D&B Engineers and Architects, P.C.

ACTIVE INDUSTRIAL UNIFORM SITE GROUNDWATER EXTRACTION AND TREATMENT SYSTEM

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New York State Department of Environmental Conservation

Payson Long Project Manager
E-mail: Payson.Long@dec.ny.gov

CONSULTANT

D&B Engineers and Architects, P.C.

James Van Horn, Project Manager
email: JVanHorn@db-eng.com

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NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Environmental Remediation
625 Broadway, 12th Floor, Albany, New York 12233

Site

NYSDEC Site No. 152125, Active Industrial Uniform Site Groundwater Extraction and Treatment System, Village of Lindenhurst, Town of Babylon, Suffolk County, New York.

Project Background and Site Description

The Active Industrial Uniform site (the Site) groundwater extraction and treatment system (GWE&TS) was designed to recover and treat a chlorinated solvent-contaminated groundwater plume emanating from the Site, a former dry cleaning and laundry facility. Dry cleaning activities were conducted at the Site from 1970 to 1987. The GWE&TS has been in operation since December 2001; however, D&B assumed site management duties for the Site in February 2005. Refer to *Figure 1* for a Site location map depicting the GWE&TS location.

Groundwater Extraction and Treatment System Overview

The GWE&TS consists of two, 8-inch diameter extraction wells; one located on-site in the southwest portion of the Site (RW-1), and one located off-site, approximately 1,500 feet southwest of the Site (RW-2). As per NYSDEC direction, extraction well RW-2 was shut down in April 2010 due to historically low VOC concentrations, and is now being monitored on a quarterly basis. Extracted groundwater is conveyed to the GWE&TS building via underground piping to two packed-tower air strippers. Based on influent concentrations and flow rate the operation of each tower is currently switched on a quarterly basis where only one tower is operated at any given time. Treated groundwater is pumped via underground piping to a storm water basin located approximately 1,000 feet west of the Site, which subsequently discharges into Little Neck Creek, in accordance with all applicable discharge standards. Exhaust gas from the air stripping towers was treated utilizing two granular activated carbon (GAC) vessels in series. Based on historically low contaminant concentrations detected in the air stripper exhaust gas, the air stripper exhaust piping was reconfigured to bypass the GAC vessels and discharge directly to the atmosphere in June 2011, per the direction of the NYSDEC. The GWE&TS is equipped with instrumentation and controls which allow for automated start-up and operation, and an autodial alarm notification system. Refer to *Figure 2* for an "as-built" system layout diagram.

Regulatory Requirements/Cleanup Goals

Site-specific remedial goals have been established through the remedy selection process and are documented in the Record of Decision (ROD), dated March 1997. The site-specific goals outlined in the March 1997 ROD are provided in *Attachment A*. The overall goal is to meet all appropriate Standards, Criteria, and Guidance (SCGs) and to be protective of human health and the environment. Implementation of the GWE&TS is specifically focused on the following goals:

- Reduce, control, or eliminate contaminated media to the extent practicable.
- Eliminate the threat to surface waters by remediating groundwater to the extent practicable.

- Mitigate the impacts of contaminated groundwater to the environment.
- Prevent, to the extent possible, migration of contaminants.
- Provide for attainment of SCGs for groundwater, soil and indoor air within the limits of the affected area, to the extent practicable.
- Reduce the threat of inhalation of site-related vapor-phase contaminants to residents within homes downgradient of the Site.

Remedial System Optimization (RSO)

As part of an ongoing Remedial System Optimization (RSO) effort to improve the efficiency, effectiveness and net environmental benefit of the GWE&TS, an on-site source area assessment and temporary well plume re-delineation program was completed at the Site in February and March 2013. As per a recommendation of the subsequent July 2013 RSO Data Summary Report, a remedial alternatives study was performed for the Site in October 2013. Following review of the remedial alternatives study and several follow-up discussions with the NYSDEC, it was determined that further plume delineation would be required prior to implementing any alternative remedial approach for the Site.

To this end, and based on D&B's recommendations, a membrane interface probe (MIP) investigation, including targeted groundwater sample collection, was completed at the Site on July 7 through 11 and July 14, 2014. It should be noted that the GWE&TS was manually shut down during the MIP Investigation in an effort to achieve static aquifer conditions. The results of the completed MIP investigation and groundwater sampling activities were summarized in a February 2015 MIP Investigation Summary Report. Based on the recommendations presented in the February 2015 MIP Investigation Summary Report, D&B prepared a draft chemical injection Pilot Study Scope of Work to address the identified remaining contamination at and downgradient of the Site.

As further detailed below, the GWE&TS was restarted in August 2016; however, the system was only operational for a few days until Transfer Pump P-2 failed. Following troubleshooting activities and system updates the GWE&TS was put back on-line on March 8, 2017, with only Transfer Pump P-1 operating; however, on March 13, 2017, D&B returned to site for a system inspection and found the system off due to a freeze up at AST-1. As a result, D&B and the NYSDEC Remedial Services Contractor continued efforts to complete system troubleshooting activities successfully restarting the system on April 26, 2017.

Treatment System Operational Status

The GWE&TS was operating for the majority of this reporting period with the exception of maintenance activities and operational issues as detailed below.

System Wiring and Controls

During a previous reporting period the NYSDEC Remedial Services Contractor contacted ALM Systems, a systems integrator, to assess and troubleshoot issues associated with electrical wiring and systems controls. Following their assessment, several wiring issues were noted at the systems control panel and the PLC was also noted to not be optimally programmed. ALM Systems also concluded that wiring in the VFD had been incorrectly installed and an inoperable cooling fan in the VFD was contributing to operational issues with Transfer Pump P-1. ALM Systems recommended the wiring and systems control issues be rectified. In February of 2016 the NYSDEC Remedial Services Contractor replaced the pressure transducers at AST-1 and AST-2. On January 16, 2017, the NYSDEC Remedial Services Contractor was on-site to complete troubleshooting activities for the GWE&TS. While on-site the technician completed a check of the transducer wiring to confirm the correct wiring was previously evaluated. On January 17, 2017, the NYSDEC Remedial Services Contractor was on-site to continue troubleshooting activities. At the start of testing the technician reported no readings from the transducers at the PLC and the NYSDEC Remedial Services Contractor then checked and confirmed the transducer was receiving power. After re-checking the wiring and connections, all were determined to be shielded and grounded properly. No motors were found to be running, no freezing was evident at the transducer and no splices were

found in the lines. The technician continued the system check utilizing a process meter; however, all readings displayed at the PLC were erratic. On January 18, 2017, the NYSDEC Remedial Services Contractor returned to site to continue troubleshooting activities. Utilizing a process meter, the NYSDEC Remedial Services Contractor continued simulating signal checks at the PLC; however, all readings displayed erratic results. In response to the issues noted by the NYSDEC Remedial Services Contractor, D&B continued troubleshooting activities on February 14, 2017. They confirmed that the transducers were properly wired and producing appropriate outputs based on varying levels in the respective sumps. Based on their observations it was concluded that the erratic readings observed at the PLC were most likely attributed to faulty PLC components and recommended coordinating with a controls contractor to continue troubleshooting efforts. On March 8, 2017, D&B returned to the site with ALM Systems where the following items were identified and remedied:

