



**GAMMIE AIR
MONITORING, LLC**

16 Progress Circle, Suite 1B
Newington, CT 06111
860-757-3340

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JAN 23 2018

Air Quality Division
Detroit Office

Mercury Emissions Test Report
Great Lakes Water Authority
Multiple Hearth Incinerator
Nos. 8, 9 and 10
State Registration Number (SRN) B2103
Permit-to-Install Application ID# 61-13
Detroit, Michigan

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JAN 25 2018

AIR QUALITY DIVISION

Prepared for:

Mr. CJ Pokorny
Walsh Construction Company

Prepared by:

Mr. Leigh A. Gammie, QSTI
Gammie Air Monitoring, LLC

October 2017

GamAir Project No.: 753-1713

REPORT CERTIFICATION

I have personally examined and am familiar with the information submitted in this document and all attachments thereto, and I certify, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, that the submitted information is true, accurate, and complete to the best of my knowledge and belief.



24 OCT 2017

Leigh A. Gammie, QSTI
Principal
Gammie Air Monitoring, LLC

Date

1.0 INTRODUCTION

1.1 Summary of Test Program

Gammie Air Monitoring, LLC (GamAir) performed a mercury emissions compliance retest program on multiple hearth incinerator (MHI) Nos. 8, 9 and 10 which are owned and operated by the Great Lakes Water Authority (GLWA). This mercury retest was brought on by the failed ERA mercury audit that was associated with MHI Nos. 8, 9, and 10.

The applicable USEPA MACT 129 mercury emission limit is as follows.

Parameter	Units	USEPA MACT 129 Emission Limits
Mercury	milligrams per dry standard cubic meter @ 7% O ₂	0.28

The mercury tests were conducted in accordance with the conditions and monitoring requirements for compliance testing as set forth in the State of Michigan Department of Environmental Quality (MDEQ) and United States Environmental Protection Agency (USEPA) Part 60, Subpart M - Emission Guidelines for Existing Sewage Sludge Incineration Units (Model Rule).

Compliance tests were conducted in accordance with EPA Methods 1-4 and 29 as published in Title 40, Code of Federal Regulations, Part 60. The test program for each MHI was conducted over a one day period. Unit No. 8 was tested on 29 September 2017, Unit No. 9 was tested on 27 September and Unit No. 10 was tested on 28 September 2017. Representatives from Gammie Air Monitoring, LLC (GamAir) and GLWA were responsible for coordinating the testing with the MDEQ. Mr. Mark Dziadosz served as the onsite representative from MDEQ. GamAir was responsible for collecting all process data, collecting and analyzing all biosolid samples, collecting all air emission samples and the respective analysis of those samples.

Section 2.0 of this report presents a description of each source and describes the sampling locations. Section 3.0 summarizes the test results. Section 4.0 describes the sampling and analysis methodologies. Section 5.0 provides the quality assurance and quality control (QA/QC) procedures specific to this test program.

1.2 Test Program Organization

The following is a list of those individuals responsible for the organization of this test program.

Mr. CJ Pokorny Walsh Construction (313) 363-6570
Email: cpokorny@walshgroup.com

Mr. Melvin Dacres GLWA (313) 297-0363
Email: melvin.dacres@glwater.org

2.0 SOURCE AND SAMPLE LOCATION DESCRIPTIONS

2.1 Process and Air Pollution Control Description

GLWA operated three identical multiple hearth incinerators (MHI), identified at Nos. 8, 9 and 10, which are 22 foot in diameter and are equipped with 12-hearths. Sludge was dewatered with centrifuges and conveyed to the multiple hearth furnaces with belt conveyors. The sludge conveyors were equipped with nuclear weigh scales for continuous monitoring of the amount of sludge being incinerated. During the compliance test program, each incinerator operated at a minimum 85 percent of rated capacity. Each furnace is equipped with auxiliary natural gas burners at hearths 2, 4, 6, 8, 10, and 12. The firing rate of the burners is modulated by a central control system to sustain the desired hearth temperatures. Each air pollution control system is comprised of a double zero hearth afterburner section of Hearths 1 and 2, a quench section, and EnviroCare® Venturi-Pak (venturi throat sections and mist eliminator) scrubber system. Individual process monitoring for each incinerator are shown in Tables 2-1 through 2-3.

2.2 Process Monitoring

All process monitoring data are shown in Appendix D.

