



October 31, 2018

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

Subject: Third Quarter 2018 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 July, August, and September 2018. 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:

No methane was detected in the sampling points located along Harbor Avenue SW during the reporting period, confirming that methane is not migrating off-site to the west since the blower has been shut down.

Methane concentrations measured at sampling ports SP-12 and SP-13 continued to exhibit levels above the lower explosive limit (LEL) of five percent. These two sampling ports are located to the east and outside the consolidated landfill area but within the geomembrane-capped footprint of the former landfill where waste is still present. The elevated methane levels observed in SP-12 and SP-13 may reflect continued gas generation from waste in this area. Sampling ports SP-12 and SP-13 are located in a railyard within a limited access, open-air industrial area. The nearest building (maintenance facility) is approximately 400 feet away and outside the geomembrane-capped portion of the former landfill.

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 since September 2017 is included as Figure 4.

The third 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.

The next semiannual inspection is scheduled for the fourth quarter of 2018.

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.

No monitoring was completed during August 2018 because the landfill monitoring was shipped out for calibration. 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.

Landfill gas concentrations measured during July and September remain stable; therefore, no action is needed to recover any lost time. No deviations in the schedule are anticipated moving forward.

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 was received during this quarter.

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

We plan to install four soil vapor probes to further delineate the extent of methane gas within the subsurface originating from the former landfill. Our vapor probe installation plan was approved by Ecology via email on June 12, 2018, and includes the installation of soil vapor probes on the south, east, and north boundaries of the former landfill footprint. Proposed soil vapor probe locations are shown on Figure 5. The field work is currently being coordinated and scheduled by Hart Crowser for November 2018.

The next routine deliverable will be a letter summarizing the monitoring performed during the fourth quarter of 2018, and will be titled, Fourth Quarter 2018 Progress Report, Remediation Areas 1, 2, 3, and 5. This progress report will summarize our updated monitoring plan per Ecology's request. As requested in your email dated June 30, 2017, all sampling ports, including any newly installed sampling ports, will be included in the monitoring plan and 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 fourth quarter of 2018.

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

Figure 5 – Site Plan with Proposed Soil Vapor Probe Locations

Attachment 1 – Terminal 5 Landfill Gas Collection and Treatment System Monitoring Results
Memorandum – Third Quarter 2018

Attachment 2 – Terminal 5 Landfill Gas Collection and Treatment System Monthly Monitoring Results
Tables – Third Quarter 2018

cc: Warren Hansen – Windward Environmental, LLC
Mark Dagele – Hart Crowder, 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

