BrightFields, Inc.

Appendix 17-A

JUSTISON LANDING PUBLIC WORKS YARD
WILMINGTON, DELAWARE

SIRB ID: DE-1377 (FORMERLY DE-1090)

BrightFields, Inc.

GENERAL SITE INFORMATION

Site Name: Former Wilmington Public Works Yard

SIRB ID Number: DE-1377 (Formerly DE-1090)

Site Location and Description: The Justison Landing Redevelopment project consists of approximately 15 acres along the Wilmington Riverfront in New Castle County, Delaware. The project is bordered by West Street and the AAA building to the north, the Christina River and the Riverwalk to the east, Hollingsworth Avenue to the south, and South Madison Street to the west.

The Justison Landing Public Works Yard (PWY) is located at 300 South Madison Street (tax parcel ID# 26-042.00-006) is approximately seven acre portion of the Justison Landing Redevelopment project. The PWY was divided into two operable units (OU-1 and OU-2) and an area called "rest of site" (ROS) based on differing environmental conditions as discussed below. The surrounding land is generally commercial and/or industrial.

Previous Site Uses: The PWY is located in an area of the Wilmington Riverfront that has been in continuous industrial use since the late 1700s. Review of aerial photographs and Sanborn maps of the property showed that the site was historically used for building steamships, steel manufacturing, railroad cars, boilers, and coal gas operations. These historical documents also showed that a dry dock and culvertized stream were located just south of the property. This stream (Shipley Run) has been covered and is now part of the City of Wilmington Combined Sewer Overflow (CSO) system. The site was previously occupied by the Harlan and Hollingsworth Corporation, Bethlehem Steel, Wilmington Coal Gas Company, and Delmarva Power & Light. Recently, Delmarva Power, the City of Wilmington Public Works Yard, and the Wilmington Rowing Club operated on the properties. Surrounding property uses in the area during the late 1800s included a tannery, gas works, foundry, boiler works, coal yard, lumber yard, planing mill, steam saw mill and carriage factory. Industrial usage of the surrounding properties appears to have continued through at least 1992.

There have been many buildings and structures located on the PWY property throughout the years. Their usage, and the usage of the grounds associated with the property over the course of time, appears to have included: storage houses and sheds, a carpenter shop, a fitting iron shop, a laying out shop, car shops (containing erecting shops and pattern storage), punch shed, ship yard tool and storage room, angle shop, annealing shop, furnace, lumber shed, and blacksmith shop, garage, gasometer (gas holder), lumber piles and treatment, railroad tracks, parking, and an

electrical equipment storage yard. The buildings were described as being heated with steam. Over the years, the lighting was provided by gas, lard oil and refined kerosene oil lamps, and electricity. Fuel used included coal and coke (oil in furnace).

Site Regulatory Status: This section briefly summarizes previous investigations performed on the site through the Site Investigation and Restoration Branch (SIRB) program. A current SIRB regulatory status is also included.

Investigation or Regulatory Action	Dates	Description
Brownfield Preliminary Assessment II	1997	Metals, PAHs, and toxaphene were above DNREC uniform risk based remediation standards (URS) in the soil. Metals were above URS in sediment. Groundwater was above URS for metals, cyanide, VOCs and SVOCs. "No dig" restriction placed on property until adequate Health and Safety Plan was developed. (DNREC, 1997)
Draft Remedial Investigation (Wilmington Public Works Yard)	1/2005	Site divided into 3 sections OU-1, OU-2, and "rest of site" (ROS) based on environmental conditions; For the ROS, arsenic, lead, and PAHs were contaminants of concern (COCs) for unrestricted and a restricted use. PCBs were COC for unrestricted use. For OU-1, PCB concentrations were low since initial sampling in 2004. In OU-2, arsenic, lead, and several PAH compounds were site COCs for restricted use. Groundwater discharge was acceptable except for Aroclor-1260. (BrightFields, 2005)
Supplemental Remedial Investigation Report (Wilmington Public Works Yard)	4/2005	In ROS, arsenic, lead, and several PAHs compounds were site COCs for a restricted use and an unrestricted use. PCBs are a COC for an unrestricted use. In OU-2, arsenic, lead, and several PAHs compounds are site COCs for a restricted use and an unrestricted use. Cyanide, benzene, several PAH compounds, and Aroclor-1260 are COCs in groundwater. (BrightFields, 2005)
Interim Response Action Report	6/2005	Approximately 53 tons of PCB-impacted soil was removed from OU-1 in the area surrounding monitoring well RHQ-1. Confirmation samples indicated that the bottom and sidewalls of the excavation contained PCBs up to 1.3 mg/kg, below the action level of 3 mg/kg.

