FIRST FIVE-YEAR REVIEW REPORT
ONONDAGA LAKE SUPERFUND SITE
SALINA LANDFILL SUBSITE
ONONDAGA COUNTY, NEW YORK

Prepared by

U.S. Environmental Protection Agency
Region 2
New York, New York

May 2016

Approved by:

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Emergency and Remedial Response Division

Date:

May 20, 2016

Contents

Executive Summary

This is the first five-year review for the Salina Landfill Subsite of the Onondaga Lake Superfund site, located in the Town of Salina, Onondaga County, New York. The implemented remedial actions have adequately addressed all exposure pathways that could result in unacceptable risks. Groundwater monitoring for the Subsite began in January 2015. Although only a few rounds of samples have been collected, data to date shows improvements in groundwater downgradient of the landfill. Data will continue to be collected to evaluate remedy performance in future five-year reviews. The remedy is protective of human health and the environment.

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Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Onondaga Lake – Salina Landfill Subsite		
EPA ID: NYD986913580		
Region: 2	**State:** NY	**City/County:** Town of Salina/Onondaga County

SUBSITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the Subsite achieved construction completion?** Yes

REVIEW STATUS
Lead agency: State ***[If "Other Federal Agency", enter Agency name]*:** Click here to enter text.
Author name (Federal or State Project Manager): Mark Granger
Author affiliation: EPA
Review period: 11/29/2010 - 2/15/2016
Date of Site inspection: 10/22/2015
Type of review: Statutory
Review number: 1
Triggering action date: 11/29/2010
Due date *(five years after triggering action date)*: 11/29/2015

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
08

OU PROTECTIVENESS STATEMENT		
Operable Unit:	*Protectiveness Determination:* **Protective**	*Addendum Due Date (if applicable):* N/A
Protectiveness Statement: The remedy is protective of human health and the environment.		

Introduction

The purpose of a five-year review is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment and is functioning as intended by the decision documents. The methods, findings, and conclusions of these efforts are documented in the five-year review. In addition, five-year review reports identify issues found during the review, if any, and document recommendations to address them.

This is the first five-year review for the Salina Landfill subsite (Subsite) of the Onondaga Lake Superfund site, located in the Town of Salina, Onondaga County, New York. This five-year review was conducted by the Environmental Protection Agency (EPA) Remedial Project Manager (RPM) Mark Granger. The review was conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. §9601 *et seq.* and 40 CFR 300.430(f)(4)(ii), and in accordance with the *Comprehensive Five-Year Review Guidance*, OSWER Directive 9355.7-03B-P (June 2001). This report will become part of the Subsite file.

The triggering action for this statutory review is the start of on-site construction on November 29, 2010. A five-year review is required at this Subsite due to the fact that hazardous substances, pollutants or contaminants will remain at the Subsite above levels that will allow for unlimited use and unrestricted exposure.

Site Chronology

See **Table 1** for the Subsite chronology.

Background

Physical Characteristics

The Subsite, approximately 55 acres in size, is located in the Town of Salina, Onondaga County, New York. It is bounded by the New York State Thruway to the north and by Route 11 (Brewerton Road) to the east. An Onondaga County Resource Recovery Agency Transfer Station is located immediately to the west. Ley Creek, a Class B stream, runs through the approximate eastern half of the Subsite and along the southern border of the approximate western half of the Subsite. The eastern half of the Subsite is bounded to the south by the banks of a separate tributary, known as Old Ley Creek Channel (OLCC). A portion of Ley Creek was moved in the early 1970s to its current location. Landfilled materials were identified on the property both north of Ley Creek (approximately 50 acres) and south of Ley Creek (approximately 5 acres) as far as the OLCC (see **Figure 1** for a vicinity location map).

For clarity during cleanup activities, the Subsite was segregated into seven parcels (see **Figure 2** for a Subsite layout and for a layout of the seven parcels):

- **Parcel 1**: Located in the northeastern portion of the Subsite, this parcel is approximately 5 acres in size. All municipal solid waste on this parcel was relocated to Parcel 2. In addition, a 1.33-acre wetland mitigation area and the groundwater/leachate pretreatment plant was constructed on this parcel.

- **Parcel 2**: This parcel consists of the main landfill, approximately 25 acres in size. Municipal solid waste and construction and demolition debris excavated from other parcels (mostly Parcels 1, 6 and 7) were relocated to this parcel. Following waste consolidation efforts, Parcel 2 was capped with geomembrane.

- **Parcel 3**: This 8-acre parcel consists of utility corridors bisecting Parcels 1, 2, 4 and 5. The majority of this parcel was covered with a clay cap in order to facilitate better access to electric and gas utilities.

- **Parcel 4**: This parcel, approximately 6 acres in size, occupies the southwestern-most portion of the landfill property, immediately south of Parcel 2. Municipal solid waste along Ley Creek on this parcel was pulled back approximately 30 feet and relocated to Parcel 2. Following completion of excavation activities, the parcel was graded and capped with geomembrane.

- **Parcel 5**: This parcel is approximately 5 acres in size and is located in the eastern portion of the Subsite. It is bordered by Parcels 1, 2 and 7 to the north, east and west, and Ley Creek to the South. Municipal solid waste along Ley Creek on this parcel was pulled back approximately 30 feet and relocated to Parcel 2. Following completion of excavation activities, the parcel was graded and capped with geomembrane.

- **Parcel 6**: This parcel is south of, and across Ley Creek from, the remaining parcels. It is bordered by Ley Creek to the north and west and the OLCC to the east and south. Parcel 6 is approximately 5 acres in size. Municipal solid waste was excavated from this parcel and relocated to Parcel 2. Poly-chlorinated biphenyl (PCB)-impacted waste (> 50 milligrams per kilogram [mg/kg] PCBs) located in the northeastern portion of the parcel was excavated, transported and disposed of off site. Volatile organic compound (VOC) impacted materials located in the north central portion of the parcel below the municipal solid waste were also excavated and relocated to Parcel 2. Following completion of excavation activities, the parcel was backfilled, graded and seeded. In addition, a 2.05-acre wetland mitigation area was constructed on this parcel.

- **Parcel 7**: This parcel was identified during remedial activities and is located immediately east of Parcels 1 and 5. Parcel 7 is approximately 2 acres in size. Waste from Parcel 7 was excavated and relocated to Parcel 2. The parcel was then backfilled, graded and seeded.

Subsite Geology/Hydrogeology

Groundwater underlying the Subsite is found in two water-bearing units. The uppermost unit is unconfined. The water table ranges from 4 to 22 feet below ground surface (bgs) and is present either within the waste or in the uppermost sand unit. The lower water-bearing unit is under confined conditions and is present in the lower sand unit, above the till.

The bedrock geology in the area of the Subsite generally consists of sedimentary rock units from the Paleozoic-age Salina Group which, in order of oldest to youngest, consists of the Vernon Formation, the Syracuse Formation, Camillus Shale and the Bertie Formation. Specifically, the bedrock is made up of units of the Vernon Formation, which consists of upper Silurian shale and dolostone.

Land and Resource Use

The Salina Landfill is located within an area zoned as an "Industrial District." Land located immediately to the south and to the west of the Subsite is also zoned as an "Industrial District." The land directly east of the Subsite, on the opposite side of Brewerton Road, is zoned both as a "Highway Commercial District" and a “One-Family Residential District." The land located to the north of the Subsite, on the opposite side of the New York State Thruway, is zoned as an "Open-Land District," a "Planned Commercial District," and a "One-Family Residential District."

Currently, the underlying aquifers are not used for drinking water. Residents located in the vicinity of the Subsite use the public water supply provided by Onondaga County.

History of Contamination

In 1962, the Salina Town Board closed a dump known as the “Mattydale Dump” pursuant to a court action. The Mattydale Dump was located in the vicinity of the current town garage off of Factory Avenue, approximately 1/2 mile to the east of the Subsite. With the closure of the Mattydale Dump, it is believed that the Town proceeded to work with a property owner (East Plaza, Inc.) to start landfill operations at the current location of the Town of Salina Landfill. During the period the landfill was in operation, in addition to accepting municipal solid waste, the landfill also accepted hazardous wastes including paint sludge, paint thinner, polychlorinated biphenyl (PCB)-contaminated wastes, and contaminated sediments dredged from Ley Creek.

