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May 18, 2020

Ms. Tania Taff
Department of Natural Resources
2984 Shawano Avenue
Green Bay, WI 54313-6727

RE: Stack Test Results for Fluid Bed Incinerator

Dear Ms. Taff:

Green Bay Metropolitan Sewerage District (GBMSD) performed compliance emissions testing for its fluid bed incinerator (FBI) on March 18 and 19, 2020. Emissions from the FBI are regulated in the facility Title V Operation Permit, Permit No. 405004600-P30 (the "Permit"). The testing was performed for two reasons: 1) to verify the level of mercury emission control provided by the granular activated carbon (GAC) system that had been out of service and 2) to establish new ranges of monitoring parameters for the emission control systems used with the FBI, including parameters on the scrubber. Previous testing was conducted on May 1-2, 2019 so the annual compliance emission test is not due for 13 months following the testing (that is, by June 2, 2020). The final report from GBMSD's contract air emissions testing firm, Advanced Industrial Resources, Inc., is provided with this transmittal and has also been submitted to WDNR's WAMS Switchboard reporting website.

Results from the testing are summarized in Table 1.

Green Bay Metropolitan Sewerage District
2231 North Quincy Street | Green Bay, WI 54302 | Phone (920) 432-4893 | Fax (920) 432-4302 | www.newwater.us

Table 1: Results Summary

Source	Pollutant	Average Measured	Allowable	Units	Regulatory basis
FBI Stack 08	**PM**, filterable	30.5	9.6	mg/dscm @ 7%O_2	60 LLLL
	SO_2	0.0611	5.3	mg/dscm @ 7%O_2	60 LLLL
	NO_x	12.2	30	mg/dscm @ 7%O_2	60 LLLL
	CO	1.51	27	mg/dscm @ 7%O_2	60 LLLL
	HCl	< 0.0424	0.24	ppm corr. to 7%O_2	60 LLLL
	Dioxins / Furans	0.00095	0.0044	ng (TEQ) /dscm@ 7% O_2	60 LLLL
		0.0198	0.013	ng (TMB) /dscm@ 7% O_2	60 LLLL
	Mercury (Hg)	< 0.0002	0.001	mg/dscm @ 7%O_2	60 LLLL
		< 0.0001	7.1	lb/24-hour	Permit
	Beryllium (Be)	< 0.00001	0.022	lb/24-hour	Permit
	Cadmium (Cd)	< 0.0001	0.0011	mg/dscm @ 7%O_2	60 LLLL
	Lead (Pb)	0.000455	0.00062	mg/dscm @ 7%O_2	60 LLLL

Results show that the measured particulate matter (PM) concentration, 30.5 mg/dscm @ 7%O_2 exceeded the limit. The measured concentration of dioxins and furans exceeded the allowable concentration on a Total Mass Basis (TMB) but met the allowable concentration on a Toxicity Equivalency Basis (TEQ). GBMSD is required to meet either of the two dioxin and furan limits. Since the limit is met on a TEQ basis, emissions from the FBI meet the dioxin and furan permit requirements.

When GBMSD learned that the measured PM concentration exceeded the Permit limit, GBMSD returned the FBI and pollution control equipment operation to within the parameters that demonstrated compliance during the May 2019 emission test.

Discussion of results for particulate matter

The result for PM was unexpected for several reasons. GBMSD's fluid bed sewage sludge incinerator is equipped with state-of-the-art-pollution control technology, consisting of a venturi wet scrubber, wet electrostatic precipitator, and granulated activated carbon unit (GAC). Performance for particulate removal has been very good prior to this test result, and emissions of PM have been well within Permit limits during all previous compliance test efforts (Table 2).

Table 2: Results of particulate matter emissions from I08 during previous compliance tests

Test Date	Average Measured	Allowable	Units
10/18/2018	< 0.6	9.6	mg/dscm @ 7%O_2
5/1/2019	□0□	9.6	mg/dscm @ 7%O_2

To ensure optimal scrubber performance for emissions testing, GBMSD enlisted assistance from its technical expert with the company that designed the scrubber. The expert, who is based in California, was scheduled to be onsite in Green Bay for the testing, but instead advised remotely due to the COVID-19 pandemic. Prior to and during emissions testing, GBMSD shared real-time operating data with the technical expert, who recommended operational adjustments in order to optimize pollution control of the scrubber system. By following the recommendations of the expert, GBMSD was confident that the scrubber was operating optimally.

Additionally, GBMSD opted to have informational engineering tests run for particulate matter at the inlet of the GAC concurrent with the tests that were run at the compliance point, just downstream of the GAC. Voluntary testing at the GAC inlet was conducted to better understand the removal efficiency of the GAC for particulate matter and to gather information on the PM loading rate to the GAC.

Test results from the engineering testing indicated that the concentration of particulate matter in the scrubber exhaust as it entered the GAC was 2.61 mg/dscm @ 7% O_2, which is well within the limit of 9.6 mg/dscm @ 7%O_2.

As noted above, concurrent compliance testing in the stack (just downstream of the GAC outlet) showed emissions of PM in excess of the Permit limit. The stack testing firm reported that a brown oily substance was present in the beakers (that processed the solvent rinse of the test probe) after the beakers were processed in accordance with the test protocol. This residue accounted for virtually the entire PM catch (See Appendix 1, Paragraph 3.2).

The reported PM results, along with the unexpected substance that was present in the beakers, led GBMSD to question whether the results were valid, and GBMSD determined that investigation was necessary. Several steps were taken. First, GBMSD shared the test results and information about the substance in the beakers with several individuals to ask for input. Individuals contacted included a consultant who specializes in fluid bed sewage sludge incinerators and who is closely familiar with GBMSD's incineration system; the designer of the GAC system; an air Permitting consultant; and an experienced emissions testing engineer who has worked with GBMSD extensively in the past.

Following advice of the experts, several steps were taken to understand potential explanations for the test results that are believed to be invalid. First, the samples of the substance in the beakers were shipped to GBMSD's contract organics lab for gas chromatography-mass spectrometry analysis. The results of this analysis are not yet available.

Secondly, the GAC outlet ducting was inspected for any evidence of the unusual material. During the inspection, a small film of a soot-like substance was observed. The GAC outlet and ducting were professionally cleaned. A sample of the soot-like material was also sent to the contract laboratory for analysis and comparison with the material that was in the beakers after emissions testing.

Initial analysis showed that the substance from the beakers is not the same as the soot-like substance, which appears to be carbon. Additional testing on the substance from the beakers will identify its chemical composition, which will help identify the process(es) or material(s) that may have generated the substance. The recent malfunction caused extensive damage to the internal components of the GAC. There is a possibility that the substance was generated by repair activities, which included fiberglass work and re-building of damaged grid panels that support the carbon media within the GAC, or associated chemical products.

The third step that GBMSD has taken in response to receiving the emission testing results is to schedule an additional engineering test for particulate matter. The test was conducted on May 14, 2020. Results are not yet available. The intent is to schedule a second compliance test for particulate matter soon after the completion of the engineering test.

After completing this analysis, GBMSD will provide an update report describing the results of that analysis

Comment on Permit Compliance

GBMSD disclosed the draft PM emission test results to the US Environmental Protection Agency and the Wisconsin Department of Natural Resources in an email dated April 24, 2020. The final test results are transmitted with this letter. After the completion of the analysis described in the body of this letter, GBMSD and the agencies will be in a better position to determine whether the results of the March 18 and 19, 2020 emission test represent a violation of the Permit.

It is also important to note that the Permit allows GBMSD to conduct emission testing to re-establish operating parameters for the pollution control systems operated with the FBI. When GBMSD discovered particulate results from the Stack Test, GBMSD returned the FBI and pollution control equipment operation to within the parameters that demonstrated compliance during the May 2019 emission test. In the event the recent stack test represented actual particulate emissions at the time of that test, GBMSD believes that this action resulted in a return to the level of particulate emissions represented by the May, 2019 stack test results, to wit: compliance with the particulate emissions limit in the Permit. GBMSD intends on re-testing the PM concentration to confirm compliance with the permit before the date on which the annual emission test is required (June 2, 2020). A test protocol for this testing will be provided to WDNR.

Please feel free to contact me with any questions or concerns you may have about GBMSD's emissions testing.

Sincerely,

GREEN BAY METROPOLITAN
SEWERAGE DISTRICT

Julie C. Maas

Julie Maas
Environmental Compliance Specialist

Appendices

1) SEWAGE SLUDGE INCINERATION UNIT EMISSION TEST REPORT - FLUIDIZED BED INCINERATOR (FBI) PROCESS I08 – STACK S08
2) Report Dated May 15, 2020: Visible Emissions Testing - March 18, 2020

cc: Ms. Louise Gross, US EPA
Mr. Dan Schaufelberger, US EPA
Mr. James Bonar Bridges, Wisconsin DNR

ADVANCED INDUSTRIAL RESOURCES, INC.

APPENDIX 1

SEWAGE SLUDGE INCINERATION UNIT EMISSION TEST REPORT FLUIDIZED BED INCINERATOR (FBI) PROCESS I08 – STACK S08 AT GREEN BAY METROPOLITAN SEWERAGE DISTRICT TREATMENT PLANT PROJECT ID: KR-10425

PREPARED FOR:

GREEN BAY METROPOLITAN SEWERAGE DISTRICT
2231 NORTH QUINCY STREET
GREEN BAY, WISCONSIN 54302

PREPARED BY:

ADVANCED INDUSTRIAL RESOURCES, INC.
3407 NOVIS POINTE
ACWORTH, GEORGIA 30101

TEST DATE:
MARCH 18-19, 2020

REPORT CERTIFICATION SHEET

Having conducted the Technical Review of this report, I hereby certify the data, information, results, and calculations in this report to be accurate and true according to the methods and procedures used.

Ross Winne — May 18, 2020

Ross Winne
Technical Director
Advanced Industrial Resources

Date

Having written and prepared this report, I hereby certify that the data, information and results in this report to be correct and all inclusive of the necessary information required for a complete third-party review of the testing event.

Steven Haigh — May 18, 2020

Steven Haigh
Report Preparation Director
Advanced Industrial Resources

Date

Having supervised all aspects of the field testing, I hereby certify the equipment preparation, field sample collection procedures, and all equipment calibrations were conducted in accordance to the applicable methodologies.

May 18, 2020

Dan Kirk
Field Project Supervisor
Advanced Industrial Resources

Date

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APPENDIX A: TEST RESULTS

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1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

The Green Bay Metropolitan Sewerage District (GBMSD) operates the wastewater treatment plant located at 2231 North Quincy Street, Green Bay, Wisconsin. The facility includes a variety of wastewater treatment processes including a fluidized bed incinerator (FBI) unit identified in the facility's permit as Process I08 which vents to atmosphere via Stack S08. The unit is subject to the operating and emission limits standards set forth in the Wisconsin Department of Natural Resources (Wisconsin DNR) Federal Operation Permit (FOP) No. 405004600-P30, which includes federal standards of 40 CFR 60 Subpart LLLL – *Standards of Performance for New Sewage Sludge Incineration Units*. This document represents the report for a test program to document compliance with the various emission standards set forth in the facility's operating permit and 40 CFR 60 Subpart LLLL.

The FBI is also subject to the federal standards of 40 CFR 61 Subpart E – *National Emission Standards for Mercury* and 40 CFR 61 Subpart C – *National Emission Standards for Beryllium*. This document includes emission test results to demonstrate compliance with these federal standards.

Testing was conducted on the FBI Stack S08 to determine the emissions of particulate matter (total filterable PM), nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxides (SO_2), hydrogen chloride (HCl), dioxins and furans (TEQ & TMB), and metals, including beryllium (Be), cadmium (Cd), lead (Pb), and mercury (Hg). Visible emissions (opacity) observations were conducted on the FBI Stack S08. It is noted that the incinerator's ash handling system is a wet transfer system and observations for the presence of fugitive emissions are applicable to this system only during transfer of dewatered ash to vehicles. Transfer of dewatered ash did not occur during this emissions testing effort.

Testing was conducted on March 18-19, 2020, in accordance with a Wisconsin DNR approved Site-Specific Test Protocol (SSTP). Except for visible emissions testing, all testing was conducted by Advanced Industrial Resources, Inc. (*AIR*) in accordance with approved USEPA Methods (i.e., 40 CFR 60 Appendix A, Methods 1, 2, 3, 3A, 4, 5, 6C, 7E,

10, 23, 26A and 29). Visible emission testing was conducted by others and the results of the testing are to be submitted under separate cover.

1.2 KEY PERSONNEL

The key personnel who coordinated the test program and their telephone numbers are:

Julie Maas, *Green Bay MSD*	920-438-1045
Bruce Bartel, *Green Bay MSD*	920-438-1006
Derek Stephens, *Advanced Industrial Resources*	404-843-2100
Scott Wilson, *Advanced Industrial Resources*	800-224-5007

2.0 PROCESS AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION

The Green Bay Metropolitan Sewerage District (GBMSD) operates wastewater treatment plants in Green Bay and De Pere, Wisconsin. GBMSD implemented the Resource Recovery and Electrical Energy Project (R2E2) to replace its solid handling facility and meet the increased capacity of sludge from the De Pere Facility along with meeting the Subpart LLLL SSI standards. The facility receives and treats wastewater by screening, grit removal, primary clarification, and activated sludge treatment with biological phosphorus removal. The solids at the De Pere Facility are pumped to the Green Bay Facility where they are dewatered and incinerated, the resulting ash of which is landfilled.

The Fluidized Bed Incinerator (FBI) receives anaerobically digested, polymer conditioned, and centrifuge dewatered biosolids. The FBI system includes a biosolids dryer, incinerator feed pumps, a fluidized bed reactor, a hot thermal oil heat exchanger, a wet scrubber, a wet electrostatic precipitator, an exhaust gas conditioner and re- heater, a static bed carbon adsorber, blowers, fans, exhaust flues, and ducting. The FBI has a design sludge feed rate of 51 dry tons per day.

The FBI system is equipped with an ammonia injection system to control NOx emissions. However, the system was not operating during the emission tests (i.e. no ammonia was injected).

The operation of the FBI and the associated control equipment is monitored using flow monitors, combustion temperature, power inputs, scrubber liquid pH, effluent water flow rate, and pressure differential monitors for determining the pressure drop of gas flow across the scrubbers. The exhaust of the FBI is also equipped with oxygen (wet and dry) and carbon monoxide continuous emissions monitoring systems (CEMS).

2.2 SAMPLING LOCATION DESCRIPTION

The exhaust Stack S08 of the FBI has a circular cross section with an internal diameter of 23.625 inches. The sampling locations are located at 15.3 equivalent diameters downstream from the nearest upstream flow disturbance and at 34.7 equivalent diameters upstream from the nearest downstream flow disturbance or stack exhaust. The stack has two sampling ports oriented 90 degrees to one another in a plane perpendicular to the flow direction.

Twelve sampling points (six points per port), were used for USEPA Methods 2, 3, 4, 5, 23, 26A, and 29 sampling, in accordance with USEPA Method 1 requirements.

A three-point stratification test was conducted for instrumental methods 3A, 6C, 7E, and 10 in accordance with Method 7E Section 8.1.2. It was determined that the concentration at each measurement location varied from the mean concentration by no more than 5% or 0.5 ppm. Therefore, sampling was conducted at a single sample traverse point, centrally located within the gas stream.

3.0 SUMMARY AND DISCUSSION OF TEST RESULTS

3.1 OBJECTIVES

Testing was conducted on the FBI Stack S08 to determine the emissions of particulate matter (total filterable PM), nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxides (SO_2), hydrogen chloride (HCl), dioxins and furans (TEQ & TMB), and metals, including beryllium (Be), cadmium (Cd), lead (Pb), and mercury (Hg). Visual emissions (opacity) observations were also conducted on the FBI Stack S08 by GBMSD personnel. It is noted that the incinerator's ash handling system is a wet transfer system and observations for the presence of fugitive emissions are applicable to this system only during transfer of dewatered ash to vehicles. Transfer of dewatered ash did not occur during this emissions testing effort.

3.2 FIELD TEST CHANGES, PROBLEMS, & ITEMS OF NOTE

The testing was conducted in accordance with the associated Site-Specific Test Protocol submitted to Wisconsin DNR prior to testing. No problems were encountered during testing that required deviation from the planned test. Items of note include:

- PM Final results. Beakers M8, M33, and A13, which contained the test probe solvent washes from each of the three PM test runs, had a brown oily substance present after processing the beakers which accounted for virtually the entire PM catch.

3.3 PRESENTATION OF TEST RESULTS

Emission test results are presented in Appendix A and are summarized in Table 3-1. The measured PM concentration, 30.5 mg/dscm @ 7% O_2, exceeded the allowable PM concentration, 9.6 mg/dscm @ 7% O_2. The measured Dioxin/Furan concentration on a Total Mass Basis (TMB), 0.0198 ng (TMB)/dscm @ 7% O_2, exceeded the allowable concentration, 0.013 ng (TMB)/dscm @ 7% O_2, however the Dioxin/Furan concentration on a Toxicity Equivalency (TEQ) basis met the allowable concentration. Reduced and tabulated data from the field-testing is included in Appendix B. The calculations and nomenclature used to reduce the data are presented in Appendix C. Actual raw field data sheets are presented in Appendix D. Laboratory reports and custody records are presented

in Appendix E. Equipment calibration information and Gas Calibration Certification sheets are presented in Appendix F. Facility process data, as provided, is included in Appendix G.

Source	Pollutant	Average Measured	Allowable	Units	Regulatory basis
FBI Stack 08	**PM**, filterable	30.5	9.6	mg/dscm @ 7%O_2	60 LLLL
	SO_2	0.0611	5.3	mg/dscm @ 7%O_2	60 LLLL
	NO_x	12.2	30	mg/dscm @ 7%O_2	60 LLLL
	CO	1.51	27	mg/dscm @ 7%O_2	60 LLLL
	HCl	< 0.0424	0.24	ppm corr. to 7%O_2	60 LLLL
	Dioxins / Furans	0.00095	0.0044	ng (TEQ) /dscm@ 7% O_2	60 LLLL
		0.0198	0.013	ng (TMB) /dscm@ 7% O_2	60 LLLL
	Mercury (Hg)	< 0.0002	0.001	mg/dscm @ 7%O_2	60 LLLL
		< 0.0001	7.1	lb/24-hour	Permit
	Beryllium (Be)	< 0.00001	0.022	lb/24-hour	Permit
	Cadmium (Cd)	< 0.0001	0.0011	mg/dscm @ 7%O_2	60 LLLL
	Lead (Pb)	0.000455	0.00062	mg/dscm @ 7%O_2	60 LLLL

3.4 PROCESS MONITORING

All essential process monitoring equipment was operating properly and recording data throughout the test period so as to allow necessary monitoring parameters and limits to be established. Data is presented in Appendix E.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

Testing was conducted according to the methodology in the *Title 40 Code of Federal Regulation*, Part 60, Appendix A as applicable. The following methods were employed for emission sampling and analyses:

- EPA Method 1 was used for the qualification of the location of sampling ports and for the determination of the number and positions of stack traverse points, as applicable to sample traverses for Method 2.

- EPA Method 2 was employed for the determination of the stack gas velocity and volumetric flow rate during stack sampling using the Type "S" Pitot tube.

- EPA Methods 3 and 3A were used for the calculation of the density and dry molecular weight of the effluent stack gas. An instrumental analyzer was used for the determination of molecular oxygen and carbon dioxide concentrations.

- EPA Method 4 was used for the determination of moisture content.

- EPA Method 5 was used for the determination of filterable particulate matter emissions.

- EPA Method 6C was used for the determination of sulfur dioxide (SO_2) concentrations via an instrumental analyzer.

- EPA Method 7E was used for the determination of nitrogen oxides concentrations via an instrumental analyzer.

- EPA Method 10 was used for the determination of carbon monoxide concentrations via an instrumental analyzer.

- EPA Method 23 was used for the determination of polychlorinated dibenzo p-dioxin and polychlorinated dibenzofuran emission rate concentration. Results are reported on a Toxicity Equivalency basis (TEQ) and Total Mass Basis (TMB) where the one-half of the analytical detection limit (DL/2) was used for reporting emissions which were determined to be below the detection limit for the TEQ and zero (0) was used for reporting emissions determined to be below the detection limit for TMB.

- EPA Method 26A was used for the determination of hydrogen chloride concentrations.

- EPA Method 29 was used for the determination of metal emissions including mercury, beryllium, cadmium, and lead.

Emission and process samples were recovered on site in a controlled environment and stored in appropriate storage containers. The liquid level was marked to verify no liquid was lost during transport. Filters were placed and sealed in a Petri dish. All emission and sludge samples were stored upright in a closed sample box until final laboratory analysis. In order to limit the chain of custody, only essential *AIR* personnel are permitted access to these samples.

5.0 QUALITY ASSURANCE ACTIVITIES

The quality assurance/quality control (QA/QC) measures associated with the sampling and analysis procedures given in the noted EPA reference methodologies, in Subparts A of 40 *CFR* 60 and 40 *CFR 63*, and in the *EPA QA/QC Handbook*, Volume III (EPA 600/R-94/038c) were employed, as applicable. Such measures included, but were not limited to, the procedures detailed below.

5.1 PROBE NOZZLE DIAMETER CHECKS

Probe nozzles were calibrated before field testing by measuring the internal diameter of the nozzle entrance orifice along three different diameters. Each diameter was measured to the nearest 0.001 inch, and all measurements were averaged. The diameters were within the limit of acceptable variation of 0.004 inch.

5.2 PITOT TUBE FACE PLANE ALIGNMENT CHECK

Before field testing, each Type S Pitot tube was examined in order to verify that the face planes of the tube were properly aligned, per Method 2 of 40 *CFR* 60, Appendix A. The external tubing diameter and base-to-face plane distances were measured in order to verify the use of 0.84 as the baseline (isolated) Pitot coefficient. At that time the entire probe assembly (i.e., the sampling probe, nozzle, thermocouple, and Pitot tube) was inspected in order to verify that its components met the interference-free alignment specifications given in EPA Method 2. Because the specifications were met, then the baseline Pitot coefficient was used for the entire probe assembly.

After field testing, the face plane alignment of each Pitot tube was checked. No damage to the tube orifices was noted.

5.3 METERING SYSTEM CALIBRATION

Every three months each dry gas meter (DGM) console is calibrated at five orifice settings according to Method 5 of 40 *CFR* 60, Appendix A. From the calibration data, calculations of the values of Y_m and $\Delta H_@$ are made, and an average of each set of values is obtained. The limit of total variation of Y_m values is ± 0.02, and the limit for $DH_@$ values is ± 0.20.

After field testing, the calibration of the DGM console was checked by performing three calibration runs at a single intermediate orifice setting that is representative of the range used during field-testing. Each DGM was within the limit of acceptable relative variation from Y_m of 5.0%.

5.4 TEMPERATURE GAUGE CALIBRATION

After field testing, the temperature measuring instruments on each sampling train was calibrated against standardized mercury-in-glass reference thermometers. Each indicated temperature was within the limit of acceptable variation between the absolute reference temperature and the absolute indicated temperature of 1.5%.

5.5 GAS ANALYZER CALIBRATION

5.5.1 CALIBRATION GAS CONCENTRATION VERIFICATION

AIR obtained a certificate from the gas manufacturer and confirmed that the documentation included all information required by the Environmental Protection Agency Traceability Protocol No. 1. AIR confirmed that the manufacturer certification was complete and current and that calibration gases certifications had not expired. This documentation was available on-site for inspection during testing and is presented in Appendix E.

5.5.2 MEASUREMENT SYSTEM PREPARATION

AIR assembled, prepared, and preconditioned each measurement system by following the manufacturer's written instructions for preparing and preconditioning each gas analyzer and, as applicable, the other system components. *AIR* made all necessary adjustments to calibrate the analyzers and the data recorders and to achieve the correct sampling rate.

5.5.3 ANALYZER CALIBRATION ERROR

After sampling system and analyzer assembly, preparation and calibration, AIR conducted a 3-point analyzer calibration error test before the first run. AIR introduced the low-, mid-

, and high-level calibration gases sequentially in direct calibration mode. During the test, AIR made no adjustments to the system except to maintain the correct flow rate. AIR recorded the analyzer's response to each calibration gas and calculated the system calibration error. At each calibration gas level (low, mid, and high) the calibration error was within ± 2.0 percent or 0.5 ppm of the calibration span.

5.5.4 INITIAL SYSTEM BIAS AND CALIBRATION ERROR CHECKS

Before sampling began, AIR determined that the high-level calibration gas best approximated the emissions and used it as the upscale gas. AIR introduced the upscale gas at the probe upstream of all sample conditioning components in system calibration mode. The time it took for the measured concentration to increase to a value that is within 95 percent of the certified gas concentration was recorded. AIR continued to observe the gas concentration reading until reached a final, stable value and recorded the value.

Next, AIR introduced the low-level gas in system calibration mode and recorded the time required for the concentration response to decrease to a value that was within 5.0 percent of the certified low-range gas concentration.

AIR continued to observe the low-level gas reading until it reached a final, stable value and recorded the result. AIR operated the measurement system at the normal sampling rate during all system bias checks and made only the adjustments necessary to achieve proper calibration gas flow rates at the analyzer. From this data, AIR determined the initial system bias was less than 5% of the calibration span for the low- and high- level gases.

5.5.5 MEASUREMENT SYSTEM RESPONSE TIME

AIR calculated the measurement system response time from the data collected during the Initial System Bias Check.

5.6 NO_2-NO CONVERSION EFFICIENCY

Before the field test, AIR conducted an NO_2 to NO conversion efficiency test by introducing a concentration of 40 to 60 ppm_v NO_2 to the analyzer in direct calibration mode and

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recording the NO_x concentration displayed by the analyzer. The converter efficiency was calculated using Equation 7E-7 in Method 7E Section 12.7, to be greater than or equal to 90%.

5.7 INSTRUMENT INTERFENCE RESPONSE

AIR obtained instrument vendor data that demonstrates the interference performance specification is not exceeded as defined in EPA Method 7E Section 13.4. Documentation is provided in Appendix D.

5.8 DATA REDUCTION CHECKS

AIR ran an independent check (using a validated computer program) of the calculations with predetermined data before the field test, and the *AIR* Team Leader conducted spot checks on-site to assure that data was being recorded accurately. After the test, *AIR* checked the data input to assure that the raw data had been transferred to the computer accurately.

5.9 EXTERNAL QUALITY ASSURANCE

5.9.1 TEST PROTOCOL EVALUATION

A Site-Specific Test Protocol was submitted to the Wisconsin DNR in advance of testing, which provided regulatory personnel the opportunity to review and comment upon the test and quality assurance procedures used in conducting this testing.

5.9.2 ON-SITE TEST EVALUATION

A test schedule was submitted with the Site-Specific Test Protocol. No tests were performed earlier than stated in the original schedule. Therefore, regulatory personnel were afforded the opportunity for on-site evaluation of all test procedures.

6.0 DATA QUALITY OBJECTIVES

The data quality objectives (DQOs) process is generally a seven-step iterative planning approach to ensure development of sampling designs for data collection activities that support decision making. The seven steps are as follows: (1) defining the problem; (2) stating decisions and alternative actions; (3) identifying inputs into the decision; (4) defining the study boundaries; (5) defining statistical parameters, specifying action levels, and developing action logic; (6) specifying acceptable error limits; and (7) selecting resource-effective sampling and analysis plan to meet the performance criteria. The first five steps are primarily focused on identifying qualitative criteria such as the type of data needed and defining how the data will be used. The sixth step defines quantitative criteria and the seventh step is used to develop a data collection design. In regards to emissions sampling, these steps have already been identified for typical monitoring parameters.

Monitoring methods presented in 40 *CFR* 60 indicate the following regarding DQOs: Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods. At a minimum, each method provides the following types of information: summary of method; equipment and supplies; reagents and standards; sample collection, preservation, storage, and transportation; quality control; calibration and standardization; analytical procedures, data analysis and calculations; and alternative procedures. These test methods have been designed and tested according to DQOs for emissions testing and analysis.

APPENDIX A

TEST RESULTS

Advanced Industrial Resources, Inc.

Test Results

Green Bay MSD
Green Bay, WI
FBI Stack 08

Notes:

1) tpy-tons per year assumes continuous operation or 8,760 hours per year.

3) 40 CFR 60 LLLL New SSI Emission limits - Table 1

		Units	Run 1	Run 2	Run 3	Averages
Test Date			18-Mar-20	18-Mar-20	18-Mar-20	
Start Time			11:50	13:15	14:50	
End Time			12:53	14:19	15:54	
P_m	Pressure of meter gases	inches Hg	29.63	29.63	29.63	29.63
P_s	Pressure of stack gases	inches Hg	29.48	29.48	29.48	29.48
$V_{m(std)}$	Volume of gas sample	dscf	39.25	39.23	39.32	39.27
$V_{w(std),meas}$	Meas. volume of water vapor	scf	0.56	0.61	0.66	0.61
$B_{ws,meas}$	Measured moisture	dimensionless	0.014	0.015	0.016	0.015
$B_{ws,theo}$	Theoretical max. moisture		0.100	0.093	0.096	0.096
$B_{ws,act}$	Actual moisture		0.014	0.015	0.016	0.015
M_d	Mol. Wt. Of gas at DGM	lb./lb.-mole	30.00	29.93	30.00	29.97
M_s	Mol. Wt. Of gas at stack	lb./lb.-mole	29.83	29.75	29.80	29.79
v_s	Velocity of stack gas	ft./sec	51.47	51.41	51.68	51.52
A_n	Area of nozzle	ft^2	0.000241	0.000241	0.000241	0.000241
A_s	Area of stack	ft^2	3.04	3.04	3.04	3.04
Gas Stream Flow Rates						
Q_a	Vol. Flow rate of actual gas	cfm	9,401	9,390	9,439	9,410
Q_w	Vol. Flow rate of wet gas	scfm	8,517	8,544	8,574	8,545
Q_w	Vol. Flow rate of wet gas	scfh	511,002	512,642	514,438	512,694
Q_{sd}	Vol. Flow rate of dry gas	dscfm	8,396	8,413	8,433	8,414
I	Isokinetic sampling ratio	percent	98.6	98.4	98.4	98.5
Process Data						
$P_{(product\ input)}$	Sludge input	dry tons / hr	1.73	1.78	1.81	1.77
Gas Stream Particulate Concentrations Method 5						
c_{PM}	Conc. Of PM in dry stack gas	mg/dscm	35.6	39.5	5.90	27.0
c'_{PM}	PM Conc. Corrected to 7% O_2	mg/dscm @ 7%O_2	39.6	45.6	6.31	**30.5**
$c'_{PM,\ All}$	Allow. $PM_{filterable}$ Conc. [3]	mg/dscm @ 7%O_2	9.6	9.6	9.6	**9.6**
% of All	% of Allowable	%	413%	475%	66%	**318%**
c_{PM}	Conc. Of PM in dry stack gas	gr/dscf	0.0155	0.0172	0.0026	0.0118
Particulate Matter Mass Rates Method 5						
E_{PM}	Emission rate of PM	lb/hour	1.12	1.24	0.187	0.850
E_{PM}	Emission rate of PM	tpy[1]	4.90	5.45	0.817	3.72

Advanced Industrial Resources, Inc.

Test Results

Green Bay MSD
Green Bay, WI
FBI Stack 08

Notes:
1) tpy-tons per year assumes continuous operation or 8,760 hours per year.
3) 40 CFR 60 LLLL New SSI Emission limits - Table 1

		Units	Run 1	Run 2	Run 3	Averages
Test Date			18-Mar-20	18-Mar-20	18-Mar-20	
Start Time			11:50	13:15	14:50	
End Time			12:53	14:19	15:54	
P_m	Pressure of meter gases	inches Hg	29.63	29.63	29.63	29.63
P_s	Pressure of stack gases	inches Hg	29.48	29.48	29.48	29.48
$V_{m(std)}$	Volume of gas sample	dscf	39.25	39.23	39.32	39.27
$V_{w(std),meas}$	Meas. volume of water vapor	scf	0.56	0.61	0.66	0.61
$B_{ws,meas}$	Measured moisture	dimensionless	0.014	0.015	0.016	0.015
$B_{ws,theo}$	Theoretical max. moisture		0.100	0.093	0.096	0.096
$B_{ws,act}$	Actual moisture		0.014	0.015	0.016	0.015
M_d	Mol. Wt. Of gas at DGM	lb./lb.-mole	30.00	29.93	30.00	29.97
M_s	Mol. Wt. Of gas at stack	lb./lb.-mole	29.83	29.75	29.80	29.79
v_s	Velocity of stack gas	ft./sec	51.47	51.41	51.68	51.52
A_n	Area of nozzle	ft^2	0.000241	0.000241	0.000241	0.000241
A_s	Area of stack	ft^2	3.04	3.04	3.04	3.04
Gas Stream Flow Rates						
Q_a	Vol. Flow rate of actual gas	cfm	9,401	9,390	9,439	9,410
Q_w	Vol. Flow rate of wet gas	scfm	8,517	8,544	8,574	8,545
Q_w	Vol. Flow rate of wet gas	scfh	511,002	512,642	514,438	512,694
Q_{sd}	Vol. Flow rate of dry gas	dscfm	8,396	8,413	8,433	8,414
I	Isokinetic sampling ratio	percent	98.6	98.4	98.4	98.5
Process Data						
$P_{(product\ input)}$	Sludge input	dry tons / hr	1.73	1.78	1.81	1.77
Sulfur Dioxide Concentrations Method 6C						
c_{SO2}	Conc. of SO_2 in dry stack gas	ppm	0.0	0.103	0.0600	0.0543
c_{SO2}	SO_2 Conc. Corrected to 7% O_2	ppm corr. 7% O_2	0.0	0.119	0.0641	**0.0611**
$c_{SO2\ All}$	Allowable SO_2 conc. [3]	ppm corr. 7% O_2	5.3	5.3	5.3	**5.3**
% Allow	% of Allowable	%	0%	2%	1%	**1%**
c_{SO2}	Conc. of SO_2 in dry stack gas	mg/dscm	0.0	0.274	0.160	0.145
c_{SO2}	Conc. of SO_2 in dry stack gas	gr/dscf	0.0	0.000120	0.0000697	0.0000631
Sulfur Dioxide Mass Rates Method 6C						
E_{SO2}	Emission rate of SO_2	lb/hour	0.0	0.00864	0.00504	0.00456
E_{SO2}	Emission rate of SO_2	tpy[1]	0.0	0.0378	0.0221	0.0200
E_{SO2}	Emission rate of SO_2	lb/ton of dry sludge	0.00	0.00	0.00	0.00

Advanced Industrial Resources, Inc.

Test Results

Green Bay MSD
Green Bay, WI
FBI Stack 08

Notes:

1) tpy-tons per year assumes continuous operation or 8,760 hours per year.

3) 40 CFR 60 LLLL New SSI Emission limits - Table 1

		Units	Run 1	Run 2	Run 3	Averages
Test Date			18-Mar-20	18-Mar-20	18-Mar-20	
Start Time			11:50	13:15	14:50	
End Time			12:53	14:19	15:54	
P_m	Pressure of meter gases	inches Hg	29.63	29.63	29.63	29.63
P_s	Pressure of stack gases	inches Hg	29.48	29.48	29.48	29.48
$V_{m(std)}$	Volume of gas sample	dscf	39.25	39.23	39.32	39.27
$V_{w(std),meas}$	Meas. volume of water vapor	scf	0.56	0.61	0.66	0.61
$B_{ws,meas}$	Measured moisture	dimensionless	0.014	0.015	0.016	0.015
$B_{ws,theo}$	Theoretical max. moisture		0.100	0.093	0.096	0.096
$B_{ws,act}$	Actual moisture		0.014	0.015	0.016	0.015
M_d	Mol. Wt. Of gas at DGM	lb./lb.-mole	30.00	29.93	30.00	29.97
M_s	Mol. Wt. Of gas at stack	lb./lb.-mole	29.83	29.75	29.80	29.79
v_s	Velocity of stack gas	ft./sec	51.47	51.41	51.68	51.52
A_n	Area of nozzle	ft^2	0.000241	0.000241	0.000241	0.000241
A_s	Area of stack	ft^2	3.04	3.04	3.04	3.04
Gas Stream Flow Rates						
Q_a	Vol. Flow rate of actual gas	cfm	9,401	9,390	9,439	9,410
Q_w	Vol. Flow rate of wet gas	scfm	8,517	8,544	8,574	8,545
Q_w	Vol. Flow rate of wet gas	scfh	511,002	512,642	514,438	512,694
Q_{sd}	Vol. Flow rate of dry gas	dscfm	8,396	8,413	8,433	8,414
I	Isokinetic sampling ratio	percent	98.6	98.4	98.4	98.5
Process Data						
$P_{(product\ input)}$	Sludge input	dry tons / hr	1.73	1.78	1.81	1.77
Nitrogen Oxides Concentrations Method 7E						
c_{NOx}	Conc. of NO_x in dry stack gas	ppm	12.1	10.2	10.6	11.0
c_{NOx}	NO_x Conc. Corrected to 7% O_2	ppm corr. 7% O_2	13.5	11.8	11.4	**12.2**
$c_{NOx\ All}$	Allowable NO_x conc. [3]	ppm corr. 7% O_2	30	30	30	**30**
% Allow	% of Allowable	%	45%	39%	38%	**41%**
c_{NOx}	Conc. of NO_x in dry stack gas	mg/dscm	23.1	19.5	20.4	21.0
c_{NOx}	Conc. of NO_x in dry stack gas	gr/dscf	0.0101	0.00850	0.00889	0.00917
Nitrogen Oxides Mass Rates Method 7E						
E_{NOx}	Emission rate of NO_x	lb/hour	0.728	0.613	0.643	0.661
E_{NOx}	Emission rate of NO_x	tpy[1]	3.19	2.69	2.82	2.90
E_{NOx}	Emission rate of NO_x	lb/ton of dry sludge	0.422	0.345	0.355	0.374

Advanced Industrial Resources, Inc.

Test Results

Green Bay MSD
Green Bay, WI
FBI Stack 08

Notes:

1) tpy-tons per year assumes continuous operation or 8,760 hours per year.

3) 40 CFR 60 LLLL New SSI Emission limits - Table 1

		Units	Run 1	Run 2	Run 3	Averages
Test Date			18-Mar-20	18-Mar-20	18-Mar-20	
Start Time			11:50	13:15	14:50	
End Time			12:53	14:19	15:54	
P_m	Pressure of meter gases	inches Hg	29.63	29.63	29.63	29.63
P_s	Pressure of stack gases	inches Hg	29.48	29.48	29.48	29.48
$V_{m(std)}$	Volume of gas sample	dscf	39.25	39.23	39.32	39.27
$V_{w(std),meas}$	Meas. volume of water vapor	scf	0.56	0.61	0.66	0.61
$B_{ws,meas}$	Measured moisture	dimensionless	0.014	0.015	0.016	0.015
$B_{ws,theo}$	Theoretical max. moisture		0.100	0.093	0.096	0.096
$B_{ws,act}$	Actual moisture		0.014	0.015	0.016	0.015
M_d	Mol. Wt. Of gas at DGM	lb./lb.-mole	30.00	29.93	30.00	29.97
M_s	Mol. Wt. Of gas at stack	lb./lb.-mole	29.83	29.75	29.80	29.79
v_s	Velocity of stack gas	ft./sec	51.47	51.41	51.68	51.52
A_n	Area of nozzle	ft^2	0.000241	0.000241	0.000241	0.000241
A_s	Area of stack	ft^2	3.04	3.04	3.04	3.04
Gas Stream Flow Rates						
Q_a	Vol. Flow rate of actual gas	cfm	9,401	9,390	9,439	9,410
Q_w	Vol. Flow rate of wet gas	scfm	8,517	8,544	8,574	8,545
Q_w	Vol. Flow rate of wet gas	scfh	511,002	512,642	514,438	512,694
Q_{sd}	Vol. Flow rate of dry gas	dscfm	8,396	8,413	8,433	8,414
I	Isokinetic sampling ratio	percent	98.6	98.4	98.4	98.5
Process Data						
$P_{(product\ input)}$	Sludge input	dry tons / hr	1.73	1.78	1.81	1.77
Carbon Monoxide Concentrations Method 10						
c_{CO}	Conc. of CO in dry stack gas	ppm	1.17	1.27	1.64	1.36
c_{CO}	CO Conc. Corrected to 7% O_2	ppm corr. 7% O_2	1.30	1.47	1.75	**1.51**
$c_{CO\ All}$	Allowable CO conc. [3]	ppm corr. 7% O_2	27	27	27	**27**
% Allow	% of Allowable	%	5%	5%	6%	**6%**
c_{CO}	Conc. of CO in dry stack gas	mg/dscm	1.36	1.48	1.909	1.58
c_{CO}	Conc. of CO in dry stack gas	gr/dscf	0.000594	0.000647	0.000834	0.000692
Carbon Monoxide Mass Rates Method 10						
E_{CO}	Emission rate of CO	lb/hour	0.0428	0.0467	0.0603	0.0499
E_{CO}	Emission rate of CO	tpy[1]	0.187	0.205	0.2642	0.219
E_{CO}	Emission rate of CO	lb/ton of dry sludge	0.0248	0.026	0.03332	0.0281

Advanced Industrial Resources, Inc.

Test Results

Green Bay MSD
Green Bay, WI
FBI Stack 08

Notes:

1) tpy-tons per year assumes continuous operation or 8,760 hours per year.

3) 40 CFR 60 LLLL New SSI Emission limits - Table 1

		Units	Run 1	Run 2	Run 3	Averages
Test Date			18-Mar-20	18-Mar-20	18-Mar-20	
Start Time			11:50	13:15	14:50	
End Time			12:53	14:19	15:54	
P_m	Pressure of meter gases	inches Hg	29.63	29.63	29.63	29.63
P_s	Pressure of stack gases	inches Hg	29.48	29.48	29.48	29.48
$V_{m(std)}$	Volume of gas sample	dscf	39.25	39.23	39.32	39.27
$V_{w(std),meas}$	Meas. volume of water vapor	scf	0.56	0.61	0.66	0.61
$B_{ws,meas}$	Measured moisture	dimensionless	0.014	0.015	0.016	0.015
$B_{ws,theo}$	Theoretical max. moisture		0.100	0.093	0.096	0.096
$B_{ws,act}$	Actual moisture		0.014	0.015	0.016	0.015
M_d	Mol. Wt. Of gas at DGM	lb./lb.-mole	30.00	29.93	30.00	29.97
M_s	Mol. Wt. Of gas at stack	lb./lb.-mole	29.83	29.75	29.80	29.79
v_s	Velocity of stack gas	ft./sec	51.47	51.41	51.68	51.52
A_n	Area of nozzle	ft^2	0.000241	0.000241	0.000241	0.000241
A_s	Area of stack	ft^2	3.04	3.04	3.04	3.04
Gas Stream Flow Rates						
Q_a	Vol. Flow rate of actual gas	cfm	9,401	9,390	9,439	9,410
Q_w	Vol. Flow rate of wet gas	scfm	8,517	8,544	8,574	8,545
Q_w	Vol. Flow rate of wet gas	scfh	511,002	512,642	514,438	512,694
Q_{sd}	Vol. Flow rate of dry gas	dscfm	8,396	8,413	8,433	8,414
I	Isokinetic sampling ratio	percent	98.6	98.4	98.4	98.5
Process Data						
$P_{(product\ input)}$	Sludge input	dry tons / hr	1.73	1.78	1.81	1.77
Gas Stream Hydrogen Chloride Concentrations Method 26A						
c_{HCl}	Conc. Of HCl in wet stack gas	$ppm_{,wet}$	< 0.02	< 0.02	< 0.03	< 0.02
c_{HCl}	Conc. Of HCl in dry stack gas	$ppm_{,dry}$	< 0.04	< 0.04	< 0.04	< 0.04
c_{HCl}	HCl Conc. Corr. to 7% O_2	ppm corr. 7% O_2	< 0.04	< 0.04	< 0.04	**< 0.04**
$c_{HCl\ All}$	Allow. HCl concentration [2]	ppm corr. 7% O_2	0.24	0.24	0.24	**0.24**
% Allow	% of Allowable	%	< 17%	< 18%	< 18%	**< 18%**
c_{HCl}	Conc. Of HCl in dry stack gas	mg/dscm	< 0.06	< 0.06	< 0.06	< 0.06
c_{HCl}	Conc. Of HCl in dry stack gas	gr/dscf	< 0.00002	< 0.00002	< 0.00003	< 0.00003
Hydrogen Chloride Mass Rates Method 26A						
E_{HCl}	Emission rate of HCl	lb/hour	< 0.002	< 0.002	< 0.002	< 0.002
E_{HCl}	Emission rate of HCl	tpy[1]	< 0.008	< 0.008	< 0.008	< 0.008
E_{HCl}	Emission rate of HCl	lb/ton of dry sludge	< 0.001	< 0.001	< 0.001	< 0.001

Advanced Industrial Resources, Inc.

