

**REVISED
FINAL PLAN OF REMEDIAL ACTION
FOR THE
BANCROFT MILLS/WILMINGTON PIECE DYE
SITE
WILMINGTON, DELAWARE**

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DNREC Project DE-1130
Project Officer: Lynn M. Krueger**

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Division of Air and Waste Management
Site Investigation and Restoration Branch**

TABLE OF CONTENTS

I. INTRODUCTION2

II. PURPOSE.....3
 SITE DESCRIPTION AND HISTORY3

III. PRIOR INVESTIGATION RESULTS.....3

IV. REVISED PROPOSED AND FINAL PLANS OF REMEDIAL ACTION8

V. PUBLIC PARTICIPATION8

VI. DECLARATION.....8

I. INTRODUCTION

In June 1998, RMT, Inc., of Michigan ("RMT") conducted a Remedial Investigation/Feasibility Study ("RI/FS") at the Wilmington Piece Dye Site in Wilmington, Delaware ("Site"). This RI/FS was conducted under the Delaware Department of Natural Resources and Environmental Control – Site Investigation and Restoration Branch ("DNREC-SIRB") approved RI/FS Work Plan, in accordance with the Consent Order signed by the DNREC-SIRB in the matter of the Wilmington Finishing Company Site, One Mill Road, Wilmington, Delaware (June 18, 1998). The recorded owner of the Site, Wilmington Finishing Company, filed for bankruptcy on May 15, 1998, and the Site is now controlled by Wilmington Piece Dye ("WPD") and Lanscot-Arlen Fabrics, Inc. ("Lanscot"). The Consent Order addresses releases of hazardous substances to the environment, which will require remedy.

The DNREC-SIRB conducted a Brownfield Preliminary Assessment II ("BPA II") of the Site during the period from November 4–7, 1997. DNREC-SIRB's validated results of laboratory analysis from that investigation and the sample location map were utilized for RMT's development of the RI/FS. RMT performed additional sampling and testing as part of the RI for this Site. The results of this additional sampling are contained in the completed RI for the Wilmington Piece Dye Site dated May 1999.

WPD and Lanscot entered into the DNREC-SIRB Voluntary Cleanup Program ("VCP") for the RI/FS and the remediation of the Site. The purposes of the RI/FS were to: (1) identify potential sources of contamination within the limits of construction, and (2) develop remedial alternatives to address any contamination to protect human health, welfare and the environment.

The RI was completed in May 1999 and the FS was completed in November 1999.

A Final Plan of Remedial Action ("Final Plan") was issued in April 2000 by DNREC-SIRB, and it included the following remedial action for the Site:

- Deed restriction to limit Site use;
- Excavate soil in the vicinity of SS-14 and TP-10 and dispose of material off-site;
- Pave or repair roads and parking areas;
- Line drainage ditches with concrete;
- Divert storm water flow from adjacent properties;
- Use sand filter to remove suspended solids from storm water.

In July 2001, during the implementation of the Final Plan, it was determined that, based on Site conditions encountered (underground utilities and granite), it was not possible to remove all contamination to less than 1.0 E^{-5} risk level in the location identified in the Final Plan as SS-14. Based on DNREC-SIRB's review, it was determined that, with the proposed "clean" fill and concrete culvert on top of the area of concern, there would be limited risk of exposure. This Revised Proposed Plan of Remedial Action ("Revised Proposed Plan") was developed to incorporate this revision to the remedial alternative contained in the Final Plan. To further control risks at the Site, the Revised Proposed Plan also required a deed restriction be placed on

the Site to require the written approval of DNREC-SIRB prior to any future excavation near the location of SS-14.

II. PURPOSE

This Revised Final Plan of Remedial Action (“Revised Final Plan”) is based on the RI/FS, Original Final Plan, and the new information obtained during the Remedial Action being conducted by RMT, on behalf of WPD and Lanscot. It presents to the public the Department’s proposal for a revised selection of the remedial activities to occur at the Wilmington Piece Dye Site. This Revised Final Plan is issued under the provisions of the Delaware Hazardous Substance Cleanup Act (“HSCA”), 7 Del. C., Chapter 91, and the Regulations Governing Hazardous Substance Cleanup (“Regulations”).

