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# New York State Department of Environmental Conservation

## Division of Environmental Remediation

# Active Industrial Uniform Site

## Site No. 152125

# Periodic Review Report

Dvirka and Bartilucci Consulting Engineers

A Division of 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.

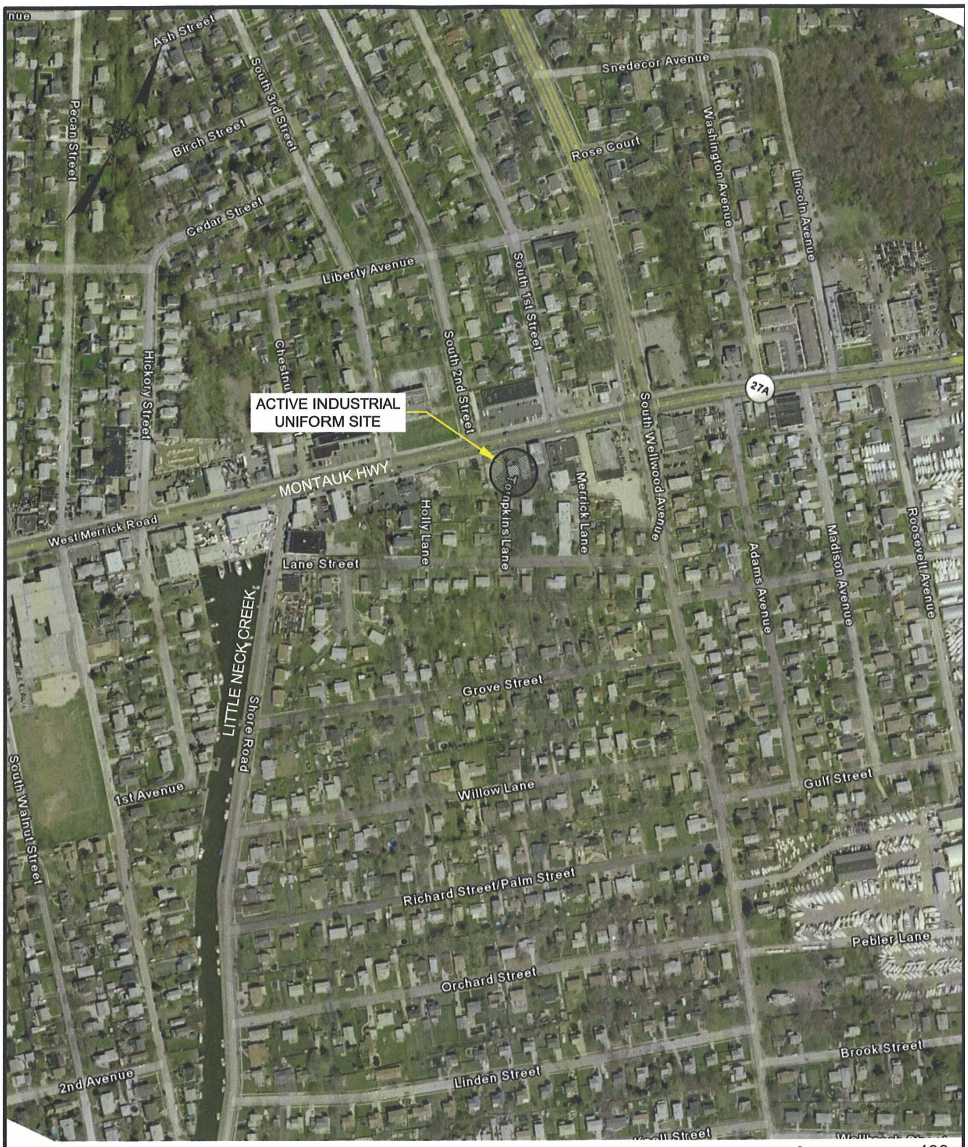
Based on evaluation of the performance, effectiveness and protectiveness of the GWE&TS throughout this reporting period (January 1, 2011 through December 31, 2011), the following conclusions and associated recommendations are briefly summarized:

- O&M Plan: The Operation and Maintenance (O&M) scope of services was generally performed in accordance with the requirements outlined in the site-specific Operations and Maintenance Manual (OMM), dated April 2002, with the exception of the routine maintenance of the pressure blower and transfer pump. The following O&M recommendations have been proposed in order to enhance the performance, effectiveness and protectiveness of the GWE&TS:
  - Perform maintenance of the pressure blower and transfer pump, and all other system components, in accordance with their respective manufacturer's specifications, as provided in the April 2002 OMM;
  - Based on the continued unreliability of the building heaters, it is recommended that the building heaters be replaced in-kind with new units; and
  - Based on review of the NYSDEC "call-out" contractor system monitoring logs, it appears as if the autodialer has not properly notified the NYSDEC "call-out" contractor of system alarms on several occasions during this reporting period. As such, it is recommended that the autodialer be properly set prior to leaving the Site. In addition, if these situations persist, evaluation and/or replacement of the autodialer should be completed.
- Groundwater Monitoring Well Condition Summary: In order to maintain the security and functionality of the groundwater monitoring well network, the following recommendations are provided:
  - Repair/replace the well casing eyelets at monitoring wells MW-109 and MW-111 and the well casing at monitoring well MW-2S;
  - Ensure the measuring points are clearly marked on all monitoring wells; and
  - Replace the concrete well pads at monitoring well locations MW-104 and MW-5S following final restoration/grading to the west of the treatment system building.
- Monitoring Plan: System monitoring requirements were maintained throughout this reporting period in accordance with the requirements outlined in the site-specific OMM, dated April 2002 and the previous Periodic Review Report (PRR), dated December 2011, with the exception of conformance with the revised groundwater monitoring well sampling schedule provided in the previous PRR. As outlined in the previous PRR, the monitoring frequency for several groundwater monitoring wells has been reduced from a quarterly basis to a semiannual basis. Note that this revised sampling frequency is currently in-place;
- Institutional Control/Engineering Control (IC/EC) Plan: ICs, as listed on the IC/EC Certification Form, are not currently recorded with the Suffolk County Clerk or the Village of Lindenhurst. The EC for the Site (the GWE&TS) is currently in-place and operating in accordance with the requirements of the March 1997 Record of Decision. Based on this information, the following recommendations are provided:
  - Groundwater and land use restrictions should be filed with the Suffolk County Clerk and the Village of Lindenhurst for the Site; and
  - The IC/EC form provided by the NYSDEC should be revised to include the GWE&TS as an EC for the Site.

- Green and Sustainability Recommendations: A qualitative assessment of the overall environmental impacts or "footprint" associated with the GWE&TS was completed in accordance with the NYSDEC's DER-31 Green Remediation policy. Based on this evaluation, the following recommendations are provided:
    - Investigate the feasibility of installing motion sensors on the existing building exterior lights. In addition, it is recommended that all light bulbs within the building be replaced with high efficiency bulbs;
    - Evaluate 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; and
    - Continue transmitting reports electronically as PDF files to the NYSDEC for review and approval.
- General Recommendations: The following general recommendations are provided for the continued operation and management of the GWE&TS:
    - The GWE&TS should remain in place until remedial objectives have been obtained;
    - As per the NYSDEC, the requirements of the O&M Plan, Monitoring Plan and IC/EC Plan portions of this PRR will be detailed in a Site Management Plan (SMP) for the Site, which is currently being drafted;
    - D&B recommends that a Remedial System Optimization (RSO) evaluation be completed for the Site in order to improve the efficiency, effectiveness and net environmental benefit of the GWE&TS. The RSO should include, but not be limited to:
        - Complete a pump test of on-site extraction well RW-1 utilizing the existing groundwater monitoring well network to confirm that a minimum flow rate of 100 gpm is adequate to influence all areas of the Site;
        - An evaluation of the installation of a variable frequency drive (VFD) for the extraction well pump within RW-1;
        - An assessment of a possible on-site "source area" in the vicinity of monitoring well MW-106; and
        - An assessment of the off-site groundwater plume to more accurately define its current location and configuration.
- Complete PRRs initially on an annual basis, with the frequency of follow-up PRRs to 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). The Site is located at 63 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, 2011 through December 31, 2011. However, portions of this report incorporate pertinent historical background information and monitoring data, as appropriate.




