



June 4, 2019

Ms. Sunny Becker
Washington State Department of Ecology
3190 160th Avenue SE
Bellevue, WA 98008-5452

Subject: First Quarter 2019 Progress Report, Southwest Harbor Project Remediation Areas 1, 2, 3, and 5 Ecology Facility/Site Numbers 2384, 2385, 2127, and 2383

Dear Sunny:

This letter contains the combined quarterly progress report for the Ecology-lead portions of the Southwest Harbor Project (SWHP) for remediation areas (RAs) 1, 2, 3, and 5 and covers January, February, and March 2019. This report satisfies the reporting requirement stipulated in the consent decrees for these sites as modified by the Port's November 15, 2016 letter to Ecology and subsequent communication from Ecology to the Port on December 2, 2016, and June 30, 2017 (see previous Progress Reports for additional details).

A. List of on-site activities that have taken place during the quarter.

Biweekly Landfill Monitoring:

Two detections of methane occurred in the SG sampling points located along Harbor Avenue SW during the reporting period. The first detection was at 11 percent methane in sampling port SG-329 on January 11, 2019. Five subsequent bi-weekly non-detect measurements were obtained following this detection; therefore, this detection was thought to be an anomalous data point. The second detection was in sampling point SG-302 on January 31, 2019. This detection of 0.1 percent was well below the lower explosive limit (LEL) of 5 percent. All other SG sampling points along Harbor Avenue SW were non-detect.

Methane concentrations measured soil vapor probes VP-1 to VP-4 were below the LEL of five percent or non-detect. The SG sampling results and these vapor probe results indicate that methane concentrations remain below the action level of 5 percent beyond the former landfill boundary.

A vicinity map showing the landfill relative to nearby structures is included as Figure 1; a site map showing the extent of the consolidated landfill, extent of the former landfill area, sampling probe/port locations, and the extent of the landfill cap is included as Figure 2; a representative schematic cross section of typical landfill cap construction is included as Figure 3; and a map showing methane concentrations this quarter is included as Figure 4.

The first quarter monitoring results are discussed further in Attachment 1, and monitoring results are presented in Attachment 2.

We will reevaluate the monitoring results and make recommendations as necessary in the next quarterly monitoring report.

B. Detailed description of any deviations from the required tasks not otherwise documented in project plans or amendment requests.

There have been no deviations during the past quarter.

C. Description of all deviations from the schedule during the current quarter and any planned deviations in the upcoming quarter.

One monitoring event was completed during February 2019, due to scheduling issues—although the event was made up on March 1, 2019—making it three monitoring events during the month of March. No deviations are planned in the upcoming quarter.

D. For any deviations in schedule, a plan for recovering lost time and maintaining compliance with the schedule.

No deviations are anticipated.

E. All raw data (including laboratory reports) received by the Port during the past quarter and an identification of the source of the sample.

No raw laboratory data were received during this quarter.

F. A list of deliverables and activities for the upcoming quarter.

The next routine deliverable will be a letter summarizing the monitoring performed during the second quarter of 2019, and will be titled *Second Quarter 2019 Progress Report, Remediation Areas 1, 2, 3, and 5*. This progress report will summarize our updated monitoring plan per Ecology's request. In addition, we will include a summary of our analysis of the correlations of observed methane concentrations with seasonal variations and atmospheric pressure. Biweekly monitoring will continue until monitoring results indicate stable methane concentrations.

The next semiannual inspection of site pavement caps, drainage, ballast cover areas, fencing, and warning signs is scheduled for the second quarter of 2019.

Please contact me at (206) 787-3193 if you have any questions or comments about our activities at the SWHP site.

Sincerely,



Brick Spangler
Sr. Environmental Program Manager

Attachments:

Figure 1 – Vicinity Map Showing Nearby Structures

Figure 2 – Site Plan

Figure 3 – Cap Schematic Cross Section

Figure 4 – Methane Monitoring Results

Attachment 1 – Terminal 5 Landfill Gas Collection and Treatment System Monitoring Results
Memorandum – First Quarter 2019

Attachment 2 – Terminal 5 Landfill Gas Collection and Treatment System Monthly Monitoring Results
Tables – First Quarter 2019

cc: Warren Hansen – Windward Environmental, LLC
Mark Dagel – Hart Crowser, Inc.



