2017 PERIODIC REVIEW REPORT
AMERICAN THERMOSTAT SITE
NYSDEC SITE NO. 420006

WORK ASSIGNMENT NO. D007619-01

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Consulting, P.C.
Portland, Maine

MACTEC: 3612112204

JANUARY 2018

2017 PERIODIC REVIEW REPORT
AMERICAN THERMOSTAT SITE
NYSDEC SITE NO. 420006

WORK ASSIGNMENT NO. D007619-01

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

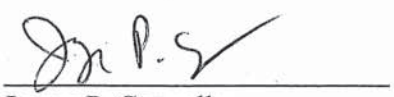
Prepared by:

MACTEC Engineering and Consulting, P.C.
Portland, Maine

MACTEC: 3612112204

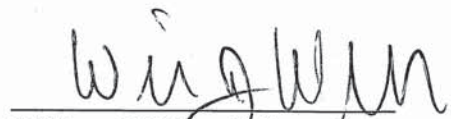
JANUARY 2018

Submitted by:



Jayme P. Connolly
Project Manager

Approved by:



William J. Weber, P.E.
Principal Professional

TABLE OF CONTENTS

LIST OF FIGURES

Figure

LIST OF TABLES

Table

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AGC	Annual Guideline Concentrations
AT	American Thermostat Company
AWQ	Ambient Water Quality
bgs	below ground surface
BOD	Basis of Design
cis-1,2-DCE	cis-1,2-dichloroethene
EC	engineering control
EW	bedrock well
GAC	granular activated carbon
gpm	gallon(s) per minute
GWETS	groundwater extraction and treatment system
HMI	human machine interface
IC	institutional control
LTM	long term monitoring
MACTEC	MACTEC Engineering and Consulting, P.C.
µg/l	microgram(s) per liter
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
O&M	operation and maintenance
OM&M	Operation, Maintenance and Monitoring
OU	operable unit
OW	overburden well

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

PCE	tetrachloroethene
PLC	Programmable Logic Controller
POET	point of exposure treatment system
PRR	periodic review report
RAO	Remedial Action Objective
ROD	Record of Decision
RSO	remedial systems optimization
SGC	Short-Term Guideline Concentrations
Site	American Thermostat site
SM	site management
SMP	Site Management Plan
SVI	soil vapor intrusion
TCE	trichloroethene
USEPA	United States Environmental Protection Agency
VI	vapor intrusion
VOC	volatile organic compound

EXECUTIVE SUMMARY

The American Thermostat site (NYSDEC Site No. 420006; herein referred to as the Site) consists of approximately eight acres and is located in South Cairo, Town of Catskill, Greene County, New York. The Site has been remediated in accordance with Record of Decision (ROD) for Operable Unit 1 (OU1) (potable water supply) (United States Environmental Protection Agency [USEPA], 1988) and OU2 (soil, sediment, surface water, groundwater, and building contamination) (USEPA, 1990). The Site includes an active groundwater extraction and treatment system (GWETS). The contaminants of concern are volatile organic compounds including tetrachloroethene (PCE), trichloroethene (TCE), 1,2-dichloroethene, and vinyl chloride. Remedial goals outlined in the ROD documents for the Site are instituted to ensure protection of groundwater from site contaminants in soil, restore groundwater to drinking water standards or until a point has been reached at which contaminant concentrations in the groundwater "level off," and reduce risk to human health and the environment. Current Site Management (SM) requirements for monitoring the performance and effectiveness of the remedial measures completed at the Site consist of operating the groundwater extraction system to maintain hydraulic control in source area, routine inspection, sampling, and reporting.

The GWETS has been operational since 1998, and monitoring results have indicated that achieving groundwater cleanup goals in a reasonable period of time will not be possible. The exposure pathways resulting from Site contaminants being released into the environment have either been eliminated through previous and current actions (i.e., extension of the public water supply and thermal treatment of shallow contaminated soil, as well as residential point of exposure treatment [POET] systems), or are not complete (i.e., vapor intrusion). However, vapor mitigation of the on-Site American Thermostat building may be warranted if occupancy of the currently vacant building resumes. The objective of treating groundwater "until federal and state standards for the organic contaminants have been achieved" is not realistic at this site. As a result, the Remedial Action Objective for the Site has been redefined to focus on hydraulic containment of the source area. This is an achievable goal that is protective and cost-effective.

Based on information gathered as part of the Remedial System Optimization (RSO) investigation and the updated conceptual site model, optimization measures to the GWETS were initiated in 2013

and completed in 2017. By focusing on hydraulic containment of the source area and eliminating off-site deep bedrock extraction wells, the northwestern edge of the PCE plume is expected to separate from the remainder of the plume and migrate towards Catskill Creek. Therefore, the effectiveness of the GWETS will be increased, operating costs will decrease, groundwater will continue to be treated and its quality gradually improved with time, and on-going monitoring will evaluate migration pathways and potential receptors.

This Periodic Review Report (PRR) summarizes SM activities completed at the Site from January 2017 through December 2017. The recommendations highlighted in the RSO Implementation Activities Report (MACTEC Engineering and Consulting, P.C. [MACTEC], 2013a), and Basis of Design Memorandum for improvement to the treatment facility (MACTEC, 2013b) as well as to the groundwater extraction system (MACTEC, 2013c) were substantially completed in 2017.

During the reporting period, the GWETS was shut down on several occasions for continued system optimization. As of December 2017, the GWETS improvements were completed and operation transitioned from full time oversight (upon transfer to the NYSDEC in 2010) to partially-manned oversight (approximately 1 day per week).

Hydraulic gradient verification and groundwater quality monitoring (15-month cycle) was performed in June 2017. GWETS system performance monitoring occurred monthly. Results from these monitoring programs show the system is performing and effective in maintaining an inward hydraulic gradient to the site. As expected, the groundwater plume’s concentration core is responding to the reconfiguration of extraction well pumping and residual offsite groundwater contamination appears to be migrating toward Catskill Creek as planned.

1.0 SITE OVERVIEW

1.1 SITE HISTORY AND DESCRIPTION

American Thermostat Company (AT) produced thermostats and used chlorinated and non-chlorinated solvents in its manufacturing from 1954 to 1985. The waste solvents were disposed on the property and/or discharged to the septic system.

In 1981, the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health sampled nearby residential wells and detected tetrachloroethene (PCE) in residential wells exceeding the federal maximum contaminant levels. Shortly thereafter, the United States Environmental Protections Agency (USEPA) took over the management of the American Thermostat site (Site) and installed a Point of Exposure Treatment System (POET) consisting of carbon filtration units on affected homeowners' wells. AT ended site operations in 1985, and in 1987 the USEPA commissioned a focused Feasibility Study to evaluate an Alternative Water Supply for the affected residents. In 1988, a Record of Decision (ROD) was signed for Operable Unit 1 (OU1) that outlined an extension of the existing public water supply as well as maintaining POET systems for several private wells, including the communal water supply for the Country Estates trailer park. The USEPA conducted a Remedial Investigation for soil, surface water and groundwater at the Site. In 1990, the ROD for OU2 was issued outlining mitigation measures for the source area, including implementation of a groundwater extraction and treatment system (GWETS).

The ROD for OU2 states that: "The groundwater treatment will continue until federal and state standards for the organic contaminants have been achieved in the groundwater throughout the contaminated plume area or until a point has been reached at which contaminant concentrations in the groundwater 'level off'. At that point, the remedy will be reevaluated for its effectiveness". It was assumed in the OU2 ROD that the selected remedial alternative for groundwater would take up to 30 years to achieve cleanup levels (5 micrograms per liter [µg/L] for PCE).

The GWETS became fully operational in 1998 and the USEPA conducted 5-year reviews in 2003, 2008 and 2013. In 2008, following 10 years of Site management (SM) by the USEPA, the Site was

transferred to the NYSDEC. The NYSDEC completed a Periodic Review Report (PRR) in 2010. This review indicated that monitoring of plume concentrations was primarily conducted at active extraction wells, and concentrations of site contaminants appear to be steady and/or slightly trending downward in the plume area. However, in the source area, concentrations remain elevated (above 1,000 µg/l) and declining at an even slower rate, indicating that concentrations may be sustained by the presence of a residual contaminant source. It appeared that groundwater treatment had reached a point at which contaminant concentrations had more or less 'leveled off' and the remedial action should be reevaluated for its effectiveness.

In the winter of 2012, the vapor intrusion (VI) pathway within the plume boundaries was evaluated (MACTEC Engineering and Consulting, P.C. [MACTEC], 2012). Soil VI (SVI) Sampling indicated a potential migration pathway of vapors to the Site manufacturing building and the adjacent Hook property. A sump cover was installed by the property owner to reduce potential exposure to vapors.

In the spring/summer 2012, a Remedial Systems Optimization (RSO) Implementation field investigation was conducted. Results of the RSO Implementation activities suggested numerous recommendations for improvement regarding the groundwater remedy (MACTEC, 2013a). Specific to the GWETS, a Basis of Design (BOD) memorandum (MACTEC, 2013b) was prepared following the RSO Implementation Activities Report to define modifications to the groundwater treatment system for a more streamlined system to improve effectiveness and lower operating costs.

From 2013 through the end of 2015, the majority of GWETS improvements were completed. In 2016 and 2017, GWETS operation troubleshooting efforts were underway to optimize flow and groundwater elevation, and to reduce routine maintenance requirements. A new control system was installed at the extraction wells and within the main plant. Currently, the GWETS consists of five bedrock extraction wells and seven overburden extraction wells, and discharges treated effluent to a surface drainage swale on the eastern side of the Site that eventually leads to Catskill Creek. Besides the GWETS, the groundwater remedial measure includes individual wellhead point of exposure treatment [POET] treatment systems of three residential wells with granular activated carbon (GAC).

1.2 PHYSICAL SETTING

The Site is located in a rural residential area in South Cairo, Town of Catskill, Greene County, New York, approximately 30 miles southwest of Albany and five miles west of the Village of Catskill. The approximately eight-acre site is bordered by Routes 23B and Route 23 on the north and south, respectively, by a residential property on the west, and by New York State (NYS)-owned property on the east (see Figure 1.1). The Site contains the former American Thermostat building and the water treatment plant constructed for the implementation of the groundwater remedy.

The topography within the vicinity of the Site is characterized by the gently rolling foothills of the Catskill Mountains, which are deeply incised by stream channels. The Site is located on a slight ridge overlooking Catskill Creek Valley. Immediately west of the facility is a small valley which includes Tributary B, a tributary of Catskill Creek. East of the facility is Tributary A, which also flows into Catskill Creek, located approximately a quarter mile to the east of the Site.

Regionally, the bedrock within Greene County consists of interbedded shales and sandstones of Devonian age, known as the Catskill Formation. The Catskill Formation is made up of four distinct bedrock groups. From oldest to youngest, these groups are Hamilton, Genesee, Sonya, and West Falls. The Site lies within the Hamilton Group. In the vicinity of the Site, the bedrock is at an average depth of 28 to 30 feet below the ground surface (bgs); however, in the vicinity of the former manufacturing building, bedrock is approximately 100 feet bgs. The overburden overlying the bedrock is primarily glacially-derived soils.

