Landfill Gas Monitoring Readiness

Go East Landfill/Alpine Estates Development

Prepared for
Snohomish County Health Department

Prepared by
Herrera Environmental Consultants, Inc.

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Prepared for
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Introduction

This letter presents the current conditions of the landfill perimeter soil gas probes (perimeter probes) and monitoring elements installed at the Go East Landfill (landfill)/Alpine Estates Development (site). It also presents results of landfill gas monitoring and an overview of what has been done to get the monitoring elements ready for required compliance monitoring according to the Landfill Gas Monitoring and Contingency Plan (LFGMCP) (Herrera 2024).

The landfill is located at 4330 108th Street Southeast, Everett, Washington, and was operated as an excavation and sand reclamation site from 1969 through 1971. Between 1972 and 1977 the landfill operator (Rekoway) accepted wood waste debris that included partially burned trees and stumps, and concrete solid material that were compacted and placed in sealed cells before the site was closed initially in 1978. After reopening in 1979, with Go East Corporation (Go East) as the Owner/Operator, the site accepted wood waste in enclosed cells from 1979 to 1983, after which the landfill ceased all operations. In 2009 the property was purchased by P&GE, LLC (P&GE). P&GE completed landfill closure in July 2022 in accordance with the Go East Landfill Closure Plan (LFCP) that was approved by Snohomish County Health Department (SCHD) under their Solid Waste Facility Permit #SW-027. The Washington State Department of Ecology (Ecology) provided a letter of consent for landfill closure to SCHD on July 25, 2022. Monitoring elements including perimeter probes and landfill gas continuous monitoring sumps (sumps) were installed as part of the landfill closure. Figure 1 shows a map of the closed landfill and its landfill gas (LFG) collection, conveyance, and monitoring elements as well as the proposed lot layout for future homes. In May 2022, another developer, Century Communities®, purchased the redevelopment project from P&GE and began installation of the utilities for the planned housing community (Alpine Estates).

In September 2022, Herrera Environmental Consultants (Herrera) was hired onto the project by Century Communities® to be the LFG consultant for the site. Herrera reviewed several reports and plans from the site including the Landfill Closure Plan (last updated in June 2021), Construction Quality Assurance Report (PACE Engineers 2022), Landfill Gas Monitoring and Contingency Plan (Vikek Environmental Engineers, LLC (Vikek) 2022), Landfill Gas Probe Installation Technical Memorandum (Vikek 2022), and the Final Post-Construction Condition Review Report (Vikek 2022). After understanding the systems installed and goals of monitoring, Herrera performed an initial inspection of the site to assess the condition of the perimeter probes and continuous monitoring equipment, and collected reads at the perimeter probes to evaluate the soil gas levels.

The information presented in this letter is organized from source (landfill) to potential receptor (offsite structures including Alpine Estates homes and electrical building):

- Landfill Gas Sumps: Continuous monitoring devices within landfill perimeter containment system
- Perimeter Soil Gas Probes: Soil vapor monitoring stations beyond the landfill containment system
- Offsite Structures: Ventilation trench monitoring stations beneath Alpine Estates homes and first floor interior of Alpine Estates homes and an electrical building

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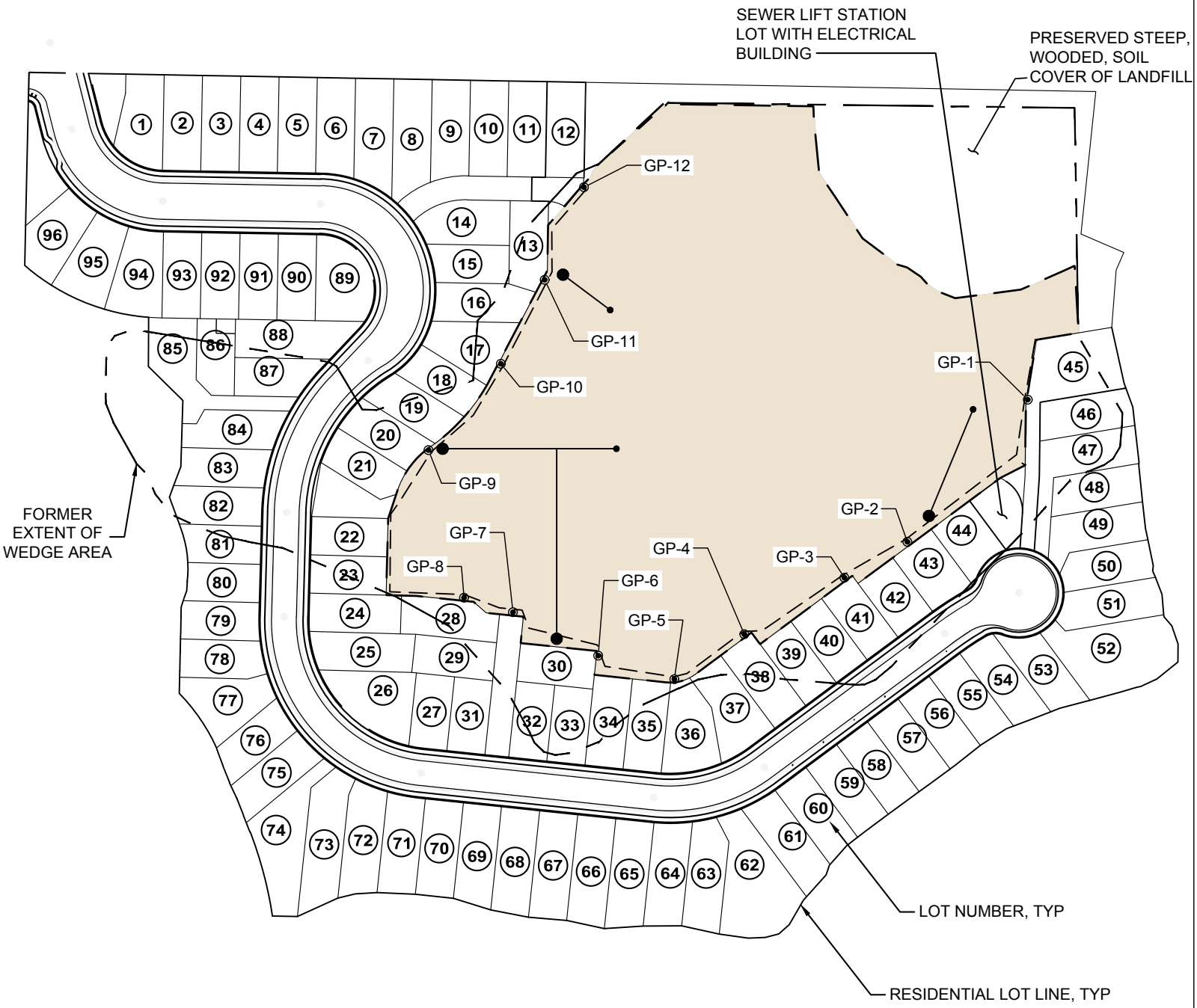
Figure 1.
Landfill Gas Monitoring Locations.



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◉ GP-#	LANDFILL PERIMETER SOIL GAS PROBE	— — — —	GRAVEL TRENCH WITH 2 IN PERF PIPE
●	LANDFILL GAS SUMP	———	GRAVEL TRENCH WITH 2 IN PIPE
•	LANDFILL GAS VENT	▭	CAPPED AND CLOSED LANDFILL AREA

Landfill Gas Sumps

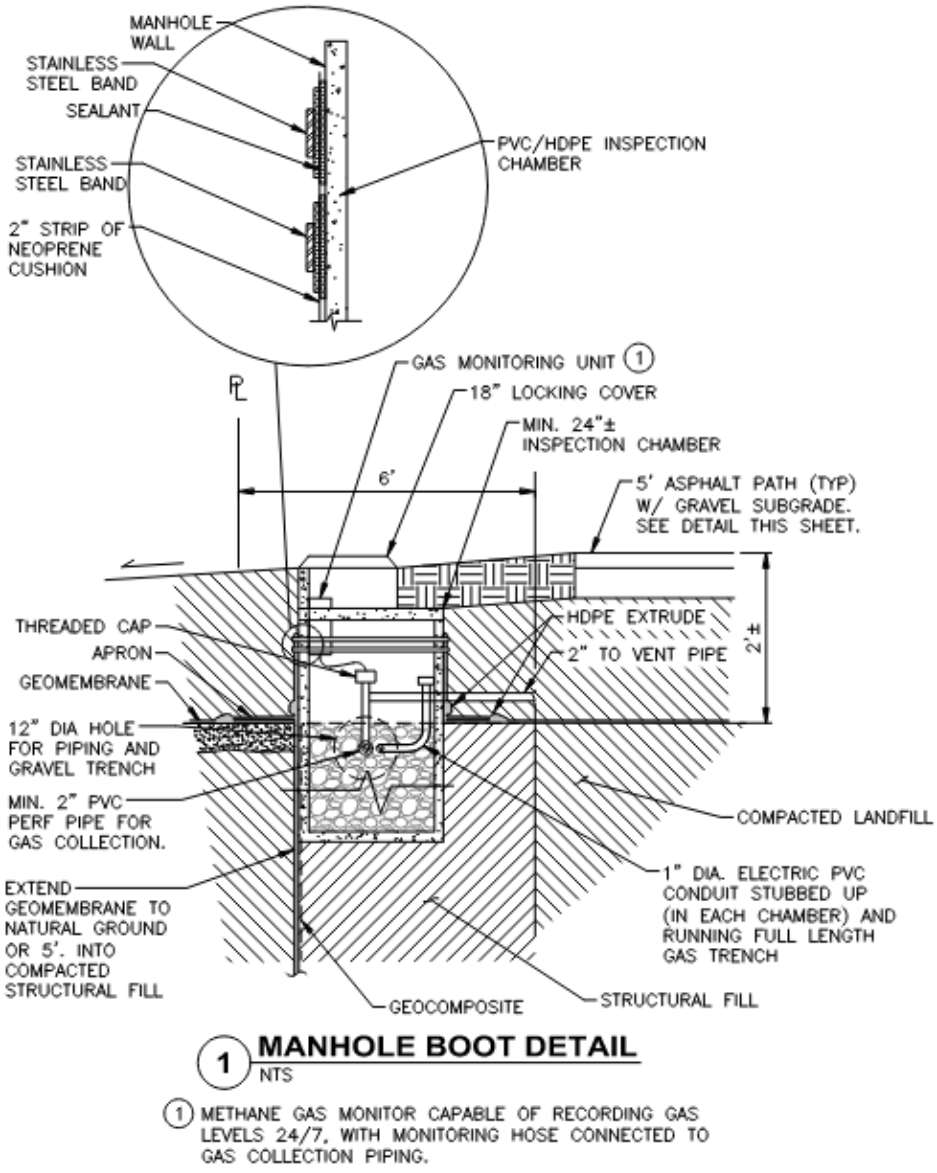
Four continuous monitoring devices are setup at the edge of the landfill liner cap and are connected to the collection trench (Figure 1). These sumps and sensors were installed to remotely evaluate the content of LFG collected from the landfill.

The gravel-filled methane vent trench system located at the inner perimeter of the closed landfill contains a 2-inch diameter perforated collection pipe that conveys the gas to one of four sump structures for continuous gas monitoring. As designed, the gas rises from the landfill, encounters the impenetrable landfill cap surface, and travels horizontally to the gravel-filled methane vent trench system located around the perimeter of the closed landfill. From the trench, the gas reaches these sump-like structures and is then conveyed to one of three 10-foot-high discharge vent pipes located over 100 feet from any lot (Figure 1).

Existing Conditions and Adjustments

Herrera reviewed the design of the continuous monitoring sumps according to Detail 1 of Sheet 8 of the Go East Landfill Closure Plan (Pace 2022). Figure 2 shows the detail from the Go East Landfill Closure Plan (Pace 2022).

Figure 2. Typical LFG Sump Detail.



After inspecting the installed sumps and monitoring devices, the main issue discovered across all devices was the improper sealing between electrical components and LFG which contains methane, a flammable gas. The National Electrical Code (NEC) defines hazardous locations as those areas "where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings." A “Class I Location” is created by the presence of flammable gases or vapors in the air in sufficient quantities to be explosive or ignitable. When these materials are found in the atmosphere, a potential for explosion exists if an electrical or other source of ignition is present. A landfill site has flammable gases and vapors present in form of methane and other gases which makes it a Class I type of hazard location.

In designing equipment for Class I, Division 1 locations, it is assumed that the hazardous gases or vapors will be present and eventually seep into the enclosure, so there is a chance for an internal explosion to occur. The electrical transmitter for the continuous monitoring system was found directly connected to the sensor that is sampling LFG. Additionally, the sump was not adequately sealed providing another access point for LFG to migrate towards the electrical components. The post-construction closure issues found and the adjustments made to fix these issues are summarized in Table 1. Fixes to the sumps and continuous monitoring devices took place over the course of several months.

Table 1. Landfill Gas Sump Adjustments.

Post-Construction Issues	• Conduit from LFG sump to panel not rated for an explosive environment. • Missing electrical sealoff. • Inadequate seal around sump. • Sensors not functioning properly. • Batteries not holding charge. • Stand holding monitoring panel not structurally sound and not in great condition.		
Adjustments Made	• Replaced conduit. • Removed wood stand and installed Unistrut stand with concrete bases. • Installed electrical sealoff. • Sealed liner around sump. • Ordered and installed new sensors. • Installed new larger volt batteries.		
Photographs (after adjustments were made)	Sump 	Front of panel stand 	Back of Panel Stand 

Landfill Gas Conditions

Herrera set up the remote data viewing for the continuous monitoring devices in the sumps and data has been collected since March 3, 2023. The sump by the perimeter probe 6 has been reading around 0.2 percent by volume (%) methane. The sump by perimeter probe 2 has been reading around 2.5% methane. The sumps by perimeter probes 9 and 11 don't appear to be operating correctly as reads at or above 100% methane, and reads in the negatives have been recorded. Additionally, the sump by perimeter probe 11 has not collected a methane read since the end of May. The continuous monitoring equipment in the sumps will be calibrated or otherwise troubleshooted to make sure all are in working condition. See Figure 3, Figure 4, Figure 5, and Figure 6 for a three-month snapshot of methane reads collected at the sumps by perimeter probe 2, perimeter probe 6, perimeter probe 9, and by perimeter probe 11, respectively.

Figure 3. GeoTech Remote Data Viewer for Sump by Probe 2.

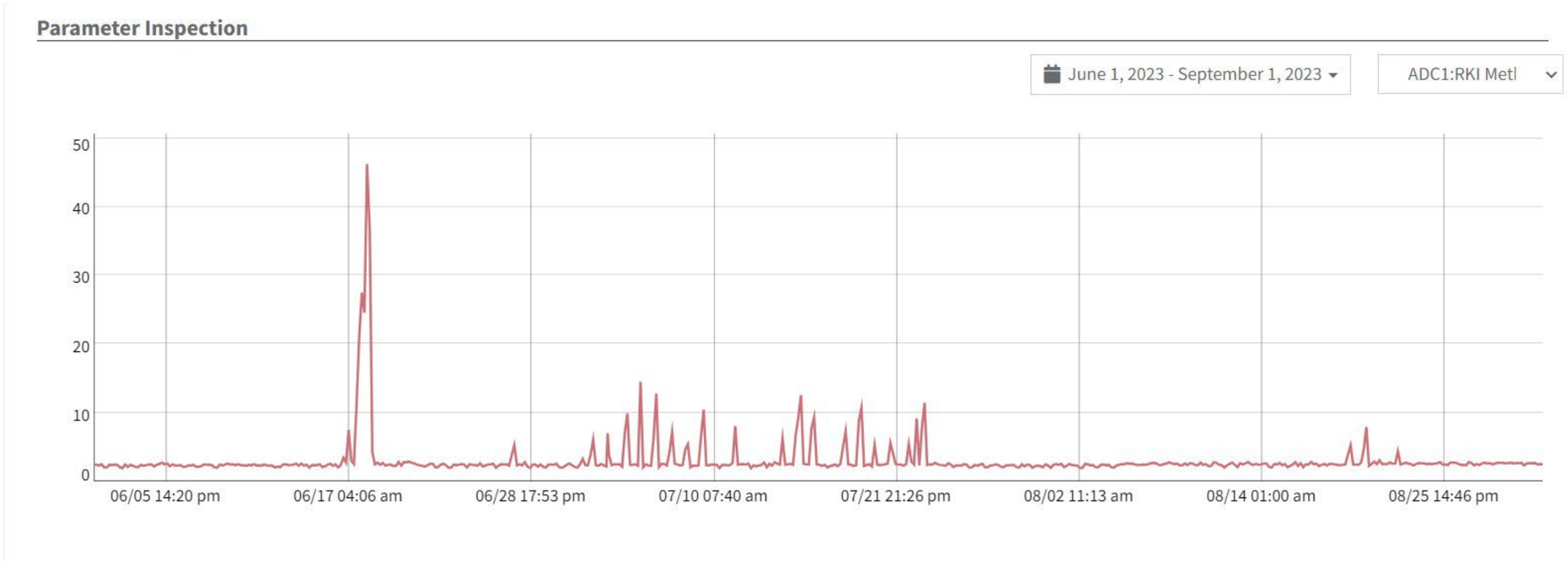


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Figure 4. GeoTech Remote Data Viewer for Sump by Probe 6.

