FIFTH FIVE-YEAR REVIEW REPORT FOR HERTEL LANDFILL SUPERFUND SITE ULSTER COUNTY, NEW YORK

Prepared by

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

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Date

Table of Contents

LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
BERA	Baseline Ecological Risk Assessment
BHHRA	Baseline Human Health Risk Assessment
BOD	Biochemical Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
COD	Chemical Oxygen Demand
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
ICs	Institutional Controls
LEL	Lowest Effects Level
MCLs	Maximum Contaminant Levels
µg/L	microgram per liter
mg/kg	milligrams/kilogram
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	Operation and Maintenance
OU	Operable Unit
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated biphenyls
PRP	Potentially Responsible Party
RD/RA	Remedial Design/Remedial Action
RAO	Remedial Action Objectives
RL	Reporting Limit
RSLs	Regional Screening Levels
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total Suspended Solids
UCDOH	Ulster County Department of Health
VOC	Volatile Organic Compound
WQS	Water Quality Standards

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 and is functioning as intended by the decision documents. The methods, findings, and conclusions of reviews are documented in the FYR. 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 FYR 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 Hertel Landfill Superfund site (Site), located in the Town of Plattekill, Ulster County, New York. The triggering action for this statutory review is the signature date of the previous FYR, which was September 28, 2015. A FYR is required at this Site because the remedial actions selected at the Site will leave hazardous substances, pollutants, or contaminants on Site above levels that allow for unlimited use and unrestricted exposure.

The Site is being addressed in one operable unit (OU). This OU is the subject of this FYR.

The Hertel Landfill Superfund Site FYR was led by Lorenzo Thantu, the EPA Remedial Project Manager (RPM). Participants included David Edgerton (EPA hydrogeologist), Julie McPherson (EPA Human Health and Ecological Risk Assessor), and Larisa Romanowski (EPA community involvement coordinator). The Town of Plattekill and the potentially Responsible Parties (PRPs) were notified of the initiation of the FYR. The FYR began on July 15, 2019.

Site Background

The Hertel Landfill Superfund site is located in the Town of Plattekill, Ulster County, New York, just south of U.S. Route 44/NY Route 55 and approximately midway between Bedell Avenue and Tuckers Corner Road (**Figure 1**). An approximate 15-acre portion of the 80-acre Site property was a waste disposal area that was established in 1963 as a private landfill accepting municipal and industrial waste (**Figure 2**). In 1976, the Ulster County Department of Health (UCDOH) revoked the landfill permit for numerous violations including allegations of illegal industrial dumping. This UCDOH action and a Town of Plattekill ordinance prohibiting the dumping of out-of-town garbage resulted in the permanent closing of the Hertel Landfill in March 1977.

Wetlands border the Site property to the north, south, and east, and a small unnamed stream crosses the southern and eastern portion of the Site and flows adjacent to the landfill. The unnamed stream flows into Pancake Hollow Creek and then Black Creek and then the Hudson River. There are two aquifers beneath the Site, an overburden glacial till aquifer and a bedrock aquifer, the Austin Glen formation.

The Site and the area surrounding the Site are zoned residential. Approximately 1,350 people live within three miles of the landfill and there are about 500 people living within a mile of the Site. Residents in the area obtain their drinking water from individual drinking water wells. No permanent structures are located on the Site.

The Site was placed on the NPL in June 1986.

FIFTH FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Hertel Landfill Site		
EPA ID: NYD0980780779		
Region: 2	**State:** NY	**City/County:** Town of Plattekill/Ulster County
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:** NA		
Author name (Federal or State Project Manager): Lorenzo Thantu		
Author affiliation: EPA		
Review period: 9/28/2015 - 11/30/2019		
Date of site inspection: 10/2/2019		
Type of review: Statutory		
Review number: 5		
Triggering action date: 9/28/2015		
Due date *(five years after triggering action date)*: 9/28/2020		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

During the initial Remedial Investigation/Feasibility Study (RI/FS), which was released to the public in July 1991, a Baseline Human Health Risk Assessment (BHHRA) was performed. Both current and future land use scenarios were considered. The primary cancer and noncancer risks were associated with the future use of the Site as a residential area. The routes of exposure of most concern included dermal contact with soil, ingestion of ground water and ingestion of soil. The contaminants of concern (COCs) included polynuclear aromatic hydrocarbons (PAHs), arsenic, and chromium in soil and ground water, and manganese in ground water.

An ecological assessment was also conducted as part of the RI/FS. It was determined that a general trend of elevated concentrations of organic and inorganic contaminants, which included arsenic, iron, lead, manganese, chromium, thallium and benzene, existed in one or more environmental media at the Site and presented potential ecological effects.

Based upon the results of the RI, BHHRA, and ecological assessment, EPA determined that active remediation was necessary to protect public health or welfare and the environment from actual and threatened releases of hazardous substances into the environment.

Response Actions

A Record of Decision (ROD) for the Site was signed in September 1991. The remedy selected in the 1991 ROD included:

- Construction of a multi-layer cap consistent with New York State Part 360 solid waste landfill closure requirements;
- Additional soil sampling along the western portion of the disposal area
- Regrading and compaction of the landfill mound to provide a stable foundation for the placement of the cap prior to its construction;
- Construction of a gas venting system;
- Performance of air monitoring prior to, during, and following construction at the Site, to ensure that air emissions resulting from the cap construction meet applicable or relevant and appropriate requirement (ARARs);
- Quarterly groundwater monitoring using existing groundwater monitoring wells, and six additional wells to be installed beyond the capped area (The monitoring program will include sampling of selected residential wells with subsequent follow-up actions as necessary);
- Construction of fencing around the perimeter of the capped area;
- Establishment of ordinances or restrictions imposed on the deed to ensure that future use of the Site property will maintain the integrity of the cap;
- Installation of a groundwater extraction and treatment system to control leachate migration;
- Delineation and evaluation of the wetlands and drainage channels flowing through the wetlands adjacent to the landfill;
- Full evaluation of the wetlands prior to remediation activities to determine measures necessary to mitigate potential negative impacts to the wetlands;
- Performance of a treatability study to demonstrate the effectiveness of the innovative technology for groundwater treatment;
- Disposition of treatment residuals in accordance with Resource Conservation and Recovery Act requirements, including its Land Disposal Restrictions; and
- Implementation of Alternative 4 as a contingency remedy should the treatability study indicate the innovative groundwater treatment technology is not effective.

The remedial action objective (RAO) of the OU 1 remedy was to control the source of contamination. Given the improvements in Site groundwater quality over the ensuing several years, EPA re-evaluated the active groundwater extraction and treatment remedy specified in the 1991 ROD. The re-evaluation included an updated assessment of human health and ecological risks. In November 2003, an updated BHHRA was conducted to evaluate potential human health risks from exposure to the contaminated

groundwater at the Site. In addition, in August 2004, the updated Baseline Ecological Risk Assessment (BERA) evaluated the extent to which current conditions posed a risk to ecological receptors at the Site, including any risk associated with residual sediment contamination and provided information necessary for evaluating and addressing groundwater impacts at the Site. Ecological receptors of concern at the Site included sediment-dwelling (benthic) intervertebrates, zooplankton, amphibians, and aquatic-feeding insectivorous birds based on exposure potential and sensitivity. Based upon the results of the updated BHHRA and the BERA, Site-related human and ecological exposures were found to be at acceptable levels. In addition, groundwater modeling performed during early remedial design work predicted that a groundwater pump and treat system, if implemented, would have a negative impact on the wetlands immediately adjacent to the landfill, without achieving the goal of remediating groundwater contamination in the saturated zone.

As a result of these evaluations, in 2005, EPA approved a ROD Amendment for the Site. The ROD Amendment clarified the RAOs for the Site. The two Site-specific RAOs are:

> (1) protect human health by ensuring that future residents are not exposed to contaminated groundwater; and
>
> (2) reduce further contamination of the wetlands in the area, and the migration of contaminants in groundwater.

The major components of the modification to the selected remedy include:

- Elimination of the groundwater extraction and treatment system requirement of the 1991 selected remedy;
- Implementation of a long-term monitoring program where groundwater, surface water, sediment samples, and residential well water will be collected and analyzed on an annual basis to ensure that the remedy remains protective of human health and the environment; and
- Maintenance of Site access restrictions, and implementation of institutional controls (ICs) to prohibit any use of the Site that would impair the effectiveness of the landfill cap and leachate collection system and to prohibit any digging of wells or extraction of groundwater in or immediately adjacent to the landfill cap.

The selected remedies in both the 1991 ROD and the 2005 ROD Amendment would enable EPA Maximum Contaminant Levels (MCLs) and NYSDEC Ambient Water Quality Standards (WQS) for drinking water to be met.

Status of Implementation

In September 1992, EPA issued a Unilateral Administrative Order (UAO) to six PRPs, directing them to perform the remedial design/remedial action (RD/RA). Ford Motor Company (Ford) was the only PRP at the time to comply with the UAO. Subsequently, EPA entered into a RD/RA with 11 PRPs (the Hertel Steering Committee) including Ford as well as cost recovery settlements with additional PRPs.

In 1994, Ford completed a pre-design investigation for the Site which defined the extent of the landfill mass, modeled Site groundwater dynamics and characterized soil, groundwater, surface water, and sediment contamination.

In September 1996, EPA approved the remedial pre-design investigation, which formed the basis of the landfill cap design. The PRPs completed the construction of the approximately 13.5-acre multi-layer landfill cap in December 1998. In May 1999, EPA approved a Remedial Action Report, which determined that the landfill cap and leachate collection system had been completed in accordance with the approved Remedial Design Report and New York State Part 360 solid waste landfill closure requirements. In addition to the cap, a fence was installed at the Site. The gas venting system and leachate collection systems were also constructed in 1998.