A groundwater investigation as part of the RSO Implementation activities indicated that there is limited hydraulic connection between the overburden and bedrock at the Site. Overburden groundwater is perched and slowly drains laterally toward low lying areas, and vertically into the bedrock aquifer. Bedrock groundwater level fluctuations recorded during the RSO Implementation activities were compared to barometric fluctuations over the same time period. The resulting relationship between water level fluctuation and barometric fluctuation indicated that the bedrock aquifer is likely semi-confined.

The area surrounding the Site is characterized as rural-residential. There are a few full-time residences, vacation homes, and several small businesses in the vicinity of the Site. The American Thermostat Corporation was the only manufacturing facility in the area.

Approximately 5,000 people live within a 3-mile radius of the Site in low-density residential areas. Until a public water supply line was installed to protect the public from exposure to contaminated groundwater, all homes within ½ mile of the Site used private wells. At present, various residences and businesses within the immediate vicinity of the Site property receive water from the municipal water supply of the Village of Catskill. However, while a municipal water supply was provided, property owners were not required to connect to the system. Therefore, the need for POET systems remains in three private residential wells and the trailer park within the limits of the groundwater plume.

Catskill Creek is classified as a trout stream and has considerable recreational value to local and visiting fishermen. The Creek is also an auxiliary water supply for the Village of Catskill.

1.3 CLEANUP GOALS AND REMEDIAL PROGRESS

Based on the ROD, groundwater treatment will continue until "federal and state standards for the organic contaminants have been achieved in the groundwater throughout the contaminated plume area or until a point has been reached at which contaminants concentrations in the groundwater 'level off'. At that point, the remedy will be reevaluated for its effectiveness". Based on the results of the RSO activities and presented in the 2012 PRR, the remedial objective has been modified by the NYSDEC to be limited to source control and (onsite) hydraulic containment of grossly contaminated groundwater.

Hydraulic containment is accomplished through the use of five bedrock extraction wells and seven overburden wells. Previous offsite extraction wells maintained the shape and direction of the plume against the natural groundwater flow path towards Catskill Creek. The RSO investigation findings predicted that eliminating the off-site deep bedrock extraction wells would separate the northeastern edge of the PCE plume from the plume and migrate towards Catskill Creek. As a result, a small portion of the offsite plume will be drawn into the Country Estates wells where it will be treated via the existing treatment system that is in place, and the remainder of the plume will begin to slowly

move toward Catskill Creek where it will eventually discharge and dilute to low concentrations. Monitoring the migration and/or degradation of the plume is accomplished with the long term monitoring (LTM) program.

2.0 EVALUATION OF REMEDY PERFORMANCE, EFFECTIVENESS AND PROTECTIVENESS

The Site Management Plan (SMP) for the AT Site includes an institutional controls/engineering controls (ICs/ECs) Plan, Operation and Maintenance (O&M) Plan, LTM Plan, and associated reporting (MACTEC, 2016). SM requirements are summarized in Table 2.1. The content of Table 2.1 is a combination of the requirements specified in the SMP and those being implemented as part of the RSO Implementation recommendations (MACTEC, 2013a). The SMP is currently being updated (Revision 2) to reflect the fundamental process changes implemented at the Site.

2.1 INSTITUTIONAL CONTROLS/ENGINEERING CONTROLS

IC/ECs provide added measures of protection for potentially exposed receptors over and above natural attenuation mechanisms and source area remedial measures. ECs off-site consist of restrictions directing potentially affected residential groundwater supplies through GAC units. These ECs are monitored through the collection and analysis of samples following water supply treatment through the GAC units for three individual residential supply wells. On-site, institutional controls consist of a restriction on excavation, groundwater use and well installation, and engineered controls consist of the GWETS and site perimeter fence. Some off-site groundwater is also captured by the GWETS to confine the plume extent and migration and recover contaminant mass.

The RSO Implementation field activities in 2012 identified surface and subsurface soil PCE contamination at the Site that exceeds the ROD cleanup goal of 1 milligram per kilogram. Surface soil contamination was identified immediately adjacent to the former manufacturing building (MACTEC, 2013a). The SMP includes a soil excavation plan controlling exposure to contaminants during excavation of soil, thereby establishing an IC for soil at American Thermostat (MACTEC, 2016).

The former manufacturing building is now being used to store vintage cars slated for restoration. The building owner is not permitted to excavate soil on the property without permission of the NYSDEC. If the owner uses the building for any activity other than storage (current use), vapor mitigation may be necessary to address worker exposure via SVI.

2.1.1 Site Controls and Evaluation

Requirements for the Site controls are presented on Table 2.1. Effectiveness of the groundwater remedial measures is directly related to monitoring and maintenance of the groundwater residential well GAC units, and maintenance and monitoring of treatment processes related to the GWETS. Progress of the groundwater remediation is tracked through the LTM program (Table 2.2), interpretation of plume extent, and evaluation of trends in concentration over time. Observations regarding each of these components are discussed in the following subsections.

2.1.2 Groundwater Extraction and Treatment System

Operating parameters for the GWETS include monitoring volume treated (gallons), flow rate and flow per reporting period (approximately monthly) and total volatile organic compounds (VOCs) extracted from groundwater. These quantities are summarized on Tables 2.3 and 2.4. During the reporting period, the treatment plant processed approximately 14.4 million gallons of groundwater at an average flow rate of approximately 31.7 gallons per minute (gpm), and removed approximately 180 pounds of total VOCs. A summary of GWETS performance monitoring results for 2017 are provided in the tables and charts located in Appendix A.

In 2017, modifications to the extraction system were completed (BOD Memorandum MACTEC, 2013b). Improvements implemented during 2017 include:

- Control panel improvements at each extraction well, including:
    - Human machine interface (HMI) panel programming to provide process data logging and HMI screens for operator use
    - Programmable logic controller (PLC) programming to provide advanced operations of extraction well pumps to support remedial action objectives (RAOs)
    - Improved labelling for more efficient operations and maintenance activities
- Control panel improvements at the main control panel, including:
    - HMI panel programming to provide process data logging and HMI screens for operator use
    - PLC programming to provide advanced operations of treatment building pumps to reduce on-Site labor requirements
    - Connection of fiber optic communications between eleven of twelve operational

extraction wells, and radio communications to extraction well EW-9, including monitoring capabilities from the treatment building

- Improved labelling for more efficient operations and maintenance activities

2.1.3 Residential Granular Activated Carbon POET Treatment Systems

While municipal water is supplied through the town distribution system to many houses in the area, three households located within the plume are equipped with wellhead protection POET systems via small ultraviolet and GAC treatment trains. Sampling and reporting are conducted on a quarterly basis.

2.2 OPERATION & MAINTENANCE PLAN

The remedial measures in place require routine inspection, sampling, and maintenance to provide effective remediation and reduction of exposure to site-related contaminants. O&M procedures and requirements are presented in the SMP (MACTEC, 2016). The O&M Plan is being revised as part of the SMP to incorporate the numerous changes implemented at the Site over the last four years. The following subsections describe requirements and compliance with the O&M Plan with respect to the GWETS, and individual residential GAC units.

2.2.1 Groundwater Extraction and Treatment System

Monthly progress reports are generated to summarize GWETS system operation and to present operational and maintenance data to the NYSDEC (MACTEC, 2017a-k).

A total of 12 extraction wells are active and include 5 bedrock wells (EWs) and 7 overburden wells (OWs):

- EW-2, EW-6, EW-7, EW-9, EW-16
- OW-2, OW-3, OW-5, OW-7, OW-13, OW-14, OW-16

Although active, OW-16 is not operating at the time of the submittal of this Report due to an electrical issue. Repairs are planned for 2018.

During this reporting period, approximately 1,159 hours were reported as downtime. The GWETS was shut down on several occasions in 2017 due to system alarms. Down time represented approximately 13.2 percent of total available operating time.

During this reporting period, approximately 14 million gallons of extracted groundwater were processed with an average flow rate of approximately 31.7 gpm, and approximately 180 pounds of total VOCs were removed (Tables 2.3 and 2.4). The influent and effluent VOC samples are collected and analyzed monthly, so mass removal is an approximation.

Downtime for the GWETS increased between 2016 and 2017 (7% and 13.2%, respectively). However, the total amount of water pumped over the current reporting period was greater than the reporting periods between 2013 and 2016. In 2017, the system pumped approximately 99% of the total water pumped in 2012, which was the first reporting period after the initial implementation of improvements laid out by the RSO Implementation Activities Report (MACTEC, 2013b).

In 2017, programming was completed so that elevation of groundwater in the pumping wells are displayed on the control panel within the treatment plant. The PLC measurements and calculation backup for transducer calibration is provided in Appendix B. During 2017, bedrock extraction well flow rates were optimized to affect groundwater elevation and maximize capture of onsite bedrock contamination.

As of 2013, the NYSDEC started using the Ambient Water Quality (AWQ) Standards and Guidance (NYSDEC, 1998) for comparison to the treated groundwater being discharged to the swale. These limitations are applicable at the point of discharge at the end of the force main which leads to the unnamed Tributary A (a Class C surface water body).

Performance monitoring results are summarized in Table 2.5. Site VOCs in effluent exceeded AWQ criteria in September 2017 and iron exceeded AWQ criteria for five months during 2017. The performance monitoring sample collected in September 2017 was taken shortly after a system shutdown, in a period where there was unusually high concentrations in the air stripper sump (likely due to untreated water trickling through the stripper after system shutdown). Since that occurrence, a step has been added to the system startup wherein the air stripper sump will be drained to the influent tank via the building floor sump prior to startup.

Treated groundwater effluent is discharged to a drainage swale which ultimately leads to Catskill Creek. With the exception of VOCs and iron noted above, the treated effluent met surface discharge limits during the reporting period.

2.2.2 Residential Granular Activated Carbon Treatment Systems

Maintenance and monitoring of the three residential wellhead protection systems (POET) (Klinke, Kubler, and Viella) is performed on a quarterly basis. Results are summarized in Table 2.6. As shown in Table 2.6, carbon filtration is effective for the one residential location (Klinke) in which site-related VOCs were detected pre-filtration (cis-1,2-dichloroethene [cis-1,2-DCE] at an estimated value above the reporting limit (but below the NYS Class GA groundwater standard).

Maintenance performed during the reporting period included:

- carbon filter changes at the Viella and Klinke locations
- troubleshooting the UV system at the Kubler residence; replacement of the malfunctioning unit is scheduled for first quarter 2018.

2.3 LONG TERM MONITORING

The LTM program includes collecting samples and recording water level measurements (depth to groundwater) at selected extraction wells and monitoring wells for plume delineation and bedrock potentiometric surface maps (see Figure 2.1 and 2.2).