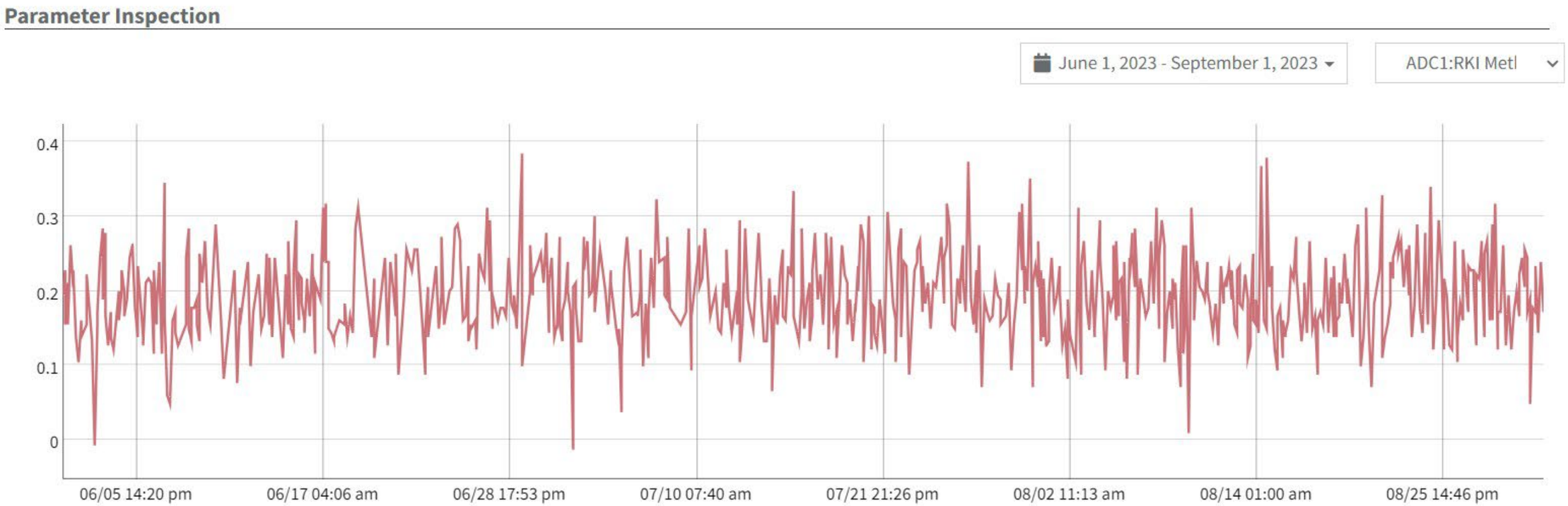

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Figure 5. GeoTech Remote Data Viewer for Sump by Probe 9.

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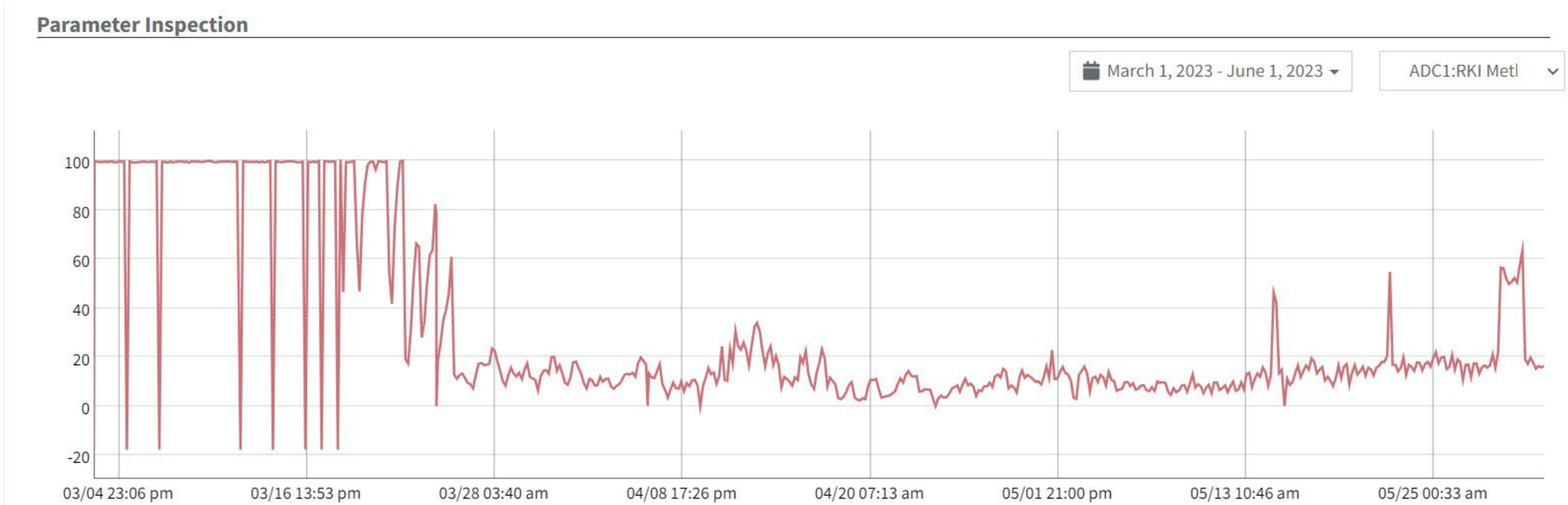
Figure 6. GeoTech Remote Data Viewer for Sump by Probe 11.



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Perimeter Soil Gas Probes

Twelve gas monitoring perimeter probes were installed just outside the closed landfill boundary and are called out on Figure 1. These perimeter probes were installed to evaluate how well the landfill cap and passive collection system function to prevent migration of LFG. Per the Washington Administrative Code (WAC) 173-350-400, limited purposes landfills must be designed to control methane and other explosive gases to ensure they do not exceed the lower explosive limit (LEL) for gases in soil at the property boundary or beyond. This is monitored by measuring the soil gas content, specifically methane, in perimeter probes positioned just beyond the limits of buried waste. The LEL for methane is 5% or 50,000 parts per million by volume (ppmV).

The closed landfill has an engineered final cover constructed of the following layers (from the top); a minimum 12 inches of topsoil, 12 inches of on-site sand, geocomposite (200 mil [0.2 inches] GSE® Fabrinet, double-sided composite with 6 ounce nonwoven geotextile), geomembrane (40 mil GSE® UltraFlex, linear low-density polyethylene (LLDPE) double-sided textured), and a 6 inch bottom layer of on-site sand. As designed, the gas rises, encounters the impenetrable landfill cap, and travels horizontally to the gravel-filled methane vent trench system located around the perimeter of the closed landfill. The gas then conveys from the trench to one of three 10-foot-high discharge vent pipes located over 100 feet from any lot (Figure 1).

Existing As-Built Conditions and Adjustments Made

Herrera reviewed the condition of the perimeter probes according to Chapter 173-160 of WAC and Detail 7 of Sheet 8 of the Go East Landfill Closure Plan (Pace 2022). Figure 7 shows the general resource protection well cross section included in the WAC and Figure 8 shows the detail from the Go East Landfill Closure Plan (Pace 2022).

Figure 7. General Resource Protection Well from Figure 6 of WAC 173-160.

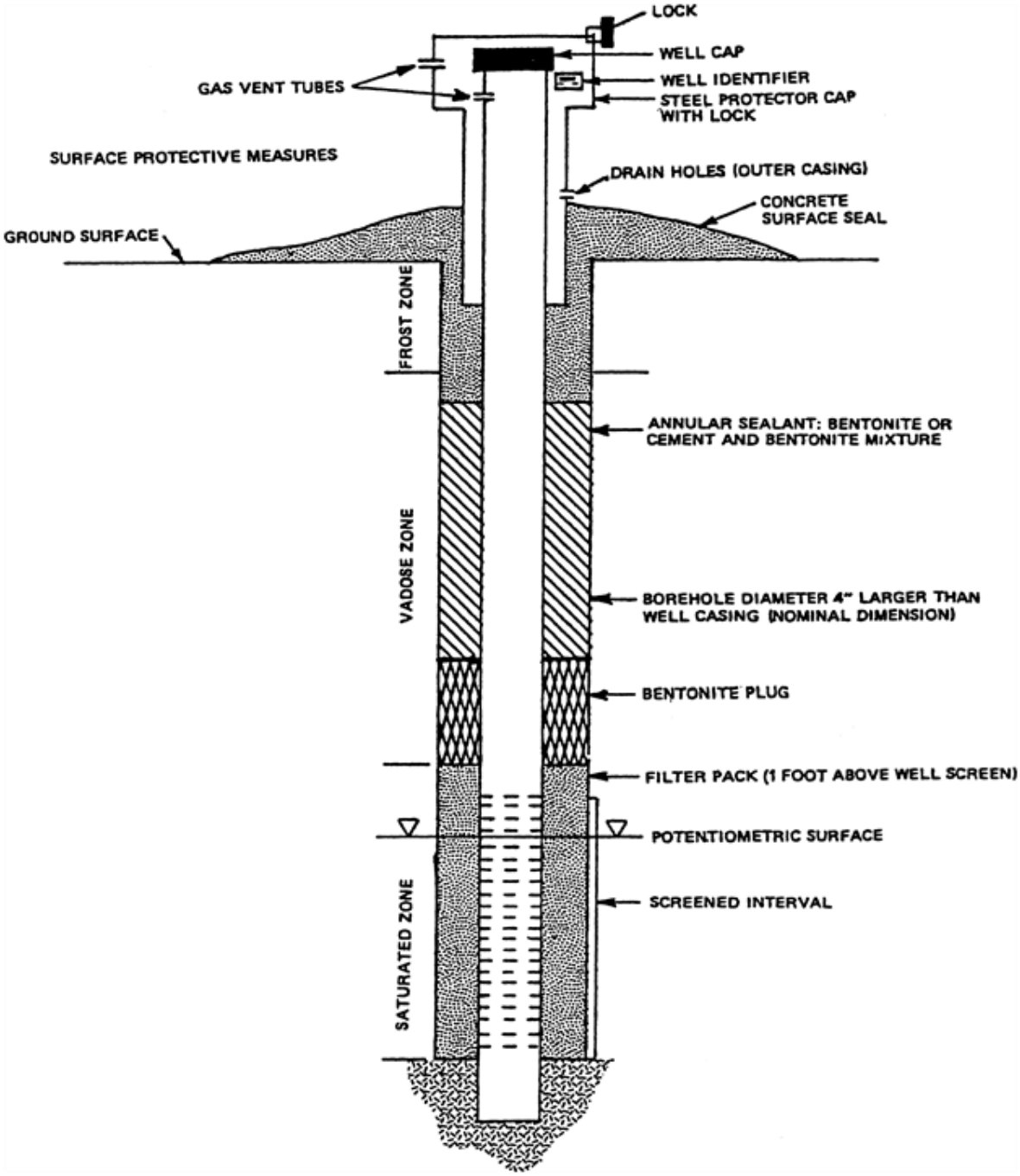
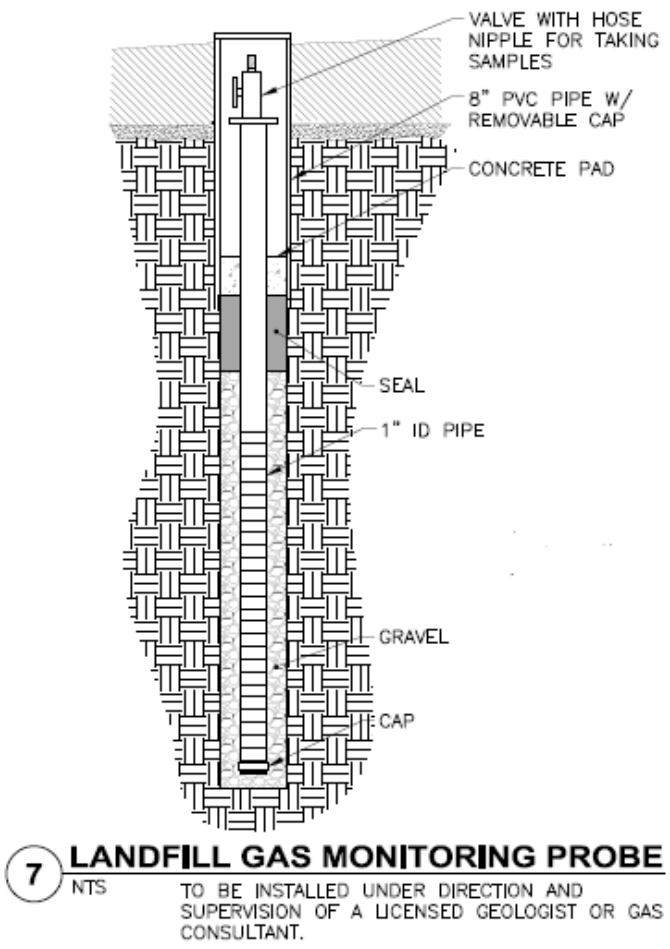


Figure 8. Typical Landfill Monitoring Probe.



Final closure grading and the start of development construction disturbed most of the perimeter probes. A few perimeter probes were found to be in good shape and others required improvements to remain in accordance with WAC 173-160. Some suggested improvements were documented in the Final Post-Construction Condition Review for the Landfill Gas Monitoring Probes and Continuous Monitors (Vikek 2022) that the previous LFG consultants prepared before Herrera transitioned into the role. Herrera found additional issues that were not included in this report. Main issue found was with lack of a proper surface seal. Most perimeter probes were found with very little concrete and a layer of soil between the concrete and bentonite.

Herrera inspected each perimeter probe at the landfill and made adjustments to the perimeter probes on November 19 and 20, 2022. This section discusses the observations made during the inspection and the adjustments made to the perimeter probes to prepare them for compliance monitoring. Table 2 includes a summary of issues found at each perimeter probe following post-construction, what repairs or adjustments were made at the perimeter probe, and a photo of the perimeter probe after adjustments were made. Final perimeter probe boring logs are included in Appendix A.

Table 2. Landfill Gas Monitoring Perimeter Probe Adjustments.		
Current Condition of Perimeter Probes after Adjustments	**Post-Construction Issues**	**Adjustments Made**
Perimeter Probe #1		
	• Inadequate concrete pad/seal was observed • Protective casing was not centered around perimeter probe	• Removed protective casing. • Placed sonotube around the perimeter probe • Poured concrete to form continuous seal across bentonite layer and concrete • Placed protective casing centered around perimeter probe. • Changed valve fittings to allow water level indicator to fit down perimeter probe.
Perimeter Probe #2		
	• Inadequate concrete pad/seal was observed	• Dug down to top of bentonite seal • Removed protective casing. • Placed sonotube around the perimeter probe • Poured concrete to form continuous seal across bentonite layer and concrete • Placed protective casing centered around perimeter probe. • Changed valve fittings to allow water level indicator to fit down perimeter probe.

Table 2 (continued). Landfill Gas Monitoring Perimeter Probe Adjustments.		
Current Condition of Perimeter Probes after Adjustments	**Post-Construction Issues**	**Adjustments Made**
Perimeter Probe #3		
	• Protective casing was not centered around perimeter probe • Inadequate concrete pad/seal was observed	• Dug down to top of bentonite seal • Removed protective casing. • Placed sonotube around the perimeter probe • Poured concrete to form continuous seal across bentonite layer and concrete • Placed protective casing centered around perimeter probe. • Changed valve fittings to allow water level indicator to fit down perimeter probe.
Perimeter Probe #4		
	• Protective casing was not centered around perimeter probe • Inadequate concrete pad/seal was observed	• Dug down to top of bentonite seal • Removed protective casing. • Placed sonotube around the perimeter probe • Poured concrete to form continuous seal across bentonite layer and concrete • Placed protective casing centered around perimeter probe. • Changed valve fittings to allow water level indicator to fit down perimeter probe.

Table 2 (continued). Landfill Gas Monitoring Perimeter Probe Adjustments.		
Current Condition of Perimeter Probes after Adjustments	**Post-Construction Issues**	**Adjustments Made**
Perimeter Probe #5		
	• Damaged labcock valve • Inadequate concrete pad/seal was observed	• Dug down to top of bentonite seal • Removed protective casing. • Poured concrete into casing to form continuous seal across bentonite layer and concrete • Placed protective casing centered around perimeter probe. • Changed valve fittings to allow water level indicator to fit down perimeter probe. • Installed a new labcock valve
Perimeter Probe #6		
	• Damaged labcock valve • Inadequate concrete pad/seal was observed	• Dug down to top of bentonite seal • Removed protective casing. • Poured concrete into casing to form continuous seal across bentonite layer and concrete • Placed protective casing centered around perimeter probe. • Changed valve fittings to allow water level indicator to fit down perimeter probe. • Installed a new labcock valve

Table 2 (continued). Landfill Gas Monitoring Perimeter Probe Adjustments.		
Current Condition of Perimeter Probes after Adjustments	**Post-Construction Issues**	**Adjustments Made**
Perimeter Probe #7		
	• Inadequate concrete pad/seal was observed	• Dug down to top of bentonite seal • Removed protective casing. • Placed sonotube around the perimeter probe • Poured concrete to form continuous seal across bentonite layer and concrete • Placed protective casing centered around perimeter probe. • Changed valve fittings to allow water level indicator to fit down perimeter probe.
Perimeter Probe #8		
	• Inadequate concrete pad/seal was observed	• Dug down to top of bentonite seal • Removed protective casing. • Placed sonotube around the perimeter probe • Poured concrete to form continuous seal across bentonite layer and concrete • Placed protective casing centered around perimeter probe. • Changed valve fittings to allow water level indicator to fit down probe.

Table 2 (continued). Landfill Gas Monitoring Perimeter Probe Adjustments.		
Current Condition of Perimeter Probes after Adjustments	**Post-Construction Issues**	**Adjustments Made**
Perimeter Probe #9		
	• Inadequate concrete pad/seal was observed • Labcock valve was damaged.	• Dug down to top of bentonite seal • Removed protective casing. • Placed sonotube around the perimeter probe • Poured concrete to form continuous seal across bentonite layer and concrete • Placed protective casing centered around perimeter probe. • Changed valve fittings to allow water level indicator to fit down perimeter probe. • Installed a new labcock valve
Perimeter Probe #10		
	• Inadequate concrete pad/seal was observed	• Dug down to top of bentonite seal • Removed protective casing. • Placed sonotube around the perimeter probe • Poured concrete to form continuous seal across bentonite layer and concrete • Placed protective casing centered around perimeter probe. • Changed valve fittings to allow water level indicator to fit down perimeter probe.