The Department provided public notice and opportunity to comment on the Revised Proposed Plan in accordance with HSCA and Section 12 of the Regulations. The original Final Plan, the Revised Proposed Plan, all prior investigations of the Site, the comments received from the public, the Department’s responses to the comments, and all of the Site documents form the basis for this Revised Final Plan.

This Revised Final Plan includes a description of the Wilmington Piece Dye Site, the investigation results, and an explanation of the reason for the Revised Proposed Plan, the required wording for a revised deed restriction, and the public participation requirements.

Site Description and History

The Wilmington Piece Dye Site is located at One Mill Road in Wilmington, Delaware on the banks of the Brandywine Creek (Figure 1) and consists of approximately 16 acres of land in two parcels. The primary parcel covers 15 acres and contains the Site operations and over 20 buildings (Figure 2). A smaller, separate parcel is located northwest of the main Site and is used exclusively as a water filtration plant as part of the processing operations (i.e., cooling water for machines). The Site is surrounded by residential and commercial property. The Site is bordered by Brandywine Creek to the east and north; and by office buildings and residential properties to the west and south.

The Site has been in continuous operation since the early 1800’s. Historical businesses in the area reportedly centered on the manufacturing and dying of woolen and cotton fabrics, and bleaching and waterproofing of fabrics.

Operations began at the Site in 1831, when Joseph Bancroft opened a cotton cloth mill. Since that time, textile finishing/manufacturing have been in continuous operation. Processes conducted included dying, waterproofing, bleaching, and starching of cotton and wool cloth.

III. PRIOR INVESTIGATION RESULTS

As mentioned in Section I, DNREC-SIRB conducted a BPA II of the Site on November 4 through 7, 1997. DNREC-SIRB’s validated the results of the laboratory analysis from the 1997

investigation, and the sample location map were utilized in RMT's development of the RI/FS. RMT performed additional sampling and testing as part of the RI for the Site. The results of this additional sampling are contained in the May 1999 RI Report for the Wilmington Piece Dye Site.

Eighteen shallow soil samples, sixteen deep soil samples, five groundwater samples, eleven surface water samples, and fifteen sediment samples were collected during the RI and sent to a Delaware Certified HSCA laboratory for analysis using Standard Operating Procedures for Chemical Analytical Programs (DNREC 1997). A subset of the prepared data was used by RMT for preparation of the RI/FS Report. Based on the analytical results from these samples, and from samples collected during the BPA II, the nature and extent of contamination has been evaluated and can be summarized as follows:

- Polynuclear aromatic hydrocarbons ("PAHs") and metals are the constituents of primary concern ("COPCs") detected at the Site. These constituents are found in the shallow and deep soil above DNREC-SIRB's restricted Uniform Risk Based Standards ("URS"). PAH concentrations above the URS for protection of the environment were also detected in the sediment samples collected from the Brandywine Creek.
- The highest concentrations of PAHs and metals (primarily benzo(a)pyrene and arsenic) were detected in TP-10 and SS-14.
- Benzo(a)pyrene was the primary PAH found across the Site in excess of the URS. Other PAHs that exceeded the URS were limited to the areas near SS-14.
- Volatile organic compounds ("VOCs") were not detected above the URS.
- Polychlorinated biphenyls ("PCBs") and pesticides were generally not present in the Site media. The exception to this was the presence of the pesticide aldrin in sediments above the URS for sediments. Aldrin was detected in sediment samples collected upstream from the Site indicating an off-site source for this constituent.
- Several metals, benzo(a)pyrene and one (1) VOC had been detected in groundwater in MW-107 at levels above the URS for groundwater; however, groundwater is only encountered intermittently due to it being almost entirely contained within the fractures of the Wilmington Complex underlying the Site. Furthermore, although groundwater is a potential pathway for exposure, the intermittent groundwater conditions indicate that it is not a significant pathway.
- Asbestos was detected in one of the 18 shallow soil samples collected during the RI.

The contaminants identified as exceeding the URS criteria were primarily located in the surface and subsurface soils, and included several PAHs and several metals. With the exception of the area around SS-14, which included exceedences of several other PAHs, the COPCs across the Site were benzo(a)pyrene and arsenic.

