2014 SOURCE CONTROL SUMMARY FOR THE ONONDAGA LAKE BOTTOM SUBSITE
Syracuse, New York

Prepared For:

Honeywell

301 Plainfield Road, Suite 330
Syracuse, New York 13212

Prepared By:

PARSONS

301 Plainfield Road, Suite 350
Syracuse, New York 13212

In association with

O'BRIEN & GERE

OCTOBER 2014

OVERVIEW

As documented in the Onondaga Lake Record of Decision (NYSDEC, 2005), the remediation of Onondaga Lake is being coordinated with upland remedial activities. This report provides a summary of the lake capping and dredging activities anticipated to be performed in 2014, and documents that potential sources of recontamination to the 2014 remediation areas that are controlled by Honeywell have been addressed.

The schedule goal for the lake remediation is to complete dredging to the extent practical in four years (beginning in 2012), and capping in five years (beginning 2012). A sequencing plan for the dredging and capping activities was developed by the design team with input from the remediation contractor, as detailed in the Onondaga Lake Capping, Dredging, Habitat and Profundal Zone (SMU 8) Final Design (Parsons, 2012). Based on this sequencing plan and subsequent updates, capping and dredging activities are anticipated to be underway in all Remediation Areas (A, B, C, D, and E) by the end of 2014, as shown in Figure 1 and 2.

As documented in the *2012 and 2013 Source Control Summary for the Onondaga Lake Bottom Subsite* (Parsons, 2013), mitigation of the following potential sources has been demonstrated:

- Area Groundwater associated with the Semet, Willis and West Wall hydraulic containment systems
- Tributary 5A
- I-690 Storm Drain System
- Upper Harbor Brook
- East Flume

Honeywell-controlled sources addressed in this report include:

- Area Groundwater associated with the East Wall hydraulic containment system – Attachment A
- LCP, Geddes Brook, and Ninemile Creek – Attachment B
- Wastebed 1-8 and Ditch A – Attachment C
- Tributary 5a – Attachment D
- Upper Harbor Brook – Attachment E

As detailed in Attachments A and B, remedial activities associated with the Semet, Willis, West Wall, and East Wall hydraulic control systems; LCP; Geddes Brook; and Ninemile Creek have been sufficiently completed, consistent with NYSDEC-approved designs, such that the potential for lake recontamination from these sources has been mitigated. Attachment A also contains an update to the information presented in the 2012 and 2013 source control report

documenting ongoing hydraulic control of area groundwater associated with the Semet, Willis and West Wall hydraulic containment systems. As discussed in Appendix C, start up and demonstration of hydraulic containment by the Wastebed 1-8 hydraulic control trenches is ongoing. Therefore, cap placement in areas adjacent to the hydraulic control trenches will not be initiated until it has been demonstrated that the relevent collection system is able to achieve hydraulic control. Similarly, remediation of Ditch A is ongoing. Therefore, cap placement in the area of the lake impacted by Ditch A will not be initiated until Ditch A remediation is sufficiently complete to prevent recontamination. As discussed in Appendix D, initial groundwater collection system performance verification data demonstrate hydraulic control for Tributary 5A, therefore the potential for lake recontamination from this source has been mitigated. As discussed in Appendix E, groundwater elevations in the collection trenches have been maintained below the surface water elevation in the adjacent open water area, along upper Harbor Brook. Therefore the potential for lake recontamination from this source has been mitigated.

REFERENCES

New York State Department of Environmental Conservation and United States Environmental Protection Agency Region 2. 2005. *Record of Decision. Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site*. July 2005.

Parsons 2013. 2012 and 2013 Source Control Summary for the Onondaga Lake Bottom Subsite. Prepared for Honeywell Inc., December 2013.

ATTACHMENT A

AREA GROUNDWATER

WILLIS AVENUE/SEMET TAR BEDS SITES IRM & WASTEBED B / HARBOR BROOK IRM HYDRAULIC BARRIER WALL AND GROUNDWATER COLLECTION SYSTEMS

Area groundwater has been addressed through construction of the Willis Avenue/Semet Tar Beds Sites (Willis/Semet) IRM and the Wastebed B/Harbor Brook IRM hydraulic control systems. These systems, each of which includes a sheet pile barrier wall and a groundwater collection system, were constructed in three phases beginning in 2006 and finishing in 2012. The systems were designed and constructed to eliminate, to the extent practicable, the discharge of contaminated groundwater and non-aqueous phase liquids (NAPL) to Onondaga Lake from the Southwest Shoreline area of Onondaga Lake (Figures 1 and 2). As detailed below, these systems were constructed consistent with the NYSDEC-approved designs. They prevent the discharge of contaminated groundwater and NAPL to the lake from this area, and have addressed the potential for groundwater upwelling to impact the Onondaga Lake sediment cap consistent with the cap design assumptions for this area.

In addition to the IRMs discussed below, dense non-aqueous-phase liquid (DNAPL) collection was initiated along the lakeshore in 1993. The system was expanded to include additional collection wells in 1995 and 2002. In 2012, the system was again expanded and the entire system upgraded and optimized. To date, over 50,000 gallons of DNAPL have been recovered and transported off-site for disposal/incineration.

Construction of the IRMs included the following elements:

- Grading, as required, to establish a work platform to allow for implementation of the IRMs
- Installation of a sealed interlock sheet pile barrier wall along the lakeshore to prevent migration of contaminated groundwater and NAPL to Onondaga Lake
- Installation of a shallow (bottom elevation of 358 ft. (NAVD 88)) groundwater collection trench with wick drains to work in conjunction with the barrier wall to prevent the discharge of contaminated groundwater and NAPL to Onondaga Lake from the shallow and intermediate depth hydrogeologic units
- Backfilling, as required, behind the barrier wall to establish required grades
- Removal/abandonment of defunct utilities in conflict with the barrier wall/trench alignment

- Realignment of the Harbor Brook channel
- Pumping collected groundwater to the Willis Avenue Groundwater Treatment Plant (GWTP) for treatment

The hydraulic control systems were constructed from west to east beginning in the vicinity of Tributary 5A and extended to the area adjacent to the CSX rail line east of Harbor Brook. The construction was completed in the following phases (Figure 1):

- Phase 1 (Semet) – Installation of 1,288 linear feet of barrier wall and groundwater collection system from October 2006 to May 2007.
- Phase 2 (Willis) – Installation of 1,612 linear feet of barrier wall and groundwater collection system, placement of approximately 43,000 cy of light-weight aggregate behind the barrier wall, abandonment of existing 72 inches and 84 inches diameter Allied intake pipelines from the barrier wall alignment to the shoreline, installation of an HDPE liner system along portions of the barrier wall subject to flooding during high lake water events, and installation of a tie-back anchorage system to mitigate deflection of the barrier wall in areas with deep water present outboard of the wall from August 2008 to May 2012.
- Phase 3 (Wastebed B/Harbor Brook East and West)– Construction of a work platform, installation of a total of 4,678 linear feet of barrier wall and a groundwater collection system (1,630 ft. for the East Wall and 3,048 ft. for the West Wall), realignment of the lower reach of Harbor Brook, and replacement of the lower Harbor Brook culvert were completed from December 2009 to March 2012.

HYDRAULIC BARRIER/GROUNDWATER COLLECTION SYSTEM DESCRIPTION

The barrier walls were completed consistent with the design and prevent the discharge of contaminated groundwater and NAPL to the lake from this area by creating an inward groundwater gradient. The hydraulic barrier wall is constructed of coated steel sheet piling. Every other interlock was factory seal welded to reduce the number of joints and minimize the potential for interruptions in the hydraulic barrier. Interlocks that are not seal welded were sealed with a hydrophilic material that swells 200 percent when in contact with water. All seal welds and interlocks were inspected by quality control technicians prior to installation. Sheet piling was installed a minimum of 3 ft. into a clay layer present across the site at depths ranging from 35 to 70 ft. below grade.

The groundwater collection system was installed up-gradient of the wall to collect groundwater captured behind the barrier wall. The collection system consists of the following components:

- 6-inch diameter perforated collection pipe installed at elevation 358.00 ft. (NAVD 88) in a trench backfilled with granular material
- Wick drains to transmit intermediate depth groundwater to the collection piping
- Groundwater conveyance piping
- Groundwater pump stations
- Shallow piezometers for monitoring groundwater levels adjacent to the collection trench

All groundwater collected by the system is pumped from the groundwater pump stations through the conveyance piping to the "Lakeshore Pump Station" and then to the Honeywell Willis-Semet GWTP where it is treated prior to discharge.

