EA Engineering, P.C.

6712 Brooklawn Parkway
Syracuse, NY 13211
Telephone: 315-431-4610
www.eaest.com

12 October 2015

Mr. Gary Priscott
Engineering Geologist II
Division of Environmental Remediation
New York State Department of Environmental Conservation
1679 NY Route 11
Kirkwood, New York 13795

RE: Work Plan for Remedial System Optimization Investigation
Contract/WA No: D007624-31
Site/Spill No./Pin: Owego Heat Treat (Site No. 754011)

Dear Mr. Priscott:

This letter work plan describes the activities proposed for the remedial system optimization (RSO) investigation at the Owego Heat Treat Site (No. 754011) located in Apalachin, Tioga County New York (Figure 1). EA Engineering, P.C. (EA) will be conducting an RSO investigation to collect sufficient data to evaluate RSO options that would be effective in aiding remedial efforts, and reducing remedial timeframes that are consistent with New York State Department of Environmental Conservation (NYSDEC) Standards, Criteria, and Guidance and the existing Record of Decision (ROD)[1]. Specifically the objectives of the RSO investigation are as follows:

- Evaluate/confirm the extent of volatile organic compound (VOC) contamination in groundwater
- Further delineate and refine the extent of subsurface soil impacts
- Define *in-situ* soil characteristics using geotechnical data
- Evaluate potential sediment impacts within the drainage swale that received discharge during historical processing operations
- Assess the potential of monitored natural attenuation using general chemistry and compound specific isotope data from a number of groundwater sampling depths.

Field sampling activities will be conducted in accordance with EA's Generic Field Activities Plan[2], Quality Assurance Project Plan[3], and Health and Safety Plan[4].

1 NYSDEC. 1994. Owego Heat Treat Inactive Hazardous Waste Site ROD. Site No. 7-54-011. March.
2 EA. 2011a. Generic Field Activities Plan for Work Assignments under NYSDEC Contract D007624. April.
3 EA. 2011c. Generic QAPP for Work Assignments under NYSDEC Contract D007624. October.
4 EA. 2011b. Generic HASP for Work Assignments under NYSDEC Contract D007624. October.

The following activities will be completed as part of the RSO investigation (Attachment A—Project Schedule):

- Drilling and installation of continuous multichannel tubing (CMT) wells
- Advancement of soil borings
- Groundwater sampling
- Subsurface soil sampling
- Sediment sampling
- Laboratory analysis
- Data validation
- Site surveying.

SITE DESCRIPTION

The subject site is located at 1646 Marshland Road in the town of Apalachin, Tioga County, New York (Figure 1). The site occupies approximately 37 acres and is bisected by Marshland Road. The property is bounded to the north by the Susquehanna River, to the east by a golf course, to the south by New York State Route 17, and to the west by a mix of residential and agricultural land. The northern portion of the site is primarily vacant with one residential structure immediately north of Marshland Road (Figure 2). Three primary structures are present on the southern portion of the site, and include one residential structure and two buildings (Building-1 and Building-5) formerly associated with historical heat treating operations. The footprints of former Buildings-4 and -6, also associated with historical heat treating operations, are present to the south. Building-2, which housed degreasing tanks used to clean metallic parts after cooling via oil quenching, was located between Buildings-1 and -4. Its footprint is no longer visible at the site. Farther to the south of Marshland Road, the site is undeveloped, and a 2-acre pond is present (Figure 3). A drainage swale that begins to the south of Building-5 flows south to the pond and was historically used as a discharge point for process water during heat treating operations.

SITE HISTORY

Heat treating operations were conducted at the site from 1953 to September 2011 when operations were forced to cease due to flooding associated with Tropical Storm Lee. While operational, pre-fabricated metallic parts were heat treated to specific temperatures and then cooled at controlled rates via oil quenching techniques. Subsequent to cooling, the metal parts were immersed in degreasing tanks for cleaning and degreasing. Tetrachloroethene (PCE) was used for the degreasing process until 1992. In 1992, the use of PCE ended, and an alkaline process that used 1,1,1-trichloroethane was adopted. The use of 1,1,1-trichloroethane was gradually phased out and replaced by a citrus-based, environmentally safe, cleaner.

Based on the ROD, during building renovations in December 1987, a strong chemical odor was detected emanating from soils beneath the flooring of Building-2. Upon inspection of the concrete lined pit underlying a PCE tank in the southeast corner of Building-2, standing water was discovered with noticeable contamination (Figure 2). The standing water was pumped into 55-gallon drums for disposal, and soils underlying the pit were excavated and disposed of in accordance with NYSDEC guidance. Confirmatory soil samples collected after excavation revealed that VOC concentrations in remaining soil were less than 0.05 ppm.

Three residential wells were also sampled at that time, and one of the three wells had been impacted by VOC contaminants.

PREVIOUS INVESTIGATIONS

Several phases of field investigation and remedial activities have taken place at the site since contamination was discovered in 1987. Previous investigations and remedial efforts include:

- 1988/1989 – Groundwater and soil vapor sampling
- 1989 – Additional groundwater and soil vapor sampling, electrical resistivity survey
- 1992 – Construction of a groundwater extraction and treatment system (system was operated almost continuously until the 2011 flood event)
- 1994 – Under a consent order from NYSDEC, continue operation of the groundwater treatment system, long-term monitoring of onsite wells, and imposition of a deed restriction prohibiting use of groundwater at the site as potable water
- 2006 – Soil vapor intrusion evaluation and mitigation of four onsite buildings
- 2006 – Demolition of four onsite buildings, two of the buildings had mitigation systems, following flooding caused by heavy rains in the region. Resume heat treating operations and operation of groundwater extraction and treatment system
- 2011 – Discontinue heat treating operations and operation of the groundwater extraction and treatment system due to flooding related to Tropical Storm Lee
- 2013 – Consent order and administrative settlement with NYSDEC in preparation for sale of the property.

Subsequent to the consent order and administrative settlement in 2013, a site characterization (SC) was completed at the site by Aztech Technologies, Inc. (Aztech)[5]. The SC included well top-of-casing and water level surveying, a membrane interface probe (MIP) study, and groundwater sampling at existing wells and MIP borings within the suspected source area. Findings from the SC included the following:

- The suspected source area is located in the area beneath former Building-2, and impacted source soil is present in the depth interval of 10 to 20 feet (ft) below ground surface (bgs).

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5 Aztech. 2013. Site Characterization Report for the Owego Heat Treat Inactive Hazardous Waste Disposal Site. 1646 Marshland Road, Apalachin, Tioga County, New York. November.

- Groundwater PCE concentrations from select MIP boring locations within the suspected source area ranged from 230 micrograms per liter (µg/L) to 390 µg/L.

- PCE concentrations ranged from 2.8 µg/L (MW-7) to 1,100 µg/L (MW-10) in samples collected from existing monitoring wells (Figure 3).

- Groundwater moving through the source area appeared to be undergoing natural attenuation as it continued toward the north (supported by the presence of PCE daughter compounds trichloroethene, dichloroethene, and vinyl chloride). Additionally, the relative percentage of PCE when compared to the total VOC concentration appeared to decline with distance from the source area.

Findings from the SC conducted in 2013 identified data gaps that would need to be addressed in order to evaluate remedial alternatives for the site. As a result, Aztech completed supplemental site characterization (SSC) activities at the site from February to March 2014[6]. Activities completed as part of the SSC included drilling at select locations in and around the suspected source area, soil sampling, installation of temporary monitoring wells, groundwater sampling, infiltration testing, and hydraulic conductivity testing. A summary of select findings from the SSC include the following:

- A layer of glacial till was expected between 30 to 35 ft bgs but was not encountered during the SSC.

- The soil type observed during drilling operations consisted of primarily silt with 10 to 35 percent clay.

- The extent of soil impacted with VOCs in excess of regulatory standards was not defined to the north, west, or south of the suspected source area (Figure 4).

- Historically, the greatest concentrations of dissolved phase total VOCs were detected in MW-2 which is located approximately 50 ft downgradient of the suspected source area (Figure 4). During the SSC the total VOC concentration in MW-2 was 11,515 µg/L.

