

PCB Mass Loading
Dravo Shipyard Property - Amer
SIRB ID: DE-1092
Wilmington, Delaware



BrightFields, Inc.

Appendix 11-A

DRAVO SHIPYARD AMER INDUSTRIAL TECHNOLOGIES, INC. WILMINGTON, DELAWARE

SIRB ID: DE-1092

GENERAL SITE INFORMATION

Site Name: Dravo Shipyard – Amer Industrial Technologies, Inc.

SIRB ID Number: DE-1092

Site Location and Description: The Dravo Shipyard – Amer Industrial Technologies, Inc. (Dravo Shipyard – Amer) consists of approximately 18 acres and is located southwest of the City of Wilmington business district. This area was historically the site of shipbuilding and other heavy industrial activities. Much of the area was marshland that was filled with slag and other industrial waste products. Currently, this property is used for commercial retail space, a riverwalk, a parking lot, and open land.

The subject property is directly adjacent to The Dravo Shipyard – Harbor Associates property. The actual site extents to each property were never clearly defined. For the purposes of this assessment BrightFields utilized Figure 15 from the Preliminary Report of Field Investigation Activities Dravo Shipyard (Amer Industrial Technologies, Inc.) issued by DNREC. This report outlines the property boundary of “The Amer Property”. The remainder of the area was then considered the Harbor Associated property. Because this assessment was established, different reports incorporate portions of both properties.

Previous Site Uses: The site is located in an area of Wilmington that has been in continuous industrial use since the late 1700s. The historical use of the site was investigated through a review of the following sources: aerial photographs, fire insurance maps, historic atlases, interviews with past and/or present owners and operators, and building records.

According to historical records, much of the Dravo Shipyard – Amer area to the west of the Christina River consisted of undeveloped, commercial or industrial properties, including marsh land, a bone mill, and a shipyard. The first developed use of the property, a bone mill, appeared to have occurred in 1868 or earlier. Between 1893 and 1951, the area was used as a shipyard with three buildings on the property. The buildings were removed from the property sometime between 1987 and 1993. In 2001, the property was redeveloped into a riverwalk, commercial space, a parking lot, and a portion is still a vacant land.

Site Regulatory Status: This section briefly summarizes previous investigations performed on the site through the SIRB program. The following reports summarize information pertaining to

the established boundary of the Dravo-Amer property defined for this assessment. A current SIRB regulatory status is also included.

Previous Investigations

1997

In August 1997, DNREC-SIRB completed the Preliminary Report of Field Investigation Activities Dravo Shipyard (Amer Industrial Technologies, Inc.) Brownfield Preliminary Assessment (DE-1092). A 16.5 acre portion of the shipyard site was assessed to determine the possible existence and potential release of hazardous substances. Seventeen test pits were excavated, and over 40 shallow and deep soil samples were collected. Surface water and sediment samples were collected from the Christina River, utility tunnels, and storm drains. Groundwater samples were collected from 5 Hydropunch borings, and one monitoring well that was constructed. The soil and sediment samples indicate contamination consistent with the former industrial operations at the site. Field screening results indicated that there were elevated concentrations of inorganic analytes, some metals (most notably lead), the pesticide DDT, and PAHs in sediment samples and some metals (most notably lead) and PAHs in soil samples. There was no field screening of surface water or groundwater samples. Laboratory analysis of three soil samples indicated that one sample exceeded the regulatory level for lead and two others were slightly below the applicable level.

Other site observations included the presence of an Above Ground Storage Tank (AST), two Underground Storage Tank filling lines (UST) near the property border, and potential for other USTs in the field between the buildings. The field was overgrown with vegetation but was believed to be used as a fueling station at one time. It was recommended that the tanks and their associated parts be properly removed.

General conclusions were that there was a potential exposure of people to contaminated soil through inadvertent ingestion and inhalation of airborne dust and a potential exposure of workers to contaminated soil during excavation and construction. There was concern with the transport of contaminated soils to the Christina River through surface runoff by means of direct overland flow and storm sewer drainage.

In September 1997, the Supplemental Report of Field Investigation Activities Dravo Shipyard (Amer Industrial Technologies, Inc.) Brownfield Preliminary Assessment II was completed by

DNREC-SIRB. The supplemental report provides the laboratory analysis of the samples from the August 1997 Preliminary Report of Field Activities. The primary contaminants of concern are PAHs and lead. PAHs, lead, and other metals were present at moderate concentrations in sediment samples from the river and at very high concentrations in sediment samples from the storm sewers. PCBs were at significant levels in one storm sewer sample. DNREC suggested that the river is likely affected by storm water runoff from the property. No organic contamination was found in the river samples, and no significant contamination from inorganic or organic compounds was found in the water samples from the underground utility vault. Low level concentrations of PAHs were found in shallow groundwater samples, but this result is likely related to high quantities of sediment in the samples. Iron and manganese levels in the groundwater samples from the monitoring well were elevated, but the levels may be due to natural conditions unrelated to the site.

1998

In August 1998, EA Engineering, Science, and Technology, Inc. submitted an Interim Action Summary Report and Remedial Investigation/Feasibility Study to Harbor Associates and Riverfront Development Corporation. One hundred-sixty soil and sediment samples were collected from excavated soil from utility trenches and test pits throughout the area. Contaminants of concern identified during the interim action are PAHs, arsenic, lead, and PCBs. Approximately 3,900 tons of soil from utility trench excavations was disposed offsite. The soil remaining on site was not expected to pose a threat to human health or the environment if it is not disturbed and is capped by a concrete or asphalt barrier.