17627-05

1/18



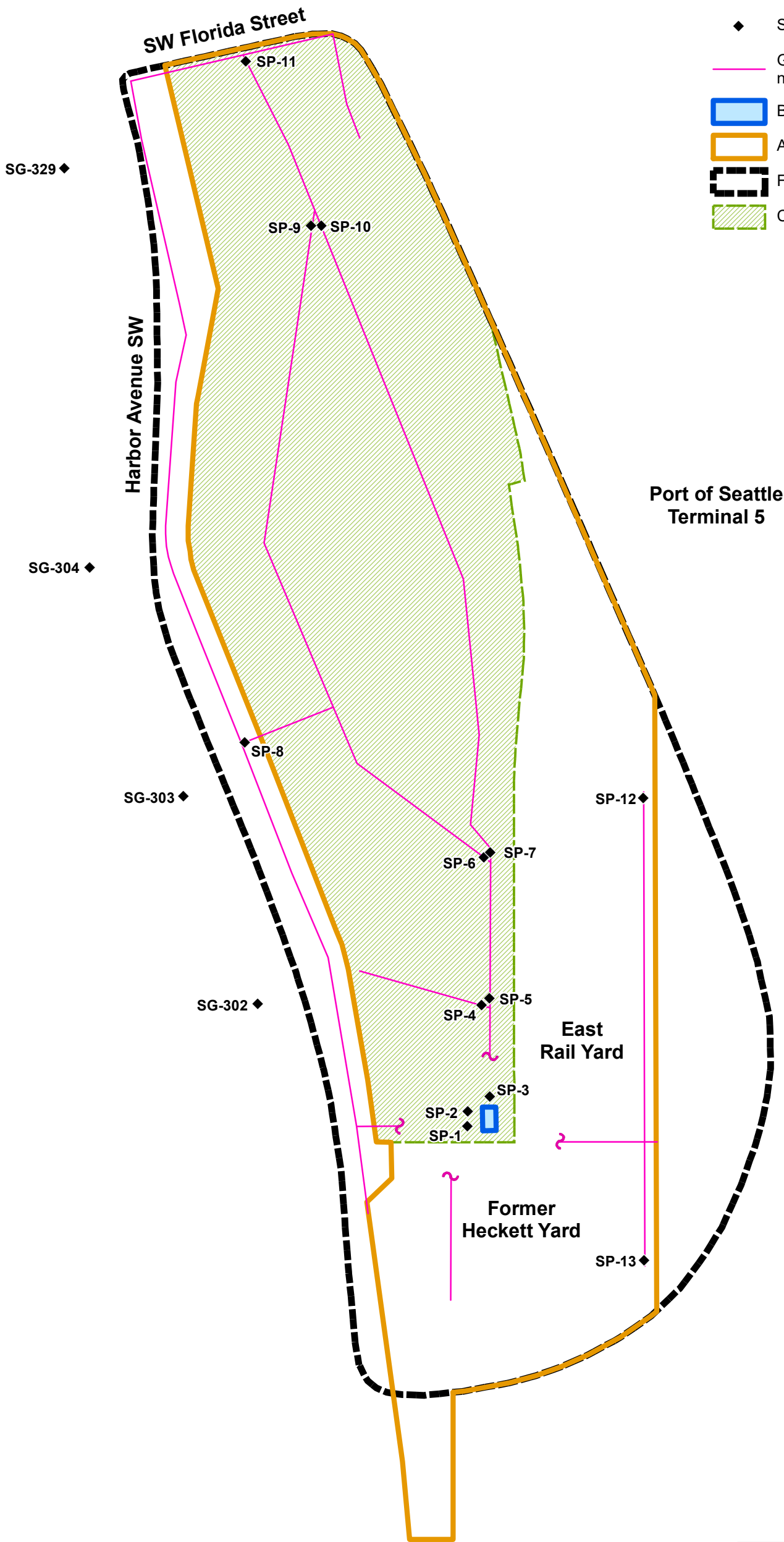
Figure


1



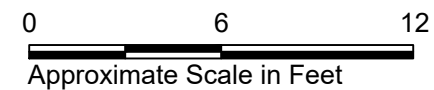
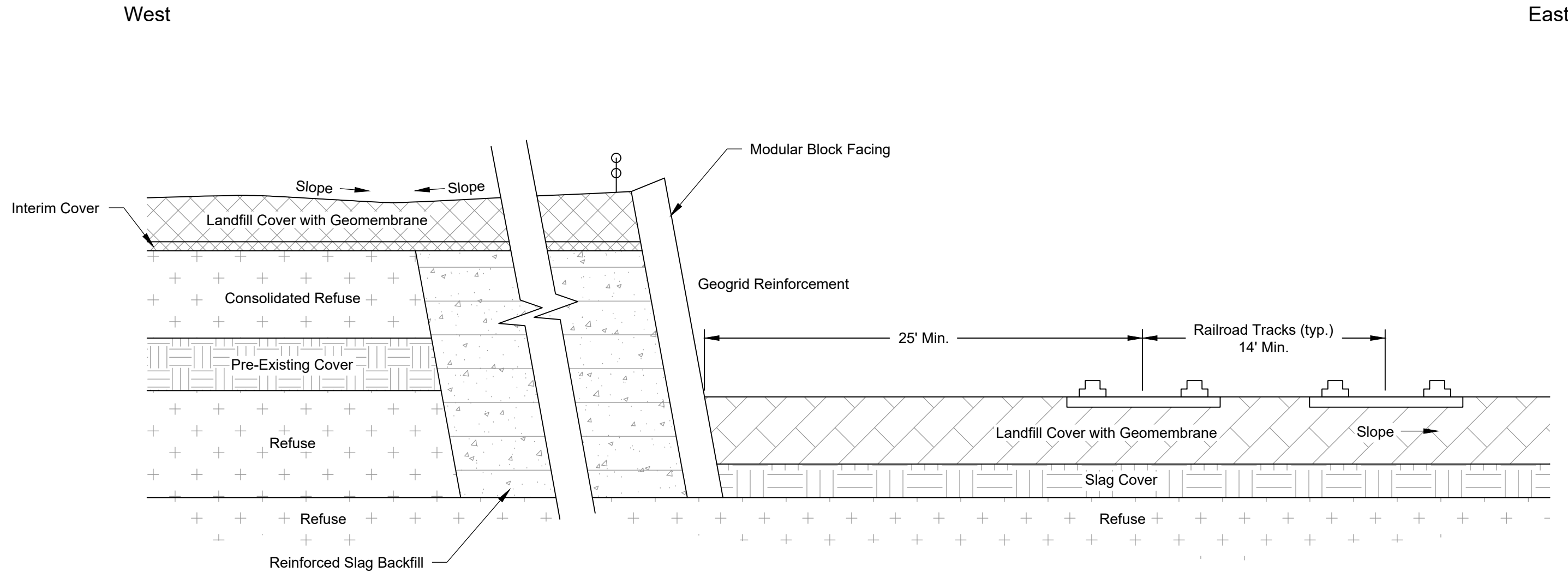
Legend

- ◆ Sampling Points
- Gas Collection Pipes (detail omitted near blower system compound)
- Blower System Compound
- Approximate Geomembrane Limits
- Former Landfill Limits
- Consolidated Landfill Limits



