D&B Engineers and Architects, P.C.

ACTIVE INDUSTRIAL UNIFORM SITE GROUNDWATER EXTRACTION AND TREATMENT SYSTEM

Latitude 40.677°, Longitude -73.365°

REPORT TITLE

Site Management Quarterly Report No. 55

REPORTING PERIOD

July 1, 2018 through September 30, 2018

CLIENT

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

MARCH 2019

3150-07 - AIU Quarterly Report 55.indd (03/15/19 - 7:41 AM)

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 shutdown 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 shutdown 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.

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

On August 9, 2018, the NYSDEC Remedial Services Contractor was on-site to conduct routine operations and maintenance activities and found the system off due to a general system alarm. The autodialer was found unplugged, prior to leaving Site the Remedial Services Contractor plugged the autodialer in to ensure future alarms are called out.

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]	2,143 hours	97%
Approximate Downtime - Current Reporting Period [2]	65 hours	3%
Approximate Total Runtime to Date [3]	72,920 hours	62%
Approximate Total Downtime to Date [3]	45,203 hours	38%

Notes:

1. Total elapsed time for current reporting period is 2,208 hours (July 1, 2018 through September 30, 2018).
2. The downtime associated with this reporting period is due to system shutdowns and on-going maintenance activities.
3. Total downtime is based on when D&B assumed O&M duties in February 2005. The GWE&TS was shutdown 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 shutdown 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, 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.

Parameter	Quarter 55 (July 1, 2018 through September 30, 2018)	Quarter 54 (April 1, 2018 through June 30, 2018)	Totals to Date (February 2005 through current Quarter)
Influent			
RW-1 Average Pumping Rate (gal per min)[1]	80.30	70.37	--
RW-1 Total Flow Volume (gal)	10,324,880	6,517,987	426,952,115
RW-1 Maximum Influent PCE Concentration (ug/l)[2]	130	40	--
RW-2 Average Pumping Rate (gal per min)	NA	NA	--
RW-2 Total Flow Volume (gal)	NA	NA	129,900,729
RW-2 Maximum Influent PCE Concentration (ug/l)[3]	0.69	0.55	--
Influent Total Flow Volume (gal)	10,324,880	6,517,987	556,852,844
Effluent [4]			
Effluent Total Flow Volume (gal)	10,632,199	6,675,224	557,354,674
Maximum Effluent PCE Concentration (ug/l)[5]	2.4	0.56	--
VOC Removal Summary			
Total VOC Removal (lbs)	21.01	2.55	1,676
Average VOC Removal Rate (lbs/hr)	9.80E-3	1.65E-03	--
VOC Removal Efficiency Range (%)	97.06 - 97.65%	97.00 - 99.21%	--

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

Notes:

1. RW-1 average pumping rates for this and the last reporting period were higher than the previous periods because the NYSDEC Remedial Services Contractor did not adjust the flow rate following the effluent pipe repair.
2. As the GWE&TS was operating for the majority of this reporting period, RW-1 influent samples are scheduled to be collected on a monthly basis from the system, as such, three influent system samples were collected on July 12, August 23, and September 5, 2018.
3. As described above, extraction well RW-2 was shutdown 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 shutdown 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 for the majority of this reporting period, effluent samples are scheduled to be collected on a monthly basis from the system, as such, three effluent samples were collected on July 12, August 23, and September 5, 2018. Concentrations are reflected in the table above.

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-18	Aug-18	Sept-18	Oct-18	Nov-18	Dec-18
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	7/12/18 7/27/18	8/9/18 8/23/18	9/14/18			
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	7/12/18 7/27/18	8/9/18 8/23/18	9/14/18			

: Planned Activity

Facility Maintenance:

- On July 13 and 27, August 9 and 23 and September 5, 2018 the NYSDEC Remedial Services Contractor completed grounds keeping activities on-site.

