ATTACHMENT A
DETAILED CONSTRUCTION ACTIVITIES FOR OU-3
HAVERTOWN PCP SITE
HAVERTOWN, PENNSYLVANIA

1.0 INTRODUCTION

This attachment provides details of construction activities performed under OU-3 Remedial Action (RA) phase. The construction was based on the OU-3 BOD Report, which included detailed technical specifications and drawings.

Prior to construction phase, Tetra Tech prepared necessary documents for Erosion and Sedimentation (E&S) permit application and submitted to Delaware County Conservation District. A copy of this permit is included at the end of this attachment. Tetra Tech also videotaped the proposed construction area and area around the residential properties prior to any construction activities.

2.0 SITE PREPARATION

Site preparation consisted of pictures and video of existing conditions, surveying all construction locations, posting project and safety signs, setting up the contractor's office (trailer with power and internet connections), and restricting access as required. A field office was set up on the McCandless lot. Figure 2 is an overall site plan depicting the OU-3 construction area.

2.1 Clearing and Grubbing

Site clearing was necessary to allow ample access to the entire work area (Recreation and Open Space [ROS] and railroad right-of-way). This site clearing consisted of the removal and disposal of all shrubs, roots, and any other materials that could interfere with any work within the areas defined on the Contract Drawings. The clearing procedure required all trees and other vegetation to be cut within 1½ inches of the ground surface.

All grubbing efforts consisted of the removal of all stumps, roots, and buried logs. All tap roots, lateral roots, or other projections more than 2 inches in diameter were removed to a depth of 3 feet below the natural ground surface. All holes caused by grubbing operations were backfilled and graded in accordance with the technical specifications.

In general, clearing and grubbing were performed at all areas to be excavated and also at areas where earth or rock-fill was placed. All clearing was extended a minimum of 10 feet outside the limits of all excavations and fill areas.

2.2 Temporary Bridge Construction and Access Roads

Before any excavation work could begin at the ROS area, construction of a temporary culvert to cross over the tributary of Naylors Run was necessary to connect the McCandless lot to the ROS area.

This temporary culvert was constructed of two 4-foot diameter corrugated metal pipes with helical 2⅔ by ½-inch corrugations. Bedding material, consisting of crushed rock or pea gravel, was then overlain, before a final 8-inch loose layer of gravel was installed and compacted with a 20,000 lb. compactor. The final thickness was 6 inches or greater.

The access road under the existing railroad right-of-way (ROW) was upgraded with gravel, and a new temporary access road was cut through the existing berm of the railroad ROW at the end of Harvard Road. The access road and access up onto the ROW was stabilized with crushed rock and gravel. The existing gates were secured with chain and combination locks.

2.3 Soil Staging Area

On the McCandless lot, a large area was prepared to receive the excavated soils from ROS area. This area received an impervious liner and a drainage sump.

2.4 Sheet Piling Installation

Sheet piling was installed along Naylors Run where excavation meets or could compromise the creek bank. The sheet piling was installed using one-piece sheet piling lengths, tightly interlocked, to form a continuous barrier.

To accurately install the sheet piling, templates and guide frames were used. To limit vertical offset of adjacent sheet piling, accurate alignment of exposed faces of sheet piling was completed. All sheet piling sheet tops were cut at a uniform elevation just above the top of excavation. A steel channel was welded on top of the sheet piling to form a flat and consistent covering as shown on Figure 4.

2.5 Dewatering Sump

To prevent any surface/subsurface or groundwater from entering an excavation, a dewatering sump was constructed in the ROS area. This dewatering sump was constructed to prevent any ponding on prepared subgrades, and/or any flooding of the work site and immediate surrounding areas.

The dewatering sump consisted of the installation of a 24” high density polyethylene (HDPE) perforated, corrugated pipe (about 10’ deep) in the vicinity of the proposed valve pit (VP)-4 area. A submersible pump was installed in this sump, along with filter material, to pump and transport all water collected within the sump. The use of filter materials inside the sump prevented the pumping of fine sands or silts from the subsurface. In addition, a temporary sump pump was used to dewater all excavated areas. This pump discharged water into dewatering sump.