Test Results - Method 23 (Dioxins/Furans)

Green Bay MSD
Green Bay, WI
FBI Stack 08

Notes:

* 'L' = 'Detection Limit Limited' where some but not all of the target cogeners were determined to be below the analytical detection limit

1) WHO-2005 TEQ (ND=DL/2; EMPC=EMPC) - Toxicity Equivalency Basis

2) TMB - Total Mass Basis - Total PCDD/Fs (2378-X ND=0; EMPC=EMPC)

3) Emission limits established in Table 1 of 40 CFR 60 LLLL for New SSI Units

		Units	Run 1	Run 2	Run 3	Averages
Test Date			19-Mar-20	19-Mar-20	19-Mar-20	
Start Time Method 23			7:30	11:15	14:50	
End Time Method 23			10:36	14:20	17:57	
P_m	Pressure of meter gases	inches Hg	29.48	29.48	29.48	29.48
P_s	Pressure of stack gases	inches Hg	29.35	29.35	29.35	29.35
$V_{m(std)}$	Volume of gas sample	dscf	114.70	115.16	117.72	115.86
$V_{w(std),meas}$	Meas. volume of water vapor	scf	1.41	1.41	1.84	1.55
$B_{ws,meas}$	Measured moisture	dimensionless	0.012	0.012	0.015	0.013
$B_{ws,theo}$	Theoretical max. moisture		0.095	0.097	0.096	0.096
$B_{ws,act}$	Actual moisture		0.012	0.012	0.015	0.013
M_d	Mol. Wt. Of gas at DGM	lb./lb.-mole	29.96	29.95	29.91	29.94
M_s	Mol. Wt. Of gas at stack	lb./lb.-mole	29.82	29.81	29.73	29.78
v_s	Velocity of stack gas	ft./sec	51.08	51.26	51.11	51.15
A_n	Area of nozzle	ft^2	0.000241	0.000241	0.000241	0.000241
A_s	Area of stack	ft^2	3.04	3.04	3.04	3.04
Gas Stream Flow Rates						
Q_a	Vol. Flow rate of actual gas	cfm	9,331	9,362	9,336	9,343
Q_{sd}	Vol. Flow rate of dry gas	dscfm	8,339	8,355	8,313	8,335
I	Isokinetic sampling ratio	percent	96.8	97.0	99.6	97.8
Process Data						
$P_{(product\ input)}$	Sludge input	dry ton/hr	1.99	1.95	1.90	1.95
Gas Stream Total Dioxin / Furan Concentrations (Toxicity Equivalency Basis - TEQ)[1]						
$c_{D/F}$	Conc. Of D/F in dry stack gas	ng (TEQ)/dscm	0.000576	0.00130	0.000594	0.000822
$c'_{D/F}$	D/F Conc. Corrected to 7% O_2	ng (TEQ) /dscm @ 7% O_2	0.000669	0.00151	0.000681	**0.000952**
$c'_{D/F,\ All}$	Allowable D/F Concentration[3]		0.0044	0.0044	0.0044	**0.0044**
% of All	% of Allowable	%	15%	34%	15%	**22%**
$c_{D/F}$	Conc. Of D/F in dry stack gas	gr (TEQ) /dscf	2.52E-13	5.67E-13	2.60E-13	3.59E-13
Total Dioxin / Furan Mass Rates (Toxicity Equivalency Basis - TEQ)						
$E_{D/F}$	Emission rate of D/F	gr (TEQ) /hr	1.26E-07	2.84E-07	1.29E-07	1.80E-07
Gas Stream Total Dioxin / Furan Concentrations (Total Mass Basis - TMB)[2]						
$c_{D/F}$	Conc. Of D/F in dry stack gas	ng (TMB)/dscm	0.00717	0.00389	0.0405	0.0172
$c'_{D/F}$	D/F Conc. Corrected to 7% O_2	ng (TMB) /dscm @ 7% O2	0.00834	0.00452	0.0464	**0.0198**
$c'_{D/F,\ All}$	Allowable D/F Concentration[3]		0.013	0.013	0.013	**0.013**
% of All	% of Allowable	%	64%	35%	357%	**152%**
$c_{D/F}$	Conc. Of D/F in dry stack gas	gr (TMB) /dscf	3.14E-12	1.70E-12	1.77E-11	7.51E-12
Total Dioxin / Furan Mass Rates (Total Mass Basis - TMB)						
$E_{D/F}$	Emission rate of D/F	gr (TMB) /hr	1.57E-06	8.53E-07	8.83E-06	3.75E-06

Advanced Industrial Resources, Inc.

Test Results

Green Bay MSD

Green Bay, WI

Incinerator 1 Outlet

Notes:

1) tpy-tons per year assumes continuous operation or 8,760 hours per year.

2) Permit FOP No. 405004600-P30 Emission limits

3) 40 CFR 60 LLLL New SSI Emission limits - Table 1

* "Less than' symbol (<) indicates analyte of interest below the analytical detection limit; values reported based upon lab's detection limit

		Units	Run 1	Run 2	Run 3	Averages
Test Date			19-Mar-20	19-Mar-20	19-Mar-20	
Start Time			7:30	11:15	14:50	
End Time			10:36	14:20	17:57	
P_m	Pressure of meter gases	inches Hg	29.45	29.45	29.45	29.45
P_s	Pressure of stack gases	inches Hg	29.35	29.35	29.35	29.35
$V_{m(std)}$	Volume of gas sample	dscf	111.96	112.61	111.78	112.12
$V_{w(std)}$	Volume of water vapor	scf	1.42	1.79	2.03	1.75
B_{ws}	Moisture in stack gas	dimensionless	0.012	0.016	0.018	0.015
$B_{ws,theo}$	Theoretical max. moisture		0.098	0.096	0.097	0.097
$B_{ws,act}$	Actual moisture		0.012	0.016	0.018	0.015
M_d	Mol. Wt. Of gas at DGM	lb./lb.-mole	29.96	29.95	29.91	29.94
M_s	Mol. Wt. Of gas at stack	lb./lb.-mole	29.81	29.77	29.70	29.76
v_s	Velocity of stack gas	ft./sec	51.02	51.22	51.33	51.19
A_n	Area of nozzle	ft^2	0.000218	0.000218	0.000218	0.000218
A_s	Area of stack	ft^2	3.04	3.04	3.04	3.04
Gas Stream Flow Rates						
Q_a	Vol. Flow rate of actual gas	cfm	9,318	9,356	9,375	9,350
Q_{sd}	Vol. Flow rate of dry gas	dscfm	8,310	8,327	8,318	8,318
I	Isokinetic sampling ratio	percent	104.4	104.8	104.2	104.5
Process Data						
$P_{(product}$	Sludge input	dry tons / hr	1.99	1.95	1.90	1.95
Gas Stream Mercury Concentrations						
c_{Hg}	Conc. Of Hg in dry stack gas	mg/dscm	< 0.0002	< 0.0002	< 0.0002	< 0.0002
c'_{Hg}	Hg Conc. Corr. to 7% O_2	mg/dscm @ 7%O_2	< 0.0002	< 0.0002	< 0.0002	**< 0.0002**
$c'_{Hg, All}$	Allow. Hg Conc. [3]	mg/dscm @ 7%O_2	0.0010	0.0010	0.0010	**0.0010**
% of All	% of Allowable	%	< 18%	< 18%	< 18%	**< 18%**
c_{Hg}	Conc. Of Hg in dry stack gas	10^{-6} gr/dscf	< 0.07	< 0.07	< 0.07	< 0.07
Mercury Mass Rates						
E_{Hg}	Emission rate of Hg	lb/hour	< 0.000005	< 0.000005	< 0.000005	< 0.000005
E_{Hg}	Emission rate of Hg	lb/24-hour	< 0.0001	< 0.0001	< 0.0001	< 0.0001
E_{Hg} All	Allowable Hg Em. Rate	lb/24-hour[2]	7.1	7.1	7.1	7.1
% of All	% of Allowable	%	< 0.002%	< 0.002%	< 0.002%	**< 0.002%**
E_{Hg}	Emission rate of Hg	tpy[1]	< 2.2E-05	< 2.1E-05	< 2.2E-05	< 2.1E-05
		lb/ton of dry sludge	< 2.5E-06	< 2.5E-06	< 2.6E-06	< 2.5E-06

Advanced Industrial Resources, Inc.

Test Results

Green Bay MSD

Green Bay, WI

Incinerator 1 Outlet

Notes:

1) tpy-tons per year assumes continuous operation or 8,760 hours per year.

2) Permit FOP No. 405004600-P30 Emission limits

3) 40 CFR 60 LLLL New SSI Emission limits - Table 1

* "Less than' symbol (<) indicates analyte of interest below the analytical detection limit; values reported based upon lab's detection limit

		Units	Run 1	Run 2	Run 3	Averages
Test Date			19-Mar-20	19-Mar-20	19-Mar-20	
Start Time			7:30	11:15	14:50	
End Time			10:36	14:20	17:57	
P_m	Pressure of meter gases	inches Hg	29.45	29.45	29.45	29.45
P_s	Pressure of stack gases	inches Hg	29.35	29.35	29.35	29.35
$V_{m(std)}$	Volume of gas sample	dscf	111.96	112.61	111.78	112.12
$V_{w(std)}$	Volume of water vapor	scf	1.42	1.79	2.03	1.75
B_{ws}	Moisture in stack gas	dimensionless	0.012	0.016	0.018	0.015
$B_{ws,theo}$	Theoretical max. moisture		0.098	0.096	0.097	0.097
$B_{ws,act}$	Actual moisture		0.012	0.016	0.018	0.015
M_d	Mol. Wt. Of gas at DGM	lb./lb.-mole	29.96	29.95	29.91	29.94
M_s	Mol. Wt. Of gas at stack	lb./lb.-mole	29.81	29.77	29.70	29.76
v_s	Velocity of stack gas	ft./sec	51.02	51.22	51.33	51.19
A_n	Area of nozzle	ft^2	0.000218	0.000218	0.000218	0.000218
A_s	Area of stack	ft^2	3.04	3.04	3.04	3.04
Gas Stream Flow Rates						
Q_a	Vol. Flow rate of actual gas	cfm	9,318	9,356	9,375	9,350
Q_{sd}	Vol. Flow rate of dry gas	dscfm	8,310	8,327	8,318	8,318
I	Isokinetic sampling ratio	percent	104.4	104.8	104.2	104.5
Process Data						
$P_{(product}$	Sludge input	dry tons / hr	1.99	1.95	1.90	1.95
Gas Stream Beryllium Concentrations						
c_{Be}	Conc. Of Be in dry stack gas	mg/dscm	< 1.6E-05	< 1.6E-05	< 1.6E-05	< 1.6E-05
c'_{Be}	Be Conc. Corrected to 7% O_2	mg/dscm @ 7%O_2	< 0.00002	< 0.00002	< 0.00002	< 0.00002
c_{Be}	Conc. Of Be in dry stack gas	10^{-6} gr/dscf	< 0.007	< 0.007	< 0.007	< 0.007
Beryllium Mass Rates						
E_{Be}	Emission rate of Be	lb/hour	< 4.9E-07	< 4.9E-07	< 4.9E-07	< 4.9E-07
		lb/24-hour	< 0.00001	< 0.00001	< 0.00001	< 0.0000118
E_{Be} All	Allowable Be Emission Rate	lb/24-hour[2]	0.022	0.022	0.022	0.022
% of All	% of Allowable	%	< 0.05%	< 0.05%	< 0.05%	**< 0.05%**
E_{Be}	Emission rate of Be	tpy[1]	< 2.2E-06	< 2.1E-06	< 2.2E-06	< 2.1E-06
		lb/ton of dry sludge	< 2.5E-07	< 2.5E-07	< 2.6E-07	< 2.5E-07

Advanced Industrial Resources, Inc.

Test Results

Green Bay MSD

Green Bay, WI

Incinerator 1 Outlet

Notes:

1) tpy-tons per year assumes continuous operation or 8,760 hours per year.

2) Permit FOP No. 405004600-P30 Emission limits

3) 40 CFR 60 LLLL New SSI Emission limits - Table 1

* "Less than' symbol (<) indicates analyte of interest below the analytical detection limit; values reported based upon lab's detection limit

		Units	Run 1	Run 2	Run 3	Averages
Test Date			19-Mar-20	19-Mar-20	19-Mar-20	
Start Time			7:30	11:15	14:50	
End Time			10:36	14:20	17:57	
P_m	Pressure of meter gases	inches Hg	29.45	29.45	29.45	29.45
P_s	Pressure of stack gases	inches Hg	29.35	29.35	29.35	29.35
$V_{m(std)}$	Volume of gas sample	dscf	111.96	112.61	111.78	112.12
$V_{w(std)}$	Volume of water vapor	scf	1.42	1.79	2.03	1.75
B_{ws}	Moisture in stack gas	dimensionless	0.012	0.016	0.018	0.015
$B_{ws,theo}$	Theoretical max. moisture		0.098	0.096	0.097	0.097
$B_{ws,act}$	Actual moisture		0.012	0.016	0.018	0.015
M_d	Mol. Wt. Of gas at DGM	lb./lb.-mole	29.96	29.95	29.91	29.94
M_s	Mol. Wt. Of gas at stack	lb./lb.-mole	29.81	29.77	29.70	29.76
v_s	Velocity of stack gas	ft./sec	51.02	51.22	51.33	51.19
A_n	Area of nozzle	ft^2	0.000218	0.000218	0.000218	0.000218
A_s	Area of stack	ft^2	3.04	3.04	3.04	3.04
Gas Stream Flow Rates						
Q_a	Vol. Flow rate of actual gas	cfm	9,318	9,356	9,375	9,350
Q_{sd}	Vol. Flow rate of dry gas	dscfm	8,310	8,327	8,318	8,318
I	Isokinetic sampling ratio	percent	104.4	104.8	104.2	104.5
Process Data						
$P_{(product}$	Sludge input	dry tons / hr	1.99	1.95	1.90	1.95
Gas Stream Cadmium Concentrations						
c_{Cd}	Conc. Of Cd in dry stack gas	mg/dscm	< 0.00006	< 0.00006	< 0.00006	< 0.00006
c'_{Cd}	Cd Conc. Corr. to 7% O_2	mg/dscm @ 7%O_2	< 0.00007	< 0.00007	< 0.00007	**< 0.00007**
$c'_{Cd, All}$	Allow. Cd Conc. [3]	mg/dscm @ 7%O_2	0.0011	0.0011	0.0011	**0.0011**
% of All	% of Allowable	%	< 7%	< 7%	< 7%	**< 7%**
c_{Cd}	Conc. Of Cd in dry stack gas	10^{-6} gr/dscf	< 0.03	< 0.03	< 0.03	< 0.03
Cadmium Mass Rates						
E_{Cd}	Emission rate of Cd	lb/hour	< 2.0E-06	< 2.0E-06	< 2.0E-06	< 2.0E-06
		tpy[1]	< 8.6E-06	< 8.6E-06	< 8.6E-06	< 8.6E-06
		lb/ton of dry sludge	< 9.8E-07	< 1.0E-06	< 1.0E-06	< 1.0E-06

Advanced Industrial Resources, Inc.

Test Results

Green Bay MSD

Green Bay, WI

Incinerator 1 Outlet

Notes:

1) tpy-tons per year assumes continuous operation or 8,760 hours per year.

2) Permit FOP No. 405004600-P30 Emission limits

3) 40 CFR 60 LLLL New SSI Emission limits - Table 1

* "Less than' symbol (<) indicates analyte of interest below the analytical detection limit; values reported based upon lab's detection limit

		Units	Run 1	Run 2	Run 3	Averages
Test Date			19-Mar-20	19-Mar-20	19-Mar-20	
Start Time			7:30	11:15	14:50	
End Time			10:36	14:20	17:57	
P_m	Pressure of meter gases	inches Hg	29.45	29.45	29.45	29.45
P_s	Pressure of stack gases	inches Hg	29.35	29.35	29.35	29.35
$V_{m(std)}$	Volume of gas sample	dscf	111.96	112.61	111.78	112.12
$V_{w(std)}$	Volume of water vapor	scf	1.42	1.79	2.03	1.75
B_{ws}	Moisture in stack gas	dimensionless	0.012	0.016	0.018	0.015
$B_{ws,theo}$	Theoretical max. moisture		0.098	0.096	0.097	0.097
$B_{ws,act}$	Actual moisture		0.012	0.016	0.018	0.015
M_d	Mol. Wt. Of gas at DGM	lb./lb.-mole	29.96	29.95	29.91	29.94
M_s	Mol. Wt. Of gas at stack	lb./lb.-mole	29.81	29.77	29.70	29.76
v_s	Velocity of stack gas	ft./sec	51.02	51.22	51.33	51.19
A_n	Area of nozzle	ft^2	0.000218	0.000218	0.000218	0.000218
A_s	Area of stack	ft^2	3.04	3.04	3.04	3.04
Gas Stream Flow Rates						
Q_a	Vol. Flow rate of actual gas	cfm	9,318	9,356	9,375	9,350
Q_{sd}	Vol. Flow rate of dry gas	dscfm	8,310	8,327	8,318	8,318
I	Isokinetic sampling ratio	percent	104.4	104.8	104.2	104.5
Process Data						
$P_{(product}$	Sludge input	dry tons / hr	1.99	1.95	1.90	1.95
Gas Stream Lead Concentrations						
c_{Pb}	Conc. Of Pb in dry stack gas	mg/dscm	3.97E-04	5.74E-04	2.05E-04	3.92E-04
c'_{Pb}	Pb Conc. Corr. to 7% O_2	mg/dscm @ 7%O_2	0.00046	0.00067	0.00024	**0.00045**
$c'_{Pb, All}$	Allow. Pb Conc. [3]	mg/dscm @ 7%O_2	0.00062	0.00062	0.00062	**0.00062**
% of All	% of Allowable	%	74%	108%	38%	**73%**
c_{Pb}	Conc. Of Pb in dry stack gas	10^{-6} gr/dscf	0.174	0.251	0.090	0.171
Lead Mass Rates						
E_{Pb}	Emission rate of Pb	lb/hour	1.24E-05	1.79E-05	6.40E-06	1.22E-05
		tpy[1]	5.42E-05	7.84E-05	2.80E-05	5.35E-05
		lb/ton of dry sludge	6.20E-06	9.17E-06	3.37E-06	6.25E-06

APPENDIX B

FIELD DATA REDUCTION

Advanced Industrial Resources, Inc.
Data Reduction Sheet

Client:	Green Bay MSD	**Console ID:**	C-016
Location:	Green Bay, WI	**Y_m:**	0.959
Source:	FBI Stack 08	**$\Delta H_@$:**	1.918
Test Team:	JL, AS, CJS, SS, DK	**C_p:**	0.84
EPA Methods:	1, 2, 3, 4, 5, 6c, 7e, 10, 26a	**Analyte(s):**	PM, NOx, CO, SO2

		Units	Run 1	Run 2	Run 3
Test Date			18-Mar-20	18-Mar-20	18-Mar-20
Start Time			11:50	13:15	14:50
End Time			12:53	14:19	15:54
V_m	Volume of gas sample	dcf	42.608	42.881	43.086
M_{lc}	Mass of liquid collected	g	12.0	13.0	14.0
Δp	Velocity head of stack gas	inches H_2O	0.788	0.787	0.795
$(\Delta p)^{1/2}$	Square root of velocity head	(inches $H_2O)^{1/2}$	0.887	0.887	0.891
ΔH	Pressure differential	inches H_2O	1.58	1.57	1.59
θ	Total sampling time	minutes	60.0	60.0	60.0
D_n	Diameter of nozzle	inches	0.210	0.210	0.210
D_s	Diameter of stack	inches	23.6	23.6	23.6
T_m	Temperature of meter	°R	544	548	549
T_s	Temperature of stack gas	°R	574	572	573
P_{bar}	Barometric pressure	inches Hg	29.51	29.51	29.51
p_g	Gauge pressure of stack gas	inches H_2O	-0.35	-0.35	-0.35
% O_2	Percent O2 by volume	percent ($^v/_v$)	8.42	8.88	7.90
% CO_2	Percent CO2 by volume	percent ($^v/_v$)	10.38	9.84	10.51
% N_2	Percent N2 by volume	percent ($^v/_v$)	81.2	81.3	81.6
P	Sludge input	dry tons / hr	1.73	1.78	1.81
m_{PM}	Mass of PM Method 5	mg	39.54	43.83	6.58
c_{SO2}	Sulfur Dioxide Concentration	ppm	0.0	0.10	0.06
c_{NOx}	Nitrogen Oxide Concentratio	ppm	12.10	10.18	10.64
c_{CO}	Carbon Monoxide Concentra	ppm	1.17	1.27	1.64
m_{HCl}	Mass of HCl	mg	< 0.063	< 0.063	< 0.067

Advanced Industrial Resources, Inc.
Data Reduction Sheet

Client:	Green Bay MSD	**Console ID:**	C-16
Location:	Green Bay, WI	Y_m:	0.959
Source:	FBI Stack 08	$\Delta H_@$:	1.918
Test Team:	JL, AS, DK, SS, CJS	C_p:	0.84
EPA Methods:	1, 2, 3A, 4 & 23	**Analyte(s):**	Dioxins/Furans

		Units	Run 1	Run 2	Run 3
Test Date			19-Mar-20	19-Mar-20	19-Mar-20
Start Time Method 23			7:30	11:15	14:50
End Time Method 23			10:36	14:20	17:57
V_m	**Volume of gas sample**	dcf	126.577	127.139	130.004
M_{lc}	**Mass of liquid collected**	g	29.9	29.9	38.9
Δp	**Velocity head of stack gas**	inches H_2O	0.774	0.778	0.773
$(\Delta p)^{1/2}$	**Square root of velocity head**	(inches $H_2O)^{1/2}$	0.880	0.882	0.878
ΔH	**Pressure differential**	inches H_2O	1.55	1.56	1.55
θ	**Total sampling time**	minutes	180.0	180.0	180.0
D_n	**Diameter of nozzle**	inches	0.210	0.210	0.210
D_s	**Diameter of stack**	inches	23.6	23.6	23.6
T_m	**Temperature of meter**	°R	550	551	551
T_s	**Temperature of stack gas**	°R	572	573	573
P_{bar}	**Barometric pressure**	inches Hg	29.37	29.37	29.37
p_g	**Gauge pressure of stack gas**	inches H_2O	-0.34	-0.34	-0.34
% O_2	**Percent O2 by volume**	percent ($^v/_v$)	8.937	8.934	8.780
% CO	**Percent CO2 by volume**	percent ($^v/_v$)	10.034	9.972	9.757
% N_2	**Percent N2 by volume**	percent ($^v/_v$)	81.0	81.1	81.5
P	**Sludge input**	dry tons / hr	1.99	1.95	1.90
$m_{D/F}$	**Mass of Total Dioxin / Furans**	ng (TEQ)[1]	0.00187	0.00423	0.00198
		ng (TMB)[2]	0.0233	0.0127	0.135

Notes:

1) WHO-2005 TEQ (ND=DL/2; EMPC=EMPC) - Toxicity Equivalency Basis

2) TMB - Total Mass Basis - Total PCDD/Fs (2378-X ND=0; EMPC=EMPC)

Advanced Industrial Resources, Inc.

Data Reduction Sheet

Client:	Green Bay MSD	**Console ID:**	C-009
Location:	Green Bay, WI	**Y_m:**	0.982
Source:	Incinerator 1 Outlet	**$\Delta H_@$:**	1.640
Test Team:	JL, CJS, AS, DK, SS	**C_p:**	0.84
EPA Methods:	1, 2, 3A, 4 & 29	**Analyte(s):**	HAP Metals

		Units	Run 1	Run 2	Run 3
Test Date			19-Mar-20	19-Mar-20	19-Mar-20
Start Time			7:30	11:15	14:50
End Time			10:36	14:20	17:57
V_m	Volume of gas sample	dcf	119.622	120.718	119.877
M_{lc}	Mass of liquid collected	g	29.9	37.9	42.9
Δp	Velocity head of stack gas	inches H_2O	0.771	0.777	0.778
$(\Delta p)^{1/2}$	Square root of velocity head	(inches $H_2O)^{1/2}$	0.878	0.881	0.881
ΔH	Pressure differential	inches H_2O	1.08	1.09	1.09
θ	Total sampling time	minutes	180.0	180.0	180.0
D_n	Diameter of nozzle	inches	0.200	0.200	0.200
D_s	Diameter of stack	inches	23.6	23.6	23.6
T_m	Temperature of meter	°R	545	547	547
T_s	Temperature of stack gas	°R	573	573	573
P_{bar}	Barometric pressure	inches Hg	29.37	29.37	29.37
p_g	Gauge pressure of stack gas	inches H_2O	-0.34	-0.34	-0.34
% O_2	Percent O2 by volume	percent ($^v/_v$)	8.937	8.934	8.780
% CO_2	Percent CO2 by volume	percent ($^v/_v$)	10.034	9.972	9.757
% N_2	Percent N2 by volume	percent ($^v/_v$)	81.0	81.1	81.5
P	Sludge input	dry tons / hr	1.99	1.95	1.90
m_{Hg}	Mass of mercury	mg	< 0.0005	< 0.0005	< 0.0005
m_{Be}	Mass of beryllium	mg	< 0.00005	< 0.00005	< 0.00005
m_{Cd}	Mass of cadmium	mg	< 0.0002	< 0.0002	< 0.0002
m_{Pb}	Mass of lead	mg	0.00126	0.00183	0.00065

APPENDIX C

EXAMPLE CALCULATIONS & NOMENCLATURE

Advanced Industrial Resources, Inc.
Sample Calculation Sheet

Green Bay MSD, Green Bay, WI
FBI Stack 08, Run #1

Area of nozzle:

$A_n = 3.1415 \times D_n^2 / 4 / 144$ in^2/ft^2

$A_n = 3.1415 \times (0.21) / 4 / 144$

$A_n =$ 0.000241 ft^2

Area of stack:

$A_s = 3.1415 \times D_s^2 / 4 / 144$ in^2/ft^2

$A_s = 3.1415 \times (23.6) / 4 / 144$

$A_s =$ 3.04 ft^2

Absolute pressure of meter gases:

$P_m = P_{bar} + \Delta H / 13.6$

$P_m = 29.51 + 1.575 / 13.6$

$P_m =$ 29.63 inches Hg

Absolute pressure of stack gases:

$P_s = P_{bar} + p_g / 13.6$

$P_s = 29.51 + -0.35 / 13.6$

$P_s =$ 29.48 inches Hg

Volume of gas sample, standardized:

$V_{m(std)} = V_m \times Y_m (T_{std} / T_m) (P_m / P_{std})$

$V_{m(std)} = (42.608) \times (0.959) \times (528/544) \times (29.63/29.92)$

$V_{m(std)} =$ 39.27 dscf

Volume of water vapor in the gas sample, standardized:

$V_{w(std)} = (V_{lc} \times p_w \times R \times T_{std}) / (M_w \times P_{std})$

$V_{w(std)} = (11.976) \times (0.002201) \times (21.85) \times (528) / (18 \times 29.92)$

$V_{w(std)} =$ 0.56 scf

Volume proportion of water in the stack gas stream, measured:

$B_{ws,meas} = V_{w(std)} / (V_{m(std)} + V_{w(std)})$

$B_{ws,meas} = (0.56 / (39.27 + 0.56))$

$B_{ws,meas} =$ 0.0141

Volume proportion of water in the stack gas stream, theoretical maximum:

$B_{ws,theo} = 10^{\{6.37-2827/(Ts - 95.2)\}} / P_s$

$B_{ws,theo} = 10 \wedge \{6.37-2827/(574 - 95.2)\} / 29.48$

$B_{ws,theo} =$ 0.0991

*Note: Values may not agree exactly with results shown elsewhere in this report due strictly to rounding

Advanced Industrial Resources, Inc.
Sample Calculation Sheet

Green Bay MSD, Green Bay, WI
FBI Stack 08, Run #1

Volume proportion of water in the stack gas stream:

$B_{ws,act}$= lower of $B_{ws,meas}$ and $B_{ws,theo}$

$B_{ws,act}$= 0.0141

Theoretical maximum moisture collection at saturation:

$V_{lc,theo}$= $V_{m(std)}$ x $B_{ws,theo}$ / (1 - $B_{ws,theo}$) / 0.04707

$V_{lc,theo}$= (39.27 x (0.0991) / (1 - 0.0991) / 0.04707

$V_{lc,theo}$= 91.8

Nitrogen content of gas at the DGM:

$\%N_2$ = 100% - $\%CO_2$ - $\%O_2$ - %CO

$\%N_2$ = 100% - 10.38% - 8.42% - 0%

$\%N_2$ = 81.2 %

Molecular weight of gas at the DGM:

M_d = ((44 x $\%CO_2$) + (32 x $\%O_2$) + (28 x ($\%N_2$ + %CO)))/100%

M_d = ((44 x 10.38) + (32 x 8.42) + (28 (81.2 + 0)))/100%

M_d = 30.00 lb/lb-mole

Molecular weight of gas at the stack:

M_s= M_d (1 - B_{ws}) + M_w x B_{ws}

M_s= (30 x (1 - 0.0141)) + (18 x 0.0141)

M_s= 29.83 lb/lb-mole

Velocity of stack gas:

v_s = K_p x C_p $[\varnothing p]^{1/2}$ x $[T_s/(P_s M_s)]^{1/2}$

v_s = (85.49 x 0.84 x 0.887 x [574 / (29.48 x 29.83)]^1/2

v_s = 51.46 ft/s

Volumetric flow rate of actual stack gas:

Qa = v_s x A_s x 60 sec/min

Q_a = (51.46) x (3.04) x (60 sec/min)

Q_a = 9386 cfm

Volumetric flow rate of dry stack gas, standardized:

Q_{sd} = (60 sec/min) x (1 - B_{ws}) v_s A_s (T_{std} / T_s) x (P_s/P_{std})

Q_{sd} = (60 sec/min) x (1 - 0.0141) x 51.46 x 3.04 x (528 / 574) x (29.48 / 29.92)

Q_{sd} = 8387 dscfm

*Note: Values may not agree exactly with results shown elsewhere in this report due strictly to rounding

Advanced Industrial Resources, Inc.
Sample Calculation Sheet

Green Bay MSD, Green Bay, WI
FBI Stack 08, Run #1

Isokinetic sampling ratio expressed as percentage:

$I = 100\ T_s\ [(K_3 \times V_{lc}) + (Y_m \times V_m \times P_m / T_m)] / (60 \times \theta \times v_s \times P_s \times A_n)$

$I = 100 \times (574) \times ((0.002669 \times 11.976) + (0.959 \times 42.608 \times 29.63 / 544)))/(60 \times 60 \times 51.46 \times 29.48 \times 0.000241)$

I= 98.5 %

Concentration of PM in dry stack gas, standardized:

$c = (m / V_{m(std)})\ (35.32\ ft^3 / m^3)$

c= (39.5 / 39.27) x 35.32

c= 35.5 mg/dscm

Concentration of PM in dry stack gas, standardized:

$c = (mg/dscm) / (35.32\ ft^3 / m^3) / (64.8\ mg/gr)$

c= (35.527) / 35.32 / 64.8

c= 0.0155 gr/dscf

Emission rate of PM, time basis:

$E = c_{mg/dscm} \times Q_{sd} \times (60\ min/hr) \times (2.2046 \times 10^{-6}\ lb/mg) / (35.32\ ft^3 / m^3)$

E= 35.527 x 8387 x 60 x 2.2046 x 10-6 / 35.32

E= 1.12 lb/hr

Concentration of NOx in dry stack gas, standardized:

$c = c_{ppm} \times M_{analyte} / 24.05$

c= 12.103 x 46 / 24.05

c= 23.1 mg/dscm

Emission rate of NOx, time basis:

$E = (c_{mg/dscm} \times Q_{sd}\ ((60\ min/hr)\ (2.2046 \times 10^{-6}\ lb./mg) / (35.32\ ft^3 / m^3)$

E= 23.1 x 8387 x (60 min/hr) (2.2046x10-6 lb./mg) / (35.32 ft3 / m3)

E= 0.726 lb/hr

*Note: Values may not agree exactly with results shown elsewhere in this report due strictly to rounding

Advanced Industrial Resources, Inc.
Sample Calculation Sheet (Hg)

Green Bay MSD, Green Bay, WI
Incinerator 1 Outlet, Run

Area of nozzle:

$A_n = 3.1415 \times D_n^2 / 4 / 144 \text{ in}^2/\text{ft}^2$

$A_n = 3.1415 \times (0.2) \times (0.2) / 4 / 144$

$A_n = 0.000218 \quad \text{ft}^2$

Area of stack:

$A_s = 3.1415 \times A_n^2 / 4 / 144 \text{ in}^2/\text{ft}^2$

$A_s = 3.1415 \times (Hg) \times (Hg) / 4 / 144$

$A_s = 3.05 \quad \text{ft}^2$

Absolute pressure of meter gases:

$P_m = P_{bar} + \varnothing H / 13.6$

$P_m = 29.37 + 1.079 / 13.6$

$P_m = 29.45$ inches Hg

Absolute pressure of stack gases:

$P_s = P_{bar} + p_g / 13.6$

$P_s = 29.37 + -0.34 / 13.6$

$P_s = 29.35$ inches Hg

Volume of gas sample, standardized:

$V_{m(std)} = V_m \times Y_m (T_{std} / T_m) (P_m / P_{std})$

$V_{m(std)} = (119.622) \times (0.982) \times (528/545) \times (29.45/29.92)$

$V_{m(std)} = 112.02$ dscf

Volume of water vapor in the gas sample, standardized:

$V_{w(std)} = (V_{lc} \times p_w \times R \times T_{std}) / (M_w \times P_{std})$

$V_{w(std)} = (30) \times (0.002201) \times (21.85) \times (528) / (18 \times 29.92)$

$V_{w(std)} = 1.41$ scf

Volume proportion of water in the stack gas stream:

$B_{ws} = V_{w(std)} / (V_{m(std)} + V_{w(std)})$

$B_{ws} = (1.41 / (112.02 + 1.41))$

$B_{ws} = 0.0124$

Nitrogen content of gas at the DGM:

$\%N_2 = 100\% - \%CO_2 - \%O_2 - \%CO$

$\%N_2 = 100\% - 10.03\% - 8.94\% - 0\%$

$\%N_2 = 81 \quad \%$

*Note: Values may not agree exactly with results shown elsewhere in this report due strictly to rounding

Advanced Industrial Resources, Inc.
Sample Calculation Sheet (Hg)

Green Bay MSD, Green Bay, WI
Incinerator 1 Outlet, Run

Molecular weight of gas at the DGM:

$M_d = ((44 \times \%CO_2) + (32 \times \%O_2) + (28 \times (\%N_2 + \%CO)))/100\%$

$M_d = ((44 \times 10.03) + (32 \times 8.94) + (28\ (81 + 0)))/100\%$

$M_d =$ 29.95 lb/lb-mole

Molecular weight of gas at the stack:

$M_s = M_d\ (1 - B_{ws}) + M_w \times B_{ws}$

$M_s = (29.95 \times (1 - 0.0124)) + (18 \times 0.0124)$

$M_s =$ 29.80 lb/lb-mole

Velocity of stack gas:

$v_s = K_p \times C_p\ [\varnothing p]^{1/2} \times [T_s/(P_s M_s)]^{1/2}$

$v_s = (85.49 \times 0.84 \times (0.771)$^1/2 $\times [573 / (29.35 \times 29.8)]$^1/2

$v_s =$ 51.04 ft/s

Volumetric flow rate of actual stack gas:

$Qa = v_s \times A_s \times 60$ sec/min

$Q_a = (51.04) \times (3.045384) \times (60$ sec/min)

$Q_a =$ 9326 cfm

Volumetric flow rate of dry stack gas, standardized:

$Q_{sd} = (60$ sec/min) $\times (1 - B_{ws})\ v_s\ A_s\ (T_{std} / T_s) \times (P_s/P_{std})$

$Q_{sd} = (60$ sec/min) $\times (1 - 0.0124) \times 51.04 \times 3.045384 \times (528 / 573) \times (29.35 / 29.92)$

$Q_{sd} =$ 8326 dscfm

Isokinetic sampling ratio expressed as percentage:

$I = 100\ T_s\ [(K_3 \times V_{lc}) + (Y_m \times V_m \times P_m / T_m)] / (60 \times Q \times v_s \times P_s \times A_n)$

$I = 100 \times (573) \times ((0.002669 \times 30) + (0.982 \times 119.622 \times 29.45 / 545)))/(60 \times 180 \times 51.04 \times 29.35 \times 0.000218)$

$I =$ 104.4 %

*Note: Values may not agree exactly with results shown elsewhere in this report due strictly to rounding

Advanced Industrial Resources, Inc.
Sample Calculation Sheet (Hg)

Green Bay MSD, Green Bay, WI
Incinerator 1 Outlet, Run

Concentration of Hg in dry stack gas, standardized:

c= $(m / V_{m(std)})$ $(35.32\ ft^3 / m^3)$

c= (0.0005 / 112.02) x 35.32

c= 0.0002 mg/dscm

Concentration of Hg in dry stack gas, standardized:

c= (mg/dscm) / $(35.32\ ft^3 / m^3)$ / (64.8 mg/gr) x 1000000

c= (0.000158) / 35.32 / 64.8*100000

c= 0.07 10^{-6} gr/dscf

Emission rate of Hg, time basis:

E= $c_{mg/dscm}$ x Q_{sd} x (60 min/hr) x $(2.2046 \times 10^{-6}$ lb/mg) / $(35.32\ ft^3 / m^3)$

E= 0.000158 x 8326 x 60 x 2.2046 x 10-6 / 35.32

E= 0.000005 lb/hr

*Note: Values may not agree exactly with results shown elsewhere in this report due strictly to rounding

EXAMPLE CALCULATIONS

$A_n = D_n^2 \pi / 4$

$A_s = D_s^2 \pi / 4$

$B_{ws} = V_{w(std)} / (V_{m(std)} + V_{w(std)})$

$c_{analyte} = (m_{analyte} / V_{m(std)}) (35.31466\ ft^3/m^3)$

$'c_{analyte} = (m_{analyte} / V_{m(std)}) (0.015432\ gr/mg)$

$c_{analyte} = 'c_{analyte}\ MW_{analyte} / 24.04\ l/mol$

$CC = t_{0.975} (S_d / n^{1/2})$

$d = 1/n\ (Sd_i)$

$DE = (E_{Inlet} - E_{Outlet}) / E_{,Inlet} \times 100\%$

$E_{analyte} = (m_{analyte} / V_{m(std)})\ Q_{sd}\ (60\ min/hr)\ (2.2046 \times 10^{-6}\ lb./mg)$

$E_{analyte} = c_{analyte}\ Q_{sd}\ (60\ min/hr)\ (2.2046 \times 10^{-6}\ lb./mg)$

$I = 100\ T_s\ (K_3\ V_{lc} + Y_m\ V_m\ P_m / T_m) / (60\ \theta\ v_s\ P_s\ A_n)$

where $K_3 = 0.002669\ (in.\ Hg\ ft^3) / (mL\ °R)$

$K_I = [(2.0084 \times 10^7\ \Delta H_@)\ A_n\ (1 - B_{ws})]^2\ (M_d / M_s)\ (T_m / T_s)\ (P_s / P_m)$

$M_d = 0.44\ (\%\ CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2 + \%\ CO)$

$M_s = M_d\ (1 - B_{ws}) + M_w\ B_{ws}$

$P = Qsd / F\text{-}Factor \times 60 \times (20.9\text{-}O_2) / 20.9$

$P_m = P_{bar} + \Delta H / 13.6$

$P_s = P_{bar} + p_g / 13.6$

$Q_a = (60\ s/min)\ v_s\ A_s$

$Q_{sd} = (60\ s/min)\ (1 - B_{ws})\ v_s\ A_s\ (T_{std} / T_s)\ (P_s / P_{std})$

$RA = [Abs(d) + Abs(CC)]/RM$

$S_d = [(Sd_i^2 - (Sdi)^2/n)/(n-1)]^{1/2}$

$T_m = t_m + 460°$

$T_s = t_s + 460°$

$V_{m(std)} = V_m\ Y_m\ (T_{std} / T_m)\ (P_m / P_{std})$

$V_{w(std)} = (V_{lc}\ \rho_w\ R\ T_{std}) / (M_w\ P_{std})$

$v_s = K_p\ C_p\ [\Delta p]^{1/2}\ [T_s / (P_s\ M_s)]^{1/2}$

NOMENCLATURE

Symbol	Units	Description
Abs(x)	dimensionless	Absolute value of parameter x
A_n	ft^2	Area of the nozzle
A_s	ft^2	Area of the stack
B_{ws}	dimensionless	Volume proportion of water in the stack gas stream
C_p	dimensionless	Type S pitot tube coefficient
$c_{analyte}$	mg/dscm	Concentration of analyte in dry stack gas, standardized
$'c_{analyte}$	gr./dscf	Concentration of analyte in dry stack gas, standardized
$'c_{analyte}$	ppm	Concentration of analyte in dry stack gas, standardized
CC	dimensionless	One-tailed 2.5% error confidence coefficient
d	ppm	Arithmetic mean of differences
d_i	ppm	Difference between individual CEM and reference method concentration value
D_n	inches	Internal diameter of the nozzle at the entrance orifice
D_s	inches	Internal diameter of the stack at sampling location
DE	percent	Destruction efficiency
ΔH	inches H_2O	Average pressure differential across the meter orifice
$\Delta H@$	inches H_2O	Orifice pressure differential that corresponds to 0.75 cfm of air at 68 °F and 29.92 inches of Hg
Δp	inches H_2O	Velocity head of stack gas
$E_{analyte}$	lb./hour	Emission rate of analyte, time basis
I	percent	Isokinetic sampling ratio expressed as percentage
K_I	dimensionless	K-factor, ratio of DH to DP, ideal
K_p	$ft[(lb/lb\text{-}mol)(in.\ Hg)]^{1/2}$	Type S pitot tube constant,
	$s[(°R)(in.\ H_2O)]^{1/2}$	= 85.49
L_p	cfm	Measured post-test leakage rate of the sampling train
M_d	lb./lb.-mole	Molecular weight of gas at the DGM
M_s	lb./lb.-mole	Molecular weight of gas at the stack

NOMENCLATURE

Symbol	Units	Description
M_w	lb./lb.-mole	Molecular weight of water,
		= 18.0
$m_{analyte}$	mg	Mass of analyte in the sample
n	dimensionless	Number of data points
P	MMBtu	Fuel firing rate
P_{bar}	inches Hg	Barometric pressure at measurement site
P_{input}	tons/hour	Process dry mass input rate
p_g	inches H_2O	Gauge (static) pressure of stack gas
P_m	inches Hg	Absolute pressure of meter gases
P_s	inches Hg	Absolute pressure of stack gases
P_{std}	inches Hg	Standard absolute pressure
		= 29.92
Q_a	cfm	Volumetric flow rate of actual stack gas
Q_{sd}	dscfm	Volumetric flow rate of dry stack gas, standardized
R	(in. Hg)(ft^3)	Ideal gas constant,
	(lb-mole)(°R)	= 21.85
RA	percent	Relative accuracy
RE	percent	Removal efficiency
RM	ppm	Average reference method concentration
r_w	lb/mL	Density of water,
		= 0.002201
r_a	g/mL	Density of acetone,
		= 0.7899
S_d	dimensionless	Standard deviation
T_m	°R	Absolute temperature of dry gas meter
T_s	°R	Absolute temperature of stack gas
T_{std}	°R	Standard absolute temperature,
		= 528
$t_{0.975}$	dimensionless	2.5 percent error t-value
t_m	°F	Temperature of DGM
t_s	°F	Temperature of stack gas
θ	minutes	Total sampling time

NOMENCLATURE

Symbol	Units	Description
V_{lc}	mL	Total volume of liquid collected
V_m	dcf	Volume of gas sample as measured by the DGM
$V_{m(std)}$	dscf	Volume of gas sample as measured by the DGM, standardized
$V_{w(std)}$	scf	Volume of water vapor in the gas sample, standardized
v_s	ft./sec	Velocity of stack gas
Y_m	dimensionless	DGM calibration coefficient
Y_c	dimensionless	DGM calibration check value
Y_w	dimensionless	Reference (wet) gas meter calibration coefficient
% CO_2	percent	Percent CO_2 by volume, dry basis
% O_2	percent	Percent O_2 by volume, dry basis
% N_2	percent	Percent N_2 by volume, dry basis

APPENDIX D

FIELD DATA

SEE ATTACHED CD FOR COMPLETE MONITOR DATA

Advanced Industrial Resources, Inc.
Field Data Sheet

Client:	Green Bay MSD	**Test Date:**	March 18, 2020
Location:	Green Bay, WI	**Console ID:**	C-016
Source:	FBI Stack 08	**Y_m / $\Delta H_@$:**	0.959 1.918
Test Team:	JL, AS, CJS, SS, DK	**Sampling Box ID:**	B-16
EPA Methods:	1, 2, 3, 4, 5, 6c, 7e, 10, 26a	**Probe Assembly ID:**	P3-02
D_s (in.):	23.625	**D_n (in.):**	0.210
% O_2	8.42	**Assumed B_{ws}:**	0.0
% CO_2	10.38	**P_{bar} (in. Hg):**	29.51
Start Run:	11:50 AM	**p_g (in. H_2O):**	-0.35
End Run:	12:53 PM	**Minutes/Point:**	5.0
Run Number:	1	**K-Factor:**	2.0

		Inches H_2O			Temperature Readings (°F)						
Point	**Meter (dcf)**	**Δp**	**ΔH**	**$(\Delta p)^{1/2}$**	**t_s**	**Probe**	**Filter**	**Last Impinger**	**t_m Average**	**Filter Exit CPM**	**Vacuum (in. Hg)**
1	419.938	0.68	1.36	0.825	114	255	251	68	80	249	2
2	423.25	0.72	1.44	0.849	115	256	252	62	80	252	2
3	426.67	0.76	1.52	0.872	116	257	253	57	80	253	2
4	430.48	0.78	1.56	0.883	113	256	252	57	82	254	2
5	433.75	0.77	1.54	0.877	113	255	260	58	83	254	2
6	437.13	0.80	1.60	0.894	114	256	257	60	84	255	2
7	440.69	0.75	1.50	0.866	111	254	256	61	84	256	2
8	444.21	0.82	1.64	0.906	113	256	254	62	85	254	2
9	447.85	0.85	1.70	0.922	116	257	255	63	87	255	2
10	451.53	0.86	1.72	0.927	117	256	256	63	87	256	2
11	455.26	0.85	1.70	0.922	116	254	255	65	88	254	2
12	458.73	0.81	1.62	0.900	114	254	256	66	89	256	2
End	462.546										

Total moisture collected (mL):	12.0
Theoretical maximum moisture collection at saturation (ml):	92.7
Pre System Leak Check (cfm):	0.000
Post System Leak Check (cfm):	0.000

Advanced Industrial Resources, Inc.
Field Data Sheet

Client:	Green Bay MSD	**Test Date:**	March 18, 2020
Location:	Green Bay, WI	**Console ID:**	C-016
Source:	FBI Stack 08	**Y_m / $\Delta H_@$:**	0.959 1.918
Test Team:	JL, AS, CJS, SS, DK	**Sampling Box ID:**	B-16
EPA Methods:	1, 2, 3, 4, 5, 6c, 7e, 10, 26a	**Probe Assembly ID:**	P3-02
D_s (in.):	23.625	**D_n (in.):**	0.210
% O_2	8.877	**Assumed B_{ws}:**	3.0
% CO_2	9.836	**P_{bar} (in. Hg):**	29.51
Start Run:	1:15 PM	**p_g (in. H_2O):**	-0.35
End Run:	2:19 PM	**Minutes/Point:**	5.0
Run Number:	2	**K-Factor:**	2.0

		Inches H_2O			Temperature Readings (°F)						
Point	**Meter (dcf)**	**Δp**	**ΔH**	**$(\Delta p)^{1/2}$**	**t_s**	**Probe**	**Filter**	**Last Impinger**	**t_m Average**	**Filter Exit CPM**	**Vacuum (in. Hg)**
1	462.594	0.75	1.50	0.866	113	256	255	68	85	240	2
2	466.11	0.72	1.44	0.849	114	255	257	56	86	243	2
3	469.51	0.75	1.50	0.866	115	256	256	55	86	242	2
4	472.94	0.79	1.58	0.889	114	253	255	59	86	243	2
5	476.83	0.78	1.56	0.883	112	254	255	59	86	244	2
6	480.09	0.73	1.46	0.854	111	255	256	60	88	246	2
7	483.56	0.76	1.52	0.872	110	256	254	60	88	249	2
8	487.09	0.80	1.60	0.894	111	256	254	61	88	249	2
9	490.75	0.82	1.64	0.906	112	256	255	60	89	250	2
10	494.47	0.85	1.70	0.922	110	255	256	60	90	252	2
11	498.15	0.84	1.68	0.917	111	256	255	61	91	253	2
12	502.03	0.85	1.70	0.922	109	256	256	61	91	252	2
End	505.475										

