

**THE FIFTH FIVE-YEAR REVIEW REPORT FOR
ISLIP MUNICIPAL LANDFILL SUPERFUND SITE
SUFFOLK COUNTY, NEW YORK**



Prepared by

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

A handwritten signature in black ink, appearing to read "A. Carpenter".

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9.27.18

Date

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
ICs	Institutional Controls
IRRA	Islip Resource Recovery Agency
MSW	Municipal Solid Waste
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	Operation and Maintenance
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
ROD	Record of Decision
RPM	Remedial Project Manager
TBC	To be considered
VOCs	Volatile Organic Compounds

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) 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. The methods, findings, and conclusions of reviews are documented in five-year review reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the Islip Municipal Landfill Superfund Site (also known as Blydenburgh Road Landfill site (Site)). The triggering action for this statutory review is the signature date of the previous FYR Report, which was September 30, 2013. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The work at the site has been conducted as a single operable unit.

The Islip Municipal Landfill Superfund Site FYR was led by Mark Dannenberg (remedial project manager). Participants included Kathryn Flynn (hydrogeologist), Nick Mazziotta (human health risk assessor), Charles Nace (ecological risk assessor) and Cecilia Echols (community involvement coordinator). The Islip Resource Recovery Agency (IRRA) was notified of the initiation of the FYR. The review began on 1/15/2018.

Site Background

The Site property is located in Hauppauge, in the Town of Islip, Suffolk County, New York (see **Figure 1**, Site Location Map). The Site is part of a larger complex owned by the Town of Islip, and operated by the IRRA.

The landfill complex consists of four contiguous, solid waste management areas: (1) the approximately 52-acre, closed and capped municipal solid waste (MSW) landfill with both lined and unlined components, which is designated as the Superfund Site; (2) an approximately two-acre closed and capped ash monofill; (3) a 13-acre operational clean fill landfill which accepts construction and demolition debris; and (4) a 17.5-acre sandy borrow pit which is intended to be converted into an extension to the clean fill landfill. The remainder of the acreage is committed to buffer zones, leachate storage, surface water management, a groundwater treatment system, office and maintenance buildings, on-site roadways, and landfill gas recovery energy utilization.

Residential communities and a pre-school are located to the north and west of the landfill. A hotel and golf course with residential properties are located to the east of the landfill. The landfill is bordered on the south by Motor Parkway, which is predominantly a commercial area. A school is located approximately one-half mile further south.

Most of the landfilling activities in the unlined portion of the MSW landfill were carried out from the late 1960s through the early 1980s. In 1978, approximately 70 fifty-five gallon drums of chlorinated solvents were allegedly disposed here. The southern section of the landfill was lined on the bottom and was operated from 1982 to 1990. The Site stopped receiving municipal solid waste in December 1990.

The landfill complex is fenced and mostly vacant. A portion of the landfill complex unrelated to the Site is actively used as a clean fill (for construction and demolition debris) disposal site. The Town of Islip does not have any future plans for alternative uses of the Site.

The Site was proposed for listing on the National Priorities List (NPL) in January 1987 and was added to the NPL on March 31, 1989.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Islip Municipal Landfill		
EPA ID: NYD980531727		
Region: 2	State: NY	City/County: Islip/Suffolk
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: State <i>[If "Other Federal Agency", enter Agency name]:</i>		
Author name (Federal or State Project Manager): Mark Dannenberg		
Author affiliation: EPA		
Review period: 10/11/2013 - 8/30/2018		
Date of site inspection: 4/19/2018		
Type of review: Statutory		
Review number: 5		
Triggering action date: 9/30/2013		
Due date (five years after triggering action date): 9/30/2018		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

A primary basis for taking remedial action at the Site was the potential for human exposure to contaminated groundwater. The human health risk assessment (HHRA), conducted in 1992, was based on future exposures to the contaminants of concern (COCs) detected in the groundwater monitoring wells. The COCs are Volatile Organic Compounds (VOCs), primarily chlorinated solvents such as trichloroethylene, tetrachloroethylene, dichloroethylene, trichloroethane, and vinyl chloride. This is assumed to be related to the drums of chlorinated solvents allegedly disposed here in 1978. The assessment assumed future installation of public supply wells within the impacted shallow or intermediate zone aquifers. The HHRA and Record of Decision (ROD) identified unacceptable cancer risks from drinking contaminated groundwater under a future use scenario; the main contributors to this risk were the following COCs: vinyl chloride, arsenic, and beryllium. The main COCs driving noncancer hazards identified in the HHRA and ROD are: antimony, thallium, and four VOCs (benzene, trichloroethylene, tetrachloroethylene and vinyl chloride). Exposures via the inhalation of contaminants in air by workers at the landfill and off-site residents were also evaluated based on results from an air dispersion model; the resulting risks were below EPA thresholds. As the primary concern was contaminated groundwater, ecological risks were not evaluated as part of the RI.

Ecological risks were not evaluated as part of the RI.

A chronology of Site events is presented in **Table 1**.

Response Actions

In 1979, two houses adjacent to the landfill were purchased by the Town of Islip after high concentrations of methane gas were detected in their basements. The source of this methane was thought to be the landfill. In 1983, an active gas-collection system was installed to control migration of flammable or explosive gases (e.g., methane) beyond the Site boundary. Furthermore, groundwater investigations were conducted in 1980 in the vicinity of the landfill which indicated that groundwater adjacent to the landfill was contaminated with volatile organic compounds (VOCs), namely, vinyl chloride and tetrachloroethene. In 1981, the Town of Islip connected the residents adjacent to the Site to a permanent public water supply to prevent exposure to contaminated groundwater in private wells.

On September 1, 1987, the Town of Islip and NYSDEC entered into an Order on Consent to conduct a remedial investigation (RI) and a remedial program at the Site. The RI for the Site began in September 1988 and was completed in May 1991.