1. The VFD for the fan blower would not run when the system was in auto and required the operator to start the VFD manually. A jumper was installed to automatically engage the drive instead of relying on manually starting the blower;
2. The pressure switches at the discharge of Transfer Pumps P-1 & P-2 had been disabled and the pressure switch at Transfer Pump P-1 was also inoperable. As Transfer Pump P-2 has failed, its pressure switch was relocated to Transfer Pump P-1 and the switch was properly hooked up to the system controls; and,
3. The PLC analog input module was replaced, as erroneously high readings were being observed at the PLC for liquid levels in AST-1 and AST-2 and for flow readings. Upon replacement, the levels observed properly correlated to the level readings anticipated from directly powering and measuring the pressure transducers at the towers. Additionally, the flow readings correlated with the readings observed at the individual flow meters except for at discharge flow meter. The span was adjusted for the discharge flow meter to correct the discrepancy.

Following completion of the above repairs, the system was successfully restarted on March 8, 2017, utilizing only AST-1 as Transfer Pump P-2 needs repair or replacement. Based on the system inspection completed on March 8, 2017, D&B recommended implementation of the following repairs pertaining to the GWE&TS wiring and controls:

1. Addition of a low safety switch for the AST-1 and AST-2 sumps;
2. Replacement of the pressure switches for Transfer Pump P-1 and P-2
3. Repair of wiring for Transfer Pump P-1 and P-2;
4. Replacement of the control panel lights with LEDs as all lights were inoperable;
5. Replacement of the auto dialer as it was inoperable; and,
6. Configuring of the VFDs for Transfer Pump P-1 and P-2 to operate at operator selected fixed frequencies instead of PID loops.

On March 13, 2017, D&B returned to the site for a system inspection and found the system off due to a freeze up at AST-1. Additionally, erratic signals were observed at the PLC and D&B recommended replacing the PLC base. Per the NYSDEC's direction, the system was left off pending completion of additional system repairs. On April 5, 2017, D&B met with the NYSDEC Remedial Services Contractor to review the proposed repairs to the system wiring and controls discussed above, as well as to discuss the required repairs to the various other system components further discussed below. The NYSDEC Remedial Services Contractor returned to the site from April 12 through April 14, 2017, where they added a low safety switch for AST-1 and replaced the pressure switch for Transfer Pump P-1. They returned again on April 18, 2017, to repair the wiring for Transfer Pumps P-1 and P-2. On April 20, 2017, D&B and ALM Systems continued troubleshooting the system controls. During troubleshooting they identified a faulty PLC base and replaced the unit. Additionally, they configured the VFDs as recommended above. The system was left off at this time pending completion of the remaining control repairs. On April 26, 2017, D&B met the NYSDEC Remedial Services Contractor to complete the remaining repairs to the system controls and wiring, except for the installation of the low safety switch for AST-2 and pressure switch for Transfer Pump P-2. Upon completion of the repairs the system was successfully restarted with only Transfer Pump P-1 running. The NYSDEC Remedial Services Contractor returned to the site from June 6 through June 12, 2017, to install the remaining low safety switch at AST-2.

Transfer Pump P-2

Based on the system inspection completed on March 8, 2017, D&B recommended repair or replacement of the Transfer Pump P-2 pump head and repair of the Transfer Pump P-2 motor shroud. Additionally, D&B recommend replacing the pressure gauge for Transfer Pump P-2. In the previous reporting period the NYSDEC Remedial Services Contractor returned to the site in April 2017, where they replaced the pressure gauge for Transfer Pump P-2 and again on June 8, 2017, to decontaminate the pump head for shipment to the manufacturer for evaluation. On August 28, 2017, of this reporting period the NYSDEC Remedial Services Contractor reinstalled a replacement pump end for Transfer Pump P-2.

Influent and Effluent Piping

Based on the system inspection completed on March 8, 2017, D&B recommended implementation of the following repairs pertaining to the GWE&TS influent and effluent piping:

- Replacing of the pressure gauges for RW-1 and the combined influent line;
- Installing a vacuum breaker on the effluent line to eliminate siphoning; and,
- Repairing a leak identified at the threaded plug/tee where piping exits through this building slab.

The NYSDEC Remedial Services Contractor returned to the site from April 12 through April 14, 2017, where they completed the above recommended repairs. Additionally, on August 29, 2017, of this reporting period, the NYSDEC Remedial Services Contractor was on-site to install a new vacuum breaker to prevent siphoning at the Transfer Pump P-2 effluent line.

Air Stripper Towers

Based on the system inspection completed on March 8, 2017, D&B recommended implementation of the following repairs pertaining to the Air Stripper Towers:

- Reinstalling heat trace and associated insulation on the drains of both towers;
- Replacing the vacuum gauges and associated tubing for both towers; and,
- Installing a sight glass with associated heat trace and insulation for both towers.

The NYSDEC Remedial Services Contractor returned to the Site from April 12 through April 14, 2017, where they replaced the vacuum gages and associated tubing for both towers, as well as installed a sight glass for AST-1. Additionally, they returned to the Site from June 6 through June 12, 2017 to install a sight glass at AST-2.

On September 7, 2017, of this reporting the NYSDEC Remedial Services Contractor was on-site to install heat trace and associated insulation on all exterior piping, thereby completing the remaining repairs to the air stripper towers.

Extraction Well Redevelopment

On August 9, 2016, well redevelopment activities were attempted at extraction well RW-2. Approximately 13 feet of accumulated material was identified in the well. After several attempts, approximately 6 feet of the accumulated material was removed; however, NYSDEC Remedial Services Contractor was unable to successfully complete the slated well redevelopment. On August 16, 2016, the NYSDEC Remedial Services Contractor was on-site to complete boroscoping activities at extraction well RW-2 to identify any structural issues within the well. The inspection did not identify any structural issues with RW-2.

