0.200 J	ND (1.80)	ND (1.80)	ND (0.47)	ND (1.90)	5,300
Benzo (a) Anthracene	0.280 J	0.190 J	ND (1.80)	1.100	ND (1.90)	7.8
Chrysene	0.360 J	0.250 J	ND (1.80)	1.300	0.230 J	790
bis(2-Ethylhexyl)Phthalate	ND (1.80)	0.260 J	ND (1.80)	0.055 J	0.340 J	410
Benzo (b)Fluoranthene	0.390 J	0.200 J	ND (1.80)	1.300	ND (1.90)	7.8
Benzo (k)Fluoranthene	0.450 J	0.250 J	ND (1.80)	0.750	ND (1.90)	78
Benzo(a)Pyrene	0.360 J	0.200 J	ND (1.80)	1.000	0.210 J	0.78
Ideno(1,2,3-cd)Pyrene	0.180 J	ND (1.80)	ND (1.80)	0.630	ND (1.90)	7.8
Dibenz(a,h)Anthracene	ND (1.80)	ND (1.80)	ND (1.80)	0.270 J	ND (1.90)	0.78
Benzo(g,h,i)Perylene	ND (1.80)	ND (1.80)	ND (1.80)	0.670	ND (1.90)	nca
Total TICs	ND	ND	ND	ND	ND	nca
PESTICIDES (mg/Kg)						
alpha-BHC	0.0014 JP	ND (0.019)	ND (0.019)	0.0011 JP	ND (0.019)	0.91
beta-BHC	0.019 P	0.0058 JP	0.011 J	0.0024	0.0058 JP	3.2
gamma-BHC (Lindane)	ND (0.019)	ND (0.019)	ND (0.019)	0.00025 JP	ND (0.019)	4.4
Heptachlor	ND (0.019)	ND (0.019)	ND (0.019)	0.00069 JP	ND (0.019)	1.3
4,4'-DDE	ND (0.037)	ND (0.037)	ND (0.037)	0.0020 JP	ND (0.038)	17
Endosulfan II	0.0079 JP	ND (0.037)	0.0053 JP	0.0092	0.0068 JP	10,000
4,4'-DDD	0.023 JP	0.037 P	0.034 JP	0.031 P	0.038 P	24
4,4'-DDT	0.010 JP	ND (0.037)	ND (0.037)	ND (0.0047)	ND (0.038)	17
Methoxychlor	ND (0.19)	ND (0.19)	ND (0.19)	0.0090 BP	ND (0.19)	10,000
Endrin-Ketone	ND (0.037)	ND (0.037)	0.007 JP	ND (0.0047)	ND (0.038)	610
alpha-Chlordane	ND (0.019)	0.013 BJP	0.012 BJ	0.022 JP	0.014 BJP	nca
gamma-Chlordane	0.012 J	0.012 JP	0.011 JP	0.029 P	0.015 J	nca
Total Chlordane	0.012	0.025	0.023	0.051	0.029	4.4
Aroclor-1260	0.480	0.480	0.350 J	1.700	0.440	0.74

nca - No criteria available
ND - not detected; detection limit shown in parenthesis
Bold type indicates the results exceed Screening Levels
B - Result falls between the IDL and the CRDL
J - Result is below the detection limit and is an estimated value
P - Greater than 25% difference for the detected compound between the two GC columns. The lower value has been reported.

Table 4
Remedial Investigation
Estate of Lester Nolan
Wilmington, Delaware
Soil Analytical Data
Volatile Organic Compounds (mg/Kg)

Sample ID	Date	Depth	Toluene	Ethylbenzene	Total TICs	Major TIC Component
TP11-S001	10/13/95	4	ND (0.23)	ND (0.23)	ND	
TP11-S002	10/13/95	8.5	0.049J	ND (0.32)	49.5	Napthalene, 2-methyl
TP12-S001	10/13/95	1-3	0.039 J	ND (0.18)	ND	
TP12-S101	10/13/95	1-3	ND (0.16)	ND (0.16)	ND	
TP13-S001	10/13/95	3	ND (0.18)	ND (0.18)	ND	
TP14-S001	10/13/95	1	0.025 J	ND (0.17)	ND	
TP15-S001	10/13/95	2	0.024 J	ND (0.17)	ND	
TP15-S102	10/13/95	2	ND (0.18)	ND (0.18)	ND	
TP16-S002	10/11/95	3.5	ND (0.25)	ND (0.25)	2.99	Naphthalene, 2-methyl
TP18-S002	10/11/95	4	ND (0.20)	0.067 J	3.26	Benzene Dimethyl Methylethyl
TP20-S001	10/12/95	1	ND (0.21)	ND (0.21)	ND	
TP21-S002	10/12/95	5.5	ND (0.18)	ND (0.18)	6.6	Ideno Dihydro Dimethyl Isomer
TP21-S102	10/12/95	5.5	0.02 J	ND (0.17)	0.36	Benzene Ethyl Methylethyl Isomer
TP24-S002	10/12/95	4	ND (0.24)	ND (0.24)	1.44	Ideno Dihydro Dimethyl Isomer
TP28-S002	10/12/95	5	0.023 J	ND (0.18)	7.7	Benzene Dimethyl Methylethyl
TP29-S001	3/19/96	3.5	ND (0.36)	ND (0.36)	2.14	Unknown Alkane
Selected Nolan Estate Surface Soil Screening Level			5	5	nca	
Selected Nolan Estate Subsurface Soil Screening Level			5	5	nca	