The GWE&TS consists of two 4-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). Note that extraction well RW-2 was shut-down in April 2010, as directed by the NYSDEC, due to low historical concentrations of site-specific VOCs and a continued decline in total VOC concentrations. Extracted groundwater is conveyed to the GWE&TS building via underground piping, and was initially pumped to two series-configured packed-tower air strippers. However, based on low historic contaminant concentrations detected in system water samples collected between the air stripper towers and in order to increase the overall efficiency of the GWE&TS, the GWE&TS piping was reconfigured to bypass the lead air stripper tower in July 2011, per the direction of the NYSDEC. Treated groundwater is pumped via underground piping to a storm water basin located approximately 1,000 feet west of the Site, which then discharges the treated water 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 historic 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, and an autodial alarm notification system.

Environmental Assessment and Remediation (EAR), a NYSDEC "call-out" contractor, was responsible for the Site operation throughout this reporting period, monitoring and maintenance, while all reporting and engineering services were completed by D&B.

The objectives of the PRR for the Site include:

- Presenting background information;
- Identifying the remedial goals established for the Site;
- Presenting a description of the GWE&TS components;
- Reviewing Site monitoring protocols;
- Evaluating the GWE&TS operation and performance; and
- Presenting recommendations regarding the operation of the GWE&TS with respect to system performance, effectiveness and protectiveness and the GWE&TS's ability to achieve the goals established for the Site by the Record of Decision (ROD), dated March 1997.

The remainder of this document consists of five sections: Section 2.0 provides a Site overview, including a Site description, a summary of background information and remedial history; Section 3.0 provides an overview and evaluation of the Operation and Maintenance (O&M) Plan; Section 4.0 provides an overview and evaluation of the Monitoring Plan; Section 5.0 provides an overview and evaluation of the Institutional Control/Engineering Control (IC/EC) Plan; Section 6.0 provides a discussion of the remedy with regard to sustainable and "green" initiatives, consistent with the NYSDEC DER-31 policy; Section 7.0 provides a cost evaluation for this reporting period; and Section 8.0 provides conclusions and recommendations regarding the continued operation and overall performance of the GWE&TS.

## 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.

### 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 tetrachoroethene (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. 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 Record of Decision (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 existing upgradient, on-site and downgradient of the Site and periodic reviews; and
- 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 investigations 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 gpm to 100 gpm.

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

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 nine drywell structures were also removed and disposed of as part of these activities. The lateral extent of the soil excavation, as well as the former locations of the drywells are provided on Figure 2-2.

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.

## Figure 2-2

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

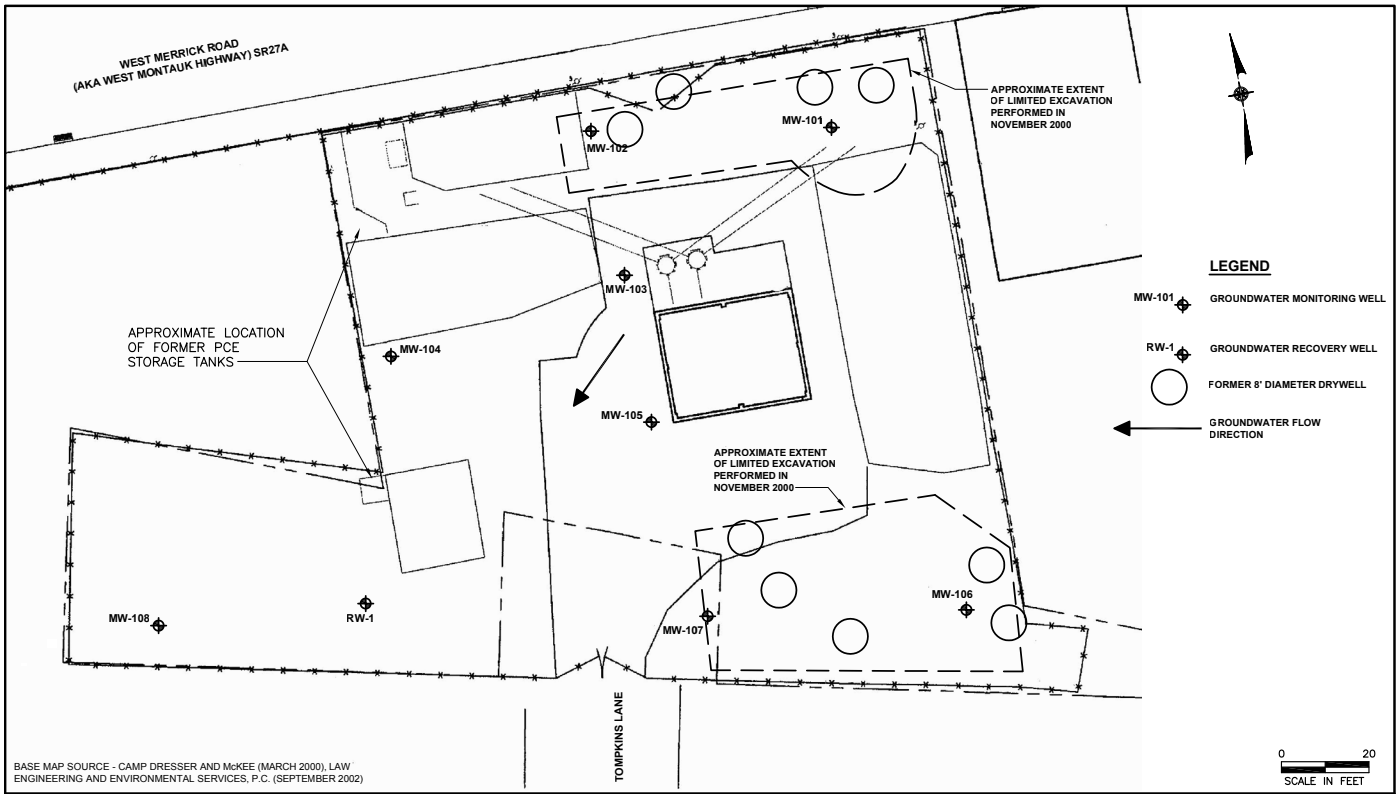


**Figure 2-3**

**Off-Site Monitoring Wells and Extraction Well Location Map**


The construction of the GWE&TS began in June 2001 and was completed in December 2001. It is our 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. Copies of the Site Activities Logs and Maintenance reports, which include details of shut downs and the non-routine maintenance activities that have occurred throughout this reporting period, 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 groundskeeping of the GWE&TS property. General facility maintenance activities completed during this reporting period include:

- Inspection of the perimeter fence for tears and breaks;
- Lubrication of gate locks;
- Verification of posted safety information to ensure all information is current and accurate;
- Inspection of the extraction and monitoring wells to ensure the wells are secure and accessible;
- Snow removal services;
- Removal of overgrown vegetation; and
- Inspection of vehicle driveway for potholes and other damage.

### Routine GWE&TS Inspection and Maintenance Activities

A summary of the routine GWE&TS inspection and maintenance services and their typical frequencies of completion are provided on Table 3-1. However, as detailed in Section 3.2, the GWE&TS experienced significant downtime during this reporting period. As a result, routine maintenance of the pressure blower and transfer pump were not completed as per the frequencies detailed in Table 3-1. The routine GWE&TS inspection and maintenance activities completed during this reporting period include:

- Monthly inspection/monitoring (while the GWE&TS was operating) of GWE&TS equipment (extraction well, packed-tower air stripper, transfer pump and pressure blower);
- Monthly inspection (while the GWE&TS was operating) of the groundwater recovery pump to check for operating pressure, drawdown, periods of cycling and operation of controls;

### 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. 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 is provided on Table 3-2.