Prior to the early 1970s, poor channel conditions and large impermeable areas in the watershed caused extensive flooding of Ley Creek. These flooding events led to the creation of the Ley Creek Drainage District. Beginning in 1970, the Onondaga County Department of Drainage and Sanitation widened, deepened and rerouted Ley Creek through the Town of Salina Landfill. Dredged materials were spread, among other places, along the banks of Ley Creek.

In 1971, several complaints were made by the New York State Thruway Authority because landfill-related refuse was blowing onto the Thruway. The Thruway Authority

requested that the Town cover the landfill. Between 1971 and 1974, landfill operations continued with little or no control over the refuse haulers that were dumping in the landfill. Town records indicate that the trucks with permit stickers were on the "honor system" and were not checked for source or quantity of refuse and that only town residents that brought their own refuse to the landfill were checked. Reaching its capacity, the landfill was officially closed sometime in late 1974 or early 1975, pursuant to an order by New York State Department of Environmental Conservation (NYSDEC).

In 1976, landfill cover specifications were issued by NYSDEC for dirt fill and grading of the property. However, litigation proceedings commenced between the Town of Salina and the property owner East Plaza, Inc. In 1981, the Town purchased the western portion of the property (approximately 29 acres) from East Plaza, Inc. Once again, landfill cover specifications were issued by NYSDEC in July 1981.

In September 1981, the Town awarded a contract to cover the landfill with a two-foot clay-type soil. Once the soil was placed, the area was hydroseeded to establish a vegetative cover. This project was completed in November 1982.

Initial Response

In 1986, NYSDEC and the Onondaga County Department of Health collected three soil samples adjacent to the north bank of Ley Creek along the landfill. At the same time, four surface water samples were collected from Ley Creek and from drainage ditches to the north and east of the landfill. The soil samples contained polyaromatic hydrocarbon compounds (PAHs), metals, VOCs and pesticides in low levels. PCBs were detected in the soil samples.

In 1987, NUS Corporation (on behalf of EPA) collected one surface water and one sediment sample from an upstream location in Ley Creek (west of Route 11), one surface water and one sediment sample alongside the landfill (in the drainage swale in the northeast section of the landfill), and one surface water and one sediment sample from just downstream of the landfill in Ley Creek. The surface water and sediment samples collected alongside and downstream of the landfill did not contain higher concentrations of contaminants than the samples collected upstream from the landfill.

In 1987, Atlantic Testing (on behalf of NYSDEC) attempted to install three groundwater monitoring wells on-site. Only one well was completed, as drilling for the other two wells encountered wastes in the form of black oil and petroleum-saturated soil in two boreholes. The soils in these borings contained PCBs, low levels of semi-volatile organic compounds (SVOCs) and dibenzofuran, and elevated levels of cadmium, chromium, nickel and zinc. One upgradient monitoring well was installed. The groundwater from this well contained low levels of VOCs and SVOCs, high iron and manganese.

In 1989, a bioaccumulation study conducted by O'Brien & Gere (on behalf of General Motors Corporation) on fish caught in Ley Creek showed that the fish contained up to 6.8 mg/kg PCBs.

In 1991, during an inspection of the landfill by Ecology and Environment (on behalf of NYSDEC), a leachate outbreak was observed along the northern bank of Ley Creek downgradient of an area near the southwestern corner of the landfill.

In 1994, Ecology and Environment completed a Preliminary Site Assessment (on behalf of NYSDEC). This investigation included the collection of 10 surface water and sediment samples from locations in Ley Creek alongside the landfill, (including one upstream of the landfill) and in the adjacent drainage ditches situated to the north and west of the landfill. Additionally, five surface soil samples were collected on or around the landfilled area, and three leachate samples were collected from the north bank of Ley Creek (two along the southwestern corner of the landfill, and one near the power lines that pass over Ley Creek). The results indicated low levels of VOCs and SVOCs in the surface water. PCBs, pesticides, VOCs, and SVOCs were detected in the sediment samples, soil samples, and leachate samples.

In 1994, EPA designated Onondaga Lake, and its tributaries and upland areas which have contributed or are contributing hazardous substances to the lake (subsites), as a Superfund National Priorities List (NPL) site. In 1997, NYSDEC and EPA jointly notified the Town that the Salina Landfill was a subsite of the Onondaga Lake NPL site due to releases or the threat of releases of hazardous substances, pollutants or contaminants into the environment.

In 1996, Ecology and Environment prepared a Preliminary Site Assessment Addendum (on behalf of NYSDEC). This supplemental investigation was conducted to provide further information on potential groundwater contamination at the landfill. Five new monitoring wells were installed, developed and sampled in the landfilled area north of Ley Creek. The groundwater from most wells contained low levels of VOCs and SVOCs. PCBs were detected in one well at a low concentration. One of the downgradient wells contained elevated levels of a number of metals. Two surface water and sediment samples collected by NYSDEC from drainage ditches on-site indicated PCBs were present in the sediment, but were absent from the surface water.

Removal Action

During the RI, groundwater quality monitoring identified the presence of elevated VOCs in monitoring well (MW) 10. This well is located very close to Ley Creek. NYSDEC initiated an Interim Remedial Measure (IRM) in an effort to remove the source of the VOC's upgradient of MW-10. OP-TECH Environmental was retained by NYSDEC to perform a limited subsurface investigation, as well as the IRM source removal in January 2010.

The subsurface investigation included a total of nine test trenches with the collection of investigative samples in the area northeast of MW-10. Soils were screened with a photo-ionization detector for the presence of organic compounds, and analyzed for VOCs and PCBs. A total of 45 soil samples were submitted for analysis and

characterization. The investigation identified soils that required removal and disposal as nonhazardous, hazardous and Toxic Substances Control Act (TSCA)-regulated waste.

During the IRM, approximately 1,250 tons of nonhazardous soils were removed from the Subsite and disposed of at the Ontario County landfill located in Stanley, New York; approximately 450 tons of hazardous soils were removed and disposed of at the Michigan Disposal Waste Treatment Plant located in Belleville, Michigan; and approximately 116 tons of TSCA-regulated soils were disposed of at Wayne Disposal, Inc., located in Belleville, Michigan.

Basis for Taking Action

On October 29, 1997, the Town of Salina entered into an Order on Consent with the NYSDEC to perform a remedial investigation (RI), feasibility study (FS), remedial design (RD), and remedial action (RA) for the Subsite. An RI report was submitted to NYSDEC by the Town in May 2000.

The RI report indicated that the primary contaminants in each media were as follows:

- *Surface Soils:* The primary contaminants in the surface soils were metals and PAHs. Additionally, elevated levels of Aroclor 1248 (ranging from 0.22 to 8.4 mg/kg) were encountered on Parcel 6.
- *Subsurface soils:* While several contaminants were identified in the subsurface soils, the primary groups of contaminants encountered were PAHs and PCBs.
- *Sediment:* The primary contaminants in the sediment were PAHs, PCBs (Aroclor 1248 and 1260) and metals.
- *Groundwater:* The primary contaminants in the groundwater were VOCs. Additionally, elevated concentrations of SVOCs, pesticides, and metals were detected.
- *Leachate:* Benzene, chlorobenzene, Aroclor 1248 and metals were identified in the leachate.
- *Surface Water:* One PAH, Aroclor 1248, aluminum and iron were identified as the contaminants within Subsite surface water.

The human health risk assessment concluded that contaminants of concern detected at the Subsite posed elevated carcinogenic and noncarcinogenic health risks to potentially exposed populations. The ecological risk assessment concluded that the contamination at the Subsite poses a risk to soil invertebrates and terrestrial vertebrates. In addition, the ecological risk assessment also indicated that soil-invertebrate feeding birds are potentially at risk. Based upon the human health and ecological risk assessments, and the fact that groundwater containing hazardous substances in excess of groundwater standards discharge into Ley Creek, a tributary of Onondaga Lake, it was determined that the Subsite posed an unacceptable threat that warranted remediation.

