



December 21, 2022

Michael Kovalchick, Senior Environmental Engineer
Michigan Department of Environment, Great Lakes, and Energy
Air Quality Division
Jackson District Office
301 East Louis Glick Highway
Jackson, MI 49201-1556

Sent via email

Re: Response to AQD Dec 8, 2022 Violation Notice (SRN: N2688)

Dear Mr. Kovalchick:

This letter responds to the Michigan Department of Environment, Great Lakes, and Energy, Air Quality Division (AQD) violation notice (VN) dated December 8, 2022 and addresses the potential causes and duration of each event when the Perimeter Methane Action Level was triggered from September 22 to December 6, 2022. Specifically, the VN alleges:

The Perimeter Methane Action Level has been exceeded on more than 20 separate days from September 22, 2022, through December 6, 2022. The Company continues to fail to properly identify and correct the cause(s) of the exceedances within 48 hours and prevent reoccurrences.

Preliminary Comments

Even though the Violations Notices and the Complaint that preceded the Consent Judgment generated their fair share of technical and legal disagreements, we believe Arbor Hills and AQD ended the process in a cooperative manner. Having spent more than a year working through the complex issues involved in operating a large, modern landfill, the Consent Judgment sets out a comprehensive and stringent program to address the focal point of AQD's enforcement efforts; specifically, the reduction of odors to the extent feasible for an industrial facility that by definition accepts discarded odorous waste materials. The Consent Judgment requires the use of two state-of-the-art emission monitoring devices, the Sniffer drone and the perimeter monitoring

system; imposes stringent wellhead inspections; requires the reduction of liquid levels in wells, enhanced well monitoring, and surface emission monitoring; imposes special procedures for managing highly odorous waste and compost; requires the accelerated installation of gas wells in future cells; and includes a unique procedure to address and correct odors before they become a compliance concern. In sum, we believe the odor control systems and procedures at Arbor Hills are second to none in the State of Michigan.

These extra compliance measures are in addition to three Supplemental Projects, all geared to further enhance site operations and benefit the surrounding community.

In light of the cooperative manner in which the parties consummated the Consent Judgment, and the undeniable improvements in site operations, we cannot help but be disappointed with the December 8, 2022 Violation Notice and, specifically, with the way in which AQD appears to be interpreting Section 5.5(E) of the Consent Judgment. For the record, we explain the basis of our disagreement below. In short, Arbor Hills performed a root cause analysis for each exceedance, and identified and performed corrective actions as necessary in accordance with Section 5.5(E).

Despite the apparent disagreement with the AQD over the interpretation of Section 5.5, Arbor Hills remains committed to reaching a “meeting of the minds” on the practical solution to implementing Section 5.5(E), something that we believe will be best accomplished in an in-person meeting.

Purpose of Section 5.5(E)

During the negotiation of Section 5.5(E) of the Consent Judgment, we raised the example of an exceedance that essentially “corrects itself.” In that instance, the standard root cause protocol – find the cause of the problem and fix it to return the site to compliance – does not fit the circumstances encountered. This is because the undesired effect – an exceedance of the action level – went away by its own accord.

For this reason, the words, “as necessary,” were added to the first section of Section 5.5(E): “if any of the monitoring stations detected H₂S or methane above the respective action levels, then AHL shall conduct a root cause analysis and implement corrective action, *as necessary*, to correct the exceedance[.]” Thus, if the exceedance is short-lived and no additional corrective action is necessary, nothing more need be done.

The second sentence of Section 5.5(E) shows that the goal of this section is to “meet the Perimeter H₂S Action Levels and the Perimeter Methane Action Levels.” If an exceedance of an action level is sustained and a root cause is found that allows the site to “meet the action levels,” then AQD would no doubt agree that Arbor Hills was in compliance with the Consent Judgment. Similarly, if an exceedance of the action level is intermittent, and the methant (CH₄) readings drop below the actions levels, this situation should also be considered in compliance with Consent Judgment. Whether Arbor Hills did or not undertake affirmative corrective measures, the area still returned to compliance.

AQD's position further assumes that the source of any particular intermittent exceedance is both localized and constant, such as the same broken pipe in an identifiable area of the landfill. But our investigation shows that the intermittent exceedances in question are fugitive emissions, the source of which may change from day-to-day. As explained further below, we believe the data shows that the source of the intermittent exceedances are fugitive emissions that settle in low-lying areas during periods of low wind speeds. The data demonstrates that the elevated readings are not sustained beyond a few hours, and downwind measurements show no migration of the gas even to the next monitoring station. Most importantly, these intermittent, inconstant exceedances have no correlation with the generation of off-site odors.

Purpose of Perimeter Monitoring System

The perimeter monitoring system acts as an early warning sign that CH₄ readings exceeding 40 ppm could potentially create nuisance odors in the nearby community. The perimeter monitoring system is designed to be proactive and to identify sustained CH₄ readings that may be associated with offsite odors. The following discussion shows that the intermittent exceedances of the action levels at issue, which occur during low wind speeds, are not associated with off-site odors. The elements supporting this conclusion are: 1) lack of correlation exists between the intermittent action-level exceedances and complaints; 2) the CH₄ concentrations dissipate quickly on their own accord; and 3) investigating the potential root cause of the source of individual CH₄ exceedances encountered during variable (or scattered) low wind events is an exercise in futility because the elevated levels drop quickly; finding the source (assuming one exists) is simply not feasible. Furthermore, to be clear, we do not agree that the intermittent exceedances are continuous; rather they are independent of each other and as explained below these intermittent events should be handled differently than events that have defined corrective actions. Consequently, Arbor Hills is of the opinion that devoting significant attention to these fleeting exceedances distracts from more important tasks and that, in conjunction with AQD, we should develop a different approach to dealing with these events. The following sections provide suggestions on a path forward.

Lack of Correlation Between Intermittent Exceedances and Complaints during Variable Low-Wind Conditions

As presented in Table 1, the data shows no correlation between CH₄ readings and complaints. Table 1 lists each event where the CH₄ concentrations at the six perimeter monitoring stations exceeded 40 ppm, alongside complaints logged during the timeframe of September 22 to December 6, 2022. Based on the data presented in Table 1, of the 87 days of operation (2,088 total hours) from September 22 to December 6, 2022, there were 489 minutes (8.15 hours) when a coincidental complaint was received, which is less than 1% of the period.