Legend

--- Approximate Geomembrane Limits

0 250 500 1,000
Feet



Port of Seattle, Southwest Harbor Terminal 5
Seattle, Washington

Vicinity Map Showing Nearby Structures

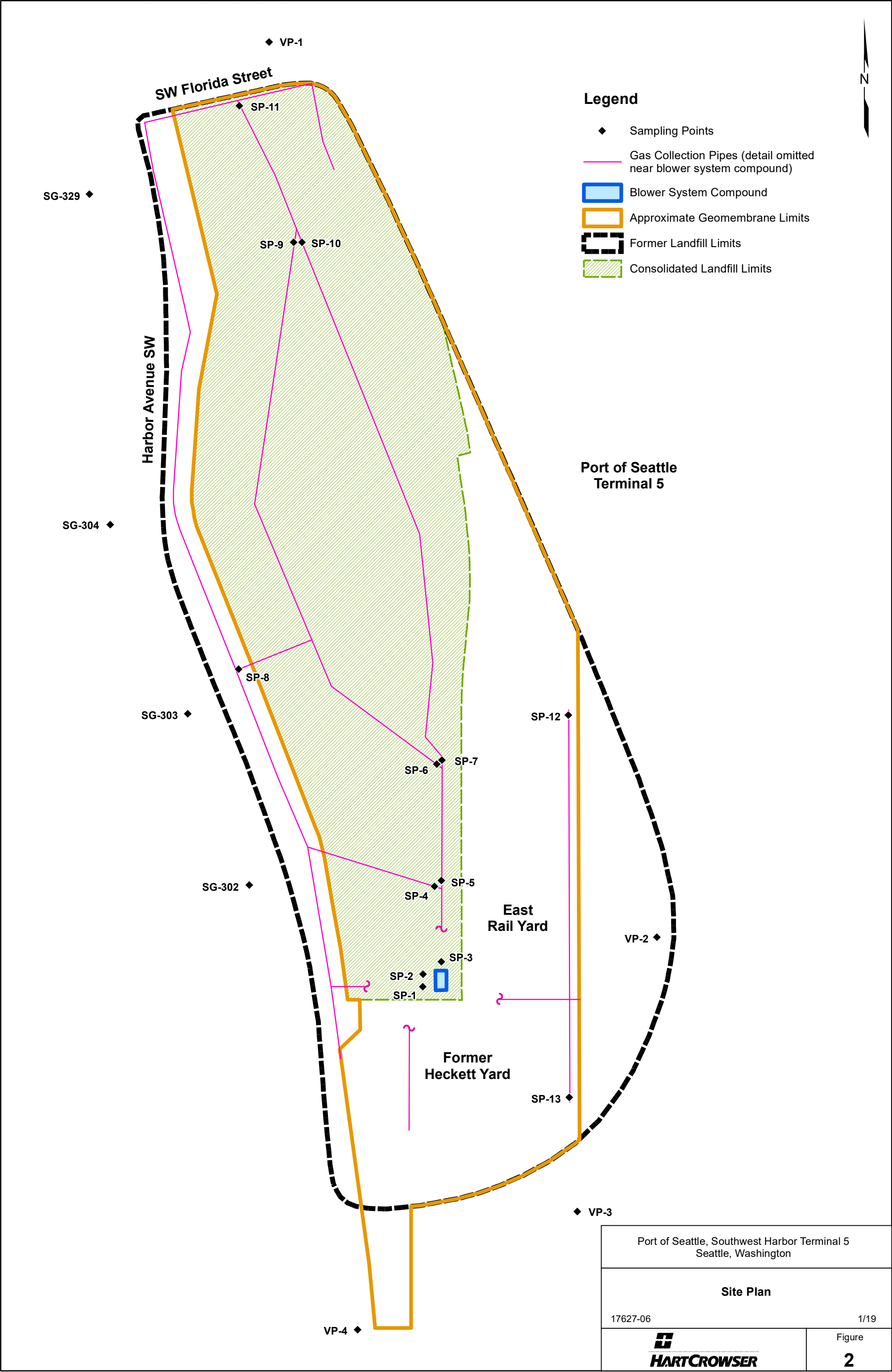
17627-06

1/19

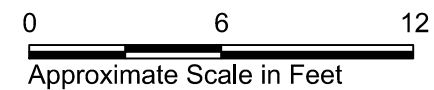
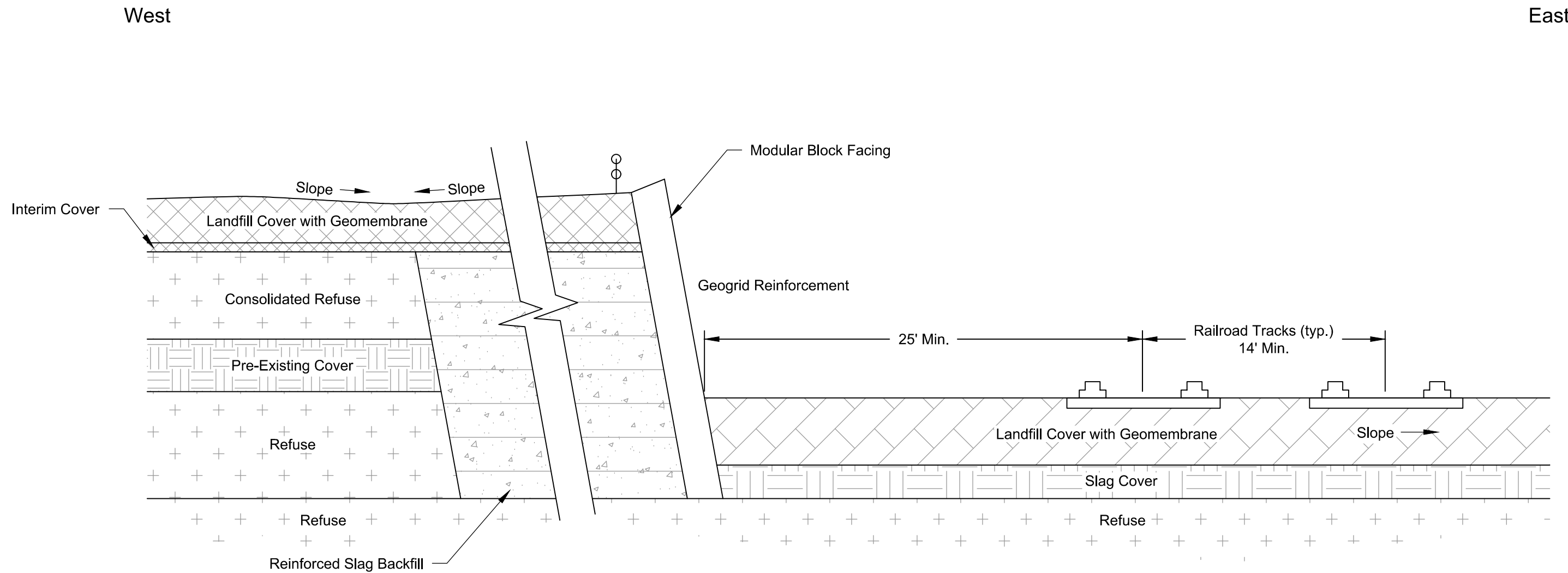


