Derenzo and Associates, Inc.
Environmental Consultants

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EMISSIONS TEST REPORT

Title	NSPS Emission Test Report for Landfill Gas-to- Energy IC Engine Generator Sets at the Waste Management of Michigan Eagle Valley Landfill
Report Date	November 24, 2014
Test Date(s)	October 8, 2014

Facility Information	
Name	Waste Management of Michigan, Inc. Eagle Valley Landfill
Street Address	3925 Giddings Road
City, County	Orion, Oakland
Phone	(800) 796-9696

Facility Permit Information			
State Registration No.:	N3845	Permit No.:	116-10

Emission Unit ID	Description	Serial #
EUICENGINE1	CAT G3520C IC Engine	GZJ00471
EUICENGINE2	CAT G3520C IC Engine	GZJ00470

Testing Contractor	
Company	Derenzo and Associates, Inc.
Mailing Address	39395 Schoolcraft Road Livonia, MI 48150
Phone	(734) 464-3880
Project No.	1406004

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

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: Waste Management of Michigan, Inc. (Eagle Valley) County: Oakland

Source Address: 3925 Giddings Road City: Orion

AQD Source ID (SRN): N3845 ROP No.: MI-ROP-N3845-2010 ROP Section No.: ______

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 ______ To ______

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

Test report for the verification of CO, NOx and VOC emissions from two (2) landfill gas fired CAT G3520C reciprocating internal combustion engines (Permit to Install 116-10). Document prepared by Derenzo and Associates, Inc. dated November 24, 2014.

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

Charles H. Cassie — Name of Responsible Official (print or type)
Senior District Manager — Title
(248) 391-0990 — Phone Number

Signature of Responsible Official

11-24-14 — Date

* Photocopy this form as needed.

EQP 5736 (Rev 11-04)

NSPS EMISSION TEST REPORT
FOR
LANDFILL GAS-TO- ENERGY IC ENGINE GENERATOR SETS
AT THE
WASTE MANAGEMENT EAGLE VALLEY LANDFILL

1.0 INTRODUCTION

Waste Management of Michigan, Inc. (WMI) operates two (2) Caterpillar (CAT®) Model No. G3520C gas-fired reciprocating internal combustion (IC) engines and electricity generator sets at the Eagle Valley Landfill in Orion, Oakland County, Michigan. The treated landfill gas (LFG) fueled IC engine generator sets (Serial Nos. GZJ00471 and GZJ00470) are identified as emission unit EUICENGINE1 and EUICENGINE2 (Flexible Group ID: FGICENGINES) in Permit to Install (PTI) 116-10 issued by the Michigan Department of Environmental Quality-Air Quality Division (MDEQ-AQD).

Pursuant to the requirements of Title 40 of the Code of Federal Regulations, Part 60 Subpart JJJJ *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*; (40 CFR Part 60 Subpart JJJJ), §60.4243(a)(2)(ii), WMI is required to perform testing for specific regulated air pollutant emissions exhausted from the IC engine-generator sets every 8760 operating hours or three years, whichever comes first.

The performance testing for emission units EUICENGINE1 and EUICENGINE2 was conducted on October 8, 2014, by Derenzo and Associates, Inc., an environmental consulting and testing company in Livonia, Michigan. Mr. Daniel Wilson and Patrick Triscari of Derenzo and Associates performed the testing. Mr. James Dunn of WMI assisted with process coordination and operating parameter data acquisition. MDEQ-AQD representative Mark Dziadosz was on site to witness the test event.

The compliance demonstration consisted of triplicate, one-hour, test runs for the determination of nitrogen oxides (NOx), carbon monoxide (CO), and volatile organic compounds (VOC, as non-methane hydrocarbons) mass emission rates. The exhaust gas sampling and analysis was performed using procedures specified in the Test Protocol dated August 1, 2014, and approved by the MDEQ-AQD on August 28, 2014.

Questions regarding this emission test report should be directed to:

Mr. Daniel Wilson	Mr. Victor Saufley
Environmental Consultant	Manager-Environmental, Safety and Health Programs
Derenzo and Associates, Inc.	WM RENEWABLE ENERGY
39395 Schoolcraft Road	1001 Fannin, Suite 400
Livonia, MI 48150	Houston, TX 77002
(734) 464-3880	(713) 328-7348

Report Certification

This test report was prepared by Derenzo, Associates, Inc. based on field sampling data collected by Derenzo and Associates, Inc. Facility process data were collected and provided by Waste Management of Michigan employees or representatives.

I certify that the testing was conducted in accordance with the approved test plan unless otherwise specified in this report. I believe the information provided in this report and its attachments are true, accurate, and complete.

Report Prepared By:

Daniel Wilson
Environmental Consultant
Derenzo and Associates, Inc.

Reviewed By:

Robert L. Harvey, P.E.
General Manager
Derenzo and Associates, Inc.