Each of the exceedances occurred during low wind speeds, and most of them occurred during the nighttime.¹ Occasionally, the wind was not even blowing toward the nearby community.

Therefore, Arbor Hills is recommending relocating MS-1 to the southeast corner of Napier Road and Six Mile Road. As discussed in the following paragraphs, the variable low wind conditions appear to concentrate the fugitive CH₄ from across the surface of the landfill into the localized low-lying areas where the perimeter monitors are located. Comparing the perimeter monitor CH₄ concentrations to a monitor located across the road will allow the identification of those events that are localized to the landfill from those events that could potentially cause nuisance odors in the nearby community.

CH₄ Concentrations Quickly Dissipate during Variable Low Wind Conditions

With regard to low wind-speed events associated with readings exceeding 40 ppm CH₄, the concentrations quickly dissipated to well below the action level threshold. As shown in Table 2, the CH₄ concentrations measured at the perimeter monitors (MS-1 through MS-6) were compared to the CH₄ concentrations measured at the mobile monitor (MS-7) located east of MS-4 across Napier Road. This comparison demonstrates that during these variable low wind conditions, the CH₄ quickly dissipated rendering any additional corrective action unnecessary.

Table 2 lists the 20 event days cited in the December 8, 2022 VN and compiles the following information and data to assess the effects of variable low wind conditions on CH₄ concentrations. The table shows that when a root cause could be determined, timely and effective corrective action was performed. Table 2 contains the following information:

- CH₄ concentrations for each perimeter monitoring station (MS-1 through MS-6) with a reading greater than the action level threshold of 40 ppm (event). The individual perimeter monitoring CH₄ readings are provided in the green highlighted column.
- Corresponding CH₄ reading of mobile monitor MS-7 for each of the perimeter monitoring station event. The MS-7 CH₄ readings observed during the corresponding perimeter monitoring event times are provided in the blue highlighted column.
- Reduction of CH₄ concentration from the individual perimeter monitoring station compared to MS-7 CH₄ concentrations.
- Wind speed and wind direction.
- Root cause noted as a result of the investigation of the triggered action level event.

As noted in Table 2, the terms “undetermined” and “dense fog” are listed as a root cause. For clarification, the terms “undetermined” and “dense fog” refer to the meteorological conditions that caused the concentration of CH₄ in the low-lying areas during variable low wind conditions. Arbor Hills acknowledges that weather is not the source of the CH₄, but it is the

¹ See figure 1 that charts the time and date of each of these action level events that clearly shows that the events predominantly occurred during the evening hours.

meteorological condition that contributes to the concentration of CH₄ in a localized area (which is not migrating into the community). An example of this phenomenon is the evaluation of the October 29 event data provided in Table 2. During the October 29 event, several of the perimeter monitors experienced CH₄ concentrations greater than the action level of 40 ppm. The wind speed was light and variable throughout the event. As noted in Table 2, the CH₄ concentration at MS-7 quickly dissipated to below 15 ppm CH₄ and in most cases to single digits across the street from the perimeter monitors. This data supports the need to distinguish these fleeting, inconsequential events from those that are sustained and that could result in nuisance odors in the nearby community.

In contrast, each event occurring during a period where a complaint was logged resulted in a root cause evaluation identifying a corrective action that was implemented. This demonstrates Arbor Hills' compliance with Section 5.5(E) through properly identifying and correcting the cause(s) of the triggered action level thresholds within 48 hours and prevention of reoccurrences. The following summarizes the actions taken during the September 22 through December 6, 2022 timeframe as a result of timely root cause investigations.

- September 29 and 30, 2022 – Arbor Hills placed additional clay cover on the northeast portion of Arbor Hills East
- October 25 and 26, 2022 – Arbor Hills installed vacuum collection near the toe collector. The horizontal toe collector was brought online October 28, 2022.
- October 31 through November 4, 2022 – Well 290 was identified as experiencing a compromised vacuum line through the corrective action investigation. Well 290 vacuum line was repaired on November 4, 2022.
- November 22 and 23, 2022 – Arbor Hills personnel identified odors attributed to the leachate system frac tanks. Arbor Hills quickly shutdown the frac tanks aeration system and increased the hydrogen peroxide dosage, which rapidly reduced identifiable odors. Based upon this investigation, Arbor Hills determined that the increased hydrogen peroxide dosage and aeration of the leachate system 500,000-gallon tank is sufficient to prevent odors from the leachate system and that continued aeration of the frac tanks is no longer required. Discontinuing the use of the frac tank aeration should minimize the potential of leachate odors from recurring. In addition, Arbor hills has begun to design and upgrade a more permanent structure to replace the frac tanks located on the south side of the landfill.
- November 24 through 29, 2022 – Through root cause evaluations occurring during this timeframe, Arbor Hills personnel identified that the ditch located on Arbor Hills East, approximately halfway up the hillside could be contributing to the action level thresholds being triggered. Arbor Hills completed the filling of this ditch on November 30, 2022.

In addition to these corrective actions performed during the September 22 through December 6, 2022 time period, Arbor Hills continues to proactively identify areas that could be contributing to the elevated CH₄ readings and make improvements to prevent recurrence. One of

these proactive activities is to evaluate means to eliminate the low-lying areas along the east side of the landfill or other engineering solutions.

As proposed in the November 18, 2022 Arbor Hills response letter to AQD, Arbor Hills recommends relocating MS-1 monitoring station to east of Napier Road to distinguish localized intermittent events from those that would result in a root cause evaluation identifying an actionable corrective action.

Investigating the Potential Root Cause during Variable Low Wind Conditions

Performing a constructive root cause investigation during the variable low wind meteorological conditions proves to be challenging due to the lack of identification of the source of CH₄. Evaluating the December 5, 2022 event data, the wind speeds were low, wind direction was variable, and a multitude of potential sources of the CH₄ are identified coming from all directions, including east of Napier Road. As presented in the reverse trajectory analysis of December 5, 2022 as shown in Figure 2, the potential source of CH₄ could be coming from all directions and is therefore undetermined. Thus, attempting to identify the source is not feasible and the exercise impractical. Arbor Hills is recommending a practical solution to identify events that could cause nuisance odors to the community.

