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Consulting and Testing

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EMISSIONS TEST REPORT

Title	NSPS Emission Test Report for Landfill Gas-to-Energy Reciprocating Internal Combustion Engine Generator Sets
Report Date	November 16, 2016
Test Date(s)	September 27, 2016

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

Facility Permit Information			
State Registration No.:	N3845	Permit No.:	MI-ROP-N3845-2015

Emission Unit ID	Description	Serial #
EUICENGINE1	CAT® G3520C RICE	GZJ00471
EUICENGINE2	CAT® G3520C RICE	GZJ00470

Testing Contractor	
Company	Derenzo Environmental Services
Mailing Address	39395 Schoolcraft Road Livonia, MI 48150
Phone	(734) 464-3880
Project No.	1601045

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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.: N3845-2015 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 9/27/2016 To 9/27/2016

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 RICE. The testing was performed according to the approved test plan and the the facility was operated at, or near, maximum routine operating conditions in compliance with the conditions of MI-ROP-N3845-2015.

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	Senior District Manager	(248) 391-0990
Name of Responsible Official (print or type)	Title	Phone Number

[signature] 11-9-16

Signature of Responsible Official Date

* Photocopy this form as needed.

EQP 5736 (Rev 11-04)

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NSPS EMISSION TEST REPORT FOR LANDFILL GAS-TO- ENERGY RICE GENERATOR SETS AT THE WASTE MANAGEMENT EAGLE VALLEY RECYCLE AND DISPOSAL FACILITY

1.0 INTRODUCTION

Waste Management of Michigan, Inc. (WMI) operates two (2) Caterpillar (CAT®) Model No. G3520C gas-fired reciprocating internal combustion engine (RICE) electricity generator sets at the Eagle Valley Recycling and Disposal Facility in Orion, Oakland County, Michigan. The treated landfill gas (LFG) fueled RICE generator sets (Serial Nos. GZJ00471 and GZJ00470) are identified as emission unit EUICENGINE1 and EUICENGINE2 (Flexible Group ID: FGICENGINES) in the Renewable Operating Permit (MI-ROP-N3845-2015) issued by the Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD).

Pursuant to the current permit and requirements of 40 CFR §60.4243(b)(2)(ii) of the *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines* (SI RICE NSPS, 40 CFR Part 60 Subpart JJJJ), WMI is required to perform testing for specific regulated air pollutant emissions exhausted from the RICE-generator sets every 8760 operating hours or three years, whichever comes first.

Emission testing for EUICENGINE1 and EUICENGINE2 was previously performed September 30, 2015. This test report presents the results of emission testing conducted on September 27, 2016. The testing was performed by Derenzo Environmental Services (DES) representatives Daniel Wilson and Tyler Wilson. Mr. James Dunn of WMI provided process coordination and operating parameter data acquisition.

The compliance demonstration consisted of triplicate, one-hour, test periods 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 July 20, 2016 and approved by the MDEQ-AQD on September 19, 2016.

Questions regarding this emission test report should be directed to:

Mr. Daniel Wilson
Environmental Consultant
Derenzo Environmental Services
39395 Schoolcraft Road
Livonia, MI 48150
(734) 464-3880

Mr. Victor Saufley
Manager-Environmental, Safety and Health Programs
WM RENEWABLE ENERGY
1001 Fannin, Suite 400
Houston, TX 77002
(713) 328-7348

Report Certification

This test report was prepared by DES based on field sampling data collected by DES. Facility process data was 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 Environmental Services

Reviewed By:

Robert L. Harvey, P.E.
General Manager
Derenzo Environmental Services

2.0 SUMMARY OF RESULTS

The exhaust from two (2) LFG-fueled RICE-generator sets (identified as EUICENGINE1 and EUICENGINE2) were sampled on September 27, 2016 to determine the concentration of NOx, CO and VOC. Exhaust gas velocity, moisture, oxygen (O_2) content, and carbon dioxide (CO_2) content was measured for each test period to calculate pollutant mass emission rates.