**Table 3-1: Routine Inspection and Maintenance Services Summary**

| Routine Inspection/Maintenance Item | Frequency | | | |
|---|---|---|---|---|
| | Monthly | Bi-Monthly | Semiannual | As-Needed |
| **Extraction Well Inspection Items** | | | | |
| Flow Rate (gpm) | ✓ | | | |
| Total Flow (gal) | ✓ | | | |
| Pump Pressure (psi) | ✓ | | | |
| Drawdown | ✓ | | | |
| Controls Inspection | ✓ | | | |
| **Air Stripper Tower Inspection Items** | | | | |
| Stripper Inlet Pressure (psi) | ✓ | | | |
| Transfer Pump (P-1) Outlet Pressure (psi) | ✓ | | | |
| Sump Level (inches) | ✓ | | | |
| Discharge Speed (%) | ✓ | | | |
| **Air Stripper Blower Inspection Items** | | | | |
| Moisture Knockout Influent Vacuum (inches $H_2O$) | ✓ | | | |
| Blower Influent Vacuum (inches $H_2O$) | ✓ | | | |
| Blower Effluent Pressure (inches $H_2O$) | ✓ | | | |
| Blower Effluent Velocity (feet/minute) | ✓ | | | |
| Blower Effluent Temperature ($^oF$) | ✓ | | | |
| Blower Effluent Flow Rate ($ft^3$/minute) | ✓ | | | |
| **Treated Water Discharge Inspection Items** | | | | |
| 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 | | | | ✓ |

**Table 3-2: Treatment System Performance Summary [1]**

| Parameter | Quarter 25 (January 1, 2011 through March 31, 2011) | Quarter 26 (April 1, 2011 through June 30, 2011) | Quarter 27 (July 1, 2011 through September 30, 2011) | Quarter 28 (October 1, 2011 through December 31, 2011) |
|---|---|---|---|---|
| **Influent** | | | | |
| RW-1 Average Pumping Rate (gpm) | - | - | 111 | 109 |
| RW-1 Total Flow Volume (gpm) | - | - | 8,781,682 | 10,325,064 |
| Maximum Total Influent VOC Concentration (ug/l) | -- | -- | 126.40 | 187.90 |
| **Effluent** | | | | |
| Effluent Total Flow Volume (gal) | - | - | 8,813,216 | 10,352,780 |
| Maximum Total Effluent VOC Concentration (ug/l) | -- | -- | <5.0 | 11.70 |
| **VOC Removal Summary** | | | | |
| Total VOC Removal (lbs) [2] | -- | -- | 4.30 | 23.96 |
| Average Total VOC Removal Rate (lbs/hr) | -- | -- | $7.01E^{-03}$ | $9.96E^{-03}$ |
| Total VOC Removal Efficiency [3] | -- | -- | 96.04% | 93.76% |

Notes:
1. The GWE&TS was not operational from January 2011 through July 2011 and September through October 2011 due to several equipment failures and non-routine maintenance activities as detailed on Table 3-1.
2. The average VOC removal is 25.63 lbs for this time period and the total cumulative VOC removal is 1,425 lbs.
3. The VOC removal efficiency has ranged from approximately 92.65% to 99.47% since D&B assumed O&M duties in February 2005 to the end of this reporting period (December 31, 2011).

Overall, the GWE&TS was non-operational from January 2011 through July 2011 and September through October 2011, with a combined total of approximately 239 days (5,736 hours) throughout this reporting period as a result of equipment failures and non-routine maintenance activities. As detailed below, the majority of this downtime resulted from freezing of the stripper towers prior to this reporting period, failure of the bed screen supports located in the carbon vessels and evaluation/completion of several system modifications during this reporting period.

### 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 event. 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

No alarm conditions occurred during this reporting period.

## 3.2 Evaluation of O&M Activities

### General Facility Evaluation

Throughout the course of this reporting period, general facility maintenance activities were completed as specified in the OMM. Overall, the scope of services for general facility maintenance activities is considered satisfactory.

### GWE&TS Inspection and Operation Evaluation

As summarized above, the GWE&TS was not operational from January 2010 through July 2011 and September through October 2011, due to several equipment failures and non-routine maintenance activities. As a result, pressure blower and transfer pump maintenance activities were not completed as per the frequencies specified in the OMM. It should be noted that these maintenance items have not been completed during this reporting period, following restart of the GWE&TS in October 2011. As such and as recommended in Section 8.2, D&B recommends that the NYSDEC "call-out" contractor complete these routine maintenance items as soon as possible and as per the frequencies specified in the OMM during future reporting periods.

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 detailed on the State Pollution Discharge Elimination System (SPDES) permit equivalency, provided in ***Appendix D***;
- Vacuum blower: The design flow rate for the vacuum blower is a maximum of 1,350 cubic feet per minute (CFM); however, the vacuum blower has been operating at approximately 1,100 cfm since D&B assumed site management duties in February 2005 and throughout this reporting period.

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 is provided on Table 3-2. As summarized on Table 3-2, RW-1 has been operating at a flow rate of between 109 gpm and 111 gpm (averaging approximately 110 gpm). The GWE&TS treated and discharged approximately 19,165,996 gallons of contaminated groundwater and removed approximately 28.26 pounds of total VOCs throughout this reporting period.

With regard to the overall operation of the GWE&TS, all system components functioned as intended, with the exception of the following items:

- The bed screen supports located in the carbon vessels rusted and failed during the previous reporting period (on December 23, 2010), resulting in ejection of the granular activated carbon (GAC) material, which was noted during a routine system monitoring event on January 5, 2011. As the GWE&TS was shutdown at the time, the GWE&TS was not re-started at that time. Following review of bed screen replacement options, the NYSDEC decided that, based on current vapor-phase contaminant concentrations, carbon treatment of the vapor-phase discharge was no longer necessary. As such and based on NYSDEC direction, the bed screen was not replaced. In addition and as detailed in Section 4.6, the carbon units were bypassed in order to increase the efficiency of the overall GWE&TS and the GWE&TS was restarted on June 14, 2011;
- The building heaters and associated exhaust piping was evaluated on February 23, 2011 following several failures of the building heaters during this and the previous reporting period. Based on this evaluation, the NYSDEC "call-out"

contractor concluded that the low height of the building heater exhaust pipes may be causing the heater pilot lights to become extinguished by wind gusts and down-drafts. As such, the NYSDEC "call-out" contractor extended/modified the building heater exhaust pipes on February 23, and September 12, 2011. Note that the building heaters continue to malfunction following the extension/modification of the exhaust pipes; and

- Based on review of the NYSDEC "call-out" contractor system monitoring logs, it appears as if the autodialer has not properly notified the NYSDEC "call-out" contractor of system alarms on several occasions during this reporting period. As recommended in Section 8.2, D&B recommends that the NYSDEC "call-out" contractor ensure that the autodialer is properly set prior to leaving the Site. In addition, if these situations persist, evaluation and/or replacement of the autodialer is warranted.

### GWE&TS Downtime Evaluation

The GWE&TS experienced a total of approximately 239 days (5,736 hours) of downtime throughout this reporting period due to system alarm/shutdown conditions and as a result of several system modifications completed to improve the efficiency of the overall GWE&TS. Downtime and associated non-routine maintenance and/or alarm events are detailed on Table 3-3. A brief summary of the GWE&TS downtime is provided below:

- This reporting period began with the GWE&TS down due to freezing of the stripper tower pressure transducers, valves and other outside piping during the previous reporting period. Note, heat blankets and insulation had been installed in these areas during the previous reporting period. In addition, added insulation has since been installed around the pressure transducers to prevent further freezing of these areas;
- In addition to the air stripper towers freezing, the bed screen supports located in the carbon vessels rusted and failed during the previous reporting period, resulting in ejection of the granular activated carbon (GAC) material. Following review of bed screen replacement options during this reporting period, the NYSDEC decided that, based on current vapor-phase contaminant concentrations, carbon treatment of the vapor-phase discharge was no longer necessary. As such and based on NYSDEC direction, the bed screen was not replaced. In addition, the GAC material was cleaned-up and properly disposed of. Waste manifests for the GAC disposal are provided in ***Appendix E***;
- Several system modifications were evaluated and implemented during this reporting period, resulting in further system downtime. Specific details of these system modifications are discussed in Section 4.6; and
- Following completion of the system modifications referenced above, the NYSDEC received complaints from residential neighbors to the south of the Site relating to a continuous loud resonance being emitted by the vapor-phase discharge piping. As a result, the GWE&TS experienced further system downtime while the NYSDEC evaluated further system modification options to reduce/eliminate this loud resonance. The loud resonance was ultimately eliminated via the installation of a silencer within the GWE&TS vapor-phase discharge piping on October 25, 2011.