On June 19, 2017, water levels were measured in 20 monitoring wells, 5 bedrock extraction wells and 7 overburden extraction wells (Table 2.7). During the LTM event, water level measurements were recorded from the PLC at each extraction well control panel. Figure 2.2 shows the bedrock potentiometric surface when the five bedrock extraction wells are pumping and indicates groundwater flow in proximity to the site is toward the site; groundwater is no longer flowing to the west from the site. Consistent with historical elevations, the groundwater elevation at IW-10 is approximately 77 feet higher than that measured in IW-8, which is located approximately 200 feet to the southeast. Based on a recent Google Earth image, the pond in Tributary B just west of IW-10

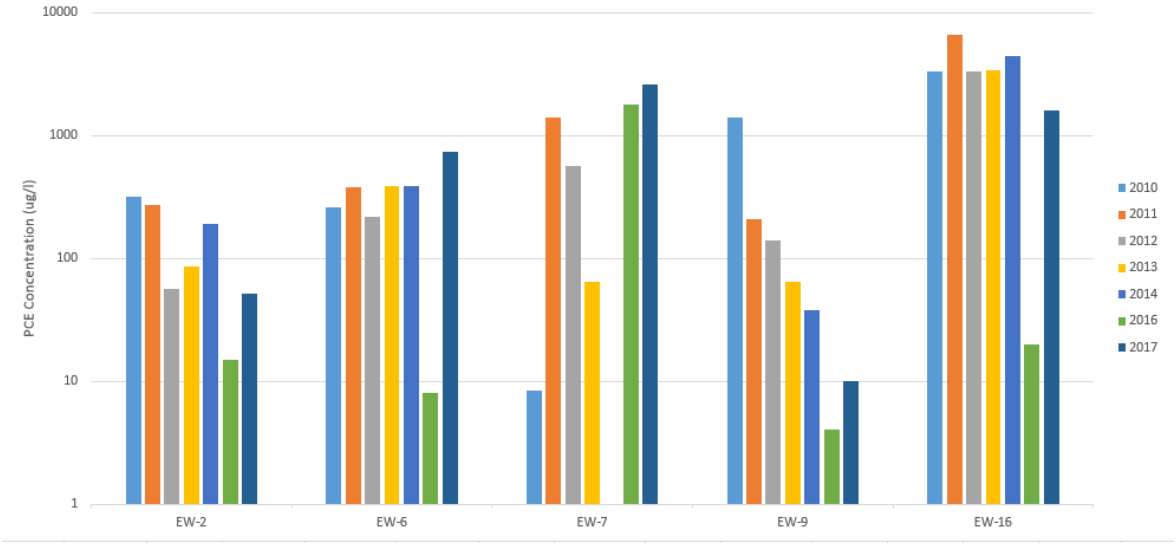
is approximately 223 feet in elevation. It is likely that the pond is hydraulically connected to IW-10 and as a result is affecting/controlling groundwater levels in the well.

Since 2014, the groundwater sampling events for the site are scheduled on a 15-month basis. The last LTM sampling event was conducted in June 2017. During that event, monitoring wells and extraction wells were sampled (see Tables 2.2 and 2.8).

Table 2.8 summarizes LTM results observed at concentrations exceeding Class GA groundwater standards. The principal compounds detected during 2017 are PCE, TCE, cis-1,2-DCE and vinyl chloride. The highest concentrations of PCE and TCE in bedrock were observed in groundwater at EW-7 and EW-16. In overburden during the 2017 sampling round, OW-3 and OW-14 were observed to contain the highest concentrations of Site VOCs. These findings are consistent with results since the re-configuration of the GWETS. Laboratory results for samples were provided to NYSDEC in electronic document delivery format for loading into EQuIS.

The plume shows signs of changing shape and shifting toward Catskill Creek, likely as a result of the discontinuance of offsite extraction wells. The leading edge of the bedrock groundwater plume, as evidenced by PCE detected at EW-13, is interpreted to be beyond the influence of the on-site extraction system and is expected to continue to migrate towards Catskill Creek.

The core of the plume, previously centered around EW-16, appears to have shifted northeastward to EW-7 (see Figure 2.3). Comparing 2017 results to historical results indicates the concentration of PCE via grab sample from well IW-9 has decreased from 1300 µg/L in 2013 to 10 µg/L in 2017. The histogram plot shown below presents PCE concentrations over time in the bedrock extraction wells. The increase in PCE in all bedrock extraction wells from 2016 concentrations is likely a result of re-focusing the extraction of groundwater with the re-configured GWETS (and no longer extracting clean water from off-site extraction wells.



The re-configured extraction well arrangement appears to have resulted in pulling back the plume (i.e., to the southeast) from its previous high offsite concentration location at IW-9 to an onsite high concentration centered on EW-7. The change in concentrations observed in 2017 will continue to be evaluated during the next 15-month sampling event.

Time series plots of PCE in select wells were constructed to evaluate the long-term effectiveness of the modified extraction well network (Appendix C). Overburden extraction well OW-14 and bedrock extraction well EW-16 were selected to monitor the on-site changes in groundwater quality at these two wells, both have shown consistently high concentrations of PCE over their sampling history. As shown on the plots, the general trend over the past three years has been a decline in concentration; however, there was a rebound in concentration in 2017 (see Appendix C).

Monitoring well M-5 was selected as a measure of the northeastward (offsite) progression of the plume that, as shown in Figure 2.3, appears to be migrating more northward since the offsite extraction wells located northwest of the site were shut down. Although PCE concentration in groundwater at location M-5 during June 2017 was not detected, cis-1,2-DCE was observed demonstrating degradation of PCE.

Country Estates primary supply well, CE-2, is used to track in time-series the distal end (i.e., northwest tip) of the residual plume as the offsite body of the plume continues to flow toward the northeast and eventual discharge in Catskill Creek. June 2017 sampling shows a steadying in

concentration in CE-2 below the NYS standard of 5 µg/L for PCE, suggesting that the plume is influenced by pumping of Country Estates primary supply well.

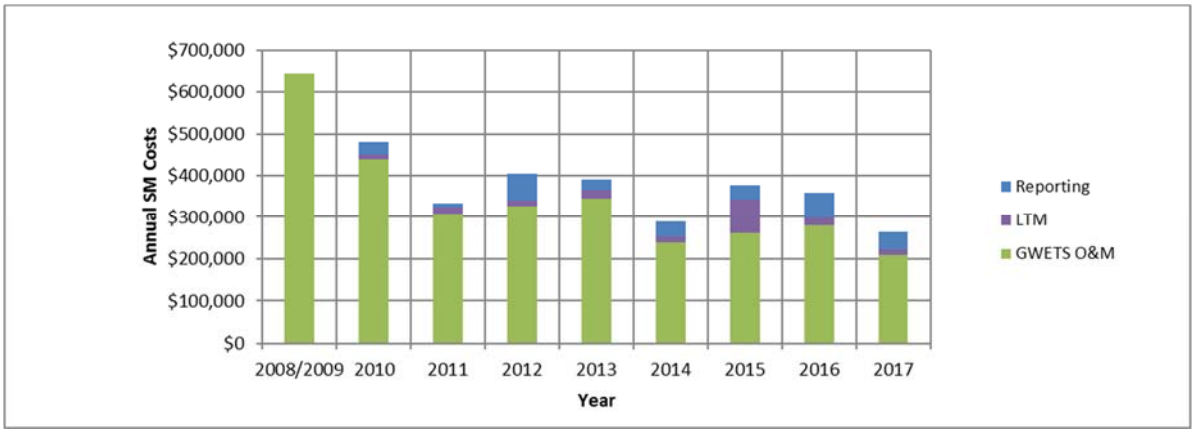
3.0 COST CONTROL SUMMARY

A cost summary for the reporting period is provided below by task. As shown, most of the SM costs for the reporting period were incurred for operation and maintenance of the GWETS.

Task 1 (Scoping)	
Labor	$1,581
Task 2 (GWETS OM&M)[a]	
Labor	$116,246
Lodging, Travel, and MI&E	$9,591
Shipping	$136
Waste Disposal	$1,071
Phone/Internet	$2,907
Plowing	$2,232
Supplies & Equipment	$2,667
Electricity*	$12,839
Propane*	$5,264
Water*	$270
Laboratory Services*	$5,642
	$158,866
Task 3 (LTM)	
Labor	$11,125
Lodging, Travel, and MI&E	$986
Shipping	$73
Supplies & Equipment	$1525
	$13,709
Task 4 (Reporting, including PRR)	
Labor	$26,553
Task 5 (SMP updates)	
Labor	$16,671
Task 6 (GWETS Modifications)	
Task competed in 2016 – no charges	
Task 7 (GWETS Commissioning)	
Labor	$35,856
Lodging, Travel, and MI&E	$3,138
Subcontractor Services	$8,261
	$47,255
Annual Total:	**$264,635**

NOTES:
[a] includes residential GAC system Operation, Maintenance & Monitoring (OM&M)
*NYSDEC direct expense

Since the NYSDEC has assumed responsibility for the Site, annual OM&M costs have decreased by an average of 59 percent. Optimization measures to reduce the overall operating expenses have been and will continue to be implemented in an effort to provide further cost savings at the Site.



Notes:

GWETS O&M includes Country Estates and residential GAC system O&M, as applicable.

2008/2009: Costs as of 10/1/2008

2010: Reporting includes preparation of 2008/2009 PRR.

2012: O&M includes preparation of detailed design drawings for GWTS improvements; Reporting includes preparation of SMP and 2001/2011 PRR.

2013: O&M does not include preparation of detailed design drawings for GWTS improvements or implementation of RSO improvements. LTM includes conducting hydraulic effectiveness monitoring and EW-9 step test.

2014: Reporting includes 2014 PRR and drafting SMP update. O&M does not include GWETS Modifications.

2015: GWETS O&M includes oversight and coordination of GWETS upgrades/modifications; LTM reflects quarterly residential GAC system OM&M, extraction well decommissioning, EW-5 over drilling/MW conversion, & EW-5 investigation derived waste disposal.

2016 & 2017: GWETS O&M included modifications, GWETS commissioning. Reporting includes PRR preparation and SMP updates.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The RAO was redefined in 2012 to focus on hydraulic containment of the source area. During the 2017 reporting period, implementation of the RSO improvements/upgrades were completed (December 2017) and inward gradients to the site was maintained. The following minor recommendations are provided in an effort to improve cost effectiveness.

4.1 INSTITUTIONAL CONTROLS/ENGINEERING CONTROLS

The current ICs/ECs are adequate to achieve the objectives for protection of human health and the environment based on current Site use. A soil vapor exposure pathway exists at the former manufacturing building; however, the building is currently used only for storage purposes. Therefore, mitigation would be necessary to address exposure to SVI should the building be occupied.

With the exception of one month, effluent concentrations of site-related VOCs did not exceed the surface water or DAR-1 discharge criteria in 2017.

GAC systems on three residential wells continue to provide adequate protection from site-related contaminants of concern. Only one residential location contained site-related VOCs in pre-filtered water.

4.2 OPERATIONS AND MAINTENANCE PLAN

The SMP will be updated in 2018 to reflect the 2017 commissioned GWETS. As a result of the system modification, a reduction in OM&M operator level of effort (approximately one day per week) and associated expenses will occur in 2018.

4.3 GROUNDWATER MONITORING PROGRAM

LTM sampling was completed in June 2017. The next LTM sampling event will be conducted in September 2018. Changes in concentration resulting from the extraction well array modifications

have been observed and are consistent with the objective of establishing hydraulic capture of contaminated bedrock groundwater in close proximity to the Site. The changes in groundwater concentrations will continue to be monitored during the 15-month sampling events. The apparent groundwater mound in proximity of IW-10 will continue to be monitored and evaluated to assess whether the mound is well-specific or affecting the general area proximate to IW-10.