Alarm Conditions:

- On August 9, 2018 the NYSDEC Remedial Services Contractor arrived on-site to complete a routine Site check. Upon arrival the technician found the system off due to a general alarm. No alarm call was logged due to the unplugged autodialer. While on-site the NYSDEC Remedial Services Contractor reset and restarted the system and plugged the autodialer into the power source.
- On September 6, 2018, a general alarm caused the system shutdown. The NYSDEC Remedial Services Contractor responded on September 7, 2018 to reset and restart the system.
- On September 14, 2018, the NYSDEC Remedial Services Contractor responded to a general systems alarm due to a possible loss of power to the system. The system was reset and restarted on the same day.
- On September 20, 2018, the NYSDEC Remedial Services Contractor responded to a general systems alarm. The system was reset and restarted on the same day.

Non-Routine Treatment System Maintenance:

- The autodialer was found unplugged on August 9, 2018, while on-site the NYSDEC Remedial Services Contractor plugged the autodialer back in.

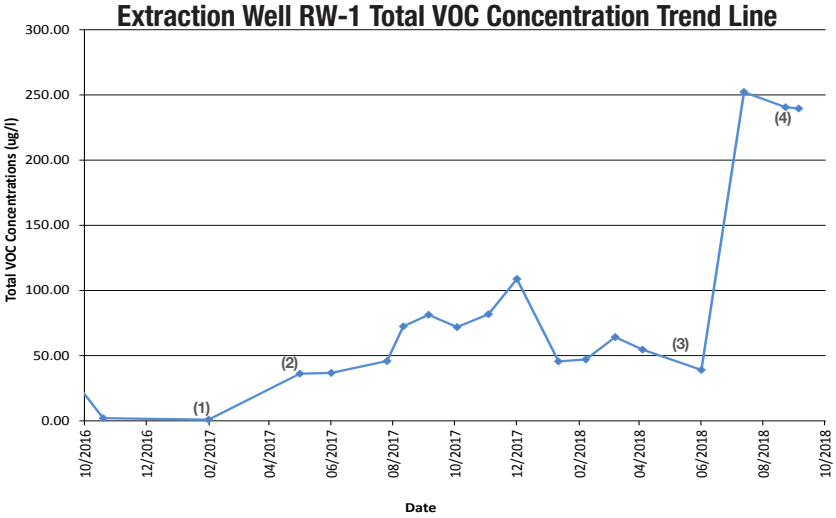
Treatment System Monitoring and Sampling Results

A summary of the routine treatment system monitoring and sampling collection and associated results are provided below. Refer to *Attachment C* for analytical data results.

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	7/12/18 8/23/18 9/5/18	7/12/18 8/23/18 9/5/18					
Extraction Well RW-2 Influent[1]							
Air Stripper Aqueous-Phase Effluent [2]	7/12/18 8/23/18 9/5/18	7/12/18 8/23/18 9/5/18	9/5/18				
Air Stripper Vapor-Phase Effluent [3][4]							7/12/18
Groundwater Monitoring Wells MW-103 through MW-107, MW-2S, MW-4D, MW-5S and RW-2					7/2/18 7/3/18		
Groundwater Monitoring Wells MW-101, MW-102, MW-108, MW-109 and MW-111						7/2/18 7/3/18	

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. The NYSDEC Remedial Services Contractor completed three system sampling events on July 12, August 23, and September 5, 2018.
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 this reporting period on July 12, 2018.



1. 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.
2. 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.
3. The GWE&TS was operating for the majority of the reporting period only two aqueous-phase influent samples were collected during this reporting period while the system was operating (April 4 and June 1, 2018). A system sample was not collected in May 2018 due to an effluent piping failure and repair activities.
4. As the GWE&TS was for the majority of this reporting period, three aqueous-phase influent samples were collected on July 12, August 23 and September 5, 2018, 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*	*Class GA Groundwater Standard*
Tetrachloroethene (PCE)	120 - 130 ug/l	24 - 40 ug/l	5.0 ug/l
Trichloroethene (TCE)	20 - 28 ug/l	2.5 - 3.9 ug/l	5.0 ug/l
Cis-1,2-Dichloroethene (Cis-1,2-DCE)	81 - 110 ug/l	10 - 12 ug/l	5.0 ug/l
Vinyl Chloride (VC)	0.97 - 1.1 ug/l	0.35 - 0.52 ug/l	2.0 ug/l
Iron	ND	ND - 394 ug/l	300 ug/l
Manganese	836 - 890 ug/l	1,030 - 1,080 ug/l	300 ug/l
Sodium	36,300 - 41,400 ug/l	39,000 - 40,500 ug/l	20,000 ug/l

