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Groundwater Sampling Report (November 2018 Sampling Event) ServAll Laundry Site Site #1-52-077 Work Assignment No. D007626-17.2

Draft

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1.0 Introduction

AECOM Technical Services Northeast, Inc. (AECOM) has prepared this Groundwater Monitoring Report for the ServAll Laundry Site (Site) in Bay Shore, New York (Site No. 1-52-077). This work was performed for the New York State Department of Environmental Conservation (NYSDEC) under Work Assignment D007626-17.2. Previous long-term monitoring was performed under Work Assignment D004445-14. As part of the long-term monitoring plan for the Site, groundwater samples are collected from selected monitoring wells once every five quarters. This groundwater monitoring report provides the results of the groundwater sampling data collected in November 2018.

To date, eleven sampling events have been conducted under AECOM's long-term monitoring work assignments:

- The first round of samples (Round 1) was collected in June 2006.
- An abbreviated round of groundwater sampling (Round 1A) was conducted in April 2007 to confirm the concentration of tetrachloroethene (PCE) detected in monitoring well MW-6A; samples were collected from monitoring wells MW-4, MW-5, MW-6A and MW-6B.
- The second full round of samples (Round 2) was collected in August 2007.
- The third full round of samples (Round 3) was collected in November 2008.
- The fourth round of samples (Round 4) was collected in February 2010.
- The fifth round of samples (Round 5) was collected in May 2011.
- The sixth round of samples (Round 6) was collected in August 2012.
- The seventh round of samples (Round 7) was collected in November 2013.
- The eighth round of samples (Round 8) was collected in March 2015.
- The ninth round of samples (Round 9) was collected in May 2016.
- The tenth round of samples (Round 10) was collected in September 2017.
- The eleventh round of samples (Round 11) was conducted in November 2018.

2.0 Background Information

2.1 Site Description

The Site is located at 8 Drayton Avenue in Bay Shore, Suffolk County, New York (Figure 1) in a mixed use industrial/residential area. The ServAll Laundry facility was located on a 20,000 square foot property. The ServAll Uniform Rental, Inc. operated as a commercial laundry from 1969 to 1972, and as dry cleaner/laundry from 1972 to 1984. During this time, unknown quantities of wash water overflow containing PCE and heavy metals were pumped to, and occasionally overflowed from, on-Site cesspools.

2.2 Site History

In 1978, the Suffolk County Department of Health Services (SCDHS) conducted an on-Site sampling of cesspools and storm drains. Results from some of the samples showed detections of tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride, chloroform, methylbenzenes, and a number of Target Analyte List (TAL) metals. ServAll Uniform cleaned the on-Site storm drains and an unknown number of cesspools in 1981 removing sludge and contaminated water.

In 1983, SCDHS performed a groundwater investigation and identified a volatile organics plume southeast of the Site. The plume was found to extend 0.3 miles upgradient from the Suffolk County Water Authority (SCWA) Thomas Avenue Wellfield (located 1 mile south of the Site). The Thomas Avenue Wellfield is located off Thomas Avenue, near the Bay Shore Middle School and northwest of MW-11 (see Figure 2).

A State-funded remedial investigation/feasibility study (RI/FS) was completed at the Site, in which field work was completed from November 1990 through December 1991. The results of the investigation were documented in the final report dated January 1992 (E.C. Jordon Co.). The RI/ FS confirmed the presence of volatile organic compounds (VOCs) in groundwater, delineated the groundwater plume, and quantified on-Site contamination.

The plume is located in the Upper Glacial Aquifer, which consists of coarsely stratified, fine to medium sand with trace amounts of gravel, cobbles, coarse sand, and silt. The aquifer ranges in thickness from 120 feet at the Site to 86 feet 1.5 miles downgradient of the Site. Groundwater flows to the southeast towards Penataquit Creek at about 910 feet per year (ft/year). The RI concluded that the plume appeared to be moving at approximately 443 to 484 ft/year from 1974 to 1988, and 355 ft/year since 1988 (E.C. Jordan, October 1991).

A Record of Decision (ROD) was issued by the NYSDEC for the Site on March 31, 1992. The remedy presented in the ROD was in-situ source soil treatment/source area groundwater extraction. The

ROD stated that treatment of the entire plume emanating from the Site was not found to be practical, and therefore, the selected remedy would not satisfy the statutory preference for complete treatment as a principal element. Determination of the ultimate fate of the untreated portion of the plume was determined by the ROD directed discharge study (ABB Environmental Services, December 1995), which was conducted on the leading edge (hydraulically downgradient) of the plume.