This test report has been reviewed by Waste Management of Michigan representatives and approved for submittal to the Michigan Department of Environmental Quality. I certify that the facility operating conditions were in compliance with permit requirements and were at the maximum routine operating conditions for the facility. Based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate and complete.

Charles H. Cassie
Senior District Manager
Waste Management of Michigan

2.0 SUMMARY OF RESULTS

The exhaust from two (2) LFG-fueled IC engine-generator sets (identified as EUICENGINE1 and EUICENGINE2) were tested on October 8, 2014 to determine the mass emission rate of NOx, CO and VOC.

Exhaust gas velocity, moisture, oxygen (O_2) content, and carbon dioxide (CO_2) content was determined for each test period to calculate pollutant mass emission rates.

The testing was performed while each IC engine operated at normal base load conditions (i.e., 1,600 kW peak electricity output +/- 10%). Test results and applicable emission limits are provided in the following table. The test results demonstrate compliance with emission limits specified in 40 CFR Part 60, Subpart JJJJ and Permit to Install No. 116-10.

Pollutant	Results for EUICENGINE1 (g/bhp-hr)	Results for EUICENGINE2 (g/bhp-hr)	Emission Limits (g/bhp-hr)
NOx	0.67	0.73	0.9 g/bhp (PTI No. 116-10) 2.0 g/bhp-hr (NSPS JJJJ)
CO	2.29	2.28	4.13 g/bhp (PTI No. 116-10) 5.0 g/bhp-hr (NSPS JJJJ)
VOC	0.11	0.12	1.0 g/bhp (PTI No. 116-10) 1.0 g/bhp-hr (NSPS JJJJ)

3.0 SOURCE AND SAMPLING LOCATION DESCRIPTION

3.1 General Process Description

Landfill gas (LFG) is produced in the Eagle Valley Landfill from the anaerobic decomposition of disposed waste materials. The LFG is collected from active landfill cells using a system of wells that are connected to a central header (gas collection system). The collected LFG is treated and then directed to the Eagle Valley electricity generation facility where it is used as fuel for the two (2) CAT® Model No.G3520C IC engine-generator sets that produce electricity for transfer to the local utility.

3.2 Rated Capacities, Type and Quantity of Raw Materials Used

The Caterpillar G3520C engines are spark ignition, lean-burn, reciprocating internal combustion engines fueled by treated landfill gas. Each engine genset has an engine power rating of 2,233 hp at 100% load, and a generator power rating of 1,600 kW. Each CAT G3520C IC Engine was tested while operating at baseload conditions, within 10% (+/-) of the maximum electricity generation rate of 1,600 kW per engine. Fuel consumption is regulated to maintain the required heat input rate to support engine operations and is dependant on the fuel heat value (methane content).

3.3 Emission Control System Description

The CAT® G3520C IC engine use an electronic air-to-fuel ratio controller to fire lean fuel mixtures and produce low combustion by-product emissions. Emissions from the combustion of LFG are released uncontrolled into the ambient air through a stack connected to the IC engine exhaust manifold and noise control system (noise muffler).

3.4 Sampling Locations (USEPA Method 1)

The exhaust stack sampling port for the Model G3520C IC engines tested satisfied the USEPA Method 1 criteria for a representative sample location. The inner diameter of each engine exhaust stack is 16 inches. Each stack is equipped with two (2) sample ports, opposed 90°, that provide a sampling location 54 inches (3.4 duct diameters) downstream and 60 inches (3.8 duct diameters) upstream from any flow disturbance.

Velocity pressure traverse locations for the sampling points were determined in accordance with USEPA Method 1 for the engine exhaust.

Figure 1 presents the performance test sampling and measurement locations.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

A test protocol for the compliance testing was prepared by Derenzo and Associates and reviewed by the MDEQ-AQD. This section provides a summary of the sampling and analytical procedures that were used during the test and presented in the test plan.

Appendix A provides a copy of the MDEQ-AQD test protocol approval letter.

4.1 Exhaust Gas Velocity and Flowrate Determination (USEPA Method 2)

In order to determine air pollutant emission rates on a mass basis (e.g., pound per hour), IC engine exhaust stack gas velocities, and volumetric flow rates were determined using USEPA Method 2 during each 60-minute test. An S-type Pitot tube connected to a red-oil manometer was used to determine velocity pressure. Gas temperature was measured using a K-type thermocouple mounted to the Pitot tube. The Pitot tube and connective tubing were leak-checked to verify the integrity of the measurement system.

The absence of cyclonic flow for each sampling location was verified using an S-type Pitot tube and oil manometer. The Pitot tube was positioned at all of the velocity traverse points with the planes of the face openings of the Pitot tube perpendicular to the stack cross-sectional plane. The Pitot tube was then rotated to determine the null angle (rotational angle as measured from the perpendicular, or reference, position at which the differential pressure is equal to zero).

Exhaust gas velocity pressure and temperature were measured before and after each one-hour sampling period in accordance with USEPA Method 2.