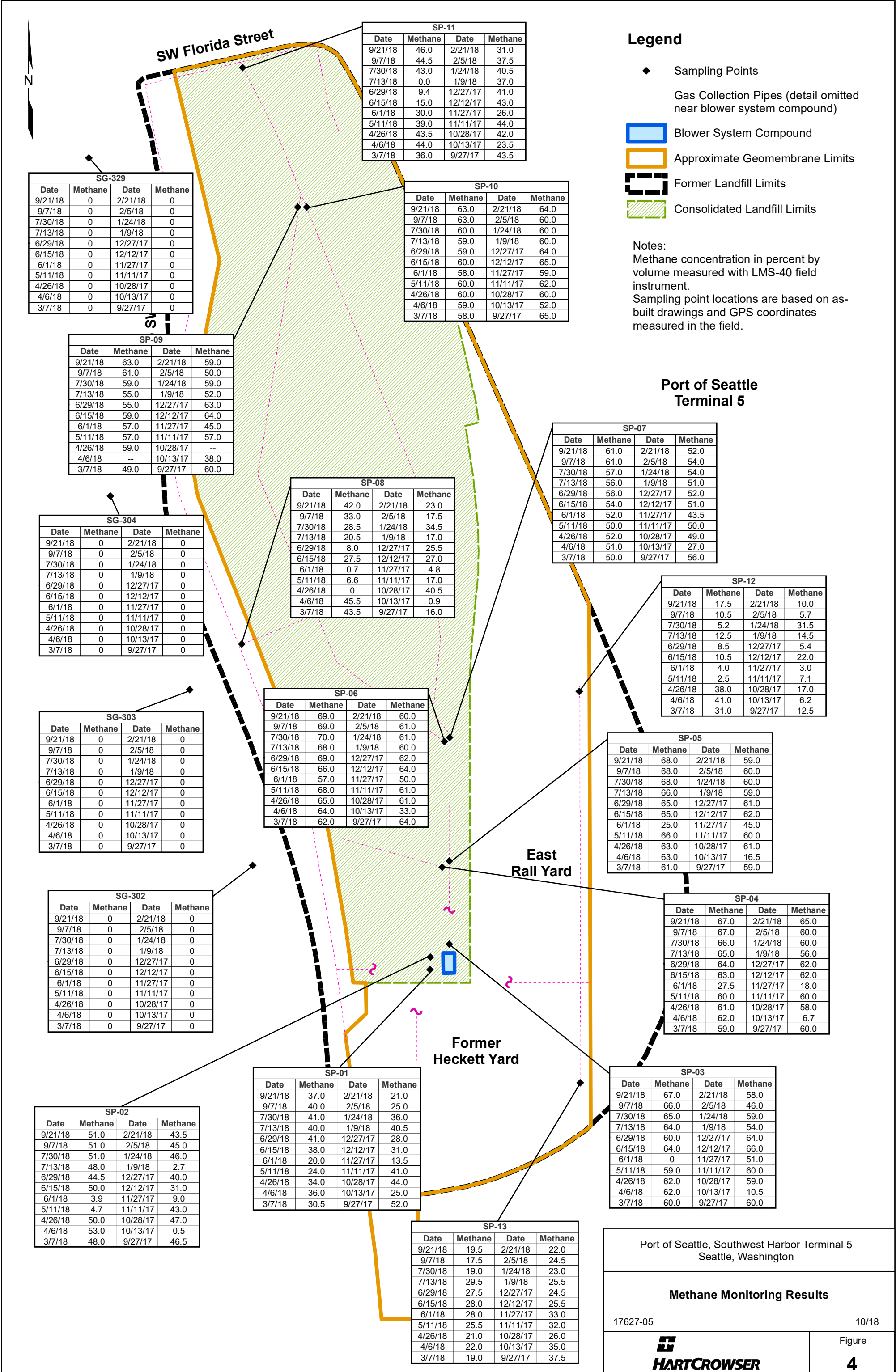
Port of Seattle, Southwest Harbor Terminal 5 Seattle, Washington	
Site Plan	
17627-05	1/18
	Figure 2