The ROD specified source removal work consisting of a soil vapor extraction (SVE) system. The SVE system was in operation from the Spring of 1996 to the Spring of 1998. The groundwater pump and treat remedial system operated from March 1998 through November 2001. The operation of the remedial system was terminated in November 2001 when NYSDEC determined further operations were not necessary as stated in a letter dated October 18, 2001 from NYSDEC to Earth Tech.

2.3 Deviations from the Site Management Plan

There were no deviations from the Site Management Plan (SMP, AECOM, 2015) during this round of sampling. The field crew was unable to locate MW-2; the area appears to have been paved over (Appendix A).

The field sampling crew misidentified MW-6A and MW-6B. This error was noted in the laboratory data where MW-6A (shallow well) has historically had much higher concentrations of PCE compared to MW-6B (deep well). The discrepancy was confirmed in the purge forms where the measured depth to bottom was recorded. Lab data for MW-6A and MW-6B have been switched to the correct well.

3.0 Field Activities

The eleventh sampling event occurred November 5 through 8, 2018. Sampling was conducted in accordance with the SMP prepared by AECOM, dated July 2015 (revision 1). All field work was performed in Level D personnel protection. Sampling activities were conducted by Yu & Associates, a subconsultant of AECOM.

3.1 Water Level Survey

Prior to the start of the November 2018 groundwater sampling event, water table measurements were collected from the 14 monitoring wells included in the sampling event. A summary of well data is included on Table 1. Water level measurements were recorded on the NYSDEC Monitoring Well Field Inspection Forms in Appendix A. A summary of groundwater elevations in selected monitoring wells is presented in Table 2. A groundwater contour map was prepared using data from the November 2018 sampling event and is presented in Figure 3. As shown on the map, groundwater flow is to the south-southeast. A groundwater hydrograph is shown on Figure 4. The gradient was calculated for the Site. North of the Southern State Parkway (near the Site), the gradient is approximately 0.0011. At the southern end of the study area (near the Sunrise Highway), the gradient increases to approximately 0.0036. The gradient across the entire study area is 0.0027. These numbers represent fairly shallow gradients.

E.C Jordan (RI/FS Report, 1992) calculated the flow rate at the Site at 2.5 ft/day or 910 ft/year using the following equation:

$$flow\ rate = \frac{\mathrm{K\ (hydaulic\ gradient)}}{n}$$

Where K is the hydraulic conductivity (9.0 x 10^{-2} cm/sec or 255 ft/day and *n* = porosity, 0.30). E.C. Jordan measured the hydraulic gradient at 0.003, yielding a flow rate of 2.5 ft/day or 910 ft/year.

Using the same values for K and *n*, the estimated flow rate for the Site in November 2018 was:

Hydraulic gradient of 0.0011 (northern area) = 0.935 ft/day or 341 ft/year

Hydraulic gradient of 0.0036 (southern) = 3.06 ft/day or 1,117 ft/year

Hydraulic gradient of 0.0027 (study area) = 2.30 ft/day or 838 ft/year

3.2 November 2018 Groundwater Sampling Event

Fourteen monitoring wells were identified for long-term monitoring at the Site. The selected wells included MW-2, MW-3A, MW-3B, MW-4, MW-5, MW-6A, MW-6B, MW-11, MW-12, MW-13, MW-14, MW-16, MW-23S and MW-23D. Each location was photo-documented and a hand-held GPS unit was used to record the coordinates. MW-2 could not be located in the new landscaping/parking lot. MW-1 was included in this sampling round as MW-2 could not be sampled.

In accordance with the SMP, the monitoring wells were purged and sampled using low flow sampling techniques. A QED bladder pump with Teflon discharge tubing was used to purge each monitoring well. The flow rate was typically set between 300 and 500 milliliters per minute. Measurements of pH, specific conductance, temperature, oxidation reduction potential, and turbidity were recorded on the Well Sampling Forms during purging at five minute intervals. Well Sampling Forms are provided in Appendix B. A NYSDEC Monitoring Well Field Inspection Log was also completed for each well sampled and is included in Appendix A. The sample was carefully poured into laboratory supplied containers and placed in an ice-filled cooler. The samples were then transported to Hampton-Clarke Veritech via their courier. Proper chain-of-custody procedures and requirements were maintained throughout the sampling event in accordance with the SMP.