All collected water from the dewatering sump was pumped into a temporary holding tank located near the collection trench sump (CTR) area. A temporary 2” pipe was constructed (buried below grade for freeze protection) from the sump to the tank along the railroad right-of-way. Water from the holding tank was then allowed to drain by gravity into the CTR sump for final transport to the groundwater treatment facility. The tank allowed settling of solids and a means to regulate the flow through the treatment facility.

3.0 REMEDIATION OF ROS AREA

3.1 Pre-Sampling Grid Layout

Prior to start of excavation, the ROS area was laid out in a rectangle comprising of 54 cells (Figure 4). The cells were placed three columns across and 18 rows down, centered along the abandoned sewer pipe. The rectangle was elongated in a northwest to southeast direction.

The extent of excavation in the ROS area was a narrow zone located along the abandoned sewer line from an abandoned MH-7 (cell #5) to the caissons (SW-8 and SW-9 in cell #53), located a short distance northeast of the confluence of Naylors Run and its eastern tributary. Also, the portion of the abandoned 10”/12” Vitrified Clay Sewer Line that had not been previously sealed (between MH-7 and the end of the ROS area) was also removed.

Excavation began near the residential area (Cell 11) and moved down toward Naylors Run. All excavation along the abandoned pipe was performed to a depth shown on contract drawings. Excavation in the first three rows was performed to a limited depth because of structural issues. All excavated soils were transported to a staging area at the McCandless lot.

The excavation required dewatering. Some cells required a temporary submersible pump be installed during the excavation to keep up with the groundwater infiltration. The temporary pump was discharged to the main sump pump that was installed for dewatering.

All excavation was conducted in accordance with the substantive portions of the Pennsylvania Storm Water Management Act (32 P.S. § 680.13).

4.0 RAPID ASSAY PCP FIELD SCREENING

To confirm that pentachlorophenol (PCP) concentrations in excavated sidewall soils were below the RAO, real-time field screening sampling was conducted during the excavation process. This real-time field sampling was conducted to screen for PCP concentrations prior to confirmatory laboratory sampling and backfilling the excavation.

4.1 Sampling Protocols

At the completion of excavating each cell, two composite soil samples (1 shallow and 1 deep) were collected along each excavated sidewall. The shallow soil samples were collected from 0'-5' below top of grade, and the deep soil samples were collected from 5'-10' below top of grade. At each location, disposable plastic scoops were used to collect soil from the sidewall. A representative volume of 40 ounces of soil was collected from each sampling area. The volume of soil was homogenized in a stainless steel mixing bowl, from which the field screening sample was prepared. If the field screening sample had a PCP concentration less than 0.5 mg/kg, then the volume of soil was held for the confirmatory samples.

To perform the field screening analysis, each of the sidewall soil samples were field screened utilizing RaPID Assay test kits (EPA Method SW-846 4010). The RaPID Assay test kit had a quantitation limit of 0.1 mg/kg for PCP.

Samples collected from the east sidewall were odd numbered (e.g., FS-01, FS indicating field screening), and samples collected from the west sidewall were even numbered (e.g., FS-02). One exception was FS-26S (Cell 49), collected from the east sidewall because the orientation of the excavation did not permit a sample to be collected from the west sidewall. Other exceptions were FS-25D-L8 and FS-25S-L8 (Cell 46), which were collected from the north wall of the excavation.

Two samples, FS-29S (Cell 5) and FS-30S (Cell 2), were collected using a hand auger because the excavation could not be extended far enough away from the sewer pipe to expose sidewalls. The excavation could not be extended because of the proximity of a house foundation. No deep samples were collected in Cells 5 and 43 because of the presence of apparent free product. No samples were collected in Cell 8 because of sidewall stability concerns.

A total of 86 field screening analyses were completed. Twenty-four of those samples had duplicates taken at the same location to insure the test kits were functioning properly. Results for the RaPID Assay PCP field screening are included as Attachment B. Note that field sampling numbers are not the same as cell numbers.

4.2 Over-Excavation Procedure

If a field screening (FS) sample had a PCP concentration greater than 0.5 mg/kg, the excavation was extended laterally (beyond 10 feet from the sewer pipe) to attempt to find the limit of PCP contamination. The soil samples collected for FS after the lateral extension of the excavation were denoted with an "L" for lateral, followed by the number of feet the excavation was extended. For example, FS-05D (fifth field screening sample, collected from deep depth) had a PCP concentration greater than 0.5 mg/kg, so the excavation was extended. The decision was made to extend the excavation by 4 feet. The subsequent sample was FS-05D-L4.

