

REPORT

Phase III Completion Report



**PPL – Martins Creek Steam Electric Station
Lower Mount Bethel, PA**

May 2006

Table of Contents

Acronyms and Abbreviations	1
Executive Summary.....	1
Section 1. Introduction	1-1
1.1 Background.....	1-1
1.2 Summary of Previous Cleanup Activities	1-2
1.2.1 Oughoughton Creek	1-2
1.2.2 Easton Water Authorities Intake Structure	1-2
1.2.3 Phase I.....	1-2
1.2.4 Phase II.....	1-3
1.3 Review of Regulatory Interactions for Phase III Activities.....	1-3
Section 2. Oughoughton Creek Cleanup Activities.....	2-1
Section 3. Procedures to Define Phase III Scope of Work.....	3-1
3.1 Pool 1 and Pool 2 Delineation	3-1
3.1.1 Initial Delineation – September 2005	3-1
3.1.2 First Reassessment– November 2005.....	3-2
3.1.3 Second Reassessment – January 2006.....	3-3
3.2 Phase III Work Plan.....	3-3
3.3 Phase III Work Plan Modifications.....	3-4
Section 4. Phase III Operations	4-1
4.1 Dive Platforms	4-1
4.2 Establishing Dredge Locations.....	4-2
4.3 Vacuum Dredging Operations	4-2
4.4 Pump Station System to Ash Basin 4.....	4-2
4.4.1 Pump Station 3.....	4-3
4.4.2 Pipeline Winterization.....	4-3
4.5 Delaware River Conditions Affecting Dredge Operations	4-3
4.6 Monitoring of Dredge Operations	4-4
4.7 Safety Considerations	4-4
Section 5. Phase III Results and Accomplishments.....	5-1
5.1 Pool 1 Removal Activities	5-1
5.1.1 Equipment Used and Dates of Operation.....	5-1
5.1.2 Pool 1 Removal Summary.....	5-1
5.2 Pool 2 Removal Activities	5-2
5.2.1 Equipment Used and Dates of Operation.....	5-2
5.2.2 Pool 2 Removal Summary.....	5-2

5.3	Total Removal Summary	5-3
5.4	Demobilization and Site Restoration	5-3
5.4.1	Martins Creek Boat Access Area	5-3
5.4.2	Williams-Gillespie Property.....	5-3
5.4.3	Sanico Property	5-4
5.4.4	Hutch Property.....	5-4
5.4.5	Joe Smith Property	5-4
5.4.6	Pipeline to Ash Basin 4.....	5-4
5.4.7	Temporary Bridge for DuPues Road	5-4
5.4.8	Upland Areas.....	5-4
5.4.9	Temporary Roadways	5-5
Section 6.	Summary	6-1
Section 7.	References	7-1

Attachments

- 1 Phase III Permits
- 2 Phase III Work Plan (Final)
- 3 Bimonthly Update Reports to PADEP
- 4 Oughoughton Creek Removal Area
- 5 Sediment Characterization Drawings
- 6 Phase III Project Timeline
- 7 Photo Log of Phase III Activities
- 8 Dive Platform Layout Drawings
- 9 Ash Removal Production Field Forms
- 10 Quality Assurance/Quality Control Plan (Dredge Operations)
- 11 Dredge Operations Daily Summary Reports
- 12 Completed Dredge Areas and Volumes – Summary Tables
- 13 Completed Dredge Areas and Volumes – Summary Figures

Acronyms and Abbreviations

BBL	Blasland, Bouck & Lee, Inc.
cfs	cubic feet per second
cy	cubic yard
DRBC	Delaware River Basin Commission
EWA	Easton Water Authority
GPS	global positioning system
HDPE	high-density polyethylene
NCSCD	Northampton County Soil Conservation District
NJDEP	New Jersey Department of Environmental Protection
NRD	Natural Resource Damage team
PADEP	Pennsylvania Department of Environmental Protection
PVC	polyvinyl chloride
sf	square feet
Shaw	Shaw Environmental and Infrastructure, Inc.
USACE	United States Army Corps of Engineers
USGS	United States Geological Service

Executive Summary

This *Phase III Completion Report* summarizes work completed during Phase III cleanup activities completed in the Delaware River (River) as part of the emergency response effort focused on removal of fly ash in the River. The cleanup activities were performed in response to the August 23, 2005 release of fly ash to the River from PPL's Martins Creek Steam Electric Station (Plant). This report includes a presentation of the procedures and results of cleanup activities conducted in Oughoughton Creek and portions of the Delaware River from August 2005 through March 2006.

Oughoughton Creek cleanup activities were conducted as part of the initial emergency response to the August 23, 2005 release. Removal of ash from the dry Oughoughton Creek bed was completed with emergency permit approvals due to concerns with the forecasted weather which called for possible severe weather from the remnants of Hurricane Katrina. Bulk fly ash deposits were removed from the dry creek bed using conventional earth moving equipment and laborers equipped with hand tools consisting of shovels, hand spades, and small trowels. All material removed from Oughoughton Creek was transported to Ash Basin 1 for disposal. The overall area of the creek that was disturbed is estimated to be approximately 69,000 square feet. The estimated volume of suspected ash removed is approximately 2,555 cubic yards. The bulk excavation of fly ash from the Oughoughton Creek was completed on September 6, 2005.

PPL's initial characterization program conducted within the Delaware River in September 2005 identified two primary suspected fly ash deposits. These two areas were located within 1½ miles of the Ash Basin 4 discharge structure and were designated Pool 1 and Pool 2. Pool 1 was approximately 2,600 feet in length and covered approximately 19 acres of area. Pool 2 was approximately 3,100 feet in length and covered approximately 20 acres of area. Two significant high-flow events in October 2005 and January 2006 necessitated two reassessments to evaluate a redistribution of the remaining deposits of suspected fly ash and to further aid the development of the final Phase III Work Plan.

Using the results of the initial reconnaissance activities and two subsequent reassessments required as a result of changing river conditions, PPL developed work plans outlining the procedures and equipment which would be utilized during Phase III activities to recover suspected ash from Pools 1 and 2. PPL worked with the United States Army Corps of Engineers (USACE), the Pennsylvania Department of Environmental Protection (PADEP), New Jersey Department of Environmental Protection (NJDEP), the Delaware River Basin Commission (DRBC), and local townships to obtain the permits and work plan approvals necessary to characterize the extent of the ash release and to conduct Phase III cleanup operations. In order to simplify the overall interaction with the regulatory agencies and the Natural Resource Damage (NRD) team, the PADEP took the lead for all interactions between PPL and the NRD team members. All key documents and interactions were coordinated through the PADEP, who distributed to all NRD team members and coordinated a single response to PPL. Phase III work plans were submitted to PADEP in several iterations beginning in September 2005 to address NRD team member comments and to address changes in river conditions. The final *Phase III – Delaware River Fly Ash Release Recovery Operations Work Plan* (PPL, 2005f) was submitted on December 12, 2005 and approved for implementation by the NRD team on December 14, 2005.

The initial draft Phase III Work Plan (PPL, 2005c) outlined the use of diver-assisted vacuum dredging for the removal of suspected ash deposits from Pools 1 and 2 in the Delaware River. The final Phase III Work Plan (PPL, 2005f) specified the construction of up to three dive platforms to support diver-assisted vacuum dredging operations. Each dive platform had a representative from Shaw Environmental and Infrastructure, Inc., on board at all times to direct the diver-assisted vacuum dredging and track removal rates and locations. The removal locations were recorded by collecting GPS coordinates of the dive platform, and visually estimating the position

of the divers relative to the dive platform working in 10-foot by 10-foot grids. Commercial hard-hat divers operated a submersible pump to vacuum a slurry of grey material suspected to be fly ash, sediment, and water from the river bottom. The slurry was ultimately transported to Ash Basin 4 for disposal via high-density polyethylene (HDPE) pipe. The slurry was pumped to one of two shoreline-based screening and pumping stations and screened to remove larger solids at the first pumping station(s) before being pumped to a second pumping station and ultimately to Ash Basin 4 for disposal. The larger sized materials recovered at the first pumping station(s) were transported by truck to Ash Basin 4 for disposal throughout Phase III operations.

