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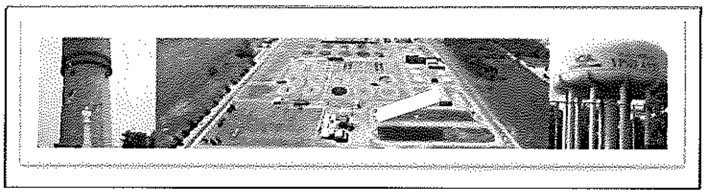

AIR EMISSIONS TEST REPORT

February 2, 2018 GamAir Project No.: 825-1710

Ypsilanti Community Utilities Authority Fluidized Bed Sewage Sludge Incinerator Ypsilanti, MI

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1.0 INTRODUCTION

1.1 Summary of Test Program

The purpose of this emission measurement test program is verification of Mercury (Hg) emission rate from EU-FBSSI as required by YCUA's Renewable Operating Permit ROP no. MI-ROP-B6237-2015. Additionally, measurement of Hydrogen Chloride (HCl) was also included in this test program. The purpose of inclusion of HCl in the test program is internal use and to develop a correlation between the Sulfur Dioxide (SO_2) emissions measured by YCUA's continuous emission monitoring system and HCl measurement from the stack testing. Testing was conducted on December 5, 2017 per the approved test protocol (Appendix G). The applicable Michigan Department of Environmental Quality (MDEQ) and United States Environmental Protection Agency (USEPA) emission limits are as follows.

Parameter	Units	USEPA Emission Limit
Hydrogen Chloride	ppmvd @ 7% O_2	**0.51**
Mercury	milligrams per dry standard cubic meter @ 7% O_2	0.28
Mercury	grams per 24 hours	3200
Parameter	**Units**	**MDEQ Emission Limit**
Hydrogen Chloride	pound per dry ton of sludge	0.8
Mercury	pound per dry ton of sludge	6.9E-04

Compliance emission tests focused on the parameters listed above. The tests were conducted in accordance with the conditions and monitoring requirements for compliance testing as set forth with the MDEQ guidelines for source emission testing. Compliance tests were conducted in accordance with EPA Methods 1-4, 26A, and 29, as published in Title 40, CFR, Part 60. Testing of the FBSSI occurred over a one day period. Representatives from YCUA and GamAir were responsible for coordinating the testing with the MDEQ. YCUA personnel were responsible for collecting all process data and biosolids samples; biosolids sample analysis were by contract lab, Maxxam Analytics. Gammie Air Monitoring, LLC (GamAir) was responsible for collecting all air emission samples and the respective analysis of those samples.

The MDEQ has identified this source as the following:

State Registration Number: B6237

Permit Number: MI-ROP-B6237-2015

Section 2.0 of this report presents a description of each source. Section 3.0 discusses and summarized the test results. Section 4.0 describes the sampling and analysis methodologies employed. Quality assurance and quality control (QA/QC) procedures specific to this test program are described in Section 5.0.

2.0 SOURCE AND SAMPLING LOCATION DESCRIPTIONS

2.1 Process Description

The Ypsilanti Community Utilities Authority (YCUA) operates a municipal wastewater treatment plant in Ypsilanti, Michigan. As part of the Wastewater Treatment, biosolids are generated. YCUA utilizes a Fluidized Bed Sewage Sludge Incinerator (FBSSI) to incinerate the dewatered biosolids (sludge). Sludge is introduced into the incinerator using conveyors and pumps. YCUA FBSSI utilizes an advanced air pollution control system. The air pollution control system is controlled by programmable logic controlled monitoring system based on operating parameters developed from the 2016 Emissions Testing. The maximum permitted capacity of FBSSI system is 6300 dry pounds/hr. During the 12-month period preceding the current testing, YCUA FBSSI operated at 4,322 dry pounds (maximum average) /hr (December 2016-November 2017). The current testing was conducted on December 5, 2017 at 4,890.0 dry pounds/hr. YCUA's Renewable Operating Permit ROP no. MI-ROP-B6237-2015 requires the verification of Hg emission rate from EU-FBSSI once per calendar year, performed at maximum routine operating feed.

