EMISSION TEST REPORT

Report Title: TEST REPORT FOR EMISSIONS TESTING OF WASTE TREATMENT PROCESS EXHAUST GAS

Report Date: August 29, 2017

Test Dates: July 12, 2017

Facility Information	
Name:	US Ecology, Inc. / Michigan Disposal Waste Treatment Plant
Street Address:	49350 I-94 Service Drive
City, County:	Belleville, Wayne

Facility Permit Information	
Renewable Operating Permit:	MI-ROP-M4782-2010a
Permit to Install:	108-12
Emission Unit IDs:	FG_EAST

Testing Contractor	
Company:	Derenzo Environmental Services
Mailing Address:	39395 Schoolcraft Road Livonia, Michigan 48150
Phone:	(734) 464-3880
Project No.:	1701061

TEST REPORT FOR
THE EMISSIONS TESTING OF
WASTE TREATMENT PROCESS EXHAUST GAS

US ECOLOGY, INC. / MICHIGAN DISPOSAL WASTE TREATMENT PLANT
BELLEVILLE, WAYNE COUNTY

1.0 INTRODUCTION

US Ecology, Inc. (US Ecology) operates the Michigan Disposal Waste Treatment Plant (MDWTP) hazardous and nonhazardous waste processing facility. The facility consists of two processing lines FG_EAST and FG_WEST and is located in Belleville, Michigan, Wayne County. The facility has been issued State of Michigan Renewable Operating Permit (ROP) MI-ROP-M4782-2010a. FG_EAST has also been issued State of Michigan Permit to Install (PTI) No. 108-12.

Conditions of the operating permit require MDWTP to perform emissions tests for FG_EAST as summarized in the following table:

Emission Unit	Pollutant	Test Type	Test Method
FG_EAST	Methylene Chloride	Emissions Test	USEPA RM 18
	Benzene		
	1,1,2,2-tetrachloroethane		
	Carbon tetrachloride		
	Chloroform		
	Trichloroethane		
	Tetrachlorethene		
	Hydrogen Chloride	Emissions Test	USEPA RM 26A
	VOCs	Emissions Test	USEPA RM 25A/18

The emissions testing was performed by Derenzo Environmental Services representatives Andrew Rusnak, Jason Logan, and Blake Beddow. The exhaust gas sampling and analysis was performed using procedures specified in the Test Plan dated May 2, 2017 that was submitted to the MDEQ-AQD for review and approval and subsequent emails regarding the testing of chlorinated compounds. The project was coordinated by Ms. Sylwia Scott, Environmental Manager – US Ecology, Inc. Mr. Mark Dziadosz and Ms. Nazaret Sandoval of the MDEQ-AQD were on-site to observe portions of the compliance testing.

This test report document provides information required by *Format for Submittal of Source Emission Test Plans and Reports* issued by the MDEQ-AQD on December 2013 for source emission test program procedures. A Renewable Operating Permit Report Certification (EQP 5736), signed by the MDWTP Responsible Official accompanies the submittal of this test report.

Questions regarding this emission test report should be directed to:

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This test report was prepared by Derenzo Environmental Services based on field sampling data collected by Derenzo Environmental Services personnel. Facility process data were collected and provided by US Ecology, Inc. employees or representatives.

I certify that the testing was conducted in accordance with approved methods and procedures 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:

For Jason Logan
Project Manager
Derenzo Environmental Services

Report Reviewed By:

Andy Rusnak, QSTI
Technical Manager
Derenzo Environmental Services

2.0 SUMMARY OF RESULTS

Regenerative thermal oxidizer (RTO) inlet and exhaust gas streams were monitored simultaneously for three (3) one-hour test periods to determine the VOC destruction efficiency (DE). In addition the RTO exhaust gas stream was measured for three one-hour test periods to determine mass emissions of:

- Hydrogen chloride (HCl),
- Methylene chloride,
- Benzene,
- 1,1,2,2-tetrachloroethane,
- Carbon tetrachloride,
- Chloroform,
- Trichloroethane, and
- Tetrachlorethene.