Diver-assisted vacuum dredging was completed over 83 operating days in Pools 1 and 2 beginning on November 7, 2005 and ending March 11, 2006. Approximately 56,500,000 gallons of slurry were pumped to Ash Basin 4 during Phase III activities. The amount of suspected ash recovered was approximately 379 cubic yards over 47,117 square feet in Pool 1 and 909 cubic yards over approximately 100,270 square feet in Pool 2.

The total amount of suspected ash removed during the Phase III diver-assisted vacuum dredge operations and Oughoughton Creek cleanup activities was approximately 3,843 cy recovered over approximately 147,387 square feet (approximately 3.4 acres) of the river bottom and 69,000 square feet (approximately 1.6 acres) of the Oughoughton Creek channel bottom.

1. Introduction

The purpose of this *Phase III Completion Report* (report) is to summarize Phase III Delaware River (River) cleanup activities that PPL completed as part of the emergency response effort focused on removal of fly ash from the dry Oughoughton Creek bed and from the Delaware River, and to provide the necessary removal documentation required by the Natural Resource Damage (NRD) team. The cleanup activities were performed in response to an August 2005 release of fly ash from Ash Basin 4 that occurred at PPL's Martins Creek Steam Electric Station (Plant). This report includes a presentation of the procedures and results of cleanup activities conducted in Oughoughton Creek and portions of the Delaware River from August 2005 through March 2006. Activities associated with other phases of the cleanup activities have previously been presented in other documents, the relevant portions of which are briefly discussed in Section 1.2.

Following this introduction, this report presents the results of Phase III activities conducted in the Delaware River.

- Section 2 presents cleanup activities conducted for Oughoughton Creek.
- Section 3 presents the procedures used to define and refine the Phase III scope of work.
- Section 4 presents the equipment and methods used to conduct Phase III diver-assisted vacuum dredging operations in the Delaware River.
- Section 5 presents the results and accomplishments of the Phase III diver-assisted vacuum dredging operations, including the removal areas and quantity of material removed.
- Section 6 presents a summary of the Phase III activities.
- Section 7 presents the documents referenced in this report.

1.1 Background

On August 23, 2005 one of the wooden stop-log components of the main ash basin's discharge control structure failed within Ash Basin 4 at PPL's Martins Creek plant. This release resulted in the discharge of a mixture of water and fly ash, estimated at approximately 100 million gallons, from Ash Basin 4. The resulting release deposited ash onto PPL-owned land, onto the dry channel bottom of Oughoughton Creek, and into the Delaware River in the immediate vicinity of the Ash Basin 4 discharge control structure.

PPL responded proactively to address issues related to the release and implemented a scientific investigation to characterize the potential impacts and conduct emergency response actions to remove bulk fly ash deposits from the river and upland areas. Area roadways that were impacted with fly ash have been repeatedly swept and washed. Fly ash has been removed from agricultural areas, open ground, drainage swales and Oughoughton creek and those areas have been restored.

To date, PPL has removed ash from PPL-owned land, Oughoughton Creek, the river bottom near the Easton Water Authorities (EWA) intake structure, and the Delaware River in close proximity to and immediately downstream from the Ash Basin 4 discharge control structure. The Delaware River cleanup operations have been conducted via a phased approach, as follows:

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- Initial emergency response: Performed from August 25, 2005 through September 15, 2005, consisting of containment and removal of bulk ash deposits from along the Delaware River shoreline using booms, straw bales, vacuum trucks, and laborers using hand tools (e.g., shovels, pumps).
 - Phase I: Excavation “in the wet”, consisting of removal of suspected fly ash and impacted river sediment from along and within the Delaware River in the immediate vicinity of the Ash Basin 4 discharge structure.
 - Phase II: Excavation “in the dry”, consisting of excavation and removal of suspected fly ash and impacted river sediment. This work was conducted in the Delaware River from within a temporary dam structure which encompassed an area of approximately 2.5 acres near the Ash Basin 4 discharge structure.
 - Phase III: Cleanup via vacuum dredging, consisting of removal of recoverable (i.e., bulk) suspected fly ash deposits and impacted river sediment. The suspected fly ash depositional areas were located at discrete areas immediately downstream from the Ash Basin 4 discharge structure to approximately 1½ miles downstream from the discharge structure. The discrete areas were located in two areas referred to as Pool 1 and Pool 2. The identification and delineation of recoverable fly ash present in Pools 1 and 2 are described further in Section 3.
 - Phase IV: The Phase IV activities will be conducted to evaluate the presence and potential impacts of any residual fly ash remaining in the Delaware River through performance of supplemental characterization activities from upstream of the Ash Basin 4 discharge control structure to Trenton, New Jersey. Phase IV activities will determine if any final actions may be required in response to the August 23, 2005 release.

1.2 Summary of Previous Cleanup Activities

Previous cleanup activities have been performed on PPL-owned land, Oughoughton Creek, the river bottom near the EWA intake structure, and the Delaware River near the Ash Basin 4 discharge structure (referred to as the Phase I and Phase II removal activities). A brief summary of these cleanup activities follows.

1.2.1 Oughoughton Creek

As part of the emergency ash cleanup activities commenced immediately after the August 23 release was discovered, PPL removed ash that had settled onto PPL-owned land and into the dry channel bottom of Oughoughton Creek. During this portion of the cleanup, approximately 2,555 cubic yards (cy) of ash were removed from the Oughoughton Creek over approximately 69,000 square feet (sf) of the channel bottom. This portion of the cleanup activities is described more fully in Section 2.

1.2.2 Easton Water Authorities Intake Structure

PPL proactively removed a small pocket of grey material located near the EWA intake structure that was identified during the initial river assessment activities (the assessment activities are described further in Section 3.1). From September 20 through 23, 2005, a team consisting of divers and personnel from Shaw Environmental and Infrastructure, Inc. (Shaw), Onyx Environmental, and Lewis Environmental removed approximately 15,000 gallons of slurry containing suspected ash and impacted sediment located near the water intake and surrounding areas using a diver-assisted vacuum dredging process. The removed slurry was transported back to PPL’s Ash Basin 4 for disposal. Further details of this removal program are presented in the *Easton Water Authority – Summary of Work Completed 9/20 through 9/23* submitted by PPL to the PADEP on October 20, 2005 (PPL, 2005a).

1.2.3 Phase I

Phase I of the river cleanup was completed from September 16, 2005 to September 19, 2005. Phase I consisted of excavation and removal of bulk deposits of suspected ash and impacted river sediment from along and within

the Delaware River in the immediate vicinity of the Ash Basin 4 discharge structure. Excavation was performed “in the wet” using excavators with a reach of approximately 50 feet. All operations were performed inside a turbidity curtain to contain suspended solids and to minimize disturbance to the river. Bulk deposits of suspected ash were scraped from the river bottom, drained, and brought to Ash Basin 4 for disposal. Larger rocks were removed from the excavated material, cleaned, and used during restoration.

Thirty-four truck loads of suspected ash and impacted river sediment were removed from the river during the Phase I operations. At an average weight of 13 tons per truck load, approximately 442 tons of suspected ash were removed during the Phase I operations. A summary of the work performed was documented in a Phase I Report (PPL, 2005b) submitted to the PADEP on October 4, 2005.

1.2.4 Phase II

The Phase II portion of the work began on September 19, 2005 and was essentially completed on October 7, 2005. Phase II consisted of installation of a temporary dam structure (“Portadam”) in the river, in the vicinity of the Ash Basin 4 discharge structure and the mouth of Oughoughton Creek. The area confined by the Portadam was dewatered, the suspected ash and impacted river sediment from within the Portadam was excavated “in the dry” using conventional earth moving equipment, and the area restored. The Portadam area was divided into two cells and covered an area of approximately 2.5 acres.