Table 2 (continued). Landfill Gas Monitoring Perimeter Probe Adjustments.		
Current Condition of Perimeter Probes after Adjustments	**Post-Construction Issues**	**Adjustments Made**
Perimeter Probe #11		
	• None identified	• Changed valve fittings to allow water level indicator to fit down perimeter probe.
Perimeter Probe #12		
	• Protective casing was not installed • Inadequate concrete pad/seal was observed	• Dug down to top of bentonite seal • Removed protective casing. • Placed sonotube around the perimeter probe • Poured concrete to form continuous seal across bentonite layer and concrete • Placed protective casing centered around perimeter probe. • Changed valve fittings to allow water level indicator to fit down perimeter probe.

Landfill Gas Conditions and Contingency Actions

Herrera collected initial gas reads at the perimeter probes on November 23, 2022, to evaluate the perimeter soil gas following landfill closure. It was expected that methane measurements could be high at the perimeter probes due to the recent landfill closure construction and relocation of refuse into a smaller area. After several monitoring events, high methane levels above the LEL of 5% (50,000 ppmV) were observed and confirmed at a number of perimeter probes so several contingency measures were implemented per the Go East Landfill Closure Plan (Pace, 2018) and the original LFGMCP (Vikek 2022).

Table 3 includes data from monitoring events since the landfill closure construction completed. Gas reads were collected using a Landtec GEM5000 gas analyzer (GEM5000). Key dates associated with monitoring events are included in the Actions column of Table 3. More details of these dates and contingency actions related to the LFG reads are outlined in the following subsections. This monitoring was not done as part of the compliance monitoring outlined in the original LFGMCP (Vikek 2022) but rather to investigate LFG conditions and make sure LFG reads at the perimeter probes are representative of how well the landfill cap and collection system are performing.

Table 3. Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
1	11/2/2022	3.9	27	0	69.2	
	11/23/2022	**8.5**	30.5	0	61	
	1/13/2023	**10.9**	24.1	0.1	64.9	- Turbine vents installed on landfill gas vent (12/12/2022 – present)
	2/23/2023	**6.3**	21.8	0.1	71.8	- Vacuum extraction from methane trench (2/10/2023 – 6/16/2023) - Probe valves left open to vent (2/23/2023 – 3/22/2023)
	3/3/2023	0.4	3.5	11.8	84.3	
	3/10/2023	0	0.3	21.2	78.4	
	3/22/2023	0	0.8	19.6	79.6	- Probe valves closed (3/22/2023 – present)
	4/1/2023	1.1	15.6	1.3	82	
	5/9/2023	0	0	19.9	80.1	
	6/15/2023	0	0.2	19.6	80.1	
	6/27/2023	0.5	13.4	0.1	86	- Blower shut off (6/16/2023 – 6/17/2023) - Vacuum extraction from methane trench (6/17/2023 – 6/26/2023) - Blower shut off (6/26/2023 – 7/24/2023)
	7/5/2023	0.6	14.4	0.1	84.9	
	8/21/2023	0	8.3	9.8	81.9	- Vacuum extraction from methane trench (7/24/2023 – 8/18/2023) - Blower shut off (8/18/2023 – 8/23/2023)
	9/5/2023	0	7.3	11.6	81.1	- Vacuum extraction from methane trench (8/23/2023 – 11/10/2023)
	9/22/2023	0	1.2	17.5	81.3	
	10/21/2023	0.9	20.5	0.1	78.5	
	11/1/2023	1.1	20.1	0.1	78.7	
	11/10/2023	1.3	12.1	0.1	86.5	- Blower shut off (11/10/2023 – present)
	11/17/2023	1.4	16.9	0.1	81.6	
	11/30/2023	1.7	11.8	0.2	86.3	
	12/8/2023	1.8	11.1	0.1	87.0	

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
2	11/2/2022	**12.3**	29.2	0	58.4	
	11/23/2022	**14.1**	26.9	0	39.1	
	1/13/2023	**15.7**	25.2	0.1	59.1	- Turbine vents installed on landfill gas vent (12/12/2022 – present)
	2/23/2023	**16.4**	24	0.1	59.6	- Vacuum extraction from methane trench (2/10/2023 – 6/16/2023) - Probe valves left open to vent (2/23/2023 – 3/22/2023)
	3/3/2023	0.0	1.8	17.7	80.5	
	3/10/2023	0.0	0.2	21.3	78.4	
	3/22/2023	0.0	0.2	20	79.9	- Probe valves closed (3/22/2023 – present)
	4/1/2023	0.6	9.9	1.5	87.9	
	5/9/2023	0.0	0	20.1	79.8	
	6/15/2023	0.0	0.5	19.7	79.8	
	6/27/2023	0.0	13.5	0.4	86.1	- Blower shut off (6/16/2023 – 6/17/2023) - Vacuum extraction from methane trench (6/17/2023 – 6/26/2023) - Blower shut off (6/26/2023 – 7/24/2023)
	7/5/2023	0.2	15.6	0.1	84.2	
	8/21/2023	0.1	22.7	0.1	77.1	- Vacuum extraction from methane trench (7/24/2023 – 8/18/2023) - Blower shut off (8/18/2023 – 8/23/2023)
	9/5/2023	0.1	22.8	0.1	76.9	- Vacuum extraction from methane trench (8/23/2023 – 11/10/2023)
	9/22/2023	0.0	21.4	0.1	78.4	
	10/21/2023	0.9	22.2	0.1	76.9	
	11/1/2023	0.9	21.6	0.1	77.4	
	11/10/2023	1.3	21.2	0.1	77.4	- Blower shut off (11/10/2023 – present)
	11/17/2023	1.5	20.1	0.1	78.3	
	11/30/2023	1.6	20.3	0.1	78.1	
	12/8/2023	1.5	19.8	0.0	78.6	

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
3	11/2/2022	**27.5**	29.2	0	43.3	
	11/23/2022	**24**	24.7	0	51.4	
	1/13/2023	**23**	22.9	0.1	54	- Turbine vents installed on landfill gas vent (12/12/2022 – present)
	2/23/2023	**16.2**	19.9	1.1	62.8	- Vacuum extraction from methane trench (2/10/2023 – 6/16/2023) - Probe valves left open to vent (2/23/2023 – 3/22/2023)
	3/3/2023	0.2	1.6	18.2	79.9	
	3/10/2023	0.0	0.1	21.6	78.4	
	3/22/2023	0.0	0	20.2	79.8	- Probe valves closed (3/22/2023 – present)
	4/1/2023	0.0	11.7	7.5	80.8	
	5/9/2023	0.0	0	20.3	79.7	
	6/15/2023	0.0	0	20.4	79.6	
	6/27/2023	0.0	13.1	4.7	82.3	- Blower shut off (6/16/2023 – 6/17/2023) - Vacuum extraction from methane trench (6/17/2023 – 6/26/2023) - Blower shut off (6/26/2023 – 7/24/2023)
	7/5/2023	0.1	15.8	0.1	84.1	
	8/21/2023	1.7	24	0.1	74.2	- Vacuum extraction from methane trench (7/24/2023 – 8/18/2023) - Blower shut off (8/18/2023 – 8/23/2023)
	9/5/2023	2.7	25.2	0.1	72	- Vacuum extraction from methane trench (8/23/2023 – 11/10/2023)
	9/22/2023	0.2	21.3	0.1	78.4	
	10/21/2023	0	18	0.2	81.8	
	11/1/2023	0	17.3	0.1	82.6	
	11/10/2023	0	17.5	0.2	82.3	- Blower shut off (11/10/2023 – present)
	11/17/2023	0.0	17.0	0.1	82.9	
	11/30/2023	0.4	17.4	0.1	82.1	
	12/8/2023	0.0	17.9	1.7	80.5	

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
4	11/2/2022	**28.4**	31.7	0.1	39.8	
	11/23/2022	**32.9**	27.7	0	39.3	
	1/13/2023	**32.5**	26.5	0	41	- Turbine vents installed on landfill gas vent (12/12/2022 – present)
	2/23/2023	**31.6**	25.6	0.1	42.7	- Vacuum extraction from methane trench (2/10/2023 – 6/16/2023) - Perimeter probe valves left open to vent (2/23/2023 – 3/22/2023)
	3/3/2023	0.0	0.2	20.9	79	
	3/10/2023	0.0	0.1	21.6	78.3	
	3/22/2023	0.0	0	20.4	79.6	- Perimeter probe valves closed (3/22/2023 – present)
	4/1/2023	**11.1**	10.5	0	78.3	
	5/9/2023	0.6	14.3	3.2	81.9	- Vacuum extraction from soil gas probes (4/17/2023 – 6/16/2023)
	6/15/2023	3.6	21.1	0.2	75.1	
	6/27/2023	4	23.4	0	72.6	- Blower shut off (6/16/2023 – 6/17/2023) - Perimeter probe valve closed (6/16/2023 - 6/17/2023) - Vacuum extraction from methane trench (6/17/2023 – 6/26/2023) - Vacuum extraction from soil gas probes (6/17/2023 – 6/26/2023) - Blower shut off (6/26/2023 – 7/24/2023) - Perimeter probe valve closed (6/26/2023 - 7/24/2023)
	7/5/2023	4.6	23.2	0.1	72.2	
	8/21/2023	4.6	21.9	0.1	73.4	- Vacuum extraction from soil gas probes (7/21/2023 – 8/18/2023) - Vacuum extraction from methane trench (7/24/2023 – 8/18/2023) - Blower shut off (8/18/2023 – 8/23/2023) - Perimeter probe valve closed (8/18/2023 - 8/23/2023)
	9/5/2023	4.2	21.1	0.4	74.4	- Vacuum extraction from methane trench (8/23/2023 – 11/10/2023) - Vacuum extraction from soil gas probes (8/23/2023 – 11/10/2023)

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
4 (continued)	9/22/2023	3.8	20.3	0.5	75.3	
	10/21/2023	2.4	19.8	0.1	77.8	
	11/1/2023	2.1	19.3	0.1	78.5	
	11/10/2023	2.7	19.9	0.1	77.4	- Blower shut off (11/10/2023 – present) - Perimeter probe valve closed (11/10/2023 – present)
	11/17/2023	3.0	19.6	0.1	77.4	
	11/30/2023	3.7	20.5	0.1	75.7	
	12/8/2023	4.0	20.7	0.0	75.2	
5	11/2/2022	0.0	0.7	21.7	77.6	
	11/23/2022	**28.8**	18.3	0	52.9	
	1/13/2023	**29**	18.2	0.1	52.7	- Turbine vents installed on landfill gas vent (12/12/2022 – present)
	2/23/2023	**25.4**	14.8	1.5	58.3	- Vacuum extraction from methane trench (2/10/2023 – 6/16/2023) - Perimeter probe valves left open to vent (2/23/2023 – 3/22/2023)
	3/3/2023	0.9	0.6	18.8	79.8	
	3/10/2023	0.0	0.1	21.7	78.2	
	3/22/2023	0.0	0	20.5	79.4	- Perimeter probe valves closed (3/22/2023 – present)
	4/1/2023	**9.2**	11.8	0	79	
	5/9/2023	0.4	3	15.4	81.2	- Vacuum extraction from soil gas probes (4/17/2023 – 6/16/2023)
	6/15/2023	1.7	13.2	3.2	81.9	
	6/27/2023	0.0	13.9	0.5	85.6	- Blower shut off (6/16/2023 – 6/17/2023) - Perimeter probe valve closed (6/16/2023 - 6/17/2023) - Vacuum extraction from methane trench (6/17/2023 – 6/26/2023) - Vacuum extraction from soil gas probes (6/17/2023 – 6/26/2023) - Blower shut off (6/26/2023 – 7/24/2023) - Perimeter probe valve closed (6/26/2023 - 7/24/2023)
	7/5/2023	0.4	14	0	85.5	

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
5 (continued)	8/21/2023	2.6	17.6	0.1	79.7	- Vacuum extraction from soil gas probes (7/21/2023 – 8/18/2023) - Vacuum extraction from methane trench (7/24/2023 – 8/18/2023) - Blower shut off (8/18/2023 – 8/23/2023) - Perimeter probe valve closed (8/18/2023 - 8/23/2023)
	9/5/2023	3.0	17.3	0.4	79.4	- Vacuum extraction from methane trench (8/23/2023 – 11/10/2023) - Vacuum extraction from soil gas probes (8/23/2023 – 11/10/2023)
	9/22/2023	2.0	15.8	1.6	80.6	
	10/21/2023	1.3	15.6	2.8	80.3	
	11/1/2023	0.3	11.5	5.8	82.4	
	11/10/2023	0.3	13.3	3.7	82.7	- Blower shut off (11/10/2023 – present) - Perimeter probe valve closed (11/10/2023 – present)
	11/17/2023	0.0	10.3	4.9	84.8	
	11/30/2023	0.0	12.9	2.1	85.0	
	12/8/2023	0.2	15.4	0.0	84.3	
6	11/2/2022	0.0	0.3	21.8	77.8	
	11/23/2022	**82**	18	0	0	
	1/13/2023	**35**	18.5	0	46.5	- Turbine vents installed on landfill gas vent (12/12/2022 – present)
	2/23/2023	**35.4**	15.4	0.2	49	- Vacuum extraction from methane trench (2/10/2023 – 6/16/2023) - Perimeter probe valves left open to vent (2/23/2023 – 3/22/2023)
	3/3/2023	**17.6**	13.4	3.3	65.8	
	3/10/2023	**22.2**	22.2	0.2	55.5	- Vacuum extraction from soil gas probes (3/10/2023 – 6/16/2023)
	3/22/2023	**11.6**	21.8	0.1	66.5	
	4/1/2023	**8.7**	22.3	0.1	68.9	
	5/9/2023	0.0	0	21	79	
	6/15/2023	1.0	3.2	16	79.8	

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
6 (continued)	6/27/2023	**5.5**	16.7	0	77.8	- Blower shut off (6/16/2023 – 6/17/2023) - Perimeter probe valve closed (6/16/2023 - 6/17/2023) - Vacuum extraction from methane trench (6/17/2023 – 6/26/2023) - Vacuum extraction from soil gas probes (6/17/2023 – 6/26/2023) - Blower shut off (6/26/2023 – 7/24/2023) - Perimeter probe valve closed (6/26/2023 - 7/24/2023)
	7/5/2023	4.8	14.4	0	80.8	
	8/21/2023	**7.1**	15.8	0.6	76.6	- Vacuum extraction from soil gas probes (7/21/2023 – 8/18/2023) - Vacuum extraction from methane trench (7/24/2023 – 8/18/2023) - Blower shut off (8/18/2023 – 8/23/2023) - Perimeter probe valve closed (8/18/2023 - 8/23/2023)
	9/5/2023	**8.1**	16.5	0.9	74.5	- Vacuum extraction from methane trench (8/23/2023 – 11/10/2023) - Vacuum extraction from soil gas probes (8/23/2023 – 11/10/2023)
	9/22/2023	**6.8**	17.5	0.8	74.9	
	10/21/2023	**5**	19.5	0.1	75.5	
	11/1/2023	4.3	19.2	0.1	76.4	
	11/10/2023	0	0.1	20.9	79	- Blower shut off (11/10/2023 – present) - Perimeter probe valve closed (11/10/2023 – present)
	11/17/2023	3.7	17.7	0.1	78.5	
	11/30/2023	2.9	17.1	0.0	80.0	
	12/8/2023	3.2	14.6	0.0	82.2	

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
7	11/2/2022	**35.5**	20.7	0	43.4	
	11/23/2022	**38**	20	0	42.6	
	1/13/2023	**36.4**	20.6	0.1	43	- Turbine vents installed on landfill gas vent (12/12/2022 – present)
	2/23/2023	**37.9**	19.6	0.1	42.4	- Vacuum extraction from methane trench (2/10/2023 – 6/16/2023) - Perimeter probe valves left open to vent (2/23/2023 – 3/22/2023)
	3/3/2023	**13.1**	6.1	12.7	68.2	
	3/10/2023	**26.7**	18.3	3.1	51.9	- Vacuum extraction from soil gas probes (3/10/2023 – 6/16/2023)
	3/22/2023	**17.2**	18.4	1.4	63	
	4/1/2023	**12.8**	20.5	1.2	65.5	
	5/9/2023	4.6	15.8	4	75.6	
	6/15/2023	4.2	18.6	0.2	77	
	6/27/2023	0.2	18.8	0.2	80.7	- Blower shut off (6/16/2023 – 6/17/2023) - Perimeter probe valve closed (6/16/2023 - 6/17/2023) - Vacuum extraction from methane trench (6/17/2023 – 6/26/2023) - Vacuum extraction from soil gas probes (6/17/2023 – 6/26/2023) - Blower shut off (6/26/2023 – 7/24/2023) - Perimeter probe valve closed (6/26/2023 - 7/24/2023)
	7/5/2023	2.3	16.2	0	81.5	
	8/21/2023	0.7	14.9	0.3	84	- Vacuum extraction from soil gas probes (7/21/2023 – 8/18/2023) - Vacuum extraction from methane trench (7/24/2023 – 8/18/2023) - Blower shut off (8/18/2023 – 8/23/2023) - Perimeter probe valve closed (8/18/2023 - 8/23/2023)
	9/5/2023	**8.1**	17.9	0.1	73.9	- Vacuum extraction from methane trench (8/23/2023 – 11/10/2023) - Vacuum extraction from soil gas probes (8/23/2023 – 8/25/2023) - Perimeter probe valve closed and removed from vacuum extraction system (8/25/2023 – present)
	9/22/2023	**8.5**	17.9	0.1	73.5	
	10/21/2023	**7.4**	19.1	0.1	73.4	
	11/1/2023	**6.6**	19.2	0	74.1	