4.4 RECOMMENDATIONS

The following upgrades are recommended in an effort to continue optimizing system efficiency:

Immediate Items:

- Install 1/8" diameter elbows on bag filter pressure relief valves (3).
- Install jumper cable (EW-6 only).
- Repair non-operational OW-5 well panel power button.
- Install small piece (1” diameter, ~4” length) of insulation between well casings and first union.
- Replace OW-13 insulation at elbow. Appears to be melted due to undetermined reasons.

Near Term Items:

- Add a removable filter to the inlet ducting.
- Relocate V-031 to location that doesn’t require ladder access.
- Replace float switches in air stripper sump with alternative level sensor with more reliability.
- Replace existing building light fixtures with LED fixtures.
- Test air stripper high and [effluent] low pressure alarms to make sure they shut down the system.
- Reprogram building sump transducer to include high level sump pump operation (float switch faulty).
- Add on/off/auto button for floor sump to main operating screen.
- Program MCP to indicate when system is shut down.
- Test EW-7 high pressure shut down alarm (shut down set point changed from 65-55 psi).
- EW-7 well keypad does not allow starting of the well (could be faulty keypad or VFD error).

- EW-9 well keypad does not allow starting or stopping of the well (could be faulty keypad or VFD error).
- Verify consistent operation of extraction wells via the MCP.
- Check pump intake elevations and operational elevations to verify extraction wells are operating in the appropriate elevation ranges.
- Repair OW-16 wiring issue.

Future Items:

- Raise influent piping above air stripper to a level equivalent to six inches greater than high-high alarm in influent tank.
- Install actuators on air stripper influent valves to adjust air source based on temperature.
- Complete assessment on use of extracted groundwater as source for geothermal cooling in the summer and heat in winter.
- Perform tractor maintenance (professional tune-up).
- Change color of non-operating wells on MCP HMI to gray (wells that were turned off by hand or high flow).
- Install clear protection guards for Grundfos controllers in extraction well panels.
- Fix communication issue between EW-9 PLC program and computer in operations building.

5.0 REFERENCES

MACTEC Engineering and Consulting, P.C. (MACTEC), 2018. Monthly Progress Report. December 2017. American Thermostat Site. Site #4-20-006. January, 2018

MACTEC, 2016. Draft Site Management Plan, American Thermostat Site (Site No. 420006), Treatment Plan Improvements, Revision 1. Prepared for the New York State Department of Environmental Conservation. March 31, 2016.

MACTEC, 2017a. Monthly Progress Report. January 2017. American Thermostat Site. Site #4-20-006. February, 2017

MACTEC, 2017b. Monthly Progress Report. February 2017. American Thermostat Site. Site #4-20-006. March, 2017

MACTEC, 2017c. Monthly Progress Report. March 2017. American Thermostat Site. Site #4-20-006. April, 2017

MACTEC, 2017d. Monthly Progress Report. April 2017. American Thermostat Site. Site #4-20-006. May, 2017

MACTEC, 2017e. Monthly Progress Report. May 2017. American Thermostat Site. Site #4-20-006. June, 2017

MACTEC, 2017f. Monthly Progress Report. June 2017. American Thermostat Site. Site #4-20-006. July, 2017

MACTEC, 2017g. Monthly Progress Report. July 2017. American Thermostat Site. Site #4-20-006. August, 2017

MACTEC, 2017h. Monthly Progress Report. August 2017. American Thermostat Site. Site #4-20-006. September, 2017

MACTEC, 2017i. Monthly Progress Report. September 2017. American Thermostat Site. Site #4-20-006. October, 2017

MACTEC, 2017j. Monthly Progress Report. October 2017. American Thermostat Site. Site #4-20-006. November, 2017

MACTEC, 2017k. Monthly Progress Report. November 2017. American Thermostat Site. Site #4-20-006. December, 2017

MACTEC, 2013a. Final RSO Implementation Activities Report, American Thermostat Site (Site No. 420006). Prepared for the New York State Department of Environmental Conservation. January 10, 2013.

MACTEC, 2013b. Basis of Design Memorandum, American Thermostat Site (Site No. 420006), Treatment Plan Improvements. Prepared for the New York State Department of Environmental Conservation. January 29, 2013.

MACTEC, 2013c. Basis of Design Memorandum, Extraction Well & System Monitoring Improvements, American Thermostat Site (Site No. 420006), Prepared for the New York State Department of Environmental Conservation. May 24, 2013.

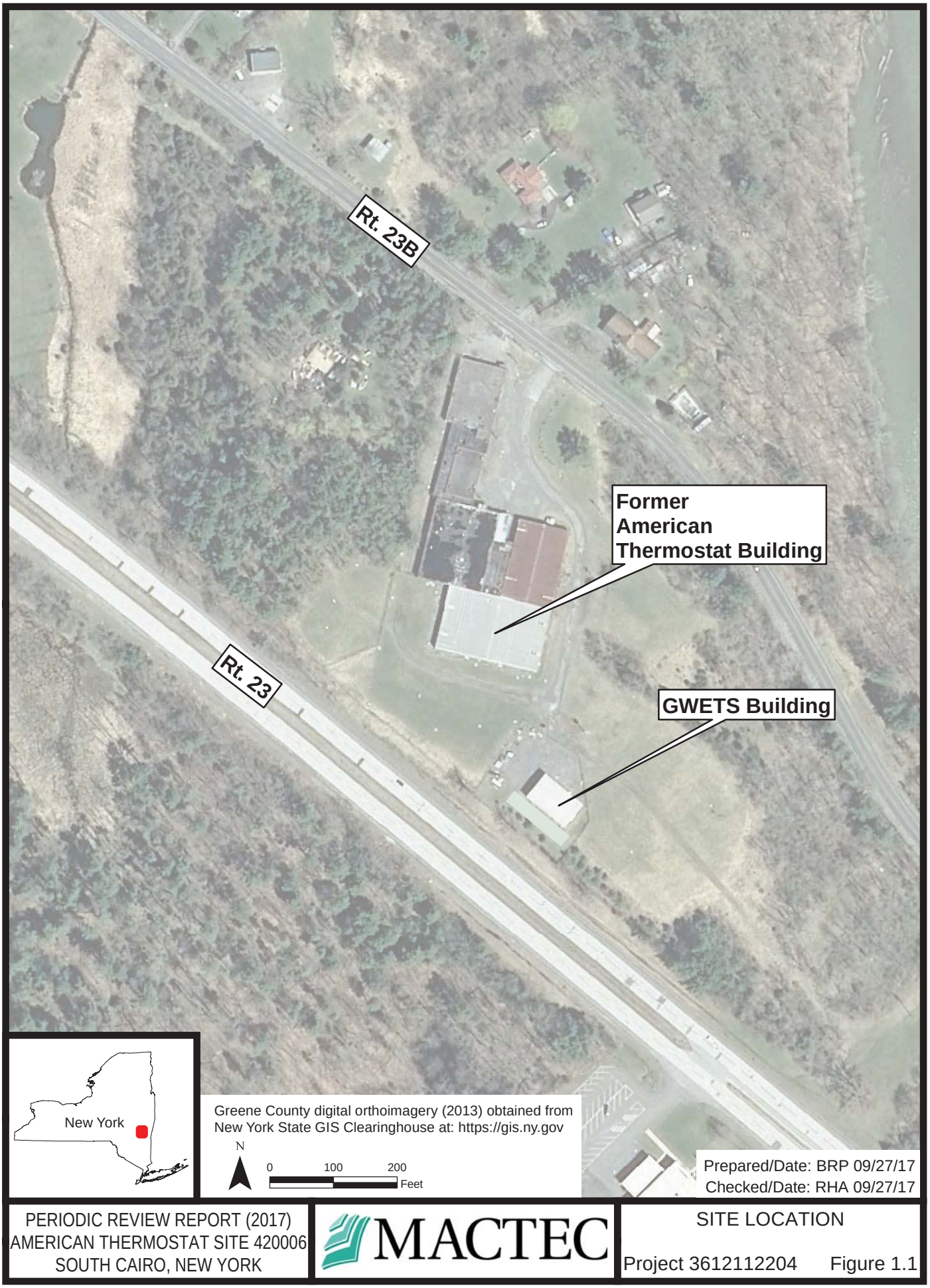
MACTEC, 2012. Confidential Soil Vapor Intrusion Evaluation (SVIE) Letter Report, American Thermostat Site Characterization – Site Number 4-20-006. Prepared for the New York State Department of Environmental Conservation. May 18, 2012.

New York State Department of Environmental Conservation (NYSDEC), 1998. Division of Water Technical and Operational Guidance Series (TOGS) (1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. October 1998 (revised).

United States Environmental Protection Agency (USEPA), 1990. USEPA Region II – Record of Decision, Operable Unit 2, American Thermostat site, South Cairo, Greene County, New York. June 29, 1990.

USEPA, 1988. USEPA Region II – Record of Decision for the American Thermostat site, South Cairo, Greene County, New York. January 7, 1988.

FIGURES



Prepared/Date: BRP 09/27/17
Checked/Date: RHA 09/27/17

PERIODIC REVIEW REPORT (2017)
AMERICAN THERMOSTAT SITE 420006
SOUTH CAIRO, NEW YORK

MACTEC

SITE LOCATION

Project 3612112204 Figure 1.1

Document: P:\Projects\nysdec1\Contract D007619\Projects\American Thermostat - SM4.0_Deliverables\4.5_Databases\GIS\MapDocuments\AmericanThermostat_SiteLocMap.mxd
PDF: P:\Projects\nysdec1\Contract D007619\Projects\American Thermostat - SM4.0_Deliverables\4.1_Reports\PRR(2017)\Figures\Figure 1.1 - Site Location.pdf 09/27/2017 1:36 PM brian.peters

KLINKE
KUBLER
VIELLA
R-1
CE-2
CE-1
EW-14
SPEENBURGH
M-6
M-5
EW-13
R-6
IW-14
R-18
EW-15
EW-12
M-14
IW-12
EW-10
M-12
R-11
M-7
R-12
M-10
IW-11
EW-11
M-4
R-19
EW-8
IW-10
IW-8
IW-9
EW-9
I-30
M-8
EW-16
EW-6
MW-02
WB-1A
MUELLER
M-3
EW-3
IW-1
IW-6

EW-7
IW-5
EW-4
OW-2
IW-3
OW-3
EW-2
OW-7
OW-5
IW-4
IW-2
OW-13
EW-5
OW-14
OW-16

Inset Scale:
0 75 150
Feet

Legend

- Monitoring Well
- Residential Well with Point of Entry Treament System
- Overburden Extraction Well
- Bedrock Extraction Well
- Decommissioned Well

N
0 200 400
Feet

Greene County digital orthoimagery (2009) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 09/27/17
Checked/Date: RHA 09/27/17

PERIODIC REVIEW REPORT (2017)
AMERICAN THERMOSTAT SITE 420006
SOUTH CAIRO, NEW YORK

MACTEC

GROUNDWATER WELL LOCATIONS

Project 3612112204 Figure 2.1

CE-2
NM

EW-14
NM

M-5
170.51

EW-13
166.44

M-6
218.66

CE-1
NM

EW-15
NM

EW-12
169.91

EW-11
166.82

M-4
166.42

EW-10
NM

Tributary B

EW-8
135.67

IW-10
228.92

IW-8
152.11

IW-9
146.98

EW-9
149

MW-108
233.34

EW-7
71.64

EW-4
144.62

M-8
NM

EW-16
105.16

MW-109
237.77

EW-2
150.29

EW-6
152.94

MW-104
228.03

EW-3
143.99

Tributary A

EW-5
256.59

MW-113
249.57

MW-112
252.63

M-9
NM

200
180
160
140
120
100

Legend

- Bedrock Well
- Active Extraction Well
- Interpreted Bedrock Groundwater Contour, feet above mean sea level

Depth to Water measurements collected June 19, 2017.
NM - Well not measured.
Inferred groundwater gradient.