Total moisture collected (mL):	13.0
Theoretical maximum moisture collection at saturation (ml):	85.6
Pre System Leak Check (cfm):	0.000
Post System Leak Check (cfm):	0.000

Advanced Industrial Resources, Inc.
Field Data Sheet

Client:	Green Bay MSD	**Test Date:**	March 18, 2020
Location:	Green Bay, WI	**Console ID:**	C-016
Source:	FBI Stack 08	**Y_m / $\Delta H_@$:**	0.959 1.918
Test Team:	JL, AS, CJS, SS, DK	**Sampling Box ID:**	B-16
EPA Methods:	1, 2, 3, 4, 5, 6c, 7e, 10, 26a	**Probe Assembly ID:**	P3-02
D_s (in.):	23.625	**D_n (in.):**	0.210
% O_2	7.897	**Assumed B_{ws}:**	3.0
% CO_2	10.505	**P_{bar} (in. Hg):**	29.51
Start Run:	2:50 PM	**p_g (in. H_2O):**	-0.35
End Run:	3:54 PM	**Minutes/Point:**	5.0
Run Number:	3	**K-Factor:**	2.0

		Inches H_2O			Temperature Readings (°F)						
Point	**Meter (dcf)**	**Δp**	**ΔH**	**$(\Delta p)^{1/2}$**	**t_s**	**Probe**	**Filter**	**Last Impinger**	**t_m Average**	**Filter Exit CPM**	**Vacuum (in. Hg)**
1	505.551	0.70	1.40	0.837	110	257	255	68	86	244	2
2	508.91	0.75	1.50	0.866	111	256	255	57	86	256	2
3	512.46	0.79	1.58	0.889	112	255	256	57	86	256	2
4	516.17	0.79	1.58	0.889	114	256	255	60	89	254	2
5	519.65	0.80	1.60	0.894	113	256	255	61	89	256	2
6	523.41	0.75	1.50	0.866	112	255	254	61	89	250	2
7	526.72	0.78	1.56	0.883	112	255	256	61	90	251	2
8	530.16	0.81	1.62	0.900	114	256	255	62	90	250	2
9	533.87	0.84	1.68	0.917	116	257	256	62	91	252	2
10	537.50	0.85	1.70	0.922	115	256	254	63	91	250	2
11	541.25	0.86	1.72	0.927	114	257	253	63	91	251	2
12	544.96	0.82	1.64	0.906	111	255	254	64	92	250	2
End	548.637										

Total moisture collected (mL):	14.0
Theoretical maximum moisture collection at saturation (ml):	88.6
Pre System Leak Check (cfm):	0.000
Post System Leak Check (cfm):	0.000

Advanced Industrial Resources, Inc.
Method 23 Field Data Sheet

Client:	Green Bay MSD	**Test Date:**	March 19, 2020
Location:	Green Bay, WI	**Console ID:**	C-16
Source:	FBI Stack 08	**Y_m / $\Delta H_@$:**	0.959 1.918
Test Team:	JL, AS, DK, SS, CJS	**Sampling Box ID:**	B-16
EPA Methods:	1, 2, 3A, 4 & 23	**Probe Assembly ID:**	P3-02
D_s (in.):	23.625	**D_n (in.):**	0.210
% O_2	8.937	**Assumed B_{ws}:**	2.0
% CO_2	10.034	**P_{bar} (in. Hg):**	29.37
Start Run:	7:30 AM	**p_g (in. H_2O):**	-0.34
End Run:	10:36 AM	**Minutes/Point:**	15.0
Run Number:	1	**K-Factor:**	2.0

		Inches H_2O			Temperature Readings (°F)						
Point	**Meter (dcf)**	**Δp**	**ΔH**	**$(\Delta p)^{1/2}$**	**t_s**	**Probe**	**Filter**	**Last Impinger**	**t_m Average**	**XAD Trap**	**Vacuum (in. Hg)**
1	548.860	0.74	1.48	0.860	110	258	254	68	82	51	2
2	559.15	0.73	1.46	0.854	111	254	254	52	84	50	2
3	569.39	0.75	1.50	0.866	114	255	254	50	86	50	2
4	579.73	0.76	1.52	0.872	115	255	253	50	89	49	2
5	590.02	0.74	1.48	0.860	113	256	254	51	91	50	2
6	600.12	0.71	1.42	0.843	110	253	254	52	93	50	2
7	610.50	0.75	1.50	0.866	110	252	255	52	94	51	3
8	621.19	0.80	1.60	0.894	113	251	256	53	93	52	3
9	632.22	0.86	1.72	0.927	113	250	255	54	93	52	3
10	643.01	0.84	1.68	0.917	115	252	255	55	93	55	3
11	654.21	0.81	1.62	0.900	114	253	256	56	93	55	3
12	665.19	0.80	1.60	0.894	111	254	255	56	94	56	3
End	675.437										

Total moisture collected (mL):	30.0
Theoretical maximum moisture collection at saturation (ml):	256.3
Pre System Leak Check (cfm):	0.000
Post System Leak Check (cfm):	0.000

Advanced Industrial Resources, Inc.
Method 23 Field Data Sheet

Client:	Green Bay MSD	**Test Date:**	March 19, 2020
Location:	Green Bay, WI	**Console ID:**	C-16
Source:	FBI Stack 08	**Y_m / $\Delta H_@$:**	0.959 1.918
Test Team:	JL, AS, DK, SS, CJS	**Sampling Box ID:**	B-16
EPA Methods:	1, 2, 3A, 4 & 23	**Probe Assembly ID:**	P3-02
D_s (in.):	23.6	**D_n (in.):**	0.210
% O_2	8.934	**Assumed B_{ws}:**	2.0
% CO_2	9.972	**P_{bar} (in. Hg):**	29.37
Start Run:	11:15 AM	**p_g (in. H_2O):**	-0.34
End Run:	2:20 PM	**Minutes/Point:**	15.0
Run Number:	2	**K-Factor:**	2.0

		Inches H_2O			Temperature Readings (°F)						
Point	**Meter (dcf)**	**Δp**	**ΔH**	**$(\Delta p)^{1/2}$**	**t_s**	**Probe**	**Filter**	**Last Impinger**	**t_m Average**	**XAD Trap**	**Vacuum (in. Hg)**
1	675.610	0.78	1.56	0.883	111	256	242	59	85	60	3
2	686.19	0.83	1.66	0.911	114	254	254	50	85	49	3
3	697.34	0.83	1.66	0.911	116	255	254	46	87	46	3
4	708.31	0.82	1.64	0.906	115	254	255	46	90	45	3
5	718.91	0.90	1.80	0.949	114	255	256	48	91	46	3
6	729.98	0.76	1.52	0.872	109	256	256	49	92	46	3
7	740.68	0.72	1.44	0.849	111	254	254	51	93	47	3
8	750.89	0.76	1.52	0.872	113	255	254	50	93	48	3
9	761.55	0.77	1.54	0.877	116	255	254	51	93	49	4
10	772.29	0.73	1.46	0.854	116	254	255	53	93	50	4
11	782.46	0.72	1.44	0.849	115	256	254	54	93	51	4
12	793.02	0.72	1.44	0.849	109	254	255	54	93	52	4
End	802.749										

Total moisture collected (mL):	30.0
Theoretical maximum moisture collection at saturation (ml):	264.2
Pre System Leak Check (cfm):	0.000
Post System Leak Check (cfm):	0.000

Advanced Industrial Resources, Inc.
Method 23 Field Data Sheet

Client:	Green Bay MSD	**Test Date:**	March 19, 2020
Location:	Green Bay, WI	**Console ID:**	C-16
Source:	FBI Stack 08	**Y_m / $\Delta H_@$:**	0.959 1.918
Test Team:	JL, AS, DK, SS, CJS	**Sampling Box ID:**	B-16
EPA Methods:	1, 2, 3A, 4 & 23	**Probe Assembly ID:**	P3-02
D_s (in.):	23.625	**D_n (in.):**	0.210
% O_2	8.780	**Assumed B_{ws}:**	2.0
% CO_2	9.757	**P_{bar} (in. Hg):**	29.37
Start Run:	2:50 PM	**p_g (in. H_2O):**	-0.34
End Run:	5:57 PM	**Minutes/Point:**	15.0
Run Number:	3	**K-Factor:**	2.0

		Inches H_2O			Temperature Readings (°F)						
Point	**Meter (dcf)**	**Δp**	**ΔH**	**$(\Delta p)^{1/2}$**	**t_s**	**Probe**	**Filter**	**Last Impinger**	**t_m Average**	**XAD Trap**	**Vacuum (in. Hg)**
1	802.875	0.72	1.44	0.849	110	255	254	68	86	68	3
2	813.41	0.75	1.50	0.866	111	255	255	61	86	60	3
3	824.10	0.77	1.54	0.877	115	255	254	55	88	53	3
4	835.35	0.75	1.50	0.866	116	254	255	51	89	49	3
5	845.89	0.71	1.42	0.843	114	255	255	51	91	48	3
6	856.39	0.69	1.38	0.831	113	254	255	52	92	49	3
7	866.46	0.78	1.56	0.883	108	255	254	52	92	50	3
8	877.61	0.82	1.64	0.906	109	256	253	52	92	51	3
9	889.10	0.83	1.66	0.911	113	255	254	53	93	51	4
10	899.78	0.84	1.68	0.917	116	255	256	53	93	50	4
11	910.50	0.82	1.64	0.906	114	254	255	54	94	51	4
12	922.98	0.79	1.58	0.889	113	255	255	54	94	51	4
End	932.879										

Total moisture collected (mL):	39.0
Theoretical maximum moisture collection at saturation (ml):	265.1
Pre System Leak Check (cfm):	0.000
Post System Leak Check (cfm):	0.000

Advanced Industrial Resources, Inc.
Field Data Sheet

Client:	Green Bay MSD	**Test Date:**	March 19, 2020
Location:	Green Bay, WI	**Console ID:**	C-009
Source:	Incinerator 1 Outlet	**Y_m / $\Delta H_@$:**	0.982 1.640
Test Team:	JL, CJS, AS, DK, SS	**Sampling Box ID:**	B-09
EPA Methods:	1, 2, 3A, 4 & 29	**Probe Assembly ID:**	P4-02
D_s (in.):	23.625	**D_n (in.):**	0.200
% O_2	8.937	**Assumed B_{ws}:**	2.0
% CO_2	10.034	**P_{bar} (in. Hg):**	29.37
Start Run:	7:30 AM	**p_g (in. H_2O):**	-0.34
End Run:	10:36 AM	**Minutes/Point:**	15.0
Run Number:	1	**K-Factor:**	1.4

		Inches H_2O			Temperature Readings (°F)						
Point	**Meter (dcf)**	**Δp**	**ΔH**	**$(\Delta p)^{1/2}$**	**t_s**	**Probe**	**Filter**	**Last Impinger**	**t_m Average**	**Filter Exit CPM**	**Vacuum (in. Hg)**
1	362.856	0.71	0.99	0.843	111	249	256	68	78		1
2	372.52	0.79	1.11	0.889	112	250	258	58	80		1
3	382.75	0.83	1.16	0.911	113	248	261	56	82		1
4	392.69	0.85	1.19	0.922	116	249	262	56	84		1
5	402.88	0.84	1.18	0.917	114	250	263	57	84		1
6	413.24	0.80	1.12	0.894	112	251	262	57	86		1
7	423.56	0.72	1.01	0.849	111	251	260	57	88		1
8	433.81	0.75	1.05	0.866	114	250	261	58	88		1
9	444.02	0.78	1.09	0.883	115	252	262	59	89		1
10	453.91	0.75	1.05	0.866	116	253	261	60	88		1
11	463.75	0.74	1.04	0.860	115	254	260	61	88		1
12	473.94	0.69	0.97	0.831	112	252	261	61	88		1
End	482.478										

Total Moisture Collected (mL):	30.0
Theoretical maximum moisture collection at saturation (ml):	258.2
Pre System Leak Check (cfm):	0.000
Post System Leak Check (cfm):	0.000

Advanced Industrial Resources, Inc.
Field Data Sheet

Client:	Green Bay MSD	**Test Date:**	March 19, 2020
Location:	Green Bay, WI	**Console ID:**	C-009
Source:	Incinerator 1	**Y_m / $\Delta H_@$:**	0.982 1.640
Test Team:	JL, CJS, AS, DK, SS	**Sampling Box ID:**	B-09
EPA Methods:	1, 2, 3A, 4 & 29	**Probe Assembly ID:**	P4-02
D_s (in.):	23.625	**D_n (in.):**	0.200
% O_2	8.934	**Assumed B_{ws}:**	2.0
% CO_2	9.972	**P_{bar} (in. Hg):**	29.37
Start Run:	11:15 AM	**p_g (in. H_2O):**	-0.34
End Run:	2:20 PM	**Minutes/Point:**	15.0
Run Number:	2	**K-Factor:**	1.4

		Inches H_2O			Temperature Readings (°F)						
Point	**Meter (dcf)**	**Δp**	**ΔH**	**$(\Delta p)^{1/2}$**	**t_s**	**Probe**	**Filter**	**Last Impinger**	**t_m Average**	**Filter Exit CPM**	**Vacuum (in. Hg)**
1	482.830	0.72	1.01	0.849	110	250	253	57	83		1
2	492.46	0.75	1.05	0.866	113	250	260	51	82		1
3	502.53	0.74	1.04	0.860	115	252	263	48	84		1
4	512.49	0.76	1.06	0.872	115	253	262	48	86		1
5	522.06	0.76	1.06	0.872	114	250	260	49	88		1
6	532.09	0.70	0.98	0.837	110	251	260	49	88		1
7	541.25	0.76	1.06	0.872	109	248	260	50	88		1
8	551.16	0.82	1.15	0.906	112	248	261	51	89		1
9	561.84	0.86	1.20	0.927	116	249	260	51	89		1
10	572.63	0.85	1.19	0.922	115	247	261	52	89		1
11	582.99	0.81	1.13	0.900	114	248	261	52	89		1
12	593.41	0.79	1.11	0.889	110	249	262	53	90		1
End	603.548										

Total Moisture Collected (mL):	38.0
Theoretical maximum moisture collection at saturation (ml):	254.3
Pre System Leak Check (cfm):	0.000
Post System Leak Check (cfm):	0.000

Advanced Industrial Resources, Inc.
Field Data Sheet

Client:	Green Bay MSD	**Test Date:**	March 19, 2020
Location:	Green Bay, WI	**Console ID:**	C-009
Source:	Incinerator 1 Outlet	**Ym / DH@:**	0.982 1.640
Test Team:	JL, CJS, AS, DK, SS	**Sampling Box ID:**	B-09
EPA Methods:	1, 2, 3A, 4 & 29	**Probe Assembly ID:**	P4-02
D_s (in.):	23.625	**Dn (in.):**	0.200
% O_2	8.780	**Assumed Bws:**	2.0
% CO_2	9.757	**Pbar (in. Hg):**	29.37
Start Run:	2:50 PM	**pg (in. H2O):**	-0.34
End Run:	5:57 PM	**Minutes/Point:**	15.0
Run Number:	3	**K-Factor:**	1.4

		Inches H_2O			Temperature Readings (°F)						
Point	**Meter (dcf)**	**Δp**	**ΔH**	**$(\Delta p)^{1/2}$**	**t_s**	**Probe**	**Filter**	**Last Impinger**	**t_m Average**	**Filter Exit CPM**	**Vacuum (in. Hg)**
1	603.792	0.80	1.12	0.894	112	250	260	68	83		1
2	614.65	0.81	1.13	0.900	114	251	262	57	84		1
3	624.31	0.87	1.22	0.933	117	252	263	53	85		1
4	635.69	0.84	1.18	0.917	114	251	262	51	87		1
5	645.61	0.80	1.12	0.894	112	252	263	51	87		1
6	655.79	0.79	1.11	0.889	110	251	264	52	88		1
7	665.74	0.72	1.01	0.849	109	250	264	52	88		1
8	675.28	0.73	1.02	0.854	112	251	263	53	89		1
9	685.42	0.77	1.08	0.877	115	250	262	53	89		1
10	694.69	0.75	1.05	0.866	116	251	263	55	89		1
11	704.21	0.75	1.05	0.866	115	252	262	55	89		1
12	714.95	0.70	0.98	0.837	113	251	263	56	90		1
End	723.669										

Total Moisture Collected (mL):	43.0
Theoretical maximum moisture collection at saturation (ml):	256.5
Pre System Leak Check (cfm):	0.000
Post System Leak Check (cfm):	0.000

Advanced Industrial Resources, Inc.
Cyclonic Flow Absence Verification Field Data
EPA Method 1

Client:	Green Bay MSD	**Date:**	March 18, 2020
Location:	Green Bay, WI	**D_s (in.):**	23.6
Source:	FBI Stack 08	**A_s (ft^2):**	3.04
Test Team:	JL, AS, CJS, SS, DK	**D_n (in.):**	0.210
Probe ID:	P3-02	**A_n (ft^2):**	0.000241
C_p:	0.84		

t_m (°F):	80
Console ID:	C-016
Y_m:	0.959
$\Delta H_@$:	1.918
Assumed B_{ws}:	3%
P_{bar} (in. Hg):	29.51

Point	Δp (in. H_2O)	α (degrees)
1	0.0	0.0
2	0.0	5.0
3	0.0	0.0
4	0.0	0.0
5	0.0	0.0
6	0.0	0.0
Change Ports		
1	0.0	0.0
2	0.0	0.0
3	0.0	5.0
4	0.0	0.0
5	0.0	0.0
6	0.0	0.0

Advanced Industrial Resources, Inc.
Source Description Sheets

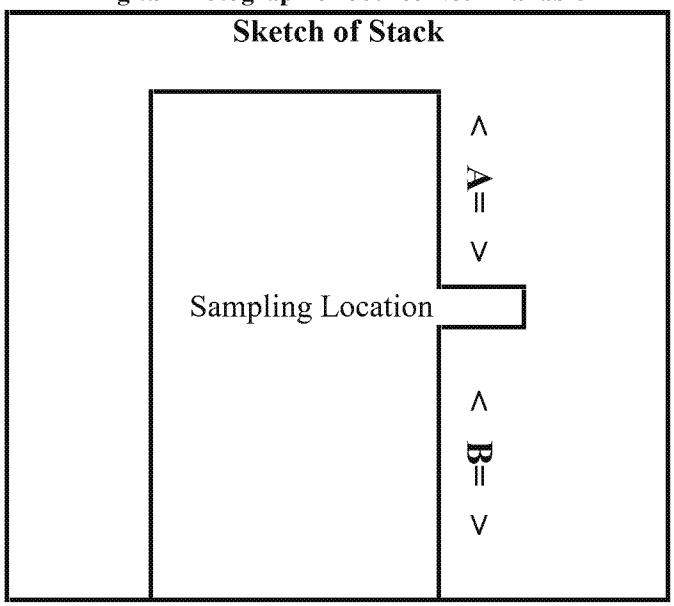
Client:	Green Bay MSD	**Date:**	March 18, 2020
Location:	Green Bay, WI	**Test Team:**	JL, AS, CJS, SS, DK
Source:	FBI Stack 08		

D_n (in.):	0.210
A_n (ft^2):	0.000241
D_s (in.):	23.625
A_s (ft^2):	3.04
Length A (in.):	47.3
Length B (in.):	189
t_{amb} (°F):	85
Assumed B_{ws}:	3%
P_{bar} (in. Hg):	29.51
P_g (in. H_2O):	-0.35
% O_2:	9%
% CO_2:	10%
Console ID:	C-16
Y:	0.959
$\Delta H_@$:	1.918
C_p:	0.84
K-Factor:	2.0

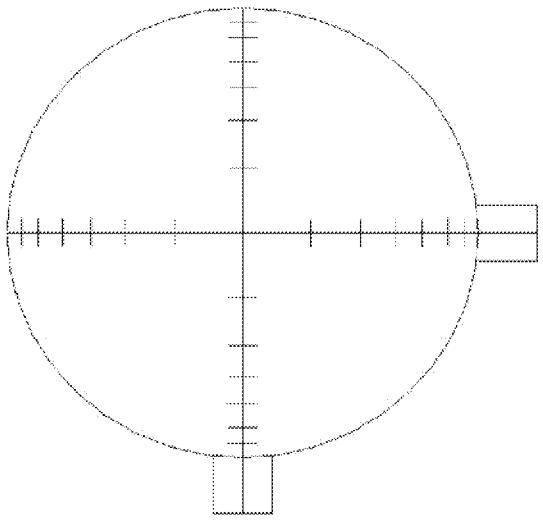
Point	Δp (in. H_2O)	t_s (°F)
1	0.67	114
2	0.68	115
3	0.70	115
4	0.75	114
5	0.76	115
6	0.73	115
Change Ports		
1	0.74	115
2	0.77	115
3	0.76	114
4	0.78	114
5	0.80	113
6	0.79	114

Digital Photograph of Source Not Available

Sketch of Stack



Traverse Point Locations
for
Green Bay MSD
FBI Stack 08



23.6 Inch Diameter Stack
Two Ports at 90°

Sampling Point	Distance from Stack Wall (inches)
1	1.0
2	3.4
6	7.0
4	16.6
5	20.2
6	22.6

Advanced Industrial Resources, Inc.

Field Data Sheet

Client:	Green Bay MSD	Test Date:	3-18-2020
Location:	Green Bay, WI	Console ID:	C-016
Source:	FBI stack (Outlet)	Y_m / $\Delta H_@$:	0.959 / 1.918
Test Team:	JL, AS, CJS, SS, DK	Sampling Box ID:	B-16
EPA Methods:	1-5, 26A	Probe Assembly ID:	P3-02
D_s (in.):	23.625	D_n (in.):	0.210
% O_2	8.42	Assumed B_{ws}:	~~2%~~ 3% JML
% CO_2	10.38	P_{bar} (in. Hg):	29.51
Start Run:	1150	p_g (in. H_2O):	-0.35
End Run:	1253	Minutes/Point:	5.0
Run Number:	1	K-Factor:	2.0

		Inches H_2O		Temperature Readings (°F)							
Point	Meter (dcf)	Δp	ΔH	t_s	Probe	Filter Box	Last Impinger	t_m Inlet JML 80	t_m Outlet	Filter Exit (M5 or ~~CPM~~)	Vacuum (in. Hg)
1	419.988	0.68	1.36	114	255	251	68	~~78~~	80	249	2
2	423.25	0.72	1.44	115	256	252	62	80	80	252	2
3	426.67	0.76	1.52	116	257	253	57	80	80	253	2
4	430.48	0.78	1.56	113	256	252	57	82	82	254	2
5	433.75	0.77	1.54	113	255	260	58	83	83	254	2
6	437.13	0.80	1.60	114	256	257	60	84	84	255	2
7											
8											
9											
10											
11											
12											
Change Ports											
1	440.69	0.79	1.58	111	254	256	61	84	84	256	2
2	444.21	0.82	1.64	113	256	254	62	85	85	254	2
3	447.85	0.85	1.70	116	257	255	63	87	87	255	2
4	451.53	0.86	~~1.76~~ 1.72	117	256	256	63	87	87	256	2
5	455.26	0.85	1.70	116	254	255	65	88	88	254	2
6	458.73	0.81	1.62	114	254	256	66	89	89	256	2
7											
8											
9											
10											
11											
12											
End	462.546										

Moisture Collected (g)

	Initial	Final	Net
Body:	200.0	208.0	8.0
Silica Gel:	200.0	204	4
Gel Number:		Total:	12

Pre-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 10"
Pitot A: ✓
Pitot B: ✓

Post-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Silica Gel Desc. (initial): ~~Ls~~ Blue JML
Silica Gel Desc. (final): Amber
Test Team Leader Review:
Data Entry Review:

Reagent 1: 0.1 N H_2SO_4 Lot No: 19160074
Reagent 2: Acetone Lot No: 192788

Advanced Industrial Resources, Inc.

Field Data Sheet

Client:	Green Bay MSD	Test Date:	3-18-2020
Location:	Green Bay, WI	Console ID:	C-016
Source:	FBC Stack (Outlet)	Y_m / $\Delta H_@$:	0.959 / 1.918
Test Team:	JC, AS, OK, SS, CJS	Sampling Box ID:	B-16
EPA Methods:	1-5/26A	Probe Assembly ID:	P3-02
D_s (in.):	23.625	D_n (in.):	0.210
% O_2	8.877	Assumed B_{ws}:	3%
% CO_2	9.836	P_{bar} (in. Hg):	29.51
Start Run:	1315	p_g (in. H_2O):	-0.35
End Run:	1419	Minutes/Point:	5.0
Run Number:	2	K-Factor:	2.0

		Inches H_2O		Temperature Readings (°F)							
Point	Meter (dcf)	Δp	ΔH	t_s	Probe	Filter Box	Last Impinger	t_m Inlet	t_m Outlet	Filter Exit (M5 or ~~CPM~~)	Vacuum (in. Hg)
1	462.594	0.75	1.50	113	256	255	68	85	85	240	2
2	466.11	0.72	1.44	114	255	257	56	86	86	243	2
3	469.51	0.75	1.50	115	256	256	55	86	86	242	2
4	472.94	0.79	1.58	114	253	255	59	86	86	243	2
5	476.88	0.78	1.56	112	254	255	59	86	86	244	2
6	480.09	0.73	1.46	111	255	256	60	88	88	246	2
7											
8											
9											
10											
11											
12											
Change Ports											
1	483.56	0.76	1.52	110	256	254	60	88	88	249	2
2	487.09	0.80	1.60	111	256	254	61	88	88	245	2
3	490.75	0.82	1.64	112	256	255	60	89	89	250	2
4	494.47	0.85	1.70	110	255	256	60	90	90	252	2
5	498.15	0.84	1.68	111	256	255	61	91	91	253	2
6	502.03	0.85	1.70	109	256	256	61	91	91	252	2
7											
8											
9											
10											
11											
12											
End	505.475										

Moisture Collected (g)

	Initial	Final	Net
Body:	200.0	208.0	8.0
Silica Gel:	200.0	205	5
Gel Number:		Total:	13

Pre-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Post-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Silica Gel Desc. (initial): Blue
Silica Gel Desc. (final): Amber
Test Team Leader Review:
Data Entry Review:

Reagent 1: 0.1 N H_2SO_4 Lot No: 191 60074
Reagent 2: Acetone Lot No: 192788

REV021717

Advanced Industrial Resources, Inc.

Field Data Sheet

Client:	Green Bay MSD	Test Date:	3-18-2020
Location:	Green Bay, WI.	Console ID:	C-016
Source:	FBI stack (Outlet)	Y_m / $\Delta H_@$:	0.959 / 1.918
Test Team:	JL, SS, AS, CJS, OK	Sampling Box ID:	B-16
EPA Methods:	1-5, 26A	Probe Assembly ID:	P3-02
D_s (in.):	23.625	D_n (in.):	0.210
% O_2	7.897	Assumed B_{ws}:	3%
% CO_2	10.505	P_{bar} (in. Hg):	29.51
Start Run:	~~1440~~ 1450 JML	p_g (in. H_2O):	-0.35
End Run:	1554	Minutes/Point:	5.0
Run Number:	3	K-Factor:	2.0

Point	Meter (dcf)	Inches H_2O Δp	Inches H_2O ΔH	Temperature Readings (°F) t_s	Probe	Filter Box	Last Impinger	t_m Inlet	t_m Outlet	Filter Exit (M5 or ~~CPM~~)	Vacuum (in. Hg)
1	505.551	0.70	1.40	110	257	255	68	86	86	244	2
2	508.91	0.75	1.50	111	256	255	57	86	86	245	2
3	512.46	0.79	1.58	112	255	256	57	86	86	246	2
4	516.17	0.79	1.58	114	256	255	60	89	89	245	2
5	519.65	0.80	1.60	113	256	255	61	89	89	246	2
6	523.41	0.75	1.50	112	255	254	61	89	89	250	2
7											
8											
9											
10											
11											
12											
Change Ports											
1	526.72	0.78	1.56	112	255	256	61	90	90	251	2
2	530.16	0.81	1.62	114	256	255	62	90	90	250	2
3	533.87	0.84	1.68	116	257	256	62	91	91	252	2
4	537.50	0.85	1.70	115	256	254	63	91	91	250	2
5	541.25	0.86	1.72	114	257	253	63	91	91	251	2
6	544.96	0.82	1.64	111	255	254	64	92	92	250	2
7											
8											
9											
10											
11											
12											
End	548.637										

Moisture Collected (g)

	Initial	Final	Net
Body:	200.0	207.0	7.0
Silica Gel:	200.0	207	7
Gel Number:		Total:	14

Pre-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Post-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Silica Gel Desc. (initial): Blue
Silica Gel Desc. (final): Amber
Test Team Leader Review:
Data Entry Review:

Reagent 1: 0.1 N H_2SO_4 Lot No: 19160074
Reagent 2: Acetone Lot No: 192788

REV021717

Advanced Industrial Resources, Inc.

Field Data Sheet

Client:	Green Bay MSD	Test Date:	3-19-2020
Location:	Green Bay, WI	Console ID:	C-016
Source:	FBI Stack (Outlet)	Y_m / $\Delta H_@$:	0.959 / 1.918
Test Team:	JL, AS, DK, SS, CJS	Sampling Box ID:	B-16
EPA Methods:	M23	Probe Assembly ID:	P3-02
D_s (in.):	23.625	D_n (in.):	0.210
% O_2	8.937	Assumed B_{ws}:	2%
% CO_2	10.034	P_{bar} (in. Hg):	29.37
Start Run:	0730	p_g (in. H_2O):	~0.34
End Run:	1036	Minutes/Point:	15.0
Run Number:	1	K-Factor:	2.0

		Inches H_2O		Temperature Readings (°F)								
Point	Meter (dcf)	Δp	ΔH	t_s	Probe	Filter Box	Last Impinger	t_m Inlet	t_m Outlet	Filter Exit (M5 or ~~CFM~~)	Vacuum (in. Hg)	XAD
1	548.860	0.74	1.48	110	258	254	68	82	82	N/A	2	51
2	559.15	0.73	1.46	111	254	254	52	84	84	N/A	2	50
3	569.39	0.75	1.50	114	255	254	50	86	86	N/A	2	50
4	579.73	0.76	1.52	115	255	253	50	89	89	N/A	2	49
5	590.02	0.74	1.48	113	256	254	51	91	91	N/A	2	50
6	600.12	0.71	1.42	110	253	254	52	93	93	N/A	2	50
7												
8												
9												
10												
11												
12												
Change Ports												XAD
1	610.50	0.75	1.50	110	252	255	52	94	94	N/A	3	51
2	621.19	0.80	1.60	113	251	256	53	93	93	N/A	3	52
3	632.22	0.86	1.72	113	250	255	54	93	93	N/A	3	52
4	643.01	0.84	1.68	115	252	255	55	93	93	N/A	3	55
5	654.21	0.81	1.62	114	253	256	56	93	93	N/A	3	55
6	665.19	0.80	1.60	111	254	255	56	94	94	N/A	3	56
7												
8												
9												
10												
11												
12												
End	675.437											

Moisture Collected (g)

	Initial	Final	Net
Body:	100.0	124.0	24.0
Silica Gel:	200.0	206	6
Gel Number:		Total:	30

Pre-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 10"
Pitot A: ✓
Pitot B: ✓

Post-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Silica Gel Desc. (initial): Blue
Silica Gel Desc. (final): Amber
Test Team Leader Review:
Data Entry Review:

Reagent 1: Acetone Lot No: 192788
Reagent 2: $MeCl_2$ Lot No: C799187
Toluene 18354163

REV021717

Advanced Industrial Resources, Inc.

Field Data Sheet

Client:	Green Bay MSD	Test Date:	3-19-2020
Location:	Green Bay, WI	Console ID:	C-016
Source:	FBI stack (Outlet)	Y_m / $\Delta H_@$:	0.959 / 1.918
Test Team:	JL, AS, DK, CJS, SS	Sampling Box ID:	B-16
EPA Methods:	M23	Probe Assembly ID:	P3-02
D_s (in.):	23.625	D_n (in.):	0.210
% O_2	8.934	Assumed B_{ws}:	2%
% CO_2	9.972	P_{bar} (in. Hg):	29.37
Start Run:	1115	p_g (in. H_2O):	-0.34
End Run:	1420	Minutes/Point:	15.0
Run Number:	2	K-Factor:	2.0

		Inches H_2O		Temperature Readings (°F)						XAD	
Point	Meter (dcf)	Δp	ΔH	t_s	Probe	Filter Box	Last Impinger	t_m Inlet	t_m Outlet	~~Filter Exit (M5 or CPM)~~	Vacuum (in. Hg)
1	675.610	0.78	1.56	111	256	242	59	85	85	60	3
2	686.19	0.83	1.66	114	254	254	50	85	85	49	3
3	697.34	0.83	1.66	116	255	254	46	87	87	46	3
4	708.31	0.82	1.64	115	254	255	46	90	90	45	3
5	718.91	0.80	1.60	114	255	256	48	91	91	46	3
6	729.98	0.76	1.52	109	256	256	49	92	92	46	3
7											
8											
9											
10											
11											
12											
Change Ports											
1	740.68	0.72	1.44	111	254	254	51	93	93	47	3
2	750.89	0.76	1.52	113	255	254	50	93	93	48	3
3	761.55	0.77	1.54	116	255	254	51	93	93	49	4
4	772.29	0.73	1.46 ~~0.73~~	116	254	255	53	93	93	50	4
5	782.46	0.72	1.44 ~~0.72~~	115	256	254	54	93	93	51	4
6	793.02	0.72	1.44 ~~0.72~~	109	254	255	54	93	93	52	4
7											
8											
9											
10											
11											
12											
End	802.749										

Moisture Collected (g)

	Initial	Final	Net
Body:	100.0	125.0	25.0
Silica Gel:	200.0	205	5
Gel Number:		Total:	30

Pre-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Post-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Silica Gel Desc. (initial): Blue
Silica Gel Desc. (final): Amber
Test Team Leader Review:
Data Entry Review:

Reagent 1: Acetone Lot No: 192788
Reagent 2: $MeCl_2$ Lot No: C799187
Toluene 18354163

REV021717

Advanced Industrial Resources, Inc.

Field Data Sheet

Client:	Green Bay MSD	Test Date:	3-19-2020
Location:	Green Bay, WI	Console ID:	C-016
Source:	FBI Stack (Outlet)	Y_m / $\Delta H_@$:	0.959 / 1.918
Test Team:	JL, AS, SS, CJS, DK	Sampling Box ID:	B-16
EPA Methods:	M23	Probe Assembly ID:	P3-02
D_s (in.):	23.625	D_n (in.):	0.210
% O_2	8.78	Assumed B_{ws}:	2%
% CO_2	9.757	P_{bar} (in. Hg):	29.37
Start Run:	1450	p_g (in. H_2O):	-0.34
End Run:	1757	Minutes/Point:	15.0
Run Number:	3	K-Factor:	2.0

		Inches H_2O		Temperature Readings (°F)						XAD	
Point	Meter (dcf)	Δp	ΔH	t_s	Probe	Filter Box	Last Impinger	t_m Inlet	t_m Outlet	~~Filter Exit (MM or CPM)~~	Vacuum (in. Hg)
1	802.875	0.72	1.44	110	255	254	68	86	86	68	2
2	813.41	0.75	1.50	111	255	255	61	86	86	60	3
3	824.10	0.77	1.54	115	255	254	55	88	88	53	3
4	835.35	0.75	1.50	116	254	255	51	89	89	49	3
5	845.89	0.71	1.42	114	255	255	51	91	91	48	3
6	856.32	0.69	1.38	113	254	255	52	92	92	49	3
7											
8											
9											
10											
11											
12											
Change Ports											
1	866.46	0.78	1.56	108	255	254	52	92	92	50	3
2	877.61	0.82	1.64	109	256	253	52	91	92	51	3
3	889.10	0.83	1.66	113	255	254	53	93	93	51	4
4	899.78	0.84	1.68	116	255	256	53	93	93	50	4
5	910.50	0.82	1.64	114	254	255	54	94	94	51	4
6	922.98	0.79	1.58	113	255	255	54	94	94	51	4
7											
8											
9											
10											
11											
12											
End	932.879										

Moisture Collected (g)

	Initial	Final	Net
Body:	100.0	129.0	29.0
Silica Gel:	200.0	210	10
Gel Number:		Total:	39

Pre-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Post-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Silica Gel Desc. (initial): Blue
Silica Gel Desc. (final): Amber
Test Team Leader Review:
Data Entry Review:

Reagent 1: Acetone Lot No: 192788
Reagent 2: MeCl2 Lot No: C799187
Toluene 18354163

REV021717

Advanced Industrial Resources, Inc.

Field Data Sheet

Client:	Green Bay MSD	Test Date:	3-19-2020
Location:	Green Bay, WI	Console ID:	C-009
Source:	FBI stack (Outlet)	Y_m / $\Delta H_@$:	0.982 / 1.640
Test Team:	JL, CJS, AS, DK, CJS	Sampling Box ID:	B-09
EPA Methods:	M29	Probe Assembly ID:	P4-02
D_s (in.):	23.625	D_n (in.):	0.200
% O_2	8.937	Assumed B_{ws}:	2%
% CO_2	10.034	P_{bar} (in. Hg):	29.37
Start Run:	0730	p_g (in. H_2O):	-0.34
End Run:	1036	Minutes/Point:	15.0
Run Number:	1	K-Factor:	1.4

Point	Meter (dcf)	Inches H_2O Δp	Inches H_2O ΔH	Temperature Readings (°F) t_s	Probe	Filter Box	Last Impinger	t_m Inlet	t_m Outlet	Filter Exit (M5 or ~~CPM~~)	Vacuum (in. Hg)
1	362.856	0.71	0.99	111	249	256	68	78	78	N/A ~~44~~	1
2	372.52	0.79	1.11	112	250	258	58	80	80	N/A	1
3	382.75	0.83	1.16	113	248	261	56	82	82	N/A	1
4	392.69	0.85	1.19	116	249	262	56	84	84	N/A	1
5	402.88	0.84	1.18	114	250	263	57	84	84	N/A	1
6	413.24	0.80	1.12	112	251	262	57	86	86	N/A	1
7											
8											
9											
10											
11											
12											
Change Ports											
1	423.56	0.72	1.01	111	251	260	57	88	88	N/A	1
2	433.81	0.75	1.05	114	250	261	58	88	88	N/A	1
3	444.02	0.78	1.09	115	252	262	59	89	89	N/A	1
4	453.91	0.75	1.05	116	253	261	60	88	88	N/A	1
5	463.75	0.74	1.04	115	254	260	61	88	88	N/A	1
6	473.94	0.69	0.97	112	252	261	61	88	88	N/A	1
7											
8											
9											
10											
11											
12											
End	482.478										

Moisture Collected (g)

	Initial	Final	Net
Body:	400.0	421.0	21.0
Silica Gel:	200.0	209	9
Gel Number:		Total:	30

Pre-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 10"
Pitot A: ✓
Pitot B: ✓

Post-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Silica Gel Desc. (initial): Blue
Silica Gel Desc. (final): Amber
Test Team Leader Review:
Data Entry Review: [signature]

Reagent 1: $KMnO_4$ Lot No: 178323
Reagent 2: DI H_2O Lot No: 17481712
H_2SO_4 14160074
HNO_3 1807538
H_2O_2 ~~C584~~ 194486
HCl C584901

REV021717

Advanced Industrial Resources, Inc.

Field Data Sheet

Client:	Green Bay MSD	Test Date:	3-19-2020
Location:	Green Bay, WI	Console ID:	C-009
Source:	FBI Stack (Outlet)	Y_m / $\Delta H_@$:	0.982 / 1.640
Test Team:	JL, AS, CJS, SS, DK	Sampling Box ID:	B-09
EPA Methods:	M29	Probe Assembly ID:	P4-02
D_s (in.):	23.625	D_n (in.):	0.200
% O_2	8.934	Assumed B_{ws}:	2%
% CO_2	9.972	P_{bar} (in. Hg):	29.37
Start Run:	1115	p_g (in. H_2O):	-0.34
End Run:	1420	Minutes/Point:	15.0
Run Number:	2	K-Factor:	1.4

Point	Meter (dcf)	Inches H_2O Δp	Inches H_2O ΔH	Temperature Readings (°F) t_s	Probe	Filter Box	Last Impinger	t_m Inlet	t_m Outlet	Filter Exit (M5 or CPM)	Vacuum (in. Hg)
1	482.850	0.72	1.01	110	250	253	57	83	83	N/A	1
2	492.46	0.75	1.05	113	250	260	51	82	82		1
3	502.53	0.74	1.04	115	252	263	48	84	84		1
4	512.49	0.76	1.06	115	253	262	48	86	86		1
5	522.06	0.76	1.06	114	250	260	49	88	88		1
6	532.09	0.70	0.98	110	251	260	49	88	88		1
7											
8											
9											
10											
11											
12											
Change Ports											
1	541.25	0.76	1.06	109	248	260	50	88	88	N/A	1
2	551.16	0.82	1.15	112	248	261	51	89	89		1
3	561.84	0.86	1.20	116	249	260	51	89	89		1
4	572.63	0.85	1.19	115	247	261	52	89	89		1
5	582.99	0.81	1.13	114	248	261	52	89	89		1
6	593.41	0.79	1.11	110	249	262	53	90	90		1
7											
8											
9											
10											
11											
12											
End	603.548										

Moisture Collected (g)

	Initial	Final	Net
Body:	400.0	430.0	30.0
Silica Gel:	200.0	208	8
Gel Number:		Total:	38

Pre-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Post-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Silica Gel Desc. (initial): Blue
Silica Gel Desc. (final): Amber
Test Team Leader Review:
Data Entry Review:

Reagent 1:	$KMnO_4$	Lot No:	178323
Reagent 2:	DI H_2O	Lot No:	17481712
	H_2SO_4		19160074
	HNO_3		18075381
	H_2O_2		194486
	HCl		C584901

REV021717

Advanced Industrial Resources, Inc.

Field Data Sheet

Client:	Green Bay MSD	Test Date:	3-19-2020
Location:	Green Bay WI.	Console ID:	C-009
Source:	FBI Stack (Outlet)	Y_m / $\Delta H_@$:	0.982 / 1.640
Test Team:	JL, SS, AS, CJS, DK	Sampling Box ID:	B-09
EPA Methods:	M29	Probe Assembly ID:	P4-02
D_s (in.):	23.625	D_n (in.):	0.200
% O_2	8.78	Assumed B_{ws}:	2%
% CO_2	9.757	P_{bar} (in. Hg):	29.37
Start Run:	1450	p_g (in. H_2O):	-0.34
End Run:	1757	Minutes/Point:	15.0
Run Number:	3	K-Factor:	1.4

		Inches H_2O		Temperature Readings (°F)							
Point	Meter (dcf)	Δp	ΔH	t_s	Probe	Filter Box	Last Impinger	t_m Inlet	t_m Outlet	Filter Exit (M5 or CPM)	Vacuum (in. Hg)
1	603.792	0.80	1.12	112	250	260	68	83	83	N/A	1
2	614.65	0.81	1.13	114	257	262	57	84	84	↓	1
3	624.31	0.87	1.22	112	252	263	53	85	85	↓	1
4	635.69	0.84	1.18	114	257	262	51	87	87	↓	1
5	645.61	0.80	1.12	112	252	263	51	87	87	↓	1
6	655.79	0.79	~~1.14~~ 1.11	110	251	264	52	88	88	↓	1
7											
8											
9											
10											
11											
12											
Change Ports											
1	665.74	0.72	1.01	109	250	264	52	88	88	N/A	1
2	675.28	0.73	1.02	112	251	263	53	89	89	↓	1
3	685.42	0.77	1.08	115	250	262	53	89	89	↓	1
4	694.69	0.75	1.05	116	251	263	55	89	89	↓	1
5	704.21	0.75	1.05	115	252	262	55	89	89	↓	1
6	714.95	0.70	0.98	113	251	263	56	90	90	↓	1
7	~~723.66~~										
8	JMC										
9											
10											
11											
12											
End	723.669										

Moisture Collected (g)

	Initial	Final	Net
Body:	400.0	428.0	28.0
Silica Gel:	200.0	215	15
Gel Number:		Total:	43

Pre-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Post-Run Leak Checks (dcfm @ "Hg)

Sampling Line: 0.000 @ 5"
Pitot A: ✓
Pitot B: ✓

Silica Gel Desc. (initial): Blue
Silica Gel Desc. (final): Amber
Test Team Leader Review:
Data Entry Review:

Reagent 1:	$KMnO_4$	Lot No:	178323
Reagent 2:	DI H_2O	Lot No:	17481712
	H_2SO_4		19160074
	HNO_3		18075381
	H_2O_2		194486
	HCl		C584907

REV021717

Advanced Industrial Resources, Inc.

Cyclonic Flow Absence Verification Field Data

EPA Method 1

Client: Green Bay MSD
Location: Green Bay, WI
Source: FBI Stack (Outlet)
Test Team: SS, JL, AS, CJS, DK
Probe ID: P3-02
C_p: 0.84

t_m (°F): 80
Console ID: C-16
Y_m: 0.959
$\Delta H_@$: 1.918
Assumed B_{ws}: 3%
P_{bar} (in. Hg): 29.51

Date: 3/18/20
D_s (in.): 23.625
A_s (ft^2): 3.04
D_n (in.): 0.210
A_n (ft^2): 0.000241

Point	Δp (in. H_2O)	α (degrees)
1	0.0	0
2	0.0	5
3	0.0	0
4	0.0	0
5	0.0	0
6	0.0	0
Change Ports		
1	0.0	0
2	0.0	0
3	0.0	5
4	0.0	0
5	0.0	0
6	0.0	0

Test Team Leader Review:
Data Entry Review:

Advanced Industrial Resources, Inc.