High-flow events in the river in October 2005, caused by precipitation from the remnants of tropical storm Tammy, forced the temporary discontinuation of the Phase II work until river conditions returned to levels that allowed safe entry by the work crews. Prior to this storm event, an estimated 2,750 tons of sediment and suspected ash was recovered during Phase II work activities.

On October 26, 2005, PPL requested PADEP authorization to close out Phase II with the removal of the Portadam and restoration of the river bottom using washed river rock. On November 4, 2005, the PADEP granted PPL approval via e-mail to conduct vacuum dredging in the Phase II area and just downstream of the Portadam in order to remove the suspected ash that was left in place following completion of the initial Phase II operations. The results of the Phase II work were documented in a Phase II Report (PPL, 2006a) submitted to the PADEP on March 20, 2006.

1.3 Review of Regulatory Interactions for Phase III Activities

PPL worked with the United States Army Corps of Engineers (USACE), the PADEP, New Jersey Department of Environmental Protection (NJDEP), the Delaware River Basin Commission (DRBC), and local townships to obtain the permits and work plan approvals necessary to characterize the extent of the ash release and to conduct Phase III cleanup operations. In order to simplify the overall interaction with the regulatory agencies and the Natural Resource Damage (NRD) team, the PADEP served as the primary contact for all interactions between PPL and NRD team members. Permits obtained to conduct the Phase III activities are included in Attachment 1.

All key documents and interactions were coordinated through the PADEP. Phase III work plans were submitted to PADEP in several iterations to address NRD team comments and to address changes in river conditions resulting from several extreme weather events. Work plan submittals include the following:

- *Draft Phase III – Delaware River Fly Ash Release Recovery Operations* (PPL, 2005c, submitted September 24, 2005);
- *Phase III Reassessment Plan* (PPL, 2005d, submitted October 20, 2005);
- *Updated Phase III Work Plan– Delaware River Fly Ash Release Recovery Operations* (PPL, 2005e, submitted November 29, 2005); and

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- Final *Phase III Work Plan – Delaware River Fly Ash Release Recovery Operations* (PPL, 2005f, submitted December 12, 2005).

The final Phase III Work Plan (PPL, 2005f) is included in Attachment 2.

Bimonthly update reports were submitted to PADEP throughout the duration of Phase III activities. These reports are included in Attachment 3.

The reporting requirements outlined in the final Phase III Work Plan include preparation of a report detailing the removal operations for submittal to PADEP within 60 days of the completion of Phase III activities. As required by the permitting process, this report describes the overall operations, total estimated ash and sediment removed, areas dredged, estimated quantity of water pumped to Ash Basin 4, deviations from the work plan, and other supporting information where relevant.

2. Oughoughton Creek Cleanup Activities

Oughoughton Creek is an intermittent creek which discharges to the Delaware River. During the August 23, 2005 release, water containing fly ash flowed out from the top of several manholes from the Ash Basin 4 discharge pipe, flowed across farm fields, and entered the creek bed near the properties of Elizabeth Bush and Levi Nicholas. Fly ash settled in pockets at multiple locations along the creek. Removal of ash from the dry Oughoughton Creek bed was completed with emergency permit approvals due to concerns with the forecasted weather which called for possible severe weather from the remnants of Hurricane Katrina.

In anticipation of the remnants of Hurricane Katrina, a check dam was constructed in the creek bed near the Delaware River to mitigate the potential for fly ash present in the dry creek bed from being washed into the River. A small sump area, 6-foot by 6-foot by 3-foot (4 cy), was created by the check dam and two (one primary and one backup) 1,000-gallon per minute pumps with floats were installed. The pump discharge was piped to the existing plant Ash Basin 1 before all placement of material into Ash Basin 1 was ceased. Frac tanks and vacuum trucks were also onsite as an additional contingency should both pumps fail. It never became necessary to utilize the pumps during the cleanup, as the remnants of the hurricane did not produce precipitation.

Initial efforts were focused on the removal of the bulk areas of fly ash deposition in both the upland areas and from Oughoughton Creek. Bulk removal was initiated with construction of temporary access roads to allow access to the creek by heavy excavation equipment. Materials removed from Oughoughton Creek were transported to Ash Basin 1 for disposal.

Because the remnants of the hurricane did not produce precipitation, the decision was made to continue excavation of the remaining deposits of fly ash from the creek bed. Bulldozers, dump trucks, and excavators were used to complete removal of the bulk fly ash deposits. Laborers equipped with hand tools consisting of shovels, hand spades, and small trowels walked the creek bed cleaning any small areas the excavating equipment could not access. Several areas of large rocks were washed to remove any remaining deposits of fly ash. The area of the creek that was disturbed is estimated to be approximately 69,000 sf over 6,200 linear feet of the creek bed (see Attachment 4). The estimated volume of suspected ash removed is approximately 2,555 cy.

The bulk excavation of fly ash from the Oughoughton Creek was completed on September 6, 2005. Subsequently, erosion and sedimentation control measures were developed through discussions with the Northampton County Soil Conservation District (NCSCD) and with PADEP. Based on the recommendations of the NCSCD and PADEP, portions of Oughoughton Creek shoreline were seeded and mulched, and large boulders in select areas were returned to the creek bed. All access roads were addressed to control noted erosion and sedimentation concerns and restrict access by vehicle. In addition to the removal of ash deposits, efforts were also taken to address natural areas of bank erosion during restoration of the creek.

3. Procedures to Define Phase III Scope of Work

Several methods were used to determine the presence and extent of recoverable fly ash deposits when conducting the various studies related to the August 23, 2005 release. These methods consisted of sediment probing, obtaining sediment cores, visual observation, and chemical and microscopic analysis. Because the physical nature of fly ash (i.e., a fine grained grey material) is similar in color and grain size to some of the natural sediment found in the Delaware River, ash deposits could not always be positively identified in the field. Therefore, during field reconnaissance, areas of “grey material” that were suspected to contain fly ash were noted. For select samples, the presence of fly ash in the grey material was determined through laboratory and/or microscopic analysis. The following sections summarize the river characterization studies performed to delineate the presence and extent of suspected fly ash (herein referred to as grey material) in the Delaware River sediments.

3.1 Pool 1 and Pool 2 Delineation

In September 2005, PPL’s initial characterization program included several sampling and reconnaissance activities to determine the presence and extent of grey material in the river sediments adjacent to and downstream of the point of release, as noted through visual observation. Two significant high-flow events in October 2005 and January 2006 necessitated additional reconnaissance activities to evaluate whether these high-flow events may have caused a redistribution of the remaining deposits of grey material, particularly in the Phase III work area.

3.1.1 Initial Delineation – September 2005

From September 7 through 16, 2005, Shaw and Normandeau Associates, in conjunction with divers from Underwater Screening Services, implemented a diver-assisted reconnaissance program from the point of release downstream to the confluence of the Lehigh and Delaware Rivers in Easton, Pennsylvania, covering approximately 11 miles of river length. The objective of the investigation was to assess and document the presence and extent of grey material within the river, targeting the more quiescent, deeper areas of the river where fly ash deposition was most likely to have occurred. A series of transects were established and assessed at discrete locations selected as those most likely to have ash deposition. To provide more complete coverage, shallow areas were also visually assessed from boats. The location of all assessment points were recorded using global positioning system (GPS) coordinates.

The results of the initial delineation identified two areas of deposition of grey material, denoted as Pool 1 and Pool 2, located within approximately 1½ miles of the point of the fly ash release. Pools 1 and 2 were defined as areas containing grey material more than 2 to 3 inches thick. Pool 1 contained grey material extending approximately 2,600 feet, from the release area at the Ash Basin 4 discharge structure to immediately upstream of a shallow rapids area located approximately ½-mile downstream from the release area. The area of Pool 1 was approximately 19 acres. Pool 2 contained grey material that extended downstream from the shallow rapids area and terminated several hundred yards upstream from Kiefer Island. Pool 2 was approximately 3,100 feet in length and covered approximately 20 acres of area. The Pool 1 and 2 areas delineated by the September 2005 reconnaissance are presented in Attachment 5 as Figure 1.