- Monitoring wells installed within the suspected source area and sampled as part of the SSC revealed total VOC concentrations in groundwater as high as 156,498 µg/L.

- VOC impacted groundwater was identified in excess of groundwater standards in samples obtained from MW-10 (Figure 3) which is located north of Marshland Road, approximately 500 ft downgradient of the suspected source area.

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6 Aztech. 2014. Supplemental Site Characterization Report for the Owego Heat Treat Inactive Hazardous Waste Disposal Site. 1646 Marshland Road, Apalachin, Tioga County, New York. June.

Based on findings from the SSC field investigation, the following recommendations were made by Aztech:

- Impacted soil within the suspected source area are likely the source of dissolved-phase VOCs identified in groundwater. As a result, the Unrestricted Use Soil Cleanup Objective was recommended as the target cleanup criteria for impacted site soil.

- Additional soil borings and soil sampling should be completed to further define the extent of soil contamination in areas to the north and west of the suspected source area.

- Additional monitoring wells should be installed and sampled to define the extent of impacted groundwater.

REMEDIAL SYSTEM OPTIMIZATION INVESTIGATION

The primary focus of the RSO investigation is to collect sufficient data to evaluate up to three potential remedial optimization alternatives that would supplement current and historical remediation efforts at the site. Alternatives will be evaluated for subsurface soil and groundwater at the site. RSO field activities will include the collection of groundwater, subsurface soil, and sediment samples at various locations throughout targeted areas of the site. Analytical data will be evaluated against the existing land use designation—commercial, as well as residential use, and unrestricted use to provide a basis for comparison of optimized remedial alternatives for costs, implementability, and effectiveness.

GROUNDWATER EVALUATION

The objective of the groundwater evaluation is to provide a better understanding of mass discharge zones in the area immediately north of the source area, and will evaluate preferential flow path regimes downgradient of the source area, and upgradient of MW-10 where historical VOC contamination has been observed. Additionally, two onsite residential wells will be sampled to assess potential impacts from site related VOC contaminants. Groundwater data generated during the RSO investigation will allow for the following assessments:

- Determination of the mass discharge from the source area, and a comparison with mass discharge across the downgradient area to determine mass removal rates due to natural attenuation, which will allow for an estimate of natural attenuation rates due to both biological and abiotic processes.

- Understanding the mass discharge from the source area will allow for a better estimate of the amount of residual contamination in the source area (adsorbed and dense non-aqueous phase liquid).

- Evaluation of potential *in-situ* remedial technologies for impacted groundwater zones targeting specific depth intervals.

- Evaluation of the potential use of monitored natural attenuation as an effective remedy for remediation in downgradient areas.

Continuous Multichannel Tubing Well Installation

Two lines of CMT wells will be installed along transects that run perpendicular to the groundwater flow direction (Figure 5). The first transect will be approximately 150-ft long with eight well points located every 20 ft immediately downgradient of the suspected source area just south of Building-1. Each CMT well will have up to seven discrete depth interval sampling ports. Based on existing groundwater elevation data, sampling ports will be installed at 10, 15, 20, 25, 30, 35, and 40 ft bgs. The second transect will be approximately 200-ft long with eleven well points located every 20 ft just north of existing monitoring wells MW-7 and MW-5. Sampling ports for these CMT wells will be installed at 20, 25, 30, 35, 40, 45, and 50 ft bgs. The drilling subcontractor will be responsible for identifying any subsurface utility lines in locations where wells will be installed. The drilling and installation of CMT wells will be supervised and documented via boring logs by an EA field geologist according to the procedures described.

CMT wells will be installed using rotosonic drilling methods to advance a 6-inch (in.) diameter borehole to the required depth. The CMT device consists of a 1.7-in. outer diameter polyethylene tube that is internally partitioned to form seven separate internal channels within the larger tube (i.e., six outside channels and one central channel). The diameter of the six outer channels is 0.4-in. while the diameter of the central channel is 3/8-in. The CMT tubing will be cut to the appropriate length and assembled by the drilling subcontractor prior to mobilizing to the site. The bottom of the channels will be fitted with stoppers, and a sampling port will be drilled into each channel at the prescribed sampling depth. Ultrafine stainless steel mesh screen will be fitted over the sample ports, and each channel will be blocked below the port with a polyethylene plug to prevent the accumulation of stagnant water. The completed CMT tubing is then fitted with finned centralizers that maintain its position in the center of the boring and allow sand and bentonite chips to be poured around the tubing (Attachment B—CMT Data Sheet). Once the CMT tubing has been set in the boring a 3-ft sandpack consisting of #0 Morie Sand, or equivalent, will be used to backfill across each screened sample port. A 2-ft layer of bentonite chips will be placed between each sandpack interval and hydrated. The remaining annular space will be backfilled with a cement/bentonite grout mixture to grade. The casing will be withdrawn and the grout within the borehole will be topped off, as necessary. CMT wells will be completed with a protective CMT wellhead with numbered channels and a well cap specifically designed for CMT wells.

Continuous Multichannel Tubing Well Development

The newly installed CMT wells will be developed no sooner than 48-hours following installation. Due to the small size of each channel within the CMT wells, each channel will be developed using only pumping techniques. CMT well development will be considered complete when temperature, conductivity, and potential Hydrogen (pH) have stabilized and a turbidity of less than 50 nephelometric turbidity units has been achieved within each channel. Development water will be discharged to the ground surface away from the well, unless otherwise directed by the NYSDEC. If non-aqueous phase liquid or an odor is observed, or if directed by NYSDEC, the development water will be containerized, handled, and disposed of as detailed in Section 13 of the Generic Field Activities Plan[2]. Well development forms will be completed during purging and development activities.

Groundwater Sampling

A total of 19 newly installed CMT wells with seven discrete sampling depths per well will be sampled twice during the RSO investigation (i.e., once in the winter and once in the spring). Two onsite residential wells will also be sampled during the winter sampling event to assess potential impacts from site related VOC contaminants (Figure 3). Groundwater sampling procedures will include water level measurements, well purging, field water quality measurements (including dissolved oxygen [DO] and oxidation-reduction potential), and sample collection at each well location. Purging and sampling log forms will be used to record well purging, water quality measurements, and sampling flow rates. The objective of the groundwater sampling protocol is to obtain samples that are representative of the aquifer at each discrete sampling depth so that the analytical results reflect the composition of the groundwater at each depth interval as accurately as possible.

Rapid and significant changes can occur to groundwater samples upon exposure to sunlight, temperature, and pressure changes at ground surface. Therefore, groundwater sampling will be conducted in a manner that will minimize interaction of the sample and the surface environment. The equipment and protocol for collection groundwater samples are described below.

Purging and Sampling Equipment

CMT and residential well purging and sampling will be performed using a submersible pump and dedicated section of polyethylene tubing. Equipment for purging and sampling will include the following:

- Solinst® 408M Micro Double Valve Pump (3/8-in.) and Solinst® 464 Electronic Pneumatic Pump Control Unit.
- Solinst® 102 Electronic Water Level Indicator with accuracy of 0.01 ft.
- Flow measurement device (containers graduated in milliliters) and stop watch.
- Water quality meter (Horiba U-52 or similar) with flow-through cell (flushed with distilled water before use at each well) for field measurement of pH, specific conductance, temperature, ORP, turbidity, and DO.
- Photoionization detector (PID) instrument (MiniRAE or similar) to monitor vapor concentrations during purging and sampling.

Groundwater Sampling Purge Method

Prior to the start of each groundwater sampling event, water levels will be collected from each channel within each newly installed CMT well and from the existing monitoring well network to prepare a groundwater contour map, and evaluate groundwater flow patterns across the site. The following procedures will be used for sampling the residential wells and each channel within all newly installed CMT wells:

- Wear appropriate personal protective equipment. In addition, samplers will use new nitrile sampling gloves for the collection of each sample.

- Unlock and remove the well cap.

- Obtain PID readings from each channel or well and record them on the field sampling forms.

- Measure the static water level within each channel or well with an electronic water level indicator. The water level indicator will be washed with Alconox detergent and water, then rinsed with deionized water between individual monitoring wells to prevent cross-contamination.

- Calculate the volume of water in each channel or well.