The ROD was issued on September 30, 1992. The ROD included the following remedial action objectives:

- Minimize the infiltration of rainfall or snow melt into the landfill, thus reducing the quantity of water percolating through the landfill materials and leaching out contaminants;

- Prevent inhalation of vapors from the landfill;
- Reduce the movement and toxicity of the contaminated landfill leachate into groundwater, and subsequent downgradient migration of contaminants;
- Reduce the movement and toxicity of contaminants in the groundwater; and
- Restore the aquifer to drinking-water quality.

The three major components of the selected remedy were (1) capping and closure of the Municipal Solid Waste landfill; (2) installation and operation of a groundwater extraction and treatment system; and (3) institutional controls. These components are described in greater detail below.

- Installation of a modified geosynthetic membrane cap on the landfill which is designed in compliance with Part 360 of Title 6 of the New York Code of Rules and Regulations (6 NYCRR Part 360), Solid Waste Management Facilities. The areal extent of the cap is approximately 52 acres. The synthetic membrane cap includes layers of fill material, drainage layers, an impermeable membrane, and a gas-venting system that utilizes Rolite-treated incinerator ash;
- Construction of a stormwater system that will direct and control runoff from the Site to on-site recharge basins;
- Development and implementation of an on-site groundwater extraction and treatment system. Groundwater contaminated with approximately 50 parts per billion (ppb) of total VOCs or more will be extracted, treated via aeration, and discharged to an on-site recharge basin. The ROD established a cleanup value of 50 ug/L for VOCs;
- Implementation of a groundwater-monitoring system to monitor the groundwater contamination plume and to evaluate the effectiveness of the groundwater treatment system, including natural attenuation processes;
- Performance of a treatability study to determine the effectiveness of aeration in precipitating inorganic compounds from the groundwater. If the study demonstrates that this technology is not effective in removing inorganic compounds, then a contingency remedy which utilizes chemical precipitation and air stripping to treat groundwater will be implemented. The contingency remedy is identical to the selected remedy in all other aspects;
- Determination of whether carbon adsorption will be required as a polishing treatment step to ensure compliance with New York State Pollutant Discharge Elimination System (SPDES) standards;
- Evaluation of the groundwater treatment system to determine whether an air pollution control device is necessary to comply with air emission requirements;
- Collection of ambient air samples to determine whether modifications to the landfill gas control system are necessary. If ambient air samples indicate that landfill gas emissions from the three existing flares are unacceptable, and operation of the current flare system cannot be modified to reduce VOC emissions while maintaining perimeter subsurface control of explosive gas, then supplemental fuel will be provided to sustain combustion in the flares;
- Completion and evaluation of the supplemental groundwater investigation begun in June 1992 to determine whether the groundwater contamination detected at well cluster 7 (well 7M-1) is Site-related. If the contamination in well 7M-1 is determined to be attributable to the Site, then the selected remedy will be appropriately modified during the design stage to accommodate this additional volume of contaminated groundwater;

- Development of an air-monitoring system to ensure compliance with ambient air standards; and
- Recommendations that deed and well restrictions be imposed to prevent the installation of drinking water wells in impacted areas.

Status of Implementation

A complete closure program of the entire MSW landfill area (including capping, methane recovery, and landfill gas-monitoring activities) has been implemented, as required by a December 18, 1990 NYSDEC Consent Order with the Town of Islip. In December 1990 the Town of Islip ceased landfilling of municipal solid wastes at the Site. The construction contract for the closure plan and landfill cap design were issued in September 1992, the on-site mobilization began in January 1993, and all work required under the contract was completed in November 1993.

The final cover section of the MSW landfill and ash monofill consists of multiple natural and geosynthetic layers. Leachate collected from the MSW landfill is ultimately transferred to tanker trucks for off-site treatment and disposal at the permitted Suffolk County Wastewater Treatment Plant. The groundwater treatment system required by the ROD has been operating since 1996. Contaminated groundwater is presently being extracted from five extraction wells and pumped to the treatment facility to remove VOCs and metals. Treated water is discharged back into the groundwater via the recharge (or injection) wells.

Institutional Controls

The ROD recommended that deed and well restrictions be imposed to prevent the installation of drinking water wells in impacted areas. Institutional controls are in effect at the Site as summarized in the IC Summary Table below.

Additionally, with the exception of one residence, all residences surrounding the Islip Landfill Site are supplied with public water. The one residential well is not believed to be in the contaminant plume. The well was tested by the Suffolk County Department of Health Services in August 2009 and November 2009 and site-related contamination was not detected. The NYSDOH and ATSDR recommended that periodic monitoring be conducted at this well to ensure that it is not impacted by site-related contamination in the future. This well has not been monitored since 2009. NYSDOH will request that Suffolk County Department of Health Services contact the owner of this private well during the Fall of 2018 to schedule an appointment to collect sample(s).

IC Summary Table

Table A: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater and Landfill property	Yes	Yes	Impacted areas of the groundwater plume.	The ROD recommends that deed and well restrictions be imposed to prevent the installation of drinking water wells in impacted areas *	Deed restrictions are currently in place for the site property. In addition, drinking water well restrictions have been carried out in part by compliance with Suffolk County, Department of Health Services Private Water Systems Standards.

*The property continues to be owned and controlled by the Town of Islip and deed restrictions recorded on November 28, 2001 prevent disturbance of the waste material and restrict changes in use of the property

Systems Operations/Operation & Maintenance

The IRRA implements a groundwater sampling and monitoring program, which consists of collecting water-level measurements and groundwater quality sampling at 36 monitoring wells (see **Figure 2**) to evaluate changes in groundwater quality over time. Groundwater samples were originally collected on a quarterly basis and are currently collected semi-annually. The groundwater samples are analyzed for VOCs, iron and manganese in the first round of sampling each year, and for VOCs, metals, and leachate parameters in the second round of sampling each year. In addition, monthly monitoring of the groundwater treatment plant effluent is conducted to monitor levels of VOCs, iron, and manganese, and to verify compliance with SPDES permit limits. At the request of NYSDEC, Freon 21 and Freon 22 were added to the list of parameters for analysis in 2015. In addition, and also at the request of NYSDEC, the IRRA will collect samples for PFAS (per and polyfluoroalkyl substances) in the near future; NYSDEC will perform the analysis for these parameters.