A baseline risk assessment, completed as part of the RI report, assessed human health risk. Figure 3 summarizes the human health risk COPCs for surface and subsurface soil at the Site.

The Regulations have established a value of 1.0×10^{-5} as the acceptable maximum limit for excess lifetime carcinogenic risk. The estimated incremental potential risks using reasonable maximum exposure ("RME") assumptions for the industrial worker under current land use considerations were less than 1.0×10^{-5} , within the acceptable risk. This assumes that the soils in the area of TP-10 and SS-14 will be removed as part of the remedy for this property. Comparatively, RME risk estimates for the hypothetical construction worker (less exposure) under future land use considerations were less than 1.0×10^{-6} . This result indicates that incremental carcinogenic risks are unlikely with industrial worker exposure to baseline conditions at the Site. The potential risk calculations and Hazard Index (HI) estimates for the exposure pathways quantified are summarized in the RI report.

A benthic macroinvertebrate bioassessment was performed on September 27, 1999 to evaluate the ecological risk to the Brandywine Creek, adjacent to the Site. The assessment followed United States Environmental Protection Agency ("USEPA") protocols outlined in *Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish* (USEPA document EPA 444/4-89/001,1989). EA Engineering Science and Technology collected biological samples at two locations chosen by the DNREC-SIRB. Based on the overall score produced by this assessment, the downstream score is 85% of the reference score, which classifies it in the nonimpaired biological condition category. Therefore, it was concluded that the Site is not adversely impacting biota in the Brandywine Creek.

According to HSCA Regulation 8.4(1), remedial action objectives must be established for all Plans of Remedial Action. The remedial action is evaluated utilizing both Qualitative and Quantitative Objectives. The following considerations were taken into account in the development of the Qualitative and Quantitative Objectives:

- The Site is an on-going industrial facility; and
- The Site is located adjacent to the Brandywine Creek.

The Qualitative Objectives for this Site are:

- Minimize potential exposure to construction or other workers who may be exposed to surface or subsurface soils;
- Maintain control of the Site to prevent non-industrial uses;
- Minimize potential erosion of contaminated sediments into the Brandywine Creek; and
- Minimize potential contaminated surface water run-off into the Brandywine Creek.

Based on the Qualitative Objectives, Quantitative Objectives are established that DNREC-SIRB determines will meet the Qualitative Objectives. For the Site, a site-specific baseline risk assessment was performed, which enabled RMT to establish Remedial Goal Options ("RGOs") for the Site. RGOs are media-specific remediation concentrations estimated from each COPC identified from the Site-specific baseline risk evaluations. The Site-specific RGOs are calculated to represent an acceptable Site-wide average concentration estimate for each COPC. The RGOs

were derived following USEPA guidance (Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, June 1997 update).

COPCs for the soils at the WPD Site were identified from the RME risk calculations for the industrial worker and were limited to arsenic and the semivolatile organic constituent, benzo(a)pyrene. The calculated incremental carcinogenic risk and HI for the hypothetical exposure of a construction worker to the WPD Site were less than 1.0×10^{-6} and 1, respectively. As a result, there were no COPCs identified for any of the exposure pathways associated with the hypothetical construction worker.

The risk-based RGOs for the soil COPCs were derived using the RME industrial worker exposure assumptions (i.e., worst case scenario) relied upon in the baseline risk assessment to maintain the most conservative/protective approach for the FS. The risk-based RGOs for the Site are depicted in Figure 4.

The extent of remediation will be based on the RGOs discussed above using risk levels prescribed in Section 4 of the HSCA Guidance Manual. Specifically, areas to be addressed will be those that exceed the 1.0×10^{-5} cancer risk level or a HI of 1. Since SS-14 and TP-10 were the only areas to exceed a 1.0×10^{-5} cancer risk level, they will be the only areas where excavation is necessary. Since the Site-specific baseline risk assessment demonstrated that the incremental cancer risk at other areas of the Site were less than 1.0×10^{-5} , other alternatives such as no action, deed restrictions, soil treatment and engineered barriers were considered for the Site.