- Place polyethylene sheeting around the well casing to prevent contamination of sampling equipment in the event sampling equipment is dropped.

- Purge 3-5 well volumes of water from the well, using the method described.
  - Pump with a Solinst® 408M Micro Double Valve Pump equipped with new polyethylene tubing dedicated to each channel or well. Set the pump intake at the sample port depth or screened interval specific to each channel or well and start the pump.

- Allow field parameters of pH, reduction-oxidation potential (Eh), DO, specific conductivity, turbidity, and temperature to stabilize before sampling. Purging will be considered complete if the following conditions are met:
  - Consecutive pH readings are ±0.1 pH units of each other
  - Consecutive DO readings are ±10 percent of each other
  - Consecutive Redox readings are ±0.10 units of each other
  - Consecutive measured specific conductance is ±3 percent of each other
  - Turbidity < 50 nephelometric turbidity unit
  - Purge rate of 250 milliliters per minute (ml/min) with a draw down less than 0.3 ft.

The flow rate during CMT and residential well purging will not exceed 250 ml/min. If these parameters are not met after purging a volume equal to 3–5 times the volume of standing water in each channel or well, the EA Project Manager will be contacted to determine the appropriate action(s).

- If the channel or well is purged dry before the required volumes are removed, the channel or well may be sampled when it recovers (recovery period up to 24 hours).

- Collect the sample aliquot for VOC analysis at a flow rate not exceeding 250 ml/min.

- Obtain field measurement of pH, DO, temperature, and specific conductivity, and record it on the purging and sampling form. The instruments will be decontaminated between wells to prevent cross-contamination.

- Place analytical samples in cooler and chill to 4°C. Samples will be shipped to the analytical laboratories within 24 hours.

- The Solinst® 408M Micro Double Valve Pump will be decontaminated and the polyethylene suction/discharge line will be properly discarded.

- Re-lock well cap.

- Fill out field sampling form, labels, custody seals, and chain-of-custody forms.

All groundwater samples collected during the first and second sampling events will be analyzed for VOCs by EPA Method 8260B (Table 1). A subset of samples collected during the second (i.e., spring) sampling event will also be analyzed for, alkalinity by EPA Method 310.1, methane/ethane/ethene by RSK175, sulfate by EPA Method 375.4, nitrate by EPA Method 352.1, Total Organic Carbon by EPA Method 9060, and compound specific isotope analysis. All samples will be analyzed in accordance with the NYSDEC Analytical Services Protocol.

SUBSURFACE SOIL EVALUATION

Existing MIP and soil sampling data has identified the majority of the source area south of Building-1 (Figure 4). However, areas to the west and north should be further evaluated to delineate the source area. Refinement of the subsurface soil impacts will ensure that pockets of residual source material in soil and/or dense non-aqueous phase liquid have not migrated further to the north, in the areas surrounding Building-1 and Building-5, which may have been outside of the previous MIP and soil boring investigations. Subsurface soil data generated during the RSO investigation will allow for the following:

- Delineation of impacted source area soil and potential dense non-aqueous phase liquid that would require treatment to remediate.

- Identification of *in-situ* soil characteristics to be used as design parameters for an evaluation of potential in-situ remedial technologies.

- An estimation of the quantity of subsurface soil that requires treatment.

Up to 30 soil borings will be advanced in areas within the vicinity of SB-4 (to the west), SB-1 (to the north), and SB-3 (to the north) to further delineate and refine the potential extents of subsurface soil impacts (Figure 6) within the source area. Soil borings will be advanced using direct-push technologies (i.e., Geoprobe®). Soil will be collected continuously at each boring location with dedicated acetate sleeve liners and screened in the field using a (PID). Each soil boring location will be advanced to approximately 40 ft bgs and/or until PID readings return to background levels. An onsite geologist will prepare soil boring logs describing subsurface soil encountered at each of the boring locations. Descriptions of soil sample texture, composition, color, consistency, moisture content, recovery, odor, PID readings, and staining will be documented using the Unified Soil Classification System. Soil samples collected from the soil borings will be collected directly from the acetate sleeve liners, from the desired sample interval, by hand using dedicated nitrile gloves and placed into the appropriate laboratory glassware.

One subsurface soil sample will be collected from each soil boring from the most contaminated interval based on PID readings and/or visual and olfactory evidence. A second subsurface soil sample will be collected from each soil boring from "clean" material directly below the contaminated interval based on PID readings. All subsurface soil samples will be analyzed for VOCs by EPA Method 8260B (Table 1). A subset of subsurface soil samples will also be analyzed for grain size by ASTM-D422 and Total Organic Compound by Lloyd Kahn Method. All samples will be analyzed in accordance with the NYSDEC Analytical Services Protocol.

SEDIMENT EVALUATION

Historical processing operation discharges were directed to a former outfall channel located southwest of the former processing building (Building-2) (Figure 3). To date, no data has been generated to confirm or dispute the presence of impacted sediments within the former outfall channel. As a result, sediment samples will be collected along the centerline of the channel at 100-ft intervals south to the pond. Approximately seven sediment samples will be collected to provide coverage of the channel (Figure 7).

Field personnel will collect the sediment samples starting at the furthest downstream location. Two samples will be collected at each location, including one sediment sample from the 0- to 2-in. depth interval, and one from the 2- to 6-in. depth interval. Sediment samples will be collected using a decontaminated hand auger sampler in accordance with the following general protocol:

- The sampling location will be identified and recorded in the field logbook.

- Vegetation will be removed from the sample location and the hand auger or shovel will be advanced through the surface water (if any) and into the sediment at the desired sample location. Any standing water that accumulated in the hand auger will be decanted prior to sample collection.

- The sample container will be identified in terms of designation, depth, date, and time the sample was obtained.

All sediment samples will be analyzed for VOCs by EPA Method 8260B in accordance with the NYSDEC Analytical Services Protocol (Table 1).

DECONTAMINATION PROCEDURES

Non-dedicated equipment and tools used to collect samples for chemical analysis will be decontaminated prior to and between each sample. Split-spoon and macrocore samplers will be decontaminated using a non-phosphate detergent wash and potable water rinse. Other non-dedicated sampling equipment (e.g., stainless steel spoons, scoops, hand augers, etc.) will be decontaminated with a non-phosphate detergent wash, potable water rinse, isopropanol rinse, potable water rinse, followed by deionized water rinse. Additional cleaning of the equipment with steam may be needed under some circumstances.

Decontamination fluids will be discharged to the ground surface unless a visible sheen or odor is detected either on the equipment or the fluids, at which point the decontamination water will be staged in an appropriate container and disposed of appropriately.

LABORATORY ANALYSIS AND REPORTING

It is anticipated that preliminary analytical results will be available within two weeks of receipt at the laboratory, and final results will be provided to the NYSDEC within the standard turnaround time (i.e., 30 days). Samples collected will be validated by a party independent of the laboratory that performed the analyses and the consultant that performed the field work. A usability analysis will be conducted by a qualified data validator and a Data Validation/Usability Report will be submitted to NYSDEC 30 days following the data validator's data package receipt.

SITE SURVEY

Following completion of the RSO field sampling, a site survey will be completed. The site survey will capture coordinate data (X, Y, and Z) at the following locations:

- CMT well locations
- Soil boring locations
- Sediment sample locations.

Popli Design Group, a New York State licensed surveyor and approved standby subcontractor under EA Contract No. D007624, will complete the post field investigation survey. The surveyor will survey horizontal locations and ground surface elevations of all newly installed CMT wells, soil borings, and sediment sampling locations. CMT wells installed as part of the field investigation will be surveyed, including the horizontal locations and ground surface elevation, and the vertical elevations of the polyvinyl chloride riser of each monitoring well. Any additional sampling locations will be updated to the base map.

Vertical control will be established to the nearest +/-0.1 ft for all ground surface elevations. Monitoring well riser elevations shall be reported to the nearest +/-0.01 ft. Elevations shall be determined relative to the North American Vertical Datum of 1988, with reference made to an existing monument in the vicinity of the site. Horizontal coordinates will be given in the State Plane Central Zone (feet), North American Datum of 1983, to an accuracy of +/-0.5 ft.