4.2 Exhaust Gas Molecular Weight Determination (USEPA Method 3A)

CO_2 and O_2 content in the IC engine exhaust was measured continuously throughout each one-hour test period in accordance with USEPA Method 3A. The CO_2 content of the exhaust was monitored using a non-dispersive infrared (NDIR) gas analyzer. The O_2 content of the exhaust was monitored using a gas analyzer that utilizes a Paramagnetic sensor.

During each one-hour sampling period, a continuous sample of the IC engine exhaust gas stream was extracted from the stack using a stainless steel probe connected to a Teflon® heated sample line. The sampled gas was conditioned by removing moisture prior to being introduced to the analyzer; therefore, measurement of O_2 and CO_2 concentrations correspond to standard dry gas conditions. The instrument was calibrated using appropriate calibration gases to determine accuracy and system bias (described in Section 5.5 of this document).

Figure 2 presents the instrument analyzer sampling train.

4.3 Exhaust Gas Moisture Content Determinations (Method 4)

Moisture content of the IC engine exhaust gas was determined in accordance with USEPA Method 4 using a chilled impinger sampling train, which was performed concurrently with the instrumental analyzer sampling periods. At the conclusion of each sampling period, the moisture gain in the impingers was determined gravimetrically by weighing each impinger to determine net weight gain.

Figure 3 presents the moisture sampling train schematic.

4.4 NOx and CO Concentration Measurements (USEPA Method 7E and 10)

NOx and CO pollutant concentrations in the exhaust of the IC engine were determined using a chemiluminescence NOx analyzer and NDIR CO analyzer.

Three (3) one-hour sampling periods were performed for the IC engine exhaust testing. Throughout each one-hour test period, a continuous sample of the engine exhaust gas was extracted from the stack using the Teflon® heated sample line and gas conditioning system described in Section 4.2 of this document, and delivered to the instrumental analyzers. Instrument response for each analyzer was recorded on a data logging system that monitored the analog output of the instrumental analyzers continuously and logged data as one-minute averages. Prior to, and at the conclusion of each test, the instruments were calibrated using appropriate upscale calibration and zero gas to determine analyzer calibration error and system bias. Sampling times were recorded on field data sheets.

Figure 2 presents the instrument analyzer train.

4.5 VOC Concentration Measurements (USEPA Method ALT 096)

VOC emission rate was determined by measuring the nonmethane hydrocarbon (NMHC) concentration in the IC engine exhaust gas. NMHC pollutant concentration was determined using a Thermo Environmental Instruments (TEI) Model 55i Methane / Nonmethane hydrocarbon analyzer. The TEI 55i analyzer contains an internal gas chromatograph column that separates methane from non-methane components and has been approved by the USEPA for measuring VOC relative to 40 CFR Part 60 Subpart JJJJ compliance test demonstrations (Alternative Test Method 096 or ALT-096). The concentration of NMHC in the sampled gas stream, after separation from methane, is determined relative to a propane standard using a flame ionization detector in accordance with USEPA Method 25A.

Samples of the exhaust gas were delivered directly to the instrumental analyzer using the Teflon® heated sample line to prevent condensation. The sample to the NHMC analyzer was not conditioned to remove moisture. Therefore, VOC measurements correspond to standard conditions with no moisture correction (wet basis).

The instrumental analyzer was calibrated using certified propane concentrations in hydrocarbon-free air to demonstrate detector linearity and determine calibration drift and zero drift error.

Figure 2 presents the instrument analyzer train.

Appendix A provides a copy of the USEPA ALT 096 approval letter.

5.0 QA/QC ACTIVITIES

5.1 NOx Converter Efficiency Test

The NO_2 – NO conversion efficiency of the TEI Model 42C instrumental analyzer was verified prior to the commencement of the performance tests. The instrument analyzer NO_2 – NO converter uses a catalyst at high temperatures to convert the NO_2 to NO for measurement. A USEPA Protocol 1 certified NO_2 calibration gas was used to verify the efficiency of the NO_2 – NO converter.

The NO_2 – NO conversion efficiency test satisfied the USEPA Method 7E criteria (the calculated NO_2 – NO conversion efficiency is greater than or equal to 90%).

5.2 Calibration Gas Divider Field Validation

A STEC Model SGD-710C 10-step gas divider was used to obtain appropriate calibration span gases. The ten-step STEC gas divider was NIST certified (within the last 12 months) with a primary flow standard in accordance with Method 205. When cut with an appropriate zero gas, the ten-step STEC gas divider delivered calibration gas values ranging from 0% to 100% (in 10% step increments) of the USEPA Protocol 1 calibration gas that was introduced into the system. The field evaluation procedures presented in Section 3.2 of Method 205 were followed prior to use of gas divider. The field evaluation yielded no errors greater than 2% of the triplicate measured average and no errors greater than 2% from the expected values.