Air emissions from the FBI were controlled by a venturi/impingement tray scrubber operating at 33.1inches of water column (in. w.c.) scrubber pressure drop. Total water injection to the venturi scrubber was approximately 454.7 gallons per minute (gpm); the water injection rate to the impingement tray is approximately 599.4 gpm. Following the scrubber there was a wet electrostatic precipitator (WESP) followed by a granular activated carbon (GAC) filter.

Operating Parameter	ROP Operating Ranges	Subpart MMMM Operating Limits*
Venturi Scrubber Water Flow	>300 gpm	NA
Impingement Tray Scrubber Water Flow	>350 gpm	NA
Venturi Scrubber Pressure Drop	30 – 40 in w.c.	Minimum 31.7 in w.c.
Impingement Tray Scrubber Pressure Drop	5 – 15 in w.c.	9.1 in w.c.
Granular Activated Carbon (GAC) Pressure Drop	1 – 10 in w.c.	N/A
Granular Activated Carbon (GAC)	Minimum ΔT of 27 °F between GAC inlet WESP outlet	N/A
Power Input to Electrostatic Precipitator**	N/A	463 W

*Established during December 2016 testing.

**Calculated as the product of secondary voltage and secondary amperage measured during testing.

2.2 Process Monitoring

During the test program the incinerator was operated at an optimized feed rate. The process parameters monitored during each test at a minimum consisted of the following:

Hourly sludge tonnage input
Sludge moisture content (%)
Operating temperature of the incinerator
Scrubber water flowrates
Scrubber system pressure drop
pH of the scrubber liquid

Table 2-1
Summary of Process Data
Compliance Test Program
Ypsilanti Community Utilities Authority
Fluidized Bed Incinerator
Ypsilanti, Michigan
5 December 2017

Method/Component	Units	Run 1 0845-1026	Run 2 1048-1226	Run 3 1250-1427	Average
Biosolids Feed Rate	dry tons/hour	2.55	2.39	2.38	2.44
Sludge Moisture content (%)	%	1.93	2.13	2.19	2.08
Fluidized Bed Temperature	°F	1352	1350	1356	1352
Free Board Temperature	°F	1697	1739	1754	1730
Venturi Water Flow	gallon/minute	454.2	455.3	454.7	454.7
Total Scrubber Water Flow	gallon/minute	598.2	599.8	600.3	599.4
Total Scrubber Pressure Drop	inches w.c.	33	33.5	32.7	33.1
Scrubber Water Outlet	pH	4.48	5.29	5.41	5.06

3.0 SUMMARY AND DISCUSSION OF RESULTS

3.1 Objectives and Test Matrix

The purpose of this test program was to verify the mercury emission rate from the FBSSI as required by the Renewable Operating Permit (ROP). In addition, informational HCl emissions testing was performed in accordance with EPA Method 26. Eight EPA Method 26 tests, each being 30-minutes in duration, were performed simultaneously with the three EPA Method 26A tests. The purpose of the informational HCl tests, via Method 26, was to develop a correlation between HCl emissions and SO_2 emissions. Emissions testing was conducted in accordance with EPA approved test procedures. Three emissions tests were conducted 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 the FBI test program were to:

- Measure carbon dioxide (CO_2) and oxygen (O_2) emissions from the outlet stack in accordance with EPA Methods 3 or 3A.
- Measure mercury emissions from the outlet stack in accordance with EPA Method 29.
- Measure hydrogen chloride (HCl) emissions from the outlet stack in accordance with EPA Method 26A.
- Measure hydrogen chloride (HCl) emissions from the outlet stack in accordance with EPA Method 26.
- Record sulfur dioxide (SO_2) emissions from the outlet stack using the YCUA continuous emissions monitor system (CEMS) during each of the eight Method 26 test runs.
- Determine percent solids from collected sludge samples in accordance with Method SM2540G (Standard Methods).
- Monitor and record scrubber pressure drop, FBSSI operating temperatures, and sludge feed rate.