No pockets of deposition of grey material greater than ½-inch thick were observed downstream from Pool 2, with the exception of an area immediately adjacent to a boom near the EWA intake. The EWA pocket of grey material was approximately 2-3 inches thick and diminished to ¼ inch just 6 to 12 inches away from the boom. This material was removed by vacuum dredging shortly after its presence was noted, as described in Section 1.2.2.

3.1.2 First Reassessment– November 2005

Beginning on October 7, 2005, remnants of tropical storm Tammy created a significant precipitation event (approximately 10+ inches over 24 hours) across the Delaware River Basin. The precipitation increased flows at the nearby U.S. Geological Service (USGS) Belvidere, NJ gage station from less than 2,000 cubic feet per second (cfs) to a peak flow of more than 44,000 cfs, recorded on October 9, 2005. This was followed less than a week later by additional rain events that increased the river flow to approximately 45,000 cfs on October 14, 2005 at the Belvidere gage. Later in the month (October 26) another high-flow event occurred resulting in a peak flow of 34,200 cfs. A desktop simulation of river hydraulics and sedimentation processes suggested that these high-flow events had the potential to change the physical conditions of the river bottom and may have caused a redistribution of deposits of grey material in the river (i.e., natural recovery of the river bottom), particularly in the Phase III work area (i.e., Pools 1 and 2).

As a result of the October high-flow events, post-storm investigations were conducted once river flows had returned to safe levels for diver-assisted and boat-based operations. On November 1, 2005, PPL and the PADEP discussed via conference call the *Phase III Reassessment Plan* (PPL, 2005d) that was submitted on October 20, 2005. The objective of the plan was to reassess the river for deposits of grey material previously delineated in Pools 1 and 2 prior to the October high-flow event, so that a revised Phase III Work Plan could be developed. The post-storm reassessment was conducted by Blasland, Bouck, and Lee, Inc. (BBL) with Seaway Divers from November 4 through 22, 2005.

The reassessment was performed at each of the discrete locations surveyed during the initial assessment performed in September 2005. GPS coordinates collected during the September 2005 assessment were used to relocate the assessment points, and a hard-hat diver observed an approximate 15-foot radius around each location. The diver reconnaissance included video documentation, sediment probing, and the collection of sediment cores at the locations with sufficient sediment thickness to allow the collection of a sample.

During the November reassessment, the assessment team noted that the previously observed points in Pools 1 and 2 located in deeper water toward the center of the river did not have continuous deposits of grey material. However, some locations in shallower water near the shorelines were characterized by continuous deposits of grey material. As a result of this finding, the assessment team conducted a detailed reconnaissance of the near-shore areas. A diver observed near-shore areas at five-foot intervals along the entire length of the original Pool 1 and 2 areas. At each interval, the diver traversed perpendicular to the shore from the shoreline to a river depth where neither sediment nor grey materials were observed. During the reassessment, the diver placed concrete blocks on the river bottom with surface buoys attached to outline the recoverable deposits of grey material. As described in the approved Phase III Work Plan (PPL, 2005f), recoverable deposits of grey material were defined as pockets identified with clearly defined layers of grey material (i.e., not interstitially mixed), where a minimum of 1 cubic yard of grey material is present, and where the majority of a defined layer is covered by less than 12 inches river sand and debris.

The November 2005 reassessment results indicated that much of the original Pool 1 and 2 areas were no longer covered with grey material, but significant recoverable deposits remained under a layer of sand deposited during the October 2005 high-flow events. The findings of the November 2005 reassessment are included in Attachment 5 as Figures 2 and 3. These results were previously presented in the updated *Phase III Work Plan* (PPL, 2005e), submitted to the PADEP on November 29, 2005.

No recoverable deposits of grey material were observed in the portion of the river downstream of Pool 2 during the November 2005 reassessment. Grey material was observed in measurable quantities at only eight of 51 locations downstream of Pool 2. Of these eight locations, trace amounts of grey material (less than one-eighth

inch) were found at five locations, and one-quarter inch or less of grey material was reported at the remaining three locations.

3.1.3 Second Reassessment – January 2006

Dredging activities for the recoverable deposits of grey material identified in Pool 1 were completed on December 16, 2005. Diver-assisted vacuum dredging continued in Pool 2 until storm events on January 14, 2006 (0.9 inches of rain) and January 18, 2006 (1.2 inches of rain) caused elevated flow rates and turbidity in the Delaware River. A maximum flow rate of approximately 80,000 cfs was recorded at the Belvidere, New Jersey gage station on January 19, 2006. Due to the unsafe working conditions resulting from the elevated flow rates, the diver-assisted vacuum dredging operations were suspended on January 14, 2006.

Once river flows returned to levels allowing safe dive operations, a second post-storm reassessment was conducted by BBL with Seaway Divers in the Pool 2 area from January 27, 2006 to January 30, 2006. The objective of this investigation was to reassess the nature and extent of suspected fly ash in the river in Pool 2 following the January 2006 storm events. To provide a timely assessment of the Pool 2 area, the boundaries and distribution of suspected ash remaining in Pool 2 were initially reassessed at transects spaced approximately 50 feet apart. At each transect, the diver traversed perpendicular to the shore from the shoreline to a river depth where neither sediment nor grey material were observed.

The January 2006 reassessment results indicated that significant recoverable deposits of grey material did remain at the previously identified Pool 2 locations, but the deposits were generally narrower after the January 2006 high-flow event. The findings of the January 2006 post-storm investigation are included in Attachment 5 as Figure 4.

After the initial reassessment at 50-foot intervals, periodic assessments of the Pool 2 areas were performed throughout the remainder of the Phase III activities. Divers periodically reassessed the recoverable deposits at 5-foot intervals to further refine the delineation of recoverable pockets of grey material. Concrete blocks were placed on the river bottom at 5-foot intervals to outline the recoverable deposits of grey material ahead of the diver-assisted dredge operations. The concrete blocks were removed from the river at the conclusion of dredge operations.

3.2 Phase III Work Plan

As discussed above, using the results of the initial reconnaissance activities conducted from September 7 through 16, 2005, PPL developed a draft Phase III Work Plan (PPL, 2005c) which was submitted to the PADEP on September 24, 2005. The draft Phase III Work Plan outlined the procedures and equipment that would be utilized to recover suspected ash from Pools 1 and 2. Based on the size (19 acres in Pool 1 and 20 acres in Pool 2) and location (i.e., surficial deposits) of the pockets of grey material identified during the reconnaissance activities, the draft Phase III Work Plan was developed to utilize diver-assisted vacuum dredging operating from support platforms. In order to properly manage the amount of water generated by the vacuum dredging activities, construction of two sediment dewatering and water treatment facilities was proposed.

The draft Phase III Work Plan (PPL, 2005c) required fabrication of the dive platforms, site preparation, and installation of sediment dewatering and water treatment systems at two locations. While preparations were made to implement the Phase III work (including site preparation, equipment purchase and setup, permit acquisition), a pilot test was conducted to evaluate the proposed diver-assisted vacuum dredging methodology and refine the dredging techniques. The results of the pilot test were documented in the report *Work Plan Description of Pilot - Demonstration of Diver Dredging Operations for Fly Ash Impacted Riverbed Removal* (PPL, 2005g) submitted to the PADEP on October 5, 2005. The pilot test indicated that diver-assisted vacuum

dredging, utilizing land-based sediment dewatering and water treatment systems, would effectively remove the grey material identified in Pools 1 and 2, covering 39 to 40 acres of the river bottom.