Figure


1

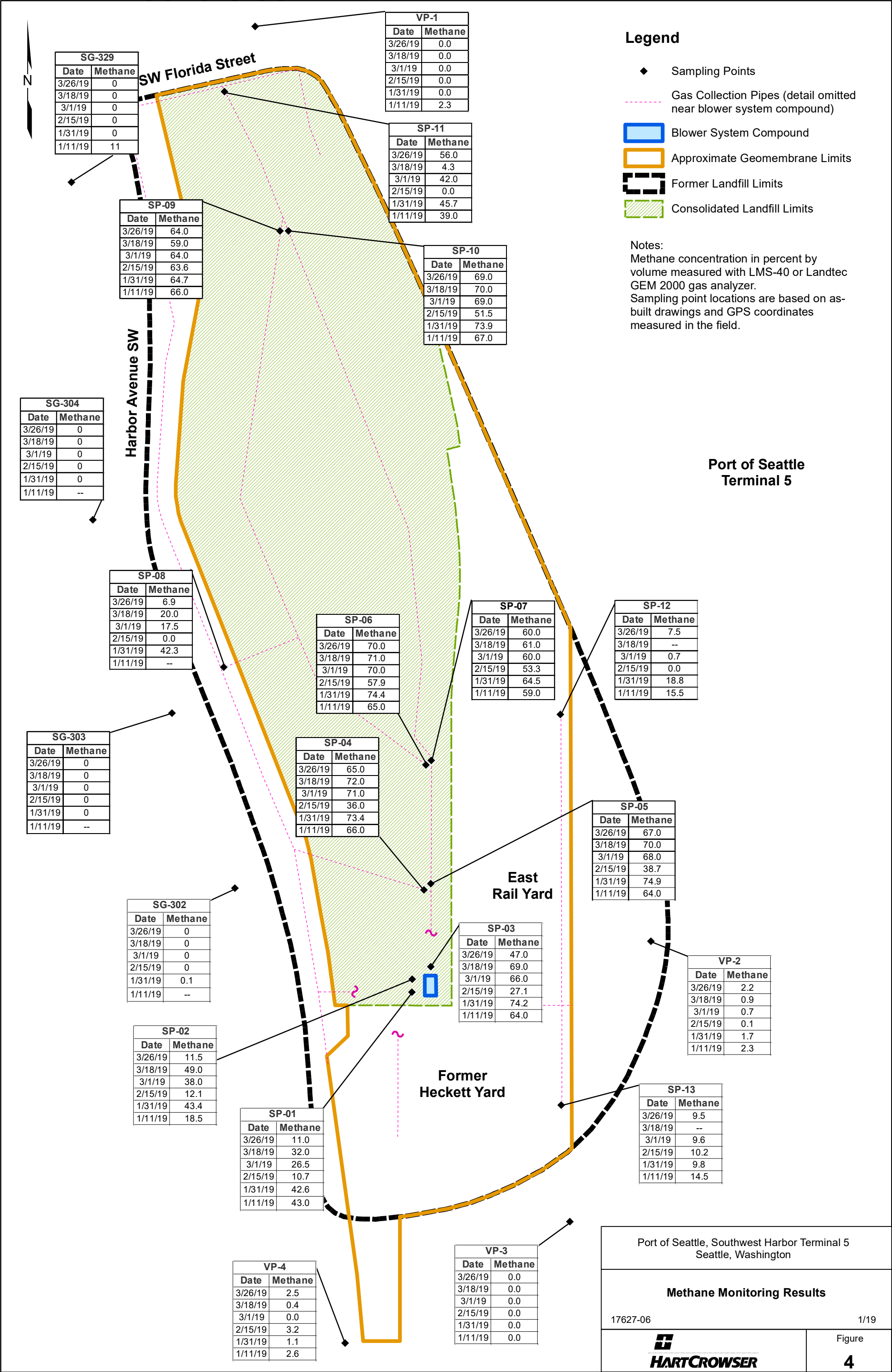


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Sources: Figure prepared from PDF "Cross Section - Final Landfill Cover System," created by Woodward-Clyde Consultants, dated 2/21/95.

Port of Seattle, Southwest Harbor Terminal 5 Seattle, Washington	
Cap Schematic Cross Section	
17627-06	1/19
	Figure 3





ATTACHMENT 1

Terminal 5 Landfill Gas Collection and Treatment System

Monitoring Results Memorandum

First Quarter 2019

MEMORANDUM

DATE: June 4, 2019

TO: Brick Spangler, Port of Seattle

FROM: Jamalyn Green and Mark Dagel, Hart Crowser

RE: **Terminal 5 Landfill Gas Collection System Monitoring Results**
First Quarter 2019
17627-06

This memorandum presents the results of the first quarter of 2019 monitoring at the Terminal 5 (T-5) Remediation Area 3 landfill gas collection system.

First Quarter Monitoring Summary

This quarter's report includes biweekly monitoring from January through March 2019. Gas concentrations were measured in the field using a LMS-40 or Landtec GEM 2000 gas analyzer. The landfill gas collection system was converted to a passive system in December 2016, by replumbing the system discharge piping to bypass the blower and shutting the blower off.

Monitoring was performed at the following locations:

- System effluent sampling port BV-1;
- System sampling ports SP-01 through SP-13;
- Off-site soil gas probes SG-302, SG-303, SG-304, and SG-329; and
- Former landfill boundary soil vapor probes VP-1, VP-2, VP-3, and VP-4.

Monitoring locations are shown on Figure 2. Results are presented in Attachment 2 and summarized below.

Effluent Sampling Port Results

Effluent sample port BV-1 is located within the system manifold and represents the vapor concentrations that are exiting the system via the discharge stack. Methane concentrations during this quarter ranged from 15.4 to 61.2 percent by volume. Carbon dioxide concentrations ranged from 3.9 to 6.5 percent by volume. Oxygen concentrations ranged from non-detect to 3.9 percent by volume.



Additional parameters measured within the system manifold were vapor temperature and flow rate. Temperature was measured at in-line temperature gage T-1 and averaged 44°F; consistent with normal ambient subsurface conditions for this time of year. Flow rate was monitored at flow meter F1, located between BV-1 and the condensate drum. The meter indicated a flow rate of non-detect; however, the existing meter was originally installed to measure the higher flow rates in an active system and is not sensitive enough to detect the low flow rates in the current passive system.

Collection System Sampling Port Results

Sampling ports SP-01 through SP-13 allow vapor samples to be collected from various locations within the underground gas collection piping system (Figure 2). Sampling ports SP-12 and SP-13 are located in the easternmost arm of the collection system.

During this quarter, methane concentrations ranged from non-detect to 74.9 percent, carbon dioxide concentrations ranged from non-detect to 15.1 percent, and oxygen concentrations ranged from non-detect to 21.9 percent.

Temperature within each of the sampling ports was measured with an infrared thermometer and values ranged from 43° to 65°F.

Off-Site Soil Gas Probe Results

Off-site soil gas probes SG-302, SG-303, SG-304, and SG-329 are located to the west of the landfill along Harbor Avenue. There were methane detections in two gas probes during this sampling period. The first detection was in sampling probe SG-329 at a concentration of 11 percent on January 11, 2019, above the lower explosive level (LEL) of 5 percent. Ecology was contacted, and a plan was developed to address any future detections, because it was the second detection above the LEL for this sampling probe within 3 months. Five subsequent non-detect measurements were collected following this monitoring event (January 31, February 15, March 1, March 18, and March 26); therefore, this detection was thought to be spurious. The second detection was in sampling probe SG-302 at a concentration of 0.1 percent on January 31, 2019, well below the lower explosive limit (LEL) of 5 percent. All other sampling probes were non-detect for methane.