Remedial Actions

Remedy Selection

Based upon the results of an FS report, in January 2003 NYSDEC and EPA released a Proposed Plan describing the remedial alternatives considered for the Subsite and identifying the preferred remedy with the rationale for the preference. The primary elements of the preferred remedy included constructing impermeable caps over the landfill areas north and south of Ley Creek, constructing groundwater/leachate collection trenches north and south of Ley Creek, and pumping the collected groundwater/leachate to the Metropolitan Syracuse Wastewater Treatment Plant (METRO).

During the public comment period it was learned that Onondaga County had a policy not to accept wastewater from inactive hazardous-waste sites at METRO. The Town of Salina and the County participated in extended negotiations in an effort to reach an agreement to allow the landfill's groundwater/leachate to be treated at METRO. At the time that the Record of Decision (ROD) was signed in March 2007, no agreement had been reached.

The March 2007 ROD provided the following remedial action objectives (RAOs):

- Reduce/eliminate contaminant leaching to groundwater;
- Control surface water runoff and erosion;
- Prevent the off-site migration of contaminated groundwater and leachate;
- Restore groundwater quality to levels which meet state and federal drinking-water standards;
- Prevent human contact with contaminated soils, sediment and groundwater; and
- Minimize exposure of aquatic species and wildlife to contaminants in surface water, sediments, and soils.

The selected remedy included:

- Excavation of contaminated sediments in the western drainage ditch;
- Construction of groundwater/leachate collection trenches north and south of Ley Creek;
- Consolidation of the excavated sediments and the soils and wastes (from the excavation of the collection trenches) on the landfill areas;
- Construction of 6 NYCRR Part 360 caps over the landfill areas north and south of Ley Creek;
- Lining the drainage ditches located along the northern and eastern borders of the Subsite;
- Engineered drainage controls and fencing;
- Installation of a 150,000-gallon storage tank to hold excess water volume stemming from storm events;
- Treatment of the collected contaminated groundwater/leachate at an on-site treatment plant; discharge of treated effluent to Ley Creek;

- Institutional controls (such as restrictive covenants or environmental easements) to prohibit residential use of property and the installation and use of groundwater wells, as well as to protect and ensure the integrity of the caps, groundwater/leachate collection trenches, and engineered drainage controls;
- Maintenance of the caps and groundwater/leachate collection trenches; and
- Long-term monitoring.

A contingency remedy was selected: if the negotiations between the Town and Onondaga County related to the utilization of METRO were successful, then the collected groundwater/leachate would be pretreated on-site and conveyed to METRO in lieu of the groundwater leachate undergoing complete treatment at an on-site treatment facility and thereafter being discharged to Ley Creek.

In July 2007, the Town of Salina's contractor commenced the design of the selected remedy. On September 10, 2008, the Town of Salina and the County entered into an agreement for METRO to accept the pretreated groundwater/leachate.

In the March 2007 ROD, an alternative including excavation of landfilled materials from Parcel 6 and consolidation north of Ley Creek was eliminated from consideration due to concerns that significant quantities of hazardous waste were commingled with the municipal refuse from Parcel 6, which would have significantly increased the cost of the remedy since these wastes would require off-site disposal. As part of the design of the selected remedy, samples were collected from the waste from Parcel 6. Upon analysis of these samples, it was concluded that Parcel 6 likely contained a heterogeneous mixture of municipal refuse with only low concentrations of hazardous substances that were typically associated with municipal refuse. As a result of this conclusion, the remedy selected in the ROD was reevaluated and a ROD amendment was issued in September 2010. The major components of the selected modified remedy include the following:

- Excavation of the landfilled wastes located on Parcel 6;
- Excavation of waste in the northeastern corner of the landfill area north of Ley Creek;
- Excavation of waste on the northern boundary of the landfill area north of Ley Creek so that the Buckeye natural-gas pipeline will not be in contact with wastes from the Subsite;
- Excavation of waste 30 feet from the northern bank of Ley Creek;
- Excavation of contaminated sediments in the western drainage ditch;
- Off-site treatment/disposal at a TSCA-compliant facility of all excavated sediments, soils, and wastes which have PCB concentrations which equal or exceed 50 mg/kg;
- Consolidation of the excavated sediments, soils, and wastes on the landfill area north of Ley Creek;
- Construction of 6 NYCRR Part 360 cap over the landfill area north of Ley Creek;

- Installation of a clay cap in the corridors containing underground natural gas lines or overhead electric lines to allow National Grid to maintain its utilities without damaging a geomembrane cap;
- Evaluation of the groundwater/leachate collection trench and/or pre-treatment system requirements;
- Based on the evaluation of trench and pre-treatment requirements, if necessary, construction of a groundwater/leachate collection trench north of Ley Creek and construction of a pre-treatment facility;
- After pre-treatment (if necessary), treatment of the collected leachate and groundwater at METRO;
- Installation of an on-site storage tank to hold excess water volume from the groundwater/leachate collection trench(es) stemming from storm events;
- Engineered drainage controls and fencing, as appropriate;
- Implementation of institutional controls (such as environmental easements) to prohibit residential use of the Subsite property and the installation and use of groundwater wells, as well as to protect and ensure the integrity of the cap, the groundwater/leachate collection trench(es), and the engineered drainage controls;
- Operation and maintenance (O&M) of the on-site treatment plant and groundwater/leachate collection trench(es), if these remedy components are necessary, and maintenance of the Part 360 cap;
- If any portion of the Subsite is redeveloped, NYSDEC and the New York State Department of Health will require that an evaluation be completed to determine the potential for soil vapor intrusion to occur in any future constructed buildings, including provision for implementing actions recommended to address exposures; and
- Long-term monitoring.

The RAOs from the 2007 ROD were not changed.

Remedy Implementation

Clough Harbour & Associates was retained by the Town of Salina to prepare the RD documents for the Subsite, provide construction administration and construction inspection during construction, and to serve as the certifying engineer.

From August 13 to August 27, 2010, National Grid relocated the transmission lines and sub-transmission utilities at the Subsite because it was determined that the electric lines would not have sufficient ground clearance after the cap was constructed. Additionally several poles and lines were re-routed to facilitate the Subsite remediation.

The RD associated with the landfill consolidation and capping was approved by NYSDEC in August 2010.

The construction contractor mobilized for the landfill consolidation, trench construction, and capping effort on November 29, 2010. During the RA, approximately 176,000 cubic

yards of material was excavated from Parcel 6. Approximately 1,100 tons of PCB-contaminated material at levels greater than 50 mg/kg was disposed of at the Model City Landfill in Model City, New York. After consolidating the nonhazardous material on the northern landfill, the material was graded and the landfill was capped. See **Figure 3** for a layout of the landfill cover components.

NYSDEC approved the RD for the pretreatment plant in June 2014. The pretreatment plant was constructed between June and December 2014.

System Operations/Operation and Maintenance

A Site Management Plan (SMP) was prepared to provide guidance for the following O&M activities:

- Post-closure groundwater monitoring of the Subsite
- Landfill gas monitoring
- Cap mowing and inspections
- Plan for corrective actions
- Contingency plan

The SMP includes a description of institutional and engineering controls to be used at the Subsite, as well as future reporting requirements for the project, including annual periodic review reports and five-year review reports. The SMP includes the following individual plans:

- National Grid Access and Operations Plan
- Engineering and Institutional Control Plan
- Environmental Monitoring Plan
- Corrective Actions Plan
- Contingency/Safety Plan
- Groundwater Collection Trench/Pretreatment Plant Operations Manual

Potential site impacts from climate change have been assessed; the performance of the groundwater monitoring is currently not at risk due to the expected effects of climate change in the region and near the Subsite.

Progress Since Last Five-Year Review

This is the first five-year review for the Subsite.

Five-Year Review Process

Administrative Components

The five-year review team included Mark Granger (EPA RPM), Ed Modica (EPA Hydrologist), Chloe Metz (EPA Human Health Risk Assessor), Mindy Pensak (EPA Ecological Risk Assessor) and Larisa Romanowski (EPA Community Involvement Coordinator). This is a potentially-responsible-party lead Subsite.

