D&B Engineers and Architects, P.C.

123 POST AVENUE OPERABLE UNIT 2 (OU2) SITE

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REPORT TITLE

Monitoring Well Installation and Sampling Report
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CLIENT

New York State Department of Environmental Conservation

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NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation
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Purpose and Project Description

The purpose of this report is to document the monitoring well installation and sampling activities completed by D & B Engineers and Architects (D&B) at the 123 Post Avenue – Operable Unit 2 Site (the Site). The Site is located in a residential area of Westbury, Nassau County, New York (*see Figure 1*). Prior investigation work performed at the Site identified a plume of contaminated groundwater migrating from the 123 Post Avenue – Operable Unit 1 Site. In response to the identified groundwater impacts a Scope of Work and Project Schedule for a Remedial Investigation/Feasibility Study (RI/FS) was developed by D&B and approved by the New York State Department of Environmental Conservation (NYSDEC).

Prior to the implementation of this phase of work a chemical oxidation pilot study was performed at the Site between October 2011 and March 2013. The study was focused in the vicinity of monitoring well OU2-3 between Lennox and Bedford Avenues, along South Grand Street. During the study a total of thirteen (13) monitoring wells and three (3) injection wells were installed in order to perform the study. A total of 25,075 gallons of 5% sodium permanganate was injected into three injection wells in September and October 2012. The study found that the injection of sodium permanganate had reduced the concentrations of tetrachloroethene (PCE) and its breakdown products including trichloroethene (TCE) and cis-1,2-dichloroethene (cis-1,2-DCE) in groundwater.

The activities completed during this phase of work were implemented in accordance with Task 2 – Phase I Remedial Investigation, of the RI/FS Scope of Work. This phase of work included the following activities:

- Installation and development of four (4) new monitoring wells in the vicinity of Taylor Avenue in Westbury;
- Collection of groundwater samples from twelve (12) existing monitoring wells and two existing injection points located throughout the site for target compound list (TCL) volatile organic compounds (VOCs);
- Collection of groundwater samples from the four (4) newly installed monitoring wells, one (1) existing monitoring well (OU2-11) and the Big M Car Wash Well for TCL VOCs.

All work was completed in accordance with the NYSDEC approved Scope of Work and Project Schedule dated December 2013. The installation of the monitoring wells was completed in April and May 2014. Due to integrity issues, one of the deep monitoring wells was reinstalled in September 2014. The monitoring wells were developed in May and September 2014 and subsequently sampled in October 2014. Additionally, twelve existing monitoring wells and two existing injection points were sampled in March 2014. A site plan showing the locations of the monitoring wells and injection points is provided as *Figure 2*.

Monitoring Well Installation & Development

Four new monitoring wells (OU2-12D/E and OU2-13D/E) were installed at the Site to further delineate the areal and vertical extent of groundwater contamination from the 123 Post Avenue site. D&B utilized Aztech Technologies, Inc (Aztech) to perform the well installation and development activities. All of the monitoring wells were installed utilizing a sonic drill rig that advanced 8" diameter casing.

Prior to drilling activities, Aztech arranged for "One-Call" utility markouts to be completed in the vicinity of the proposed well installation areas. As a further precaution, the upper 5-feet of each location was pre-cleared utilizing hand tools.

As part of the well installation, soil samples were collected and logged for geology, inspected for evidence of contamination (e.g., staining or odors) and screened for organic vapors utilizing a photoionization detector (PID). Soil samples were not collected for laboratory analysis during the installation of the monitoring wells. The soil boring logs are provided in *Attachment 1*. Additionally, at the completion of drilling for monitoring wells OU2-13D/E, the borehole was gamma logged. A copy of the gamma log can be found in *Attachment 2*. Well construction details are shown below.