3.3 Site Inspection

In accordance with the SMP, the Site was inspected the week of November 8, 2018 as part of the 5-quarterly sampling event. The Site inspection form is included in Appendix C. The Site is in general disrepair. There is evidence of unauthorized entry into the Site building. The padlock on the side door of the building is missing. The rollup door on the front of the building appears secure. The tenants next door reported observing people entering the ServAll building. Vegetation growth in the back of the building is overgrown and the fence along the back property line is damaged.

4.0 Sampling Results

Groundwater samples were analyzed by Hampton-Clarke Veritech of Fairfield, New Jersey. Samples were analyzed for VOCs using SW-846 Method 8260C. Data packages consisted of a New York State Analytical Services Protocol (NYS ASP) Category A deliverable. As this is a long-term monitoring project, the data were not validated. An AECOM chemist provided a limited review of the data packages for completeness and readily apparent anomalies (see Section 4.4, below). The laboratory Data Summary Packages are in Appendix D. As noted in Section 2.3, the laboratory data for MW-6A and MW-6B have been switched on the tables and figures based on the recorded depth to bottom on the NYSDEC Monitoring Well Field Inspection Logs.

A summary of the VOC exceedances is presented on Figure 5. The sampling results are described below in Sections 4.1 and 4.2.

4.1 Volatile Organic Compounds

VOC data for the eleven long-term sampling events are summarized in Table 3. VOCs exceedances are shown on Figure 5. During the eleven sampling events conducted to date, 17 target compound list VOCs have been detected in the long-term monitoring wells. Of these 17 compounds, only nine have equaled or exceeded their Class GA criterion (vinyl chloride, acetone, benzene, methyl tert-butyl ether [MTBE], cis-1,2-dichloroethene [DCE], 1,1,1-trichloroethane, TCE, PCE, and toluene). Of these nine compounds, only four, cis-1,2- DCE, TCE and PCE, have been detected three or more times in any one monitoring well. cis-1,2- DCE, TCE and PCE, as well as 1,1-DCE, 1,1-dichloroethane [DCA] and vinyl chloride, are listed as compounds of concern (COCs) in the ROD (NYSDEC, 1992). MTBE is not a COC. Summaries of detections for these three compounds are presented in Figure 6 (PCE), Figure 7 (TCE) and Figure 8 (cis-1,2-DCE). On each of these three figures, monitoring wells were selected based on the presence of the COC at or above its criterion. As shown on Figure 6, PCE has been detected in eight monitoring wells at or above the 5 microgram per liter (µg/L) criterion. TCE concentrations have only exceeded the 5 µg/L criterion in five monitoring wells as shown on Figure 7. Cis-1,2-DCE concentrations have only exceeded the 5 µg/L criterion in six monitoring wells as shown on Figure 8. 1,1-DCE and 1,1-DCA have not been detected above the criterion in any monitoring well during the long-term sampling (2006 through 2018). Vinyl chloride was detected above its criterion (2 µg/L) twice during the eleven rounds of sampling, in Round 6 at MW-16 at an estimated concentration of 2.1 µg/L, and in Round 10 at MW-11 at a concentration of 2.5 µg/L.

4.1.1 Upgradient Monitoring Wells

Three monitoring wells, MW-2, MW-3A and MW-3B, are located upgradient of the Site along Drayton Avenue as shown on Figure 2.

Monitoring well MW-2 was not located until the November 2008 sampling event. Benzene was detected above the Class GA criterion of 1 µg/L in monitoring well MW-2 at an estimated concentration of 1.7 µg/L during the November 2008 sampling event. Toluene was also detected at an estimated concentration of 1.4 µg/L (below the Class GA criterion of 5 µg/L). No VOCs were detected during the February 2010 sampling event. PCE was detected at an estimate concentration of 2.1 µg/L during the May 2011 sampling event. No VOCs were detected during the August 2012 or November 2013 sampling events. PCE was detected below the criterion during the March 2015 sampling event. An obstruction in the well prevented the field team from collecting a sample during the May 2016 sampling event. As noted above in Section 3, MW-2 could not be located as the area around the well location had been disturbed which prevented the field team from collecting a sample during this sampling event.