TABLE 3-1
Test Matrix
Compliance Test Program
Ypsilanti Community Utilities Authority
Fluidized Bed Incinerator
Ypsilanti, Michigan

Sampling Location	No. of Runs	Pollutant Type	Sampling Method	Sampling Organization	Sample Run Time (min.)	Analytical Method[a]	Analytical Laboratory
Incinerator Stack Exhaust	3	O_2/CO_2	EPA M3A	GamAir	96	CEM	GamAir
Incinerator Stack Exhaust	3 + blank	Mercury	EPA M29	GamAir	96	CVAAS	Maxxam
Incinerator Stack Exhaust	3 + blank	HCl	EPA 26A	GamAir	96	IC	Maxxam
Incinerator Stack Exhaust	8	HCl	EPA 26	GamAir	30	IC	Maxxam
Process Feed	3	Percent Solids	Grab	YCUA	Grab	Gravimetric	Maxxam

[a] CEM – continuous emissions monitoring and CVAAS – cold vapor atomic absorption spectroscopy; IC – ion chromatography

3.2 Summary of Test Results

Table 3-2
Executive Summary of Emissions Data
Compliance Test Program
Ypsilanti Community Utilities Authority
Fluidized Bed Incinerator
Ypsilanti, Michigan
5 December 2017

Method/Component	Units	3 Run Average	MDEQ Limit	Percent of Limit
Method 26A -	ppm at 7% O_2	<0.18	0.51	<35.3
Hydrogen Chloride	lb/dry ton sludge	<0.191	0.8	<23.9
Method 29 - Mercury	mg/dscm at 7% O_2	0.011	0.28	4.0
	lb/dry ton sludge	2.66E-04	6.90E-04	38.6
	grams/ 24hr	7.06	3200	0.2

dscfm – dry standard cubic feet per minute (M26A)
% - percent, dry, volume
ppm at 7% O_2 – parts per million (dry volume basis) corrected to 7% oxygen
lb/ton dry sludge – pounds per ton of dry sludge burned
mg/dscm at 7% O_2 – milligrams per dry standard cubic meter corrected to 7% oxygen

Table 3-3
Summary of Emissions Data
Ypsilanti Community Utilities Authority
Fluidized Bed Incinerator
Ypsilanti, Michigan
5 December 2017

Method/Component	Units	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8
Method 26 - Hydrogen Chloride	ppm	5.88	1.32	1.36	<0.393	<0.432	<0.414	<0.373	<0.355

*ppm at 7% O_2 – parts per million (dry volume basis) corrected to 7% oxygen

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 3A/B	Determination of oxygen and carbon dioxide concentrations in emissions from stationary sources (Instrumental/Orsat analyzer procedure)
EPA Method 4	Determination of moisture content in stack gases
EPA Method 26	Determination of hydrogen chloride emissions from stationary sources
EPA Method 26A	Determination of hydrogen chloride emissions from stationary sources – isokinetic method
EPA Method 29	Determination of metals emissions from stationary sources

The following sections describe the sampling and analytical procedures utilized during this emissions test program. All tests were performed in triplicate unless otherwise noted. All sampling and analytical procedures followed those outlined in Title 40, CFR, Part 60; any proposed deviations from this test program are addressed in the following sections.

4.1 Volumetric Flow Rate Tests

The volumetric flowrate of the exhaust gases, at the GAC filter outlet test locations, were determined using EPA Methods 1-4. In accordance with EPA Method 1 twelve (12) traverse points were utilized for flue gas velocity measurements during the isokinetic tests. The locations of the traverse points, as determined by EPA Method 1, are listed in the Appendix. Flue gas velocity measurements were taken at each traverse point during each test run using an S-type pitot tube and an inclined water manometer in accordance with EPA Method 2. Stack temperature measurements were also taken at each traverse point using a Type-K thermocouple and digital temperature readout. The stack static pressure was measured during each test run using the Pitot tube and manometer setup. Pitot tube leak checks were performed before and after each test run in accordance with EPA Method 2.

The molecular weight of the outlet exhaust gases was determined by measuring the oxygen (O_2) and carbon dioxide (CO_2) concentrations using either EPA Method 3A or 3B. During conventional mercury and HCl sampling, EPA Method 3A was employed. When the CEM is not occurring, integrated Tedlar bag samples were collected during the course of the entire test run. The collected Tedlar bag sample are then analyzed using the properly calibrated CEM system. The minimum sample volume of the Tedlar bag(s) was 24 liters. The flue gas moisture content was determined from the moisture catch of each isokinetic sampling train during the emissions testing in accordance with EPA Method 4. A minimum sample volume of 36 dry standard cubic feet was collected during each moisture test run. The moisture content of the flue gas was calculated as the ratio of the moisture catch corrected to standard conditions to the sum of the dry sample volume and the moisture catch, both corrected to standard conditions. Calculated moisture contents, which exceed the saturation moisture at the average duct temperature, will be defaulted to the saturation moisture.

