NOVEMBER 2019

New York State Department of Environmental Conservation

Division of Environmental Remediation

Active Industrial Uniform Site

Site No. 152125

2018 Periodic Review Report

(January 2018 through December 2018)

D&B Engineers and Architects, P.C.

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EXECUTIVE SUMMARY

The Active Industrial Uniform Site (the Site) groundwater extraction and treatment system (GWE&TS) is located in the Village of Lindenhurst, Suffolk County, New York. The GWE&TS was designed to recover and treat a chlorinated solvent groundwater contamination plume emanating from the Site and discharge the treated groundwater to Little Neck Creek in accordance with all applicable discharge standards.

Based on evaluation of the performance, effectiveness and protectiveness of the GWE&TS throughout this reporting period (January 1, 2018 through December 31, 2018), the following conclusions and associated recommendations are briefly summarized:

Conclusions:

Based on the evaluation of the GWE&TS performance, effectiveness and protectiveness throughout this reporting period, and as detailed in the preceding sections, the following conclusions have been established:

Operation and Maintenance

- O&M Plan Requirements and Compliance: As noted in Section 3.0, the O&M scope of services was performed in accordance with the requirements of the site-specific O&M Plan, dated April 2002 and the September 2012 SMP, revised January 2014, with the exception of routine maintenance of the pressure blower and transfer pump.
- GWE&TS Downtime: The GWE&TS was operating for the majority of the reporting period with the exception of some downtime due to troubleshooting activities, general alarm conditions and the system shutdown which was conducted as part of the RSO evaluation on November 30, 2018. In total, the GWE&TS was shutdown throughout this reporting period a total of 68 days (or 1,636 hours).

Monitoring Plan

- System Monitoring: As noted in Section 4.1, monitoring requirements were generally maintained throughout the reporting period.
- System Aqueous-Phase Effluent Contaminant Concentrations: Based on the analytical data, all analytes in the system aqueous-phase effluent were in compliance with SPDES requirements throughout this reporting period, with the exception of two copper exceedances in June and August 2018 and pH readings detected below the permit equivalency range, as detailed in Section 4.2.
- Vapor-Phase Effluent Sampling: Based on the analytical data, analytes in the system vapor-phase effluent were in compliance with permit equivalency requirements with the exception of an exceedance of total-1,2-dichloroethene; however, the site-specific total VOC effluent was below the limit of 0.5 lbs/hr throughout this reporting period, as detailed in Section 4.2.
- Monitoring Well Contaminant Concentrations: Site-specific VOCs have been detected at concentrations in exceedance of their Class GA Standard in several monitoring wells during this reporting period (on-site monitoring wells MW-103, MW-104, MW-106 and MW-4D, as well as off-site monitoring well MW-2S).

Institutional and Engineering Controls

- IC/EC Compliance Status: ICs consisting of a Declaration of Covenant and Restrictions, including groundwater and land-use restrictions, is currently filed with the Suffolk County Clerk's office and the Village of Lindenhurst. There is no on-site use of groundwater for potable purposes and the use of the property has been and will continue to be restricted to operation of the GWE&TS only. No changes have been made to the property during this reporting period. The GWE&TS has generally operated in accordance with the SMP requirements throughout the majority of this reporting period, with the exception of two copper exceedances in June and August 2018 and pH readings detected below the

permit equivalency range and one exceedance of total-1,2-dichloroethene in the vapor-phase effluent system sample. Total-1,2-dichloroethene was detected at a concentration of 0.00648 lbs/hr in the effluent sample collected on July 12, 2018. The site specific total vapor-phase VOC discharge limit of 0.5 lbs/hr was not exceeded during this reporting period.

Recommendations:

Based on evaluation of the operation of the GWE&TS throughout this reporting period, and as detailed in this report, the following recommendations have been established to improve the overall performance, effectiveness and protectiveness of the GWE&TS:

Operation and Maintenance

- Facility Maintenance: Ensure snow plowing/removal activities and lawn maintenance activities, as well as proper reporting of such, are completed, as necessary.
- OM&M Logs: D&B recommends that the NYSDEC Remedial Services Contractor record more clear and detailed descriptions of completed field activities and issues encountered. In addition, multiple copies of logs, that sometimes include differing information is periodically reviewed. 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 facilitate a more efficient preparation of the Site Management Quarterly Reports.

GWE&TS Repairs:

- Well Redevelopment: D&B recommends that the NYSDEC Remedial Services Contractor complete well redevelopment activities at extraction well RW-2.

Monitoring Plan

- Monitoring/Extraction Well Sampling: Based on the widely varying VOC concentrations detected in several wells over previous reporting periods, it is recommended that the NYSDEC ensure that the Remedial Services Contractor is utilizing proper and consistent sampling techniques during each groundwater sampling event. It is also recommended that the NYSDEC Remedial Services Contractor complete the groundwater monitoring well sampling on a quarterly basis as approved by the NYSDEC following the system shutdown on November 30, 2018.

Institutional Controls/Engineering Controls

- IC/ECs: As per direction from the NYSDEC, the GWE&TS was shutdown on November 30, 2018. As such, the system shall remain off until a source area investigation to evaluate possible areas of remaining contamination at the Site can be completed. Following the completion of the RSO activities, a recommendation will be made regarding the future operation of the GWE&TS. In the event the GWE&TS is restated, it is recommended that a full round of start-up groundwater and vapor sampling be completed to determine the need to bring the carbon filters on-line.

Green and Sustainability Recommendations

- Building Lighting: It is recommended that all light bulbs within the building be replaced with high efficiency bulbs, when needed.
- Renewable Energy Feasibility Assessment: D&B recommends evaluating the feasibility of installing alternate energy sources or purchasing renewable energy credits in order to off-set the electricity usage for the GWE&TS from non-renewable energy sources.
- Reduction of Paper Use: Continue transmitting reports electronically as PDF files to the NYSDEC for review and approval.

General Recommendations

- General GWE&TS Operation: Based on evaluation of the groundwater sampling results collected following the return of the system to full-time operation April 2017, D&B recommended that an evaluation be completed regarding continued operation of the GWE&TS and implementation of a source area investigation to evaluate possible areas of remaining contamination at the Site. To facilitate these RSO activities, D&B recommended shutting down the GWE&TS to allow for the subsurface environment to come to equilibrium prior to completing the proposed work. The NYSDEC approved shutdown of the system on November 16, 2018 and on November 30, 2018, the NYSDEC Remedial Services Contractor completed a round of O&M activities and subsequently shutdown the system. As detailed above, the system shutdown is to enable the subsurface environment to come to equilibrium prior to completing the proposed RSO work.

- RSO Evaluation: Based on the current status of the GWE&TS and the remaining elevated contaminant concentrations in groundwater detected at the Site, the necessary RSO activities to complete the recommended source area investigation include the installation of several on-site test pits, completion of an on-site soil vapor study, off-site discrete groundwater sampling, and the installation of off-site groundwater monitoring wells. Following the completion of the RSO activities, a recommendation will be made regarding the future operation of the GWE&TS.

- SMP Revisions: It is recommended that the Site SMP be revised to include the NYSDEC-approved revised sampling frequencies and include additional information regarding remaining contamination at the Site.

- PRR Reporting Frequency: Based on a review of the guidance documents provided by the NYSDEC, it is recommended that PRRs continue be completed on an annual basis. The frequency of follow-up PRRs will be determined by the NYSDEC based on future Site conditions and compliance.

1.0 INTRODUCTION

The purpose of this Periodic Review Report (PRR) is to summarize and evaluate the performance of the groundwater extraction and treatment system (GWE&TS) at the Active Industrial Uniform Site (the Site), located at 63 West Montauk Highway in the Village of Lindenhurst, Suffolk County, New York (see Figure 1-1). The information provided in this report covers the period from January 1, 2018 through December 31, 2018; however, portions of this report incorporate pertinent historical background information and monitoring data, as appropriate.

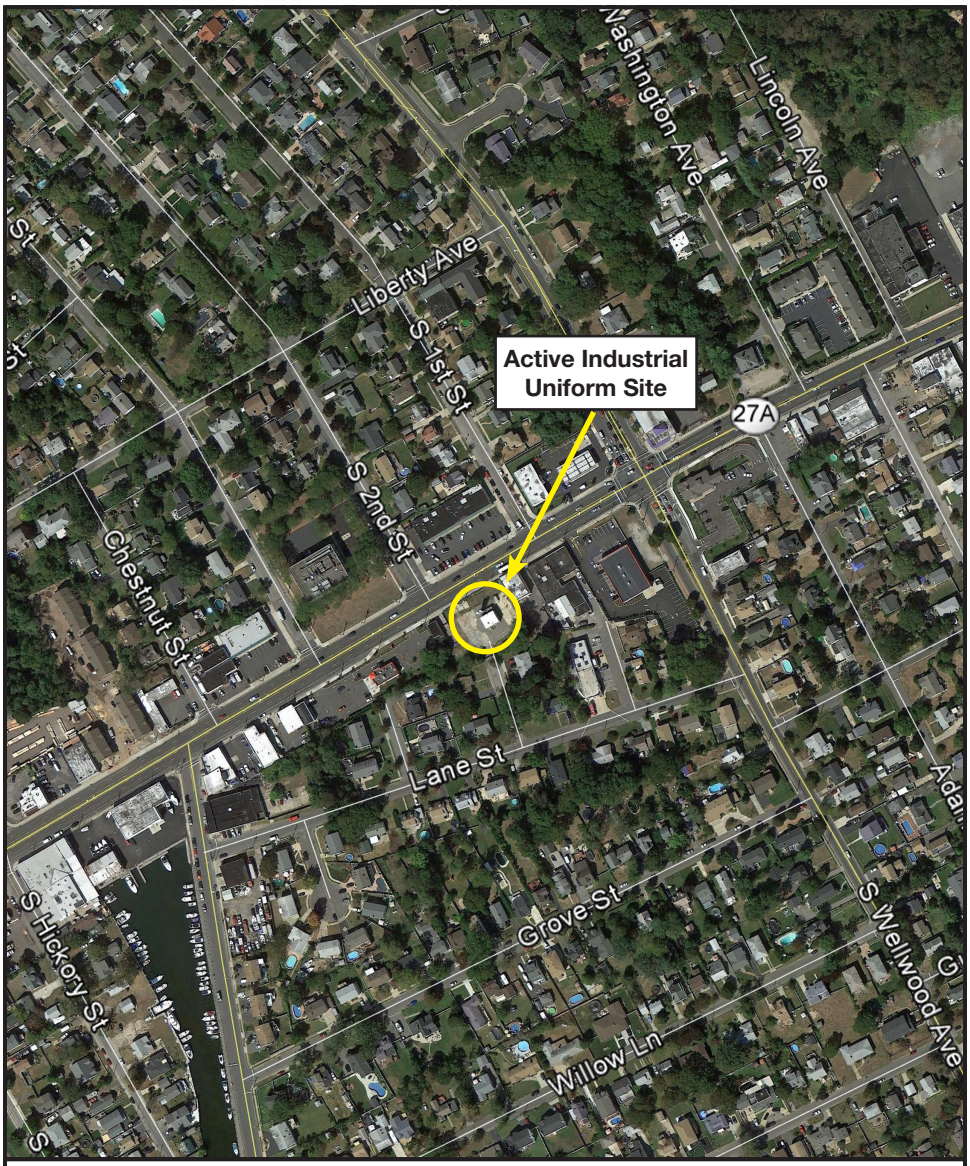
Several clickable hyperlinks are provided in this report (indicated by blue text), which include tables, graphs, figures, etc.