Based on the containment of groundwater provided by the system as described above, concerns related to potential recontamination of the cap have been addressed.

SYSTEM OPERATION

The groundwater collection system was activated as the respective phases of construction were completed. A description of the system operational status for each phase is provided below.

Phase 1 (Semet): Construction/activation of collection system was completed May 2007. Operation details from startup through November 2013 are provided in the final 2012 and 2013 source control report. The system has operated continuously since then except for intermittent shutdown between 3/3/14 and 3/10/14 due to required vault repairs.

Phase 2 (Willis): Construction/activation of the collection system was completed November 2009. Operation details from startup through November 2013 are provided in the final 2012 and 2013 source control report. The system has operated continuously since then except for intermittent shutdown between 3/3/14 and 3/10/14 due to required vault repairs.

Phase 3: (Wastebed B/Harbor Brook): Construction/activation of the West Wall collection system was completed August 2011. Operation details from startup through November 2013 are provided in the final 2012 and 2013 source control report. The system has operated continuously since then except for intermittent shutdown between 3/3/14 and 3/10/14 due to required vault repairs. Construction/activation of the East Wall collection system was completed July 2012. The East Wall monitoring system (i.e., recording of data) became operational in August 2013 as a result of delays from difficulties with system data

loggers. The system has operated continuously since then except for intermittent shutdown between 3/3/14 and 3/10/14 due to required vault repairs.

SYSTEM PERFORMANCE

Overall system performance is assessed based on groundwater elevations that are monitored in the shallow piezometers and based on the volume of groundwater collected/treated. The design goal is to maintain groundwater levels below lake levels. If discrepancies in the data are noted, they are investigated to determine their significance and if response actions are needed.

The ability to contain groundwater was demonstrated in the 2012 and 2013 source control report for the Semet (Phase I), Willis (Phase II) and West Wall (part of Phase III) portions of the containment system (Parsons 2013). Figures 3, 4 and 5 provide data collected since submittal of the 2012 and 2013 report and shows that containment of groundwater continues. Figure 6 presents groundwater levels collected along the East Wall (Phase III) since startup. All elevations are presented in the NAVD 88 datum. This information demonstrates the ability to contain groundwater behind that section of the wall. As shown on the figures, during normal operating periods all sections of the hydraulic containment system typically demonstrate groundwater levels below lake level, indicating that hydraulic capture and an inward hydraulic gradient are achieved. Occasionally water levels in the collection trench rise above lake level for short periods of time. These short-term increases do not affect the ability of the overall system to maintain an inward gradient and do not pose a concern unless contaminated groundwater from the trench overtops the barrier wall and reaches the lake. The wall has never been overtopped by groundwater, and whenever collection trench water levels are observed rising rapidly or approaching lake levels the cause is investigated and responded to as appropriate. Findings related to collection trench groundwater level increases or atypical piezometer data are shown in Figures 3 through 6:

- Weather event 2/19/14 and 2/23/14. During this timeframe, snowmelt from temperatures ranging from the high 30's to the mid-40's, combined with 0.7 inches of precipitation, resulted in increased trench levels; in some cases a short-term excursion above lake levels. However, in all cases trench groundwater levels remained below corresponding wall elevations.

- A second significant weather event occurred towards the end of March 2014 with additional snowmelt from increasingly warm temperatures and heavy precipitation (almost 1.5 inches of rain within 2 days), resulting in flooding of the lakeshore and lake water overtopping of sections of the west wall and all of the east wall.

- From mid-September through November 2013, Piezometers 18 (PZ-18) and 19 (PZ-19) along the east wall showed periodic times when groundwater was higher than lake levels. This condition was monitored, and in December 2013 through January 2014 PZ-18 and PZ-19 along the east wall showed groundwater elevations consistently above the lake level elevation. System repairs were made including multiple trench lancings from collection sump 6 to collection sump 7 and east, as well as replacement of the pump in collection sump 7. Once repairs to the system were completed at the end of January, groundwater elevations in PZ-18 and PZ-19 declined rapidly.

As detailed above, the containment of groundwater provided by the barrier wall and the groundwater collection system addresses concerns related to potential recontamination of the cap. The ability to contain groundwater and in general maintain an inward gradient, even during periods where external contributions influence groundwater levels, has been demonstrated for all three Phases of the IRM and is expected to continue indefinitely.

ATTACHMENT B

LCP BRIDGE STREET, GEDDES BROOK AND NINEMILE CREEK

LINDEN CHEMICAL AND PLASTICS BRIDGE STREET, GEDDES BROOK AND NINEMILE CREEK

A primary source of mercury to Onondaga Lake was the former Linden Chemical and Plastics (LCP) Bridge Street Operable Unit 1 (OU-1) facility via the West Flume, Geddes Brook and Ninemile Creek (Figure 7). The source area (i.e., LCP), West Flume, Geddes Brook and Ninemile Creek have been sufficiently remediated such that they no longer present a significant source of recontamination to Onondaga Lake.

Remedial construction was completed at LCP OU-1 in 2007. Remedial construction included excavation of approximately 132,600 cy of soil and sediment from site upland and wetland areas, including 22,500 cy from the West Flume. In 2010 and 2011 an additional 25,000 cy were removed from Wetland C. The excavated material was placed in an onsite Final Cover Area, specifically designed to accommodate the LCP-related materials and soil/sediment from downstream areas. Following the excavations, the LCP OU-1 site, including associated wetlands and the West Flume, was restored. Upon receipt of final materials from sources described below, the LCP final cover area will be covered with a 6 NYCRR part 360 equivalent cover in accordance with the ROD.

Removal of contaminated soils and sediments from the Geddes Brook Site were completed in 2011, with restoration activities extending into 2013. Following the removal of contaminated soils and sediments, post-excavation samples were collected and results were approved by the NYSDEC prior to final backfill installation. Remedial construction included excavation of approximately 84,000 cy of soil/sediment from both the Outfall 019 drainage ditch and the Geddes Brook channel, as well as the adjoining floodplains. The excavated material was placed in the LCP Final Cover Area. Following excavations, clean backfill was installed per the approved design and extensive restoration activities were implemented.

Remedial construction activities at Ninemile Creek were initiated in 2012. In general, remedial construction has progressed from upstream to downstream. Over 5,000 feet of the Ninemile Creek channel and adjacent floodplains have been remediated to date. In addition, the SYW-10 forested wetland area has also been excavated and restored. Following the removal of contaminated soils and sediments from both of these areas, either post-excavation sample results, or survey data verifying the design lines and grades had been achieved, were approved by the NYSDEC. Following excavations, clean backfill was installed in accordance with the approved design and extensive restoration activities were implemented to improve the habitat in and adjacent to Ninemile Creek.

The portion of Ninemile Creek channel yet to be remediated does not present a significant recontamination source and therefore remedial capping and dredging can proceed in Remediation Area A, which is the portion of the lake at the mouth of Ninemile Creek. Approximately 1,800 feet of Ninemile Creek remains to be remediated (i.e., station 21+00 to 3+00) and will be completed in 2014. Figure 8 shows this portion of Ninemile Creek and the associated concentration of mercury

remaining in the channel. Adjacent floodplain areas will also be remediated. However, these areas will be remediated in the dry and do not present a significant recontamination risk to Remediation Area A. The vast majority of channel sediments remaining contain mercury concentrations below the Onondaga Lake goal of 2.2 mg/kg; only 4 samples out of 136 exceed the lake cleanup level of 2.2 mg/kg. Dredge residuals are sediments that are dislodged or re-suspended by dredge operations and subsequently re-deposited on the bottom. These are the materials that could be left behind and/or washed downstream into Remediation Area A of Onondaga Lake. As described in USACE 2008, a generally accepted method to estimate the mass and chemical concentrations in residuals is to assume that the residual concentration would be equal to the depth-weighted average concentration of the sediment removed. To apply this method, to the remaining 1,800 feet of Ninemile Creek that will be remediated in 2014, the Creek was broken into 3 subsections with each subsection being approximately 600 ft long. Table 1 illustrates the depth weighted concentration of sediments in each of these three lower Ninemile Creek subsections. The depth-weighted average concentrations for each of the subsections (1.5 mg/kg, 0.29 mg/kg, and 0.55 mg/kg) are below the Onondaga Lake mercury cleanup goal.