The cap is routinely inspected and is properly maintained. The landfill cap construction included an active landfill gas collection/control system (see **Figure 3**) to prevent migration of gases off-site. The perimeter landfill gas collection wells are vented directly to the atmosphere; the gases collected from the central internal lines are combusted. The IRRA routinely collects soil gas samples from the monitoring wells placed along the perimeter of the landfill which demonstrates the effectiveness of the methane gas collection system and verifies that gas is not migrating beyond the landfill boundary.

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

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the **last** five-year review as well as the recommendations from the **last** five-year review and the current status of those recommendations.

Table B: Protectiveness Determinations/Statements from the 2013 FYR

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Short-term Protective	The remedy currently protects human health and the environment because the cap prevents direct exposure to soil contaminants. All surrounding residences (with one exception) are on public water. In order for the remedy to be protective in the long term, modifications to the groundwater extraction system will need to reflect containment of groundwater contaminant migration from the landfill property and the evaluation of the landfill gas collection system will need to verify that gases are not migrating beyond the perimeter of the site property.

Table C: Status of Recommendations from the 2013 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
	modifications to the groundwater extraction system will need to reflect containment of groundwater contaminant migration from the landfill property.	The PRP is installing an additional groundwater extraction system to capture contamination.	Completed	Monitoring well GM-1D was converted to a temporary extraction well in order to capture contaminated groundwater from migrating from the southern portion of the Site.	10/1/2013
	A private well is in use approximately 500 feet southwest of the landfill. The well was tested by the Suffolk County Department of Health Services in August 2009 and November 2009;	Conduct periodic monitoring of this private well beginning in 2014.	Addressed in Next FYR	This well has not been monitored since 2009. NYSDOH will request that Suffolk County Department of Health Services	Click here to enter a date

	site-related contamination was not detected. The NYSDOH and ATSDR concluded that drinking or using the groundwater from this well is not expected to harm people's health, and have recommended that periodic monitoring be conducted to ensure that it is not impacted by site-related contamination in the future.			contact the owner of this private well during the Fall of 2018 to schedule an appointment to collect sample(s).	
	Verify whether gases are migrating beyond the perimeter of the site property.	An evaluation should be conducted of the landfill gas collection system to verify whether gases are migrating beyond the perimeter of the site property	Completed	A soil vapor investigation was performed in September/October 2013, which included collecting data from the landfill gas collection system and off-site soil vapor samples. The results suggests that significant off-site migration of landfill gas is not occurring.	October 2013

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

The current five-year review team consists of Mark Dannenberg (RPM), Kathryn Flynn (Hydrogeologist), Nick Mazziotta (Human Health Risk Assessor), Charles Nace (Ecological Risk Assessor) and Cecilia Echols (Community Involvement Coordinator).

On October 2, 2017, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 31 Superfund sites in New York and New Jersey, including the Islip Municipal Landfill site. The announcement can be found at the following web address:

https://www.epa.gov/sites/production/files/2017-10/documents/five_year_reviews_fy2018_final.pdf

A public notice was made available by posting the notice with the Central Islip Public Library on 4/9/2018, stating that there was a five-year review and inviting the public to submit any comments to the U.S. EPA. The results of the review and the report will be made available at the Site information repository located at the Central Islip Public Library (located at 33 Hawthorne Avenue, Central Islip,

NY), and in the Administrative Record maintained in EPA's office at 290 Broadway, New York, NY, and on the EPA website.

Data Review

Groundwater

Groundwater Treatment System

Data from the extraction wells are presented in **Table 5**. Extraction wells EW-1 and EW-2 are screened in the Middle Upper Glacial Aquifer, and EW-3, EW-4, EW-5, and EW-6 are screened in the Deep Upper Glacial/Shallow Magothy Aquifer. Extraction wells EW-2 and EW-6 were shut-off in 2006. The groundwater treatment system has not been, thus far, adversely affected by the shut-down of these extraction wells. Monitoring well GM-1D was converted into an extraction well in October 2013, and has been operated continuously since then. VOC concentrations at all of the extraction wells have declined over time.

The ROD also required that the groundwater treatment system would be evaluated to determine whether an air pollution control device will be necessary to comply with air emission requirements. The IRRA has monitored air emissions from the groundwater treatment system, has indicated that air monitoring from the groundwater treatment system reflected compliance with the NYSDEC Air Guide No. 1 limits, which became effective in July, 2000, and reported that no further air pollution control device(s) are deemed necessary.

Groundwater Monitoring

Groundwater monitoring data from 2013 through 2017 were reviewed for this report. Twenty-five (25) monitoring wells are sampled semi-annually, and all 36 monitoring wells are sampled annually. Extraction wells EW-2 and EW-6, which are no longer operating, are sampled monthly, and the remaining four extraction wells, as well as the temporary extraction well (GM-1D), are sampled semi-annually. Groundwater samples are analyzed for VOCs, metals, and leachate indicators according to 6 NYCRR Part 360 Baseline Parameters.