Source Description Sheets

Client: Green Bay MSD
Location: Green Bay, WI
Source: FBI Stack (Outlet)

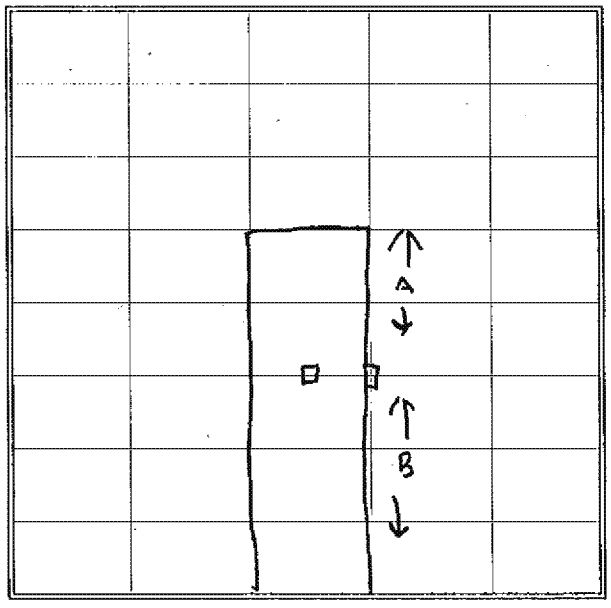
Date: 3/18/20
Test Team: SS, JL, AS, CJS, DK

D_n (in.): 0.210
A_n (ft^2): 0.000241
D_s (in.): 23.625
A_s (ft^2): 3.04
Length A (in.): >47.3
Length B (in.): >189.0

t_{amb} (°F): 85
Assumed B_{ws}: 3%
P_{bar} (in. Hg): 29.51
P_g (in. H_2O): ~0.35
% O_2: 9
% CO_2: 10
Console ID: C-16
Y: 0.959
$\Delta H_@$: 1.918
C_p: 0.84
K-Factor: 2.0 43 ft

Point	Δp (in. H_2O)	t_s (°F)
1	0.67	114
2	0.68	115
3	0.70	115
4	0.75	114
5	0.76	115
6	0.73	115
Change Ports		
1	0.74	115
2	0.77	115
3	0.76	114
4	0.78	114
5	0.80	113
6	0.79	114
	Δp=0.77	116

Sketch of Stack



Test Team Leader Review:
Data Entry Review:

APPENDIX E

LABORATORY REPORTS

METHOD 5 LAB REPORT

Advanced Industrial Resources, Inc.
Laboratory Test Report

Client: Green Bay MSD
Location: Green Bay, WI
Source: FBI Stack

Test Date: March 18, 2020
Analytical Method: 5
Target Analytes: particulate matter

Particulate Matter Analysis Data and Results

Wash Blank Volume: 200 mL
Actual Blank Residue: 0.5 mg
Max Allowed Blank Residue: 1.6 mg

Acetone Density: 0.7899 g/mL
Residue Concentration: 0.0028 mg/g

Filter Samples

Test	Filter ID	Tare Weights (g)		Gross Weights (g)		Average Net Weight (g)
1	Q830	0.4038	0.4039	0.4039	0.4038	0.0000
2	Q887	0.4049	0.4047	0.4047	0.4046	0.0000
3	Q889	0.4050	0.4049	0.4006	0.4001	0.0000
Blank	Q890	0.4054	0.4054	0.4064	0.4061	0.0009

Solvent Wash Samples

Test	Beaker ID	Tare Weights (g)		Gross Weights (g)		Average Net Weight (g)
1	M8	113.0295	113.0300	113.0694	113.0697	0.0398
2	M33	114.8169	114.8168	114.8607	114.8612	0.0441
3	A13	109.5876	109.5873	109.5942	109.5943	0.0068
Blank	F-1	112.2899	112.2903	112.2907	112.2904	0.0005

Initial Solvent Residue

Test	Beaker ID	Solvent Volume (mL)	Actual Solvent Residue (g)	Max. Allowed Solvent Residue (g)	Solvent Residue Value Used (g)
1	M8	115	0.0003	0.0009	0.0003
2	M33	120	0.0003	0.0009	0.0003
3	A13	100	0.0002	0.0008	0.0002

Net Particulate Matter in Sample

Test	m_{PM} (g)
1	**0.0395**
2	**0.0438**
3	**0.0066**

Analytical Balance ID: AS 220/c/2 (1)

Comments: Final results. Beaker M8, M33, and A13 had brown oily substance present after cook

Prepared By: Will Borgognoni

Date: April 7, 2020

Format_REV060615

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Is hereby granting a Louisiana Environmental Laboratory Accreditation to

Advanced Industrial Resources
3407 Novis Pointe
Acworth, Georgia 30101

Agency Interest No. 114715
Activity No. ACC20190001

According to the Louisiana Administrative Code, Title 33, Part I, Subpart 3, LABORATORY ACCREDITATION, the State of Louisiana formally recognizes that this laboratory is technically competent to perform the environmental analyses listed on the scope of accreditation detailed in the attachment.

The laboratory agrees to perform all analyses listed on this scope of accreditation according to the Part I, Subpart 3 requirements and acknowledges that continued accreditation is dependent on successful ongoing compliance with the applicable requirements of Part I. Please contact the Department of Environmental Quality, Louisiana Environmental Laboratory Accreditation Program (LELAP) to verify the laboratory's scope of accreditation and accreditation status.

Accreditation by the State of Louisiana is not an endorsement or a guarantee of validity of the data generated by the laboratory. Accreditation of the environmental laboratory does not imply that a product, process, system, or person is approved by LELAP. To be accredited initially and maintain accreditation, the laboratory agrees to participate in two single-blind, single-concentration PT studies, where available, per year for each field of testing for which it seeks accreditation or maintains accreditation as required in LAC 33:I.4711.

Cheryl Sonnier Nolan
Administrator
Public Participation and Permit Support Services Division

Issued Date: 24 June 2019

Effective Date: **July 1, 2019**
Expiration Date: **June 30, 2020**
Certificate Number: **04085**

METHOD 23 LAB REPORT

FINAL LAB REPORT

Green Bay MSD

B4195

08-Apr-2020

Prepared by

SGS NORTH AMERICA

Prepared for

Advanced Industrial Resources, Inc.

Derek Stephens

3407 Novis Pointe

Acworth, GA 30101

Phone: 800-224-5007

Email: dstephens@airtest1.com

This report is approved by

Amy Boehm

Senior Project Manager

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Results reported relate only to the items tested.

PROJECT INFORMATION SUMMARY *(When applicable, see QC Annotations for details)*

Client Project	Green Bay MSD
SGS Project #	B4195
Analytical Protocol(s)	M23
No. Samples Submitted	4
Additional QC Sample(s)	0
No. Laboratory Method Blanks	1
No. OPRs / Batch CS3	1
Date Received	25-Mar-20
Condition Received	Good
Temperature upon Receipt (ºC)	12.3 (Traps & Filters), 12.3 (Solvents)
Extraction within Holding Time	Yes
Analysis within Holding Time	Yes

QC ANNOTATIONS:

1. Please see Appendices attached for data qualifier/attribute and lab identifier descriptions which may be contained in the project.

APPENDIX A: GENERAL DATA QUALIFIERS / DATA ATTRIBUTES

B	The analyte was found in the method blank, at a concentration that was at least 10% of the concentration in the sample.
C	Two or more congeners co-elute. In EDDs, C denotes the lowest IUPAC congener in a co-elution group and additional co-eluters for the group are shown with the number of the lowest IUPAC co-eluter.
E	The reported concentration exceeds the calibration range (upper point of the calibration curve) and is an estimated value.
EMPC	Represents an Estimated Maximum Possible Concentration. EMPCs arise in cases where the signal/noise ratio is not sufficient for peak identification (the determined ion-abundance ratio is outside the allowed theoretical range), or where there is a co-eluting interference.
H/h	If the standard recovery is below the method or SOP specified value "H" is assigned. If the obtained value is less than half the specified value "h" is assigned.
J	Indicates that an analyte has a concentration below the reporting limit (lowest point of the calibration curve) and is an estimated value.
ND	Indicates a non-detect.
NR or R	Indicates a value that is not reportable.
PR	Due to interference, the associated congener is poorly resolved.
QI	Indicates the presence of a quantitative interference.
SI	Denotes "Single Ion Mode" and is utilized for PCBs where the secondary ion trace has a significantly elevated noise level due to background PFK. Responses for such peaks are calculated using an EMPC approach based solely on the primary ion area(s) and may be considered estimates.
U	The analyte was not detected. The estimated detection limit (EDL) may be reported for this analyte.
V	The labeled standard recovery was found to be outside of the method control limits.

APPENDIX B: DRBC/TMDL SPECIFIC DATA QUALIFIERS / DATA ATTRIBUTES

J	The reported result is an estimate. The value is less than the minimum calibration level but greater than the estimated detection limit (EDL).
U	The analyte was not detected in the sample at the estimated detection limit (EDL).
E	The reported concentration is an estimate. The value exceeds the upper calibration range (upper point of the calibration curve).
D	Dilution Data. Result was obtained from the analysis of a dilution.
B	Analyte found in the sample and associated method blank.
C	Co-eluting congener
Cxx	Co-elutes with the indicated congener, data is reported under the lowest IUPAC congener. 'Xx' denotes the IUPAC number with the lowest numerical designated congener.
NR	Analyte is not reportable because of problems in sample preparation or analysis.
V	Labeled standard recovery is not within method control limits.
X	Results from re-injection/repeat/second-column analysis.
EMPC	Estimated maximum possible concentration. Indicates that a peak is identified but did not meet the method specified ion-abundance ratio.

APPENDIX C: LAB IDENTIFIERS

AR	Indicates use of the archived portion of the sample extract.
CU	Indicates a sample that required additional clean-up prior to MS injection/processing.
D	Indicates a dilution of the sample extract. The number that follows the "D" indicates the dilution factor.
DE	Indicates a dilution performed with the addition of ES (extraction standard) solution.
DUP	Designation for a duplicate sample.
MS	Designation for a matrix spike.
MSD	Designation for a matrix spike duplicate.
RJ	Indicates a reinjection of the sample extract.
S	Indicates a sample split. The number that follows the "S" indicates the split factor.

SGS CERTIFICATIONS

Alaska	17-012
Arkansas	18-042-0
California (ELAP)	ELAP Cert #2914
CLIA	34D1013708
Connecticut	PH-0258
USDA Soil Permit	P330-17-00055
American Association for Laboratory Accreditation (A2LA)	2726.01 (ISO 17025:2005, 2009 TNI, DoD ELAP QSM 5.1)
Florida DOH	E87634
Louisiana DEQ	4115
Louisiana DOH	LA031
Maine	2018018
Massachusetts	M-NC919
Minnesota (Primary NELAP For Method 23)	1535636
Mississippi	Reciprocity
Montana	0106
New Hampshire	208318 & 208518
New Jersey	NC100
New York	11685
North Carolina DEQ	481
North Dakota	R-197
Oregon	NC200002
Pennsylvania	68-03675
South Carolina	99029002
Texas	T104704260
US Coast Guard	16714/159.317/SGS
Vermont	VT-87634
Virginia	10101
Washington	C913
West Virginia	293

Rev. 06-Mar-2019

B4195 - TEQ

Project ID: Green Bay MSD

Sample Summary
Part 1

SGS

Method 23

Analyte	Method Blank B4195_17409	Method Blank B4195_17409	KR10426 - Test 1	KR10426 - Test 2	KR10426 - Test 3	KR10426 - Blank
	pg	pg	pg	pg	pg	pg
2,3,7,8-TCDD	(2.39)	(1.92)	(1.71)	(3.96)	(1.15)	(1.76)
1,2,3,7,8-PeCDD	(2.42)	(1.41)	(1.26)	(3.29)	(1.5)	(1.23)
1,2,3,4,7,8-HxCDD	(1.82)	(1.45)	(0.761)	(1.36)	(0.825)	(0.737)
1,2,3,6,7,8-HxCDD	(1.74)	(1.36)	(0.768)	(1.33)	(0.841)	(0.761)
1,2,3,7,8,9-HxCDD	(1.84)	(1.47)	(0.816)	(1.35)	(0.937)	(0.852)
1,2,3,4,6,7,8-HpCDD	(1.29)	(1.4)	1.65	[1.49]	[2.43]	(0.886)
OCDD	(1.95)	(1.55)	[10.6]	8.9	6.51	(1.08)
2,3,7,8-TCDF	(1.48)	(1.23)	(0.704)	(1.48)	[2.17]	(0.798)
1,2,3,7,8-PeCDF	(1.49)	(1.08)	(0.638)	(0.838)	[1.58]	(0.723)
2,3,4,7,8-PeCDF	(1.14)	(0.932)	(0.537)	(0.729)	(0.719)	(0.61)
1,2,3,4,7,8-HxCDF	(1.26)	(0.988)	(0.57)	(0.878)	(0.608)	(0.644)
1,2,3,6,7,8-HxCDF	(1.24)	(0.956)	(0.554)	(0.839)	(0.596)	(0.633)
2,3,4,6,7,8-HxCDF	(1.25)	(1.02)	(0.532)	(0.876)	(0.594)	(0.651)
1,2,3,7,8,9-HxCDF	(1.47)	(1.32)	(0.703)	(1.01)	(0.781)	(0.817)
1,2,3,4,6,7,8-HpCDF	(1.18)	(0.703)	(0.513)	(0.763)	(0.619)	(0.626)
1,2,3,4,7,8,9-HpCDF	(1.14)	(0.764)	(0.576)	(0.737)	(0.646)	(0.642)
OCDF	(1.32)	(1.35)	(1.08)	(1.15)	(0.839)	(1.15)
ITEF TEQ (ND=0; EMPC=0)	**0**	**0**	**0.0165**	**0.0089**	**0.00651**	**0**
ITEF TEQ (ND=0; EMPC=EMPC)	**0**	**0**	**0.0272**	**0.0238**	**0.326**	**0**
ITEF TEQ (ND=DL/2; EMPC=0)	**2.75**	**2.08**	**1.61**	**3.48**	**1.4**	**1.66**
ITEF TEQ (ND=DL/2; EMPC=EMPC)	**2.75**	**2.08**	**1.62**	**3.49**	**1.72**	**1.66**
ITEF TEQ (ND=DL; EMPC=EMPC)	**5.49**	**4.15**	**3.22**	**6.96**	**3.11**	**3.33**
Checkcode	805-848-SYH	795-954-BZK	898-065-CLY	467-737-VPT	833-955-BPS	006-881-ZCZ
Lab ID	MB1_17409_DF_SDS-CU	MB1_17409_DF_SDS	B4195_17409_DF_001	B4195_17409_DF_002-CU	B4195_17409_DF_003	B4195_17409_DF_004

( ) = DL
[ ] = EMPC

B4195 - TEQ

Project ID: Green Bay MSD

Sample Summary Part 1

SGS

Method 23

Analyte	Method Blank B4195_17409	Method Blank B4195_17409	KR10426 - Test 1	KR10426 - Test 2	KR10426 - Test 3	KR10426 - Blank
	pg	pg	pg	pg	pg	pg
2,3,7,8-TCDD	(2.39)	(1.92)	(1.71)	(3.96)	(1.15)	(1.76)
1,2,3,7,8-PeCDD	(2.42)	(1.41)	(1.26)	(3.29)	(1.5)	(1.23)
1,2,3,4,7,8-HxCDD	(1.82)	(1.45)	(0.761)	(1.36)	(0.825)	(0.737)
1,2,3,6,7,8-HxCDD	(1.74)	(1.36)	(0.768)	(1.33)	(0.841)	(0.761)
1,2,3,7,8,9-HxCDD	(1.84)	(1.47)	(0.816)	(1.35)	(0.937)	(0.852)
1,2,3,4,6,7,8-HpCDD	(1.29)	(1.4)	1.65	[1.49]	[2.43]	(0.886)
OCDD	(1.95)	(1.55)	[10.6]	8.9	6.51	(1.08)
2,3,7,8-TCDF	(1.48)	(1.23)	(0.704)	(1.48)	[2.17]	(0.798)
1,2,3,7,8-PeCDF	(1.49)	(1.08)	(0.638)	(0.838)	[1.58]	(0.723)
2,3,4,7,8-PeCDF	(1.14)	(0.932)	(0.537)	(0.729)	(0.719)	(0.61)
1,2,3,4,7,8-HxCDF	(1.26)	(0.988)	(0.57)	(0.878)	(0.608)	(0.644)
1,2,3,6,7,8-HxCDF	(1.24)	(0.956)	(0.554)	(0.839)	(0.596)	(0.633)
2,3,4,6,7,8-HxCDF	(1.25)	(1.02)	(0.532)	(0.876)	(0.594)	(0.651)
1,2,3,7,8,9-HxCDF	(1.47)	(1.32)	(0.703)	(1.01)	(0.781)	(0.817)
1,2,3,4,6,7,8-HpCDF	(1.18)	(0.703)	(0.513)	(0.763)	(0.619)	(0.626)
1,2,3,4,7,8,9-HpCDF	(1.14)	(0.764)	(0.576)	(0.737)	(0.646)	(0.642)
OCDF	(1.32)	(1.35)	(1.08)	(1.15)	(0.839)	(1.15)
WHO-2005 TEQ (ND=0; EMPC=0)	**0**	**0**	**0.0165**	**0.00267**	**0.00195**	**0**
WHO-2005 TEQ (ND=0; EMPC=EMPC)	**0**	**0**	**0.0197**	**0.0176**	**0.29**	**0**
WHO-2005 TEQ (ND=DL/2; EMPC=0)	**3.22**	**2.32**	**1.87**	**4.21**	**1.7**	**1.9**
WHO-2005 TEQ (ND=DL/2; EMPC=EMPC)	**3.22**	**2.32**	**1.87**	**4.23**	**1.98**	**1.9**
WHO-2005 TEQ (ND=DL; EMPC=EMPC)	**6.44**	**4.64**	**3.72**	**8.44**	**3.68**	**3.81**
Checkcode	805-848-SYH	795-954-BZK	898-065-CLY	467-737-VPT	833-955-BPS	006-881-ZCZ
Lab ID	MB1_17409_DF_SDS-CU	MB1_17409_DF_SDS	B4195_17409_DF_001	B4195_17409_DF_002-CU	B4195_17409_DF_003	B4195_17409_DF_004

( ) = DL
[ ] = EMPC

B4195 - Totals

Project ID: Green Bay MSD

Sample Summary Part 2

SGS

Method 23

Analyte	Method Blank B4195_17409	Method Blank B4195_17409	KR10426 - Test 1	KR10426 - Test 2	KR10426 - Test 3	KR10426 - Blank
	pg	pg	pg	pg	pg	pg
Totals						
TCDDs	0	0	6.48	0	11.2	0
PeCDDs	0	0	0	0	0	0
HxCDDs	0	0	0	0	0	0
HpCDDs	0	0	1.65	0	0	0
OCDD	0	0	0	8.9	6.51	0
TCDFs	0	0	0	0	60.3	0
PeCDFs	0	0	0	0	5.21	0
HxCDFs	0	0	0	0	0	0
HpCDFs	0	0	0	0	0	0
OCDF	0	0	0	0	0	0
Total PCDD/Fs (ND=0; EMPC=0)	**0**	**0**	**8.13**	**8.9**	**83.3**	**0**
Total PCDD/Fs (ND=0; EMPC=EMPC)	**0**	**0**	**23.3**	**12.7**	**135**	**0**
Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)	**26.4**	**20.9**	**35.1**	**33.3**	**146**	**14.6**
Total 2378s (ND=0; EMPC=0)	**0**	**0**	**1.65**	**8.9**	**6.51**	**0**
Total 2378s (ND=0.5; EMPC=0)	**13.2**	**10.4**	**8.1**	**19.7**	**13.1**	**7.3**
Total 2378s (ND=1; EMPC=0)	**26.4**	**20.9**	**14.5**	**30.6**	**19.6**	**14.6**
Total 2378s (ND=0; EMPC=1)	**0**	**0**	**12.3**	**10.4**	**12.7**	**0**
Total 2378s (ND=0.5; EMPC=1)	**13.2**	**10.4**	**18.2**	**20.7**	**18**	**7.3**
Total 2378s (ND=1; EMPC=1)	**26.4**	**20.9**	**24**	**31**	**23.3**	**14.6**
Checkcode	805-848-SYH	795-954-BZK	898-065-CLY	467-737-VPT	833-955-BPS	006-881-ZCZ
Lab ID	MB1_17409_DF_SDS-CU	MB1_17409_DF_SDS	B4195_17409_DF_001	B4195_17409_DF_002-CU	B4195_17409_DF_003	B4195_17409_DF_004

Total 2378s = Sum of 17 2378-substituted PCDD/PCDF congeners (SARA 313)

( ) = DL
[ ] = EMPC

B4195 - Others

Project ID: Green Bay MSD

Sample Summary
Part 3

SGS

Method 23

Analyte	Method Blank B4195_17409	Method Blank B4195_17409	KR10426 - Test 1	KR10426 - Test 2	KR10426 - Test 3	KR10426 - Blank
	pg	pg	pg	pg	pg	pg
Other PCDD/Fs (ND=0, EMPC=0)						
Other TCDD	0	0	6.48	0	11.2	0
Other PeCDD	0	0	0	0	0	0
Other HxCDD	0	0	0	0	0	0
Other HpCDD	0	0	0	0	0	0
Other TCDF	0	0	0	0	60.3	0
Other PeCDF	0	0	0	0	5.21	0
Other HxCDF	0	0	0	0	0	0
Other HpCDF	0	0	0	0	0	0
Other PCDD/Fs (ND=0, EMPC=EMPC)						
Other TCDD	0	0	8.51	0	20.4	0
Other PeCDD	0	0	0	0	0	0
Other HxCDD	0	0	0	0	0	0
Other HpCDD	0	0	2.53	2.28	2.51	0
Other TCDF	0	0	0	0	90.3	0
Other PeCDF	0	0	0	0	9.09	0
Other HxCDF	0	0	0	0	0	0
Other HpCDF	0	0	0	0	0	0
Checkcode	805-848-SYH	795-954-BZK	898-065-CLY	467-737-VPT	833-955-BPS	006-881-ZCZ
Lab ID	MB1_17409_DF_SDS-CU	MB1_17409_DF_SDS	B4195_17409_DF_001	B4195_17409_DF_002-CU	B4195_17409_DF_003	B4195_17409_DF_004

( ) = DL
[ ] = EMPC

B4195 - DLs

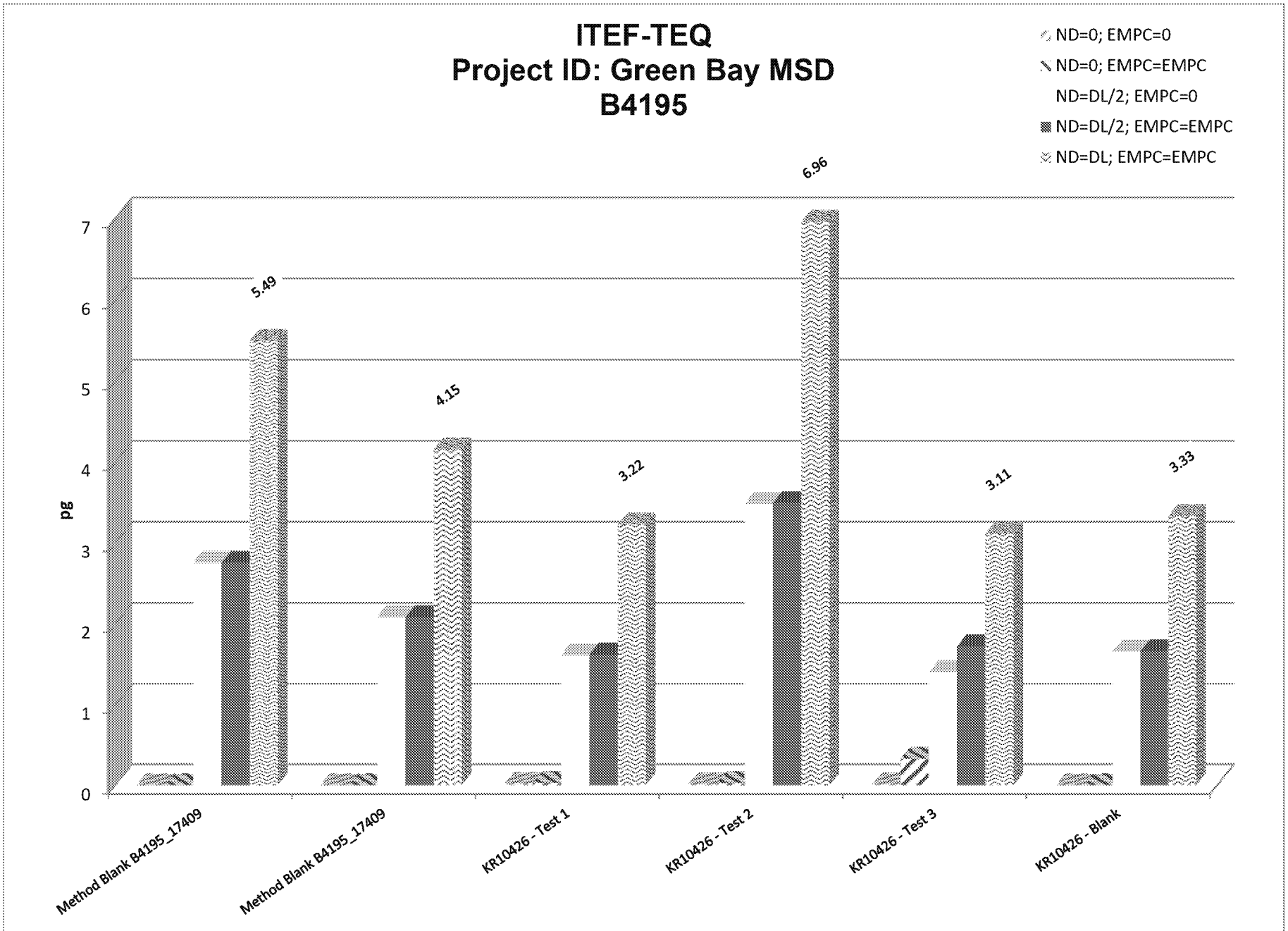
Project ID: Green Bay MSD

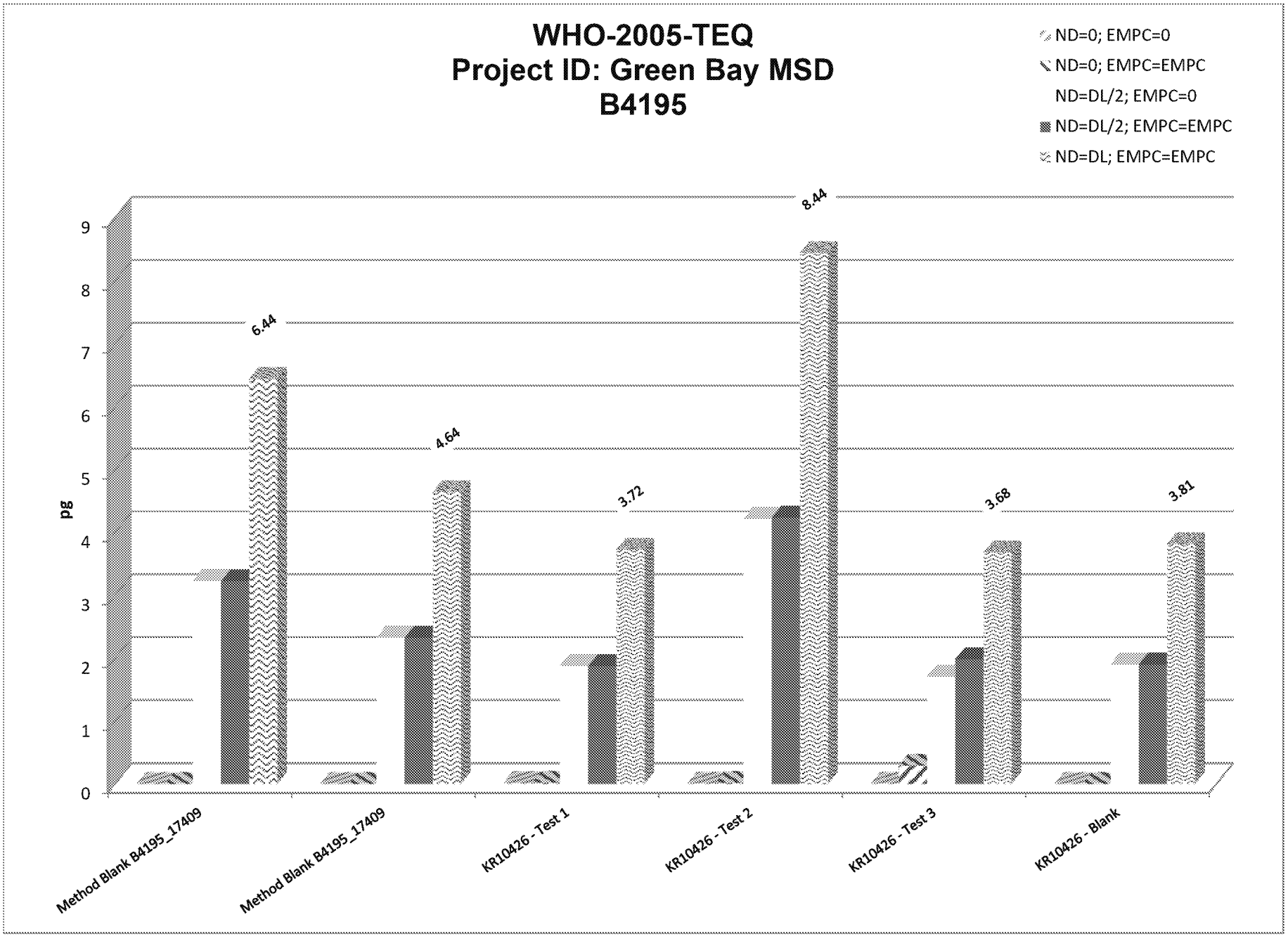
Sample Summary
Part 5 (DLs)

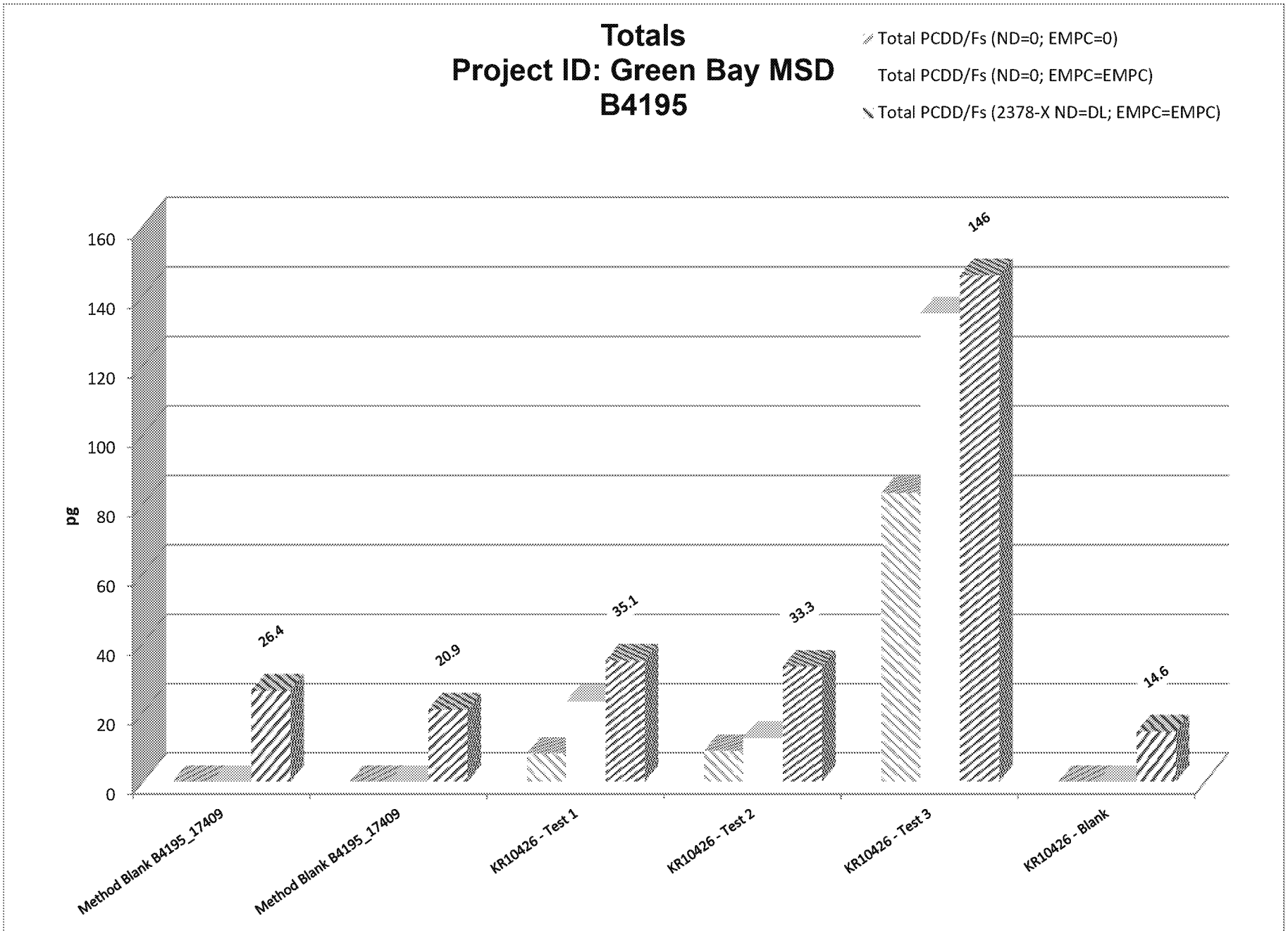
SGS

Method 23

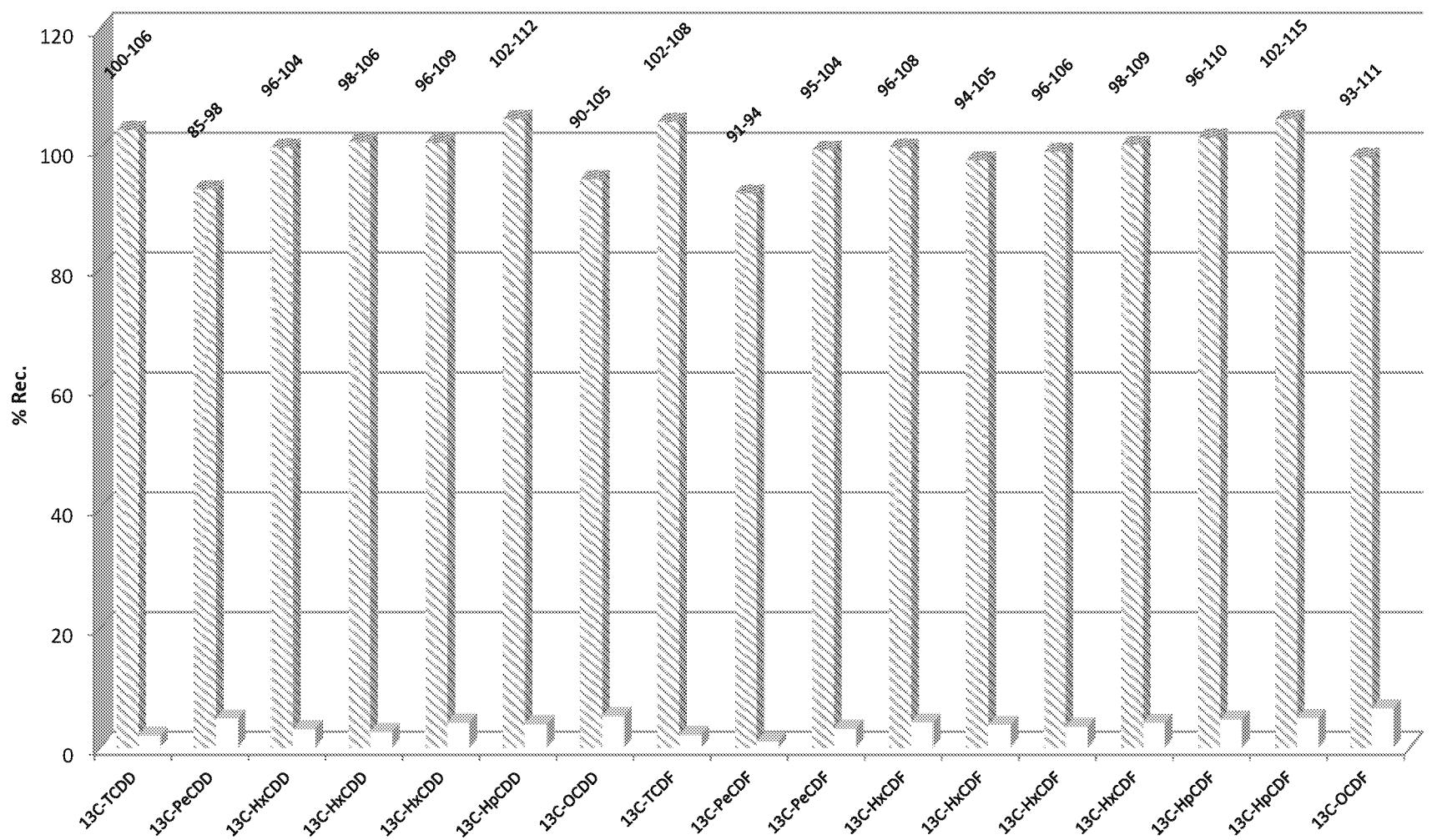
Analyte	Method Blank B4195_17409	Method Blank B4195_17409	KR10426 - Test 1	KR10426 - Test 2	KR10426 - Test 3	KR10426 - Blank
	pg	pg	pg	pg	pg	pg
2,3,7,8-TCDD	2.39	1.92	1.71	3.96	1.15	1.76
1,2,3,7,8-PeCDD	2.42	1.41	1.26	3.29	1.5	1.23
1,2,3,4,7,8-HxCDD	1.82	1.45	0.761	1.36	0.825	0.737
1,2,3,6,7,8-HxCDD	1.74	1.36	0.768	1.33	0.841	0.761
1,2,3,7,8,9-HxCDD	1.84	1.47	0.816	1.35	0.937	0.852
1,2,3,4,6,7,8-HpCDD	1.29	1.4	1.31	1.07	0.753	0.886
OCDD	1.95	1.55	1.16	1.27	0.981	1.08
2,3,7,8-TCDF	1.48	1.23	0.704	1.48	0.887	0.798
1,2,3,7,8-PeCDF	1.49	1.08	0.638	0.838	0.848	0.723
2,3,4,7,8-PeCDF	1.14	0.932	0.537	0.729	0.719	0.61
1,2,3,4,7,8-HxCDF	1.26	0.988	0.57	0.878	0.608	0.644
1,2,3,6,7,8-HxCDF	1.24	0.956	0.554	0.839	0.596	0.633
2,3,4,6,7,8-HxCDF	1.25	1.02	0.532	0.876	0.594	0.651
1,2,3,7,8,9-HxCDF	1.47	1.32	0.703	1.01	0.781	0.817
1,2,3,4,6,7,8-HpCDF	1.18	0.703	0.513	0.763	0.619	0.626
1,2,3,4,7,8,9-HpCDF	1.14	0.764	0.576	0.737	0.646	0.642
OCDF	1.32	1.35	1.08	1.15	0.839	1.15
Total TCDD	2.39	1.92	1.71	3.96	1.15	1.76
Total PeCDD	2.42	1.41	1.26	3.29	1.5	1.23
Total HxCDD	1.8	1.42	0.779	1.35	0.865	0.781
Total HpCDD	1.29	1.4	1.31	1.07	0.753	0.886
Total TCDF	1.48	1.23	0.704	1.48	0.887	0.798
Total PeCDF	1.3	1	0.584	0.781	0.78	0.663
Total HxCDF	1.3	1.06	0.585	0.896	0.638	0.68
Total HpCDF	1.16	0.732	0.543	0.751	0.632	0.634
Checkcode	805-848-SYH	795-954-BZK	898-065-CLY	467-737-VPT	833-955-BPS	006-881-ZCZ
Lab ID	MB1_17409_DF_SDS-CU	MB1_17409_DF_SDS	B4195_17409_DF_001	B4195_17409_DF_002-CU	B4195_17409_DF_003	B4195_17409_DF_004


ITEF-TEQ
Project ID: Green Bay MSD
B4195
ND=0; EMPC=0
ND=0; EMPC=EMPC
ND=DL/2; EMPC=0
ND=DL/2; EMPC=EMPC
ND=DL; EMPC=EMPC
pg
0
1
2
3
4
5
6
7
5.49
4.15
3.22
6.96
3.11
3.33
Method Blank B4195_17409
Method Blank B4195_17409
KR10426 - Test 1
KR10426 - Test 2
KR10426 - Test 3
KR10426 - Blank

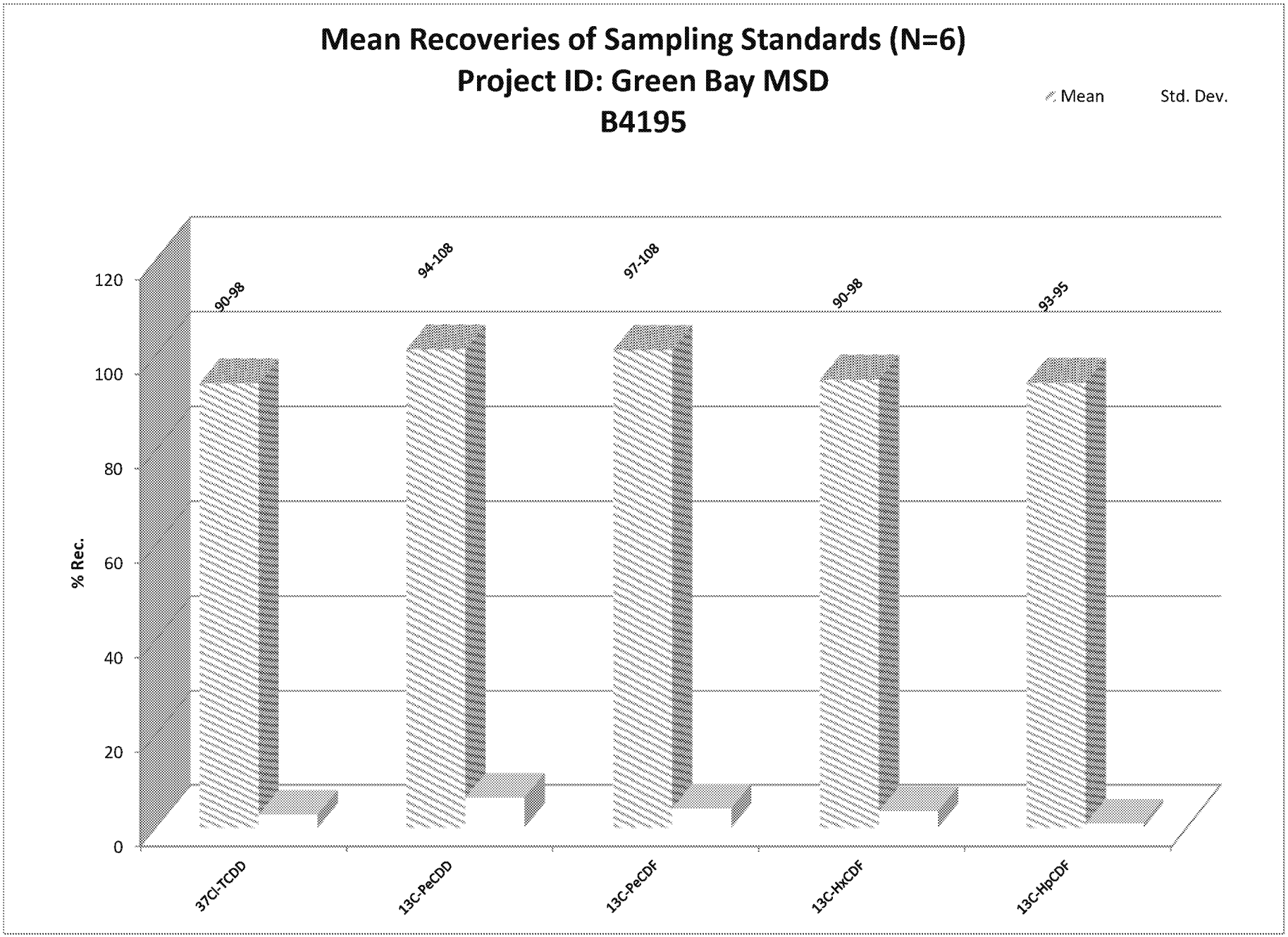

WHO-2005-TEQ
Project ID: Green Bay MSD
B4195
ND=0; EMPC=0
ND=0; EMPC=EMPC
ND=DL/2; EMPC=0
ND=DL/2; EMPC=EMPC
ND=DL; EMPC=EMPC
pg
0
1
2
3
4
5
6
7
8
9
6.44
4.64
3.72
8.44
3.68
3.81
Method Blank B4195_17409
Method Blank B4195_17409
KR10426 - Test 1
KR10426 - Test 2
KR10426 - Test 3
KR10426 - Blank


Totals
Project ID: Green Bay MSD
B4195
Total PCDD/Fs (ND=0; EMPC=0)
Total PCDD/Fs (ND=0; EMPC=EMPC)
Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)
pg
0
20
40
60
80
100
120
140
160
26.4
20.9
35.1
33.3
146
14.6
Method Blank B4195_17409
Method Blank B4195_17409
KR10426 - Test 1
KR10426 - Test 2
KR10426 - Test 3
KR10426 - Blank

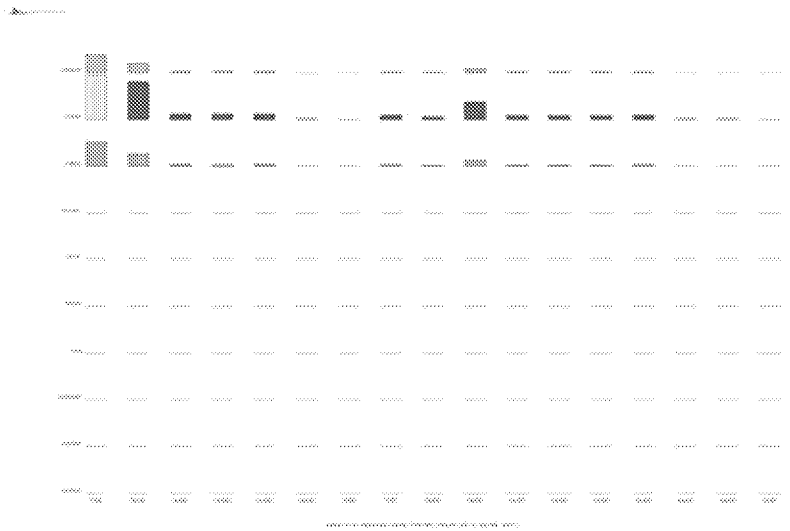
Mean Recoveries of Extraction Standards (N=6)
Project ID: Green Bay MSD
B4195