N

0 160 320 Feet

Greene County digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: https://gis.ny.gov

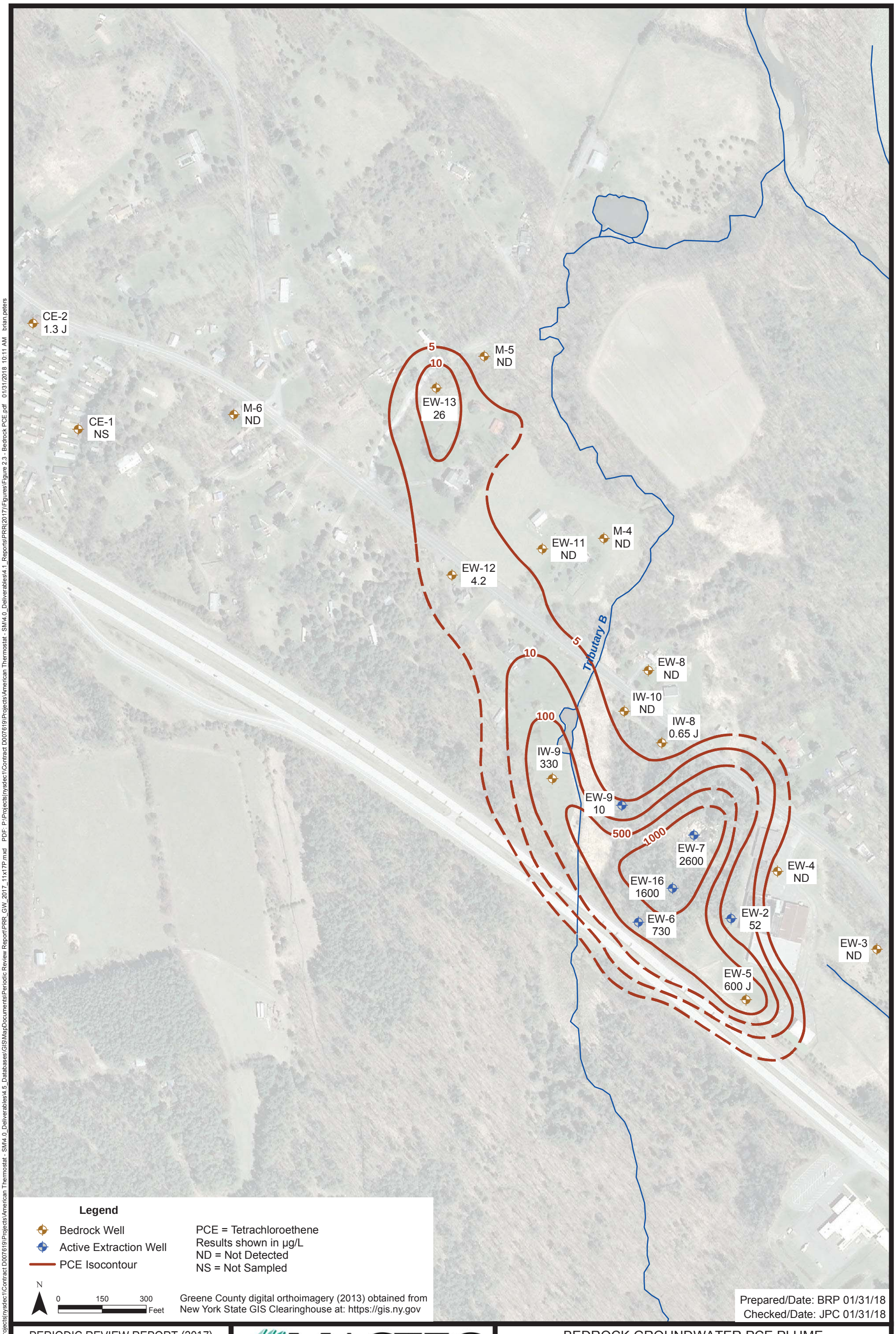
Prepared/Date: BRP 01/19/18
Checked/Date: JPC 01/19/18

PERIODIC REVIEW REPORT (2017)
AMERICAN THERMOSTAT SITE 420006
SOUTH CAIRO, NEW YORK

MACTEC

JUNE 2017 INTERPRETED BEDROCK POTENTIOMETRIC SURFACE (PUMPING)
Project 3612112204 Figure 2.2

Document: P:\Projects\nysdec1\Contract D007619\Projects\American Thermostat - SM4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Periodic Review Report\PRR_GW_2017_11x17P.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\American Thermostat - SM4.0_Deliverables\4.1_Reports\PRR(2017)\Figures\Figure 2.2 - Bedrock GW.pdf 01/31/2018 10:08 AM brian.peters



PERIODIC REVIEW REPORT (2017)
AMERICAN THERMOSTAT SITE 420006
SOUTH CAIRO, NEW YORK

MACTEC

BEDROCK GROUNDWATER PCE PLUME
JUNE 2017

Project 3612112204

Figure 2.3

Document: P:\Projects\nysdec1\Contract D007619\Projects\American Thermostat - SM4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Periodic Review Report\PRR_GW_2017_11x17P.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\American Thermostat - SM4.0_Deliverables\4.1_Reports\PRR(2017)\Figures\Figure 2.3 - Bedrock PCE.pdf 01/31/2018 10:11 AM brian.peters

TABLES

Table 2.1: Site Management Requirements

Component	Action	Required Frequency	Comments/Recommendations
Groundwater Extraction and Treatment System			
GWETS Operation - Checklist	Inspection	Each O&M Visit	Check water treatment operation: flow rates, chemical usage, meter readings, system components.
Extraction wells	Inspection	Weekly	Check extraction wells, housing, control panels.
Control panel, heaters	Inspection	Weekly	Check function of control panel indicating lights. In cold weather verify pilot light operation of heaters.
Safety equipment, plant lighting	Inspection	Monthly	Inspect safety equipment (ladders, eyewash, fire extinguishers, etc.). Inspect plant lighting for proper operation.
Site Security	Inspection	Monthly	Check treatment building door locks, fencing, and site perimeter fence for defects.
Air stripper	Inspection	Annually	Perform cleaning of air stripper unit trays and sump, if necessary.
Plant heaters	Inspection	Annually	Have subcontractor perform maintenance on treatment plant heaters.
Ground Water Monitoring System	Inspection	15 Months	Visually inspect well pads/locks at site wells; repair as necessary to maintain integrity and security.
System Performance Monitoring (see Table 2.2)			
Influent equalization tank	Influent water sampling	Monthly	Grab sample collected to evaluate and monitor GWETS system performance.
Air stripper effluent water	Air stripper effluent water sampling	Monthly	Grab sample collected to evaluate and monitor GWETS system performance.
Point of Entry Treatment System (see Table 2.2)			
POET System	Residential water supply sampling and inspection	Quarterly	Grab sample collected between carbon filters to evaluate and monitor water supply. Perform system maintenance on carbon filters, UV system as needed, annual at a minimum.
Environmental Monitoring (see Table 2.2)			
Groundwater Monitoring Program	groundwater sampling of 31 wells	15-month sampling interval	Grab samples collected from 31 locations; including 2 public supply wells, monitoring wells, former and active bedrock and overburden extraction wells, former injection wells, and residential water supply wells before filters.

Table 2.2: Long Term Monitoring and System Performance Sampling - 2017

Sampling Location	Semiannual Water Level	VOCs	Sample Description
Monitoring Wells (15 month LTM)			
M-4	X	X	PDB
M-5	X	X	PDB
M-6	X	X	grab
Mueller	X	X	PDB
CE-1		X	Before filters
CE-2		X	Before filters
EW-3	X	X	PDB
EW-4	X	X	PDB
EW-5	X	X	PDB
EW-8	X	X	PDB
EW-11	X	X	PDB
EW-12	X	X	PDB
EW-13	X	X	PDB
IW-8	X	X	PDB
IW-9	X	X	PDB
IW-10	X	X	PDB
Active Bedrock Extraction Wells (15 month LTM)			
EW-2	X	X	grab
EW-6	X	X	grab
EW-7	X	X	grab
EW-9	X	X	grab
EW-16	X	X	grab
Active Overburden Extraction Wells (15 month LTM)			
OW-2	X	X	grab
OW-3	X	X	grab
OW-5	X	X	grab
OW-7	X	X	grab
OW-13	X	X	grab
OW-14	X	X	grab
OW-16	X	X	grab
Residential Wells (15 month LTM)			
VIELLA		X	Before filters
KUBLER		X	Before filters
KLINKE		X	Before filters
Residential Wells (Quarterly POET System Performance)			
VIELLA_BET		Quarterly, VOCs	Between filters
KUBLER_BET		Quarterly, VOCs	Between filters
KLINKE_BET		Quarterly, VOCs	Between filters
GWETS System Performance (Monthly)			
PS-INFLUENT	Influent	Monthly	VOCs, Metals, TDS, TSS
PS-AS-EFFLUENT	Air stripper effluent water	Monthly	VOCs

VOCs = Volatile Organic Compounds
TDS = Total Dissolved Solids
TSS = Total Suspended Solids

Prepared by: TNG 1/25/18
Checked by: JPC 1/30/18

Table 2.3: Treatment Plant Monthly Throughput

Month	Calendar Year (Gallons)									
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
January	-	2,327,342	2,188,662	3,154,385	2,643,561	3,112,140	1,452,060	1,969,101	1,850,648	1,860,431
February	-	1,946,464	1,828,969	3,202,253	2,400,906	2,640,103	1,323,679	1,627,579	1,724,943	1,484,866
March	-	1,570,828	2,782,069	3,397,280	2,581,039	3,032,627	1,433,444	1,505,083	1,726,705	1,797,869
April	-	1,986,297	2,625,243	3,325,592	3,015,136	2,956,081	1,621,998	1,888,648	1,860,726	1,651,491
May	-	1,876,550	2,689,205	3,507,403	2,827,722	2,279,599	1,511,813	1,679,210	2,038,414	1,595,631
June	-	1,810,328	2,515,671	3,241,052	3,087,176	2,817,292	1,378,343	1,635,094	2,225,379	1,567,880
July	-	1,880,672	2,845,066	2,846,350	3,109,504	2,828,580	1,829,427	1,679,658	1,700,523	1,656,624
August	1,845,307	2,865,086	2,656,221	3,323,930	2,969,001	2,862,294	2,488,132	1,675,021	1,505,840	1,680,981
September	2,326,580	2,849,292	2,790,754	3,116,812	2,826,453	2,805,159	2,214,838	1,668,387	1,573,918	1,559,100
October	2,000,099	2,967,620	3,191,008	3,172,179	3,126,848	2,889,540	2,016,922	1,048,462	2,365,602	1,624,903
November	1,387,734	2,840,040	2,906,470	2,668,748	3,151,070	2,703,444	2,147,628	1,753,165	2,542,691	1,628,116
December	1,515,814	2,996,042	3,089,535	2,676,774	3,043,354	1,743,574	2,218,612	1,804,582	1,570,319	1,779,807
Total for Calendar Year	9,075,534	27,916,561	32,108,873	37,632,758	34,781,770	32,670,433	21,636,896	19,933,990	22,685,708	19,887,699
Cumulative Total Throughput	9,075,534	36,992,095	69,100,968	106,733,726	141,515,496	174,185,929	195,822,825	215,756,815	238,442,523	258,330,222