The VOC destruction efficiency test results and mass emissions for each pollutant listed above (three-test average) are summarized in Tables 2.1 and 2.2 respectively.

Results for each one hour test period are presented in Section 6 of this report.

Table 2.1 Summary of VOC destruction efficiency test results

Parameter	Average VOC Mass Flow Rate RTO Inlet (lb/hr)	RTO Exhaust (lb/hr)	Three-Test Average VOC Destruction Efficiency
Measurement Results	11.1	0.30	98.3%
Permit Limit			**>95.0%**

Table 2.2 Summary of pollutant mass emissions

Criteria Pollutant	Mass Emissions (lb/hr)	**Permit Limit (lb/hr)**
VOC	0.30	**22.85**
Methylene chloride	0.02	**14.92**
Benzene	0.01	**0.71**
1,1,2,2-tetrachloroethane	0.02	**0.16**
Carbon tetrachloride	0.03	**0.28**
Chloroform	0.02	**3.02**
Trichloroethane	0.02	**4.52**
Tetrachlorethene	0.02	**12.7**
Hydrogen chloride	0.55	**28.4**

3.0 SOURCE DESCRIPTION

3.1 Process Description

MDWTP receives and processes hazardous and nonhazardous waste at its Belleville facility. Liquid and solid waste that is generated offsite is treated in order to meet land disposal requirements. Off-site and on-site waste is processed in one of two buildings FG_EAST or FG_WEST depending on the type of waste, treatment requirements and pollution control requirements. Treated waste is sent to a Subtitle C landfill after processing. Performance testing was conducted on FG_EAST. The emission unit consists of EU_SLUDGETANK12 and EU_STORAGETANK1 (EU_PUGMILL1 was removed from the facility in 2013).

3.2 Type of Raw Materials Used

The primary raw material is hazardous and nonhazardous waste. EU_SLUDGETANK12 is a 40,000 gallon sludge tank. EU_STORAGETANK1 consists of four waste treatment and storage tanks (Tank E, F, G and H).

3.3 Emission Control System Description

FG_EAST is equipped with three pollution control devices. Emissions are first routed through a fabric filter baghouse dust collector for particulate matter removal followed by a regenerative thermal oxidizer (RTO) for VOC reduction. Finally emissions are routed through a sodium hydroxide packed bed wet scrubber to reduce acid gas emissions.

The baghouse is operated to maintain a pressure drop across the unit of between 1.5 and 8.0 inches of water column.

The RTO is operated to maintain a minimum combustion chamber temperature of 1,500 °F.

The caustic packed bed wet scrubber is operated with a pH greater than 7.3 and liquid flow rate of between 225 and 350 gallons per minute.

3.4 Process Operating Conditions During the Compliance Testing

During testing the process operated at normal rates. Data for oxidizer fan speed was collected at one second intervals and is presented in this report as 15-minute averages. The oxidizer combustion temperature data and inlet gas flowrate were recorded as 5-minute averages.

Appendix 1 provides a copy of the US Ecology process data during the performance testing. Confidential waste characterization reports were provided MDEQ representatives while they were on site to witness the emissions testing.

Table 3.1 Summary of process operating conditions during performance testing

Operating Variable	Three-test Average
Oxidizer Combustion Temperature (°F)	1,633
Oxidizer Inlet Flowrate (scfm)	20,499
Oxidizer Fan Speed (Hz)	46

4.0 SAMPLING AND ANALYTICAL PROCEDURES

A description of the sampling and analytical procedures was provided in the Test Plan dated May 2, 2017, which was approved by the MDEQ-AQD with one exception which is outlined in Section 6.3. This section provides a summary of those procedures.