Figure 2 shows 10-minute reverse trajectories for the measured action level concentrations that occurred on December 5 and 6, 2022 at MS-4. Each node of the trajectory represents each minute of the 10-minute interval, working backwards in time from the monitor location. The trajectory numbers are chronological, with trajectory #1 (prior to the start of the elevated levels) at the earliest start time (21:07), and trajectory #6 (at the end of the elevated levels) starting at 00:40 on December 6, 2022. The trajectories are also color coded, with red representing the highest measured values and green representing measured values below the action level.

Figure 2 shows that wind direction at MS-4 started from the southeast (T #1) and shifted from the northwest (T #5). Maximum CH₄ levels were observed during the middle periods (T#3 and T#4). These reverse trajectories indicate that elevated CH₄ levels could have originated anywhere from the east, west to the northwest of MS-4. The figure clearly shows that wind direction is too variable to identify a culpable emission source.

As previously listed, Arbor Hills is recommending adjustment of the 40 ppm CH₄ concentration action level threshold to occur at a perimeter monitor as well as at the relocated MS-1 to the east of Napier Road. This recommended revision could be documented in an odor operations plan that would focus efforts on meaningful events that results in corrective actions. If needed, these recommendations could be addressed in an addendum to the Consent Judgment.

Conclusion and Action Items

In conclusion, for each event with a discernible root cause, Arbor Hills performed timely corrective action to prevent recurrences in compliance with Section 5.5(E). The VN concerns a unique subset of distinct exceedances that are intermittent and occur during variable (or

scattered) low wind conditions. Therefore, Arbor Hills believes that the responsive actions for these unique events should be different than those for a sustained event with a discernible root cause.

Based on the findings addressed in this letter in combination with the November 18, 2022 response letter, Arbor Hills recommends meeting with AQD to evaluate the data and findings presented in these letters. As previously noted, Arbor Hills would like to discuss the following recommended items:

- Reconsider how the 40 ppm action level for CH₄ should apply during these variable low wind meteorological conditions.
- Invite the manufacturer of the perimeter stations to a site visit to discuss their recommendations on using the technology during low wind conditions.
- Consider preparing an addendum to the Consent Judgment, setting forth in more detail the appropriate response actions based upon varying meteorological conditions.
- Draft an odor operations plan to focus investigations and corrective actions to meaningful events.
- Consider relocating MS1 to the southeast corner of Napier Road and Six Mile Road to understand if the CH₄ concentrations are contained to the landfill or potentially emanating towards the nearby community

Arbor Hills reiterates that the perimeter monitoring system is new technology, and its application is still in the development stage. Arbor Hills is requesting AQD take these recommendations into consideration when contemplating next steps and a path forward to result with the intended purpose of the perimeter monitoring system as an early indicator to minimize nuisance odor observations in the nearby community.

If you have questions or comments regarding this submittal, please contact me at (248) 412-0704.

Sincerely

Arbor Hills Landfill, Inc.



David Seegert

General Manager

cc: Jenine Camilleri, Enforcement Unit Manager, Air Quality Division
Scott Miller, EGLE Air Quality Division
Diane Kavanaugh-Vetort, EGLE Air Quality Division

Anthony Pelletier, GFL Environmental Inc., Area Landfill Director
Anthony Testa, GFL Environmental Inc., Landfill Site Engineer
Tami Craig, GFL Environmental Inc., Regional Landfill Gas Program Manager
Paul Sgriccia, GFL Environmental Inc., Regional Environmental Compliance Manager
Mindy Gilbert, GFL Environmental Inc., General Counsel
Melissa Bachhuber, GFL Environmental Inc., Vice President US Legal

Attachments:

Figure 1 - Times and Dates with >40ppm CH₄ Readings
Figure 2 – Reverse Trajectory Dec 5, 2022 29, 2022
Table 1 – Sep 22 – Dec 6, 2022 Alarm Log_w-complaints
Table 2 – Sep 22 – Dec 6, 2022 CH₄ Readings and Mobile Unit (MS7)