1999

In August 1999, EA Engineering, Science, and Technology completed the OU II Remedial Investigation/Feasibility Study Dravo Shipyard – Harbor Associates and Former Amer (RDC) Properties for Harbor Associates and Riverfront Development Corporation. Seventy-five composite soil samples were collected from test pits excavated every 100 feet to the depth where groundwater was encountered. Instead of comparing site soil data to the URS, EA utilized the soil disposition criteria (ex: Level A, B, C, Z) used for this project: “The RI/FS plan states that the plan serves as the disposition plan for subsurface material during the redevelopment construction. The soil reuse decision plan was based on the DNREC-SIRB Remediation Standards document with respect to the Uniform Risk-Based Standards (URS) for unrestricted and restricted reuse classification. The decision plan is intended to protect human health by

limiting reuse options of material dependent on the concentration of constituents of concern (COC) detected.”

- Samples were screened by DNREC for PCBs and carcinogenic polycyclic aromatic hydrocarbons (PAHs) using immunoassay analysis and for metals using X-ray Fluorescence (XRF). Screening results indicated that the maximum concentration for carcinogenic PAHs was 229 ppm (TP-32). No samples exceeded the DNREC on site reuse criteria (Level Z) concentration of 300 ppm. The PCB screening results ranged from 0.14 ppm (TP-34 and TP-35) to below the detection limit. Arsenic ranged from 31.1 ppm (TP-34) to below the detection limit. The maximum detected lead concentration was 403 ppm (TP-4), which is above the DNREC unlimited reuse criteria (Level A) concentration of 400 ppm. BTEX was not detected.
- From the 75 screened samples, eleven were sent for PAH confirmatory analysis, five for PCB confirmatory analysis, and six for metals confirmatory analysis. Total PAHs ranged from 15.4 mg/kg (TP-32) to 0.2 mg/kg (TP-73). No PCBs were detected in the confirmatory analyses. Arsenic ranged from 7.5 mg/kg (TP-14) to 2.4 mg/kg (TP-32), and lead ranged from 130 mg/kg (TP-4) to 4.4 mg/kg (TP-52).
- An additional 17 soil samples were collected from within the proposed bioswale area. DNREC screening results indicated the concentration of PAHs ranged from 126.6 ppm (BS-13d) to below the detection limit. Eight of the samples were over 50 ppm. PCBs ranged from 0.44 ppm (BS-1d) to below the detection limit. Arsenic (26 mg/kg (BS-2d) to not detected) and lead (399 ppm (BS-2d)) were below the unlimited reuse criteria (Level A).
- Based on the screening results for the bioswale samples, seven samples were sent for confirmatory analysis for SVOCs, three samples for PCBs, and five samples for metals. The SVOC results ranged from 39.9 mg/kg (BS-7d) to 0.39 (BS-9d). The PCB confirmatory results were below the detection limit. Arsenic ranged from 8.2 mg/kg (BS-2d) to 1.3 mg/kg (BS-11s), and lead ranged from 126 mg/kg (BS-7s) to 60.1 mg/kg (BS-5s). It was determined that the soil excavated from the bioswale area could be used on site if it was placed under an impermeable cap.
- Six groundwater monitoring wells were installed. Groundwater samples were collected and analyzed for TCL VOCs, TCL SVOCs, and dissolved TAL metals. SVOCs and VOCs were below the detection limits. Aluminum, iron, and manganese were above the URS. The maximum concentration of arsenic (23.1 µg/L) was found at MW-6. Lead concentrations were not above the detection limit.

The RI/FS concluded that contaminants on the property could be transported to the river by surface water, groundwater, or sediment transport and/or as particulates in the air, and could present a risk to the public, future construction worker, and the environment. The recommended

remedial action was to contain contaminated soil under an impermeable cap, which would remove the exposure routes.

2000

In April 2000, EA Engineering, Science, and Technology prepared an OUIV Analytical Sediment Summary Report for the Riverfront Development Corporation. OUIV consists of the sediments of the Christina River directly adjacent to the former Dravo Shipyard. Sediment samples were collected in February 1999 to assess sediment quality and the presence or absence of contaminants along the Harbor Associates Property. Eleven sediment samples (SD-1 through SD10) (including one duplicate) were collected using a Ponar sampler from locations approximately 5 feet from the edge of the property into the river and 300 feet apart. Sediment samples were analyzed for TCL VOCs, PCBs, TCL SVOCs, and TAL metals at the former EA Laboratories a DNREC HSCA-approved laboratory and were validated by Meridian Science & Technology, Inc. of Annapolis Maryland. VOCs including methylene chloride (SD-1 and SD-6), benzene (SD-6), and toluene (SD-6, SD-7, SD-9, and SD-10) were detected at concentrations exceeding their respective URS standards. Several PAHs were detected at concentrations exceeding their respective URS for Protection of the Environment. Other SVOCs detected at concentrations exceeding their respective URS include butyl benzyl phthalate (SD-8) and bis(2-ethylhexyl)phthalate (SD-8). PCBs were not detected at a concentration above their respective URS. Numerous metals including arsenic, lead, chromium, and zinc were detected at concentrations exceeding the URS criteria. No conclusions or recommendations were presented in this report.

2001

A Final Plan of Remedial Action was issued by DNREC in February 2001 to address the soil and subsoil for Operable Unit (OU) II and groundwater for OUs I, II, and III at the Dravo Shipyard Site. Three remedial alternatives were evaluated. Remedial Alternative 2, consisting of containment of impacted soil was chosen as the most appropriate remedial action because it is cost effective, meets the remedial objectives, and satisfies the evaluation criteria.

Current Regulatory Status:

The Final Plan of Remedial Action was issued in February 2001, and the site was redeveloped into commercial space, open space, a riverwalk, and a parking lot.

SUMMARY OF SITE PCB INFORMATION

Site Investigation PCB Findings:

Total PCBs were detected in 13 surface soil sample locations at a concentrations ranging from 0.042 mg/kg to 4.3 mg/kg. Seven subsurface unsaturated samples were reported to have total PCBs ranging from 0.042 mg/kg to 2.34 mg/kg. There were no subsurface saturated samples reported to have concentrations above the detection limit for PCBs. Furthermore, no groundwater samples contained PCBs above their respective detection limits.