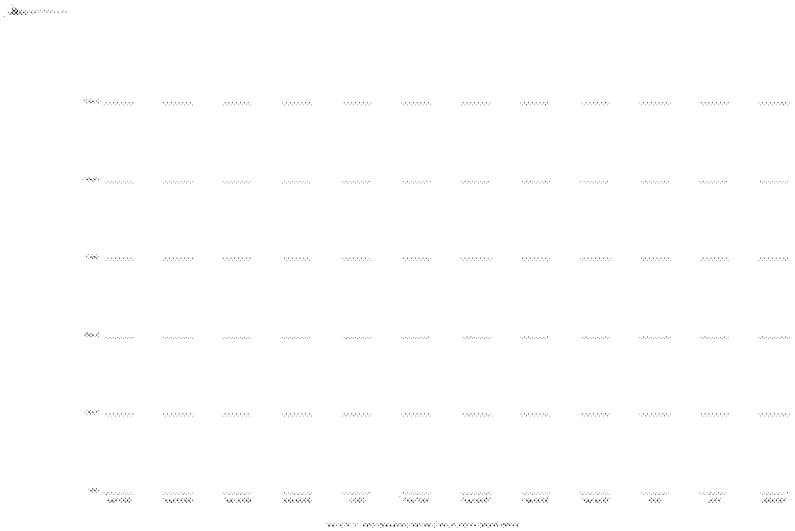


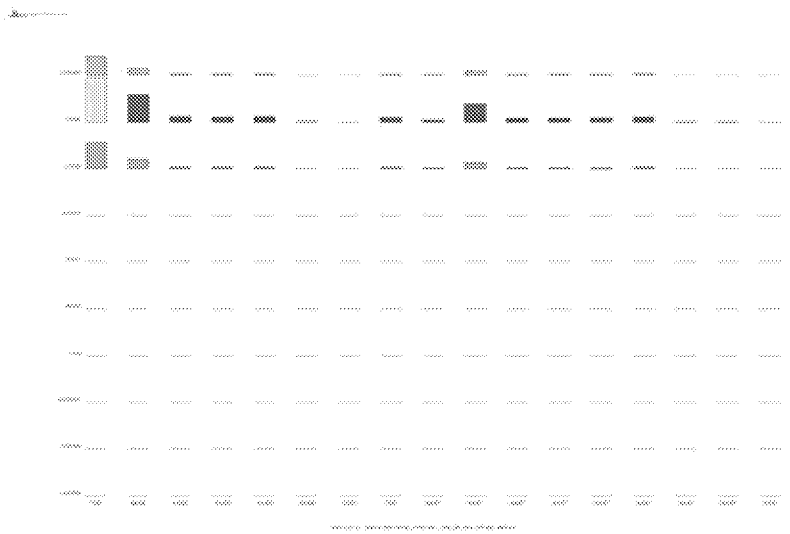
Method Specification Limits: Tetra-Hexa ES: 40-130%, Hepta-Octa ES: 25-130% (F = fail)

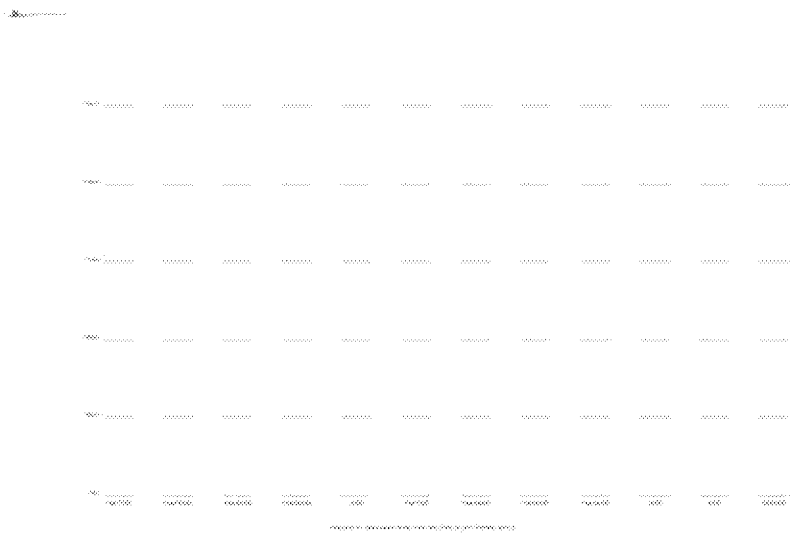


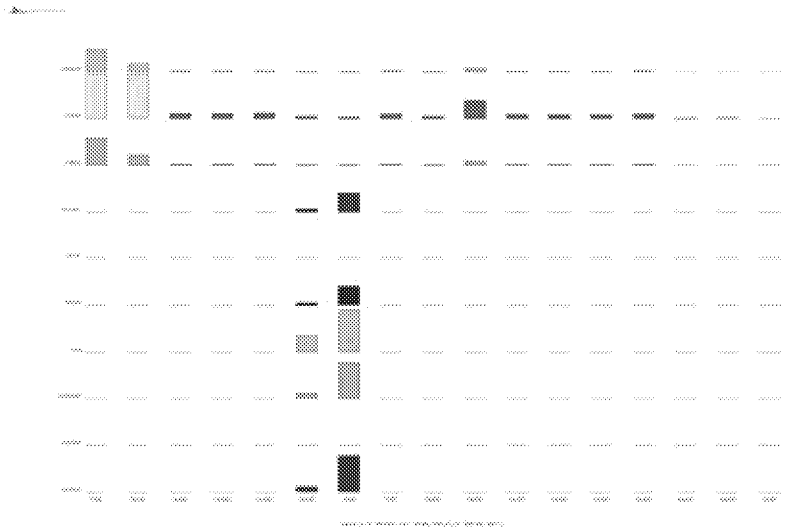
Method Specification Limits: Tetra-Octa SS: 70-130% (F = fail)

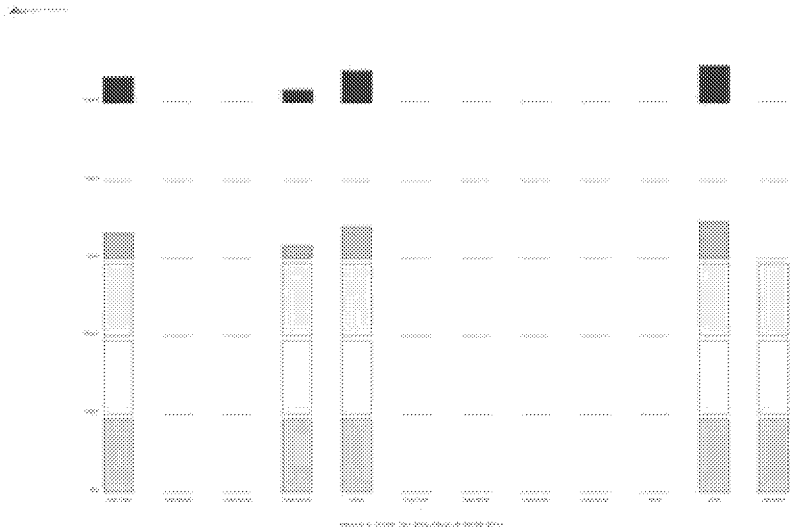


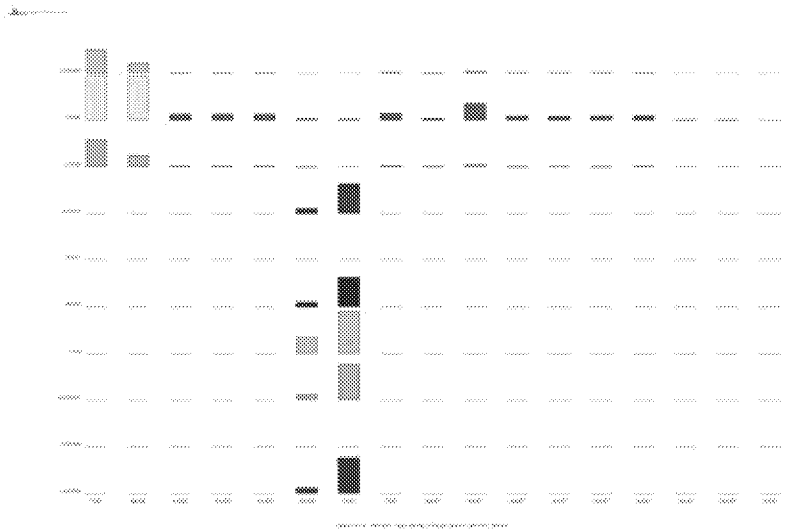


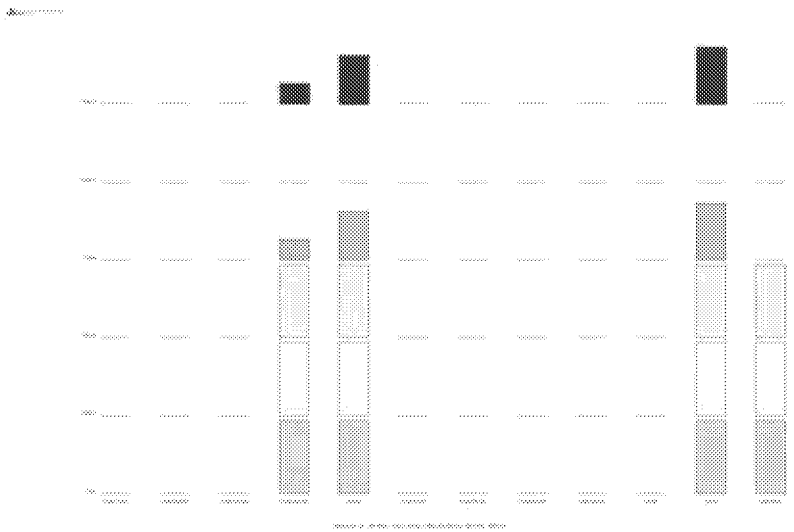


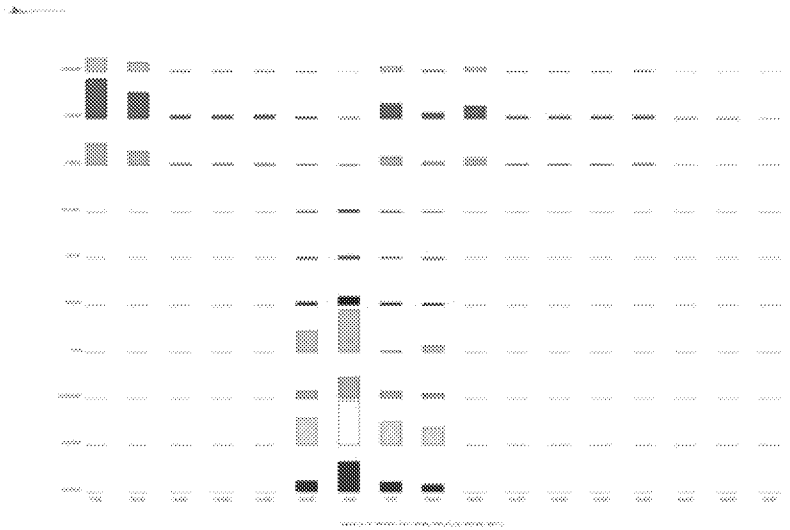


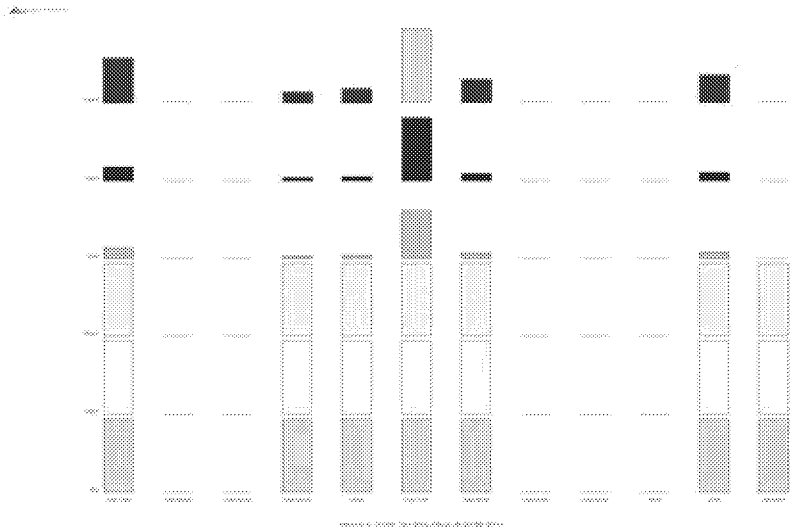


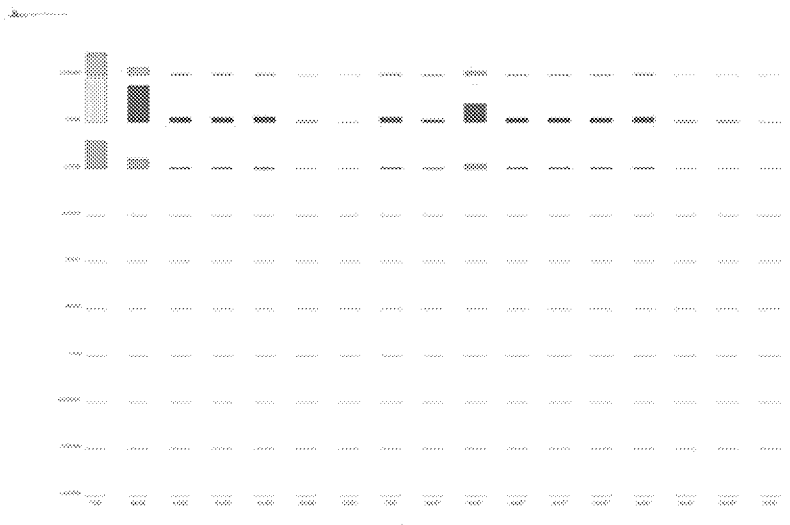












Sample ID: KR10426 - Test 1 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Advanced Industrial Resources, Inc.	Matrix:	Air	Lab Project ID:	B4195	Date Received:	25-Mar-2020
Project ID:	Green Bay MSD	Weight/Volume:	1	Lab Sample ID	B4195_17409_DF_001	Date Extracted:	26-Mar-2020
Date Collected:	19-Mar-2020			QC Batch No:	17409	Date Analyzed:	31-Mar-2020
		Split:	2	Dilution:	-	Time Analyzed:	15:52:57

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	1.71			ES 2378-TCDD	103	
12378-PeCDD	ND	1.26			ES 12378-PeCDD	98.1	
123478-HxCDD	ND	0.761			ES 123478-HxCDD	101	
123678-HxCDD	ND	0.768			ES 123678-HxCDD	99.9	
123789-HxCDD	ND	0.816			ES 123789-HxCDD	100	
1234678-HpCDD	1.65			J	ES 1234678-HpCDD	102	
OCDD	EMPC		10.6	J	ES OCDD	90.5	
2378-TCDF	ND	0.704			ES 2378-TCDF	103	
12378-PeCDF	ND	0.638			ES 12378-PeCDF	92.8	
23478-PeCDF	ND	0.537			ES 23478-PeCDF	104	
123478-HxCDF	ND	0.57			ES 123478-HxCDF	97.3	
123678-HxCDF	ND	0.554			ES 123678-HxCDF	95.7	
234678-HxCDF	ND	0.532			ES 234678-HxCDF	97.3	
123789-HxCDF	ND	0.703			ES 123789-HxCDF	100	
1234678-HpCDF	ND	0.513			ES 1234678-HpCDF	99.5	
1234789-HpCDF	ND	0.576			ES 1234789-HpCDF	103	
OCDF	ND	1.08			ES OCDF	94.6	
Totals					**Standard**	**SS/AS Recoveries**	
					SS 37Cl-2378-TCDD	95	
Total TCDD	6.48		8.51		SS 12347-PeCDD	102	
Total PeCDD	ND	1.26	ND		SS 12346-PeCDF	101	
Total HxCDD	ND	0.779	ND		SS 123469-HxCDF	95.1	
Total HpCDD	1.65		4.18		SS 1234689-HpCDF	95.4	
					AS 1368-TCDD	96.4	
Total TCDF	ND	0.704	ND		AS 1368-TCDF	99.2	
Total PeCDF	ND	0.584	ND				
Total HxCDF	ND	0.585	ND				
Total HpCDF	ND	0.543	ND				
Total PCDD/Fs	**8.13**		**23.3**				
ITEF TEQs							
TEQ: ND=0	0.0165		0.0272				
TEQ: ND=DL/2	1.61	1.6	1.62				
TEQ: ND=DL	3.21	3.21	3.22				

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Sample ID: KR10426 - Test 2 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Advanced Industrial Resources, Inc.	Matrix:	Air	Lab Project ID:	B4195	Date Received:	25-Mar-2020
Project ID:	Green Bay MSD	Weight/Volume:	1	Lab Sample ID	B4195_17409_DF_002-CU	Date Extracted:	26-Mar-2020
Date Collected:	19-Mar-2020			QC Batch No:	17409	Date Analyzed:	07-Apr-2020
		Split:	2	Dilution:	-	Time Analyzed:	13:59:24

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	3.96			ES 2378-TCDD	104	
12378-PeCDD	ND	3.29			ES 12378-PeCDD	84.6	
123478-HxCDD	ND	1.36			ES 123478-HxCDD	95.9	
123678-HxCDD	ND	1.33			ES 123678-HxCDD	98.2	
123789-HxCDD	ND	1.35			ES 123789-HxCDD	101	
1234678-HpCDD	EMPC		1.49	J	ES 1234678-HpCDD	106	
OCDD	8.9			J	ES OCDD	95.8	
2378-TCDF	ND	1.48			ES 2378-TCDF	108	
12378-PeCDF	ND	0.838			ES 12378-PeCDF	92.7	
23478-PeCDF	ND	0.729			ES 23478-PeCDF	95.3	
123478-HxCDF	ND	0.878			ES 123478-HxCDF	97.5	
123678-HxCDF	ND	0.839			ES 123678-HxCDF	96	
234678-HxCDF	ND	0.876			ES 234678-HxCDF	97.6	
123789-HxCDF	ND	1.01			ES 123789-HxCDF	99.7	
1234678-HpCDF	ND	0.763			ES 1234678-HpCDF	101	
1234789-HpCDF	ND	0.737			ES 1234789-HpCDF	104	
OCDF	ND	1.15			ES OCDF	101	
Totals					**Standard**	**SS/AS Recoveries**	
					SS 37Cl-2378-TCDD	92.5	
Total TCDD	ND	3.96	ND		SS 12347-PeCDD	94.1	
Total PeCDD	ND	3.29	ND		SS 12346-PeCDF	98.4	
Total HxCDD	ND	1.35	ND		SS 123469-HxCDF	93.3	
Total HpCDD	ND		3.77		SS 1234689-HpCDF	94	
					AS 1368-TCDD	97.6	
Total TCDF	ND	1.48	ND		AS 1368-TCDF	106	
Total PeCDF	ND	0.781	ND				
Total HxCDF	ND	0.896	ND				
Total HpCDF	ND	0.751	ND				
Total PCDD/Fs	**8.9**		**12.7**				
ITEF TEQs							
TEQ: ND=0	0.0089		0.0238				
TEQ: ND=DL/2	3.48	3.48	3.49				
TEQ: ND=DL	6.95	6.95	6.96				

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Sample ID: KR10426 - Test 3 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Advanced Industrial Resources, Inc.	Matrix:	Air	Lab Project ID:	B4195	Date Received:	25-Mar-2020
Project ID:	Green Bay MSD	Weight/Volume:	1	Lab Sample ID	B4195_17409_DF_003	Date Extracted:	26-Mar-2020
Date Collected:	19-Mar-2020			QC Batch No:	17409	Date Analyzed:	31-Mar-2020
		Split:	2	Dilution:	-	Time Analyzed:	17:28:04

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	1.15			ES 2378-TCDD	100	
12378-PeCDD	ND	1.5			ES 12378-PeCDD	93.9	
123478-HxCDD	ND	0.825			ES 123478-HxCDD	97.5	
123678-HxCDD	ND	0.841			ES 123678-HxCDD	100	
123789-HxCDD	ND	0.937			ES 123789-HxCDD	96.4	
1234678-HpCDD	EMPC		2.43	J	ES 1234678-HpCDD	102	
OCDD	6.51			J	ES OCDD	91.2	
2378-TCDF	EMPC		2.17	J	ES 2378-TCDF	104	
12378-PeCDF	EMPC		1.58	J	ES 12378-PeCDF	91.3	
23478-PeCDF	ND	0.719			ES 23478-PeCDF	101	
123478-HxCDF	ND	0.608			ES 123478-HxCDF	96.5	
123678-HxCDF	ND	0.596			ES 123678-HxCDF	94.5	
234678-HxCDF	ND	0.594			ES 234678-HxCDF	96.2	
123789-HxCDF	ND	0.781			ES 123789-HxCDF	97.7	
1234678-HpCDF	ND	0.619			ES 1234678-HpCDF	95.8	
1234789-HpCDF	ND	0.646			ES 1234789-HpCDF	102	
OCDF	ND	0.839			ES OCDF	93.3	
Totals					**Standard**	**SS/AS Recoveries**	
					SS 37Cl-2378-TCDD	90.1	
Total TCDD	11.2		20.4		SS 12347-PeCDD	95.2	
Total PeCDD	ND	1.5	ND		SS 12346-PeCDF	97.3	
Total HxCDD	ND	0.865	ND		SS 123469-HxCDF	89.7	
Total HpCDD	ND		4.95		SS 1234689-HpCDF	93	
					AS 1368-TCDD	97.5	
Total TCDF	60.3		92.5		AS 1368-TCDF	98.3	
Total PeCDF	5.21		10.7				
Total HxCDF	ND	0.638	ND				
Total HpCDF	ND	0.632	ND				
Total PCDD/Fs	**83.3**		**135**				
ITEF TEQs							
TEQ: ND=0	0.00651		0.326				
TEQ: ND=DL/2	1.4	1.46	1.72				
TEQ: ND=DL	2.79	2.93	3.11				

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Sample ID: KR10426 - Blank

Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Advanced Industrial Resources, Inc.	Matrix:	Air	Lab Project ID:	B4195	Date Received:	25-Mar-2020
Project ID:	Green Bay MSD	Weight/Volume:	1	Lab Sample ID	B4195_17409_DF_004	Date Extracted:	26-Mar-2020
Date Collected:	19-Mar-2020			QC Batch No:	17409	Date Analyzed:	31-Mar-2020
		Split:	2	Dilution:	-	Time Analyzed:	18:15:37

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	1.76			ES 2378-TCDD	106	
12378-PeCDD	ND	1.23			ES 12378-PeCDD	97.3	
123478-HxCDD	ND	0.737			ES 123478-HxCDD	100	
123678-HxCDD	ND	0.761			ES 123678-HxCDD	101	
123789-HxCDD	ND	0.852			ES 123789-HxCDD	101	
1234678-HpCDD	ND	0.886			ES 1234678-HpCDD	106	
OCDD	ND	1.08			ES OCDD	94.6	
2378-TCDF	ND	0.798			ES 2378-TCDF	106	
12378-PeCDF	ND	0.723			ES 12378-PeCDF	94.1	
23478-PeCDF	ND	0.61			ES 23478-PeCDF	102	
123478-HxCDF	ND	0.644			ES 123478-HxCDF	101	
123678-HxCDF	ND	0.633			ES 123678-HxCDF	97.7	
234678-HxCDF	ND	0.651			ES 234678-HxCDF	100	
123789-HxCDF	ND	0.817			ES 123789-HxCDF	100	
1234678-HpCDF	ND	0.626			ES 1234678-HpCDF	102	
1234789-HpCDF	ND	0.642			ES 1234789-HpCDF	102	
OCDF	ND	1.15			ES OCDF	96.6	
Totals					**Standard**	**SS/AS Recoveries**	
					SS 37Cl-2378-TCDD	n/a	
Total TCDD	ND	1.76	ND		SS 12347-PeCDD	n/a	
Total PeCDD	ND	1.23	ND		SS 12346-PeCDF	n/a	
Total HxCDD	ND	0.781	ND		SS 123469-HxCDF	n/a	
Total HpCDD	ND	0.886	ND		SS 1234689-HpCDF	n/a	
					AS 1368-TCDD	99.3	
Total TCDF	ND	0.798	ND		AS 1368-TCDF	99	
Total PeCDF	ND	0.663	ND				
Total HxCDF	ND	0.68	ND				
Total HpCDF	ND	0.634	ND				
Total PCDD/Fs	**ND**		**ND**				
ITEF TEQs							
TEQ: ND=0	0		0				
TEQ: ND=DL/2	1.66	1.66	1.66				
TEQ: ND=DL	3.33	3.33	3.33				

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Sample ID: Method Blank B4195_17409 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Advanced Industrial Resources, Inc.	Matrix:	Air	Lab Project ID:	B4195	Date Received:	n/a
Project ID:	Green Bay MSD	Weight/Volume:	1	Lab Sample ID	MB1_17409_DF_SDS	Date Extracted:	26-Mar-2020
Date Collected:	n/a			QC Batch No:	17409	Date Analyzed:	31-Mar-2020
		Split:	2	Dilution:	-	Time Analyzed:	15:05:31

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	1.92			ES 2378-TCDD	104	
12378-PeCDD	ND	1.41			ES 12378-PeCDD	94.4	
123478-HxCDD	ND	1.45			ES 123478-HxCDD	103	
123678-HxCDD	ND	1.36			ES 123678-HxCDD	102	
123789-HxCDD	ND	1.47			ES 123789-HxCDD	99	
1234678-HpCDD	ND	1.4			ES 1234678-HpCDD	102	
OCDD	ND	1.55			ES OCDD	92.6	
2378-TCDF	ND	1.23			ES 2378-TCDF	104	
12378-PeCDF	ND	1.08			ES 12378-PeCDF	91.3	
23478-PeCDF	ND	0.932			ES 23478-PeCDF	100	
123478-HxCDF	ND	0.988			ES 123478-HxCDF	101	
123678-HxCDF	ND	0.956			ES 123678-HxCDF	99.6	
234678-HxCDF	ND	1.02			ES 234678-HxCDF	100	
123789-HxCDF	ND	1.32			ES 123789-HxCDF	97.9	
1234678-HpCDF	ND	0.703			ES 1234678-HpCDF	103	
1234789-HpCDF	ND	0.764			ES 1234789-HpCDF	104	
OCDF	ND	1.35			ES OCDF	95.6	
Totals					**Standard**	**SS/AS Recoveries**	
					SS 37Cl-2378-TCDD	97.5	
Total TCDD	ND	1.92	ND		SS 12347-PeCDD	108	
Total PeCDD	ND	1.41	ND		SS 12346-PeCDF	108	
Total HxCDD	ND	1.42	ND		SS 123469-HxCDF	98	
Total HpCDD	ND	1.4	ND		SS 1234689-HpCDF	94.8	
					AS 1368-TCDD	104	
Total TCDF	ND	1.23	ND		AS 1368-TCDF	106	
Total PeCDF	ND	1	ND				
Total HxCDF	ND	1.06	ND				
Total HpCDF	ND	0.732	ND				
Total PCDD/Fs	**ND**		**ND**				
ITEF TEQs							
TEQ: ND=0	0		0				
TEQ: ND=DL/2	2.08	2.08	2.08				
TEQ: ND=DL	4.15	4.15	4.15				

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Sample ID: Method Blank B4195_17409 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Advanced Industrial Resources, Inc.	Matrix:	Air	Lab Project ID:	B4195	Date Received:	n/a
Project ID:	Green Bay MSD	Weight/Volume:	1	Lab Sample ID	MB1_17409_DF_SDS-CU	Date Extracted:	26-Mar-2020
Date Collected:	n/a			QC Batch No:	17409	Date Analyzed:	07-Apr-2020
		Split:	2	Dilution:	-	Time Analyzed:	13:11:50

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	2.39			ES 2378-TCDD	102	
12378-PeCDD	ND	2.42			ES 12378-PeCDD	91.3	
123478-HxCDD	ND	1.82			ES 123478-HxCDD	104	
123678-HxCDD	ND	1.74			ES 123678-HxCDD	106	
123789-HxCDD	ND	1.84			ES 123789-HxCDD	109	
1234678-HpCDD	ND	1.29			ES 1234678-HpCDD	112	
OCDD	ND	1.95			ES OCDD	105	
2378-TCDF	ND	1.48			ES 2378-TCDF	102	
12378-PeCDF	ND	1.49			ES 12378-PeCDF	93	
23478-PeCDF	ND	1.14			ES 23478-PeCDF	97	
123478-HxCDF	ND	1.26			ES 123478-HxCDF	108	
123678-HxCDF	ND	1.24			ES 123678-HxCDF	105	
234678-HxCDF	ND	1.25			ES 234678-HxCDF	106	
123789-HxCDF	ND	1.47			ES 123789-HxCDF	109	
1234678-HpCDF	ND	1.18			ES 1234678-HpCDF	110	
1234789-HpCDF	ND	1.14			ES 1234789-HpCDF	115	
OCDF	ND	1.32			ES OCDF	111	
Totals					**Standard**	**SS/AS Recoveries**	
					SS 37Cl-2378-TCDD	95.4	
Total TCDD	ND	2.39	ND		SS 12347-PeCDD	107	
Total PeCDD	ND	2.42	ND		SS 12346-PeCDF	101	
Total HxCDD	ND	1.8	ND		SS 123469-HxCDF	98.3	
Total HpCDD	ND	1.29	ND		SS 1234689-HpCDF	93.9	
					AS 1368-TCDD	101	
Total TCDF	ND	1.48	ND		AS 1368-TCDF	103	
Total PeCDF	ND	1.3	ND				
Total HxCDF	ND	1.3	ND				
Total HpCDF	ND	1.16	ND				
Total PCDD/Fs	**ND**		**ND**				
ITEF TEQs							
TEQ: ND=0	0		0				
TEQ: ND=DL/2	2.75	2.75	2.75				
TEQ: ND=DL	5.49	5.49	5.49				

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Wilmington, NC 28405, USA
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Tel: +1 910 794-1613; Toll-Free 866 846-8290

Sample Receipt Notification

5500 Business Drive
Wilmington, NC 28405 USA
Tel: 910 794-1613
Toll Free: 866 846-8290
Fax: 910 794-3919

Project Manager:	*Amy Boehm*
Receipt Date & Time:	*25-Mar-20 at 10:04*
AP Project name:	*B4195*
Requested TAT:	*10 business days*
Projected due date:	*8-Apr-20*
Matrix:	*Air - M23*
Phone#:	*910-794-1613*
Email Address:	*Amy.Boehm@sgs.com*

Company Contact:	*Derek Stephens*
Company:	*Advanced Industrial Resources, Inc.*
Project Name & Site:	*Green Bay MSD*
Project PO#:	*KR-10426*
QAAP/Contract #:	*n/a*
Requested Analysis:	*Method 23*
Phone#:	*800-224-5007*
Email Address:	*dstephens@airtest1.com*

Received Temps (°C)

Client Smp ID	AP Smp ID	Components	Sampling Date	Sampling Time	XAD	Solvent Rinse(s)	Container #	Shipping #
KR10426 - Test 1	B4195_001	Filter #1, T3597-002, Rinse, Rinse	19-Mar-20	00:00	12.3	12.3	1	1z 63A 1W5 01 9207 3633
KR10426 - Test 2	B4195_002	Filter #1, T3597-001, Rinse, Rinse	19-Mar-20	00:00	12.3	12.3	1	1z 63A 1W5 01 9207 3633
KR10426 - Test 3	B4195_003	Filter #1, T3597-004, Rinse, Rinse	19-Mar-20	00:00	12.3	12.3	1	1z 63A 1W5 01 9207 3633
KR10426 - Blank	B4195_004	Acetone, MeCL2, Toluene	19-Mar-20	00:00	12.3	12.3	1	1z 63A 1W5 01 9207 3633

Sample Seals Intact: No **Sample(s) Condition:** Intact

Notes/Comments:

Sample 001: Petri Dish received broken, placed in ziplock bag.

Any un-extracted sample will be stored for 90 days from reporting date.
Additional storage fees may apply for any samples stored longer than 90 days.

Received by: Ashley Owens *Logged in by:* Ashley Owens *QC'ed by:* AK 25 Mar 20

All services are rendered in accordance with the applicable SGS General Conditions of Service accessible via: http://www.sgs.com/terms_and_conditions.htm

Advanced Industrial Resources, Inc.
Compliance Sample Custody Record

B4195

Client: Green Bay MSD
Green Bay, WI

Sample ID		Date	Source	Description	Matrix	Analysis Desired: Method 23				Sample Condition	Comments
KR10426	71	3/19/2020	Stack Exhaust	Test 1 Container No. 1	M5	x					
KR10426	72	3/19/2020	Stack Exhaust	Test 1 Container No. 2	M5	x					
KR10426	73	3/19/2020	Stack Exhaust	Test 1 Container No. 3	M5	x					
KR10426	74	3/19/2020	Stack Exhaust	Test 1 XAD	M5	x					T3593-002
KR10426	75	3/19/2020	Stack Exhaust	Test 2 Container No. 1	M5	x					
KR10426	76	3/19/2020	Stack Exhaust	Test 2 Container No. 2	M5	x					
KR10426	77	3/19/2020	Stack Exhaust	Test 2 Container No. 3	M5	x					
KR10426	78	3/19/2020	Stack Exhaust	Test 2 XAD	M5	x					T3593-001
KR10426	79	3/19/2020	Stack Exhaust	Test 3 Container No. 1	M5	x					
KR10426	80	3/19/2020	Stack Exhaust	Test 3 Container No. 2	M5	x					
KR10426	81	3/19/2020	Stack Exhaust	Test 3 Container No. 3	M5	x					
KR10426	82	3/19/2020	Stack Exhaust	Test 3 XAD	M5	x					T3593-004
KR10426	83	3/19/2020	Stack Exhaust	Acetone Blank	M5	x					
KR10426	84	3/19/2020	Stack Exhaust	Methylene Chloride Blank	M5	x					
KR10426	85	3/19/2020	Stack Exhaust	Toluene Blank	M5	x					

Relinquished By/Sign:	Date/Time	Received By / Sign:	Relinquished By / Sign:	Date/Time	Received By / Sign:
Will Bayger	3/4/20 15:00				
Relinquished By/Sign:	**Date/Time**	**Received By / Sign:**	**Relinquished By / Sign:**	**Date/Time**	**Received By / Sign:**
	3/25/2020 10:04	[illegible]			

Field Team Members: DJK JL JG

AIR Field Supervisor: Dan Kirk

Field Supervisor Sign: Will Bayger for Dan Kirk

AIR Contact Name: Derek Stephens

AIR Contact Number: (404) 843-2100

Analyses To Be Performed By:
SGS
5500 Business Dr
Wilmington, NC 284058446
910-794-1613

Type & Quantity of Sampling Modules

Qty. XAD Traps:	4
Resin Batch No.:	51980
Qty. PUF:	NA
PUF Batch No.:	NA
Filter Size:	82.6mm
Qty. Filter:	6
Filter Batch #:	6835952
Qty. Petri Dishes:	4
# of BCS3 & MB:	1

Client Specific Instructions

rental traps

Other Requirements

Spike Profile

Vol. PCDD/F : 40µL

Solution ID: D/F CS/55 Amount: 1.6-4 ng

Vial ID: 23-182-1 Expiration: 5-22

SGS

Sampling Module Request Form

Trap Order #: T3597

Following sample recovery, please return this form with the field samples to:

5500 Business Dr.
Wilmington, NC 28405
Ph.:910-794-1613
Fax.: 910-794-3919

Please be aware of your trap batch #
QC begins when we prep your traps.
The Method Blanks and BCS_3 are prepared simultaneously with the trap and are properly stored until the trap batch returns for analysis.

We recommend keeping trap batches together and if a set of traps is to be split into multiple projects, please let us know so we can prepare extra Method Blanks/BCS_3

Spike By: 3/12-2020

Witness: 3/12/2020

Client Information

Company:	Advanced Industrial Resources, Inc.
Contact:	Derek Stephens
Email:	dstephens@airtest1.com
Phone:	800-224-5007
Project Name:	Green Bay MSD
PO#:	KR-10425
Order Date:	10-Mar-20
Arrival Date:	13-Mar-20

Ship To: Advanced Industrial Resources, Inc.
Derek Stephens
3407 Novis Pointe
Acworth, GA 30101
USA
dstephens@airtest1.com
800-224-5007

All PROJECTS ARE SHIPPED PRIORITY OVERNIGHT VIA FEDEX

Analyses

Rec'd 3 used = B4195

PCDD/F AO

3/25/2020

Additional Information

AP Rental Traps Qty.:	4
Air Bill #:	1327 1734 2607
# Containers:	1
Ship Date:	3/12/2020

Ref:
Dep:

Date: 12Mar20
Wgt: 12.25 LBS
DV:

Svc: PRIORITY OVERNIGHT
TRK: 1327 1734 2607

SHIPPING: 28.41
SPECIAL: 1.78
HANDLING: 0.00
TOTAL: 0.00 30.19

All services are rendered in accordance with the applicable SGS General Conditions of Service accessible via: http://www.sgs.com/terms_and_conditions.htm

METHOD 26A LAB REPORT

Advanced Industrial Resources, Inc.

3407 Novis Pointe
Acworth, GA 30101

Project ID: Green Bay MSD

Hydrogen Chloride

EPA Method 26A

Analytical Report
34539

el1

Element One, Inc.
6319-D Carolina Beach Rd., Wilmington, NC 28412
910-793-0128 FAX: 910-792-6853 e1lab@e1lab.com

The following data for Analytical Report 34539
has been reviewed for completeness, accuracy,
adherence to method protocol,
and compliance with quality assurance guidelines.

Review by:

Linda Ann Webb

Linda Ann Webb, M.S. Chemist
March 31, 2020

Report Reviewed and Finalized By:

Ken Smith, Laboratory Director
March 31, 2020

ED_012958_00010534-00107

SUMMARY OF RESULTS

ED_012958_00010534-00108

Summary of Analysis

Summary of Method 26A Analysis

Element	Power Boiler 2 M26A-R1 e34539-8 Total mg	Power Boiler 2 M26A-R2 e34539-9 Total mg	Power Boiler 2 M26A-R3 e34539-10 Total mg
HCl	< 0.063	< 0.063	< 0.067

Element	0.1N H_2SO_4 Reagent Blank e34539-1 H_2SO_4 Total mg
HCl	< 0.049

ED_012958_00010534-00109

ANALYTICAL NARRATIVE

ED_012958_00010534-00110

Element One Analytical Narrative

Client:	Advanced Industrial Resources, Inc.	Element One #:	34539
Client ID:	Green Bay MSD, Atlanta, GA	Analyst:	LAW
Method:	M26A	Dates Received:	03.25.20
Analytes:	HCl	Dates Analyzed:	03.30.20

Summary of Analysis

The samples were prepared and analyzed according to Method 26A protocol. The samples were analyzed for chloride on a Metrohm 881/858 ion chromatograph system.

Detection Limits

The Metrohm reporting limit was 0.1 µg/mL for chloride.

Analysis QA/QC

Duplicate analyses relative percent difference (RPD) and spike sample recovery data are summarized in the Quality Control section. All QA/QC data was within the criteria of the method.

Additional Comments

The reported results have not been corrected for any blank values or spike recovery values. The reported results relate only to the items tested or calibrated.

ED_012958_00010534-00111

QUALITY CONTROL SUMMARY

ED_012958_00010534-00112

Summary of Quality Control Data

Summary of Method 26A Duplicate Analysis RPD

(Method 26A QC limits: < 5% for RPD)

Element	Power Boiler 2 M26A-R1 RPD	Power Boiler 2 M26A-R2 RPD	Power Boiler 2 M26A-R3 RPD
HCl	NA	NA	NA

Element	0.1N H_2SO_4 Reagent Blank RPD
HCl	NA

Summary of Method 26A Spike Recoveries

(Method 26A QC limits: 90-110% for Spike Recoveries)

Element	Power Boiler 2 M26A-R3 Recovery
HCl	98%

ED_012958_00010534-00113

SAMPLE CUSTODY

ED_012958_00010534-00114

Advanced Industrial Resources, Inc.
Compliance Sample Custody Record

34539

Client: Green Bay MSD
Atlanta GA

Sample ID		Date	Source	Description	Matrix	Method 26A	Sample Condition	Comments
KR10426	25	3/18/2020	Incinerator 1	Test 1 impinger contents & rinse	ms	X		
KR10426	26	3/18/2020	Incinerator 1	Test 2 impinger contents & rinse	ms	X		
KR10426	27	3/18/2020	Incinerator 1	Test 3 impinger contents & rinse	ms	X		
KR10426	28	3/18/2020	Incinerator 1	0.1 N H2SO4 Blank	ms	X		

Relinquished By/Sign:	Date/Time	Received By / Sign:	Relinquished By / Sign:	Date/Time	Received By / Sign:
[illegible]	3/24/20 1330			3-25-20 1157	[illegible]

Field Team Members: DK CIS JL AS SS

AIR Field Supervisor: Dan Kirk
Field Supervisor Sign: [illegible] for Dan Kirk
AIR Contact Name: Derek Stephens
AIR Contact Number: (404) 847-2100

Analyses To Be Performed By:
Element One
~~[illegible]~~ 6319 Carolina Beach Rd
Wilmington, NC 28412
910-793-0128

Samples received in good condition. No empty containers.

elementOne
34530 AIR M26A Report Packet
Page 10 of 17

ANALYTICAL DATA

ED_012958_00010534-00116

Analytical Calculations

HCl-

Total HX (mg) = [X Results (µg/mL)*Dilution*Beginning Volume (mL)/1000]*Correction Factor

Where-

X Results= Raw sample concentration (ppm) — *IC Data Sheets*

Dilution= $\frac{\text{Diluted Volume}}{\text{Aliquot}}$—*IC Run Sheet*

Beginning Volume--*Sample Submission*

1.028= Correction factor for hydrogen chloride

Analytical Calculations

Spike Recovery-

$$\text{Spike (\%)} = \frac{\text{(Spiked Result (µg/mL) – Sample Result (µg/mL))}}{\text{Spike Amount (µg/mL)}} \times 100$$

Where-

Spike Result = Raw sample concentration (ppm)--*IC-Data Sheet*

Sample Result = Raw sample concentration (ppm)--*IC-Data Sheet*

Spike Amount—*IC Data Sheet*

Duplicate Analysis RPD-

$$\text{RPD (\%)} = \frac{\text{(Duplicate Result (µg/mL) - Sample Result (µg/mL))}}{\text{Average (µg/mL)}} \times 100$$

Where-

Sample Result and Duplicate Results=Raw sample concentration (ppm)--*IC-Data Sheet*

Average= $\frac{\text{(Duplicate + Sample Results)}}{2}$

elementOne **AIR TESTING SAMPLE SUBMISSION FORM** **Lab ID 34539**

Analysis Due Date 04.02.20
QA/QC/Report Due Date 04.06.20

Client	Advanced Industrial Resources, Inc.
Project ID	Green Bay MSD

Date Received	03.25.20
Time Received	1145

Volume Marked	Volume Loss	FH pH < 2	BH pH > 8	Ref. Method:
Y N	Y N ?	Y N	Y N	26 / 26A

Sample Identification

8	Power Boiler 2-M26A-R1	11	Reagent Blank		
9	Power Boiler 2-M26A-R2				
10	Power Boiler 2-M26A-R3				
	Power Boiler 2-M26A-R3 Spike				

Analyses Requested: Samples 8-11 HCl

Runs/FB

	Impinger 1,2, & 3 (.1) & BT						Impinger 4 & 5 (.2)			
	FH Impinger 1 (or Combined Imp)		FH Impinger 2		FH Impinger 3		BH Impinger 4 (or Combined Imp)		BH Impinger 5	
Lab ID	BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml
8	305									
9	305									
10.S	325									

Reagent Blanks

Lab ID	Fractions	BV, ml	FV, ml	NOTES
11	0.1 N H_2SO_4	250		
	0.1 N NaOH			
	DI H_2O			

Lab Notes / Communications

Fractions Received: Runs/RB: H2SO4---03.25.20 LLB

SS Page 3 of 3
SS by [illegible]
3/26/2020 2:07:24 PM

Imp 1, 2, &3 Prep By / Date 03.30.20 [illegible]
Imp 4 & 5 Prep By / Date
Labeled By/Date [illegible] 3.26.20
ID Verification By/Date [illegible] 3/26/20

BV & pH - [illegible] 3/26/20

Metrohm 881/858 Ion Chromatograph System

elementOne **M26A-HCl IC Data Sheet** **Lab ID #: 34539**

Client: AIR
Date: 03.31.20
Analyst: LAW
Detection Limit, (µg/ml): 0.10

Column: Metrosep A Supp 5
Eluent: 6.4 mM Na_2CO_3/ 2.0 mM $NaHCO_3$
Flow Rate: 0.7mL/min.
Cl^- to HCl factor: 1.028

Sample ID	Cl^- µg/ml	Dilution	Final Vol, ml	HCl, Total mg	Spike, µg/ml	% RPD/ Recovery	File Name	Date Time
LRB	-0.025	1	10	< 0.001			-1373242b:1712b6269c9:-7cb0	3/30/2020 12:24
LRB	-0.021	1	10	< 0.001		NA	-1373242b:1712b6269c9:-7cae	3/30/2020 12:38
LRB SPK	4.841	1	10	0.050	5.00	97%	-1373242b:1712b6269c9:-7cac	3/30/2020 12:53
LRB SPK	4.777	1	10	0.049	5.00	96%	-1373242b:1712b6269c9:-7caa	3/30/2020 13:07
34539-8	0.011	2	305	< 0.063			-1373242b:1712b6269c9:-7ca8	3/30/2020 13:22
34539-8 DUP	0.018	2	305	< 0.063		NA	-1373242b:1712b6269c9:-7ca6	3/30/2020 13:36
34539-9	0.002	2	305	< 0.063			-1373242b:1712b6269c9:-7bc1	3/30/2020 13:51
34539-9 DUP	0.021	2	305	< 0.063		NA	-1373242b:1712b6269c9:-7bcf	3/30/2020 14:05
34539-10	0.003	2	325	< 0.067			-1373242b:1712b6269c9:-7bc5	3/30/2020 15:18
34539-10 DUP	0.003	2	325	< 0.067		NA	-1373242b:1712b6269c9:-7bc3	3/30/2020 15:32
34539-10 SPK	4.739	2	325	3.17	5.00	95%	-1373242b:1712b6269c9:-7bc1	3/30/2020 15:47
34539-10 SPK DUP	5.046	2	325	3.37	5.00	101%	-1373242b:1712b6269c9:-7bcf	3/30/2020 16:01
34539-11 RB	0.000	2	240	< 0.049			-1373242b:1712b6269c9:-7aa8	3/30/2020 16:16
34539-11 RB DUP	0.000	2	240	< 0.049		NA	-1373242b:1712b6269c9:-7aa6	3/30/2020 16:30

Standards	Cl^- µg/ml	Dilution	QC, µg/ml	% Recovery	File Name	Date Time
0	0.000				-1373242b:1712b6269c9:-7ab4	3/30/2020 9:30
0.1	0.099				-1373242b:1712b6269c9:-7ab2	3/30/2020 9:44
1	1.027				-1373242b:1712b6269c9:-7ab0	3/30/2020 9:59
3	2.953				-1373242b:1712b6269c9:-7aae	3/30/2020 10:13
5	4.978				-1373242b:1712b6269c9:-7aac	3/30/2020 10:28
10	10.045				-1373242b:1712b6269c9:-7aaa	3/30/2020 10:42
0.1	0.108				-1373242b:1712b6269c9:-7a9c	3/30/2020 17:43
1	1.075				-1373242b:1712b6269c9:-7a9a	3/30/2020 17:57
3	2.985				-1373242b:1712b6269c9:-7a98	3/30/2020 18:12
5	4.988				-1373242b:1712b6269c9:-7a96	3/30/2020 18:26
10	10.085				-1373242b:1712b6269c9:-7a94	3/30/2020 18:41
Correlation-	0.999356					
QC	4.873		5.00	97%	-1373242b:1712b6269c9:-7cbc	3/30/2020 10:57
QC	4.710		5.00	94%	-1373242b:1712b6269c9:-7cba	3/30/2020 11:11
QC	4.994		5.00	100%	-1373242b:1712b6269c9:-7cbd	3/30/2020 14:20
QC	4.967		5.00	99%	-1373242b:1712b6269c9:-7cbb	3/30/2020 14:34
QC	4.899		5.00	98%	-1373242b:1712b6269c9:-7aa0	3/30/2020 17:14
QC	4.941		5.00	99%	-1373242b:1712b6269c9:-7a92	3/30/2020 18:55
DL	0.103		0.10	103%	-1373242b:1712b6269c9:-7cb4	3/30/2020 11:55
DL	0.109		0.10	109%	-1373242b:1712b6269c9:-7cb2	3/30/2020 12:09
DL	0.110		0.10	110%	-1373242b:1712b6269c9:-7a90	3/30/2020 19:09
32799-11 QC	6.678	1	6.70	103%	-1373242b:1712b6269c9:-7aa4	3/30/2020 16:45
32799-11 QC DUP	6.684	1	6.70	103%	-1373242b:1712b6269c9:-7aa2	3/30/2020 16:59

HCl-Data 1 of 1

elementOne
e 34539-HCl

elementOne **IC Sample Sheet/Digestion Worksheet** **Lab ID #:** 34539

Date: 03-30-20
Analyst: LAW
Batch name: 03-30-20-35139

Column: Metrosep A Supp 5
Eluent: 6.4 mM Na_2CO_3/ 2.0mM $NaHCO_3$
Flow Rate: .7 mL/min.