Figure 1 - Times and Dates with >40 ppm CH4 Readings at Perimeter Monitors

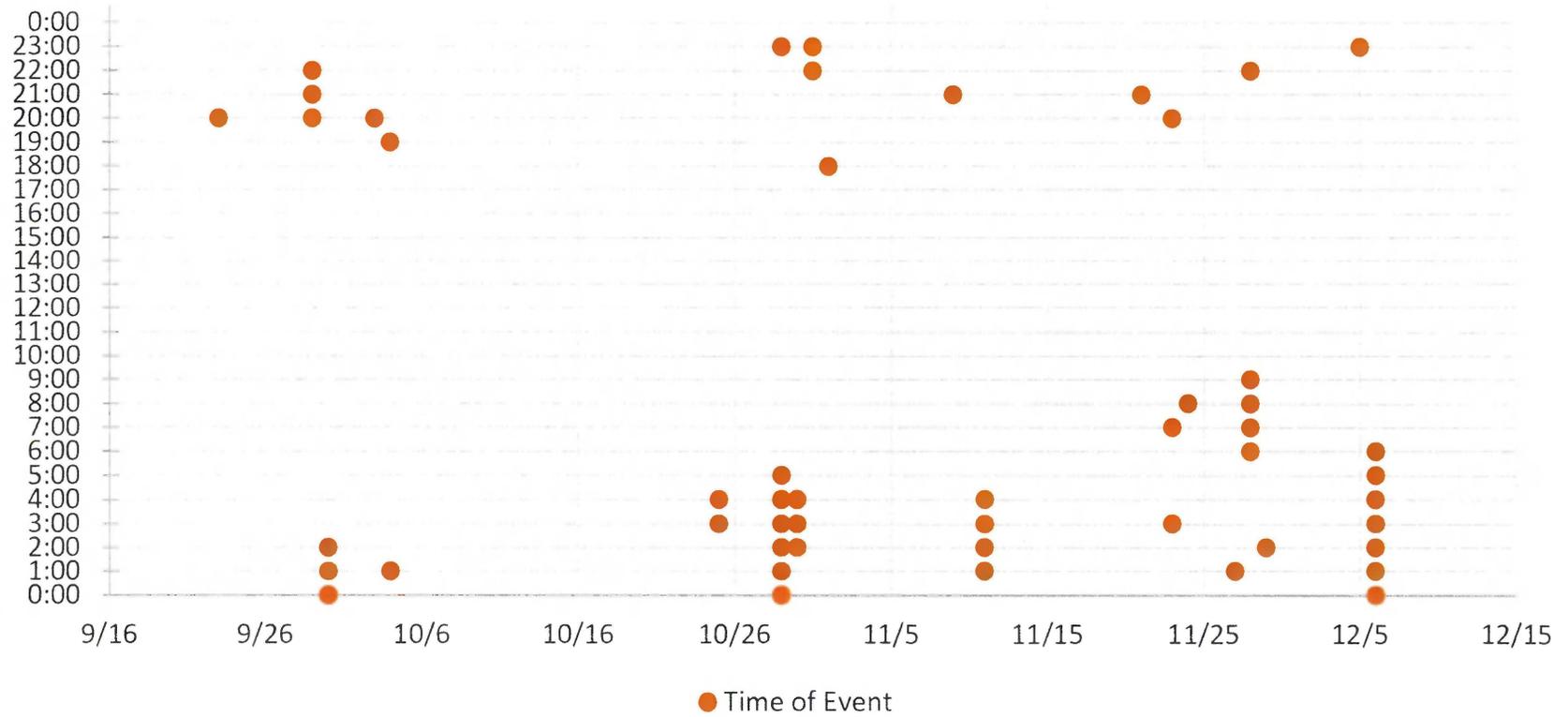


Figure 2 - 12/5/2022 Reverse Trajectories, MS-4



Color (Number)	Date	Start Time (EST)	End Time (EST)	MS-4 CH ₄ Value (ppm) [1-min values]*	Wind Speed (mph)*	Wind Direction (deg)*	Description
Green (1)	12/5	21:07	21:15	2.7	0.4	125	10-minute reverse trajectory, low CH ₄ concentration before event
Orange (2)	12/5	21:40	21:48	45.7	1.4	299	10-minute reverse trajectory, elevated CH ₄ concentration
Red (3)	12/5	22:31	22:40	223.6	0.7	252	10-minute reverse trajectory, 2 nd maximum CH ₄ concentration
Red (4)	12/5	22:47	22:56	234.4	0.5	181	10-minute reverse trajectory, 1 st maximum CH ₄ concentration
Orange (5)	12/6	00:26	00:37	46.4	1.9	308	10-minute reverse trajectory, decreasing CH ₄ concentration after event
Green (6)	12/6	00:40	00:49	9.8	1.8	258	10-minute reverse trajectory, low CH ₄ concentration after event

*value shown is maximum from time period

Table 1 - Arbor Hills Landfill
Perimeter Monitoring System Sept 20 through Dec 6, 2022

Complaint Recorded
Complaint Occurs at Different Time than Action Level
No Complaint Recorded

Comparison of Complaint Hours to Total Operating Hours	Date (EST)	Start Time (EST)	End Time (EST)	Duration	Monitor	Sensor	Maximum Reading	Wind Direction (Out of) Degrees	Wind Direction (Out of)	Wind Speed (Average)
0.39% 87 days 2088 hrs 489 min 439 Minutes of Events w/complaint	09/21/22	0:13	0:20	0:08	MS-6	CH4	46.1	183	S	1.8
	09/23/22	19:01	19:20	0:20	MS-4	CH4	178.4	334	NNW	0.6
		21:47	21:48	0:02	MS-4	CH4	42.4	337	NNW	0.6
		23:00	23:10	0:11	MS-4	CH4	55.3	325	NW	1.1
		23:17	23:43	0:27	MS-4	CH4	62	283	W	0.4
	09/24/22	19:56	20:35	0:40	MS-4	CH4	123.2	336	NNW	0.5
		20:50	20:50	0:01	MS-3	CH4	40.7	228	SW	0.5
		21:21	21:32	0:12	MS-4	CH4	61.8	182	S	1.4
		21:50	22:06	0:17	MS-4	CH4	60.7	185	S	0.9
		21:52	22:11	0:20	MS-3	CH4	66.4	190	S	0.8
		21:55	22:06	0:12	MS-2	CH4	56.9	163	SSE	1.2
		23:39	23:45	0:07	MS-4	CH4	45.1	220	SW	1.6
	09/25/22	0:27	0:42	0:16	MS-4	CH4	71.2	309	NW	0.7
		0:58	1:28	0:31	MS-4	CH4	78.2	336	NNW	0.9
	09/29/22	17:51	18:00	0:10	MS-3	CH4	56.7	172	S	0.8
		18:33	18:46	0:14	MS-4	CH4	51.8	337	NNW	0.8
		19:07	19:08	0:02	MS-6	CH4	99.8	314	NW	2.6
		19:16	20:10	0:55	MS-4	CH4	101.2	334	NNW	0.9
		20:22	20:35	0:14	MS-4	CH4	59.2	325	NW	1.3
		20:53	21:13	0:21	MS-4	CH4	58.2	316	NW	0.9
		21:31	22:28	0:58	MS-4	CH4	62.2	321	NW	1.2
		22:55	23:31	0:37	MS-6	CH4	50.5	12	N	0.4
		23:44	0:00	0:17	MS-6	CH4	99.4	360	N	0.3
	09/30/22	23:45	23:46	0:02	MS-4	CH4	41.1	319	NW	2.2
		0:00	1:44	1:45	MS-6	CH4	102	288	WNNW	0.5
		0:11	2:21	2:11	MS-5	CH4	44.9	38	NE	0.7
		0:59	1:01	0:03	MS-4	CH4	99.5	310	NW	2.7
		2:39	2:52	0:14	MS-4	CH4	51.7	335	NNW	1.5
		3:16	3:21	0:06	MS-4	CH4	43.1	311	NW	2.5
		18:55	19:08	0:14	MS-4	CH4	61.5	308	NW	1.5
		19:22	19:44	0:23	MS-4	CH4	55.9	321	NW	1.5
	10/03/22	20:37	20:42	0:06	MS-4	CH4	41.6	308	NW	2.7
		17:31	17:32	0:02	MS-4	CH4	42.8	9	N	0.5
		18:16	18:27	0:12	MS-4	CH4	47.6	330	NW	0.9
		19:01	19:37	0:37	MS-4	CH4	95.9	320	NW	0.8
		20:36	20:55	0:20	MS-4	CH4	59	351	N	0.8
		21:56	22:20	0:25	MS-6	CH4	52.9	317	NW	0.4
		22:40	22:49	0:10	MS-6	CH4	45.4	239	SW	1.2
		23:19	23:24	0:06	MS-6	CH4	41.5	184	S	0.7
	10/04/22	23:27	23:37	0:11	MS-4	CH4	43.4	328	NW	1.4
		23:40	23:59	0:20	MS-6	CH4	49.2	352	N	0.8
		0:00	1:18	1:19	MS-6	CH4	92	332	NNW	0.9
		3:27	3:28	0:02	MS-4	CH4	40.4	320	NW	1.4
		3:41	3:58	0:18	MS-4	CH4	49.1	313	NW	1.7
		17:43	18:30	0:48	MS-6	CH4	52.4	301	NW	2.6
		17:48	18:01	0:14	MS-4	CH4	49.5	334	NNW	0.6
	10/05/22	18:47	19:02	0:16	MS-6	CH4	43.5	305	NW	3.3
		19:20	19:22	0:03	MS-6	CH4	40.8	306	NW	3.2
		2:13	2:25	0:13	MS-4	CH4	54.2	334	NNW	1.3
		17:43	17:49	0:07	MS-3	CH4	44.8	250	WSW	0.5
		17:51	18:16	0:26	MS-4	CH4	50.6	234	SW	1.9
		18:34	18:58	0:25	MS-3	CH4	46.1	337	NNW	0.9
	18:35	19:01	0:27	MS-2	CH4	44.5	341	NNW	0.9	