REMEDIAL SYSTEM OPTIMIZATION EVALUATION AND REPORTING

The primary focus of this Work Assignment is to evaluate RSO options that would be effective in aiding remedial efforts, and reducing remedial timeframes that are consistent with NYSDEC Standards, Criteria, and Guidance and the existing ROD. Therefore, upon completion of the RSO investigation activities, all data will be evaluated relative to NYSDEC Standards, Criteria, and Guidance, and the ROD and discussions/meetings will be held with the NYSDEC to understand and update the current Conceptual Site Model. Based on this evaluation, a final report will be completed to identify necessary requirements and remedial alternatives to optimize the remedial action, including any recommended changes or additions to the recommended alternative as described in the ROD. The Report will include at a minimum:

- Summary of field activities, analytical data, figures depicting impacted media, identification of any remaining data gaps, an updated Conceptual Site Model. Conceptual Site Model, and conclusions/recommendations based upon the RSO investigation results.

- Analytical data will be evaluated against existing land use designation— commercial as well as residential use, and unrestricted use to provide a basis for comparison of optimized remedial alternatives for costs, implementability, and effectiveness.

- Identify other concerns which may affect the public health, the environment, or future land use.

- The RSO report will identify up to three potential optimization alternatives to supplement remediation efforts at the site. Alternatives will be evaluated for both subsurface soil and groundwater, and each alternative will include a conceptual layout, regulatory requirements, an engineer's estimate, and other design features needed for implementation.

A Draft and Final version of the document will be submitted to the NYSDEC for review, comment, and approval.

If you have any questions, please do not hesitate to contact me at (315) 431-4610, extension 1853.

Sincerely yours,

EA ENGNEERING, P.C.

Donald Conan

Donald Conan, P.E.
Project Manager

DC/dml
Attachments

Figures

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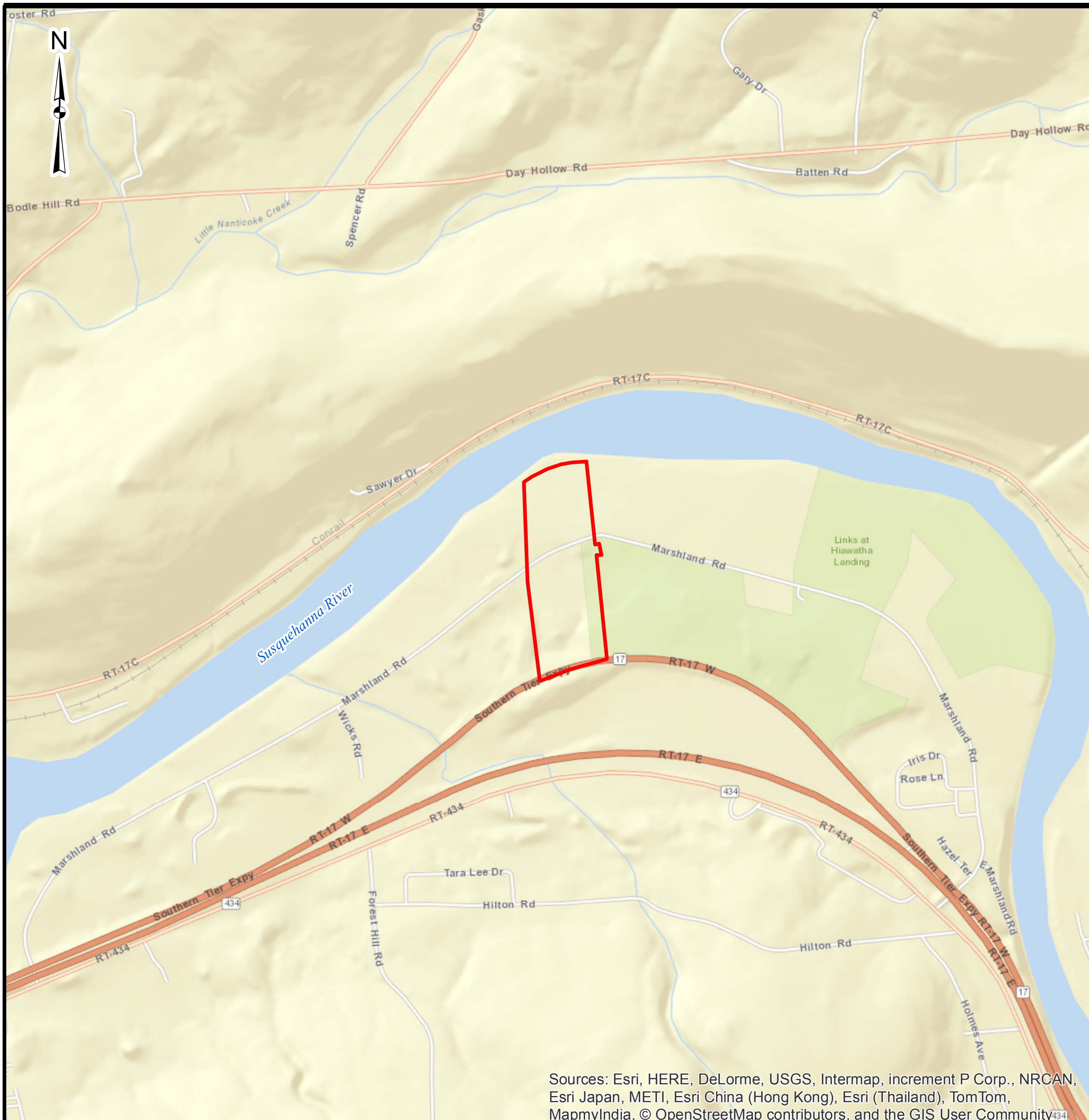

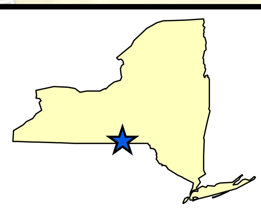

Legend

Approximate Property Boundary
(1646 Marshland Road)

0 0.5 1 Miles

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

OWEGO HEAT TREAT SITE (Site No. 754011)
APALACHIN, NEW YORK

FIGURE 1
SITE LOCATION

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
DC	JCP	JCP	RC	AS SHOWN	OCT 2015	14907.31	GIS/PROJECTS/ FIGURE1.MXD

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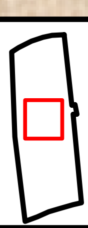

Legend

Former Pit Location

Building-2 Original Limit

Former Building Footprint

Approximate Property Boundary (1646 Marshland Road)

Feet

0 50 100

OWEGO HEAT TREAT SITE (Site No. 754011)
APALACHIN, NEW YORK

FIGURE 2
SITE BUILDING LAYOUT

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
DC	JCP	JCP	RC	AS SHOWN	OCT 2015	14907.31	GIS/PROJECTS/ FIGURE2.MXD

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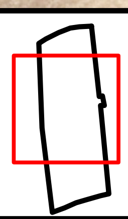

Legend

- Residential Well
- Existing Monitoring Well
- Former Pit Location
- Building-2 Original Limit
- Former Building Footprint
- Approximate Property Boundary (1646 Marshland Road)

Feet
0 150 300

OWEGO HEAT TREAT SITE (Site No. 754011)
APALACHIN, NEW YORK

FIGURE 3
SITE LAYOUT AND
EXISTING MONITORING WELL
NETWORK

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
DC	JCP	JCP	RC	AS SHOWN	OCT 2015	14907.31	GIS/PROJECTS/ FIGURE3.MXD

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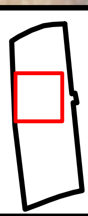

Legend

- Residential Well
- Existing Monitoring Well
- Former Pit Location (Suspected Source Area)
- Building-2 Original Limit
- Former Building Footprint
- Approximate Property Boundary (1646 Marshland Road)

Feet
0 75 150

EA / NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation	OWEGO HEAT TREAT SITE (Site No. 754011) APALACHIN, NEW YORK	FIGURE 4 SOIL VOC DISTRIBUTION

