Compliance Test Report
Determination of
Tier 2
Non-methane Organic Compound Concentrations

Glen's Landfill
Maple City, Michigan

RECEIVED
NOV 14 2016
AIR QUALITY DIV.

WASTE MANAGEMENT

Prepared for:

Waste Management of Michigan, Inc.
Glen's Landfill
518 M-72 West
Maple City, MI 49664

Prepared by:

Environmental Information Logistics, LLC
130 E. Main Street
Caledonia, MI 49316

November, 2016

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

RECEIVED

NOV 14 2016

AIR QUALITY DIV.

RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating Permit (ROP) program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: Glen's Sanitary Landfill — County: Leelanau

Source Address: 518 East Traverse Highway — City: Maple City

AQD Source ID (SRN): N3261 — ROP No.: N3261-2015 — ROP Section No.: 1

Please check the appropriate box(es):

☐ **Annual Compliance Certification (Pursuant to Rule 213(4)(c))**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the ROP.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the ROP, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From N/A To _____

Additional monitoring reports or other applicable documents required by the ROP are attached as described:

Tier 2 Test Report for NSPS Five Year Retest

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete

James Palmer	District Manager	989-705-8930
Name of Responsible Official (print or type)	Title	Phone Number

[signature]	11-7-16
Signature of Responsible Official	Date

* Photocopy this form as needed.

EQP 5736 (Rev 11-04)

1.0 INTRODUCTION

Environmental Information Logistics, LLC (EIL) was retained by Glen's Landfill to perform Tier 2 landfill gas sampling and analysis at the site, which is located in Maple City, Michigan. 40 CFR 60.754(a)(3)(iii) requires the landfill owner to retest the site-specific NMOC concentration every five years. The purpose of this report is to document the results of the five year NMOC retest program at the landfill. The tests were performed on September 29, 2016 and October 7, 2016. MDEQ was present to observe portions of both test events.

A Tier 2 testing workplan was submitted to the Michigan Department of Environmental Quality (MDEQ) on August 16, 2016. The workplan was approved by MDEQ on August 31, 2016.

2.0 REGULATORY BACKGROUND

Glen's Landfill, a municipal solid waste landfill operated by Waste Management of Michigan, Inc., began accepting waste in 1973. The facility is subject to the New Source Performance Standards (NSPS), 40 CFR 60 Subpart WWW. To comply with the NSPS the facility submitted an Initial Design Capacity Report and an NSPS Tier 1 calculation report as required by the regulations. The Glen's Landfill decided to improve the accuracy of the emission calculation by performing Tier 2 landfill gas sampling and analysis to show the facility NMOC emissions may be less than the 50 Mg/year NSPS emission threshold. The Tier 2 NMOC value must be retested every 5 years.

Based on the sampling results provided in this report, gas collection and control requirements are still not applicable to the facility, since NMOC emissions using the new Tier 2 value do not exceed 50 Mg/yr. The measured site-specific NMOC concentration was determined to be 242 ppm NMOC as hexane. This value was used in the NSPS equation to recalculate NMOC emissions of 20.58 Mg/year in 2016.

NMOC emissions are not estimated to exceed 50 Mg/yr for the next five years, using an assumed waste intake rate of 220,000 tons/year. The five year projection is provided in Appendix A of this report. Pursuant to 40 CFR 60.757(b)(1)(ii), the landfill owner or operator may submit a five year report in lieu of annual reports, as long as the actual waste volumes received in subsequent years are less than the estimated projections.

The Tier 2 testing results are valid for five years according to 40 CFR 60.754. A new site-specific NMOC concentration will have to be obtained in 2021.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 Sample Locations

The NSPS requires collection of two samples per hectare of landfill surface area in which waste has been in-place for a minimum of two years. At the Glen's Landfill approximately 54 acres, or 21.9 hectares, met the two-year age criteria.

As shown in Figure 1, the existing gas collection system (GCS), consists of vertical gas wells, horizontal collection trenches, multiple connections to the leachate system via cleanout risers, and a utility flare. This GCS covers the majority of the waste mass eligible for Tier 2 sampling. Three (3) samples from the main header to the gas plant were collected for Tier 2 sampling. One additional sample was collected from the flare as a spare, in case one of the three samples was unusable.