As described above, the LCP source area and Geddes Brook/Ninemile Creek corridor has been remediated to a point where remediation activities at the mouth of Ninemile Creek can proceed without unacceptable risk of recontamination. Furthermore, Ninemile Creek remediation will be conducted in accordance with the approved Ninemile Creek Water Quality Management Plan (Parsons, 2012) which includes details on dredging Best Management Practices (BMPs) and silt curtain deployment.

References

Parsons, 2012. *Water Quality Management Plan*. Prepared for Honeywell, Inc. by Parsons, April 2012.

USACE 2008. Technical Guidelines for Environmental Dredging on Contaminated Sediments. Technical Report ERDC/EL TR-08-29. United States Army Corps of Engineers (USACE), Environmental Laboratory, Vicksburg, MS. September 2008.

ATTACHMENT C

WASTEBEDS 1-8 AND DITCH A

WASTEBEDS 1-8 SOURCE CONTROL SUMMARY

This remediation project (Wastebeds 1-8 Integrated IRM) was undertaken to address groundwater influences to Onondaga Lake and Ninemile Creek, as well as sediment migration to Onondaga Lake and Ninemile Creek from Ditch A (**Figure 9**). To achieve these objectives, the project includes hydraulic control of shallow and intermediate groundwater, as well as sediment removal and restoration of Ditch A, as described in the NYSDEC-approved Revised Final Design Report (O'Brien & Gere 2013a). The groundwater hydraulic control systems include Ninemile Creek, Eastern Shoreline, and Remediation Area A, as detailed below.

WB 1-8 Integrated IRM Design Component Construction Status

- Ninemile Creek Hydraulic Control and Seep Collection System
  - Groundwater hydraulic control system construction was completed in September 2013.
  - Seep apron construction was completed in June 2014.
  - Groundwater hydraulic control system start-up (*i.e.,* operational verification; draft O'Brien & Gere 2014) is ongoing and anticipated to be completed in Summer 2014.
- Eastern Shoreline Hydraulic Control and Seep Collection System
  - Groundwater hydraulic control system is anticipated to be completed in July 2014.
  - Seep apron installation is anticipated to be completed in July 2014.
  - Groundwater hydraulic control system start-up (*i.e.,* operational verification; O'Brien & Gere 2013b) is anticipated to begin in Summer 2014.
- Remediation Area A Hydraulic Control System
  - Groundwater hydraulic control system construction was completed in October 2013.
  - During initial start-up activities, passive wells exhibited performance issues that appears to be related to sand pack fouling
  - Installation of an interim pumping system to achieve hydraulic control of the passive wells was completed in June 2014
  - Interim groundwater hydraulic control system start-up (*i.e.,* operational verification; O'Brien & Gere 2013b) is anticipated to be completed in Summer 2014.
- Upper, Middle, and Lower Ditch A Rehabilitation
  - Rehabilitation of Upper Ditch A was completed in June 2013.
  - Excavation of Middle Reach Ditch A was completed in April 2013.
  - Construction of stone check dams in Middle Reach Ditch A was completed in May 2013.
  - Construction of Lower Ditch A is anticipated to be completed in Summer 2014.

Conclusions

Work to address potential groundwater and sediment impacts directly to Onondaga Lake is ongoing. Sequencing of remedial activities within the lake, and how they relate to the Ninemile Creek, Eastern Shoreline, and Remediation Area A hydraulic control systems, and Ditch A rehabilitation, is included in the main body of the Source Control Summary.

REFERENCES

O'Brien & Gere. 2014. *Draft Wastebeds 1-8 Integrated IRM: Ninemile Creek Start-up Plan Interim Summary.* Prepared on behalf of Honeywell International, Inc. Morristown, NJ. March, 2014.

O'Brien & Gere. 2013a. *Integrated IRM, Mitigation Wetlands, and Remediation Area A Hydraulic Control System 100% Design Report Wastebeds 1-8.* Prepared on behalf of Honeywell International, Inc., Morristown, NJ. January, 2013.

O'Brien & Gere. 2013b. *Wastebeds 1-8 Integrated IRM Start-Up Plan.* Prepared on behalf of Honeywell International, Inc., Morristown, NJ. June, 2013.

ATTACHMENT D

TRIBUTARY 5A

This remediation project was undertaken to address groundwater influences to Tributary 5A and Onondaga Lake, as well as sediment migration to Onondaga Lake. To achieve these remedial action objectives, the project included shallow groundwater collection, sediment removal, isolation layer installation, and tributary restoration, as further described in the NYSDEC-approved Construction Completion Report (O'Brien & Gere 2013b).

This summary provides an overview of performance verification activities performed from October 2013 through May 2014. These activities were performed in accordance with the *Monitoring and Verification Plan* (O'Brien & Gere 2013a). 2013 performance verification activities, including data interpretation are also detailed in the *2013 Annual Report* (O'Brien & Gere 2014).

Groundwater elevations were monitored at six total locations, three in Reach 1 (R1CO-1, R1OM-5, and R1CO-12) and three in Reach 2 (R2CO-1, R2OM-1, and R2CO-8). The performance verification data and interpretation are described below.

GROUNDWATER COLLECTION SYSTEM PERFORMANCE VERIFICATION EVALUATION

Groundwater elevation data was compared to the LLDPE textured geomembrane (liner) invert and tributary invert elevations, in accordance with the performance criterion specified in the *Monitoring and Verification Plan* (O'Brien & Gere 2013a). Monitoring locations are shown on **Figure 10**. The liner invert elevation is approximately 18 inches lower than tributary invert elevation due to material (*e.g.*, embankment, stone substrate) placed above the liner. Graphical representation of this comparison is included as **Figures 11 – 16** to this report.

During the surface water elevation monitoring period, the documented maximum fluctuation in surface water elevations was about 0.5 ft. A graph depicting the surface water elevations is **Figure 17** to this report. Staff gage and surface water elevation monitoring data are provided as **Tables 2 - 4.** Average surface water elevations were tabulated to use as a comparison to the groundwater elevations. The average surface water elevations are shown on **Figures 11-16** to this report. Due to the configuration of tributary pool and riffle areas and varying invert elevations of Crucible outfalls, surface water depths vary along the alignment of the tributary.

As part of the corrective actions proposed in the *2013 Annual Report* (O'Brien & Gere 2014), one existing staff gauge was relocated (R1CO-12) and two new staff gauges were installed (R1CO-1 and R1OM-5). The corrective action's objective was to gather more representative surface water elevation data in the vicinity of the Reach 1 monitoring locations. Due to existing conditions within the tributary (*i.e.,* pool and riffle locations), the staff gauge associated with R1OM-5 is located approximately 60-feet downstream. The liner and tributary invert elevations, shown on **Figure 12,** are representative of those elevations at the staff gauge location, not the groundwater monitoring location (R1OM-5). Where new or relocated staff gauges have been installed (R1CO-1, R1OM-5, and R1CO-12), only the most recent surface water data was used to generate the average surface water elevation.

Reach 1

Groundwater elevations along the Reach 1 collection trench alignment fluctuated within a narrow range during the fall and winter months of the monitoring period but generally trended up during the latter half of the monitoring period (February 2014 through May 2014). Groundwater elevation fluctuations may be attributable to the manner in which the pump station operates, rainfall, and snow melt. The pump operates on a variable frequency drive (VFD) but has a minimum pump speed. If groundwater flows to the collection system are less than the minimum pump speed, the pump will run until wet well elevations drop below the pump shut off elevation. The pump will not turn back on until groundwater elevations exceed the pump on set point, at which time the pump will run again until it shuts off.