Three cells (29, 32, and 43) had to be re-sampled after analytical results were received from the certified laboratory program (CLP) performing the confirmatory analysis. The validated results for shallow soil were above the screening level for PCP.

5.0 CONFIRMATORY FIXED-LAB SAMPLING

Upon the satisfactory completion of field screening the shallow and deep sidewalls of each excavation cell, the composited soils were collected and submitted to an EPA CLP laboratory for analyses. A total of 35 shallow composite samples including three field duplicates, and 27 deep composite samples including two field duplicates were collected and sampled for benzo(a)pyrene, PCP, aluminum, iron, and manganese analyses.

In addition, 10 samples including one field duplicate were analyzed for dioxin (EPA Method DLM02.0). The locations of the dioxin samples were biased to the areas that contained higher concentrations of PCP during field screening.

Samples collected from the east sidewall were odd numbered (e.g., CS-01, CS indicating confirmatory screening), and samples collected from the west sidewall were even numbered (e.g., CS-02). The exception to this was CS-26S (Cell 49), collected from the east sidewall, because the orientation of the excavation did not permit a sample to be collected from the west sidewall. Other exceptions were CS-25D-L8 and CS-25S-L8 (Cell 46), which were collected from the north wall of the excavation.

Two samples, CS-29S (Cell 5) and FS-30S (Cell 2), were collected using a hand auger because the excavation could not be extended far enough away from the sewer pipe to expose sidewalls. The excavation could not be extended because of the proximity of a house foundation . No deep samples were collected in Cells 5 and 43 because of the presence of apparent free product. No samples were collected in Cell 8 because of sidewall stability concerns.

Results for the confirmatory soil sampling data are included as Attachment C.

6.0 ON-SITE SOIL STORAGE AND OFF-SITE DISPOSAL

All excavated soils from the ROS area that were staged on the McCandless lot were sampled for classification and subsequent off-site disposal. A composite soil sample was taken on February 15, 2010 and analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated biphenyl (PCBs), total metals, and dioxin/furans. The composite soil sample was collected together from five locations on the top and the sides of the excavated soil pile. A field duplicate sample was also taken. The results of the waste characterization and the off-site soil disposal tracking sheet is included as Attachment D.

7.0 BACKFILL OF ROS AREA

Prior to any trenching excavation, a modified proctor test (Sample No. 1) was completed on a 5-gallon sample of soil taken from the railroad ROW to verify that existing soil met the 90% Proctor suitable for backfill and compaction. Also, a modified proctor test (Sample No. 2) was conducted on the clean backfill soil that came from off-site to be used for the ROS area excavation backfill. Copies of the modified proctor tests are included in Attachment E.

Upon completion of all excavation processes in the ROS area, all excavated areas were backfilled with clean fill, with at least 6 inches of topsoil at the surface. A vegetative cover was then planted over the backfilled areas to allow for a stabilized ground surface. A portion of the area was planted with native grasses and wildflowers to reduce the need for mowing and maintenance. All backfilled areas were graded appropriately to manage storm water runoff and erosion. Also, any plantings that were removed during the excavation were replaced with acceptable replacement plantings.

Compaction was completed in both the ROS area and in all trenching areas where macadam was to be reinstalled. This compaction was completed with the use of a remote-controlled vibratory trench roller, before any compaction testing was completed. A copy of the compaction testing results is included in Attachment E.

7.1 Air Monitoring

Air monitoring was conducted during all excavation activities. If air quality levels were found to exceed regulatory compliance, the plan was for remediation activities to be temporarily shut down in order to comply with federal and state regulations governing air quality (25 PA Code §§ 123.1-123.2, 40 CFR §§ 50.6-50.7 and 25 PA Code § 123.41). At no time during the excavation process did air emissions exceed the regulatory compliance enforcement limits.

7.2 Discovery of Second Pipe

While excavating soils near the southwest corner of cell #11, a second Vitrified Clay Pipe (VCP) was identified within the limits of excavation. This VCP was discovered approximately 6 inches below the previously identified abandoned 10"/12" VCP pipe in the ROS area.