A small, pre-subtitle D area exists on the southeast side of the site. This area is approximately 13.2 acres (5.34 hectares) in size. A total of 11 Tier 2 sample probes were required for installation as shown in Figure 1. As indicated on the drawing, a small undisturbed area with no refuse separates the capped area on the west edge from the eastern edge of Cell 2 Phase II South.

In order to minimize disturbance to the geosynthetic cap and sand overlay, probes were planned for installation on the southern and eastern edges of this area, as shown on Figure 1.

Therefore, for the 54 acres subject to Tier 2 testing at Glen's Landfill, a total of 14 samples were to be collected: Three from the main header, and 11 from the installed probes.

3.2 Probe Installation

Two attempts with two different geoprobe rigs occurred in an effort to collect usable samples. The first attempt was on September 29, 2016. The geoprobe rig contactor used stainless probes with stainless steel push rods to probe into the cover and waste material. The probe was pushed through the cover material until the probe reached waste material. Once waste was encountered the probe was pushed an additional 3 feet into the underlying waste material. The probe and stainless rods were then removed and a piece of perforated push rod was put in the hole. The hole was temporarily sealed at ground surface with surface materials so that a quick check of gas quality could be performed. Bentonite was planned to be used to

further seal the surface penetration for the sampling process if gas of sufficient qualities for sampling were found, but none of the test locations were found to have landfill gas concentrations that met the standards of less than 5% oxygen or less than 20% nitrogen (Balance gas on the field gas meter provided an indicator of nitrogen). Probe rods were found to be saturated after they were removed. Following probe installation, gas samples were tested for quality to determine if the location was acceptable for sampling. Seven probes were installed using this method but none showed gas meeting the Tier 2 quality requirements (i.e. oxygen < 5% or balance gas < 20%).

Following these attempts, the installation technique was modified slightly. The probe rods were installed to depth (at least 3 feet into the waste material) with a small cap attached to it. Once the desired depth was reached the probe rods were extracted approximately 1 foot so that the cap would fall, allowing gas samples to be taken through the geoprobe rods which acted as the sample tubing. The area at the surface was then sealed up with surface materials. The probe was installed to depth and was pulled up 1'. MCC attempted to install eight more probes, but again, no gas was detected.

After discussions between Waste Management and MDEQ, EIL and MCC obtained the services of a different geoprobe contractor and re-mobilized the following week at the facility. At each location, a 21-inch long, 3/8 inch diameter perforated stainless steel sample probe attached to a segment of poly tubing was utilized. Waste depth was verified at each point by visually verifying waste matter in the sample probe, and by the geoprobe contractor noting the change in density as the probes were being installed. After waste depth was verified the probe was pushed an additional four feet into the waste layer. After depth was reached, the sample probe rods were extracted and a new set of rods with a disposable tip were used to probe back down to depth of 4 feet into the underlying waste material. Once the appropriate depth was reached the disposable tip was removed and the stainless/poly tube sampling apparatus was installed through the probes to depth. Once the sampling apparatus was installed, the probe rods were removed. Afterwards the sampling apparatus was filled around with a well pack material in order to keep the screen mesh from clogging with debris down hole. Once adequate well pack material was installed to cover the screen mesh, bentonite was installed to provide a seal up to the ground surface and hydrated to ensure a good seal between the landfill cover and the sample probe. After the sample probes were sealed in place, the poly tube was connected to the field monitoring instrument and was purged. A gas quality reading was taken with an Elkins Earthworks Envision meter and the field data was recorded. If the measurement was within the sampling criteria (i.e. less than 20% nitrogen and less than 5% oxygen) then an actual laboratory sample was collected. A few locations had to be relocated and reprobed due to the presence of liquids in the poly tubing during the purging process, but the sampling conditions had improved greatly over the prior week and most of the sample locations contained usable gas. Three

additional probes were installed as a spare, and a composite sample was collected from these for a total of five canisters from 14 test probes.

The attached Table 2 contains the information for each sample probe including collection times, beginning and ending cylinder vacuums, barometric pressure and ambient temperatures as required by Method 25C.