At the R1CO-1 and R1OM-5 monitoring locations, groundwater elevations were consistently observed to be above the liner elevation. While the groundwater elevations at R1CO-1 were consistently above the liner elevation, they remained below the tributary surface water elevation with the exception of the data spikes noted on **Figure 11**. Groundwater elevations at R1OM-5 were consistently above the liner and surface water elevations (**See Figure 12**); however, visual inspection of the area around R1OM-5 did not indicate that the liner was impacted or floating. Groundwater elevations at the R1CO-12 monitoring location were consistently below

the adjacent tributary and surface water elevations with the exception of the spikes noted on **Figure 13**. These data and visual inspection information demonstrates movement of groundwater to the collection system.

The cause of the data spikes is not known but could be attributable to an input of storm water from leaking pipes (*i.e.*, Crucible outfalls). During the spring, there was also ongoing snow melt, which may have also contributed to the data spikes. Following spikes in groundwater data, the groundwater elevations decreased and returned to elevations below the tributary surface water at R1CO-12. The data and visual inspection at R1OM-5 and R1CO-1 indicate that there is not a direct connection to the tributary (*i.e.*, major liner system failure). The cause of the general upward trend in groundwater elevations is likely attributable to blockages (*e.g.,* sedimentation, slots clogged or fouled) within the collection pipe.

The data collected demonstrates spikes in groundwater and an increasing trend in groundwater elevations in Reach 1 that exceed the performance verification criterion; however, the installed liner provides a redundant measure to minimize the potential of impacted groundwater reaching Onondaga Lake. Based on field observations and a comparison of groundwater elevations versus tributary surface water elevations, the liner appears to be intact and functioning as intended.

Proposed corrective actions to address the increasing groundwater elevations and data spikes are discussed in the *2013 Annual Report* (O'Brien & Gere 2014). Based on this evaluation, there is a short-term need to address groundwater conditions in Reach 1. Coordination with the Operations and Maintenance Contractor and property owners (*e.g.,* Crucible, CSX) to clean the Reach 1 collection system is ongoing.

Reach 2

Groundwater elevations along the Reach 2 collection trench alignment remained relatively stable during the monitoring period. Spikes in groundwater elevations that exceeded the tributary invert and surface water elevations were observed but returned to relatively stable conditions below the tributary invert and surface water elevations.

At the R2CO-1 monitoring location, groundwater elevations were consistently below the liner elevation; however, beginning in March 2014, numerous data spikes were observed at R2CO-1 that exceeded the tributary invert and surface water elevations (see **Figure 14**), but returned to relatively static conditions below the liner and surface water. At the R2CO-8 monitoring location, groundwater elevations were consistently below the liner elevation, with the exception of the data spikes noted on **Figure 16**. Groundwater elevations at R2OM-1 were consistently above the liner elevation but below the tributary invert elevation, with the exception of the data spikes noted on **Figure 15**. This data demonstrates movement of the groundwater to the collection system.

The cause of these data spikes is not known but may be attributable to storm water from leaking pipes (*i.e.,* Crucible outfalls) or flow restriction due to blockages (*e.g*., sedimentation, slots clogged or fouled) within the collection pipe. During this time, there was also ongoing snow melt that may have contributed to the data spikes. Following spikes in groundwater data, the groundwater elevations decreased and returned to elevations below the tributary surface water. This data trend indicates that there is not a direct connection to the tributary (*i.e.*, major liner system failure).

Additionally, water was observed to be overflowing from a manhole on the 42-inch sanitary sewer, located in the southern end of Reach 2, which may have provided a direct input of water to the collection system as the liner adjacent to the manhole is was exposed. The observations directly coincide with rainfall events on March 30, 2014 and May 16, 2014.

The data collected demonstrates spikes in groundwater that exceed the performance verification criterion; however, the installed liner provides a redundant measure to minimize the potential of impacted groundwater reaching Onondaga Lake. Based on field observations and a comparison of groundwater elevations versus tributary surface water elevations, the liner appears to be intact and functioning as intended, with the exception of the exposed liner referenced above.

The Reach 2 groundwater collection pipe was cleaned on May 14, 2014 using high-pressure flushing methods to remove accumulated sediment and fouling of the collection pipe slots. Several sediment blockages were encountered during cleaning, specifically in the portion of the collection pipe installed within the Reach 2 tributary limits. An immediate response in the form of increased pump speed and pump runtime was observed.

Following cleaning of the collection system, after a period of approximately five days, the groundwater elevations reached a relatively static elevation. Review of groundwater and operational data is ongoing and additional corrective actions will be implemented, as necessary.

REFERENCES

O'Brien & Gere. 2013a. *Monitoring and Verification Plan*. Semet Residue Ponds Remedial Design Groundwater Remedial Alternative, Geddes, New York. Prepared for Honeywell, Morristown, NJ. November 2013.

O'Brien & Gere. 2013b. *Construction Completion Report*. Semet Residue Ponds Remedial Design Groundwater Remedial Alternative, Geddes, New York. Prepared for Honeywell, Morristown, NJ. December 2013.

O'Brien & Gere. 2014. *2013 Annual Report*. Semet Residue Ponds Remedial Design Groundwater Remedial Alternative, Geddes, New York. Prepared for Honeywell, Morristown, NJ. February 2014.

ATTACHMENT E

UPPER HARBOR BROOK

This remediation project was undertaken to address groundwater influences to Upper Harbor Brook and Onondaga Lake as well as impacted sediment migration to Onondaga Lake. To achieve these remedial action objectives, the project included a shallow groundwater collection system and treatment at the Willis GWTP, sediment removal, isolation layer installation, sealing of leaks in the culverts, and ditch/stream/wetland restoration, as further described in the NYSDEC-approved Upper Harbor Brook IRM Final Design Report O'Brien Gere, 2012).

In 2014, initial performance verification and monitoring was initiated, which included initial performance verification activities and data interpretation. These activities were performed in accordance with the draft Plan (O'Brien & Gere 2014), which was submitted to NYSDEC for review. The groundwater elevations in the collection trenches have generally been maintained below the surface water elevation in Harbor Brook since January 2014, which is further described below:

As described in the Plan, the performance criterion for the Upper Harbor Brook groundwater collection systems is that the groundwater elevations in the collection trenches are maintained below the surface water elevation in Harbor Brook. The method and location of obtaining the surface water elevation will be detailed in the Plan. However, in the interim, the U.S. Geologic Survey (USGS) Onondaga Lake at Liverpool, New York gage station will be used to obtain surface water elevation data.

Groundwater elevations in the two groundwater collection trenches (Harbor Brook -1 and -2 Collection Trench) are collected manually from four observation ports (See **Figure 18**). In the summer of 2014, automatic data loggers will be installed to monitor the groundwater elevations in the collection trenches.

For the initial performance verification evaluation, various set points were selected for the pumps in the groundwater collection wet wells to evaluate groundwater elevations in the collection trench. Based on the initial evaluation, set points were selected on April 29, 2014 with an operational goal to maintain groundwater elevations in the collection trenches at approximately the top of the substrate in OW-3 (361.6) for Harbor Brook –1 Collection Trench and OW-1 (360.9) for Harbor Brook -2 Collection Trench 2. Graphs depicting the surface water elevations, groundwater elevations, and open water channel invert elevations for the Harbor Brook -1 and -2 Collection Trenches are provided as **Figure 19**.

As shown on the graphs, the groundwater elevations in the collection trenches have been maintained generally below the surface water elevation in Harbor Brook since January 2014.

REFERENCES

O'Brien & Gere. 2012. Upper Harbor Brook IRM Final Design Report. Upper Harbor Brook, Geddes, New York. Prepared for Honeywell, Morristown, NJ. March 2014.

O'Brien & Gere. 2014. *Performance Verification and Monitoring Plan*. Upper Harbor Brook, Geddes, New York. Prepared for Honeywell, Morristown, NJ. April 2014.

FIGURES

Note: Not to scale. Locations approximate.

Area where remediation is anticipated to be in progress or completed by end of 2014

FIGURE 1

Honeywell

Onondaga Lake 2014

Remediation Areas: RA-C, RA-D and RA-E

PARSONS

301 Plainfield Road, Suite 350, Syracuse, NY 13212

Area where remediation is anticipated to be in progress or completed by end of 2014

Note: Not to scale. Locations approximate.