Instrument: 881/858
Method: 26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
1	0.0			QC	Manual	1.2	
2	0.1		Cl⁻	8C8X1333	Signal	0.999856	.999856
3	1.0						
4	3.0						
5	5.0						
6	10.0						
7	QC						
8	QC						
9	Blk						
10	Blk						
11	DL						
12	DL						
13	LCS						
14	LCS						
15	LCS+						
16	LCS+						
17	34539-8	AIR	HCl		—	2x	
18	-10	↓	↓		—	↓	
19	-9				—		
20	-9 D				—		
21	QC LCS Spike		Spike				
22	QC						
23	Blk						
24	Blk						
25	34539-10						

Curve IC Lot # SCI-91-2 Comments: 0.1 of 2
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s/IC ME Solution 1833Da,330 HF
QC: Spike 50 uL from 1000 ug/mL F, Cl, and Br Std. to 10mL sample; lot #'s listed above.
Submitted for QC- Date: 03/31/20 Time: 3:53 By: [illegible] QC Review- Date: Time: By:
Re-Submitted for QC- Date: Time: By: QC Review- Date: Time: By:

ED_012958_00010534-00121

elementOne **IC Sample Sheet/Digestion Worksheet** **Lab ID #:** 34539

Date: ~~[illegible]~~ 03-30-20 Column: Metrosep A Supp 5 Instrument: 881/858
Analyst: LAW Eluent: 6.4 mM Na_2CO_3/ 2.0mM $NaHCO_3$
Batch name: ~~[illegible]~~ 03-30-20 - 34539 Flow Rate: .7 mL/min. Method: 26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
26	34539-10 D	AIR	HCl		—	2X	
27	-10+	↓	↓		—	↓	
28	-10+ D	↓	↓		4.739	↓	
29	-11 RB	↓	↓		5.046	↓	
30	-11 D RB	↓	↓		—	↓	
31	32799-11 QL		↓		6.678	1X	TV=6.70
32	-11 QC		↓		6.684	↓	
33	QC						
34	BLK						
35	0.1						
36	1.0						
37	3.0						
38	5.0						
39	10.0						
40	QC						
41	DL						
42	BLK						
43							
44							
45							
46							
47							
48							
49							
50							

Curve IC Lot #_____ Comments: p.2 of 2
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s:IC ME Solution _____
QC: Spike 50 uL from 1000 ug/mL F, Cl, and Br Std. to 10mL sample; lot #'s listed above.
Submitted for QC- Date:_____ Time:_____ By:_____ QC Review- Date:_____ Time:_____ By:_____

METHOD 29 LAB REPORT

Advanced Industrial Resources, Inc.

3407 Novis Pointe
Acworth, GA 30101

Project ID: Green Bay MSD

Beryllium, Cadmium, Lead
and Mercury

EPA Method 29 Analysis

Analytical Report
34539

el1

Element One, Inc.
6319-D Carolina Beach Rd., Wilmington, NC 28412
910-793-0128 FAX: 910-792-6853 e1lab@e1lab.com

The following data for Analytical Report 34539
has been reviewed for completeness, accuracy,
adherence to method protocol,
and compliance with quality assurance guidelines.

Review by:

Daphne Woodman, B.S. Chemist
April 7, 2020

Report Reviewed and Finalized By:

Ken Smith, Laboratory Director
April 7, 2020

ED_012958_00010534-00125

SUMMARY OF RESULTS

ED_012958_00010534-00126

Summary of Analysis

Stack Exhaust - Summary of Method 29 Mercury Analysis

Run Number		Average Total Catch, µg	Front Half µg	H_2O_2 /HNO_3 µg	Empty Impinger µg	$KMnO_4$ µg	HCl µg
Stack Exh-M29-R1	#1	< 0.5	< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
Stack Exh-M29-R2	#1	< 0.5	< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
Stack Exh-M29-R3	#1	< 0.5	< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
Reagent Blank	#1	< 0.5	< 0.1	< 0.2	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.2	< 0.2	< 0.5	< 0.4

Stack Exhaust - Summary of Method 29 Metals Analysis

Element	M29-T1 34539-1 Total µg	M29-T2 34539-2 Total µg	M29-T2 34539-2 dup Total µg	M29-T3 34539-3 Total µg	Reagent Blank 34539-4 Total µg
Beryllium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cadmium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Lead	1.26	1.83	1.83	0.650	0.293

ANALYTICAL NARRATIVE

ED_012958_00010534-00128

Element One Analytical Narrative

Client:	Advanced Industrial Resources, Inc.	Element One #:	34539
Client ID:	Green Bay MSD	Analyst:	MAR, DBW
Method:	Method 29	Dates Received:	03/25/20
Analytes:	Be, Cd, Pb & Hg	Dates Analyzed:	03/27/20-04/07/20

Summary of Analysis

The Method 29 samples were digested, prepared, and analyzed according to Method 29 protocol. Samples were analyzed for mercury on a PerkinElmer FIMS-100 CVAA mercury analyzer. The samples were analyzed for metals on PerkinElmer NexIon 350X ICP-MS.

Detection Limits

The FIMS-100 CVAA instrument reporting limit for mercury was 0.004 µg per aliquot analyzed. The ICP-MS instrument reporting limits were 0.25µg/L for beryllium and 1.0µg/L for the other metals.

Analysis QA/QC

Duplicate analyses relative percent difference (RPD), spike sample recovery, and second source calibration verification data are summarized in the Quality Control Section. All QA/QC data was within the criteria of the method.

Additional Comments

The reported results have not been corrected for any blank values or spike recovery values. The reported results relate only to the items tested or calibrated.

The ICP analysis of the Reagent Blank sample revealed detectable traces of lead. The prepared front half, archived c8a 0.1N HNO_3 and archived c9 5% HNO_3/10% H_2O_2 fractions were analyzed to determine the source of the metals. Lead was present in the prepared front half and archived c9 fractions.

QUALITY CONTROL SUMMARY

ED_012958_00010534-00130

Summary of Quality Control Data

Mercury Duplicate Analysis RPD

(Method 29 QC limits: < 10% for RPD)

Run Number	Front Half	H_2O_2/HNO_3	Empty Imp	$KMnO_4$	HCl
Stack Exh-M29-R1	NA	NA	NA	NA	NA
Stack Exh-M29-R2	NA	NA	NA	NA	NA
Stack Exh-M29-R3	NA	NA	NA	NA	NA
Reagent Blank	NA	NA	NA	NA	NA

Mercury Spike Recoveries

(Method 29 QC limits: 75-125% for Spike Recoveries)

Run Number		Front Half	H_2O_2/HNO_3	Empty Imp	$KMnO_4$	HCl
Stack Exh-M29-R3	#1	105%	102%	103%	108%	109%
	#2	104%	102%	101%	108%	108%

Summary of Quality Control Data

Metals Duplicate Analysis RPD

(Method 29 QC limits: < 20% for RPD)

Element	Stack Exhaust-M29-T2 RPD
Beryllium	NA
Cadmium	NA
Lead	0.2%

Metals Analysis Spike Recoveries

(Method 29 QC limits: 75-125% for Spike Recoveries)

Element	Stack Exhaust -M29-T3 Recovery
Beryllium	79%
Cadmium	81%
Lead	97%

Second Source Calibration Check Recoveries

(Method 29 QC limits: ±10% for Second Source Continuing Check Standard)*

Element	0.25 ppb	1 ppb	50 ppb	100 ppb*	125 ppb
Beryllium	107%	109%	97%	104%	104%
Cadmium		103%	97%	101%	101%
Lead		105%	99%	102%	101%

SAMPLE CUSTODY

ED_012958_00010534-00133

34539

Advanced Industrial Resources, Inc.
Compliance Sample Custody Record

Client: Green Bay MSD
Green Bay WI

Sample ID		Date	Source	Description	Matrix	Analysis Desired: Method 29				Sample Condition	Comments
KR10426	29	3/19/2020	Stack Exhaust	T1 Container 1	MS	x					
KR10426	30	3/19/2020	Stack Exhaust	T1 Container 2	MS	x					Re, Cd, Pb, Hg
KR10426	31	3/19/2020	Stack Exhaust	T1 Container 4	MS	x					
KR10426	32	3/19/2020	Stack Exhaust	T1 Container 5A	MS	x					FH/BH combined
KR10426	33	3/19/2020	Stack Exhaust	T1 Container 5B	MS	x					
KR10426	34	3/19/2020	Stack Exhaust	T1 Container 5C	MS	x					Per Derek via phone
KR10426	35	3/19/2020	Stack Exhaust	T2 Container 1	MS	x					
KR10426	36	3/19/2020	Stack Exhaust	T2 Container 3	MS	x					[illegible] 3-25-20
KR10426	37	3/19/2020	Stack Exhaust	T2 Container 4	MS	x					
KR10426	38	3/19/2020	Stack Exhaust	T2 Container 5A	MS	x					
KR10426	39	3/19/2020	Stack Exhaust	T2 Container 5B	MS	x					
KR10426	40	3/19/2020	Stack Exhaust	T2 Container 5C	MS	x					
KR10426	41	3/19/2020	Stack Exhaust	T3 Container 1	MS	x					
KR10426	42	3/19/2020	Stack Exhaust	T3 Container 3	MS	x					
KR10426	43	3/19/2020	Stack Exhaust	T3 Container 4	MS	x					
KR10426	44	3/19/2020	Stack Exhaust	T3 Container 5A	MS	x					
KR10426	45	3/19/2020	Stack Exhaust	T3 Container 5B	MS	x					
KR10426	46	3/19/2020	Stack Exhaust	T3 Container 5C	MS	x					

Relinquished By/Sign:	Date/Time	Received By / Sign:	Relinquished By / Sign:	Date/Time	Received By / Sign:
[signature]	3/24/20 13:30	[signature] 3/25/20 1145			

Field Team Members: DK CJS JL AS SS

AIR Field Supervisor: Dan Kirk

Field Supervisor Sign: [signature] for Dan Kirk

AIR Contact Name: Derek Stephens

AIR Contact Number: (404) 843-2100

Analyses To Be Performed By:
Element One
~~[illegible]~~ 6319 D Carolina Beach Rd
Wilmington, NC 28412
910-793-0128

Samples received in good condition. No empty container.

34539

Advanced Industrial Resources, Inc.
Compliance Sample Custody Record

Client: Green Bay MSD
Green Bay WI

Sample ID		Date	Source	Description	Matrix	Analysis Desired: Method 29				Sample Condition	Comments
KR10426	65	3/19/2020	Inlet/Exhaust	Container 8A	MS	x					0.1N HNO3 blank
KR10426	66	3/19/2020	Inlet/Exhaust	Container 8B	MS	x					H2O blank
KR10426	67	3/19/2020	Inlet/Exhaust	Container 9	MS	x					5% HNO3/10% H2O2 blank
KR10426	68	3/19/2020	Inlet/Exhaust	Container 10	MS	x					Acidified KMNO4 Blank
KR10426	69	3/19/2020	Inlet/Exhaust	Container 11	MS	x					8N HCL blank
KR10426	70	3/19/2020	Inlet/Exhaust	Container 12	MS	x					Filter blank

Relinquished By/Sign:	Date/Time	Received By / Sign:	Relinquished By / Sign:	Date/Time	Received By / Sign:
[signature]	3/20/20 13:30	[signature] 3-25-20	1145		

Field Team Members: D/K JL JG

AIR Field Supervisor: Dan Kirk

Field Supervisor Sign: [signature]

AIR Contact Name: Derek Stephens

AIR Contact Number: (404) 843-2100

Analyses To Be Performed By:
Element One
~~[illegible]~~ 6319 Carolina Beach Rd
Wilmington, NC 28412
910-793-0128

ED_012958_00010534-00135

elementOne
34539 AIR M29 Report Packet
Page 12 of 30

ANALYTICAL DATA

Analytical Calculations

Metals-

Element Results (µg) =ICP Results (µg/L)*Dilution*Final Volume (L)

Where-

ICP Results= Raw sample concentration (ppb)--*ICP-Data Sheet*

Dilution= Diluted Volume--*ICP-MS Run Sheet*
Aliquot

Final Volume=FH=Final Volume (FV)--*Sample Submission*
BH=Received Volume (BV)*Final Volume (FV)--*Sample Submission*
Aliquot (Used)
Combined Results=FH+BH

Mercury-

Mercury Results (µg) =CVAA Results (µg) *Final Volume (ml)
Aliquot (ml)

Where-

CVAA Results= Raw sample reading (µg)--*Hg-Data Sheet*

Aliquot= Sample Aliquot (Alq.)--*Hg-Data Sheet*

Final Volume=Final Volume (FV)*--*Sample Submission*
* With the exception of the BH fraction where-
=Received Volume (BV)--*Sample Submission*

Analytical Calculations

Spike Recovery-

$$\textbf{Spike (\%)} = \frac{\textbf{(Spiked Result (µg/L) – Sample Result (µg/L))}}{\textbf{Spike Amount (µg/L)}} \textbf{ X100}$$

Where-

Spike Result = Raw sample concentration (ppb)--*ICP-Data Sheet*

Sample Result = Raw sample concentration (ppb)--*ICP-Data Sheet*

Spike Amount--*ICP-MS Spike Table*

Duplicate Analysis RPD-

$$\textbf{RPD (\%)} = \frac{\textbf{(Duplicate Result (µg/L) - Sample Result (µg/L))}}{\textbf{Average (µg/L)}} \textbf{ X100}$$

Where-

Sample Result and Duplicate Results=Raw sample concentration (ppb)--*ICP-Data Sheet*

Average= $\frac{\textit{(Duplicate + Sample Results)}}{2}$

elementOne **AIR TESTING SAMPLE SUBMISSION FORM** **Lab ID 34539**

FH/BH Combined

Analysis Due Date 04.02.20
QA/QC/Report Due Date 04.06.20

Client	Advanced Industrial Resources, Inc.	Date Received	03.25.20
Project ID	Green Bay MSD	Time Received	1145

HNO_3 Lot: 9075 EW	HF Lot: 3117070 Pre	HCl Lot: 4118110 Sedge	**Ref. Method:**
Volume Marked Y / N	Volume Loss Y / N / ?	Acetone Lot: —	**29**

Sample Identification

1	Stack Exhaust-M29-R1	4	Reagent Blank		
2	Stack Exhaust-M29-R2				
	Stack Exhaust-M29-R2 Duplicate				
3	Stack Exhaust-M29-R3				
	Stack Exhaust-M29-R3 Spike				

Analyses Requested	Samples 1-4	Be, Cd, Pb
	Samples 1-4	Hg

Runs / FB	Fil / Ace (FH)		HNO_3 (FH)		5% HNO_3/10% H_2O_2 (BH)			HNO_3 (A)		$KMnO_4$ (B)		HCl (C)	
			pH <2.0 Y / N		pH <2.0 Y / N			pH <2.0 Y / N		pH <2.0 Y / N		pH <2.0 Y / N	
Lab ID	Fil ID	BV ml	BV ml	FV ml	BV ml	Used	FV ml	BV ml	FV ml	BV ml	FV ml	BV ml	FV ml
1			102	100	325	165	50	104	200	360	500	330	400
2.D			96	↓	325	165	↓	102	↓	380	↓	330	↓
3.S			100	↓	315	160	↓	96	↓	360	↓	330	↓

M-29 Reagent Blank

Lab ID	Fraction			BV, ml	FV, ml	Comments
4	C 7	FH	Acetone Blank			
	C 8A	FH	0.1N HNO_3	295	100	used 100 ml cBH
	C 8A	A	0.1N HNO_3	295		
	C 8B	B	DI H_2O	97		
	C 9	BH	5% HNO_3/10% H_2O_2	198	50	used 98 ml c9
	C 10	B	4% $KMnO_4$ /10%H_2SO_4	90		90 c10 + 30 ml c8b
	C 11	C	8N HCl DI H_2O	200	400	
	C 12	FH	Filter			

Lab Communications

Lab spiked w/0.1 ml 2.5 ppm standards 02/4/20 - A BH

Fractions Received: Runs; C1, C3, C4, C5A, C5B, C5C---RB; C12, C8A, C8B, C9, C10, C11---03.25.20 LLB

SS Page 1 of 3
3/25/2020 2:07:24 PM
SS Form By [signature]
Labeled By/Date [signature] 3.25.20

FH Prep By/Date MAR 3/31/20
BH Prep By/Date MAR 3/31/20
BH/FH Prep By/Date
PM Prep By/Date —

A Prep By/Date MAR 3/26/20
B Prep By/Date MAR 3/26/20
C Prep By/Date DKH 3/27/20
ID Verification By / Date MAR 3/26/20

BH Hg Prep — MAR 3/26/20
[signature] DKH 3/27/20 MAR 3/26/20

elementOne

Method 29 Microwave Worksheet

Lab ID # e34539

Client: AIR

Date Digested: 3/31/20 Initials: MAL Worksheet Prepared by: MAL

Auto Sample Loc.	Sample Lab ID	# of filters digested	Spike	Prep Volume (ml)	Comments
1	LRB			100	
3	LRB +		0.1mL ABH		
5	34539-1	1			
7	-2				
9	-3				
11	-4				
13	clean				
15	clean				

HNO_3 Lot #: 59035 EMD	mLs Used: 6
HF Lot #: 5118036 GFC	mLs Used: 2

LRB spiked w/0.1mL 25ppm 021420-ABH

Element One, Inc. F214 R1 Microwave Sheet M29

Sample/Batch Report

4/7/20

User Name: r2d2
Computer Name: PESERVICE-PC
Sample File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Sample\a2.sam
Report Date/Time: Tuesday, April 07, 2020 10:50:44

A/S Loc.	Batch ID	Sample ID	Description	Sample Type	Init. Quant.	Prep. Vol.	Aliquot Vol.	Diluted Vol.	Solids Ratio
7		QC Std 2		Sample					
401		LRB	AIR	Sample					
402	s	LRB	AIR	Spike - 1 of 2					
403		34539-1	AIR	Sample					
404		34539-2	AIR	Sample					
405	d	34539-2	AIR	Duplicate of 5					
406		34539-3	AIR	Sample					
407	s	34539-3	AIR	Spike - 1 of 7					
408		34539-4	AIR	Sample					
409		34539-4	AIR	Sample					
410		34539-4 FH	AIR	Sample					
411		34539-4 c8A	AIR	Sample					
412		34539-4 c9	AIR	Sample					

Dataset Report

4/7/20

User Name: r2d2
Computer Name: PESERVICE-PC
Dataset File Path: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\DataSet\040720-1a\
Report Date/Time: Tuesday, April 07, 2020 10:50:33

The Dataset

Time	Sample ID	Batch ID	Read Type	Description	Init. Quant Prep. Vol.	Aliquot Vol.	Diluted Vol.
09:40:49 Tue 07-Apr-20	Blank		Blank				
09:42:46 Tue 07-Apr-20	Standard 1		Standard #1				
09:44:42 Tue 07-Apr-20	Standard 2		Standard #2				
09:46:39 Tue 07-Apr-20	Standard 3		Standard #3				
09:48:36 Tue 07-Apr-20	Standard 4		Standard #4				
09:50:33 Tue 07-Apr-20	Standard 5		Standard #5				
09:52:30 Tue 07-Apr-20	Standard 6		Standard #6				
09:54:27 Tue 07-Apr-20	QC Std 1		QC Std #1				
09:56:24 Tue 07-Apr-20	QC Std 2		QC Std #2				
09:58:21 Tue 07-Apr-20	QC Std 3		QC Std #3				
10:00:19 Tue 07-Apr-20	QC Std 4		QC Std #4				
10:02:16 Tue 07-Apr-20	QC Std 5		QC Std #5				
10:04:14 Tue 07-Apr-20	QC Std 6		QC Std #6				
10:06:11 Tue 07-Apr-20	QC Std 7		QC Std #7				
10:08:09 Tue 07-Apr-20	QC Std 8		QC Std #8				
10:10:06 Tue 07-Apr-20	QC Std 2		Sample				
10:13:36 Tue 07-Apr-20	LRB		Sample	AIR			
10:15:33 Tue 07-Apr-20	LRB	s	Spike - 1 of 17	AIR			
10:17:30 Tue 07-Apr-20	34539-1		Sample	AIR			
10:19:27 Tue 07-Apr-20	34539-2		Sample	AIR			
10:21:24 Tue 07-Apr-20	34539-2	d	Duplicate of 20	AIR			
10:23:20 Tue 07-Apr-20	34539-3		Sample	AIR			
10:25:17 Tue 07-Apr-20	34539-3	s	Spike - 1 of 22	AIR			
10:27:14 Tue 07-Apr-20	34539-4		Sample	AIR			
10:29:12 Tue 07-Apr-20	QC Std 1		QC Std #1				
10:31:09 Tue 07-Apr-20	QC Std 4		QC Std #4				
10:39:14 Tue 07-Apr-20	34539-4		Sample	AIR			
10:41:11 Tue 07-Apr-20	34539-4 FH		Sample	AIR			
10:43:08 Tue 07-Apr-20	34539-4 c8A		Sample	AIR			
10:45:05 Tue 07-Apr-20	34539-4 c9		Sample	AIR			
10:47:02 Tue 07-Apr-20	QC Std 1		QC Std #1				
10:48:59 Tue 07-Apr-20	QC Std 4		QC Std #4				

Method 6020 & 200.8 Metals Summary Report

Sample ID: Blank

Sample Date/Time: Tuesday, April 07, 2020 09:40:49
Sample Description:
Number of Replicates: 3
Batch ID:
Dataset File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\DataSet\040720-1s\Blank.001
Sample Prep Volume (mL):
Initial Sample Quantity (mg):
Aliquot Volume (mL):
Diluted To Volume (mL):
Autosampler Position: 1

Calibration

Analyte	Curve Type	Slope	Correlation Coefficient	Intercept
Li	Linear Thru Zero			
Be	Linear Thru Ze	0.005	0.999643	0.00
Sc	Linear Thru Zero			
Rh	Linear Thru Zero			
Cd	Linear Thru Ze	0.006	0.999980	0.00
Cd	Linear Thru Ze	0.012	0.999900	0.00
Ho	Linear Thru Zero			
Pb	Linear Thru Ze	0.046	0.999956	0.00
Kr	Linear Thru Zero			

elementOne
Analyst:--DBW--

ICP-MS RUN SHEET
4/7/2020

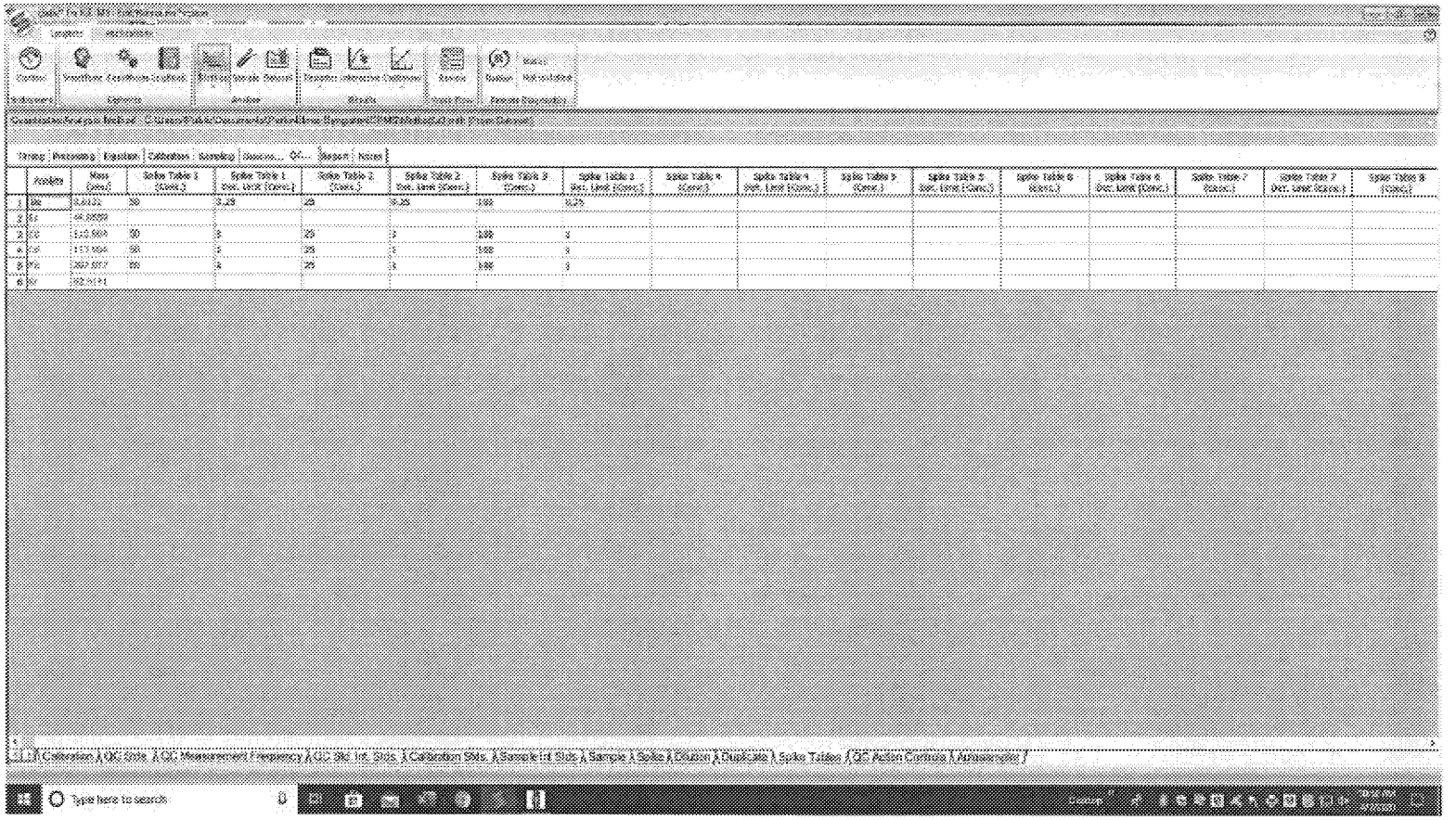
Job Number:
14

A/S Loc.	Dilution	Sample ID	Client	Type	Weight (g)	Prep Vol (ml)
7		QC Std 2		Sample		
401		LRB	AIR	Sample		100x2
402	s	LRB	AIR	Spike - 1 of 2		100x2
403		34539-1	AIR	Sample		100x2
404		34539-2	AIR	Sample		100x2
405	d	34539-2	AIR	Duplicate of 5		100x2
406		34539-3	AIR	Sample		100x2
407	s	34539-3	AIR	Spike - 1 of 7		100x2
408		34539-4	AIR	Sample		100x2
409		34539-4	AIR	Sample		100x2
410		34539-4 FH	AIR	Sample		100
411		34539-4 c8A	AIR	Sample		295
412		34539-4 c9	AIR	Sample		198

Spikes are post at 0.02mL of 25ppm spiking solution lot 021420-A in a final volume of 10mL

Submitted for QC by:	Date/Time:		QC Review By:	Date/Time:	
DBW	4/7/20 10:53		DBW	4/7/20 1110	
Re-Test Required:	No: ✓	Yes:	Comments:		
Resubmitted for QC by:	Date/Time:		QC Review:	By:	Date/Time:

S:\Forms\Blank Forms\F208 R2 ICP-MS Run Sheet



Tuesday, Apr 07, 2020 10:58 AM

ED_012958_00010534-00145

ICP-MS Standards and QC Standards Values Table

Element or Test	Mass	Symbol	Std.#1 ppb	Std.#2 ppb	Std.#3 ppb	Std.#4 ppb	Std.#5 ppb	Std.#6 ppb	QC #1	QC #2	QC #3	QC #4	QC #5	QC #6 A	QC #7 AB	QC #8 .25	QC #9 LRB	QC #10 LRB+
Lithium	6	*Li*																
Lithium	7	Li	1	50	100	200	250		0	1	125	100	50				0	50
Beryllium	9	Be	1	50	100	200	250	0.25	0	1	125	100	50			0.25	0	50
Boron	10	B	5	50	100	200	250		0	5	125	100	50				0	50
Boron	11	B	5	50	100	200	250		0	5	125	100	50				0	50
Sodium	23	Na	21	500	1100	2200	2750		0	21	1250	1100	250	5000	5000		0	550
Magnesium	24	Mg	21	500	1100	2200	2750		0	21	1250	1100	250	5000	5000		0	550
Magnesium	25	*Mg*	21	500	1100	2200	2750		0	21	1250	1100	250				0	550
Aluminum	27	Al	1	50	100	200	250		0	1	125	100	50	5000	5000		0	50
Phosphorus	31	P	20	500	1000	2000	2500		0	20	1250	1000	200	5000	5000		0	400
Potassium	39	K	21	500	1100	2200	2750		0	21	1250	1100	250	5000	5000		0	400
Calcium	44	Ca	50	500	1100	2200	2750		0	21	1250	1100	250	5000	5000		0	550
Scandium	45	*Sc*																
Titanium	47	Ti	1	50	100	200	250		0	1	125	100	50	100	100		0	50
Titanium	49	Ti	1	50	100	200	250		0	1	125	100	50	100	100		0	50
Vanadium	51	V	1	50	100	200	250		0	1	125	100	50	0	2		0	50
Vanadium	51	V	1	50	100	200	250		0	1	125	100	50	0	2		0	50
Chromium	52	Cr	1	50	100	200	250		0	1	125	100	50	0	1		0	50
Chromium	53	*Cr*	1	50	100	200	250		0	1	125	100	50				0	50
Iron	54	Fe	21	500	1100	2200	2750		0	21	1250	1100	250	5000	0		0	
Manganese	55	Mn	1	50	100	200	250		0	1	125	100	50	0	1		0	50
Iron	57	Fe	21	500	1100	2200	2750		0	21	1250	1100	250	5000	0		0	
Cobalt	59	Co	1	50	100	200	250		0	1	125	100	50	0	2		0	50
Nickel	60	Ni	1	50	100	200	250		0	1	125	100	50	0	2		0	50
Copper	63	Cu	1	50	100	200	250		0	1	125	100	50	0	1		0	50
Copper	65	Cu	1	50	100	200	250		0	1	125	100	50	0	1		0	50
Zinc	66	Zn	1	50	100	200	250		0	1	125	100	50	0	1		0	50
Zinc	67	*Zn*	1	50	100	200	250		0	1	125	100	50				0	50
Zinc	68	*Zn*	1	50	100	200	250		0	1	125	100	50				0	50
Germanium	72	Ge	1	50	100	200	250		0	1	125	100	50				0	50
Arsenic	75	As	1	50	100	200	250		0	1	125	100	50	0	1		0	50
Selenium	77	*Se*	1	50	100	200	250		0	1	125	100	50				0	50
Selenium	82	Se	1	50	100	200	250		0	1	125	100	50	0	1		0	50
Strontium	88	Sr	1	50	100	200	250		0	1	125	100	50				0	50
Molybdenum	95	Mo	1	50	100	200	250		0	1	125	100	50	100	100		0	50
Molybdenum	97	Mo	1	50	100	200	250		0	1	125	100	50	100	100		0	50
Molybdenum	98	Mo	1	50	100	200	250		0	1	125	100	50	100	100		0	50
Rhodium	103	*Rh*																
Silver	107	Ag	1	50	100	200	250		0	1	125	100	50	0	1		0	50
Silver	109	*Ag*	1	50	100	200	250		0	1	125	100	50				0	50
Cadmium	111	Cd	1	50	100	200	250		0	1	125	100	50	0	0.5		0	50
Cadmium	114	*Cd*	1	50	100	200	250		0	1	125	100	50				0	50
Tin	118	Sn	1	50	100	200	250		0	1	125	100	50				0	50
Antimony	121	*Sb*	1	50	100	200	250		0	1	125	100	50				0	50
Antimony	123	Sb	1	50	100	200	250		0	1	125	100	50				0	50
Tellurium	128	Te	1	50	100	200	250		0	1	125	100	50				0	50
Cesium	133	Cs	1	50	100	200	250		0	1	125	100	50				0	50
Barium	135	*Ba*	1	50	100	200	250		0	1	125	100	50				0	50
Barium	137	Ba	1	50	100	200	250		0	1	125	100	50				0	50
Lanthanum	139	La	1	50	100	200	250		0	1	125	100	50				0	50
Tantalum	169	Ta	1	50	100	200	250		0	1	125	100	50				0	50
Holmium	165	*Ho*																
Platinum	195	Pt	1	50	100	200	250		0	1	125	100	50				0	50
Gold	181	Au	1	50	100	200	250		0	1	125	100	50				0	50
Thallium	205	Tl	1	50	100	200	250		0	1	125	100	50				0	50
Lead	208	Pb	1	50	100	200	250		0	1	125	100	50				0	50
Bismuth	209	Bi	1	50	100	200	250		0	1	125	100	50				0	50
Thorium	232	Th	1	50	100	200	250		0	1	125	100	50				0	50
Uranium	238	U	1	50	100	200	250		0	1	125	100	50				0	50
Krypton	83	*Kr*																

MERCURY BATCH DIGESTION - RUN WORKSHEET

Date Prepared/Digested: 3/26/20 Prep By: MAR/DKH SIF File #: 032720-1
Block #1 Temperature: 94.04 Start Time: 5:45 Machine ID: F2
Block #2 Temperature: — Stop Time: 8:00 Batch Analyst: MAR
Block #3 Temperature: — Typed By: MAR Verified By: DKH

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
1	Lab BLK (3/ batch)	0		40	40	Standard #1 (for working std) Lot #: 4807882 RICCA
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: Hg3-181-3 by: MAR
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: Hg3-181-4
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: Hg3-181-5
7	QC #2= 0.08ug	0.2ml #2 std		40	40	
8	QC #3= 0.08ug	0.2ml #3 std		40	40	Curve prepared by: DKH

Initial Review By: MAR Date: 3/27/20 Time: 3:00
Final QC Review By: DAM/KLG Date: 3-30-2020 Time: 1548
Comments:

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
9	33926-20 QC	7470A			0.1	5	FV=5.8
10	L/L	↓			1	1	=0.008
✓ 11	34539-1 BH	M29			4	325	
12	-2 BH	↓			↓	325	
13	-2 BH Dup	↓			↓	↓	
14	-3 BH	↓			↓	315	
15	-3 BH+	↓			↓	↓	
16	-4 BH	↓			↓	198	
17	-5 BH	↓			2	340	
18	-6 BH	↓			↓	325	
19	-6 BH+	↓			↓	↓	

NOTES: Lab blanks and spikes must be prepared with each batch digestion

"+" Denotes spike for Hg, Use calibration working 0.4ug/ml standard at the rate of 0.20ml per 40ml sample, unless otherwise noted.

Digestion chemicals to be added in order at the following rate per 40ml volumes.

H_2SO_4 @ 2.0ml..... HNO_3 @ 1.0ml..... $KMnO_4$ @ 6.0ml..... Persulfate @ 3.2ml

H_2SO_4 Lot # 191965 Fisher *HNO_3 Lot #* 59035 EMD *HCl Lot #:* 4118110 Fisher

Persulfate Lot # Hg3-175-7 *$KMnO_4$ Lot #* Hg3-179-11 *Hydrox Lot#:* Hg3-179-8

Clear samples after digestion with 2.4 ml of Hydroxylamine solution.

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elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 033730-1

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL, or "1" for conc.	Comments
✓ 20	34539-38M	M29			2	330	
21	-38M+	↓			↓	↓	
22	-1A				4	200	
23	-2A					↓	
24	-2AD						
25	-3A						
26	-3A+						
27	-4A						
28	-5A						
29	-6A						
30	-6AD						
31	-7A						
32	-7A+					↓	
33	-1B					500	
34	-2B					↓	
35	-2BD						
36	-3B						
37	-3B+						
38	-4B						
39	-5B						
40	-6B						
41	-6BD						
42	-7B						
43	-7B+	↓			↓	↓	
44	34446-538 MS	7470A			2.0	1	
45	-BLK	↓			↓	↓	
✓ 46	34496-7						
47	-7Dup						
48	-8						
✓ 49	-8+						
✓ 50	34539-1						
51	-2-20g						
52	-2-20gDup						
53	-2-15g						
54	-2-15gDup	↓			↓	↓	

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MERCURY BATCH DIGESTION - RUN WORKSHEET

Date Prepared/Digested: 03/30/20 Prep By: MAK/BKM SIF File #: 033020-1
Block #1 Temperature: 97.32 Start Time: 8:30 Machine ID: F1
Block #2 Temperature: ~95 Stop Time: 9:30 Batch Analyst: MK
Block #3 Temperature: — Typed By: MAK Verified By: DKH

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
1	Lab BLK (3/ batch)	0		40	40	Standard #1 (for working std) Lot #: 4820882 RICCA
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: Hg3-184-1 by: MAK
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: Hg3-184-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: Hg3-184-3
7	QC #2= 0.08ug	0.2ml #2 std		40	40	
8	QC #3= 0.08ug	0.2ml #3 std		40	40	Curve prepared by: BKM

Initial Review By: MAK Date: 3/20/20 Time: 1:15
Final QC Review By: DAM/KLG Date: 3-30-2020 Time: 1616
Comments: 34539-5,6,7 FM

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
9	33926-20 QC	7470A			0.1	5	TV=5.8
10	LK	↓			1	1	0.008
✓ 11	34539-1C	M29			4	400	
12	-2C						
13	-2CD						
14	-3C						
15	-3C+						
16	-4C						
17	-5C						
18	-6C						
19	-6CD	↓			↓	↓	

NOTES: Lab blanks and spikes must be prepared with each batch digestion

"+" Denotes spike for Hg, Use calibration working 0.4ug/ml standard at the rate of 0.20ml per 40ml sample, unless otherwise noted.

Digestion chemicals to be added in order at the following rate per 40ml volumes.

H_2SO_4 @ 2.0ml..... HNO_3 @ 1.0ml..... $KMnO_4$ @ 6.0ml..... Persulfate @ 3.2ml

H_2SO_4 Lot # 191965 Fisher *HNO_3 Lot #* 59035 EMD *HCl Lot #:* 4118110 Fisher
Persulfate Lot # Hg3-175-1 *$KMnO_4$ Lot #* Hg3-179-11 *Hydrox Lot#:* Hg3-179-8

Clear samples after digestion with 2.4 ml of Hydroxylamine solution.

Element One, Inc F209 R9 Page 1 of 3

MERCURY BATCH DIGESTION - RUN WORKSHEET

Date Prepared/Digested: 3/31/20 Prep By: MM/DKH SIF File #: 040120-1
Block #1 Temperature: 96.9 Start Time: 5:45 Machine ID: F1
Block #2 Temperature: ~95 Stop Time: 8:00 Batch Analyst: MM
Block #3 Temperature: ~95 Typed By: MM Verified By: DKH

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
1	Lab BLK (3/ batch)	0		40	40	Standard #1 (for working std) Lot #: 4807882 RICCA
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: Hg3-184-1 by: MM
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: Hg3-184-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: Hg3-184-3
7	QC #2= 0.08ug	0.2ml #2 std		40	40	
8	QC #3= 0.08ug	0.2ml #3 std		40	40	Curve prepared by: DKH

Initial Review By: MM Date: 4/1/20 Time: 11:30
Final QC Review By: [illegible] Date: 04-01-20 Time: 8:45
Comments: 34562-2, 4

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
9	33926-20 DC	4440A			0.1	5	TV=5.8
10	L/C	↓			1	1	20.008
✓ 11	34526-24	M29			0.03	5	
12	-24 D				↓	↓	
13	-24 +				↓	↓	
14	-23				0.5	100	
15	-23 D				↓	↓	
16	-23 +				↓	↓	
17	-20 C				4	400	
18	34539 LAB FH				4	100	
✓ 19	-LAB FH +	↓			1.6	↓	

NOTES: Lab blanks and spikes must be prepared with each batch digestion

"+" Denotes spike for Hg. Use calibration working 0.4ug/ml standard at the rate of 0.20ml per 40ml sample, unless otherwise noted.

Digestion chemicals to be added in order at the following rate per 40ml volumes.

H_2SO_4 @ 2.0ml..... HNO_3 @ 1.0ml..... $KMnO_4$ @ 6.0ml..... Persulfate @ 3.2ml

H_2SO_4 Lot # 191965 [illegible] *HNO_3 Lot #* 59035 [illegible] *HCl Lot #:* 4118110 [illegible]
Persulfate Lot # Hg3-175-7 *$KMnO_4$ Lot #* Hg3-179-11 *Hydrox Lot#:* Hg3-179-8

Clear samples after digestion with 2.4 ml of Hydroxylamine solution.