An investigation was conducted to determine if the second VCP followed the original abandoned sewer pipe all the way to the groundwater collection trench near MH-1 (near CTR area behind Philadelphia Chewing Gum [PCG]). Excavation near MH-1 was conducted and the second VCP was found still located beneath the original abandoned sewer. The second VCP was injected with grout at ROS area and near MH-1 to seal it.

8.0 SITE RESTORATION

8.1 ROS Area

The OU3 recovery and treatment system was installed as inconspicuously as possible. All recovery wells and valve pits were completed as flush-mount type with all piping, connections and fittings enclosed. All monitoring wells installed in the ROS area were finished as stick-up type to avoid loss or damage.

After completing the soil excavation activities in the ROS area, the area was re-vegetated and landscaped consistent with the surrounding area. The valve pit VP-4 and electrical panel were fenced, and an "open paver" maintenance path was installed.

8.2 Force Main Excavation

All disturbed areas were fertilized and seeded immediately upon establishing final grade. Implementation of adequate erosion and sedimentation control measures during the course of construction was met in accordance with Section 01351, "Environmental Protection" of the ROD.

9.0 MCCANDLESS PROPERTY SAMPLING RESULTS

Prior to beginning any construction activities, four surface soil samples were collected at the McCandless property. These surface soil samples were collected to obtain background data prior to any construction activities on the site. Figure 4 shows sample locations.

On December 28, 2009, Tetra Tech collected four surface soil samples (MCC1 through MCC4) at the McCandless property. These samples were collected from 0'-1' below grade, and were analyzed for target analyte list (TAL) metals and dioxin. A copy of the analytical report is attached in Attachment F.

10.0 GROUNDWATER REMEDIATION TASKS

MONITORING WELL INSTALLATION (CW-32, CW-33, CW-34)

On April 1 and 2, 2010, U.S. Environmental contracted A.C. Shultes, a Pennsylvania licensed driller, to install three 2-inch monitoring wells (CW-32, CW-33, and CW-34). All wells were installed in the ROS area (Figure 5). These monitoring wells were installed to help further monitor shallow groundwater conditions in the ROS area. The drilling contractor obtained all necessary permits for the installation of these monitoring wells, as well as contacted "PA One Call" prior to excavation and drilling activities. Well boring logs are included as Attachment G.

10.1 Borehole Installation

Each of the three boreholes installed were drilled using hollow-stem auger methods. Samples were collected via Standard Penetration Test (SPT) methods, at 5-foot centers.

10.2 Well Casing

Polyvinyl chloride (PVC) was used for the construction of the monitoring well casing at each of the 2-inch monitoring wells. All PVC casing conformed to standards ASTM F480 and ASTM D 1785. All PVC casing is standard Schedule 40 pipe with threaded leak-proof flush joints and was completed with a protective steel casing such that it extended approximately 2.5 feet above the final grade.

10.3 Well Screen

At each of the 2-inch monitoring wells, a PVC screen was used in the construction of the monitoring well screen. This well screen and attached end fittings were fabricated from PVC standard Schedule 40 pipe and has a slot size of 0.020 inches. All screen sections have threaded leak-proof flush joints.

10.4 9.4 Protective Casing

A 10-inch diameter carbon steel protective surface casing was installed at each monitoring well to protect the inner PVC well casing. All carbon steel protective casing conforms to the ASTM standard A211 and is standard Schedule 40. A standard lid with lock and well ID tag were also provided.

10.5 Well Development

Upon completion of well construction, A.C. Schultes conducted well development tasks at each monitoring well. The purpose of the well development was to remove drilling damage along with silts and clays from the intake area of the well and the surrounding aquifer.

11.0 RECOVERY WELL INSTALLATION (RW-8, RW-9, RW-10)

On April 5 through April 8, 2010, U.S. Environmental contracted A.C. Schultes to install three 4-inch stainless steel recovery wells (RW-8, RW-9 and RW-10) and associated piping. All three of these wells were installed in the ROS area (Figure 5). The objective of these additional recovery wells was to address shallow groundwater contamination and restore the groundwater to beneficial use. Well boring logs are included as Attachment G.

The three recovery wells, with overlapping capture zones, were located within the contaminated groundwater plume, but downgradient of its center, located above the northeast bank of the confluence of Naylors Run and its eastern tributary.