The testing was performed while each RICE 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 the SI RICE NSPS and MI-ROP-N3845-2015.

Pollutant	Results for EUICENGINE1 (g/bhp-hr)	Results for EUICENGINE2 (g/bhp-hr)	Emission Limits (g/bhp-hr)
NOx	0.67	0.67	0.9 g/bhp (MI-ROP-N3845-2015) 2.0 g/bhp-hr (NSPS JJJJ)
CO	2.37	2.48	4.13 g/bhp (MI-ROP-N3845-2015) 5.0 g/bhp-hr (NSPS JJJJ)
VOC	0.09	0.10	1.0 g/bhp (MI-ROP-N3845-2015) 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 landfill cells using a system of wells that are connected to a central header (gas collection system). The collected LFG is treated and used as fuel for the two (2) CAT® Model No.G3520C RICE-generator sets that produce electricity for transfer to the local utility.

3.2 Rated Capacities, Type and Quantity of Raw Materials Used

Each CAT® G3520C RICE-genet consists of a spark ignition, lean-burn, RICE fueled by treated LFG and a connected electricity generator. The RICE has a rated mechanical output of 2,233 bhp and the connected generator produces 1,600 kW of electricity. Fuel consumption is regulated to maintain the required heat input rate to support engine operations and is dependent on the fuel heat value (methane content). Emission testing was performed while each unit operated within 10% of the design capacity electricity generation rate of 1,600 kW.

3.3 Emission Control System Description

The CAT® G3520C RICE do not have add-on emission control equipment. The electronic air-to-fuel ratio controllers automatically adjust the air-to-fuel ratio to maintain efficient fuel combustion, which minimizes air pollutant emissions. Exhaust gas is exhausted directly to the atmosphere through noise mufflers and vertical exhaust stacks.

3.4 Sampling Locations (USEPA Method 1)

The exhaust stack sampling port for the CAT® G3520C RICE 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 exhaust stack information and the performance test sampling locations.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

A test protocol for the compliance testing was prepared by DES 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.

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

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

RICE exhaust stack gas velocity and volumetric flow rate were determined using USEPA Method 2 during each 60-minute test period. An S-type Pitot tube connected to a red-oil manometer was used to determine gas velocity pressure. Gas temperature was measured using a K-type thermocouple mounted to the Pitot tube. Exhaust gas velocity pressure and temperature were measured before and after each one-hour sampling period. 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).

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

CO_2 and O_2 content in the RICE 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 RICE 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 content correspond to standard dry gas conditions. The instrument was calibrated using appropriate calibration gases to determine accuracy and system bias (described in Section 5.4 of this document).

Figure 2 presents the instrument analyzer sampling train.

4.3 Exhaust Gas Moisture Content Determinations (Method 4)

The moisture content of the RICE exhaust gas was determined in accordance with USEPA Method 4 using a chilled impinger sampling train, which was performed during each instrumental analyzer sampling period. 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 RICE exhaust gas were determined using a chemiluminescence NOx analyzer and NDIR CO analyzer. 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.

4.5 VOC Concentration Measurements (USEPA Method 25A / ALT 096)

VOC emission rate was determined by measuring the nonmethane hydrocarbon (NMHC) concentration in the RICE 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.

5.0 <u>QA/QC ACTIVITIES</u>

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 delivers 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 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 NOx, 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, NOx, 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.

5.5 Determination of Exhaust Gas Stratification

A stratification test for the RICE 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 RICE exhaust stack gas indicate that the measured CO, NOx, CO2 and O2 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.

5.6 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.

Attachment 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

MI-ROP-N3845-2015 and 40 CFR 60.4243(b)(2)(ii) of the SI RICE NSPS specify that owners and operators of new stationary spark-ignited RICE 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 43,711 and 43,635, respectively and are within 8,760 operating hours of those recorded during the previous test event on September 30, 2015.