Environmental Assessment and Remediation (EAR), a NYSDEC Remedial Services contractor, completed all operation, maintenance, monitoring and sampling activities throughout this reporting period, while all evaluation, reporting and engineering services were completed by D&B.

Since the return of the system to full-time operation on April 26, 2017, routine monitoring indicates an increasing trend in contaminant concentrations in the influent of the GWE&TS. This increase may be due to the GWE&TS intercepting deeper on-site contamination. As such, D&B recommended that an evaluation be completed regarding continued operation of the GWE&TS, in addition to implementation of a source area investigation to evaluate possible areas of remaining contamination at the Site. To facilitate these RSO activities, D&B recommends the GWE&TS remain off to allow for the subsurface environment to come to equilibrium prior to completing the proposed work.

Figure 1-1

Site Location Map



SOURCE: GOOGLE EARTH PROFESSIONAL, 2013

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SCALE IN FEET

The objectives of this PRR include:

- Identify the remedial goals established for the Site.
- Present a description of the GWE&TS components.

- Review Site monitoring and sampling protocols.
- Evaluate the GWE&TS operation and performance.
- Present recommendations regarding the operation of the GWE&TS with respect to system performance, effectiveness and protectiveness, and its ability to achieve the goals established for the Site by the Record of Decision (ROD), dated March 1997.

1.1 Remedial System Optimization

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 associated 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 the collection of targeted groundwater samples, was completed at the Site in July 2014. The results of the completed MIP investigation and groundwater sampling activities were summarized in the February 2015 MIP Investigation Summary Report.

Recently, routine monitoring indicates an increasing trend in contaminant concentrations in the influent of the GWE&TS. This increase may be due to the GWE&TS intercepting deeper on-site contamination. As such, D&B recommended that an evaluation be completed regarding continued operation of the GWE&TS, in addition to implementation of a source area investigation to evaluate possible areas of remaining contamination at the Site. To facilitate these RSO activities, D&B recommends the GWE&TS remain off to allow for the subsurface environment to come to equilibrium prior to completing the proposed work.

Proposed RSO work activities include on-site test pits and subsurface soil sampling, off-site discrete-depth groundwater sampling, installation, development and sampling of groundwater monitoring wells, and soil vapor and sub-slab soil vapor probe sampling. Following all RSO activities recommendations for potential system modifications and/or the application of alternate remedial technologies in order to expedite site closure will be provided. The results of the evaluation will be documented in a report and submitted to the NYSDEC for review and approval upon task completion.

1.2 Treatment System Operational Issues

The operational issues which have affected the GWE&TS in 2018, are detailed below:

System Wiring and Controls

On February 6, 2018, the NYSDEC Remedial Services Contractor was on-site to install a system runtime meter. On April 27, 2018, the NYSDEC Remedial Services Contractor was on-site to relocate the pressure switches at Transfer Pumps P-1 and P-2 to before the check valves on the effluent discharge piping. 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.

Transfer Pump P-1

On March 4, 2018, the GWE&TS shutdown due to a high water level alarm and a high sump alarm at AST-1. The NYSDEC Remedial Services Contractor responded to the alarms on March 5, 2018. While on-site the technician pumped out the sump and restarted the system; however, upon restart of the system a leak was identified at Transfer Pump P-1. The system was left off pending inspection of the piping and troubleshooting activities. On March 7, 2018, the NYSDEC Remedial Services Contractor and D&B returned to Site and while on-site it was identified that the pump failure was caused by a check valve failure on the discharge piping of Transfer Pump P-1. The failed check valve obstructed the discharge line causing the rear casing of Transfer Pump P-1 to fail due to the build up of pressure. It was also identified that the pressure switch on the discharge line did not activate as it was installed after the check valve on the discharge piping.

On April 12, 2018, the NYSDEC Remedial Services Contractor was on-site to replace the pump head at Transfer Pump P-1. On June 15, 2018, the NYSDEC Remedial Services Contractor was on-site to repair a leak in the ball valve at Transfer Pump P-1.

Effluent Piping

On April 17, 2018, a high sump level alarm was recorded and the GWE&TS shutdown. The NYSDEC Remedial Services Contractor responded on April 18, 2018, and while on-site the technician pumped water out of the sump and restarted the system; however, a leak was identified under the building floor slab located by the effluent piping. It was noted that the leak occurred when the transfer pump was operating. The NYSDEC Remedial Services Contractor turned the system off to allow for further troubleshooting activities. On April 23, 2018, the NYSDEC Remedial Services Contractor returned to the Site to complete test pits at the exterior of the building to assess the effluent piping leak. The initial test pit revealed that the leak was coming from a section of the effluent piping located under the building. The NYSDEC Remedial Services Contractor covered and secured the excavation prior to departing from the Site. On May 10, 2018, the NYSDEC Remedial Services Contractor returned to Site to complete excavation work in the interior of the building. The effluent piping was cracked at an elbow joint identified near the building footing. The NYSDEC Remedial Services Contractor completed the necessary repairs to the effluent piping and returned on May 14, 2018, to successfully restart the system and backfill both interior and exterior test pits after confirming the integrity of the repair. While on-site, the NYSDEC Remedial Services Contractor backfilled the interior and exterior test pits.

GWE&TS Influent Manifold

On January 31, 2018, the NYSDEC Remedial Services Contractor was on-site to remove and reconstruct the influent manifold. This was necessary to replace a leaking ball valve that could not be replaced without a complete rebuild of the manifold.

Air Stripper Towers

On November 30, 2018, the NYSDEC Remedial Services Contractor drained the air stripper towers to allow for successful shutdown of the system.

Extraction Well Redevelopment

Historically, approximately 13 feet of accumulated material has been identified in extraction well RW-2. The extraction well should be redeveloped to remove this material.

2.0 SITE OVERVIEW

2.1 Site Operations and Description

The Site is a NYSDEC Class 2 Inactive Hazardous Waste Site and is listed on the New York State Registry of Inactive Hazardous Waste Sites (Site No. 152125). Laundering operations began at the Site in 1945 and continued until 1993. Dry cleaning activities were also conducted at the Site for a 17-year period between 1970 and 1987. All on-site buildings associated with these operations were demolished in February 1995.

The Site is approximately 1/2 acre in size. The surrounding properties are primarily commercial, with the exception of a residential area located to the south of the Site on Tompkins Lane. Access to the Site is from Tompkins Lane. A Site location map is provided as Figure 1-1.

The GWE&TS consists of two 8-inch diameter extraction wells, with 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). Extraction Well RW-2 is not currently operating, as directed by the NYSDEC, due to low historical concentrations of site-specific VOCs and a general decline in total VOC concentrations. Extracted groundwater is conveyed to the GWE&TS building via underground piping, and is pumped 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

then pumped via underground piping to a storm water basin located approximately 1,000 feet west of the Site, which then discharges into Little Neck Creek, in accordance with all applicable discharge standards.

Exhaust gas from each air stripper was initially treated utilizing two granular activated carbon (GAC) vessels connected in series; however, based on low historical contaminant concentrations detected in the air stripper vapor-phase discharge, the vapor-phase discharge 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 startup and operation of the GWE&TS, as well as an auto dial alarm notification system.

2.2 Site Impacts and Investigation History

Initial Investigation Activities

An initial investigation of the Site was completed in December 1987 by the property owner, American Linen Supply. Soil and groundwater samples collected at the Site during the initial investigation exhibited elevated concentrations of chlorinated volatile organic compounds (VOCs), including tetrachloroethene (PCE). The sources of the contamination were determined to be three former PCE storage tanks. These tanks were reportedly removed between 1985 and 1987; however, it was not determined if the contamination was the result of leaks, spills or both. Based on the results of the initial investigation, a soil vapor extraction (SVE) system was installed in the southeast portion of the Site, as part of an Interim Remedial Measure (IRM). The SVE system was placed into operation in July 1991 and is believed to have operated until the GWE&TS was installed (see below for details). The goal of the IRM was to remove on-site soil contamination and to prevent migration of soil vapor to off-site areas.

Figure 2-1 depicts the locations of former on-site features, including the former Active Industrial Uniform building, former dry wells/cesspools, the former SVE system, the locations of the former PCE tanks, as well as sample locations associated with the initial and pre-design investigations.

A Remedial Investigation (RI) was performed between October 1993 and April 1994. Based on the results of the RI, both shallow and deep groundwater contaminant plumes were identified extending from the Site in southwesterly directions toward Little Neck Creek (approximately 800 feet southwest of the Site). The shallow plume was found to have concentrations of PCE of as high as 20 milligrams per liter (mg/l) migrating south-southwest. The deep plume had a more southerly direction and was believed to be following a confining clay layer reported to be located at approximately 70 feet bgs. Soil contamination was identified in the on-site dry wells/cesspools with PCE concentrations of as high as 40,000 milligram per kilogram (mg/kg) identified in the southern portion of the Site. Elevated concentrations of PCE were also found in the soil at the former locations of the PCE tanks with concentrations of up to 30,000 mg/kg. Copies of the historical off-site plume maps are provided in ***Appendix A***.

Record of Decision

Based on the findings of the RI, the NYSDEC issued a ROD for the Site in March 1997. In order to eliminate or mitigate threats to human health and the environment, the NYSDEC selected the following remedies:

- Continued operation of the SVE system to remediate shallow source-area soil and expansion of the system to treat contaminated soil in the area of the dry wells/cesspools on the north side of the Site and under portions of the former building.
- Removal of VOCs from the SVE system emissions by activated carbon.
- Installation of an air sparging (AS) system to remediate shallow on-site groundwater.
- Installation of a GWE&TS to capture and treat shallow off-site groundwater and discharge the treated groundwater to the storm water sewer system.
- Environmental monitoring of groundwater upgradient, on-site and downgradient of the Site and periodic reviews.
- Implementation of a deed restriction, including restrictions on soil excavation and other disturbance of on-site soil, and implementation of a groundwater use restriction for the property.