FIGURE 2

Honeywell

Onondaga Lake 2014

Remediation Areas: RA-A and RA-B

PARSONS

301 Plainfield Road, Suite 350, Syracuse, NY 13212

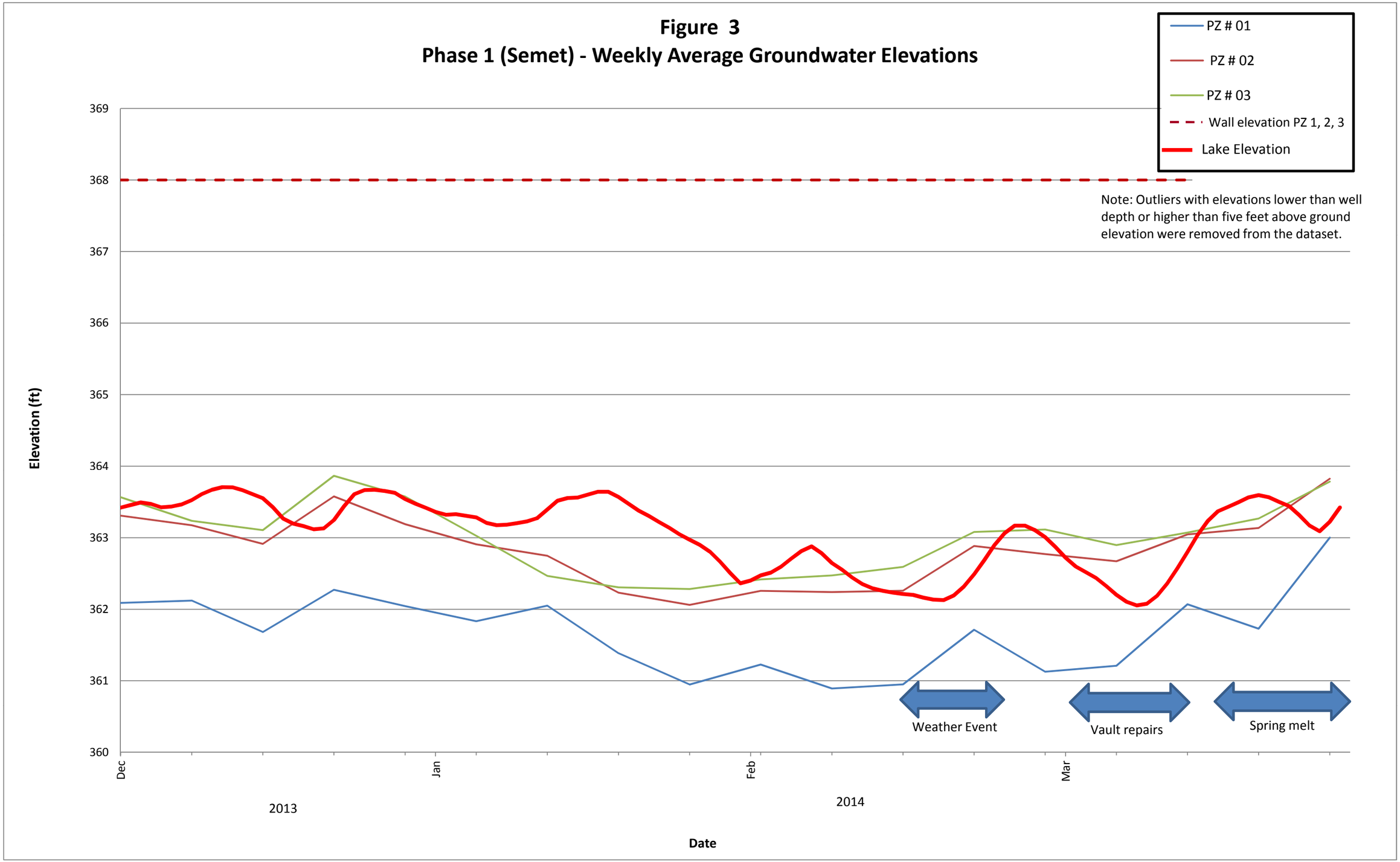


Figure 3
Phase 1 (Semet) - Weekly Average Groundwater Elevations
PZ # 01
PZ # 02
PZ # 03
Wall elevation PZ 1, 2, 3
Lake Elevation
Note: Outliers with elevations lower than well depth or higher than five feet above ground elevation were removed from the dataset.
Elevation (ft)
369
368
367
366
365
364
363
362
361
360
Weather Event
Vault repairs
Spring melt
Dec
Jan
Feb
Mar
2013
2014
Date

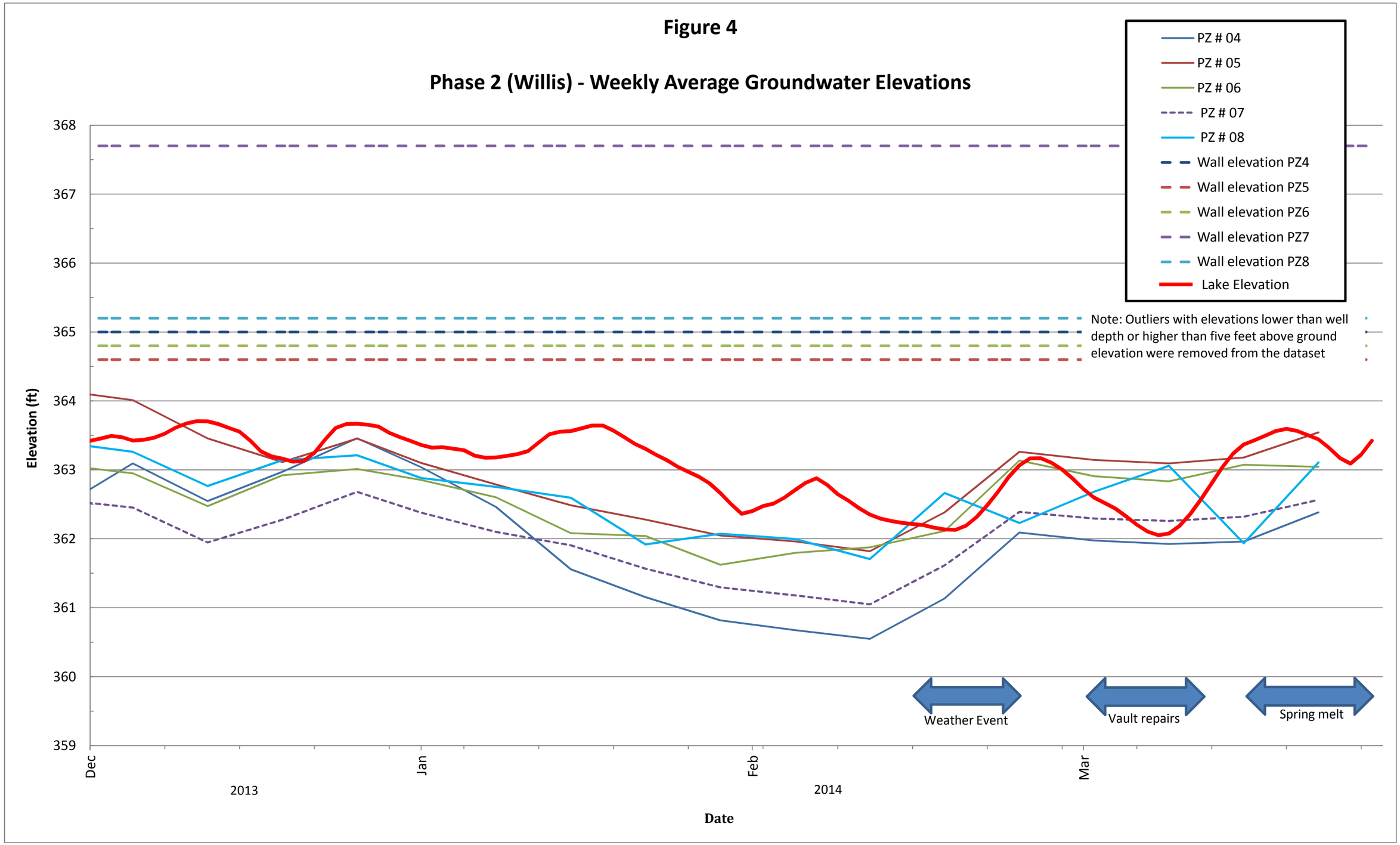


Figure 4
Phase 2 (Willis) - Weekly Average Groundwater Elevations
PZ # 04
PZ # 05
PZ # 06
PZ # 07
PZ # 08
Wall elevation PZ4
Wall elevation PZ5
Wall elevation PZ6
Wall elevation PZ7
Wall elevation PZ8
Lake Elevation
Note: Outliers with elevations lower than well depth or higher than five feet above ground elevation were removed from the dataset
Elevation (ft)
368
367
366
365
364
363
362
361
360
359
Weather Event
Vault repairs
Spring melt
Dec
Jan
Feb
Mar
2013
2014
Date