6.2 Operating Conditions During the Compliance Test

Each LFG-fueled RICE was operated at base load conditions (100% rated capacity +/- 10%) during the compliance testing. The following process data was monitored and recorded for each test run and is presented in attachment B.

- Treated LFG fuel use (scfm)
- LFG methane and CO2 content (% volume)
- LFG heat value (Btu/scf)
- Engine air-to-fuel ratio

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:

Engine output (bhp) = Electricity output (kW) / (0.957) / (0.7457 kW/hp)

Operating parameters are summarized in the following table.

	EUICENGINE1	EUICENGINE2
Average Electrical Rate (kW)	1,641	1,658
Average Engine Output (bhp)	2,299	2,323
Average LFG Flow (scfm)	544	545

The engines operated at a mechanical output of between 2,283 to 2,349 bhp (lowest and highest readings during the test periods).

6.3 Air Pollutant Sampling Results

The exhaust gas for each LFG-fueled RICE was monitored for three (3) one-hour test periods, during which the NOx, 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 NOx, CO and VOC mass emission rates.

The measured exhaust gas concentration for:

- NOx run averages ranged between 42.4 and 47 ppmvd corrected to 15% O_2, which results in calculated mass emission rates of 0.66 to 0.68 g/bhp-hr (calculated as NO_2).
- CO run averages ranged between 257 and 275 ppmvd corrected to 15% O_2, which results in calculated mass emission rates of 2.36 g/bhp-hr to 2.50 g/bhp-hr.
- VOC run averages ranged between 12.5 and 13.0 ppmv measured as propane (C_3), which results in calculated emission rates of 0.09 to 0.10 g/bhp-hr.

Tables 6.1 and 6.2 present measured exhaust gas conditions and calculated air pollutant emission rates for LFG-fueled RICE, EUICENGINE1 and EUICENGINE2, respectively.

Attachment C provides computer calculated and field data sheets for the RICE tests.

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

6.4 Variations from Normal Sampling Procedures or Operating Conditions

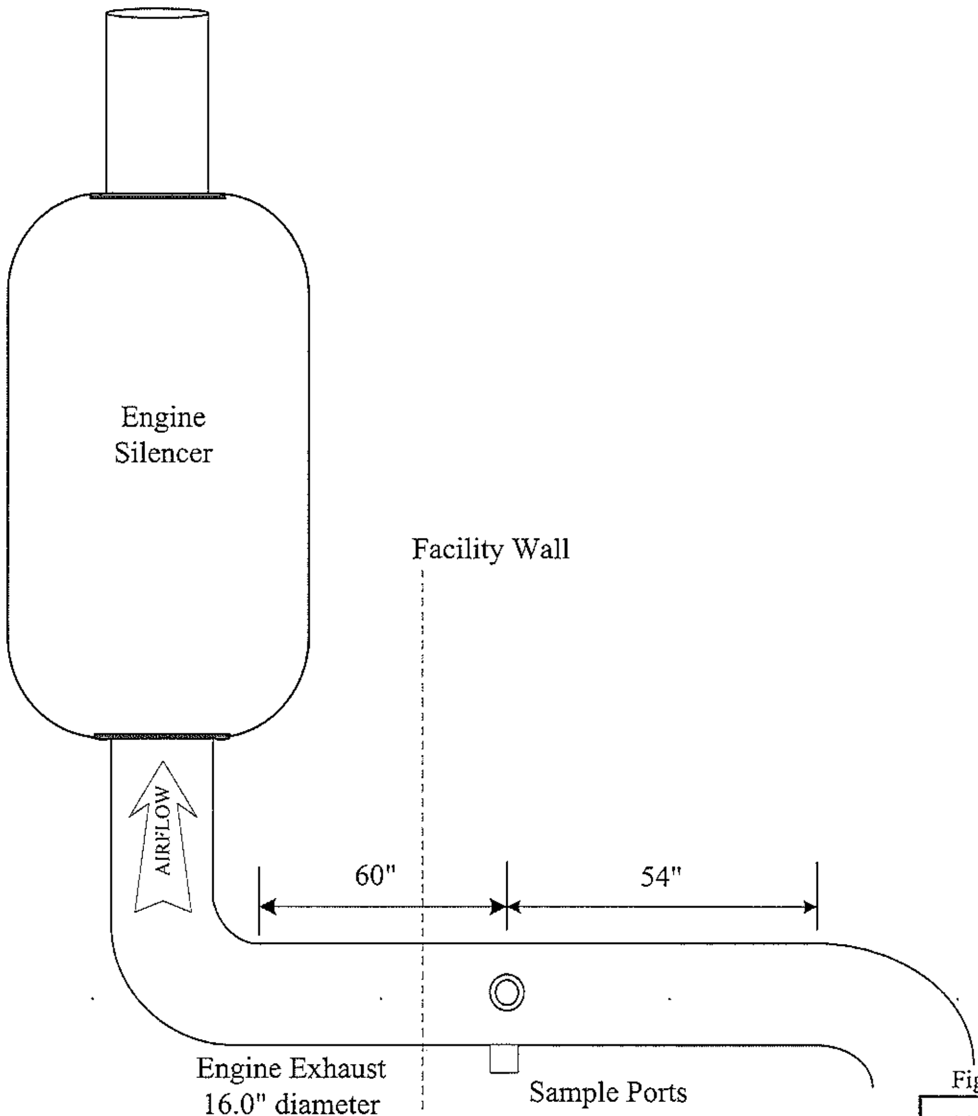
The LFG-fueled RICE were operated normally at the conditions specified in Attachment 2 and Tables 6.1 and 6.2. The compliance tests for all pollutants were performed in accordance with the approved Test Protocol dated July 20, 2016 and USEPA stationary source test methods.