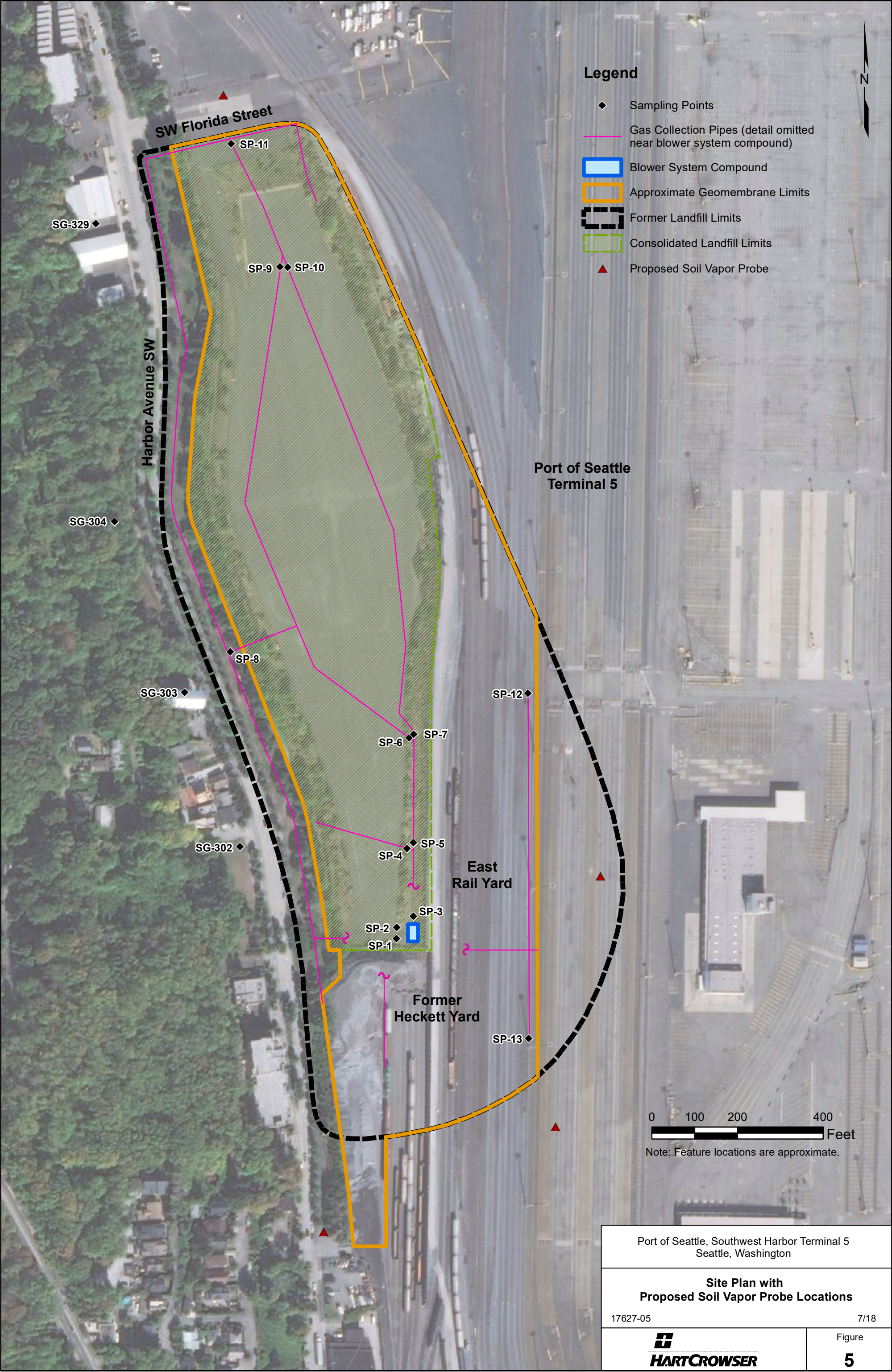
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Sources: Figure prepared from PDF "Cross Section - Final Landfill Cover System," created by Woodward-Clyde Consultants, dated 2/21/95.

Port of Seattle, Southwest Harbor Terminal 5 Seattle, Washington	
Cap Schematic Cross Section	
17627-05	11/17
	Figure 3







ATTACHMENT 1

Terminal 5 Landfill Gas Collection and Treatment System

Monitoring Results Memorandum

Third Quarter 2018

MEMORANDUM

DATE: October 31, 2018

TO: Brick Spangler, Port of Seattle

FROM: Jamalyn Green and Mark Dagel, Hart Crowser

RE: **Terminal 5 Landfill Gas Collection System Monitoring Results**
Third Quarter 2018
17627-05

This memorandum presents the results of the third quarter of 2018 monitoring at the Terminal 5 (T-5) Remediation Area 3 landfill gas collection system. This quarter's report includes biweekly monitoring from July through September 2018. Gas concentrations were measured in the field using a LMS-40 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.

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 52 to 56 percent by volume. Carbon dioxide concentrations ranged from 5.8 to 9.5 percent by volume. Oxygen concentrations were non-detect.

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 75°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 70 percent, carbon dioxide concentrations ranged from non-detect to 20 percent, and oxygen concentrations ranged from non-detect to 21 percent.

Below is a table listing the occurrence of elevated oxygen levels (compared with previous quarters) accompanied by a comparably lower concentration of methane.