IC Summary Table

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)
Soil	Yes	Yes	Landfill Cap and Leachate Collection System	Prohibit Any Use of the Site That Would Impair the Effectiveness of the Landfill Cap and Leachate Collection System	Town of Plattekill Code, Chapter 110-53 (Aquifer Protection Zone)
Groundwater	Yes	Yes	Aquifer Protection Zone for the Hertel Landfill Site	Designated as Environmental Impact Assessment Area (EIAA) - Properties within EIAA Subject to Multiple Water Supply Development Requirements, Which Include Site-Specific Drilling, Testing, and Water Quality Studies	Town of Plattekill Code, Chapter 110-53 (Aquifer Protection Zone)
Groundwater	Yes	Yes	Block Parcels: 4-l1.001 4-36.001 4-13.001 4-12.001	Deed Restrictions/Environ-mental Easements to Prohibit the Development of Potable Water Wells	Recorded Dates 4-l1.001 – 10-12-11 4-36.001 – 8-22-11 4-13.001 – 6-24-11 4-12.001 – 6-24-11 4-37.000 – 9-20-11

			4-37.000 4-38.000	within the Potential Limits of the Site-Impacted Groundwater Plume	4-38.000 – 7-12-11

The 2005 ROD Amendment specified that ICs would be put in place to prohibit any use of the Site that would impair the effectiveness of the landfill cap and leachate collection system, and to prohibit any digging of wells or extraction of groundwater in or immediately adjacent to the landfill cap. ICs would also be put in place to ensure continued access to the Site by EPA and the State of New York.

Appropriate ICs have been put in place at the Site. The Town of Plattekill Code, Chapter 110-53 (Aquifer Protection Zone) was enacted into law solely for the Site. It established a designated Environmental Impact Assessment Area (EIAA) (**Figure 2**). Properties within EIAA are subject to multiple water supply development requirements, which include Site-specific drilling, testing, and water quality studies. These studies are required to be completed by a qualified hydrogeologist or engineer representing the applicant/property owner. The application may also be referred to an independent hydrogeologist or engineer selected by the Town at the applicant's expense.

EPA worked with the PRPs to develop and implement deed restrictions/environmental easements on several properties. On November 26, 2013, the PRPs submitted a letter to EPA documenting that all ICs as required by the 2005 ROD Amendment were met. The November 26, 2013 letter stated that ICs in the form of deed restrictions/environmental easements were implemented/recorded for all parcels except parcel 4-14.000 where EPA determined that a deed restriction/environmental easement was not required.

Systems Operations/Operation & Maintenance

The landfill cap and leachate collection system are being monitored and maintained by the PRPs as set forth in the RD/RA Consent Decree and the EPA-approved Post-Closure Operation and Maintenance (O&M) Manual (January 1999). In accordance with the EPA-approved monitoring plan of the Post-Closure O&M Manual, long-term post-closure compliance monitoring has consisted of sampling of groundwater monitoring wells, sediment and surface water, residential wells (i.e., potable wells), and landfill gas vents. The locations of media-specific monitoring locations are depicted on **Figure 3** and the locations of the residential wells are depicted on **Figure 4**.

Prior to October 2017, the EPA-approved Site monitoring plan consisted of sampling of the Site monitoring wells on a semiannual frequency, sediment and surface water locations on an annual frequency, residential wells in the site vicinity on an annual frequency; and passive gas vents (i.e., landfill gas vents) on an annual frequency (via field measurement equipment). In the landfill gas monitoring program, a sample would be collected from the location exhibiting the highest field readings for laboratory analysis. The details on media-specific monitoring locations, analytes, and frequencies are presented in **Table 1**.

In May 2017, Ford submitted a written request to the EPA to secure approval for a reduction in the monitoring frequency and a reduction in the list of media-specific parameters for the Site. On October 27,

2017, EPA, in consultation with the NYSDEC and the NYSDOH, approved the revised compliance monitoring and sampling plan. The revised compliance monitoring and sampling plan consists of sampling of the Site monitoring wells biennially for metals and quinquennially for Benzene, Toluene, Ethylbenzene and Xylene (BTEX); sediment and surface water locations biennially for metals and quinquennially for Pesticides, Polychlorinated biphenyls (PCBs), VOCs, semivolatile organic compounds (SVOCs); residential wells in the site vicinity annually for metals, VOCs; and passive gas vents (i.e., landfill gas vents) biennially (via field measurement equipment) for TO-14 VOCS, carbon dioxide, and methane. The details of the post-October 2017 long-term post-closure compliance monitoring program are presented in **Table 2**.

NYSDEC has requested that the Hertel Steering Committee conduct sampling of select Site monitoring wells for emerging contaminants, 1,4-dioxane and per- and polyfluoroakyl substances (PFAS), to evaluate their presence in groundwater. The sampling event is expected to be conducted in 2020.

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

The fourth FYR was completed in September 2015 and concluded that the remedy for the Hertel Landfill Superfund site protects human health and the environment.

Since the last FYR, there has been no significant change in chemical and hydrogeological conditions at the Site or Site uses.

There were no specific recommendations included in the last FYR.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On October 1, 2019, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at Superfund sites in New York, New Jersey, Puerto Rico and the U.S. Virgin Islands including the Hertel Landfill Superfund site. The announcement can be found at the following web address: https://www.epa.gov/aboutepa/fiscal-year-2020-five-year-reviews.

In addition to this notification, a public notice was distributed via email to local Town officials and other interested parties and copies were also mailed to interested parties. The announcement indicated that EPA is conducting a FYR of the remedy for the Site to ensure that the implemented remedy remains protective of public health and the environment and is functioning as designed. It also indicated that once the FYR is completed, the results will be made available in the local Site repository at the Plattekill Town Hall, P.O. Box 45, Modena, New York 12548, as well as the website: www.epa.gov/superfund/hertel-landfill. In addition, the notice included contact information, including addresses and telephone numbers, for questions related to the FYR process or the Hertel Landfill site.

No interviews were conducted as part of this FYR.

Data Review

Since the completion of the landfill cap at the Site in 1998, the groundwater, sediment and surface water, residential wells, and landfill gas vents have been monitored and sampled pursuant to the RD/RA Consent Decree operation and maintenance plan and the amended long-term post-closure compliance monitoring program approved by EPA on October 27, 2017. However, with the exception of limited discussion of historical data to evaluate trends for various COCs, e.g., arsenic, this data review specifically covers analytical results for groundwater, sediment and surface water, residential wells, and landfill gas vents that were collected during the monitoring period from June 2014 through September 2019.

Groundwater Monitoring Wells

The groundwater monitoring program includes sampling of 19 monitoring wells located adjacent to or nearby the landfill that were sampled on a semi-annual basis for the reporting period for VOCs and inorganic compounds (e.g., metals and water quality parameters); the sampling results are summarized in **Tables 3 and 4**.

The groundwater sampling results were compared to EPA MCLs or NYSDEC Ambient Water Quality Standards (WQS), whichever is more stringent. The only VOC that exceeded the WQS during this monitoring period was an isolated occurrence of benzene found in well MW-W1SA during the 2015 sampling event. Benzene was detected at a concentration of 1 microgram per liter (µg/L), equal to the WQS (1 µg/L). All subsequent sampling events (2016 to 2019) detected trace concentrations of benzene at MW-W1SA that were below the WQS (**Table 3**). Historically, these groundwater monitoring wells were sampled for VOCs on a quarterly basis from December 1996 to January 2001 and then sampled semi-annually until October 2017, when the wells have been sampled quinquennially (once every 5 years) only for BTEX. VOCs, which were present in monitoring wells during the remedial investigation, had not been detected since 1999 until benzene was detected in well MW-W1SA.

Analytical results identified the inorganic compounds, arsenic, iron, magnesium, manganese and sodium, at concentrations exceeding their drinking water standards and criteria (**Table 4**). Arsenic was detected in monitoring wells MW-W1SA and MW-W2SA, which are located along the eastern boundary of the landfill, adjacent to the wetland and near the unnamed creek. The detection of arsenic was sporadically inconsistent, with concentrations up to 61 µg/L at MW-W1SA, exceeding EPA MCL (10 µg/L). Historically, arsenic was either not detected or detected at lower concentrations than 61 µg/L. Monitoring well sampling data that were considered in the 2005 ROD Amendment showed 111 detections out of 322 samples collected and analyzed with the highest detection at 45.7 µg/L. The WQS for the summed concentrations of iron and manganese is 500 µg/L. The WQS for magnesium is 35,000 µg/L and sodium is 20,000 µg/L. The discussion of inorganic results for wells based on their downgradient versus upgradient locations are provided in more detail below.

The upgradient wells MW-3S and MW-16DS are located along the southwest end of the landfill and assumed to represent the ambient hydrochemical conditions for the overburden and bedrock aquifers, respectively. Neither iron, manganese nor sodium concentrations exceeded the NYSDEC WQS in MW-W3S (overburden aquifer) during the monitoring period. However, the analytical results for MW-16DS

(bedrock aquifer) exceeded the WQS for iron (6,640 to 32,600 µg/L) and arsenic (up to 61 µg/L) as listed in **Table 4.**

Analytical results from monitoring wells MW-14S/I/D installed along the western boundary of the landfill cap, and topographically upgradient, did not exceed the NYSDEC WQSs for iron, manganese or sodium. However, analytical results from the downgradient monitoring wells located along the eastern boundary of the landfill cap, adjacent to the unnamed creek and wetlands, exceeded the WQS for iron (up to 29,300 µg/L), manganese (up to 20,300 µg/L), and sodium (61,800 µg/L). The iron concentrations along the eastern boundary are elevated, but within the range of background concentrations assumed from the upgradient well MW-16DS. The highest concentrations of manganese and sodium for this monitoring period were observed downgradient at the northeast toe of the landfill cap near wells MW-W1SA and MW-W1D. The average concentrations of manganese and sodium for this location are 10,642 µg/L and 39,485 µg/L, respectively. Wells MW-W1SA, MW-W1D and MW-W2D are also the only wells in the monitoring network that exhibit arsenic concentrations that exceed the EPA MCL for drinking water (10 µg/L). These constituents are present in the regional aquifer and are likely being mobilized due to the typically reducing and acidic geochemistry of landfills. The elevated arsenic concentrations in wells along the eastern boundary are similar to background conditions, but trends will be monitored in the future as precautionary measure. Iron, manganese, and sodium in wells located near the northeast toe of the landfill are not considered to be either a human health or environmental risk and will be monitored in the next five-year period.