3.3 Active Gas Collection System

As shown in Figure 1, the existing gas collection system (GCS), consisting of vertical gas wells, horizontal collection trenches, multiple connections to the leachate system via cleanout risers, and a utility flare, provides coverage for the majority of the area eligible for Tier 2 sampling. Three samples from the main header to the utility flare were therefore collected for Tier 2 sampling during the September 29, 2016 sampling event. A fourth canister was collected as a spare, but did not need to be analyzed since the first three samples met the Tier 2 gas quality criteria.

Actual sampling locations at the header pipe leading to the flare station are shown on the map on Figure 1. The attached Table 1 contains the information for each sample point including collection times, beginning and ending cylinder vacuums, barometric pressure and ambient temperatures as required by Method 25C.

3.4 Composite Sampling and Analysis

The Method 25C procedures allow for composite sampling to occur in the field, as long as approximately equal volumes of sample are collected from each gas probe/sample location. Composite sampling was conducted using from two to three sample points for each composite sample. Samples were collected from the various sample probes installed on the landfill. Each sample was collected as show in Figure 2.

Each eight (8) liter sample canister was pre-filled with less than half its volume of helium. The remaining liters were collected in equal volumes based on pre-determined pressure that resulted in a sample volume of at least 1 liter for each sample for a composite sample.

Composite sampling was performed by taking an initial vacuum reading from the sample tank. To assure the cylinder did not reach ambient pressure and maintain a vacuum in the sample canister, one (1) inch Hg was subtracted from the initial tank pressure that was recorded prior to sampling. The initial vacuum was subtracted by one (1) inch Hg and divided by 3 (allowing 3 samples to be composited into one

canister). The subsequent samples for this tank would use the set amount of vacuum calculated above during the compositing process. Upon completion of the last sample for each tank containing 3 samples, the remaining vacuum was one (1) inch mercury (Hg). For those canisters containing 2 samples, the vacuum remaining in the tank was per the calculation shown above. The attached Table 2 contains the composite information for each probe sample point including collection times, beginning and ending cylinder vacuums, barometric pressure and ambient temperatures as required by Method 25C. The sample flow rate was set between 100 - 200 cc/min (100 - 200 ml/min) and was adjusted as necessary during the composite sample to maintain a constant sample flow rate.

The three samples collected from the main header line were not composited. The samples were collected from the header at a flow rate of less than 500 ml/min. A six liter summa canister was utilized for each of the main header samples.

Analyses were performed at Triangle Environmental Services, Inc., of Research Triangle Park, North Carolina. Samples were analyzed at the laboratory with gas chromatography equipped with a flame ionization detector (GC/FID) for 25C and gas chromatography equipped with a thermal conductivity detector (GC/TCD) for 3C. All seven samples were analyzed for oxygen and nitrogen (following Method 3C). All samples showed concentrations of either oxygen below 5%, or nitrogen concentrations below 20%; thus they were all suitable for 25C analysis and were all included in the final averages for the site. Each sample was also analyzed for methane, carbon dioxide and NMOC (following Method 25C). NMOC results are reported as carbon, and must be divided by six to obtain NMOC values as hexane for use in the emissions equation. A schematic of the Method 25C sampling train is found in Figure 2.

4.0 RESULTS

Samples cannot contain oxygen and nitrogen above the acceptable thresholds (i.e. greater than 5% oxygen or greater than 20% nitrogen). All samples were acceptable for use in the calculations. Laboratory analytical data is provided in Appendix B. A summary of laboratory results is shown in Table 3.

The average NMOC value for the site was 242 parts per million (ppm) as hexane. The EPA's LandGEM model, which utilizes the equation provided in 40 CFR 60.754(a), was used to calculate Tier 2 emissions (Appendix A).

The NMOC emission rate of 20.58 Mg/yr for the year 2016 is below the 50 Mg/year trigger for installation of gas collection and control systems. The Tier 2 sampling results (Appendix B) are valid for five years (until 2021). At that time, a new Tier 2 value will need to be obtained.