As presented in **Table 3**, monitoring wells at the Site are screened in three zones of depth relative to mean sea level (msl). Zone 1 is within the Shallow Upper Glacial Aquifer and the Middle Upper Glacial Aquifer (ranging from 2 to 45 feet above msl). Zone 2 is the base of the Deep Upper Glacial Aquifer/ Magothy Aquifer contact (ranging from 124 feet below msl to 167 feet below msl). Zone 3 is deeper within the Magothy Aquifer (extending from 237 feet below msl down to 368 feet below msl). The primary VOCs found in the groundwater impacted by the Site are: dichloroethane, dichloroethene, trichloroethene, 1,1,1-trichloroethane, tetrachloroethene, chlorobenzene, dichlorobenzene, and vinyl chloride. Monitoring well data is presented in **Table 4**. VOC trends for each groundwater zone are discussed in more detail below.

In addition to VOCs, the site risks documented in the ROD attributed unacceptable risks to arsenic, antimony, beryllium, and thallium in groundwater Zones 1 and 2 of the Site. In 2017, arsenic was detected

above the NYSDEC groundwater standard only in well 12M-1, and thallium exceeded the standard in wells 4G-1, 4G-2, 18G-1, and 18G-2. Iron, manganese, and sodium were above NYSDEC drinking water standards at most of the monitoring wells and the extraction wells, and other metals and leachate parameters were elevated at a few individual wells.

Zone 1

Data from monitoring wells in Zone 1 generally indicate a significant reduction in concentrations of total VOCs over time. Eight of the twelve monitoring wells in this zone are consistently ND; the other four monitoring wells are consistently below 10µg/L. In the mid-Upper Glacial zone (between Zones 1 and 2), only monitoring well 11G-2 reflected elevated VOC concentrations (typically below 50µg/L).

Zone 2

In the Zone 2 monitoring wells, the trend of VOC concentrations is consistent or decreasing at all of the wells and all but two of the fifteen wells are consistently below 50 ppb. The monitoring wells with the most significant concentrations of VOCs are GM-2I, 4M-1, 10M-1, 11M-1, 12-M-1, 13M-1, and 14M-1. Over the last five years, only 4M-1 and 14M-1 have exceeded the 50µg/L total VOCs required by the ROD. Monitoring wells 10M-1 and 13M-1 are downgradient of the Site property boundary, which reflects that the landfill contaminant plume extends off-site; this indicates incomplete capture of the plume by the groundwater extraction well network (see **Figure 2**). Based on the contamination in these two wells, the decision was made to expand the extraction well network by converting monitoring well GM-1D into an extraction well. Both of these wells (10M-1 and 13M-1) seem to have decreasing VOC concentrations since the additional extraction well began operating in October 2013, with the most recently collected data from August 2017 reflecting concentrations of 1.6µg/L (10M-1) and ND (13M-1).

Zone 3

Of the five monitoring wells in Zone 3, three monitoring wells reflect ND concentrations of VOCs. The other two wells, 4M-2 and GM-1D, reflect total VOC concentrations ranging from 3.1 to 14µg/L (in 4M-2) and 33 to 55µg/L (in GM-1D). Monitoring well GM-1D consistently has elevated levels of VOCs. In 2013, monitoring well GM-1D was converted into a temporary extraction well and continues to be used as an extraction well.

Groundwater Summary

In summary, the results of the groundwater monitoring efforts indicate that the groundwater treatment system is operating according to design and that groundwater quality is continuing to improve in response to the ongoing remediation. The effluent from the groundwater treatment system is monitored and does not exceed discharge values. Additional efforts are recommended to further enhance the efficacy of the extraction and treatment system.

The groundwater extraction and treatment system is effectively reducing groundwater contaminant concentrations within the on-site plume. Specifically, data demonstrates that VOC concentrations are very low in the Shallow Upper Glacier Aquifer (Zone 1). However, the groundwater data shows that total VOC concentrations are still elevated in monitoring well 11G-2 in the deeper horizon within Zone 1, and several other wells in Zones 2 and 3. Monitoring well GM-1D, which has operated as a temporary extraction well since 2013, appears to be effectively capturing contaminated groundwater along the southern portion of the site property.

Extraction Wells EW-1, EW-3, EW-4, and EW-5 are now pumping relatively clean groundwater. However, there are monitoring wells on the southern, downgradient side of the landfill that still reflect elevated levels of VOCs. Specifically, monitoring wells 11G-2 (in the middle upper glacial aquifer in *Zone 1*), and intermediate monitoring wells 10M-1, 11M-1, and 13M-1 (all in *Zone 2*) are not reflecting a constant or steady decline in Total VOCs. This trend analysis may indicate that extraction well locations and pumping rates may not be optimal for containment of the groundwater contamination plume. The area where these wells are located, along the southern side of the of the landfill, should be the focus for future remediation efforts.

Gas-collection System

Gas monitoring reports since 2009 have demonstrated the effectiveness of the methane gas collection system for controlling gas migration beyond the boundary of the landfill.

To evaluate whether the off-site migration of landfill gases could present a potential health concern to residences adjacent to the landfill, a soil vapor investigation was performed by IRRA in September/October 2013 upon recommendation from NYSDOH. As part of this investigation, soil vapor monitoring probes were installed in off-site areas where methane had been sporadically detected previously in landfill gas monitoring wells. Eight probes (SVP-01 through SVP-08) were installed west, northwest, northeast and east of the landfill. Each probe was screened between 8 and 10 feet bgs to intercept any VOCs that could potentially infiltrate a typical residential basement area. VOC samples were collected from each probe as well as two landfill gas collection discharge points for comparison.