4.1 Summary of Test Procedures

Derenzo Environmental Services performed the specified pollutant measurements in accordance with the following USEPA reference test methods:

Parameter/Analyte	Sampling Methodology	Analytical Methodology
Velocity traverses	USEPA Method 1	Selection of sample and velocity traverse locations by physical stack measurements
Volumetric flow rate	USEPA Method 2	Measurement of velocity head using a Type-S Pitot tube and inclined manometer
Oxygen and Carbon dioxide	USEPA Method 3/3A	Fyrite gas scrubber analyzers and IR & Paramagnetic instrumental analyzers
Moisture	USEPA Method 4	Wet bulb / dry bulb temperature measurements and gravimetric weight gain in chilled impingers
Volatile organic compounds	USEPA Method 25A/18	Flame ionization detection analyzer (with methane subtraction)
Hydrogen chloride	USEPA Method 26A	Ion chromatography analysis
Chlorinated Compounds	USEPA Method 18	Measurement of gaseous organic compound emissions by gas chromatography and Fourier transform infrared (FTIR)

In addition to the measurement methods specified in the previous table:

- USEPA Method 205; *Verification of Dilution Systems for Field Instrument Calibrations,* was used to verify linearity of the calibration gas dilution system.

4.2 Sampling Locations (USEPA Method 1)

The sampling location for the RTO inlet is in the 36-inch diameter horizontal duct after the baghouse control. The inlet sampling location is approximately 69 inches downstream and 18 inches upstream from the nearest flow disturbances. The sampling location for the RTO exhaust is in the 48-inch diameter vertical duct after the RTO and caustic wet scrubber controls. The exhaust sampling location is approximately 380 inches downstream and 177 inches upstream from the nearest flow disturbances.

The RTO exhaust sampling locations meets the USEPA Method 1 criteria for representative sampling locations. The RTO inlet B dimension does not meet the USEPA Method 1 criteria for representative sampling location (1.9 duct diameters, opposed to the required 2.0 duct diameters), however, it is the only straight section of duct between the system fan and RTO inlet. The straight section of duct is 7.25 ft. long.

Appendix 2 provides diagrams of the performance test sampling locations.

4.3 Process Air Flowrate Measurements (USEPA Method 2)

RTO inlet and exhaust gas velocity pressure and temperature were measured at each sampling location in accordance with USEPA Method 2. RTO inlet measurements were performed prior to each 1-hour test. RTO exhaust measurements were performed as a component of the isokinetic sampling train. An S-type Pitot tube connected to a red-oil manometer was used to determine velocity pressure and a K-type thermocouple mounted to the Pitot tube was used for temperature measurements. The Pitot tube and connective tubing were periodically leak-checked to verify the integrity of the measurement system.

Appendix 3 provides flowrate field data sheets and calculations.

4.4 Diluent Gas Measurements (USEPA Methods 3, 3A, and 4)

Carbon dioxide (CO_2) and oxygen (O_2) content for the RTO inlet gas stream was measured using Fyrite® gas analyzers containing scrubbing solutions to selectively remove CO_2 and O_2 from the gas sample. Samples were withdrawn from the air stream near the beginning of each test period using a sample probe and hand-held aspirator and introduced to the Fyrite® solutions through the scrubbing tube inlet valve. The sampled gas was passed through the appropriate scrubbing solution several times and the gas concentration (CO_2 or O_2) was determined by the solution volume change as indicated by the calibrated scale on the Fyrite® scrubber chamber. Moisture content for the inlet gas stream was determined in accordance with the Method 4 approximation technique using wet bulb/dry bulb temperatures in conjunction with a psychrometric chart.

Carbon dioxide (CO_2) and oxygen (O_2) content for the RTO exhaust gas stream was measured using a Servomex 4900 instrumental analyzer which utilizes single beam single wavelength

(SBSW) technology for CO_2 and a paramagnetic sensor for O_2. Moisture content in the RTO exhaust gas was determined using gravimetric weight gain in chilled impingers as a component of the isokinetic sampling train.

Appendix 4 provides diluent gas concentration calculations.

Appendix 5 provides raw instrument response data.