Table 6.1 Measured exhaust gas conditions and air pollutant emission rates for EUICENGINE1 CAT® G3520C Serial No. GZJ00471

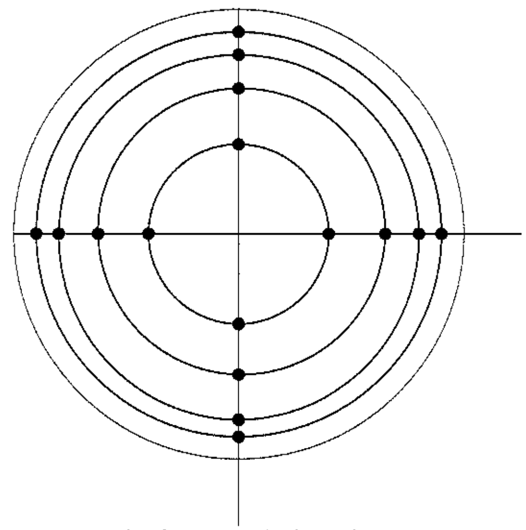
Test No. Test date Test period (24-hr clock)	1 09/27/16 11:48-12:48	2 09/27/16 13:11-14:11	3 09/27/16 14:35-15:35	Test Avg.
Generator output (kW)	1,639	1,646	1,637	1,641
Engine Horsepower (Hp)	2,297	2,306	2,294	2,299
Exhaust gas composition				
CO_2 content (% vol)	11.9	11.8	11.8	11.9
O_2 content (% vol)	7.96	7.95	8.00	7.97
Moisture (% vol)	12.1	11.6	12.4	12.0
Engine Fuel Use (scfm)	541	546	545	544
LFG Methane Content (% CH4)	52.5	52.5	52.5	52.5
LFG Heat Content (btu/scf)	478	478	478	478
Exhaust gas flowrate				
Standard conditions (scfm)	5,221	5,192	5,233	5,215
Dry basis (dscfm)	4,602	4,570	4,583	4,585
Nitrogen oxides emission rates				
NO_X conc. (ppmvd)	103	103	102	103
NO_X corrected to 15% O_2	47.0	46.6	46.5	46.7
NO_X emissions (lb/hr NO_2)	3.41	3.36	3.36	3.38
NO_X emissions (g/bhp-hr)	0.67	0.66	0.66	0.67
NO_X permit limit (g/bhp-hr)				*0.90*
Carbon monoxide emission rates				
CO conc. (ppmvd)	604	602	596	601
CO corrected to 15% O_2	275	273	271	273
CO emissions (lb/hr)	12.1	12.0	11.9	12.0
CO emissions (g/bhp-hr)	2.40	2.36	2.36	2.37
CO permit limit (g/bhp-hr)				*4.13*
VOC/NMHC emission rates				
VOC conc. (ppmv C_3)	12.5	12.5	12.5	12.5
VOC corrected to 15% O_2	6.49	6.42	6.51	6.47
VOC emissions (lb/hr)	0.45	0.45	0.45	0.45
VOC emissions (g/bhp-hr)	0.09	0.09	0.09	0.09
VOC permit limit (g/bhp-hr)				*1.0*