Analytical results of water quality parameters samples identified isolated occurrences of sulfide that exceeded the WQS (50 µg/L). Elevated sulfide concentrations were detected in the upgradient monitoring well MW-16DS (75 to 140 µg/L) and downgradient wells MW-K3S/D and MW-P1 (86 to 280 µg/L), indicating that under ambient conditions sulfide concentrations are elevated.

Potable Wells in Residential Area

The maximum detected concentrations of inorganics in the private wells are compared to their respective residential groundwater Regional Screening Levels (RSLs), EPA MCLs (National Primary Drinking Water Standards), and NYSDEC WQS. As part of the Site monitoring program, 10 residential wells along Route 44/55 are sampled annually and analyzed for VOCs, SVOCs, and inorganics (**Figure 4**).

Analytical results for VOCs and SVOCs were non-detect in all private wells and for all sampling events in this monitoring period. Two inorganic compounds exceeded their WQS, sodium and copper. Sodium exceedances (WQS = 20,000 µg/L) were reported for wells PW-3, PW-4, PW-8, PW-10, PW-11 and PW-13 for at least three consecutive sampling events during this monitoring period. Sodium is commonly associated with landfill leachate, but it is also associated with waters subjected to enhanced evaporation, such as wetlands, water softening treatment systems to replace calcium, and/or wellheads impact by road salt. It is unlikely that the sodium in private wells is from the landfill since no other site COCs were detected. Iron and manganese were below the combined WQS (500 µg/L) in all potable wells and all sampling events, except for a single event (September 2016) in potable well PW1 when 842 µg/L iron was detected (Table 3); but these concentrations are well below the RSL for iron (14, 000 µg/L) and managenese (430 µg/L).

Copper exceeded the WQS (200 µg/L) in residential wells PW-8, PW-9 and PW-13 in three isolated sampling events between 2015 and 2017 (**Table 5**). Copper ranged from 280 to 595 µg/L and was not

detected in groundwater samples collected from the landfill. This suggests the presence of copper in the private wells is not Site-related and most likely from a secondary source, such as copper plumbing or brass water fixtures. Arsenic was either not detected or detected at low levels (highest 6.4 µg/L) well below its EPA MCL of 10 µg/L.

The private wells will continue to be monitored annually.

Surface Water and Sediments

The monitoring program includes annual collection of sediment and surface-water samples from six locations on the eastern edge of the landfill. The samples are collected from the upstream area of the unnamed creek to the toe of the landfill cap, and from one location northeast of the landfill in the wetland area. Samples were analyzed for VOC, SVOCs, pesticides, and inorganics.

Analytical results for VOCs, and SVOCs were non-detect for sediments at the seven locations (SSW-1A, -2, - 3, -4, -4A, -5, and -6). Analytical results for inorganics are similar to previous years, with persistent occurrences of iron and manganese, and isolated and discontinuous occurrences of arsenic, cadmium, copper, lead, nickel and zinc that exceeded the NYSDEC Lowest Effects Level (LEL) standard for sediments. Iron and manganese exceeded the LEL at all seven locations for all sediment sampling events. The LEL of iron is 2 percent (%) with concentrations ranging up to 22% iron in sediments; and the LEL for manganese is 460 milligrams per kilogram (mg/kg) with concentrations ranging up to 200,000 mg/kg. There is no systematic pattern of either iron or manganese concentrations from upstream to downstream. In addition, manganese concentrations are well below the soil concentrations analyzed for the BERA completed in 2003. This BERA was performed prior to the ROD Amendment of 2005 and dictates that the concentrations identified from sediment sampling events performed in 2002 and 2003 do not pose a threat/impact to the wetlands.

Surface-water samples (SW-1A, -2, -3, -4, 5 and -6) were analyzed for VOCs, SVOCs, pesticides and inorganics for this monitoring period. Analytical results for VOCs and SVOCs were non-detect for all sampling events. Iron and manganese exceeded the WQS at all surface water sample locations and for all sampling events. Aluminum, antimony, mercury and selenium occurred in isolated events and are temporally inconsistent. Arsenic, cobalt, copper lead and zinc are found only at surface water location SW-5.S at all surface water sample locations and for all sampling events. Aluminum, antimony, mercury and selenium occurred in isolated events and are temporally inconsistent. Arsenic, cobalt, copper lead and zinc are found only at surface water location SW-5.As with sediments, there was no progressive decrease or increase of concentrations in surface water with distance downstream.

In addition, several geological and groundwater reports published by the U.S. Geological Survey, U.S. Department of the Interior, and New York Rural Water Association suggest that iron and manganese are both naturally occurring constituents in the regional geologic formation. These reports, coupled with the iron and manganese concentration trends at the Site, indicate that the Site geology is a natural contributor to elevated levels of iron and manganese historically observed regionally and at the Site.

Air (Gas Vent) Quality

All gas vents are field sampled on an annual basis using a four-gas detector. Samples are analyzed for TO-14 VOCS, carbon dioxide, and methane. No combustible gas levels have been reported in off-site gas

probes screened in non-landfill material. No standard exceedances for these compounds have been recorded for the period.

Site Inspection

The inspection of the Site was conducted on October 2, 2019. The purpose of the inspection was to assess the protectiveness of the remedy. The following parties were in attendance:

Lorenzo Thantu, EPA RPM
David Edgerton, EPA Hydrogeologist
Michael Squire, NYSDEC Project Manager
Mohamed Zakkar, Ford Motor Company
Brian Henning, Hatch Mott MacDonald (consultant to the Hertel Steering Committee)
John Bruno, Hatch Mott MacDonald

The gas venting system and leachate collection system are maintained and monitored by the Site contractor for the Hertel Steering Committee.

During the Site visit, the Site contractor stated that the gas venting system has had no recovery for years. No combustible gas levels have been recorded in the off-site gas probes screened in the non-landfill material, indicating that there is no migration of gas away from the main landfill. This is likely the result of the age of the material in the landfill, which, for the most part, has already generated its peak gas quantity. In addition, the waste is relatively shallow, in terms of typical solid waste landfills, and consequently would not be expected to generate extensive quantities of gas. No standard exceedances for these compounds (i.e., TO-14 VOCS, carbon dioxide, and methane) have been recorded over the evaluation period.

For the leachate collection system, the previous FYR documented that moisture content of the waste has continued to decrease, as a result of cap construction, which was evidenced by the decrease of the leachate volume being generated and discharged into the sump. Immediately after capping, the Site contractor periodically pumped and removed collected leachate from the sump. However, as the cap became effective, the amount of leachate produced was reduced to the point where it has not been necessary to empty the sump. The leachate drain had not collected any leachate for close to ten years. The fact that the leachate collection system had not collected leachate in the past ten years indicates that the landfill cap is performing as designed, and is not allowing rainwater to enter the landfill waste to produce additional leachate.

In general, the landfill cover system and slopes appear to be well maintained. No breaches or depressions were noted during the Site inspection except for a missing cover for the extraction-port of the 1,800-gallon capacity concrete collection sump. Further visual inspection of standing liquid within the interior of the concrete collection sump structure showed what appeared to be stormwater. The Site contractor stated that it will schedule in Spring 2020 a repair and replacement of the extraction-port cover during the sump pump-out activity and also an inspection using a downhole, flex-cable camera to observe the integrity of the leachate collection drain. Runoff control features appear to be in good repair.

V. TECHNICAL ASSESSMENT

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

According to the 1991 ROD, the remedy calls for a multi-layered cap, a drainage system, a gas venting system, leachate collection system, groundwater monitoring program and access restrictions.

The cap complies with Title 6 NYCRR Part 360 and covers approximately 13.5 acres. The cover system and slopes appear to be well maintained. No breaches or depressions were noted during the October 2, 2019 Site inspection except for a missing cover for the extraction-port of the 1,800-gallon capacity concrete collection sump. Runoff control features appear to be in good repair.

The gas venting systems appear to function as designed.

A perimeter fence surrounds the capped area and prevents unauthorized personnel from entering the Site.

Performance of the remedy is evaluated with groundwater-quality data collected in monitoring wells that circumscribe the cap area, sentinel wells located to the northwest of the landfill near the wetland, and residential wells. Monitoring wells were sampled semi-annually for organic and inorganic compounds until October 2017, after which all wells have been sampled biennially for inorganic compounds. Groundwater quality data for the previous five years show no exceedances of the NYSDEC WQS for organic compounds. The analyses do show elevated levels of iron, manganese, sodium, and, to a lesser extent, arsenic and magnesium on-site monitoring wells. Iron, manganese, sodium and magnesium exceed NYSDEC WQS. Iron and manganese are found in most wells at elevated levels in excess of NYSDEC WQS in and adjacent to the landfill. It is important to note that these constituents are present in the regional aquifer and are likely being mobilized due to the typically reducing and acidic geochemistry of landfills. Additionally, iron and manganese are regulated as secondary MCLs under EPA's Secondary Drinking Water Regulations, which are not based on human health but rather are based on cosmetic or aesthetic effects. Arsenic exceedances are localized and sporadic. Results of groundwater analysis from residential wells along Route 44/55 indicate that the iron, manganese, sodium and, to a lesser extent, copper have occasionally been detected above their respective NYSDEC WQS and/or EPA's secondary MCLs. Consistent with the on-site wells, the maximum detected concentration of iron and manganese did not exceed their respective human health risk-based criteria (RSLs) of 1.4E+04 µg/L and 4.3E+02 µg/L. Copper was detected in one private well sample above NYSDEC standards but was not detected in the on-site monitoring wells above the criteria, suggesting that the exceedances of copper in the private wells are not Site-related and may be related to secondary sources (e.g., copper plumbing or brass water fixtures).