Investigation or Regulatory Action	Dates	Description
Supplemental Groundwater Report (Wilmington Public Works Yard)	9/2005	The direction of shallow groundwater flow is strongly influenced by the presence of sewer pipes and trenches that act as drains in the shallow flow zone. Groundwater appeared to flow from the edges of the former yard toward the center. (BrightFields, 2005)
Triangle Parcel Additional Delineation Summary Report (Wilmington Public Works Yard)	11/21/2005	Arsenic, lead, BTEX, and PAH concentrations are consistent with previous studies. Non-aqueous phase liquids (NAPL) limited in extent. (BrightFields, 2005)
Focused Feasibility Study Volume 2 (Unrestricted Use) (Wilmington Public Works Yard)	3/2006	To make area suitable for residential and commercial use, the recommended remedy is to remove area of focused impact, install vapor barrier, and apply appropriate institutional controls and environmental management. Excavation and asphalt repair to remediate soil; groundwater wells monitored and sampled periodically; Deed restrictions need to be placed on property. (BrightFields, 2006)
Final Plan of Remedial Action (Justison Landing Redevelopment)	4/2006	DNREC- required plan to remove hotspots, place barrier cap on surface, install vapor barriers beneath buildings, groundwater monitoring, institutional controls, and management during construction. (DNREC, 2006)
UST and Hydraulic Lift Removal Report (Justison Landing Redevelopment)	10/2006	Three 10,000-gallon USTs, fuel dispensers, piping, and 9 hydraulic lifts were removed from the vicinity of the Vehicle Maintenance Building (VMB), which was demolished as well. Samples were taken at each removal. PCBs were detected below restricted use URS in lift 3, 5, and 6 samples. Eight additional soil borings were drilled in and around the VMB, and sample results were consistent with previous findings. (BrightFields, 2006)
PCB Delineation and Remedial Action Report (Justison Landing Redevelopment)	12/8/2006	191.72 tons of soil removed from SM5 North Area for off-site disposal. Confirmation samples indicated PCBs below 3 mg/kg of total PCBs, so risk was reduced. (BrightFields, 2006)

Documents that focused on NAPL characterization or removal activities are not included in the above summary.

Current Regulatory Status:

The Public Works Yard is now divided into Parcels 1, 3, 4 and part of parcel 6 of Justison Landing Redevelopment. Construction has not begun on Parcels 1, 3, and is partially complete 6. Parcel 4 received a Certificate of Completion of Remedy (COCR) in August 2008. All hotspot removals at the PWY have been completed.

An Operations and Maintenance (O&M) Plan is in the process of completion. This plan will address site monitoring after the COCRs are issued for each of the parcels. Monitoring includes photo documentation of current site conditions and observing any potential exposure to native site soil or migration of soil off-site.

SUMMARY OF SITE PCB INFORMATION

Site Investigation PCB Findings:

During the Remedial Investigation of the Riverfront Headquarters Property, now AAA, completed in March 2004 by BrightFields, concentrations of PCBs were reported in the groundwater at 15 ug/L in well RHQ 1 (BrightFields 2004). In an effort to determine the source of the PCB contamination, BrightFields conducted additional sampling in June 2004 for the RHQ property Remedial Investigation. Twenty-seven additional borings were advanced in a gridded area immediately surrounding monitoring well RHQ-1 and the area previously used as a transformer unloading and/or storage area. Soil PCB concentrations in the investigation area above the DNREC URS for PCBs of 3 mg/kg were detected at boring locations GP9 (PC24), PC16, PC17 and PC30. Results from the June 2004 PCB characterization did not indicate an elevated PCB source in the vicinity of monitoring well RHQ-1.