VOCs were not detected in monitoring well MW-3A during any of the first nine long-term monitoring events with one exception. During the August 2012 sampling event, chloroform was detected at an estimated concentration of 0.53 µg/L (Class GA criterion of 7 µg/L). During the September 2017 sampling event, TCE and PCE were detected at concentrations below the Class GA criterion of 5 µg/L. No VOCs were detected during the November 2018 sampling event.

MW-3B was not located until the November 2008 Round 3 sampling event. VOCs were not detected in monitoring wells MW-3B during any of the eight long-term monitoring sampling events conducted at the ServAll Site between 2008 and 2018.

4.1.2 Source Area Monitoring Wells

Five monitoring wells are located in and around the ServAll Laundry building. Monitoring well MW-1 is located on the ServAll property. Four monitoring wells, MW-4, MW-5, MW-6A and MW-6B, are located immediately south of the Site along Frederick Avenue. Well locations are shown on Figure 2.

Monitoring Well MW-1 was located during the fourth sampling event and was included in this sampling round. No VOCs were detected during this sampling event. MW-1 was not sampled during May 2011 sampling event. Historically, PCE has been detected above the criterion in each of the five previous sampling events conducted at this location with concentrations ranging from 5.6 µg/L to 50 µg/L. TCE, cis-1,2-DCE, and total xylenes have also been detected at this location but at concentrations below their respective Class GA criteria.

No VOCs have been detected in MW-4 during sampling rounds 1 through 11. The well was not sampled during Round 8 as the field crew mistakenly identified PZ-4 as MW-4. PZ-4 has a damaged well lid and is filled with soil.

MW-5 could not be sampled during Round 11 as there was insufficient water in the well for the pump to operate properly; similar to the situation in Rounds 7, 9, and 10. Estimated concentrations of cis-1,2-DCE (3 µg/L and 2 µg/L) were detected during the June 2006 and April 2007 sampling events

(Round 1 and 1A) but have not been detected since. PCE was detected at an estimated concentration of 2 µg/L only during the August 2007 sampling event (less than the Class GA criterion of 5 µg/L). Acetone was detected at a concentration of 170 µg/L (exceeding the Class GA criterion of 50 µg/L) only during the November 2008 sampling event. 2-Butanone was detected only during the November 2008 sampling event at an estimated concentration of 38 µg/L (less than the Class GA criterion of 50 µg/L). During the Round 3 event in November 2008, toluene was detected at a concentration of 1,200 µg/L and was detected again during the February 2010 sampling event at a concentration of 230 µg/L (Class GA criterion of 5 µg/L) but was not detected in May 2011, August 2012 or March 2015.

TCE and PCE were detected during this sampling event at concentrations above their Class GA criteria in monitoring well MW-6A. TCE was detected at a concentration of 2.7 µg/L (Class GA Criterion of 5 µg/L). The only other detection of TCE was in May 2016 at a concentration of 1.1 µg/L and 22 µg/L in September 2017. PCE was detected at a concentration of 15 µg/L (Class GA criterion of 5 µg/L). The only previous detection of PCE occurred during the February 2010 sampling event at an estimated concentration of 1.2 µg/L and 11 µg/L during the September 2017 event. During the November 2013, March 2015, and May 2016 sampling events, chloroform was detected at concentrations of 5.7 µg/L, 2.8 µg/L, and 1.8 µg/L, respectively (Class GA criterion of 7 µg/L).

Three VOCs were detected in monitoring well MW-6B above the Class GA criteria. Cis-1,2-DCE was detected above the Class GA criterion of 5 µg/L during 11 of 12 sampling events (plus the April 2007 confirmation round) at concentrations ranging from 44 µg/L to 210 µg/L. TCE was detected above the Class GA criterion of 5 µg/L during ten of eleven sampling events (plus the April 2007 confirmation round) at concentrations ranging from 7.3 µg/L to 85 µg/L. PCE was detected above the Class GA criterion of 5 µg/L during all eleven sampling events (plus the April 2007 confirmation round) at concentrations ranging from 23 µg/L to 2,000 µg/L.

4.1.3 Downgradient Monitoring Wells

Five monitoring wells are located downgradient of the Site. Wells MW-12, MW-13 and MW-14 are located along the Southern State Parkway, approximately 3,000 ft south of the Site. Monitoring well MW-11 is located in the Bay Shore Middle School athletic fields. Monitoring well MW-16 is located on Abrew Street, south of the Middle School. Well locations are shown on Figure 2.