5.3 Sampling System Response Time Determination

The response time of the sampling system was determined prior to the compliance test program by introducing upscale gas and zero gas, in series, into the sampling system using a tee connection at the base of the sample probe. The elapsed time for the analyzer to display a reading of 95% of the expected concentration was determined using a stopwatch.

Sampling periods did not commence until the sampling probe had been in place for at least twice the system response time.

5.4 Instrumental Analyzer Interference Check

The instrumental analyzers used to measure NOx, CO, O_2 and CO_2 have had an interference response test performed prior to their use in the field, pursuant to the interference response test procedures specified in USEPA Method 7E. The appropriate interference test gases (i.e. gases that would be encountered in the exhaust gas stream) were introduced into each analyzer, separately and as a mixture with the analyte that each analyzer is designed to measure. All of analyzers exhibited a composite deviation of less than 3.0% of the span for all measured interferent gases. No major analytical components of the analyzers have been replaced since performing the original interference tests.

5.5 Instrument Calibration and System Bias Checks

At the beginning of each day of the testing program, initial three-point instrument calibrations were performed for the NO_x, CO, CO_2 and O_2 analyzers by injecting calibration gas directly into the inlet sample port for each instrument. System bias checks were performed prior to and at the conclusion of each sampling period by introducing the upscale calibration gas and zero gas into the sampling system (at the base of the stainless steel sampling probe prior to the particulate filter and Teflon® heated sample line) and determining the instrument response against the initial instrument calibration readings.

At the beginning of each test day, appropriate high-range, mid-range, and low-range span gases followed by a zero gas were introduced to the NMHC analyzer, in series at a tee connection, which is installed between the sample probe and the particulate filter, through a poppet check valve. After each one hour test period, mid-range and zero gases were re-introduced in series at the tee connection in the sampling system to check against the method's performance specifications for calibration drift and zero drift error.

The instruments were calibrated with USEPA Protocol 1 certified concentrations of CO_2, O_2, NO_x, and CO in nitrogen and zeroed using hydrocarbon free nitrogen. The NMHC (VOC) instrument was calibrated with USEPA Protocol 1 certified concentrations of propane in air and zeroed using hydrocarbon-free air. A STEC Model SGD-710C ten-step gas divider was used to obtain intermediate calibration gas concentrations as needed.

5.6 Determination of Exhaust Gas Stratification

A stratification test for the IC engine exhaust stack was performed during the performance test sampling periods. The stainless steel sample probe was positioned at sample points correlating to 16.7, 50.0 (centroid) and 83.3% of each stack diameter. Pollutant concentration data were recorded at each sample point for a minimum of twice the maximum system response time.

The recorded data for each IC engine exhaust stack gas indicate that the measured CO concentrations did not vary by more than 5% of the mean across either stack diameter. Therefore, the stack gas of the engine was considered to be unstratified and the compliance test sampling was performed at a single sampling location within the engine exhaust stack.

5.7 Meter Box Calibrations

The dry gas meter sampling console used for moisture testing was calibrated prior to and after the testing program. This calibration uses the critical orifice calibration technique presented in USEPA Method 5. The metering console calibration exhibited no data outside the acceptable ranges presented in USEPA Method 5.

The digital pyrometer in the metering console was calibrated using a NIST traceable Omega® Model CL 23A temperature calibrator.

Appendix E presents test equipment quality assurance data (NO_2 – NO conversion efficiency test data, instrument calibration and system bias check records, calibration gas certifications, interference test results, meter box calibration records, and Pitot tube calibration records).

6.0 TEST RESULTS AND DISCUSSION

6.1 Purpose and Objectives of the Tests

Permit to Install No. 116-10 and 40 CFR 60.4243(b)(2)(ii) (Subpart JJJJ) specify that owners and operators of new stationary spark-ignited IC engines with a power rating greater than 500 horsepower must conduct an initial performance test and conduct subsequent performance testing every 8,760 hours or 3 years, whichever comes first, thereafter to demonstrate compliance.

The recorded engine hours at the beginning of Test No. 1 for EUICENGINE1 and EUICENGINE2 were 27,076.5 and 27,013.5, respectively and are within 8,760 operating hours of those recorded during the previous test event on October 15, 2013.

6.2 Operating Conditions During the Compliance Test

Each LFG-fueled IC engine was operated at base load (100% capacity +/- 10%) conditions during the compliance testing. The average kilowatt (kW) output and fuel use values were recorded by facility operators during each test event. The average electrical output rates during the test events were 1,625 kW and 1,626 kW for EUICEENGINE1 and EUICENGINE2, respectively.

Engine output (bhp) cannot be measured directly. Therefore, it is calculated based on the recorded electricity output, the generator efficiency (95.7%), and the unit conversion factor for kW to horsepower (0.7457 kW/hp). The following equation was used to calculate average engine horsepower for each test period based on a linear relationship between engine output and electricity generator output:

$$\text{Engine output (bhp)} = \text{Electricity output (kW)} / (0.957) / (0.7457\ \text{kW/hp})$$

The engines operated at a mechanical output of between 2,271 to 2,281 bhp (average for one-hour test period).