11.1 Borehole Installation

Each of the three boreholes installed was drilled using hollow-stem auger methods. Samples were collected using SPT methods, at 5-foot centers.

11.2 Well Casing

At each of the 4-inch recovery wells, carbon steel riser pipe was used to construct the recovery well casing. The recovery well casing was completed approximately 2 feet below grade to allow for installation of a vault.

11.3 Well Screen

At each of the 4-inch recovery wells, a stainless steel screen was used in the construction of the recovery well screen. This well screen and attached end fittings were fabricated from stainless steel and has a slot size of 0.020 inches. All screen sections have threaded leak-proof flush joints.

11.4 Well Development

Upon completion of well construction, A.C. Shultes conducted well development tasks at each recovery well. The purpose of the well development was to remove drilling damage along with silts and clays from the intake area of the well and the surrounding aquifer.

11.5 Vault Construction

To provide ample room and protection for each of the three recovery wells, a pre-cast concrete flush-mount vault was installed at each of the three locations. A larger pre-cast concrete valve vault (VP-4) was installed in the ROS area in a centralized location to the recovery wells to allow connection to the force main for plant treatment.

12.0 PUMPING ANALYSIS TEST

Upon completion of all additional drilling activities, Tetra Tech conducted a pump test on the RW-9 recovery well. The purpose of the pump test was to determine the approximate sustainable pumping rate available for the capture of contaminated groundwater migrating into the ROS area.

12.1 Pump Test Procedure Details

Pumping was performed on one well in the area (RW-9), with the other five wells utilized as observation wells for the duration of the test (RW-8, RW-10, MW-32, MW-33, and MW-34).

The pumping of RW-9 was performed using a Grundfos Redi-Flow 3®submersible pump, powered by a generator. The Redi-Flow pump used an adjustable rate control box to control the pumping rate. To monitor the flow rate, a digital flow meter was installed in the discharge line near the final discharge point. The flow rate was compared to timed measurements for filling a 5-gallon bucket.

Water levels were monitored using the In-Situ Pump Test Kit, which consisted of the Virtual Hermit software, Six Troll pressure transducers, and a Troll hub data center. The software and transducers were hooked up to a laptop and allowed for the monitoring of drawdown of water from the wells in real time. Water levels were recorded using a water level meter and compared to the transducer collected data to insure that the data collected was accurate.

All flow data was recorded into the field book, as were manually recorded water level readings. Digital data was stored on the pressure transducers (which recorded data regardless of whether the computer was connected) and downloaded to the laptop approximately every 2 hours as a backup measure.

Discharge water from the pump test was collected into an on-site open-top tank. A sump pump with an approximate pumping rate of 30 gpm was installed in the tank and manually activated when the tank was filled. Discharge water was then pumped through an existing 2” temporary force main to the groundwater treatment facility. A second generator powered the sump pump.

Two testing procedures were performed: (1) a step-test, during which the pumping rate was fluctuated, and (2) a constant rate pumping test. Upon completing both tests, water level data was again collected as the wells recovered (recharged), providing an additional data set to analyze. A copy of the pumping test result report is included as Attachment H.

12.2 Conclusion

Based on the data obtained, it appeared there were a variety of conditions prevalent in the ROS area that affected flow to the new recovery wells.

The 5-gpm step test data demonstrated a very different transmissivity in comparison with the 3-gpm pump test; however, the 5-gpm step was performed after the day of step testing in the ROS area, and may have represented the conditions after continuous pumping had drained the overlaying porous soils.

Based on the data obtained and the analysis performed, a flow rate of 3 gpm was determined to be a sustainable rate for extraction, though a higher rate may be possible for a shorter duration. Thus, the 10-gpm submersible pumps specified in the Basis of Design Report were changed to a 7-gpm model.

13.0 CONVERSION OF CW-31D TO RW-7

One additional recovery well, designated as RW-7, was installed in the former PCG source area as part of the remedy. This well was constructed by converting an existing monitoring well (CW-31D). Well boring logs are included as Attachment G.

The objectives of the additional recovery well were to address deeper groundwater contamination, enhance performance of the current groundwater remediation system in order to prevent the off-site migration of site-related contaminants, and restore the groundwater to beneficial use. Based upon an evaluation of historical pumping test data, the groundwater modeling data for the site suggested a significant capture zone could possibly be achieved at a proposed pumping rate of 30 gpm.