4.5 Hydrocarbon Concentration Measurements (USEPA Methods 18 and 25A)

Total hydrocarbon (THC) concentration in the oxidizer inlet gas stream was determined using a Thermo Environmental Instruments, Inc. (TEI) Model 51c flame ionization analyzer (FIA) in accordance with USEPA Method 25A, *Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer.*

Due to the potential for minor quantities of methane in the RTO exhaust, the exhaust gas non-methane hydrocarbon (NMHC) concentration was measured using a TEI Model 55i Methane-NMHC analyzer. The TEI 55i is an automated batch analyzer that repeatedly collects and analyzes samples of the exhaust gas stream that are drawn into the instrument by the internal sampling pump. The sampled gas is separated by an internal gas chromatography (GC) column into methane and non-methane fractions and each fraction is analyzed separately using a flame ionization detector (FID), in accordance with USEPA Method 25A.

Throughout each test period, a sample of the gas from each measurement location was delivered to each analyzer, independently, using an extractive gas sampling system and heated Teflon® sample line equipped with a heating element and temperature controller to maintain the temperature of the sample line at approximately 280°F. The sampled gas streams were not dried prior to being introduced to the FIA instruments; therefore, THC concentration measurements correspond to standard conditions with no moisture correction. Instrument response for each analyzer was recorded on an ESC Model 8816 data logging system that monitors the analog output of the instrumental analyzers continuously and logs data as one-minute averages.

Prior to the first test period, appropriate high-range, mid-range and low-range span gases (USEPA protocol 1 certified calibration gases of propane in air) followed by a zero gas (hydrocarbon free air) were introduced into each sampling system to verify instrument response and sampling system integrity. The calibration gas was delivered to the sampling system through a spring-loaded check valve and a stainless steel "Tee" installed at the base of the sample probe. At the conclusion of each test period, instrument calibration was verified against mid-range and low-range calibration gases and zero gas. A STEC Model SGD-710C 10-step gas divider was used to obtain intermediate calibration gas concentrations as needed.

Appendix 2 provides diagrams of the USEPA Method 25A sample configuration.

Appendix 4 provides measured gas stream VOC concentration and mass flow rate calculations.

Appendix 5 provides raw instrument response data.

4.6 Hydrogen Chloride Measurements (USEPA Method 26A)

HCl concentration in the RTO exhaust gas was determined using USEPA Method 26A. An integrated sample of the exhaust gas was withdrawn isokinetically through chilled impingers containing 0.1 normal sulfuric acid (0.1N H_2SO_4). At the end of each one-hour test period the impinger solutions were recovered in appropriate sample containers, labelled, and capped. The samples were hand delivered to the contract laboratory (Bureau Veritas in Novi, Michigan) for hydrogen chlorine analysis by ion specific electrode analysis in accordance with USEPA Method 26A.

Appendix 2 provides the isokinetic sampling train diagram.

Appendix 6 provides isokinetic data sheets, calculations and HCl emission rates.

Appendix 7 provides a copy of the HCl laboratory analytical report.

4.7 Speciated Organic Compound Measurements (USEPA Method 18)

The concentration of target speciated organic compounds in the RTO exhaust gas was performed by Prism Analytical Technologies (Mount Pleasant, MI) using Prism Max™ technology. The Prism Max™ system couples a MKS Multi-Gas 2030 FTIR spectrometer with a gas chromotagraph. This system is able to provide real time results with low detection limits even with high compound interference.

Throughout each one-hour test period, a continuous sample of the exhaust gas was extracted from the stack using a Teflon® heated sample line and heated particulate filter. Two (2) AS002 tri-matrix thermal desorption collection tubes (spiked tube and unspiked tube) were connected in parallel to the gas stream that was delivered to the Thermo Model 55i instrument. The sampled gas was not conditioned prior to being introduced to the tubes; therefore, the measurement of speciated organic compound concentrations correspond to standard wet gas conditions. At the conclusion of each sample run the sample tubes were immediately analyzed on the GC-FTIR analyzer to determine the spiked tube recovery (i.e., if the run was acceptable).