Before the draft Phase III Work Plan (PPL, 2005c) was finalized, a high-flow event caused by remnants of tropical storm Tammy necessitated a reassessment of the distribution of suspected ash in Pools 1 and 2 (as described in Section 3.1.2). Construction of the sediment dewatering and water treatment systems continued while awaiting the river flows to return to safe levels to permit the reassessment. Before the reassessment could be conducted, the system at the Williams-Gillespie property was completed and ready for operation, and all equipment for the system at the Sanico property was ready for final construction.

The reassessment was conducted once water levels receded to a level which permitted safe dive operations (Section 3.1.2). The reassessment indicated a significant redistribution of recoverable deposits of grey material in Pools 1 and 2, and based on this information, an updated Phase III Work Plan (PPL, 2005e) was developed and submitted to the PADEP on November 30, 2005. To address recoverable deposits remaining in Pools 1 and 2, the updated Phase III work plan outlined the use of primary screeners to remove solids at the first pumping station, with the remaining fine solids and slurry water being pumped directly to Ash Basin 4 in lieu of operating sediment dewatering and water treatment systems at the Williams-Gillespie and Sanico properties.

PPL received comments on the updated Phase III Work Plan from the NRD team through the PADEP and edited the work plan to address the comments. The final Phase III Work Plan (PPL, 2005f), which was approved for implementation on December 14, 2005, is included in Attachment 2. This plan specified the use of diver-assisted vacuum dredging to remove recoverable pockets of grey material with direct pumping of the slurry to Ash Basin 4, with screening of larger solids at the first pump station. This system was chosen rather than utilizing the sediment dewatering and water treatment systems as proposed in the draft Phase III Work Plan (PPL, 2005c) as a more appropriate remedial process that would ensure completion of the ash removal before the permit deadline. The necessary equipment to conduct the diver-assisted vacuum dredging was already at the site and had been pilot tested. As noted previously, recoverable pockets were defined as those areas identified with clearly defined layers (i.e., not interstitially mixed), where a minimum of one cubic yard of grey material was present and where a majority of the defined layer of grey material was covered by less than 12 inches of river sand and debris.

3.3 Phase III Work Plan Modifications

The draft Phase III Work Plan (PPL, 2005c) outlined the removal of recoverable deposits of grey material from a 19-acre area in Pool 1 and a 20-acre area in Pool 2. This plan included the use of sediment dewatering and water treatment facilities at the Sanico property and the Williams-Gillespie property. As described in Section 3.1.2, the reassessment of Pools 1 and 2 conducted after the high-flow river event caused by the remnants of tropical storm Tammy indicated that much of the original Pool 1 and 2 areas were no longer covered with grey material, but significant recoverable deposits of grey material did remain underneath a layer of sand. The findings of the November 2005 post-storm investigation are included in Attachment 5 as Figures 2 and 3. Because the total area characterized by recoverable deposits of grey material was considerably reduced and covered with a layer of sand, it was determined that the most efficient method of removal would be to pump the slurry directly to Ash Basin 4 using screeners at the first pump station, without the use of the full sediment dewatering and water treatment systems outlined in the draft Phase III Work Plan (PPL, 2005c). The final Phase III Work Plan (PPL, 2005f), approved for implementation on December 14, 2005, outlines the removal of the recoverable deposits of grey material via direct pipeline to Ash Basin 4.

Diver-assisted vacuum dredging operations was proceeding from three dive platforms until storm events on January 14, 2006 (0.9 inches of rain) and January 18, 2006 (1.2 inches of rain) caused elevated flow rates and turbidity in the Delaware River. The high flow rates caused significant damage to the pipelines and one of the

shore-based screening and pumping stations (Pump Station 3). Pump Station 3 had been constructed at the Williams-Gillespie property to support operation of a third dive platform (see Section 4.4.1). In order to resume dredging operations as soon as possible once river flows returned to levels allowing safe dive operations, Pump Station 3 was not reconstructed. Diver-assisted vacuum dredging operations resumed from two dive platforms on January 31, 2006, and February 1, 2006 respectively, and two dive platforms were utilized for the remainder of the Phase III operations, with the third dive platform maintained as a backup unit.

A timeline of events which affected Phase III activities are noted in the Phase III Project Timeline, included as Attachment 6.

4. Phase III Operations

Based on the size of the pockets of grey material identified during the initial September 2005 reconnaissance activities (19 acres in Pool 1 and 20 acres in Pool 2), a draft Phase III Work Plan (PPL, 2005c) was developed to utilize diver-assisted vacuum dredging operating from support platforms, and treatment of the dredged material using sediment dewatering and water treatment systems. Equipment and materials were mobilized to the site in support of this work plan, and construction of the dive platforms and treatment systems began.

As described in Section 3.3, due to a reduction in the total area of recoverable deposits of grey material which became covered with sand due to the remnants of tropical storm Tammy, it was determined that the most efficient method of removal that would ensure completion by the permit deadline would be to pump the slurry directly to Ash Basin 4, with only the use of a derrick screener at the first pump station to remove larger solids that could have plugged the 7,000-foot line to Ash Basin 4. Therefore, dive platforms, pumping stations with derrick screeners, and two 7,000-foot pipelines were constructed and utilized to conduct Phase III operations. Although construction of the original treatment system on the Williams-Gillespie property was completed before the first reassessment (Section 3.2), the system was never utilized for reasons previously discussed, with the exception of a short test which pumped only water to test the system for leaks.

The equipment and operations utilized to execute the Phase III Work Plan (PPL, 2005f) are summarized in the following section. A photographic log showing various Phase III activities, including site restoration, is included as Attachment 7.

4.1 Dive Platforms

Three custom-built dive platforms, designated as AK-1, AK-2, and AK-3, were constructed to stage the diver-assisted vacuum dredging operations. Each dive platform consisted of a plywood deck frame approximately 20 feet wide by 40 feet long covered with indoor/outdoor carpet and buoyed by three pontoons. Standard equipment aboard each dive platform included the following items:

- 12-kW diesel generator;
- 18-gallon diesel fuel cell for the diesel generator;
- 8-foot by 10-foot weather-protection shed;
- steel storage cabinet for flammable products;
- moon pool (hole through the deck frame for pump head);
- pump hoist outfitted with a one-ton winch;
- two dive ladders for egress/ingress into the river;
- 9-foot tall navigation tower containing the operating controls of the dive platform;
- two 115-horsepower Mercury four-stroke gasoline engines with 15-pitch power propellers;
- a 3-foot tall double-rail guardrail system surrounding the deck;
- four 20-foot long spuds (5-inch by 5-inch steel Bos pipes) for stationing the dive platform, each spud equipped with a one-ton winch to raise and lower the spud;
- one Heidra-pack with a silencer over-pack to power and operate the hydraulic dredge pump; and
- video and communications equipment.

Details regarding the equipment utilized on the dive platforms and the on-deck layout of the dive platforms is included in Attachment 8. To minimize disturbances to the local community, the dive platforms were designed to minimize noise and light pollution. Working lights on the dive platforms were aligned to point inward and/or downward onto the dive platform. Sound emissions were controlled through the use of critically silenced Godwin Hydra pumps with a submersible hydraulically-driven pump, installation of sound isolation pads on the

dive platforms between the pump body and the platform to reduce “sound magnification” effects, and installation of carpeting for worker safety and to muffle sound.