ND: Constituent concentration below the analytical detection limit. --: Not analyzed
Red font denotes an exceedance 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, RW-1 influent samples are collected on a monthly basis from the system on July 12, August 23, and September 5, 2018. 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**	**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	2.1 - 2.4	0.43 - 0.56	10.0 ug/l
TCE	0.58 - 0.67	ND	10.0 ug/l
Trans-1,2-DCE	ND	ND	10.0 ug/l
Cis-1,2-DCE	2.9 - 4.6	ND - 0.61	NL
VC	ND	ND	10.0 ug/l
Bromomethane	ND	ND	Monitor
Chloromethane	ND	ND	Monitor
Copper	ND - 12.3	ND - 5.8	4.0 ug/l
Iron	ND	ND - 500	1,000 ug/l
Lead	ND	ND	8.0 ug/l
Potassium	2,700 - 2,750	2,780 - 2,790	Monitor
Manganese	812 - 937	1,630 - 2,410	Monitor
Vanadium	ND	ND - 3.4	Monitor
Zinc	ND - 5.5	9.7 - 10.5	66.0 ug/l
Total Dissolved Solids (TDS)	229 - 250	112 - 209	Monitor
pH[3]	5.68	6.54 - 7.04	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 system effluent samples were collected on July 12, August 23 and September 5, 2018. Concentrations are reflected in the table above.
3. It should be noted that the NYSDEC Remedial Services Contractor collected one pH sample on September 5, 2018. Concentrations are reflected in the table above.

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 copper detected at concentrations of 12.3 ug/l in the effluent sample collected on August 23, 2018. This detection of copper is higher than the pervious reporting period and the Site Specific Effluent Limit of 4.0 ug/l. One pH reading was collected this reporting period on September 5, 2018. pH readings exhibited levels lower than the Site Specific Effluent Limits Standard range of 6.5-8.5 at a concentration of 5.68. 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	0.005671	--	0.007 lbs/hr
TCE	0.001215	--	0.006 lbs/hr
Total Xylenes	ND	--	0.001 lbs/hr
1,2-DCE (total)	0.00648	--	0.003 lbs/hr
VC	0.000057	--	0.014 lbs/hr
1,1,1-TCA	ND	--	0.001 lbs/hr
Total VOC Concentrations (field screening with PID) (2)	0.0	--	NA
Maximum Total VOC Emissions(3)	0.01342	--	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 typically collected on a semi-annual basis. A vapor-phase effluent sample was collected during this reporting period on July 12, 2018.
2. The total VOC concentrations observed in 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.

The vapor-phase effluent sample exhibited concentrations lower than the site specific limits, with the exception of 1,2-total dichloroethene, detected at a concentration of 0.00648 lbs/hr in the effluent sample collected on July 12, 2018. The detection is higher than the site-specific limit of 0.003 lbs/hr; however, the total VOC emissions were below the limit detection for the Site.

Quarterly Groundwater Monitoring Summary

Select groundwater monitoring wells and one extraction well were sampled on July 2 and 3, 2018, 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 well (MW-109, MW-111 and MW-2S) on July 2 and 3, 2018. Additionally, off-site extraction well (RW-2) was sampled as part of the quarterly groundwater sampling event on July 2, 2018, 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.

Refer to *Attachment D* 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 ranged from non-detect to a maximum of 114.7 ppm in monitoring well MW-4D in headspace readings.