In general, numerous chemicals were identified in each of the off-site sample locations, but the detections were relatively low and did not correlate well to those found within the landfill discharge points. Compounds detected within landfill gas that are typically indicative of landfill sites, such as methane, chlorobenzene and 1,4-dichlorobenzene, were not detected in the off-site soil vapor samples. The chemicals identified at the highest concentrations included acetone and naphthalene. The highest naphthalene detections were identified in the soil vapor samples collected west of the landfill, adjacent to nearby residences, at levels ranging from 78 $\mu\text{g}/\text{m}^3$ to 430 $\mu\text{g}/\text{m}^3$. The concentrations identified in the landfill gas, however, were much lower ranging from 0.84 to 7 $\mu\text{g}/\text{m}^3$. Although the groundwater sample results considered during this FYR period were not analyzed for naphthalene, this compound was not detected during the RI and was not considered a contaminant of potential concern. In addition, this area is side gradient to the site as groundwater flows south-southeast. The two highest acetone concentrations were identified just east of the site, ranging from 1,800 to 2,300 $\mu\text{g}/\text{m}^3$. Although this area is downgradient, acetone was detected at comparatively low levels in landfill gas, which ranged from 19 to 48 $\mu\text{g}/\text{m}^3$. Acetone was not detected in site groundwater at this time as well.

The poor correlation between the landfill gas and off-site soil vapor results suggests that significant off-site migration of landfill gas is not occurring. The lack of methane, chlorobenzene and 1,4-dichlorobenzene results in the off-site soil vapor locations further indicates that the low level VOCs observed off-site are not related to landfill gas migration. However, the naphthalene and acetone identified do suggest that there may be other contributing sources off-site.

Site Inspection

The inspection of the Site was conducted on 4/19/2018. In attendance were Mark Dannenberg, Kathryn Flynn, Charles Nace, Nick Mazziotta and representatives of the IRRA including the Chief Engineer of the IRRA. The purpose of the inspection was to assess the protectiveness of the remedy.

V. TECHNICAL ASSESSMENT

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

The remedy is functioning as intended by the ROD signed on September 30, 1992. The soil/sediment remedies identified in the ROD consisted of installing a 6NYCRR Part 360 cap over the landfill and installation and operation of a groundwater extraction and treatment facility. Based on the site visit and review of existing data, the remedy is functioning as intended

The remedial actions have interrupted the direct exposure pathways of direct contact with the contaminated groundwater and soils. The capping of the landfill has minimized infiltration of precipitation into the landfill, thereby minimizing the potential for contaminants to leach from the landfill and any subsequent negative impact(s) on groundwater quality. In addition, the cap acts as an effective barrier, which prevents other forms of direct exposure to contaminated soil from inhalation, ingestion and dermal contact. Furthermore, the groundwater extraction and treatment system effectively captures and treats contaminated groundwater and effluent meets discharge requirements. discharge limits. Based upon the review of the documents summarized in Table 2 and the results of the routine evaluations of the groundwater treatment system and groundwater monitoring data (see Tables 3, 4, and 5), total VOC concentrations continue to decline at most wells across the Site. Total VOC contamination continues to be detected (ranging from 0 ppb -to- 53 ppb) in several monitoring wells downgradient of the landfill, however the conversion of the groundwater monitoring well GM-1D to a temporary extraction well has resulted in decreases in concentrations in this area.

Contaminant levels at the other extraction wells are typically very low or non-detect; The locations of these extraction wells, and the pumping rate at GM-1D, may require re-evaluation since monitoring well trends are not decreasing in this area.

Furthermore, annual reports since 2010 have demonstrated the effectiveness of the methane gas collection system for controlling gas migration beyond the boundary of the landfill. The SVI further verified the effectiveness of the landfill gas collection system to control offsite migration of methane.

Finally, deed and well restrictions were required to prevent the installation of drinking water wells in impacted areas. Institutional controls are in effect at the Site. Deed restrictions recorded on November 28, 2001 prevent disturbance of the waste material and restrict changes in use of the property. In addition, drinking water well restrictions have been carried out in part by compliance with Suffolk County, Department of Health Services Private Water Systems Standards.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action

objectives (RAOs) used at the time of the remedy selection still valid?

There have been no changes in the physical conditions of the Site over the past five years that would change the protectiveness of the remedy. The human health risk assessment (HHRA) concluded that future residential exposure to contaminants in groundwater would result in human health risk and hazard exceeding EPA threshold criteria. The COCs identified in the 1992 ROD include VOCs (benzene, trichloroethylene, tetrachloroethylene, and vinyl chloride) and metals (arsenic, antimony, beryllium and thallium). The exposure assumptions, pathways, and receptors that were used to estimate the potential risks and hazards to human health followed the Risk Assessment Guidance for Superfund used by the Agency. Although specific parameters may have changed since the time the risk assessment was completed, the process that was used remains valid.

The RAOs established in the 1992 ROD, discussed in Section II, remain valid. The stabilization, capping, and fencing of the landfill effectively interrupts human exposure pathways to contaminated soils remaining onsite. One private water supply well was discovered by NYSDOH in 2009. The well was sampled in 2009 and the NYSDOH and ATSDR concluded that drinking or using the groundwater from this well is not expected to harm people's health. All remaining residences surrounding the Islip Landfill Site are supplied with public water. There are no other known private water supplies near the Site and well restrictions preventing the installation of drinking water wells in impacted areas have also been implemented. Operation of the groundwater extraction and treatment system is still ongoing and will continue to reduce contaminant mass over time.

Since the selected remedy for soils was designed to reduce contaminants leaching from the landfill, soil-specific ARARs were not established for the Site. The landfill cap, however, is regulated under state regulation 6 NYCRR Part 360, an ARAR for the Site. The 1992 ROD established Federal MCLs and New York State Groundwater Quality Standards (10 NYCRR Part 5 and 6 NYCRR Part 703) as cleanup criteria for the COCs in groundwater, which remain valid.

Changes in Toxicity Characteristics

The toxicity values for multiple groundwater contaminants evaluated in the 1992 HHRA have been updated since the ROD; however, such changes do not impact the overall conclusions of the risk assessment, the remedial decision, or cleanup criteria chosen for the Site. The chemicals with updated toxicity values in the Integrated Risk Information System (IRIS) are: benzene, chlorobenzene, dichlorobenzene, 1,2-dichloroethane, 1,1-dichloroethane, 1,1-dichloroethene, trichloroethylene, 1,1,1-trichloroethane, tetrachloroethylene, vinyl chloride, arsenic, beryllium, and manganese. Thallium has also been reevaluated, but no toxicity values have been developed to date.