Table 6.2 Measured exhaust gas conditions and air pollutant emission rates for EUICENGINE2 CAT® G3520C Serial No. GZJ00470

Test No. Test date Test period (24-hr clock)	1 09/27/16 7:35-8:35	2 09/27/16 8:58-9:58	3 09/27/16 10:23-11:23	Test Avg.
Generator output (kW)	1,653	1,657	1,663	1,658
Engine Horsepower (Hp)	2,317	2,322	2,331	2,323
Exhaust gas composition				
CO_2 content (% vol)	11.8	11.8	11.9	11.8
O_2 content (% vol)	7.98	8.01	7.98	7.99
Moisture (% vol)	11.1	11.9	13.4	12.1
Engine Fuel Use (scfm)	546	544	546	545
LFG Methane Content (% CH4)	52.5	52.5	52.4	52.5
LFG Heat Content (btu/scf)	478	478	477	478
Exhaust gas flowrate				
Standard conditions (scfm)	5,840	5,889	5,866	5,865
Dry basis (dscfm)	5,168	5,144	5,080	5,131
Nitrogen oxides emission rates				
NO_X conc. (ppmvd)	93.3	93.0	93.6	93.3
NO_X corrected to 15% O_2	42.6	42.4	42.6	42.5
NO_X emissions (lb/hr NO_2)	3.46	3.43	3.41	3.43
NO_X emissions (g/bhp-hr)	0.68	0.67	0.66	0.67
NO_X permit limit (g/bhp-hr)				*0.90*
Carbon monoxide emission rates				
CO conc. (ppmvd)	567	564	570	567
CO corrected to 15% O_2	259	257	259	258
CO emissions (lb/hr)	12.8	12.7	12.6	12.7
CO emissions (g/bhp-hr)	2.50	2.47	2.46	2.48
CO permit limit (g/bhp-hr)				*4.13*
VOC/NMHC emission rates				
VOC conc. (ppmv C_3)	13.0	12.8	12.8	12.9
VOC corrected to 15% O_2	6.66	6.64	6.72	6.67
VOC emissions (lb/hr)	0.52	0.52	0.51	0.52
VOC emissions (g/bhp-hr)	0.10	0.10	0.10	0.10
VOC permit limit (g/bhp-hr)				*1.0*



Stack Cross Section



Velocity sample locations
(as measured from stack wall)

1	0.5"
2	1.7"
3	3.1"
4	5.2"
5	10.8"
6	12.9"
7	14.3"
8	15.5"

Figure 1

11/4/2015	**Eagle Valley Landfill Gas Fueled Engine Exhaust Sample Locations**		
	Scale None	Sheet 1 of 1	Derenzo Environmental Project No.: 1601045