AHL Action Level Log
Perimeter Monitoring System

Comparison of Complaint Hours to Total Operating Hours	Date (EST)	Start Time (EST)	End Time (EST)	Duration	Monitor	Sensor	Maximum Reading	Wind Direction (Out of) Degrees	Wind Direction (Out of)	Wind Speed (Average)
16		18:55	19:06	0:12	MS-4	CH4	43.2	311	NW	1.8
		20:55	21:22	0:28	MS-4	CH4	55.2	322	NW	2.1
		21:30	21:42	0:13	MS-4	CH4	48.3	332	NNW	1.6
	10/06/22	1:50	2:03	0:14	MS-4	CH4	46.5	306	NW	0.9
	10/10/22	22:32	23:00	0:29	MS-3	CH4	56.7	148	SE	0.6
		23:51	23:59	0:09	MS-4	CH4	77.5	87	E	0.3
	10/11/22	0:00	0:06	0:07	MS-4	CH4	76.6	100	E	0.3
		23:21	23:24	0:04	MS-4	CH4	47.7	5	N	0.4
	10/12/22	0:59	1:01	0:03	MS-4	CH4	40.4	24	NNE	0.5
		2:37	2:58	0:22	MS-4	CH4	88.3	354	N	0.7
		3:48	4:06	0:19	MS-4	CH4	79.6	43	NE	0.5
		4:20	4:32	0:13	MS-4	CH4	54.9	37	NE	0.6
		5:08	5:09	0:02	MS-4	CH4	41.3	350	N	0.8
	5:19	5:44	0:26	MS-4	CH4	66.8	88	E	0.7	
	10/13/22	22:59	23:14	0:16	MS-3	CH4	49.2	229	SW	4.4
	10/14/22	1:04	1:09	0:06	MS-3	CH4	41.6	229	SW	3.8
	10/15/22	0:29	0:38	0:10	MS-4	CH4	50.1	274	W	0.5
	10/20/22	1:46	1:46	0:01	MS-3	CH4	40.4	223	SW	3
		1:56	1:56	0:01	MS-3	CH4	40.4	220	SW	3
		2:41	2:43	0:03	MS-3	CH4	40.8	221	SW	3.3
	10/20/22	17:33	17:45	0:13	MS-6	CH4	59.5	277	W	1
	10/21/22	0:27	0:31	0:05	MS-4	CH4	42.6	41	NE	0.6
	10/23/22	23:52	23:56	0:05	MS-4	CH4	43.9	351	N	0.7
	10/24/22	2:38	2:43	0:06	MS-4	CH4	42.6	312	NW	0.5
		22:44	23:01	0:18	MS-4	CH4	74	345	N	0.6
	10/25/22	0:50	1:04	0:15	MS-4	CH4	50.2	335	NNW	0.6
		1:37	1:46	0:10	MS-4	CH4	55	19	NNE	0.5
		2:02	2:52	0:51	MS-4	CH4	107.8	346	N	0.8
		3:23	3:46	0:24	MS-4	CH4	89.2	354	N	0.5
		4:09	4:20	0:12	MS-2	CH4	56.1	309	NW	0.5
		4:56	5:09	0:14	MS-4	CH4	42.3	196	SSW	0.5
		5:38	5:52	0:15	MS-4	CH4	54	220	SW	0.4
		6:01	6:05	0:05	MS-4	CH4	44.5	217	SW	0.5
		23:31	23:44	0:14	MS-6	CH4	72.8	273	W	0.5
	23:52	23:59	0:08	MS-4	CH4	49.8	228	SW	0.6	
	10/26/22	0:00	0:05	0:06	MS-4	CH4	49.4	207	SSW	0.6
1:03		1:11	0:09	MS-3	CH4	51.3	208	SSW	0.6	
1:37		1:52	0:16	MS-4	CH4	68.6	285	W	0.7	
10/28/22	23:18	23:27	0:10	MS-4	CH4	44.2	179	S	0.4	
	23:35	23:43	0:09	MS-4	CH4	44.3	199	SSW	0.3	
	23:56	23:59	0:04	MS-4	CH4	63.8	314	NW	0.7	
	0:00	0:59	1:00	MS-4	CH4	101.2	328	NW	0.8	
	1:28	2:41	1:14	MS-4	CH4	108.9	326	NW	0.9	
	2:10	2:46	0:37	MS-3	CH4	51.7	332	NNW	0.5	
	2:24	2:26	0:03	MS-2	CH4	42.5	267	W	0.7	
	2:31	2:38	0:08	MS-2	CH4	41.8	281	W	0.4	
	3:00	5:03	2:04	MS-3	CH4	87.2	333	NNW	0.8	
	3:00	5:31	2:32	MS-4	CH4	81.8	323	NW	0.7	