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

Site-Specific Contaminant of Concern Concentrations

Monitoring Well [1]	PCE		TCE		Cis-1,2-DCE		Vinyl Chloride		Site-Specific 2-Year Total VOC 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	0.57 ug/l	NS	ND	NS	ND	NS	ND	NS	Stable
MW-102	1.5 ug/l	NS	0.31 ug/l	NS	0.4 ug/l	NS	ND	NS	Stable
MW-103	1.9 ug/l	2.7 ug/l	0.41 ug/l	0.41 ug/l	0.39 ug/l	2.1 ug/l	ND	ND	Decreasing
MW-104	19 ug/l	44 ug/l	1.2 ug/l	3.9 ug/l	ND	0.59 ug/l	ND	ND	Decreasing
MW-105	0.67 ug/l	3.8 ug/l	ND	0.23 ug/l	ND	ND	ND	ND	Decreasing
MW-106	8 ug/l	2.4 ug/l	6.2 ug/l	2.5 ug/l	40 ug/l	1,200 ug/l	7.5 ug/l	58 ug/l	Increasing
MW-107	0.9 ug/l	0.83 ug/l	0.36 ug/l	0.31 ug/l	ND	ND	ND	ND	Stable
MW-108	0.54 ug/l	NS	ND	NS	ND	NS	ND	NS	Decreasing
MW-4D	64,000 ug/l	47,000 ug/l	8,600 ug/l	3,900 ug/l	260 ug/l	400 ug/l	71 ug/l	61 ug/l	Increasing
MW-5S	ND	0.45 ug/l	ND	ND	ND	ND	ND	ND	Stable
Off-Site Monitoring Wells									
MW-109	1.1 ug/l	NS	1.9 ug/l	NS	1.7 ug/l	NS	ND	NS	Stable
MW-111	ND	NS	ND	NS	ND	NS	ND	NS	Stable
MW-2S	11 ug/l	2.2 ug/l	4.9 ug/l	2.9 ug/l	2,500 ug/l	2,300 ug/l	2.7 ug/l	1.9 ug/l	Increasing
RW-2 [1]	0.69 ug/l	0.55 ug/l	1.4 ug/l	1.5 ug/l	2.7 ug/l	1.4 ug/l	ND	ND	Stable

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: acetone, 1,1-dichloroethane, 1,1-dichloroethene, chloroform, 2-chlorotoluene, ethylbenzene, MTBE, toluene, trans-1,2-dichloroethene, sec-butylbenzene, and total xylenes.

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. 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.

On-Site Monitoring Well Network (MW-101 through MW-108, MW-4D and MW-5S)

- MW-101 (screened at 5 to 15 feet below grade): MW-101 concentrations of site-specific VOCs were detected at concentrations below their respective Class GA Standards throughout this reporting period.
- MW-102 (screened at 5 to 15 feet below grade): MW-102 concentrations of site-specific VOCs were detected at concentrations below their respective Class GA Standards throughout this reporting period.
- MW-103 (screened at 5 to 15 feet below grade): Concentrations of site-specific VOCs in monitoring well MW-103 have exhibited decreasing to stable trends throughout the last two-year period. Site-specific contaminants of concern were not detected at concentrations exceeding the Class GA Standards during this reporting period. PCE, cis-1,2-DCE and VC, site-specific contaminants, were detected at concentrations exceeding the Class GA Standards throughout the previous 2-year period, as follows:
  - PCE was detected at a concentration of 8.0 ug/l on July 6, 2017, exceeding its respective Class GA Standards of 5.0 ug/l.

- Cis-1,2-DCE was detected at a concentration of 180 ug/l on January 19, 2017, exceeding its respective Class GA Standards of 5.0 ug/l.
- VC was detected at concentrations of 29 ug/l on January 19, 2017, exceeding its respective Class GA Standards of 2.0 ug/l.

- MW-104 (screened at 5 to 15 feet below grade): Site-specific VOCs have been consistently detected at concentrations in exceedance of the Class GA Standards in MW-104. Note that the site-specific contaminants within monitoring well MW-104 have steadily decreased since D&B assumed O&M duties in February 2005. PCE was detected in exceedance of it's respective Class GA Standard throughout the previous 2-year period, as follows:
  - PCE was detected at concentrations ranging from 19 ug/l to 49 ug/l, with the maximum concentration detected on April 24, 2017. PCE has generally exhibited a slightly decreasing trend over the last two year period.