Pre-Design Investigation

Following the selection of the remedial alternatives outlined in the March 1997 ROD, a Pre-Design Investigation (PDI) was completed in 1998. The purpose of the PDI was to further define on-site soil and groundwater contamination, and off-site groundwater contamination, and to perform groundwater modeling studies to assess various pumping scenarios to best address the contaminant plumes.

The on-site soil and groundwater investigation conducted as part of the PDI targeted the on-site dry wells/cesspools. The locations of the sampling points are depicted on ***Figure 2-1***. Analytical results generated from the PDI identified the on-Site cesspools as a significant source of contamination at the Site. Similar to the results of remedial investigation conducted at the Site between October 1993 and April 1994, the greatest concentrations of chlorinated VOCs were identified in soil samples collected from the southern portion of the Site. PCE concentrations of up to 760,000 mg/kg were detected in the 0 to 4 foot bgs sample collected at soil boring GP-22, located in the southeastern portion of the Site. Additionally, elevated concentrations of petroleum hydrocarbons, most notably total xylenes, were identified in the soil on the southern portion of the property. The maximum recorded concentration of total xylenes was 62,000 ug/kg, detected in the 10 to 11-foot bgs sample collected at soil boring GP-21. Soil boring GP-21 was located in the southeastern portion of the Site. The greatest on-site concentrations of total VOCs in groundwater were identified at temporary groundwater sample point GP-1 (26,000 ug/l), located in the western portion of the Site. All on-site groundwater samples were collected from 10 to 16-feet bgs.

Based on the results of the off-site groundwater investigation, the most significant VOC contamination was present between 26 to 40 feet bgs, extending in a southwesterly direction from the Site. The PDI investigation determined Little Neck Creek to be the discharge point for the contaminant plume.

In order to better monitor on-site and off-site groundwater contaminant concentrations, 11 groundwater monitoring wells were installed as part of the PDI, prior to installation of the GWE&TS. Eight groundwater monitoring wells were installed on-site (MW-101 through MW-108) and three groundwater monitoring wells were installed off-site (MW-109, MW-110 and MW 111), downgradient of the Site (see Figures 2-2 and 2-3 provided below). Note that monitoring well MW-110 was paved over and/or destroyed soon after it was installed and has not been sampled as part of the routine groundwater monitoring activities since D&B assumed O&M duties in February 2005.

Based on the results of the pre-design investigation, the GWE&TS design initially outlined in the ROD was modified by moving the off-site recovery well location further downgradient of the Site than was originally proposed and increasing the design extraction flow rates from 60 gallons per minute (gpm) to 100 gpm.

Monitoring and extraction well as-builts are provided in ***Appendix B***.

November 2000 IRM

Additionally, a second IRM was completed in November 2000 based on the results of the PDI, which consisted of the excavation and off-site disposal of approximately 600 cubic yards of unsaturated contaminated soil from the northeastern and southeastern portions of the Site. A total of twelve dry well structures were also removed and disposed of as part of these activities. The approximate lateral extent of the soil excavation, as well as the known locations of nine of the removed dry wells are provided on Figure 2-2 below.

In a letter dated February 5, 2001, the NYSDEC determined that the November 2000 IRM soil excavation had removed the on-site sources of contamination and, as a result, the planned air sparging system would not be installed. The NYSDEC further concluded that if any residual contamination remained on-site, installation of an on-site extraction well (RW-1) pumping at a rate of 100 gpm, would create a sufficient “capture zone” to capture any contamination that would have otherwise been addressed by the air sparging system. It should be noted that the design documents for the GWE&TS indicated that 80% of the design flow rate (or 80 gpm) would be sufficient for containment of the plume.

Figure 2-2

On-Site Monitoring Wells and Extraction Well Locations and Pertinent Historical Features

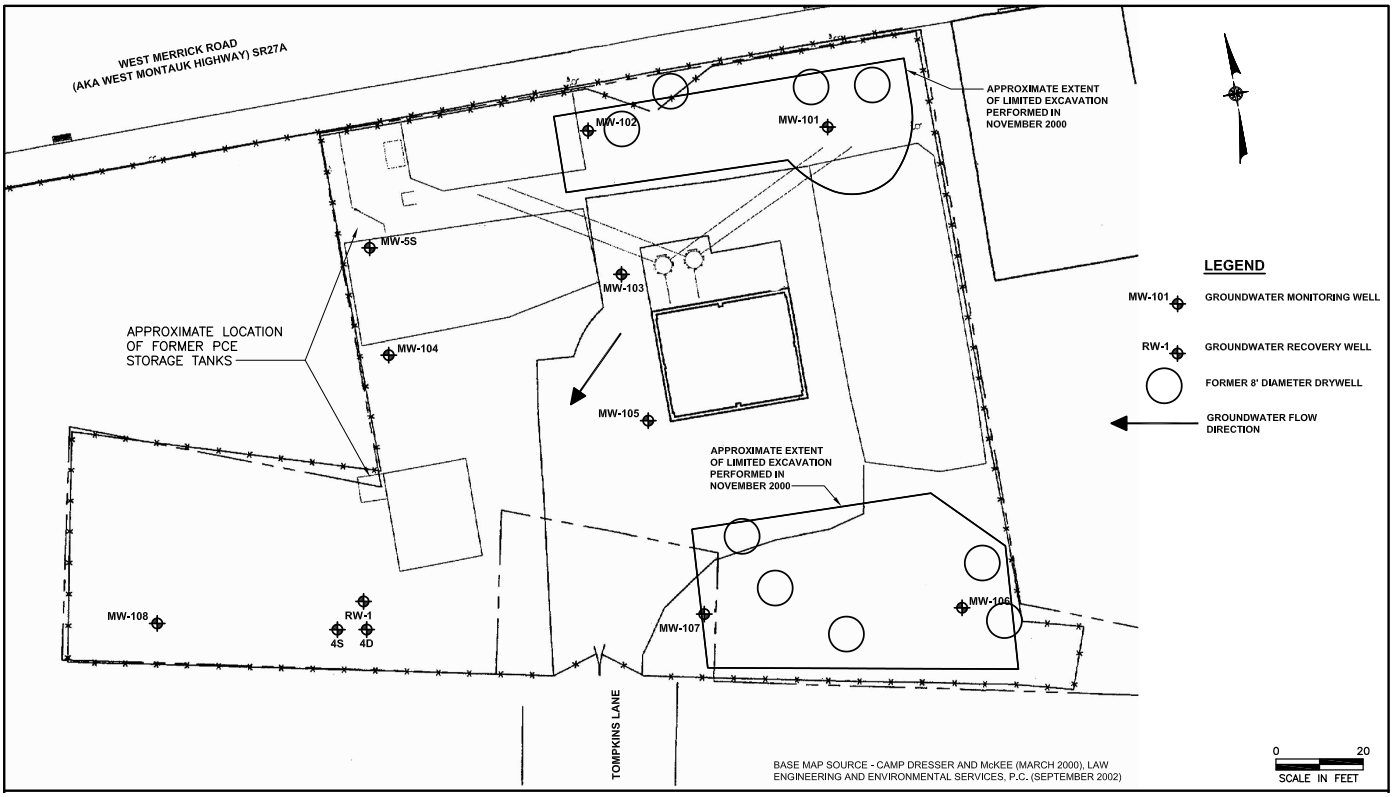


Figure 2-3

Off-Site Monitoring Wells and Extraction Well Location Map

GWE&TS Construction

The construction of the GWE&TS began in June 2001 and was completed in December 2001. It is D&B's understanding that the former SVE system was shut down and dismantled during the GWE&TS construction process. The on-site GWE&TS was placed into routine operation on December 27, 2001 and was operated by others until D&B assumed Site management duties in February 2005.

3.0 OPERATION AND MAINTENANCE (O&M) PLAN COMPLIANCE

3.1 O&M Plan Requirements and Compliance Status

The O&M scope of services for the GWE&TS consists of general facility maintenance activities, routine GWE&TS maintenance activities, non-routine GWE&TS maintenance activities and system alarm/shutdown response activities, in accordance with the requirements of the site-specific Operations and Maintenance Manual (OMM), dated April 2002 and the September 2012 Site Management Plan (SMP), revised January 2014. Site Activities Logs and Maintenance reports, which include details of shut downs and non-routine maintenance activities are prepared by the NYSDEC Remedial Services Contractor. Copies of the Site Activities Logs are provided in ***Appendix C***.

Presented below is a summary of the O&M activities performed throughout this reporting period.

General Facility Maintenance Activities

General facility maintenance work items are those tasks which involve the maintenance and upkeep of the GWE&TS, as well as grounds keeping of the GWE&TS property. General facility maintenance activities completed during this reporting period include:

- Landscape maintenance and snow removal on an as-needed basis.
- Periodic inspection of the extraction and monitoring wells to ensure the wells are secure and accessible.
- Periodic verification of posted safety information to ensure all information is current and accurate.
- Periodic maintenance of ground cover to prevent soil erosion and surface runoff.
- Periodic inspection of the vehicle driveway for potholes and other damage.
- Lubrication of gate locks on an as-needed basis.

Routine GWE&TS Inspection and Maintenance Activities

A summary of the routine GWE&TS inspection and maintenance services and their typical frequencies of completion, based on the current SMP, are provided on Table 3-1. The routine GWE&TS inspection and maintenance activities completed during this reporting period include:

- Bi-weekly inspection/monitoring of GWE&TS equipment (extraction well, packed tower air stripper, transfer pump and pressure blower).
- Bi-weekly inspection of the groundwater recovery pump to check for operating pressure, drawdown, periods of cycling and operation of controls.
- Bi-monthly pressure blower maintenance was completed on March 3, 2018, June 1, 2018, July 12, and 27, 2018, August 9 and 23, 2018, September 14, 2018, October 2 and 17, 2018 and November 14, 2018. The NYSDEC Remedial Services Contractor did not complete the pressure blower maintenance per the requirements of the routine maintenance schedule; however, the maintenance activities were completed on a consistent basis throughout this reporting period.
- Quarterly transfer pump maintenance was completed on March 3, 2018, June 1, 2018, July 12, and 27, 2018, August 9 and 23, 2018, September 14, 2018 and October 17, 2018. The NYSDEC Remedial Services Contractor did not complete the transfer pump maintenance per the requirements of the routine maintenance schedule; however, the maintenance activities were completed on a consistent basis throughout this reporting period.

Also, note that the particulate filter has been taken out of service for the past several years, per NYSDEC direction, since particulate levels in the aqueous-phase effluent did not warrant use of a filter. As such, routine maintenance associated with this item was not completed during this reporting period.