Methane concentrations ranged from non-detect to 11 percent, carbon dioxide concentrations ranged from non-detect to 4.3 percent, and oxygen concentrations ranged from non-detect to 9.7 percent. Carbon dioxide concentrations ranged from non-detect to 4.5 percent and oxygen concentrations ranged from 8.0 to 21.8 percent.



Former Landfill Boundary Soil Vapor Probes

Former landfill boundary soil vapor probes VP-1, VP-2, VP-3, VP-4 are located to the north, east, and south of the former landfill boundary. The vapor probes were installed in November 2018. Methane concentrations ranged from non-detect to 3.2 percent, carbon dioxide concentrations ranged from non-detect to 4.0 percent, and oxygen concentrations ranged from non-detect to 19.5 percent.

System Maintenance and Other Notes

None.

Trend Analysis

Since conversion to a passive system, methane and oxygen concentrations throughout the collection piping (SP-01 to SP-13) have shown similar trends. Methane concentrations increased markedly upon conversion to passive operation and, since then, have remained within the typical phase IV landfill decomposition range with month-to-month variation. Oxygen concentrations have remained low with occasional spikes in some sampling ports.

We plan to continue bi-weekly monitoring of the system. Our next report will cover the second quarter of 2019. Please feel free to contact us with any questions or concerns.

\\\\seafs\\Projects\\Notebooks\\1762706_Env_Services_Harbor_Island_and_T-5\\Deliverables\\Reports\\1Q2019 Progress Report\\FINAL_06-04-19\\Attachment 1-T5 Landfill 1Q2019.docx



ATTACHMENT 2

Terminal 5 Landfill Gas Collection and Treatment System

Monthly Monitoring Results Tables

First Quarter 2019

Terminal 5 / RA-3 Landfill Gas Treatment System

Monitoring Results October 2017 - March 2019

**Parameter: PRESSURE (negative)**

(Gauge - inches of water.)

Date	Monitoring Location																				
	SG-302	SG-303	SG-304	SG-329	SP-01	SP-02	SP-03	SP-04	SP-05	SP-06	SP-07	SP-08	SP-09	SP-10	SP-11	SP-12	SP-13	VP-1	VP-2	VP-3	VP-4
26-Mar-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Mar-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	0	0	0	0
01-Mar-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Feb-19	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	>1	0	0	0	0	0	0
31-Jan-19	0	0	0	0	0	0	0.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Jan-19	0	0	0	0	0	0	0	0	0	0	0	0.2	0.1	0	0.6	0	0	0	0	0	0
26-Dec-18	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0
11-Dec-18	0	0	0	0	0	0	0	0	0	0	0	0	0.24	0	0.1	0	0	0	0	0	0
30-Nov-18	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0	0.52	0	0	0	0	0	0
20-Nov-18	0	0	0	0	0	0	0.01	0	0	0	0	0	0.1	0	0	0	0	--	--	--	--
02-Nov-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
08-Oct-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
21-Sep-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
07-Sep-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
30-Jul-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
13-Jul-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
29-Jun-18	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0	0	0	0	--	--	--	--
15-Jun-18	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	--	--	--	--
01-Jun-18	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.001	--	--	--	--
11-May-18	0	0	0	0	0	1.41	0.43	0	0	0	0	0	0	0	0	0	0	--	--	--	--
26-Apr-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
06-Apr-18	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0	0	0	--	--	--	--
07-Mar-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
21-Feb-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
05-Feb-18	0	0	1.0	0	0	0	0.08	0	0	0	0	0	0	0	0	0	0	--	--	--	--
24-Jan-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
09-Jan-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
27-Dec-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
12-Dec-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
27-Nov-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
11-Nov-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
28-Oct-17	0	0	0	0	0.02	0.01	0	0	0	0	0	0	--	0	0	0	0	--	--	--	--
# Readings	32	32	32	32	32	32	32	32	32	32	32	32	30	32	31	31	31	9	9	9	9
Min. value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max. value	0	0	1	0	0.02	1.41	0.43	0.00	0.00	0.00	0.30	0.30	0.24	0.00	0.60	0	0.00	0.00	0.00	0.00	0.00
AVERAGE	0	0	0	0	0.00	0.04	0.02	0.00	0.00	0.00	0.01	0.02	0.02	0.00	0	0	0.00	0.00	0.00	0.00	0.00
Location	SG-302	SG-303	SG-304	SG-329	SP-01	SP-02	SP-03	SP-04	SP-05	SP-06	SP-07	SP-08	SP-09	SP-10	SP-11	SP-12	SP-13	VP-1	VP-2	VP-3	VP-4

Terminal 5 / RA-3 Landfill Gas Treatment System

Monitoring Results October 2017 - March 2019



Parameter: METHANE

(LMS-40 or Landtec GEM 2000 instrument field measurement - percent by volume.)