- MW-105 (screened at 5 to 15 feet below grade): Concentrations of site-specific VOCs were detected at concentrations below their respective Class GA Standards during this reporting period; however, it should be noted that MW-105 has exhibited a decreasing trend in total contaminants of concern throughout the last two-year period. PCE, cis-1,2-DCE and VC, site-specific contaminants, were detected at concentrations exceeding their respective Class GA Standards throughout the previous 2-year period, as follows:
  - PCE was detected at concentrations ranging from 0.86 ug/l to 14 ug/l, with the maximum concentration detected on January 17, 2018.
  - Cis-1,2-DCE was detected at concentrations ranging from non-detect to 260 ug/l, with the maximum concentration detected on April 24, 2017.
  - VC was detected at concentrations ranging from non-detect to 27 ug/l, with the maximum concentration detected on April 24, 2017.

- MW-106 (screened at 5 to 15 feet below grade): Site-specific VOCs have generally been detected at concentrations in exceedance of the Class GA Standards throughout this reporting period and since D&B assumed O&M duties in February 2005. MW-106 has exhibited generally increasing trends for contaminants of concern, cis-1,2-DCE and VC; additionally, total VOCs have increased throughout the previous two-year period. PCE, TCE, cis-1,2-DCE and VC have been detected in exceedance of their respective Class GA Standards throughout the previous 2-year period, as follows:
  - PCE was detected at concentrations ranging from 2.4 ug/l to 17 ug/l, with the maximum concentration detected on April 24, 2017. Overall, PCE concentrations have exhibited stable trends throughout the last two-year period.
  - TCE was detected at concentrations ranging from 2.5 ug/l to 9.10 ug/l, with the maximum concentration detected on January 19, 2017. Overall, TCE concentrations have exhibited a stable trend over the last two-year period.
  - Cis-1,2-DCE was detected at concentrations ranging from 21 ug/l to 1,200 ug/l, with the maximum concentration detected on May 22, 2018. Overall, cis-1,2-DCE concentrations have exhibited an increasing trend throughout the last two-year period reporting period.
  - VC was detected at concentrations ranging from 3.1 ug/l to 58 ug/l, with the maximum concentration detected on May 22, 2018. Overall, VC concentrations have exhibited an increasing trend over the last two-year period.

- MW-107 (screened at 5 to 15 feet below grade): Concentrations of site-specific VOCs were detected at concentrations below their respective Class GA Standards throughout this reporting period, similar to the previous reporting period.

- MW-108 (screened at 5 to 15 feet below grade): MW-108 site-specific VOCs were detected at concentrations below the Class GA Standards in this reporting period. Overall, PCE concentrations have exhibited a decreasing trend over the last two year period and total VOC concentrations have also exhibited a decreasing trend throughout the last two-year period.

- MW-4D (screened at 60 to 70 feet below grade): Site-specific VOCs have been detected at concentrations in exceedance of their Class GA Standards since this well was added to the routine groundwater monitoring list in June 2012. It should also be noted that site-specific VOC concentrations in MW-4D have been detected at widely varying concentrations since 2012. Total VOCs exhibited in MW-4D have increased since the system start-up in April 26, 2017. PCE, TCE, cis-1,2-DCE and VC have been detected in exceedance of their respective Class GA Standards throughout the previous 2-year period, as follows:
  - PCE was detected at concentrations ranging from 170 ug/l to 67,000 ug/l, with the maximum concentration detected on January 17, 2018. Overall, PCE concentrations have exhibited an increasing trend throughout the last two-year period.
  - TCE was detected at concentrations ranging from 54 ug/l to 8,600 ug/l, with the maximum concentration detected on July 2, 2018. Overall, TCE concentrations have exhibited an increasing trend throughout last two-year period.
  - Cis-1,2-DCE was detected at concentrations ranging from 5.3 ug/l to 490 ug/l, with the maximum concentration detected on January 17, 2018. Overall, cis-1,2-DCE concentrations have exhibited an increasing trend throughout last two-year period.
  - VC was detected at concentrations ranging from non-detect to 71 ug/l, with the maximum concentration detected on July 2, 2018. Overall, VC concentrations have exhibited an increasing trend throughout last two-year period.
- MW-5S (screened at 14 to 24 feet below grade): MW-5S has been sampled as part of D&B's work assignment since June 2010. Site-specific VOCs were detected at concentrations below their respective Class GA Standards during this reporting period and have exhibited generally stable trends since June 2010.