As detailed above and due to the system shutdown on November 30, 2018, routine maintenance of the pressure blower and transfer pump were not completed as per the frequencies detailed in Table 3-1.

Table 3-1: Routine Inspection and Maintenance Services Summary

Routine Inspection/Maintenance Item	Frequency				
	Bi-Weekly	Monthly	Bi-Monthly	Quarterly	As-Needed
Extraction Well Inspection Items					
Flow Rate (gpm)	✓				
Total Flow (gal)	✓				
Pump Pressure (psi)	✓				
Drawdown	✓				
Controls Inspection	✓				

Table 3-1: Routine Inspection and Maintenance Services Summary (cont.)

Routine Inspection/Maintenance Item	Frequency				
	Bi-Weekly	Monthly	Bi-Monthly	Quarterly	As-Needed
Air Stripper Tower Inspection Items					
Stripper Inlet Pressure (psi)	✓				
Air Stripper Blower Inspection Items					
Sump Level (inches)	✓				
Discharge Speed (%)	✓				
Moisture Knockout Influent Vacuum (inches H_2O)	✓				
Blower Influent Vacuum (inches H_2O)	✓				
Blower Effluent Pressure (inches H_2O)	✓				
Flow Rate (gpm)	✓				
Total Flow (gal)	✓				
Routine Maintenance Items					
Pressure Blower Maintenance			✓		
Particulate Filter Maintenance		✓			
Transfer Pump Maintenance				✓	
Air Stripper Maintenance					✓
GAC Removal and Replacement					✓
Air Stripper Packing Removal and Replacement					✓

Non-Routine GWE&TS Maintenance Activities

Non-routine GWE&TS maintenance activities are those maintenance activities which involve out-of-scope maintenance and upkeep of the GWE&TS, as well as out-of-scope maintenance in response to system alarm and/or shut-down events.

Non-routine maintenance activities completed throughout 2018 are summarized below:

January 1, 2018 through March 31, 2018 (Quarter 53)

- On January 10, 2018, the NYSDEC Remedial Services Contractor was on-site to transfer operation from AST-2 to AST-1 due to high level alarms occurring at AST-2.
- On January 16, 2018, the NYSDEC Remedial Services Contractor was on-site to disconnect the low-level sensor float at AST-2 following the transfer from AST-2 to AST-1.
- On January 31, 2018, the NYSDEC Remedial Services Contractor was on-site to dismantle and rebuild the influent manifold. The system was left off overnight to allow glue to dry. The NYSDEC Remedial Services Contractor returned to the Site on February 1, 2018, to inspect the new influent manifold and restart the system; however, a leak was identified at the union fittings and the system was shutdown. On February 2, 2018, the NYSDEC Remedial Services Contractor was on-site to complete repairs to the leaking union fittings and restart the system with AST-1 in operation.
- On February 6, 2018, the NYSDEC Remedial Services Contractor was on-site to install a system runtime meter.
- On March 7, 2018, the NYSDEC Remedial Services Contractor and D&B were on-site to complete trouble shooting activities at AST-1 and Transfer Pump P-1. Upon inspection it was identified that the Transfer Pump P-1 casing ruptured due to a check valve failure at the discharge piping. The NYSDEC Remedial Services Contractor transferred operation of the system from AST-1 to AST-2 and the system was restarted.

April 1, 2018 through June 30, 2018 (Quarter 54)

- On April 12, 2018, the NYSDEC Remedial Services Contractor was on-site to replace the Maganatex pump head at Transfer Pump P-1.
- On April 18, 2018, the NYSDEC Remedial Services Contractor was on-site for a routine site check; however, upon arrival the system was found off due to a high sump level alarm. While on-site the technician pumped water out of the sump and restarted the system. Upon restart the source of the sump water was identified as a potential leak in the piping located below the building slab in the vicinity of the effluent line. Upon departure from the Site the NYSDEC Remedial Services Contractor shutdown the system for pending maintenance activities.
- On April 23, 2018, the NYSDEC Remedial Services Contractor was on-site to begin excavation test pits at the exterior of the building to identify and assess the potential leak at the effluent pipe. The initial test pit revealed that the leak was coming from a section of the effluent piping located under the building footing. The NYSDEC Remedial Services Contractor covered and secured the excavation prior to departing from the site.
- On April 27, 2018, the NYSDEC Remedial Services Contractor modified the effluent piping at Transfer Pump P-1 and P-2 to relocate the pressure switches prior to the check valves.
- On May 10, 2018, the NYSDEC Remedial Services Contractor returned to the Site to excavate test pits in the interior of the building. The test pits revealed that the effluent piping was cracked at an elbow identified near the building footing. The NYSDEC Remedial Services Contractor completed the necessary repairs to the effluent piping and returned on May 14, 2018, to successfully restart the system after confirming the integrity of the repair. While on-site the NYSDEC Remedial Services Contractor backfilled both the interior and exterior test pits.
- On May 23, 2018 the NYSDEC Remedial Services Contractor installed a 2-inch locking well cap and new padlock at monitoring well MW-106.
- On June 15, 2018, the NYSDEC Remedial Services Contractor placed and tamped aggregate at the interior excavation area and installed #4 rebar in preparation to repair the concrete slab. Additionally, while on-site the NYSDEC Remedial Services Contractor tested Transfer Pump P-1 motor operation and repaired a leak at the Transfer Pump P-1 ball valve.

July 1, 2018 through September 30, 2018 (Quarter 55)

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

October 1, 2018 through December 31, 2018 (Quarter 56)

- On October 31, 2018, the NYSDEC Remedial Services Contractor inspected and snaked the eye wash station drain. It should be noted that the NYSDEC Remedial Services Contractor observed that the eye wash station drain is not connected to a discharge outlet. Additionally, a loose fernco coupling was observed at the floor basin plumbing. The NYSDEC Remedial Services contractor attempted to repair the fernco coupling. The Contractor was unable to repair the coupling and suggested that it be replaced.
- On November 21, 2018, the NYSDEC Remedial Services Contractor cleaned the sight tube for Transfer Pump P-1.
- On November 30, 2018, the NYSDEC Remedial Services Contractor repaired the heater vent and drained both air stripper towers to complete activities for the system shutdown. Additionally, the Contractor replaced missing bolts for the monitoring well manhole covers.

GWE&TS Alarms

The GWE&TS is equipped with an autodialer alarm notification system, which is programmed to call technicians in the event of an alarm condition. The following is a list of the current alarms for the system:

- Alarm #1 – Temperature Alarm
- Alarm #2 – Sound Level Alarm
- Alarm #3 – General Alarm
- Alarm #4 – High Pressure Stripper
- Alarm #5 – High Level Stripper
- Alarm #6 – High Pressure Transfer Pump
- Alarm #7 – Low Flow Stripper
- Alarm #8 – Low Flow Extraction Well

January 1, 2018 through March 31, 2018 (Quarter 53)

- On January 8, 2018, the GWE&TS shutdown due to a high level alarm at AST-1. The NYSDEC Remedial Services Contractor responded on the same day to pump out AST-1 and AST-2 but was unable to restart the system. On January 9, 2018, the NYSDEC Remedial Services Contractor returned to the Site to reset and restart the system.
- On January 15, 2018, the GWE&TS shutdown due to a high level alarm at AST-1. The NYSDEC Remedial Services Contractor reset and restarted the system on the same day.
- On January 18, 2018, the GWE&TS shutdown due to general alarm caused by low air flow at the blower. The NYSDEC Remedial Services Contractor reset and restarted the system on the same day.
- On March 5, 2018, the GWE&TS shutdown due to high level alarm at AST-1 and a high sump alarm. The NYSDEC Remedial Services Contractor pumped out the floor sump and attempted to restart the system; however, a leak was identified at Transfer Pump P-1. As such, the system was restarted on March 7, 2018, following system maintenance activities.
- On March 15, 2018, the GWE&TS shutdown due to a general alarm caused by a loss of power to the Site. The NYSDEC Remedial Services Contractor reset and restarted the system on the same day.

April 1, 2018 through June 30, 2018 (Quarter 54)

- On April 17, 2018, the GWE&TS shutdown due to a high-level alarm at the sump. The NYSDEC Remedial Services Contractor responded to the high-level alarm on April 18, 2018. While on-site, the technician pumped water out of the sump and attempted to restart the system; however, a leak was identified due to the effluent piping failure, and water was observed coming up through the slab where the effluent pipe exits the treatment system building. The system was left off until trouble shooting activities were completed. The system repairs were completed on May 10, 2018 and the system was successfully restarted on May 14, 2018.

July 1, 2018 through September 30, 2018 (Quarter 55)

- 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 autodialer being found unplugged. 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 system 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 system alarm. The system was reset and restarted on the same day.

October 1, 2018 through December 31, 2018 (Quarter 56)

- On October 18, 2018, the NYSDEC Remedial Services Contractor responded to a general system alarm. The system was reset and restarted on the same day.

- On November 21, 2018, the NYSDEC Remedial Services Contractor responded to a general system alarm. The system was reset and restarted on the same day.

3.2 Evaluation of O&M Activities

General Facility Evaluation

General facility maintenance activities were completed as needed and as specified in the Site Management Plan (SMP) for the Site. Overall, the scope of services for general facility maintenance activities is considered satisfactory.

GWE&TS Inspection and Operation Evaluation

A summary of the minimum operating requirements for the major GWE&TS components is provided below:

- Extraction wells: The design flow rate for extraction wells RW-1 and RW-2 is 100 gpm. However, based on information presented in the Active Industrial Final Design documents, dated March 2000, containment of the chlorinated plume could be achieved with the on-site extraction well pumping at a minimum of 80% of the design flow rate of 100 gpm (80 gpm).
- Packed-tower air strippers: The design of the packed-tower air strippers is based on the removal of influent contaminant concentrations at the design combined flow rate of 200 gpm and a maximum PCE concentration of 5,900 ug/l, to concentration levels below the specified site-specific effluent limits. As described in Section 1.0, a revised SPDES permit equivalency was issued for the Site by the NYSDEC Division of Water/Bureau of Water Permits on February 12, 2013. The revised permit equivalency is provided in ***Appendix D***.
- Pressure blower: The design flow rate for the pressure blower is a maximum of 1,350 cubic feet per minute (CFM). The pressure blower operated at an average of approximately 1,104 CFM throughout this reporting period.

As the GWE&TS was brought back on-line on April 26, 2017, and has operated for a majority of the time, a summary of the GWE&TS operating conditions, including average influent pumping rates, flow volumes and total VOC concentrations; total effluent flow volumes and total VOC concentrations; and total VOC removals and efficiencies are provided on Table 3-2. It should be noted that the GWE&TS was shutdown on November 30, 2018 of this reporting period to allow groundwater to reach equilibrium for the planned RSO evaluation.