Date	Monitoring Location																				
	SG-302	SG-303	SG-304	SG-329	SP-01	SP-02	SP-03	SP-04	SP-05	SP-06	SP-07	SP-08	SP-09	SP-10	SP-11	SP-12	SP-13	VP-1	VP-2	VP-3	VP-4
26-Mar-19	0	0	0	0	11.0	11.5	47.0	65.0	67.0	70.0	60.0	6.9	64.0	69.0	56.0	7.5	9.5	0	2.2	0	2.5
18-Mar-19	0	0	0	0	32.0	49.0	69.0	72.0	70.0	71.0	61.0	20.0	59.0	70.0	4.3	--	--	0	0.9	0	0.4
01-Mar-19	0	0	0	0	26.5	38.0	66.0	71.0	68.0	70.0	60.0	17.5	64.0	69.0	42.0	0.7	9.6	0	0.7	0	0
15-Feb-19	0	0	0	0	10.7	12.1	27.1	36.0	38.7	57.9	53.3	0	63.6	51.5	0	0	10.2	0	0.06	0	3.2
31-Jan-19	0.1	0	0	0	42.6	43.4	74.2	73.4	74.9	74.4	64.5	42.3	64.7	73.9	45.7	18.8	9.8	0	1.7	0	1.1
11-Jan-19	--	--	--	11	43.0	18.5	64.0	66.0	64.0	65.0	59.0	--	66.0	67.0	39.0	15.5	14.5	2.3	2.3	0	2.6
26-Dec-18	0	0	0	0	22.5	40.0	57.0	64.0	65.0	65.0	59.0	0	5.7	67.0	35.0	9.7	12.5	0	2.2	0	0
11-Dec-18	0	0.3	0	0	60.0	49.0	68.0	69.0	60.0	68.0	59.0	52.0	65.0	65.0	57.0	37.0	18.0	0	3.0	0	0.7
30-Nov-18	0	0	0	0	33.0	48.0	66.0	68.0	66.0	66.0	57.0	33.0	50.0	65.0	45.0	44.0	20.0	0	2.9	0	2.1
20-Nov-18	0	0	0	11	43.0	52.0	68.0	69.0	69.0	69.0	59.0	46.0	66.0	68.0	53.0	15.0	20.0	--	--	--	--
02-Nov-18	0	0	0	0	10.5	24.5	48.0	47.0	57.0	58.0	46.5	21.5	47.0	58.0	35.5	3.8	11.0	--	--	--	--
08-Oct-18	0	0	0	0	32.5	49.0	66.0	66.0	66.0	67.0	59.0	40.0	63.0	63.0	46.0	16.0	22.0	--	--	--	--
21-Sep-18	0	0	0	0	37.0	51.0	67.0	67.0	68.0	69.0	61.0	42.0	63.0	63.0	46.0	17.5	19.5	--	--	--	--
07-Sep-18	0	0	0	0	40.0	51.0	66.0	67.0	68.0	69.0	61.0	33.0	61.0	63.0	44.5	10.5	17.5	--	--	--	--
30-Jul-18	0	0	0	0	41.0	51.0	65.0	66.0	68.0	70.0	57.0	28.5	59.0	60.0	43.0	5.2	19.0	--	--	--	--
13-Jul-18	0	0	0	0	40.0	48.0	64.0	65.0	66.0	68.0	56.0	20.5	55.0	59.0	0	12.5	29.5	--	--	--	--
29-Jun-18	0	0	0	0	41.0	44.5	60.0	64.0	65.0	69.0	56.0	8.0	55.0	59.0	9.4	8.5	27.5	--	--	--	--
15-Jun-18	0	0	0	0	38.0	50.0	64.0	63.0	65.0	66.0	54.0	27.5	59.0	60.0	15.0	10.5	28.0	--	--	--	--
01-Jun-18	0	0	0	0	20.0	3.9	0	27.5	25.0	57.0	52.0	0.7	57.0	58.0	30.0	4.0	28.0	--	--	--	--
11-May-18	0	0	0	0	24.0	4.7	59.0	60.0	66.0	68.0	50.0	6.6	57.0	60.0	39.0	2.5	25.5	--	--	--	--
26-Apr-18	0	0	0	0	34.0	50.0	62.0	61.0	63.0	65.0	52.0	0	59.0	60.0	43.5	38.0	21.0	--	--	--	--
06-Apr-18	0	0	0	0	36.0	53.0	62.0	62.0	63.0	64.0	51.0	45.5	--	59.0	44.0	41.0	22.0	--	--	--	--
07-Mar-18	0	0	0	0	30.5	48.0	60.0	59.0	61.0	62.0	50.0	43.5	49.0	58.0	36.0	31.0	19.0	--	--	--	--
21-Feb-18	0	0	0	0	21.0	43.5	58.0	65.0	59.0	60.0	52.0	23.0	59.0	64.0	31.0	10.0	22.0	--	--	--	--
05-Feb-18	0	0	0	0	25.0	45.0	46.0	60.0	60.0	61.0	54.0	17.5	50.0	60.0	37.5	5.7	24.5	--	--	--	--
24-Jan-18	0	0	0	0	36.0	46.0	59.0	60.0	60.0	61.0	54.0	34.5	59.0	60.0	40.5	31.5	23.0	--	--	--	--
09-Jan-18	0	0	0	0	40.5	2.7	54.0	56.0	59.0	60.0	51.0	17.0	52.0	60.0	37.0	14.5	25.5	--	--	--	--
27-Dec-17	0	0	0	0	28.0	40.0	64.0	62.0	61.0	62.0	52.0	25.5	63.0	64.0	41.0	5.4	24.5	--	--	--	--
12-Dec-17	0	0	0	0	31.0	31.0	66.0	62.0	62.0	64.0	51.0	27.0	64.0	65.0	43.0	22.0	25.5	--	--	--	--
27-Nov-17	0	0	0	0	13.5	9.0	51.0	18.0	45.0	50.0	43.5	4.8	45.0	59.0	26.0	3.0	33.0	--	--	--	--
11-Nov-17	0	0	0	0	41.0	43.0	60.0	60.0	60.0	61.0	50.0	17.0	57.0	62.0	44.0	7.1	32.0	--	--	--	--
28-Oct-17	0	0	0	0	44.0	47.0	59.0	58.0	61.0	61.0	49.0	40.5	--	60.0	42.0	17.0	26.0	--	--	--	--
# Readings	31	31	31	32	32	32	32	32	32	32	32	31	30	32	32	31	31	9	9	9	9
Min. value	0	0	0	0	10.5	2.7	0.0	18	25.0	50.0	44	0	5.7	51.5	0.0	0	10	0	0	0	0
Max. value	0	0	0	11	60.0	53.0	74.2	73.4	74.9	74.4	64.5	52.0	66.0	73.9	57.0	44.0	33.0	2.3	3.0	0.0	3.2
AVERAGE	0	0	0	1	32.2	37.4	58.3	60.3	61.6	64.6	54.8	23.9	56.7	62.5	36.0	15.0	21.0	0.3	1.8	0.0	1.4
Location	SG-302	SG-303	SG-304	SG-329	SP-01	SP-02	SP-03	SP-04	SP-05	SP-06	SP-07	SP-08	SP-09	SP-10	SP-11	SP-12	SP-13	VP-1	VP-2	VP-3	VP-4

Terminal 5 / RA-3 Landfill Gas Treatment System

Monitoring Results October 2017 - March 2019

**Parameter: CARBON DIOXIDE**

(LMS-40 or Landtec GEM 2000 instrument field measurement - percent by volume.)