### Groundwater Monitoring Well Condition Summary

- All groundwater monitoring and extraction wells were found to be accessible during the groundwater monitoring sampling events conducted during this reporting period. Although all groundwater monitoring wells were located as indicated on the Site map, none had visible well IDs. All groundwater monitoring well protective casings, surface seals, PVC well risers, well plugs and locks were observed to be present and in good condition, with the following exceptions:
- The well casing eyelets at monitoring wells MW-109 and MW-111 and the well casing at monitoring well MW-2S are damaged;
- Measuring points are not clearly marked on any monitoring well; and
- As final restoration/grading had not been completed in the vicinity of monitoring well locations MW-104 and MW-5S at the time of the groundwater sampling event, these wells do not have concrete well pads.

## Table 3-3: Runtime/Downtime and Associated Non-Routine Maintenance/Alarm Event Summary

| Time Period | TOTAL HOURS IN QUARTER | RUNTIME | | DOWNTIME | | TOTAL NUMBER OF ALARM EVENTS | NON-ROUTINE MAINTENANCE/ALARM EVENT SUMMARY |
|---|---|---|---|---|---|---|---|
| | | HOURS | PERCENT OF TOTAL TIME PERIOD | HOURS | PERCENT OF TOTAL TIME PERIOD | | |
| Quarter 25 (January 1, 2011 through March 31, 2011) | 2,160 | 0.0 | 0.0% | 2,160.0 | 100.0% | 0 | This reporting period began with the GWE&TS shut-down due to freezing of the stripper tower pressure transducers, valves and other outside piping during the previous reporting period.<br><br>In addition, the bed screen supports located in the carbon vessels rusted and failed during the previous reporting period. Following review of bed screen replacement options throughout this reporting period, the NYSDEC decided that, based on current vapor-phase contaminant concentrations, carbon treatment of the vapor-phase discharge was no longer necessary. As such and based on NYSDEC direction, the bed screen was not replaced. |
| Quarter 26 (April 1, 2011 through June 30, 2011) | 2,184 | 4.0 | 0.2% | 2,180.0 | 99.8% | 0 | The GWE&TS remained shut-down for the majority of this reporting period as the NYSDEC decided to not replace the carbon unit bed screen and bypass the carbon units based on low current total VOC concentrations in vapor-phase discharge and in order to increase the overall GWE&TS efficiency. The GWE&TS remained shut-down while the vapor-phase discharge piping was reconfigured to bypass the carbon units.<br><br>In addition, following the bypassing of the carbon units and restart of the GWE&TS, several residential neighbors complained that a loud noise was being emitted by the GWE&TS. As such, the NYSDEC decided that the GWE&TS would remain shut-down for the remainder of this reporting period while a means to reduce or eliminate this loud noise was evaluated. |
| Quarter 27 (July 1, 2011 through September 30, 2011) | 2,208 | 1,429.0 | 64.7% | 779.0 | 35.3% | 0 | Further system efficiency-related modifications, consisting of bypassing of one of the two air stripping towers and the installation of a VFD for the pressure blower, were evaluated and implemented during this reporting period. It was anticipated that manipulation of the pressure blower output via the VFD would also reduce the GWE&TS exhaust velocity, and subsequently reduce the loud noise.<br><br>Following completion of the system modifications referenced above and restart of the GWE&TS, the NYSDEC again received complaints regarding a loud noise being emitted by the GWE&TS. As a result, the GWE&TS was shut-down while the NYSDEC evaluated further system modification options to reduce/eliminate the loud noise. |
| Quarter 28 (October 1, 2011 through December 31, 2011) | 2,208 | 1,591.0 | 72.1% | 617.0 | 27.9% | 0 | The loud noise was ultimately eliminated via the installation of a silencer within the GWE&TS vapor-phase discharge piping on October 25, 2011 and the GWE&TS was restarted. |
| ***Total*** | ***8,760*** | ***3,024.0*** | ***34.5%*** | ***5,736.0*** | ***65.5%*** | ***0*** | |

# 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 site-specific OMM, dated April 2002. 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 performed throughout this reporting period included 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. The GWE&TS monitoring activities completed during this reporting period include the following. A summary of the routine GWE&TS monitoring analytes and their typical frequency of completion is provided on Table 4-1.

### Groundwater Monitoring Activities

Groundwater monitoring activities performed throughout this monitoring period included the sampling of nine on-site groundwater monitoring wells (MW-101 through MW-108 and MW-5S) and four off-site groundwater monitoring wells (MW-109, MW-111, MW-2S and RW-2) for VOCs by Method 624. 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. Groundwater monitoring activities consists of the collection and analysis of samples from each of the thirteen monitoring 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.

### Data Analysis

All aqueous-phase samples collected during this reporting period were submitted to Test America Laboratories, Inc. (TAL) for analysis. However, due to issues regarding the approval of the NYSDEC's "call-out" laboratory contract during this reporting period, aqueous and vapor-phase samples collected in December 2011 were submitted to Mitkem Corporation (Mitkem), a subsidiary of Spectrum Analytical, for analysis.

Mitkem and TAL are both New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratories.

**Table 4-1: Treatment System Monitoring Summary**

| Sampling Location | Sampling Frequency | | | Analytical Parameters | | | | |
|---|---|---|---|---|---|---|---|---|
| | Monthly | Quarterly | Semi-Annual | VOC (EPA Method 624) | VOC (EPA Method TO-15) | TAL Metals (EPA SOW ILM 04.0) | pH (EPA Method 9040) | Additional SPDES Parameters(1) |
| Extraction Well RW-1 | ✓ | | | ✓ | | ✓ | ✓ | |
| Extraction Well RW-2 | | ✓ | | ✓ | | | | |
| Air Stripper Aqueous Effluent | ✓ | | | ✓ | | | | |
| Air Stripper Aqueous Effluent | | ✓ | | ✓ | | ✓ | | |
| Air Stripper Aqueous Effluent | | | ✓ | ✓ | | | | ✓ |
| Air Stripper Vapor Effluent | | | ✓ | | ✓ | | | |
| Groundwater Monitoring Wells MW-103 through MW-107, MW-2S and MW-5S | | ✓ | | ✓ | | | | |
| Groundwater Monitoring Wells MW-101, MW-102, MW-108, MW-109 and MW-111 | | | ✓ | ✓ | | | | |

Notes:
1. Additional SPDES parameters include COD by EPA Method 410.1/410.2, Alkalinity by EPA Method 310.1, TSS by EPA Method 160.28 and TDS by EPA Method 160.1.

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 State Pollution Discharge Elimination System (SPDES) permit equivalency, which provides for site-specific VOCs, metals, pH and wet chemistry parameter discharge limits. A copy of the SPDES permit equivalency and a summary of the site-specific aqueous-phase discharge limits, as included in the O&M Manual, 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 requirements throughout this reporting period.

### Vapor-Phase Discharge Standards and Compliance Status

Vapor-phase discharge generated by the GWE&TS as a result of the air stripping process was initially directed through two 5,000-pound vapor phase granular activated carbon (GAC) vessels, connected in a "series" configuration, prior to discharge

to the atmosphere. However, based on low historic contaminant concentrations detected in the vapor-phase discharge, the air stripper 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 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 OMM, 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 discharge by the GWE&TS.