Month	Calendar Year (Gallons)									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
January	1,621,909	2,009,299	1,715,140	1,660,400	1,617,600	1,287,600	605,868	1,055,444	1,028,212	1,492,216
February	1,661,136	1,973,492	1,562,130	1,608,200	1,592,100	1,165,900	537,554	726,839	1,142,661	906,043
March	1,872,515	2,109,251	2,144,107	1,677,100	1,545,800	1,213,400	828,412	818,456	1,197,620	1,123,788
April	1,922,613	2,164,940	1,972,606	1,807,700	976,300	1,213,400	1,311,895	829,691	1,176,265	1,197,556
May	1,496,402	2,086,536	1,692,254	1,869,800	1,050,200	1,024,000	1,181,124	918,585	1,105,646	1,049,899
June	1,519,804	2,069,749	1,657,835	1,617,700	655,200	560,000	1,036,409	1,174,145	1,027,389	1,426,931
July	1,344,964	2,413,904	1,710,898	1,626,100	435,000	-	1,101,365	1,364,309	1,159,271	1,168,068
August	2,366,862	1,461,639	1,814,591	1,676,400	1,572,000	368,300	968,790	1,069,571	1,156,925	1,576,200
September	2,053,268	1,572,872	1,502,900	1,764,200	1,098,900	282,600	516,422	1,424,510	1,179,487	928,859
October	2,649,688	1,962,537	1,736,300	1,646,400	1,363,800	1,133,000	771,419	890,175	1,145,887	1,428,789
November	2,172,569	1,782,527	1,505,900	1,806,000	1,223,500	1,240,188	643,451	-	936,208	863,212
December	2,466,153	2,171,560	1,799,400	1,966,500	1,351,200	950,031	804,076	251,416	953,286	1,231,949
Total for Calendar Year	23,147,883	23,778,306	20,814,061	20,726,500	14,481,600	10,438,419	10,306,785	10,523,141	13,208,857	14,393,510
Cumulative Total Throughput	281,478,105	305,256,411	326,070,472	346,796,972	361,278,572	371,716,991	382,023,776	392,546,917	405,755,774	420,149,284

Note:
Plant modifications resulted in plant shut down during the months of July 2013 and November 2015.

Table 2.4: Total VOCs in Extracted Groundwater (lbs)

Month	Calendar Year									
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
January	-	26.5	57.5	42.7	28.1	38.2	29.7	39.4	33.8	32.3
February	-	49.3	47.2	42.6	26.0	37.3	31.3	33.0	28.5	19.8
March	-	43.7	62.3	50.5	28.3	43.8	39.2	20.5	27.2	28.8
April	-	39.2	58.7	44.1	43.4	44.8	42.0	21.8	29.0	34.4
May	-	26.7	43.7	54.4	42.5	34.1	34.6	29.6	40.2	19.8
June	-	31.0	50.0	45.5	44.8	45.5	32.6	23.6	44.1	18.7
July	-	23.9	40.8	34.7	40.5	32.7	32.1	24.3	13.1	20.2
August	104.7	47.3	41.5	41.2	38.5	42.0	31.6	14.3	14.1	16.4
September	24.5	39.0	33.9	29.5	37.3	51.9	26.9	17.5	24.4	15.8
October	42.4	63.2	34.6	71.5	36.9	49.3	36.0	15.2	40.1	15.8
November	26.6	58.1	42.7	23.9	42.3	35.1	26.8	31.8	40.4	20.2
December	35.0	66.9	49.9	27.9	42.8	34.4	34.3	31.3	23.1	21.9
Total for Calendar Year (lbs)	233	515	563	509	451	489	397	302	358	264
Cumulative Total VOCs (lbs)	233	748	1,311	1,820	2,271	2,760	3,157	3,460	3,818	4,082

Month	Calendar Year									
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
January	23.9	23.0	19.0	18.2	18.5	21.8	7.5	14.1	24.0	13.9
February	24.3	18.5	19.4	15.9	18.6	27.9	11.0	6.4	19.1	37.0
March	34.0	20.0	30.6	35.5	18.0	30.2	25.1	6.1	18.0	10.3
April	30.6	21.0	23.6	26.3	18.8	18.7	18.1	15.5	32.1	27.0
May	22.7	23.8	15.1	25.1	24.0	18.6	26.1	15.5	14.4	10.5
June	14.7	19.4	13.9	22.9	5.4	13.1	15.6	16.8	17.6	18.6
July	11.8	25.3	12.0	19.5	27.5	-	13.0	16.9	14.1	10.0
August	24.7	15.8	9.8	19.8	39.6	20.0	40.3	14.2	9.5	20.5
September	21.8	14.8	13.7	25.0	12.8	10.4	7.0	17.4	9.5	10.9
October	24.8	16.9	21.8	22.5	29.2	17.1	8.9	10.5	13.4	7.1
November	24.1	19.9	18.0	19.8	23.9	18.5	14.0	-	8.6	6.1
December	25.3	26.5	30.4	22.5	17.0	14.1	10.7	8.9	16.1	8.0
Total for Calendar Year (lbs)	283	245	227	273	253	211	197	142	196	180.0
Cumulative Total VOCs (lbs)	4,364	4,609	4,836	5,109	5,363	5,573	5,770	5,912	6,109	6289

Note:
Total VOCs in Extracted Groundwater = GWETS Influent Total VOCs Concentrations per month multiplied by the Monthly Flow Rate and the Monthly System Operating Duration.
Values are in pounds (lbs).
July 2013/November 2015 - system down for plant modifications.

Table 2.5: System Performance Sampling Results

Location	Matrix	Date	Field Sample ID	Units	1,2-DCE (total)	PCE	TCE	Vinyl Chloride	Barium	Iron	Total Dissolved Solids
Parameter					1,2-DCE (total)	PCE	TCE	Vinyl Chloride	Barium	Iron	Total Dissolved Solids
Discharge Criteria					-	1 µg/L	40 µg/L	-	-	300 µg/L	-
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
PS-Influent	L	1/4/2017	PS-INFLUENT		**350**	**620**	**150**	20 U	57.7	84.9	396
PS-Influent	L	2/24/2017	PS-INFLUENT		**1500**	**2,400**	**1000**	50 U	143	**401**	406
PS-Influent	L	3/16/2017	PS-INFLUENT		**460**	**430**	**200**	**9.5** J	63.9	**521**	383
PS-Influent	L	4/3/2017	PS-INFLUENT		**690**	**1,400**	**610**	20 U	66.2	**308**	356
PS-Influent	L	5/1/2017	PS-INFLUENT		**420**	**550**	**210**	20 U	57.8	278	356
PS-Influent	L	6/8/2017	PS-INFLUENT		**370**	**930**	**260**	20 U	60.1	178	328
PS-Influent	L	7/6/2017	PS-INFLUENT		**340**	**470 J**	**210**	20 U	59.8	**487**	356
PS-Influent	L	8/1/2017	PS-INFLUENT		**470**	**830 J**	**200**	20 U	57.9	115	357
PS-Influent	L	9/12/2017	PS-INFLUENT		**580**	**540**	**230**	20 U	64	**349**	397
PS-Influent	L	10/3/2017	PS-INFLUENT		**240**	**250**	**82**	8 U	57.8	222	412
PS-Influent	L	11/1/2017	PS-INFLUENT		**370**	**310**	**140**	8 UJ	57.9	239	346
PS-Influent	L	12/15/2017	PS-INFLUENT		**210**	**510** J	**54**	**4.6**	46.2	50 U	436
Air Stripper Eff	L	1/4/2017	PS-AS-EFFLUENT		2 U	1 U	1 U	1 U	59.2	**303**	386
Air Stripper Eff	L	2/24/2017	PS-AS-EFFLUENT		2 U	**1** U	1 U	1 U	104	239	405
Air Stripper Eff	L	3/16/2017	PS-AS-EFFLUENT		2 U	1 U	1 U	1 U	64.6	**413**	385
Air Stripper Eff	L	4/3/2017	PS-AS-EFFLUENT		2 U	1 U	1 U	1 U	74.8	213	358
Air Stripper Eff	L	5/1/2017	PS-AS-EFFLUENT		2 U	1 U	1 U	1 U	64.2	**456**	372
Air Stripper Eff	L	6/8/2017	PS-AS-EFFLUENT		2 U	1 U	1 U	1 U	61.2	168	343
Air Stripper Eff	L	7/6/2017	PS-AS EFFLUENT		2 U	1 U	1 U	1 U	62.6	**338**	338
Air Stripper Eff	L	8/1/2017	PS-AS EFFLUENT		2 U	1 U	1 U	1 U	57.7	107	368
Air Stripper Eff	L	9/12/2017	PS-AS EFFLUENT		**35**	**17**	**8.2**	1 U	68	**630**	421
Air Stripper Eff	L	10/3/2017	PS-AS-EFFLUENT		2 U	1 U	1 U	1 U	64.3	167	392
Air Stripper Eff	L	11/1/2017	PS-EFFLUENT		4 U	2 U	2 U	2 U	59.4	197	385
Air Stripper Eff	L	12/15/2017	PS-EFFLUENT		2 U	1 U	1 U	1 U	57.7	238	397

Notes:
µg/L = Micrograms per liter
mg/L = Milligrams per liter
FS = Field Sample
FD = Field Duplicate
" - " = No Criteria

Table 2.6: Residential Treatment System Sampling Results

Location	Sample Date	Description	1,2-Dichloroethene (total)	Cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Tetrachloroethene	Trichloroethene	Vinyl chloride
Parameter								
Units			ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
GA			5	5	5	5	5	2
KLINKE	1/11/2017	Between Filters	1.2 J	1.2	1 U	1 U	1 U	1 U
KLINKE	4/13/2017	Between Filters	2 U	1 U	1 U	1 U	1 U	1 U
KLINKE	6/20/2017	Between Filters	2 U	1 U	1 U	1 U	1 U	1 U
KLINKE	7/6/2017	Before Filters (LTM)	3.5	3.5	1 U	1 U	1 U	1 U
KLINKE	12/6/2017	Between Filters	2 U	1 U	1 U	1 U	1 U	1 U
VIELLA	1/11/2017	Between Filters	2 U	1 U	1 U	1 U	1 U	1 U
VIELLA	4/13/2017	Between Filters	2 U	1 U	1 U	1 U	1 U	1 U
VIELLA	6/20/2017	Between Filters	2 U	1 U	1 U	1 U	1 U	1 U
VIELLA	7/6/2017	Before Filters (LTM)	2 U	1 U	1 U	1 U	1 U	1 U
VIELLA	12/6/2017	Between Filters	2 U	1 U	1 U	1 U	1 U	1 U
KUBLER	1/11/2017	Between Filters	2 U	1 U	1 U	1 U	1 U	1 U
KUBLER	4/13/2017	Between Filters	2 U	1 U	1 U	1 U	1 U	1 U
KUBLER	6/20/2017	Between Filters	2 U	1 U	1 U	1 U	1 U	1 U
KUBLER	7/6/2017	Before Filters (LTM)	2 U	1 U	1 U	1 U	1 U	1 U
KUBLER	12/6/2017	Between Filters	2 U	1 U	1 U	1 U	1 U	1 U