Appendix A also contains the calculations for projected yearly uncontrolled NMOC emissions for five years, as permitted by 40 CFR 60.757(b)(1)(ii). Again, based on the projected waste intake rates, emissions of NMOC stay below 50 Mg/year for the next five years.

TABLES

Table 1: Glens Landfill
Tier 2 Sampling Field Data - Flare
Maple City, Michigan

Sample #	Canister #	Barometric Pressure (inches w.c.)	Temperature (°F)	Weather				
1	6105	30.28	57	P. Cloudy				
Gas Quality Check	Time	%CH4	%CO2	%O2	% Bal. Gas			
	8:25	51.24	35.21	0.79	12.76			
Leak Check	Vac.	Time	Vac.	Time				
	-9	8:31	-9	8:32				
Sample	Sample Date	Sample Time	Initial Vac. (inches w.c.)	Time	Flare Flow (cfm)	End Vac (inches w.c.)	Time	Flare Flow (cfm)
	9/29/2016	8:44	-16.5	8:44	557	-4	8:58	557
Leak Check	Vac.	Time	Vac.	Time				
	-9.5	9:01	-9.5	9:02				

Sample #	Canister #	Barometric Pressure (inches w.c.)	Temperature (°F)	Weather				
2	6120	30.3	55	P. Cloudy				
Gas Quality Check	Time	%CH4	%CO2	%O2	% Bal. Gas			
	9:03	50.9	35.01	0.78	13.31			
Leak Check	Vac.	Time	Vac.	Time				
	-9	9:10	-9	9:11				
Sample	Sample Date	Sample Time	Initial Vac. (inches w.c.)	Time	Flare Flow (cfm)	End Vac (inches w.c.)	Time	Flare Flow (cfm)
	9/29/2016	9:12	-16.5	9:12	547	-4	9:24	547
Leak Check	Vac.	Time	Vac.	Time				
	-9	9:27	-9	9:28				

Sample #	Canister #	Barometric Pressure (inches w.c.)	Temperature (°F)	Weather				
3	6124	30.3	55	P. Cloudy				
Gas Quality Check	Time	%CH4	%CO2	%O2	% Bal. Gas			
	9:29	50.9	35.55	0.77	12.78			
Leak Check	Vac.	Time	Vac.	Time				
	-10	9:32	-10	9:33				
Sample	Sample Date	Sample Time	Initial Vac. (inches w.c.)	Time	Flare Flow (cfm)	End Vac (inches w.c.)	Time	Flare Flow (cfm)
	9/29/2016	9:35	-16.5	9:35	548	-4	9:47	548
Leak Check	Vac.	Time	Vac.	Time				
	-10	9:50	-10	9:51				

Sample #	Canister #	Barometric Pressure (inches w.c.)	Temperature (°F)	Weather				
4	6159	30.32	63	P. Cloudy				
Gas Quality Check	Time	%CH4	%CO2	%O2	% Bal. Gas			
	9:52	50.86	35.48	0.75	12.91			
Leak Check	Vac.	Time	Vac.	Time				
	-10	9:55	-10	9:56				
Sample	Sample Date	Sample Time	Initial Vac. (inches w.c.)	Time	Flare Flow (cfm)	End Vac (inches w.c.)	Time	Flare Flow (cfm)
	9/29/2016	10:00	-16.5	10:00	494	-4	10:16	494
Leak Check	Vac.	Time	Vac.	Time				
	-10	10:20	-10	10:21				

Table 2: Glens Landfill
Tier 2 Sampling Field Data - Test Probes
Maple City, Michigan