Community Involvement

On November 19, 2015, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 32 Superfund sites and four federal facilities in New York and New Jersey, including the Onondaga Lake, Salina Landfill Subsite. The announcement can be found at the following web addresses:

http://www2.epa.gov/sites/production/files/2015-11/documents/fy_16_fyr_public_website_summary.pdf

In addition to this notification, a notice of the commencement of the five-year review was sent to local public officials. The notice was provided to the Town of Salina by email on February 3, 2016 with a request that the notice be posted in the respective municipal offices and on the Town of Salina webpage. In addition, the notice was distributed via the NYSDEC's Onondaga Lake News email listserv, which includes approximately 7,500 subscribers. The purpose of the public notice was to inform the community that the EPA would be conducting a five-year review to ensure that the remedy implemented at the site remains protective of public health and is functioning as designed. In addition, the notice included contact information, including addresses and telephone numbers, for questions related to the five-year review process or the Subsite.

Once the five-year review is completed, the results will be made available at the Subsite repositories, which are NYSDEC's Albany and Syracuse offices; Salina Town Hall, 201 School Road, Liverpool, New York; Salina Free Library, 100 Belmont Street, Salina, New York; Onondaga County Public Library, Syracuse Branch at the Galleries 447 South Salina Street, Syracuse New York; and the Atlantic States Legal Foundation, 658 West Onondaga Street, Syracuse, New York. In addition, efforts will be made to reach out to local public officials to inform them of the results.

Document Review

The documents, data and information which were reviewed in completing this five-year review are summarized in **Table 2**.

Data Review

Groundwater Monitoring Network

Quarterly monitoring of the performance of the remedy was stipulated to be conducted for the first five years following the completion of the remedial construction. Semi-annual monitoring will be conducted for years six and seven while annual monitoring is to be conducted through year ten, after which the monitoring frequency will be reassessed. A network of on-site wells was designed to evaluate groundwater quality and elevation beneath the landfill; the well network is organized as follows:

Monitoring well MW-200 is located upgradient in Parcel 1 (northeast corner), in an area from where all of the waste was removed, to provide background groundwater quality data from upgradient sources.

Monitoring wells MW-14 and MW-15 are located within the waste mass in Parcel 2 (the main area in the northwest section of the landfill), and are used to evaluate, among other things, groundwater mounding subsequent to cap installation.

Monitoring wells MW-201 and MW-202 are located on the western edge of the landfill, just beyond the western limits of Parcels 2 and 4, to evaluate downgradient groundwater quality.

Four monitoring wells are located on the southern edges of Parcels 4 and 5 near Ley Creek: MW-203, MW-205, MW-10 and MW-9. These monitoring wells are used to measure groundwater elevations and confirm drawdown within the collection trench. Monitoring well MW-10 is also used to monitor water quality, as historical VOC contamination has been detected in this well.

Four temporary piezometers, PZ-204, PZ-206, PZ-207 and PZ-208, are installed between the collection trench and Ley Creek in order to measure both water quality and water levels and to evaluate the effectiveness of the collection trench.

Another six monitoring wells, MW-19, MW-209, MW-210, MW-211, MW-212 and MW-213, are located on Parcel 6 (which is downgradient and across Ley Creek from the other parcels) to provide groundwater quality data for that area.

See **Figure 4** for the location of the monitoring wells.

Groundwater Quality

Because the RA at the Subsite has only recently been completed (2015), limited groundwater quality data is available for evaluation; additional water-quality data collected over a period of several years will be needed to determine water-quality trends at the Subsite and the remedy performance. Data for this five-year review is derived from analysis of groundwater samples collected in January, April, and July of 2015.

Upgradient monitoring point (background):

As noted previously, monitoring well MW-200 serves as the upgradient well for the monitoring network and is used to evaluate background water-quality conditions. For all 2015 sampling events, iron and sodium were the only constituents to exceed their groundwater standards (0.3 mg/L and 20 mg/L, respectively). The concentrations of iron ranged from 0.48 to 1.4 mg/L, whereas the concentrations of sodium ranged from 25.7 to 35.7 mg/L.

Monitoring points north of the collection trench and Ley Creek:

For the January 2015 sampling event, elevated concentrations of VOCs were detected in monitoring well MW-10 (located close to Ley Creek south of Parcel 5). 1,1-Dichloroethylene (1,1-DCA) was detected at 710 micrograms per liter (ug/L), chloroethane at 800 ug/L, ethylbenzene at 780 ug/L, *cis*-1,2-dichloroethylene (*cis*-1,2-DCE) at 3,500 ug/L, vinyl chloride at 1,200 ug/L and toluene at 7,600 ug/L. While total VOCs amounted to about 22,122 ug/L, these concentrations represent a significant decrease compared to VOC concentrations in previous sampling events (down 92% from the highest historical concentrations observed in 2009, and down 82% from the most recent sampling event in April 2011). VOCs were not sampled for in the April and July 2015 sampling events.

Of the metals, iron (10.5 mg/L and 11.2 mg/L), magnesium (35 mg/L and 50.4 mg/L) and sodium (44.9 mg/L and 44.9 mg/L) exceeded the groundwater standards of 0.3 mg/L, 35 mg/L and 20 mg/L, respectively, in the January and July 2015 sampling events. Manganese slightly exceeded the standard of 0.3 mg/L, and was detected at 0.37 mg/L and 0.4 mg/L for these two sampling events. Chloride was detected at 292 mg/L, exceeding the standard of 250 mg/L.

For monitoring wells on the western edge of the landfill, low concentrations of VOCs were observed for the January 2015 sampling event: For well MW-201, 1,1-DCA was detected at 62 ug/L, chloroethane at 41 ug/L, cis-1,2-DCE at 14 ug/L, and vinyl chloride at 9 ug/L. No VOC concentrations exceeding standards were reported for well MW-202 for the January 2015 sampling, nor for wells MW-201 and MW-202 for the July 2105 sampling event.

In monitoring well MW-201, iron was detected at concentrations ranging from 0.92 mg/L to 6.2 mg/L and magnesium at 373 mg/L in the January 2015 sampling event, and manganese at 0.6 mg/L at slightly above standard in the April 2015 sampling event. In monitoring well MW-202, iron was detected at concentrations ranging from 5 mg/L to 9.3 mg/L, whereas sodium was consistently detected at an average concentration of 31.6 mg/L, in all of the 2015 sampling events.

Monitoring points between the collection trench and Ley Creek:

For the piezometers installed downgradient of the collection trench (PZ-204, PZ-206, PZ-207 and PZ-208), minor concentrations of VOCs, metals and PCBs were observed,

although, as previously noted, the collection trench and pretreatment plant commenced operations in January 2015.

For the January 2015 sampling event, low concentrations of VOCs were reported in piezometer PZ-204: 1,1-DCA was detected at 6.1 ug/L, cis-1,2-DCE at 9 ug/L and vinyl chloride at 6 ug/L. VOCs were also reported in piezometer PZ-208: for the January 2015 sampling event, 1,1-DCA at 19 ug/L, cis-1,2-DCE at 9 ug/L, vinyl chloride at 47 ug/L, benzene at 1.5 ug/L and chloroethane at 14 ug/L. A number of VOCs exceeded the groundwater standards in piezometer PZ-207 for the July 2015 sampling: trichloroethylene (TCE) at 5.6 ug/L, 1,1-DCA at 220 ug/L, cis-1,2-DCE at 77 ug/L, vinyl chloride at 39 ug/L, chloroethane at 1,100 ug/L, toluene at 18 ug/L and benzene at 2 ug/L. Piezometer PZ-207 is located across from monitoring well MW-10, which historically contained high levels of VOCs.