As summarized on Table 3-2, RW-1 has been operating at an average flow rate of between 49.42 gpm and 80.30 gpm (averaging approximately 65 gpm while operating). The GWE&TS treated and discharged approximately 27,844,164 gallons of contaminated groundwater and removed approximately 35.75 pounds of total VOCs throughout this reporting period.

Table 3-2: Treatment System Performance Summary

Parameter	Quarter 53 (January 1, 2018 through March 31, 2018) (1)	Quarter 54 (April 1, 2018 through June 30, 2018)	Quarter 55 (July 1, 2018 through September 30, 2018)	Quarter 56 (October 1, 2018 through December 31, 2018) (1)
Influent				
RW-1 Average Pumping Rate (gpm)	49.42	70.37 (2)	80.30(2)	58.74
RW-1 Total Flow Volume (gal)	5,894,687	6,517,987	10,324,880	5,106,610
Maximum Total Influent VOC Concentration (ug/l)	64.23	54.62	252.13	260.57
Effluent(1)				
Effluent Total Flow Volume (gal)	6,630,305	6,675,224	10,632,199	5,225,372
Maximum Total Effluent VOC Concentration (ug/l)	1.1	1.17	7.38	4.95
VOC Removal Summary				
Total VOC Removal (lbs)(3)	2.57	2.55	21.01	9.62
Average Total VOC Removal Rate (lbs/hr)	1.29E-03	1.65E-03	9.80E-3	6.64E-3
Average Total VOC Removal Efficiency (%)	97.72- 100%	97.00 - 99.21%	97.06 - 97.65%	98.10 - 99.47%

Notes:
NA: Not applicable.

1. As the GWE&TS was operating for only a portion of Quarter 54 (April 1, 2018 through June 30, 2018) and Quarter 56 (October 1, 2018 through December 31, 2018) the NYSDEC Remedial Services Contractor collected only two aqueous system samples within each reporting period.
2. RW-1 average pumping rates for Quarter 54 and Quarter 55 were higher than the previous periods because the NYSDEC Remedial Services Contractor did not adjust the flow rate following the effluent pipe repair; however, flow rate was adjusted from 78 gpm to 50 gpm on October 17, 2018.
3. The total annual VOC removal is approximately 35.75 lbs for this reporting period.

GWE&TS Downtime Evaluation

As previously discussed, the GWE&TS was shutdown on November 30, 2018 for the planned RSO evaluation . As such, the GWE&TS experienced a total of 68 days (approximately 1,636 hours) of downtime throughout this reporting period, as compared to approximately 129 days (approximately 3,096 hours) of downtime reported during the previous reporting period.

Some downtime occurred throughout this reporting period due to several alarm conditions, equipment malfunctions and due to the planned system shutdown on November 30, 2018. Downtime and associated non-routine maintenance and/or alarm events are detailed on Table 3-3.

Table 3-3: Runtime/Downtime Evaluation

Time Period	TOTAL HOURS IN QUARTER	RUNTIME		DOWNTIME		TOTAL NUMBER OF ALARM EVENTS	Downtime Description
		HOURS	PERCENT OF TOTAL TIME PERIOD	HOURS	PERCENT OF TOTAL TIME PERIOD		
Quarter 53 (January 1, 2018 through March 31, 2018)	2,160	1,988	92%	172	8%	5	On January 8, 2018, the GWE&TS shutdown due to a high level alarm at AST-1. The NYSDEC Remedial Services Contractor responded on the same day to pump out AST-1 and AST-2 but was unable to restart the system. On January 9, 2018, the NYSDEC Remedial Services Contractor returned to Site to reset and restart the system. On January 15, 2018, the GWE&TS shutdown due to a high level alarm at AST-1. The NYSDEC Remedial Services Contractor reset and restarted the system on the same day. On January 18, 2018, the GWE&TS shutdown due to general alarm caused by low air flow at the blower. The NYSDEC Remedial Services Contractor reset and restarted the system on the same day. On March 5, 2018, the GWE&TS shutdown due to high level alarm at AST-1 and a high sump alarm. The NYSDEC Remedial Services Contractor pumped out the floor sump and attempted to restart the system; however, a leak was identified at Transfer Pump P-1. As such, the system was restarted on March 7, 2018, following system maintenance activities. On March 15, 2018, the GWE&TS shutdown due to a general alarm caused by a loss of power to the Site. The NYSDEC Remedial Services Contractor reset and restarted the system on the same day.
Quarter 54 (April 1, 2018 through June 30, 2018)	2,184	1,544	71%	640	29%	1	On April 17, 2018, the GWE&TS shutdown due to a high-level alarm at the sump. The NYSDEC Remedial Services Contractor responded to the high-level alarm on April 18, 2018. While on-site, the technician pumped water out of the sump and attempted to restart the system; however, a leak was identified due to the effluent piping failure, where water was coming up through the slab where the effluent pipe exits the treatment system building. The system was left off until trouble shooting activities were completed. The system repairs were completed on May 10, 2018 and the system was successfully restarted on May 14, 2018.

Table 3-3: Runtime/Downtime Evaluation (cont.)

Time Period	TOTAL HOURS IN QUARTER	RUNTIME		DOWNTIME		TOTAL NUMBER OF ALARM EVENTS	Downtime Description
		HOURS	PERCENT OF TOTAL TIME PERIOD	HOURS	PERCENT OF TOTAL TIME PERIOD		
Quarter 55 (July 1, 2018 through September 30, 2018)	2,208	2,143	97%	65	3%	4	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 autodialer being found unplugged. 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 system 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 system alarm. The system was reset and restarted on the same day.
Quarter 56 (October 1, 2018 through December 31, 2018)	2,208	1,449	66%	759	34%	2	On October 18, 2018, the NYSDEC Remedial Services Contractor responded to a general system alarm. The system was reset and restarted on the same day. On November 21, 2018, the NYSDEC Remedial Services Contractor responded to a general system alarm. The system was reset and restarted on the same day.
Total	***8,760***	***7,124***	***81%***	***1,636***	***19%***	***12***	

Groundwater Monitoring Well Condition Summary

All groundwater monitoring wells and extraction wells RW-1 and RW-2 were located as indicated on the Site map and found to be accessible during the groundwater monitoring sampling events completed during this reporting period. All monitoring well concrete well pads, protective casings, surface seals, PVC well risers, well plugs and locks were observed to be present and in good condition; with the exception of monitoring well MW-108, where the January 2018 monitoring well inspection log indicated the manhole, pad and lock should be replaced due to damages identified. It should be noted that the NYSDEC Remedial Services Contractor inadvertently did not complete monitoring well logs for MW-4S and RW-2 in Quarter 56 (October 2018 through December 2018). Monitoring well inspection forms are provided in ***Appendix E***.

4.0 MONITORING PLAN COMPLIANCE

4.1 Monitoring Requirements and Compliance Status

The monitoring scope of services for the GWE&TS consists of system monitoring activities and groundwater monitoring well network monitoring activities completed in accordance with the requirements of the SMP, unless otherwise noted. Presented below is a summary of each monitoring activity performed throughout this reporting period, as well as associated performance standards, a performance evaluation and associated compliance status, as appropriate.

GWE&TS Monitoring Activities

GWE&TS monitoring activities typically performed include the sampling of the various system processes to monitor overall VOC removal efficiencies, while at the same time ensuring that all GWE&TS discharges are below applicable standards and/or discharge limits. A summary of the routine GWE&TS monitoring analytes and their typical frequencies of completion are provided below on Table 4-1.

Groundwater Monitoring Activities

Groundwater monitoring activities performed throughout this monitoring period included the sampling of eleven on-site groundwater monitoring wells (MW-101 through MW-108, MW-4S, MW-4D and MW-5S) and three off-site groundwater monitoring wells (MW-109, MW-111 and MW-2S), as well as extraction well RW-2 for VOCs by Method 8260. It should be noted that the NYSDEC Remedial Services Contractor inadvertently collected a sample from MW-4S in Quarter 56 (October 2018 through December 2018).

As detailed above, extraction well RW-2 was shut down in April 2010 based on low contaminant concentrations, and is currently being monitored on a quarterly basis with the monitoring wells.

Groundwater monitoring activities consist of the collection and analysis of samples from each of these fifteen wells on a quarterly/semiannual basis, as per the frequencies summarized on Table 4-1. Groundwater monitoring well locations are provided in Figures 2-2 and 2-3. It should be noted that following the GWE&TS shutdown all groundwater monitoring wells are scheduled to be sampled on a quarterly basis, per the NYSDEC approval.

Data Analysis

All groundwater and GWE&TS aqueous-phase influent and effluent samples collected during this reporting period were submitted to Test America Laboratories, Inc. (TAL) for analysis. TAL is a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory. As previously discussed, nine aqueous-phase influent and effluent samples were collected this reporting period for VOC and metal analysis. One vapor-phase effluent sample was collected this reporting period on July 12, 2018, as the GWE&TS was operating for only a portion of this reporting period.

Table 4-1: Treatment System and Groundwater Sampling Summary

Sampling Location	Sampling Frequency			Analytical Parameters				
	Monthly	Quarterly	Semi-Annual	VOC (EPA Method 8260B)	VOC (EPA Method TO-15)	TAL Metals (EPA Method 6010B)	pH (EPA Method 9040)(1)	TDS (EPA Method 160.1 or SM 2540C)
Extraction Well RW-1 (2)	✓			✓		✓		
Extraction Well RW-2 (3)		✓		✓		✓		
Combined Influent (4)								
Air Stripper Aqueous-phase Effluent (5)	✓			✓		✓	✓	✓
Air Stripper Vapor-phase Effluent (6)(7)			✓		✓			
Groundwater Monitoring Wells MW-103 through MW-107, MW-2S, MW-4D, MW-5S and RW-2		✓		✓				
Groundwater Monitoring Wells MW-101, MW-102, MW-108, MW-109 and MW-111			✓	✓				

Notes:
1. Field analysis.
2. Extraction well RW-1 samples are scheduled to be collected on a monthly basis from the system; however, a sample was not collected from RW-1 in May 2018 in Quarter 54 (April 2018 through June 2018) due to a leak in the effluent piping and subsequent repair activities. Additionally, due to the GWE&TS shutdown on November 30, 2018 in Quarter 56 (October 2018 through November 2018) the system was operating for only a portion of the reporting period. As such, only two samples were collected from RW-1 in Quarter 56.
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 historical 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.
4. Combined influent analysis is not collected when only one extraction well is operating.
5. Effluent samples are scheduled to be collected on a monthly basis from the system; however, a system sample was not collected in May 2018 due to a leak in the effluent piping and subsequent repairs activities. Additionally, due to the GWE&TS shutdown on November 30, 2018 in Quarter 56 (October 2018 through November 2018) the system was operating for only a portion of this reporting period. As such, only two effluent samples were collected.
6. In addition to the laboratory analysis, total VOC concentrations in vapor-phase are monitored on a monthly basis utilizing a PID.
7. Only one vapor-phase effluent system sample was collected this reporting period, on July 12, 2018 as the GWE&TS was shutdown on November 30, 2018.