Based on the significant amount of downtime experienced by the GWE&TS during this reporting period and based on the semiannual frequency of vapor-phase sample analysis, only one vapor-phase sample was collected for laboratory analysis during this reporting period. No VOCs were detected at concentrations exceeding their respective site-specific vapor-phase discharge limits during this reporting period. In addition, 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

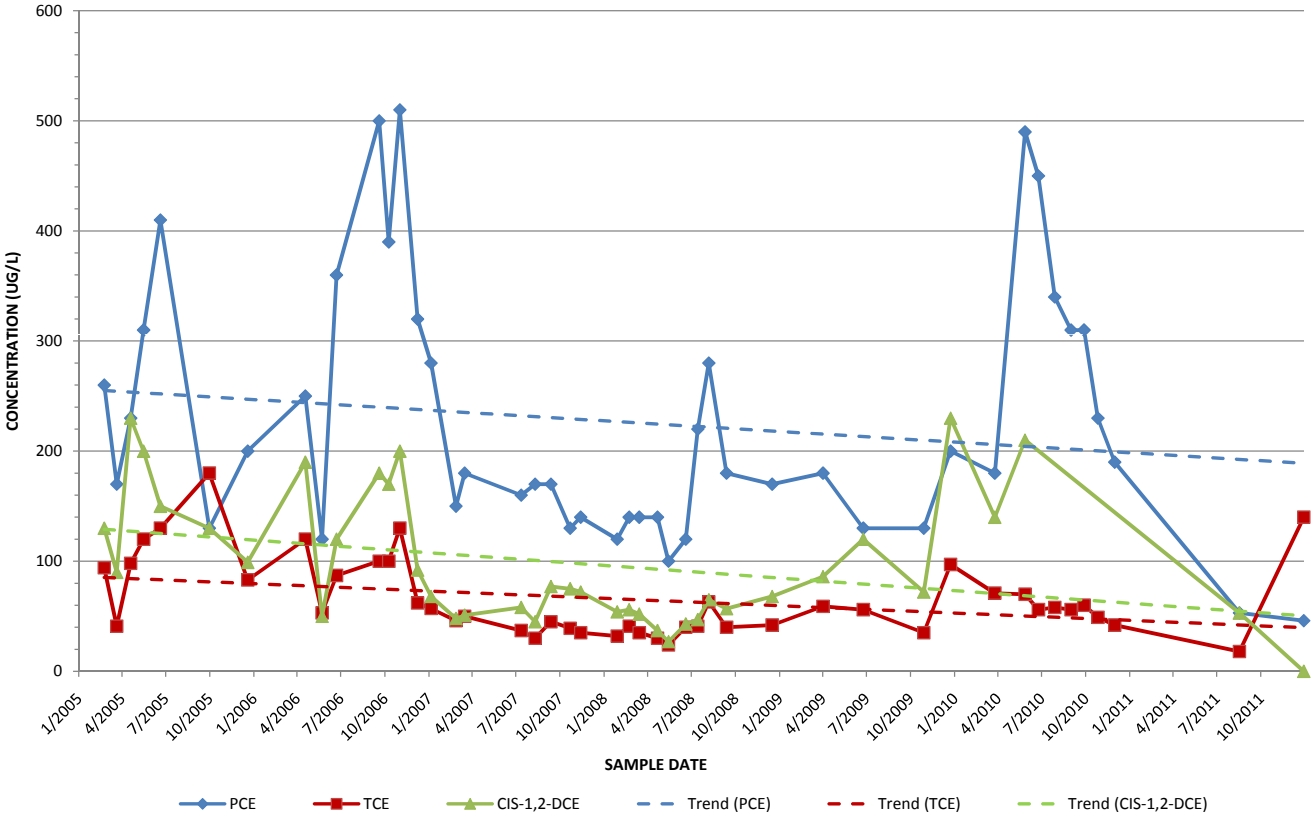
### Groundwater Treatment Performance

Based on the influent sample results for this reporting period, RW-1 influent VOC concentrations ranged from a low of 126 micrograms per liter (ug/l) to a high of 188 ug/l, detected on December 29, 2011.

Based on the influent sample results, cis-1,2-dichloroethene (cis-1,2-DCE), trichloroethylene (TCE) and PCE 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 cis-1,2-DCE, TCE and PCE in extraction well RW-1 since D&B assumed O&M duties in February 2005 through this reporting period, is provided as Figure 4-1. As shown on Figure 4-1, PCE was the predominant site-specific VOC detected in RW-1 influent groundwater during this reporting period ranging from a low of 46 ug/l to a high of 53 ug/l, detected on August 17, 2011. In addition, note that TCE has exhibited a decreasing trend since January 2010 and throughout the majority of this reporting period; however TCE was detected at a concentration of 140 ug/l during the most recent round of groundwater sampling (December 2012).

**Figure 4-1**

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




All site-specific contaminants of concern have exhibited generally decreasing trends since mid to late 2010, generally coinciding with the first of two phases of contaminated soil removal completed in June 2010 and July 2011.

As discussed in Section 4.2, the GWE&TS has effectively been treating the extracted groundwater to below the required aqueous-phase effluent standards. No VOC was detected at concentrations exceeding its site-specific aqueous-phase discharge limits during this reporting period. Approximately 28.26 pounds of VOCs were removed from the extracted groundwater during this reporting period and the total pounds per hour (lb/hr) average VOC removal rate for this reporting period ranged from a low of $7.01 \times 10^{-3}$ lb/hr to a high of $9.96 \times 10^{-2}$ lb/hr detected on December 29, 2011. The average total VOC removal efficiency for the GWE&TS throughout this reporting period was approximately 94.9%. A summary of the GWE&TS performance results for the reporting period is provided on Table 3-2.

### Vapor Phase Treatment Performance

Based on the significant amount of downtime experienced by the GWE&TS during this reporting period and based on the semiannual frequency of vapor-phase sample analysis, only one vapor-phase sample was collected for laboratory analysis during this reporting period. Based on the vapor-phase discharge sample results for this reporting period, total vapor-phase discharge VOCs were detected at a concentration of 853 micrograms per cubic meter ($ug/m^3$), with a lb/hr average VOC emission rate of approximately $3.8 \times 10^{-3}$, detected on detected on December 29, 2011. As VOC removal efficiency requirements are not provided in the April 2002 O&M Plan, the VOC efficiency of the GWE&TS was evaluated throughout this reporting period based on the contaminant concentrations in vapor-phase discharge, as compared to the site-specific effluent limits and a total discharge VOC limit of 0.5 lbs/hr, as per the NYSDEC.

No VOC was detected at concentrations exceeding its site-specific vapor-phase discharge limits during this reporting period. In addition, the site-specific total vapor-phase VOC discharge limit of 0.5 lbs/hr was not exceeded during this reporting period.

### 4.4 Groundwater Monitoring Network Evaluation

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

A summary of the site-specific VOCs (PCE, cis-1,2-DCE, TCE and VC) detected throughout this reporting period in each of the nine on-site groundwater monitoring wells is provided below. Note that contaminant concentrations in exceedance of the Class GA Standards are graphically presented on figures provided in hyperlinks below.

- MW-101: Concentrations of site-specific VOCs have been detected at concentrations below their respective Class GA Groundwater Standards throughout this reporting period.
- MW-102: Concentrations of site-specific VOCs have been detected at concentrations below their respective Class GA Groundwater Standards throughout this reporting period.
- ***MW-103***: Site-specific VOC, have generally been detected below Class GA Groundwater Standards throughout this reporting period, with the exception of PCE. PCE, at a concentration of 17 ug/l, was detected in exceedance of its Class GA Standard of 5 ug/l on March 17, 2011. PCE has been sporadically detected at concentrations in exceedance of its Class GA Standard on three separate occasions since December 2008; however, please note that PCE concentrations in monitoring well MW-103 have steadily decreased since D&B assumed O&M duties in February 2005.
- ***MW-104***: Site-specific VOCs have consistently been detected at concentrations in exceedance of the Class GA Groundwater Standards in MW-104. However, please note that the site-specific contaminants within monitoring well MW-104 have steadily decreased since D&B assumed O&M duties in February 2005. PCE and TCE have been the site-specific VOCs predominately detected within monitoring well MW-104, as follows:
  - PCE was detected at concentrations ranging from non-detect to 79 ug/l, detected on September 8, 2011. Overall, PCE concentrations have exhibited decreasing trends since completion of the UST and contaminated soil removal activities in June 2010 and July 2011; and
  - TCE was detected at concentrations ranging from non-detect to 5.1 ug/l, detected on September 8, 2011. Overall, PCE concentrations have exhibited decreasing trends since completion of the UST and contaminated soil removal activities in June 2010 and July 2011.
- ***MW-105***: Site-specific VOCs have been detected below Class GA Groundwater Standards since December 2009 and have exhibited overall decreasing trends since D&B assumed O&M duties in February 2005. However, short-term concentration "spikes" were detected during this reporting period on March 17 and June 16, 2011, as follows:
  - PCE was detected at a concentration exceeding the Class GA Standard of 5 ug/l at a concentration of 9.1 ug/l on June 16, 2011. Note, PCE was detected at concentrations well below its Class GA Standard of 5 ug/l during the two following sampling events completed on September 8 (0.49 ug/l) and December 27 (0.76 ug/l), 2011. Overall, PCE concentrations have exhibited a decreasing trend since February 2005;
  - TCE was detected at concentrations of 37 ug/l and 20 ug/l on March 17 and June 16, 2011, respectively, exceeding the Class GA Standard of 5 ug/l. Note, TCE was not detected during the two following sampling events completed on September 8 and December 27, 2011;
  - Cis-1,2-DCE was detected at concentrations of 430 ug/l and 1,000 ug/l on March 17 and June 16, 2011, respectively, exceeding the Class GA Standard of 5 ug/l. Note, cis-1,2-DCE was detected at concentrations well below its Class GA Standard of 5 ug/l during the two following sampling events completed on September 8 (0.57 ug/l) and December 27 (nondetect), 2011; and
  - VC has been nondetect in monitoring well MW-105 during all monitoring events since February 2005, with the exception of the March 17 and June 16, 2011 sampling events. VC was detected at concentrations exceeding its

Class GA Standard of 2 ug/l in monitoring well MW-5 at concentrations of 65 ug/l and 77 ug/l on March 17 and June 16, 2011. Note, VC was not detected during the two following sampling events completed on September 8 and December 27, 2011.