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elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 04-01 20-1

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
20	3039-1 FM	M29			4	100	
21	-2 FM						
22	-2 FMD						
23	-3 FM						
24	-3 FM +						
25	-4 FM						
26	-5 FM						
27	-6 FM						
28	-6 FMD						
29	-7 FM						
30	-7 FM +						
31	3925-1 A					200	
32	-2 A						
33	-2 AD						
34	-3 A						
35	-3 A +						
36	-4 A						
37	-5 A						
38	-5 AD						
39	-6 A						
40	-6 A +						
41	-7 A						
42	-8 A						
43	-8 AD						
44	-9 A						
45	-9 A +						
46	-10 A						
47	-11 A						
48	-11 AD						
49	-12 A						
50	-12 A +						
51	-13 A						
52	-14 A						
53	-14 AD						
54	-15 A						

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PerkinElmer NexIon 350X ICP-MS

Method 6020 & 200.8 Metals Summary Report
Sample ID: Blank
Sample Dat Tuesday, April 07, 2020 09:40:49
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1782800		ppb
|-	Be	9	28.3		ppb
|-	Sc	45	1362003.8		ppb
|>	Rh	103	1316282.6		ppb
|	Cd	111	25.7		ppb
|-	Cd	114	2.7		ppb
|>	Ho	165	1642062.3		ppb
|-	Pb	208	4156.9		ppb
	Kr	83	83		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: Standard 1
Sample Dat Tuesday, April 07, 2020 09:42:46
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1733097.7		ppb
|-	Be	9	8867.4	1.12178	ppb
|-	Sc	45	1318506.1		ppb
|>	Rh	103	1274018.8		ppb
|	Cd	111	7567.3	1.0683	ppb
|-	Cd	114	17648.1	1.12217	ppb
|>	Ho	165	1595939.7		ppb
|-	Pb	208	84018.9	1.09969	ppb
	Kr	83	95.3		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: Standard 2
Sample Dat Tuesday, April 07, 2020 09:44:42
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1752722.8		ppb
|-	Be	9	416732	52.29895	ppb
|-	Sc	45	1350013.8		ppb
|>	Rh	103	1308607.7		ppb
|	Cd	111	364210.2	50.21674	ppb
|-	Cd	114	838367.7	51.90514	ppb
|>	Ho	165	1644091.2		ppb
|-	Pb	208	3899713	51.99595	ppb
	Kr	83	99.3		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: Standard 3
Sample Dat Tuesday, April 07, 2020 09:46:39
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1766396.1		ppb
|-	Be	9	836872.1	104.21048	ppb
|-	Sc	45	1356812.4		ppb
|>	Rh	103	1305163.1		ppb
|	Cd	111	726953.5	100.50417	ppb
|-	Cd	114	1674730.6	103.96831	ppb
|>	Ho	165	1656951.4		ppb
|-	Pb	208	7702132	101.96258	ppb
	Kr	83	103		ppb

PerkinElmer NexIon 350X ICP-MS

Method 6020 & 200.8 Metals Summary Report
Sample ID: Standard 4
Sample Dat Tuesday, April 07, 2020 09:48:36
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1795186		ppb
|-	Be	9	1671803.6	204.8079	ppb
|-	Sc	45	1346581.7		ppb
|>	Rh	103	1287043.3		ppb
|	Cd	111	1437086.6	201.47486	ppb
|-	Cd	114	3175994.1	199.92616	ppb
|>	Ho	165	1651756.5		ppb
|-	Pb	208	15085721	200.36746	ppb
	Kr	83	124		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: Standard 5
Sample Dat Tuesday, April 07, 2020 09:50:33
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1801748.5		ppb
|-	Be	9	1999166.9	244.00918	ppb
|-	Sc	45	1373859.1		ppb
|>	Rh	103	1314393.8		ppb
|	Cd	111	1810525.5	248.57482	ppb
|-	Cd	114	4024245.7	248.09023	ppb
|>	Ho	165	1680003.3		ppb
|-	Pb	208	19030713	248.52141	ppb
	Kr	83	143		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: Standard 6
Sample Dat Tuesday, April 07, 2020 09:52:30
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1815625		ppb
|-	Be	9	2630.2	0.31509	ppb
|-	Sc	45	1390910.6		ppb
|>	Rh	103	1329057.6		ppb
|	Cd	111	469.6	0.06023	ppb
|-	Cd	114	1055.1	0.06416	ppb
|>	Ho	165	1673496		ppb
|-	Pb	208	10668.6	0.08438	ppb
	Kr	83	92		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 1
Sample Dat Tuesday, April 07, 2020 09:54:27
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1842225.7		ppb
|-	Be	9	362.3	0.03974	ppb
|-	Sc	45	1395442		ppb
|>	Rh	103	1329947.8		ppb
|	Cd	111	356.3	0.04484	ppb
|-	Cd	114	725.6	0.04404	ppb
|>	Ho	165	1686601.7		ppb
|-	Pb	208	6014.8	0.02271	ppb
	Kr	83	100.3		ppb

PerkinElmer NexIon 350X ICP-MS

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 2
Sample Dat Tuesday, April 07, 2020 09:56:24
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1823502.2		ppb
|-	Be	9	9086.2	1.09228	ppb
|-	Sc	45	1395027.3		ppb
|>	Rh	103	1344971.2		ppb
|	Cd	111	7818.1	1.04543	ppb
|-	Cd	114	17924.3	1.07959	ppb
|>	Ho	165	1684868.6		ppb
|-	Pb	208	85981.9	1.0643	ppb
	Kr	83	77.3		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 3
Sample Dat Tuesday, April 07, 2020 09:58:21
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1777529.9		ppb
|-	Be	9	1045492.2	129.3843	ppb
|-	Sc	45	1356855.1		ppb
|>	Rh	103	1302207.6		ppb
|	Cd	111	909799.1	126.06666	ppb
|-	Cd	114	2031588.5	126.40124	ppb
|>	Ho	165	1652678.2		ppb
|-	Pb	208	9514426.2	126.2908	ppb
	Kr	83	107		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 4
Sample Dat Tuesday, April 07, 2020 10:00:19
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1792257.9		ppb
|-	Be	9	848000.1	104.04539	ppb
|-	Sc	45	1382920		ppb
|>	Rh	103	1318892.4		ppb
|	Cd	111	739772.4	101.2063	ppb
|-	Cd	114	1698112	104.3129	ppb
|>	Ho	165	1679522.7		ppb
|-	Pb	208	7817306.8	102.09072	ppb
	Kr	83	110.3		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 5
Sample Dat Tuesday, April 07, 2020 10:02:16
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1770320.7		ppb
|-	Be	9	391883.5	48.67714	ppb
|-	Sc	45	1373407.2		ppb
|>	Rh	103	1304609.6		ppb
|	Cd	111	349438.6	48.32963	ppb
|-	Cd	114	803649.5	49.91059	ppb
|>	Ho	165	1658590.9		ppb
|-	Pb	208	3756328.8	49.64435	ppb
	Kr	83	81.3		ppb

PerkinElmer NexIon 350X ICP-MS

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 6
Sample Dat Tuesday, April 07, 2020 10:04:14
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1834775.2		ppb
|-	Be	9	301.7	0.03269	ppb
|-	Sc	45	1532754.4		ppb
|>	Rh	103	1412050.6		ppb
|	Cd	111	407.8	0.0486	ppb
|-	Cd	114	1697	0.09719	ppb
|>	Ho	165	1898165.5		ppb
|-	Pb	208	9299.2	0.05195	ppb
	Kr	83	100		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 7
Sample Dat Tuesday, April 07, 2020 10:06:11
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1697778.7		ppb
|-	Be	9	94.3	0.00872	ppb
|-	Sc	45	1492208.9		ppb
|>	Rh	103	1403433.4		ppb
|	Cd	111	3988.4	0.50934	ppb
|-	Cd	114	10065.9	0.58093	ppb
|>	Ho	165	1854435.9		ppb
|-	Pb	208	5361.1	0.00788	ppb
	Kr	83	105.3		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 8
Sample Dat Tuesday, April 07, 2020 10:08:09
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1655007.5		ppb
|-	Be	9	2037.1	0.26722	ppb
|-	Sc	45	1413642.9		ppb
|>	Rh	103	1371828.3		ppb
|	Cd	111	110	0.01094	ppb
|-	Cd	114	274.5	0.01605	ppb
|>	Ho	165	1714250.4		ppb
|-	Pb	208	3829.5	-0.00653	ppb
	Kr	83	71.3		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 2
Sample Dat Tuesday, April 07, 2020 10:10:06
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1674085.9		ppb
|-	Be	9	8422.1	1.10303	ppb
|-	Sc	45	1427824.6		ppb
|>	Rh	103	1382623.9		ppb
|	Cd	111	7911.9	1.02909	ppb
|-	Cd	114	18416.6	1.07895	ppb
|>	Ho	165	1736881.2		ppb
|-	Pb	208	87294.5	1.04758	ppb
	Kr	83	74		ppb

PerkinElmer NexIon 350X ICP-MS

Method 6020 & 200.8 Metals Summary Report
Sample ID: LRB
Sample Dat Tuesday, April 07, 2020 10:13:36
Sample De: AIR
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1700523.8		ppb
|-	Be	9	82.3	0.00718	ppb
|-	Sc	45	1454872.3		ppb
|>	Rh	103	1434044.6		ppb
|	Cd	111	182.6	0.01946	ppb
|-	Cd	114	-513.9	-0.02903	ppb
|>	Ho	165	1883067.8		ppb
|-	Pb	208	10627.9	0.0683	ppb
	Kr	83	80.7		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: LRB
Sample Dat Tuesday, April 07, 2020 10:15:33
Sample De: AIR
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1668650.9		ppb
|-	Be	9	290645.7	38.30025	ppb
|-	Sc	45	1451164.6		ppb
|>	Rh	103	1411215.4		ppb
|	Cd	111	302055.7	38.62047	ppb
|-	Cd	114	702428.3	40.32807	ppb
|>	Ho	165	1840621.1		ppb
|-	Pb	208	4038982.4	48.09829	ppb
	Kr	83	83.3		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: 34539-1
Sample Dat Tuesday, April 07, 2020 10:17:30
Sample De: AIR
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1609243.4		ppb
|-	Be	9	379.7	0.04836	ppb
|-	Sc	45	1431914.1		ppb
|>	Rh	103	1381694.6		ppb
|	Cd	111	4167.8	0.54075	ppb
|-	Cd	114	1219.2	0.07133	ppb
|>	Ho	165	1845277.7		ppb
|-	Pb	208	532682.4	6.27914	ppb
	Kr	83	107.3		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: 34539-2
Sample Dat Tuesday, April 07, 2020 10:19:27
Sample De: AIR
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1666014.6		ppb
|-	Be	9	218.7	0.02535	ppb
|-	Sc	45	1491644.3		ppb
|>	Rh	103	1433998.1		ppb
|	Cd	111	4588.8	0.5739	ppb
|-	Cd	114	2968.7	0.16759	ppb
|>	Ho	165	1913956.2		ppb
|-	Pb	208	802025	9.14047	ppb
	Kr	83	87.3		ppb

PerkinElmer NexIon 350X ICP-MS

Method 6020 & 200.8 Metals Summary Report
Sample ID: 34539-2
Sample Dat Tuesday, April 07, 2020 10:21:24
Sample De: AIR
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1652091.2		ppb
|-	Be	9	204.7	0.02375	ppb
|-	Sc	45	1476926.7		ppb
|>	Rh	103	1420995.9		ppb
|	Cd	111	4467.3	0.56372	ppb
|-	Cd	114	2623.4	0.14957	ppb
|>	Ho	165	1912720.8		ppb
|-	Pb	208	800307.4	9.12651	ppb
	Kr	83	94.7		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: 34539-3
Sample Dat Tuesday, April 07, 2020 10:23:20
Sample De: AIR
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1595191		ppb
|-	Be	9	169	0.01981	ppb
|-	Sc	45	1422142.3		ppb
|>	Rh	103	1403990.9		ppb
|	Cd	111	2620.4	0.33331	ppb
|-	Cd	114	-911.1	-0.05251	ppb
|>	Ho	165	1848276.2		ppb
|-	Pb	208	278387.8	3.24989	ppb
	Kr	83	95.3		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: 34539-3
Sample Dat Tuesday, April 07, 2020 10:25:17
Sample De: AIR
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1610849.4		ppb
|-	Be	9	289846.4	39.56897	ppb
|-	Sc	45	1438050.3		ppb
|>	Rh	103	1401562.9		ppb
|	Cd	111	316171.3	40.70656	ppb
|-	Cd	114	726111.7	41.97972	ppb
|>	Ho	165	1868001.7		ppb
|-	Pb	208	4417278.2	51.84254	ppb
	Kr	83	95		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: 34539-4
Sample Dat Tuesday, April 07, 2020 10:27:14
Sample De: AIR
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1656585.8		ppb
|-	Be	9	262.3	0.03132	ppb
|-	Sc	45	1463555.4		ppb
|>	Rh	103	1417576.2		ppb
|	Cd	111	2443.1	0.30748	ppb
|-	Cd	114	-208.1	-0.01204	ppb
|>	Ho	165	1883632.2		ppb
|-	Pb	208	130699.5	1.46719	ppb
	Kr	83	78.7		ppb

PerkinElmer NexIon 350X ICP-MS

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 1
Sample Dat Tuesday, April 07, 2020 10:29:12
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1678588.6		ppb
|-	Be	9	74.7	0.00629	ppb
|-	Sc	45	1401955.9		ppb
|>	Rh	103	1361249		ppb
|	Cd	111	151.2	0.01652	ppb
|-	Cd	114	174.3	0.01021	ppb
|>	Ho	165	1716171.1		ppb
|-	Pb	208	2916.4	-0.01826	ppb
	Kr	83	79.7		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 4
Sample Dat Tuesday, April 07, 2020 10:31:09
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1663882.9		ppb
|-	Be	9	785569.9	103.82314	ppb
|-	Sc	45	1404152.6		ppb
|>	Rh	103	1353765		ppb
|	Cd	111	747086.6	99.57599	ppb
|-	Cd	114	1730701	103.57755	ppb
|>	Ho	165	1689024.9		ppb
|-	Pb	208	7920915.8	102.85915	ppb
	Kr	83	96.7		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: 34539-4
Sample Dat Tuesday, April 07, 2020 10:39:14
Sample De: AIR
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1613232.2		ppb
|-	Be	9	158	0.01803	ppb
|-	Sc	45	1420968.8		ppb
|>	Rh	103	1357366.5		ppb
|	Cd	111	2200.9	0.28907	ppb
|-	Cd	114	-524.1	-0.0315	ppb
|>	Ho	165	1785907.8		ppb
|-	Pb	208	126470.5	1.49844	ppb
	Kr	83	83.7		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: 34539-4 FH
Sample Dat Tuesday, April 07, 2020 10:41:11
Sample De: AIR
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1486236.9		ppb
|-	Be	9	233.3	0.03104	ppb
|-	Sc	45	1297514.5		ppb
|>	Rh	103	1281765.9		ppb
|	Cd	111	2658.9	0.37079	ppb
|-	Cd	114	1634	0.10313	ppb
|>	Ho	165	1663986.6		ppb
|-	Pb	208	111636.8	1.41665	ppb
	Kr	83	82		ppb

PerkinElmer NexIon 350X ICP-MS

Method 6020 & 200.8 Metals Summary Report
Sample ID: 34539-4 c8A
Sample Dat Tuesday, April 07, 2020 10:43:08
Sample De: AIR
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1397432		ppb
|-	Be	9	40.7	0.0029	ppb
|-	Sc	45	945478.6		ppb
|>	Rh	103	1222569.2		ppb
|	Cd	111	53.9	0.00443	ppb
|-	Cd	114	122.2	0.00793	ppb
|>	Ho	165	1548893.2		ppb
|-	Pb	208	30370.3	0.37475	ppb
	Kr	83	65.3		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: 34539-4 c9
Sample Dat Tuesday, April 07, 2020 10:45:05
Sample De: AIR
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1558928.4		ppb
|-	Be	9	33.7	0.00126	ppb
|-	Sc	45	1308525.2		ppb
|>	Rh	103	1257477.7		ppb
|	Cd	111	192.1	0.02403	ppb
|-	Cd	114	-254.1	-0.01639	ppb
|>	Ho	165	1639314.2		ppb
|-	Pb	208	63384.5	0.7929	ppb
	Kr	83	67.7		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 1
Sample Dat Tuesday, April 07, 2020 10:47:02
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1659154.7		ppb
|-	Be	9	35.7	0.00123	ppb
|-	Sc	45	1390524		ppb
|>	Rh	103	1333488.7		ppb
|	Cd	111	76.1	0.00676	ppb
|-	Cd	114	81.8	0.00482	ppb
|>	Ho	165	1678992.6		ppb
|-	Pb	208	2196.7	-0.02684	ppb
	Kr	83	74		ppb

Method 6020 & 200.8 Metals Summary Report
Sample ID: QC Std 4
Sample Dat Tuesday, April 07, 2020 10:48:59
Sample Description:
Concentration Results

	Analyte	Mass	Meas. Intens	Conc. Mear	Report Unit
|>	Li	6	1656165		ppb
|-	Be	9	790141.2	104.91793	ppb
|-	Sc	45	1381778.7		ppb
|>	Rh	103	1349894.1		ppb
|	Cd	111	749189.6	100.14725	ppb
|-	Cd	114	1715045.6	102.94411	ppb
|>	Ho	165	1697144.5		ppb
|-	Pb	208	7887808.2	101.94646	ppb
	Kr	83	93.3		ppb

PerkinElmer FIMS-100 CVAA Mercury Analyzer

Sample_ID	Date	Time	Mean_Sig	Mean_Rd	Mean_Rt	Units	Alq.	Vol.	Sig 1	Reading-1	Result-1	Sig 2	Reading-2	Result-2	Cor. Coeff.
Calib Blank	3/27/2020	11:17:28 AM	6.89E-05			µg			8.17E-05			5.60E-05			
STD1 = .004ug	3/27/2020	11:19:10 AM	0.00053319			µg			0.00053524			0.00053113			
STD2 = .04ug	3/27/2020	11:20:53 AM	0.00501131			µg			0.00499621			0.00502641			
STD3 = .08ug	3/27/2020	11:22:35 AM	0.00993826			µg			0.00998914			0.00988737			
STD4 = .16ug	3/27/2020	11:24:29 AM	0.01959923			µg			0.01957194			0.01962653			
STD5 = .2ug	3/27/2020	11:26:22 AM	0.02440895			µg			0.02449319			0.02432471			
Reagent Blank	3/27/2020	11:28:14 AM	5.67E-05	0.00046315	0.00046315	µg			5.73E-05	0.00046774	0.00046774	5.62E-05	0.00045856	0.00045856	
0.004ug = DL	3/27/2020	11:33:21 AM	0.00052063	0.00425116	0.00425116	µg			0.00053253	0.00434828	0.00434828	0.00050874	0.00415403	0.00415403	0.999948226
0.080ug = QC STD 2	3/27/2020	11:35:02 AM	0.01008805	0.08237246	0.08237246	µg			0.01011565	0.08259786	0.08259786	0.01006044	0.08214707	0.08214707	0.999948226
Reagent Blank	3/27/2020	11:36:54 AM	-1.32E-06	-1.08E-05	-1.08E-05	µg			-4.41E-07	-3.60E-06	-3.60E-06	-2.20E-06	-1.79E-05	-1.79E-05	0.999948226
34539-1 BH	3/27/2020	11:42:14 AM	0.00014463	0.00071783	0.05832397	µg	4	325	0.00015223	0.00077987	0.06336443	0.00013704	0.0006558	0.05328351	0.999948226
34539-2 BH	3/27/2020	11:43:57 AM	0.00011885	0.00050729	0.04121721	µg	4	325	0.00011746	0.00049592	0.04029332	0.00012024	0.00051866	0.0421411	0.999948226
34539-2 BH DUP	3/27/2020	11:45:41 AM	8.99E-05	0.00027123	0.02203715	µg	4	325	8.93E-05	0.00026622	0.02162998	9.06E-05	0.00027624	0.02244431	0.999948226
34539-3 BH	3/27/2020	11:47:24 AM	8.09E-05	0.00019718	0.01552773	µg	4	315	8.41E-05	0.00022342	0.01759456	7.77E-05	0.00017093	0.01346091	0.999948226
34539-3 BH SPK	3/27/2020	11:49:06 AM	0.01008872	0.08191482	6.45079244	µg	4	315	0.01008568	0.08189002	6.44883872	0.01009176	0.08193963	6.45274616	0.999948226
34539-4 BH	3/27/2020	11:50:58 AM	0.00017769	0.00098775	0.04889363	µg	4	198	0.00017857	0.00099492	0.0492483	0.00017681	0.00098058	0.04853895	0.999948226
0.004ug = DL	3/27/2020	11:56:24 AM	0.00058776	0.00479927	0.00479927	µg			0.00061001	0.00498097	0.00498097	0.00056551	0.00461757	0.00461757	0.999948226
0.080ug = QC STD 2	3/27/2020	11:58:07 AM	0.01065138	0.08697231	0.08697231	µg			0.01063338	0.08682528	0.08682528	0.01066939	0.08711934	0.08711934	0.999948226
Reagent Blank	3/27/2020	11:59:59 AM	1.55E-05	0.00012656	0.00012656	µg			1.56E-05	0.0001274	0.0001274	1.54E-05	0.00012572	0.00012572	0.999948226
34539-1 A	3/27/2020	12:07:20 PM	4.09E-05	-0.0001291	-0.0064544	µg	4	200	4.33E-05	-0.0001097	-0.0054856	3.85E-05	-0.0001485	-0.0074232	0.999948226
34539-2 A	3/27/2020	12:09:04 PM	0.00015983	0.00084192	0.04209606	µg	4	200	0.00015149	0.00077379	0.0386895	0.00016817	0.00091005	0.04550262	0.999948226
34539-2 A DUP	3/27/2020	12:10:48 PM	0.0001361	0.00064818	0.03240922	µg	4	200	0.00014659	0.00073378	0.03668892	0.00012562	0.00056259	0.02812952	0.999948226
34539-3 A	3/27/2020	12:12:32 PM	0.00020608	0.00121957	0.06097828	µg	4	200	0.00020574	0.00121679	0.06083953	0.00020642	0.00122234	0.06111703	0.999948226
34539-3 A SPK	3/27/2020	12:14:16 PM	0.01008774	0.08190678	4.09533908	µg	4	200	0.01019657	0.08279548	4.13977382	0.0099789	0.08101809	4.05090434	0.999948226
34539-4 A	3/27/2020	12:16:08 PM	2.95E-05	-0.0002221	-0.0111046	µg	4	200	2.38E-05	-0.0002689	-0.0134472	3.53E-05	-0.0001752	-0.0087619	0.999948226
0.004ug = DL	3/27/2020	12:19:33 PM	0.00055568	0.00453736	0.00453736	µg			0.00056437	0.0046083	0.0046083	0.000547	0.00446643	0.00446643	0.999948226
0.080ug = QC STD 2	3/27/2020	12:21:15 PM	0.01078035	0.08802538	0.08802538	µg			0.01080332	0.08821297	0.08821297	0.01075738	0.08783779	0.08783779	0.999948226
0.080ug = QC STD 2	3/27/2020	12:23:07 PM	0.01075305	0.0878025	0.0878025	µg			0.01074544	0.08774029	0.08774029	0.01076067	0.0878647	0.0878647	0.999948226
Reagent Blank	3/27/2020	12:24:59 PM	5.20E-06	4.25E-05	4.25E-05	µg			8.16E-06	6.67E-05	6.67E-05	2.25E-06	1.83E-05	1.83E-05	0.999948226
34539-1 B	3/27/2020	12:33:43 PM	0.00024111	0.00150563	0.18820354	µg	4	500	0.00025322	0.00160449	0.20056079	0.00022901	0.00140677	0.1758463	0.999948226
34539-2 B	3/27/2020	12:35:26 PM	0.00025502	0.00161916	0.20239557	µg	4	500	0.00025596	0.00162686	0.20335734	0.00025408	0.00161147	0.2014338	0.999948226
34539-2 B DUP	3/27/2020	12:37:10 PM	0.00026556	0.00170527	0.21315936	µg	4	500	0.00026246	0.00167994	0.20999301	0.00026867	0.00173061	0.21632572	0.999948226
34539-3 B	3/27/2020	12:38:53 PM	0.00024077	0.00150285	0.18785563	µg	4	500	0.00023998	0.00149636	0.18704453	0.00024157	0.00150933	0.18866673	0.999948226
34539-3 B SPK	3/27/2020	12:40:38 PM	0.01063311	0.08635995	10.7949938	µg	4	500	0.01061104	0.08617971	10.7724638	0.01065518	0.08654019	10.8175237	0.999948226
34539-4 B	3/27/2020	12:42:32 PM	0.00010982	0.00043353	0.05419135	µg	4	500	0.00010548	0.00039814	0.04976812	0.00011415	0.00046892	0.05861457	0.999948226
0.004ug = DL	3/27/2020	12:44:14 PM	0.00053389	0.00435939	0.00435939	µg			0.00054161	0.00442246	0.00442246	0.00052616	0.00429632	0.00429632	0.999948226
0.080ug = QC STD 2	3/27/2020	12:45:56 PM	0.01070341	0.08739711	0.08739711	µg			0.01072611	0.08758251	0.08758251	0.0106807	0.08721172	0.08721172	0.999948226
Calib Blank	3/30/2020	10:00:31 AM	0.00019384			µg			0.00022004			0.00016764			
STD1 = .004ug	3/30/2020	10:02:12 AM	0.00034807			µg			0.00035065			0.00034549			
STD2 = .04ug	3/30/2020	10:03:55 AM	0.00386818			µg			0.00387876			0.00385759			
STD3 = .08ug	3/30/2020	10:05:38 AM	0.00802699			µg			0.008073			0.00798098			
STD4 = .16ug	3/30/2020	10:07:22 AM	0.01610661			µg			0.01618695			0.01602628			
STD5 = .2ug	3/30/2020	10:09:16 AM	0.02033764			µg			0.0203996			0.02027567			
Reagent Blank	3/30/2020	10:11:08 AM	-4.58E-05	-0.0004532	-0.0004532	µg			-2.52E-05	-0.0002489	-0.0002489	-6.65E-05	-0.0006576	-0.0006576	
0.004ug = DL	3/30/2020	10:12:50 AM	0.00040159	0.00397178	0.00397178	µg			0.00039427	0.00389938	0.00389938	0.00040891	0.00404417	0.00404417	0.999896818
0.080ug = QC STD 3	3/30/2020	10:14:32 AM	0.00830241	0.08211145	0.08211145	µg			0.00830189	0.08210629	0.08210629	0.00830293	0.0821166	0.0821166	0.999896818
0.080ug = QC STD 2	3/30/2020	10:16:14 AM	0.00835095	0.08259151	0.08259151	µg			0.00835813	0.08266256	0.08266256	0.00834377	0.08252046	0.08252046	0.999896818
Reagent Blank	3/30/2020	10:17:55 AM	-5.27E-05	-0.0005215	-0.0005215	µg			-6.79E-05	-0.0006716	-0.0006716	-3.75E-05	-0.0003713	-0.0003713	0.999896818
34539-1 C	3/30/2020	10:23:15 AM	6.70E-05	0.00111618	0.11161832	µg	4	400	6.87E-05	0.00113242	0.11324182	6.54E-05	0.00109995	0.10999481	0.999896818
34539-2 C	3/30/2020	10:24:59 AM	0.00018972	0.00232953	0.23295296	µg	4	400	0.00018513	0.00228417	0.22841735	0.0001943	0.00237489	0.23748857	0.999896818
34539-2 C DUP	3/30/2020	10:26:44 AM	0.00016616	0.0020966	0.20966042	µg	4	400	0.00016346	0.00206988	0.20698824	0.00016887	0.00212333	0.2123326	0.999896818
34539-3 C	3/30/2020	10:28:27 AM	8.81E-05	0.0013248	0.13248037	µg	4	400	9.05E-05	0.00134859	0.13485883	8.57E-05	0.00130102	0.13010191	0.999896818
34539-3 C SPK	3/30/2020	10:30:09 AM	0.00870254	0.08652202	8.65220244	µg	4	400	0.00874029	0.08689531	8.68953066	0.0086648	0.08614874	8.61487422	0.999896818
34539-4 C	3/30/2020	10:31:50 AM	-1.76E-05	0.00027908	0.0279084	µg	4	400	-2.44E-05	0.00021174	0.02117412	-1.08E-05	0.00034643	0.03464267	0.999896818
0.004ug = DL	3/30/2020	10:37:07 AM	0.0003893	0.00385023	0.00385023	µg			0.00038289	0.00378682	0.00378682	0.00039571	0.00391364	0.00391364	0.999896818
0.080ug = QC STD 2	3/30/2020	10:38:49 AM	0.00881161	0.08714751	0.08714751	µg			0.00881257	0.08715698	0.08715698	0.00881066	0.08713805	0.08713805	0.999896818
Reagent Blank	3/30/2020	10:40:31 AM	-5.81E-05	-0.0005745	-0.0005745	µg			-6.34E-05	-0.0006273	-0.0006273	-5.27E-05	-0.0005216	-0.0005216	0.999896818
Calib Blank	4/1/2020	8:50:14 AM	0.00026013			µg			0.00027879			0.00024147			
STD1 = .004ug	4/1/2020	8:51:56 AM	0.00048125			µg			0.00051502			0.00044748			
STD2 = .04ug	4/1/2020	8:53:39 AM	0.00527551			µg			0.00529638			0.00525464			
STD3 = .08ug	4/1/2020	8:55:22 AM	0.01090638			µg			0.01095342			0.01085935			
STD4 = .16ug	4/1/2020	8:57:17 AM	0.02197066			µg			0.02204571			0.02189562			
STD5 = .2ug	4/1/2020	8:59:10 AM	0.02777864			µg			0.02789701			0.02766027			
Reagent Blank	4/1/2020	9:01:01 AM	4.55E-05	0.00032967	0.00032967	µg			5.68E-05	0.00041165	0.00041165	3.42E-05	0.00024769	0.00024769	
0.004ug = DL	4/1/2020	9:02:43 AM	0.00048461	0.00351221	0.00351221	µg			0.0004791	0.00347225	0.00347225	0.00049012	0.00355218	0.00355218	0.999875936
0.080ug = QC STD 3	4/1/2020	9:04:26 AM	0.01101713	0.07984688	0.07984688	µg			0.01106039	0.08016039	0.08016039	0.01097387	0.07953336	0.07953336	0.999875936
0.080ug = QC STD 2	4/1/2020	9:06:18 AM	0.01123322	0.08141295	0.08141295	µg			0.01126936	0.0816749	0.0816749	0.01119707	0.081151	0.081151	0.999875936
Reagent Blank	4/1/2020	9:08:10 AM	6.06E-05	0.00043911	0.00043911	µg			6.59E-05	0.00047751	0.00047751	5.53E-05	0.00040072	0.00040072	0.999875936
34539 LRB FH	4/1/2020	9:26:33 AM	-0.0001442	-0.0013747	-0.0343681	µg	4	100	-0.0001521	-0.001432	-0.035801	-0.0001363	-0.0013174	-0.0329351	0.999875936
0.004ug = DL	4/1/2020	9:28:15 AM	0.00055424	0.00401687	0.00401687	µg			0.00057035	0.00413362	0.00413362	0.00053813	0.00390012	0.00390012	0.999875936
0.080ug = QC STD 2	4/1/2020	9:29:57 AM	0.01163487	0.08432392	0.08432392	µg			0.01164481	0.08439599	0.08439599	0.01162492	0.08425185	0.08425185	0.999875936
Reagent Blank	4/1/2020	9:31:49 AM	2.64E-05	0.00019112	0.00019112	µg			1.88E-05	0.00013621	0.00013621	3.39E-05	0.00024602	0.00024602	0.999875936
34539 LRB FH SPK	4/1/2020	9:33:30 AM	0.0097825	0.07056916	4.41057237	µg	1.6	100	0.00979916	0.0706899	4.41811891	0.00976584	0.07044841	4.40302584	0.999875936
34539-1 FH	4/1/2020	9:35:24 AM	-6.99E-05	-0.0008363	-0.0209067	µg	4	100	-5.51E-05	-0.0007293	-0.0182323	-8.47E-05	-0.0009432	-0.023581	0.999875936
34539-2 FH	4/1/2020	9:37:06 AM	-6.95E-05	-0.0008332	-0.0208305	µg	4	100	-8.02E-05	-0.0009109	-0.0227726	-5.88E-05	-0.0007555	-0.0188884	0.999875936
34539-2 FH DUP	4/1/2020	9:38:49 AM	-1.87E-05	-0.0004652	-0.0116309	µg	4	100	-1.34E-05	-0.0004271	-0.0106778	-2.40E-05	-0.0005034	-0.0125841	0.999875936
34539-3 FH	4/1/2020	9:40:33 AM	-0.0001394	-0.0013397	-0.0334931	µg	4	100	-0.0001434	-0.001369	-0.0342249	-0.0001353	-0.0013105	-0.0327614	0.999875936
34539-3 FH SPK	4/1/2020	9:42:17 AM	0.01157069	0.08352915	2.08822868	µg	4	100	0.01160308	0.08376384	2.09409605	0.01153831	0.08329445	2.08236132	0.999875936
34539-4 FH	4/1/2020	9:44:12 AM	-0.0001412	-0.0013527	-0.0338177	µg	4	100	-0.000155	-0.0014527	-0.0363179	-0.0001274	-0.0012527	-0.0313176	0.999875936
0.004ug = DL	4/1/2020	9:51:02 AM	0.0005378	0.0038977	0.0038977	µg			0.00053111	0.00384921	0.00384921	0.00054449	0.00394619	0.00394619	0.999875936
0.080ug = QC STD 2	4/1/2020	9:52:44 AM	0.01176238	0.08524809	0.08524809	µg			0.01178688	0.08542566	0.08542566	0.01173788	0.08507052	0.08507052	0.999875936
Reagent Blank	4/1/2020	9:54:36 AM	7.36E-05	0.00053335	0.00053335	µg			7.31E-05	0.00053002	0.00053002	7.41E-05	0.00053669	0.00053669	0.999875936

SLUDGE LAB REPORT

April 29, 2020

Service Request No:T2000501

Derek Stephens
Advanced Industrial Resources
3407 Novis Pointe
Acworth, GA 30101

Laboratory Results for: Green Bay MSD

Dear Derek,

Enclosed are the results of the sample(s) submitted to our laboratory March 25, 2020
For your reference, these analyses have been assigned our service request number **T2000501.**

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results
apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

R.V. Poulsen

Ralph Poulsen

ADDRESS 4208 S Santa Rita Avenue, Tucson, AZ 85714
PHONE +1 520 573 1061 | FAX +1 520 623 9218
ALS Group USA, Corp.
dba ALS Environmental

ED_012958_00010534-00162

Data Qualifiers

Lab Standard

+	Possible Tedlar bag artifact.
A	TIC is a suspected aldol-condensation product
B	Analyte found in the associated method blank as well as in the sample.
BC	Reported results are not blank corrected.
BH	The back section of the tube yielded higher results than the front.
BT	Results indicated possible breakthrough; back section >=10% front section.
C	Result identification confirmed.
D	Compound identified in an analysis at a secondary dilution factor
D	Spike was diluted out
DE	Reported results are corrected for desorption efficiency.
E	Estimated value. Concentration above calibration range
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
H1	Sample analysis performed past holding time. See case narrative.
H2	Initial analysis within holding time. Reanalysis for the required dilution was past holding time.
H3	Sample was received and analyzed past holding time.
H4	Sample was extracted past required extraction holding time, but analyzed within analysis holding time. See case narrative.
I	Internal standard not within the specified limits. See case narrative.
J	Estimated Value. Concentration found below MRL.
K	A deflection in the QC ion may indicate interference with the quantitation of this ion. The concentration of this analyte should be considered as an estimate.
K	Analyte was detected above the method reporting limit prior to normalization.
L1	Laboratory control sample recovery outside the specified limits; results may be biased high.
L2	Laboratory control sample recovery outside the specified limits; results may be biased low.
L3	Laboratory control sample recovery outside the specified limits.
M	Matrix interference; results may be biased high.
M	The duplicate injection precision not met.
M1	Matrix interference due to coelution with a non-target compound; results may be biased high.
N	Presumptive evidence of a compound for TICs that have been identified based on a mass spectral library search.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
P	Indicates chlorodiphenyl ether interference present at the retention time of the target compound.
P	Pesticide/Aroclor target analyte > 40% difference for detected concentrations between GC columns
Q	Indicates as estimated value because the P and P + 2 theoretical abundance ratio does not meet method criteria.
R	Duplicate Precision not met.
R1	Duplicate precision not within the specified limits; however, the results are below the MRL and considered estimated.
S	Surrogate recovery not within specified limits.

ED_012958_00010534-00163

Data Qualifiers

Lab Standard

S The reported value was determined by the Method of Standard Additions (MSA).
T Analyte is a tentatively identified compound, result is estimated.
U Compound was analyzed for, but was not detected (ND).
V1 The continuing calibration verification standard was outside (biased high) the specified limits for this compound.
V2 The continuing calibration verification standard was outside (biased low) the specified limits for this compound.
W Result quantified, but the corresponding peak was detected outside the generated retention time window.
W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
X See case narrative.
Y Recovery outside limits
Y The chromatogram resembles a petroleum product but does not match the calibration standard.
Z The chromatogram does not resemble a petroleum product.
i The MRL/MDL has been elevated due to a matrix interference.

ED_012958_00010534-00164

T2000501 5

Advanced Industrial Resources
Green Bay MSD

CHAIN OF CUSTODY / LABORATORY ANALYSIS REQUEST FORM

ALS Environmental
4208 S Santa Rita Rd, Tuscon, AZ 8514 / Phone (520) 573-1061

www.alsglobal.com

Page 1 of 4

Project Name	Project Number
Green Bay MSD	KR-10426
Report To: Derek Stephens - AIR	Report CC: dstephens@airtest1.com
Company/Address: 3407 Novis Pointe, Acworth, GA 30101	
Phone #: 800-224-5007	FAX #: 404-845-0020
Sampler's Signature: Will Bergagnoni for Dan Kirk	Sampler's Printed Name: Dan Kirk

ANALYSIS REQUESTED (Include Method Number and Container Preservative)

Preservative Key: 0. None; 1. HCL; 2. HNO3; 3. H2SO4; 4. NaOH; 5. Zn. Acetate; 6. MeOH; 7. NaHSO4

CLIENT SAMPLE ID			LAB ID	SAMPLING DATE	SAMPLING TIME	Matrix	NUMBER OF CONTAINERS	Total Solids (@105°C)	Fixed Solids (@550°C)	Volatile/Combustibles Solids	Mercury	Wet density (lbs/gal)	heat content - Btu/lb 'as received' & 'dry basis'	REMARKS
KR-10426	1	Sludge #	1A	Run 1	3/18/20	11:20	Solid (Dewatered Sludge)	1	X			X		Method 5/26A - Runs 1, 2, & 3 - *Use portions of Grab Sample Sludge # 1D2A to add to Run 1 & Run 2 Composite samples. *Use portions of Grab Sample Sludge # 2D3A to add to Run 2 and Run 3 Composite samples.
KR-10426	2	Sludge #	1B	Run1	3/18/20	11:50		1						
KR-10426	3	Sludge #	1C	Run 1	3/18/20	12:20		1						
KR-10426	4	Sludge #	1D2A	Run 1	3/18/20	12:50		1						
				Run 2				1	X			X		
KR-10426	5	Sludge #	2B	Run 2	3/18/20	13:20		1						
KR-10426	6	Sludge #	2C	Run 2	3/18/20	13:50		1						
KR-10426	7	Sludge #	2D3A	Run 2	3/18/20	14:20		1						
				Run 3				1	X			X		
KR-10426	8	Sludge #	3B	Run 3	3/18/20	14:50		1						
KR-10426	9	Sludge #	3C	Run 3	3/18/20	15:20		1						
KR-10426	10	Sludge #	3D	Run 3	3/18/20	15:50		1						

Special Instructions/Comments:

Two (2) Composite samples are to be generated from each set of respective Run grab samples. One (1) of the Composite samples will be analyzed and the 2nd duplicate composite sample will be held for later analysis, only if found necessary.

TURNAROUND REQUIREMENTS
- ___ RUSH (SURCHARGES APPLY)
- ___ STANDARD
- REQUESTED FAX DATE
- REQUESTED REPORT DATE

REPORT REQUIREMENTS
- I. Results Only
- X II. Results + QC Summaries (LCS, DUP, MS/MSD as required)
- III. Results + QC and Calibration Summaries
- IV. Data Validation Report with Raw Data
- Edata ___ Yes ___ No

INVOICE INFORMATION
- P.O. # KR-10426
- Bill to: AIR, PO Box 846, Marietta, GA 30061

Relinquished By	Received By	Relinquished By	Received By	Relinquished By	Received By
Signature: Will Bergagnoni	Signature: [illegible]	Signature	Signature	Signature	Signature
Printed Name: Will Bergagnoni	Printed Name	Printed Name	Printed Name	Printed Name	Printed Name
Firm: AIR	Firm	Firm	Firm	Firm	Firm
Date/Time: 3/25/20 11:40	Date/Time: 3/25/20 1028	Date/Time	Date/Time	Date/Time	Date/Time

ED_012958_00010534-00165

T2000501 5
Advanced Industrial Resources
Green Bay MSD

CHAIN OF CUSTODY / LABORATORY ANALYSIS REQUEST FORM

ALS Environmental
4208 S Santa Rita Rd, Tuscon, AZ 8514 / Phone (520) 573-1061
www.alsglobal.com

Project Name	Project Number
Green Bay MSD	KR-10426
Report To: Derek Stephens - AIR	Report CC: dstephens@airtest1.com
Company/Address: 3407 Novis Pointe, Acworth, GA 30101	
Phone #: 800-224-5007	FAX #: 404-845-0020
Sampler's Signature: Will Borgognoni for Dan Kirk	Sampler's Printed Name: Dan Kirk

ANALYSIS REQUESTED (Include Method Number and Container Preservative)

Preservative Key: 0. None; 1. HCL; 2. HNO3; 3. H2SO4; 4. NaOH; 5. Zn. Acetate; 6. MeOH; 7. NaHSO4

CLIENT SAMPLE ID	LAB ID	SAMPLING DATE	SAMPLING TIME	Matrix	NUMBER OF CONTAINERS	Total Solids (@105°C)	Fixed Solids (@550°C)	Volatile/Combustibles Solids	Mercury	Wet density	heat content - Btu/lb 'as received' & 'dry basis'	REMARKS
KR-10426 86 Sludge # 4A	Run 1	3/19/20	7:00	Solid (Dewatered Sludge)	1	X	X	X	X	X	X	Method 23/29 Run #1
KR-10426 87 Sludge # 4B	Run 1	3/19/20	7:30		1							
KR-10426 88 Sludge # 4C	Run 1	3/19/20	8:00		1							
KR-10426 89 Sludge # 4D	Run 1	3/19/20	8:30		1							
KR-10426 90 Sludge # 4E	Run 1	3/19/20	9:00		1							
KR-10426 91 Sludge # 4F	Run 1	3/19/20	9:30		1							
KR-10426 92 Sludge # 4G	Run 1	3/19/20	10:00		1							
KR-10426 93 Sludge # 4H	Run 1	3/19/20	10:30		1							

Special Instructions/Comments:

Two (2) Composite samples are to be generated from each set of respective Run grab samples. One (1) of the Composite samples will be analyzed and the 2nd duplicate composite sample will be held for later analysis, only if found necessary.

TURNAROUND REQUIREMENTS
___ RUSH (SURCHARGES APPLY)
___ STANDARD
REQUESTED FAX DATE
REQUESTED REPORT DATE

REPORT REQUIREMENTS
___ I. Results Only
X II. Results + QC Summaries (LCS, DUP, MS/MSD as required)
___ III. Results + QC and Calibration Summaries
___ IV. Data Validation Report with Raw Data
Edata ___ Yes ___ No

INVOICE INFORMATION
P.O. # KR-10426
Bill to: AIR
PO Box 846
Marietta, GA 30061

Relinquished By	Received By	Relinquished By	Received By	Relinquished By	Received By
Signature: Will Borgognoni	Signature: [illegible]	Signature	Signature	Signature	Signature
Printed Name: Will Borgognoni	Printed Name	Printed Name	Printed Name	Printed Name	Printed Name
Firm: AIR	Firm	Firm	Firm	Firm	Firm
Date/Time: 3/25/20 11:40	Date/Time: 3/25/20 1028	Date/Time	Date/Time	Date/Time	Date/Time

T2000501 5

Advanced Industrial Resources
Green Bay MSD

CHAIN OF CUSTODY / LABORATORY ANALYSIS REQUEST FORM

ALS Environmental
4208 S Santa Rita Rd, Tuscon, AZ 8514 / Phone (520) 573-1061
www.alsglobal.com

Page 3 of 4

Project Name	Project Number
Green Bay MSD	KR-10426
Report To: Derek Stephens - AIR	Report CC: dstephens@airtest1.com
Company/Address: 3407 Novis Pointe, Acworth, GA 30101	
Phone #: 800-224-5007	FAX #: 404-845-0020
Sampler's Signature: [signature]	Sampler's Printed Name: Dan Kirk

ANALYSIS REQUESTED (Include Method Number and Container Preservative)

Preservative Key: 0. None; 1. HCL; 2. HNO3; 3. H2SO4; 4. NaOH; 5. Zn. Acetate; 6. MeOH; 7. NaHSO4

CLIENT SAMPLE ID	LAB ID	SAMPLING DATE	SAMPLING TIME	Matrix	NUMBER OF CONTAINERS	Total Solids (@105°C)	Fixed Solids (@550°C)	Volatile/Combustibles Solids	Mercury	Wet density	heat content - Btu/lb 'as received' & 'dry basis'	REMARKS
KR-10426 94 Sludge # 5A	Run 2	3/19/20	11:00	Solid (Dewatered Sludge)	1	X	X	X	X	X	X	Method 23/29 Run #2
KR-10426 95 Sludge # 5B	Run 2	3/19/20	11:30		1							
KR-10426 96 Sludge # 5C	Run 2	3/19/20	12:00		1							
KR-10426 97 Sludge # 5D	Run 2	3/19/20	12:30		1							
KR-10426 98 Sludge # 5E	Run 2	3/19/20	13:00		1							
KR-10426 99 Sludge # 5F	Run 2	3/19/20	13:30		1							
KR-10426 100 Sludge # 5G	Run 2	3/19/20	14:00		1							
KR-10426 101 Sludge # 5H	Run 2	3/19/20	14:30		1							

Special Instructions/Comments:

Two (2) Composite samples are to be generated from each set of respective Run grab samples. One (1) of the Composite samples will be analyzed and the 2nd duplicate composite sample will be held for later analysis, only if found necessary.

TURNAROUND REQUIREMENTS
___ RUSH (SURCHARGES APPLY)
___ STANDARD
REQUESTED FAX DATE
REQUESTED REPORT DATE

REPORT REQUIREMENTS
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X II. Results + QC Summaries (LCS, DUP, MS/MSD as required)
___ III. Results + QC and Calibration Summaries
___ IV. Data Validation Report with Raw Data
Edata ___ Yes ___ No

INVOICE INFORMATION
P.O. # KR-10426
Bill to: AIR
PO Box 846
Marietta, GA 30061

Relinquished By	Received By	Relinquished By	Received By	Relinquished By	Received By
Signature: [signature]	Signature: [signature]	Signature	Signature	Signature	Signature
Printed Name: Will Borgognoni	Printed Name	Printed Name	Printed Name	Printed Name	Printed Name
Firm: AIR	Firm	Firm	Firm	Firm	Firm
Date/Time: 3/25/20 11:40	Date/Time: 3/25/20 1028	Date/Time	Date/Time	Date/Time	Date/Time

T2000501 5

Advanced Industrial Resources
Green Bay MSD

CHAIN OF CUSTODY / LABORATORY ANALYSIS REQUEST FORM

ALS Environmental
4208 S Santa Rita Rd, Tucson, AZ 8514 / Phone (520) 573-1061

www.alsglobal.com

Page 4 of 4

Project Name	Project Number
Green Bay MSD	KR-10426
Report To: Derek Stephens - AIR	Report CC: dstephens@airtest1.com
Company/Address: 3407 Novis Pointe, Acworth, GA 30101	
Phone #: 800-224-5007	FAX #: 404-845-0020
Sampler's Signature: Will Borgognoni for Dan Kirk	Sampler's Printed Name: Dan Kirk

ANALYSIS REQUESTED (Include Method Number and Container Preservative)

Preservative Key: 0. None; 1. HCL; 2. HNO3; 3. H2SO4; 4. NaOH; 5. Zn. Acetate; 6. MeOH; 7. NaHSO4

CLIENT SAMPLE ID	LAB ID	SAMPLING DATE	SAMPLING TIME	Matrix	NUMBER OF CONTAINERS	Total Solids (@105°C)	Fixed Solids (@550°C)	Volatile/Combustibles Solids	Mercury	Wet density	heat content - Btu/lb 'as received' & 'dry basis'	REMARKS
KR-10426 102 Sludge # 6A	Run 3	3/19/20	15:00	Solid (Dewatered Sludge)	1	X			X	X	X	Method 23/29 Run #3
KR-10426 103 Sludge # 6B	Run 3	3/19/20	15:30		1							
KR-10426 104 Sludge # 6C	Run 3	3/19/20	16:00		1							
KR-10426 105 Sludge # 6D	Run 3	3/19/20	16:30		1							
KR-10426 106 Sludge # 6E	Run 3	3/19/20	17:00		1							
KR-10426 107 Sludge # 6F	Run 3	3/19/20	17:30		1							
KR-10426 108 Sludge # 6G	Run 3	3/19/20	18:00		1							

Special Instructions/Comments:

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___ RUSH (SURCHARGES APPLY)
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REQUESTED REPORT DATE

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___ IV. Data Validation Report with Raw Data
Edata ___ Yes ___ No

INVOICE INFORMATION
P.O. # KR-10426
Bill to: AIR
PO Box 846
Marietta, GA 30061

Relinquished By	Received By	Relinquished By	Received By	Relinquished By	Received By
Signature: Will Borgognoni	Signature: [illegible]	Signature	Signature	Signature	Signature
Printed Name: Will Borgognoni	Printed Name	Printed Name	Printed Name	Printed Name	Printed Name
Firm: AIR	Firm	Firm	Firm	Firm	Firm
Date/Time: 3/25/20 11:40	Date/Time: 3/25/20 1022	Date/Time	Date/Time	Date/Time	Date/Time

4208 S.Santa Rita Ave.
Tucson, AZ 85714
T: +1 520 573 1061
www.alsglobal.com

Sample Receipt Form

T2000501 5
Advanced Industrial Resources
Green Bay MSD

Client/Project: Advanced Ind Resources Work Order Number:

Received by: Cynthia Vroegh Date & Time: 3/25/20 1028 Matrix: Solid

Samples were received via?: UPS Samples were received in: Cooler

Were custody seals on containers? ○ Yes ◉ No ○ NA If yes, how many and where?