After further evaluation of the sample locations and current site coverage, BrightFields determined that there was only one sample location that could still be contributing to mass loading via overland flow; sample DDD (2.34 mg/kg). Due to this evaluation the concentration reported at this sample location was used in the overland flow calculations instead of calculating a 95% UCL of the mean of total PCBs. There were no PCBs detected in groundwater or in the subsurface saturated zone.

Concentrations of PCBs on Site			
Sample Matrix	Corresponding Figure	Analytical Methods	Range of Total PCBs
Surface Soil	Figure 2	Method 8082 and Immunoassay	Not detected to 4.3 mg/kg
Subsurface Soil (unsaturated)	Figure 3	Method 8082 and Immunoassay	Not detected to 2.34 mg/kg
Subsurface Soil (saturated)	Figure 4	Immunoassay	Not detected
Groundwater	Figure 5	Not Available	Not Analyzed

A summary of all samples collected for PCBs are presented in the attached Tables 1 through 2

Acreage where PCBs detected:

The estimated surface soil area impacted by PCBs is 1.38 acres (Figure 2) of which only 0.32 acres (Figure 6) may still be contributing to mass loading via overland flow. The other 1.06 acres is currently under an impervious surface. The estimated subsurface unsaturated soil that is impacted by PCBs is 1.29 acres (Figure 3). There were no PCBs detected in the groundwater or in the subsurface saturated zone.

PCB Remediation Status:

No PCB remediation was required for the Dravo-Amer site. The majority of the site has been capped with asphalt, buildings and/or clean fill, thereby reducing the risk of direct contact or overland flow transport.

PCB MASS LOADING SUMMARY

The PCB mass loading rate to surface water via overland flow is discussed below. Because detected PCBs were located only in surface soil, groundwater is not a likely mechanism of transport of PCB contamination at the Dravo-Amer site and no groundwater transport calculations were performed.

A summary of the results is included below and the details of the calculations are included as attachments to this Appendix.

OVERLAND FLOW:

Overland flow has been determined on this site by using the Revised Universal Soil Loss Equation (RUSLE). The RUSLE predicts the long term average annual rate of erosion on an area based on rainfall patterns, soil type, topography, cover/canopy factors and support management practices. These factors are site-specific and require information pertaining directly to the site. A breakdown of the individual factors is presented below with a brief explanation of their selection.

Ground Cover and Canopy:

A site inspection was performed on June 23, 2008 to estimate the current site ground cover and canopy. The cover/management factor (C) assigned to the site and associated flow path is 0.044, which corresponds to crushed stone mulch 4.5 inches thick. Photographs of the site ground cover and canopy are attached.

Site Sediment and Erosion Control Practices:

As of July 2009 there is a bio-swale along the perimeter of the property parallel to the river, which prevents sediment from entering into Christina River.

Input Factors and Results:

A breakdown of the individual factors is presented below with a brief explanation of their choice.

RUSLE Factors	Values Provided	Explanation of Selection
R = rainfall-runoff erosivity index (10 ² ft-tonf-in/ac-hr)	170	An appropriate value for E for the site was determined from plots of E for the Eastern U.S. (Wischmeier and Smith, 1978).
K = soil erodibility (tonne/ha per unit of E)	0.36	The soil erodibility factor was chosen based on the information provided by the boring log represented for DDD in EA Engineering OUII Report (EA 1998).

RUSLE Factors	Values Provided	Explanation of Selection
LS = topographic factor (dimensionless)	0.24	The slope length was estimated to be 90 feet, which is the distance between the sample detection centroid and the discharge point along the overland flow path. The estimated slope (1.89 %) and slope length were used to calculate the topographic factor of 0.24 by the Windows based RUSLE2 program.
C = cover/management factor (dimensionless)	0.044	The cover/management factor C assigned to the site and associated flow path was 0.044 by the Windows based RUSLE2 program, which corresponds to stone mulch at least 4.5" thick.
P = support practice factor (dimensionless)	1.0	There are no sediment and erosion controls in place at the Dravo-Amer site.

The average annual erosion rate is based on the windows based RUSLE2 program (RUSLE2 License, version 2006-Jul-24).

Based on the calculations performed, the total PCB loading from the Dravo-Amer site to the discharge point via erosion under current site conditions is 0.4 grams per year.

Uncertainty Analysis Associated with Overland Flow:

Specific Areas and Degree of Uncertainty for the Dravo-Amer Site

	Samples Per Acre (site)	Chemical Data Quality*	Topography	Soil Type	Site Coverage	Map Quality	Distance to Discharge Point
Site Specific Information	8.86	Immunoassay	Estimated using topography	Detailed logs that are located within the area of concern	Based on a thorough site assessment	Scaled Map	90 feet
Degree of Uncertainty	Low	Moderate to High	Moderate	Low	Low	Moderate	Low to Moderate

* Primary analysis used in the historical samples

Sources of uncertainty for the Dravo-Amer Property include the following: the majority of the samples were analyzed using screening methods, which present a higher uncertainty. The majority of the samples collected from this site were composite samples from 0 to 5 feet below ground surface (bgs). This can lead to skewing of the concentrations reported in the surface soil either higher or lower depending on the actual zone of contamination. In addition, a few samples were not found on any figures and could not be included in this assessment due to the unknown locations. During the site visit, BrightFields personnel noticed that the majority of the site had



undergone extensive redevelopment. During site activities for redevelopment the original surface and subsurface soil could have been disturbed, relocated, or removed from the site. BrightFields made the assumption that all reported concentrations have remained on the property. A bio-swale is located on the perimeter of the property parallel to the river, which prevents sediment from entering into the Christina River via overland flow; however, the discharge point for the Dravo-Amer site is located on the western boundary of the site at a catch basin where the bio-swale would not affect the loading calculations. Based on this evaluation the overall level of uncertainty associated with PCB mass loading via overland flow from the Dravo-Amer Property is **low to moderate**.