A summary of GWE&TS runtime/downtime for this reporting period is summarized below.

Treatment System Runtime/Downtime Summary		
Approximate Runtime - Current Reporting Period [1][2]	1,915 hours	86.7%
Approximate Downtime - Current Reporting Period [2]	293 hours	13.3%
Approximate Total Runtime to Date [3]	65,086 hours	59.5%
Approximate Total Downtime to Date [3]	44,277 hours	40.5%

Notes:

1. Total elapsed time for current reporting period is 2,208 hours (July 1, 2017 through September 30, 2017).
2. The downtime associated with this reporting period is due to on-going system control issues and maintenance activities.
3. Total downtime is based on when D&B assumed O&M duties in February 2005. The GWE&TS was shut down from December 2012 to May 2013 due to elevated VOC concentrations detected in system aqueous-phase effluent samples and to allow for the completion of the field investigation portion of the RSO evaluation at the Site. Additionally, GWE&TS was manually shut down on April 30, 2014, and remained off until November 3, 2014, when it was restarted. The GWE&TS remained off during this time due to anomalous elevated contaminant concentrations in aqueous-phase effluent samples, for inspection of a partially blocked discharge pipe and in an effort to achieve static aquifer conditions for the MIP Investigation program. The GWE&TS had not operated from December of 2014 through April of 2017, except for brief periods in August of 2016 and March of 2017. The GWE&TS was restarted on April 26, 2017, of the previous reporting period after repairs were completed to bring the system back online.

Treatment System Performance Summary

The GWE&TS performance during the current reporting period and since D&B assumed O&M duties in February 2005 is summarized below. The GWE&TS was operational for the majority of this reporting period, as detailed above.

Treatment System Performance Summary

Parameter	Quarter 51 (July 1, 2017 through September 30, 2017)	Quarter 50 (April 1, 2017 through June 30, 2017)	Totals to Date (February 2005 through current Quarter)
Influent			
RW-1 Average Pumping Rate (gal per min)	56.17	54.42	135.18
RW-1 Total Flow Volume (gal)	6,452,258	4,819,668	397,983,478
RW-1 Maximum Influent PCE Concentration (ug/l) (1)(2)	14	17	510
RW-2 Average Pumping Rate (gal per min)	NA	NA	80
RW-2 Total Flow Volume (gal)	NA	NA	129,900,729
RW-2 Maximum Influent PCE Concentration (ug/l)(3)	0.54	0.69	140
Influent Total Flow Volume (gal)	6,452,258	4,819,668	527,884,207
Effluent (4)			
Effluent Total Flow Volume (gal)	7,332,005	5,713,090	526,527,826
Maximum Effluent PCE Concentration (ug/l)(5)	ND	ND	16
VOC Removal Summary			
Total VOC Removal (lbs)	3.58	1.47	1,645
Average VOC Removal Rate (lbs/hr)	1.87E-03	9.99E-04	2.53E-02
VOC Removal Efficiency Range (%)	98.29-99.22%	91.56-98.87%	77.66 - 99.71%

NA: Not applicable. ND: Constituents concentrations below the analytical detection limit.

Notes:

1. The GWE&TS was not operating for the majority of April 2017; therefore, an influent system sample was not collected from RW-1 in April 2017. However, RW-1 was sampled as part of the quarterly groundwater sampling event on April 24, 2017, and PCE was detected at a concentration of 1.7 ug/l. Two aqueous-phase influent samples were collected on May 1, 2017 and June 1, 2017, when the system was operating, and are reflected in the table above.
2. As the GWE&TS was operating for the majority of this reporting period with the exception of some downtime, three aqueous-phase influent samples were collected from extraction well RW-1 on July 26, 2017, August 11, 2017 and September 5, 2017.
3. As described above, extraction well RW-2 was shut down in April 2010, and has generally remained off since this time, based on low historic VOC concentrations, as per NYSDEC direction. As RW-2 is not currently operating, monthly samples are not collected from this extraction well. RW-2 is currently being sampled on a quarterly basis, as part of the quarterly groundwater sampling effort. Concentrations are reflected in the table above.
4. The effluent flow meter was noted by the NYSDEC Remedial Services Contractor to be malfunctioning on January 1, 2014. The GWE&TS was shut down from this date until January 10, 2014. Per NYSDEC request, the GWE&TS was then operated without the effluent flow meter from January 10, 2014 to March 19, 2014, when a new meter was installed. The GWE&TS flow values were estimated based on recent effluent flow volume data from this approximate time period.
5. As the GWE&TS was operating throughout the majority of this reporting period, three aqueous-phase effluent samples were collected on July 26, 2017, August 11, 2017 and September 5, 2017. Concentrations are reflected in the table above.

Treatment System Cost Summary[1]		
COST ITEM	**CURRENT REPORTING PERIOD BUDGET EXPENDED (July 1, 2017 through September 30, 2017)**	**PREVIOUS REPORTING PERIOD BUDGET EXPENDED (April 1, 2017 through June 30, 2017)**
ENGINEERING SUPPORT		
D&B Engineers and Architects, P.C.	$13,792	$28,017
SUBCONTRACTORS		
NYSDEC Remedial Services Contractor[2] (Routine/Non-Routine Maintenance Activities)	$23,739	$27,044
Test America (Analytical Laboratory)	$7,417	$1,269
SUB-TOTAL	$31,156	$28,313
UTILITIES		
Electric	$3,581	$6,608
Telephone	$184	$124
Natural Gas	$130	$144
Water	$33	$0
SUB-TOTAL	$3,928	$6,876
TOTAL COSTS	$48,876	$63,206
AVERAGE COST/MONTH	$16,292	$21,069
COST/POUND OF VOC REMOVED	$13,653[3]	$43,292[4]

NA: Not applicable.

Notes:

1. The treatment system costs include monthly utility charges, maintenance costs and engineering costs. Capital construction costs and NYSDEC project management efforts are not included in this evaluation.
2. Remedial Services Contractor costs do not include utility costs.
3. Based on a total of approximately 3.58 lbs of total VOCs removed during this reporting period.
4. Based on a total of approximately 1.47 lbs of total VOCs removed during the previous reporting period.

Treatment System Operation and Maintenance

All alarm conditions and routine and non-routine system maintenance activities completed during this reporting period are summarized below. Refer to *Attachment B* for operations and maintenance logs, as prepared by the NYSDEC Remedial Services Contractor for this reporting period.