All data packages were reviewed for completeness and compliance with NYSDEC Analytical Services Protocol (ASP) Quality Assurance/Quality Control (QA/QC) requirements. Any QA/QC issues arising with the sample results were qualified in the Active Industrial quarterly monitoring reports. Copies of all tabulated analytical data generated throughout this reporting period are provided in ***Appendix F***. Copies of all Data Validation Checklists are provided in ***Appendix G***.

4.2 GWE&TS Performance Standards and Compliance Status

Aqueous-Phase Discharge Standards and Compliance Status

The treated groundwater discharged from the GWE&TS is pumped via underground piping to Little Neck Creek. This discharge is authorized by the NYSDEC under a SPDES permit equivalency, which provides for site-specific VOCs, metals, pH and wet chemistry parameter discharge limits. As described in Section 1.0, a revised SPDES permit equivalency was issued for the Site by the NYSDEC Division of Water/Bureau of Water Permits on February 12, 2013. The revised permit equivalency is provided in ***Appendix D*** .

Based on the analytical data, all analytes in the treated groundwater discharged from the GWE&TS were in compliance with all SPDES equivalency requirements throughout this reporting period, with the exception of two copper exceedances and several pH readings detected below the permit equivalency range, as detailed below.

- Copper was detected at 5.8 ug/l and 12.3 ug/l in the effluent samples collected on June 6, 2018 and August 23, 2018, respectively, in exceedance of the site-specific aqueous-phase effluent limit of 4.0 ug/l. The NYSDEC was notified of this exceedance.
- pH levels collected throughout this reporting period were below the site-specific aqueous-phase effluent range of 6.5-8.5 on several occasions. The NYSDEC was notified of this exceedance.

Vapor-Phase Discharge Standards and Compliance Status

The GWE&TS vapor-phase discharge is authorized by the NYSDEC under an air discharge permit equivalency, which provides for site-specific discharge parameters. A copy of the air discharge permit equivalency document and a summary of site-specific vapor-phase discharge limits, as included in the site-specific O&M Plan, are provided in ***Appendix H***. In addition, a site-specific total VOC effluent 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 discharged by the GWE&TS.

Only one vapor-phase effluent system sample was collected on July 12, 2018. VOCs were not detected at concentrations exceeding their respective site-specific vapor-phase discharge limits during this reporting period with the exception of total-1,2-dichloroethene, detected at a concentration of 0.00648 lbs/hr in the effluent sample collected on July 12, 2018. The site specific total vapor-phase VOC discharge limit of 0.5 lbs/hr was not exceeded during this reporting period.

4.3 GWE&TS Performance Evaluation

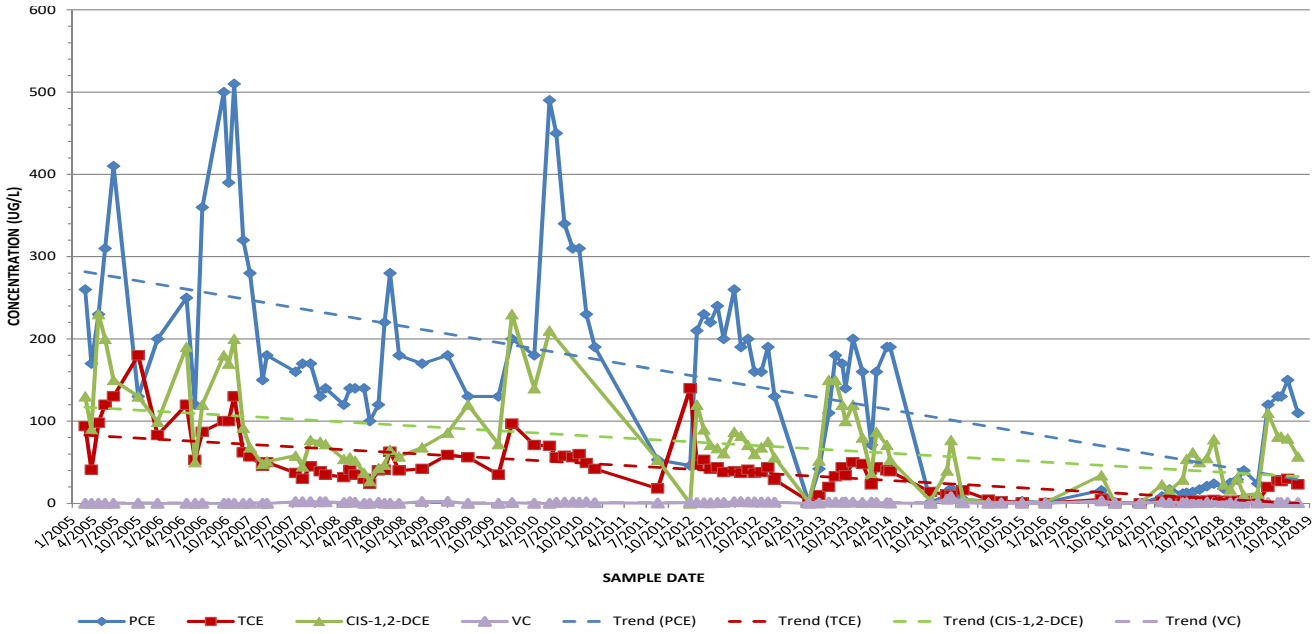
Groundwater Treatment Performance

Based on the influent sample results for this reporting period, RW-1 influent total VOC concentrations ranged from a low of 39.02 micrograms per liter (ug/l) to a high of 260.57 ug/l. PCE, TCE and cis-1,2-DCE have been detected at concentrations in RW-1 influent groundwater above their applicable NYSDEC Class GA Standards throughout this reporting period. A graph depicting the concentrations of PCE, TCE, cis-1,2-DCE and VC in extraction well RW-1 since D&B assumed O&M duties in February 2005 through the end of this reporting period, is provided as Figure 4-1. As shown on Figure 4-1, PCE is the predominant site-specific VOC detected in RW-1 influent groundwater.

All site-specific VOC contaminants of concern have exhibited generally decreasing trends since D&B assumed Site management duties in February 2005, as depicted in Figure 4-1 below.

Figure 4-1

Historical Results of RW-1 Influent Analysis – Site Specific VOCs



Based on the influent sample results for this reporting period, PCE concentrations in extraction well RW-1 influent ranged from 18 ug/l to a maximum concentration of 150 ug/l. TCE ranged from 2.5 ug/l to a maximum concentration of 30 ug/l. Cis-1,2-DCE ranged from 10 ug/l to a maximum concentration of 110 ug/l. Contaminant of concern VC exhibited concentrations below its SCG of 2 ug/l throughout this reporting period. It should be noted that several other VOCs, including, 1,1-dichloroethene, methyl tert-butyl ether (MTBE) and trans-1,2-dichloroethene were detected at generally low levels and well below their respective Class GA Standards in extraction well RW-1.

Total VOC results during the last one-year period in extraction well RW-1 exhibited an increasing trend; however, since start up in 2005 RW-1 total VOC concentrations have exhibited an overall decreasing trend. This increase may be due to the GWE&TS intercepting deeper on-site contamination since the system restart in April 2016. As discussed in Section 4.2, the GWE&TS has effectively been treating the extracted groundwater to below the required aqueous-phase effluent standards, with the exception of two copper exceedances on June 6, 2018 and August 23, 2018 and several pH readings detected below the permit equivalency range. Approximately 35.75 pounds of VOCs were removed from the extracted groundwater during this reporting period. A summary of the GWE&TS performance results for the reporting period is provided on Table 3-2.

Vapor Phase Treatment Performance

PID readings collected from the vapor-phase effluent ranged from 0 ppm to 0.1 ppm during this reporting period.

Only one vapor-phase effluent sample was collected during this reporting period on July 12, 2018. Sample results corresponded to total VOC emissions of 1.34E-02 lbs/hr, well below the site-specific maximum total VOC emissions limit of 0.5 lbs/hr. It should be noted that, VOCs were detected at concentrations below their respective site-specific vapor-phase discharge limits, with the exception of total-1,2-dichloroethene, detected at a concentration of 0.00648 lbs/hr in the effluent sample collected on July 12, 2018. However, as noted above, the site specific total vapor-phase VOC discharge limit of 0.5 lbs/hr was not exceeded during this reporting period.

TABLE 4.2 - Vapor-phase Air Stripper Effluent Concentrations Summary		
SAMPLE	**JULY 12, 2018 (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.
PID: Photoionization Detector
Red font denotes an exceedance of the applicable site-specific limit.

1. Only one vapor-phase effluent sample for laboratory analysis was collected throughout this reporting period on July 12, 2018. Typically a vapor-phase effluent sample is to be collected on a semi-annual basis, per the NYSDEC sampling schedule.
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.

4.4 Groundwater Monitoring Well Network Evaluation

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

A summary of the site-specific VOCs (PCE, TCE, cis-1,2-DCE and VC) detected throughout this reporting period in each of the ten on-site groundwater monitoring wells is provided below. The Class GA Standard for PCE, TCE and cis-1,2-DCE is 5 ug/l and the Class GA Standard for VC is 2 ug/l. Note that monitoring wells with contaminant concentrations detected in exceedance of the Class GA Standards during this reporting period are presented on graphs provided in hyperlinks below. Data tables for the sampling events completed throughout this reporting period are shown in ***Appendix F.***

- MW-101 (screened at 5 to 15 feet below grade): Concentrations of site-specific VOCs have been detected at concentrations well below their respective Class GA Standards throughout this reporting period.
- MW-102 (screened at 5 to 15 feet below grade): Concentrations of site-specific VOCs have been 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 have generally been detected at concentrations below their respective Class GA Standards. However, PCE was detected at a concentration exceeding its Class GA Standards during this reporting period, as follows:
  - PCE was detected at a concentration of 6.7 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. PCE and TCE was detected in exceedance of the respective Class GA Standards, as follows:
  - PCE was detected at concentrations ranging from 19 ug/l to 57 ug/l.
  - TCE was detected at concentrations ranging from 1.20 ug/l to 5.6 ug/l.
- MW-105 (screened at 5 to 15 feet below grade): Concentrations of site-specific VOCs have been detected at concentrations below their respective Class GA Standards.
- ***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. PCE, TCE, cis-1,2-DCE and VC have been detected in exceedance of their respective Class GA Standards throughout this reporting period, as follows:

- PCE was detected at concentrations ranging from 2.4 ug/l to 10 ug/l.
- TCE was detected at concentrations ranging from 2.5 ug/l to 6.2 ug/l.
- Cis-1,2-DCE was detected at concentrations ranging from 21 ug/l to 1,200 ug/l.
- VC was detected at concentrations ranging from 2.4 ug/l to 58 ug/l.