4.2 Establishing Dredge Locations

As described in Section 3.1.2, recoverable deposits of grey material were defined as river bottom areas containing layers of grey material (i.e., not interstitially mixed), where a minimum of 1 cubic yard of grey material is present, and where the majority of a defined layer is covered by less than 12 inches river sand and debris. Dive teams located areas in the river with recoverable deposits of grey material, and marked the deposits with concrete blocks on the river bottom and surface buoys. The surface buoys were used to position the dive platforms adjacent to the deposits on the channel-side of the buoy line. Once the dive platform was in position, divers placed 10-foot by 10-foot grids on the river bottom inside the recoverable deposit of grey material. The grids were constructed out of 1-inch polyvinyl chloride (PVC) pipe weighted with imported fill sand and were positioned adjacent to each other. Two divers worked from each dive platform, and each diver worked in one 100-sf grid. When one grid was verified as complete (Section 4.6), the second grid would be left in place while the completed grid frame was moved to its new location to ease movement of the grids and maintain their proper orientation within the removal area. The two grids were moved throughout the removal area in this manner, keeping the grids adjacent to each other to maintain proper orientation, until the entire recoverable deposit of grey material had been removed.

4.3 Vacuum Dredging Operations

As noted previously, a pilot test was conducted to evaluate the effectiveness of diver-assisted vacuum dredging operations. The results of the pilot test, which indicated that diver-assisted vacuum dredging would be effective, were documented in the report *Work Plan Description of Pilot - Demonstration of Diver Dredging Operations for Fly Ash Impacted Riverbed Removal* (PPL, 2005g) submitted to the PADEP on October 5, 2005.

Once the proper grid positions were established as described in Section 4.2, divers subcontracted by Shaw through KT Marine commenced vacuum dredging within the grids. Each diver (two divers per dive platform with up to three platforms in operation) used a 3-inch diameter flexible hose with a smaller-diameter nozzle to minimize large rocks picked up by the vacuum. The two 3-inch hoses were connected to a 6-inch diameter submersible pump located onboard the dive platform. The divers used the pump connected to the two 3-inch hoses to vacuum a slurry of grey material, sediment, and water through a 6-inch diameter high density polyethylene (HDPE) pipe. The 6-inch HDPE pipe transported the slurry to the first pump station where the larger solids were screened out before the remaining slurry was pumped to Ash Basin 4 for disposal. To overcome the elevation change from the river to Ash Basin 4, a total of two pump stations were used to assist pumping the slurry to the basin (see Section 4.4). Both divers vacuumed the slurry at a rate of approximately 300 gallons per minute (600 gallons per minute from each dive platform). Dredging operations were monitored and directed according to the procedures outlined in Section 4.6.

4.4 Pump Station System to Ash Basin 4

In order to transport the vacuum-dredged slurry to Ash Basin 4, two pump stations were constructed to provide the necessary lift. The slurry was pumped via 6-inch HDPE pipelines from each dive platform to Pump Station 1, which was located at the PPL boat launch area on the Pennsylvania side of the river. Pump Station 1 was composed of two frac tanks to store water and provide feed to the pumps located at the pump station. The frac tanks were equipped with a derrick screener to remove heavy sand, sediment, and larger particles from the slurry. Diesel-powered centrifugal pumps were used to pump the screened slurry water from Pump Station 1 to Pump Station 2.

Pump Station 2 was located approximately 3,800 feet from Pump Station 1, at a point approximately half-way between Pump Station 1 and Ash Basin 4. Pump Station 2 also consisted of two frac tanks to allow additional

solids to settle before the slurry was pumped to Ash Basin 4 with a diesel-powered centrifugal pump. Slurry water from Pump Station 2 was pumped 3,400 feet for discharge to Ash Basin 4. Sediment which accumulated in the frac tanks located at Pump Stations 1 and 2 was periodically removed from the frac tanks using vacuum trucks and transported to Ash Basin 4 for disposal.

The discharge to Ash Basin 4 from the pipeline was controlled by securing a whip to the top of the basin. The whip floated on the water surface in the basin and projected approximately 100 feet into the basin. The whip ensured that the slurry water discharge entered Ash Basin 4 away from the edge of the basin to protect the basin liner, allow for even deposition of the slurry into Ash Basin 4, and help to keep the discharge line from freezing.

To control sound emissions at the pump stations, the pumps were stationed at least 800 feet from the nearest residential receptor and the pump stations were outfitted with a muffler and a high-performance sound enclosure.

4.4.1 Pump Station 3

In order to accommodate slurry material generated by a third dive platform (AK-3), a water holding and pumping station was constructed at the Williams-Gillespie property and designated Pump Station 3. During the period when three dive platforms were operating, AK-3 pumped slurry material to Pump Station 3, where the material was screened to remove larger particles which were periodically removed and transported to Ash Basin 4 for disposal. The remaining slurry was stored during daylight hours, as the two existing 7,000-foot pipelines were already being operated at their designed maximum capacity of 1,200 gallons per minute. A night crew would pump the accumulated slurry material from Pump Station 3 to Pump Station 1 and eventually to Ash Basin 4 during night hours. The storage capacity of the Pump Station 3 was approximately 325,000 gallons. Pump Station 3 was in operation from January 8, 2006 through January 13, 2006 in support of the third operating dive platform. Pump Station 3 suffered substantial damage during the January 2006 high-flow event and was not returned to service.

4.4.2 Pipeline Winterization

Winterization of the pump stations and 6-inch HDPE pipelines located on land was accomplished with a combination of techniques and materials as needed during non-dredge hours when temperatures were below freezing. A night crew was employed to periodically pump water through the system during non-dredge hours (nighttime). The dive platforms would pump enough water to Pump Station 1 during the day to provide adequate water for the overnight pumping. The overnight pumping kept water moving through the lines throughout the night to minimize the potential for freezing. The 6-inch HDPE lines were also insulated using straw bales and black polyethylene sheeting. The pump stations were enclosed within a scaffolding structure covered with opaque sheeting. The structure protected the pump stations from the weather, and heaters were used inside the structures to provide warmth for the equipment and slurry water. Heating the pump station structures kept the water stored at the pump stations at a warmer temperature, assisting with freeze prevention during the nighttime pumping.

During periods of extended down time, the lines were drained of water and flushed with a mixture of polypropylene glycol and water to prevent freezing in any low lying areas. The glycol was food safe and biodegradable. This method of freeze protection was utilized over the Christmas holiday and the storm-related suspension of operations from January 14, 2006 to January 31, 2006.

4.5 Delaware River Conditions Affecting Dredge Operations

Tropical storm Tammy created a significant precipitation event which prevented divers from entering the water safely and necessitated a reassessment of river bottom conditions (Section 3.1.2). Once divers were able to safely assess river conditions and delineate areas of grey material deposition, dredge operations and Phase II

Portadam recovery efforts commenced on November 7, 2005. Storm events on January 14, 2006 (0.9 inches of rain) and January 18, 2006 (1.2 inches of rain) caused elevated flow rates in the Delaware River which forced the suspension of diver-assisted vacuum dredge operations and another reassessment of river bottom conditions (Section 3.1.3). Dredging operations were suspended on January 14, 2006, and resumed on January 31, 2006 when river conditions allowed safe entry by the divers.

Smaller precipitation events and resulting high-water conditions also caused unsafe working conditions which forced the suspension of dredge operations on December 1 and 2, 2005 and from February 4 to 7, 2006. Also, heavy snowfall caused unsafe working conditions which forced the suspension of dredge operations on February 12, 2006.

4.6 Monitoring of Dredge Operations

A representative from Shaw was onboard each dive platform at all times to direct the diver-assisted vacuum dredging and to track removal rates and locations. A representative from BBL was also on board for quality assurance verification of removal rates and locations. The Shaw and BBL representatives were able to directly view video footage of the vacuum dredge activities that was transmitted by one of the divers via a camera mounted to the hard hat of the diver. The Shaw representative was also able to communicate with each diver at all times via an audio communication link.

Once a diver completed a 10-foot by 10-foot grid, a second diver would inspect the grid to verify that all recoverable grey material was removed and the grid complete. If both divers, Shaw, and the BBL representative aboard the dive platform agreed that the grid was complete, the Shaw and BBL representatives would record the number of the completed grid and the characteristics of the grid as viewed on video and relayed to the dive platform by the diver. This information included the average thickness of deposition of grey material in the grid, average sand thickness deposited on top of the grey material, the percentage of the grid that contained continuous coverage of grey material, the average water depth, and other relevant observations. The information for each grid was recorded by the Shaw representative and verified by the BBL representative. Attachment 9 contains an example of the field form used by the Shaw representative to record the diver-assisted vacuum dredge operations.