4.2 Hydrogen Chloride Tests - Isokinetic Method

The hydrogen chloride (HCl) emissions was sampled and analyzed in accordance with EPA Method 26A. Three 96-minutes tests was performed for compliance determination. This sampling train is shown in the Appendix. The Method 26A sampling train consists of a Pyrex® glass nozzle, a heated glass lined sample probe, a heated Teflon filter (untared), a set of four tared glass impingers connected in series in an ice bath, a control module consisting of a leak free sampling pump, a calibrated critical orifice, an inclined manometer, and a calibrated dry gas meter.

The first two impingers each contain 100 ml of 0.1 N sulfuric acid (H_2SO_4) while the third impinger contains 100 ml of sodium hydroxide (NaOH). The fourth impinger contains a known quantity of silica gel. The sampling train glassware is cleaned prior to testing with soap and water and rinsed thoroughly with water. The sample probe and oven box are maintained at a temperature of 250-273°F during sampling to prevent moisture condensation. The impinger outlet temperature is maintained below 68°F during sampling by adding ice to the cold box. A vacuum line is connected from the outlet of the fourth impinger to the control module.

Before each test, the sampling train was leak checked to ensure no leakage greater than 0.02 cubic feet per minute at 10" Hg vacuum. The probe is then placed in the stack and stack gas is withdrawn isokinetically for an equal period of time at each traverse point with a sampling rate not exceeding 1.0 cfm.

The velocity differential pressure, critical orifice differential pressure, dry gas meter volume, dry gas meter outlet temperatures, probe temperature, stack temperature, oven box temperature, impinger outlet temperature, and sample vacuum were recorded at each traverse point during sampling. At the end of each test, the sampling train was leak checked to ensure no leakage greater than 0.02 cubic feet per minute at the highest recorded test vacuum.

Sample recovery consists of rinsing the nozzle and probe with acetone. These rinses are discarded and not saved. The Teflon filter is reused unless the pressure drop across the filter becomes too high. The contents of the four impingers are measured gravimetrically for moisture gain then transferred to sample Container 3. Impingers 1 and 2 and their connecting glassware are then rinsed with deionized distilled (DI) water twice. These rinses are added to Container 3. The third impinger contents are discarded. The sample container is sealed and the liquid levels marked. The HCl samples are then shipped to a contract laboratory for analysis. The HCl analysis are performed by ion chromatography as described in EPA Method 26A.

4.3 Mercury Tests

Mercury was sampled and analyzed in accordance with EPA Method 29. Mercury tests were performed in triplicate at the exhaust stack location during 96-minutes test runs. A schematic of the mercury sampling train is shown in the Appendix. The following is a description of the mercury sampling train and the procedures to be used to quantify mercury during the test program. The mercury sampling train consists of a glass nozzle, a heated glass lined probe, a quartz filter/holder in a heated box, a set of six glass impingers connected in series, a control module consisting of a leak free sampling pump, a calibrated critical orifice, an inclined manometer, and a calibrated dry gas meter. A Teflon fitting connects the nozzle to the probe liner. All of the sampling train glassware was cleaned and nitric acid soaking procedure described in EPA Method 29 prior to testing. The sample probe and oven box was maintained at a temperature of $248\underline{+}25^0$F during sampling to prevent moisture condensation. The first and second impingers each contain 100 ml of 5% nitric acid/10% hydrogen peroxide ($5\%HNO_3/10\%H_2O_2$). The third impinger is empty. The fourth and fifth impingers contain 100 ml of 4% potassium permanganate/10% sulfuric acid ($4\%KMnO_4/10\%H_2SO_4$). The acidic permanganate solution was prepared fresh on-site. The sixth impinger contained a known quantity of silica gel. The second impinger was a Greenburg-Smith impinger with a standard tip, while the other impingers have modified tips. The temperature at the outlet of the sixth impinger was maintained below 68°F during sampling by adding ice to the water bath. A vacuum line connects the outlet of the sixth impinger to the control module.