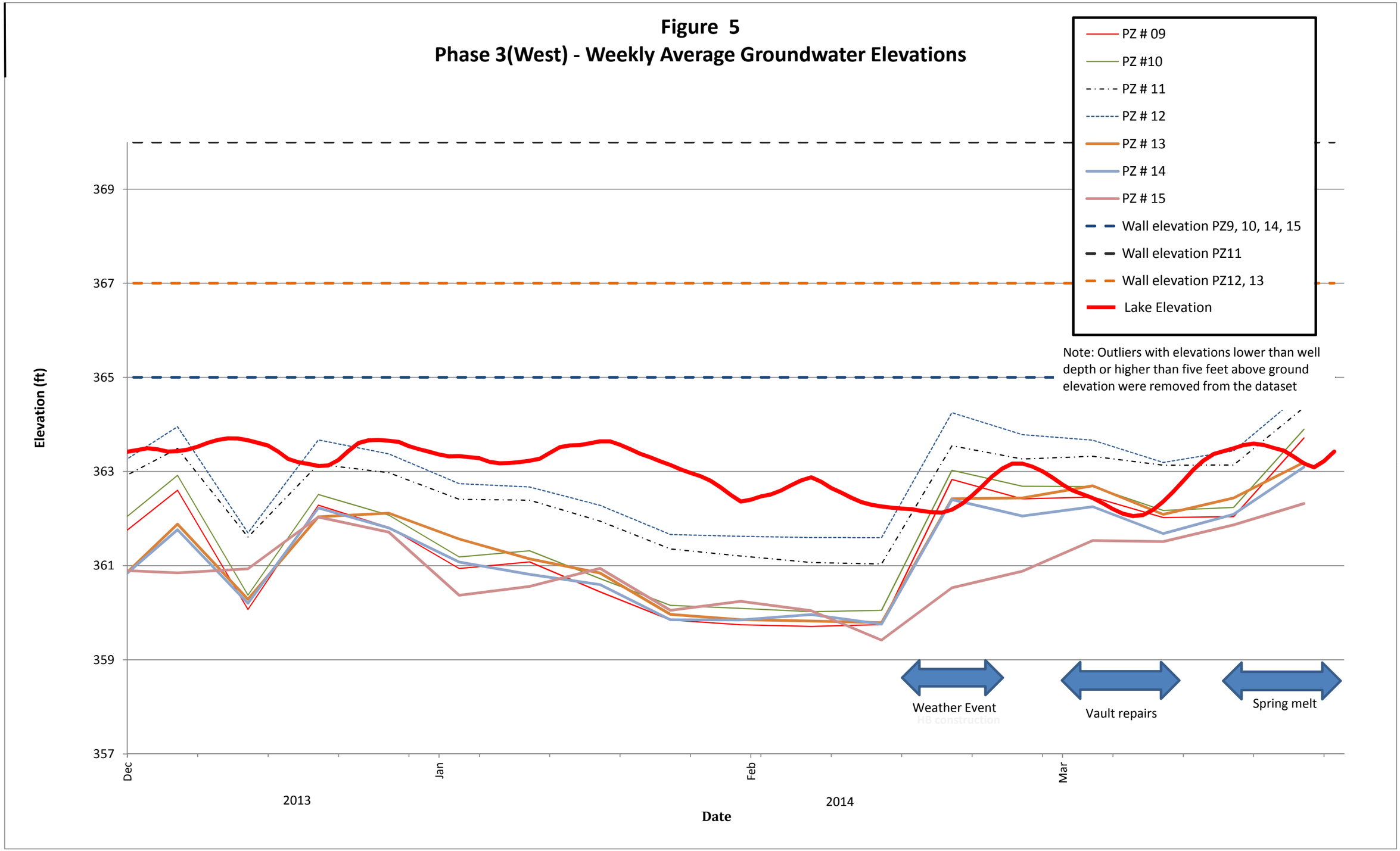


Figure 5
Phase 3(West) - Weekly Average Groundwater Elevations
PZ # 09
PZ #10
PZ # 11
PZ # 12
PZ # 13
PZ # 14
PZ # 15
Wall elevation PZ9, 10, 14, 15
Wall elevation PZ11
Wall elevation PZ12, 13
Lake Elevation
Note: Outliers with elevations lower than well depth or higher than five feet above ground elevation were removed from the dataset
Elevation (ft)
369
367
365
363
361
359
357
Dec
Jan
Feb
Mar
2013
2014
Date
Weather Event
Vault repairs
Spring melt

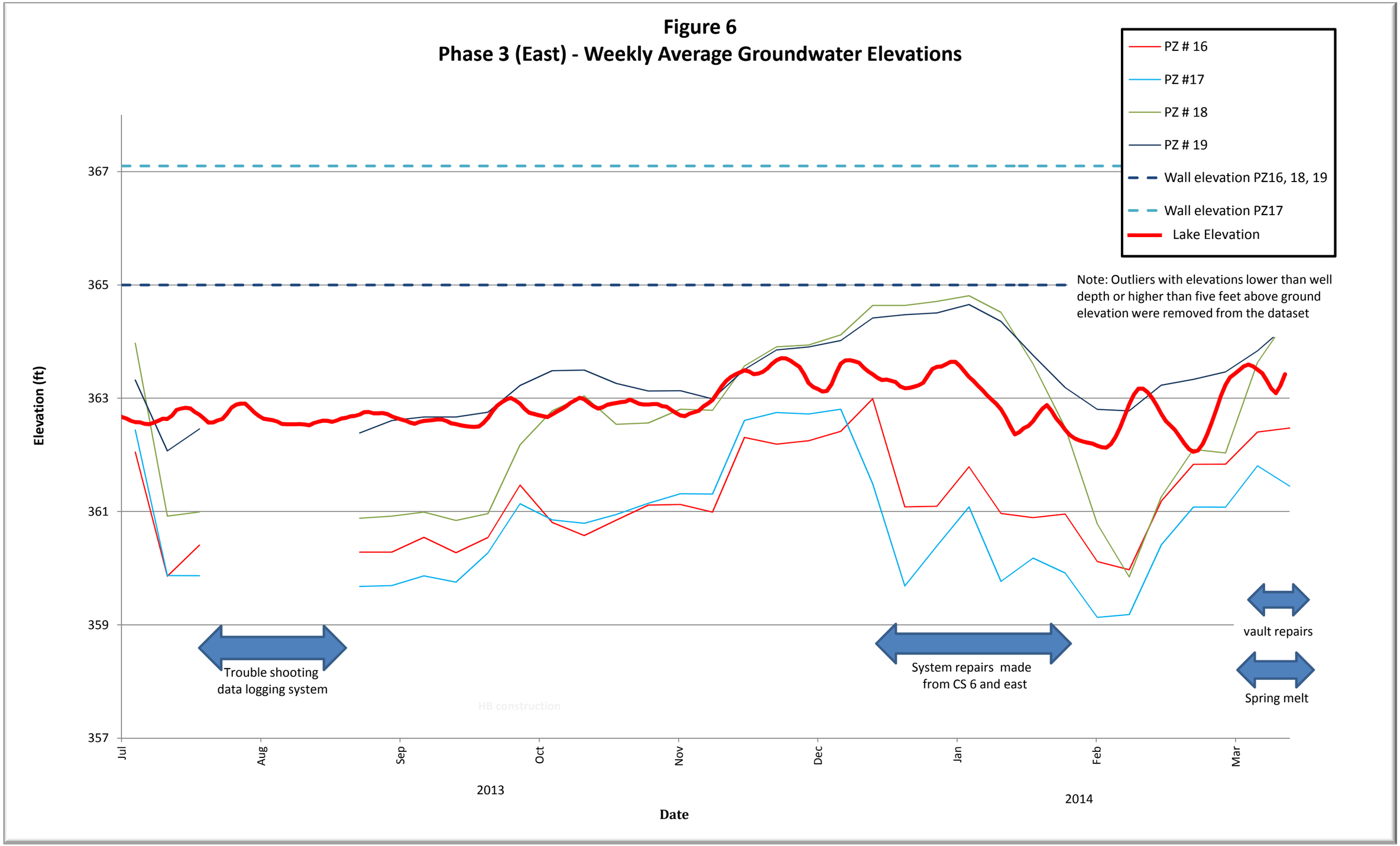


Figure 6
Phase 3 (East) - Weekly Average Groundwater Elevations
PZ # 16
PZ #17
PZ # 18
PZ # 19
Wall elevation PZ16, 18, 19
Wall elevation PZ17
Lake Elevation
Note: Outliers with elevations lower than well depth or higher than five feet above ground elevation were removed from the dataset
Elevation (ft)
367
365
363
361
359
357
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
2013
2014
Date
Trouble shooting data logging system
System repairs made from CS 6 and east
vault repairs
Spring melt