Site References:

Delaware Department of Natural Resources and Environmental Control (DNREC) – Site Investigation and Restoration Branch (SIRB), 2001, Final Plan of Remedial Action at the Dravo Shipyard Site, February 2001.

DNREC-SIRB, 1997, Supplemental Report of Field Investigation Activities Dravo Shipyard (Amer Industrial Technologies, Inc.) Brownfield Preliminary Assessment II, September 1997.

DNREC-SIRB, 1997, Preliminary Report of Field Investigation Activities Dravo Shipyard (Amer Industrial Technologies, Inc.) Brownfield Preliminary Assessment (DE-1092), August 1997.

EA Engineering, Science, and Technology, 2000, OU IV Analytical Sediment Summary Report, April 2000.

EA Engineering, Science, and Technology, Inc., 2000, Letter regarding Soil from Phase III and IV to Operable Unit II Shipyard Shops, April 2000.

EA Engineering, Science, and Technology, Inc., 2000, Closeout Report Bioretention Swale Area, Dravo Shipyard (OU II) RDC/AMER Property, March 2000.

EA Engineering, Science, and Technology, Inc., 1999, OU II Remedial Investigation/Feasibility Study Dravo Shipyard - Harbor Associates and Former Amer (RDC) Properties, August 1999.

EA Engineering, Science, and Technology, Inc., 1999, Letter with comments on OU II Remedial Investigation/Feasibility Study, May 1999.

EA Engineering, Science, and Technology, Inc., 1998, Interim Action Summary Report and Remedial Investigation/Feasibility Study Harbor Associates and Portion of the Amer Properties, August 1998.

PCB Mass Loading
Dravo Shipyard Property - Amer
SIRB ID: DE-1092
Wilmington, Delaware



BrightFields, Inc.

Figures



Legend

- ▲ Sediment Sample Location
- Soil Boring Location
- Surface Water Sample Location
- Test Pit Location
- ⊕ Well Location
- Tax Parcel
- Dravo Shipyard- Former Amer Property Boundary

Total Site Area= 17.16 acres

BrightFields, Inc.
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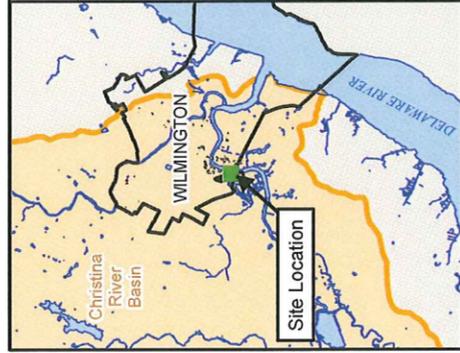
801 Industrial Street, Suite 1
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Historical Sample Locations and Aerial Photograph (2007)
 Dravo Shipyard- Former Amer Property
 Wilmington, Delaware

By	Date	Scale	File Name:
Drawn	SMD 10/15/08	1:1800	amer aerial.mxd
Checked	JPR 10/15/08	Fig. No.	
Project #	0985.26.51	Figure 1	

0 75 150 Feet



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PCB Distribution in Surface Soil
 Dravo Shipyard- Former Amer Property
 Wilmington, Delaware

By	Date	Scale:	File Name:
Drawn	SMD 1/8/09	1:1800	amer 0-2.mxd
Checked	JPR 1/8/09	Fig. No.	Figure 2
Project #	0985.26.51		

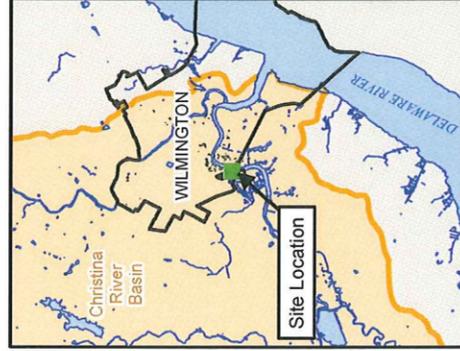
0 75 150 Feet

Legend

0.042 (0.0-5.0) Total PCB Concentration (mg/Kg)

- (<0.5) Screening Result
- ▲ Sediment Sample Location
- Soil Boring Location
- Surface Water Sample Location
- Test Pit Location
- ⊕ Well Location
- ▨ Estimated PCB Distribution
- ▨ Existing Building
- ▨ Water
- ▨ Tax Parcel
- ▨ Dravo Shipyard- Former Amer Property Boundary

Note: Samples in gray indicate that no sample was collected at this depth or the sample was not analyzed for PCBs



Site Location



Legend

- 0.385 (0.0-6.0) Total PCB Concentration (mg/Kg)
- <0.5 Screening Result
- ▲ Sediment Sample Location
- Soil Boring Location
- Surface Water Sample Location
- Test Pit Location
- ⊕ Well Location
- ▨ Estimated PCB Distribution
- ▨ Existing Building
- ▨ Historic Building
- ▨ Water
- ▨ Tax Parcel
- ▨ Dravo Shipyard- Former Amer Property Boundary