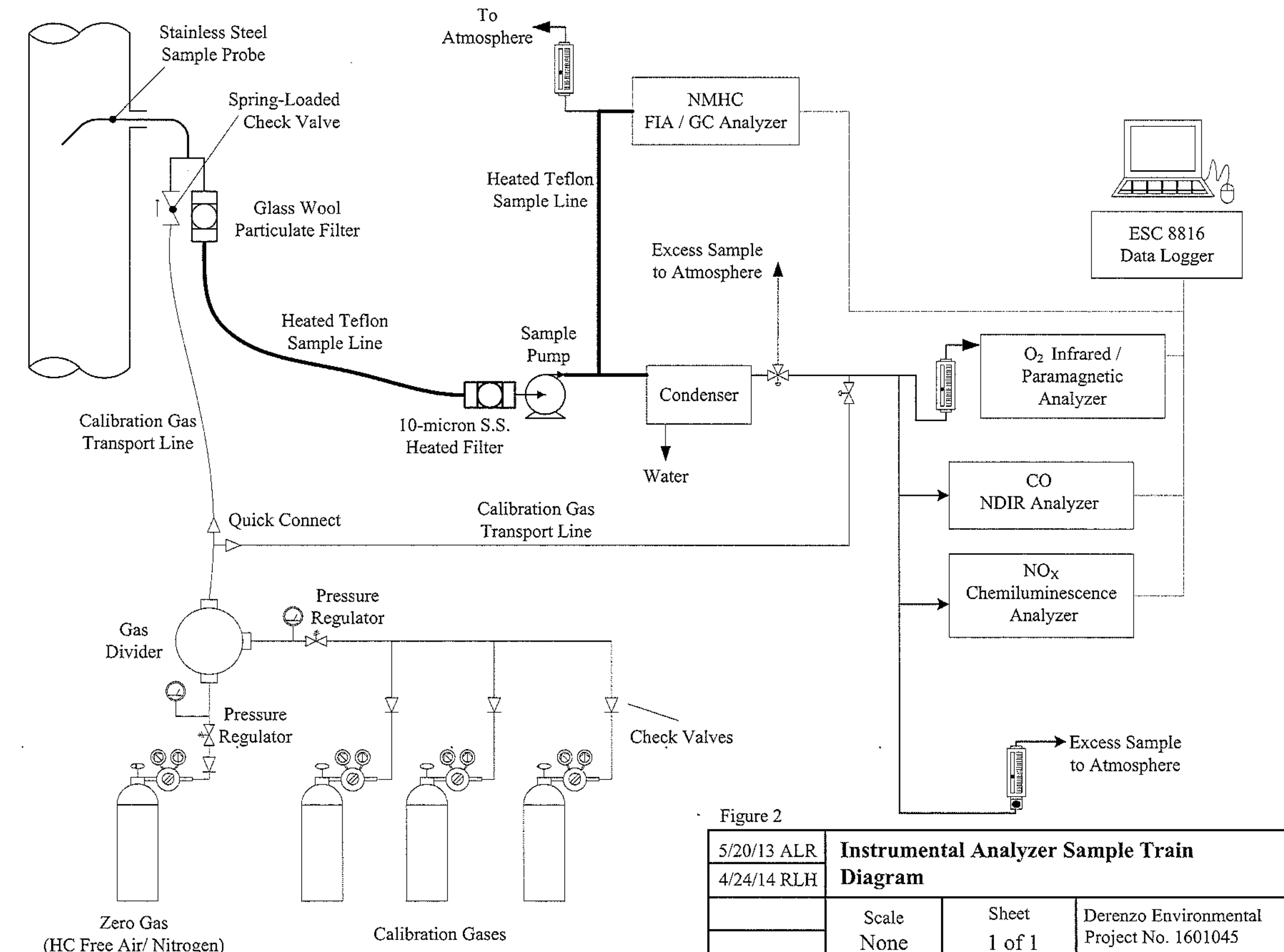


Figure 2

5/20/13 ALR 4/24/14 RLH	**Instrumental Analyzer Sample Train Diagram**		
	Scale None	Sheet 1 of 1	Derenzo Environmental Project No. 1601045