Four additional Geoprobe® borings were advanced in a 10-foot radius around RHQ-1 on August 20, 2004 to further characterize both horizontal and vertical soil PCB concentrations. One filtered and one un-filtered groundwater sample were also collected from RHQ-1 to evaluate current groundwater conditions. Soil PCB concentrations in the additional four borings were below the DNREC URS of 3 mg/kg for PCBs in all samples except for PC32-S002, which contained 4.2 mg/kg of PCB 1260. Aroclor 1260 was detected in the unfiltered groundwater sample at 0.94 µg/L. No PCBs were detected in the filtered groundwater sample from RHQ-1.

Based on the results from the June and August 2004 sampling, a soil removal action, in the immediate vicinity of RHQ-1, was completed for the PWY site. Approximately 53 tons of soil in the vicinity of RHQ-1 was removed and disposed off-site to Soil Safe. Confirmation samples indicate that the bottom and south sidewall samples do not contain PCBs at levels detectable by the standard EPA analytical method SW-846 8082. The remaining sidewalls contain PCB concentrations ranging from 0.116 to 1.3 mg/kg, which are all below the restricted URS of 3 mg/kg.

In addition BrightFields, Inc. (BrightFields) began a Remedial Investigation of the PWY property. Soil samples collected from borings advanced during the PWY RI and during the Supplemental RI contained total PCBs in the surface soil at concentrations ranging from not detected to 8.5 mg/kg. The sample results show that elevated concentrations of PCBs were present in the surface soil in the vicinity of the former Vehicle Maintenance Building (the

northeastern portion of future Parcel 1). Based on historical maps, it is likely that the PCBs are the result of previous transformer staging in the vicinity.

Once the areas were delineated, BrightFields performed the removal of two additional areas, one associated with the storm water line adjacent to the retention wall of the AAA building and one in the direct vicinity of GP-39. A total of 191.72 tons of soil in the Soil Management Area SM5-North were removed and disposed off-site through Clean Earth Philadelphia. Confirmation samples indicated that the remediation goal of 3 mg/kg of total PCBs was achieved.

Parcel 1 has been filled using reusable material from the Justison Landing redevelopment and then stabilized with grass. As of June 2008 Parcel 3 contained impervious cover in the western portion of the site and the eastern portion of Parcel 3 was filled with reusable soil and covered with stone. This parcel has been used as a staging area for construction activities. Parcel 4 has been completed and received a COCR. It is covered with an impervious surface and two feet of clean fill in the landscaped areas.

The current surface soils do not contain PCBs.

PCBs were detected in subsurface non-saturated soil at various locations at concentrations ranging from 0.12 to 14.8 mg/kg. PCBs were detected in the subsurface saturated soil at various locations at concentrations ranging from 0.046 to 8.7 mg/kg. PCB congener analysis was completed on a groundwater sample collected at RHQ-1 and during dewatering activities that took place at the PWY. These values were used to determine the groundwater transport of PCBs from the site.

Concentrations of PCBs Remaining on Site

Sample Matrix	Corresponding Figure	Analytical Methods	Range of Total PCBs
Surface Soil	Figure 2	Method 8082	Not detected
Subsurface Soil (unsaturated)	Figure 3	Method 8082	Not detected to 14.8 mg/kg
Subsurface Soil (saturated)	Figure 4	Method 8082	Not detected to 8.7 mg/kg
Groundwater	Figure 5	PCB congener analysis (1668a) and Method 8082	Not detected to 0.086 µg/L

A summary of all samples collected for PCBs are presented in the attached Tables 1 through 4.

Acreage where PCBs detected:

The estimated subsurface unsaturated soil area impacted by PCBs is 4.93 acres (Figure 3). The estimated subsurface saturated soil area impacted by PCBs is 1.19 acres (Figure 4).

