BrightFields, Inc.

Appendix 8

DEL CHAPEL PLACE

NEWARK, DELAWARE

SIRS ID: DE-0163

BrightFields, Inc.

GENERAL SITE INFORMATION

Site Name: Del Chapel Place

SIRS ID Number: DE-0163

Site Location and Description:

The Del Chapel Place site is located on 70 South Chapel Street in Newark, Delaware (Figure 1). The site is approximately 21 acres in size and is comprised of two tax parcels (#1802100031 and #1802000209) located along Delaware Avenue and Chapel Street. The property is bounded to the north by Delaware Avenue and some commercial properties, to the east by Newark High School, to the south by a school bus depot and Wyoming Road, and to the west by residential and commercial properties. The surrounding land is mixed residential and commercial. Cool Run, a tributary of White Clay Creek, begins on the Site.

The property is separated into three separate parcels. OU-1, previously referred to as "the vacant lot," is the most western parcel and is 2.4 acres, the smallest of the parcels. The remaining area of the site is split north-south by the former Penn Central Railroad Right of Way, with one parcel on either side. OU-2, referred to as the "Tree Lot Parcel," covers the eastern 11.4 acres of the site and OU-3, referred to as the "Industrial Parcel", is the remaining 8.5 acre western portion. Both OU-2 and OU-3 were purchased in 1998 and developed into an apartment complex for students, which is the current use for the property. At that time, the existing buildings, smoke stacks, and water towers were demolished. OU-1 was sold to Continental Court, LLC in April 1998.

Previous Site Uses:

The site was previously utilized by Continental Fiber/Continental-Diamond Fiber Company in the early 20th century and then Budd Company from 1952 to 1972. Most of the industrial activities took place in OU-2 and OU-3. For a short time, until about 1982, part of an on-site building was leased by Keene Corporation and small businesses such as the Helix Association and Continental Can. Some of the materials utilized for industrial purposes include ammonia, phenolic resin, formaldehyde, acetone, toluene, methyl ethyl ketone (MEK), zinc chloride, plasticizers, and epoxy resin. Details are limited on the exact uses for the facility but among the materials produced were formica, canvas coating, vulcanized fiber, coated silicon rubber, flame retardant materials, and silicon-coated fiberglass.

Site Regulatory Status:

This section briefly summarizes previous investigations performed on the site through the SIRS program. A current SIRS regulatory status is also included.

Preliminary Assessment (DNREC, 1987)

Buried tank cars were discovered at the site during the P.A. They were believed to be used from approximately 25-30 years prior to the assessment by Budd Company to store alcohol, but upon further investigation, one of the tanks had about two feet of oil and the other tank was filled with rain water. DNREC recommended no further action under the Preliminary Assessment/Site Investigation (PA/SI) program and referred the site to the DNREC Underground Storage Tank program.

Draft Brownfield Preliminary Assessment II (DNREC, 1997)

At the time of the Brownfield Preliminary Assessment II, there were 37 buildings, two smoke stacks, and a water tower on the site from previous industrial activities which were being prepared for demolition. A total of 39 soil samples and 2 sediment samples were collected and screened, then 12 soil and one sediment sample were submitted for confirmatory analysis. Three soil samples had PCB concentrations exceeding EPA Risk-Based Concentration (RBC) values and/or three times the background value or quantitation limit. PCB detections in some of the samples may have been inhibited by high petroleum contamination, so it is possible that PCBs were present at high concentrations in additional samples. One sediment sample, SED-2, contained low concentrations of PCBs (Aroclor 1260). Two surface water samples were also collected but PCBs were not detected in either sample. Four groundwater monitoring wells were installed and sampled. PCBs were not detected. Samples revealed the highest inorganic and organic compound concentrations at the northeast corner OU-3 and in the south-central part of the property known as the drum storage area. PCB concentrations were detected in the northern portion of the property at concentrations below RBC industrial risk values (but above RBC residential risk values) and in the drum storage area exceeding both residential and industrial RBC levels. DNREC recommended cleanup in both portions of the site to decreases contaminant concentrations to below RBC industrial benchmarks.

Facility Evaluation: OU-2 (Environmental Alliance, 1998)

In June 1998, a Facility Evaluation (FE) was performed in the eastern parcel (OU-2). Aerial photographs were examined to determine potential areas of concern. Visual inspection and vapor monitoring of soils from test pits did not reveal contamination. Four additional monitoring wells were installed and sampled along with groundwater from three hydropunch locations and one surface water sample. The OU-2 surface water and groundwater samples showed minor VOC and metal contamination downgradient from OU-3.