Five remedial alternatives were identified to address the RAOs. The alternatives identified for the surface and subsurface soil contaminants were as follows:

- No Action;
- Institutional Controls;
- Soil Removal and Disposal;
- Soil Treatment; and
- Engineered Barrier.

Each of the remedial options was evaluated based on technical practicability. Specific process options for these technologies were screened based on effectiveness, operational ease, reliability and cost.

Based on the evaluation, the "No Action" approach was not considered because it was not effective in protecting human health and the environment. The soil treatment (soil washing) approach was not considered due to hydrogeologic conditions at the Site. DNREC-SIRB determined in the Final Plan that the following remedial actions used in combination for specific areas of the Site would meet the Remedial Action Objectives for the Site:

- Institutional Controls (Deed Restriction) - Institutional controls would be implemented in the form of a deed restriction requiring that the future use of the property is consistent with its current use. This would ensure that the risk assessment conclusions that were based on industrial and construction worker exposure would remain valid.

- Soil Removal and Disposal - Exposure to COPCs would be eliminated by excavating and disposing of soil. The excavation would be back-filled with clean fill.
- Engineered Barrier (Capping) - Industrial worker exposure to COPCs would be eliminated by interrupting the exposure pathway. This approach would place a concrete layer over areas where COPCs were evaluated and routine exposure to the industrial worker would be possible. At areas where asphalt paving currently exists, this may involve the repair or upgrade of the asphalt surface. An Operations & Maintenance Plan (“O&M”) in order to periodically inspect the repaired or upgraded areas, would be required.
- Engineered Barrier (Drainage Control) - Limiting the transport of surface contaminants through open drainage ditches would minimize further degradation of sediment and surface water. This includes lining the existing, naturally occurring drainage ditches with concrete to eliminate erosion of impacted soil. Additionally, barriers would be installed to limit storm water flowing onto the Site from adjacent properties. Storm water that flows across the eastern portion of the Site would be channeled through a sand filter to minimize the amount of suspended solids entering the Brandywine Creek. The appropriate permits will be applied for by WPD.

The details of each remedial action as evaluated were contained in RMT’s FS for the Site.

During the Remedial Action phase of the project, it was determined that two of the steps previously mentioned were not sufficient to deal with the contamination at the Site. Therefore, the requirement to excavate all contaminated soil in the area of SS-14, and the type of deed restriction are being revised in this Revised Final Plan. Based on the underlying geological formation, underground utility lines and the building foundation in the area of SS-14, as defined in the Final Plan, dated April 2000, DNREC-SIRB determined that it was not feasible to remove all the soil that may contain low levels of contamination. In order to reduce the potential risk of exposure to any contamination remaining in place, the excavated area is to be filled with clean fill and the concrete storm water culvert will be placed over the area. To further reduce the risk, the deed restriction will be expanded to include the following language:

There shall be no digging, drilling, excavating, grading, constructing, earth moving, utility repair, removal or any other land disturbing activities on the Site without the prior written approval of the DNREC-SIRB.

As a result, DNREC-SIRB is issuing this Revised Final Plan of Remedial Action to incorporate changes to the original Final Plan, dated April 2000.

IV. REVISED PROPOSED AND FINAL PLANS OF REMEDIAL ACTION

Based upon the information obtained during the remedial action at the Site, DNREC-SIRB has determined that the Final Plan, dated April 2000, requires modification. All of the remediation actions in the April 2000 Final Plan shall remain in effect, and the following additional remedial actions will be required as part of the Revised Final Plan:

- Expand upon the deed restriction to prohibit any digging, drilling, excavating, grading, constructing, earth moving, utility repair, removal or any other land disturbing activities on the Site without the prior written approval of the DNREC-SIRB; and
- Excavate the contaminated soil in the vicinity of SS-14 to the point of refusal, based on Site conditions, and properly dispose of material off-site, place clean fill in the excavated area of SS-14, place the concrete storm water culvert over a portion of the area, and provide a deed restriction, as stated in the action listed above.

This revision meets or exceeds all the criteria utilized in the evaluation of remedial alternatives that is conveyed in Subsection 8.5 of the Regulations, and is the most cost-effective remedy. Additional information regarding the evaluation of the remedial criteria is contained in the RMT FS for the Site.