Occurrence of Elevated Oxygen Levels in Sampling Ports

Monitoring Location	Date	Oxygen	Methane
SP-11	7/13/18	21	0

Notes:

- Parameter measurements units are percent by volume.

Temperature within each of the sampling ports was measured with an infrared thermometer and values ranged from 69° to 93.7°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. As in previous quarters, no methane was detected at these probes. Carbon dioxide concentrations ranged from 1.5 to 4.1 percent and oxygen concentrations ranged from 2.2 to 19.1 percent.

System Maintenance and Other Notes

The valve that connects the easternmost arm of the collection system (where SP-12 and SP-13 are located) to the rest of the system was reopened on during the July 13th monitoring event. That arm had been temporarily valved off to assess subsurface gas concentrations in eastern part of the landfill.

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 fourth quarter of 2018. Please feel free to contact us with any questions or concerns.

\\seafs\projects\Notebooks\1762705_Env Services - T-5, T-10, T-18, Harbor Island\Deliverables\Reports\FINAL 3Q2018\Attachment 1 - T5 Landfill 3Q2018.docx



ATTACHMENT 2

Terminal 5 Landfill Gas Collection and Treatment System

Monthly Monitoring Results Tables

Third Quarter 2018

Terminal 5 / RA-3 Landfill Gas Treatment System

Monitoring Results February 2017 - September 2018

**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
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
13-Oct-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Sep-17	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0.04	0.02	0.04	0
16-Sep-17	0	0	0	0	0.02	0.01	0	0	0	0.02	0.02	0	0.02	0.01	0.01	0	0
30-Aug-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Aug-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-Jul-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Jul-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08-Jun-17	0	0	0	0	--	--	--	--	--	--	--	--	--	--	--	0	0
09-May-17	0	0	0	0	--	--	--	--	--	--	--	--	--	--	--	0	0
11-Apr-17	0	0	0	0	--	--	--	--	--	--	--	--	--	--	--	0	0
08-Mar-17	0	0	0	0	--	--	--	--	--	--	--	--	--	--	--	0	0
21-Feb-17	0	0	0	0	--	--	--	--	--	--	--	--	--	--	--	0	0
# Readings	32	32	32	32	27	27	27	27	27	27	27	27	25	27	27	32	32
Min. value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max. value	0.00	0.00	1.00	0.00	0.02	1.41	0.43	0.00	0.00	0.02	0.02	0.05	0.06	0.04	0.02	0.04	0.00
AVERAGE	0.00	0.00	0.03	0.00	0.00	0.05	0.02	0.00	0.00	0.00	0.00	0.00	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

Terminal 5 / RA-3 Landfill Gas Treatment System

Monitoring Results February 2017 - September 2018

**Parameter: METHANE**

(LMS-40 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
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
13-Oct-17	0	0	0	0	25.0	0.5	10.5	6.7	16.5	33.0	27.0	0.9	38.0	52.0	23.5	6.2	35.0
27-Sep-17	0	0	0	0	52.0	46.5	60.0	60.0	59.0	64.0	56.0	16.0	60.0	65.0	43.5	12.5	37.5
16-Sep-17	0	0	0	0	50.0	48.5	61.0	57.0	60.0	61.0	55.0	40.0	56.0	59.0	39.0	30.0	35.0
30-Aug-17	0	0	0	0	39.0	43.0	58.0	56.0	61.0	59.0	55.0	14.5	55.0	56.0	33.0	9.9	37.0
17-Aug-17	0	0	0	0	36.0	36.5	54.0	54.0	60.0	61.0	56.0	6.4	55.0	57.0	34.0	6.5	36.0
24-Jul-17	0	0	0	0	45.0	49.0	55.0	53.0	57.0	58.0	52.0	31.0	51.0	53.0	39.0	13.5	28.0
10-Jul-17	0	0	0	0	43.0	42.5	53.0	51.0	56.0	58.0	53.0	20.5	51.0	53.0	38.0	12.5	26.5
08-Jun-17	0	0	0	0	--	--	--	--	--	--	--	--	--	--	--	5.4	21.0
09-Apr-17	0	0	0	0	--	--	--	--	--	--	--	--	--	--	--	15.5	19.0
11-Apr-17	0	0	0	0	--	--	--	--	--	--	--	--	--	--	--	32.0	17.5
08-Mar-17	0	0	0	0	--	--	--	--	--	--	--	--	--	--	--	13.0	0
21-Feb-17	0	0	0	0	--	--	--	--	--	--	--	--	--	--	--	0.6	17.0
# Readings	32	32	32	32	27	27	27	27	27	27	27	27	25	27	27	32	32
Min. value	0	0	0	0	13.5	0.5	0.0	6.7	16.5	33.0	27.0	0.0	38.0	52.0	0.0	0.6	0.0
Max. value	0	0	0	0	52.0	53.0	67.0	67.0	68.0	70.0	61.0	45.5	64.0	65.0	46.0	41.0	37.5
AVERAGE	0	0	0	0	35.2	38.1	55.5	55.6	58.3	61.5	52.2	21.9	55.6	59.6	34.9	14.2	25.1
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