Subsurface Remedial Investigation of OU-1 (Duffield Associates, 1999)

The 1997 BPA II showed elevated concentrations of petroleum hydrocarbons and gasoline-range organics in one of the shallow soil samples. The purpose of the Remedial Investigation (RI) was to perform a subsurface exploration and to investigate petroleum contamination in OU-1 and the potential contribution of off-site sources. However, sampling and analysis of soil from within the site boundary did not reveal petroleum hydrocarbons. Five test pits along the northern border of the site were analyzed with a flame ionization detector (FID) and photoionization detector (PID). Organic vapors were detected in one of the test pits but not volatile organic compounds, which could indicate that an organic compound or compounds that had not been previously identified was present in the test pit.

Upon review of the Draft RI, DNREC-SIRB recommended further delineating the extent of petroleum contamination in TP-4. The stained soil in the area appeared to be about two inches thick. Four soil samples were collected from within the area as well as two from test pit excavations. The contaminated area was found to be only a thin layer with an area less than ten square feet and a Total Petroleum Hydrocarbon concentration of 5,000 ppm. The contaminated soil was removed and DNREC-SIRB recommended no further action for the site.

Facility Evaluation: OU-3 (Environmental Alliance, 2000)

A FE of OU-3 was performed including the collection of over 200 samples, with soil and groundwater samples collected within the site and sediment and surface water samples collected outside of the site boundaries. An ecological investigation and a geophysical investigation were performed as part of the FE as well as an additional OU-2 groundwater and surface water investigation. Environmental Alliance recommended the excavation and removal of over 3,500 tons of soil to remediate the site, which successfully reduced residual concentrations to acceptable

levels. Following remediation, Courtyard Communities developed plans to redevelop the property into housing for University of Delaware students.

Assessment of Contaminants in Stream Sediments Adjacent to the Del Chapel site (DNREC, 2006)

DNREC's Division of Water Resources conducted an assessment of contaminants in stream sediments in the stream adjacent to the Del Chapel site. The data used in the assessment was previously collected during DNREC's BPA II in 1997. The Division of Water Resources evaluated the one PCB detection (Aroclor 1260, at a concentration of 0.025 mg/kg) in sediment to estimate potential PCB concentration in the sediment pore water. Sediment pore water is a primary exposure route for organisms living in the streambed.

Based on DNREC's evaluation, the estimated PCB concentration in sediment pore water did not exceed Delaware water quality standards for the protection of aquatic life. Furthermore, the PCB concentration in the sediment was determined to be lower than relevant bioaccumulation-based sediment quality criterion, meaning that any bioaccumulation of PCBs originating from sediment would not result in unacceptable levels that could present a human health risk.

Remedial Action Closeout Report (Environmental Alliance, 2007)

The Final Plan of Remedial Action (FPRA) included injecting magnesium hydroxide slurry into the ground to reduce zinc migration to the stream, development of a two year Operations and Monitoring (O&M) Plan, establishment of a Groundwater Management Zone (GMZ), and an environmental covenant signed by the site owner to restrict groundwater usage.

Current Regulatory Status:

According to documents from the DNREC Environmental Navigator, the site was issued a Certificate of Completion letter by DNREC for soil in the eastern parcel (OU-2) in March of 2000. DNREC recommended no further action for OU-1. Following completion of remediation in 2007, the site received regular Operations and Maintenance (O&M) inspections through 2009 and DNREC chose to perform an additional year of quarterly inspections from July 2012 through June 2013.

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SUMMARY OF SITE PCB INFORMATION

Site Investigation PCB Findings:

For purposes of the PCB loading estimates, surface soil is defined as 0 to 2 feet below ground surface (bgs). Samples collected from soil depths spanning 2 feet bgs were included in both the surface and subsurface data sets.

PCBs were detected in four surface soil samples with concentrations ranging from 0.011 mg/kg (TP-4S) to 4.3 mg/kg (TP-17S). Surface soil at these locations was removed during site remediation. Screening results showed PCBs in one unsaturated subsurface soil sample with a concentration between 0.5 mg/kg and 5.0 mg/kg. In saturated subsurface soil, PCBs were detected in one sample at a concentration of 0.10 mg/kg.

Due to the fact that there was only one detection in the subsurface saturated soil, this detected value was used in the calculations instead of calculating the 95% upper confidence limit (UCL) of the mean across the site. There were no PCBs detected in groundwater.

Concentrations of PCBs on Site			
Sample Matrix	**Corresponding Figure**	**Analytical Methods**	**Range of Total PCBs**
Surface Soil	Figure 2	Method 8082 and Screening Data	Not detected to 4.3 mg/kg
Subsurface Soil (unsaturated)	Figure 3	Method 8082 and Screening Data	Not detected to <5.0 mg/kg
Subsurface Soil (saturated)	Figure 4	Method 8082 and Screening Data	Not detected to 0.10 mg/kg
Groundwater	Figure 5	Method 8082	Not Detected

A summary of all samples collected for PCB analyses are presented in Tables 1 through 3.