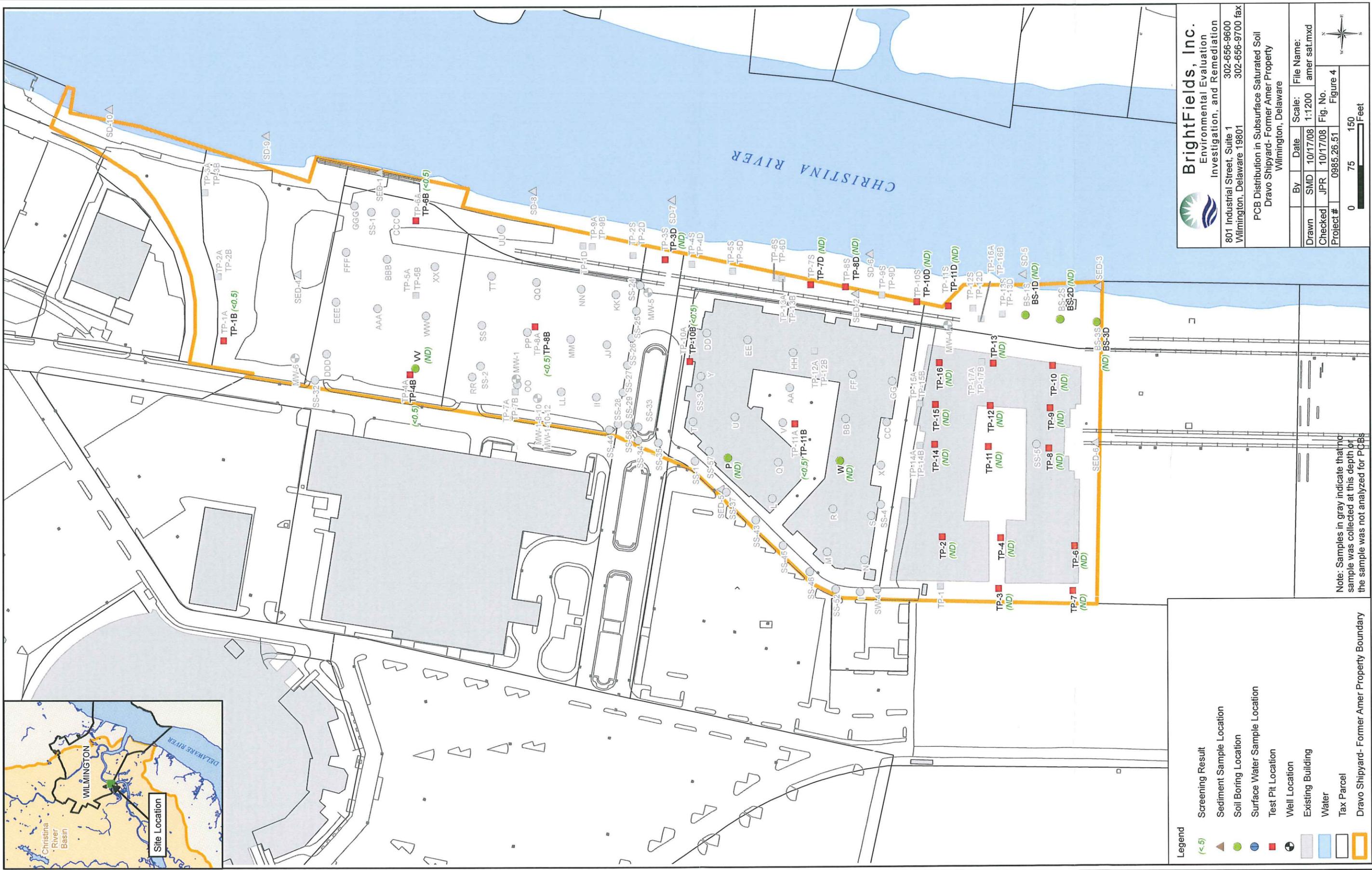
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PCB Distribution in Subsurface Unsaturated Soil
 Dravo Shipyard- Former Amer Property
 Wilmington, Delaware

By	Date	Scale:	File Name:
Drawn	SMD 1/8/09	1:1800	amer unsat.mxd
Checked	JPR 1/8/09	Fig. No.	Figure 3
Project #	0985.26.51		

0 75 150 Feet



Legend

- (<0.5) Screening Result
- ▲ Sediment Sample Location
- Soil Boring Location
- Surface Water Sample Location
- Test Pit Location
- ⊕ Well Location
- ▭ Existing Building
- ▭ Water
- ▭ Tax Parcel
- ▭ Dravo Shipyard - Former Amer Property Boundary

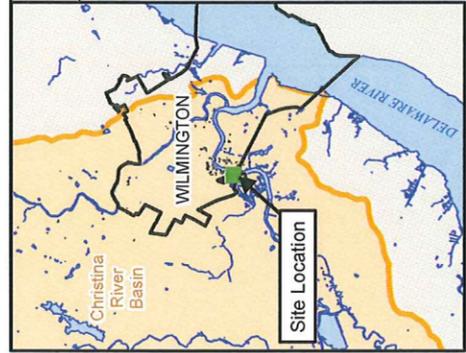
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PCB Distribution in Subsurface Saturated Soil
 Dravo Shipyard- Former Amer Property
 Wilmington, Delaware

By	Date	Scale:	File Name:	
Drawn	SMD	10/17/08	1:1200	amer sat.mxd
Checked	JPR	10/17/08	Fig. No.	Figure 4
Project #	0985.26.51			

0 75 150 Feet

Note: Samples in gray indicate that no sample was collected at this depth or the sample was not analyzed for PCBs



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PCB Distribution in Groundwater
 Dravo Shipyard-Former Amer Property
 Wilmington, Delaware

By	Date	Scale	File Name:
SMD	10/17/08	1:1800	amer gw.mxd
Checked	JPR	10/17/08	Fig. No.
Project #	0985.26.51		Figure 5

0 75 150 Feet

Note: Samples in gray indicate that no sample was collected at this depth or the sample was not analyzed for PCBs.

Legend

- Well Location
- Existing Building
- Water
- Tax Parcel
- Dravo Shipyard- Former Amer Property Boundary

PCB Mass Loading
Dravo Shipyard Property - Amer
SIRB ID: DE-1092
Wilmington, Delaware



BrightFields, Inc.