nca - No criteria available
ND - Not Detected Detection limit shown in parenthesis
J - Result is below the detection limit and is an estimated value

Table 5
Remedial Investigation
Estate of Lester Nolan
Wilmington, Delaware
Soil Analytical Data
Semi-Volatile Organic Compounds (mg/Kg)

Sample ID	Date Sampled	Depth (ft)	Naphthalene	2-Methylnaphthalene	Acenaphthylene	Acenaphthene
TP11-S001	10/13/95	4	ND (43.0)	ND (43.0)	ND (43.0)	ND (43.0)
TP11-S002	10/13/95	8.5	ND (110.0)	120	ND (110.0)	19.0 J
TP12-S001	10/13/95	1-3	0.063 J	0.072 J	0.17 J	0.14 J
TP12-S101	10/13/95	1-3	0.038 J	0.046 J	0.11 J	0.066 J
TP13-S001	10/13/95	3	0.093 J	0.091 J	0.25 J	0.12 J
TP14-S001	10/13/95	1	ND (1.2)	0.13 J	0.12 J	0.65 J
TP15-S001	10/13/95	2	0.058 J	ND (0.40)	0.045 J	0.11 J
TP15-S102	10/13/95	2	0.26 J	0.18 J	0.11 J	0.31 J
TP16-S002	10/11/95	3.5	ND (9.4)	4.3 J	ND (9.4)	1.2 J
TP18-S002	10/11/95	4	0.45 J	2.7 J	ND (4.5)	ND (4.5)
TP20-S001	10/12/95	1	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)
TP21-S002	10/12/95	5.5	0.13 J	0.43	ND (0.38)	0.13 J
TP21-S102	10/12/95	5.5	0.84 J	4.8	ND (4.0)	0.84 J
TP23-S002	10/12/95	3.5	ND (13.0)	ND (13.0)	ND (13.0)	ND (13.0)
TP24-S002	10/12/95	4	ND (24.0)	20.0 J	ND (24.0)	3.1 J
TP26-S001	10/12/95	1	3.8 J	25.0 J	ND (27.0)	ND (27.0)
TP28-S002	10/12/95	5	ND (12.0)	2.3 J	ND (12.0)	2.9 J
TP29-S001	3/19/96	3.5	0.650 J	0.470 J	ND (4.30)	ND (4.30)
Selected Nolan Estate Surface Soil Screening Level			30	nca	nca	10,000
Selected Nolan Estate Subsurface Soil Screening Level			30	nca	nca	200

nca - No criteria available

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J - Result is below the detection limit and is an estimated value

‡ - Screening Level modified based on acreage

Table 15
Remedial Investigation
Estate of Lester Nolan
Wilmington, Delaware
Soil Analytical Data
Semi-Volatile Organic Compounds (mg/Kg)