Appendix 4 provides speciated chlorinated compound calculation sheets.

The report prepared by Prism Analytical, which details the methodology and QA/QC results, is provided in Appendix 8.

5.0 QA/QC ACTIVITIES

5.1 Volumetric Flowrates

Prior to arriving onsite, the instruments used during the source test to measure exhaust gas properties and velocity (barometer, pyrometer, and Pitot tube) were calibrated to specifications outlined in the sampling methods.

The Pitot tube and connective tubing were leak-checked prior to each traverse to verify the integrity of the measurement system.

The absence of significant cyclonic flow was verified using an S-type Pitot tube and oil manometer. The Pitot tube was positioned at 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).

5.2 Gas Divider Certification (USEPA Method 205)

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 Instrumental Analyzer Interference Check

The instrumental analyzer used to measure O_2 and CO_2 have had an interference response test preformed 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 2.5% of the span for all measured interferent gases. No major analytical components of the analyzers have been replaced since performing the original interference tests.

5.4 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 CO_2 and O_2 analyzer 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 THC and NMHC analyzers, 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 and O_2 in nitrogen and zeroed using hydrocarbon free nitrogen. The THC and NMHC instruments were 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 Meter Box Calibrations and Isokinetic Sampling

The dry gas meter isokinetic sampling console, which was used for HCl 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 calculated isokinetic variation for each one hour test period is within the method allowance, +/-10% of the isokinetic sampling rate, as required by USEPA Method 26A.

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

All method blanks were appropriately packaged with the samples and all QA/QC was performed in accordance with USEPA Method 26A.

Appendix 9 presents test equipment quality assurance data (instrument calibration and system bias check records, calibration gas and gas divider certifications, interference test results, meter box calibration records, Pitot tube, scale, and nozzle calibration records, etc).

6.0 TEST RESULTS AND DISCUSSION

6.1 Oxidizer VOC Destruction Efficiency

The THC concentration in the oxidizer inlet and NMHC concentration in the oxidizer exhaust gas streams were monitored simultaneously to determine the mass flowrate entering and exiting the emission control system. Three (3) one-hour sampling periods were performed.

Air flowrate measurements on the RTO inlet were performed prior to the beginning of each 1-hour test period. Air flowrate measurements on the RTO exhaust were performed as a component of the isokinetic sampling train. Gas molecular weight measurements (fixed gases and moisture determinations) were performed for each one-hour test period.

The VOC mass flowrate into and out of the oxidizer emission control system was calculated using the following equation:

$$M_{VOC} = Q\,[C_{VOC}]\,(MW_{C3})\,(60\ min/hr) / V_M / 1E{+}06$$

Where: M_{VOC} = Mass flowrate VOC (lb/hr)
Q = Volumetric flowrate (scfm)
C_{VOC} = THC concentration (ppmv C_3)
MW_{C3} = Molecular weight of propane (44.1 lb/lb-mol)
V_M = Molar volume of ideal gas at standard condition (385 scf/lb-mol)

The THC destruction efficiency of the oxidizer emission control system was determined for each test period using the following equation:

$$DE = [1 - (M_{VOC\ out} / M_{VOC\ in})] * 100\%$$

Where: DE = VOC destruction efficiency (%wt)
$M_{VOC\ in}$ = VOC mass flowrate into the oxidizer (lb/hr)
$M_{VOC\ out}$ = VOC mass flowrate exhausted from the oxidizer (lb/hr)

The calculated VOC destruction efficiency for three tests averaged 98.3%. Conditions of MI-ROP-M4782-2010a and PTI No. 108-12 state "the permittee shall not process waste with a VOC concentration great than 500 ppm in FG_EAST unless the destruction efficiency of the thermal oxidizer is a minimum of 95%". The performance testing of the RTO confirms the destruction efficiency to be greater than 95%.