ICs have been implemented, as stated above, to prohibit any land use that would impair the effectiveness of the cap, and prohibit installation of wells immediately adjacent to cap.

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?

Some chemical specific toxicity values have changed since the Site was originally assessed. In order to account for changes in toxicity values since the baseline human health risk assessment was performed, the maximum detected concentrations of the COCs identified during the 2015 through 2019 sampling period

were compared to EPA MCLs and NYSDEC WQS, which are the chemical-specific ARARs established in the ROD. The results indicate that the concentrations of several contaminants continue to be elevated and exceed their respective NYSDEC WQS or EPA MCL. As stated above, however, iron and manganese are regulated as secondary MCLs under EPA's Secondary Drinking Water Regulations, which are not based on human health but rather are based on cosmetic or aesthetic effects. In addition, the detected concentrations do not exceed their respective human health risk-based RSLs.

The RAOs are to minimize further contamination of the wetland area and the downgradient migration of contaminants in groundwater and to protect human health by ensuring that future residents are not exposed to contaminated groundwater. The RAOs are still valid.

The exposure assumptions, toxicity data, and screening levels used to complete the August 2004 BERA are still valid. Sediment and surface water quality data are compared to NSYDEC WQS. Sediment and surface water concentrations for iron and manganese (both upgradient and downgradient) continue to be evaluated and exceed screening levels, but are consistent or lower than pre-remediation concentrations and concentrations analyzed in the 2004 BERA. Although ecological risk assessment methodologies have changed since 2004, the results of the 2004 BERA are still valid. Since concentrations in sediment and surface water do not exceed values used in 2004, it is determined that there are no adverse ecological impacts in the wetlands downgradient of the Site.

Soil vapor intrusion was evaluated in previous FYRs. Over the past ten years, there are no organic contaminants that exceed vapor intrusion screening criteria. Therefore it has been concluded that this exposure pathway is not a concern at this Site.

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

There is no new information that calls into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU 1

OTHER FINDINGS

As stated above in Section IV, during the October 2, 2019 Site inspection, a breach with the 1,800-gallon capacity concrete collection sump in the form of a hole atop the structure was discovered. Further inspection of standing water within the interior of the structure showed what appeared to be stormwater. The Site contractor has scheduled a pump-out for the concrete collection sump for Spring 2020, at which time the breach will be repaired to put back the leachate collection system in working order as designed.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: 1	*Protectiveness Determination:* Protective
Protectiveness Statement: The implemented remedies for the Hertel Landfill Superfund Site are protective of human health and the environment.	

Sitewide Protectiveness Statement
Protectiveness Determination: Protective
Protectiveness Statement: The implemented remedies for the Hertel Landfill Superfund Site are protective of human health and the environment.

VIII. NEXT REVIEW

The next FYR report for the Hertel Landfill Superfund site is required five years from the completion date of this review

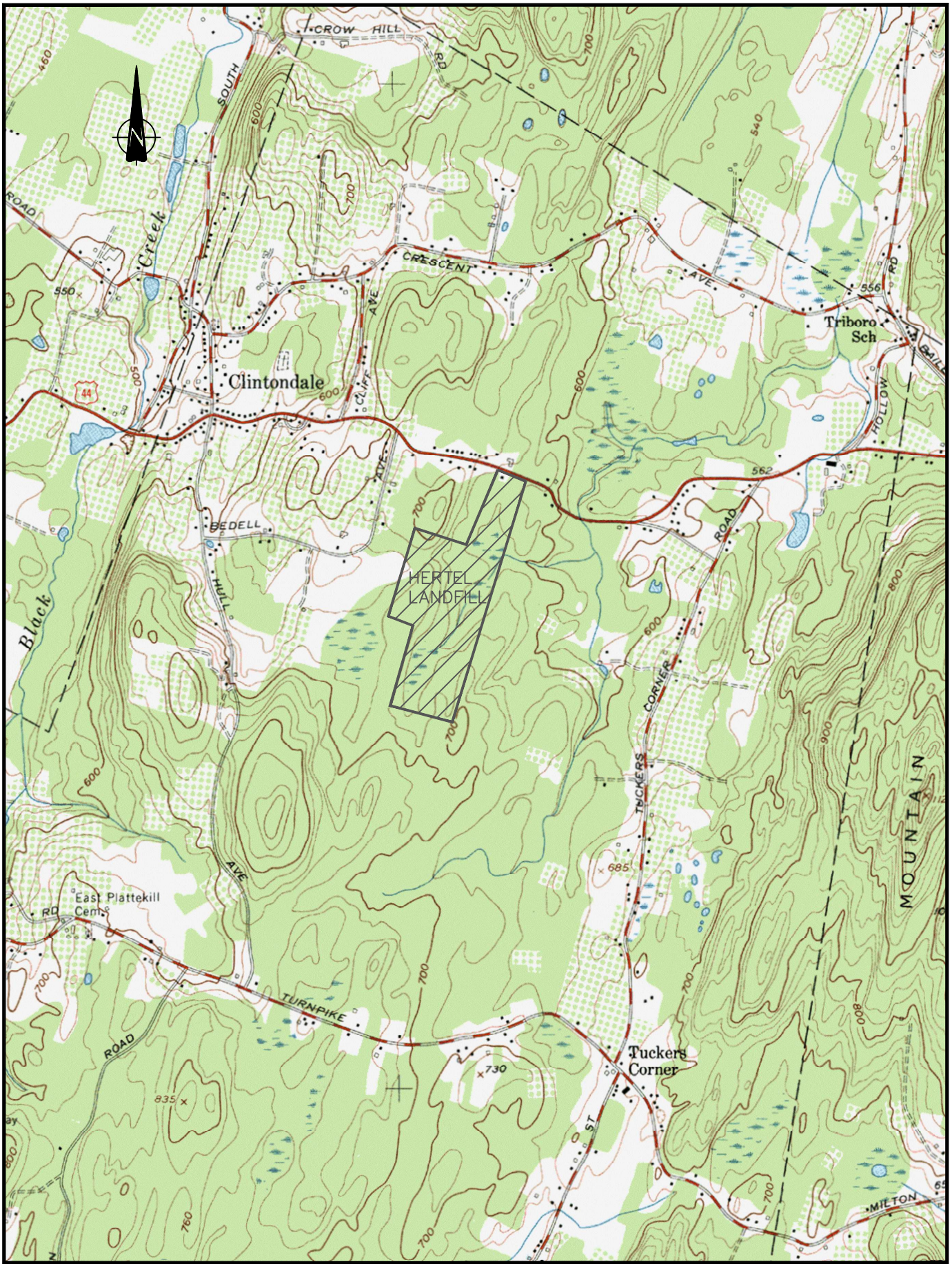
APPENDIX A - Reference List

Document Title, Author	Submittal Date
Remedial Investigation/Feasibility Study	July 1991
Former Hertel Landfill Site Remedial Action Report, Killam Associates	April 1999
Record of Decision, EPA	September 1991
First Five-Year Review, EPA	September 2001
Former Hertel Landfill Site, Groundwater Technical Report, Hatch Mott MacDonald	October 2002
Baseline Human Health Risk Assessment (BHHRA) Update	November 2003
Final Baseline Ecological Risk Assessment, Arcadis G & M	August 2004
ROD Amendment, EPA	January 2005
Second Five-Year Review, EPA	June 2005
Third Five-Year Review, EPA	April 2010
Environmental Protection Easements Letter, Hatch Mott MacDonald	November 26, 2013
Quarterly Inspection Reports, Hatch Mott MacDonald	2014-2019
Groundwater, Residential, Surface water and Sediment Sampling Data Reports, Hatch Mott MacDonald	2010-2014
2014 Hertel Landfill - Evaluation of Site Monitoring Data Report, Hatch Mott MacDonald	October 10, 2014
Fourth Five-Year Review, EPA	September 2015
2019 Hertel Landfill - Evaluation of Site Monitoring Data Report, Hatch Mott MacDonald	August 30, 2019

APPENDIX B - Chronology of Site Events

Table 1: Chronology of Events	
Date	**Event**
June 1986	Site placed on NPL
July 1991	Remedial Investigation/Feasibility Study (RI/FS) released
September 1991	ROD issued
September 1996	Remedial Pre-Design Investigation approved
November 1996	Preliminary clearing and grubbing of the landfill area
June 1997	Beginning of construction activities
December 1998	Construction of landfill cap completed
December 1998	Site Inspection of landfill cap
May 1999	Remedial Action Report Approved
September 2001	First Five-Year Review completed
October 2002	Groundwater Technical Report completed
July 2004	Post-Decision Proposed Plan issued
July 2004	Upgradient Residential Sampling performed
September 2004	Final Site Inspection conducted
February 2005	Preliminary Close-Out Report documenting completion of Site construction activities approved
January 2005	ROD Amendment
June 2005	Second Five-Year Review completed
April 2010	Third Five-Year Review completed
2005 – to present	Long-term monitoring program
September 2015	Fourth Five-Year Review completed