Routine Equipment Maintenance Schedule Summary

Major System Component	Manufacturer	Model Number	Maintenance Frequency	Maintenance Summary					
				Current Reporting Period			Next Reporting Period		
				Jul-17	Aug-17	Sept-17	Oct-17	Nov-17	Dec-17
Extraction Well Pump RW-1	Grundfos Pump Corp.	150550-2	As needed based on flow trends						
Extraction Well Pump RW-2	Grundfos Pump Corp.	1505100-5	As needed based on flow trends						
Pressure Blower	Cincinnati Fan	PB-18	Bi-Monthly		8/21/17				
Air Stripper Maintenance	Branch Environmental	48T-25H	As needed based contaminant concentrations						
Air Stripper Transfer Pump Maintenance	Magnatex Pumps, Inc.	MTA-A10-P-F20-2-FE	Quarterly		8/21/17				

: Planned Activity

Facility Maintenance:

- On July 12, 2017, the NYSDEC Remedial Services Contractor, while on-site, completed housekeeping and lawn maintenance within the Site property.
- On July 26, 2017, the NYSDEC Remedial Services Contractor, while on-site, completed lawn maintenance within the Site property.
- On August 11, 2017, the NYSDEC Remedial Services Contractor completed lawn maintenance within the Site property.

Alarm Conditions:

- On July 3, 2017, the GWE&TS shut down due to a high sump alarm in the floor sump. The NYSDEC Remedial Services Contractor pumped out the floor sump, reset and restarted the GWE&TS on July 5, 2017; however, later the same day the GWE&TS failed due to a similar alarm, a high sump alarm at the floor sump. The system was left off pending troubleshooting activities on July 6, 2017. On July 6, 2017, the NYSDEC Remedial Services Contractor attempted to restart the GWE&TS; however, due to suspected mechanical issues at the sump pump and a suspected leak from the potable water sink, the system went back down and remained off. The NYSDEC Remedial Services Contractor returned to site on July 7, 2017, to complete troubleshooting activities, where it was identified that a leaking check valve was allowing extracted groundwater to fill the sump. Per D&B's request the NYSDEC Remedial Services Contractor isolated the line by closing a ball valve and restarted the GWE&TS.
- On August 18, 2017, the NYSDEC Remedial Services Contractor received a general systems alarm. The NYSDEC Remedial Services Contractor reset and restarted the system upon departure on August 21, 2017.
- On August 30, 2017, the NYSDEC Remedial Services Contractor responded to a high water level alarm at AST-1. The NYSDEC Remedial Services Contractor attempted to reset and restart the system on the same day; however, due to a similar alarm the GWE&TS failed later the same day. The NYSDEC Remedial Services Contractor returned to site on August 31, 2017, to reset and restart the system.
- On September 14, 2017, the GWE&TS shut down due to a high sump alarm at the floor sump. The NYSDEC Remedial Services Contractor responded on September 15, 2017, while on-site the technician attempted to reset and restart the

system; however, due to an identified leak in a ball valve on the effluent line between transfer pumps the system was left off pending repair activities. On September 18, 2017, the NYSDEC Remedial Services Contractor returned to the site to replace the valve with a section of pipe and restarted the GWE&TS upon departure.

Non-Routine Treatment System Maintenance:

- On July 12, 2017, the NYSDEC Remedial Services Contractor and Land Valve Specialists were on-site to perform a back flow inspection.
- On August 25, 2017, the NYSDEC Remedial Services Contractor was on-site to repair a leak found at the slop sink.
- On August 28, 2017, the NYSDEC Remedial Services Contractor was on-site to install a replacement Magnatex pump at Transfer Pump P-2 and begin piping installation.
- On August 29, 2017, the NYSDEC Remedial Services Contractor was on-site to install a vacuum breaker at Transfer Pump P-2 effluent line. While on-site the NYSDEC Remedial Services Contractor observed a leak at the Transfer Pump P-2 effluent line ball valve. The technician was able to reset the valve and restart the system.
- On September 7, 2017, D&B and the NYSDEC Remedial Services Contractor to conducted testing of AST-2 operations and disconnected the auto louvre controls, per D&B request. While on-site the NYSDEC Remedial Services Contractor completed winterization of the new exterior plumbing.
- On September 18, 2017, the NYSDEC Remedial Services Contractor was on-site to replace a leaking valve located on the effluent line with a small section of pipe.

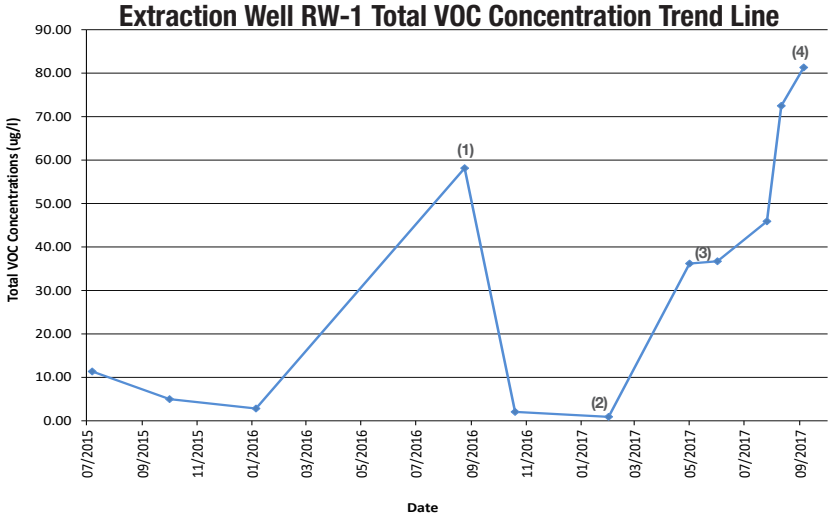
Treatment System Monitoring and Sampling Results

A summary of the routine treatment system monitoring and sampling collection and associated results are provided below.