PCB Remediation Status:

Approximately 53 tons of soil in the vicinity of RHQ-1 was removed and disposed off-site through Soil Safe. A total of 191.72 tons of soil in the Soil Management Area SM5-North were removed and disposed off-site through Clean Earth Philadelphia. A more detailed explanation of the removal activities is included above. No additional PCB removals are required at the site.

PCB MASS LOADING SUMMARY

Due to the current site conditions there is no estimated PCB contribution via the overland flow transport mechanism. The PCB mass loading rate to surface water via groundwater transport was estimated for the Former Public Works Yard. A summary of the results is included below and the details of the calculations are included as attachments to this Appendix.

OVERLAND FLOW

Ground Cover and Canopy:

A site inspection was performed on June 30, 2008 to estimate the current site ground cover and canopy. Photographs of the site ground cover and canopy are attached.

Site Sediment and Erosion Control Practices:

As of June 2008 a portion of the site (Parcel 3) still contained silt fence to prevent sediment and erosion dispersion.

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.

Because PCBs were detected in the groundwater, these detected values were used in the assessment; however, due to the spatial data available for the groundwater BrightFields also used the subsurface saturated sample information to define the areas of concern and cross sectional areas.

The concentration used for the groundwater discharge assessment for all areas defined below was 0.086 ug/L. This concentration was reported from a sample collected during a dewatering event during the relocation of the storm water line at the Riverfront Headquarters (now AAA) utilizing congener analysis (method 1668a). BrightFields believes that this concentration best represents current groundwater conditions on the site.

Input Factors:

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

Area A: Vicinity of boring RHQ-1

Groundwater Transport Factors	Value Used		Justification/Derivation of Value Used
	min	max	
K = Hydraulic Conductivity (ft/day)	5.67	14.2	An examination of the drilling logs shows that the groundwater being monitored is within a moderately coarse-grained fill unit that overlies the marsh deposit clay. The fill unit ranges in composition from fine to coarse-grained sand to silt, with some area of gravel. The hydraulic conductivity for silty sand ranges from approximately 2 x 10^{-3} to 5 x 10^{-3} cm/sec (Cernica, 1995).
I = Horizontal Groundwater Gradient	0.0057	0.0095	On October 13, 2004 and December 16, 2004, BrightFields measured depth to groundwater in each of the wells to assess the groundwater flow direction and horizontal gradient at the site. Calculations of the horizontal gradient from these measurements showed that the gradient was fairly consistent and ranged from approximately 0.0057 to 0.0095 ft/ft.
Saturated Thickness (ft)	6	6	Based on the borings logs, the saturated zone above the marsh deposits is between 4 and 8 feet thick. An average thickness of 6 feet was used.
Lateral Discharge Distance (ft)	100	120	The lateral discharge distance was estimated equal to the length of the PCB impacted area measured perpendicular to the Christina River.
A= Cross-Sectional Area (ft2)	600	720	Calculated from the saturated thickness and lateral discharge distance.
Groundwater PCB Concentration (µg/L)	0.086		Groundwater concentration observed in this area during dewatering activities associated with the storm water line relocation (Pre-Treatment PCB Congener Concentrations May 11, 2004 Sample Riverfront Headquarters).
Distance to Discharge point (ft)	Directly adjacent		Approximate distance from property boundary to closest surface water location.

The PCB loading via groundwater discharge for Area A is between 0.02 to 0.1 grams per year. Please see attached tables for specific variables.