Well ID	Well Inner Diameter	Well Depth (feet bgs)	Screen Length
OU2-12D	2.5 inch	275 feet	10 feet
OU2-12E	2.5 inch	350 feet	10 feet
OU2-13D	2.5 inch	300 feet	10 feet
OU2-13E	2.5 inch	350 feet	10 feet

Monitoring wells OU2-12D/E were installed as a well cluster with two wells completed within an 8" borehole. The well cluster was completed from May 12 through May 20, 2014 as two 2½ -inch wells. OU2-12D was completed with 10 feet of 0.010-inch slot screen and 265 feet of Schedule 80 PVC riser. The monitoring well was completed to a depth of 275 feet below grade with the screened interval located at a depth of approximately 265 to 275 feet below grade. OU2-12E was completed with 10 feet of 0.010-inch slot screen and 340 feet of Schedule 80 PVC riser. The monitoring well was completed to a depth of 350 feet below grade with the screened interval located at a depth of approximately 340 to 350 feet below grade. A monitoring well construction log and soil boring log for OU2-12D/E is provided in *Attachment 1*.

Monitoring wells OU2-13D/E were installed as a well cluster with two wells completed within an 8" borehole. The well cluster was completed from April 28 through May 8, 2014 as two 2½ -inch wells. OU2-13D was completed with 10 feet of 0.010-inch slot screen and 290 feet of Schedule 80 PVC riser. The monitoring well was completed to a depth of 300 feet below grade with the screened interval located at a depth of approximately 290 to 300 feet below grade. OU2-13E was completed with 10 feet of 0.010-inch slot screen and 340 feet of Schedule 80 PVC riser. The monitoring well was completed to a depth of 350 feet below grade with the screened interval located at a depth of approximately 340 to 350 feet below grade. During the subsequent development of OU2-13E it was found that the monitoring well was compromised, where grout had sealed up the screen zone. It was determined that the grout could not be removed through the development efforts. The well was therefore re-installed from September 18 through September 30, 2014 and the original well was properly abandoned on September 30, 2014. A monitoring well construction log and soil boring log for OU2-13D/E and the re-installed OU2-13E is provided in *Attachment 1*.

A number 2 sand pack was installed from the bottom of each well to 2-foot above the top of the well screen. A 2-foot bentonite seal was installed above the sand pack. A cement/bentonite grout mixture was installed above the bentonite seal and each well was finished at grade with a concrete well pad, a 12-inch flush-mounted well cover and a compression plug. All drilling equipment was decontaminated prior to and between uses at each monitoring well location.

The newly installed monitoring wells were developed by pumping and surging each well for a minimum of two hours or until the turbidity of the groundwater was reduced to at least 50 nephelometric turbidity units

(NTUs). Well development water was also monitored for field parameters, including pH, temperature, specific conductance, turbidity, oxidation reduction potential and dissolved oxygen, using a calibrated Horiba U52 mulit-parameter water quality meter with flow through cell. Development continued until the field parameters stabilized for a minimum of three consecutive readings of 10 percent variability or less. The well development logs are provided as *Attachment 3*.

The soil generated during well installation was contained on-site in 55-gallon DOT approved drums for proper off-site disposal. Well development water was similarly containerized in 55-gallon DOT approved drums. Copies of the waste manifests are provided as *Attachment 4*.

Groundwater Sampling

Groundwater sampling of twelve (12) existing monitoring wells and two (2) existing injection points was performed in March 2014. The monitoring wells that were sampled included OU2-6, OU2-7A, OU2-7B, OU2-8A, OU2-8B, OU2-8C, OU2-9A, OU2-9B, OU2-9C, OU2-10A, OU2-10B and OU2-10C. Additionally, the two injection points sampled during this monitoring event were IW-1 and IW-2(OU2-3).

Groundwater sampling of four (4) newly installed monitoring wells, one (1) existing monitoring well and one (1) water supply well was performed in October 2014. The monitoring wells that were sampled included wells OU2-11, OU2-12D, OU2-12E, OU2-13D, and OU2-13E. Additionally, the Big M Car Wash Well was sampled.