Vapor Intrusion

There are no buildings other than structures associated with the landfill and the groundwater treatment system currently located onsite. During the previous FYR, VOC results were compared to target EPA Vapor Intrusion Screening Levels (VISLs) within groundwater. Consistent with the OSWER 2002 *Draft Subsurface Vapor Intrusion Guidance* available at the time, the analysis focused on wells within 100 feet of ground surface. Contaminated regions at deeper intervals are considered to be at depths great

enough to pose little or no risk from vapor intrusion. The majority of contaminant concentrations at this time were non-detect and the maximum levels evaluated were both within the target risk range (1×10^{-6} to 1×10^{-4}) and below a hazard of 1. This analysis was consistent with the most current EPA *Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air* (2015) and the evaluation of groundwater results yielded during this FYR period present the same conclusions.

NYSDOH and ATSDR have also concluded that vapor intrusion from contaminated shallow groundwater does not present a current inhalation exposure concern. To evaluate whether the off-site migration of landfill gases could present a potential health concern to residences adjacent to the landfill, a soil vapor investigation was performed by IRRA in 2014 upon recommendation from NYSDOH. As stated in the Data Review Section, the detections identified in the offsite soil vapor probes did not correlate well to those found within the landfill discharge points, thus indicating that significant off-site migration of landfill gas is not occurring.

Ecological Risks

During the site visit a wide variety of avian species were observed using the site, including American robin, Northern mockingbird, red-winged blackbird, Canada goose, mallard duck, and common crow. The landfill surface is covered with vegetation consisting primarily of grasses and small bushes. The vegetation on the landfill is maintained through mowing and pruning and/or cutting down small trees as they grow. The surface water runoff from the site is diverted to a recharge basin at a corner of the landfill site. The recharge basin was filled with water during the visit and several mallard ducks and Canada geese were using the basin. The quality of habitat that the recharge basin provides is unknown due to the fluctuating water levels, but it provides a source of water for wildlife while filled.

Previous FYRs identified that an ecological risk assessment was not completed for the site, however, the decision documents did state that nearby wetlands were not impacted by the contaminated groundwater or from surface water runoff from the site. Based on this, an evaluation was made to determine if any exposure pathways associated with the landfill were complete. The only potentially completed pathway identified was for burrowing animals that could potentially dig through the cap, however it was determined that due to multiple layers of membranes, drainage layers and several feet of soil, that burrowing into the waste by animals would be difficult.

Given that the contaminated soils were capped, and there are no off-site ecological impacts, the potential for exposure to ecological receptors has been eliminated. Since these actions have resulted in interrupting the exposure pathways for ecological receptors, the remedial action objectives used at the time of the remedy are still valid and protective of the environment.

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

No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations	
OU(s) without Issues/Recommendations Identified in the Five-Year Review:	
<i>Two (see below)</i>	

Issues and Recommendations Identified in the Five-Year Review:

OU(s):	Issue Category: Remedy Performance			
	Issue: groundwater contamination on the southern boundary of the Site property.			
	Recommendation: Some monitoring wells along the southern, downgradient side of the landfill (e.g., shallow well 11G-2 and intermediate wells 10M-1, 11M-1, and 13M-1) are not declining in total VOCs, indicating that pumping rates or locations may not be adequate in these zone of the aquifers. This should be further evaluated and it may be appropriate to consider this area for a future extraction well (remediation efforts).			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	PRP	State	10/31/2019

Issues and Recommendations Identified in the Five-Year Review:

OU(s):	Issue Category: Monitoring			
	Issue: monitoring of the private well located approximately 500 feet southwest of the Site property.			
	Recommendation: The private well was sampled by NYSDOH in 2009. NYSDOH and ATSDR have previously recommended that this well be re-sampled periodically. This well should be re-sampled in the near future.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	State	State	10/31/2019

VII. PROTECTIVNESS STATEMENT

Protectivness Statement(s)		
<i>Operable Unit:</i>	<i>Protectivness Determination:</i> Short-term Protective	<i>Planned Addendum Completion Date:</i> 8/31/2021
<i>Protectivness Statement:</i> The remedy currently protects human health and the environment in the short term. In order for the remedy to be protective in the long-term, extraction well location and pumping rates will need to be evaluated to increase groundwater extraction and treatment system efficiency. In addition, the private residential well will need to be re-sampled.		

Sitewide Protectivness Statement	
<i>Protectivness Determination:</i> Short-term Protective	<i>Planned Addendum Completion Date:</i> 8/31/2021
<i>Protectivness Statement:</i> The remedy currently protects human health and the environment in the short term. In order for the remedy to be protective in the long-term, extraction well location and pumping rates will need to be evaluated to increase groundwater extraction and treatment system efficiency and the private well will need to be re-sampled.	

VIII. NEXT REVIEW

The next FYR report for the Islip Municipal Landfill Superfund Site is required five years from the completion date of this review.