Before each test and after test run, the sampling train was leak checked to ensure no leakage greater than 0.02 cubic feet per minute at 15" Hg vacuum. The probe was then placed in the stack and stack gas was withdrawn isokinetically for an equal period of time at each traverse point. The velocity differential pressure, critical orifice differential pressure, dry gas meter volume, dry gas meter inlet and outlet temperatures, probe temperature, stack temperature, oven box temperature, impinger outlet temperature, and sample vacuum was recorded at each traverse point during sampling. Before port changes and at the completion of each test, the sampling train was leak checked to ensure no leakage greater than 0.02 cubic feet per minute at the highest recorded test vacuum. After the post-test leak check, the sampling train was disassembled, all open ends sealed, and the sampling train components moved to the cleanup area for recovery. The recovery procedure for the multiple-metals sampling train is described as follows. The filter is carefully removed from the filter holder with Teflon coated forceps and placed in a labeled plastic Petri dish (Container 1). Any particulate matter or filter fragments that adhere to the filter holder gasket are transferred to the Petri dish using a dry, acid cleaned nylon bristle brush. The Petri dish is then sealed for transport to the laboratory.

The nozzle, probe liner, and filter holder front half were then rinsed and brushed thoroughly with 100 ml of 0.1 N nitric acid (HNO_3) using a Teflon coated brush. These rinses were collected in a labeled glass sample jar (Container 3). The sample jars were sealed and the liquid level marked. The nozzle, probe liner, and filter holder front half are then rinsed with deionized water followed by acetone. These rinses were discarded. The moisture gain in the first two impingers were measured gravimetrically and their contents transferred to a labeled glass sample jar (Container 4). The first two impingers, the filter support, the back half of the filter holder, and the connecting glassware between the back half of the filter holder and the second impinger were then rinsed with 100 ml of 0.1 N HNO_3. These rinses were combined with the impinger contents and the sample jar is sealed and the liquid level marked.

The moisture gain in the third impinger was measured gravimetrically and its contents transferred to a labeled glass sample jar (Container 5A). This impinger is then rinsed with 100 ml of 0.1 N HNO_3. The rinses are combined with the impinger contents and the sample jar is sealed and the liquid level marked.

The moisture gain in the permanganate impingers was measured gravimetrically and the contents were transferred to a labeled glass sample jar (Container 5B). The impinger and connecting glassware are then rinsed with 100 ml of fresh 4%$KMnO_4$/10%H_2SO_4 followed by a rinse with 100 ml of deionized water. The permanganate and deionized water rinses are combined with the impinger contents and the sample jar is sealed and the liquid level is marked. This sample jar is not completely filled and is vented to relieve excess pressure. If any visible permanganate deposits remain after the water rinses, the permanganate impinger was rinsed with a total of 25 ml of 8N HCl. The walls and stem of the permanganate impingers are rinsed and collected in a labeled sample jar containing 200 ml of deionized water (Container 5C). The sample jar was then sealed and the liquid level marked. The silica gel impinger is weighed for moisture gain. The silica gel was then returned to its original storage container to be dried for reuse. The following is a list of the sample recovery containers.

Container 1	filter is removed from filter holder and stored in sealed Petri dish
Container 2	not used in this procedure, used for FPM procedure
Container 3	nozzle, sample probe, and front half of filter housing are brushed and rinsed three times with 100 ml of 0.1N HNO_3 and save
Container 4	measure contents of impingers 1 and 2 and save; filter support, back half of filter housing, and flexible Teflon line are rinsed three times with 100 ml of 0.1N HNO_3 and save
Container 5A	measure contents of impinger 3 then rinse three times with 100 ml of 0.1N HNO_3 and save
Container 5B	measure contents of impingers 4&5 then rinse three times with 100 ml of acidified $KMnO_4$ and 100 ml of deionized distilled water and save.
Container 5C	rinse impingers 4&5 with 25 ml of 8N HCl solution followed by 200 ml of deionized distilled water and save
Container 6	weigh contents of impinger 6 for moisture gain
Container 7	not used in this procedure
Container 8A	0.1N HNO3 reagent blank (300 ml)
Container 8B	deionized distilled water blank (100 ml)
Container 9	HNO_3/H_2O_2 reagent blank (200 ml)
Container 10	acidified $KMnO_4$ reagent blank (100 ml)
Container 11	8N HCl reagent blank (200 ml)
Container 12	filter blanks (3)