Calculations for each test period are presented in Appendix 4.

Table 6.1 presents measured gas conditions and VOC destruction efficiency results for each oxidizer test periods.

6.2 Pollutant Mass Emissions and Allowable Emission Rates

Process operating data and air pollutant emission measurement results for each one hour test period are presented in Table 6.2. The measured air pollutant emission rates for FG_EAST are less than the allowable limits specified in MI-ROP-M4782-2010a and PTI No. 108-12:

- 22.85 lb/hr VOC.
- 14.92 lb/hr methylene chloride.
- 0.71 lb/hr benzene.
- 0.16 lb/hr 1,1,2,2-tetrachloroethane.
- 0.28 lb/hr carbon tetrachloride.
- 3.02 lb/hr chloroform.
- 4.52 lb/hr trichloroethene.
- 12.7 lb/hr tetrachloroethene.
- 28.4 lb/hr hydrogen chloride.

6.3 Variations from Normal Sampling Procedures or Operating Conditions

The original Test Plan dated May 2, 2017 outlined using Compendium Method TO-14 to analyze for the speciated organic compounds listed in PTI 108-12. The MDEQ-AQD did not approve the use of TO-14. Ultimately the MDEQ suggested and approved analyses be performed using USEPA Method 18 via the Prism Analytical Max™ system (FTIR-GC). All other test procedures were performed in accordance with the above referenced Test Plan.

Testing was paused during the second isokinetic run for safety issues (high winds and severe weather). Isokinetic testing was paused for approximately 45 minutes from 12:42-13:27. The pause did not affect the instrumental analyzer or FTIR-GC sample trains.

The first USEPA Method 18 sampling run was discarded due to excessive moisture present in the sampling tubes. The excessive moisture caused detection problems. The sample tube collection location was moved to a location prior to entering the hydrocarbon analyzer where gas temperatures exceeded 250 °F. An additional sampling run was conducted during the isokinetic sampling train weather delay (i.e., from 13:06 – 14:06).

The MDEQ-AQD test plan approval letter specified recording RTO inlet pressure as part of the process data collection. US Ecology does not have pressure reading equipment installed on the RTO, and is not required to read RTO pressure as part of the Design/Equipment Parameters or Monitoring/Recordkeeping requirements for FG_EAST in PTI 108-12 and MI-ROP-M4782-2010a. US Ecology operates a flowrate measurement device as part of their monitoring requirements in the above referenced permits. The RTO inlet flowrate readings, as measured by US Ecology, are provided in this report. DES personnel measured static pressure during each RTO inlet flowrate, which is synonymous with RTO inlet pressure.

All test procedures were performed in accordance with the MDEQ-AQD test plan approval letter and associated test methodology. During the testing program the facility operated at normal operating conditions.

Table 6.1 Measured gas conditions and VOC destruction efficiency test results

Test No.	Test 1	Test 2	Test 3	Three
Date	7/11/17	7/11/17	7/11/17	Test
Test Times	9:10-10:10	11:43-12:43	14:36-15:36	Avg
Collection System Parameters				
RTO Combustion Temperature (°F)	1,634	1,632	1,633	1,633
RTO Fan Speed (Hz)	45	47	47	46
RTO Inlet Flowrate (scfm)[1]	20,499	20,500	20,499	20,499
Oxidizer Inlet Gas Parameters				
O2 Content (%)	21.0	21.0	21.0	21.0
CO2 Content (%)	0.0	0.0	0.0	0.0
Moisture Content (%)	2.1	3.9	4.2	3.4
Temperature (°F)	88.9	106	103	99.5
Flowrate (scfm)[2]	21,478	21,305	22,227	21,670
Average THC Conc. (ppmv C_3)	138	36.0	49.2	75.6
Calculated VOC Mass Flow (lb/hr)	20.4	5.27	7.51	11.1
Exhaust Gas Parameters				
O2 Content (%)	20.7	20.9	20.7	20.8
CO2 Content (%)	0.36	0.33	0.37	0.35
Moisture Content (%)	6.9	7.4	7.4	7.2
Temperature (°F)	99.2	101	101	100
Flowrate (scfm)	24,275	23,469	24,513	24,086
Average THC Conc. (ppmv C_3)	4.97	0.18	0.23	1.79
Calculated VOC Mass Flow (lb/hr)	0.83	0.03	0.04	0.30
Calculated Destruction Efficiency (%)				
1 - [VOC_{out} / VOC_{in}] x 100%	95.9	99.5	99.5	98.3
Permitted Limit (%)				95