Tables

Table 1
 PCB Analytical Results For Soil
 Dravo Shipyard - Amer Industrial Technologies, Inc. (DE-1092)
 Wilmington, DE

Sample ID Sampling Depth (feet bgs) Sampling Date Units Report Issued	DNREC URS for Protection of Human Health Non-critical Water Resource Area mg/Kg		TP-8S 0.0'-6.0' no date mg/Kg EA Engineering (1998)	MM 0.0'-5.0' 6/1/98 mg/Kg EA Engineering (1998)	OO 0.0'-5.0' 6/1/98 mg/Kg EA Engineering (1998)	TP-9A 0.0'-2.0' 3/17/97 mg/Kg DNREC (1997b)	SS-1 2"-4" 7/15/97 mg/Kg DNREC (1997a)
	Unrestricted Use	Restricted Use					
PCBs							
Atoclor-1016	5	82	0.185	0.019 U	0.019 U	nca	nca
Atoclor-1221	0.3	3	0.019 U	0.019 U	0.019 U	nca	nca
Atoclor-1232	0.3	3	0.019 U	0.019 U	0.019 U	nca	nca
Atoclor-1242	0.3	3	0.019 U	0.019 U	0.019 U	nca	nca
Atoclor-1248	0.3	3	0.019 U	0.019 U	0.019 U	nca	nca
Atoclor-1254	0.3	3	0.019 U	0.013	0.082	nca	nca
Atoclor-1260	0.3	3	0.200	0.029	0.019 U	nca	nca
Total PCBs	1	3	0.385	0.042	0.082 U	ND	ND

EA Engineering - Interim Action Summary Report R/FS (August 1998)

EA Engineering - Closeout Report (March 2000)

DNREC - Brownfield Preliminary Assessment II (1997a)

DNREC - Supplemental Report and Field Investigation Activities (1997b)

Qualifiers

U - The compound was not detected above laboratory detection limits

NR - Not analyzed.

nca - no criteria available

bold - concentration is above DNREC URS unrestricted use criteria

Table 2
PCB Screening Results For Soil
Dravo Shipyard - Amer Industrial Technologies, Inc. (DE-1092)
Wilmington, DE

Sample ID	Sample Depth	Investigation Report	Sample Date	DNREC URS for Protection of Human Health (Non-critical Water Resource Area) Unrestricted Use (mg/kg)	Total PCBs (mg/kg)
V	0.0'-5.0'	EA Engineering	6/98	1	0.22
VV	0.0'-5.0'	EA Engineering	6/98	1	ND
W	0.0'-5.0'	EA Engineering	6/98	1	ND
WW	0.0'-5.0'	EA Engineering	6/98	1	ND
X	0.0'-5.0'	EA Engineering	6/98	1	ND
XX	0.0'-5.0'	EA Engineering	6/98	1	ND
Y	0.0'-5.0'	EA Engineering	6/98	1	ND
TP-1D	0.0'-8.0'	EA Engineering	10/98	1	ND
TP-10D	0.0'-7.0'	EA Engineering	10/98	1	ND
TP-11D	0.0'-6.0'	EA Engineering	10/98	1	ND
TP-12D	0.0'-8.5'	EA Engineering	10/98	1	ND
TP-13D	0.0'-8.5'	EA Engineering	10/98	1	ND
TP-2D	0.0'-8.5'	EA Engineering	10/98	1	ND
TP-3D	0.0'-8.5'	EA Engineering	10/98	1	ND
TP-4D	0.0'-8.0'	EA Engineering	10/98	1	ND
TP-5D	0.0'-9.0'	EA Engineering	10/98	1	ND
TP-6D	0.0'-9.0'	EA Engineering	10/98	1	ND
TP-7D	0.0'-7.0'	EA Engineering	10/98	1	ND
TP-8D	0.0'-7.0'	EA Engineering	10/98	1	ND
TP-9D	0.0'-7.0'	EA Engineering	10/98	1	ND
TP-1S	0.0'-6.0'	EA Engineering	10/98	1	ND
TP-10S	0.0'-6.0'	EA Engineering	10/98	1	ND
TP-11S	0.0'-2.0'	EA Engineering	10/98	1	ND
TP-12S	0.0'-6.0'	EA Engineering	10/98	1	ND
TP-13S	0.0'-6.0'	EA Engineering	10/98	1	ND
TP-2S	0.0'-6.0'	EA Engineering	10/98	1	ND
TP-3S	0.0'-6.0'	EA Engineering	10/98	1	ND
TP-4S	0.0'-6.0'	EA Engineering	10/98	1	ND
TP-5S	0.0'-6.0'	EA Engineering	10/98	1	ND
TP-6S	0.0'-6.0'	EA Engineering	10/98	1	ND
TP-7S	0.0'-6.0'	EA Engineering	10/98	1	ND
TP-9S	0.0'-6.0'	EA Engineering	10/98	1	ND
TP-1	1-7.5'	EA Engineering	10/98	1	ND
TP-10	0-7'	EA Engineering	10/98	1	ND
TP-11	4.5-11'	EA Engineering	10/98	1	ND
TP-12	3-12'	EA Engineering	10/98	1	ND
TP-13	4-10'	EA Engineering	10/98	1	ND
TP-14	2-12.5'	EA Engineering	10/98	1	ND
TP-15	2-10'	EA Engineering	10/98	1	ND
TP-16	1.5-12'	EA Engineering	10/98	1	ND
TP-2	4-8'	EA Engineering	10/98	1	ND
TP-3	3-4.5'	EA Engineering	10/98	1	ND
TP-4	5.5-11'	EA Engineering	10/98	1	ND
TP-6	4.5-10'	EA Engineering	10/98	1	ND
TP-7	4-10.5'	EA Engineering	10/98	1	ND
TP-8	5-10.5'	EA Engineering	10/98	1	ND
TP-9	8-9'	EA Engineering	10/98	1	ND
BS-1S	0.0-2.0	EA Engineering	10/98	1	ND
BS-1D	0.0-7.0	EA Engineering	10/98	1	ND
BS-2D	0.0'-10.0'	EA Engineering	10/98	1	ND
BS-2S	0-2'	EA Engineering	10/98	1	ND
BS-3D	9.5'	EA Engineering	10/98	1	ND
BS-3S	0-2'	EA Engineering	10/98	1	ND
SS-1	surficial	EA Engineering	6/98 - 7/98	1	2.10
SS-24	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-25	surficial	EA Engineering	6/98 - 7/98	1	0.60
SS-26	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-27	surficial	EA Engineering	6/98 - 7/98	1	0.22
SS-28	surficial	EA Engineering	6/98 - 7/98	1	4.30
SS-29	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-32	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-33	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-34	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-35	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-37	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-43	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-44	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-45	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-46	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-52	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-57	surficial	EA Engineering	6/98 - 7/98	1	ND
SS-58	surficial	EA Engineering	6/98 - 7/98	1	ND