The grid locations were recorded by collecting GPS coordinates of the dive platform, and visually estimating the position of the grids relative to the dive platform. The position of the grids could be estimated by viewing the diver location within the grid. The *Quality Assurance/Quality Control Plan* used to direct the diver-assisted vacuum dredging and track removal rates and locations is included in Attachment 10.

4.7 Safety Considerations

A safety meeting was conducted at the beginning of each day prior to commencement of activities. New activities or changes in site conditions (e.g., colder weather) were addressed in the daily safety meeting. All personnel working on the river were equipped with personal flotation devices. During the winter months, all personnel working on the river were provided with an insulated flotation jacket, designed to delay the onset of hypothermia in the event that a person were to fall into the river. A double-guard railing was present around the perimeter of the dive platforms. All personnel on the dive platforms were required to wear work boots and hard hats.

Dredging was not conducted at night due to unsafe conditions resulting from a lack of visibility for divers in the water and for crew members on board the dive platforms. Diver-assisted vacuum dredging operations were typically conducted daily from sunrise to sunset throughout the duration of Phase III activities.

5. Phase III Results and Accomplishments

Following submittal of the draft Phase III Work Plan (PPL, 2005c) to the PADEP and approval of the pilot diver-assisted vacuum dredging work plan, Shaw implemented a pilot test of the vacuum dredging operations until the high-flow event beginning on October 7, 2005 terminated the pilot test. Following the reassessment of river bottom conditions following the October 2005 high-flow event (Section 3.1.2) and PADEP approval to continue diver-assisted vacuum dredging with discharge to Ash Basin 4, PPL's contractors began Phase III diver-assisted vacuum dredging operations on November 7, 2005. Diver-assisted vacuum dredge operations were completed on March 11, 2006. A summary of the removal activities is included in this section.

5.1 Pool 1 Removal Activities

Pool 1 removal activities commenced as soon as high water levels in the Delaware River resulting from the remnants of tropical storm Tammy had subsided sufficiently to permit divers to safely enter the water and perform work. The recoverable pockets of grey material delineated in Pool 1 are shown in Attachment 5 on Figure 2.

5.1.1 Equipment Used and Dates of Operation

Dredge operations commenced using dive platform AK-1 on November 7, 2005 near the Pennsylvania shoreline, immediately downstream from Oughoughton Creek at area P01-A08. Dive platform AK-2 began operation on November 27, 2005 in area P01-A01. These two dive platforms performed dredge operations in Pool 1 until all areas in Pool 1 were complete, at which time the dive platforms were moved down-river to Pool 2 and connected to the 6-inch HDPE piping to commence dredge operations in Pool 2.

The areas of operation and dates of operation for each dive platform in Pool 1 are as follows:

AK-1

- P01-A08: November 7, 2005 – November 14, 2005 and December 11, 2005 – December 12, 2005;
- P01-A03: November 14, 2005;
- P01-A02: November 14, 2005; and
- P01-A01: November 14, 2005 – December 10, 2005.

AK-2

- P01-A01: November 27, 2005 – December 12, 2005; and
- P01-A04: December 12, 2005 – December 16, 2005.

5.1.2 Pool 1 Removal Summary

Diver-assisted vacuum dredging was completed over 47,117 sf in Pool 1. The amount of grey material recovered was approximately 10,221 cubic feet (379 cy). The removal locations and quantities are summarized as follows:

- P01-A01: 32,533 sf (298.5 cy)
- P01-A02: 36 sf (0.2 cy)
- P01-A03: 16 sf (0.1 cy)
- P01-A04: 6,985 sf (43.3 cy)
- P01-A08: 7,547 sf (36.4 cy)

Daily production reports summarizing the dredge operations are included in Attachment 11. A summary of the dredge areas and volume removed is included in tabular form in Attachment 12 and on the figures included in

Attachment 13. Dredge operations were performed in Pool 1 over 33 days, with an average daily removal area of 1,428 sf and an average daily removal volume of 11.5 cy.

5.2 Pool 2 Removal Activities

Pool 2 removal activities commenced upon completion of dredge operations in Pool 1. The recoverable pockets of grey material delineated in Pool 2 are shown in Attachment 5 on Figure 3 (November 2005) and Figure 4 (January 2006).

5.2.1 Equipment Used and Dates of Operation

Dredge operations commenced using dive platform AK-1 on December 17, 2005 at the up-river end of area P02-A02. AK-2 began operation in the down-river portion of area P02-A02 on December 18, 2005. Construction of the third dive platform, AK-3, was completed in early January 2006, and AK-3 began operation in area P02-A01 on January 8, 2006.

The areas of operation and dates of operation for each dive platform in Pool 2 are as follows:

AK-1

- P02-A02: December 17, 2005 – January 13, 2006.

AK-2

- P02-A02: December 18, 2005 – December 22, 2005 and February 10, 2006 – March 11, 2006;
- P02-A03: January 5, 2006 – January 13, 2006; and
- P02-A01: February 1, 2006 – February 10, 2006.

AK-3

- P02-A01: January 8, 2006 – January 13, 2006;
- P02-A03: January 31, 2006 – February 18, 2006;
- P02-B04: February 19, 2006 – March 1, 2006;
- P02-B05: March 2, 2006 – March 5, 2006;
- P02-B01: March 6, 2006; and
- P02-B02: March 6, 2006.

Dredging operations were not performed from December 23, 2005 through January 4, 2006 due to the holiday break, from January 14 to 30, 2006 and February 4 to 7, 2006 due to elevated flow rates resulting from storm events, and on February 12, 2006 due to adverse weather conditions on-site. As described in Section 4.4.1, the elevated flow rates from January 14 to 30, 2006 caused significant damage to the pipelines and one of the shore-based pumping stations (Pump Station 3). In order to resume dredging operations as soon as possible once river flows returned to levels allowing safe dive operations, Pump Station 3 was not reconstructed and AK-1 remained offline for the remainder of the Phase III operations.

5.2.2 Pool 2 Removal Summary

Diver-assisted vacuum dredging was completed over 100,270 sf in Pool 2. The amount of grey material recovered was approximately 24,555 cubic feet (909 cy). The removal locations and quantities are summarized as follows:

- P02-A01: 14,500 sf (100 cy);
- P02-A02: 42,965 sf (440 cy);
- P02-A03: 28,925 sf (200 cy);
- P02-B01: 400 sf (2 cy);

-
- P02-B02: 400 sf (2 cy);
 - P02-B04: 10,805 sf (143 cy); and
 - P02-B05: 2,275 sf (22 cy).

Daily production reports summarizing the dredge operations are included in Attachment 11. A summary of the dredge areas and volume removed are included tabular form in Attachment 12 and on the figures included in Attachment 13. Dredge operations were performed in Pool 2 over 50 days, with an average daily removal area of 2,005 sf and an average daily removal volume of 18.2 cy.

5.3 Total Removal Summary

Diver-assisted vacuum dredging was completed over 83 operating days in Pools 1 and 2 beginning November 7, 2005 and ending March 11, 2006. The amount of grey material recovered was approximately 379 cy over 47,117 sf in Pool 1 and 909 cy over 100,270 sf in Pool 2. The total amount of grey material removal during the Phase III diver-assisted vacuum dredge operations was approximately 1,288 cy recovered over approximately 147,387 sf of the river bottom. The combined estimated daily removal rates for Pools 1 and 2 were an average daily removal area of 1,775 sf and an average daily removal volume of 15.5 cy.

5.4 Demobilization and Site Restoration

Several properties that are located near the Delaware River in Pennsylvania and New Jersey were utilized for remedial activities and logistical support. As part of demobilization activities, each property was subject to site restoration activities consistent with requirements defined in applicable permits and/or land-use agreements.