APPENDIX A – TABLES

APPENDIX A – TABLES

Table 1 : Chronology of Site Events	
Site proposed for listing on the NPL	January 1987
Town of Islip and NYSDEC enter into a Consent Order to develop and implement a Remedial Investigation and a Feasibility Study	August 8, 1987
Site added to the NPL	March 31, 1989
Site ceased receiving municipal solid waste (coinciding with the Long Island Landfill Ban)	December 1990
Town of Islip and NYSDEC enter into a Consent Order to perform remedial activities at the Site	December 18, 1990
Remedial Investigation conducted	1988 to 1991
Feasibility Study prepared	1992
Issuance of the Record of Decision	September 30, 1992
Completed the capping and closure of landfill	November 30, 1993
Start-up of the groundwater extraction and treatment system	September 4, 1996
Final inspection of the groundwater treatment system and the groundwater remediation program	September 27, 1996
Preliminary Closeout Report	April 8, 1998
The first Five-Year Review Report	April 1998
The second Five-Year Review Report	September 2003
Revise the long-term groundwater monitoring program	2006
Shut-off two groundwater extraction wells (EW-2 and EW-6)	2006
The third Five-Year Review Report	July 2008
The fourth Five-Year Review Report	September 2013
Convert Groundwater Monitoring Well GM-1D to a temporary extraction well.	October 2013
Soil Vapor Intrusion Study	October 2013
Five-Year Review Site Visit	April 19, 2018

Table 2: Documents Reviewed		
Author	Date	Title/Description
US Environmental Protection Agency	September 1992	Record of Decision, Islip Municipal Sanitary Landfill
New York State Department of Environmental Conservation	August 8, 1987	Consent Decree
New York State Department of Environmental Conservation	December 18, 1990	Consent Order
US Environmental Protection Agency	April 1998	The First Five-Year Review
US Environmental Protection Agency	September 2003	The Second Five-Year Review
US Environmental Protection Agency	July 2008	The Third Five-Year Review
US Environmental Protection Agency	September 2013	The Fourth Five-Year Review
Islip Resource Recovery Agency	Monthly reports (2013 to 2018)	Blydenburgh Road Landfill Complex Monthly Discharge Monitoring Reports
Dvirka & Bartilucci Consulting Engineers	Multiple dates (from 2013 into 2018)	Post Closure Groundwater Monitoring Results, Semi-Annual Reports (2008 through 2013)
Dvirka & Bartilucci Consulting Engineers	2013, 2014, 2015, 2016, and 2017	Post Closure Groundwater Monitoring Program, Annual Reports (2008, 2009, 2010, 2011, and 2012)
New York State Department of Health (in partnership with the Agency for Toxic Substances and Disease Registry)	May 31, 2012	Review of the Public Health Assessment - Health Consultation Letter dated May 31, 2012

Table 3: Designations of Hydrogeological Zones For Monitoring Wells and Extraction Wells

Shallow Upper Glacial Wells – Zone 1 (screened near or at the water table from 2 to 45 feet msl)		
GM-1S	8G-1	13G-1
GM-2S	9G-1	15G-1
4G-1	10G-1	16G-1
6G-1	11G-1	18G-1
Mid Upper Glacial Wells (above Smithtown Clay) - (from -35 to -75 feet msl)		
4G-2	14G-1A	EW-2
6G-2	18G-2*	
11G-2	EW-1	
Deep Upper Glacial/Shallow Magothy Wells – Zone 2 (from -124 to -167 feet msl)		
GM-1I	11M-1	23M-1
GM-2I	12M-1	EW-3
4M-1	13M-1	EW-4
6G-3	14G-2**	EW-5
7M-1	14M-1***	EW-6
8M-1	16M-1	
10M-1	22M-1	
Deep Magothy Wells – Zone 3 (from -237 to -368 feet msl)		
GM-1D****	4M-2	8M-2
GM-2D	6M-1	

msl – mean sea level

* Well 18G-2 screened at -9 to -29 feet msl

** Well 14G-2 screened at -83 to -103 feet msl

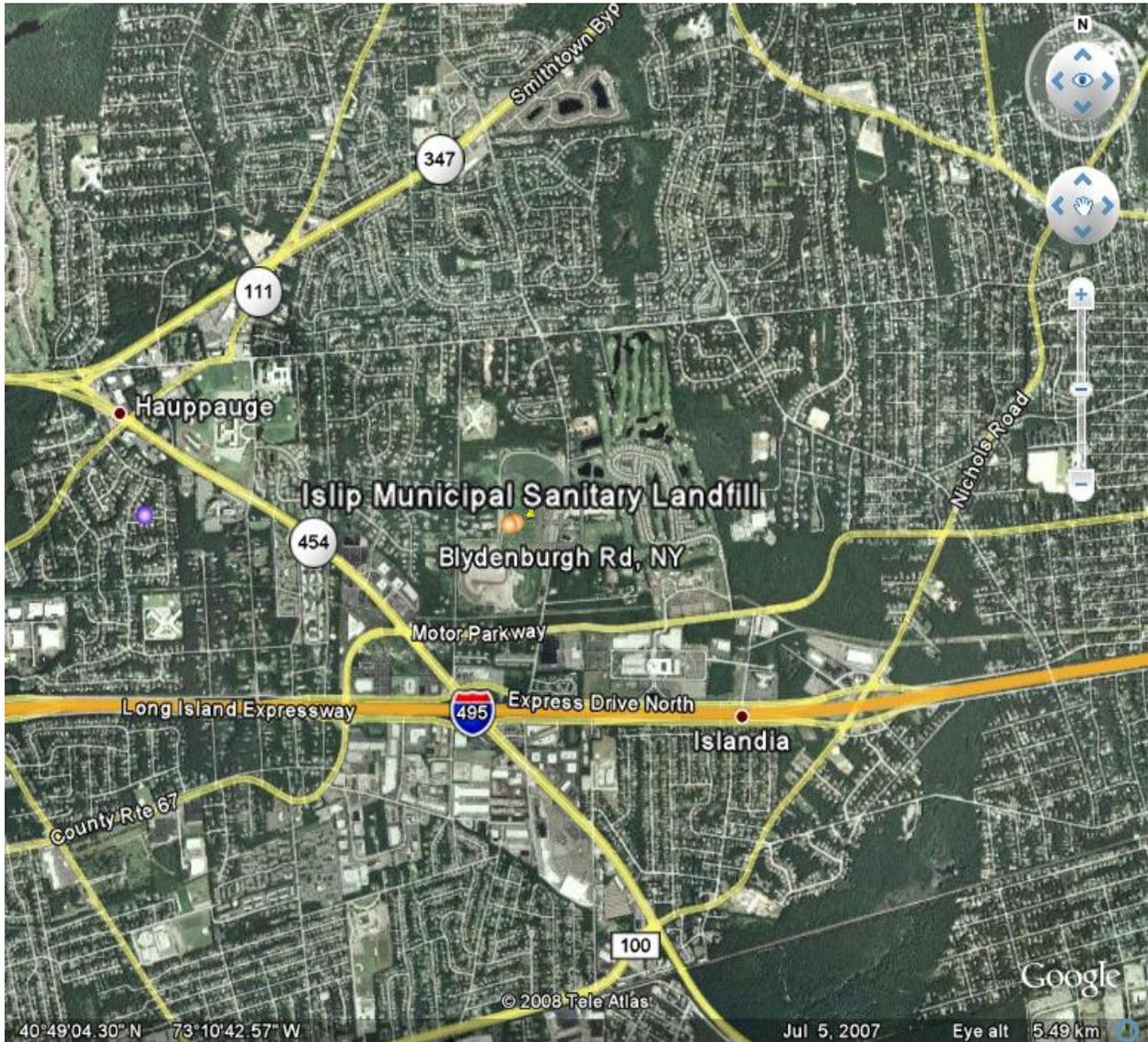
*** Well 14M-1 screened at -174 to -194 feet msl