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
7 (continued)	11/10/2023	**7.3**	20.3	0.1	72.4	- Blower shut off (11/10/2023 – present)
	11/17/2023	**6.8**	18.7	0.1	74.5	
	11/30/2023	**6.7**	20.5	0.0	72.7	
	12/8/2023	**6.8**	19.2	0.0	74.0	
8	11/2/2022	**35.6**	23.7	0	40.7	
	11/23/2022	**37.4**	21	0	41.6	
	1/13/2023	**37.1**	21.3	0	41.6	- Turbine vents installed on landfill gas vent (12/12/2022 – present)
	2/23/2023	**30.7**	22.7	0.2	46.4	- Vacuum extraction from methane trench (2/10/2023 – 6/16/2023) - Perimeter probe valves left open to vent (2/23/2023 – 3/22/2023)
	3/3/2023	**9.8**	2.5	16	71.8	
	3/10/2023	0.3	0.2	16.2	83.3	- Vacuum extraction from soil gas probes (3/10/2023 – 6/16/2023)
	3/22/2023	3.0	6.3	13.9	76.8	
	4/1/2023	1.4	5.3	16.2	77.2	
	5/9/2023	0.0	5.4	14.6	80	
	6/15/2023	0.0	2.5	17.4	80.1	
	6/27/2023	0.0	4.1	13.6	82.3	- Blower shut off (6/16/2023 – 6/17/2023) - Perimeter probe valve closed (6/16/2023 - 6/17/2023) - Vacuum extraction from methane trench (6/17/2023 – 6/26/2023) - Vacuum extraction from soil gas probes (6/17/2023 – 6/26/2023) - Blower shut off (6/26/2023 – 7/24/2023) - Perimeter probe valve closed (6/26/2023 - 7/24/2023)
	7/5/2023	0.0	8.1	4	87.9	
	8/21/2023	0.0	6.3	8.4	85.3	- Vacuum extraction from soil gas probes (7/21/2023 – 8/18/2023) - Vacuum extraction from methane trench (7/24/2023 – 8/18/2023) - Blower shut off (8/18/2023 – 8/23/2023) - Perimeter probe valve closed (8/18/2023 - 8/23/2023)

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
8 (continued)	9/5/2023	0.0	4.1	14.8	81.1	- Vacuum extraction from methane trench (8/23/2023 – 11/10/2023) - Vacuum extraction from soil gas probes (8/23/2023 – 8/25/2023) - Perimeter probe valve closed and removed from vacuum extraction system (8/25/2023 – present)
	9/22/2023	0.0	5.5	13.7	80.8	
	10/21/2023	0	5.5	15.1	79.4	
	11/1/2023	0	4.5	16.6	78.9	
	11/10/2023	3.1	12.9	2.9	81	- Blower shut off (11/10/2023 – present)
	11/17/2023	0.0	10.6	8.1	81.3	
	11/30/2023	2.4	14.0	0.0	83.5	
	12/8/2023	0.0	11.2	3.0	85.8	
9	11/2/2022	NR	NR	NR	NR	
	11/23/2022	4.2	0.1	14	81.7	
	1/13/2023	**5.8**	0.1	3.2	90.9	- Turbine vents installed on landfill gas vent (12/12/2022 – present)
	2/23/2023	NR	NR	NR	NR	- Vacuum extraction from methane trench (2/10/2023 – 6/16/2023)
	3/3/2023	NR	NR	NR	NR	
	3/10/2023	0.1	0.1	21.4	78.5	
	3/22/2023	0.1	0	21.2	78.7	
	4/1/2023	2.4	0.1	2.2	95.3	
	5/9/2023	3.1	0.1	0.2	96.6	
	6/15/2023	0.0	3.1	13.6	83.3	
	6/27/2023	0.0	6.2	5	88.8	- Blower shut off (6/16/2023 – 6/17/2023) - Vacuum extraction from methane trench (6/17/2023 – 6/26/2023) - Blower shut off (6/26/2023 – 7/24/2023)
	7/5/2023	0.1	8.8	4.7	86.4	
	8/21/2023	NR	NR	NR	NR	- Vacuum extraction from methane trench (7/24/2023 – 8/18/2023) - Blower shut off (8/18/2023 – 8/23/2023)
	9/5/2023	NR	NR	NR	NR	- Vacuum extraction from methane trench (8/23/2023 – 11/10/2023)
	9/22/2023	NR	NR	NR	NR	

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
9 (continued)	10/21/2023	NR	NR	NR	NR	
	11/1/2023	NR	NR	NR	NR	
	11/10/2023	0	6.5	4.9	88.6	- Blower shut off (11/10/2023 – present)
	11/17/2023	0.0	6.5	4.9	88.6	
	11/30/2023	0.0	6.5	4.9	88.6	
	12/8/2023	0.0	6.5	4.9	88.6	
10	11/2/2022	**35.9**	56.4	0	7.7	
	11/23/2022	**39.3**	53.6	0	6.9	
	1/13/2023	**41.9**	55.3	0.1	2.7	- Turbine vents installed on landfill gas vent (12/12/2022 – present)
	2/23/2023	**30.4**	40.5	0	29	- Blower installed and turned on (2/10/2023 – 6/16/2023) - Perimeter probe valves left open to vent (2/23/2023 – 3/22/2023)
	3/3/2023	**32.5**	31.1	0.1	36.3	
	3/10/2023	0.0	0.1	21.9	78	
	3/22/2023	0.0	0.1	21.1	78.8	- Perimeter probe valves closed (3/22/2023 – 7/21/2023)
	4/1/2023	**12.6**	15.1	0	72.3	
	5/9/2023	0.0	0.1	20.4	79.5	
	6/15/2023	0.0	0	21.1	78.9	
	6/27/2023	3.3	15.3	0	81.4	- Blower shut off (6/16/2023 – 6/17/2023) - Vacuum extraction from methane trench (6/17/2023 – 6/26/2023) - Blower shut off (6/26/2023 – 7/24/2023)
	7/5/2023	**6.4**	19.1	0	74.5	
	8/21/2023	**9.4**	31.3	0.1	59.2	- Vacuum extraction from soil gas probes (7/21/2023 – 8/18/2023) - Vacuum extraction from methane trench (7/24/2023 – 8/18/2023) - Blower shut off (8/18/2023 – 8/23/2023) - Perimeter probe valve closed (8/18/2023 - 8/23/2023)
	9/5/2023	**10.1**	30.6	0.1	59.2	- Vacuum extraction from methane trench (8/23/2023 – 11/10/2023) - Vacuum extraction from soil gas probes (8/23/2023 – 11/10/2023)
	9/22/2023	**9.3**	28.8	0.1	61.8	

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
10 (continued)	10/21/2023	**9.7**	28.3	0.1	61.9	
	11/1/2023	**10.3**	27.7	0	62	
	11/10/2023	**10**	27.5	0.1	62.4	- Blower shut off (11/10/2023 – present) - Perimeter probe valve closed (11/10/2023 – present)
	11/17/2023	**10.7**	27.6	0.0	61.7	
	11/30/2023	**15.5**	31.3	0.0	53.1	
	12/8/2023	**16.3**	32.2	0.0	51.5	
11	11/2/2022	0.0	16.2	8.2	75.7	
	11/23/2022	0.6	22.9	2.8	73.7	
	1/13/2023	**38.4**	48	0.1	13.5	- Turbine vents installed on landfill gas vent (12/12/2022 – present)
	2/23/2023	**33.3**	36.3	0	30.4	- Vacuum extraction from methane trench (2/10/2023 – 6/16/2023) - Perimeter probe valves left open to vent (2/23/2023 – 3/22/2023)
	3/3/2023	**30.9**	27	0.1	42	
	3/10/2023	0.0	0.3	21.8	77.9	
	3/22/2023	0.0	0.2	21.3	78.5	- Perimeter probe valves closed (3/22/2023 – 7/21/2023)
	4/1/2023	**19.1**	25	0.5	55.4	
	5/9/2023	0.0	0.7	20	79.3	
	6/15/2023	1.5	20.8	0.9	76.8	
	6/27/2023	**9.9**	27.2	0.4	62.5	- Blower shut off (6/16/2023 – 6/17/2023) - Vacuum extraction from methane trench (6/17/2023 – 6/26/2023) - Blower shut off (6/26/2023 – 7/24/2023)
	7/5/2023	**17.2**	33.6	0.1	49	
	8/21/2023	**7.6**	26.3	0.4	65.7	- Vacuum extraction from soil gas probes (7/21/2023 – 8/18/2023) - Vacuum extraction from methane trench (7/24/2023 – 8/18/2023) - Blower shut off (8/18/2023 – 8/23/2023) - Perimeter probe valve closed (8/18/2023 - 8/23/2023)

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
11 (continued)	9/5/2023	3.1	24	0.5	72.5	- Vacuum extraction from methane trench (8/23/2023 – 11/10/2023) - Vacuum extraction from soil gas probes (8/23/2023 – 11/10/2023)
	9/22/2023	1.6	21.9	1.8	74.7	
	10/21/2023	3	25.2	1.6	70.2	
	11/1/2023	4.2	27	0.6	68.2	
	11/10/2023	3.9	26.1	1.2	68.8	- Blower shut off (11/10/2023 – present) - Perimeter probe valve closed (11/10/2023 – present)
	11/17/2023	2.6	21.4	0.1	75.9	
	11/30/2023	**17.3**	33.4	0.1	49.2	
	12/8/2023	**21.7**	25.8	0.0	52.4	
12	11/2/2022	**22.8**	40.6	0.8	35.1	
	11/23/2022	0.0	0.2	21.4	78.4	
	1/13/2023	**27.9**	42.9	0.3	29	- Turbine vents installed on landfill gas vent (12/12/2022 – present)
	2/23/2023	**27**	42.2	0	30.8	- Vacuum extraction from methane trench (2/10/2023 – 6/16/2023) - Probe valves left open to vent (2/23/2023 – 3/22/2023)
	3/3/2023	**12.8**	24.9	0.1	62.2	
	3/10/2023	0.0	0.1	22	77.9	
	3/22/2023	0.0	0.8	20.1	79.1	- Probe valves closed (3/22/2023 – present)
	4/1/2023	**17.7**	36.1	0	46.2	
	5/9/2023	0.0	0	20.4	79.6	
	6/15/2023	0.0	2	16.7	81.3	
	6/27/2023	2.6	26.3	0.4	70.7	- Blower shut off (6/16/2023 – 6/17/2023) - Vacuum extraction from methane trench (6/17/2023 – 6/26/2023) - Blower shut off (6/26/2023 – 7/24/2023)
	7/5/2023	3.1	27.9	0.2	68.7	
	8/21/2023	4.3	30.4	0.3	65.1	- Vacuum extraction from methane trench (7/24/2023 – 8/18/2023) - Blower shut off (8/18/2023 – 8/23/2023)
	9/5/2023	4.3	31.1	0	64.5	- Vacuum extraction from methane trench (8/23/2023 – 11/10/2023)

Table 3 (continued). Investigative Perimeter Probe Gas Reads.						
Perimeter Probe Number	**Date**	**% Methane**	**% Carbon Dioxide**	**% Oxygen**	**% Balance**	**Actions/Key Dates**
12 (continued)	9/22/2023	4.1	30.4	0.8	64.6	
	10/21/2023	3.2	31.6	0.1	65	
	11/1/2023	2.8	27.9	1.8	67.5	
	11/10/2023	3.4	30.3	0.1	66.2	- Blower shut off (11/10/2023 – present)
	11/17/2023	3.4	30.4	0.0	66.2	
	11/30/2023	**7.2**	32.4	0.0	60.4	
	12/8/2023	**7.2**	32.5	0.0	60.4	

Notes:

Methane detected exceeds the LEL of 5% (50,000 ppmV) methane.

NR – Not Read

Wind Turbine Vent Caps

Wind-Driven Turbine Exhaust Ventilators were installed on top of each of the 10-foot-tall vent stacks to create pull on the trench and encourage increased LFG collection and exit from the vents. Figure 9 shows this setup at the site. As the wind blows, it turns the turbine and creates negative pressure that draws LFG out of the collection trench. The caps were installed on December 12, 2022.

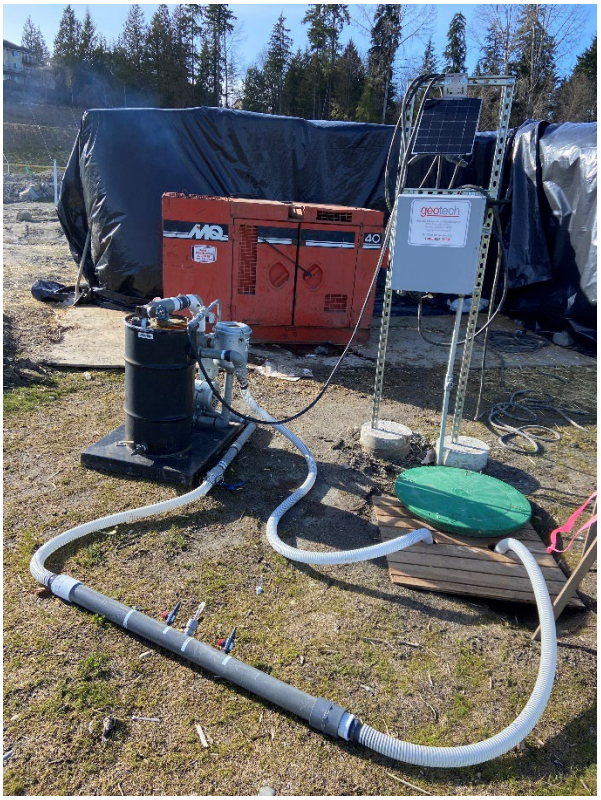
Figure 9. Wind Turbine Cap on Vent Pipe.

The installed wind caps did not accomplish enough reduction in LFG observance at the perimeter probes and methane levels remained high as shown in monitoring results from January 13, 2023 in Table 3.

Blower Unit

The wind powered vacuum system did not sufficiently decrease soil gas conditions at the perimeter probes, so a blower unit was connected to the LFG collection trench to create an active collection system. The blower is a Gast R5125Q-50 and the spec sheet is included in Appendix B. The blower was tied into the LFG sump located between perimeter probes 6 and 7 and it began running independently on February 10, 2023 at 20 inches of vacuum. The vacuum was confirmed to reach all three remaining sumps, so the entire trench was under vacuum when the blower was running. No vacuum response was observed in the perimeter probes when the blower was on; there was no change in the soil gas pressure with the blower off versus on, indicating the landfill cap barrier and methane trench appear to function as an effective barrier. Figure 10 shows the blower setup and hookup to the collection trench at the sump.

Figure 10. Blower Setup.



Regulation I of PSCAA requires the emission of air contaminants be controlled within the jurisdiction of the Agency but Section 5.03 – Applicability of Registration Program specifies that requirements of this Article apply only to sources with gas control equipment having a rated capacity of greater than or equal to 200 cfm. According to the LandGEM and IPCC models previously ran for the site and discussed in the Methane Gas Generation & Risk Assessment Report (Vikek 2019), the Go East Landfill has a max methane generation rate of 14.16 cfm. Additionally, no emissions sampling or treatment is required because no volatile organic compounds (VOCs) have been detected in previous sampling of landfill materials soils, surface water samples, and groundwater (GeoEngineers 2021).

Open Perimeter Probe Valves

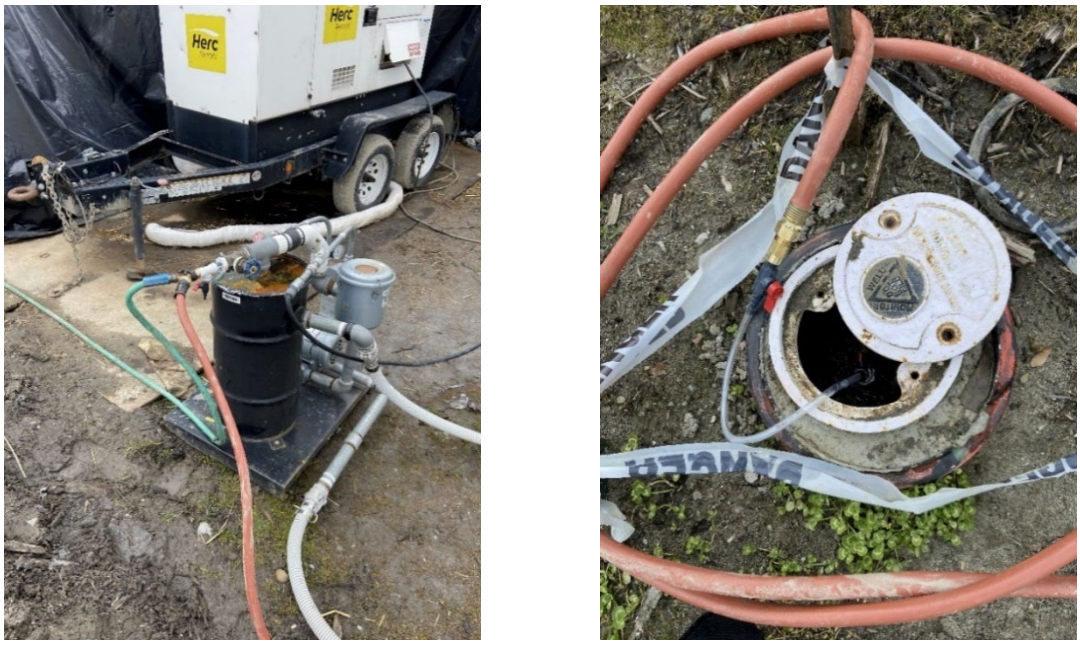
The first perimeter probe reads since the install of the blower took place on February 23, 2023. High methane levels were still recorded at the perimeter probes reaching levels around 35%. The blower was installed with a gas sample port to evaluate the content of the gas collected from the landfill. A gas measurement at the sample port of the blower was taken and the methane content was approximately 31% Nearby perimeter probes on the other side of the landfill liner measured methane levels at about 35% (Table 3). The higher methane content observed in the perimeter probes than what was collected from the landfill gave an indication that there is likely some trapped residual gas outside of the landfill liner and in the vicinity of the perimeter probes from the previous placement of refuse. This monitoring also occurred in the wet winter months so the saturated soil likely contributed to keeping the residual LFG trapped in place. To fix this issue, the perimeter probe valves were left open to attempt to

vent the residual LFG that had been trapped outside of the landfill liner and in the vicinity of the perimeter probes.