- MW-107 (screened at 5 to 15 feet below grade): Concentrations of site-specific VOCs have been detected at concentrations below their respective Class GA Standards throughout this reporting period.
- ***MW-108*** (screened at 5 to 15 feet below grade): Site-specific VOCs have generally been detected at concentrations below the Class GA Standards throughout this reporting period. Overall, PCE concentrations have exhibited a stable trend throughout this reporting 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 Standard. PCE, TCE, cis-1,2-DCE and VC exceedances detected during this reporting period are as follows:
  - PCE was detected at concentrations ranging from 40,000 ug/l to 67,000 ug/l.
  - TCE was detected at concentrations ranging from 3,900 ug/l to 8,600 ug/l.
  - Cis-1,2-DCE was detected at concentrations ranging from 260 ug/l to 490 ug/l.
  - VC was detected at concentrations ranging from 25 ug/l to 71 ug/l.
- MW-5S (screened at 14 to 24 feet below grade): MW-5S has been sampled as part of the routine sampling since June 2010. Site-specific VOCs have been detected at concentrations below their respective Class GA Standards throughout this reporting period.

Table 4.3 indicates on-site groundwater total VOC contaminant trends for on-site monitoring wells over a two-year period from July 2016 through the end of this reporting period.

TABLE 4.3 On-Site Groundwater Trend Analysis

On-site Monitoring Well [1]	Site-Specific 2-Year Total VOC Trend Analysis [2]
MW-101	Increasing
MW-102	Increasing
MW-103	Decreasing
MW-104	Stable
MW-105	Decreasing
MW-106	Increasing
MW-107	Increasing
MW-108	Decreasing
MW-4D	Increasing
MW-5S	Increasing

1. Hyperlinks are provided for graphs depicting each monitoring well trend analysis over the last two-year monitoring period.
2. The Site specific two-year total VOC trend analysis for all ten routinely monitored on-site wells is based on the degree of slope exhibited by the best fit line across each Total VOC Concentration Graph.

As detailed above, several groundwater monitoring wells exhibited concentrations of contaminants above their Class GA Standards. Six of the ten on-site monitoring wells exhibit increasing total VOC trends. The remaining four monitoring wells exhibit stable or decreasing contaminant trends. Throughout this reporting period total VOC concentrations in the ten on-site monitoring wells ranged from non-detect to 73,414 ug/l. Monitoring well MW-4D has exhibited significantly increasing trends in total VOCs throughout the last two-years with concentrations ranging from 199.53 ug/l in July 2016 to 73,414 ug/l in January 2018. Monitoring wells MW-104 and MW-106 also exhibited increasing trends throughout the last two-years. Increasing trends identified throughout the monitoring well network, as detailed above, may be due to the GWE&TS intercepting deeper on-site contamination following the return of the system to full-time operation on April 26, 2017.

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. Contaminant concentrations detected in exceedance of the Class GA Standards are presented on graphs provided in the hyperlinks 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. Site-specific VOCs have been detected at concentrations below their respective Class GA Groundwater Standards.
- MW-111 (screened at 25 to 35 feet below grade): Monitoring well MW-111 is located approximately 580 feet southwest of the Site. Site-specific VOCs have been detected at concentrations below their respective Class GA Standards.
- ***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 (including PCE, cis-1,2-DCE and VC) have routinely been detected at concentrations in exceedance of their respective Class GA Standards. PCE, cis-1,2-DCE and VC exceedances during this reporting period are as follows:
  - PCE was detected at concentrations ranging from 2.2 ug/l to 14 ug/l.
  - Cis-1,2-DCE was detected at concentrations ranging from 280 ug/l to 2,500 ug/l.
  - VC was detected at concentrations ranging from 0.37 ug/l to 2.7 ug/l.
- ***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. Throughout this reporting period, site specific contaminants of concern were detected below their Class GA Groundwater Standards.

Table 4.4 indicates off-site groundwater total VOC contaminant trends for monitoring wells over a two-year period from July 2016 through the end of this reporting period.

TABLE 4.4 Off-Site Groundwater Trend Analysis

Off-Site Monitoring Well [1]	*Site-Specific 2-Year Total VOC Trend Analysis* [2]
MW-109	Increasing
MW-111	Increasing
MW-2S	Increasing
RW-2[3]	Decreasing

1. Hyperlinks are provided for graphs depicting each monitoring well trend analysis over the last two-year monitoring period.
2. The Site specific two-year total VOC trend analysis for all four routinely monitored off-site wells is based on the degree of slope exhibited by the best fit line across each Total VOC Concentration Graph.
3. 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.

All three off-site groundwater monitoring wells have exhibited increasing trends for total VOCs over the last two-years. Recovery well (RW-2) has exhibited decreasing trends throughout the last two years. Total VOC concentrations for off-site monitoring wells throughout the last two-years ranged from non-detect to 2,538.20 ug/l in monitoring well MW-2S. Monitoring well MW-2S has exhibited an increasing trend with total contaminant concentrations ranging from 17.22 ug/l in July 2016 to 2,538.20 ug/l in July 2018. Increasing trends identified within the off-site monitoring wells, as detailed above, may be due to the GWE&TS intercepting deeper contamination following the return of the system to full-time operation on April 26, 2017.

5.0 INSTITUTIONAL CONTROL/ENGINEERING CONTROL (IC/EC) CERTIFICATION PLAN

The intent of this section is to provide a description of the Institutional and Engineering Controls (IC/ECs) in place for the Site, as well as the mechanisms used to monitor and enforce these controls.

Institutional Controls

By definition, an IC is any non-physical means for enforcing restriction on the use of real property that limits human health and environmental exposure, restricts the use of groundwater, provides notice to potential owners, operators, or member of the public, or prevents action that would interfere with the effectiveness and/or integrity of operation, maintenance and monitoring activities at or pertaining to a remedial Site.

ICs in the form of a groundwater use restriction and land-use restriction are mandatory controls required for the Site as per the site-specific ROD dated March 1997. A copy of the Declaration of Covenant and Restrictions for the Active Industrial Uniform property was obtained from the NYSDEC, which is provided in ***Appendix I***. The Covenant requires that ICs, including land and groundwater use restrictions, are in place at the Site and ensures that the current owner and any future property owners are aware of these site-specific restrictions until no longer deemed necessary by the NYSDEC. In addition, a copy of the deed for the Active Industrial Uniform property was obtained from the Suffolk County Clerk's Office and a freedom of information request was submitted to the Village of Lindenhurst. A copy of this documentation is provided in ***Appendix J***. Property owner certifications are provided in ***Appendix K***. On-site groundwater restrictions will remain in-place and the use of the property has been and will continue to be restricted to operation of the GWE&TS only. No changes have been made to the property during this reporting period.

Engineering Controls

By definition, an EC is any physical barrier or method employed to actively or passively contain, stabilize or monitor contamination, restrict the movement of contamination to ensure long-term effectiveness of a remedial program or eliminate potential exposure pathways to contamination. The GWE&TS and associated monitoring well network, fencing and security signage are the ECs currently in-place at the Site. The Site fencing and security signage are currently in-place and functioning properly. The GWE&TS has generally operated in accordance within the design standards throughout the majority of this reporting period, with the exception of two isolated aqueous-phase effluent exceedances for copper, several pH readings detected below the permit equivalency range and one exceedance of total-1,2-dichloroethene in the vapor-phase effluent system sample. Total-1,2-dichloroethene was detected at a concentration of 0.00648 lbs/hr in the effluent sample collected on July 12, 2018. The site specific total vapor-phase VOC discharge limit of 0.5 lbs/hr was not exceeded during this reporting period.

Since the return of the system to full-time operation on April 26, 2017, routine monitoring indicates an increasing trend in contaminant concentrations in the influent of the GWE&TS. This increase may be due to the GWE&TS intercepting deeper on-site contamination. As such, D&B recommended that an evaluation be completed regarding continued operation of the GWE&TS, in addition to implementation of a source area investigation to evaluate possible areas of remaining contamination at the Site. To facilitate these RSO activities, the GWE&TS was shutdown on November 12, 2018, to allow for the subsurface environment to come to equilibrium prior to completing the proposed work.

A copy of the completed IC/EC Certification form, as provided by the NYSDEC, is included as ***Appendix L***.

6.0 GREEN REMEDIATION PLAN

In accordance with the NYSDEC's DER-31 Green Remediation policy, the following section provides a qualitative assessment of the overall environmental impacts or "footprint" associated with the operation of the GWE&TS. In addition, recommendations are provided in order to minimize the environmental impacts of the remedy.

6.1 Qualitative Overview of Environmental Impacts

Electric Usage

The GWE&TS currently obtains 100% of its electricity from the local electric utility, PSEG Long Island (PSEG). Based on publicly available information, PSEG currently supplies electricity from a variety of fuel sources, including fossil fuels (46%), nuclear (11%), refuse burning (4%) and renewables (3%). The remaining 35% of its electric is supplied from other outside electric utilities. Electricity usage associated with the GWE&TS while operating is mainly attributed to operation of the submersible pump within extraction well RW-1, the pressure blower and the effluent transfer pump. Minor electricity usage can also be attributed to building and Site lighting, building HVAC and system controls.

Based on a review of the electric utility bill summary for this reporting period provided by the NYSDEC, the GWE&TS used a total of approximately 63,677 kilowatt-hours (KWH) of electricity, at an average of 174 KWH/day. It should be noted that the average electricity usage during the previous reporting period (January 2017 through December 2017) was 147 KWH/day. This increase in electric usage is due to the system being operated for the majority of this reporting period compared to 2017, in which, the system experienced more downtime due to maintenance activities.

Fossil Fuel Usage

The GWE&TS was designed to use fossil fuels (e.g., natural gas) for the operation of the building heaters. In addition, fossil fuels are indirectly used during the completion of maintenance and monitoring activities associated with the overall operation of the GWE&TS.

Fossil fuel use results from completion of the following Site-related activities:

- Operation of the natural gas building heaters.
- Transportation to and from the Site for monitoring, sampling and system alarm response/non-routine maintenance.
- Operation of a portable generator to power a submersible pump for groundwater monitoring well sampling activities.
- Off-site transportation and shipment of samples collected for laboratory analysis.
- Disposal of waste generated at the Site.

Water Usage

The GWE&TS does not directly use water for operation. However, as the GWE&TS building is connected to the Suffolk County Public Water Supply, a nominal amount of water was utilized during the completion of maintenance and monitoring activities associated with the GWE&TS and groundwater monitoring well network.