The average engine fuel consumption rates for EUICENGINE1 and EUICENGINE2 during the test periods were 569.1 and 561.4 standard cubic feet per minute (scfm), respectively, based on data recorded from the fuel flow meter installed and operated by WMI.

Appendix B provides engine generator process data collected during the compliance test.

6.3 Air Pollutant Sampling Results

The IC engines performance tests were performed on October 8, 2014. The exhausts for the LFG-fueled IC engines were monitored for three (3) one-hour test periods per engine, during which the NO_X, CO, VOC, O_2, and CO_2 concentrations were measured using instrumental analyzers. The measured pollutant concentrations were adjusted based on instrument calibrations performed prior to and following each test period (drift and bias corrected pursuant to equations in specified in the USEPA reference test methods).

Exhaust gas moisture content was determined by gravimetric analysis of the weight gain in chilled impingers in accordance with USEPA Method 4. Exhaust gas velocity was measured prior to and following each one hour test period. The calculated exhaust gas volumetric flowrate (average of the pre-test and post-test measurements) was used to calculate NO_X, CO and VOC mass emission rates based on the measured pollutant concentrations (parts per million by volume).

The measured exhaust gas concentration for:

- NO_X ranged between 29 and 45 ppmvd corrected to 15% O_2, which results in calculated mass emission rates of 0.67 to 0.74 g/bhp-hr (calculated as NO_2).
- CO ranged between 247 and 250 ppmvd corrected to 15% O_2, which results in calculated mass emission rates of 2.25 g/bhp-hr to 2.33 g/bhp-hr.
- VOC ranged between 14.3 and 16.2 ppmv measured as propane (C_3) wet gas basis, which results in calculated emission rates of 0.11 to 0.12 g/bhp-hr.

Tables 1 and 2 present measured exhaust gas conditions and calculated air pollutant emission rates for each LFG-fueled IC engine, EUICENGINE1 and EUICENGINE2, respectively.

Appendix C provides computer calculated and field data sheets for the IC engine tests.

Appendix D provides raw instrumental analyzer response data for each test period.

6.4 Variations from Normal Sampling Procedures or Operating Conditions

The compliance tests for all pollutants were performed in accordance with the Test Protocol dated August 1, 2014; the USEPA ALT-096 Approval Letter dated November 8, 2012, and the specified USEPA test methods.

Instrument calibrations and sampling period results satisfied the quality assurance verifications required by USEPA Methods 3A, 7E, 10, and ALT 096. No variations from the normal operating conditions of the IC engines occurred during the testing program.

Table 1. Summary of EUICENGINE1 Test Results (CAT G3520C)
Waste Management of Michigan, Eagle Valley Landfill
Serial Number: GZJ00471

Test No.	1	2	3	
Test date	10/08/14	10/08/14	10/08/14	Test
Test period (24-hr clock)	938-1038	1115-1215	1253-1353	Avg.
Generator output (kW)	1,621	1,626	1,628	1,625
Engine Horsepower (Hp)	2,271	2,278	2,281	2,277
Exhaust gas composition				
CO_2 content (% vol)	11.9	12.0	11.9	11.9
O_2 content (% vol)	7.92	8.01	7.98	7.97
Moisture (% vol)	11.7	11.7	11.8	11.7
Exhaust gas flowrate				
Standard conditions (scfm)	5,317	5,471	5,565	5,451
Dry basis (dscfm)	4,694	4,828	4,909	4,810
Nitrogen oxides emission rates				
NO_X conc. (ppmvd)*	99.0	97.4	97.2	97.9
NO_X corrected to 15% O_2	44.8	44.2	44.2	44.4
NO_X emissions (lb/hr NO_2)	3.33	3.37	3.42	3.37
NO_X emissions (g/bhp-hr)	0.67	0.67	0.68	0.67
NO_X permit limit (g/bhp-hr)				*0.90*
Carbon monoxide emission rates				
CO conc. (ppmvd)*	551.1	546.1	548.0	548.4
CO corrected to 15% O_2	249.4	247.8	249.0	248.7
CO emissions (lb/hr)	11.3	11.5	11.7	11.5
CO emissions (g/bhp-hr)	2.25	2.29	2.33	2.29
CO permit limit (g/bhp-hr)				*4.13*
VOC/NMHC emission rates				
VOC conc. (ppmv C_3)*	14.6	14.3	14.5	14.5
VOC corrected to 15% O_2	6.59	6.49	6.61	6.6
VOC emissions (lb/hr)	0.53	0.54	0.56	0.54
VOC emissions (g/bhp-hr)	0.11	0.11	0.11	0.11
VOC permit limit (g/bhp-hr)				*1.0*

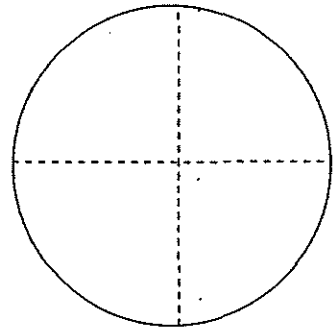
* Corrected for calibration bias.