- ***MW-106***: Site-specific VOCs have generally been detected at concentrations in exceedance of Class GA Groundwater Standards throughout this reporting period and since D&B assumed O&M duties in February 2005. PCE, TCE, cis-1,2-DCE and VC have been the site-specific VOCs predominately detected within MW-106, as follows:
  - PCE was detected at concentrations exceeding its Class GA Standard of 5 ug/l ranging from 6.4 ug/l to 92 ug/l, with the maximum concentration detected on March 17, 2011. Overall, PCE concentrations have exhibited a decreasing trend throughout this reporting period and since February 2005;
  - TCE was detected at concentrations exceeding its Class GA Standard of 5 ug/l ranging from 5.9 ug/l to 80 ug/l, with the maximum concentration detected on March 17, 2011. Overall, TCE concentrations have exhibited a decreasing trend throughout this reporting period and since February 2005;
  - Cis-1,2-DCE was detected at concentrations exceeding its Class GA Standard of 5 ug/l ranging from 50 ug/l to 140 ug/l, with the maximum concentration detected on March 17, 2011. Overall, cis-1,2-DCE concentrations have exhibited a decreasing trend throughout this reporting period and since February 2005; and
  - VC was detected at concentrations ranging from 0.31 ug/l to 43 ug/l, with the maximum concentration detected on September 8, 2011. Overall, VC concentrations have exhibited an increasing trend throughout this reporting period, but a decreasing trend since February 2005.

  Based on the historical contaminant concentration trends and relatively high VOC concentrations detected in MW-106, a "hot spot" area may be present in close proximity to MW-106. Note that, as detailed in Section 2.2, contaminated soil was identified and removed in the vicinity of MW-106 in November 2000. However, based on the above-referenced contaminant concentrations in groundwater, some contamination may remain in this area.

- ***MW-107***: Site-specific VOC concentrations have been detected below Class GA Groundwater Standards since June 2010 (with the exception of PCE) and have generally exhibited overall decreasing trends throughout this reporting period. As noted in several other on-site monitoring wells, PCE concentrations exhibited a "spike" following the completion of the UST removals and soil excavation on site in June 2010 and July 2011. PCE was detected at concentrations exceeding the Class GA Standard of 5 ug/l ranging from 7.3 ug/l to 8.7 ug/l, with the maximum concentration detected in September 8, 2011. However, note that PCE was detected at a concentration of 3.0 ug/l during the following monitoring event (December 27, 2011). In addition, PCE concentrations have exhibited a decreasing trend since D&B assumed O&M duties in February 2005.
- ***MW-108***: Site-specific VOC concentrations have been detected below Class GA Groundwater Standards since system D&B assumed O&M duties in February 2005, with the exception of PCE. As noted in several other on-site monitoring wells, PCE concentrations exhibited a "spike" following the completion of the UST removals and soil excavation on site in June 2010 and July 2011. PCE was detected at concentrations exceeding the Class GA Standard of 5 ug/l ranging from 5.6 ug/l to 6.6 ug/l, with the maximum concentration detected in March 17, 2011. However, note that PCE was detected at concentrations well below the Class GA Standard during the following two monitoring events comprising this reporting period. In addition, PCE concentrations have exhibited a decreasing trend since in February 2005.
- ***MW-5S***: MW-5S has been sampled as part of D&B's work assignment since June 2010. Site specific VOCs have been detected at concentrations below their respective Class GA Groundwater Standards from June 2010 through the end of this reporting period, with the exception of PCE. PCE was detected at a concentration of 59 ug/l during the December 27, 2011 sampling event, well above its Class GA Standard of 5 ug/l and the established PCE concentration range from June 2010 to September 2011 for monitoring well MW-5S (nondetect to a maximum concentration of 0.60 ug/l).

Despite a the short-term "spike" in contaminant concentrations during the first half of this reporting period and as described above, overall site-specific VOCs have shown a decreasing trend in the on-site monitoring wells since the excavation of several USTs and associated contaminated soil in June 2010 and July 2011 and since February 2005.

**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 of the three off-site groundwater monitoring wells located downgradient of the GWE&TS and extraction well RW-2 are provided below. Note that contaminant concentrations in exceedance of the Class GA Stardards are graphically represented on figures provided in the hyper links below.

- MW-109: 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 from June 2006 through the end of this reporting period.
- MW-111: 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 Groundwater Standards throughout this reporting period.
- ***MW-2S***: Monitoring well MW-2S is located approximately 220 feet south of the Site. One or more of the site-specific VOCs have been detected at concentrations in exceedances of their respective Class GA Groundwater Standards from when this well was added to the routine groundwater monitoring list (September 2008) through the end of this reporting period. PCE, TCE, cis-1,2-DCE and VC detections during this reporting period are as follows:
  - PCE was detected at concentrations ranging from 4 ug/l to 460 ug/l, with the maximum concentration detected on September 8, 2011. The Class GA Standard for PCE is 5 ug/l. Overall, PCE concentrations have exhibited a slightly increasing trend since September 2008;
  - TCE was detected at concentrations ranging from 5.7 ug/l to 93 ug/l, with the maximum concentration detected on September 8, 2011. The Class GA Standard for TCE is 5 ug/l. Overall, TCE concentrations have exhibited a slightly increasing trend throughout this reporting period since September 2008;
  - Cis-1,2-DCE was detected at concentrations ranging from 32 ug/l to 370 ug/l, with the maximum concentration detected on December 27, 2011. The Class GA Standard for cis-1,2-DCE is 5 ug/l. Overall, PCE concentrations have exhibited an increasing trend throughout this reporting period and since September 2008; and
  - VC was detected at concentrations ranging from 2 ug/l to 6.3 ug/l, with the maximum concentration detected on September 8, 2011. The Class GA Standard for VC is 2 ug/l. Overall, VC concentrations have exhibited a slightly decreasing trend since September 2008.
- RW-2: Extraction well RW-2 is located approximately 1,500 feet southwest of the Site. Site-specific VOCs have been detected at concentrations well below their respective Class GA Groundwater Standards throughout this reporting period.

## 4.5 Interim Remedial Measures

As detailed in the Active Industrial Uniform Site Final Engineering Report, dated January 2012, approximately 500-600 cubic yards of contaminated soil, were excavated in the southwestern portion of the Site in June and July 2011 as part of an interim remedial measure (IRM). A figure depicting the areas of completed soil removal and associated soil sampling locations is provided on ***Figure 4-2***. In addition, two drywells identified during a previous phase of contaminated soil excavation in June 2010 were removed from the southwest of the Site, and an identified drum/drywell structure was encountered and removed from the southwestern excavation area. The contaminated soil was remediated on-site utilizing an ex-situ soil vapor extraction (SVE) system for subsequent use as backfill and regarding material to the west of the treatment system building.