Air Emissions

Vapor-phase discharge from the packed-tower air strippers is released directly to the atmosphere. As previously discussed, one vapor-phase effluent sample was collected on July 12, 2018, as the GWE&TS was operating for only a portion of this reporting period. Contaminant concentrations within vapor-phase discharge were below the Site-specific discharge limits, as discussed above, with the exception of total-1,2-dichloroethene. While the GWE&TS is in operation, the vapor-phase discharge is monitored on a routine basis to prevent or limit any vapor-phase contaminant concentration exceedance events.

Monitoring and maintenance activities associated with the GWE&TS also result in indirect emissions to the air through the off-site generation of electricity utilized to power the GWE&TS and the combustion of fossil fuels, as discussed above.

Consumption of Materials and Generation of Waste

Monitoring, maintenance and reporting activities associated with the GWE&TS result in material consumption and the

generation of waste. A summary of the current material consumption and waste generation activities for the GWE&TS are summarized below:

- Personal protective equipment associated with GWE&TS and groundwater sampling, such as nitrile gloves and hearing protection, etc.
- Polyethylene tubing associated with groundwater sampling.
- Packaging material and ice used to pack and preserve samples to be submitted for laboratory analysis.
- Florescent light bulbs for building lighting.
- Paper and office supplies associated with GWE&TS Site logs, monitoring logs and report preparation.
- Repair and replacement of equipment associated with the GWE&TS, such as transfer pumps and gauges, etc.
- Consumable GWE&TS materials such as, air stripper packing material.

7.0 COST EVALUATION

The total cost of operation of the GWE&TS from January 1, 2018 through December 31, 2018 was approximately $148,903. It should be noted that this total does not include any administrative costs incurred by the NYSDEC in support of this project throughout this reporting period. This total includes engineering and subcontractor costs, as well as utility costs associated with the operation of the GWE&TS (electric, telephone, natural gas and water). A review of these costs is provided on Table 7-1. The following provides a brief review of each cost item:

- Subcontractors include the NYSDEC Remedial Services Contractor, analytical laboratory and maintenance contractors associated with the routine/non-routine maintenance of the GWE&TS. As summarized on Table 7-1, subcontractor costs were approximately 44% of the total costs for this reporting period.
- Engineering costs include effort invoiced in association with project management, report preparation, project planning and other office-related work items. As summarized on Table 7-1, engineering costs were approximately 45% of the total costs for this reporting period.
- Utilities consumed in support of the overall operation of the GWE&TS include electric, telephone, gas and water. As summarized on Table 7-1, utility costs were approximately 11% of the total costs for this reporting period, primarily due to electric usage.

Based on the total cost of $148,903 incurred during this reporting period, with the average monthly cost of approximately $12,409. The majority of this overall cost was the result of ongoing GWE&TS maintenance completed by the NYSDEC Remedial Services Contractor. As the GWE&TS was operational for a majority of this reporting period with the exception of some downtime, the cost per pound removed is $4,165 based on a total of 35.75 lbs removed. As summarized on Table 3-2.

Table 7-1: Treatment System Cost Summary

COST ITEM	BUDGET EXPENDED (January 1, 2018 THROUGH December 31, 2018)	PERCENT OF TOTAL
ENGINEERING SUPPORT		
D&B Engineers and Architects, P.C.	$67,275	45.18%
SUBCONTRACTORS		
NYSDEC Remedial Services Contractor[1] (Routine/Non-Routine Maintenance Activities)	$59,828	40.18%
Test America (Analytical Laboratory)	$6,143	4.13%
SUB-TOTAL	$65,971	44.30%
UTILITIES		
Electric	$12,146	8.16%
Telephone	$890	0.60%
Natural Gas	$2,473	1.66%
Water	$148	0.10%
SUB-TOTAL	$15,657	10.51%
TOTAL COSTS	$148,903	100%
AVERAGE COST/MONTH	$12,409	--
COST/POUND OF VOC REMOVED[2]	$4,165	--

Notes:
1. Remedial Services contractor costs do not include utility costs.
2. As the GWE&TS was operating for the majority of this reporting period, 35.75 lbs of VOCs were removed throughout this reporting period.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

Based on the evaluation of the GWE&TS performance, effectiveness and protectiveness throughout this reporting period, and as detailed in the preceding sections, the following conclusions have been established:

Operation and Maintenance

- O&M Plan Requirements and Compliance: As noted in Section 3.0, the O&M scope of services was performed in accordance with the requirements of the site-specific O&M Plan, dated April 2002 and the September 2012 SMP, revised January 2014, with the exception of routine maintenance of the pressure blower and transfer pump.
- GWE&TS Downtime: The GWE&TS was operating for the majority of the reporting period with the exception of some downtime due to troubleshooting activities, general alarm conditions and the system shutdown which was conducted as part of the RSO evaluation on November 30, 2018. In total, the GWE&TS was shutdown throughout this reporting period a total of 68 days (or 1,636 hours).

Monitoring Plan

- System Monitoring: As noted in Section 4.1, monitoring requirements were generally maintained throughout the reporting period.
- System Aqueous-Phase Effluent Contaminant Concentrations: Based on the analytical data, all analytes in the system aqueous-phase effluent were in compliance with SPDES requirements throughout this reporting period, with the exception of two copper exceedances in June and August 2018 and pH readings detected below the permit equivalency range, as detailed in Section 4.2.

- Vapor-Phase Effluent Sampling: Based on the analytical data, analytes in the system vapor-phase effluent were in compliance with permit equivalency requirements with the exception of an exceedance of total-1,2-dichloroethene; however, the site-specific total VOC effluent was below the limit of 0.5 lbs/hr throughout this reporting period, as detailed in Section 4.2.
- Monitoring Well Contaminant Concentrations: Site-specific VOCs have been detected at concentrations in exceedance of their Class GA Standard in several monitoring wells during this reporting period (on-site monitoring wells MW-103, MW-104, MW-106 and MW-4D, as well as off-site monitoring well MW-2S).

Institutional and Engineering Controls

- IC/EC Compliance Status: ICs consisting of a Declaration of Covenant and Restrictions, including groundwater and land-use restrictions, is currently filed with the Suffolk County Clerk's office and the Village of Lindenhurst. There is no on-site use of groundwater for potable purposes and the use of the property has been and will continue to be restricted to operation of the GWE&TS only. No changes have been made to the property during this reporting period. The GWE&TS has generally operated in accordance with the SMP requirements throughout the majority of this reporting period, with the exception of two copper exceedances in June and August 2018 and pH readings detected below the permit equivalency range and one exceedance of total-1,2-dichloroethene in the vapor-phase effluent system sample. Total-1,2-dichloroethene was detected at a concentration of 0.00648 lbs/hr in the effluent sample collected on July 12, 2018. The site specific total vapor-phase VOC discharge limit of 0.5 lbs/hr was not exceeded during this reporting period.

8.2 Recommendations

Based on evaluation of the operation of the GWE&TS throughout this reporting period, and as detailed in the preceding sections, the following recommendations have been established to improve the overall performance, effectiveness and protectiveness of the GWE&TS:

Operation and Maintenance

- Facility Maintenance: Ensure snow plowing/removal activities and lawn maintenance activities, as well as proper reporting of such, are completed, as necessary.
- OM&M Logs: D&B recommends that the NYSDEC Remedial Services Contractor record more clear and detailed descriptions of completed field activities and issues encountered. In addition, multiple copies of logs, that sometimes include differing information is periodically reviewed. 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 facilitate a more efficient preparation of the Site Management Quarterly Reports.

GWE&TS Repairs:

- Well Redevelopment: D&B recommends that the NYSDEC Remedial Services Contractor complete well redevelopment activities at extraction well RW-2.

Monitoring Plan

- Monitoring/Extraction Well Sampling: Based on the widely varying VOC concentrations detected in several wells over previous reporting periods, it is recommended that the NYSDEC ensure that the Remedial Services Contractor is utilizing proper and consistent sampling techniques during each groundwater sampling event. It is also recommended that the NYSDEC Remedial Services Contractor complete the groundwater monitoring well sampling on a quarterly basis as approved by the NYSDEC following the system shutdown on November 30, 2018.

Institutional Controls/Engineering Controls

- IC/ECs: As per direction from the NYSDEC, the GWE&TS was shutdown on November 30, 2018. As such, the system shall remain off until a source area investigation to evaluate possible areas of remaining contamination at the

Site can be completed. Following the completion of the RSO activities, a recommendation will be made regarding the future operation of the GWE&TS. In the event the GWE&TS is restated, it is recommended that a full round of start-up groundwater and vapor sampling be completed to determine the need to bring the carbon filters on-line.

Green and Sustainability Recommendations

- Building Lighting: It is recommended that all light bulbs within the building be replaced with high efficiency bulbs, when needed.
- Renewable Energy Feasibility Assessment: D&B recommends evaluating the feasibility of installing alternate energy sources or purchasing renewable energy credits in order to off-set the electricity usage for the GWE&TS from non-renewable energy sources.
- Reduction of Paper Use: Continue transmitting reports electronically as PDF files to the NYSDEC for review and approval.

General Recommendations

- General GWE&TS Operation: Based on evaluation of the groundwater sampling results collected following the return of the system to full-time operation April 2017, D&B recommended that an evaluation be completed regarding continued operation of the GWE&TS and implementation of a source area investigation to evaluate possible areas of remaining contamination at the Site. To facilitate these RSO activities, D&B recommended shutting down the GWE&TS to allow for the subsurface environment to come to equilibrium prior to completing the proposed work. The NYSDEC approved shutdown of the system on November 16, 2018 and on November 30, 2018, the NYSDEC Remedial Services Contractor completed a round of O&M activities and subsequently shutdown the system. As detailed above, the system shutdown is to enable the subsurface environment to come to equilibrium prior to completing the proposed RSO work.
- RSO Evaluation: Based on the current status of the GWE&TS and the remaining elevated contaminant concentrations in groundwater detected at the Site, the necessary RSO activities to complete the recommended source area investigation include the installation of several on-site test pits, completion of an on-site soil vapor study, off-site discrete groundwater sampling, and the installation of off-site groundwater monitoring wells. Following the completion of the RSO activities, a recommendation will be made regarding the future operation of the GWE&TS.
- SMP Revisions: It is recommended that the Site SMP be revised to include the NYSDEC-approved revised sampling frequencies and include additional information regarding remaining contamination at the Site.
- PRR Reporting Frequency: Based on a review of the guidance documents provided by the NYSDEC, it is recommended that PRRs continue be completed on an annual basis. The frequency of follow-up PRRs will be determined by the NYSDEC based on future Site conditions and compliance.