Table 2. Summary of EUICENGINE2 Test Results (CAT G3520C)
Waste Management of Michigan, Eagle Valley Landfill
Serial Number: GZJ00470

Test No.	1	2	3	
Test date	10/08/14	10/08/14	10/08/14	Test
Test period (24-hr clock)	1445-1545	1620-1720	1752-1852	Avg.
Generator output (kW)	1,626	1,624	1,628	1,626
Engine Horsepower (Hp)	2,279	2,276	2,281	2,279
Exhaust gas composition				
CO_2 content (% vol)	12.0	11.9	12.0	11.9
O_2 content (% vol)	8.03	8.09	7.97	8.03
Moisture (% vol)	11.2	12.0	10.0	11.1
Exhaust gas flowrate				
Standard conditions (scfm)	5,434	5,423	5,297	5,385
Dry basis (dscfm)	4,803	4,826	4,768	4,799
Nitrogen oxides emission rates				
NO_X conc. (ppmvd)*	106.3	107.3	105.3	106.3
NO_X corrected to 15% O_2	30.0	30.3	29.7	30.0
NO_X emissions (lb/hr NO_2)	3.66	3.71	3.60	3.66
NO_X emissions (g/bhp-hr)	0.73	0.74	0.72	0.73
NO_X permit limit (g/bhp-hr)				*0.90*
Carbon monoxide emission rates				
CO conc. (ppmvd)*	547.0	548.6	547.4	547.7
CO corrected to 15% O_2	249.4	250.4	248.9	249.5
CO emissions (lb/hr)	11.5	11.6	11.4	11.5
CO emissions (g/bhp-hr)	2.28	2.30	2.26	2.28
CO permit limit (g/bhp-hr)				*4.13*
VOC/NMHC emission rates				
VOC conc. (ppmv C_3)*	15.9	16.1	16.2	16.1
VOC corrected to 15% O_2	7.27	7.33	7.34	7.3
VOC emissions (lb/hr)	0.59	0.60	0.59	0.59
VOC emissions (g/bhp-hr)	0.12	0.12	0.12	0.12
VOC permit limit (g/bhp-hr)				*1.0*

* Corrected for calibration bias.

Traverse/Sampling Point	Distance from Port nipple (inches)
1	8.51
2	9.68
3	11.10
4	13.17
5	18.83
6	20.90
7	22.32
8	23.49



Diameter = 16”