Date	Monitoring Location																				
	SG-302	SG-303	SG-304	SG-329	SP-01	SP-02	SP-03	SP-04	SP-05	SP-06	SP-07	SP-08	SP-09	SP-10	SP-11	SP-12	SP-13	VP-1	VP-2	VP-3	VP-4
26-Mar-19	1.1	2.0	1.0	0.8	6.1	2.4	2.8	2.4	4.0	4.6	1.1	6.4	5.0	4.5	3.7	6.3	3.8	3.4	0.2	0	1.2
18-Mar-19	1.1	2.2	1.1	0.6	4.5	15.0	2.6	0	2.6	3.3	0.8	5.9	4.5	3.8	0	--	--	3.1	0.1	0	1.3
01-Mar-19	0.5	2.6	1.9	0.8	4.0	12.0	2.7	0	3.2	3.5	0.8	6.3	4.6	4.2	7.0	0.1	3.8	0.8	0	0	1.3
15-Feb-19	1.0	0	2.1	1.1	7.3	6.3	4.6	4	4.4	5.9	2.6	0	8.2	6.0	0.0	0.0	4.6	1.8	0.02	0	1.7
31-Jan-19	2.3	4.3	2.2	1.6	4.1	15.1	3.5	0	3.4	3.4	0.8	6.0	5.7	4.8	8.1	8.6	4.8	4.0	0.2	0	0.9
11-Jan-19	--	--	--	1.4	2.8	6.6	4.3	0	4.7	4.9	1.2	--	5.8	4.5	4.6	1.9	1.7	2.7	0	0	0.6
26-Dec-18	2.6	4.5	2.9	1.9	7.1	14.0	4.0	4.7	4.7	5.7	1.3	6.4	7.7	5.8	9.1	9.3	4.6	8.0	0	0	0
11-Dec-18	2.6	0.3	3.3	2.2	3.3	15.0	2.9	0	3.3	3.6	0.9	3.8	3.0	2.4	5.1	7.0	5.5	3.9	0	0	0.6
30-Nov-18	2.0	3.2	3.8	2.6	5.1	18.0	3.9	0	3.8	4.0	1.7	9.5	7.8	5.2	10.0	8.5	4.8	4.0	0	0	0.3
20-Nov-18	2.4	3.4	2.4	3.5	5.2	18.0	3.5	0	3.8	4.2	0.9	8.5	4.5	3.8	10.0	8.6	5.0	--	--	--	--
02-Nov-18	2.2	3.0	3.4	0	9.2	6.7	4.0	3.7	7.7	9.3	3.8	13.5	10.0	8.8	10.5	10.0	6.0	--	--	--	--
08-Oct-18	2.1	3.8	3.5	2.1	7.2	19.0	3.9	0	4.2	4.7	2.3	10.0	4.4	4.0	10.0	11.0	5.7	--	--	--	--
21-Sep-18	2.0	4.0	3.6	2.1	6.6	18.0	3.8	0	4.0	4.4	2.4	10.0	4.4	3.9	9.3	12.0	5.7	--	--	--	--
07-Sep-18	1.7	4.1	2.0	2.0	6.6	19.0	3.0	0.1	3.6	4.1	2.3	13.0	4.2	3.7	9.5	13.0	6.2	--	--	--	--
30-Jul-18	1.6	1.9	3.8	1.8	6.6	20.0	3.5	0.2	4.0	4.1	2.1	14.0	4.4	4.0	11.0	12.0	5.4	--	--	--	--
13-Jul-18	2.1	3.2	2.1	1.5	7.1	20.0	4.0	0.2	4.6	4.5	1.9	2.0	4.4	4.1	0	9.9	5.6	--	--	--	--
29-Jun-18	2.4	2.9	2.1	1.5	6.6	18.0	4.1	0.4	4.3	5.1	2.1	8.7	5.6	4.5	3.4	9.8	5.7	--	--	--	--
15-Jun-18	2.4	2.3	2.1	1.5	6.4	21.0	3.4	0	3.9	4.1	1.8	5.8	4.4	3.8	4.2	8.9	4.9	--	--	--	--
01-Jun-18	2.4	2.0	1.9	0.3	8.1	0.7	0	2.6	2.3	4.8	4.5	2.2	6.3	5.9	9.5	9.9	5.5	--	--	--	--
11-May-18	0.1	0.6	1.8	0.7	7.1	0.7	4.5	0.7	5.5	6.1	1.1	6.4	5.6	5.0	11.0	8.9	5.1	--	--	--	--
26-Apr-18	1.4	2.1	0.8	1.0	4.7	21.0	3.2	0	3.6	3.9	0.7	2.0	4.1	3.6	6.4	6.0	4.8	--	--	--	--
06-Apr-18	1.7	2.0	2.1	1.6	4.5	19.0	3.4	0	3.5	4.1	0.7	4.6	--	3.3	6.6	5.8	4.5	--	--	--	--
07-Mar-18	1.3	2.0	1.9	1.2	4.3	17.0	3.9	0	4.4	4.1	0.7	3.8	5.5	3.9	4.0	5.4	4.8	--	--	--	--
21-Feb-18	1.1	1.5	2.0	1.5	5.8	16.0	5.8	0	5.5	6.0	0.8	5.0	5.9	4.7	6.7	7.5	4.8	--	--	--	--
05-Feb-18	0.6	0	0.4	1.8	5.6	16.0	3.7	4.6	4.6	4.8	1.0	6.8	7.1	5.3	8.5	7.1	4.6	--	--	--	--
24-Jan-18	0.5	2.2	2.9	1.8	4.3	16.0	4.3	0.3	4.2	4.9	0.8	2.1	4.9	4.7	7.0	6.0	4.6	--	--	--	--
09-Jan-18	1.2	3.1	2.5	1.8	5.1	1.3	4.2	4.4	6.6	6.5	0.9	7.3	7.5	6.1	8.1	6.4	4.5	--	--	--	--
27-Dec-17	1.5	3.1	3.4	1.8	5.7	15.0	4.6	0	5.2	5.9	1.0	7.5	6.0	5.3	8.1	7.2	4.9	--	--	--	--
12-Dec-17	2.4	3.4	3.2	1.5	5.7	12.0	4.0	0.1	4.9	4.9	0.0	6.2	6.0	4.8	8.1	6.5	5.3	--	--	--	--
27-Nov-17	2.1	3.6	3.7	1.9	8.1	1.1	8.4	2.9	6.6	9.9	2.6	6.9	9.5	8.5	9.6	7.3	5.7	--	--	--	--
11-Nov-17	2.0	3.7	3.4	2.3	6.0	16.0	5.4	1.0	6.1	6.7	1.6	6.6	6.9	5.3	10.0	8.3	5.4	--	--	--	--
28-Oct-17	2.0	4.0	3.6	1.9	5.0	17.0	4.7	0	5.8	5.6	1.1	5.0	--	4.7	12.0	9.4	6.1	--	--	--	--
# Readings	31	31	31	32	32	32	32	32	32	32	32	31	30	32	32	31	31	9	9	9	9
Min. value	0.1	0.0	0	0.0	2.8	0.7	0.0	0.0	2.3	3.3	0.0	0.0	3.0	2.4	0.0	0.0	1.7	0.8	0.0	0.0	0.0
Max. value	2.6	4.5	3.8	3.5	9.2	21.0	8.4	4.7	7.7	9.9	4.5	14.0	10.0	8.8	12.0	13.0	6.2	8.0	0.2	0.0	1.7
AVERAGE	1.7	2.6	2.5	1.6	5.8	13.5	3.9	1.0	4.5	5.1	1.5	6.5	5.8	4.8	7.2	7.7	5.0	3.5	0.1	0.0	0.9
Location	SG-302	SG-303	SG-304	SG-329	SP-01	SP-02	SP-03	SP-04	SP-05	SP-06	SP-07	SP-08	SP-09	SP-10	SP-11	SP-12	SP-13	VP-1	VP-2	VP-3	VP-4