AHL Action Level Log
Perimeter Monitoring System

Comparison of Complaint Hours to Total Operating Hours	Date (EST)	Start Time (EST)	End Time (EST)	Duration	Monitor	Sensor	Maximum Reading	Wind Direction (Out of) Degrees	Wind Direction (Out of)	Wind Speed (Average)
	10/29/22	3:26	4:50	1:25	MS-2	CH4	82.1	276	W	1.1
		3:29	3:39	0:11	MS-1	CH4	48.4	256	W	1.1
		18:27	18:38	0:12	MS-4	CH4	54.7	189	S	1
		21:24	21:47	0:24	MS-4	CH4	57.1	135	SE	0.7
		22:12	22:25	0:14	MS-3	CH4	63.3	154	SSE	0.6
		22:25	22:38	0:14	MS-4	CH4	91.9	13	N	0.6
		22:56	23:07	0:12	MS-4	CH4	45.4	271	W	0.4
		23:02	23:09	0:08	MS-3	CH4	45	323	NW	0.9
	10/30/22	0:42	0:54	0:13	MS-3	CH4	60.4	141	SE	0.5
		0:53	1:08	0:16	MS-4	CH4	60.6	180	S	0.4
		1:28	4:04	2:37	MS-4	CH4	136.9	288	WNW	0.5
		1:41	1:44	0:04	MS-3	CH4	42.5	302	NW	1.5
		4:25	4:38	0:14	MS-4	CH4	53.9	129	SE	0.4
		6:21	6:38	0:18	MS-4	CH4	66.1	338	NNW	0.9
		17:00	17:02	0:03	MS-4	CH4	50.3	31	NE	0.5
		17:12	17:24	0:13	MS-4	CH4	57.8	112	ESE	0.5
		17:50	17:53	0:04	MS-4	CH4	40.9	118	ESE	0.7
		20:36	20:36	0:01	MS-4	CH4	41.1	160	SSE	1
		21:24	21:40	0:17	MS-4	CH4	84.9	345	N	0.6
60	10/31/22	0:50	0:50	0:01	MS-4	CH4	40.5	340	NNW	0.5
		20:24	20:39	0:16	MS-3	CH4	49.7	174	S	0.4
		21:33	21:46	0:14	MS-4	CH4	48.3	208	SSW	0.7
		21:33	23:06	1:34	MS-6	CH4	74.5	252	WSW	1.1
		22:03	22:24	0:22	MS-4	CH4	55.9	203	SSW	0.8
		22:14	22:22	0:09	MS-3	CH4	43.1	201	SSW	1.2
64	11/01/22	17:16	17:59	0:44	MS-2	CH4	53.5	295	WNW	1.8
		17:24	17:38	0:15	MS-3	CH4	51.5	358	N	0.9
		18:09	18:09	0:01	MS-3	CH4	40.4	343	NNW	1.4
	11/02/22	6:41	6:58	0:18	MS-4	CH4	100.5	306	NW	2.4
		7:30	7:32	0:03	MS-4	CH4	40.7	321	NW	1.5
		8:03	9:06	1:04	MS-6	H2S	80.6	70	ENE	0.4
		17:21	17:32	0:12	MS-4	CH4	46	203	SSW	0.7
		21:19	21:41	0:23	MS-4	CH4	60.8	236	SW	0.5
	11/03/22	22:11	22:17	0:07	MS-4	CH4	43.9	297	WNW	0.7
		23:33	23:40	0:08	MS-4	CH4	44	113	ESE	0.5
		0:25	0:27	0:03	MS-4	CH4	42.9	209	SSW	0.5
		0:38	0:38	0:01	MS-4	CH4	41.5	285	W	0.8
		4:03	4:09	0:07	MS-6	CH4	44.4	278	W	0.3
	11/04/22	22:50	23:03	0:14	MS-4	CH4	60	337	NNW	0.9
		0:58	1:16	0:19	MS-4	CH4	76	308	NW	1
		1:39	1:48	0:10	MS-4	CH4	54.6	344	NNW	1
		2:32	2:44	0:13	MS-4	CH4	60.3	328	NW	0.8
		3:23	3:30	0:08	MS-4	CH4	45.9	29	NNE	1.2
		4:02	4:11	0:10	MS-4	CH4	48.2	349	N	0.8
	11/09/22	6:18	6:24	0:07	MS-4	CH4	52.5	347	N	0.5
		19:41	19:53	0:13	MS-4	CH4	68.4	304	NW	0.7
	11/10/22	20:17	21:30	1:14	MS-4	CH4	131.1	350	N	0.4
		18:36	18:48	0:13	MS-4	CH4	53.5	350	N	0.7
	11/11/22	19:03	19:38	0:36	MS-4	CH4	72.2	334	NNW	0.7
		0:01	3:30	3:30	MS-4	CH4	215.7	326	NW	0.5
	11/15/22	5:14	5:29	0:16	MS-4	CH4	58.8	220	SW	0.6
		21:46	22:08	0:23	MS-4	CH4	63	325	NW	0.5
	11/21/22	20:29	21:11	0:43	MS-4	CH4	58.7	269	W	0.7
		20:40	20:59	0:20	MS-3	CH4	76.5	303	NW	0.5
202	11/22/22	7:36	7:36	0:01	MS-3	CH4	40.7	190	S	0.4
		2:01	3:14	1:14	MS-4	CH4	98.1	189	S	0.5
		2:06	2:09	0:04	MS-6	CH4	40.3	332	NNW	0.5
		2:24	2:55	0:32	MS-3	CH4	50	110	ESE	0.2
		2:30	2:38	0:09	MS-2	CH4	49	260	W	1
		4:12	4:24	0:13	MS-6	CH4	48.7	266	W	0.6