Vent Name	Date	Sample Time	CH4	CO2	O2	BAL	Pre-Test Tank Pressure	Post-Test Tank Pressure	Sample Canister#	Barometric Pressure	Ambient Temperature
Probe 6	10/7/2016	9:28	62.8	36.6	0.3	0.2	-16	-11	8T018	29.5	70
Probe 5	10/7/2016	10:05	58.2	41.4	0.4	0.0	-11	-6	8T018	29.5	70
Probe 4	10/7/2016	10:38	48.2	35.5	2.2	14.2	-6	-1	8T018	29.5	73
Probe 2	10/7/2016	11:08	47.5	34.7	2.8	15.0	-16	-11	8T012	29.48	69
Probe 1A*	10/7/2016	11:46	49.3	34.2	1.4	15.0	-11	-6	8T012	29.48	69
Probe10	10/7/2016	12:29	49.7	35.8	2.9	11.5	-6	-1	8T012	29.48	69
Probe 9	10/7/2016	12:58	54.8	41.6	1.9	1.7	-16	-11	8T032	29.48	65
Probe 7	10/7/2016	14:23	46.9	34.3	1.6	17.2	-11	-6	8T032	29.59	58
Probe 8	10/7/2016	14:43	46.4	37.1	1.6	14.9	-6	-1	8T032	29.59	58
Probe 3A	10/7/2016	15:31	50.7	30.8	0.8	17.7	-16	-11	8T037	29.6	58
Probe13	10/7/2016	16:19	49.5	31.6	0.7	18.2	-16	-11	8T027	29.6	59
Probe 11A	10/7/2016	16:54	53.9	28.3	1.3	16.6	-11	-6	8T037	29.6	59
Probe 12	10/7/2016	17:16	51.9	35.0	0.5	12.6	-11	-6	8T027	29.64	59
Probe 14	10/7/2016	17:33	58.5	30.8	0.0	10.7	-6	-1	8T027	29.64	59

*Probes with an "A" designation are those that needed to be re-installed after the first location did not contain usable gas, or was watered in.