2.2.1 Unit No. 8

During the test program MHI No. 8 operated at an optimized feed rate. Table 2-1 summarizes the process conditions during the mercury tests. Sludge feed rate ranged between 2.40 to 2.45 dry tons per hour.

2.2.2 Unit No. 9

During the test program MHI No. 9 operated at an optimized feed rate. Table 2-2 summarizes the process conditions during the mercury tests. Sludge feed rate ranged between 3.28 to 4.14 dry tons per hour.

2.2.3 Unit No. 10

During the test program MHI No. 10 operated at an optimized feed rate. Table 2-3 summarizes the process conditions during the mercury tests. Sludge feed rate ranged between 3.75 to 4.45 dry tons per hour.

Table 2-1
Summary of Process Data
Mercury Test Program
Great Lakes Water Authority - Incinerator No. 8
Detroit, Michigan
29 September 2017

Method/Component	Units	Run 7 0953-1131	Run 8 1140-1316	Run 9 1330-1507	Average
Biosolids Feed Rate	wet tons/hour	10.10	10.42	9.90	10.14
Biosolids Cake Solids	%	24.3	23.1	24.2	23.87
Biosolids Feed Rate	dry tons/hour	2.45	2.41	2.40	2.42
Afterburner Exit Temp.	°F	1207	1215	1224	1216
Total Scrubber Water Flow	gallon/minute	1336	1388	1283	1336
Total Scrubber Pressure Drop	inches w.c.	25.2	24.6	24.1	24.6
Scrubber Water Outlet	pH	6.00	5.97	5.81	5.92

% - percent

inches w.c. – inches water column

Table 2-2
Summary of Process Data
Mercury Test Program
Great Lakes Water Authority - Incinerator No. 9
Detroit, Michigan
27 September 2017

Method/Component	Units	Run 1 1010-1148	Run 2 1203-1341	Run 3 1406-1542	Average
Biosolids Feed Rate	wet tons/hour	12.07	14.63	12.75	13.15
Biosolids Cake Solids	%	27.2	28.3	29.4	28.3
Biosolids Feed Rate	dry tons/hour	3.28	4.14	3.75	3.72
Afterburner Exit Temp.	°F	1310	1225	1246	1260
Total Scrubber Water Flow	gallon/minute	1437	1474	1501	1471
Total Scrubber Pressure Drop	inches w.c.	21.2	23.4	24.6	23.1
Scrubber Water Outlet	pH	6.15	6.24	6.26	6.22

% - percent

inches w.c. – inches water column

**Table 2-3
Summary of Process Data
Mercury Test Program
Great Lakes Water Authority - Incinerator No. 10
Detroit, Michigan
28 September 2017**

Method/Component	Units	Run 4	Run 5	Run 6	Average
		0935-1113	1128-1307	1532-1712	
Biosolids Feed Rate	wet tons/hour	16.47	16.10	12.30	14.96
Biosolids Cake Solids	%	27.0	27.1	30.5	28.2
Biosolids Feed Rate	dry tons/hour	4.45	4.36	3.75	4.19
Afterburner Exit Temp.	°F	1219	1214	1246	1226
Total Scrubber Water Flow	gallon/minute	1579	1536	1370	1495
Total Scrubber Pressure Drop	inches w.c.	31.6	28.6	29.6	29.9
Scrubber Water Outlet	pH	5.95	6.11	6.22	6.09

% - percent

inches w.c. – inches water column

2.3 Outlet Flue Gas Sampling Locations

MHI Nos. 8-10 sampling locations were identical. Outlet flue gas sampling occurred at a location that is between the scrubber exhaust and induced draft fan. The inside diameter of the exhaust duct is 54 inches. Two test ports, spaced 90° apart, were located 120 inches (2.2 duct diameters) to the nearest upstream disturbance and 108 inches (2.0 duct diameters) to the nearest downstream disturbance. In accordance with EPA Method 1, twenty four (24) traverse points (12 per port) were used for isokinetic sampling and volumetric flowrate determinations. The EPA Method 1 traverse points are shown in Appendix A.

3.0 SUMMARY AND DISCUSSION OF RESULTS

3.1 Objectives and Test Matrix

The purpose of this retest program was to measure air emissions from three MHI specifically Nos. 8, 9 and 10. Emissions testing was conducted in accordance with EPA approved test procedures. Three emissions tests were conducted on each MHI for each parameter, with the average result of the three tests reported. Table 3-1 lists the compliance parameters measured, the EPA reference methods used, and the sampling times for each test. The specific objectives for each MHI were to:

- Measure mercury emissions from the outlet stack in accordance with EPA Method 29.
- Measure oxygen and carbon dioxide from the outlet stack in accordance with EPA Method 3.
- Determine percent solids from collected sludge samples in accordance with Method SM2540G (Standard Methods).
- Monitor and record scrubber pressure drop, auxiliary fuel consumption use, hearth operating temperatures, scrubber water pH, and sludge feed rate.