Historically, three VOCs have been detected above the Class GA criterion in monitoring well MW-12. PCE was detected during all ten sampling events (MW-12 could not be located during the September 2017 event) and seven samples exceeded the criterion; concentrations ranged from an estimated 0.8 µg/L to 60 µg/L. 1,2-Dichlorobenzene was detected at a concentration of 9 µg/L (Class GA criterion of 4.7 µg/L) during the June 2006 sampling event only. cis-1,2-DCE was detected in four of ten sampling events but only exceed the Class GA criterion of 5 µg/L during Round 6. Several compounds including methyl-tert-butyl-ether (MTBE), TCE and chlorobenzene, have been sporadically detected in MW-12 at concentrations below their respective Class GA criteria.

There were no detections or exceedances noted at MW-13 during the Round 11 sampling event. Historically, the only VOC exceedance at this location was during Round 1 (June 2006) where PCE was detected at a concentration of 5 µg/L during the June 2006 sampling event. PCE was also detected at an estimated concentration of 1 µg/L during the November 2008 and August 2012 sampling events (Class GA criterion of 5 µg/L), and 1.3 µg/L during the September 2017 sampling event. Several compounds, including acetone, MTBE, chloroform, and TCE, have been sporadically detected in MW-13 at concentrations below their respective Class GA criteria.

No VOCs were detected above the Class GA criteria in MW-14 during any of the eleven sampling events. PCE was detected at an estimated concentration of 2 µg/L during the August 2007 sampling event. MTBE was detected during six sampling events at concentrations ranging from an estimated 0.81 µg/L to 8 µg/L (Class GA criterion of 10 µg/L).

Monitoring well MW-11 was included in the first sampling event (June 2006). It could not be sampled during the second event (August 2008) due to an obstruction in the well that prevented the pump from being lowered into the water column. The obstruction was cleared from the well during Round 3 (November 2008) which allowed for the collection of a sample. The well was vandalized sometime after the Round 3 event and was not sampled during the next five sampling events (February 2010 through March 2015). The well was properly abandoned in August 2015 and a replacement well was installed. Sampling resumed at MW-11 during Round 9 (May 2016). Four VOCs were detected in MW-11 during the Round 11 sampling event, while only PCE exceeded the criteria. PCE has been detected above the 5 µg/L criterion during all five sampling events at MW-11 at concentrations ranging from 16 µg/L to 60 µg/L. cis-1,2-DCE has been detected above the 5 µg/L criterion in three of five sampling events at concentrations ranging from 3 µg/L to 13 µg/L. Vinyl chloride exceeded the 2 µg/L criterion during Round 10 at a concentration of 2.5 µg/L; vinyl chloride was only detected once during the three previous sampling events. Historically, toluene exceeded the 5 µg/L criterion during the Round 3 sampling event at a concentration of 63 µg/L; it has not been detected in any other sampling event. MTBE and TCE have been detected in four of five sampling events but the concentrations were all were below their respective criteria. Chlorobenzene was detected during one sampling event at a concentration below its criterion.

Four VOCs were detected at MW-16 during the Round 11 sampling event, three of which equaled or exceeded the criteria (MTBE, cis-1,2-DCE and PCE). PCE was detected during ten of eleven sampling events at concentrations ranging from an estimate 2 µg/L to 100 µg/L, eight of which exceeded the Class GA criterion of 5 µg/L. cis-1,2-DCE was detected in nine of eleven rounds at concentrations ranging from 1.1 µg/L to 20 µg/L, seven of which exceeded the criterion. MTBE equaled or exceeded the criterion during Rounds 9, 10 and 11 at concentrations of 13 µg/L, 11 µg/L and 10 µg/L (Class GA criterion is 10 µg/L). MTBE was also detected in three other rounds but at concentrations below the criterion. Vinyl chloride was detected during three previous sampling events, one of which exceeded the Class GA Criterion of 2 µg/L. TCE was detected in eight of eleven sampling events at concentrations ranging from an estimated 1.1 µg/L to 16 µg/L, four of which

exceeded the Class GA criterion of 5 µg/L. 1,1,1-Trichloroethane (1,1,1-TCA) was detected in three of eleven sampling events at concentrations ranging from an estimated 1.7 µg/L to 5 µg/L, with one sample equaling the Class GA criterion of 5 µg/L. Two other VOCs, 1,1-dichloroethene and acetone, have been sporadically detected in samples from MW-16 but at concentrations below their Class GA criteria.