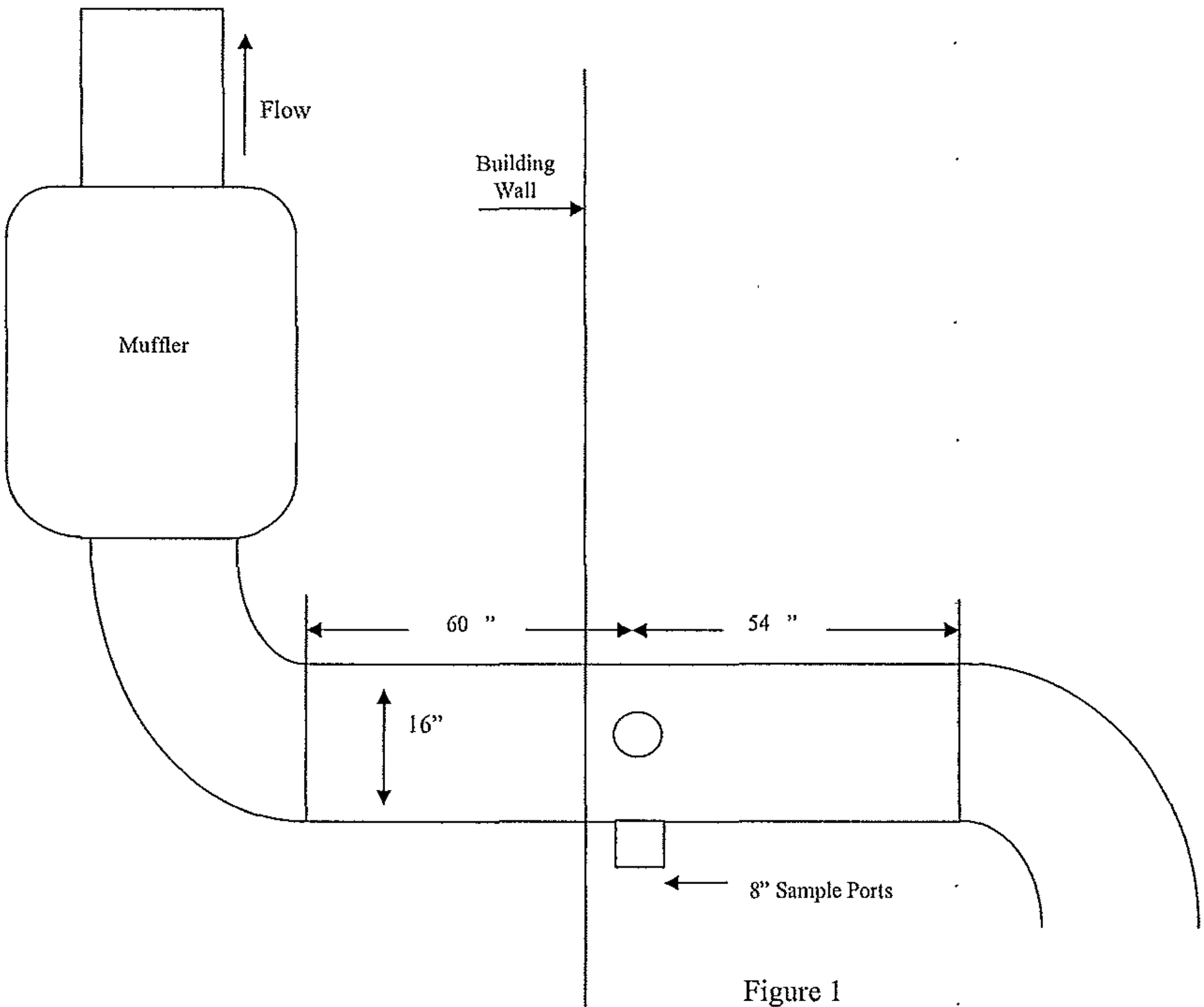


Figure 1

Eagle Valley Landfill Exhaust Sample Locations		
Scale None	Sheet 1 of 1	Derenzo and Associates Project No. 1406004