Table 3-1 presents the sampling and analytical matrix used at each of the scrubber outlet sampling locations.

TABLE 3-1
Test Matrix
Mercury Compliance Test Program
Great Lakes Water Authority
Three Multiple Hearth Incinerators - Nos. 8, 9 & 10
Detroit, Michigan

Sampling Location	No. of Runs	Pollutant Type	Sampling Method	Sampling Organization	Sample Run Time (min.)	Analytical Method ^a	Analytical Laboratory
Outlet EPA Ports	3	O ₂ & CO ₂	EPA M3	GamAir	96	Orsat	GamAir
Outlet EPA Ports	3	Mercury	EPA M29	GamAir	96	CVAAS	Maxxam
Process Feed	3	Percent Solids	Grab	Walsh	Grab	Gravimetric	Maxxam

^a CVAAS – cold vapor atomic absorption spectroscopy

3.2 Field Test Changes

There were no changes to the source test protocol.

3.3 Summary of Results

Mercury test results for MHI Nos. 8, 9, and 10 are shown in the following Tables 3-2, 3-3, and 3-4 respectively. Test results are further detailed in Appendix B. An example calculation is also contained in Appendix B. Copies of field data sheets are shown in Appendix C. Process monitoring data is contained in Appendix. D. Appendix E contains all laboratory analytical reports and Appendix F displays all equipment calibration data.

TABLE 3-2 Summary of Emissions Data Compliance Test Program Great Lakes Water Authority - Incinerator No. 8 Detroit, Michigan 29 September 2017			
Parameter	Average Test Concentration* or Emission Rate	USEPA MACT 129 or MDEQ Emission Limit*	% of Standard
USEPA MACT 129 Pollutants			
Mercury	0.044 mg/dscm	0.28 mg/dscm	15.8

*All MACT 129 concentrations are corrected to 7 percent oxygen (@ 7% O₂).
mg/dscm – milligrams per dry standard cubic meter.

TABLE 3-3 Summary of Emissions Data Compliance Test Program Great Lakes Water Authority - Incinerator No. 9 Detroit, Michigan 27 September 2017			
Parameter	Average Test Concentration* or Emission Rate	USEPA MACT 129 or MDEQ Emission Limit*	% of Standard
USEPA MACT 129 Pollutants			
Mercury	0.050 mg/dscm	0.28 mg/dscm	18.0

*All MACT 129 concentrations are corrected to 7 percent oxygen (@ 7% O₂).
mg/dscm – milligrams per dry standard cubic meter.

TABLE 3-4
Summary of Emissions Data
Compliance Test Program
Great Lakes Water Authority - Incinerator No. 10
Detroit, Michigan
28 September 2017

Parameter	Average Test Concentration* or Emission Rate	USEPA MACT 129 or MDEQ Emission Limit*	% of Standard
USEPA MACT 129 Pollutants			
Mercury	0.039 mg/dscm	0.28 mg/dscm	14.0

*All MACT 129 concentrations are corrected to 7 percent oxygen (@ 7% O₂).
mg/dscm – milligrams per dry standard cubic meter.

4.0 SAMPLING AND ANALYTICAL METHODOLOGY

The following EPA test methods were utilized during this emissions test program:

EPA Method 1	Sample and velocity traverses for stationary sources
EPA Method 2	Determination of stack gas velocity and volumetric flow rate (type S Pitot tube)
EPA Method 3	Determination of oxygen and carbon dioxide concentrations in emissions from stationary sources (Orsat analyzer procedure)
EPA Method 4	Determination of moisture content in stack gases
EPA Method 29	Determination of metals emissions from stationary sources

All tests were performed in triplicate unless otherwise noted. All sampling and analytical procedures followed those outlined in Title 40, CFR, Part 60.

5.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Three mercury audits were processed in accordance with the ERA instructions.

- Mercury in impinger (three individual audits).

Each of the three mercury audits were within their acceptable range. The audits were analyzed with the actual field samples. Results from the three audits are shown in Appendix E.