Sample ID	Date Sampled	Depth (ft)	Dibenzofuran	Fluorene	Phenanthrene	Anthracene
TP11-S001	10/13/95	4	ND (43.0)	ND (43.0)	ND (43.0)	ND (43.0)
TP11-S002	10/13/95	8.5	ND (110.0)	30.0 J	76.0 J	13.0 J
TP12-S001	10/13/95	1-3	0.093 J	0.17	1.7	0.46
TP12-S101	10/13/95	1-3	0.042 J	0.081 J	0.95	0.29 J
TP13-S001	10/13/95	3	0.077 J	0.16 J	1.2	0.37 J
TP14-S001	10/13/95	1	0.29 J	0.58 J	6.2	1.6
TP15-S001	10/13/95	2	0.066 J	0.15 J	1.3	0.32 J
TP15-S102	10/13/95	2	0.25 J	0.37 J	2.9	0.56
TP16-S002	10/11/95	3.5	1.2 J	3.4 J	7.0 J	1.2 J
TP18-S002	10/11/95	4	ND (4.5)	ND (4.5)	3.9 J	0.78 J
TP20-S001	10/12/95	1	ND (2.1)	ND (2.1)	1.8 J	0.35 J
TP21-S002	10/12/95	5.5	0.069 J	0.19 J	0.71	0.098 J
TP21-S102	10/12/95	5.5	ND (4.0)	2.0 J	ND (4.0)	ND (4.0)
TP23-S002	10/12/95	3.5	ND (13.0)	ND (13.0)	1.4 J	ND (13.0)
TP24-S002	10/12/95	4	ND (24.0)	6.4 J	12.0 J	ND (24.0)
TP26-S001	10/12/95	1	ND (27.0)	9.5 J	18.0 J	ND (27.0)
TP28-S002	10/12/95	5	ND (12.0)	2.8 J	7.4 J	ND (12.0)
TP29-S001	3/19/96	3.5	ND (4.30)	0.680 J	1.20 J	ND (4.30)
Selected Nolan Estate Surface Soil Screening Level			8,200	10,000	nca	10,000
Selected Nolan Estate Subsurface Soil Screening Level			120	160	nca	4,300

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| - Screening Level modified based on acreage

Table 5
Remedial Investigation
Estate of Lester Nolan
Wilmington, Delaware
Soil Analytical Data
Semi-Volatile Organic Compounds (mg/Kg)

Sample ID	Date Sampled	Depth (ft)	Fluoranthene	Pyrene	Benzo (a)anthracene	Chrysene
TP11-S001	10/13/95	4	ND (43.0)	ND (43.0)	ND (43.0)	ND (43.0)
TP11-S002	10/13/95	8.5	ND (110.0)	ND (110.0)	ND (110.0)	ND (110.0)
TP12-S001	10/13/95	1-3	2.2	1.9	1.3	1.2
TP12-S101	10/13/95	1-3	1.6	1.7	1.1	1.1
TP13-S001	10/13/95	3	1.9	2.1	0.98	1.1
TP14-S001	10/13/95	1	8.0	6.3	4.2	4.2
TP15-S001	10/13/95	2	1.6	1.6	0.97	1.0
TP15-S102	10/13/95	2	2.9	2.5	1.5	1.5
TP16-S002	10/11/95	3.5	3.2 J	3.7 J	1.1 J	1.3 J
TP18-S002	10/11/95	4	2.8 J	2.0 J	1.1 J	1.1 J
TP20-S001	10/12/95	1	1.8 J	1.7 J	0.83 J	0.85 J
TP21-S002	10/12/95	5.5	0.32 J	0.7	0.17 J	0.2
TP21-S102	10/12/95	5.5	1.1 J	0.95 J	0.48 J	0.55 J
TP23-S002	10/12/95	3.5	ND (13.0)	ND (13.0)	ND (6.4)	ND (6.4)
TP24-S002	10/12/95	4	ND (24.0)	ND (24.0)	ND (12.0)	ND (12.0)
TP26-S001	10/12/95	1	ND (27.0)	3.0 J	ND (13.0)	ND (13.0)
TP28-S002	10/12/95	5	ND (12.0)	ND (12.0)	ND (6.0)	ND (6.0)
TP29-S001	3/19/96	3.5	2.80 J	4.60	1.60 J	1.90 J
Selected Nolan Estate Surface Soil Screening Level			10,000	10,000	7.8	780
Selected Nolan Estate Subsurface Soil Screening Level			980	1,400	2.1†	3†

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† - Screening Level modified based on acreage

Table 5
Remedial Investigation
Estate of Lester Nolan
Wilmington, Delaware
Soil Analytical Data
Semi-Volatile Organic Compounds (mg/Kg)