APPENDIX C – Figures



P:\219626\VII - Site Reviews\2020 Five Year Review\Figures 1-3\Figure 1 - Site Location Map.dwg

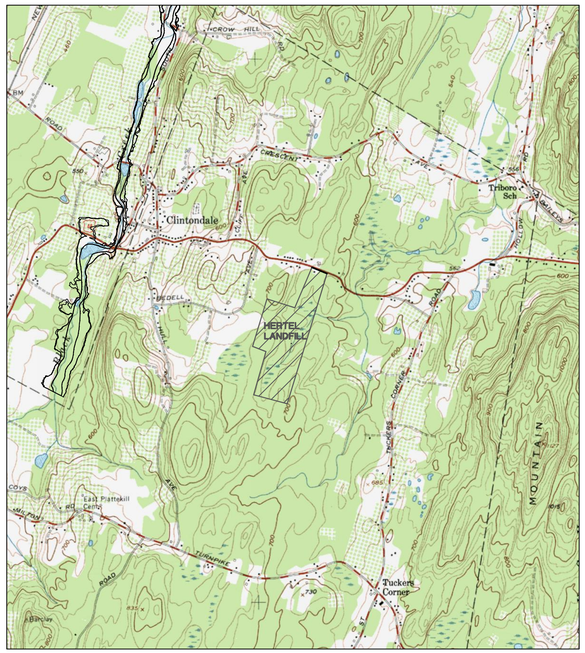
MOTT MACDONALD

111 Wood Avenue South
Iselin, NJ 08330

HERTEL STEERING COMMITTEE
PLATTEKILL, NEW YORK

HERTEL LANDFILL SITE
FIGURE 1
SITE LOCATION MAP

Designed	Drawn	Checked	Approved	Date
	CN	MBM		



SITE LOCATION MAP

2000 0 2000 4000
SCALE IN FEET

LEGEND

- BUFFER BOUNDARY
- PARCEL BOUNDARY
- STREAM/WATER BODY
- FORMER LANDFILL LIMIT
- APPROXIMATE LIMITS OF LANDFILL CAP
- PARCEL WITH A DOMESTIC SUPPLY WELL
- NYSDEC FRESH WATER WETLANDS
- 100-FT WETLANDS BUFFER
- TOWN OF PLATTEKILL EIAA DISTRICT BOUNDARY

N

NOTES:

1. THE WETLANDS INFORMATION PRESENTED IN THIS FIGURE WAS OBTAINED FROM THE ULSTER COUNTY INFORMATION SERVICES. THIS DATA SET REPRESENTS THE EXTENT AND APPROXIMATE LOCATION OF THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION FRESH WATER WETLANDS.

2. THE PARCELS INFORMATION PRESENTED IN THIS FIGURE WAS OBTAINED FROM THE ULSTER COUNTY INFORMATION SERVICES,.

3. 100-FT WETLANDS BUFFER IN ACCORDANCE WITH THE THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, FRESH WATER WETLANDS ACT.

PARCELS MAP

200 0 200 400
SCALE IN FEET

P:\219626\EPA Well Protection Buffer Request\Meetings\Buffer Line_rev4.dwg 3/11/11 1:58 pm

Revision	Date

M. BRENDAN MULLEN
Professional Engineer - N.J. Lic. No. 38346

Date

Designed	Drawn	Checked	Approved	Date
R.W.S	CEN	MBM		

Hatch Mott MacDonald
Certificate No. 24GA28016600

27 Bleeker Street
Millburn, New Jersey 07041

FORMER HERTEL LANDFILL SITE
PLATTEKILL, NY

FIGURE 2

WELL EXCLUSION BUFFER

Job	No.	
219626	1	
	B/O 1	Total 1

Contract No.

MW-K3S MW-K3D

MW-K2D MW-K2S

MW-K1D

SW/SSW-2

MW-K1S

MW-17I

MW-2S MW-2D

MW-P1

SW/SSW-5

Water

MW-W1SA

MW-W1D

SW/SSW-6

V-3 V-1

MW-11D

MW-W2SA

V-2

SW/SSW-3

MW-W2D

V-4

PV-1

MW-14S

MW-14I

MW-14D

MW-10D

V-5

SW/SSW-1A

V-8

MW-9S

V-6

SW/SSW-4A

PV-2

V-15

V-9

PV-6

MW-P3

V-7

SW/SSW-4

MW-P2

MW-3D

V-12

V-10

V-16

MW-3S

V-13

V-11

PV-3

MW-P4

PV-5

PV-4

V-14

MW-1D

MW-1S

MW-16DN

MW-16DS

MW-16S

MW-W3S

LEGEND

LIMIT OF FINAL COVER	
FORMER LANDFILL LIMIT	
MONITORING WELL	MW-14D
SURFACE WATER	SW-6
SEDIMENT SURFACE WATER	SSW-1A
VENTPOINT	V-10
PERIMETER	PV-3

NOTES

1. MAP (& PROPERTY BOUNDARY) SOURCE: BASED ON KILLAM ASSOCIATES PROPERTY SURVEY PERFORMED IN 1994 AND 2001 AND TOWN OF PLATTEKILL TAX MAPS
2. COORDINATE SOURCE: NEW YORK STATE GRID COORDINATE SYSTEM

200 0 200 400

SCALE IN FEET

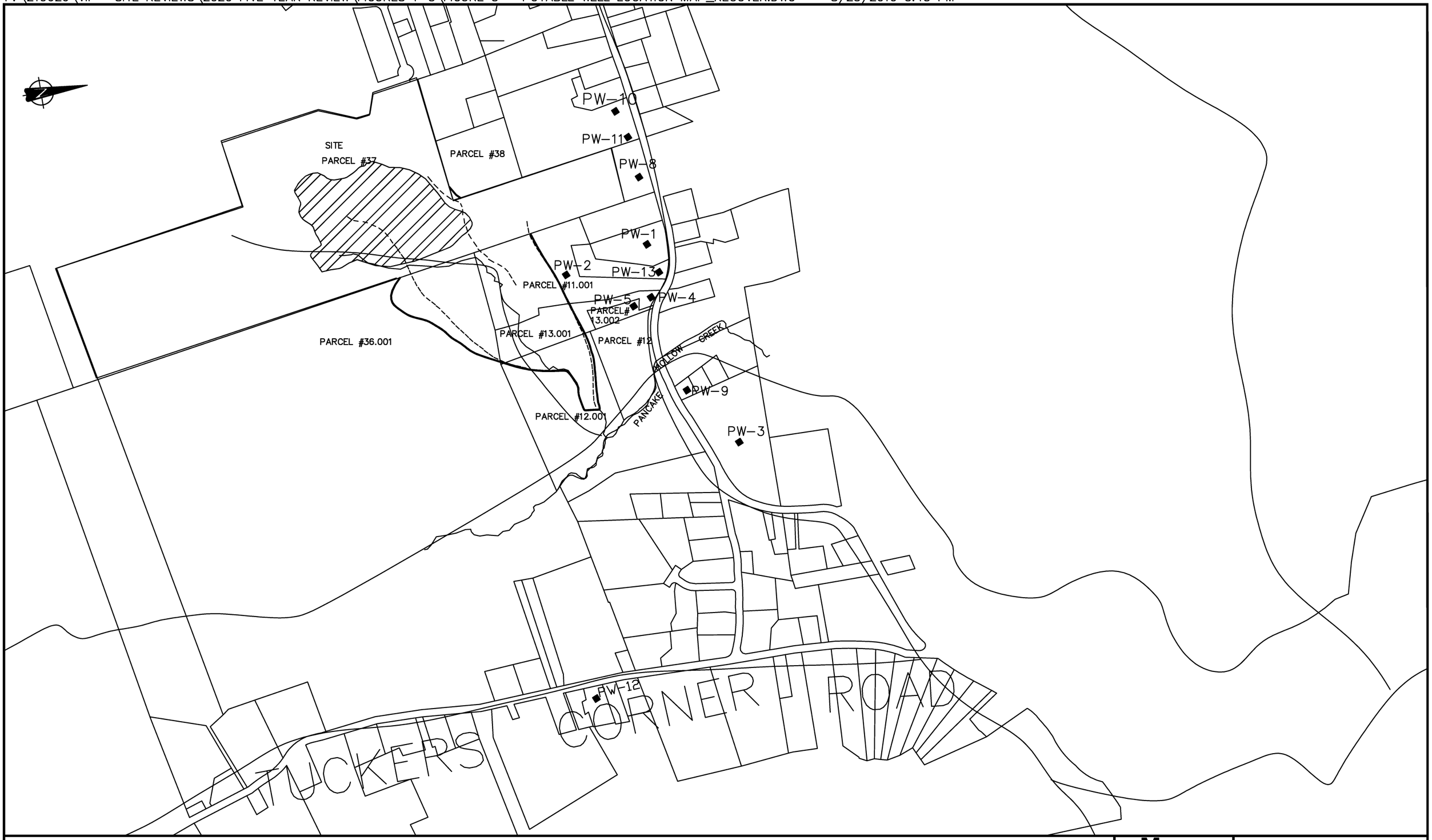
MOTT MACDONALD

111 Wood Avenue South
Iselin, NJ 08830

HERTEL MONITORING WELL & SEDIMENT AND SURFACE WATER SAMPLING LOCATIONS MAP
FIGURE 3
AUGUST 2019

P:\219626\VII - Site Reviews\2020 Five Year Review\Figures 1-3\Figure 2 - Sampling Locations.dwg