V. PUBLIC PARTICIPATION

The Department of Natural Resources and Environmental Control actively solicited public comments or suggestions on the Revised Proposed Plan of Remedial Action and welcomed opportunities to answer questions.

The public comment period began on September 26, 2001 and ended at 4:30 pm on October 16, 2001. No comments were received for the Revised Proposed Plan of Remedial Action. A public hearing was not requested.

VI. DECLARATION

This Revised Final Plan of Remedial Action for Bancroft Mills/Wilmington Piece Dye Site is protective of human health and the environment and is consistent with the requirements of the Delaware Hazardous Substance Cleanup Act ("HSCA").



John Blevins

Director, Division of Air & Waste Management

10-30-01
Date

Operator Name: lucidos
 Scale: 1" = 2000'
 Drawing Name: J:\69452\04\0401.dwg
 Plot Time: 08:17.3089 AM
 Attached Xref's: No xref's Attached.
 Dwg Size: 98958 Bytes
 Plot Date: Thursday, November 4, 1999



DELAWARE



QUADRANGLE LOCATION



SCALE IN FEET

SOURCE:

BASE MAP DEVELOPED FROM THE WILMINGTON NORTH, DELAWARE-PENNSYLVANIA 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP, DATED 1993.



WILMINGTON PIECE DYE
 WILMINGTON, DELAWARE

SITE LOCATION MAP

DRAWN BY:	SJL
APPROVED BY:	JLA
PROJECT NUMBER:	69452.04
FILE NUMBER:	0401.DWG
DATE:	NOVEMBER 1999

FIGURE 1

FIGURE 3
Summary of Constituents of Potential Concern

SEMIVOLATILE ORGANIC CONSTITUENTS	INORGANIC CONSTITUENTS
Surface Soil	
Benzo(a)pyrene	Aluminum
Benzo(b)fluoranthene	Arsenic
Benzo(a)anthracene	Iron
Dibenzo(a,h)anthracene	Lead
Indeno(1,2,3-cd)pyrene	
Subsurface Soil	
Benzo(a)pyrene	Aluminum
Benzo(a)anthracene	Arsenic
Benzo(b)fluoranthene	Beryllium
Indeno(1,2,3-cd)pyrene	Iron

**Figure 4
Remedial Goal Options for Soils
Industrial Worker**

CONSTITUENT OF CONCERN	EXPOSURE POINT CONCENTRATION (mg/kg)	CARCINOGENIC RISK ⁽¹⁾	REMEDIAL GOAL OPTIONS (mg/kg) CARCINOGENIC ⁽²⁾ TARGET RISK		HAZARD QUOTIENT ⁽³⁾	REMEDIAL GOAL OPTIONS (mg/kg) NON-CARCINOGENIC ⁽⁴⁾ TARGET HAZARD QUOTIENTS		
			1E-05	1E-06		0.1	1	3
Inorganics Arsenic	5.94	1.11E-06	54	5	0.006	99	990	2970
Semivolatile Organics Benzo(a)pyrene	0.9	2.97E-06	3	0.3	NC	NA	NA	NA

(1) Carcinogenic Risk is the cumulative risk of the ingestion, dermal, and inhalation exposure pathways

(2) RGO = Exposure Point concentration * (Target Risk / Calculated Risk)

(3) Hazard Quotient is the cumulative hazard of the ingestion, dermal, and inhalation exposure pathways

(4) RGO = Exposure Point Concentration * (Target Hazard Quotient / Calculated Hazard Quotient)

NC = A Hazard Quotient was not calculated for this constituent due to a lack of toxicity values.

NA = Not applicable.

Figure 5
Summary of Probable Costs for Remedial Alternatives
Wilmington Piece Dye

Alternative #	Remedial Alternative	Total Capital Cost	O&M Costs Over 10 Years	Total Present Worth Over 10 Years
1	Deed Restriction	\$ 2,000	\$ -	\$ 2,000
2	Excavate/Dispose soil at SS-14 and TP-10	\$ 40,000	\$ -	\$ 40,000
3	Cap	\$ 20,000 - 200,000	\$ 20,000	\$ 40,000 - 220,000
4	Drainage Control	\$ 59,000 - 68,000	\$ 10,000	\$ 69,000 - 78,000