4.1.4 Sentinel Monitoring Wells

Two monitoring wells, MW-23S and MW-23D, are located south of the Sunrise Highway on Perkel Street, approximately 7,600 ft south of the Site.

Three VOCs were detected in monitoring well MW-23S above the Class GA criteria during Round 11. PCE was detected above the Class GA criterion of 5 µg/L during all eleven sampling events at concentrations ranging from 390 µg/L to 5,200 µg/L. cis-1,2-DCE has been detected above the Class GA criterion of 5 µg/L during nine of eleven sampling events at concentrations ranging from 9.8 µg/L to 360 µg/L. TCE was detected above the Class GA criterion of 5 µg/L during nine of eleven sampling events at concentrations ranging from 5.4 µg/L to 220 µg/L. MTBE has been detected in seven sampling events but at concentrations equal to, or below, the criterion. Five other VOCs, including 1,1-DCE, trans-1,2-DEC, 1,1-dichloroethane, and 1,1,1-TCA, have been sporadically detected in samples from MW-23S at concentrations below their respective Class GA criterion.

Three VOCs were detected above the Class GA criteria during Round 11 at MW-23D. PCE has been detected during all eleven sampling events at concentrations ranging from an estimated 4 µg/L to 280 µg/L, ten of which exceeded the 5 µg/L criterion. Cis-1,2-DCE was detected during the last seven sampling events at concentrations ranging from an estimated 3 µg/L to 14 µg/L, six of which exceeded the 5 µg/L criterion. TCE was detected during the last seven sampling events at concentrations ranging from an estimated 1.2 µg/L to 9.8 µg/L, five of which were at or above the 5 µg/L criterion. MTBE was detected in MW-23D at concentrations below the Class GA criteria during the last six rounds.

4.2 Round 11 (November 2018) Data Quality Review

In accordance with the project plans, data generated for this investigation were not subject to formal validation. However, AECOM's quality assurance officer (QAO) reviewed the data for reasonableness and the presence of any anomalies, including issues identified by the laboratory in the case narrative, and other items noted in review of shipping and handling documentation, inconsistencies with previous data, and review of the laboratory quality assurance (QA) forms.

Volatiles (EPA Method 8260C)

Samples from 13 monitoring wells were prepared by SW-846 method 5030C and analyzed for target compound list (TCL) VOCs by SW-846 method 8260C and reported in one sample delivery group (SDG), AD07645. One trip blank was collected and submitted for VOC analysis. One field rinsate

blank sample was collected. Sample MW-1 was designated as the quality control (QC) sample (matrix spike and matrix spike duplicate [MS/MSD] analysis), and field duplicate for the Round 11 sampling event.

Samples were collected on November 5, 6, 7, and 8, 2018. Samples were received in good condition at the lab on November 9, 2018. Samples were properly preserved (pH ≤ 2) , except for the equipment blank which was noted as having a pH of 4 (note that although this pH was outside the specified limits, this pH would still inhibit most bacterial actions especially for the chlorinated compounds of concern). The samples were properly cooled (temperature between 0° and 6° C).

The laboratory did not flag any of the analytical results. Laboratory QC limits for the organic analysis were met for initial and continuing calibrations, and method blanks. No target or non-target compounds were detected in the trip blank or equipment blank.

SDG AD07645 included two batches, batch 73679 covered the equipment blank and the trip blank, while batch 73695 covered all of the monitoring well samples. Recoveries were outside of criteria for the MW-1 MS/MSD in batch 73695 for eleven and fifteen compounds, although all target compound recoveries were within limits. It may be noted that 2-chloroethylvinylether had 0% recovery since the acid used in preserving the samples readily decomposes this compound, therefore all results for this compound will be non-detect.

The MS/MSD in batch 73679 also contained a similar number of exceedances however, that batch used a sample from an outside source.

The relative percent difference (RPD) for the MS/MSD results exceeded criteria in both batches for one compound, camphor.

The laboratory control sample (LCS) (referred to as the Method Blank Spike by this laboratory) exceeded limits in batch 73679 for eight compounds, although not for any site related contaminants of concern). The LCS for batch 73695 had all analytes within limits.