For all four of the piezometers, iron, magnesium, manganese, sodium and copper were detected above their respective groundwater standards. Arsenic, barium and beryllium also exceeded groundwater standards in piezometers PZ-206 and PZ-207. Chromium and cobalt exceeded groundwater standards in piezometer PZ-208. Concentrations of metals observed in piezometers for all three 2015 sampling events are as follows: iron, 10.6 to 282 mg/L; magnesium, 41 to 318 mg/L; manganese, 1.6 to 13 mg/L; sodium, 24.4 to 64.1 mg/L; copper, 0.13 to 0.41 mg/L; arsenic, 0.078 to 0.12 mg/L; barium, 1.2 to 11 mg/L; beryllium, 0.0049 to 0.007 mg/L; chromium, 0.17 to 1.5 mg/L and cobalt, 0.011 mg/L. Chloride also exceeded the groundwater standard in piezometer PZ-207 at concentrations of 288 mg/L and 303 mg/L for the April and July 2015 sampling events, respectively.

PCB Aroclor 1248 was detected in piezometer PZ-206 at 3.1 ug/L (compared to the 0.09 ug/L standard) and in piezometer PZ-207 at 0.77 ug/L in the July 2015 sampling. PCB Aroclor 1242 was detected in piezometer PZ-208 at a concentration of 5.4 ug/L. It should be noted that contamination found in samples obtained from the piezometers may not necessarily be derived from the landfill. The depression of the water table induced by the collection trench in the area adjacent to the Creek may, during the low water-level season, causes losing stream conditions in the reach of Ley Creek near the trench. Thus, any contaminated stream water can potentially be caught up in groundwater sampled in piezometers under losing-stream conditions. Sampling-method variability may also mobilize colloidal solids in the groundwater giving false positives for some constituents.

Monitoring points on Parcel 6:

Monitoring wells installed on Parcel 6 include MW-209, MW-210, MW-211, MW-212, MW-213 and MW-19. For the 2015 sampling events, elevated levels of VOCs were reported in one of the wells, whereas metal exceedances were reported for most of the wells. Also, several leachate indicators (sulfur, chloride and bromide) were observed.

Elevated concentrations of VOCs were detected in monitoring well MW-211, being located near the excavation that occurred due to elevated VOC concentrations in that area. Based on the January 2015 sampling event, TCE was detected at a concentration of 870 ug/L, vinyl chloride at 18 ug/L, 1,1,1-trichloroethane at 33 ug/L, 1,1-DCA at 140 ug/L, and 1,1-DCE at 92 ug/L. The constituents cis-1,2-DCE and trans-1,2-DCE were detected at 9,700 ug/L and 24 ug/L, respectively. Benzene was also detected at a concentration of 7.3 ug/L.

Iron, magnesium and sodium were detected in all monitoring wells of this group at concentrations above their respective standards. The ranges of metal concentrations reported over the three sampling events are iron, 0.6 to 72.8 mg/L; magnesium, 47.6 to 111 mg/L; manganese, 0.5 to 1.8 mg/L and sodium, 20.6 to 306 mg/L.

Of the leachate indicators, chloride was detected at elevated concentrations above the standard in monitoring wells MW-209, MW-211 and MW-19. Concentrations ranged from 305 mg/L to 741 mg/L. Bromide was also detected in monitoring wells MW-209 and MW-211 at concentrations ranging from 2.6 mg/L to 8.4 mg/L (compared to the 2 mg/L standard). Sulfate was elevated above the standard of 250 mg/L in monitoring wells MW-209, MW-210, MW-211 and MW-212 for the three sampling events. Concentrations ranged from 338 mg/L to 1,180 mg/L.

The sulfate results are particularly elevated compared to data collected from wells located on the north side of Ley Creek and compared to results obtained during the RI in the late 1990s. The source of the sulfate is unknown, but may be related to the removal of waste above a native peat deposit. During the waste removal, a sulfur smell was noted and could be related to the decomposition of organic matter in the peat.

Groundwater Elevation

Monitoring wells MW-14 and MW-15, located within the waste mass in Parcel 2, are monitored annually to evaluate groundwater mounding subsequent to cap installation. In April 2015, the depth-to-water of 23.66 feet and 19.53 feet was measured at each well, respectively. These water levels will serve as a baseline to compare subsequent water-level measurements to track groundwater mounding beneath the landfill.

Four monitoring wells located on the southern edges of Parcels 4 and 5 along the collection trench, MW-203, MW-205, MW-10 and MW-9, are paired with piezometers PZ-204, PZ-206, PZ-207 and PZ-208, which are installed between the collection trench and Ley Creek to measure water levels and to evaluate the effectiveness of the collection trench. Based on measurements made in April 2015, the following depth-to-water determinations were made:

PZ-204/MW-203	2.41 feet/5.81 feet
PZ-206/MW-205	2.85 feet/7.34 feet
PZ-207/MW-10	2.86 feet/12.06 feet
PZ-208/MW-9	2.24 feet/10.85 feet

For all well pairs, the measurements indicate that the hydraulic gradient is from the bank

of Ley Creek to the collection trench: the collection trench functions to create a hydraulic divide and is functioning as designed. Additional measurements made on well pair PZ-207/MW-10 (3.09 feet/12.19 feet) in July 2015 show that drawdown is maintained even with seasonal water-level decreases. In addition, the second Quarterly Report of Groundwater Monitoring (June 2015) indicates that in several pump tests conducted on the constructed trench in 2013, it was documented that under pumping conditions, drawdown was observed in the piezometers located between the trench and Ley Creek and that the pumping was creating an inward gradient.

Landfill Gas Vent Monitoring

As per the Sampling Monitoring Plan, landfill gas is monitored on an annual basis. Methane was monitored in April 2015 and was detected in a majority of the gas vents. The lowest concentrations were observed on Parcels 4 and 5, where, on Parcel 4, the initial reading of percent methane gas ranged from 1.1% to 4.9% and averaged 2.2% for its seven vents, and on Parcel 5, methane ranged from 0.1% to 0.8% and averaged 0.35% for its four vents. The highest concentrations observed were from Parcel 2, where methane ranged from 0.0% to 34.2% and averaged 6.9% for its twenty-three vents, and from Parcel 3 (utilities corridor), where methane ranged from 0.0% to 18.1% and averaged 3.7% for its twelve vents. Very little methane gas was detected during the RI. However, it is likely that additional gas was generated as a result of waste-relocation activities, particularly on Parcel 2 (upon which wastes were consolidated).

Site Inspection

A five-year review inspection of the Subsite was conducted on October 22, 2015. In attendance were Mark Granger of EPA, and Curtis Waterman and Alma Lowry representing the Onondaga Nation. The cap, fencing, vents, roadways, wetlands, monitoring wells, and other closure related facilities were all in good repair at the time the inspection.

Interviews

No interviews were conducted for this five-year review.

Institutional Controls Verification

The ROD amendment called for the implementation of institutional controls (such as environmental easements) to prohibit residential use of the Subsite property; to prohibit the installation and use of groundwater wells; and to protect and ensure the integrity of the cap, the groundwater/leachate collection trench(es), the wetlands, and the engineered drainage controls. An Engineering and Institutional Control Plan (EICP) is currently being revised. Following completion of the EICP the ICs will be put in place and their effectiveness will be monitored.

Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedies selected in the March 2007 ROD and modified by the May 2010 ROD Amendment included excavation/consolidation of the landfilled wastes, off-site treatment/disposal of TSCA wastes, capping, construction of a groundwater/leachate collection trench, construction of pretreatment facility, long-term monitoring program, institutional controls, and an O&M plan. The construction of the landfill cap was successfully completed in 2013, thus reducing the potential for contaminants to leach from the landfill and eliminating the exposure pathway to both human and ecological receptors from direct contact with landfill contaminants, as well as ecological receptors ingesting contaminated sediment and soil and food items impacted by contaminant uptake. The construction of the drainage trench was completed in 2013 and the pretreatment plant was brought on line in January 2015.

As per the O&M program, the components of the landfill undergo periodic inspection and maintenance. The integrity of the geomembrane, soil and vegetative covers has been maintained. Subsite fencing, monitoring wells, engineered drainage controls and gas vents are reported to be in good repair. Based on water-level measurements in 2015, the leachate collection trench maintains drawdown conditions along the trench and prevents contaminated leachate from migrating past the trench, functioning as designed. Vegetation in the wetland areas is well established. Also, implementation of institutional controls (such as environmental easements) will, once in place, prohibit residential use of the Subsite property and help to protect the integrity of the various components of the remedy.