TABLE 2

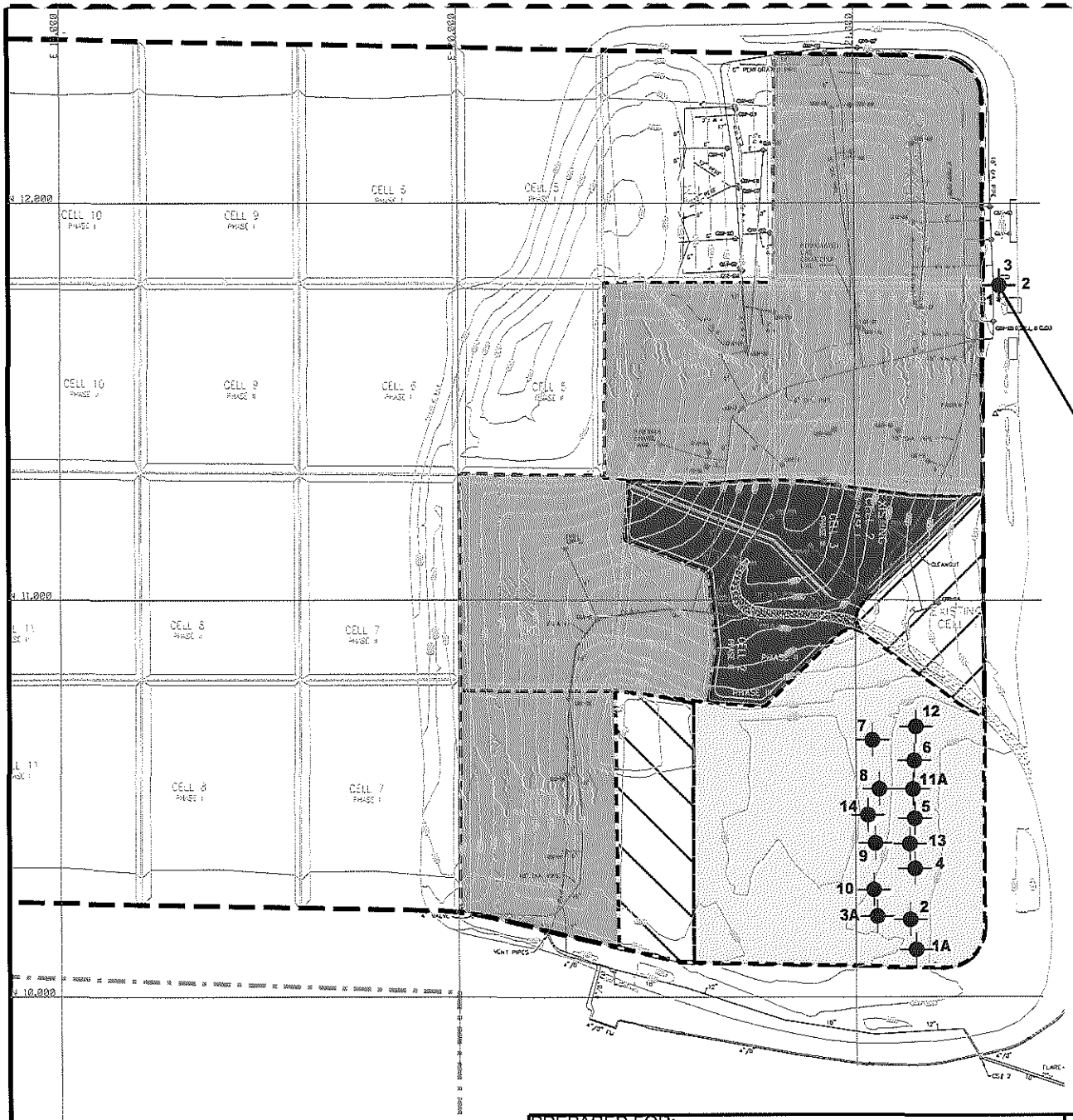
SUMMARY OF METHOD 25C AND METHOD 3C DATA

Glens Tier 2 - 2016

Sample ID Number	Sample Location	Date Sampled	CH4 (%)	CO2 (%)	O2 (%)	N2 (%)	NMOC (ppm as carbon)	NMOC (ppm as hexane)
1	Probe #3A & #11A	10/7/2016	53.8%	31.5%	1.0%	15.9%	1,418	236
2	Probe #4, #5 & #6	10/7/2016	57.4%	39.0%	0.2%	2.9%	1,195	199
3	Probe #1A, #2 & #10	10/7/2016	52.1%	37.4%	0.7%	9.8%	1,816	303
4	Probe #7, #8 & #9	10/7/2016	50.9%	38.3%	0.6%	10.8%	1,346	224
1	Flare #1	9/29/2016	48.8%	34.5%	1.5%	16.3%	1,141	190
2	Flare #2	9/29/2016	48.5%	34.3%	1.4%	15.9%	1,421	237
3	Flare #3	9/29/2016	48.6%	34.4%	1.3%	15.7%	1,843	307
		Average	**0.5**	**0.4**	**0.01**	**0.1**		**242**

CH4: methane
CO2: carbon dioxide
O2: oxygen
N2: nitrogen
%: percent
NMOC as hexane: Non Methane Organic Compounds as hexane (NMOC as carbon divided by six)

FIGURES



LEGEND

- LIMITS OF WASTE
- APPROXIMATE PROPERTY BOUNDARY
- EXISTING GAS HEADER
- N 6,000 — GRID COORDINATES
- TEMPORARY 12 MIL REINFORCED SCRIM LINER INTERIM COVER AREA
- FML OVER OLD WASTE
- FML OVER OLD WASTE WITH NEW WASTE ON TOP - ACTIVE AREA
- FINAL COVER AREA
- ACTIVE AREA - CELL 5 PHASE 1 (INITIAL WASTE PLACEMENT ON 11/5/2014)
- ACTUAL TIER II TEST LOCATION

N

SCALE 0' 200' 400'

NOTES:

1. TOPO DATED APRIL 2016.
2. GAS AS-BUILT DRAWING TAKEN FROM SHEET 1, ENTITLED "GAS SYSTEM AS-BUILTS AS OF MAY 2015", DATED JUNE 11, 2015, PROVIDED BY MIDWESTERN CONSULTING.