13.1 Vault Construction

To provide ample room and protection to the recovery well, a pre-cast concrete flush mount vault was installed.

14.0 CREATION OF INJECTION WELLS IW-1, IW-2 AND IW-3

Three existing recovery wells (RW-1, RW-2, and RW-4) located along the west side of Eagle Road (in the immediate vicinity of the Swiss Farms convenience store and Zac's Burgers restaurant) were de-activated in 2006 because of their historical low recovery rates of non-aqueous phase liquid (NAPL). The three wells were 6-inch diameter stainless steel wells, completed to a depth of 26, 28 and 26 feet below ground surface (bgs), respectively, and finished with 10 feet of screen.

Each of these three recovery wells was rehabilitated (redeveloped) to remove any buildup of materials (e.g., iron, manganese and biofilm, etc.), which may have limited the efficiency of the new injection points and were designated as wells IW-1, IW-2, and IW-3, respectively.

A 500-gallon plastic tank with an injection pump with discharge piping to three injection wells was installed. Because of an access issue at Swiss Farms, a portion of existing underground piping was utilized as-is. Plant effluent piping was modified to direct a portion of plant effluent to this tank. Injection pump (capable of pumping 30 gpm) was set to discharge 20-25 gpm to injection system (15 gpm to IW-1, 1 gpm to IW-2, and 7 gpm to IW-3).

Based upon previous groundwater modeling results, an injection rate of 5 gpm was deemed to be appropriate for recovery well capture. These groundwater models indicated that the injection of flushing solutions through the wells near RW-1 and RW-2 would have adequate coverage in the upper portion of the contaminated water column, and move downward into the deeper contaminated areas. In addition, injected solutions through well RW-1 would move along the current groundwater pathway and, therefore, be collected at the existing collection trench. In addition to the new injection points, the new recovery well (RW-7) addresses recovery of contaminants from deeper parts of the aquifer.

15.0 RECOVERY WELL PUMPS (RW-7 THROUGH 10)

For recovery well RW-7, a Gould Model 33GS20 4" submersible pump with a 2HP, 460 Volt, 3 phase motor was installed and set at a depth of 100 feet below the top of casing. The pumping capacity of the pump is 30 gpm. At startup, this pump was set to pump 25 gpm.

For recovery wells RW-8, RW-9, and RW-10, Gould Model 7GS05 4" submersible pumps with 1/2HP, 240 volt, single phase motors were installed about 5 feet below the top of the screen. The design pumping capacities of the pumps are 7 gpm.

16.0 FORCE MAIN INSTALLATION

Kemron contracted with U.S. Environmental to excavate and install approximately 2,700 linear feet of trenching/piping to transfer extracted groundwater from RW-8, RW-9 and RW-10 to the existing OU2 groundwater treatment plant. This forcemain was constructed of a double-wall pipe, 2-inch HDPE carrier pipe with a 4.25 inches outer containment pipe.

Piping from each of the three recovery wells was combined (via manifold) at a valve pit installed in the ROS area (VP-4). Then a single pipe was installed from the ROS area along the rear property lines of three residences, within the abandoned railroad right-of-way, through the PCG parking lot, and across Eagle Road to the existing groundwater treatment facility.

This force main routing required either both temporary and permanent access agreements or easements from approximately ten parcels, which were affected by remedial activities in the ROS area. Additionally, trenching under Eagle Road was necessary to connect the ROS area to the existing OU2 treatment plant.

16.1 Manhole/Vault Construction

Four new pre-cast below grade box manholes (MH-4, MH-5, MH-6, and MH-7) were installed along the force main route within the railroad right-of-way. The manholes were spaced approximately 500 feet apart and provide access to the force main and electrical junction/pull boxes. In each manhole two cleanout connections are provided to facilitate force main cleaning between manholes using high pressure jet cleaning equipment. In MH-4 an air release valve was installed to release air buildup within the force main.

A new valve pit (VP-5) was installed in the PCG parking lot near VP-2 to provide connection of the RW-7 force main to the ROS force main and provide access to the RW-7 flow control valve.