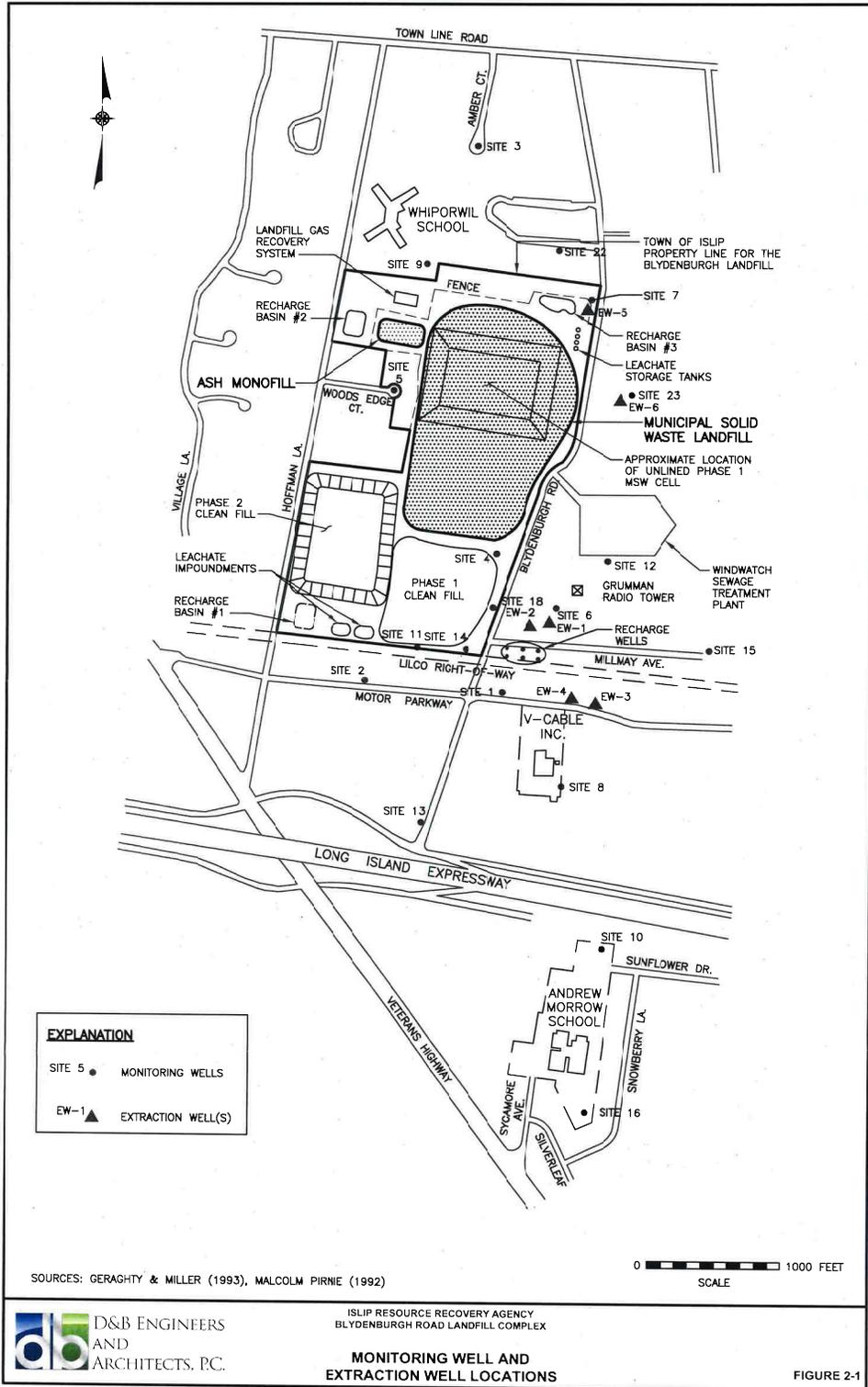
**** Well GM-1D was converted into a temporary extraction well in October 2013

Source: Post Closure Groundwater Monitoring Program – 2017 Annual Report, Dvirka and Bartilucci Consulting Engineers – January 2018

APPENDIX B - FIGURES

Figure 1 – Site Location Map





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Figure 3: Landfill Gas Collection Lines & Gas Monitoring Wells



Figure 3 – Landfill Gas Collection System Lines A, B and C and Gas Monitoring Wells