800 400 0 800 1600

SCALE: 1"=800'

FIGURE 7

Honeywell

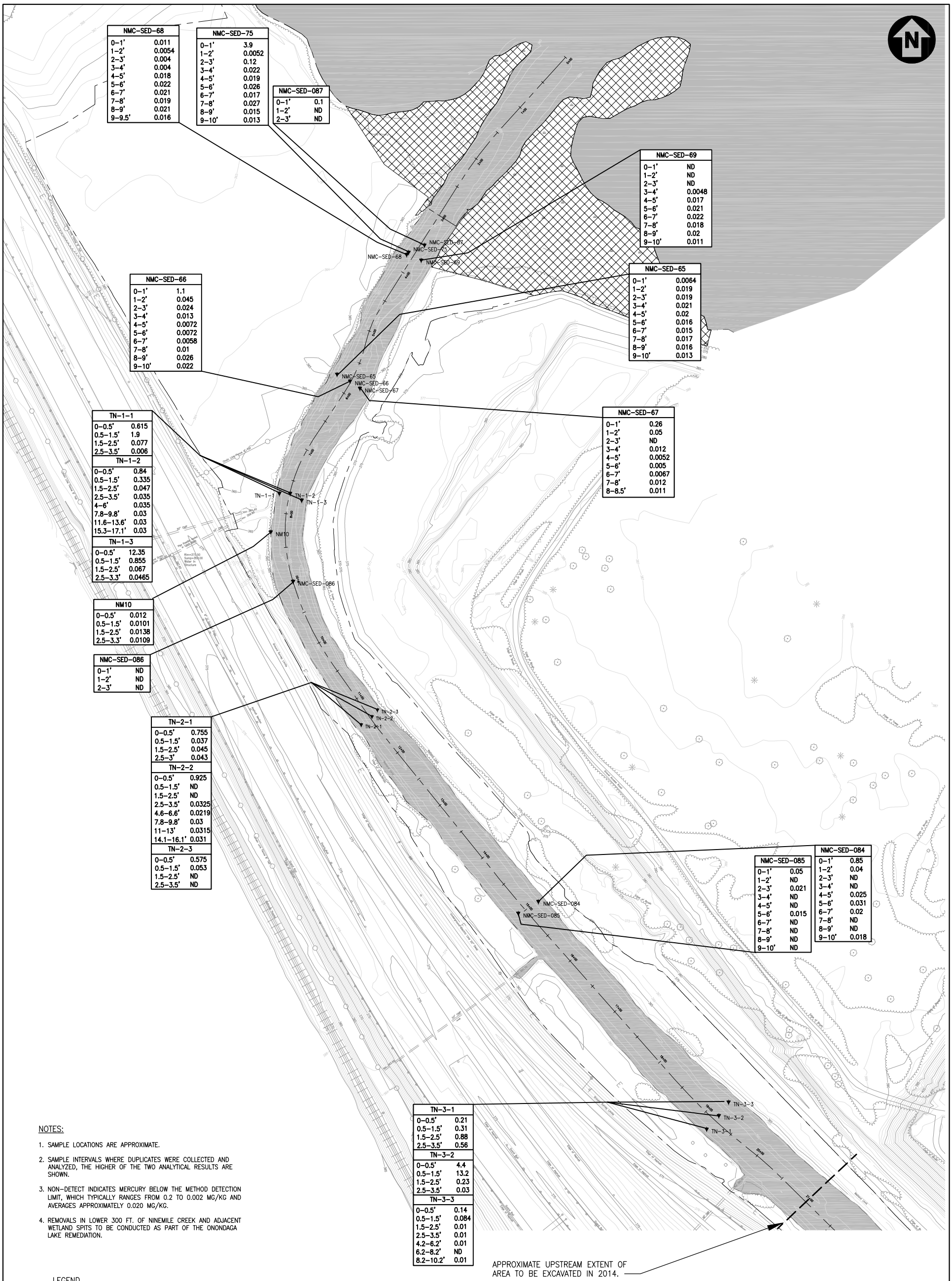
NINEMILE CREEK
SOLVAY, NEW YORK

AREA OVERVIEW
LINDEN CHEMICAL & PLASTICS, GEDDES BROOK, NINEMILE CREEK

PARSONS

301 PLAINFIELD ROAD * SUITE 350 * SYRACUSE, NY 13212 * 315/451-9560
OFFICES IN PRINCIPAL CITIES

FILE NAME: P:\HONEYWELL -SYR\446929 - NMC PRE-BILL MATERIAL & REACH CD CONSTRUCTION\10.0 TECHNICAL CATEGORIES\CAD\FIGURES\446929-SITE.DWG
PLOT DATE: 5/12/2014 11:11 AM PLOTTED BY: RUSSO, JILL



NMC-SED-68	
0–1'	0.011
1–2'	0.0054
2–3'	0.004
3–4'	0.004
4–5'	0.018
5–6'	0.022
6–7'	0.021
7–8'	0.019
8–9'	0.021
9–9.5'	0.016

NMC-SED-75	
0–1'	3.9
1–2'	0.0052
2–3'	0.12
3–4'	0.022
4–5'	0.019
5–6'	0.026
6–7'	0.017
7–8'	0.027
8–9'	0.015
9–10'	0.013

NMC-SED-087	
0–1'	0.1
1–2'	ND
2–3'	ND

NMC-SED-69	
0–1'	ND
1–2'	ND
2–3'	ND
3–4'	0.0048
4–5'	0.017
5–6'	0.021
6–7'	0.022
7–8'	0.018
8–9'	0.02
9–10'	0.011

NMC-SED-66	
0–1'	1.1
1–2'	0.045
2–3'	0.024
3–4'	0.013
4–5'	0.0072
5–6'	0.0072
6–7'	0.0058
7–8'	0.01
8–9'	0.026
9–10'	0.022

NMC-SED-65	
0–1'	0.0064
1–2'	0.019
2–3'	0.019
3–4'	0.021
4–5'	0.02
5–6'	0.016
6–7'	0.015
7–8'	0.017
8–9'	0.016
9–10'	0.013

NMC-SED-67	
0–1'	0.26
1–2'	0.05
2–3'	ND
3–4'	0.012
4–5'	0.0052
5–6'	0.005
6–7'	0.0067
7–8'	0.012
8–8.5'	0.011

TN-1-1	
0–0.5'	0.615
0.5–1.5'	1.9
1.5–2.5'	0.077
2.5–3.5'	0.006

TN-1-2	
0–0.5'	0.84
0.5–1.5'	0.335
1.5–2.5'	0.047
2.5–3.5'	0.035
4–6'	0.035
7.8–9.8'	0.03
11.6–13.6'	0.03
15.3–17.1'	0.03

TN-1-3	
0–0.5'	12.35
0.5–1.5'	0.855
1.5–2.5'	0.067
2.5–3.3'	0.0465

NM10	
0–0.5'	0.012
0.5–1.5'	0.0101
1.5–2.5'	0.0138
2.5–3.3'	0.0109

NMC-SED-086	
0–1'	ND
1–2'	ND
2–3'	ND

TN-2-1	
0–0.5'	0.755
0.5–1.5'	0.037
1.5–2.5'	0.045
2.5–3'	0.043

TN-2-2	
0–0.5'	0.925
0.5–1.5'	ND
1.5–2.5'	ND
2.5–3.5'	0.0325
4.6–6.6'	0.0219
7.8–9.8'	0.03
11–13'	0.0315
14.1–16.1'	0.031