Acreage where PCBs detected:

Based on the data available and reviewed by BrightFields, the surface soil and groundwater are not impacted by PCBs. The estimated area of subsurface unsaturated soil impacted by PCBs is 0.53 acres (Figure 3). The estimated subsurface saturated soil area impacted by PCBs is 0.26 acres (Figure 4).

PCB Remediation Status:

PCB remediation is not presently required for the Del Chapel Place site.

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PCB MASS LOADING SUMMARY

Since soil excavation removed surface soil containing PCBs, the majority of the site has been capped with asphalt, and the remaining areas were raised with soil for landscaping, overland flow is not a likely mechanism of transport of PCB contamination at the Del Chapel Place Property. The PCB mass loading rate to Cool Run via groundwater transport was estimated for the Del Chapel Place Property. A summary of the results is included below and the details of the calculations are included as attachments to this Appendix.

Overland Flow:

No overland flow analysis was performed for this site.

Groundwater Discharge Analysis:

Groundwater discharge is based on the hydraulic conductivity of the soil, the groundwater gradient, and the cross-sectional area of the aquifer. A breakdown of the individual factors used in the Darcy equation is presented below. A groundwater discharge map is included as Figure 6.

Because PCBs were detected in saturated soil, but not in groundwater, the calculated concentration of PCBs in pore water, based on partitioning, was used to calculate the mass loading.

The calculations are presented in Table B in the groundwater transport calculations attachment.

Input Factors:

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

Groundwater Transport Factors	Value Used		Justification/Derivation of Value Used
	min	max	
K = Hydraulic Conductivity (ft/day)	106	106	Drilling logs indicate that lithology beneath the site is fine to coarse sand. Based on EA's mathematical groundwater model, the hydraulic conductivity used was 106 feet/day. The hydraulic conductivity was calculated from the average transmissivity value.
I = Horizontal Groundwater Gradient	0.0055	0.0056	Calculated from the Groundwater Gradient Maps in the OU-3 FE Report. Flow is to the south.

Groundwater Transport Factors	Value Used		Justification/Derivation of Value Used
	min	max	
Saturated Thickness (ft)	2	4	Based on the borings logs, the saturated thickness, measured from the first water to unsaturated sediments.
Lateral Discharge Distance (ft)	117	117	The maximum lateral discharge distance was estimated to be equal to the distance between B-2 (1 to 5 ft bgs unsaturated) and buildings to the east measured perpendicular to groundwater flow.
A= Cross-Sectional Area (ft^2)	340	680	Calculated from the saturated thickness and lateral discharge distance.
Estimated Groundwater PCB Concentration (µg/L)	0.022	0.110	The concentration detected in the subsurface soil (0.10 mg/kg) was used to assess the estimated concentration in groundwater.
Distance to Discharge point (ft)	Approximately 700 feet		Distance from sample location to Cool Run

Mass Loading Via Groundwater Transport Result:

The groundwater discharge is 5,600 to 11,000 L/day (see attached Table A). The maximum (and only) detected PCB concentration (0.10 mg/kg) was used to calculate the groundwater concentrations for the loading estimate (Table B). The estimated minimum and maximum contaminant mass loading contributions shown in Table C assume that there are no contaminant losses due to degradation, dispersion, sorption, volatilization, etc.

The total estimated PCB loading via groundwater discharge is estimated to be between **0.22** and **0.46 grams per year** (Table C).

Uncertainty Analysis Associated with Groundwater Transport:

Specific Areas and Degree of Uncertainty for Del Chapel

	Groundwater PCB Concentration	Sampling Density	Hydraulic Conductivity	Horizontal Groundwater Gradient	Saturated Thickness	Lateral Discharge Distance	Distance to Discharge Point
Site Specific Information	Partitioning based on maximum concentration observed in saturated soil	0.17; Possible data gaps	Based on site groundwater model which is probably not applicable	Maximum of four measuring points between 06/98 and 08/98, based on water table properties	Log stopped at 3 feet bgs, thickness estimated	Few samples collected on-site, discharge limits estimated from limited log data	Approximately 700 feet
Degree of Uncertainty	Moderate	High	High	High	Moderate	Moderate	High

Based on this evaluation the level of uncertainty associated with groundwater transport PCB mass loading from Del Chapel Place is **Moderate to High.**

Site References:

Delaware Department of Natural Resources and Environmental Control (DNREC), 1987, A Preliminary Assessment of Del Chapel Place, June 1987.

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Environmental Alliance, Inc., 1998, Facility Evaluation Work Plan, Del Chapel Place: OU-3, September 1998.

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Figures