P:\219626\VII – SITE REVIEWS\2020 FIVE YEAR REVIEW\FIGURES 1–3\FIGURE 3 – POTABLE WELL LOCATION MAP_RECOVER.DWG 8/25/2019 5:13 PM



600 0 600 1200

SCALE IN FEET

MOTT MACDONALD

111 Wood Avenue South
Iselin, New Jersey 08830–4112

HERTEL LANDFILL
FIGURE 4

POTABLE WELL LOCATION MAP

Designed	Drawn	Checked	Approved	Date

APPENDIX D - Tables

TABLE 1
Pre-October 2017 Long-Term Post-Closure Compliance Monitoring Program
Winter/Spring Event and Summer/Fall Sampling Event
HERTEL LANDFILL

Pre-October 2017 Long-Term Post-Closure Compliance Monitoring Program Winter/Spring Event		
Medium	**No. of Samples**	**Analyses and Sample Location IDs**
Groundwater	6	Target Analyte List (TAL) Metals, Cyanide, Ammonia Nitrogen, Total Kjeldahl Nitrogen, Nitrate Nitrogen, Nitrite Nitrogen, Total Organic Carbon (TOC), Total Phosphorus as PO_4, Alkalinity to pH 4.5 and 8.3, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Chloride, Sulfate, Sulfide, Total Dissolved Solids (TDS), Total Suspended Solids (TSS) **Sample Locations:** MW-P1, -14I, -14S, 16DS, -W3S, -9S
Groundwater	14 (plus 2 duplicates)	Same as above plus benzene, toluene, ethylbenzene and total xylenes (BTEX) **Sample Locations:** MW-2S, -2D, -K2D, -K2S, -K3D, -K3S, -K1D, -K1S, -W1D, -W1SA, -11D, -W2D, -W2SA, -10D, and 2 duplicates
Surface Water	7	Target Compound List (TCL) Volatile Organic Compounds (VOCs), TCL Semivolatile Organic Compounds (SVOCs), TAL Metals, Cyanide, TCL pesticides, total hardness **Sample Locations:** SW-1A, -2, -3, -4, -4A, -5, and -6
Sediment	7	TCL VOCs, TCL SVOCs, TAL Metals, Cyanide, TCL Pesticides, percent moisture, TOC **Sample Locations:** SSW-1A, -2, -3, -4, -4A, -5, and -6
Landfill Gas	22 (Field Screened) 1 (For Lab Analysis	Field test with 4-gas detector and (TO-14 VOCs, CO_2, methane) **Gas Reading Locations:** V-1, -2, -3, -4, -5, -6, -7, -8, -9, -10, -11, -12, -13, -14, -15, -16 and PV-1, -2, -3, -4, -5, and -6 **Sample Location:** Vent with highest Lower Explosive Limit reading on a multi-gas meter or highest methane reading on a landfill gas meter

Pre-October 2017 Long-Term Post-Closure Compliance Monitoring Program Summer/Fall Sampling Event		
Medium	**No. of Samples**	**Analyses and Sample Location IDs**
Groundwater	6	TAL Metals, Cyanide, Ammonia Nitrogen, Total Kjeldahl Nitrogen, Nitrate Nitrogen, Nitrite Nitrogen, TOC, Total Phosphorus as PO_4, Alkalinity to pH 4.5 and 8.3, BOD, COD, Chloride, Sulfate, Sulfide, TDS, TSS **Sample Locations:** MW-P1, -14I, -14S, 16DS, -W3S, and -9S
Groundwater	14 (plus 2 duplicates)	Same as above plus BTEX **Sample Locations:** MW-2S, -2D, -K2D, -K2S, -K3D, -K3S, -K1D, -K1S, -W1D, -W1SA, -11D, -W2D, -W2SA, -10D, and 2 duplicates
Residential Wells	11	TAL Metals, TCL VOCs, Nitrate Nitrogen, Nitrite Nitrogen, Alkalinity to pH 4.5 and 8.3, Chloride, Sulfate **Sample Locations:** PW-1, -2, -3, -4, -5, -8, -9, -10, -11, -12, -13

TABLE 2
Post-October 2017 Long-Term Post-Closure Compliance Monitoring Program
HERTEL LANDFILL

Post-October 2017 Long-Term Post-Closure Compliance Monitoring Program			
Medium	**Sampling Frequency**	**Number of Samples**	**Analyses and Sample Location IDs**
Groundwater Monitoring Wells	Biennially (once every 2 years)	20 (Plus 2 Duplicates)	TAL Metals, Cyanide, Ammonia-Nitrogen, Total Kjedahl Nitrogen, Nitrate-Nitrogen, Nitrite-Nitrogen, TOC, Total Phosphorus as PO_4, Alkalinity to pH 4.5 and to pH 8.3, BOD, COD, Chloride, Sulfate, Sulfide, TDS, TSS **Sample Locations:** MW-P1, -14I, -14S, 16DS, -W3S, -9S, MW-2S, -2D, -K2D, -K2S, -K3D, -K3S, -K1D, -K1S, -W1D, -W1SA, -11D, -W2D, -W2SA, -10D, and 2 duplicates
	Quinquennially (once every 5 years)	20 (Plus 2 Duplicates)	BTEX **Sample Locations:** MW-P1, -14I, -14S, 16DS, -W3S, -9S, MW-2S, -2D, -K2D, -K2S, -K3D, -K3S, -K1D, -K1S, -W1D, -W1SA, -11D, -W2D, -W2SA, -10D, and 2 duplicates
Surface Water and Sediment	Biennially (once every 2 years)	7	TAL Metals, Total Hardness **Sample Locations:** SW-1A, -2, -3, -4, -4A, -5, and -6
	Quinquennially (once every 5 years)	7	Pesticides, PCBs, VOCs, SVOCs, Cyanide, % Moisture, TOC **Sample Locations:** SW-1A, -2, -3, -4, -4A, -5, and -6

Post-October 2017 Long-Term Post-Closure Compliance Monitoring Program			
Landfill Gas	Biennially (once every 2 years)	22 (Field Screened) 1 (For Lab Analysis)	Field screening (via GEM 2000 Meter) for %CO, %O_2, % Lower Explosive Limit, %H_2S at all locations followed by summa-canister analysis for TO-14 VOCS, CO_2, and Methane at the one location with the most elevated field screening values. **Gas Reading Locations:** V-1, -2, -3, -4, -5, -6, -7, -8, -9, -10, -11, -12, -13, -14, -15, -16 and PV-1, -2, -3, -4, -5, and -6
Potable Residential Wells	Annually (once per year)	11 (Plus 1 Duplicate)	TAL Metals, Nitrate-Nitrogen, Nitrite-Nitrogen, Alkalinity to pH 4.5 and to pH 8.3, Chloride, Sulfate, and VOCs **Sample Locations:** PW-1, -2, -3, -4, -5, -8, -9, -10, -11, -12, -13

TABLE 3
SUMMARY ANALYTICAL RESULTS FOR VOCs
IN MONITORING WELLS (2014 TO 2019)
HERTEL LANDFILL

Well	VOC	MCL	Oct-14	Mar-15	Sep-15	Mar-16	Nov-16	Mar-17	Sep-17	Sep-19
MW-9S	Benzene	1	---	---	---	---	---	---	---	0.2U
MW-9S	Toluene	5	---	---	---	---	---	---	---	0.2U
MW-10D	Benzene	1	0.5U	N.D.	0.5U	N.D.	0.5U	0.5U	0.5U	0.2U
MW-10D	Toluene	5	0.5U	N.D.	0.5U	N.D.	0.5U	0.5U	0.5U	0.2U
MW-11D	Benzene	1	0.9J	0.8J	---	---	---	---	---	0.8J
MW-11D	Toluene	5	0.5U	0.5U	---	---	---	---	---	0.2U
MW-14I	Benzene	---	---	---	---	---	---	---	---	0.2U
MW-14I	Toluene	---	---	---	---	---	---	---	---	0.2U
MW-14S	Benzene	---	---	---	---	---	---	---	---	0.2U
MW-14S	Toluene	---	---	---	---	---	---	---	---	0.2U
MW-16DS	Benzene	---	---	---	---	---	---	---	---	0.2U
MW-16DS	Toluene	---	---	---	---	---	---	---	---	0.2U
MW-17I	Benzene	1	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-17I	Toluene	5	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-2D	Benzene	1	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-2D	Toluene	5	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-K1D	Benzene	1	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-K1D	Toluene	5	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-K1S	Benzene	1	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-K1S	Toluene	5	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-K2D	Benzene	1	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-K2D	Toluene	5	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-K2S	Benzene	1	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-K2S	Toluene	5	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-K3D	Benzene	1	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-K3D	Toluene	5	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-K3S	Benzene	1	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-K3S	Toluene	5	0.5U	N.D.	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-P1	Benzene	1	---	---	---	---	---	---	---	0.2U
MW-P1	Toluene	5	---	---	---	---	---	---	---	0.2U
MW-W1D	Benzene	1	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-W1D	Toluene	5	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-W1SA	Benzene	1	1.0	0.5J	1.0	0.7J	0.5U	0.7J	0.9J	1.0
MW-W1SA	Toluene	5	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-W2D	Benzene	1	0.8J	0.7J	0.6J	0.7J	0.6J	0.6J	0.6J	0.8J
MW-W2D	Toluene	5	0.8J	0.7J	0.6J	0.7J	0.6J	0.6J	0.6J	8.0
MW-W2SA	Benzene	1	0.5J	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.6J
MW-W2SA	Toluene	5	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.2U
MW-W3S	Benzene	1	---	---	---	---	---	---	---	0.2U
MW-W3S	Toluene	5	---	---	---	---	---	---	---	0.2U

U = non-detect, J = estimated below the reporting limit, B = detected in the sampling blank, --- = not sampled
GWQS = New York State Groundwater Quality Standard