A network of monitoring wells has been installed at the Subsite to evaluate the performance of the remedy. Implementation of the groundwater-quality monitoring program has only recently been initiated (January 2015). Although limited, water-quality results from sampling in 2015 already show a significant decrease in VOC contamination in monitoring well MW-10 compared to the highest historical concentrations observed in this well in 2009. Water-quality results for wells screened downgradient of landfill parcels and the collection trench generally show no or low detections of VOCs and low detections of iron, magnesium and sodium. Elevated concentrations of VOCs were reported for monitoring well MW-211 on Parcel 6, but, in light of the removal of VOC source materials in the vicinity of this well, water quality is expected to improve in this area with time. Additional water-quality data collected over the coming years inform future five-year reviews and allow for continued review of the remedy's performance.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The baseline human-health risk assessment considered exposure to soils, leachate and groundwater by child and adult trespassers, as well as future construction workers. The exposure assumptions and the toxicity values that were used to estimate the potential

risks and hazards to human health followed the general risk-assessment practice at the time the risk assessment was performed and are consistent with current practice.

The objective of the ongoing groundwater monitoring is to ensure that groundwater contamination and leachate are not migrating off-site. Since the remedy was only recently completed, it is too early to assess groundwater trends. Although some wells show exceedances of drinking water standards, there is no exposure via the direct pathway (ingestion as a potable water source) since the surrounding community is connected to a public supply. An institutional control, which will soon be in place, preventing the installation of wells in the area of contamination will further ensure contaminated water will not be consumed.

One potential exposure pathway that was not evaluated at the time of remedy selection is vapor intrusion. The potential for soil vapor intrusion is evaluated when site soils and/or groundwater are known or suspected to contain VOCs. Although low levels of VOCs were found at the western edge of the landfill in monitoring well MW-201, there are no buildings nearby that might be impacted by vapors. Therefore, this pathway is currently considered incomplete. Institutional controls to protect the cap and prohibit the development on the landfill will soon be in place, ensuring that this pathway will remain incomplete.

The remaining waste material and contaminated soils not taken off-site for disposal were consolidated under the landfill cap. The cap provides an effective barrier to direct contact with contaminated material. Additionally, a fence controls access from the east, Ley Creek limits access from the south and highways on the north and wetlands to the west of the landfill make the Subsite difficult to access. Data for the areas where material was excavated were reviewed. Although PCBs (in Area 6) and arsenic (in Area 1) slightly exceeded the New York State commercial soil cleanup objectives in a few areas, the concentrations (maximum of 5.1 mg/kg of Aroclor 1248 and 24.8 mg/kg of arsenic) were within the acceptable risk range for these compounds. These areas are also protected by a grass and dirt cover, therefore, combined with the accessibility restrictions described previously, they are not considered to be of concern.

The methodologies, exposure assumptions and toxicity values used to determine the potential for unacceptable ecological risk followed the general risk assessment practices at the time the risk assessment was performed and remain acceptable. The terrestrial exposure pathway to surface soil contaminants has been addressed by removing waste material and contaminated soils off-site or consolidating under a cap.

Surface water and sediment in Ley Creek, which runs along the southern edge of the landfill cap, are being addressed as a separate Onondaga Lake subsite. Therefore, these media were not evaluated as part of the baseline human health and ecological risk assessments and are not addressed in this five-year review.

The RAOs remain valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other issues have been identified that could call into question the protectiveness of the remedy.

Technical Assessment Summary

The implemented remedial actions have adequately addressed all exposure pathways that could result in unacceptable risks. Because the remedial actions were only recently implemented, only a limited amount of post-remediation data has been collected. However, data collected to date show an improvement in groundwater quality.

While institutional controls are not yet in place, engineering controls are currently in place to address exposure pathways that could result in unacceptable risks. There are no changes in the physical condition of the Subsite or other issues that could call into question the protectiveness of the remedy.

Issues, Recommendations and Follow-Up Actions

There are no recommendations or follow-up actions stemming from this five-year review.

Protectiveness Statement

The remedy is protective of human health and the environment.

Next Review

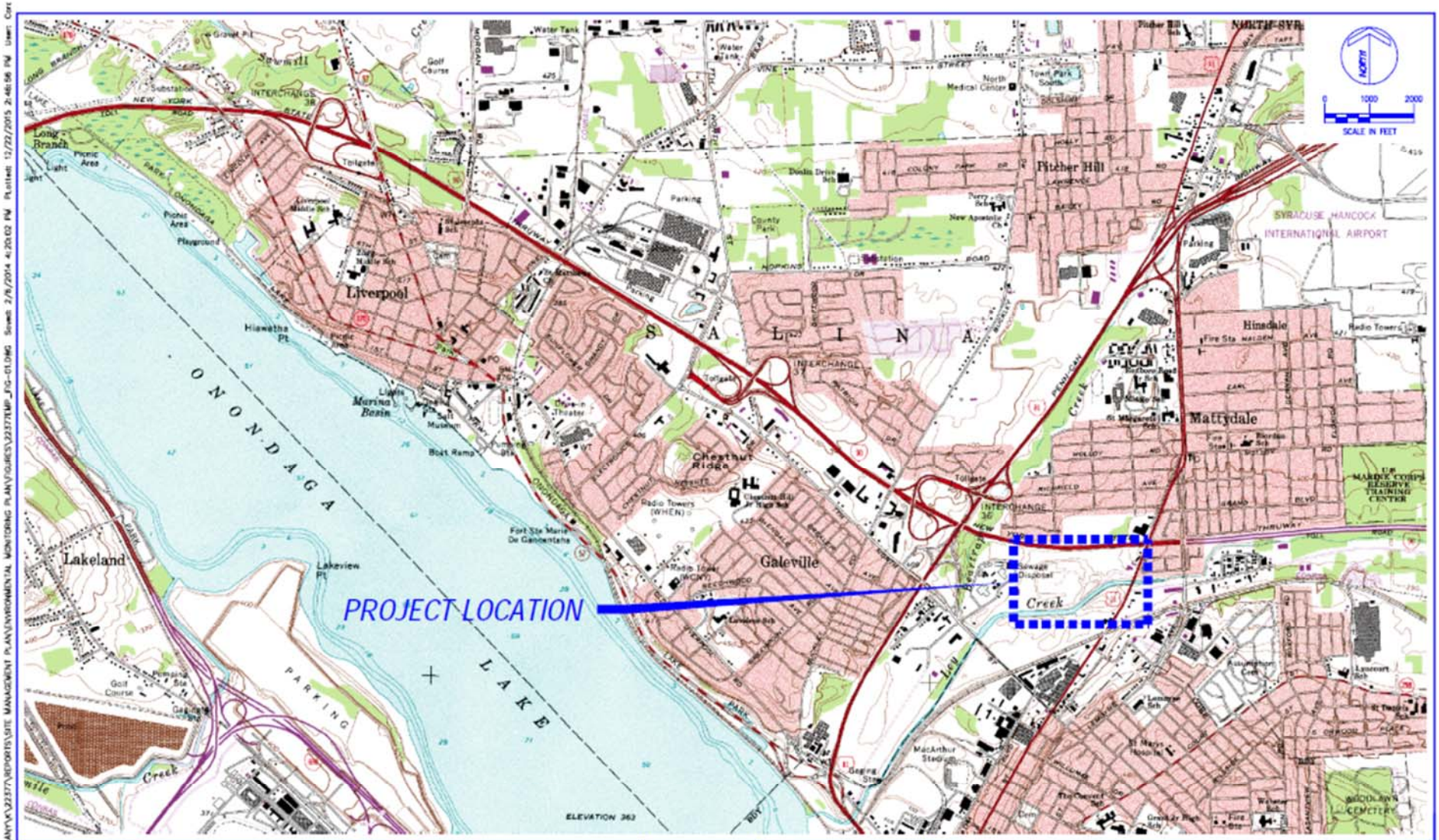
The next five-year review report for the Salina Landfill Subsite of the Onondaga Lake Superfund site is required five years from the completion date of this review.