Vacuum to Perimeter Probes

After keeping the perimeter probe valves open and allowing them to vent for 8 days, another round of readings took place. Most perimeter probes had no or very little methane observed. Perimeter probes by the blower and on top of the hill still had high levels of methane observed but the methane content had dropped significantly from before. To increase the rate of soil gas venting at the perimeter probes, a hosing system was hooked up to the dilution valve end of the blower and to nearby perimeter probes 6, 7, and 8 on March 10, 2023, to provide a constant source of vacuum extraction to the perimeter probes. This hose setup at the blower dilution valve and perimeter probe 6 is shown in Figure 11.

Figure 11. Hose Setup to Dilution Port of Blower.



Soil Gas Rebound

After leaving the valves of the perimeter probes open to allow for venting and getting all perimeter probes to levels below 5% methane (except for perimeter probes 6, 7, and 8), the perimeter probe valves were closed again to see how the soil vapor responded with the venting source taken away.

Reads were taken again a week later. Several perimeter probes remained below 5% methane. The remaining perimeter probes were above 5% methane but were still lower than they were when monitoring first began at the site showing that venting helped to clear the residual high methane gas. The perimeter probe valves were opened once again to continue this passive venting.

Summary of Soil Gas Conditions

The perimeter probe valves were closed again on June 16, 2023, and have remained closed except for the perimeter probes that continued connection to the blower vacuum extraction system. On April 15, 2023, perimeter probes 4 and 5 were added to the blower hose setup. On July 21, 2023, perimeter probes 10 and 11 were added to the hose setup. The blower was turned on and off a couple times to see how monitoring results changed. Overall, it is clear there are lingering methane hot spots outside of the landfill liner likely from the previous extents of the landfill waste. These spots have been persistent around perimeter probes 6, 7, 10, and 11 and the levels are consistent with methane levels reported at perimeter probes that were positioned within the landfill waste prior to closure. Typical levels at the perimeter probes have been between 2.7% and 10.1% methane, while the perimeter probes positioned within waste prior to closure ranged between 4.1% and 8.4% (Pace Engineers 2018). See Table 4 for summary of investigative monitoring results for each perimeter probe.

Table 4. Summary of Current Methane Conditions Observed at the Perimeter Probes.

Perimeter Probe Number	Description
1	Has been below 2% since March 2023
2	Has been below 2% methane since March 2023
3	Has been below 3% methane since March 2023
4	Has been below 5% since May 2023
5	Has been at or below 3% methane since May 2023
6	Has been mostly above 5% methane since monitoring began November 2022.
7	Has been mostly above 5% methane since monitoring began November 2022.
8	Has been below 5% methane since April 2023
9	Has been at or below 5% methane since March 2023
10	Has been mostly above 5% methane since monitoring began November 2022.
11	Has been mostly above 5% methane since monitoring began November 2022.
12	Has been mostly below 5% methane since May 2023

Notes:

#: Results have typically been at or above 5% methane.

#: Results have typically been at or below 5% methane.

#: Results have typically been at or below 3% methane.

#: Results have typically been at or below 2% methane.

Methane hot spots above 5% continue to exist around perimeter probes 6, 7, 10, and 11. The other perimeter probes have typically observed methane levels above 2%. As discussed in the updated LFGMCP (Herrera 2024), and specifically Figure C-1 Flow Chart for Triggers and Contingent Actions for Perimeter Probe Monitoring, additional monitoring measures are taken when methane levels above 1% are observed at the perimeter probes. Perimeter probes have a regulatory assessment level of 5% methane, and while not regulatory, a supplemental monitoring trigger level of 1% methane initiates monitoring at the house ventilation trench monitoring stations of specific Alpine Estates homes. Figure C-1 of the LFGMCP (Herrera 2024) defines the lots that are to be monitored when there is an exceedance of 1% methane observed at a given perimeter probe.

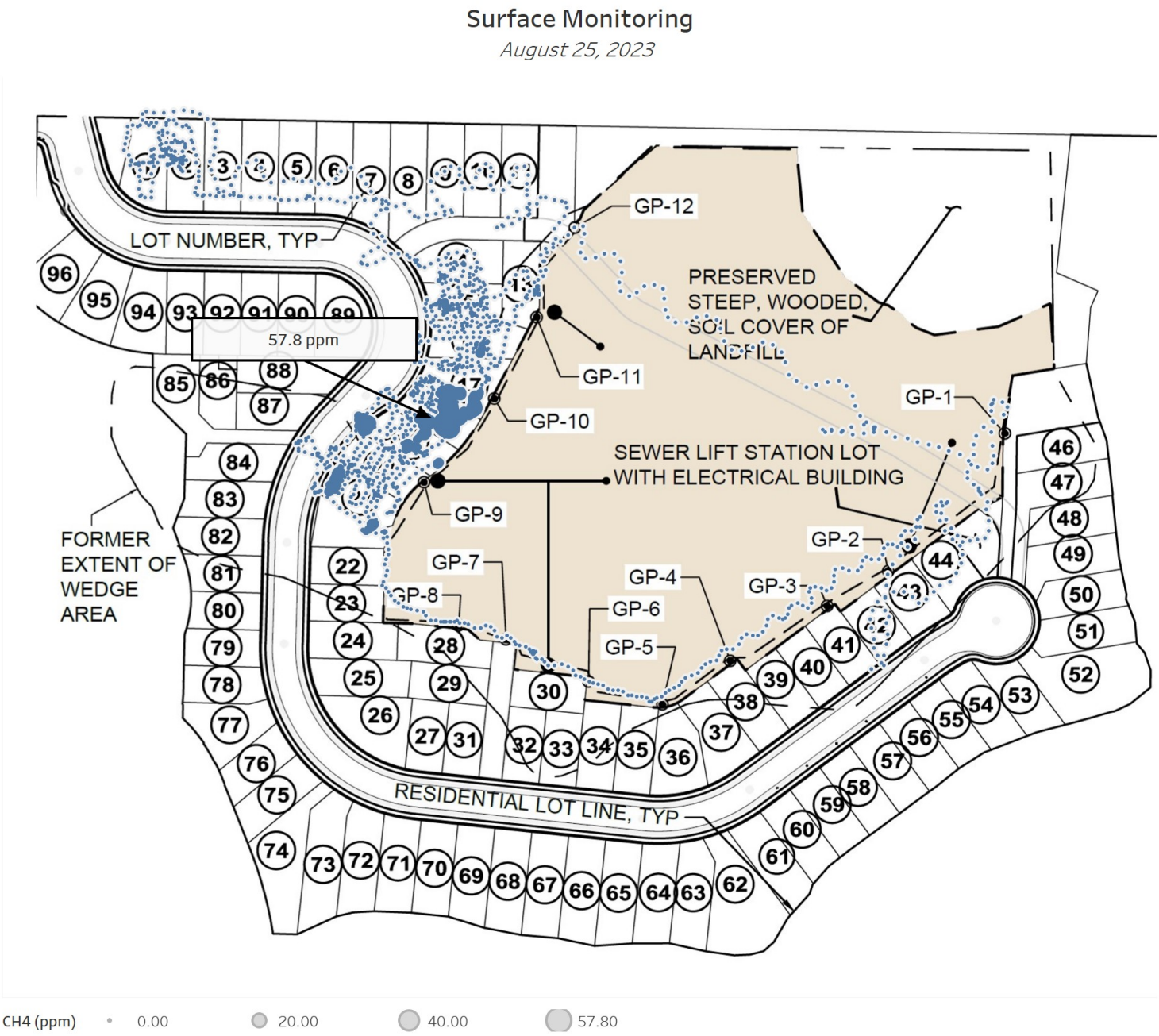
The house ventilation trench monitoring stations are positioned outside of the house and connect to the collection system pipe installed beneath the footprint of the house. Since finalization of this letter, house ventilation trench monitoring stations have been installed for homes on lots 1, 2, 15, 16, 17, 18, 19, 20, and 21 and the contingency monitoring of the lots as discussed in the LFGMCP (Herrera 2024) and Figure C-1 has begun implementation. Indoor home air monitoring with a surface emissions monitor (Landtec SEM5000 or approved equal) is required if there is a detection of methane at or above 0.1% at the house monitoring station, which has not been observed. While not required as part of Figure C-1, surface monitoring has been performed in addition to monitoring at the house monitoring stations in response to the perimeter probe soil vapor methane observances. Surface monitoring has been performed to observe methane surface levels across lots and within homes and to start trending the relationship between perimeter probe methane levels and surface methane levels (see Surface Monitoring section below).

Offsite Structures

Since development construction began on the site, Herrera has performed monitoring of the offsite structures located within 1,000 feet of the landfill that are required to be monitored per the LFGMCP (Herrera 2024). Herrera has performed monitoring at the house ventilation trench monitoring stations with a GEM5000 to evaluate the composition of soil gas beneath the Alpine Estates homes, and surface monitoring with a surface emissions monitor to evaluate the levels of methane above the ground surface of Alpine Estates lots and inside the homes.

Herrera first walked with a SEM5000 along the perimeter of the landfill and across the lots of the development homes on August 25, 2023. Figure 12 below shows the results of monitoring. One blue dot represents one recorded read. The highest concentration observed on a house lot was 57 ppmV at Lot 18. Offsite structures must not exceed 100 ppmV (0.01% methane, 0.2% of the LEL) per WAC 173-350-400. Lot 18 was still being dug and built at time of surface monitoring and liner had not yet been installed. Gas control structures including the sumps are excluded from monitoring requirements. Methane levels were below 10 ppmV during the monitoring event.

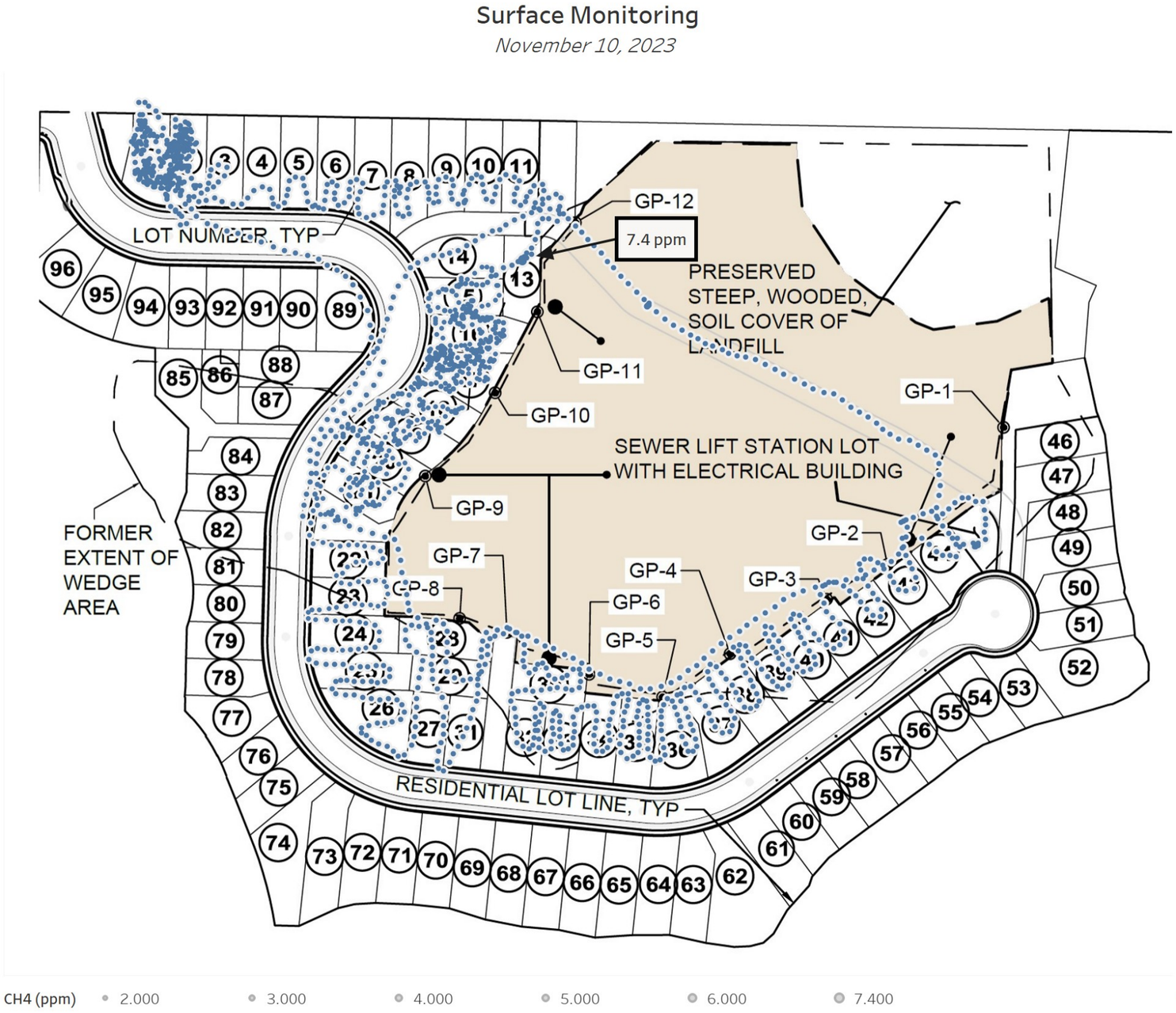
Figure 12. Surface Monitoring Performed on August 25, 2023.



Both perimeter probe and surface monitoring took place on November 10, November 30, and December 8, 2023, and the data is compared in Figure 13, Figure 14, and Figure 15, respectively.

Figure 13 shows the side-by-side comparison of the perimeter probe reads and surface reads collected on November 10, 2023. A total of eight perimeter probes had soil vapor methane levels above the supplemental monitoring trigger level of 1% triggering the house monitoring station protocol for Alpine Estates lots. The 1% assessment level is shown with the horizontal gray line across the Methane Levels at Probes bar graphs on Figure 13,Figure 14, and Figure 15. Two perimeter probes had methane levels above the regulatory assessment level of 5%, shown with the horizontal red line across the Methane Levels at Probes bar graphs on Figure 13,Figure 14, and Figure 15. The house monitoring stations of the homes being constructed on lots 15, 16, 17, 18, and 19 were monitored according to Figure C-1. While not required as part of the contingency protocol, the house monitoring stations of the lot 1, 2, 20, and 21 homes were also monitored. Methane levels recorded at the house monitoring stations were all less than 0.1%. Because levels were below 0.1%, indoor air surface monitoring with a surface emissions monitor was not required according to Figure C-1 of the LFGMCP (Herrera 2024). While not required, all neighboring lots and the indoor air of homes on lots 1, 2, 15, 16, 17, 18, 19, 20, and 21 were monitored for surface emissions to ensure methane levels are safe for future occupants. Even with the high methane levels observed at most perimeter probes, methane levels remained below 7.4 ppm throughout the surface monitoring event as shown by the methane concentration size legend below the Surface Monitoring map on Figure 13. The location of the highest methane level observed is pointed out on the Surface Monitoring map on Figure 13.

Figure 13. Comparison of Surface and Perimeter Probe Monitoring Data Collected on November 10, 2023.