Sample ID	Date Sampled	Depth (ft)	Benzo (b)fluoranthene	Benzo (k)fluoranthene	Benzo (a)pyrene	Ideno (1,2,3-cd)pyrene
TR11-S001	10/13/95	4	ND (43.0)	ND (43.0)	ND (43.0)	ND (43.0)
TR11-S002	10/13/95	8.5	ND (110.0)	ND (110.0)	ND (110.0)	ND (110.0)
TR12-S001	10/13/95	1-3	1.2	0.82	**0.90**	0.45
TR12-S101	10/13/95	1-3	0.88	0.77	**0.78**	0.30 J
TR13-S001	10/13/95	3	1.4	0.86	0.87	0.37 J
TR14-S001	10/13/95	1	4.9	2.6	**3.3**	1.5
TR15-S001	10/13/95	2	0.78	0.63	0.67	0.28 J
TR15-S102	10/13/95	2	1.5	0.84	**1.1**	0.50
TR16-S002	10/11/95	3.5	1.1 J	0.96 J	ND (4.7)	ND (4.7)
TR18-S002	10/11/95	4	0.85 J	0.9 J	ND (2.3)	ND (2.3)
TR20-S001	10/12/95	1	0.70 J	0.52 J	0.59 J	0.35 J
TR21-S002	10/12/95	5.5	0.13 J	0.11 J	0.13 J	0.088 J
TR21-S102	10/12/95	5.5	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)
TR23-S002	10/12/95	3.5	ND (6.4)	ND (6.4)	ND (6.4)	ND (6.4)
TR24-S002	10/12/95	4	ND (12.0)	ND (12.0)	ND (12.0)	ND (12.0)
TR26-S001	10/12/95	1	ND (13.0)	ND (13.0)	ND (13.0)	ND (13.0)
TR28-S002	10/12/95	5	ND (6.0)	ND (6.0)	ND (6.0)	ND (6.0)
TR29-S001	9/19/96	3.5	2.30 J	1.20 J	1.40 J	0.48 J
Selected Nolan Estate Surface Soil Screening Level			7.8	78	0.78	7.8
Selected Nolan Estate Subsurface Soil Screening Level			4	4	4	35

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Table 5
Remedial Investigation
Estate of Lester Nolan
Wilmington, Delaware
Soil Analytical Data
Semi-Volatile Organic Compounds (mg/Kg)

Sample ID	Date Sampled	Depth (ft)	Dibenzo(a,h)anthracene	Benzo (g,h,i)perylene	Carbazole
TP11-S001	10/13/95	4	ND (43.0)	ND (43.0)	ND (43.0)
TP11-S002	10/13/95	8.5	ND (110.0)	ND (110.0)	ND (110.0)
TP12-S001	10/13/95	1-3	0.24 J	ND (0.13)	0.2 J
TP12-S101	10/13/95	1-3	0.16 J	ND (0.11)	0.1 J
TP13-S001	10/13/95	3	0.17 J	ND (0.14)	0.1 J
TP14-S001	10/13/95	1	0.75 J	ND (0.44)	0.94 J
TP15-S001	10/13/95	2	0.14 J	ND (0.11)	0.16 J
TP15-S102	10/13/95	2	0.23 J	0.44	0.41
TP16-S002	10/11/95	3.5	ND (4.7)	ND (9.4)	ND (9.4)
TP18-S002	10/11/95	4	ND (2.3)	ND (4.5)	ND (4.5)
TP20-S001	10/12/95	1	ND (1.0)	0.3 J	0.29 J
TP21-S002	10/12/95	5.5	0.04 J	0.11 J	ND (0.38)
TP21-S102	10/12/95	5.5	ND (2.0)	ND (4.0)	ND (4.0)
TP23-S002	10/12/95	3.5	ND (6.4)	ND (13.0)	ND (13.0)
TP24-S002	10/12/95	4	ND (12.0)	ND (24.0)	ND (24.0)
TP26-S001	10/12/95	1	ND (13.0)	ND (27.0)	ND (27.0)
TP28-S002	10/12/95	5	ND (6.0)	ND (12.0)	ND (12.0)
TP29-S001	3/19/96	3.5	ND (4.30)	0.62 J	ND (4.30)
Selected Nolan Estate Surface Soil Screening Level			0.78	nca	290
Selected Nolan Estate Subsurface Soil Screening Level			11	nca	0.2

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Table 5
Remedial Investigation
Estate of Lester Nolan
Wilmington, Delaware
Soil Analytical Data
Semi-Volatile Organic Compounds (mg/Kg)