Treatment System and Groundwater Sampling Summary

Sampling Location	Monthly				Quarterly	Semi-Annual	
	Influent/Effluent VOC (EPA Method 8260)	Influent/Effluent TAL Metals (EPA Method 6010)	Effluent pH (Field Screening)	Effluent TDS (EPA Method 160.1 or SM 2540C)	Monitoring Well VOC (EPA Method 8260)	Monitoring Well VOC (EPA Method 8260)	Effluent VOC (EPA Method TO-15)
Extraction Well RW-1 Influent	7/26/17 8/11/17 9/5/17	7/26/17 8/11/17 9/5/17					
Extraction Well RW-2 Influent[1]							
Air Stripper Aqueous-Phase Effluent [2]	7/26/17 8/11/17 9/5/17	7/26/17 8/11/17 9/5/17	7/26/17 8/11/17				
Air Stripper Vapor-Phase Effluent [3][4]							
Groundwater Monitoring Wells MW-103 through MW-107, MW-2S, MW-4D, MW-5S and RW-2					7/3/17 7/6/17		
Groundwater Monitoring Wells MW-101, MW-102, MW-108, MW-109 and MW-111					7/3/17 7/6/17		

1. As RW-2 is not currently being operated, monthly samples are not collected from this extraction well; however, RW-2 is currently being sampled on a quarterly basis, as part of the quarterly groundwater sampling effort.
2. On September 5, 2017, the NYSDEC Remedial Services Contractor completed system sampling; however, inadvertently did not collect a pH sample due to the lack of sampling equipment on-site.
3. Monthly effluent vapor samples are analyzed utilizing tedlar bags and a hand-held photoionization detector (PID).
4. System vapor-phase effluent samples are to be collected on a semi-annual basis. A vapor-phase effluent sample for laboratory analysis was collected on June 1, 2017.



1. The GWE&TS was operating for a brief amount of time throughout the July to September 2016 reporting period. As such only one aqueous-phase influent sample was collected from RW-1 for VOC analysis only, in August 2016.
2. It should be noted that a groundwater sample was collected from extraction well RW-1 for VOC analysis only, as part of the quarterly groundwater sampling conducted on January 31, 2017.
3. The GWE&TS was not operating for the majority of April 2017, as such, aqueous-phase influent samples were not collected in April 2017; however, a groundwater sample was collected from extraction well RW-1 for VOC analysis only, as part of the quarterly groundwater sampling conducted on April 24, 2017. Two aqueous phase influent system samples were collected from RW-1 in May and June 2017, while the system was operating.
4. Three aqueous-phase influent samples were collected throughout this reporting period on July 26, 2017, August 11, 2017 and September 5, 2017, while the system was operating.

Extraction Well RW-1 - System Influent Contaminant Concentration Ranges/Averages [1]

Contaminant [2]	*Current Reporting Period* [3]	*Previous Reporting Period* [4]	*Class GA Groundwater Standard*
Tetrachloroethene (PCE)	12 -14 ug/l	8.4 - 17 ug/l	5.0 ug/l
Trichloroethene (TCE)	3.4 - 3.7 ug/l	2.5 - 2.9 ug/l	5.0 ug/l
Cis-1,2-Dichloroethene (Cis-1,2-DCE)	29 - 62 ug/l	16 - 23 ug/l	5.0 ug/l
Vinyl Chloride (VC)	0.73 - 0.85 ug/l	0.85 - 1.9 ug/l	2.0 ug/l
Iron	ND	93 - 103 ug/l	300 ug/l
Manganese	941 - 1010 ug/l	1180 - 1280 ug/l	300 ug/l
Sodium	32,100 - 34,800 ug/l	37,600 - 38,300 ug/l	20,000 ug/l

ND: Constituent concentration below the analytical detection limit. --: Not analyzed
Red font denotes an exceedances of the applicable standard.

1. Only includes constituents consistently or periodically detected in exceedance of their respective Class GA Groundwater Standard.
2. Click on the blue-colored contaminants for graphs of VOC concentrations over the last 2 years for VOCs detected above the Class GA Groundwater Standards for this and/or the previous reporting periods.
3. As the GWE&TS was operating for the majority of this reporting period three aqueous-phase influent system samples were collected from extraction well RW-1 on July 26, 2017, August 11, 2017 and September 5, 2017, while the system was operating.
4. As the GWE&TS was not operating for the month of April 2017, an aqueous-phase influent sample was not collected in April 2017; however, an aqueous-phase groundwater sample was collected on April 24, 2017 for VOC analysis only, as part of the quarterly groundwater sampling event. PCE was detected at a concentration of 1.7 ug/l. Aqueous-phase influent samples were collected from RW-1 on May 1, 2017 and June 1, 2017, while the system was operating and concentrations are reflected in the table above.

Aqueous-Phase Air Stripper Effluent Concentration Ranges [1]			
Discharge Permit Parameters	**Current Reporting Period [2]**	**Previous Reporting Period [3]**	**Site-Specific Effluent Limit**
1,2-Dichlorobenzene	ND	ND	10.0 ug/l
1-1-Dichloroethane	ND	ND	10.0 ug/l
1,1,1-Trichloroethane	ND	ND	10.0 ug/l
PCE	ND - 0.39	ND	10.0 ug/l
TCE	ND	ND	10.0 ug/l
Trans-1,2-DCE	ND	ND	10.0 ug/l
Cis-1,2-DCE	0.36 - 1.0	ND - 0.41	NL
VC	ND	ND	10.0 ug/l
Potassium	2,520 - 2,650	2,690 - 3,150	Monitor
Bromomethane	ND	ND	Monitor
Chloromethane	ND	ND	Monitor
Copper	ND	ND	4.0 ug/l
Iron	ND - 767	ND	1,000 ug/l
Lead	ND - 11.6 ug/l	ND	8.0 ug/l
Manganese	909 - 939	1,210 - 1,250	Monitor
Vanadium	ND	ND	Monitor
Zinc	ND	ND	66.0 ug/l
Total Dissolved Solids (TDS)	231 - 251	182 - 209	Monitor
pH	5.60 - 6.82	6.16 - 7.79	6.5 - 8.5

ND: Constituent concentration below the analytical detection limit. NL: No limit. - - : Not analyzed.

1. Includes constituents considered contaminants of concern, as well as requiring monitoring as detailed under the State Pollution Discharge Elimination System (SPDES) permit equivalency.
2. As the GWE&TS was operating for the majority of this reporting period, three aqueous-phase effluent system samples were collected on July 26, 2017, August 11, 2017 and September 5, 2017, while the system was operating.
3. As the GWE&TS was not operating for the majority of April 2017, an aqueous-phase effluent system sample was not collected in April 2017. Two aqueous-phase effluent system samples were collected on May 1, 2017 and June 1, 2017, while the system was operating.

Site-specific contaminants of concern for aqueous-phase air stripper effluent samples exhibited concentrations lower than the limits under the SPDES permit, with the exception of lead detected at a concentration of 11.6 ug/l in the effluent sample collected on July 26, 2017. This detection of lead is slightly higher than site specific effluent limit of 8.0 ug/l. It should be noted exceedances within the aqueous-phase air stripper effluent sample may be due to the GWE&TS being restarted in the previous reporting period. All aqueous-phase effluent sample results will be monitored on a routine basis to ensure all contaminants of concern are below SPDES limits.