AHL Action Level Log
Perimeter Monitoring System

Comparison of Complaint Hours to Total Operating Hours	Date (EST)	Start Time (EST)	End Time (EST)	Duration	Monitor	Sensor	Maximum Reading	Wind Direction (Out of) Degrees	Wind Direction (Out of)	Wind Speed (Average)
9	11/23/22	4:44	4:51	0:08	MS-4	CH4	49.2	314	NW	1.4
		5:23	5:35	0:13	MS-4	CH4	66.9	324	NW	0.6
		5:17	5:37	0:21	MS-6	CH4	51.7	339	NNW	0.5
		6:11	6:49	0:39	MS-6	CH4	46.8	161	SSE	0.6
		6:12	6:49	0:38	MS-2	CH4	60.7	276	W	1
		6:15	6:28	0:14	MS-3	CH4	53.3	319	NW	1.7
		6:21	6:48	0:28	MS-4	CH4	55.3	340	NNW	1.2
		7:37	7:37	0:01	MS-6	CH4	40.1	358	N	0.8
		17:14	17:14	0:01	MS-3	CH4	42	218	SW	1.1
		18:11	18:29	0:19	MS-3	CH4	51.4	194	S	0.5
		18:21	18:35	0:15	MS-4	CH4	65.9	188	S	1.1
		19:09	19:43	0:35	MS-3	CH4	53.4	177	S	0.7
		19:11	19:17	0:07	MS-2	CH4	45.4	146	SE	1.1
		20:32	20:55	0:24	MS-4	CH4	48.1	209	SSW	0.9
		21:41	21:41	0:01	MS-2	CH4	42.9	153	SSE	2.2
21:55	22:05	0:11	MS-4	CH4	42.3	208	SSW	1.7		
22:26	22:50	0:25	MS-4	CH4	52.6	213	SW	2.2		
9	11/24/22	4:09	4:12	0:04	MS-6	CH4	53.5	170	S	0.4
		7:13	7:43	0:31	MS-4	CH4	75.4	349	N	0.4
9	11/25/22	17:46	17:54	0:09	MS-2	CH4	42.4	271	W	3
		22:40	23:05	0:26	MS-4	CH4	74.7	241	WSW	1
9	11/26/22	23:13	23:24	0:12	MS-4	CH4	45.4	233	SW	0.9
		0:05	0:05	0:01	MS-4	CH4	45.3	197	SSW	0.6
9	11/27/22	0:25	0:37	0:13	MS-4	CH4	75.3	288	WNW	0.9
		0:55	0:57	0:03	MS-4	CH4	43.9	226	SW	2
		2:25	2:33	0:09	MS-3	CH4	50.7	191	S	1.9
		2:31	2:42	0:12	MS-2	CH4	131.1	134	SE	1.8
		2:58	3:13	0:16	MS-4	CH4	69	155	SSE	1.1
		3:07	3:08	0:02	MS-3	CH4	41.1	167	S	1.6
		3:52	3:59	0:08	MS-6	CH4	49.3	185	S	0.5
		4:11	4:23	0:13	MS-6	CH4	56.4	310	NW	0.5
		5:09	5:16	0:08	MS-4	CH4	64.4	71	ENE	1.3
		5:14	8:58	3:45	MS-6	CH4	81.7	332	NNW	1.1
9	11/28/22	17:57	18:10	0:14	MS-6	CH4	46.4	18	NNE	0.7
		18:14	18:28	0:15	MS-4	CH4	52	231	SW	0.6
		18:16	18:27	0:12	MS-3	CH4	49.6	241	WSW	0.7
		18:18	18:29	0:12	MS-2	CH4	67.3	193	S	1.2
		21:34	21:53	0:20	MS-6	CH4	66.7	51	NE	0.9
9	11/29/22	0:41	1:51	1:11	MS-6	CH4	88.1	35	NE	0.8
9	11/30/22	0:38	0:46	0:09	MS-4	CH4	51.1	360	N	0.7
9	12/05/22	17:41	17:54	0:14	MS-4	CH4	52.4	296	WNW	0.7
		21:59	23:58	2:00	MS-4	CH4	112.3	270	W	1.2
		22:08	23:12	1:05	MS-2	CH4	110.3	282	W	1.3
		22:08	23:09	1:02	MS-3	CH4	131.4	320	NW	0.9
		22:07	22:16	0:10	MS-6	CH4	40.9	330	NW	2.1
23:35	23:58	0:24	MS-6	CH4	54.5	264	W	0.8		
9	12/06/22	0:00	1:47	1:48	MS-4	CH4	116.3	324	NW	0.5
		0:00	0:40	0:41	MS-6	CH4	45	342	NNW	0.6
		0:50	0:59	0:10	MS-2	CH4	46.6	265	W	1.3
		0:14	2:09	1:56	MS-3	CH4	66.3	224	SW	0.4
		1:14	2:10	0:57	MS-2	CH4	57.7	238	SW	0.9
		2:02	2:16	0:15	MS-1	CH4	48.8	173	S	1.1
		2:31	6:15	3:45	MS-4	CH4	90	3	N	0.7
		2:57	3:01	0:05	MS-2	CH4	41.8	179	S	1.6
		3:37	4:21	0:45	MS-6	CH4	70.1	320	NW	4
		3:47	5:54	2:08	MS-5	CH4	46.7	314	NW	1
		3:54	5:14	1:21	MS-2	CH4	103.1	286	WNW	0.7
		5:41	5:54	0:14	MS-2	CH4	49.9	298	WNW	1.3
		5:55	6:29	0:35	MS-6	CH4	57.5	319	NW	2.4
6:22	6:46	0:25	MS-5	CH4	40.3	325	NW	1.6		