Terminal 5 / RA-3 Landfill Gas Treatment System

Monitoring Results February 2017 - September 2018

**Parameter: CARBON DIOXIDE**

(LMS-40 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
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
13-Oct-17	1.7	2.9	3.5	2.1	8.1	0.1	1.0	0.9	2.1	3.8	2.6	7.3	9.8	8.7	9.9	12.0	6.1
27-Sep-17	1.4	3.5	3.1	1.7	6.8	17.0	5.2	0	5.5	6.1	2.2	12.0	5.4	4.5	10.0	9.8	5.3
16-Sep-17	1.6	4.1	1.9	2.0	6.8	16.0	5.0	0	5.6	5.5	2.0	10.0	4.7	4.1	9.3	11.0	6.1
30-Aug-17	1.6	3.9	2.0	1.9	8.1	17.0	5.6	3.9	6.4	6.4	2.1	13.0	6.1	5.2	11.5	12.0	6.6
17-Aug-17	1.7	4.0	1.9	1.8	7.6	14.0	5.8	1.2	6.9	7.2	2.1	12.0	6.1	5.2	12.0	12.0	6.5
24-Jul-17	1.5	3.2	2.9	1.6	7.0	17.0	5.6	0.1	6.1	6.4	1.6	8.4	5.2	4.5	13.0	9.7	5.3
10-Jul-17	2.0	3.2	1.9	1.6	6.6	15.0	5.8	1.1	6.9	7.0	1.5	8.7	5.7	4.8	--	9.3	5.5
08-Jun-17	2.3	2.6	1.4	2.0	--	--	--	--	--	--	--	--	--	--	--	9.0	4.7
09-May-17	1.8	2.3	0.9	1.6	--	--	--	--	--	--	--	--	--	--	--	8.6	4.6
11-Apr-17	1.0	1.7	0.1	1.7	--	--	--	--	--	--	--	--	--	--	--	6.4	4.6
08-Mar-17	0.7	1.2	0.3	1.5	--	--	--	--	--	--	--	--	--	--	--	4.8	7.8
21-Feb-17	0.3	1.3	0.1	1.7	--	--	--	--	--	--	--	--	--	--	--	7.2	4.3
# Readings	32	32	32	32	27	27	27	27	27	27	27	27	25	27	26	32	32
Min. value	0.1	0.0	0.1	0.3	4.3	0.1	0.0	0.0	2.1	3.8	0.0	2.0	4.1	3.3	0.0	4.8	4.3
Max. value	2.4	4.1	3.8	2.3	8.1	21.0	8.4	4.6	6.9	9.9	4.5	14.0	9.8	8.7	13.0	13.0	7.8
AVERAGE	1.6	2.7	2.2	1.6	6.3	14.1	4.3	0.9	4.9	5.4	1.6	7.3	5.8	4.9	8.4	8.7	5.4
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