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
DC	JCP	JCP	RC	AS SHOWN	OCT 2015	14907.31	GIS/PROJECTS/ FIGURE4.MXD

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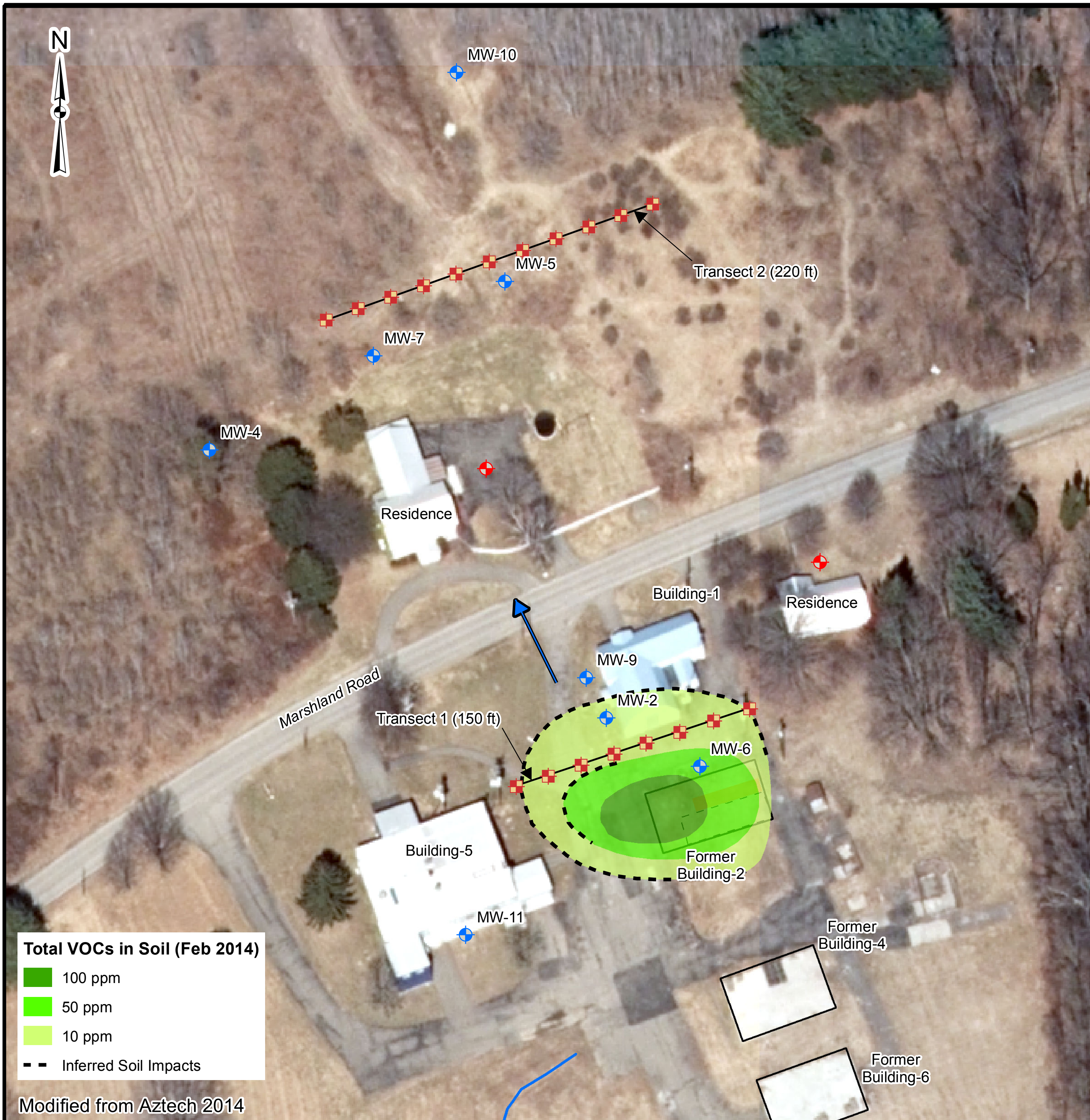

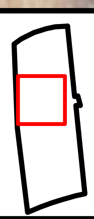

Legend

- CMT Well
- Residential Well
- Existing Monitoring Well
- Inferred Groundwater Flow Direction
- Former Pit Location
- Building-2 Original Limit
- Former Building Footprint
- Approximate Property Boundary (1646 Marshland Road)

0 75 150 Feet

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OWEGO HEAT TREAT SITE (Site No. 754011)
APALACHIN, NEW YORK

FIGURE 5
PROPOSED CMT WELL LOCATIONS

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
DC	JCP	JCP	RC	AS SHOWN	OCT 2015	14907.31	GIS/PROJECTS/ FIGURE5.MXD

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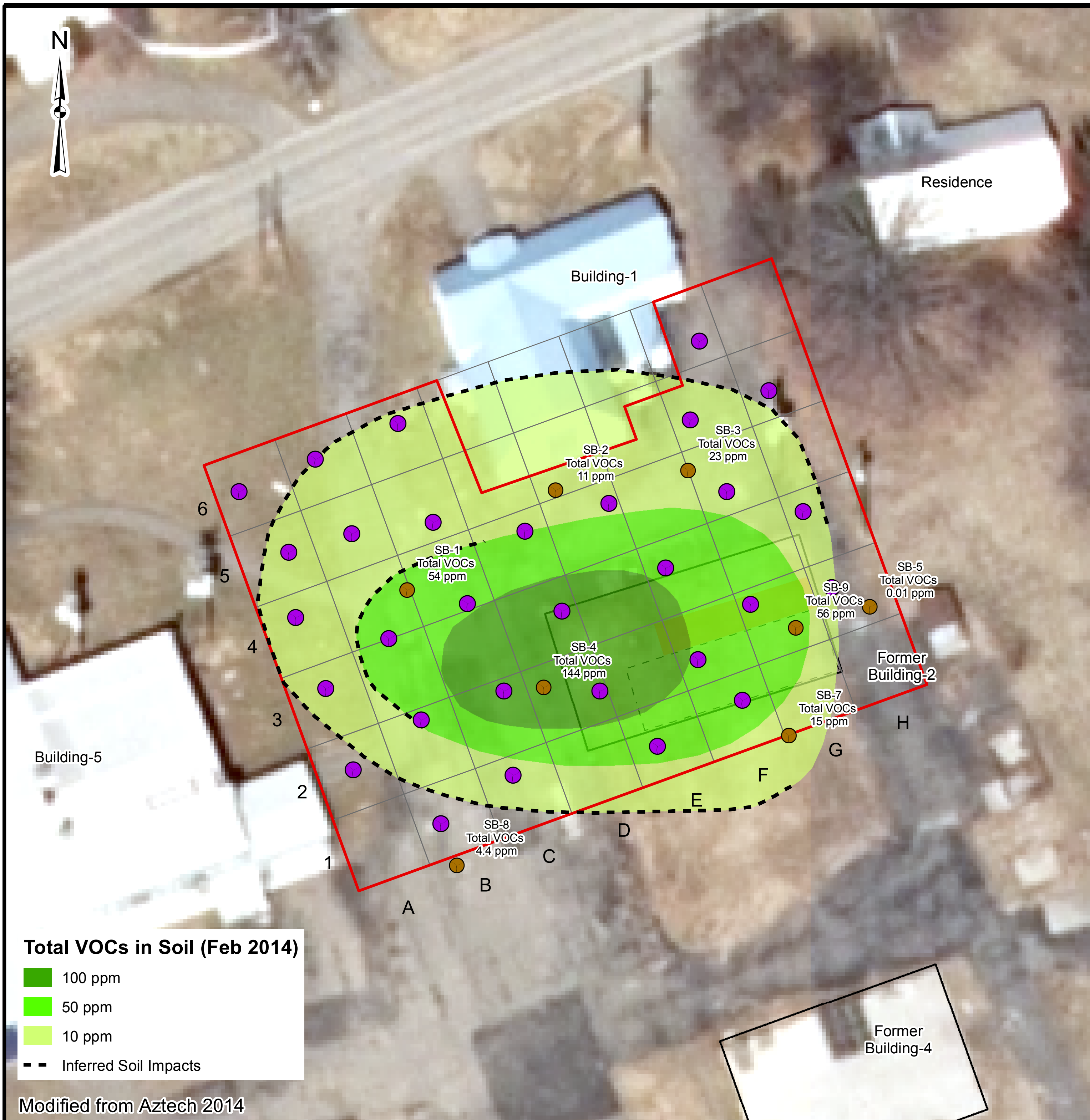