With the exception of the Big M Car Wash Well, water level data, well diameter, and well depth were used to calculate the volume of standing water contained within each well. The wells were then purged using low-flow purging techniques. During the well purging process, field measurement of pH, temperature, specific conductivity, dissolved oxygen, oxidation reduction potential and turbidity were recorded using a calibrated Horiba U52 multi-parameter water quality meter with flow through cell. The water quality logs are provided as *Attachment 5*. Groundwater samples were collected from each well using a bladder pump equipped with disposable tubing and transferred from the tubing on the outlet of the pump directly into clean laboratory-supplied sample bottles after the field parameters stabilized for a minimum of three consecutive readings of 10 percent variability or less. The sample containers were labeled and placed in a cooler with bagged ice sufficient to cool the samples to 4 degrees Celsius and submitted to Spectrum Analytical Inc. of North Kingstown, Rhode Island via chain-of-custody procedures for laboratory analysis. Each groundwater sample collected was analyzed for TCL VOCs via NYSDEC Analytical Service Protocols (ASP) Method OLMO 4.2.

Purge water was containerized for discharge to the Nassau County sanitary sewer system. The approval letter issued by the Nassau County Department of Public Works is provided as *Attachment 6*. All non-dedicated sampling equipment (e.g., oil/water interface probe, bladder pump, etc.) was decontaminated prior to and between each sampling location.

Groundwater Sampling Results

The results of the groundwater sample analysis from the March 2014 sampling event are provided in *Table 1*. The results are compared to NYSDEC Technical and Operational Guidance Series (TOGS) (1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Class GA Groundwater Standards. *Figure 3* presents the total concentration of compounds that were detected above the laboratory's method detection limit (MDL). The highest concentration of PCE was detected within monitoring well OU2-9C at a concentration of 710 ug/l. Elevated levels of PCE were also detected with OU2-7A, OU2-7B, OU2-9B, OU2-10B, and OU2-10C ranging from 9.1 to 330 ug/l. Additionally, cis-1,2-DCE was detected above its groundwater standard within the sample collected from OU2-9C and OU2-10C at

35 and 7.7 ug/l, respectively. The only other compound detected above its groundwater standard was TCE which was detected at 13 ug/l within the sample collected from OU2-9C.

The results of the groundwater sample analysis from the October 2014 sampling event are provided in *Table 2*. The results are compared to NYSDEC TOGS (1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Class GA Groundwater Standards. *Figure 3* presents the total concentration of compounds that were detected above the laboratory's MDL. The highest concentration of PCE was detected within the Big M Car Wash Well at a concentration of 610 ug/l. Elevated levels of PCE were also detected with OU2-11 at a concentration of 150 ug/l. Additionally, cis-1,2-DCE was detected above its groundwater standard within the sample collected from OU2-12E and the Big M Car Wash Well at 5.4 and 13 ug/l, respectively. The only other chlorinated compound detected above its groundwater standard was TCE that was detected within the samples collected from OU2-12E and the Big M Car Wash Well at 6 and 6.9 ug/l, respectively. One non-chlorinated compound, acetone was detected above its groundwater standard within the sample collected from OU2-12E at a concentration of 61 ug/l.

The results of the pre-injection groundwater sampling event conducted in January 2012 were plotted on a cross section and are provided as *Figure 4*. Additionally, the results of the 2014 groundwater sampling event were plotted on a cross section and are provided as *Figure 5*. These cross sections were utilized to estimate the current extent of the VOC plume and display the efficacy of the permanganate injection event.

Findings

- Acetone was detected within the groundwater sample collected from OU2-12E in excess of its groundwater standard; however, this compound is a typical laboratory contaminant and is not related to the chlorinated solvent plume associated with the Site.
- The concentrations of PCE and its breakdown products including TCE and cis-1,2-DCE have been reduced in the area of the sodium permanganate injections that were conducted in September and October 2012; however these compounds are still found to be at elevated levels, most notability within deep monitoring wells OU2-9C and OU2-10C.
- The Big M Car Wash Well and monitoring well OU2-11 continue to exhibit elevated concentrations of PCE and do not appear to have been impacted by the 2012 injection event.
- The newly installed monitoring wells that were installed in the vicinity of Taylor Avenue exhibit low-level detections of PCE and its breakdown products; however only TCE and cis-1,2-DCE were detected within OU2-12E at concentrations slightly exceeding groundwater standards.

Recommendations

- Continue to perform additional groundwater monitoring to monitor efficacy of the permanganate injection event and contaminant concentrations.
- Develop a scope of work for the installation of additional monitoring wells to further delineate the areal and vertical extent of contamination at the Site.