In general, site-specific VOCs have shown increasing trends in two on-site monitoring wells (MW-4D and MW-106) since the system start-up in April 26, 2017.

It should also be noted that monitoring well MW-4D is screened at a depth of approximately 60 to 70 feet below grade, approximately 30 feet deeper than on-site extraction well RW-1 and the site-wide monitoring well network. It should also be noted that the Gardiners Clay is located below the Site at a depth of approximately 70 feet below grade and is likely acting as a lower "confining unit" for the groundwater plume. Based on the relatively dense nature of chlorinated solvents, the groundwater plume may be "pooling" or migrating along the top of the Gardiners Clay.

Off-Site Monitoring Well Network (MW-109, MW-111, MW-2S and RW-2)

A summary of the site-specific VOCs (PCE, cis-1,2-DCE, TCE and VC) detected during this reporting period in each off- Site groundwater monitoring well located downgradient of the GWE&TS and extraction well RW-2 are provided below.

- MW-109 (screened at 25 to 35 feet below grade): Monitoring well MW-109 is located approximately 1,800 feet south of the Site. MW-109 site-specific VOCs have been detected at concentrations below their respective Class GA Groundwater Standards from June 2006 through the end of this reporting period.
- MW-111 (screened at 25 to 35 feet below grade): Monitoring well MW-111 is located approximately 580 feet southwest of the Site. MW-111 site-specific VOCs have been detected at concentrations below their respective Class GA Standards since start-up of the GWE&TS and through the end of this reporting period.
- MW-2S (screened at 12 to 22 feet below grade): Monitoring well MW-2S is located approximately 220 feet south of the Site. Site-specific VOCs (primarily including PCE and cis-1,2-DCE) have consistently been detected at concentrations in exceedance of their respective Class GA Standards from when this well was added to the routine groundwater monitoring list (September 2008) through the end of this reporting period. PCE, cis-1,2-DCE and VC have been detected in exceedance of their respective Class GA Standards throughout the previous 2-year period, as follows:
  - PCE was detected at concentrations ranging from 1.7 ug/l to 61 ug/l, with the maximum concentration detected on July 3, 2017. Overall, PCE has exhibited a stable trend over the last two-year period.

- Cis-1,2-DCE was detected at concentrations ranging from 11 ug/l to 2,500 ug/l, with the maximum concentration detected on July 3, 2018. Overall, cis-1,2-DCE concentrations have increased over the last two-year period and after system start-up on April 26, 2017.
- VC was detected at concentrations ranging from 0.69 ug/l to 2.9 ug/l, with the maximum concentration detected on July 3, 2017. Overall, VC has exhibited a stable trend over the past several years.

- RW-2 (screened at 12 to 37 feet below grade): Extraction well RW-2 is located approximately 1,500 feet southwest of the Site. As detailed above, RW-2 is now monitored on a quarterly basis with the site-wide monitoring wells due to generally low contaminant concentrations. It should be noted that site-specific VOC concentrations were observed to be erratic over the last two year period; however, concentrations of all site-specific VOCs have decreased in RW-2 and have remained generally stable throughout this reporting period. During this reporting period, site specific contaminants of concern were detected below their Class GA Groundwater Standards.

A figure depicting total VOC concentrations in on-site and off-site wells is provided as *Figure 5*.

Data Validation:

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

- The percent recovery (%R) was below the quality control (QC) limit in the matrix spike (MS) and matrix spike duplicate (MSD) for trichloroethene in groundwater samples collected on July 2, 2018. Trichloroethene was qualified as estimated (J/UJ) in all samples collected as part of the groundwater sampling effort on July 2, 2018.
- The percent recoveries (%Rs) were above the QC limit in the lab control sample (LCS) for dichlorodifluoromethane, hexachlorobutadiene and tetrachloroethene in samples collected from the groundwater sampling event completed on July 3, 2018. Tetrachloroethene was qualified as estimated (J) in samples MW-101, MW-102, MW-103, MW-104, MW-105, MW-107, and MW-2S collected on July 3, 2018.
- 1,2,3-Trichlorobenzene was detected in the method blank for the vapor-phase effluent sample collected on July 12, 2018; however, it was not detected in the sample therefore qualification of the data was not necessary.
- The relative percent differences (RPDs) were above QC limits for bromomethane in the LCS and MS/MSD and iodomethane in the MS/MSD. They were not detected in the aqueous-phase system samples collected on August 23, 2018; 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 operating for a majority of this reporting period utilizing AST-1. The GWE&TS was operation for the majority of this reporting period with the exception of brief downtime due to general system alarms throughout the reporting period.
- GWE&TS Maintenance: The NYSDEC Remedial Services Contractor completed several rounds of routine maintenance activities this reporting period. Additionally, as detailed above, non-routine maintenance was completed on one occasion throughout this reporting period.
- System Aqueous-Phase Influent and Effluent Contaminant Concentrations: As the GWE&TS was operating for the majority of this and the previous reporting periods, aqueous-phase influent samples from extraction well RW-1 and aqueous-phase effluent samples are collected on a monthly basis from the system. It should be noted that VOC influent concentrations have increased significantly since restarting the GWE&TS. This is possibly due to RW-1 influencing the deep groundwater contamination identified at MW-4D. Influent and effluent samples were collected on three occasions throughout this reporting period on July 12, 2018, August 23, 2018 and September 5, 2018, for VOC and metals analysis. The NYSDEC Remedial Services Contractor collected a groundwater sample from extraction well RW-2 on July 2, 2018, 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 copper and pH. The detection of copper was higher than exceedances exhibited in the previous reporting period and SPDES permit limits. The pH reading collected exhibited levels lower than the previous reporting period and outside of the SPDES permit acceptable range.

- System Vapor-Phase Effluent Monitoring: System vapor-phase effluent samples are typically collected on a semi-annual basis. A vapor-phase effluent sample for laboratory analysis was collected on July 12, 2018. Total VOC concentrations observed in this reporting period were below the Site Specific Maximum Total VOC emissions limit of 0.5 lbs/hr; however, 1,2-DCE was higher than its limit of 0.003 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.
- Monitoring/Extraction Well Sampling: On-site groundwater monitoring wells (MW-104, MW-106, and MW-4D), and one 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 twelve of fourteen groundwater monitoring wells sampled this reporting period at concentrations ranging from 0.54 ug/l to a maximum of 64,000 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 ranging from non-detect to a maximum of 103.3 ug/l (detected on February 12, 2014). It should be noted that monitoring well RW-2 has experienced a stable trend over the last two-years. In addition, concentrations for PCE in MW-2S have exhibited higher levels in the last two reporting periods; additionally, over-all concentrations have exhibited an increasing trend over the last two-year period and since system start up in April 2017. Off-site groundwater monitoring wells MW-109 and MW-111 both have experienced stable trends throughout the last two-years; MW-109 had VOC concentrations below the Class GA Standard of 5 ug/l and MW-111 had no VOC detections this reporting period.

Recommendations:

- General Treatment System:
  - Based on the remaining elevated contaminant concentrations in groundwater detected at the Site, it is recommended that the GWE&TS continue operating; however, shallow groundwater quality should be monitored to determine if it continues to degrade due to the GWE&TS drawing in the deep groundwater contaminant plume. Additionally, a subsurface investigation is recommended to be completed at the Site 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, it is recommended that the NYSDEC Remedial Services Contractor adhere to the routine maintenance schedule.
- Treatment System Operational Issues:
  - 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. It is also recommended that the NYSDEC Remedial Services Contractor collect pH readings during the system effluent sampling events to ensure pH readings are monitored on a routine basis.
- System Vapor-Phase Effluent Contaminant Concentrations: All vapor-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. It is

recommended that monitoring activities continue at the off-site and on-site groundwater monitoring wells to continue to evaluate the system remediation efficiency.

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: Richard M. Walka — MARCH 14, 2019 — Date

Richard M. Walka
Senior Vice President

Project Manager: James Van Horn — March 14, 2019 — Date

James Van Horn
Project Manager