Endpoint and sidewall soil samples were collected following completion of all excavation activities and were screened against the Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs). All endpoint and sidewall soil samples exhibited site-specific contaminant concentrations below their respective Unrestricted Use SCOs, with the exception of one side wall sample, exhibiting a PCE concentration of 2,100 ug/kg, collected from the northern sidewall, and one endpoint sample, exhibiting a cis-1,2-DCE concentration of 1,700 ug/kg, collected in the eastern portion of the excavation area. The Unrestricted

Use SCOs for cis-1,2-DCE and PCE are 250 ug/kg and 1,300 ug/kg, respectively. In addition, based on the proximity to extraction well RW-1 and as the IRM excavation extended to the water table, the NYSDEC determined that any residual contamination in the IRM excavation area would be addressed by the continued operation of the GWE&TS.

## 4.6 System Modifications

As referenced above, several system modifications were completed during this reporting period in order to improve the overall efficiency and effectiveness of the GWE&TS. These system modifications were detailed in a November 7, 2011 letter to the NYSDEC and are briefly summarized below:

### Modification of the Air Stripper Vapor-Phase Discharge Piping Layout

As detailed above, the bed screen supports located in the carbon vessels rusted and failed during the previous reporting period (on December 23, 2010), resulting in ejection of the granular activated carbon (GAC) material, which was noted on January 5, 2011. Following review of bed screen replacement options, the NYSDEC decided that, based on current vapor-phase contaminant concentrations, carbon treatment of the vapor-phase discharge was no longer necessary. As such and based on NYSDEC direction, the bed screen was not replaced and the vapor-phase discharge piping was modified to bypass the carbon units on June 9, 2011 to increase the efficiency of the overall GWE&TS.

### Packed-Tower Air Stripper Bypass

Based on review of current and historical aqueous-phase effluent analytical sampling results, one air stripping tower has effectively been removing approximately 99% of all aqueous-phase influent VOC contaminants to concentrations below their respective site-specific effluent limits. Given this information and in an effort to reduce the electrical consumption of the GWE&TS, the lead air stripping tower was bypassed on July 21, 2011.

Aqueous-phase system effluent samples were collected immediately following the system reconfiguration. As summarized below, all site contaminants were either non-detect or detected at concentrations well below their site-specific effluent limits.

### Pressure Blower VFD

Following the bypassing of the lead air stripping tower, a dramatic reduction in static pressure was observed in the vapor-phase discharge piping, resulting in an increase of the pressure blower airflow by approximately 200 cubic feet per minute (cfm) from its operating set-point of 1,100 cfm. Additionally, the increased effluent vapor flow caused a loud resonance in the vapor-phase discharge piping, resulting in complaints from the residential neighbors to the south of the Site.

In order to maintain efficient and effective aqueous-phase contaminant removal, as well as possibly mitigate the vapor-phase discharge piping resonance, D&B recommended installing a VFD on the blower motor to allow for modulation of the pressure blower airflow.

Prior to the installation of the VFD, and as summarized in a July 15, 2011 email to the NYSDEC, D&B contacted the air stripper manufacturer (RVT Process Equipment, Inc.), and obtained a copy of their packed-tower air stripper modeling program in order to evaluate the overall removal efficiency of a “one-stripper” scenario utilizing various flow scenarios and contaminant loading rates. Based on the results of this evaluation, D&B recommended the pressure blower continue to be operated at a minimum airflow rate of 1,100 cfm. The VFD installation was completed on July 21, 2011.

Aqueous-phase system effluent samples were collected immediately following the installation of the VFD and start-up of the GWE&TS. As summarized below, all Site contaminants were either non-detect or detected at concentrations well below their site-specific effluent limits. Based on the analytical results, the blower was ultimately set to 1,100 cfm.

### Vapor-Phase Discharge Piping Suppressor

As detailed above, the elimination of the GAC units caused a loud resonance in the vapor-phase discharge piping, resulting in complaints from the residential neighbors to the south of the Site. A suppressor was installed within the vapor-phase discharge piping on October 25, 2011, eliminating this loud resonance.

### System Modification Sampling Results

The table below summarizes the results from the sampling performed immediately following the bypassing of the lead air stripping tower and the installation of the VFD on the pressure blower. As summarized on the table below, three effluent samples were collected at blower airflow rates of 1,000 cfm, 1,100 cfm and 1,200 cfm, and based on the analytical results, the blower was ultimately set to 1,100 cfm.

**Table 4-2: System Modification Aqueous-Phase Air Stripper Effluent Concentrations**

| Discharge Permit Parameters | 1,000 CFM | 1,100 CFM | 1,210 CFM | Site-Specific Effluent Limit |
|---|---|---|---|---|
| **PCE** | 1.6 ug/l | 1.3 ug/l | 1.4 ug/l | 4.0 ug/l |
| **TCE** | 1.7 ug/l | 1.2 ug/l | 1.3 ug/l | 10.0 ug/l |
| **cis-1,2-DCE** | - - | - - | - - | 10.0 ug/l |
| **trans-1,2-DCE** | ND | ND | ND | 10.0 ug/l |
| **VC** | ND | ND | ND | 10.0 ug/l |
| **1,1,1-TCA** | ND | ND | ND | 5.0 ug/l |

Notes:
--: Not reported

## 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. In an effort to confirm that such controls exist, 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 I***. Based on the information received, the property deed does not include any groundwater or land use restrictions. Additionally, the Village of Lindenhurst does not have any restrictions on file for the property. Note that while the restrictions are not formally recorded, the intent of the ICs are currently being met since there is no on-site use of groundwater for potable purposes and no structures have been built on-site, other than the GWE&TS. In order to ensure that future property owners are aware of these restrictions, D&B recommends instituting the appropriate deed restrictions for groundwater and land use at the Site.

#### 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, site fencing and security signage are the ECs currently in-place at the Site, although the GWE&TS was the only EW required by the March 1997 ROD. The Site fencing and security signage are currently in-place and functioning properly. The GWE&TS has generally operated in accordance with the design standards throughout the majority of this reporting period, with the exception of the large amount of downtime experienced by the GWE&TS, as detailed in the preceding sections.

It should be noted, however, that the IC/EC Certification form provided by the NYSDEC does not currently list the GWE&TS as an EC. The IC/EC Certification form should be revised to include the GWE&TS as an EC. A copy of the completed IC/EC Certification form, as provided by the NYSDEC, is included as ***Appendix J***.

## 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, Long Island Power Authority (LIPA). Based on publically available information, LIPA 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 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 52,400 kilowatt-hours (KWH) of electricity, at an average of 144 KWH/day. Note, the average electricity usage during the previous reporting period (February 2005 through December 2010) was 344 KWH/day. This reduction in average electric usage is primarily the result of the large amount of downtime the GWE&TS experienced during this reporting period; however, the system modifications completed this reporting period also likely contributed to the reduction in average electrical usage.

#### Fossil Fuel Usage

The GWE&TS directly uses 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;
- 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; and
- Disposal of waste, such as spent GAC, 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 stripper is released directly to the atmosphere. However, as detailed above contaminant concentrations within vapor-phase discharge are typically well below the site-specific discharge limits. In addition, 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, twine and bailers 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; and
- Repair and replacement of equipment associated with the GWE&TS.

## 7.0 COST EVALUATION

The total cost of operation of the GWE&TS from January 1, 2011 through December 31, 2011 was approximately $340,229, including the remediation of soil completed 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). 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. 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 “call-out” 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 53% 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 3% of the total costs for this reporting period, primarily due to electric usage.

Based on the total cost of $340,229 incurred during this reporting period, the average cost of monthly system operation is approximately $28,352 per month. In addition, when compared to a total of 28.26 pounds of VOCs removed throughout this reporting period (as summarized on Table 3-2), the average total VOC removal cost is approximately $12,039 per pound of VOC.