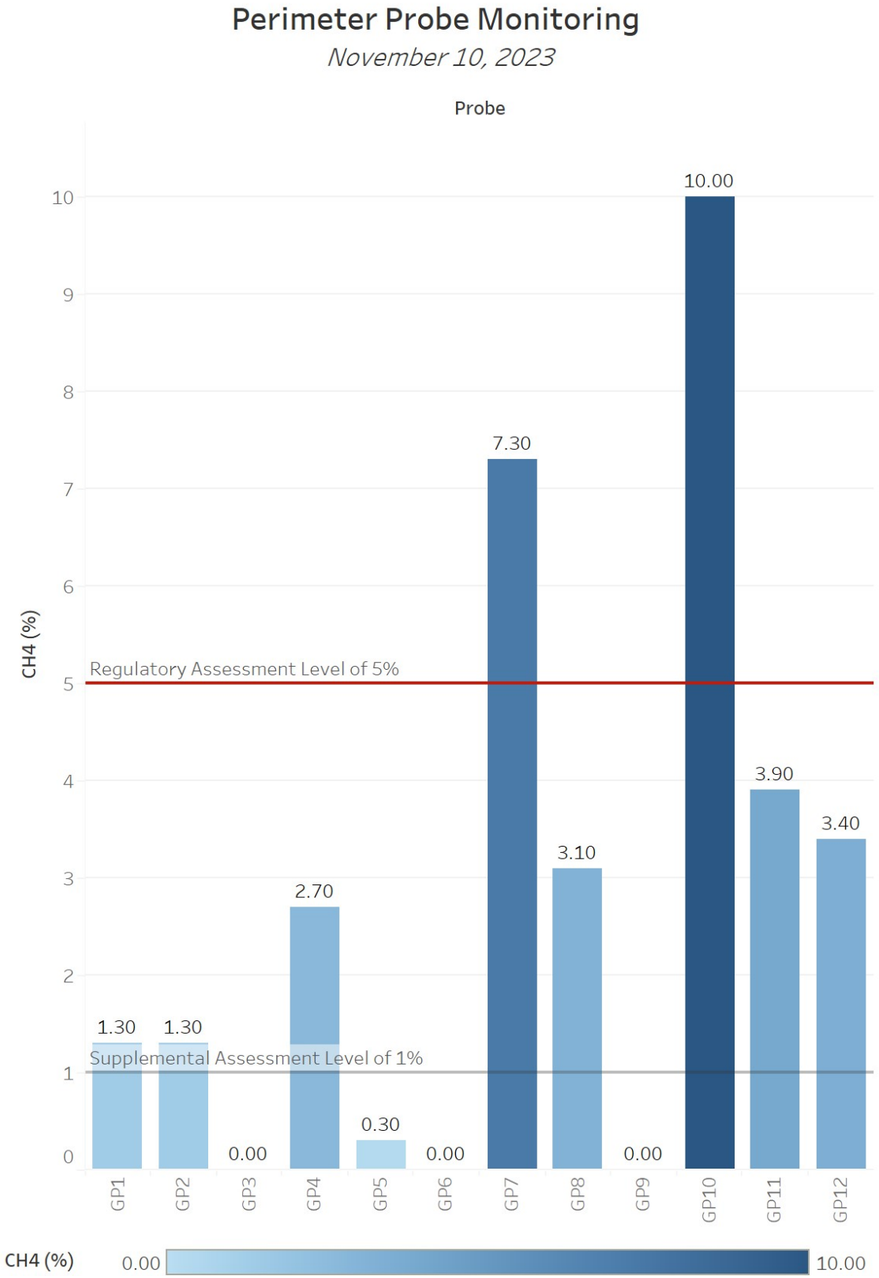


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Figure 14 shows the side-by-side comparison of the perimeter probe reads and surface reads collected on November 30, 2023. A total of nine perimeter probes had soil vapor methane levels above the supplemental monitoring trigger level of 1% triggering the house monitoring station protocol for Alpine Estates lots. Four perimeter probes had methane levels above the regulatory assessment level of 5%. The house monitoring stations of the homes being constructed on lots 15, 16, 17, 18, 19, 20, and 21 were monitored and levels were all less than 0.1%. Because levels were below 0.1%, indoor air monitoring with a surface emissions monitor was not required according to Figure C-1. While not required, all neighboring lots and the lot 15, 16, 17, 18, 19, 20, and 21 homes were monitored for surface emissions as was done on November 10, 2023. Even with the high methane levels observed at most perimeter probes, methane levels remained below 12.10 ppm throughout the surface monitoring event as shown by the methane concentration size legend below the Surface Monitoring map on Figure 14. The locations of the highest methane levels observed are pointed out on the Surface Monitoring map on Figure 14.

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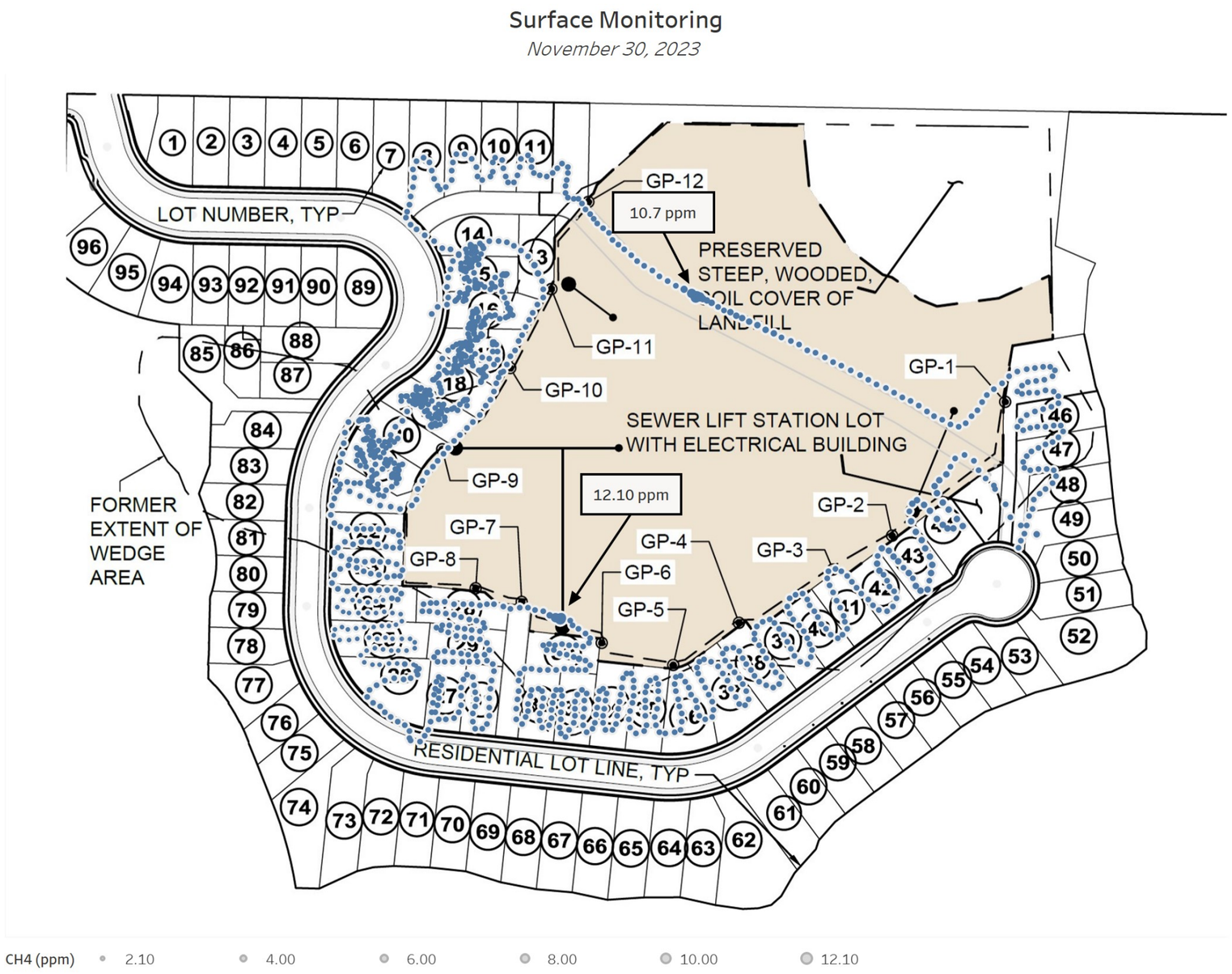
Figure 14. Comparison of Surface and Perimeter Probe Monitoring Data Collected on November 30, 2023.



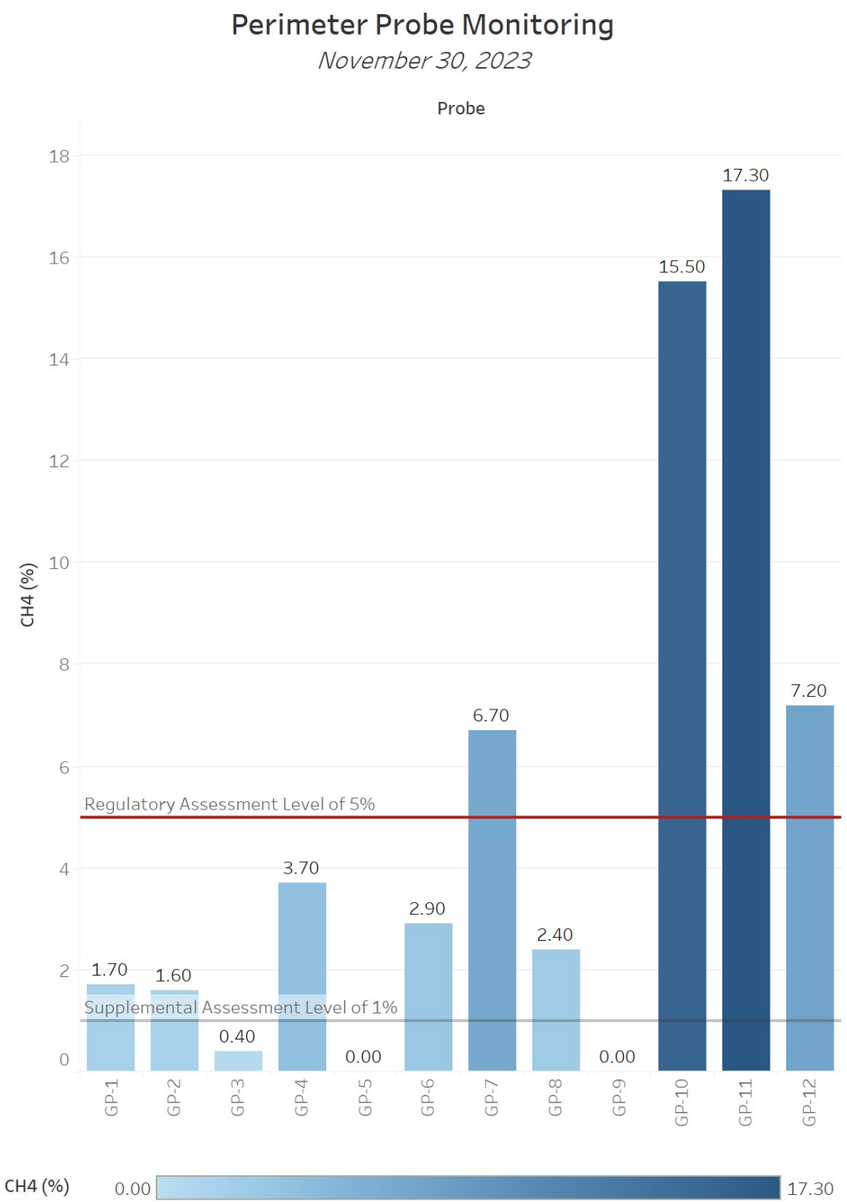


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Figure 15 shows the side-by-side comparison of the perimeter probe reads and surface reads collected on December 8, 2023. A total of eight perimeter probes had soil vapor methane levels above the supplemental monitoring trigger level of 1% triggering the house monitoring station protocol for Alpine Estates lots. Four perimeter probes had methane levels above the regulatory assessment level of 5%. The house monitoring stations of the homes being constructed on lots 15, 16, 17, 18, 19, 20, and 21 were monitored and levels were all less than 0.1%. Because levels were below 0.1%, indoor air surface monitoring with a surface emissions monitor was not required according to Figure C-1. While not required, all neighboring lots and the lot 15, 16, 17, 18, 19, 20, and 21 homes were monitored for surface emissions as was done on November 10, and November 30, 2023. Even with the high methane levels observed at most perimeter probes, methane levels remained below 2.4 ppm throughout the surface monitoring event as shown by the methane concentration size legend below the Surface Monitoring map on Figure 15. The location of the highest methane level observed is pointed out on the Surface Monitoring map on Figure 15.

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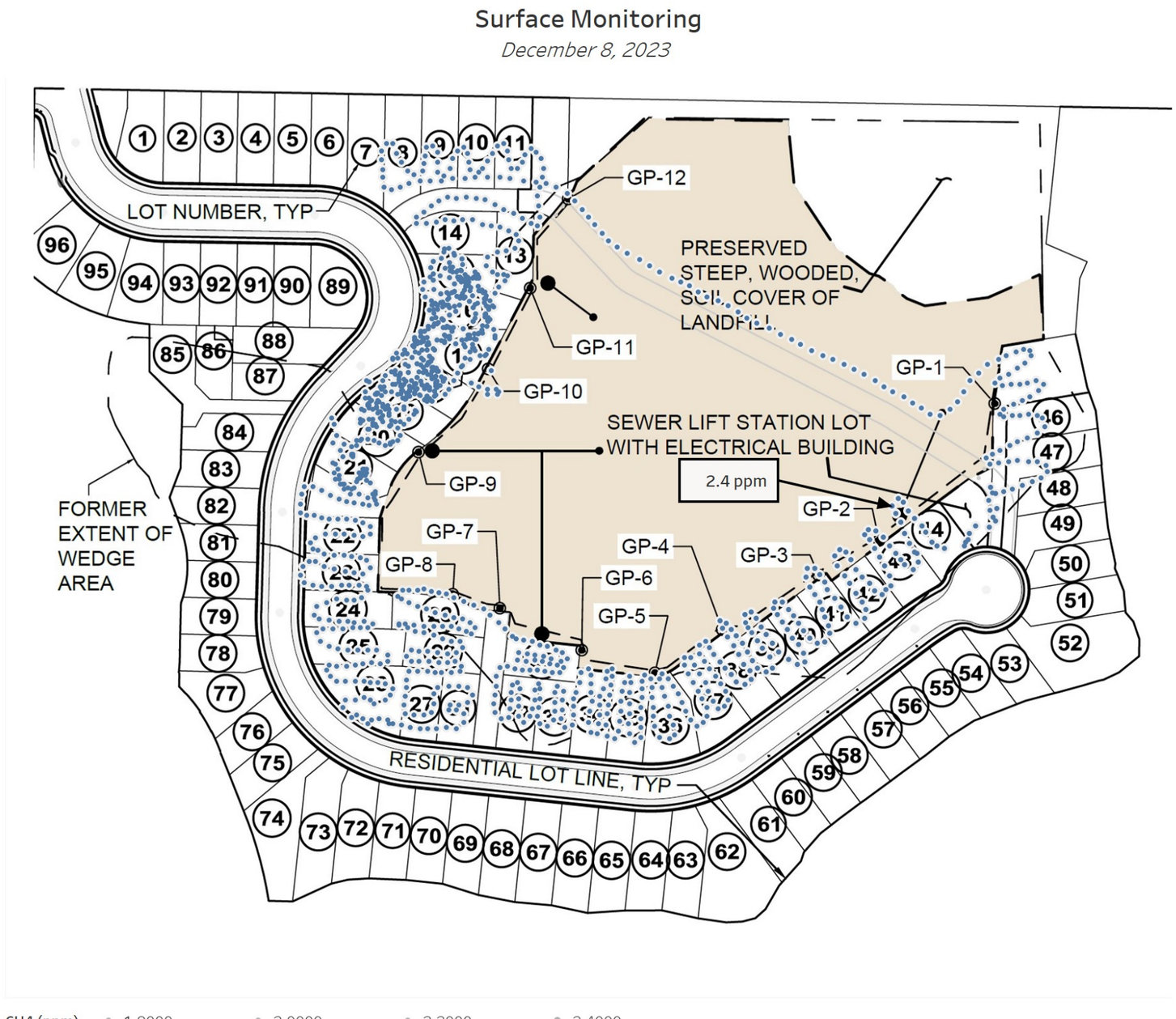
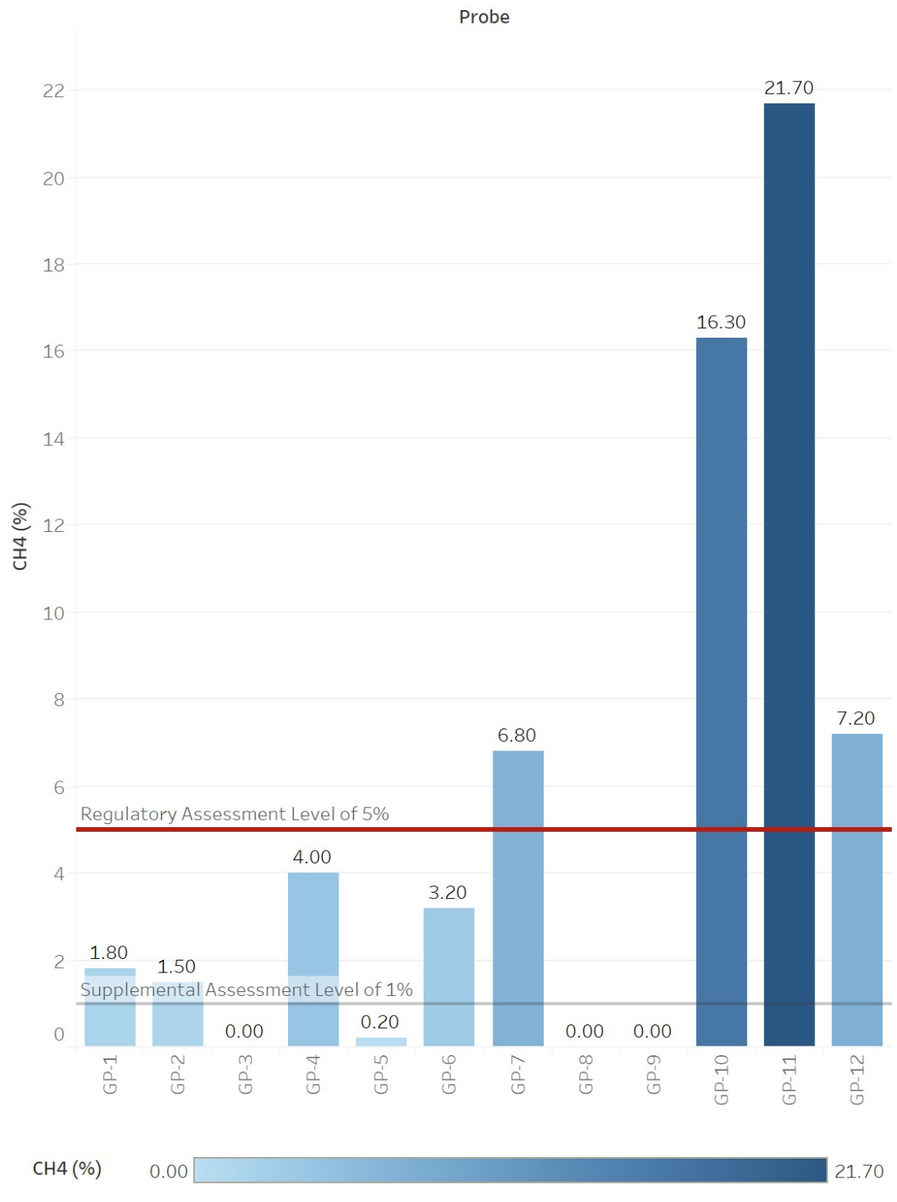
Figure 15. Comparison of Surface and Perimeter Probe Monitoring Data Collected on December 8, 2023.