U - Not Detected
J - Estimated value
LTM - pre-filtration sample collected as part of the 15 month Long Term Monitoirng

Table 2.7 Groundwater Elevations[1]

Sampling Location	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Depth to Water (ft)	Groundwater Elevation (feet msl)
Monitoring Wells					
M-4	232.19	200	TOC	65.77	166.42
M-5	213.88	200	TOC	43.37	170.51
M-6	248.31	100	TOC	29.65	218.66
M-8	261.57	200	TOC	10.67	250.9
M-9	256.39	200	TOC	88.29	168.1
MW-104	258.00	81.6	TOC	29.97	228.03
MW-108	254.72	86.1	TOC	21.38	233.34
MW-109	255.96	87.5	TOC	18.19	237.77
MW-112	256.60	25.1	TOC	3.97	252.63
MW-113	257.38	25	TOC	7.81	249.57
Mueller	183.25	114	TOC	18.75	164.5
CE-1	224.91	535	TOC	NM	NA
CE-2	224.946	287	TOC	NM	NA
EW-3	259.67	295	TOC	115.68	143.99
EW-4	256.01	322	TOC	111.39	144.62
EW-5	259.85	235.2	TOC	3.26	256.59
EW-8	223.93	318	TOC	88.26	135.67
EW-10	234.09	225	TOC	12.95	221.14
EW-11	231.4	172.2	TOC	64.58	166.82
EW-12	232.76	270.5	TOC	62.85	169.91
EW-13	217.06	360	TOC	50.62	166.44
EW-14	234.85	185	TOC	NM	NA
EW-15	232.47	275	TOC	12.11	220.36
IW-8	239.47	391.8	TOC	87.36	152.11
IW-9	224.37	358.1	TOC	77.39	146.98
IW-10	235.57	176.3	TOC	6.65	228.92
Active Bedrock Extraction Wells					
EW-2	255.29	322	TOC		150.29
EW-6	242.94	325	TOC		152.94
EW-7	251.64	227	TOC		71.64
EW-9	236.21	365	TOC		149.00
EW-16	248.16	417	TOC		105.16

[1] = Water elevations measured June 19, 2017, under pumping conditions
CE-1 = Country Estates Well #1
CE-2 = Country Estates Well #2
TOC = Top of Casing
TOV = Top of Vault
TOFM = Top of Flush Mount
NA = Not applicable
NM = Not measured
ft = feet
msl = mean sea level
PLC = measurement taken from extraction well panel

Table 2.8: Environmental Monitoring Results Above NYS Standards

Location	Sample Date	Sample ID	1,2-Dichloroethene (total)	Cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Tetrachloroethene	Trichloroethene	Vinyl chloride
Parameter								
Units			ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
GA			5	5	5	5	5	2
CE-2	6/21/2017	CE-2 BEF	2 UJ	1 UJ	1 UJ	1.3 J	1 UJ	1 UJ
EW-11	6/21/2017	EW-11	2 U	1 U	1 U	1 U	1 U	1 U
EW-12	6/21/2017	EW-12	2 U	1 U	1 U	4.2	0.52 J	1 U
EW-13	6/20/2017	EW-13	**16**	**16**	1 U	**26**	3.7	1 U
EW-16	6/20/2017	EW-16	**1500**	**1500**	20 U	**1600**	**1300**	**19** J
EW-2	6/20/2017	EW-2	**61**	**61**	1 U	**52**	**7.1**	**12**
EW-3	6/21/2017	EW-3	**6.8**	**6.8**	1 U	1 U	1 U	**3.7**
EW-4	6/21/2017	EW-4	**11**	**8.4**	2.7	1 U	1 U	1 U
EW-5	6/21/2017	EW-5	**310**	**310**	4 U	**600** J	**120**	**7**
EW-6	6/20/2017	EW-6	**160**	**160**	8 U	**730**	**170**	8 U
EW-7	6/20/2017	EW-7	**1300**	**1300**	40 U	**2600**	**1200**	40 U
EW-8	6/21/2017	EW-8	4	4	1 U	1 U	1 U	1 U
EW-9	6/20/2017	EW-9	**97**	**95**	1.8 J	**10**	**5.2**	**3.4**
IW-10	6/21/2017	IW-10	**10**	**10**	1 U	1 U	2	1 U
IW-8	6/21/2017	IW-8	2 U	1 U	1 U	0.65 J	1 U	1 U
IW-9	6/21/2017	IW-9	**830**	**830**	25 U	**330**	**390**	25 U
M-4	6/21/2017	M-4	2 U	1 U	1 U	1 U	1 U	1 U
M-5	6/20/2017	M-5	**18**	**17**	1.1	1 U	1 U	1 U
M-6	6/21/2017	M-6	2 U	1 U	1 U	1 U	1 U	1 U
MUELLER	6/20/2017	MUELLER	2 U	1 U	1 U	1 U	1 U	1 U
OW-13	6/20/2017	OW-13	**32**	**32**	5 U	**120**	**6**	5 U
OW-14	6/20/2017	OW-14	**610**	**610**	40 U	**3900**	**1000**	40 U
OW-16	6/20/2017	OW-16	**62**	**62**	10 U	**200**	**20**	10 U
OW-2	6/20/2017	OW-2	**38** J	**38**	20 U	**470**	**19** J	20 U
OW-3	6/20/2017	OW-3	400 U	200 U	200 U	**4800**	**110** J	200 U
OW-5	6/20/2017	OW-5	**900** J	**900** J	50 UJ	**1500** J	**96** J	**5.8** J
OW-7	6/20/2017	OW-7	**12**	**12**	1 U	**47**	**6**	1 U

APPENDIX A

GROUNDWATER EXTRACTION AND TREATMENT SYSTEM COMPONENT PERFORMANCE

		Location	Air Stripper Eff		Air Stripper Eff		Air Stripper Eff		Air Stripper Eff		Air Stripper Eff		Air Stripper Eff	
		Field Sample Date	1/4/2017		2/24/2017		3/16/2017		4/3/2017		5/1/2017		6/8/2017	
		Lab Sample Delivery Group	480-111834-1		480-113924-1		480-114706-1		480-115521-1		480-117245-1		480-119264-1	
		Field Sample ID	PS-AS EFFLUENT		PS-AS EFFLUENT		PS-AS EFFLUENT		PS-AS-EFFLUENT		PS-AS EFFLUENT		PS-AS EFFLUENT	
		Qc Code	FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	1,1,1-Trichloroethane	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	1,1,2,2-Tetrachloroethane	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	1,1,2-Trichloroethane	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	1,1-Dichloroethene	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	1,2-Dichloroethane	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	1,2-Dichloroethene (total)	µg/L	2	U	2	U	2	U	2	U	2	U	2	U
SW8260C	2-Hexanone	µg/L	5	U	5	U	5	U	5	U	5	U	5	U
SW8260C	Acetone	µg/L	10	U	10	U	10	U	10	U	10	U	10	U
SW8260C	Carbon disulfide	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	Carbon tetrachloride	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	Chloroform	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	Chloromethane	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	Cis-1,2-Dichloroethene	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	Methylene chloride	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	Tetrachloroethene	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	Toluene	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	trans-1,2-Dichloroethene	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	Trichloroethene	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW8260C	Vinyl chloride	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW6010C	Aluminum	µg/L	404		200	U	571		200	U	478		236	
SW6010C	Chromium	µg/L	4	U	4	U	4	U	4	U	4	U	4	U
SW6010C	Arsenic	µg/L	6	U	6	U	6	U	6	U	6	U	6	U
SW6010C	Barium	µg/L	59.2		104		64.6		74.8		64.2		61.2	
SW6010C	Cadmium	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW6010C	Copper	µg/L	10	U	10	U	10	U	10	U	10	U	10	U
SW6010C	Iron	µg/L	303		239		413		213		456		168	
SW6010C	Lead	µg/L	3	U	7.4		3	U	3.9		3	U	3	U
SW6010C	Manganese	µg/L	36.6		108		55.3		69.4		116		41.6	
SW6010C	Nickel	µg/L	10	U	10	U	10	U	10	U	10	U	10	U
SW6010C	Zinc	µg/L	10	U	10	U	10	U	10	U	11.3		10	U
SW7470A	Mercury	µg/L	0.12	U	0.12	U	0.12	U	0.12	U	0.12	U	0.12	U
SM2540C	Total Dissolved Solids	mg/L	386		405		385		358		372		343	
SM2540D	Total Suspended Solids	mg/L	4	U	4.4		4	U	4	U	4	U	4	U

Notes:
µg/L= Micrograms per liter
mg/L = Milligrams per liter
FS = Field Sample
FD = Field Duplicate

		Location	Air Stripper Eff		Air Stripper Eff		Air Stripper Eff		Air Stripper Eff		Air Stripper Eff		Air Stripper Eff	
		Field Sample Date	7/6/2017		8/1/2017		9/12/2017		10/3/2017		11/1/2017		12/15/2017	
		Lab Sample Delivery Group	480-120643-1		480-122024-1		480-124030-1		480-125285-1		480-126954-1		480-129095-1	
		Field Sample ID	PS-AS EFFLUENT		PS-AS EFFLUENT		PS-AS EFFLUENT		PS-AS EFFLUENT		PS-EFFLUENT		PS-EFFLUENT	
		Qc Code	FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	1,1,1-Trichloroethane	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW8260C	1,1,2,2-Tetrachloroethane	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW8260C	1,1,2-Trichloroethane	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW8260C	1,1-Dichloroethene	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW8260C	1,2-Dichloroethane	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW8260C	1,2-Dichloroethene (total)	µg/L	2	U	2	U	35		2	U	4	U	2	U
SW8260C	2-Hexanone	µg/L	5	U	5	U	5	U	5	U	10	U	5	U
SW8260C	Acetone	µg/L	10	U	10	U	10	U	6.1	J	20	U	10	U
SW8260C	Carbon disulfide	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW8260C	Carbon tetrachloride	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW8260C	Chloroform	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW8260C	Chloromethane	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW8260C	Cis-1,2-Dichloroethene	µg/L	1	U	1	U	35		1	U	2	U	1	U
SW8260C	Methylene chloride	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW8260C	Tetrachloroethene	µg/L	1	U	1	U	17		1	U	2	U	1	U
SW8260C	Toluene	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW8260C	trans-1,2-Dichloroethene	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW8260C	Trichloroethene	µg/L	1	U	1	U	8.2		1	U	2	U	1	U
SW8260C	Vinyl chloride	µg/L	1	U	1	U	1	U	1	U	2	U	1	U
SW6010C	Aluminum	µg/L	474		200	U	996		200	U	200	U	200	U
SW6010C	Chromium	µg/L	4	U	4	U	4	U	4	U	4	U	44.9	
SW6010C	Arsenic	µg/L	6	U	6	U	6	U	6	U	6	U	6.4	
SW6010C	Barium	µg/L	62.6		57.7		68		64.3		59.4		57.7	
SW6010C	Cadmium	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW6010C	Copper	µg/L	10	U	10	U	10	U	10	U	10	U	10	U
SW6010C	Iron	µg/L	338		107		630		167		197		238	
SW6010C	Lead	µg/L	3	U	3	U	3	U	3	U	3	U	3	U
SW6010C	Manganese	µg/L	50.5		41.2		106		50.6		40.9		29.1	
SW6010C	Nickel	µg/L	10	U	10	U	10	U	10	U	10	U	39.8	
SW6010C	Zinc	µg/L	10	U	10	U	10	U	10	U	10	U	10	U
SW7470A	Mercury	µg/L	0.12	U	0.12	U	0.12	U	0.12	U	0.12	U	0.12	U
SM2540C	Total Dissolved Solids	mg/L	338		368		421		392		385		397	
SM2540D	Total Suspended Solids	mg/L	4	U	4	U	10.4		4	U	4	U	4	U