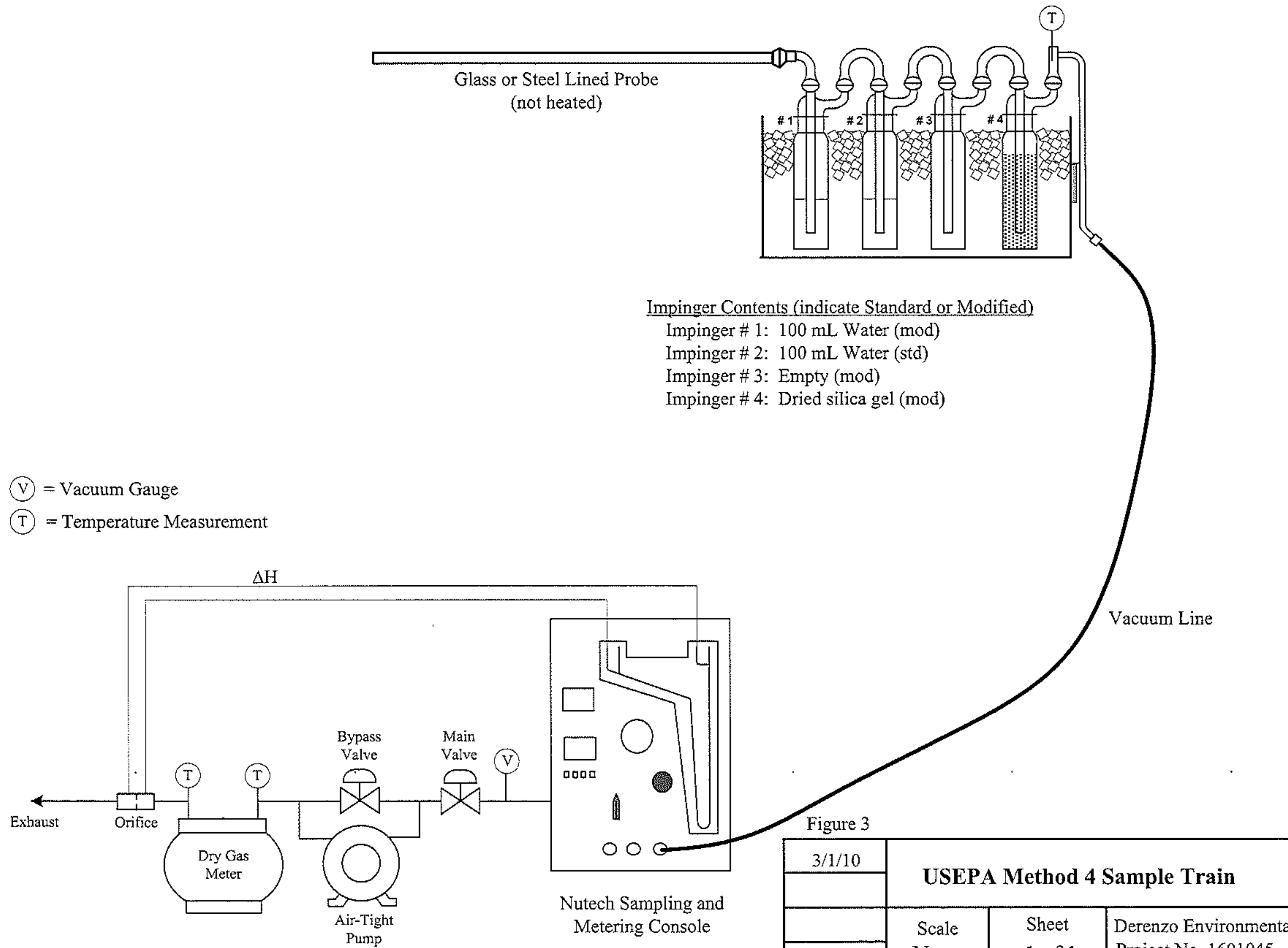


Figure 3

3/1/10	**USEPA Method 4 Sample Train**		
	Scale None	Sheet 1 of 1	Derenzo Environmental Project No. 1601045