Vapor-Phase Air Stripper Effluent Concentrations			
	Current Reporting Period	Previous Reporting Period [1]	Site-Specific Limits
PCE	--	0.000413 lbs/hr	0.007 lbs/hr
TCE	--	0.000063 lbs/hr	0.006 lbs/hr
Total Xylenes	--	0.000016 lbs/hr	0.001 lbs/hr
1,2-DCE (total)	--	ND	0.003 lbs/hr
VC	--	0.000017 lb/hr	0.014 lbs/hr
1,1,1-TCA	--	ND	0.001 lbs/hr
Total VOC Concentrations (field screening with PID) [2]	0.0 - 2.3	0.0 ppm	NA
Maximum Total VOC Emissions[3]	--	0.06909 lbs/hr	0.5 lbs/hr

ND: Constituent concentration below the analytical detection limit. NA: Not applicable. - - : Not analyzed.

PID: Photoionization Detector

Red font denotes an exceedance of the applicable site-specific limit.

1. Vapor-phase effluent samples for laboratory analysis are collected on a semi-annual basis. A sample was collected during the previous reporting period on June 1, 2017.
2. The total VOC concentrations observed this reporting period were well below the Site-Specific Maximum Total VOC Emissions Limit.
3. The Site-Specific Maximum Total VOC Emissions Limit of 0.5 lbs/hr was developed in consultation with the NYSDEC and is utilized as a means to monitor total vapor-phase VOCs emitted by the GWE&TS.

Quarterly Groundwater Monitoring Summary

Select groundwater monitoring wells and one extraction well were sampled on July 3, 2017 and July 6, 2017, to determine groundwater quality at and in the vicinity of the Site. Samples were collected from ten on-site groundwater monitoring wells (MW-101 through MW-108, MW-4D and MW-5S) and three off-site groundwater monitoring wells (MW-109, MW-111 and MW-2S) on July 3, 2017 and July 6, 2017. Additionally, off-site extraction well (RW-2) was sampled as part of the quarterly groundwater sampling event on July 6, 2017, as extraction well RW-2 is not operating.

The locations of the on-site groundwater monitoring wells are depicted on *Figure 3* and the locations of off-site groundwater monitoring wells are depicted on *Figure 4*.

Groundwater Monitoring Well Condition Summary

All sampled groundwater monitoring wells were located as indicated on the site map and the concrete well pads (where applicable), protective casings, surface seals, well IDs, PVC well risers, well plugs and locks were observed to be present and in good condition, with the following exception:

- A lock is not present at MW-108, MW-2S and MW-4D.

Refer to *Attachment C* for monitoring well inspection logs.

Groundwater Monitoring Results Summary:

A headspace reading was collected utilizing a PID at each groundwater monitoring well. PID readings were collected from each well immediately after the removal of the well caps and plugs. VOCs were detected between 0.0 to 2.3 ppm in headspace readings of the monitoring wells.

Below is a table summarizing the Site-specific contaminants of concern in on-site and off-site groundwater. Refer to *Attachment D* for analytical data results.

Site-Specific Contaminant of Concern Concentrations (1)

Monitoring Well (2)	PCE		TCE		Cis-1,2-DCE		Vinyl Chloride		Site-Specific 2-Year Contaminant Trend Analysis
	Current Reporting Period	Previous Reporting Period	Current Reporting Period	Previous Reporting Period	Current Reporting Period	Previous Reporting Period	Current Reporting Period	Previous Reporting Period	
On-Site Monitoring Wells									
MW-101	0.58 ug/l	NS	0.66 ug/l	NS	ND	NS	ND	NS	Stable
MW-102	0.86 ug/l	NS	0.53 ug/l	NS	ND	NS	ND	NS	Stable
MW-103	3.3 ug/l	3.1 ug/l	0.54 ug/l	0.36 ug/l	1.6 ug/l	ND	1.1 ug/l	ND	Increasing
MW-104	20 ug/l	49 ug/l	1.5 ug/l	4.6 ug/l	ND	0.76 ug/l	ND	ND	Decreasing
MW-105	1.6 ug/l	3.2 ug/l	0.29 ug/l	1.4 ug/l	ND	260 ug/l	ND	27 ug/l	Increasing
MW-106	6.7 ug/l	17 ug/l	7.6 ug/l	6.9 ug/l	420 ug/l	27 ug/l	49	4.1 ug/l	Increasing
MW-107	1.6 ug/l	3.4 ug/l	0.81 ug/l	0.59 ug/l	0.30 ug/l	ND	ND	ND	Stable
MW-108	0.88 ug/l	NS	ND	NS	ND	NS	ND	NS	Stable
MW-4D	1,600 ug/l	350 ug/l	230 ug/l	54 ug/l	68 ug/l	9.1 ug/l	0.70 ug/l	ND	Increasing
MW-5S	0.30 ug/l	0.32 ug/l	ND	ND	ND	ND	ND	ND	Stable
Off-Site Monitoring Wells									
MW-109	0.96 ug/l	NS	1.2 ug/l	NS	1.3 ug/l	NS	ND	NS	Stable
MW-111	ND	NS	ND	NS	ND	NS	ND	NS	Stable
MW-2S	61 ug/l	1.7 ug/l	4.4 ug/l	0.44 ug/l	48 ug/l	29 ug/l	2.9 ug/l	2.8 ug/l	Decreasing
RW-2 (2)	0.54 ug/l	0.69 ug/l	1.3 ug/l	1.2 ug/l	1.5 ug/l	1.1 ug/l	0.082 ug/l	ND	Decreasing

ND: Constituent concentration below the analytical detection limit. NS: Not sampled.
Red font denotes an exceedance of the constituents Class GA Groundwater Standard (5.0 ug/l for PCE, TCE and Cis-1,2-DCE, and 2.0 ug/l for VC).

In addition, the following VOCs were also detected in one or more wells, generally well below their respective Class GA Groundwater Standards: carbon disulfide, chloroform, 1,1- dichloroethane, 1,2-dichlorobenzene, methylene chloride, MTBE and trans-1,2-dichloroethene.

Click on monitoring well IDs for graphs depicting contaminant concentrations over the last 2 years in wells exhibiting exceedances of the Class GA Groundwater Standards for this and the previous reporting period.

1. As the system was not operating for the majority of April 2017, extraction well RW-1 was sampled as part of the quarterly groundwater sampling event on April 24, 2017, of the previous reporting period.
2. Extraction well RW-2 is sampled as part of the groundwater sampling event on a quarterly basis in order to better monitor off-site contaminant concentrations.