Notes:
µg/L= Micrograms per liter
mg/L = Milligrams per liter
FS = Field Sample
FD = Field Duplicate

		Location	PS-Influent		PS-Influent		PS-Influent		PS-Influent		PS-Influent		PS-Influent	
		Field Sample Date	1/4/2017		2/24/2017		3/16/2017		4/3/2017		5/1/2017		6/8/2017	
		Lab Sample Delivery Group	480-111834-1		480-113924-1		480-114706-1		480-115521-1		480-117245-1		480-119264-1	
		Field Sample ID	PS-INFLUENT		PS-INFLUENT		PS-INFLUENT		PS-INFLUENT		PS-INFLUENT		PS-INFLUENT	
		Qc Code	FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	1,1,1-Trichloroethane	µg/L	20	U	50	U	10	U	20	U	20	U	20	U
SW8260C	1,1,2,2-Tetrachloroethane	µg/L	20	U	50	U	10	U	20	U	20	U	20	U
SW8260C	1,1,2-Trichloroethane	µg/L	20	U	50	U	10	U	20	U	20	U	20	U
SW8260C	1,1-Dichloroethene	µg/L	20	U	50	U	10	U	20	U	20	U	20	U
SW8260C	1,2-Dichloroethane	µg/L	20	U	50	U	10	U	20	U	20	U	20	U
SW8260C	1,2-Dichloroethene (total)	µg/L	350		1500		460		690		420		370	
SW8260C	2-Hexanone	µg/L	100	U	250	U	50	U	100	U	100	U	100	U
SW8260C	Acetone	µg/L	200	U	500	U	100	U	200	U	200	U	200	U
SW8260C	Carbon disulfide	µg/L	20	U	50	U	10	U	20	U	20	U	20	U
SW8260C	Carbon tetrachloride	µg/L	20	U	50	U	10	U	20	U	20	U	20	U
SW8260C	Chloroform	µg/L	20	U	50	U	10	U	20	U	20	U	20	U
SW8260C	Chloromethane	µg/L	20	U	50	U	10	U	20	U	20	U	20	U
SW8260C	Cis-1,2-Dichloroethene	µg/L	350		1500		460		690		420		370	
SW8260C	Methylene chloride	µg/L	20	U	50	U	10	U	20	U	20	U	20	U
SW8260C	Tetrachloroethene	µg/L	620		2400		430		1400		550		930	
SW8260C	Toluene	µg/L	20	U	50	U	10	U	20	U	20	U	20	U
SW8260C	trans-1,2-Dichloroethene	µg/L	20	U	50	U	10	U	20	U	20	U	20	U
SW8260C	Trichloroethene	µg/L	150		1000		200		610		210		260	
SW8260C	Vinyl chloride	µg/L	20	U	50	U	9.5	J	20	U	20	U	20	U
SW6010C	Aluminum	µg/L	200	U	200	U	577		200	U	372		200	
SW6010C	Chromium	µg/L	4	U	4	U	15		4	U	4	U	4	U
SW6010C	Arsenic	µg/L	6	U	6	U	6	U	6	U	6	U	6	U
SW6010C	Barium	µg/L	57.7		143		63.9		66.2		57.8		60.1	
SW6010C	Cadmium	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW6010C	Copper	µg/L	10	U	10	U	10	U	10	U	10	U	10	U
SW6010C	Iron	µg/L	84.9		401		521		308		278		178	
SW6010C	Lead	µg/L	3	U	8.5		3	U	4.5		3	U	3	U
SW6010C	Manganese	µg/L	35.2		127		51.2		59.2		46.9		36.8	
SW6010C	Nickel	µg/L	10	U	10	U	10	U	10	U	10	U	10	U
SW6010C	Zinc	µg/L	10	U	10	U	10	U	10	U	10	U	10	U
SW7470A	Mercury	µg/L	0.12	U	0.12	U	0.12	U	0.12	U	0.12	U	0.12	U
SM2540C	Total Dissolved Solids	mg/L	396		406		383		356		356		328	
SM2540D	Total Suspended Solids	mg/L	4	U	4	U	4	U	4	U	4	U	5.2	

Notes:
µg/L= Micrograms per liter
mg/L = Milligrams per liter
FS = Field Sample
FD = Field Duplicate

		Location	PS-Influent		PS-Influent		PS-Influent		PS-Influent		PS-Influent		PS-Influent	
		Field Sample Date	7/6/2017		8/1/2017		9/12/2017		10/3/2017		11/1/2017		12/15/2017	
		Lab Sample Delivery Group	480-120643-1		480-122024-1		480-124030-1		480-125285-1		480-126954-1		480-129095-1	
		Field Sample ID	PS-INFLUENT		PS-INFLUENT		PS-INFLUENT		PS-INFLUENT		PS-INFLUENT		PS-INFLUENT	
		Qc Code	FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	1,1,1-Trichloroethane	µg/L	20	U	20	U	20	U	8	U	8	U	1	U
SW8260C	1,1,2,2-Tetrachloroethane	µg/L	20	U	20	U	20	U	8	U	8	U	1	U
SW8260C	1,1,2-Trichloroethane	µg/L	20	U	20	U	20	U	8	U	8	U	1	U
SW8260C	1,1-Dichloroethene	µg/L	20	U	20	U	20	U	8	U	8	U	0.58	J
SW8260C	1,2-Dichloroethane	µg/L	20	U	20	U	20	U	8	U	8	U	1	U
SW8260C	1,2-Dichloroethene (total)	µg/L	340		470		580		240		370		210	
SW8260C	2-Hexanone	µg/L	100	U	100	U	100	U	40	U	40	U	5	U
SW8260C	Acetone	µg/L	200	U	200	U	200	U	80	U	80	U	10	U
SW8260C	Carbon disulfide	µg/L	20	U	20	U	20	U	8	U	8	U	1	U
SW8260C	Carbon tetrachloride	µg/L	20	U	20	U	20	U	8	U	8	U	1	U
SW8260C	Chloroform	µg/L	20	U	20	U	20	U	8	U	8	U	1	U
SW8260C	Chloromethane	µg/L	20	U	20	U	20	U	8	U	8	UJ	1	U
SW8260C	Cis-1,2-Dichloroethene	µg/L	340		470		580		240		370		210	
SW8260C	Methylene chloride	µg/L	20	U	20	U	20	U	8	U	8	U	1	U
SW8260C	Tetrachloroethene	µg/L	470	J	830	J	540		250		310		510	J
SW8260C	Toluene	µg/L	20	U	20	U	20	U	8	U	8	U	1	U
SW8260C	trans-1,2-Dichloroethene	µg/L	20	U	20	U	20	U	8	U	8	U	10	U
SW8260C	Trichloroethene	µg/L	210		200		230		82		140		54	
SW8260C	Vinyl chloride	µg/L	20	U	20	U	20	U	8	U	8	UJ	4.6	
SW6010C	Aluminum	µg/L	509		200	U	496		200	U	200	U	200	U
SW6010C	Chromium	µg/L	4	U	4	U	4	U	4	U	4	U	4	U
SW6010C	Arsenic	µg/L	6	U	6	U	6	U	6	U	6	U	6	U
SW6010C	Barium	µg/L	59.8		57.9		64		57.8		57.9		46.2	
SW6010C	Cadmium	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
SW6010C	Copper	µg/L	10	U	10	U	10	U	10	U	10	U	10	U
SW6010C	Iron	µg/L	487		115		349		222		239		50	U
SW6010C	Lead	µg/L	3	U	3	U	3	U	3	U	3	U	3	U
SW6010C	Manganese	µg/L	37.3		33.1		39.4		70.1		41.5		15.1	
SW6010C	Nickel	µg/L	10	U	10	U	10	U	10	U	10	U	10	U
SW6010C	Zinc	µg/L	10	U	10	U	10	U	10	U	10	U	10	U
SW7470A	Mercury	µg/L	0.12	U	0.12	U	0.12	U	0.12	U	0.12	U	0.12	U
SM2540C	Total Dissolved Solids	mg/L	356		357		397		412		346		436	
SM2540D	Total Suspended Solids	mg/L	4.4		4	U	7.6		4	U	4	U	4	U

Notes:
µg/L= Micrograms per liter
mg/L = Milligrams per liter
FS = Field Sample
FD = Field Duplicate

APPENDIX B

TRANSDUCER CALIBRATION

Initial Transducer Calibration
Conversion of PLC Readout to Water Elevation and Depth to Water

Sampling Location	Measurement Point Elevation (ft msl)	Well Depth (ft bgs)	Measurement Point Reference	8 Dec 16 Manual Depth to Water (ft bTOC)	8 Dec 16 Manually Measured Groundwater Elevation (ft msl)	8 Dec 16 PLC Reading (H20 above transducer in ft)	PLC Reference Point[1]	8 Dec 16 PLC Measured Groundwater Elevation (ft msl)	PLC Measured Depth to Water (ft bTOC)
Bedrock Extraction Wells									
EW-2	255.29	322	TOC	107	148.29	171	-22.71	148.29	107
EW-6	242.94	325	TOC	91	151.94	191	-39.06	151.94	91
EW-7	251.64	227	TOC	185	66.64	12	54.64	66.64	185
EW-9	236.21	365	TOC	91	145.21	213	-67.79	145.21	91
EW-16	248.16	417	TOC	143	105.16	11	94.16	105.16	143
Overburden Extraction Wells									
OW-2	257.03	30	TOC	15	242.03	5	237.03	242.03	15
OW-3	256.81	25	TOC	13.8	243.01	NA	NA	NA	NA
OW-5	258.2	30	TOC	10	248.2	10	238.2	248.2	10
OW-7	254.57	25	TOC	20.31	234.26	NA	NA	NA	NA
OW-13	259.95	29.5	TOC	8	251.95	12	239.95	251.95	8
OW-14	261.24	30	TOC	14	247.24	7	240.24	247.24	14
OW-16	259.81	30	TOC	16	243.81	4	239.81	243.81	16

[1]PCL Reference Point = Manually Measured GW Elevation - PLC Reading

APPENDIX C

TIME-SERIES PLOTS OF KEY WELLS

Appendix C: Time-Series Graphs