DNREC - Brownfield Preliminary Assessment II (August 1997)
EA Engineering - Interim Action Summary Report RI/FS (August 1998)
EA Engineering - OUII Remedial Investigation Feasibility Study (August 1999)
DNREC - Supplemental Report and Field Investigation Activities (September 1997)

Qualifiers:
ND - compound was not detected
Bold - concentration exceeds URS
nca - no criteria available

Table 2
 PCB Screening Results For Soil
 Dravo Shipyard - Amer Industrial Technologies, Inc. (DE-1092)
 Wilmington, DE

Sample ID	Sample Depth	Investigation Report	Sample Date	DNREC URS for Protection of Human Health (Non-critical Water Resource Area) Unrestricted Use (mg/kg)	Total PCBs (mg/kg)
SS-5	2"-4"	DNREC	7/15/97	1	<0.5
TP-17A	1.0'-1.5'	DNREC	3/17/1997	1	<0.5
TP-17B	0.0'-4.0'	DNREC	3/17/1997	1	<0.5
TP-16A	0.0'-1.0'	DNREC	3/17/1997	1	<0.5
TP-16B	0.0'-4.0'	DNREC	3/17/1997	1	<0.5
TP-14A	1.5'-2.0'	DNREC	3/17/1997	1	<0.5
TP-14B	0.0'-5.0'	DNREC	3/17/1997	1	<0.5
TP-15A	0.0'-1.5'	DNREC	3/17/1997	1	<0.5
TP-15B	5.0'-6.0'	DNREC	3/17/1997	1	<0.5
SS-4	2"-4"	DNREC	7/15/97	1	<0.5
TP-11A	1.0'-1.5'	DNREC	3/17/1997	1	<0.5
TP-11B	5.0'-7.0'	DNREC	3/17/1997	1	<0.5
TP-12A	1.0'-1.5'	DNREC	3/17/1997	1	<0.5
TP-12B	8.0'-10.0'	DNREC	3/17/1997	1	<0.5
SS-3	2"-4"	DNREC	7/15/97	1	<0.5
TP-13A	0.0'-2.0'	DNREC	3/17/1997	1	<0.5
TP-13B	0.0'-5.0'	DNREC	3/17/1997	1	<0.5
TP-10A	0.0'-2.0'	DNREC	3/17/1997	1	<0.5
TP-10B	0.0'-8.0'	DNREC	3/17/1997	1	<0.5
TP-7A	1.0'-1.5'	DNREC	3/17/1997	1	<0.5
TP-7B	0.0'-3.5'	DNREC	3/17/1997	1	<0.5
MW-1-8-10	8.0'-10.0'	DNREC	7/15/97	1	<0.5
MW-1-10-12	10.0'-12.0'	DNREC	7/15/97	1	<0.5
TP-8A	0.0'-2.0'	DNREC	3/17/1997	1	<0.5
TP-8B	0.0'-7.5'	DNREC	3/17/1997	1	<0.5
SS-2	2"-4"	DNREC	7/15/97	1	<0.5
TP-4A	0.0'-2.0'	DNREC	3/17/1997	1	<0.5
TP-4B	0.0'-5.5'	DNREC	3/17/1997	1	<0.5
TP-5A	1.0'-1.5'	DNREC	3/17/1997	1	<0.5
TP-5B	4.0'-4.5'	DNREC	3/17/1997	1	<0.5
TP-6A	0.0'-2.0'	DNREC	3/17/1997	1	<0.5
TP-6B	0.0'-8.0'	DNREC	3/17/1997	1	<0.5
TP-1A	1.0'-1.5'	DNREC	3/17/1997	1	<0.5
TP-1B	0.0'-6.0'	DNREC	3/17/1997	1	<0.5
TP-2A	0.0'-2.0'	DNREC	3/17/1997	1	<0.5
TP-2B	0.0'-6.0'	DNREC	3/17/1997	1	<0.5
TP-3A	1.0'-1.5'	DNREC	3/17/1997	1	<0.5
TP-3B	5.0'-7.0'	DNREC	3/17/1997	1	<0.5
TP-9A	0.0'-2.0'	DNREC	3/17/1997	1	<0.5
TP-9B	5.0'-5.5'	DNREC	3/17/1997	1	<0.5
AA	0.0'-5.0'	EA Engineering	6/98	1	ND
AAA	0.0'-5.0'	EA Engineering	6/98	1	ND
BB	0.0'-5.0'	EA Engineering	6/98	1	ND
BBB	0.0'-5.0'	EA Engineering	6/98	1	ND
CC	0.0'-5.0'	EA Engineering	6/98	1	ND
CCC	0.0'-5.0'	EA Engineering	6/98	1	ND
DD	0.0'-5.0'	EA Engineering	6/98	1	ND
DDD	0.0'-5.0'	EA Engineering	6/98	1	2.34
EE	0.0'-5.0'	EA Engineering	6/98	1	ND
EEE	0.0'-5.0'	EA Engineering	6/98	1	ND
FF	0.0'-5.0'	EA Engineering	6/98	1	ND
FFF	0.0'-5.0'	EA Engineering	6/98	1	ND
GG	0.0'-5.0'	EA Engineering	6/98	1	0.26
GGG	0.0'-5.0'	EA Engineering	6/98	1	ND
HH	0.0'-5.0'	EA Engineering	6/98	1	0.08
I	0.0'-5.0'	EA Engineering	6/98	1	ND
II	0.0'-5.0'	EA Engineering	6/98	1	ND
JJ	0.0'-5.0'	EA Engineering	6/98	1	ND
KK	0.0'-5.0'	EA Engineering	6/98	1	0.48
L	0.0'-5.0'	EA Engineering	6/98	1	ND
LL	0.0'-5.0'	EA Engineering	6/98	1	1.70
M	0.0'-5.0'	EA Engineering	6/98	1	ND
N	0.0'-5.0'	EA Engineering	6/98	1	ND
NN	0.0'-5.0'	EA Engineering	6/98	1	ND
P	0.0'-5.0'	EA Engineering	6/98	1	ND
PP	0.0'-5.0'	EA Engineering	6/98	1	ND
Q	0.0'-5.0'	EA Engineering	6/98	1	ND
QQ	0.0'-5.0'	EA Engineering	6/98	1	ND
R	0.0'-5.0'	EA Engineering	6/98	1	ND
RR	0.0'-5.0'	EA Engineering	6/98	1	ND
S	0.0'-5.0'	EA Engineering	6/98	1	ND
SS	0.0'-5.0'	EA Engineering	6/98	1	ND
T	0.0'-5.0'	EA Engineering	6/98	1	ND
TT	0.0'-5.0'	EA Engineering	6/98	1	ND
U	0.0'-5.0'	EA Engineering	6/98	1	ND
UU	0.0'-5.0'	EA Engineering	6/98	1	ND