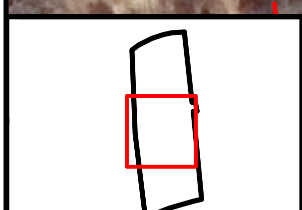
Legend

- Proposed Soil Boring
- Completed Soil Boring (Feb 2014)
- SupplementalBoringArea
- Former Pit Location
- Building-2 Original Limit
- Former Building Footprint
- Approximate Property Boundary (1646 Marshland Road)

Feet
0 25 50

EA® NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation	OWEGO HEAT TREAT SITE (Site No. 754011) APALACHIN, NEW YORK	FIGURE 6 PROPOSED SOIL BORING LOCATIONS

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
DC	JCP	JCP	RC	AS SHOWN	OCT 2015	14907.31	GIS/PROJECTS/ FIGURE6.MXD



Legend

- Proposed Sediment Sample Location
- Former Pit Location
- Building-2 Original Limit
- Former Building Footprint
- Approximate Property Boundary (1646 Marshland Road)

Feet: 0 100 200

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OWEGO HEAT TREAT SITE (Site No. 754011)
APALACHIN, NEW YORK

FIGURE 7
PROPOSED SEDIMENT SAMPLE LOCATIONS

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
DC	JCP	JCP	RC	AS SHOWN	OCT 2015	14907.31	GIS/PROJECTS/ FIGURE7.MXD

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Tables

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Table 1 Remedial System Optimization Investigation Analytical Program

	Sample Matrix	VOC	Alkalinity	Methane /ethane/ ethene	Sulfate	Nitrate	Grain Size Analysis	TOC	CSIA
GROUNDWATER SAMPLING – FIRST EVENT (WINTER)									
No. of Samples	Groundwater	135	—	—	—	—	—	—	—
Field Duplicate		7	—	—	—	—	—	—	—
Trip Blank/Rinse Blank		2/10	—	—	—	—	—	—	—
Matrix Spike/Matrix Spike Duplicate		14	—	—	—	—	—	—	—
Total No. of Analyses		168	—	—	—	—	—	—	—
GROUNDWATER SAMPLING – SECOND EVENT (SPRING)									
No. of Samples	Groundwater	133	27	27	27	27	—	27	5
Field Duplicate		7	2	2	2	2	—	—	—
Trip Blank/Rinse Blank		2/10	—	—	—	—	—	—	—
Matrix Spike/Matrix Spike Duplicate		14	4	4	4	4	—	—	—
Total No. of Analyses		166	33	33	33	33	—	27	5
SUBSURFACE SOIL SAMPLING									
No. of Samples	Soil	60	—	—	—	—	8	8	—
Field Duplicate		3	—	—	—	—	—	—	—
Trip Blank/Rinse Blank		0/5	—	—	—		—	—	—
Matrix Spike/Matrix Spike Duplicate		6	—	—	—	—	—	—	—
Total No. of Analyses		74	—	—	—	—	8	8	—

NOTE: VOC = Volatile organic compound by U.S. Environmental Protection Agency (USEPA) Method 8260B.
TOC = Total Organic Carbon by USEPA Method 9060 (aqueous).
CSIA = Compound Specific Isotope Analysis.
Alkalinity by USEPA Method 310.1.
Methane/Ethane/Ethene by RSK175.
Sulfate by USEPA Method 375.4.
Nitrate by USEPA Method 352.1.
Gain Size Analysis by ASTM-D422.
Dashes (---) indicate no sample taken.
Laboratory quality control samples will be collected at a rate of 1 per 20 samples, per matrix.
Rinse Blanks are collected one per analysis per field sampling day.

Table 1 Remedial System Optimization Investigation Analytical Program

	Sample Matrix	VOC	Alkalinity	Methane/ ethane/ ethene	Sulfate	Nitrate	Grain Size Analysis	TOC	CSIA
SEDIMENT SAMPLING									
No. of Samples	Sediment	7	—	—	—	—	—	—	—
Field Duplicate		1	—	—	—	—	—	—	—
Trip Blank/Rinse Blank		0/1	—	—	—	—	—	—	—
Matrix Spike/Matrix Spike Duplicate		2	—	—	—	—	—	—	—
Total No. of Analyses		11	—	—	—	—	—	—	—

Attachment A

Project Schedule

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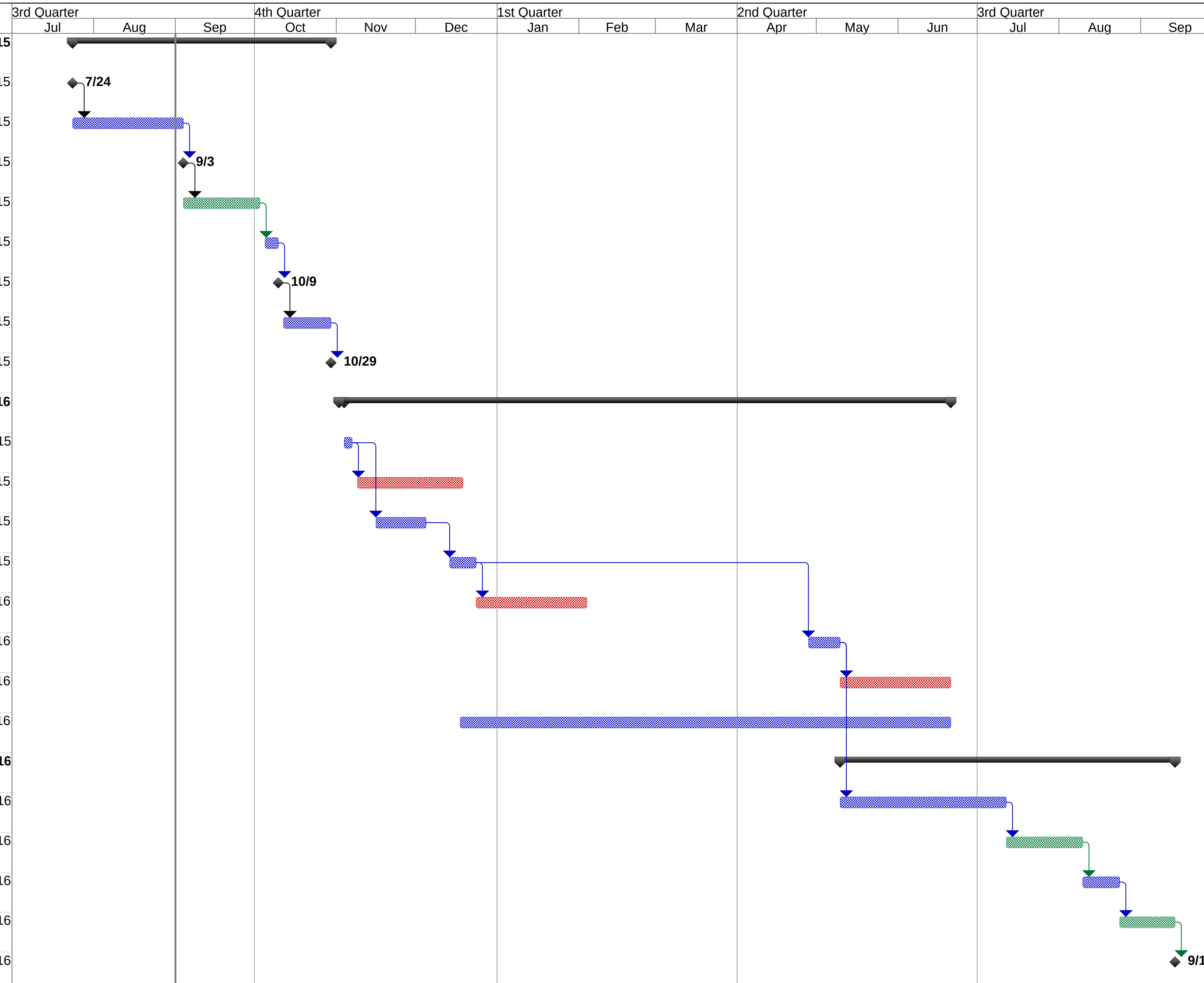
NYSDEC - Owego Heat Treat
EA Project No.: 14907.31
(July 2015 - September 2016)