16.2 Eagle Road Trenching

The Eagle Road trenching process consisted first of the cutting and removal of macadam pavement and associated concrete sidewalk along the proposed path of excavation. Once all excavation tasks were completed, two 8" steel casings were installed into the trench and then backfilled to match existing grade. Most of the work was completed overnight to reduce the impact to traffic along the heavily traveled road. Upon completion of all trenching backfill, hot mix asphalt was installed where the trench crossed Eagle Road, followed by the replacement of all appropriate road markings. Also, both concrete sidewalks previously removed (parallel with Eagle Road) were reconstructed.

Once all Eagle Road trenching activities were completed, each of the two steel casings were accessed (by backhoe) to expose both ends of each of the 8" steel casement pipes. Once both of these casement pipes were accessible, the installation of both the force main piping and associated electrical conduits were installed in both steel casings.

In one 8” steel casing, an insulated 2” HDPE double-wall pipe was installed to connect the force main piping. In the second 8” steel casing, three 2” electrical conduits were installed to supply the ROS area with utilities controlled from the treatment plant.

RW-7 Force Main

The well RW-7 force main utilizes a portion of the existing inactive RW-3 force main and then connects into a new 2” force main common to RW-8 thru RW-10. The existing force main back to RW-3 was abandoned in place after the connection. The RW-7 force main runs through MH-1 to VP-5 using the existing 1.5-inch FRP secondary containment pipe. A tee connection was installed in the existing force main before entering VP-5. The existing piping and valves remain connected in VP-2 to allow an alternate tie-in to the existing force main for cleaning and maintenance purposes.

16.3 Building Force Main

The new RW-7, 8, 9, and 10 force main enters the treatment plant near the vicinity of the existing collection force main. The 2” Schedule 80 PVC pipe follows the same path as the existing force main and tees into the existing oil-water separator (OWS) inlet after the existing flow meter. At that point all influent flows are combined (CTR, RW-5, RW-7, RW-8, RW-9, and RW-10). There are separate flow meters on the CTR/RW-5 line and RW-7 thru RW-10 line prior to OWS. These signals are transmitted to control room programmable logic controller (PLC).

16.4 Existing Manhole Modifications

The existing force main manholes (MH-1, MH-2, and MH-3) originally were designed with standard sewer-type manhole covers. The round covers were replaced with the same aluminum, square hatch design used on all the new valve pits and manholes. The new hatch is lighter and easier to access.

17.0 NEW POWER AND CONTROLS

17.1 ROS Area Control Panel

The ROS control panel receives power from an existing Philadelphia Electric Company (PECO) power pole. This panel provides power to the three recovery well pumps (RW-8 thru RW-10) and houses components for pump operation, control, flow transmitters, heat trace to VP-4 and MH-6 and MW-7, leak detection level switches in VP-4 and MH-4 through MW-7.

Recovery wells RW-8, RW-9 and RW-10 each consist of one well pump and a level transmitter. The RW vaults house junction boxes for means of disconnecting the pump electrical wiring.

Valve pit (VP-4) houses a paddlewheel flow sensor and a sample port for each recovery well.

The ROS control panel communicates with Groundwater Treatment Plant (GWTP) PLC via a fiber optics cable running from the ROS panel to a device located inside Rayox panel.

GWTP PLC monitors all well levels, flows, high water levels in new manholes/valve pit and operation of heat tracing, and controls the operation of all three recovery wells based on individual well level.

17.2 Recovery Well RW-7

Recovery well RW-7 consists of one well pump and a level transmitter. The level transmitter provides signals for the pump operation. The RW-7 vault houses a junction box for means of disconnecting the pump electrical wiring. A new flow paddlewheel sensor was installed inside existing manhole MH-1 to replace the former RW-3 sensor. The electrical and signal conduits were modified in MH-1 to include the RW-7 power and level transmitter. Three new conduits were run between MH-1 and RW-7 for power, signal, and a spare. The power wiring utilized existing wiring through VP-2. The level transmitter wiring utilized existing signal wiring in VP-2.

RW-7 level and flow signals are sent to the GWTP PLC, and the PLC controls operation of RW-7 based on its level.

17.3 Injection System

The electrical portion of the in-situ flushing system included the installation of level switches in the injection well vaults, flow elements, and modifying the heat trace in VP-1. These items are controlled by the PLC. A pump inside the treatment plant to control the flow of injection water is controlled by the PLC and the motor control center (MCC). A storage tank for the injection water was installed with a ½-HP stand-mounted mixer and an ultrasonic level transducer for level control.