Site-specific VOC concentrations in wells sampled during this reporting period were generally slightly lower than, or consistent with, those detected during the previous reporting period, with the exception of MW-4D and MW-106. In addition, ten of the fourteen sampled monitoring wells exhibited overall decreasing or stable concentrations of the site-specific contaminants of concern over the past 2-year period, and four of the fourteen sampled monitoring wells during this reporting period exhibited generally increasing contaminant trends over the past 2-year period. A figure depicting total VOC concentrations in on-site and off-site wells is provided as *Figure 5*.

It should be noted that, contaminants of concern, including TCE, Cis-1,2-DCE and VC, appeared to have increased in monitoring well MW-106 during this reporting period, as compared to the previous reporting period. It has come to attention that varying contaminant concentrations in monitoring well MW-106 may be due in part to the NYSDEC Remedial Service Contractor's sampling technician inadvertently mislabeling the sample container for MW-105 as sample MW-106; however, varying contaminant concentrations may also be a result of the recent restart of the GWE&TS, during the previous reporting period.

Additionally, as noted in previous reporting periods, the NYSDEC Remedial Service Contractor's sampling technician may have inadvertently mislabeled the sample container for MW-103 as sample MW-105, during the January 2017 groundwater monitoring event causing what appeared to be erroneous contaminant concentrations for these wells. As a result, contaminants of concern, including TCE, cis-1,2-DCE and VC, appeared to have increased in monitoring well MW-105 and decreased in monitoring well MW-103, as compared to previous reporting periods. However, if the sample containers were in fact mislabeled, contaminant concentrations within these wells have generally remained consistent over the previous 2-year period.

On-site monitoring well MW–4D exhibited an over-all increasing trend throughout the last 2 years; this reporting period site-specific VOC concentrations increased to 1,600 ug/l as compared to the previous reporting period contaminant concentration of 350 ug/l. Contaminant concentrations in monitoring well MW-4D have generally fluctuated widely over the last two years; however, concentrations have generally remained consistent in this well since May 2015, well below the greatly elevated concentrations initially observed in this well upon its identification in June 2012. It should be noted that monitoring well MW-4D is screened at a depth approximately 30 feet deeper than on-site extraction well RW-1 and the on-site monitoring wells. As previously reported, a MIP Investigation completed at the Site in July 2014 indicated that elevated concentrations of site-specific contaminants, primarily PCE, have been detected in groundwater monitoring well MW-4D, with PCE concentrations fluctuating up to a high of 110,000 ug/l (detected in both June and September 2012) since the well has been routinely sampled starting in September 2012.

As discussed in previous Site Management Quarterly Reports, off-site extraction well RW-2 has exhibited widely varying concentrations of total VOCs, with total VOC concentrations ranging from non-detect to a maximum of 103.3 ug/l (detected on February 12, 2014), since the well has been sampled along with the quarterly monitoring wells in mid-2011. Varying concentrations of cis-1,2-DCE were observed in off-site monitoring well MW-2S, ranging from 7.4 ug/l to 85 ug/l (detected in July 2015). It should be noted that monitoring wells MW-2S and RW-2 have experienced decreasing trends over the last 2 years. Off-site groundwater monitoring wells MW-109 and MW-111, have experienced stable trends throughout the last 2 years, both wells had VOC concentrations below the Class GA Standard of 5 ug/l.

Additionally, per the request of the NYSDEC, all on-site and off-site groundwater monitoring wells (MW-101 through MW-109, MW-111, MW-4D, MW-5S, MW-2S and RW-2) were sampled for polyfluoroalkyl substances (PFAS) and 1,4-dioxane during the site-wide groundwater sampling event. ***Attachment D*** presents tabulated analytical results for 1,4-dioxane and tabulated analytical results for PFAS.

Data Validation:

All sample results have been reviewed by D&B and deemed valid and usable for environmental assessment purposes.

- 1,1-Dichloroethene, 2,2-dichloropropane, carbon disulfide, methylene chloride, MTBE and trans-1,2-dichloroethene percent recoveries (%Rs) were below the quality control (QC) limit in the lab control sample (LCS), matrix spike and/or matrix spike duplicate (MS and/or MSD) associated with groundwater samples collected from MW-5S and MW-104 on July 3, 2017. 1,1-Dichloroethene, 2,2-dichloropropane, carbon disulfide, methylene chloride, MTBE and trans-1,2-dichloroethene were qualified as an estimated detection limit (UJ) in samples MW-5S and MW-104.
- The relative percent differences (RPDs) were above the QC limit for bromomethane and iodomethane in the MS/MSD associated with samples MW-101, MW-102, MW-103, MW-105, MW-106, MW-107 and MW-X. Bromomethane and iodomethane compounds were not detected in the samples therefore qualification of the data was not necessary for groundwater samples collected on July 3, 2017.
- The %Rs were below the QC limit for carbon disulfide, methylene chloride, MTBE and trans-1,2-dichloroethene in the MS and/or MSD associated with the groundwater samples collected from monitoring wells MW-108 and MW-2S on July 6, 2017. Carbon disulfide, methylene chloride, MTBE and trans-1,2-dichloroethene compounds were qualified as estimated (J/UJ) in samples MW-108 and MW-2S.
- Acetone was detected in the method blank in samples collected on July 26, 2017, as part of the remedial system sampling event. Acetone was not detected in the samples therefore qualification of the data was not necessary.

- The %R was above QC limit in the LCS for 1,1-dichloroethane for samples collected on September 5, 2017, as part of the remedial system sampling event. 1,1-Dichloroethane was not detected in the samples therefore qualification of the data was not necessary.

Data Validation Checklists are presented in *Attachment E*.