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Monitoring has been done to provide as much historical data of the site and to create a trend between methane levels observed in the soil vapor at the perimeter probes and the surface methane levels across the Alpine Estates lots and homes before each home becomes occupied. The intent is to show that while several perimeter probes remain at levels above 5%, this observed methane in the soil vapor is not migrating to the surface. The house monitoring stations of the homes built so far on lots 1, 2, 15, 16, 17, 18, 19, 20, and 21 have been checked on each day that perimeter probe monitoring has taken place and soil vapor methane levels were above 1%. Methane at or above 0.1% has not been observed at any of the house monitoring stations meaning indoor surface monitoring has not been required for the homes consistent with the Figure C-1 contingency protocol. Surface monitoring performed on November 10, November 30, and December 10, 2023, across the site and within the constructed homes was done as an extra measure to collect data and provide an initial verification of safe conditions within the homes.

Next Steps

In addition to the next step actions detailed in this section, Herrera prepared an updated LFG Monitoring and Contingency Plan (updated LFGMCP) (Herrera 2024) to provide details about the home monitoring and LFG protection at the development site. The updated LFGMCP (Herrera 2024) includes a contingency flow chart (Figure C-1) that provides the monitoring strategy and actions to follow in the event methane thresholds are reached at the perimeter probes and Alpine Estates homes.

Landfill Gas Sumps

The continuous monitoring devices began collecting reads in March 2023. Herrera performed several adjustments to the sumps and panels to make them rated for an explosive environment, replaced a couple sensors that were not reading properly, and fixed the rechargeable battery situation at each sump.

The sumps near perimeter probes 9 and 11 require additional troubleshooting as they are displaying reads at or above 100% methane and in the negatives. The other two sumps should also be calibrated again. Herrera will make sure all are calibrated and in working condition and will continue monitoring the recorded methane levels.

The LFGMCP (Herrera 2024) requires continuous LFG monitoring for three months of the dry season and for three months of the wet season. Per the LFGMCP (Herrera 2024), the continuous monitoring equipment must stay installed and active while the perimeter probes continue to be monitored. With current methane concentrations in exceedance of 5% in the soil vapor beyond the landfill boundary, Herrera is anticipating perimeter probe monitoring to continue for more than two years and therefore the continuous monitoring at the sumps will continue past the required three months of dry season and three months of wet season. As with monitoring of the perimeter probes, monitoring of the sumps will continue under SCHD and Ecology's direction and oversight.

Perimeter Soil Gas Probes

Several perimeter probes around the landfill cap have been above the 5% methane LEL threshold since the landfill was closed. Because of this, the landfill is currently out of compliance with WAC 173-350-400(4)(b)(ii), which states that the landfill must be designed to ensure that methane does not exceed 5% (LEL) at the property boundary. It is believed this high methane soil vapor is the result of residual landfill gas from the previous extents of waste. The methane does not appear to be due to gas migrating from the closed landfill because results of collection trench gas monitoring at the sumps show that methane content at the perimeter probes is often higher than the collected gas from the landfill. Additionally, vacuum was felt at each of the LFG sumps when the blower was operating, but this vacuum pressure was not observed at the perimeter probes located beyond the landfill cap. The contingency actions discussed in this letter have been working to reduce methane content and clear the area of residual LFG, but levels are not below 5% at all perimeter probes yet. Methane hot spots appear to exist around perimeter probes 6, 7, 10, and 11.

The LFGMCP (Herrera 2024) requires quarterly perimeter probe monitoring for a minimum period of two years. With current methane concentrations in soil at the landfill boundary in exceedance of 5%, Herrera is anticipating monitoring to continue for more than two years, with SCHD and Ecology's direction and oversight. For at least the near term, Herrera plans to continue monthly monitoring. Section 2.2.6 of the LFGMCP addresses reductions in the sampling requirements of the perimeter probes.

Offsite Structures

To ensure Alpine Estates homeowners are protected, Herrera has developed a contingency plan that is included in the updated LFGMCP (Herrera 2023). Once occupancy has begun, Herrera will follow the protocol included in Figure C-1. Soil vapor levels will be monitored routinely at the perimeter probes and if there is a methane level above 1%, the house monitoring stations of neighboring lots (defined in Figure C-1 table) will be checked. If the house monitoring station of any lot has methane at or above 0.1%, indoor surface monitoring will be performed with the SEM5000 or approved equal to confirm indoor methane levels are less than 100 ppm. When the perimeter probes are above 5%, the same contingency steps will be followed as when the perimeter probes are above 1%; however, SCHD will also be notified. As discussed in the LFGMCP, once occupancy has begun on the site, SCHD will be notified within 24 hours if there is a methane exceedance observed during LFG monitoring (greater than 5% methane at a perimeter probe or greater than 0.01% (100 ppmV) within an offsite structure).

In the event that methane is detected at or above the indoor criteria of 100 ppmV (0.01% methane, 0.2% of the LEL), an electrical junction box is installed in the crawl space of each house so that an intrinsically safe fan can be installed on the collection vent pipe, in the crawl space, to create an active methane collection system. As an additional safeguard, the first level of each home is equipped with three continuous methane detectors and an attached alarm system that will notify occupants to evacuate when gas levels reach 12,500 ppm within the house.

As the Landfill Gas Engineer, Herrera will submit a construction confirmation report for each individual house that describes and documents the installed methane gas barrier, ventilation, and detection system.

The construction confirmation reports will include results of construction quality assurance testing of the methane mitigation system and provide sampling results of the subslab and indoor air prior to occupancy. The gas barrier, ventilation, and detection system will be constructed for each Alpine Estates Home for the safety of its residents in accordance with the Los Angeles Department of Building and Safety Methane Mitigation Standards, a nationally recognized standard. Ecology, SCHD, and Snohomish County Planning and Development Services (SCPDS) must review and approve each construction confirmation report with a letter of consent by Ecology. SCPDS then will conduct a formal inspection for each home before final approval and the certificate of occupancy,

Herrera's priority is the health and safety of future Alpine Estates homeowners and community visitors. Herrera believes the environmental controls, monitoring, and contingency response measures installed and performed for the Alpine Estates homes provide safeguards against the potential threat of persistent remaining residual pocket landfill gas outside the landfill as well as potential landfill gas migration. While the source and extent of methane beyond the landfill boundary and between and beyond the perimeter probes is unknown, the network of house ventilation trench monitoring stations below each of the 96 houses planned for the Alpine Estates development will provide a large footprint for monitoring and evaluating landfill gas migration.

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Appendix A

Probe Boring Logs

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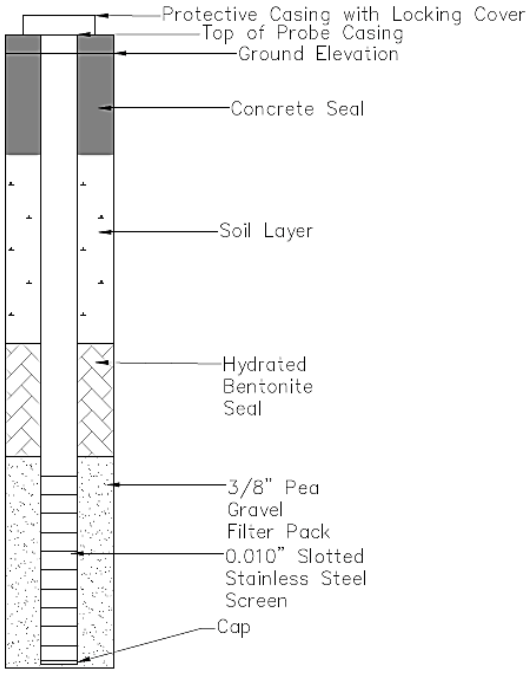
Landfill Gas Probe
Boring Log

Boring No.: GP-1
Total Depth: 16.2'
Sheet 1 of 12

Project Name: Go East Landfill / Bakerview		Ground Elevation: 221.7
Project No.: 22-07954-0000	Location: N. 330692.00 E. 1312479.49	Bottom Elevation: 205.5

DEPTH FEET	MATERIAL DESCRIPTION		ELEVATION		WELL COMPONENTS DETAIL
					
		Lid Elevation	222.2		
0.0			221.7		
	1-16'	Tan silty sand			
2.0			219.5		
			218.5		
4.0					
6.0					
			214.5		
8.0	8-11'	Trace gravel with bits of wood	213.5		
10.0			211.5		
			210.5		
12.0					
		Gravel size to ¾"			
14.0					
	15-16'	Silt content increase	206.5		
16.0		Bottom, trace water in boring	205.5	∇	
18.0					
20.0					
22.0					
24.0					
26.0					
28.0					

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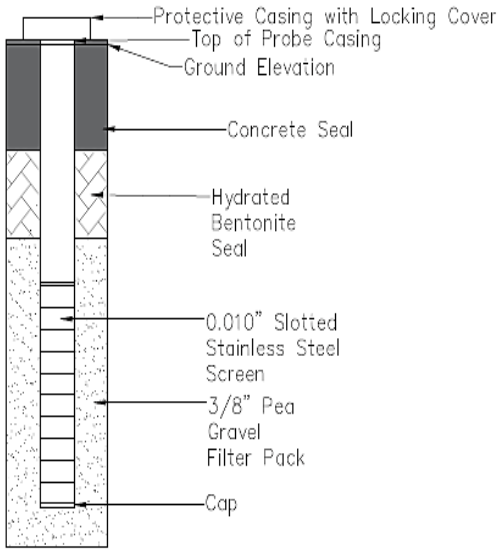
Landfill Gas Probe
Boring Log

Boring No.: GP-2
Total Depth: 13.4'
Sheet 2 of 12

Project Name: Go East Landfill / Bakerview		Ground Elevation: 229.92
Project No.: 22-07954-0000	Location: N. 330543.64 E. 1312353.98	Bottom Elevation: 216.50

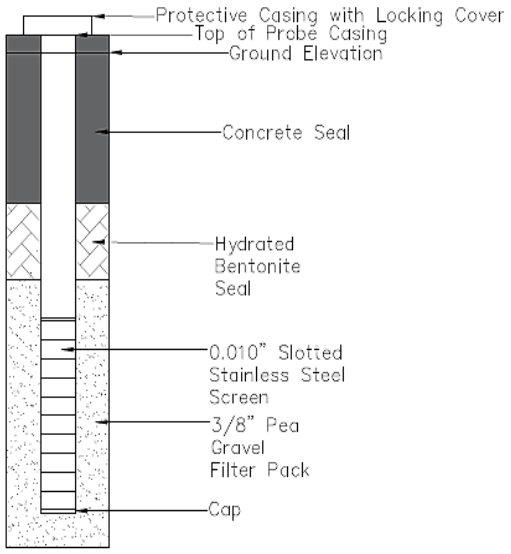
DEPTH FEET	MATERIAL DESCRIPTION		ELEVATION		WELL COMPONENTS DETAIL
		Lid Elevation	230.01		
0.0			229.92		
2.0					
4.0	4-13.4'	Tan silty sand w/ trace gravel	225.5		
6.0			223.5		
			222.5		
8.0					
10.0					
12.0			217.5		
		Bottom	216.5		
14.0					
16.0					
18.0					
20.0					
22.0					
24.0					
26.0					
28.0					



Landfill Gas Probe
Boring Log

Boring No.: GP-3
Total Depth: 13.0'
Sheet 3 of 12

Project Name: Go East Landfill / Bakerview		Ground Elevation: 229.97
Project No.: 22-07954-0000	Location: N. 330505.98 E. 1312288.39	Bottom Elevation: 217

DEPTH FEET	MATERIAL DESCRIPTION		ELEVATION		WELL COMPONENTS DETAIL
		Lid Elevation	230.43		
0.0			229.97		
2.0					
	3.5-13'	Tan silty sand			
4.0			226.00		
6.0			224.00		
			223.00		
8.0					
			221.5	∇	
10.0					
12.0			218.00		
		Bottom	217.00		
14.0					
16.0					
18.0					
20.0					
22.0					
24.0					
26.0					
28.0					

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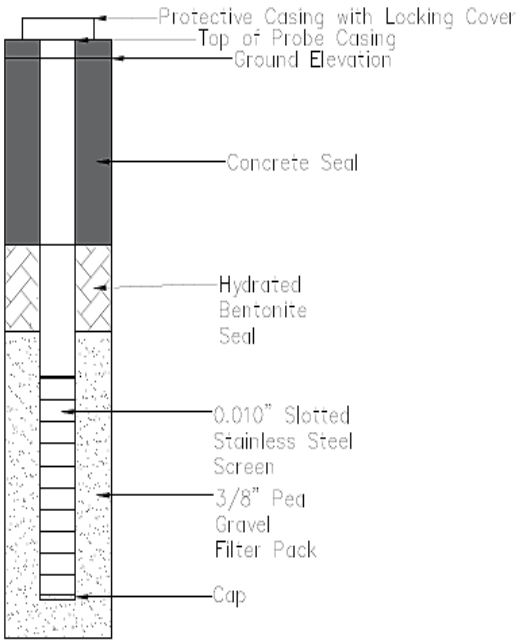
Landfill Gas Probe
Boring Log

Boring No.: GP-4
Total Depth: 15.2'
Sheet 4 of 12

Project Name: Go East Landfill / Bakerview		Ground Elevation: 230.21
Project No.: 22-07954-0000	Location: N. 330447.39 E. 1312184.5	Bottom Elevation: 215.00

DEPTH FEET		MATERIAL DESCRIPTION	ELEVATION		WELL COMPONENTS DETAIL
					
		Lid Elevation	230.63		
0.0			230.21		
2.0					
4.0	4-15.2'	Tan, silty sand w/ a few gravel			
		pieces	224.00		
6.0					
			222.00		
8.0			221.00		
10.0					
12.0					
14.0			216.00		
		Bottom of boring	215.00		
16.0					
18.0					
20.0					
22.0					
24.0					
26.0					
28.0					

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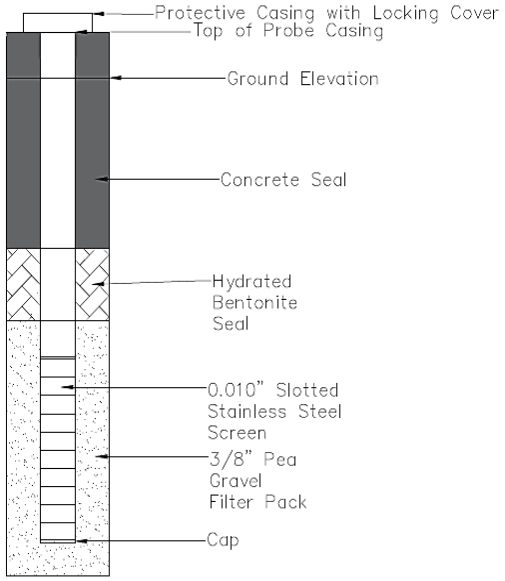
Landfill Gas Probe
Boring Log

Boring No.: GP-5
Total Depth: 13.7
Sheet 5 of 12

Project Name: Go East Landfill / Bakerview		Ground Elevation: 233.67
Project No.: 22-07954-0000	Location: N. 330400.16 E. 1312110.73	Bottom Elevation: 220

DEPTH FEET	MATERIAL DESCRIPTION		ELEVATION	
		Lid Elevation	234.93	
0.0			233.67	
2.0				
	3-5'	Grey sand w/ gravel		
4.0				
	5-13.7'	Tan silty sand w/ silt layers	229.00	
6.0				
			227.00	
8.0			226.00	
10.0				
12.0			221.00	
		Bottom of boring	220.00	
14.0				
16.0				
18.0				
20.0				
22.0				
24.0				
26.0				
28.0				

WELL COMPONENTS DETAIL



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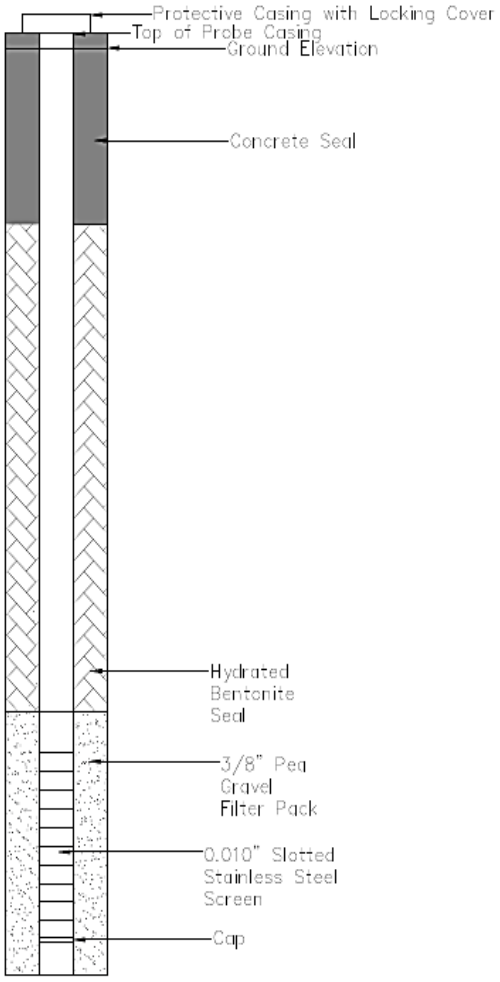
Landfill Gas Probe
Boring Log