5.4.1 Martins Creek Boat Access Area

The Martins Creek Boat Access Area served as the primary location for project support facilities. The upper boat ramp area served as a staging area for Pump Station 1, office trailers, and equipment storage containers. Minimal restoration was required at the upper boat ramp area and was limited to demobilization of equipment, materials, and facilities, and a general area cleanup.

The lower boat ramp area served as a location for construction of dive platforms, welding of HDPE pipe, deployment and removal of the HDPE pipe from the river, and periodic launching of small craft supporting operations on the river. Demobilization and restoration in the lower boat ramp area included completion of the following tasks:

- Restoration of an improved boat launch consisting of a 20-foot by 60-foot concrete ramp;
- Placement of stone armoring along the shoreline of the river south of the boat launch and at the mouth of the Oughoughton Creek;
- Removal of crushed stone which was imported to provide a working pad for fabrication of dive platforms;
- Placement of boulders around the perimeter of the turn-around circle at the boat launch ramp; and
- Grading and hydroseeding of the area between the turn-around circle and Oughoughton Creek.

5.4.2 Williams-Gillespie Property

The Williams-Gillespie property was utilized temporarily as the location for the original Phase III sediment dewatering and water treatment facilities, for Pump Station 3, and as a base of operations during dredging operations in Pool 1. Demobilization and restoration of the property consisted of the following tasks:

- Removal of the concrete pad and transportation of the material to an off-site location for recycling;
- Removal of crushed stone which was imported to provide an even working surface for the central and southern portions of the property;
- Placement of boulders on the slopes of the access ramp to the property; and

-
- Grading and hydroseeding of the property to meet the previous ground elevation and contour.

5.4.3 Sanico Property

The Sanico property was designated in the draft Phase III Work Plan (PPL, 2005c) as a site for sediment dewatering and water treatment facilities to support diver-assisted vacuum dredging operations in Pool 2. In anticipation of this work, equipment was staged at this property and significant earth work completed in preparation for the system installation. Due to changed river conditions resulting from the October 2005 high-water events, the final Phase III Work Plan (PPL, 2005f) eliminated the need for the sediment dewatering and water treatment facilities in favor of the removal of the recoverable deposits of grey material via direct pipeline to Ash Basin 4. The facilities were not constructed and demobilization from the site consisted of removal of the staged equipment.

5.4.4 Hutch Property

The Hutch property was used as a base of operations during dredging operations in Pool 2. A temporary office trailer, storage container, concrete jersey barriers, a floating dock, and mooring posts for the dive platforms were placed at the Hutch property in support of the Pool 2 operations. Demobilization and site restoration work at the Hutch property included the following:

- Removal of all equipment and materials from the property;
- Placement, grading, and compaction of crushed stone across the parking lot area; and
- Placement of soil and re-seeding of an area located in front of the permanent building at the property.

5.4.5 Joe Smith Property

The Joe Smith property was used to support river operations and served as the primary location for launching small craft used to perform delineation activities using dive teams. This property was also used occasionally for transfer and maintenance of equipment on the dive platforms during dredging operations in Pool 2. Demobilization and site restoration work consisted of removal of all equipment and materials, and grading of ruts and holes caused by movement of heavy equipment.

5.4.6 Pipeline to Ash Basin 4

Multiple six-inch HDPE pipelines were used during the dredge operations to transport the dredged slurry from the dive platforms to Ash Basin 4. The two land-based pipelines were winterized by insulating the pipeline with straw bales and black polyethylene sheeting. Demobilization of the HDPE pipelines consisted of the following:

- Removal of all river-based and land-based pipeline;
- Removal of all straw bales and plastic from the land-based pipeline; and
- Cutting the pipeline into sections (primarily 40-foot and 50-foot lengths) for demobilization.

5.4.7 Temporary Bridge for DuPues Road

A temporary bridge was constructed adjacent to DuPues Road over Oughoughton Creek to allow access to the Williams-Gillespie property for heavy equipment that would have exceeded the loading capacity of the existing bridge. The temporary bridge has been kept in service until all restoration work on the Williams-Gillespie property is complete. The removal of the temporary bridge is scheduled for the end of May.

5.4.8 Upland Areas

All disturbed upland areas (mostly farm land and open fields) impacted during the August 23, 2005 release were graded and hydroseeded to mitigate the potential for erosion. The access ramps installed on both the north and east faces of Ash Basin 4 were removed and the area restored.

5.4.9 Temporary Roadways

Temporary roadways were constructed on PPL property to support construction, winterization, inspection, and demobilization of the land-based HDPE pipeline. Restoration of the temporary roadways included the following:

- Removal of all crushed stone imported to construct the roadways;
- Placement and grading of soil; and
- Hydroseeding.

6. Summary

As outlined in the final Phase III Work Plan (PPL, 2005f), this report was prepared primarily to provide a summary of the Phase III activities for submittal to the PADEP within 60 days of the completion of Phase III activities. Phase III procedures and operations were detailed in Section 3 and Section 4, respectively, along with modifications to the Phase III Work Plan that resulted from changes in site conditions.

Diver-assisted vacuum dredging was completed over 83 operating days in Pools 1 and 2 beginning November 7, 2005 and ending March 11, 2006. Approximately 56,500,000 gallons of water were pumped to Ash Basin 4 during Phase III activities, including slurry water pumped during dredge operations and water pumped during night operations to prevent freezing. The amount of grey material recovered was approximately 379 cy over 47,117 sf in Pool 1, 909 cy over 100,270 sf in Pool 2, and approximately 2,555 cy from Oughoughton Creek. The total amount of grey material removal during the Phase III diver-assisted vacuum dredge operations and Oughoughton Creek cleanup activities was approximately 3,843 cy recovered over approximately 147,387 sf (approximately 3.4 acres) of the river bottom and 69,000 sf (approximately 1.6 acres) of the Oughoughton Creek channel bottom. The combined estimated daily removal rates for Pools 1 and 2 were an average daily removal area of 1,775 sf and an average daily removal volume of 15.5 cy.

Phase III activities are considered complete. All Phase III activities were performed in accordance with the provisions outlined in the permits included in Attachment 1, including the Department of the Army Nationwide Permit NW38 approval letter from USACE to PPL dated October 27, 2005. These activities included the cleaning and restoration of approximately 6,200 linear feet of Oughoughton Creek, diver-assisted vacuum dredging of Pools 1 and Pool 2, and removal of a small deposit of grey material from an area adjacent to the EWA water intake. All temporary structures were removed and areas returned to their pre-construction condition.

Phase IV assessment activities will be conducted to determine if any further actions may be required in response to the August 23, 2005 release. The Phase IV activities will evaluate the presence and potential impacts of any residual fly ash remaining in the Delaware River through performance of supplemental characterization activities from upstream of the Ash Basin 4 discharge control structure to Trenton, New Jersey. The results of the Phase IV study will be combined with the *Data Summary Report* (PPL, 2006b), and presented in a comprehensive assessment report.

7. References

- PPL. 2005a. *PPL Ash Removal at the Outfall to the Delaware River Ash Removal – Easton Water Authority – Summary of Work Completed 9/20 through 9/23*. Report submitted to the Pennsylvania Department of Environmental Protection (October 20, 2005).
- PPL. 2005b. *PPL Ash Removal at the Outfall to the Delaware River Phase I – Ash Removal “In the Wet” Summary of Work Completed 9/16-19/05*. Submitted to the Pennsylvania Department of Environmental Protection (October 4, 2005).
- PPL. 2005c. *Draft Phase III – Delaware River Fly Ash Release Recovery Operations*. Submitted to the Pennsylvania Department of Environmental Protection (September 24, 2005).
- PPL. 2005d. *Phase III Reassessment Plan*. Submitted to the Pennsylvania Department of Environmental Protection (October 20, 2005).
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