Due to high concentrations (exceeding the calibration range) of one target compound (PCE), one sample (MW-6A) required dilution at a dilution factor of 5. [Note the sample MW-23S also had PCE at the same concentration but was not diluted.]

The field duplicate MW-1, while it historically had high concentrations of site related contaminants, was non-detect for all compounds in the initial sample and its duplicate. Therefore the RPD values were all within limits.

5.0 Summary and Recommendations for Future Site Remediation Activities

5.1 Summary of VOCs

Three monitoring wells are located upgradient of the Site: MW-2, MW-3A and MW-3B (Figure 2). Monitoring well MW-2 was sampled for the first time during November 2008 and a slight exceedance of benzene was noted; there were no further exceedances noted in the next five sampling events. MW-2 was not sampled during Round 9 due to an obstruction in the well and could not be located during rounds 10 and 11. No VOCs exceedances have been reported at MW-3A. PCE and TCE were detected during Round 10 at concentrations below the Class GA criteria. Chloroform was detected during Round 6 at a concentration below the Class GA criterion. No VOCs have been detected in MW-3B during any of the nine sampling rounds (MW-3B was first sampled during the November 2008 Round 3 sampling event).

Monitoring well MW-1 is the only on-Site well. It has been sampled seven times during the eleven long-term sampling events. No VOCs were detected at MW-1 during the November 2018 sampling event. PCE has exceeded the Class GA criterion of 5 µg/L in five of the seven events at concentrations ranging from 5.6 µg/L to 50 µg/L. Concentrations of cis-1,2-dichloroethene, TCE and total xylenes have been noted but at concentrations below their respective Class GA criteria.

Four monitoring wells are located immediately downgradient of the Site: MW-4, MW-5, MW-6A and MW-6B. No VOCs have been noted in MW-4. No exceedances (other than toluene and acetone which were attributed to laboratory artifacts) have been noted in MW-5 during eight rounds of sampling (MW-5 was not sampled during rounds 7, 9, 10, and 11 as there was insufficient water to operate the pump). Prior to Round 10, there were no exceedances of VOCs in MW-6A (deep monitoring well). During Rounds 10 and 11, PCE was detected at concentrations above the Class GA criteria (11 µg/L and 15 µg/L, respectively). TCE was detected above the criterion in Round 10 (22 µg/L) and below the criterion in Round 11 (2.7 µg/L).

Exceedances of PCE, TCE and cis-1,2-dichloroethene have been noted at shallow monitoring well MW-6B during the eleven rounds of long-term monitoring (plus the confirmation round in April 2007). A summary of historic PCE concentration data for selected monitoring wells is shown on Table 6. The data presented on this table is a compilation of data available for review during the preparation of this report. A graph of the historic PCE concentrations is also illustrated on Figure 9. Prior to the implementation of remedial measures, the PCE concentration at MW-6B was as high as 14,000 µg/L. As noted in Section 2, the groundwater pump and treat system began operation in 1998 and by July 2000, the PCE concentration had decreased to 160 µg/L. The treatment system was shut down in 2001. PCE concentrations rebounded during the June 2006 event (1,100 µg/L), then decreased by

more than half for 2007 and 2008. The concentration then rebounded to 2,000 µg/L in February 2010, then dropped back to 23 µg/L by August 2012 and spiked to 1,500 µg/L in the November 2013 event and was at 1,200 µg/L in the March 2015 sampling event. The concentration had decreased significantly during Round 9 to 330 µg/L and remained fairly constant during Rounds 10 and 11 (340 µg/L and 470 µg/L, respectively).

Three of the monitoring wells sampled as part of the long-term monitoring program are located approximately halfway between the Site and the Bay Shore Middle School (MW-12, MW-13 and MW-14) along the Southern State Parkway. PCE was detected above the criterion in MW-12 in each event between 2006 and 2010 at concentrations ranging from 10 µg/L to 60 µg/L, but was detected below the criterion (at 1.6 µg/L, 0.80 µg/L and 2.4 µg/L) in the May 2011, August 2012 and November 2013 sampling events. The concentrations in the March 2015 event (10 µg/L), May 2016 (13 µg/L), and November 2018 (11 µg/L) all exceeded the criterion, extending the plume to the south as shown in Figures 10F, 10G and 10H; MW-12 could not be located during the September 2017 sampling event. PCE was detected at a concentration equal to the criterion in MW-13 during the June 2006 sampling event; it has been below the criterion or not detected during the last ten sampling rounds. PCE has not been detected above the criterion in monitoring wells MW-14 during the previous eleven sampling events.