Boring No.: GP-6
Total Depth: 24.7'
Sheet 6 of 12

Project Name: Go East Landfill / Bakerview		Ground Elevation: 240.68
Project No.: 22-07954-0000	Location: N. 330424.41 E. 1312030.73	Bottom Elevation: 216.00

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION		WELL COMPONENTS DETAIL
				
	Lid Elevation	241.06		
0.0	Ground Elevation	240.68		
2.0				
4.0	Brown gray sand w/ gravel	236.00		
6.0	More gravel			
		233.00	∇	
8.0	Organic silty sand			
10.0	Brown silty sand			
12.0				
	Sand w/ some silt- very moist			
14.0				
16.0	Slightly silty sand			
		223.00		
18.0		222.00		
		221.00		
20.0	Silty sand			
22.0				
24.0		216.00		
26.0				
28.0				

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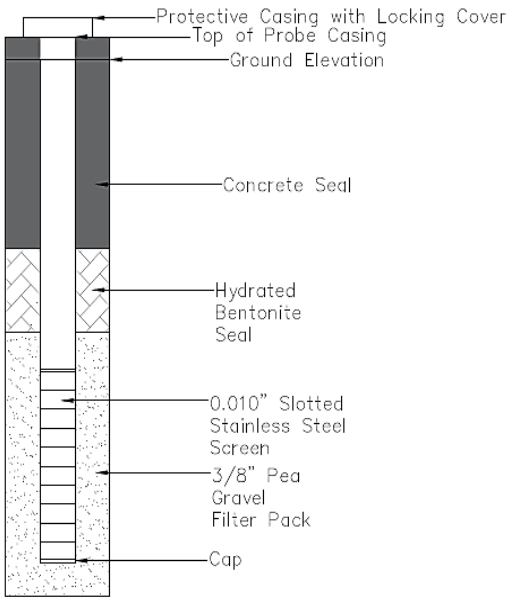
Landfill Gas Probe
Boring Log

Boring No.: GP-7
Total Depth: 13.2'
Sheet 7 of 12

Project Name: Go East Landfill / Bakerview		Ground Elevation: 241.99
Project No.: 22-07954-0000	Location: N. 330470.05 E. 1311942.01	Bottom Elevation: 228.8

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION		WELL COMPONENTS DETAIL
				
	Lid Elevation	242.59		
0.0	Ground Elevation	241.99		
2.0				
4.0				
	Silty brown sand	237.00		
6.0				
	Gravelly sand, wet, silty	234.8	∇	
8.0		233.8		
	Very moist silty sand brown/tan			
10.0		231.8		
12.0	Slightly brown sand			
	Bottom of boring	228.8		
14.0		227.8		
16.0				
18.0				
20.0				
22.0				
24.0				
26.0				
28.0				

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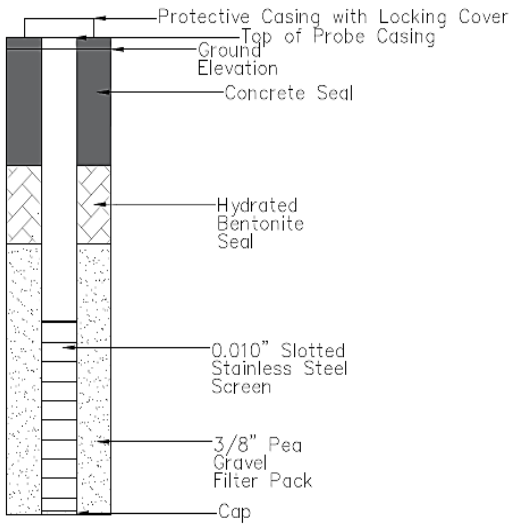
Landfill Gas Probe
Boring Log

Boring No.: GP-8
Total Depth: 12.0'
Sheet 8 of 12

Project Name: Go East Landfill / Bakerview		Ground Elevation: 242.99
Project No.: 22-07954-0000	Location: N. 330485.3 E. 1311891.07	Bottom Elevation: 231

DEPTH FEET	MATERIAL DESCRIPTION		ELEVATION		WELL COMPONENTS DETAIL
					
		Lid Elevation	243.31		
0.0			242.99		
2.0	2-12'	Tan silty sand w/ trace gravel & wood	242.99		
			240.00		
4.0		Moisture increasing			
			238.00		
6.0					
			236.00		
8.0					
10.0					
12.0		Water trickling into boring	231.00	∇	
14.0					
16.0					
18.0					
20.0					
22.0					
24.0					
26.0					
28.0					

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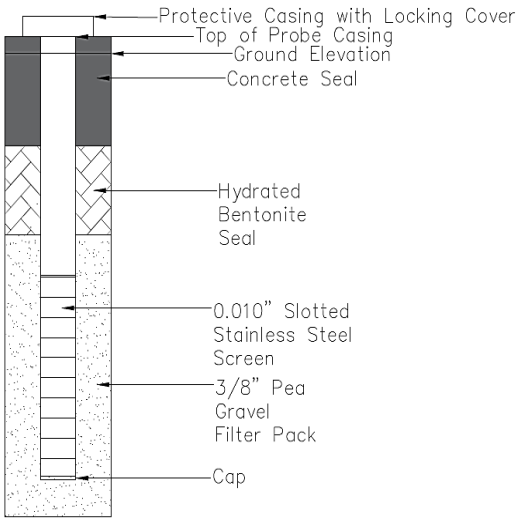
Landfill Gas Probe
Boring Log

Boring No.: GP-9
Total Depth: 11.3'
Sheet 9 of 12

Project Name: Go East Landfill / Bakerview		Ground Elevation: 258.30
Project No.: 22-07954-0000	Location: N. 330639.76 E. 1311853.74	Bottom Elevation: 247

DEPTH FEET	MATERIAL DESCRIPTION		ELEVATION		WELL COMPONENTS DETAIL
		Lid Elevation	258.72		
0.0			258.30		
	1-11.3'	Silty sand, moist, native soil			
2.0					
			256.00		
4.0					
			254.00		
6.0			253.00		
8.0					
10.0					
			248.00		
12.0			247.00		
14.0					
16.0					
18.0					
20.0					
22.0					
24.0					
26.0					
28.0					

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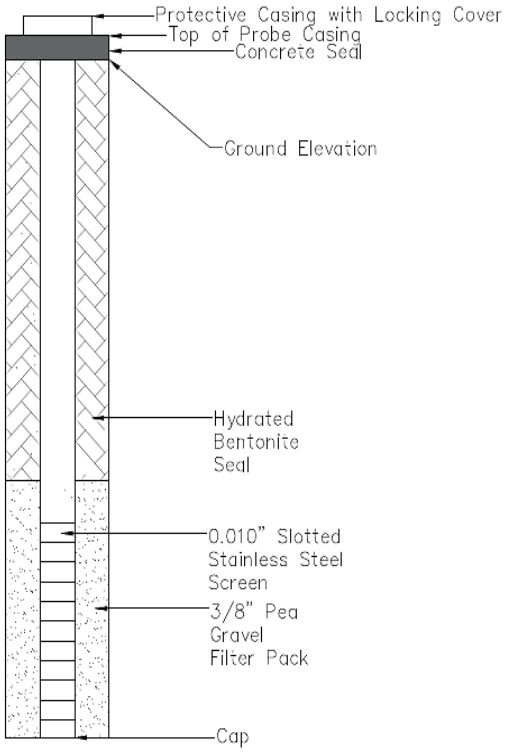
Landfill Gas Probe
Boring Log

Boring No.: GP-10
Total Depth: 17.2'
Sheet 10 of 12

Project Name: Go East Landfill / Bakerview		Ground Elevation: 262.4
Project No.: 22-07954-0000	Location: N. 330729.69 E. 1311928.98	Bottom Elevation: 245.22

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION
	Lid Elevation	263.02
0.0	Ground Elevation	262.40
	Sand w/ minor silt+gravel, brown, dry	
2.0		
4.0		
6.0		
8.0		
10.0	Silty sand, brown, slightly moist	
		251.7
12.0	Sandy silt, grey, moist, minor debris	250.7
	(brick), native	
14.0		
16.0		
18.0	Silty sand, brown, dry, depth 17.5	245.2
20.0	No odor	
22.0		
24.0		
26.0		
28.0		

WELL COMPONENTS DETAIL



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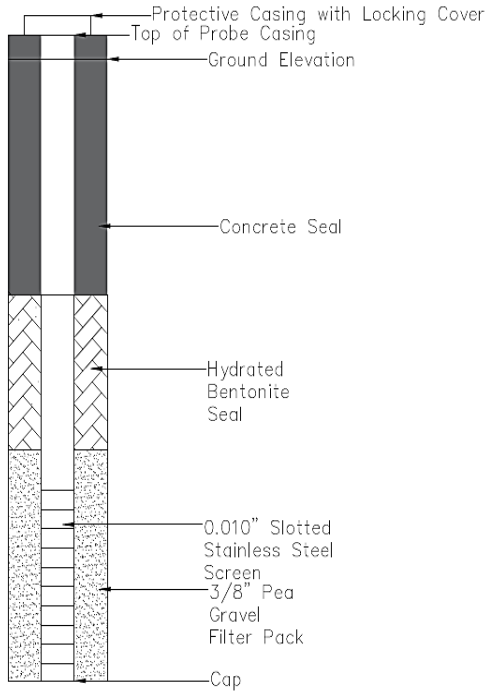
Landfill Gas Probe
Boring Log

Boring No.: GP-11
Total Depth: 16.2'
Sheet 11 of 12

Project Name: Go East Landfill / Bakerview		Ground Elevation: 263.13
Project No.: 22-07954-0000	Location: N. 330817.39 E. 1311974.87	Bottom Elevation: 246.9

DEPTH FEET		MATERIAL DESCRIPTION	ELEVATION		WELL COMPONENTS DETAIL
					
		Lid Elevation	263.76		
0.0		Ground Elevation	263.13		
2.0	2-8'	Sand w/ minor gravel, brown, slightly			
		moist			
4.0					
6.0			257.0		
8.0	8-12'	Sand, brown, dry, minor woody debris			
10.0			253.0		
		Silty sand, increasing woody debris	252.0		
12.0	12-16'	Sandy silt, gray-brown			
14.0					
16.0			246.9		
	17-18.5'	Sand, gray, very moist			
18.0					
20.0		No odor			
22.0					
24.0					
26.0					
28.0					

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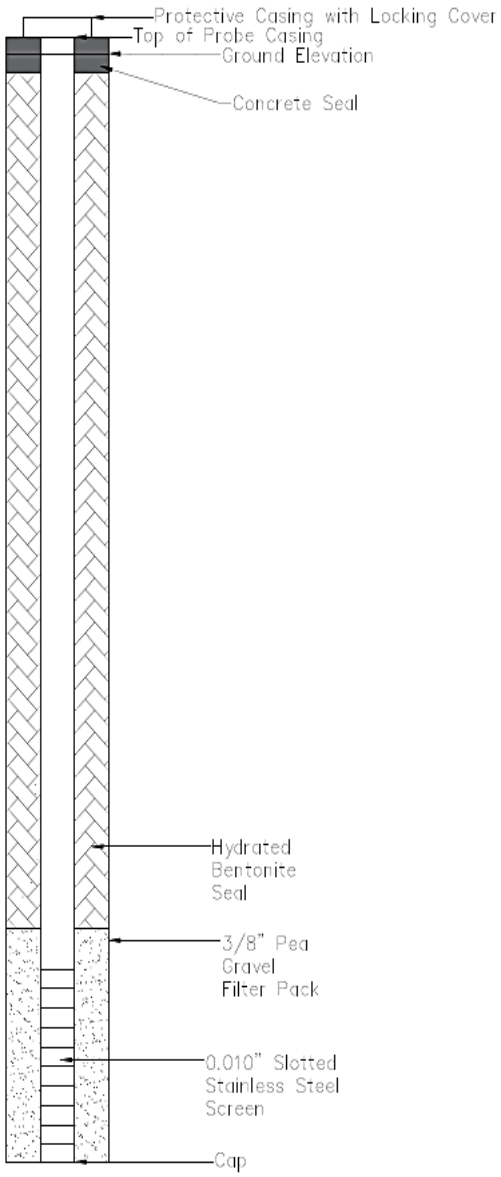
Landfill Gas Probe
Boring Log

Boring No.: GP-12
Total Depth: 28.5'
Sheet 12 of 12

Project Name: Go East Landfill / Bakerview		Ground Elevation: 260.47
Project No.: 22-07954-0000	Location: N. 330913.46 E. 1312013.66	Bottom Elevation: 232

DEPTH FEET	MATERIAL DESCRIPTION		ELEVATION	
		Lid Elevation	260.90	
0.0	0-0.5'	Sand, gravel, brown, moist	260.47	
	0.5-4'	Silty sand, brown	260.0	
2.0				
4.0	4-8'	Sand, w/ gravel, slightly moist brown-		
		gray		
6.0				
8.0	8-15.5'	Sand, brown, slightly moist, minor		
		gravel		
10.0				
12.0				
14.0				
	15.5-25'	Silty sand, brown, w/ wood, debris,		
16.0		native		
18.0				
20.0				
22.0				
			238.0	
24.0			237.0	
	25-28'	Silty sand, light brown, very moist		
26.0				
28.0				
			232.0	

WELL COMPONENTS DETAIL



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Appendix B

Blower Data Sheet

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GAST MANUFACTURING, INC.
A Unit of IDEX Corporation
Post Office Box 97
Benton Harbor, Michigan
Ph: 269/926-6171
Fax: 269/925-8288

PART NUMBER: LTD150

REVISION: D

Product Specs.

MODEL NUMBER	MOTOR SPECIFICATIONS	RPM	MAX VAC		MAX PRESS		HP	kW	NET WT.	
			"H_2O	mbar	"H_2O	mbar			lbs.	kg
R6335A-2	190-220/380-415-50-3	2850	65	162	74	199	2.5	1,9	82	37,2
	208-230/460-60-3 △	3450	80	199	80	199	3.5	2,6		

SOUND LEVEL 72/69 dB(A) MAX. @ 60/50 Hz

NORMAL AMBIENT -29°C TO 40°C

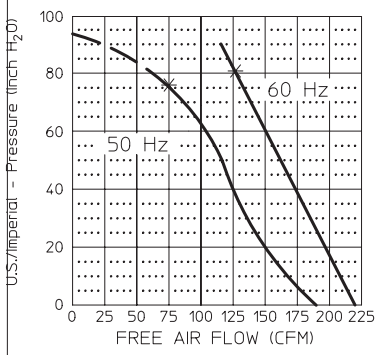
RELATIVE HUMIDITY 0% - 100% NON CONDENSING

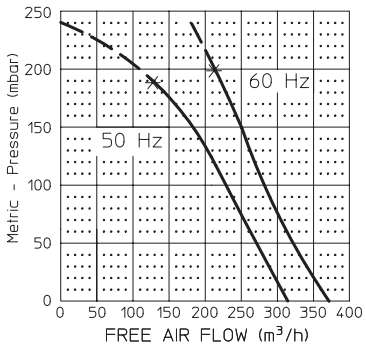
ENVIRONMENT CLEAN DUST FREE

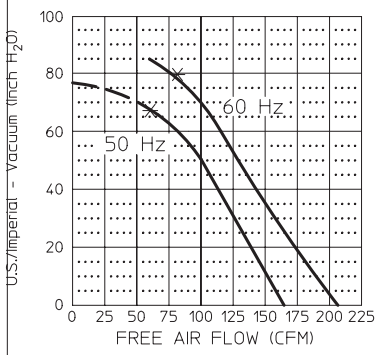
TECHNICAL DATA SUBJECT TO CHANGE WITHOUT NOTICE.

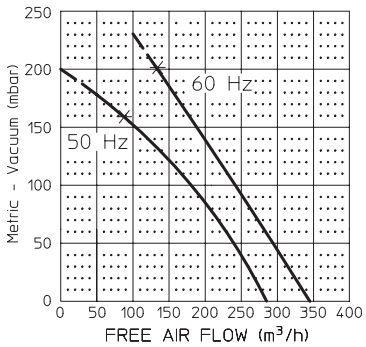
△ = REDUCE MAX. DUTY RATINGS BY 10"H 0 WHEN OPERATING FROM 207 TO 187 VOLTS, 60 Hz

Product Performance (Metric U.S. Imperial)









PERFORMANCE DATA
THE PERFORMANCE DATA SHOWN WAS DETERMINED UNDER THE FOLLOWING CONDITIONS:

LINE VOLTAGE @ 60 Hz. 230V OR 460V FOR 3 PHASE UNITS. 115V OR 230V FOR 1 PHASE UNITS.

LINE VOLTAGE @ 50 Hz. 220V FOR 3 PHASE OR 1 PHASE UNITS.

UNITS IN A TEMPERATURE STABLE CONDITION.

DELIVERY MEASUREMENTS MADE WITH OUTPUT PORT THROTTLED.

SUCTION MEASUREMENTS MADE WITH INPUT PORT THROTTLED.

TEST CONDITIONS: INLET AIR DENSITY @ 0.075 lbs. per cu. ft. [20°C (68°F), 29.92" Hg (14.7 PSIA)].

NORMAL PERFORMANCE VARIATIONS ON THE RISISTANCE CURVE WITHIN ±10% OF SUPPLIED DATA CAN BE EXPECTED.

✳ DENOTES RECOMMENDED MAXIMUM DUTY
---- INTERMITTENT DUTY ONLY

Product Dimensions

Metric (mm) / U.S. Imperial (inches)