One unused filter and aliquots of each of the impinger and rinse solutions, in the volumes specified in Method 29, were collected and submitted with the field samples as reagent blanks. Where applicable metals results will be reagent blank corrected. Front half and back half fractions are combined before analysis. The mercury analysis (Containers 1, 3, 4, 5A, 5B, and 5C) were conducted on each of the sample fractions following digestion with acid and permanganate by cold vapor atomic absorption spectroscopy (CVAAS). All collected reagent blanks were analyzed using the same methodologies as the collected samples.

4.4 Hydrogen Chloride Tests – Non-Isokinetic Method

The hydrogen chloride (HCl) emissions are sampled and analyzed in accordance with EPA Method 26. Eight 30-minutes tests were performed for informational purposes. This sampling train is shown in the Appendix. The Method 26 sampling train consists of a Pyrex® a heated glass lined sample probe, a heated Teflon filter (untared), a set of four midget impingers connected in series in an ice bath, a control module consisting of a leak free sampling pump, a calibrated critical orifice, an inclined manometer, and a calibrated dry gas meter. Sample collection, sample recovery, and all analytical procedures are performed in accordance with Method 26.

4.5 Biosolids Tests

At the completion of each test run biosolid sample containers are labeled with the test number and sampling period. Three biosolids samples were collected by YCUA during the course of each 96-minute test run. At the end of each test run the three samples were composited into one biosolids sample. Each composited sample was analyzed for total solids content in accordance with Standard Method 2540G. A total of three biosolids samples were analyzed for the three mercury tests. All biosolids sample analyses were conducted by contract laboratory Maxxam Analytics. The percent solids and the average wet biosolids feed rate, for each 96-minute test run, is used in calculating the dry tons per hour feed rate for that particular test run. GamAir was responsible for the percent solids analyses.

4.6 Sample Identification and Custody

Sample custody procedures for this program were based on EPA recommended guidelines. The project manager was responsible for ensuring that proper custody and documentation procedures were followed for the field sampling and field analytical efforts. The project manager was assisted in this effort by key sampling personnel involved in sample recovery.

All sampling data, including information regarding sampling times, locations, and any specific considerations associated with sample acquisition were recorded in black ink on pre-formatted data sheets. A master sample logbook is used to document all sample collection activities.

Following sample collection, all samples were given a unique alphanumeric sample identification code. Sample labels and integrity seals were completed and affixed to the sample container. The sample volumes were recorded and the liquid level on each bottle is marked. All samples were packed and shipped according to Department of Transportation (DOT) guidelines. As the samples were packed for shipment to the appropriate laboratories, chain-of-custody forms were completed for each shipment box, these forms were enclosed in each respective box.

5.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

5.1 QC Procedures

Specific quality control (QC) procedures were followed to ensure the continuous production of useful and valid data throughout the course of this test program. The QC checks and procedures described in this section represent an integral part of the overall sampling and analytical scheme. Strict adherence to prescribed procedures is quite often the most applicable QC check. A discussion of both the sampling and analytical QC checks that were utilized during this program is presented below.

5.1.1 Equipment Inspection and Maintenance

Each item of field test equipment purchased by GamAir is assigned a unique, permanent identification number. An effective preventative maintenance program is necessary to ensure data quality. Each item of equipment that is returned from the field is inspected before it is returned to storage. During the course of these inspections, items are cleaned, repaired, reconditioned, and recalibrated where necessary. Each item of equipment transported to the field for this test program is inspected again before being packed to detect equipment problems, which may originate during periods of storage. This minimizes lost time on the job site due to equipment failure. Occasional equipment failure in the field is unavoidable despite the most rigorous inspection and maintenance procedures. For this reason, GamAir routinely transports to the job site replacement equipment for all critical sampling train components.

5.1.2 Equipment Calibrations

Prior to the start of the test program the MDEQ received copies of all sampling equipment calibrations as described in their stack testing guidelines.