Of the two monitoring wells near the Bay Shore Middle School, the PCE concentrations at MW-11 were 56 µg/L and 60 µg/L for the June 2006 and November 2008 sampling events (an obstruction prevented the collection of a sample in August 2007 through March 2015) and 28 µg/L, 18 µg/L and 16 µg/L during the May 2016, September 2017, and November 2018 sampling events. At MW-16, the other well near the school, the concentrations of VOCs have all decreased significantly since the August 2012 sampling event. The concentrations of vinyl chloride, TCE and PCE all exceeded the criterion in August 2012; however, the concentrations of these four VOCs all dropped to below their respective criteria in November 2013 and were not detected in March 2015. The concentrations of PCE and cis-1,2-DCE rose during the May 2016 event and both now have exceeded the criterion for the last three sampling events. A bar chart of the PCE concentrations at MW-11 and MW-16 for the eleven long-term sampling events is shown on Figure 6. A bar chart of the cis-1,2-DCE concentrations at MW-11 and MW-16 for the eleven long-term sampling events is shown on Figure 8. MTBE has equaled or exceeded the criterion during the last three sampling events at concentrations ranging from 10 to 13 µg/L at MW-16.

The two most downgradient monitoring wells, MW-23S and MW-23D, are located south of the Sunrise Highway (Figure 2). As shown on Figure 9, PCE concentrations in MW-23S spiked in June 2006 (5,200 µg/L), then decreased by an order of magnitude by November 2008 (500 µg/L). PCE concentrations increased over the next four sampling rounds peaking at 2,500 µg/L in November 2013. The concentration decreased to 390 µg/L during the March 2015 event then rose significantly to 2,300 µg/L during the May 2016 event. The concentrations of PCE have dropped during the last two sampling events at MW-23S. Concentrations of TCE and cis-1,2-DCE have exceeded the

criterion in nine of 11 sampling events as shown on Figures 7 and 8. PCE concentrations in MW-23D have been generally increasing since 2004 (0.6 µg/L) through November 2018 (240 µg/L).

Isoconcentration maps were prepared for PCE and are shown on Figure 10A (June 2006 data), Figure 10B (November 2008 data), Figure 10C (May 2011 data), Figure 10D (August 2012 data), Figure 10E (November 2013 data), Figure 10F (March 2015), Figure 10G (May 2016), Figure 10H (September 2017) and 10I (November 2018). As shown on these maps, the PCE plume appears to have separated into two non-contiguous plumes starting with the May 2011 sampling event and continuing through the March 2015 sampling event: one near the Site and a second centered near MW-23S (immediately south of the Sunrise Highway). The two plumes merge starting with the May 2016 event. PCE concentrations in wells near the Site appear to be increasing at MW-6B as is the PCE concentration in MW-12 (adjacent to the Southern State Parkway). Further downgradient, near the Bay Shore High School, the PCE concentrations appear to be increasing during the latest sampling event at MW-16 and are slightly less at MW-23D.

TCE has been detected above the Class GA criterion of 5 µg/L in five monitoring wells: MW-6A, MW-6B, MW-16, MW-23S and MW-23D. A graph of the TCE concentrations for these four wells is shown on Figure 7.

Cis-1,2-DCE has been detected above the Class GA criterion of 5 µg/L in six monitoring wells, MW-6B, MW-11, MW-12, MW-16, MW-23S and MW-23D. As shown on Figure 8, there does not appear to be any discernible trend in concentration.

5.2 Future Recommendations

Future recommendations for the ServAll Laundry Site are continued monitoring of selected monitoring wells for VOCs.

Monitoring well MW-5 could not be sampled during this round as there was insufficient water to operate the pump. This was also the case during the January 2013, May 2016, and September 2017 sampling events. MW-2 could not be located during the last two sampling events. An obstruction prevented sampling during the May 2016 sampling round. An effort will be made to locate this well and remove the obstruction before the next sampling event.

Monitoring well MW-1 should be included in future long-term sampling events.

The next round of groundwater sampling is scheduled for February 2020.

Tables

Figures

Appendix A

NYSDEC Monitoring Well Field Inspection Logs

Appendix B

Monitoring Well Sampling Forms

Appendix C

Site Inspection Form

Appendix D

Laboratory Data Packages