Terminal 5 / RA-3 Landfill Gas Treatment System

Monitoring Results February 2017 - September 2018

**Parameter: OXYGEN**

(LMS-40 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
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
13-Oct-17	17.6	17.3	16.8	17.3	0.2	20.2	11.3	15.4	8.9	6.5	8.9	9.2	0	0	0	0	0
27-Sep-17	17.4	16.0	16.6	18.02	0	0.1	0	0	0	0	0	0	0	0	0	0	0.01
16-Sep-17	17.7	15.8	18.8	18.0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-Aug-17	17.8	16.1	18.6	18.3	0.1	1.1	0	0	0	0	0	0.9	0	0	0	0	0
17-Aug-17	17.4	16.1	18.9	18.6	0.6	2.6	0	0	0	0	0	3.0	0	0	0	0	0
24-Jul-17	17.8	16.2	17.2	19.0	0.2	0.3	0.2	0	0.1	0	1.3	0.9	1.0	5.3	2.2	1.5	1.2
10-Jul-17	17.3	16.0	--	--	0	1.6	0.1	0.1	0.1	0.1	0.1	1.7	--	--	--	--	--
08-Jun-17	15.4	16.2	16.8	17.6	--	--	--	--	--	--	--	--	--	--	--	0.1	0.1
09-May-17	13.0	15.2	15.4	17.3	--	--	--	--	--	--	--	--	--	--	--	0.1	0.4
11-Apr-17	13.2	16.8	20.4	16.9	--	--	--	--	--	--	--	--	--	--	--	0.1	0.2
08-Mar-17	15.3	18.3	19.9	18.8	--	--	--	--	--	--	--	--	--	--	--	1.6	3.7
21-Feb-17	16.1	18.2	20.3	15.8	--	--	--	--	--	--	--	--	--	--	--	2.2	0.7
# Readings	32	32	31	31	27	27	27	27	27	27	27	27	24	26	26	31	31
Min. value	12.6	14.9	2.2	14.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max. value	20.3	20.7	20.4	20.4	1.4	20.2	21.1	15.4	8.9	6.5	8.9	16.5	1.0	5.3	21.0	2.2	3.7
AVERAGE	15.9	16.8	16.6	17.5	0.2	3.8	1.3	1.2	0.7	0.3	0.4	2.7	0.1	0.2	2.5	0.2	0.2
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

Terminal 5 / RA-3 Landfill Gas Treatment System

Monitoring Results February 2017 - September 2018

**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
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
13-Oct-17	69	71	67	69	61	62	62	68	59	63	61	63	60
27-Sep-17	75	82	75	75	72	73	71	74	72	73	75	73	73
16-Sep-17	78	88	80	78	71	80	78	78	82	82	86	78	82
30-Aug-17	82	86	85	81	80	80	86	73	83	80	81	82	81
17-Aug-17	80	83	88	84	80	83	83	71	84	89	80	81	81
24-Jul-17	85	82	85	80	80	86	80	83	88	85	85	79	79
10-Jul-17	86	89	89	71	78	81	80	75	81	80	85	86	81
01-Jun-17	--	--	--	--	--	--	--	--	--	--	--	71	82
09-May-17	--	--	--	--	--	--	--	--	--	--	--	81	80
11-Apr-17	--	--	--	--	--	--	--	--	--	--	--	54	55
08-Mar-17	--	--	--	--	--	--	--	--	--	--	--	51	50
21-Feb-17	--	--	--	--	--	--	--	--	--	--	--	60	56
# Readings	27	27	27	27	27	27	27	27	25	27	27	32	32
Min. value	46	48	49	51	49	48	49	48	49	50	50	47	48
Max. value	86	94	91	84	86	86	86	83	92	89	90	86	82
AVERAGE	68	71	69	68	67	68	67	66	70	69	69	66	66
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