Area B: South portion of the Property

Groundwater Transport Factors	Value Used		Justification/Derivation of Value Used
	min	max	
K = Hydraulic Conductivity (ft/day)	5.67	14.2	An examination of the drilling logs shows that the groundwater being monitored is within a moderately coarse-grained fill unit that overlies the marsh deposit clay. The fill unit ranges in composition from fine to coarse-grained sand to silt, with some area of gravel. The hydraulic conductivity for silty sand ranges from approximately 2 x 10^{-3} to 5 x 10^{-3} cm/sec (Cernica, 1995).
I = Horizontal Groundwater Gradient	0.0057	0.0095	On October 13, 2004 and December 16, 2004, BrightFields measured depth to groundwater in each of the wells to assess the groundwater flow direction and horizontal gradient at the site. Calculations of the horizontal gradient from these measurements showed that the gradient was fairly consistent

			and ranged from approximately 0.0057 to 0.0095 ft/ft.
Groundwater Transport Factors	**Value Used**		**Justification/Derivation of Value Used**
	min	**max**	
Saturated Thickness (ft)	6	6	Based on the borings logs, the saturated zone above the marsh deposits is between 4 and 8 feet thick. An average thickness of 6 feet was used.
Lateral Discharge Distance (ft)	300	300	The lateral discharge distance was estimated to be equal to the length of the PCB impacted area measured perpendicular to the Christina River.
A= Cross-Sectional Area (ft2)	1,800	1,800	Calculated from the saturated thickness and lateral discharge distance.
Groundwater PCB Concentration (µg/L)	0.086		Groundwater concentration observed in this area during dewatering activities associated with the storm water line relocation (Pre-Treatment PCB Congener Concentrations May 11, 2004 Sample Riverfront Headquarters).
Distance to Discharge point (ft)	Directly adjacent		Approximate distance from property boundary to closest surface water location.

The PCB loading via groundwater discharge for Area B is 0.05 to 0.1 grams per year. Please see attached tables for specific variables.

Mass Loading Via Groundwater Transport Result:

The groundwater discharge is 2,400 to 2,500 L/day (attached Table A). The estimated minimum and maximum contaminant mass loading contributions are shown in the Table C in the groundwater transport calculations attachment. As previously described, these calculations are highly conservative (protective), and they overestimate the actual mass loading because they assume that there are no contaminant losses due to degradation, dispersion, sorption, volatilization, etc.

The total PCB loading via groundwater discharge is between 0.07 and 0.3 grams per year.

Uncertainty Analysis Associated with Groundwater Transport:

Specific Areas and Degree of Uncertainty for the Justison Landing PWY

	Groundwater PCB Concentration	**Hydraulic Conductivity**	**Horizontal Groundwater Gradient**	**Saturated Thickness**	**Lateral Discharge Distance**	**Distance to Discharge point**
Site Specific Information	Based on congener analysis in groundwater	Based on detailed site logs	Based on wells and multiple measurements collected	Multiple good quality logs	Groundwater gradient defined and multiple number of samples collected onsite	Directly adjacent
Degree of Uncertainty	Low	Moderate	Moderate	Low	Moderate	Low

Based on this evaluation the overall uncertainty associated with the Justison Landing PWY site is **low to moderate.**

Site References:

BrightFields, Inc., 2006, PCB Delineation and Remedial Action Report (Justison Landing Redevelopment), December 2006.

BrightFields, Inc., 2006, UST and Hydraulic Lift Removal Report (Justison Landing Redevelopment), October 2006.

BrightFields, Inc., 2006, Final Plan of Remedial Action (Justison Landing), April 2006.

BrightFields, Inc., 2006, Focused Feasibility Study Volume 2 (Unrestricted Use) (Wilmington Public Works Yard), March 2006.

BrightFields, Inc., 2005, Triangle Parcel Additional Delineation Summary Report (Wilmington Public Works Yard), November 2005.

BrightFields, Inc., 2005, Supplemental Groundwater Report, Wilmington Public Works Yard, September 2005.

BrightFields, Inc., 2005, Supplemental Remedial Investigation Report, Wilmington Public Works Yard, April 2005.

BrightFields, Inc., 2005, Draft Remedial Investigation Report, Wilmington Public Works Yard, January 2005.

Delaware Department of Natural Resources and Environmental Control (DNREC) – Site Investigation and Restoration Branch (SIRB), 1997, Brownfield Preliminary Assessment II of the Public Works Yard, 1997.

Figures