TABLE 4
SUMMARY ANALYTICAL RESULTS FOR INORGANICS
IN MONITORING WELLS (2014 TO 2019)
HERTEL LANDFILL

WELL	ANALYTE	GWQS	Dec-98	Oct-14	Mar-15	Sep-15	Mar-16	Nov-16	Mar-17	Sep-17	Sep-19
MW-10D	Arsenic	25	8.1B	7.2U	7.2U	7.0U	7.8U	9.7U	9.7U	9.6U	0.86U
MW-10D	Iron	300***	1,040	374J	169J	13,200	133J	234J	2,680	258J	319
MW-10D	Magnesium	35,000	7,450	9,510	8,850	11,700	9,200	8,080	8,600	7,970	9,920
MW-10D	Manganese	300***	260	307	257	718	299	311	304	226	280
MW-10D	Selenium	10	2U	4.8U	4.8U	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-10D	Sodium	20,000	5,300	5,460	5,810	6,930	6,350	5,640	5,690	5,560	4,860
MW-11D	Arsenic	25	36	24.3J	25.1J	---	---	---	---	---	31
MW-11D	Iron	300***	18,800	17,900	15,600	---	---	---	---	---	21,300
MW-11D	Magnesium	35,000	30,900	24,400	24,300	---	---	---	---	---	24,600
MW-11D	Manganese	300***	7,880	4,760	4,170	---	---	---	---	---	4,540
MW-11D	Selenium	10	3.1B	4.8U	7.9J	---	---	---	---	---	0.65U
MW-11D	Sodium	20,000	47,700	21,000	21,400	---	---	---	---	---	21,800
MW-14I	Arsenic	25	7.5B	7.2U	7.2U	12.9J	7.8U	9.7U	9.7U	9.6U	0.68U
MW-14I	Iron	300***	84.5B	1,180	233J	251J	332J	331J	880	255J	112
MW-14I	Magnesium	35,000	3,270B	7,160	3,420	4,100	3,750	2,500	4,250	2,640	2,620
MW-14I	Manganese	300***	3,430	14,100	1,510	5,210	4,430	820	7,450	3,210	1,950
MW-14I	Selenium	10	2.4B	4.8U	4.8U	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-14I	Sodium	20,000	3430B	2,540	2,040	2,170	2,250	2,280	2,130	2,150	2,320
MW-14S	Arsenic	25	8.3B	7.2U	7.2U	9.8J	7.8U	9.7U	9.7U	9.6U	7
MW-14S	Iron	300***	3,220	1,070	1,480	567	872	477	337J	346J	3,550
MW-14S	Magnesium	35,000	3520B	6,970	5,130	3,960	5,130	2,540	2,870	4,580	4,870
MW-14S	Manganese	300***	4,020	12,400	8,640	6,360	8,690	590	2,440	7,630	9,400
MW-14S	Selenium	10	2U	4.8U	4.8U	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-14S	Sodium	20,000	3,600B	2,670	2,200	2,230	2,290	2,170	2,120	2,110	2,360
MW-16DS	Arsenic	25	7.4B	7.2U	7.2U	7.3J	7.8U	9.7U	9.7U	9.6U	2
MW-16DS	Iron	300***	600	22,400	6,640	32,600	8,460	17,200	7,210	10,300	62,100
MW-16DS	Magnesium	35,000	2,400B	1,670	1,890	1,680	2,090	1,670	1,980	1,590	1,700
MW-16DS	Manganese	300***	1,190	242	171	286	145	258	154	263	371
MW-16DS	Selenium	10	2U	4.8U	5J	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-16DS	Sodium	20,000	2,090B	2,030	2,290	2,110	2,400	2,120	2,100	2,020	2,020
MW-17I	Arsenic	25	9.1B	7.2U	7.2U	13J	7.8U	9.7U	9.7U	9.6U	0.68U
MW-17I	Iron	300***	72.4B	33.4U	33.7J	33.3U	33.3U	74.7U	74.7U	80.5U	22.8U
MW-17I	Magnesium	35,000	3730B	3,880	4,240	4,140	4,500	4,060	4,670	4,060	3,960
MW-17I	Manganese	300***	10.4B	4.2J	2.4J	4.5J	2.8J	13	1.8U	2.2J	25
MW-17I	Selenium	10	2U	4.8U	6.1J	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-17I	Sodium	20,000	23,000	39,700	15,600	42,000	14,600	37,200	14,400	40,500	39,300
MW-2D	Arsenic	25	9.5B	7.2U	7.2U	7.0U	7.8U	9.7U	9.7U	9.6U	0.68U
MW-2D	Iron	300***	228	33.4U	91.1J	40.7J	33.3U	74.7U	74.7U	80.5U	22.8U
MW-2D	Magnesium	35,000	3880B	4,170	5,140	4,150	3,940	4,240	4,850	3,750	3,630
MW-2D	Manganese	300***	11B	1.5J	2.6J	1.7J	1.4J	1.8U	1.8U	5.6J	4.9U
MW-2D	Selenium	10	2U	4.8U	4.8U	10.1J	8.2U	9.7U	9.7U	9.3U	0.65U
MW-2D	Sodium	20,000	23,600	43,200	22,600	41,200	38,300	37,000	25,800	46,500	42,700
MW-9S	Arsenic	25	16	7.2U	7.2U	7.0U	7.8U	9.7U	11.2J	9.6U	0.98J
MW-9S	Iron	300***	18,300	2,690	11,000	8,150	1,460	6,160	26,000	1,140	2,520
MW-9S	Magnesium	35,000	6,460	3,360	5,030	4,340	3,360	4,120	7,470	3,130	3,410
MW-9S	Manganese	300***	671	87	532	257	125	212	1,100	125	74
MW-9S	Selenium	10	2U	4.8U	4.8U	10.5J	8.2U	9.7U	9.7U	9.3U	0.65U
MW-9S	Sodium	20,000	6,740	2,560	2,690	2,820	2,460	2,940	2,930	2,690	2,910
MW-K1D	Arsenic	25	9.9B	7.2U	7.2U	7.0U	7.8U	9.7U	9.7U	9.6U	1.2J
MW-K1D	Iron	300***	1,790	7,480	10,800	7,820	6,090	14,000	21,000	4,380	18,500
MW-K1D	Magnesium	35,000	4370B	13,600	13,800	13,300	13,900	13,100	14,100	13,700	17,700
MW-K1D	Manganese	300***	53	480	522	455	566	537	612	500	757
MW-K1D	Selenium	10	2U	4.8U	4.8U	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-K1D	Sodium	20,000	13,900	13,800	12,800	13,300	13,400	12,700	13,300	13,300	15,300
MW-K1S	Arsenic	25	9.5B	7.2U	7.2U	7.0U	7.8U	9.7U	9.7U	9.6U	0.68U
MW-K1S	Iron	300***	56.2B	1,190	344J	1,490	331J	272J	2,050	314J	607
MW-K1S	Magnesium	35,000	3160B	3,610	3,660	3,090	4,050	3,360	2,540	3,670	2,700
MW-K1S	Manganese	300***	383	686	82	834	563	325	2,530	882	300
MW-K1S	Selenium	10	2U	4.8U	4.8U	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-K1S	Sodium	20,000	6,010	10,000	8,170	8,360	10,000	9,070	5,370	9,100	6,940

U = non-detect, J = estimated below the reporting limit, B = detected in the sampling blank, --- = not sampled
GWQS = New York State Groundwater Quality Standard
** = USEPA Drinking Water MCL
*** = GWQS for iron and manganese is a summed value of 300 micrograms per liter