**Table 7-1: Treatment System Cost Summary**

| COST ITEM | BUDGET EXPENDED (January 1, 2011 THROUGH March 31, 2011) | PERCENT OF TOTAL |
|---|---|---|
| *ENGINEERING SUPPORT* | | |
| Dvirka and Bartilucci Consulting Engineers | $151,309 | 44.5% |
| *SUBCONTRACTORS* | | |
| NYSDEC ""Call Out"" Contractor[1] (Routine/Non-Routine Maintenance Activities) | $173,004 | 50.8% |
| Test America (Analytical Laboratory) | $3,639 | 1.07% |
| H2M (Analytical Laboratory) | $2,431 | 0.71% |
| *SUB-TOTAL* | *$179,074* | *52.6%* |
| *UTILITIES* | | |
| Electric | $8,673 | 2.5% |
| Telephone | $592 | 0.17% |
| Natural Gas | $362 | 0.11% |
| Water | $219 | 0.06% |
| *SUB-TOTAL* | *$9,846* | *2.9%* |
| **TOTAL COSTS** | **$340,229** | -- |
| **AVERAGE COST/MONTH** | **$28,352** | -- |
| **COST/POUND OF VOC REMOVED[2]** | **$12,039** | -- |

Notes:
1. All expenses are incorporated into the “call out” contractor overall costs.
2. Based on a total of approximately 28.26 lbs of VOCs removed during 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:

- O&M Plan: As noted in Section 3.2, the O&M scope of services was performed in accordance with the requirements of the site-specific O&M Plan, dated April 2002, with the exception of routine maintenance of the pressure blower and transfer pump. As summarized above, the GWE&TS was not operational from January 2011 through July 2011 and September through October 2011 as a result of equipment failures and non-routine maintenance activities. As a result, pressure blower and transfer pump maintenance activities were not completed as per the frequencies specified in the OMM. It should be noted that these maintenance items have not been completed during this reporting period, following restart of the GWE&TS in October 2011;
- Monitoring Plan: As noted in Section 4.1, monitoring requirements were generally maintained throughout the reporting period in accordance with the requirements of the revised monitoring schedule provided in the previous PRR, dated December 2011, with the exception of the modification of the groundwater monitoring frequency. Based on the consistent low concentrations of site-specific VOCs detected within monitoring wells MW-101, MW-102, MW-108, MW-109 and MW-111, the sampling frequency for these monitoring wells was reduced from a quarterly basis to a semiannual basis. Note that this revised sampling frequency is currently in-place; and
- IC/EC Compliance Status: As noted in Section 5.1, ICs consisting of groundwater and land-use restrictions are not currently filed with the Suffolk County Clerk's office or the Village of Lindenhurst. However, the intent of both on-site restrictions is currently being met since there is no on-site use of groundwater for potable purposes and no structures have been built on-site, other than the GWE&TS. All EC requirements are currently in place and operating as intended; however, the GWE&TS is not currently listed on the IC/EC form provided by the NYSDEC.

## 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 Recommendations

- Routine Maintenance of the Pressure Blower and Transfer Pump: In order to reduce the likelihood of premature equipment failure and resulting system downtime, D&B recommends that the NYSDEC "call-out" contractor perform maintenance of the pressure blower and transfer pump, and all other system components, in accordance with their respective manufacturer's specifications;
- Building Heaters: Based on the continued unreliability of the building heaters and in order to prevent the building piping from freezing and subsequently bursting in the event the heaters malfunction during the coldest winter months, D&B recommends that the heaters be replaced in-kind with new units; and
- Autodialer: Based on review of the NYSDEC "call-out" contractor system monitoring logs, it appears as if the autodialer has not properly notified the NYSDEC "call-out" contractor of system alarms on several occasions during this reporting period. As such, D&B recommends that the NYSDEC "call-out" contractor ensure that the autodialer is properly set prior to leaving the Site during each Site visit. In addition, if these situations persist, evaluation and/or replacement of the autodialer should be completed.
- Groundwater Monitoring Well Condition Summary: In order to maintain the security and functionality of the groundwater monitoring well network, the following recommendations are provided:

- Repair/replace the well casing eyelets at monitoring wells MW-109 and MW-111 and the well casing at monitoring well MW-2S;
- Ensure the measuring points are clearly marked on all monitoring wells; and
- Replace the concrete well pads at monitoring well locations MW-104 and MW-5S following final restoration/grading to the west of the treatment system building.

### Monitoring Recommendations

- Reduction in Groundwater Monitoring: As recommended in the previous PRR and based on the consistent low concentrations of site-specific VOCs detected within monitoring wells MW-101, MW-102, MW-108, MW-109 and MW-111, D&B again recommends reducing the sampling of these groundwater monitoring wells to a semiannual frequency. This reduction will result in lower groundwater sampling labor and laboratory analytical costs. Additionally, this reduction will also provide for an overall decrease in environmental impacts associated with the performance of such activities.

### Institutional and Engineering Control Recommendations

- Institutional Controls: Based on available information, ICs such as groundwater and land-use restrictions are not currently in-place for the Site. These ICs should be included with the property deed as a legal document to ensure that the current property owner and any future property owners are aware of these site-specific restrictions until no longer deemed necessary by the NYSDEC; and
- Engineering Controls: The IC/EC form should be revised and updated to include the GWE&TS as an active EC for the Site.

### Green and Sustainability Recommendations

- Building Lighting: In order to reduce the electric usage associated with Site lighting, D&B again recommends investigating the feasibility of installing motion sensors on the existing building exterior lights. Adding motion sensor lighting would increase Site security and reduce electrical costs. In addition, it is recommended that all light bulbs within building lighting fixtures be replaced with high efficiency bulbs to further reduce electricity costs;
- Renewable Energy Feasibility Assessment: Electricity provided from the local utility is mainly generated from non-renewable sources. In order to off-set the electricity usage for the GWE&TS from non-renewable sources, D&B recommends evaluating the feasibility of installing alternate energy sources or purchasing renewable energy credits; and
- Reduction of Paper Use: In order to reduce the use of paper associated with report preparation, it is recommended to continue transmitting reports electronically as PDF files to the NYSDEC for review and comment.

### General Recommendations

- The GWE&TS EC should remain in place until remedial objectives have been obtained;
- As per the NYSDEC, the requirements of the O&M Plan, Monitoring Plan and IC/EC Plan portions of this PRR will be detailed in a Site Management Plan (SMP) for the Site. An SMP does not currently exist for the Site. However, in order to remain consistent with this requirement, an SMP is currently being prepared for submission to the NYSDEC for review and approval;
- D&B recommends that a Remedial System Optimization (RSO) evaluation be completed for the Site in order to improve the efficiency, effectiveness and net environmental benefit of the GWE&TS, while at the same time, identifying potential modifications/alternatives for reducing overall project costs and expedite closure of the Site. The RSO should include evaluations and recommendations such as the following;

- Extraction Well RW-1 Yield and Pump Test: In order to ensure that the GWE&TS is adequately capturing the full extent of the on-site plume and to prevent off-site migration of site-specific contaminants, D&B recommends continuing operation of extraction well RW-1 at a minimum flow rate of 100 gpm. In addition, D&B further recommends completing a pump test of on-site extraction well RW-1 utilizing the existing groundwater monitoring well network to confirm that a minimum flow rate of 100 gpm is adequate to influence all areas of the Site;
- Extraction Well Pump RW-1 VFD Installation: The influent flow rate for extraction well RW-1 is currently controlled by a globe valve in the system influent piping. As such, the extraction well is pumping at 100% capacity regardless of how much water is introduced to the system from this extraction well. Therefore, in order to reduce the electric usage associated with the operation of extraction well pump RW-1, D&B recommends installing a VFD to control the extraction well pump motor. If the flow rate were controlled by a VFD rather than the globe valve, the pump would use less electricity, and subsequently be less costly to operate at any given flow rate below its maximum capacity;
- On-Site Source Area Assessment: In order to investigate the possibility of an additional "source area" in the vicinity of monitoring well MW-106 and as previously recommended, D&B recommends installing soil boring locations in this area. Note that, based on available records, an IRM consisting of the removal of approximately 600 cubic yards of unsaturated soil was completed in this area in November 2000. As such, in order to characterize any potentially remaining soil contamination in this area, it is recommended to advance the soil borings from grade to a minimum depth of 20 feet below grade. However, if evidence of contamination is observed at the terminal depth at any soil boring, that soil boring should be extended accordingly in an effort to define the vertical extent of contamination; and
- Off-Site Groundwater Plume Assessment: D&B recommends investigating the feasibility of installing several temporary Geoprobe wells downgradient of the Site in order to more accurately define the current off-site location and configuration of the groundwater plume. Based on the results of the samples collected from these temporary wells, it may be warranted to install additional permanent groundwater monitoring wells to be included as part of the long-term groundwater monitoring activities at the Site.

- Based on a review of the guidance documents provided by the NYSDEC, it is recommended that PRRs 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.