Terminal 5 / RA-3 Landfill Gas Treatment System

Monitoring Results October 2017 - March 2019

**Parameter: OXYGEN**

(LMS-40 or Landtec GEM 2000 instrument field measurement - percent by volume.)

Date	Monitoring Location																				
	SG-302	SG-303	SG-304	SG-329	SP-01	SP-02	SP-03	SP-04	SP-05	SP-06	SP-07	SP-08	SP-09	SP-10	SP-11	SP-12	SP-13	VP-1	VP-2	VP-3	VP-4
26-Mar-19	15.9	18.1	7.7	18.7	1.8	12.0	0.5	0	0.5	0	0.5	5.6	0.5	0.5	4.0	1.1	1.0	0.1	0.5	11.0	0.5
18-Mar-19	15.6	17.7	17.2	19.1	0.5	0.5	0.5	0.5	0.5	0	0.6	0.6	0.5	0.5	19.6	--	--	10.4	0.5	9.5	0.5
01-Mar-19	17.9	16.7	15.0	18.0	2.1	0.6	0.5	0.0	0.0	0.5	5.0	1.0	0.5	0.5	0.5	19.6	0.8	17.0	0.6	8.9	0.6
15-Feb-19	19.3	21.8	18.2	20.0	4.2	4.9	4.3	2.5	2.5	0	1.6	21.9	0	4.8	21.8	21.4	2.9	19.5	0	8.0	0
31-Jan-19	14.4	15.0	0	16.8	0	0	0	0	0	0	0	0	0	0	0	0	0	11.0	0	8.7	0
11-Jan-19	--	--	--	15.0	0	6.0	0	0	0	0	0	--	0	0	2.6	13.1	13.6	9.9	0	8.6	0
26-Dec-18	13.8	14.2	13.7	13.7	0	0	0	0	0	0	0	0	0	0	0	0	0	4.0	0	8.2	8.2
11-Dec-18	14.6	8.6	14.3	14.1	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	9.4	0	8.3	0
30-Nov-18	15.5	14.7	15.4	13.7	0	0	0	0	0	0	0	0	0	0	0	0	0	8.8	0.2	9.7	0
20-Nov-18	15.8	16.4	16.6	8.0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
02-Nov-18	16.1	17.0	16.0	20.6	0.8	1.5	0.3	0	0.1	0	0.5	2.3	0	0.1	0.4	0	4.9	--	--	--	--
08-Oct-18	16.0	16.4	17.1	16.4	0	0	0	0	0	0	0	0	0	0	0	0	0.7	--	--	--	--
21-Sep-18	16.7	16.1	16.8	17.4	0	0.1	0	0	0	0	0	0.1	0	0	0	0.1	0	--	--	--	--
07-Sep-18	17.8	16.2	18.7	17.6	0.3	0.3	0.2	0	0.1	0	0.1	0.3	0.1	0.1	0.2	0.3	0.8	--	--	--	--
30-Jul-18	19.1	18.8	16.0	17.4	0	0	0	0	0	0	0.1	0	0	0	0	0	0	--	--	--	--
13-Jul-18	17.1	16.5	2.2	18.2	0	0	0	0	0	0	0	0.6	0	0	21.0	0	0	--	--	--	--
29-Jun-18	16.5	16.7	18.5	19.1	0	1.4	0	0	0	0	0	5.4	0	0	15.7	0	0.3	--	--	--	--
15-Jun-18	16.3	17.4	18.3	18.9	0	0	0	0	0	0	0	0.2	0	0	13.0	0	0	--	--	--	--
01-Jun-18	15.9	17.8	18.3	20.4	0.1	18.7	21.1	3.0	6.0	0.2	0.2	12.9	0	0	2.6	0	0	--	--	--	--
11-May-18	20.3	19.6	17.5	19.5	0	17.8	0	0	0	0	0	8.6	0	0	0	0	0	--	--	--	--
26-Apr-18	13.5	17.0	18.8	19.5	0	0	0	0	0	0	0	16.5	0	0	0	0	0	--	--	--	--
06-Apr-18	14.7	17.4	15.5	17.5	0	0	0	0	0	0	0	0	--	0	0	0	0	--	--	--	--
07-Mar-18	14.0	16.8	16.1	18.0	0.3	0	0	0.3	0.3	0.3	0.3	0	0.6	0	3.0	0	0.2	--	--	--	--
21-Feb-18	13.4	17.1	16.0	16.7	0.4	0	0	0	1.1	0	0	2.3	0	0	5.1	0	0	--	--	--	--
05-Feb-18	12.6	20.7	20.2	14.9	1.4	1.8	2.0	0	0	0	0.1	2.0	0.9	0.6	2.1	0	0	--	--	--	--
24-Jan-18	13.5	17.3	13.9	14.9	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
09-Jan-18	14.6	16.0	14.9	15.2	0	19.5	0	0	0	0	0	2.9	0	0	0	0	0	--	--	--	--
27-Dec-17	14.5	16.9	13.8	15.8	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
12-Dec-17	14.3	15.4	14.4	16.1	0	0.4	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
27-Nov-17	15.2	15.5	13.5	16.3	0.8	16.0	0	13.4	3.1	0	0	5.8	0	0	0	0	0	--	--	--	--
11-Nov-17	16.5	14.9	16.1	15.7	0	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
28-Oct-17	16.3	15.3	15.7	17.0	0	0	0	0	0	0	0	0	--	0	0	0	0	--	--	--	--
# Readings	31	31	31	32	32	32	32	32	32	32	32	31	30	32	32	31	31	9	9	9	9
Min. value	12.6	8.6	0.0	8.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0
Max. value	20.3	21.8	20.2	20.6	4.2	19.5	21.1	13.4	6.0	0.5	5.0	21.9	0.9	4.8	21.8	21.4	13.6	19.5	0.6	11.0	8.2
AVERAGE	15.7	16.6	15.0	16.9	0.4	3.2	0.9	0.6	0.4	0.0	0.3	2.9	0.1	0.2	3.5	1.8	0.8	10.0	0.2	9.0	1.1
Location	SG-302	SG-303	SG-304	SG-329	SP-01	SP-02	SP-03	SP-04	SP-05	SP-06	SP-07	SP-08	SP-09	SP-10	SP-11	SP-12	SP-13	VP-1	VP-2	VP-3	VP-4