Table 2 - AHL Perimeter Monitors

Sept 20 - Dec 6, 2022

MS1-MS6 Hourly CH4 > 40 ppm with MS7 Readings

Date/Time	Monitoring ID	CH4 (ppm)	MS-7 CH4 (ppm)	WindSpeed (mph)	Wind Direction	CH4 Diff from MS7 (ppm)	% Reduced	Complaint Logged (Y/N)	Root Cause
9/23/2022 20:00	MS-4	49	29	1.1	SW	-20	-40%	N	Undetermined
9/29/2022 20:00	MS-4	60	54	1.1	NW	-6	-11%	N	Insufficient Cover
9/29/2022 21:00	MS-4	43	52	1.1	NW	9	21%	N	
9/29/2022 22:00	MS-4	44	47	1.3	NW	3	8%	N	
9/30/2022 0:00	MS-6	67	34	0.4	N	-33	-50%	N	
9/30/2022 1:00	MS-5	43	35	1.3	N	-8	-18%	N	
9/30/2022 1:00	MS-6	63	35	0.4	N	-28	-44%	N	
9/30/2022 2:00	MS-5	42	29	1.1	N	-13	-31%	N	
9/30/2022 2:00	MS-6	41	29	1.3	NW	-12	-30%	N	Undetermined
10/3/2022 20:00	MS-4	50	18	1.1	NW	-32	-64%	N	
10/4/2022 1:00	MS-6	69	17	0.9	NW	-52	-76%	N	
10/4/2022 19:00	MS-6	40	16	3.1	NW	-24	-61%	N	EGLE Requested Lower West Slope vacuum installation
10/25/2022 3:00	MS-4	64	10	0.7	N	-54	-84%	N	
10/25/2022 4:00	MS-4	41	8	0.4	NW	-33	-80%	N	
10/29/2022 0:00	MS-4	47	5	0.4	SW	-42	-90%	N	
10/29/2022 1:00	MS-4	69	15	1.8	NW	-54	-79%	N	
10/29/2022 2:00	MS-4	63	10	1.3	NW	-53	-85%	N	
10/29/2022 3:00	MS-3	45	9	0.9	NW	-36	-81%	N	
10/29/2022 3:00	MS-4	63	9	0.7	NW	-54	-86%	N	Dense Fog
10/29/2022 4:00	MS-2	56	6	0.9	W	-50	-90%	N	
10/29/2022 4:00	MS-3	65	6	1.1	NW	-59	-91%	N	
10/29/2022 4:00	MS-4	63	6	0.7	NW	-57	-91%	N	
10/29/2022 5:00	MS-2	44	8	1.1	W	-36	-82%	N	
10/29/2022 5:00	MS-3	60	8	1.1	NW	-52	-86%	N	
10/29/2022 5:00	MS-4	63	8	0.7	N	-55	-87%	N	
10/29/2022 23:00	MS-4	40	13	0.7	NW	-27	-68%	N	
10/30/2022 2:00	MS-4	41	15	1.6	NW	-26	-63%	N	
10/30/2022 3:00	MS-4	58	9	0.7	W	-49	-84%	N	
10/30/2022 4:00	MS-4	64	6	0.7	SW	-58	-91%	N	Insufficient Vacuum Well 290 - Fixed on Nov 4, 2022
10/31/2022 22:00	MS-6	44	42	0.9	W	-2	-5%	N	
10/31/2022 23:00	MS-6	47	25	1.3	W	-22	-46%	N	
11/1/2022 18:00	MS-2	44	22	1.6	W	-22	-51%	Y	Undetermined
11/9/2022 21:00	MS-4	79	4	0.4	N	-75	-94%	N	
11/11/2022 1:00	MS-4	71	5	0.7	N	-66	-92%	N	
11/11/2022 2:00	MS-4	134	19	0.7	NW	-115	-86%	N	
11/11/2022 3:00	MS-4	113	20	0.4	NW	-93	-82%	N	
11/11/2022 4:00	MS-4	55	14	0.9	SW	-41	-75%	N	
11/11/2022 4:00	MS-5	41	14	0.9	W	-27	-66%	N	
11/21/2022 21:00	MS-3	44	16	0.4	N	-28	-64%	N	Frac Tank at Leachate System
11/21/2022 21:00	MS-4	52	16	0.7	W	-36	-69%	N	
11/23/2022 20:00	MS-3	44	8	0.9	S	-36	-82%	Y	
11/23/2022 3:00	MS-4	68	ND	0.7	NW	NA	NA	Y	Frac Tank at Leachate System
11/23/2022 7:00	MS-6	41	ND	0.7	N	NA	NA	Y	
11/24/2022 8:00	MS-4	41	10	1.1	SE	-31	-77%	N	Insufficient Cover
11/27/2022 1:00	MS-4	42	ND	0.9	SW	NA	NA	N	
11/28/2022 6:00	MS-6	61	ND	1.6	NW	NA	NA	N	
11/28/2022 7:00	MS-6	59	ND	0.9	N	NA	NA	N	
11/28/2022 8:00	MS-6	44	ND	1.3	N	NA	NA	N	
11/28/2022 9:00	MS-6	43	ND	1.3	N	NA	NA	N	
11/28/2022 22:00	MS-6	40	ND	0.7	SE	NA	NA	N	
11/29/2022 2:00	MS-6	48	ND	0.9	N	NA	NA	N	Undetermined
12/5/2022 23:00	MS-2	72	ND	1.1	W	NA	NA	N	
12/5/2022 23:00	MS-3	84	ND	0.9	W	NA	NA	N	
12/5/2022 23:00	MS-4	64	ND	1.3	W	NA	NA	N	
12/6/2022 0:00	MS-4	49	ND	0.4	W	NA	NA	N	
12/6/2022 1:00	MS-4	53	ND	1.1	NW	NA	NA	N	
12/6/2022 2:00	MS-2	43	ND	1.3	S	NA	NA	N	
12/6/2022 2:00	MS-3	50	ND	1.3	S	NA	NA	N	
12/6/2022 2:00	MS-4	43	ND	1.3	SW	NA	NA	N	
12/6/2022 3:00	MS-4	50	ND	1.6	W	NA	NA	N	
12/6/2022 4:00	MS-4	54	ND	1.3	NW	NA	NA	N	
12/6/2022 4:00	MS-6	49	ND	1.6	NW	NA	NA	N	
12/6/2022 5:00	MS-2	67	ND	0.9	W	NA	NA	N	
12/6/2022 5:00	MS-4	49	ND	1.1	NW	NA	NA	N	
12/6/2022 5:00	MS-5	45	ND	1.3	NW	NA	NA	N	
12/6/2022 6:00	MS-4	44	ND	1.3	NW	NA	NA	N	
12/6/2022 6:00	MS-5	41	ND	1.3	NW	NA	NA	N	

Note: ND indicates no data was collected from the mobile station MS7. MS7 under repair beginning Nov 27, 2022. No complaints were logged between Nov 27 - Dec 6, 2022.