TABLE 4
SUMMARY ANALYTICAL RESULTS FOR INORGANICS
IN MONITORING WELLS (2014 TO 2019)
HERTEL LANDFILL

WELL	ANALYTE	GWQS	Dec-98	Oct-14	Mar-15	Sep-15	Mar-16	Nov-16	Mar-17	Sep-17	Sep-19
MW-K2D	Arsenic	25	10	7.2U	7.2U	7.0U	7.8U	9.7U	9.7U	9.6U	1.2J
MW-K2D	Iron	300***	4,560	5,270	24,600	13,800	15,700	3,480	6,040	8,240	22,700
MW-K2D	Magnesium	35,000	6,770	7,320	7,470	7,500	7,960	7,590	7,930	7,700	7,510
MW-K2D	Manganese	300***	96	129	361	215	236	106	129	112	241
MW-K2D	Selenium	10	2U	4.8U	5.6J	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-K2D	Sodium	20,000	5,660	7,370	6,890	7,200	7,200	6,890	7,080	6,760	7,180
MW-K2S	Arsenic	25	9.4B	7.2U	7.2U	7.0U	7.8U	9.7U	9.7U	9.6U	0.68U
MW-K2S	Iron	300***	1,720	404	127J	259J	43.4J	74.7U	317J	80.5U	233
MW-K2S	Magnesium	35,000	4540B	2,970	1,590	1,900	3,480	5,500	1,220	5,700	5,180
MW-K2S	Manganese	300***	116	3,230	160	813	667	1,860	139	1,270	351
MW-K2S	Selenium	10	2U	5.1J	4.8U	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-K2S	Sodium	20,000	16,100	13,100	8,810	10,800	14,300	19,200	7,300	21,900	25,700
MW-K3D	Arsenic	25	9.5B	7.2U	7.2U	7.0U	7.8U	9.7U	9.7U	9.6U	0.68U
MW-K3D	Iron	300***	6,580	6,450	3,310	6,030	3,200	205J	29,300	19,300	6,130
MW-K3D	Magnesium	35,000	14,300	13,500	14,100	14,500	16,600	6,800	18,700	17,100	17,300
MW-K3D	Manganese	300***	314	92	62	101	86	266	260	161	62
MW-K3D	Selenium	10	2U	4.8U	4.8U	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-K3D	Sodium	20,000	22,400	13,000	13,000	13,600	15,900	13,200	16,500	14,900	14,800
MW-K3S	Arsenic	25	11	7.2U	7.2U	7.0U	7.8U	9.7U	9.7U	9.6U	2.0J
MW-K3S	Iron	300***	178	1,240	285J	93.1J	1,820	2,340	919	3,900	6,460
MW-K3S	Magnesium	35,000	7,140	10,100	10,200	3,850	12,600	16,600	5,850	11,700	12,400
MW-K3S	Manganese	300***	685	2,280	671	38	1,240	44	170	1,350	1,730
MW-K3S	Selenium	10	2U	4.8U	4.8U	9.9J	8.2U	9.7U	9.7U	9.3U	0.65U
MW-K3S	Sodium	20,000	11,900	15,400	15,100	12,300	14,000	15,000	9,300	13,000	14,000
MW-P1	Arsenic	25	9.7B	7.2U	7.2U	7.2J	7.8U	9.7U	9.7U	9.6U	3
MW-P1	Iron	300***	5,990	10,900	7,070	17,000	5,110	4,610	2,310	3,890	2,280
MW-P1	Magnesium	35,000	5,170	8,780	5,450	8,720	3,780	6,820	3,420	4,240	4,280
MW-P1	Manganese	300***	2,110	4,780	2,260	3,260	1,680	2,500	1,200	1,350	1,490
MW-P1	Selenium	10	2U	4.8U	4.8U	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-P1	Sodium	20,000	24,200	31,400	31,700	32,300	34,800	32,800	31,900	30,000	35,300
MW-W1D	Arsenic	25	12	7.2U	7.2U	7.0U	7.8U	9.7U	9.7U	9.6U	6
MW-W1D	Iron	300***	2,330	1,510	1,220	1,790	1,570	1,950	1,860	2,520	3,070
MW-W1D	Magnesium	35,000	44,100	45,600	45,700	45,800	47,700	39,800	44,500	40,900	41,900
MW-W1D	Manganese	300***	3,760	3,840	3,610	3,810	4,330	5,460	3,520	4,890	5,670
MW-W1D	Selenium	10	2U	4.8U	4.8U	8.4J	8.2U	9.7U	9.7U	9.3U	0.65U
MW-W1D	Sodium	20,000	94,200	61,200	61,800	58,400	61,300	48,700	56,100	46,800	41,100
MW-W1SA	Arsenic	25	8.7B	42	31.4J	40	26.7J	9.7U	13.9J	61	66
MW-W1SA	Iron	300***	3,700	17,000	12,500	16,700	17,200	463	11,000	16,600	18,700
MW-W1SA	Magnesium	35,000	24,950	27,400	24,500	30,000	30,900	29,900	28,600	28,000	30,200
MW-W1SA	Manganese	300***	21,000	17,600	14,900	20,300	25,400	6,030	17,500	17,800	19,400
MW-W1SA	Selenium	10	12	4.8U	5.9J	8.2U	8.2U	9.7U	11J	9.3U	0.65U
MW-W1SA	Sodium	20,000	13,400	27,500	19,800	29,600	25,200	10,200	22,400	23,800	25,500
MW-W2D	Arsenic	25	25	15.4J	17.4J	10.9J	17.5J	9.7U	18.6J	18.1J	26
MW-W2D	Iron	300***	8,760	17,400	16,000	17,300	18,400	17,100	17,800	19,100	22,400
MW-W2D	Magnesium	35,000	20,800	14,700	13,300	14,200	14,000	14,500	12,900	13,100	14,500
MW-W2D	Manganese	300***	10,600	9,800	8,460	8,430	8,990	9,030	8,340	8,430	8,830
MW-W2D	Selenium	10	3.2B	4.8U	4.8U	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-W2D	Sodium	20,000	27,000	8,430	7,170	7,740	7,440	7,400	6,410	6,750	7,320
MW-W2SA	Arsenic	25	35	16.3J	32.7J	21.4J	19.9J	18J	22.9J	28.6J	27
MW-W2SA	Iron	300***	25,200	18,600	21,200	21,700	18,700	22,100	22,000	19,700	25,300
MW-W2SA	Magnesium	35,000	29,000	16,200	16,000	16,300	15,200	21,500	15,000	14,800	16,200
MW-W2SA	Manganese	300***	12,400	9,580	9,950	10,500	10,000	9,500	9,380	9,360	10,000
MW-W2SA	Selenium	10	4.6B	4.8U	4.8U	8.2U	8.2U	9.7U	9.7U	10J	0.65U
MW-W2SA	Sodium	20,000	31,700	10,700	9,470	10,000	9,040	9,940	8,210	8,970	9,420
MW-W3S	Arsenic	25	6.4B	7.2U	7.2U	7.0U	7.8U	9.7U	9.7U	9.6U	0.68U
MW-W3S	Iron	300***	1,380	64.1J	54.7J	113J	46.5J	74.7U	74.7U	567	199
MW-W3S	Magnesium	35,000	1430B	1,350	1,060	1,040	1,020	1,540	1,020	1,040	1,020
MW-W3S	Manganese	300***	56	6.5J	2.9J	6.1J	3.3J	2.2J	3.1J	14	4.9U
MW-W3S	Selenium	10	2U	5.1J	4.8U	8.2U	8.2U	9.7U	9.7U	9.3U	0.65U
MW-W3S	Sodium	20,000	1920B	2,100	2,100	1970J	2,060	1980J	1890J	1990J	2,030
MW-K2D	Arsenic	25	10	7.2U	7.2U	7.0U	7.8U	9.7U	9.7U	9.6U	1.2J

U = non-detect, J = estimated below the reporting limit, B = detected in the sampling blank, --- = not sampled
GWQS = New York State Groundwater Quality Standard
** = USEPA Drinking Water MCL
*** = GWQS for iron and manganese is a summed value of 300 micrograms per liter

TABLE 5
SUMMARY ANALYTICAL RESULTS FOR INORGANICS
IN PRIVATE WELLS (2014 TO 2019)
HERTEL LANDFILL

Well	Element	GWQS	Jun-01	Oct-14	Sep-15	Nov-16	Sep-17	Sep-18
PW-1	Copper	200	27	3,400	---	162	17	17
PW-1	Iron	300***	49.8B	9,830	---	842	80.5U	40U
PW-1	Manganese	300***	1.2B	46	---	9	2.1J	3.7J
PW-1	Sodium	20000	9,980	11,800	---	13,100	12,500	14,200
PW-2	Copper	200	20	---	284	228	75	110
PW-2	Iron	300***	33.4U	---	33.3U	74.7U	80.5U	49
PW-2	Manganese	300***	0.83U	---	12	4.6J	3.8J	1.8J
PW-2	Sodium	20000	153,000	---	14,200	13,500	15,000	16,500
PW-3	Copper	200	5.8B	3	6	21	1.7J	7
PW-3	Iron	300***	47B	181J	113J	203	199J	130J
PW-3	Manganese	300***	7.4B	108	121	98	95	129
PW-3	Sodium	20000	15,700	20,400	20,600	21,300	22,200	4,460
PW-4	Copper	200	20.9B	---	5	9	7	6
PW-4	Iron	300***	58.9B	---	33.3U	74.7U	80.5U	40U
PW-4	Manganese	300***	2.7B	---	0.80U	1.8U	1.6U	1.1U
PW-4	Sodium	20000	11,700	---	132,000	138,000	135,000	139,000
PW-5	Copper	200	10.3B	44	172	---	---	---
PW-5	Iron	300***	29.8B	33.4U	33.3U	---	---	---
PW-5	Manganese	300***	0.7B	0.83U	1J	---	---	---
PW-5	Sodium	20000	18,000	129,000	18,300	---	---	---
PW-8	Copper	200	118	17	355	595	---	---
PW-8	Iron	300***	189	36.4J	81.4J	80.5U	---	---
PW-8	Manganese	300***	2B	3.3J	2J	3.0J	---	---
PW-8	Sodium	20000	39,700	38,600	55,100	58,300	---	---
PW-9	Copper	200	8.4B	161	280	23	16	9
PW-9	Iron	300***	74.1B	255	154J	74.7U	80.5U	291
PW-9	Manganese	300***	88	119	114	140	167	96
PW-9	Sodium	20000	3,760B	4,410	4,290	4,300	4,270	22,900
PW-10	Copper	200	30	11	10	122	7	11
PW-10	Iron	300***	23.7U	33.4U	33.3U	74.7U	80.5U	40U
PW-10	Manganese	300***	1.7B	0.83U	0.80U	1.8U	1.6U	1.1U
PW-10	Sodium	20000	8,610	97,400	101,000	107,000	103,000	108,000
PW-11	Copper	200	51	109	33	26	15	12
PW-11	Iron	300***	60.8B	33.4U	33.3U	74.7U	80.5U	40U
PW-11	Manganese	300***	61	10	8	6	6	4.8J
PW-11	Sodium	20000	34,100	37,800	51,800	65,600	54,700	56,300
PW-13	Copper	200	---	292	30	35	40	8
PW-13	Iron	300***	---	365	33.3U	74.7U	80.5U	40U
PW-13	Manganese	300***	---	150	2.4J	3.8J	3.2J	1.1U
PW-13	Sodium	20000	---	14,100	121,000	97,000	128,000	180,000

U = non-detect, J = estimated below the reporting limit, B = detected in the sampling blank, --- = not sampled
GWQS = New York State Groundwater Quality Standard
** = USEPA Drinking Water MCL
*** = GWQS for iron and manganese is a summed value of 300 micrograms per liter