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Qualifiers:
 ND - compound was not detected
 Bold - concentration exceeds URS
 nca - no criteria available

PCB Mass Loading
Dravo Shipyard Property - Amer
SIRB ID: DE-1092
Wilmington, Delaware



BrightFields, Inc.

Site Photographs



**PCB Mass Loading Evaluation
Dravo-Amer Technologies**



Stone mulch cover in the vicinity of boring DDD.



Landscaped areas and impervious surfaces associated with the site.



**PCB Mass Loading Evaluation
Dravo-Amer Technologies**



Some sediment migration in the landscaped areas.



Catch Basin that is not covered.

PCB Mass Loading
Dravo Shipyard Property - Amer
SIRB ID: DE-1092
Wilmington, Delaware



BrightFields, Inc.

Overland Flow Calculations

PCB Loading Calculations from the Universal Soil Loss Equation
Dravo-Amer Technologies
Wilmington, DE
DE-1092

Surface PCB Concentration 2.34 mg/kg

Symbol	Factor	Value	Units
R	Rainfall/Runoff Erosivity Index	170	10 ² ft-tonf in/acre hr
K	Soil Erodibility	0.36	0.01 tonf acre hr/ac ft-ton in
	Estimated Slope Length	90	Feet
	Estimated Elevation Difference	1.7	Feet
	Slope	1.89	Percent
	Erodeable Area	0.32	Acres
LS	Topographic Factor	0.240	Dimensionless
C	Cover and Management Factor	0.044	Dimensionless
P	Support Practice Factor	1	Dimensionless
	Average Annual Soil Loss	0.63	ton/ac/yr

PCB Loading via Overland Flow 0.428 grams/year - PCBs

Dravo – Amer Technologies

Location:

Net C factor	0.044
Net LS factor	0.24
Net K factor	0.36
Net contour factor	1.0
Net ridge factor	1.0
Net ponding factor	0.94

Rock cover, %

Adjust rock cover

General yield level

Surf. res. cov. values

Adjust res. burial level

Soil conditioning index

Avg. slope steepness, % Slope length (horiz), ft Crit. slope length, ft

Detachment on slope, t/ac/yr Soil loss erod. portion, t/ac/yr

Sediment delivery, t/ac/yr Soil loss for cons. plan, t/ac/yr

T value, t/ac/yr

Fuel type for entire run

Equiv. diesel use for entire simulation, gal/ac

Fuel cost for entire simulation, US\$/ac

Energy use for entire simulation, BTU/ac

Align of oper on segments | General composite segment info | Biomass by layer | Biomass summary | C subfactor by day | C subfactor by period | C subfactor by operation
 Ridges_ contour by day | Erosion by day | Erosion by period | Erosion by year | Erosion by year | Extra C, L, crit. length values | Hydrology | Management output by day
 Management output by period | Residue values | Roughness | STRIPS_AND_BARRIERS | MANAGEMENT_STRIP_BUILDER | Runoff / Sediment overall results
 Runoff / Sediment results by day | Sediment results by flow path | Sediment by segment | Sediment by segment by day | Soil output by day | Yield values | Visuals | Info
 Soil | MISC_CALCULATIONS1 | Topography | Management | Strips / Barriers | Irrigation / Subsurface drainage | Diversion/terrace, sediment basin

Segment	Soil	Slope Soils	Seg length (horiz), ft	Soil loss, t/ac/yr	Sed. del., t/ac/yr	Consolidatio n time, yr
1	Generic Soils\silt loam (fm DM)		90	0.63	0.63	7

PCB Mass Loading
Dravo Shipyard Property - Amer
SIRB ID: DE-1092
Wilmington, Delaware



BrightFields, Inc.

Groundwater Transport Calculations

(Not Applicable)