TABLES

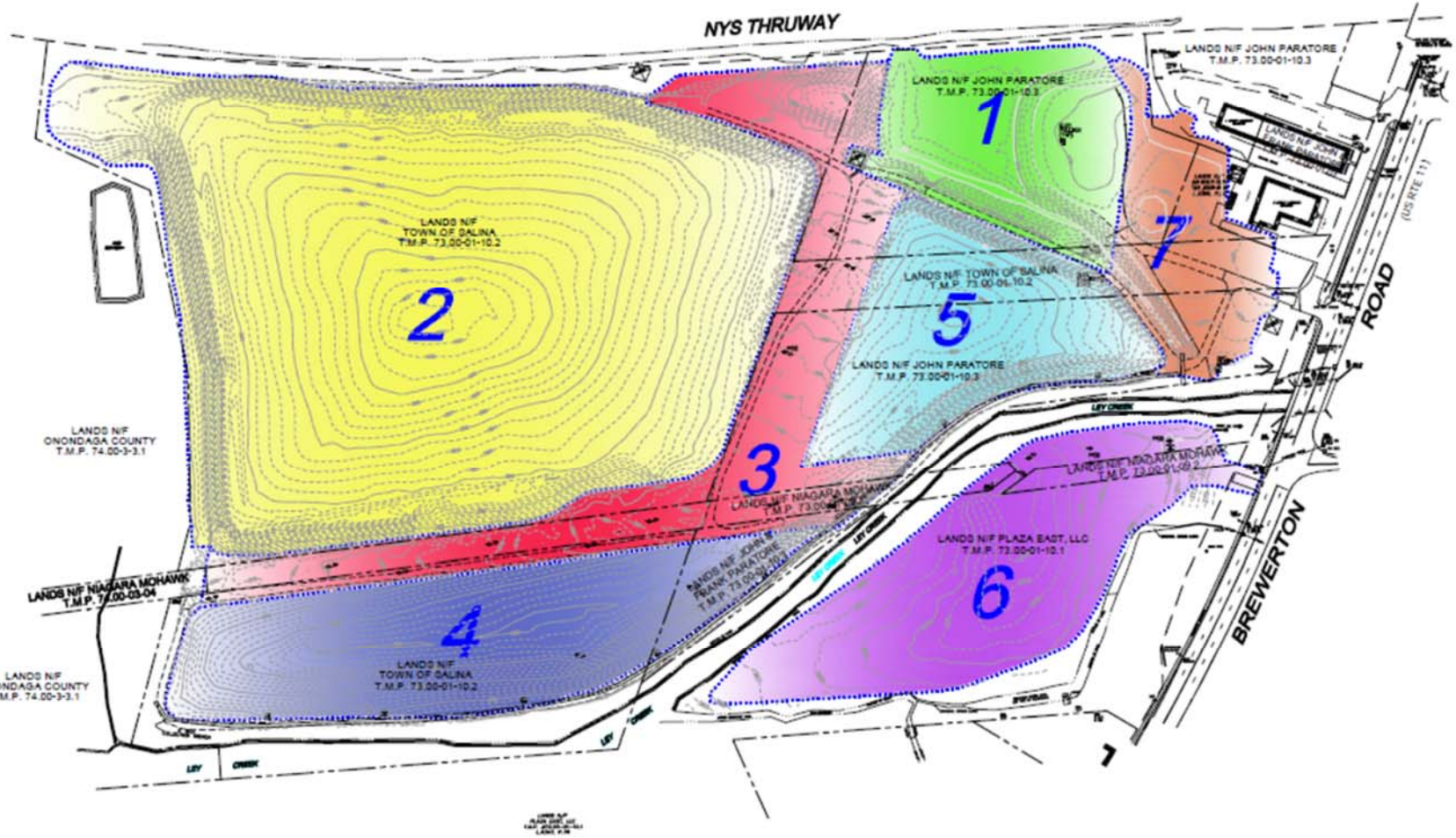
Table 1: Chronology of Subsite Events	
Event	**Date**
Town starts landfill operations at Town of Salina Landfill	1962
Landfill closed pursuant to an order by NYSDEC	Late 1974/ early 1975
Landfill covered with a two-foot clay-type soil	1981-82
NYSDEC and Onondaga County Department of Health find contamination in soil and groundwater adjacent to north bank of Ley Creek along landfill	1986
Bioaccumulation study on behalf of General Motors Corporation shows elevated PCB levels in fish caught in Ley Creek	1989
NYSDEC Preliminary Site Assessment shows Subsite-related contaminants in sediment and soil	1994
EPA designates Onondaga Lake as a Superfund National Priorities List (NPL) site	1994
NYSDEC Preliminary Site Assessment shows Subsite-related contaminants in groundwater	1996
NYSDEC and EPA jointly notify Town that Salina Landfill is Subsite of Onondaga Lake NPL site	1997
Town of Salina enters into Order on Consent with NYSDEC to perform RI/FS, remedial design (RD) and Remedial Action (RA) for Subsite	1997
Record of Decision (ROD) signed	2007
Town of Salina's contractor commenced the RD of selected remedy	2007
NYSDEC completes Interim Remedial Measure to remove VOCs from soils around MW-10	2010
Amended ROD signed	2010
NYSDEC approves RD for waste consolidation and landfill closure	2010
RA contract for landfill closure awarded	2010
NYSDEC approves RD for groundwater/leachate collection trench	2012
RA for landfill closure and collection trench completed	2013
NYSDEC approves RD for pretreatment plant	2013
RA contracts for the pretreatment plant awarded	2014
RA for the pretreatment plant completed	2014
Mobilization for construction of pretreatment plant	2014
RA Report for waste consolidation and landfill closure approved	2014
Site Management Plan approved	2014
RA Report for pre-treatment plant approved	2015

Table 2: Documents, Data and Information Reviewed in Completing the Five-Year Review	
Document Title, Author	**Date**
Remedial Investigation, CHA	May 2001
Feasibility Study, CHA	May 2002
Record of Decision (ROD), NYSDEC	March 2007
Cap Remedial Design (RD), CHA	August 2010
ROD Amendment , NYSDEC	September 2010
Trench RD, CHA	January 2012
Pre-Treatment Plant RD, CHA	December 2013
Cap/Collection Trench Remedial Action (RA) Report, CHA	September 2014
Pre-Treatment Plant RA Report, CHA	September 2015
Draft Site Management Plan, CHA	December 2015
2015 Quarterly Reports, CHA	2015