ID	Task Name	Duration	Start	Finish
1	**Task 1 - Preliminary Activities**	**70 days**	**Fri 7/24/15**	**Thu 10/29/15**
2	WA Issuance	0 days	Fri 7/24/15	Fri 7/24/15
3	Prepare WA Package	30 days	Fri 7/24/15	Thu 9/3/15
4	Submit WA Package to NYSDEC	0 days	Thu 9/3/15	Thu 9/3/15
5	NYSDEC Review	21 days	Fri 9/4/15	Fri 10/2/15
6	WA Package Revisions, as necessary	5 days	Mon 10/5/15	Fri 10/9/15
7	Submit Final WA Package	0 days	Fri 10/9/15	Fri 10/9/15
8	Final NYSDEC Review and Approvals	14 days	Mon 10/12/15	Thu 10/29/15
9	NYSDEC Issuance of Approvals	0 days	Thu 10/29/15	Thu 10/29/15
10	**Task 2 - RSO Investigation**	**166 days**	**Mon 11/2/15**	**Mon 6/20/16**
11	Subsurface Soil and Sediment Investigation	3 days	Wed 11/4/15	Fri 11/6/15
12	Laboratory Anaysis	30 days	Mon 11/9/15	Fri 12/18/15
13	Groundwater Evaluation - CMT Well Installation and Development	15 days	Mon 11/16/15	Fri 12/4/15
14	Groundwater Sampling Event #1	8 days	Mon 12/14/15	Wed 12/23/15
15	Laboratory Analysis	30 days	Thu 12/24/15	Wed 2/3/16
16	Groundwater Sampling Event #2	8 days	Thu 4/28/16	Mon 5/9/16
17	Laboratory Analysis	30 days	Tue 5/10/16	Mon 6/20/16
18	NYSDEC EQuIS - Data Management	132 days	Fri 12/18/15	Mon 6/20/16
19	**Task 4 - RSO Evaluation and Reporting**	**91 days**	**Tue 5/10/16**	**Tue 9/13/16**
20	Prepare & Submit Draft RSO Evaluation Report	45 days	Tue 5/10/16	Mon 7/11/16
21	NYSDEC Review of Draft RSO Report	21 days	Tue 7/12/16	Tue 8/9/16
22	Prepare & Submit Final RSO Evaluation Report	10 days	Wed 8/10/16	Tue 8/23/16
23	NYSDEC Review & Approval of Final RSO Report	15 days	Wed 8/24/16	Tue 9/13/16
24	Submit Final RSO Evaluation Report	0 days	Tue 9/13/16	Tue 9/13/16



Project: Owego Heat Treat
Date: September 3, 2015

Task	Project Summary	Inactive Task	Duration-only	Finish-only
Split	External Tasks	Inactive Milestone	Manual Summary Rollup	Progress
Milestone	External Milestone	Inactive Summary	Manual Summary	Deadline
Summary	Inactive Task	Manual Task	Start-only	

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Attachment B

CMT Data Sheet

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CMT Multilevel System*

Model 403

This multilevel system is reliable, easy to install and inexpensive. It provides site assessors with a better understanding of three-dimensional groundwater flow and the distribution of contaminants in the subsurface. Remediation strategies can then be targeted more precisely, focusing efforts in the most effective manner.

The CMT Multilevel System makes the accurate monitoring of contaminant plumes much more affordable. It provides detailed vertical as well as horizontal data. Monitoring zones are set where needed and the single tube design allows reliable seals between zones.

Two systems are available. The 1.7" (43 mm) OD polyethylene tubing, segmented into seven channels, allows groundwater monitoring at up to 7 depth-discrete zones. The 3-Channel System uses the same material and construction, but it is only 1.1" (28 mm) in diameter. This narrow tube was developed for smaller diameter installations, especially direct push where the annulus for seal placement is narrow.

Construction of CMT ports in a 7-Channel system installed in Silsoe, England.

CMT® Multilevel

Continuous Multichannel Tubing

Get Quote | More Info

Advantages of Multilevel Systems

- Provide the most accurate 3-D assessment of a site
- Vital to understanding vertical contaminant distribution
- Allow documentation of changes in the concentration and delineation of contaminant plumes
- Low cost compared to multiple individual wells
- Minimize site disturbance

Research has shown that contaminant plumes are often thin and highly stratified. It has also been documented that traditional monitoring wells, with long screened intervals blend the groundwater over the entire length of the screen**. This can mask the true contaminant concentrations and distribution. Multilevel wells with short screened intervals overcome this problem. This high-resolution data gives unprecedented definition of the subsurface contamination, resulting in more effective and less expensive remediation. Water quality data from short-screened wells yield high quality, defensible data.

Applications

- Identify vertical as well as horizontal contaminant distribution with transect monitoring
- Ideal for shallow wells in high water table environments
- Multilevel water sampling and level monitoring in unconsolidated soils or bedrock
- Dewatering impact assessments at construction & mining sites
- Mass transport calculations and mass flux estimation
- Monitoring of natural attenuation or remediation processes, and documentation of its effectiveness
- VOC, MTBE and Perchlorate monitoring at NAPL sites
- Determination of the best location for reactive barrier walls, the Waterloo Emitter and other remediation methodologies
- Vapor monitoring with special wellhead seals
- Helps optimize design and performance assessment of remedial options

**Patents #6,865,933 B1, #6,758,274 B2, #2,260,587, #6,581,682, #2,347,702, and #2,381,807*

***Elci et al (2001). Implications of observed and simulated ambient flow in monitoring well. Ground Water 39, no. 6: 853-862*

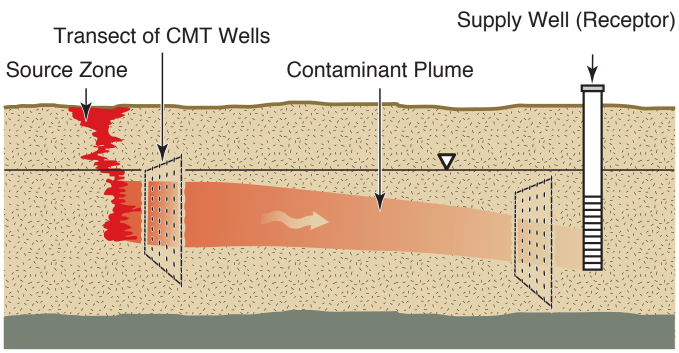
Multilevel Monitoring is Essential

Multilevels provide the most reliable, detailed data for accurate 3-D site assessment. Important advantages include:

Eliminates contaminant mixing in long screened wells – which averages out heads and contaminants, masks narrow zones of contamination and vertical variations, underestimates the extent and concentration levels due to dilution. Multilevels monitor discrete intervals.

Prevents biases due to ambient flow – cross communication of contaminants can occur when different zones in a borehole are not isolated. Properly sealed multilevels avoid ambient flow within a well.

Provides data for Mass Flux Calculations – Calculating the contaminant concentration and flow rate helps determine the maximum contaminant concentration and risk to receptors. A transect of multilevels across the groundwater flow path provides data for mass flux calculations.



CMT Transects for Mass Flux Assessment

Allows optimized remediation design – Using data from multilevels to accurately define the thickness, concentration variations and extent of a plume.

Saves Cost – through reduced permitting and drilling costs; and because narrow tubes allow smaller purge volumes, reduced disposal costs, efficient low flow sampling and rapid response to pressure changes, all reduce field time.