18.0 GROUNDWATER SAMPLING AND ANALYSIS

Groundwater sampling was conducted on the ROS area dewatering sump while it was in operation. VOC and SVOC samples were taken on January 19, 2010; February 3, 2010; March 3, 2010; March 17, 2010; April 1, 2010; June 2, 2010; and July 1, 2010. Two temporary dewatering sumps located used during the excavation were also sampled for volatiles and semi-volatiles on March 17, 2010. The sampling data for the dewatering sump samples are provided in Attachment I.

Before the ROS pumping wells were placed in operation, background groundwater sampling was conducted on the ROS area new monitoring wells CW-32, CW-33, and CW-34 on May 13, 2010. The groundwater was sampled and analyzed for VOC and SVOCs.

After the ROS area pumping wells became operational on August 16, 2010, groundwater sampling of wells RW-8, RW-9, and RW-10 was conducted on September 14, 2010, and December 21, 2010. The groundwater was sampled and analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOC)s and Semi-volatile Organic Compound (SVOC)s, Target Analytes List (TAL) total metals, and dioxin/furans. ROS monitoring wells CW-32, CW-33, and CW-34 were also sampled on December 21, 2010, for the same analyses. The sampling data for the ROS area wells are provided in Attachment I.

Groundwater sampling of the RW-7 pumping well was conducted on December 21, 2010. RW-7 groundwater was sampled and analyzed for TCL VOC and SVOCs, TAL total metals, and dioxin/furans. The sampling data for well RW-7 with previous background data before conversion from well CW-31D are contained in Attachment I.

As part of the OU-3 Sampling and Analysis Plan, the ROS pumping and monitoring wells and RW-7 pumping well will be sampled again approximately six months after start of operation. The next groundwater sampling event is planned in late March 2011.

As part of the groundwater sampling protocol, all groundwater samples collected are tested in the field for dissolved oxygen, pH, oxidation reduction potential, conductivity, and temperature. Water levels are also measured.

19.0 ECOLOGICAL SAMPLING AND ANALYSIS

SURFACE WATER, SEDIMENT, AND FISH TISSUE

The objective of the ecological monitoring program is to collect data that can be evaluated to make the following decisions:

- Determine temporal changes in chemical concentrations in surface water, sediment, and fish tissue collected from Naylors Run and a tributary to Naylors Run.

- Determine whether the benthic macroinvertebrate community in Naylors Run and a tributary to Naylors Run is healthy and improving over time.

- Determine whether the fish community in Naylors Run and a tributary to Naylors Run is healthy and improving over time.

The data needed to make the above decisions include: (1) chemical concentrations in surface water, sediment, and fish tissue; and (2) fish and benthic macroinvertebrate community data to determine site-specific Index of Biotic Integrity (IBI) scores.

Field data collections used to establish baseline conditions took place during the spring through fall of 2009 and 2010 as part of the long-term ecological monitoring program, established in accordance with the Record of Decision (ROD) for the Site. Sampling was conducted as follows:

> May 20, 2009 (Round 1, event 1) and September 2 and October 27, 2009 (Round 1, event 2)
> May 10, 2010 (Round 2, event 1) and September 20, 2010 (Round 2, event 2)

The samples were analyzed for SVOCs, PAHs by SVOC-SIM, pesticides, TAL inorganics, dioxin/furans, grain size, and total organic carbon (TOC). Also, two rounds of six fish tissue samples were collected during the Naylors Run ecological monitoring program. The samples were analyzed for SVOCs, pesticides, TAL inorganics, dioxin/furans, and percent lipids.

A review of the Year 1 and 2 data for the Naylors Run watercourse suggests significant biological impairment (fish and benthos), possibly because of a combination of contaminants in the sediment and surface water, as well as limited physical habitat and extreme flow and temperature fluctuations. The data also clearly indicate that the sediments associated with Naylors Run are impaired with SVOCs, pesticides and dioxins when compared against the BTAG screening benchmarks. The data also suggest that that the surface water from Naylors Run is impaired with SVOCs, pesticides and metals when compared against the BTAG freshwater screening benchmarks. The results are in line with the conditions expected at this phase of the cleanup.