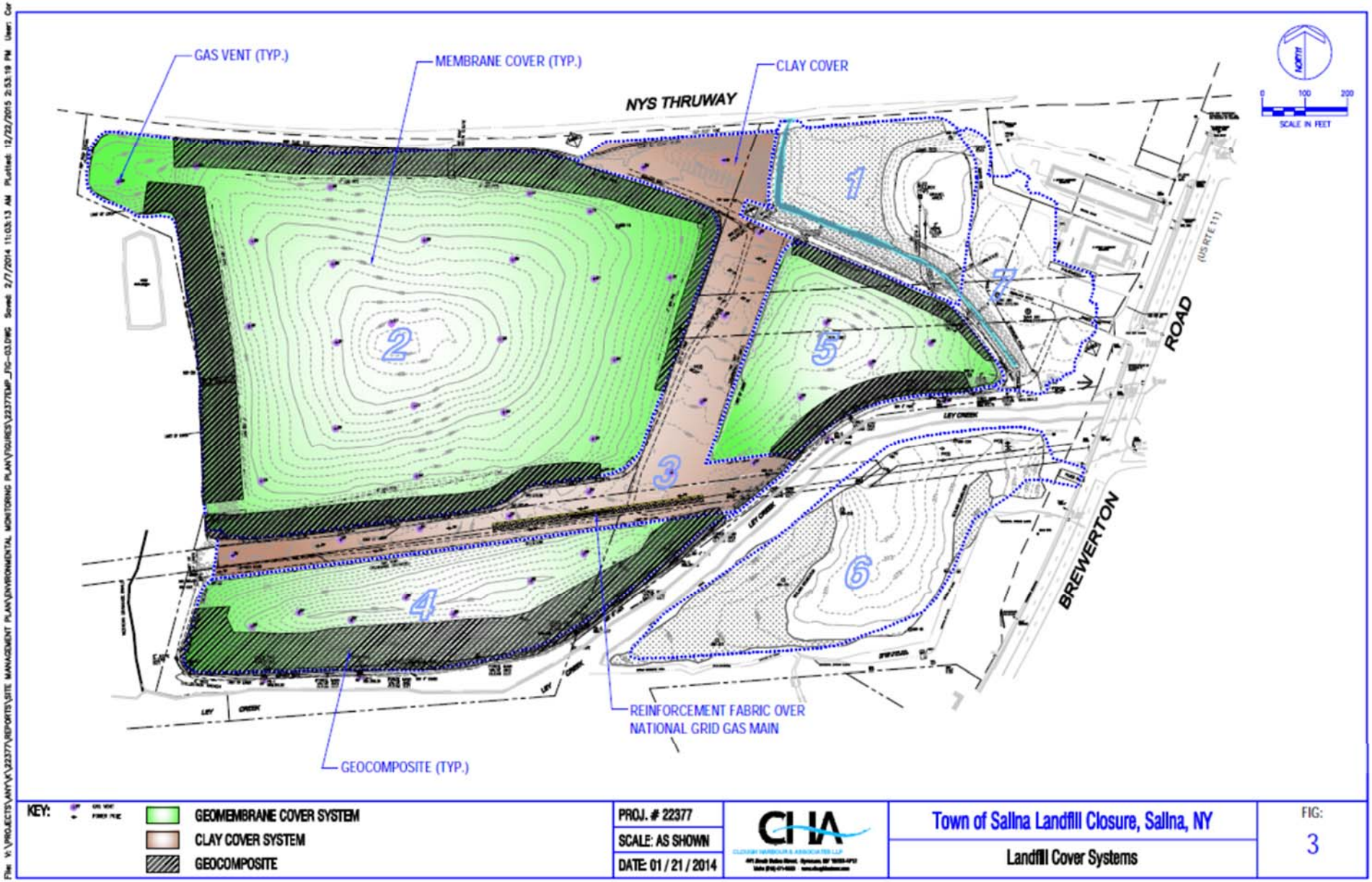
FIGURES

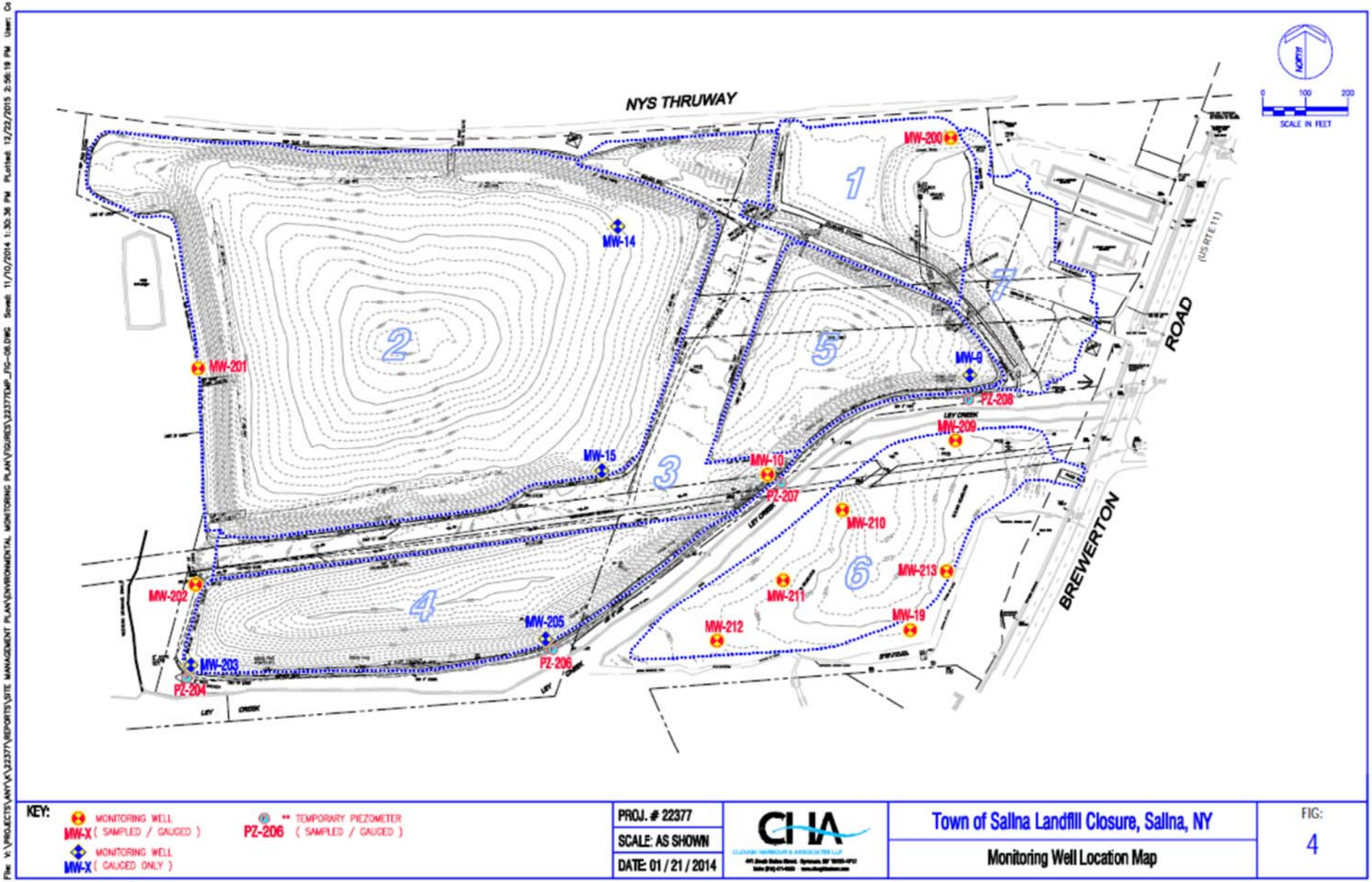


PROJ. # 22377 SCALE: AS SHOWN DATE: 01 / 21 / 2014	CHA	Town of Salina Landfill Closure, Salina, NY Vicinity Location Map	FIG: 1



PROJ. # 22377 SCALE: AS SHOWN DATE: 01 / 21 / 2014	CHA	Town of Salina Landfill Closure, Salina, NY Property Ownership and Parcel Identification Map	FIG: 2


GAS VENT (TYP.)
MEMBRANE COVER (TYP.)
CLAY COVER
NYS THRUWAY
NORTH
0 100 200
SCALE IN FEET
1
2
3
4
5
6
7
BREWERTON ROAD
(US RTE 11)
LEY CREEK
REINFORCEMENT FABRIC OVER
NATIONAL GRID GAS MAIN
GEOCOMPOSITE (TYP.)
KEY:
GEOMEMBRANE COVER SYSTEM
CLAY COVER SYSTEM
GEOCOMPOSITE
PROJ. # 22377
SCALE: AS SHOWN
DATE: 01 / 21 / 2014
CLOUGH HARBOUR & ASSOCIATES LLP
Town of Salina Landfill Closure, Salina, NY
Landfill Cover Systems
FIG:
3



KEY:

MONITORING WELL
MW-X (SAMPLED / GAUGED)

MONITORING WELL
MW-X (GAUGED ONLY)

** TEMPORARY PIEZOMETER
PZ-206 (SAMPLED / GAUGED)

PROJ. # 22377	
SCALE: AS SHOWN	
DATE: 01 / 21 / 2014	

CHA

Town of Salina Landfill Closure, Salina, NY

Monitoring Well Location Map

FIG: 4