TN-2-3	
0–0.5'	0.575
0.5–1.5'	0.053
1.5–2.5'	ND
2.5–3.5'	ND

NMC-SED-085	
0–1'	0.05
1–2'	ND
2–3'	0.021
3–4'	ND
4–5'	ND
5–6'	0.015
6–7'	ND
7–8'	ND
8–9'	ND
9–10'	ND

NMC-SED-084	
0–1'	0.85
1–2'	0.04
2–3'	ND
3–4'	ND
4–5'	0.025
5–6'	0.031
6–7'	0.02
7–8'	ND
8–9'	ND
9–10'	0.018

TN-3-1	
0–0.5'	0.21
0.5–1.5'	0.31
1.5–2.5'	0.88
2.5–3.5'	0.56

TN-3-2	
0–0.5'	4.4
0.5–1.5'	13.2
1.5–2.5'	0.23
2.5–3.5'	0.03

TN-3-3	
0–0.5'	0.14
0.5–1.5'	0.084
1.5–2.5'	0.01
2.5–3.5'	0.01
4.2–6.2'	0.01
6.2–8.2'	ND
8.2–10.2'	0.01

NOTES:

1. SAMPLE LOCATIONS ARE APPROXIMATE.
2. SAMPLE INTERVALS WHERE DUPLICATES WERE COLLECTED AND ANALYZED, THE HIGHER OF THE TWO ANALYTICAL RESULTS ARE SHOWN.
3. NON-DETECT INDICATES MERCURY BELOW THE METHOD DETECTION LIMIT, WHICH TYPICALLY RANGES FROM 0.2 TO 0.002 MG/KG AND AVERAGES APPROXIMATELY 0.020 MG/KG.
4. REMOVALS IN LOWER 300 FT. OF NINEMILE CREEK AND ADJACENT WETLAND SPITS TO BE CONDUCTED AS PART OF THE ONONDAGA LAKE REMEDIATION.

LEGEND

SAMPLE LOCATION	
SAMPLE INTERVAL (FEET BEGS)	TOTAL MERCURY RESULT (MG/KG)

BEGS = BELOW EXISTING GROUND SURFACE

NR = NO RECOVERY

ND = NOT DETECTED

CHANNEL SAMPLE LOCATION

WATER SURFACE

REMEDIAL BOUNDARY

NINEMILE CREEK SPITS

140 70 0 140 280

SCALE: 1"=140'

FIGURE 8

Honeywell

NINEMILE CREEK
SOLVAY, NEW YORK

LOWER REACH AB AREA
CHANNEL SAMPLE LOCATIONS AND
MERCURY RESULTS

PARSONS

301 PLAINFIELD ROAD * SUITE 350 * SYRACUSE, NY 13212 * 315/451-9560
OFFICES IN PRINCIPAL CITIES

FILE NAME: P:\HONEYWELL -SYR\446929 - NMC PRE-BILL MATERIAL & REACH CD CONSTRUCTION\10.0 TECHNICAL CATEGORIES\CAD\FIGURES\446929-REACH AB.DWG
PLOT DATE: 5/12/2014 11:13 AM PLOTTED BY: RUSSO, JILL

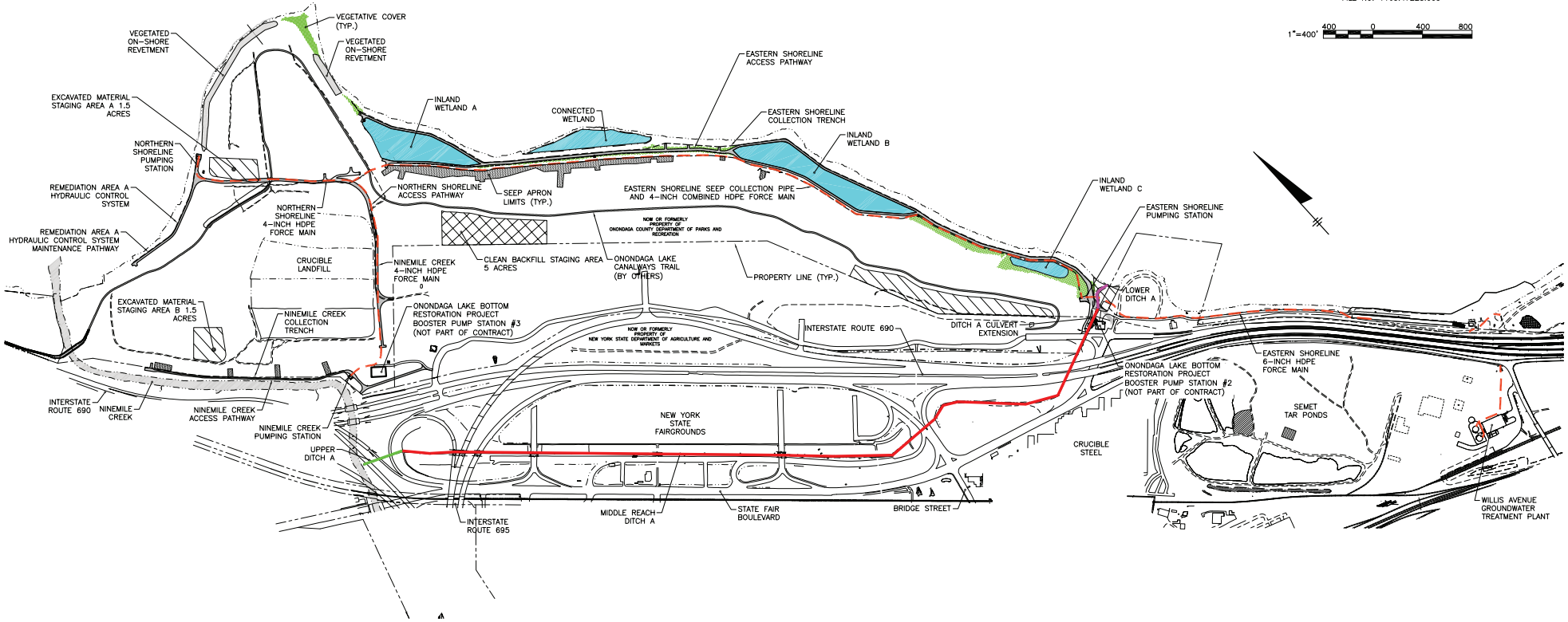
HONEYWELL WASTEBEDS 1–8
INTEGRATED IRM
GEDDES, NEW YORK

SITE PLAN

FIGURE 9

MARCH 2014
FILE NO. 1163.47228.003

1"=400' 400 0 400 800



OVERALL PLAN
SCALE: 1"=400'

O'BRIEN & GERE

2012 © O'Brien & Gere Engineers, Inc.

Mar 25, 2014 – 3:21pm
I:\Honeywell.1163\47228.Wb-1-8-Integrat\Docs\DWG\Sheets\Figures\47228.003-FIG1COLOR_rev.dwg

FIGURE 10

LEGEND

- GROUNDWATER COLLECTION PIPE CLEANOUT
- GROUNDWATER COLLECTION PIPE OBSERVATION MANHOLE
- SURFACE WATER ELEVATION MONITORING POINT
- GROUNDWATER COLLECTION SYSTEM MONITORING LOCATION
- 60" CULVERT
- 72" CULVERT REHABILITATION
- COLLECTION TRENCH
- TRIBUTARY 5A
- SEMET PONDS

HONEYWELL
TRIBUTARY 5A
GEDDES, NEW YORK

PERFORMANCE VERIFICATION MONITORING LOCATIONS

0 125 250 500
Feet

JUNE 2014
1163.50881

O'BRIEN & GERE

This document was developed in color. Reproduction in B/W may not represent the data as intended.

I:\Honeywell.1163\STDS\GIS\Semet-Willis\MXD\Monitoring Verification\Performance_Verification.mxd

PLOTDATE: 06/30/14 12:09:24 PM stantosa