New items for which calibration is required are calibrated before initial field use. Equipment whose calibration status may change with use or time is inspected in the field before testing begins and again upon return from each field use. When an item of equipment is found to be out of calibration, it is repaired and recalibrated or retired from service. All equipment is periodically recalibrated in full, regardless of the outcome of these regular inspections. Calibrations are conducted in a manner and at a frequency, which meets or exceeds USEPA specifications. GamAir follows the calibration procedures outlined in the EPA Methods, and those recommended within the Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III (EPA-600/R94-038c). When these methods are inapplicable, GamAir uses methods such as those prescribed by the American Society for Testing and Materials (ASTM). Data obtained during calibrations are recorded on standardized forms, which are checked for completeness and accuracy by GamAir. Data reduction and subsequent calculations are performed using GamAir computer facilities. Calculations are checked at least twice for accuracy. Copies of calibration forms are included in the test report.

Emissions sampling equipment requiring calibration includes sampling nozzles, pitot tubes, pressure gauges, thermocouples, and dry gas meters.

5.1.3 Analytical Quality Control Procedures

All analyses for this program are performed using accepted laboratory procedures in accordance with the specified analytical protocols. Adherence to prescribed QC procedures for the EPA methods used for this test program ensures data of consistent and measurable quality. Analytical QC focuses on the use of control standards to provide a measure of analytical precision and accuracy. The metals samples are analyzed following the procedures of EPA Method 29 and Method 26A. Reagent blanks and laboratory blanks are used to check for contamination. Also, specific acceptance criteria are defined below for various analytical operations, including calibrations, control standard analyses, drift checks, blanks, etc.

Table 6-1
Summary of Quality Assurance/Quality Control
Compliance Test Program
Ypsilanti Community Utilities Authority
Fluidized Bed Incinerator
Ypsilanti, Michigan

Test Method and QC Sample	QC Criteria
EPA Method 29	
Method Blank	Below instrument LOD
Reagent Blank	One per test program
Duplicate Analysis	20% of average
Matrix Spike	80-120% recovery
EPA Method 26A	
Method Blank	Below instrument LOD
Reagent Blank	One per test program
Duplicate Analysis	20% of average
Matrix Spike	80-120% recovery

LOD – limit of detection

5.1.4 Calculations Quality Control Procedures

Calculations for determining flow rates, moisture contents, isokinetics, particulate and gaseous concentrations are made using a computer program developed by the GamAir. This program utilizes the calculation procedures and equations specified in EPA Methods 2, 4, 5, and 7E. The program has been successfully used for numerous test efforts and has been validated by independent performance audits. Sample calculations are performed by the software program and a definition of terms will be provided in the final report. Data is transported to the software directly from the field data sheets.

5.2 QA Audits

Audit materials are ordered from ERA prior to the mobilization of the field test program. The following audits were submitted to ERA and MDEQ for their approval prior to placing the order.

- Mercury in impinger

All audit samples are submitted with the actual field samples for analysis by Maxxam Analytics, Inc.

5.3 QA/QC Checks of Data Reduction

The project manager runs an independent check (using a validated computer program) of the calculations with predetermined data before the field test. This ensures that calculations done in the field are accurate. The project manager also conducts a spot check on-site to assure that data are being recorded accurately. After the test, the QA/QC manager checks the data input to assure that the raw data has been transferred to the computer accurately.

5.4 Sample Identification and Custody

Sample custody procedures for this program are based on EPA recommended procedures. The project manager is responsible for ensuring that proper custody and documentation procedures are followed for the field sampling and field analytical efforts. The project manager is assisted in this effort by key sampling personnel involved in sample recovery.

All sampling data, including information regarding sampling times, locations, and any specific considerations associated with sample acquisition are recorded in black ink on pre-formatted data sheets. Copies of completed field data sheets will be provided at the end of each day of testing.

Following sample collection, all samples are given a unique alphanumeric sample identification (ID) code. Sample labels and integrity seals are completed and affixed to the sample container. An example sample ID is as follows:

Test Method – Run Number – Sample Container (component)
M29 -- 3 -- 4 (Imp.)

The remaining samples are stored in a secure area until shipment. The sample volumes are determined and recorded and the liquid levels on each bottle are marked. All samples are packed and shipped according to U.S. Department of Transportation guidelines. As the samples are packed for shipment to the appropriate laboratories, chain-of-custody forms are completed for each shipment box, and these forms are enclosed in each respective box. Samples are held by the laboratories for the maximum holding periods.