Terminal 5 / RA-3 Landfill Gas Treatment System

Monitoring Results October 2017 - March 2019

**Parameter: TEMPERATURE**

degrees Fahrenheit (est.)

Date	Monitoring Location												
	SP-01	SP-02	SP-03	SP-04	SP-05	SP-06	SP-07	SP-08	SP-09	SP-10	SP-11	SP-12	SP-13
26-Mar-19	50.0	55.0	51.0	53.0	50.0	52.0	51.0	51.0	52.0	56.0	55.0	51.0	50.0
18-Mar-19	47.0	52.0	50.0	51.0	50.0	50.0	51.0	51.0	51.0	53.0	52.0	--	--
01-Mar-19	42.6	51.8	48.9	52.0	65.0	46.0	48.9	51.0	54.0	48.0	43.5	51.0	50.0
15-Feb-19	43.0	43.0	44.0	46.2	50.0	44.0	46.1	50.0	47.0	44.0	46.3	43.1	43.6
31-Jan-19	50.0	52.1	49.9	52.3	56.3	51.6	50.3	53.0	54.1	50.3	52.8	48.7	50.9
11-Jan-19	49.6	51.6	50.0	54.1	51.6	51.8	51.6	--	50.1	50.9	51.3	50.7	48.7
26-Dec-18	47.1	50.7	--	51.6	47.8	50.0	50.0	50.9	48.3	49.7	44.3	48.0	44.4
11-Dec-18	48.2	50.7	48.4	53.0	47.1	51.8	51.4	55.0	46.5	51.8	48.2	51.4	50.1
30-Nov-18	51.8	54.9	54.1	55.9	52.6	54.3	53.6	57.0	51.4	55.7	54.1	50.7	52.1
20-Nov-18	48.7	52.3	47.1	55.5	52.0	52.7	51.4	58.0	49.9	55.4	54.3	51.6	50.7
02-Nov-18	62	65	63	65	62	66	63	61	63	66	62	60	62
08-Oct-18	68	72	69	68	64	61	65	65	65	66	66	63	55
21-Sep-18	74	71	73	73	70	73	69	70	71	75	76	70	71
07-Sep-18	84	89	82	71	81	81	80	74	92	89	81	81	78
30-Jul-18	84.1	93.7	91.0	78.8	79.8	80.9	79.1	75.0	88.3	87.4	89.8	78.2	81.1
13-Jul-18	83.0	86.0	88.7	79.0	86.0	78.0	75.5	69.8	91.0	81.0	82.4	73.0	75.3
29-Jun-18	73.0	79.0	74.0	83.0	68.0	72.0	70.0	65.0	82.0	77.0	76.0	65.0	68.0
15-Jun-18	74.7	81.3	85.3	69.8	81.4	71.6	71.7	73.7	89.0	71.3	71.8	70.5	71.0
01-Jun-18	67.9	73.7	72.3	66.0	66.0	65.6	64.9	66.2	60.9	70.0	65.0	70.3	70.0
11-May-18	66.0	70.3	68.7	62.9	63.1	62.6	60.7	73.9	67.0	66.2	69.4	64.2	66.2
26-Apr-18	60	69	69	64	65	71	78	74	82	80	78	72	78
06-Apr-18	64	65	63	63	58	60	59	63	--	73	69	65	63
07-Mar-18	53	55	54	59	59	51	55	56	51	51	58	51	59
21-Feb-18	52	53	51	52	56	56	49	50	49	51	50	50	51
05-Feb-18	58	59	59	60	59	60	59	59	61	58	58	51	58
24-Jan-18	55	56	51	58	51	58	56	58	53	53	53	54	54
09-Jan-18	55	55	52	59	54	51	56	58	54	54	55	51	55
27-Dec-17	51	50	52	53	53	53	53	48	50	50	50	49	49
12-Dec-17	46	54	49	51	49	48	53	54	57	52	50	47	48
27-Nov-17	48	61	53	63	60	60	60	61	51	56	58	53	51
11-Nov-17	58	48	51	58	61	60	59	61	54	56	58	58	58
28-Oct-17	65	61	61	67	69	70	55	58	--	62	72	66	63
# Readings	32	32	31	32	32	32	32	31	30	32	32	31	31
Min. value	43	43	44	46	47	44	46	48	47	44	44	43	44
Max. value	84	94	91	83	86	81	80	75	92	89	90	81	81
AVERAGE	59	62	60	61	61	60	59	60	61	61	61	58	59
Location	SP-01	SP-02	SP-03	SP-04	SP-05	SP-06	SP-07	SP-08	SP-09	SP-10	SP-11	SP-12	SP-13