Sample ID	Date Sampled	Depth (ft)	Diethylphthalate	Di-n-butylphthalate	bis(2-Ethylhexyl)phthalate
TP11-S001	10/13/95	4	ND (43.0)	ND (43.0)	ND (43.0)
TP11-S002	10/13/95	8.5	ND (110.0)	ND (110.0)	ND (110.0)
TP12-S001	10/13/95	1-3	ND (0.40)	ND (0.40)	ND (0.40)
TP12-S101	10/13/95	1-3	ND (0.39)	ND (0.39)	ND (0.39)
TP13-S001	10/13/95	3	ND (0.40)	ND (0.40)	ND (0.40)
TP14-S001	10/13/95	1	ND (1.2)	ND (1.2)	ND (1.2)
TP15-S001	10/13/95	2	ND (0.40)	0.21 J	ND (0.40)
TP15-S102	10/13/95	2	ND (0.39)	ND (0.39)	ND (0.39)
TP16-S002	10/11/95	3.5	ND (9.4)	ND (9.4)	1.30 J
TP18-S002	10/11/95	4	ND (4.5)	ND (4.5)	0.89 J
TP20-S001	10/12/95	1	ND (2.1)	ND (2.1)	ND (2.1)
TP21-S002	10/12/95	5.5	0.042 J	0.049 J	0.073 J
TP21-S102	10/12/95	5.5	ND (4.0)	ND (4.0)	ND (4.0)
TP23-S002	10/12/95	3.5	ND (13.0)	ND (13.0)	ND (13.0)
TP24-S002	10/12/95	4	ND (24.0)	ND (24.0)	ND (24.0)
TP26-S001	10/12/95	1	ND (27.0)	ND (27.0)	ND (27.0)
TP28-S002	10/12/95	5	ND (12.0)	ND (12.0)	ND (12.0)
TP29-S001	8/19/96	3.5	ND (4.30)	ND (4.30)	ND (4.30)
Selected Nolan Estate Surface Soil Screening Level			5,200	1,000	410
Selected Nolan Estate Subsurface Soil Screening Level			110	120	11

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Table 5
Remedial Investigation
Estate of Lester Nolan
Wilmington, Delaware
Soil Analytical Data
Semi-Volatile Organic Compounds (mg/Kg)

Sample ID	Date Sampled	Depth (ft)	Total TICs	Major TIC Components
TP11-S001	10/13/95	4	1,453	UNKNOWN ALKANE
TP11-S002	10/13/95	8.5	4,690	UNKNOWN ALKANE
TP12-S001	10/13/95	1-3	7.76	UNKNOWN ALKANE
TP12-S101	10/13/95	1-3	7.72	UNKNOWN ALKANE
TP13-S001	10/13/95	3	27.34	UNKNOWN
TP14-S001	10/13/95	1	17.46	UNKNOWN PAH
TP15-S001	10/13/95	2	7.82	UNKNOWN PAH
TP15-S102	10/13/95	2	5.68	UNKNOWN PAH
TP16-S002	10/11/95	3.5	1,050	UNKNOWN ALKANE
TP18-S002	10/11/95	4	537	UNKNOWN ALKANE
TP20-S001	10/12/95	1	188.5	UNKNOWN
TP21-S002	10/12/95	5.5	82.8	Pentane Hydroxy Methyl Iso
TP21-S102	10/12/95	5.5	315.3	UNKNOWN
TP23-S002	10/12/95	3.5	173.8	UNKNOWN / 2-Pentanone, 4-hydroxy-4-met
TP24-S002	10/12/95	4	1,094	UNKNOWN ALKANE
TP26-S001	10/12/95	1	1,241	UNKNOWN ALKANE
TP28-S002	10/12/95	5	369	UNKNOWN
TP29-S001	9/19/96	3.5	ND	
Selected Nolan Estate Surface Soil Screening Level			nca	
Selected Nolan Estate Subsurface Soil Screening Level			nca	

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Table 6
Summary of Alternative Evaluation

Evaluation Criteria	Alternative 1 - Excavation and Removal	Alternative 2 - Closure Cover System
Protection of Public Health, Welfare and the Environment	Yes. Potential for exposure during excavation and transportation activities.	Yes. Potential for exposure during grading activities, but significantly lower risk than the excavation alternative.
Compliance with all applicable federal, state, and local laws	Yes	Yes
Community Acceptance	Expected to be accepted	Expected to be accepted
Monitoring Requirements	No	Inspection and maintenance of cap and groundwater monitoring.
Technical Practicability	Yes	Yes
Restoration Time Frame	Estimated at 5 months	Estimated at 2 months for both cover options
Reduction in Toxicity, Mobility, and Volume Through Treatment	Reduces toxicity, mobility, and volume of contaminants on-site.	Reduces potential mobility and exposure to the material.
Long-Term Effectiveness	Yes	Yes
Short-Term Effectiveness	Yes - higher potential from exposure	Yes
Preliminary Cost Estimate (Backup information for cost estimates is presented in Appendix B)	$11,129,000	$ 407,365 for the vegetated top soil option and $ 502,045 for the flexible pavement option.