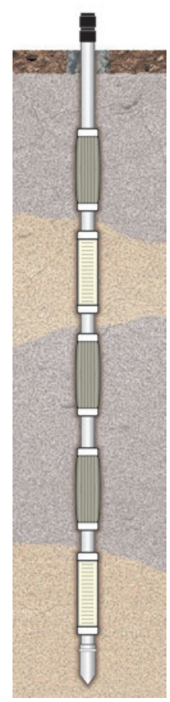
Advantages of the CMT Multilevel System

- Low cost and easy to install and use
- No joints - one smooth surface for easy, effective sealing
- Up to 7 depth-discrete zones in a single tube
- Locate ports and seals exactly where desired
- Installs quickly in large direct push casing and boreholes
- One 7-Channel CMT System can be completed by two people in under 3 hours, 3-Channel even faster
- Borehole not left open to allow cross contamination
- Isolated zones ensured using sand and bentonite layers or 3-Channel Cartridges - reliable and inexpensive
- Minimizes the risk of producing new contaminant pathways

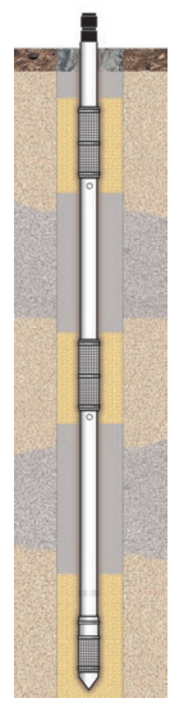
One CMT System - Two Sizes

Features	7 Channel	3 channel
Tubing diameter	1.7" (43 mm)	1.1" (28 mm)
Monitoring zones	up to 7	up to 3
Channel diameter	6-Pie: 0.4" (10 mm) 1-Hex: 3/8" (9.5 mm)	3-Hex: 3/8" (9.5 mm)
Channel volume	40 mL/ft. 30 mL/ft. (center)	30 mL/ft.
Installation options	Sand & bentonite backfill Natural formation collapse	Bentonite & sand cartridges Sand & bentonite backfill Natural formation collapse
Coil lengths (Coil 4 ft. dia.)	100 ft. (30 m), 200 ft (60 m) & 300 ft. (90 m)	100 ft. (30 m), 200 ft. (60 m) & 500 ft. (150 m)
Centralizer sizes (other sizes optional)	4.4" standard (112 mm)	3.3" standard (84 mm)
Borehole diameter recommended for backfill installations	4" (100 mm) and larger	3.5" (89 mm) and larger
Borehole diameter for installations with seal and sand cartridges	N/A	2.8" - 3.5" (71 mm - 89 mm)

Mechanical Plugs Seal Channels Securely



Typical 3-Channel CMT Installation in Overburden with Bentonite and Sand Cartridges



Typical 3 or 7-Channel CMT Installation using Layers of Bentonite and Sand Backfilled from Surface

Multichannel Tubing

A multilevel well that uses a continuous length of multichannel tubing has the advantage over other multilevels in that there are no joints. This significantly reduces the time and cost of installing wells and at the same time increases the reliability of the system. The CMT is very simple and convenient to use, as it gives full flexibility as to where monitoring zones are located.

The number and location of ports may be determined in advance, or after drilling the borehole. A Port Cutting Guide is used to create a port in a given channel, at the specified depth to be monitored. A plug is positioned and sealed in the channel just below the port opening and a stainless steel screen is fixed in place over the port to prevent fines from entering. Each channel is also sealed at the bottom of the tubing to avoid cross communication between monitoring zones.

Seals and Sand Packs

The CMT can be installed using standard sand and bentonite layers placed via a tremie pipe, or poured directly from the surface. The Model 103 Tag Line is ideal for accurate placement of sand and bentonite during borehole completion. If the installation is in loose sands, natural collapse can be used, allowing the sand to collapse around the tubing.

3-channel CMT Sand and Bentonite Cartridges

3-Channel Sand and Bentonite Cartridges

For direct push installation of the 3-Channel System, the annulus available is often too small to accurately place sand and bentonite layers. Therefore, bentonite cartridges have been developed to give reliable seals between zones, and accompanying sand cartridges to complete the installation.

These cartridges are approximately 2.4" (61 mm) in diameter and will fit inside various direct push drill rods. Ideally, the borehole diameter these bentonite cartridges are used in should not exceed a nominal 3.5" (90 mm), to ensure proper expansion and sealing.

CMT Installation at UK Chlorinated Solvents Site (Source: Waterra. UK)

Monitoring CMT Multilevel Wells

Water levels and samples can be accurately obtained using the following quality Solinst instruments:

Water Levels: The narrow, laser marked, coaxial cable Model 102 Water Level Meter and 102M Mini Water Level Meter with a 1/4" (6.3 m) dia. probe can be used to monitor water levels in any CMT channel.

Samples: Sampling can be performed using the Solinst Peristaltic Pump, which has a suction lift limit of approximately 25 ft (7.5 m). The Mini Inertial Pump can be used with inexpensive polyethylene tubing to depths of 50 ft (15 m), or using PTFE tubing to depths of 150 ft (45 m). The Micro Double Valve Pump (DVP) is ideal for low flow VOC sampling in narrow applications. The Micro DVP is made of flexible PTFE or polyethylene tubing which is 3/8" (9.5 mm) in diameter. A manifold at the surface has a quick-connect fitting for attachment to the Solinst Electronic Control Unit and a bypass for easy sample collection. Operation is easy, as the Electronic Control Unit has built in pre-sets. A multi-purge manifold is also available for the Micro DVP.

Vapor Samples: A special Vapor Wellhead Assembly can be used to obtain depth discrete vapor samples.

Mini Inertial Pump 1/4" (6 mm)

Model 410 Peristaltic Pump

Model 408M DVP 3/8" (9.5 mm)

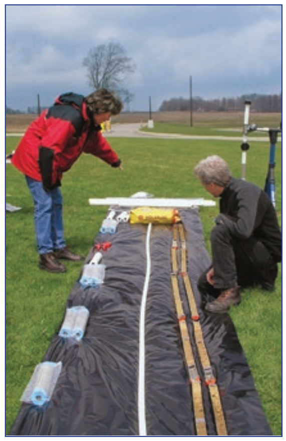
Model 102 Water Level Meter

Model 403 Vapor Wellhead

Model 464 Electronic Control Unit

CMT Field Applications

3-Channel CMT installation at a plant in Zeitz, Germany. Systems were completed using natural collapse and are being used to assess natural attenuation of BTEX.



Installation of a 3-Channel CMT System with bentonite and sand cartridges. Three zones were monitored over a 20 ft (6 m) depth. The installation was completed in glacial till at the University of Waterloo, Ontario Canada.

CMT System installed to a 60 m (200 ft) depth with seven monitoring zones. Installation was completed by placing layers of sand and bentonite to monitor a BTEX/MTBE plume in a Chalk aquifer, United Kingdom.

A gas station site in Watsonville, California. Five 3-Channel CMT Systems were installed to monitor gasoline contamination and MTBE plume. Installations were completed within hollow stem augers using bentonite and sand layers to isolate each monitoring zone.

CMT Training Programs

Solinst offers CMT courses that provide both instruction and hands-on training for CMT construction and installation. Contractors who attend and complete the course are "Trained CMT Contractors" and can be listed on the Solinst website at: **http://www.solinst.com/Prod/403/training.html**

As well as the Environmental Drilling Contractors who are training to become "Trained CMT Contractors", attendees often include regulators, consultants, and Solinst Agents and their clients. In some states, these training courses qualify for continuing education credits.

Courses are offered at various environmental conferences throughout the year, such as those put on by the NGWA, Battelle and others. For larger groups Solinst can set up a training session at the group's own facility.

Please contact Solinst should you wish to attend or set up a training session.

Instructing drilling contractors and consultants on CMT installation techniques at Battelle Bio-Symposium, Baltimore, Maryland.

CMT Installation and training as part of a "Multilevel Course" given by the University of Cranfield at Silsoe, U.K., in conjunction with Waterra (UK), British Geological Survey & Norwest Holst.

The first CMT contractor training course, conducted at the NGWA Expo in Las Vegas, December 2004. Contractors are being instructed on proper port construction.

Outdoor installation/ demonstration at premises of Parrat-Wolff, Environmental and Geotechnical Drilling Services, Syracuse, New York.

For further information contact: Solinst Canada Ltd.
Fax: +1 (905) 873-1992; (800) 516-9081 Tel: +1 (905) 873-2255; (800) 661-2023
35 Todd Road, Georgetown, Ontario Canada L7G 4R8
Web Site: www.solinst.com E-mail: instruments@solinst.com