Findings and Recommendations

Findings:

- GWE&TS Operation: The GWE&TS was restarted on April 26, 2017, with only AST-1 in operation as further troubleshooting activities are necessary for full operation of the system. Per the NYSDEC's direction the system will remain on utilizing only AST-1, pending completion of additional system repairs recommended by D&B.
- GWE&TS Maintenance: The NYSDEC Remedial Services Contractor completed one round of routine maintenance activities during this reporting period. Additionally, as detailed above, non-routine maintenance was completed throughout this reporting period in an effort to improve the GWE&TS.
- System Aqueous-Phase Influent and Effluent Contaminant Concentrations: As the GWE&TS was operating throughout the majority of this reporting period, three aqueous-phase influent samples from extraction well RW-1 and three aqueous-phase effluent samples were collected on July 26, 2017, August 11, 2017 and September 5, 2017, for VOC and metal analysis. The NYSDEC Remedial Services Contractor collected a groundwater sample from extraction well RW-2 on July 6, 2017, for VOC analysis only, as part of the quarterly groundwater sampling event, per NYSDEC direction. Site-specific contaminants of concern for aqueous-phase air stripper effluent samples exhibited concentrations lower than the limits under the SPDES permit, with the exception of lead detected at a concentration of 11.6 ug/l in the effluent sample collected on July 26, 2017. This detection of lead is slightly higher than site specific effluent limit of 8.0 ug/l.
- System Vapor-Phase Effluent Monitoring: System vapor-phase effluent samples are to be collected on a semi-annual basis. A vapor-phase effluent sample for laboratory analysis was collected on June 1, 2017, of the previous reporting period. The system vapor-phase effluent sample collected on June 1, 2017 exhibited a VOC emission rate of 0.069 lbs/hr, lower than the Site-Specific Vapor-Phase Effluent Limit of 0.5 lbs/hr.
- Monitoring Well Conditions: All on-site sampled groundwater monitoring wells were located as indicated on the Site map and the concrete well pads (where applicable), protective casings, surface seals, well IDs, PVC well risers, well plugs and locks were observed to be present and in good condition, with the following exceptions:
  - A lock is not present at MW-108, MW-2S and MW-4D.
- Monitoring/Extraction Well Sampling: On-site groundwater monitoring wells (MW-104, MW-106, and MW-4D) and off-site monitoring well (MW-2S) exhibited one or more of the site-specific VOCs at concentrations exceeding their respective Class GA Groundwater Standards during this reporting period. It should also be noted that PCE was detected in thirteen of fourteen groundwater monitoring wells sampled this reporting period at concentrations ranging from 0.30 ug/l to a maximum of 1,600 ug/l, as detected in groundwater monitoring well MW-4D. However, PCE only exceeded the Class GA Standard of 5 ug/l in four of the groundwater monitoring wells. Off-site extraction well RW-2 has exhibited widely varying concentrations of total VOCs, with total VOC concentrations ranging from non-detect to a maximum of 103.3 ug/l (detected on February 12, 2014). Varying concentrations of cis-1,2-DCE were observed in off-site monitoring well MW-2S, ranging from 7.4 ug/l to 85 ug/l (detected in July 2015). It should be noted that monitoring wells MW-2S and RW-2 have experienced decreasing trends over the last 2 years. Off-site groundwater monitoring wells MW-109 and MW-111, have experienced stable trends throughout the last 2 years, both wells had VOC concentrations below the Class GA Standard of 5 ug/l.

Recommendations:

- General Treatment System:
  - It is recommended to expedite the remaining above-referenced repair activities to bring all GWE&TS components back online.
  - Based on the remaining elevated contaminant concentrations in groundwater still detected at the Site, it is recommended that the GWE&TS continue operating and an additional subsurface investigation be completed beneath and in the immediate vicinity of the treatment system building to evaluate possible remaining areas of contamination below the treatment system building slab.
  - D&B recommends that the NYSDEC Remedial Services Contractor record more clear and detailed descriptions of completed field activities and issues encountered, as well as alarm triggers, downtime dates and times and the steps taken to bring the GWE&TS back online on the Site Activities and System Operation Logs, as appropriate. In addition, logs received over the last several quarters have included multiple copies of logs, including some differing information. As such, D&B further recommends that the NYSDEC Remedial Services Contractor make an effort to provide one set of logs with all descriptions and dates of activities clearly indicated. These steps will help enable D&B to better understand the current status of the GWE&TS and facilitate a more efficient preparation of the Site Management Quarterly Reports. In addition, it is recommended that the NYSDEC Remedial Services Contractor adhere to the routine maintenance schedule.
- Treatment System Operational Issues:
  - System Wiring and Controls: D&B recommends that the NYSDEC Remedial Services Contractor replace the pressure switch at Transfer Pump P-2.
  - Sump-Pump: D&B recommends that the NYSDEC Remedial Services Contractor replace the leaking check valve on the sump pump effluent line.
  - Well Redevelopment: D&B recommends that the NYSDEC Remedial Services Contractor complete well redevelopment activities at extraction well RW-2.
- System Aqueous-Phase Influent and Effluent Contaminant Concentrations: All aqueous-phase effluent sample results will be monitored on a routine basis to ensure all contaminants of concern are below SPDES limits.
- Monitoring/Extraction Well Sampling: Based on the widely varying VOC concentrations detected in several wells over the course of several monitoring events it is recommended that the NYSDEC ensures that the Remedial Services Contractor is utilizing proper and consistent sampling techniques during each groundwater sampling event.
- Off-Site Monitoring Well Network: Due to the varying concentrations of total VOC's exhibited in RW-2 it is recommended that the shallow groundwater monitoring well network be expanded to include the installation of additional shallow monitoring wells on Lane Street, Grove Street, Willow Lane and Palm Street.

Reclassification/Delisting Evaluation

The Site was originally listed as a Class 2 Inactive Hazardous Waste Site by the NYSDEC in November 1990. Since this time, completion of the following project phases has occurred, as summarized below:

Project Phases and Completion Dates

Project Phase	Completion Date
Remedial Investigation	04/1994
Phase II Remedial Design Investigation	12/1998
Remedial Design	06/2000
Groundwater Extraction and Treatment System Construction	12/2001 (1)
UST Removal and Phase I Contaminated Soil Removal IRM	06/2010
Phase II Contaminated Soil Removal IRM	07/2011

1. Construction of the GWE&TS was completed in December 2001. The GWE&TS was placed into routine operation in December 2001 and D&B assumed O&M duties in February 2005.

Given the above, the Active Industrial Uniform Site cannot be reclassified at this time, pursuant to the requirements identified in 6 NYCRR §375-2.7, as site-related contamination has not been fully remediated and continues to pose a significant threat to public health and the environment. As such, Site delisting is not recommended at this time, as all remediation and post-remediation activities have not been satisfactorily completed. Work continues to address residual on-site contamination and system optimization to expedite overall remediation and Site closure.

Report Certification:

I have personally examined and am familiar with the information submitted in the referenced report. To the best of my knowledge and belief, and based upon my inquiry of those individuals immediately responsible for obtaining the information reported therein, I certify that the submitted information is true, accurate, and complete.

Project Director: _____ 3.23.18

Richard M. Walka
Senior Vice President

Date

Project Manager: _____ 3.23.2018

James Van Horn
Project Manager

Date