PREPARED FOR: WASTE MANAGEMENT

PREPARED BY: ENVIRONMENTAL INFORMATION LOGISTICS, LLC

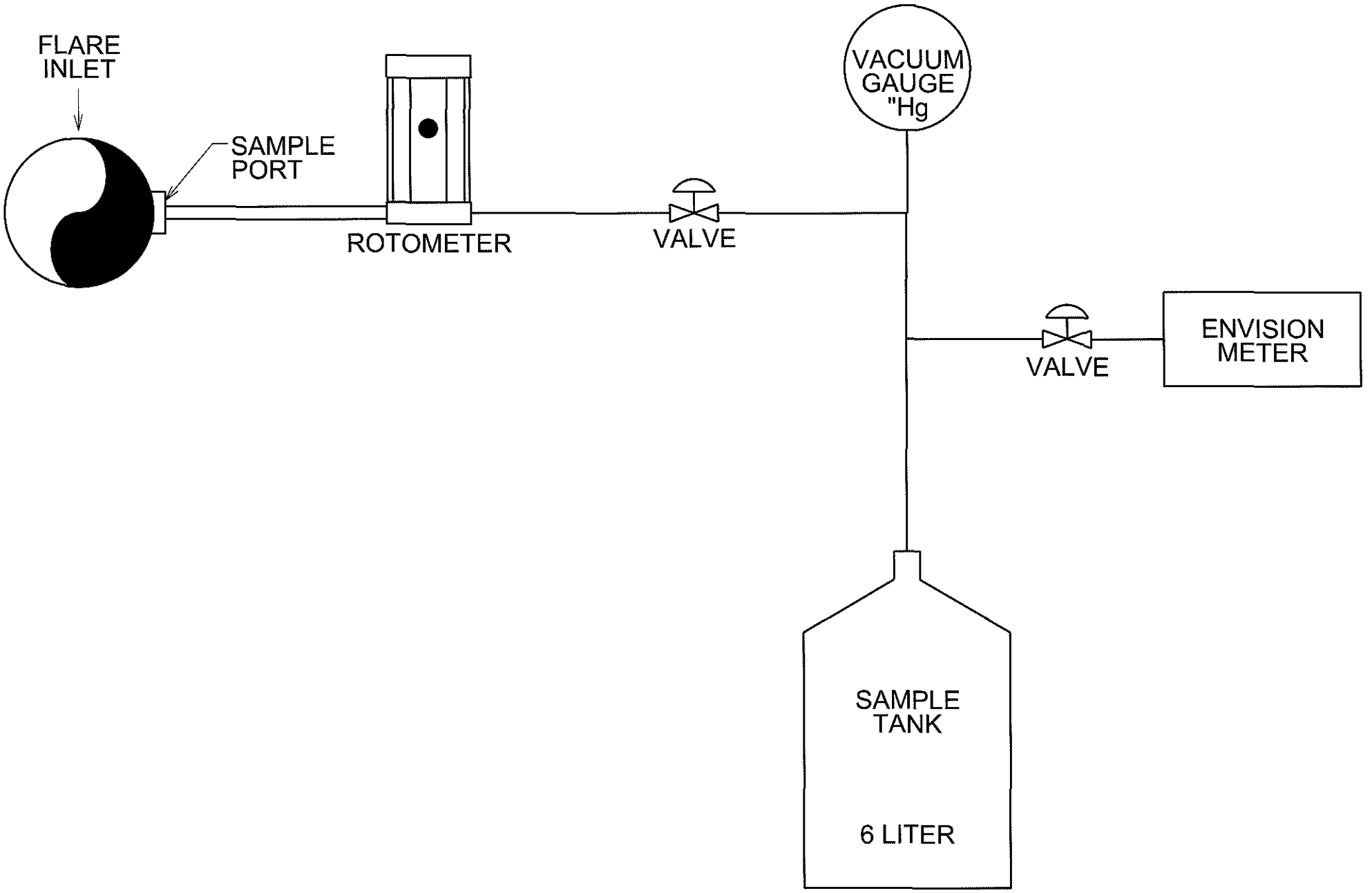
FIGURE I

ACTUAL TIER II TEST LOCATION PLAN

GLENS LANDFILL
MAPLE CITY, MICHIGAN

106703

NOVEMBER 2016



PREPARED BY
EIL ENVIRONMENTAL INFORMATION LOGISTICS, LLC

PREPARED FOR
WM WASTE MANAGEMENT

FIGURE 2
TOTAL NON-METHANE ORGANIC COMPOUND SAMPLING TRAIN
GLENS LANDFILL
MAPLE CITY, MICHIGAN

106703

AUGUST 2016