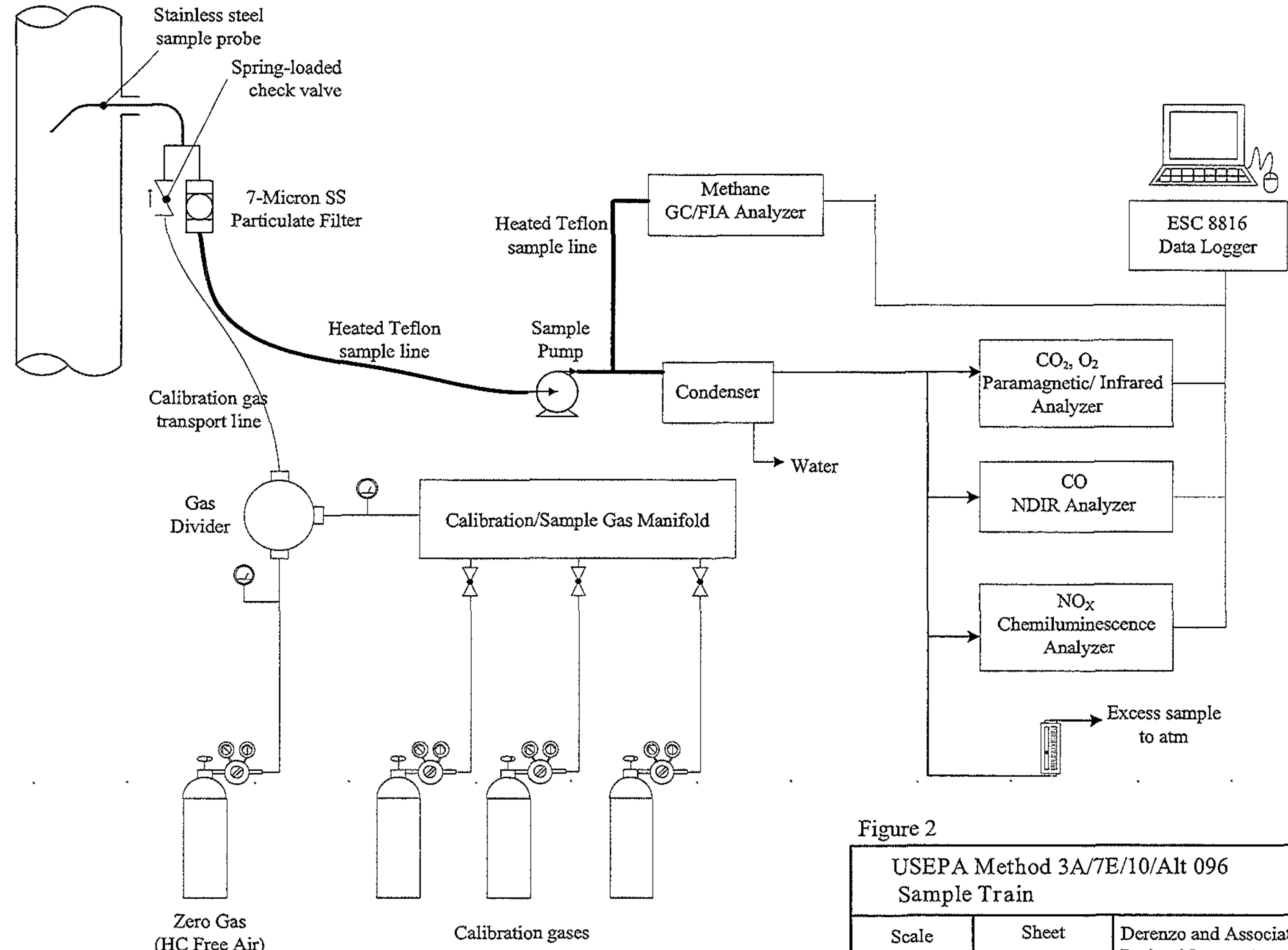


Figure 2

USEPA Method 3A/7E/10/Alt 096 Sample Train		
Scale None	Sheet 1 of 1	Derenzo and Associates Project No. 1406004

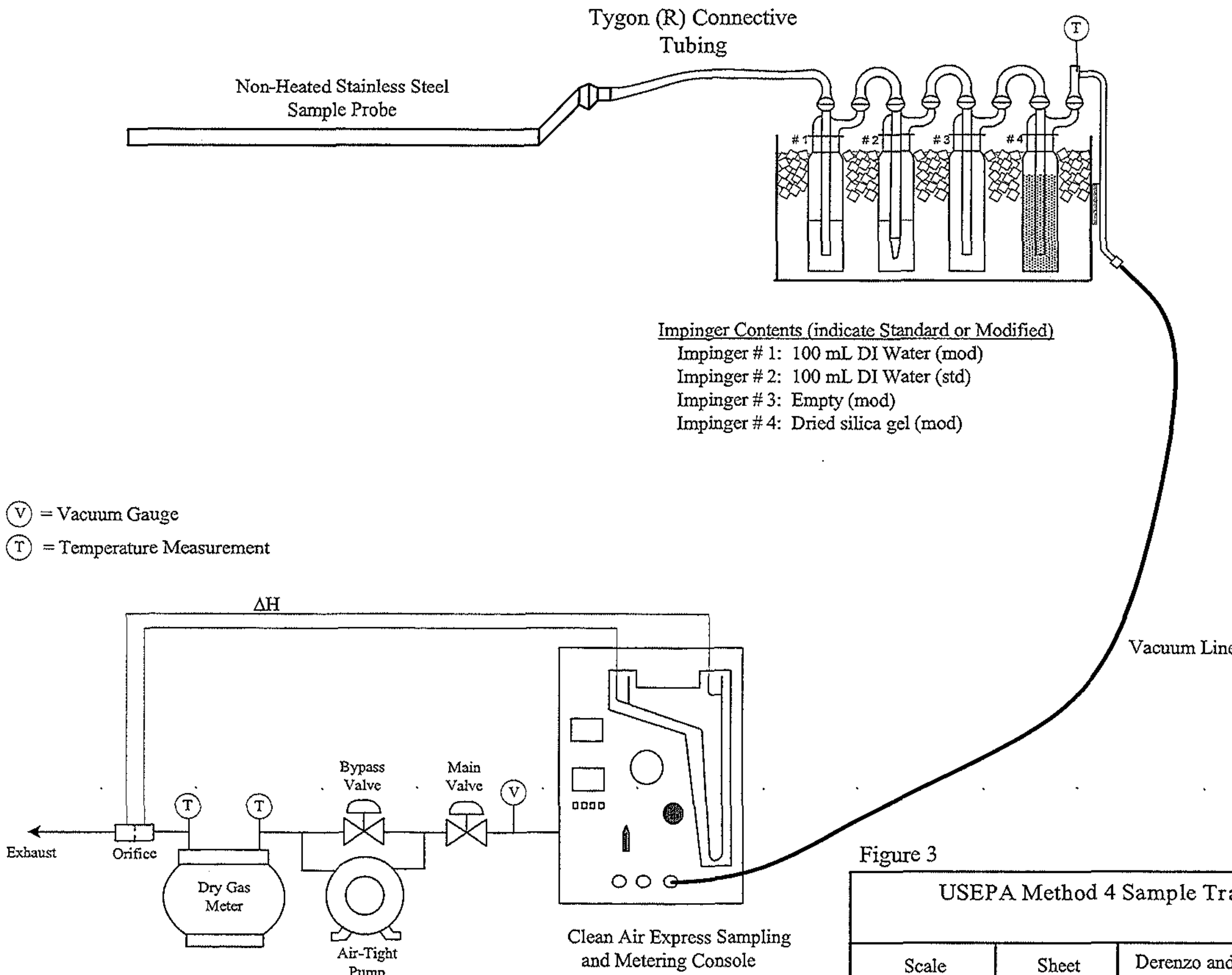


Figure 3

USEPA Method 4 Sample Train		
Scale None	Sheet 1 of 1	Derenzo and Associates Project No. 1406004