Notes for Table 6.1:

1. Inlet flowrate read by US Ecology equipment installed on the oxidizer.
2. Flowrate determined with pitot tube and manometer by testing personnel.

Table 6.2 Measured gas conditions and pollutant mass emissions test results

Test No. Date Test Times	Test 1[A] 7/11/17 9:10-10:10	Test 2 7/11/17 11:43-12:43	Test 3 7/11/17 14:36-15:36	Three Test Avg
Exhaust Gas Parameters				
O_2 Content (%)	20.7	20.9	20.7	20.8
CO_2 Content (%)	0.36	0.33	0.37	0.35
Moisture Content (%)	6.9	7.4	7.4	7.2
Temperature (°F)	99.2	101	101	100
Flowrate (scfm)	24,275	23,469	24,513	24,086
Pollutant Mass Emissions				
VOC Emissions (lb/hr)	0.83	0.03	0.04	0.30
Permitted Emissions (lb/hr)				*22.85*
Methylene Chloride Emissions (lb/hr)	0.03	0.02	0.01	0.02
Permitted Emissions (lb/hr)				*14.92*
Benzene Emissions (lb/hr)	0.01	0.01	0.01	0.01
Permitted Emissions (lb/hr)				*0.71*
1,1,2,2-tetrachloroethane Emissions (lb/hr)	0.02	0.02	0.04	0.02
Permitted Emissions (lb/hr)				*0.16*
Carbon Tetrachloride Emissions (lb/hr)	0.03	0.02	0.04	0.03
Permitted Emissions (lb/hr)				*0.28*
Chloroform Emissions (lb/hr)	0.02	0.02	0.03	0.02
Permitted Emissions (lb/hr)				*3.02*
Trichloroethene Emissions (lb/hr)	0.03	0.01	0.02	0.02
Permitted Emissions (lb/hr)				*4.52*
Tetrachloroethene Emissions (lb/hr)	0.02	0.01	0.02	0.02
Permitted Emissions (lb/hr)				*12.7*

Notes for Table 6.2:

A. Run No. 1 for chlorinated compounds was discarded. An additional run was performed from 13:06 – 14:06.

Table 6.3 Hydrogen chloride isokinetic sampling test results

Test No.	Test 1	Test 2	Test 3	Three
Date	7/11/17	7/11/17	7/11/17	Test
Test Times	9:07-10:33	11:43-13:36[A]	14:33-15:40	Avg
Exhaust Gas Parameters				
Moisture Content (%)	6.9	7.4	7.4	7.2
Flowrate (scfm)	24,275	23,469	24,513	24,086
Flowrate (dscfm)	22,597	21,738	22,708	22,348
Sample Train Data (Method 26A)				
Sample Volume (dscf)	47.5	45.5	38.2	43.7
Sample Volume (dscm)	1.35	1.29	1.08	1.24
HCl Weight (mg)	9.6	8.5	6.4	8.2
Calculated HCl Emissions				
Exhaust Gas HCl Content (mg/dscm)	7.14	6.60	5.92	6.55
Exhaust Gas HCl Content (ppmvd)	4.71	4.35	3.91	4.32
HCl Emissions (lb/hr)	0.60	0.54	0.50	0.55
Permitted Emissions (lb/hr)				**28.4**

Notes for Table 6.3:

A. Testing paused from 12:42-13:27 due to high winds and severe weather.