If present were custody seals intact? ○ Yes ◉ No If present, were they signed and dated? ○ Yes ◉ No

Arrival Temp C	Temp Blank C	Tracking Number
16.4	NA	1z 63a 1w5 01 9031 5278

Packing material used? Gel Packs | Bags | | |

Did all the bottles arrive in good condition (unbroken)? ◉ Yes ○ No ○ NA If No, record comments below

Did all sample labels and tags agree with COC? ◉ Yes ○ No ○ NA If No, record discrepancies below

Were all the appropriate containers and volumes received for the tests indicated? ◉ Yes ○ No ○ NA

Are samples received deemed acceptable? ◉ Yes ○ No

Comments:
33 - 500ml mason jars matching COC plus 2 - 500ml mason jars not COC marked Xtra

Notes, discrepancies, & resolutions:
FRIDGE E

As a part of ISO 17025 protocols, ALS must notify clients that the quoted analytical methods performed by ALS may have minor modifications from the methods as published. These modifications are written into our Standard Operating Procedures and do not impact the quality of the data. Receipt of this document will be considered an acceptance of the procedures used by the laboratory for analysis unless notified by the client.
Modifications may include, but are not limited to:

- The analysis of a sample matrix that differs from that stated in the published method (example - ASTM D5865 Standard Test Method for Gross Calorific Value of Coal and Coke is used for other matrices such as biomass, Tire Derived Fuel, etc.).
- Analyzing a sample mass that differs from those in the published method (example - to accommodate samples with high concentrations of analyte, samples of limited volume, or to comply with the instrument manufacturer's operating guidelines).
- Instruments used for the analysis may differ from those listed in the published method (example - using ICP- OES when the method references flame Atomic Absorption Spectroscopy)

ALS Environmental

Client: Advanced Industrial Resources
3407 Novis Pointe
Acworth, GA 30101

Attn: Derek Stephens
Project: Green Bay MSD

Date Received: March 25, 2020

Certificate of Analysis

Sample ID:	Sample Date & Time:	Lab #:	Moisture, Total	Solids, Total	Fixed Solids	Volatile Solids		Heating Value	
			D2974	D2974/SM 2540 G				D5865	
			wt%	wt%	Moist. Free wt%	Moist. Free wt%		As Received BTU/lb	Moist. Free BTU/lb
Sludge # Run 1	3/18/20 n/a	T2000501-001	67.18	32.82	32.94	67.06		2,253	6,866
Sludge # Run 2	3/18/20 n/a	T2000501-002	65.60	34.40	32.65	67.35		2,397	6,968
Sludge # Run 3	3/18/20 n/a	T2000501-003	64.93	35.07	31.98	68.02		2,465	7,029
Sludge # Run 4	3/19/20 n/a	T2000501-004	63.51	36.49	33.50	66.50		2,569	7,040
Sludge # Run 5	3/19/20 n/a	T2000501-005	63.84	36.16	34.66	65.34		2,494	6,899
Sludge # Run 6	3/19/20 n/a	T2000501-006	65.48	34.52	32.95	67.05		2,418	7,006

Revised 4/29/2020 to add Bulk Density values in lb/gal units and to correct the Bulk Density Value for sample T2000501-006. Also corrected the method reference for the Particle Density test. This report replaces *Rpt-T2000501 Advanced Industrial Resources Stephens*.

ALS Environmental

Client: Advanced Industrial Resources
3407 Novis Pointe
Acworth, GA 30101

Attn: Derek Stephens
Project: Green Bay MSD

Date Received: March 25, 2020

Certificate of Analysis

Sample ID:	Sample Date & Time:	Lab #:	Mercury D6722	Bulk Density (measured) E873 mod				Particle Density D854	Bulk Density (calculated theoretical)
			Moist Free ppb	As Received g/cm^3	Moist. Free g/cm^3	As Received lb/gal	Moist. Free lb/gal	Moist. Free g/cm^3	As Received lb/gal
Sludge # Run 1	3/18/20 n/a	T2000501-001	n/a	0.653	0.214	5.449	1.788	1.630	10.072
Sludge # Run 2	3/18/20 n/a	T2000501-002	n/a	0.753	0.259	6.283	2.162	1.570	9.981
Sludge # Run 3	3/18/20 n/a	T2000501-003	n/a	0.804	0.282	6.709	2.353	1.648	10.242
Sludge # Run 4	3/19/20 n/a	T2000501-004	306	0.958	0.349	7.991	2.916	1.663	10.364
Sludge # Run 5	3/19/20 n/a	T2000501-005	570	0.887	0.321	7.400	2.676	1.627	10.237
Sludge # Run 6	3/19/20 n/a	T2000501-006	505	0.882	0.266	7.361	2.224	1.565	9.973

Note - The Measured Bulk Density of the samples was measured by determining the volume and weight of as received sample is the glass 16oz jars. The Measured Bulk Density values will have a low bias compared to the Theoretical Bulk Density and will vary between sample to sample due to air voids in the samples. No attempt was made to remove the air voids through sample compaction.

The Theoretical Bulk Density was calculated using the following equation:
Bulk Density lb/gal =(Particle Density X (100 - Moisture wt%/100 + Moisturewt%/100) x 8.3454 (the 8.3454 factor is the conversion from g/cm3 to lb/gal)

APPENDIX F

CALIBRATION DATA

Advanced Industrial Resources, Inc.

Dry Gas Meter Calibration Data

Dry Gas Meter	
Console ID:	C-009
Serial Number:	28507

Reference Meter	
Meter ID:	M5RFM1
Calibration Factor, Y_w:	1.0006

Date: 06/24/19 **Performed By:** LS

Barometric Pressure, P_b (in. Hg): 29.01 **Reviewed By:**

Data								
				Temperatures (°F)				Time Elapsed
		Reference	Dry Gas	Reference	Dry Gas Meter			
Vacuum (in. Hg)	ΔH (in. H_2O)	Meter Volume V_w (ft^3)	Meter Volume V_m (ft^3)	Meter t_w	init. t_i	final t_f	avg. t_m	θ (min.)
5.0	0.50	5.154	5.103	91	82.0	83.0	82.5	11.50
5.0	1.00	5.079	5.058	91	83.0	84.0	83.5	8.20
5.0	2.00	5.087	5.109	91	86.0	86.0	86.0	6.00
5.0	3.00	5.441	5.505	91	86.0	88.0	87.0	5.25
5.0	4.00	5.046	5.136	91	89.0	90.0	89.5	4.25

Calculations						
ΔH (inches H_2O)	Y_m (dimensionless)	Variation		$ΔH_@$ (inches H_2O)	Variation (dimensionless)	
0.50	0.994	0.012		1.520	-0.120	
1.00	0.989	0.007		1.589	-0.051	
2.00	0.982	0.000		1.689	0.048	
3.00	0.974	-0.008		1.692	0.052	
4.00	0.971	-0.011		1.711	0.071	
Averages:	**0.982**			**1.640**		

Where:

Y_m is the ratio of the reading of the reference meter to that of the dry gas meter (DGM); variance limit: ±0.02.

$$Y_m = \frac{Y_w V_w P_b (t_m + 460)}{V_m (P_b + ΔH/13.6)(t_w + 460)}$$

$ΔH_@$ is the orifice pressure differential (inches H_2O) that corresponds to 0.75 cfm of air at 68 °F and 29.92 inches of mercury; variance limit: ±0.20.

$$ΔH_@ = \frac{0.0317\, ΔH\, ((t_w + 460)\quad)^2}{P_b (t_m + 460)(Y_w V_w)^2}$$

Advanced Industrial Resources, Inc.

Dry Gas Meter Calibration Data

Dry Gas Meter	
Console ID:	C-009
Serial Number:	

Reference Meter	
Meter ID:	MSRFM1
Calibration Factor, Y_w:	0.9980

Date:	03/25/20	Accepted Y_m:	0.982
Barometric Pressure, P_b (in. Hg):	29.74	Performed By:	SS

Data								
		Net	Net	Temperatures (°F)				Time
		Reference	Dry Gas	Reference	Dry Gas Meter			Elapsed
Vacuum	ΔH	Meter Volume	Meter Volume	Meter	init.	final	avg.	θ
(in. Hg)	(in. H_2O)	V_w (ft^3)	V_m (ft^3)	t_w	t_i	t_f	t_m	(min.)
5.0	3.00	6.075	6.268	53	48	50	49.0	6.00
5.0	3.00	6.090	6.312	54	50	52	51.0	6.00
5.0	3.00	6.024	6.283	55	53	54	53.5	6.00

Calculations						
ΔH (inches H_2O)	Y_m	Variation (dimensionless)		$ΔH_@$ (inches H_2O)	Variation (dimensionless)	
3.00	0.953	0.0027	**PASS**	1.619	-0.006	**PASS**
3.00	0.950	0.0003	**PASS**	1.611	-0.014	**PASS**
3.00	0.947	-0.0029	**PASS**	1.645	0.020	**PASS**
Averages:	**0.950**	**PASS**		**1.625**	**PASS**	

Calculations				
	Low Tolerance	High Tolerance	% diff	Pass or Fail?
****Note: Avg Y_m cannot be (< or >) 5% of the Accepted Y_M**	**0.933**	**1.031**	**3%**	**PASS**

Where:

Y_m is the ratio of the reading of the reference meter to that of the dry gas meter (DGM); variance limit: ±0.02.

$$Y_m = \frac{Y_w V_w P_b (t_m + 460)}{V_m (P_b + ΔH/13.6)(t_w + 460)}$$

$ΔH_@$ is the orifice pressure differential (inches H_2O) that corresponds to 0.75 cfm of air at 68 °F and 29.92 inches of mercury; variance limit: ±0.20.

$$ΔH_@ = \frac{0.0317\, ΔH\, ((t_w + 460)\quad)^2}{P_b (t_m + 460)(Y_w V_w)^2}$$

Advanced Industrial Resources, Inc.

Dry Gas Meter Calibration Data

Dry Gas Meter	
Console ID:	C16
Serial Number:	

Reference Meter	
Meter ID:	MSRFM - 1
Calibration Factor, Y_w:	0.998

Date: 12/12/19 **Performed By:** RB

Barometric Pressure, P_b (in. Hg): 29.45 **Reviewed By:**

Data								
				Temperatures (°F)				Time Elapsed
		Reference	Dry Gas	Reference	Dry Gas Meter			
Vacuum (in. Hg)	ΔH (in. H_2O)	Meter Volume V_w (ft^3)	Meter Volume V_m (ft^3)	Meter t_w	init. t_i	final t_f	avg. t_m	θ (min.)
7.0	0.50	5.772	5.904	76	67.0	67.0	67.0	15.00
7.0	1.00	5.512	5.636	76	68.0	68.0	68.0	10.00
7.0	1.50	6.833	6.993	76	69.0	69.0	69.0	10.00
7.0	2.00	6.270	6.431	76	71.0	71.0	71.0	8.00
7.0	2.50	7.057	7.242	76	72.0	72.0	72.0	8.00

Calculations						
ΔH (inches H_2O)	Y_m	Variation (dimensionless)		$\Delta H_@$ (inches H_2O)	Variation (dimensionless)	
0.50	0.958	-0.001	**PASS**	1.989	0.072	**PASS**
1.00	0.959	0.000	**PASS**	1.935	0.018	**PASS**
1.50	0.959	0.000	**PASS**	1.886	-0.032	**PASS**
2.00	0.959	0.000	**PASS**	1.904	-0.014	**PASS**
2.50	0.959	0.000	**PASS**	1.875	-0.043	**PASS**
Averages:	**0.959**	**PASS**		**1.918**	**PASS**	

Where:

Y_m is the ratio of the reading of the reference meter to that of the dry gas meter (DGM); variance limit: ±0.02.

$$Y_m = \frac{Y_w V_w P_b (t_m + 460)}{V_m (P_b + \Delta H/13.6)(t_w + 460)}$$

$\Delta H_@$ is the orifice pressure differential (inches H_2O) that corresponds to 0.75 cfm of air at 68 °F and 29.92 inches of mercury; variance limit: ±0.20.

$$\Delta H_@ = \frac{0.0317\, \Delta H\, ((t_w + 460)\quad)^2}{P_b (t_m + 460)(Y_w V_w)^2}$$

Advanced Industrial Resources, Inc.

Dry Gas Meter Calibration Data

Dry Gas Meter	
Console ID:	C-16
Serial Number:	1203009

Reference Meter	
Meter ID:	M5RFM1
Calibration Factor, Y_w:	0.9980

Date:	03/25/20	Accepted Y_m:	0.959
Barometric Pressure, P_b (in. Hg):	29.10	Performed By:	LS

Data								
		Net	Net	Temperatures (°F)				Time
		Reference	Dry Gas	Reference	Dry Gas Meter			Elapsed
Vacuum	ΔH	Meter Volume	Meter Volume	Meter	init.	final	avg.	θ
(in. Hg)	(in. H_2O)	V_w (ft^3)	V_m (ft^3)	t_w	t_i	t_f	t_m	(min.)
2.0	1.90	5.027	5.058	75	63	64	63.5	6.20
2.0	1.90	5.284	5.318	75	64	67	65.5	6.50
2.0	1.90	6.295	6.372	75	67	70	68.5	7.75

Calculations						
ΔH (inches H_2O)	Y_m	Variation (dimensionless)		$ΔH_@$ (inches H_2O)	Variation (dimensionless)	
1.90	0.966	-0.0023		1.728	0.013	
1.90	0.969	0.0012		1.713	-0.003	
1.90	0.969	0.0011		1.706	-0.010	
Averages:	**0.968**			**1.716**		

Calculations				
	Low Tolerance	High Tolerance	% diff	Pass or Fail?
**Note: Avg Y_m cannot be (< or >) 5% of the Accepted Y_M	**0.911**	**1.007**	**1%**	

Where:

Y_m is the ratio of the reading of the reference meter to that of the dry gas meter (DGM); variance limit: ±0.02.

$$Y_m = \frac{Y_w V_w P_b (t_m + 460)}{V_m (P_b + ΔH/13.6)(t_w + 460)}$$

$ΔH_@$ is the orifice pressure differential (inches H_2O) that corresponds to 0.75 cfm of air at 68 °F and 29.92 inches of mercury; variance limit: ±0.20.

$$ΔH_@ = \frac{0.0317\, ΔH\, ((t_w + 460)\quad)^2}{P_b (t_m + 460)(Y_w V_w)^2}$$

Environmental Supply Company, Inc.
Quality Source Sampling Systems & Accessories

15 POINT SECONDARY REFERENCE METER CALIBRATION

Date: 8/15/2019 DGM Model: T-110
Customer: Advanced Industrial Resources DGM S/N: 27979
Reference Prover: Cert.# A-610 Tape # 26727

Pb: 29.89 in Hg

Approx. Flow Rate (cfm) Q	Prover Volume (ft^3) V_w	DGM Volume (ft^3) V_{ds}	Temperature Prover (°F) t_w	Temperature DGM (°F) t_{ds}	Time (min) Φ	Flow Rate (cfm) Q	Meter Coefficient Y_{ds}	Average Meter Coefficient Y_{ds}
0.40	2.000	2.020	76.2	76.2	5.148	0.382	0.990	
0.40	2.000	2.019	76.1	76.1	5.117	0.384	0.991	
0.40	2.000	2.009	76.2	76.2	5.122	0.384	0.996	0.992
0.60	2.000	2.018	76.5	76.5	3.320	0.592	0.991	
0.60	2.000	2.017	75.9	75.9	3.318	0.593	0.992	
0.60	2.000	2.017	75.9	75.9	3.308	0.595	0.992	0.991
0.80	2.000	2.017	75.9	75.9	2.438	0.807	0.992	
0.80	2.000	2.017	76.2	76.2	2.432	0.809	0.992	
0.80	2.000	2.023	75.9	75.9	2.428	0.810	0.989	0.991
1.00	2.000	2.022	76.3	76.3	1.943	1.012	0.989	
1.00	2.000	2.017	75.6	75.6	1.947	1.011	0.992	
1.00	2.000	2.016	76.2	76.2	1.942	1.013	0.992	0.991
1.20	2.000	2.007	75.5	75.5	1.622	1.214	0.997	
1.20	2.000	2.016	75.5	75.5	1.623	1.213	0.992	
1.20	2.000	2.017	75.5	75.5	1.623	1.213	0.992	0.993

AVERAGE Y_{ds} **0.992**

$$Y_{ds} = \frac{V_w(t_{ds} + t_{std})}{V_{ds}(t_w + t_{std})} * \frac{P_{bar}}{\left(P_{bar} + P_m/13.6\right)}$$

$$Q = 17.64 \frac{P_{bar}}{(t_w + t_{std})} \frac{V_w}{\Phi}$$

Dry gas meter Serial Number 27979 was calibrated in accordance with the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 5 Section 16.1.1

Signature

708 E. Club Blvd., Durham, North Carolina 27704 www.environsupply.com 919-956-9688 FAX: 919-682-0333

Environmental Supply Company, Inc.

Quality Source Sampling Systems & Accessories

15 POINT SECONDARY REFERENCE METER CALIBRATION

Date: 8/27/2019 DGM Model: T-110

Customer: Advanced Industrial Resources DGM S/N: 356333

Reference Prover: Cert.# A-610 Tape # 26727

Pb: 29.86 in Hg

Approx. Flow Rate (cfm) Q	Prover Volume (ft³) V_w	DGM Volume (ft³) V_{ds}	Temperature Prover (°F) t_w	Temperature DGM (°F) t_{ds}	Time (min) Φ	Flow Rate (cfm) Q	Meter Coefficient Y_{ds}	Average Meter Coefficient Y_{ds}
0.40	2.000	1.998	77.9	75.8	5.092	0.385	0.997	
0.40	2.000	1.997	77.4	75.8	5.088	0.385	0.999	
0.40	2.000	1.998	77.4	75.7	5.097	0.385	0.998	0.998
0.60	2.000	2.004	75.8	75.8	3.290	0.598	0.998	
0.60	2.000	2.003	75.8	75.8	3.288	0.598	0.999	
0.60	2.000	2.003	75.8	75.8	3.285	0.599	0.999	0.998
0.80	2.000	2.006	75.8	75.8	2.453	0.801	0.997	
0.80	2.000	2.007	75.8	75.8	2.442	0.805	0.997	
0.80	2.000	2.001	75.5	75.5	2.440	0.806	1.000	0.998
1.00	2.000	2.001	75.9	75.9	1.918	1.025	1.000	
1.00	2.000	2.006	75.9	75.9	1.925	1.021	0.997	
1.00	2.000	2.010	75.9	75.9	1.928	1.019	0.995	0.997
1.20	2.000	2.007	75.9	75.9	1.595	1.232	0.997	
1.20	2.000	2.006	75.9	75.9	1.597	1.231	0.997	
1.20	2.000	2.006	75.9	75.9	1.588	1.238	0.997	0.997

AVERAGE Y_{ds} **0.998**

$$Y_{ds} = \frac{V_w(t_{ds} + t_{std})}{V_{ds}(t_w + t_{std})} * \frac{P_{bar}}{\left(P_{bar} + P_m/13.6\right)}$$

$$Q = 17.64 \frac{P_{bar}}{(t_w + t_{std})} \frac{V_w}{\Phi}$$

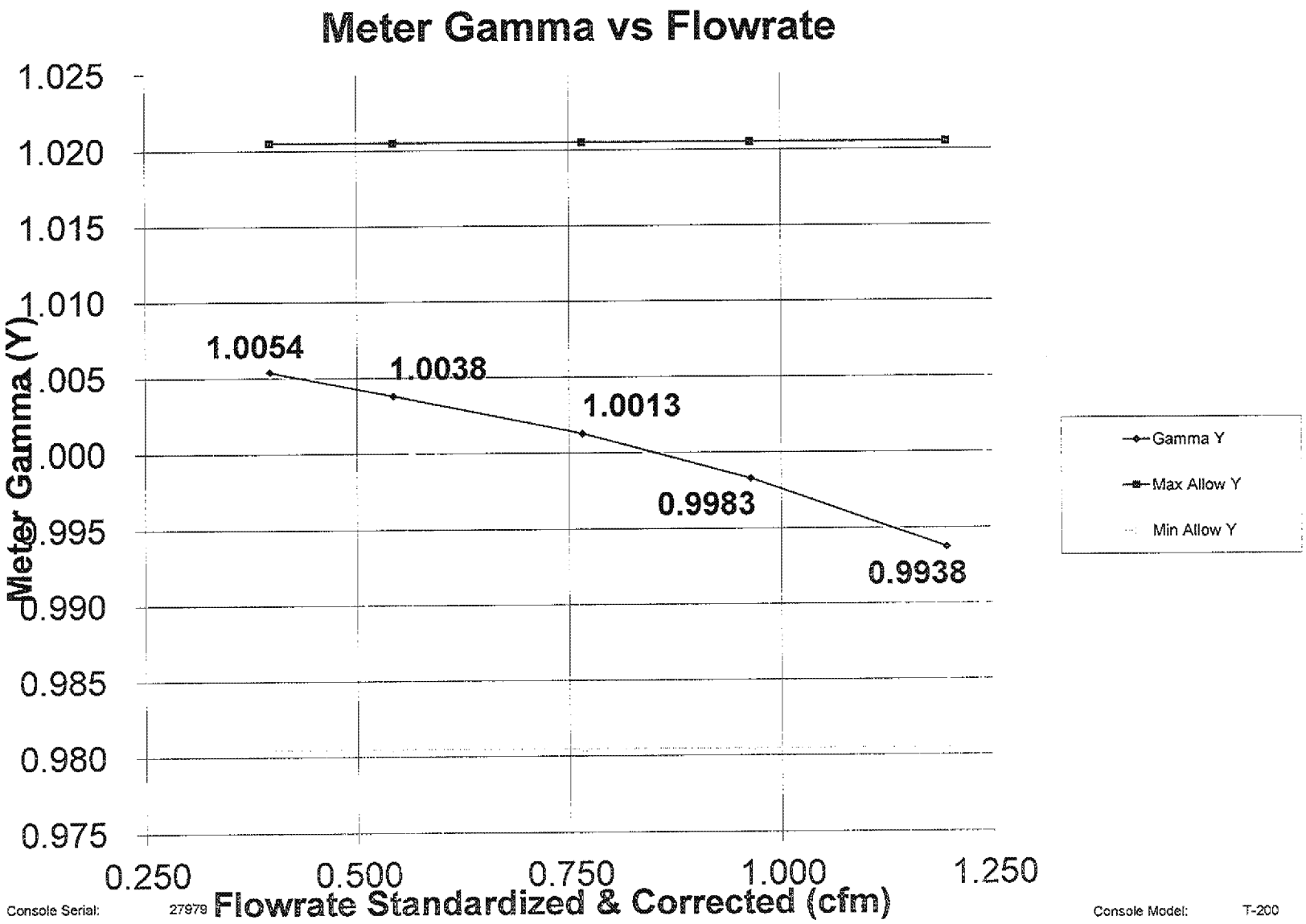
Dry gas meter Serial Number 356333 was calibrated in accordance with the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 5 Section 16.1.1

Signature

708 E. Club Blvd., Durham, North Carolina 27704 www.environsupply.com 919-956-9688 FAX: 919-682-0333

Calibration Date: 10-10-2017

Calibration Technician: EW

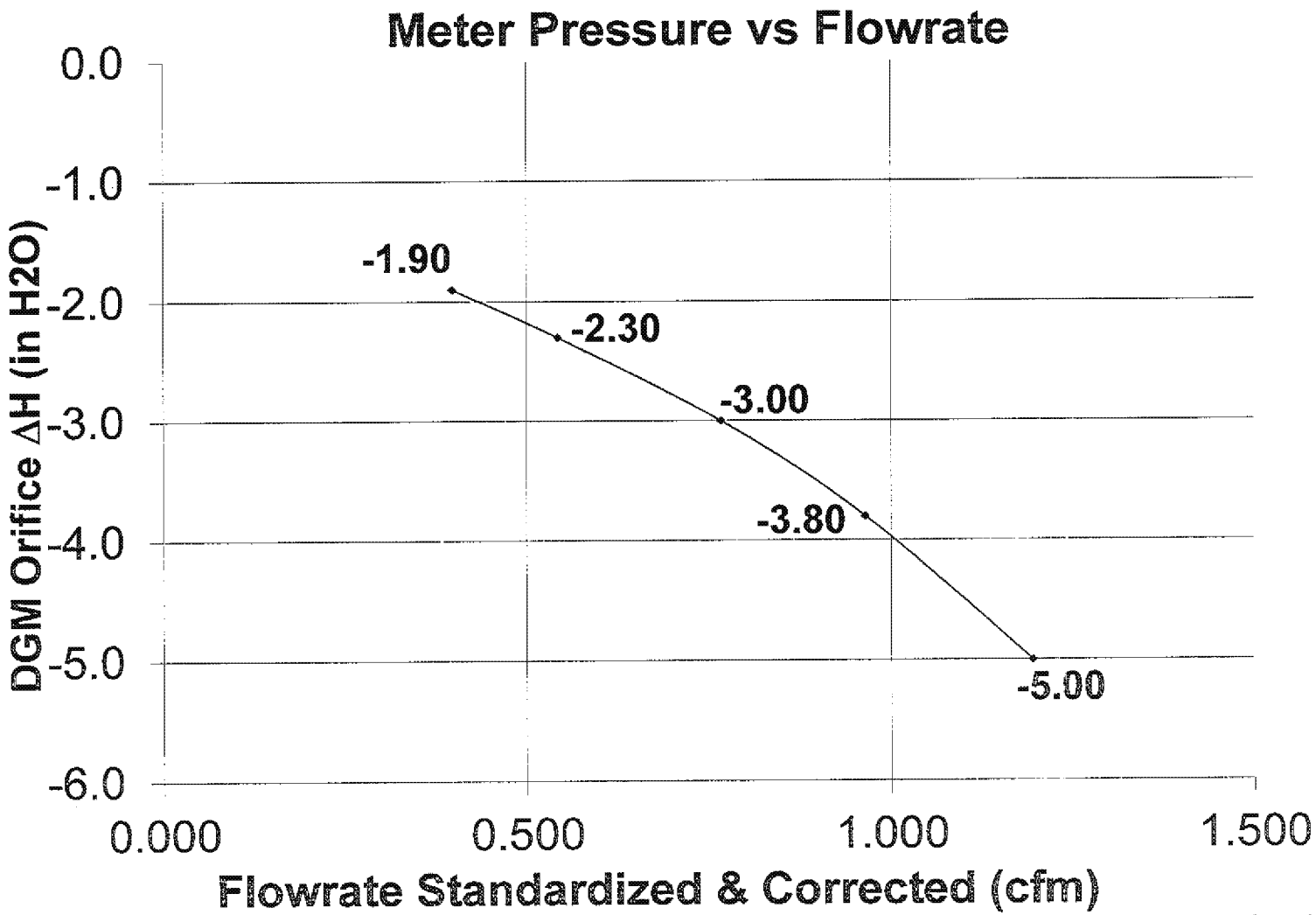


Console Serial: 27979

Console Model: T-200

Calibration Date: 10-10-2017

Calibration Technician: EW



Console Serial: 27979

Console Model: T-200

Advanced Industrial Resources, Inc.

Thermocouple Calibration Data

Thermometer ID: RT-01 ; RT-03 **Date:** 03/23/20

Bias: 0 **Performed By:** SS

Apparatus ID	Apparatus Description	Reference Temperature Reading		Indicated Temperature		Relative Variation
		°F	°R	°F	°R	%
P3-02	Stack Temp.	32	492	32	492	0.0
P3-02	Stack Temp.	210	670	210	670	0.0
B-16	Filter Temp.	32	492	33	493	0.2
B-16	Filter Temp.	210	670	210	670	0.0
B-16	Exit Imp. Temp.	32	492	32	492	0.0
B-16	Exit Imp. Temp.	210	670	211	671	0.1
C-016	Meter In Temp.	32	492	32	492	0.0
C-016	Meter In Temp.	210	670	210	670	0.0
C-016	Meter Out Temp.	32	492	33	493	0.2
C-016	Meter Out Temp.	210	670	211	671	0.1
B-16	Filter Exit Temp.	32	492	32	492	0.0
B-16	Filter Exit Temp.	210	670	210	670	0.0
P3-02	Probe Temp.	32	492	33	493	0.2
P3-02	Probe Temp.	210	670	211	671	0.1

Thermocouple Calibration Procedure

A. References

1. Mercury-in-glass refernce thermometer, calibrated against thermometric fixed points.
2. Thermometric fixed points, including ice bath and boiling water (corrected for barometric pressure)

B. Measurement

1. Compare field temperature sensors against the reference thermometer. Agreement must be within ±1.5% of the absolute reference temperature.

Advanced Industrial Resources, Inc.

Thermocouple Calibration Data

Thermometer ID: RT-01 ; RT-03 **Date:** 03/23/20

Bias: 0 **Performed By:** SS

Apparatus ID	Apparatus Description	Reference Temperature Reading		Indicated Temperature		Relative Variation
		°F	°R	°F	°R	%
P4-02	Stack Temp.	32	492	33	493	0.2
P4-02	Stack Temp.	210	670	211	671	0.1
B-09	Filter Temp.	32	492	32	492	0.0
B-09	Filter Temp.	210	670	210	670	0.0
B-09	Exit Imp. Temp.	32	492	33	493	0.2
B-09	Exit Imp. Temp.	210	670	211	671	0.1
C-009	Meter In Temp.	32	492	32	492	0.0
C-009	Meter In Temp.	210	670	210	670	0.0
C-009	Meter Out Temp.	32	492	32	492	0.0
C-009	Meter Out Temp.	210	670	212	672	0.3
B-09	Filter Exit Temp.	32	492	33	493	0.2
B-09	Filter Exit Temp.	210	670	210	670	0.0
P4-02	Probe Temp.	32	492	33	493	0.2
P4-02	Probe Temp.	210	670	210	670	0.0

Thermocouple Calibration Procedure

A. References

1. Mercury-in-glass refernce thermometer, calibrated against thermometric fixed points.
2. Thermometric fixed points, including ice bath and boiling water (corrected for barometric pressure)

B. Measurement

1. Compare field temperature sensors against the reference thermometer. Agreement must be within ±1.5% of the absolute reference temperature.

VERIFICATION OF CONSTRUCTION SPECIFICATIONS FOR THE TYPE-S PITOT TUBE

Thomas R. Clark, Wade Mason, Paul Reinermann III
PEDCo Environmental, Inc.,
Cincinnati, Ohio

Revisions to EPA Reference Method 2 - Determination of Stack Gas Velocity and Volumetric Flow Rate (Type-S Pitot Tube) - promulgated August 18, 1977, exempted certain pitot tubes from calibration and included appropriate construction criteria and application guidelines.

Figure 1 summarizes procedures for determining the calibration coefficients of Type-S pitot tubes. A pitot tube may be calibrated using procedures outlined in Method 2 or assigned a baseline coefficient (C_p) of 0.84 if it meets the following criteria:

> Pitot tube meets the construction criteria of Figures 2 and 3
>
> The external tubing diameter (D_t) is between 0.48 and 0.95 cm (3/16 and 3/8 in.)
>
> The base-to-opening plane distances (P_A and P_B) are equal and range between 1.05 and 1.50 D_t
>
> The pitot tube is used separately, or in a pitot-probe assembly, mounted in accordance with the specifications in Figures 4 and 5

Pitot tubes that meet the construction criteria of Figures 2 and 3, but do not meet the specified limits for D_t, P_A, and P_B may be used, but must be calibrated.

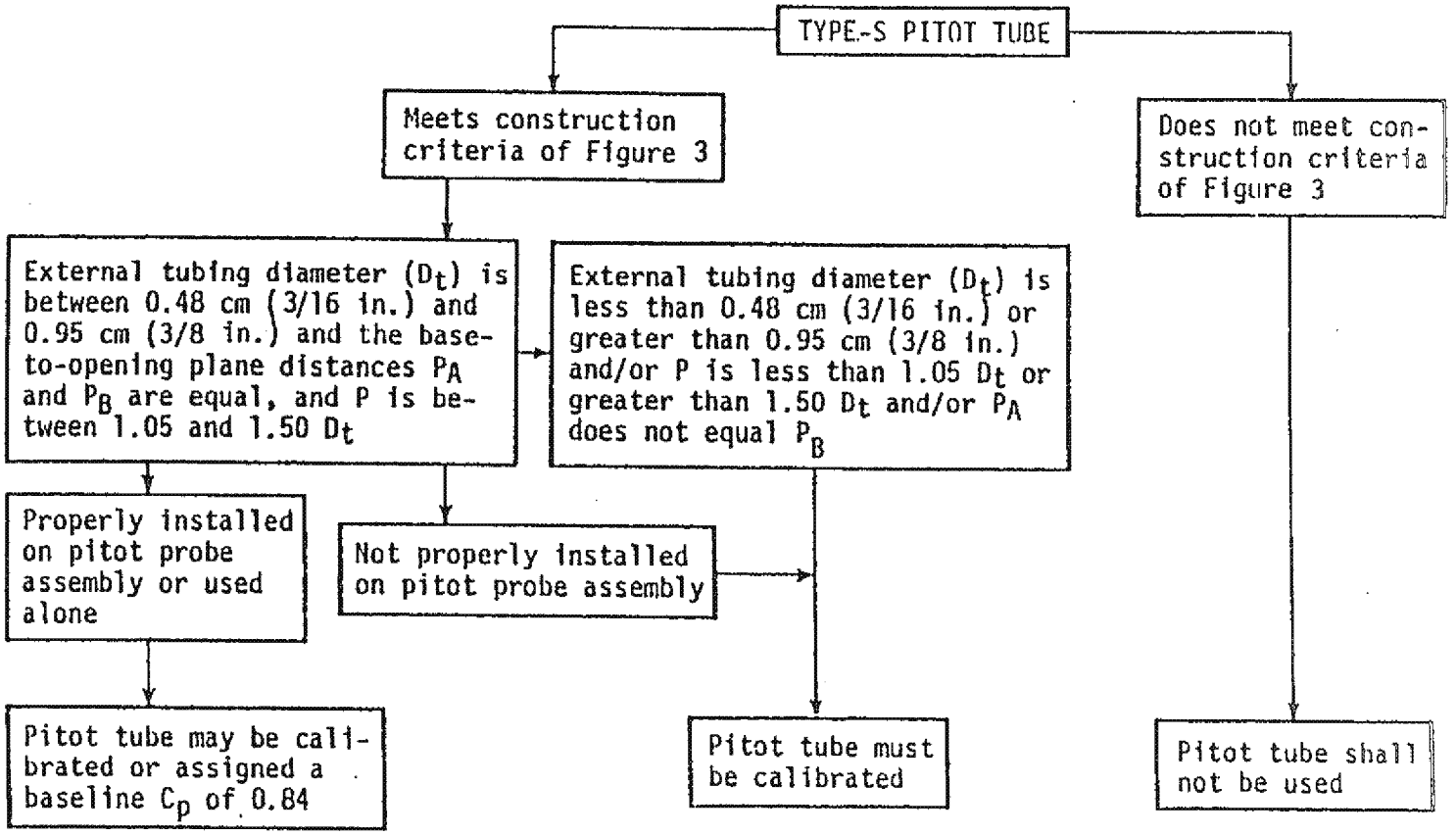


Figure 1. Procedures for determining the calibration coefficients of Type-S pitot tubes.

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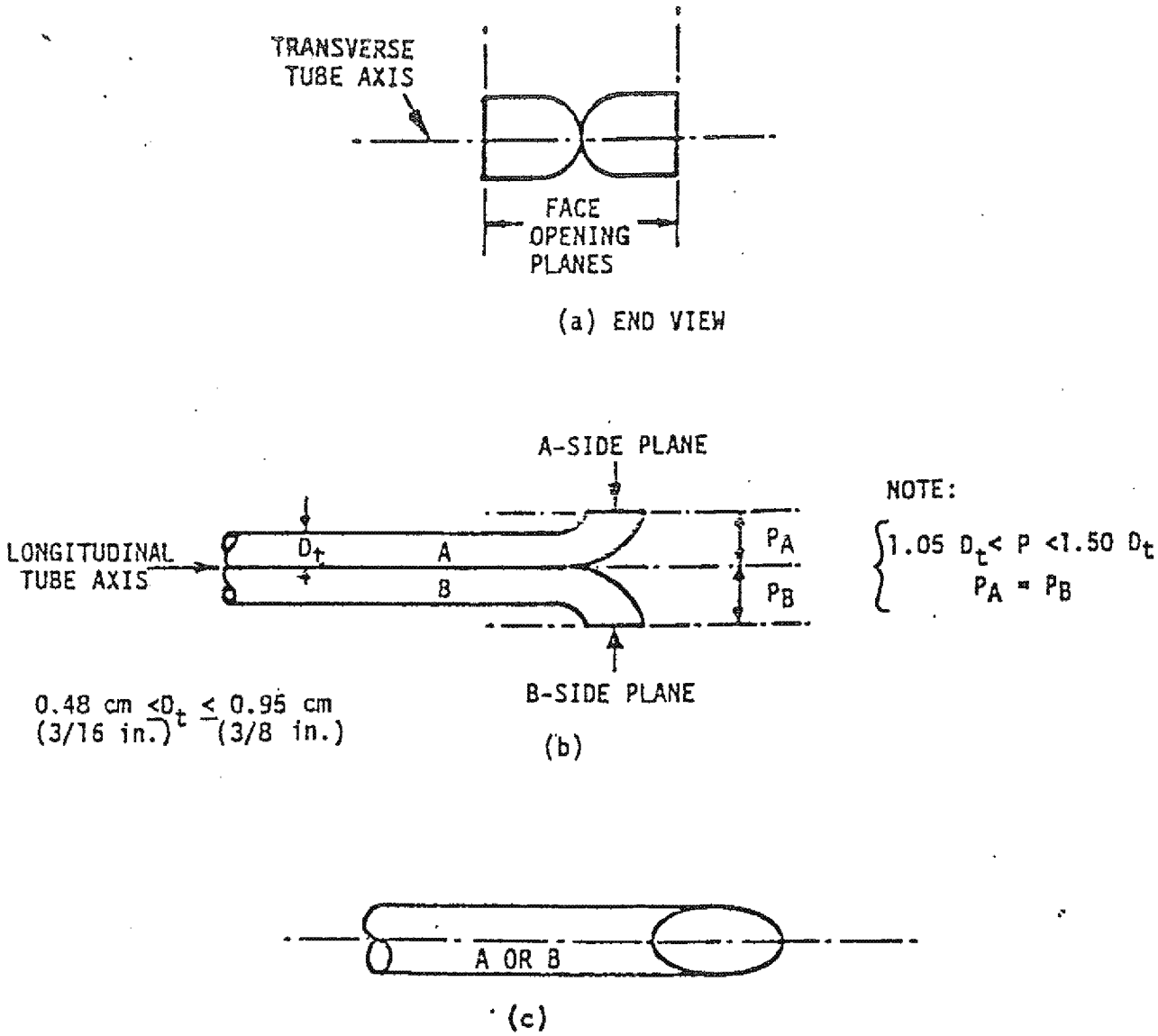


Figure 2. Properly constructed Type-S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis; (b) top view; face opening plans parallel to longitudinal axis; (c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.

ED_012958_00010534-00185

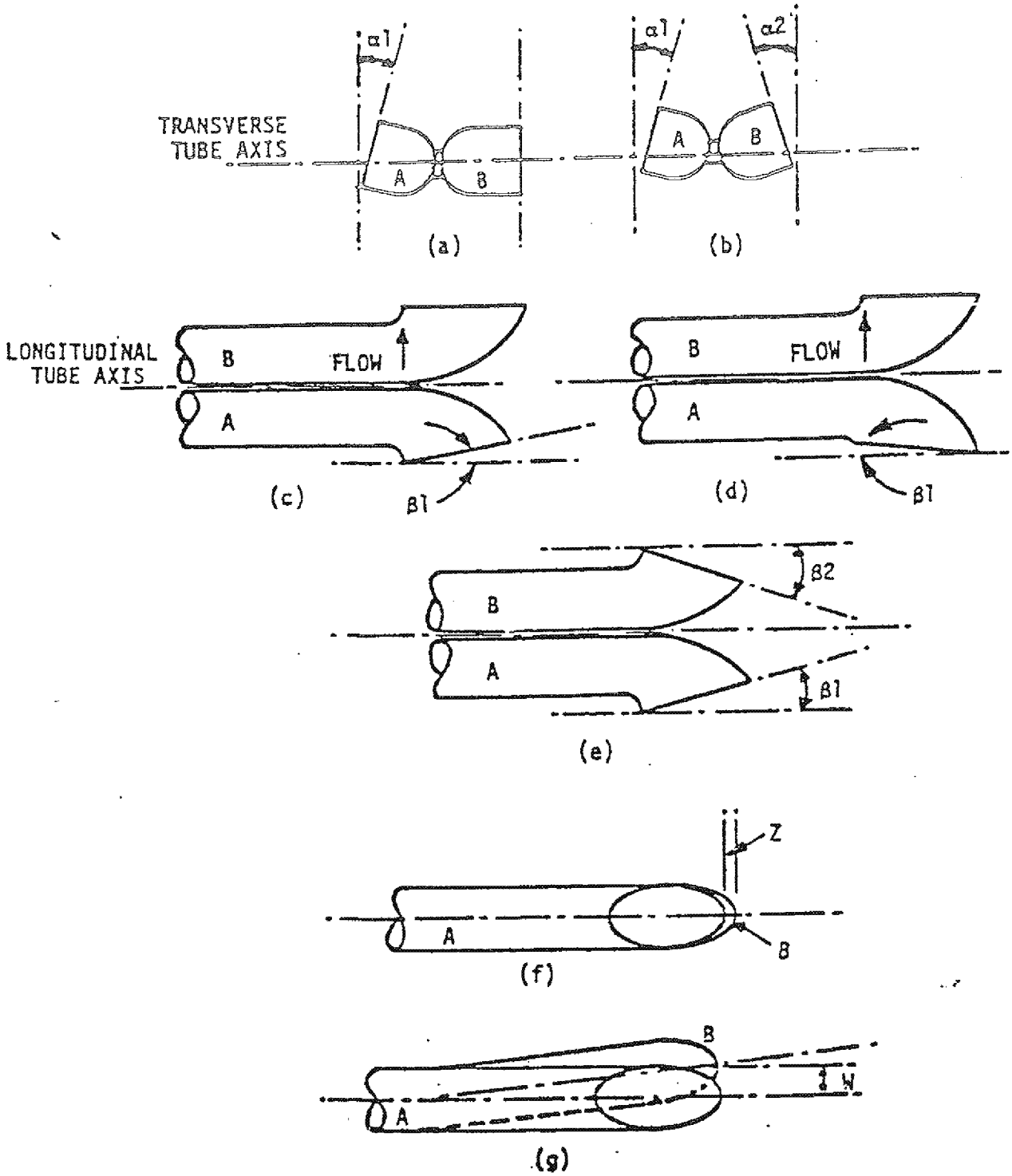
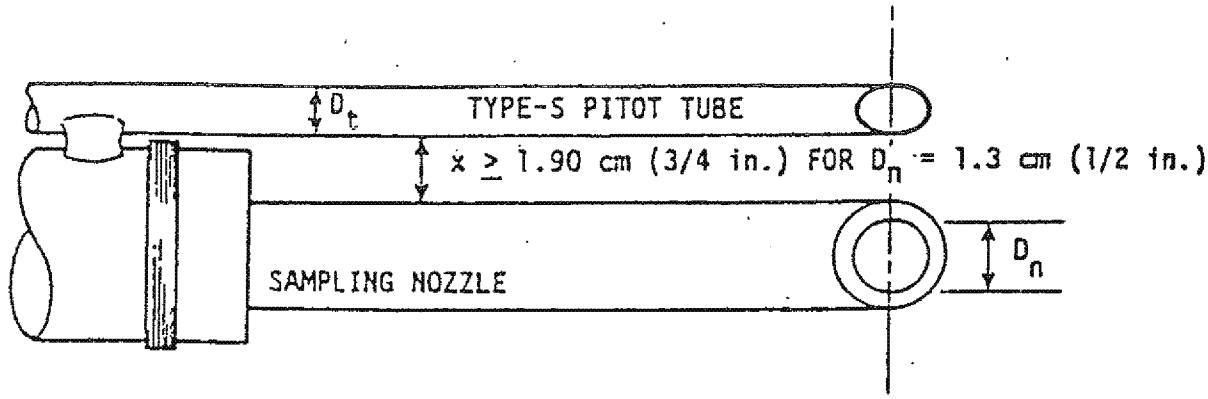
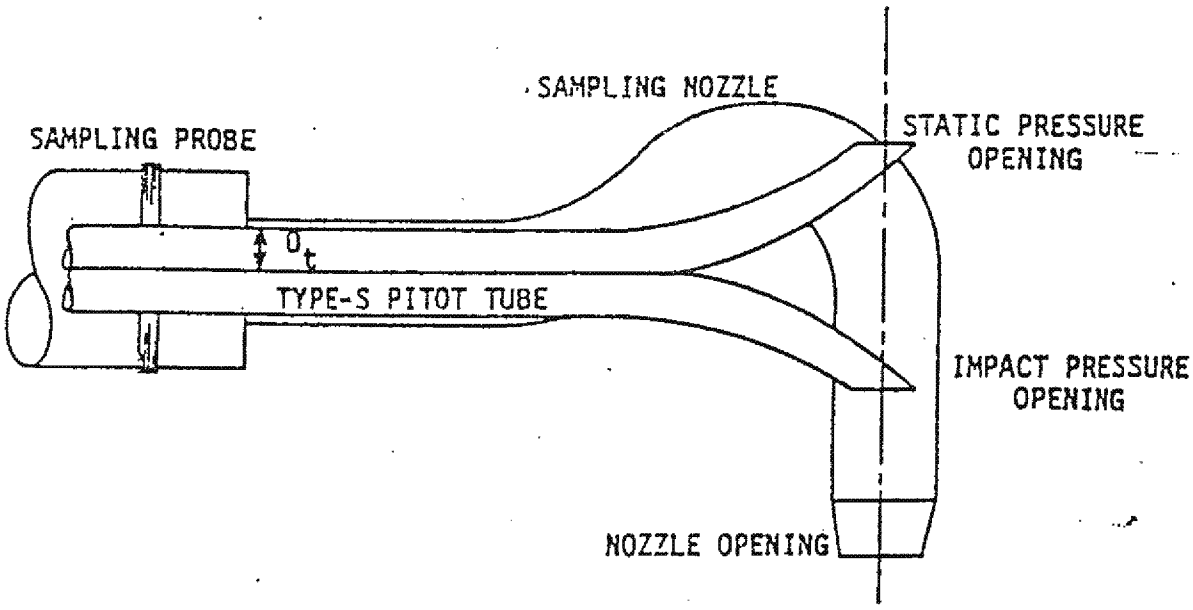


Figure 3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect Cp as long as a_1 and a_2 <10°, β_2 <5°, z <0.32 cm (1/8 in.) and w <0.08 cm (1/32 in.).

ED_012958_00010534-00186



A. BOTTOM VIEW: SHOWING MINIMUM PITOT-NOZZLE SEPARATION.



B. SIDE VIEW: TO PREVENT PITOT TUBE FROM INTERFERING WITH GAS FLOW STREAMLINES APPROACHING THE NOZZLE, THE IMPACT PRESSURE OPENING PLANE OF THE PITOT TUBE SHALL BE EVEN WITH OR ABOVE THE NOZZLE ENTRY PLANE.

Figure 4. Required pitot tube - sampling nozzle configuration to prevent aerodynamic interference; buttonhook - type nozzle; centers of nozzle and pitot opening aligned; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

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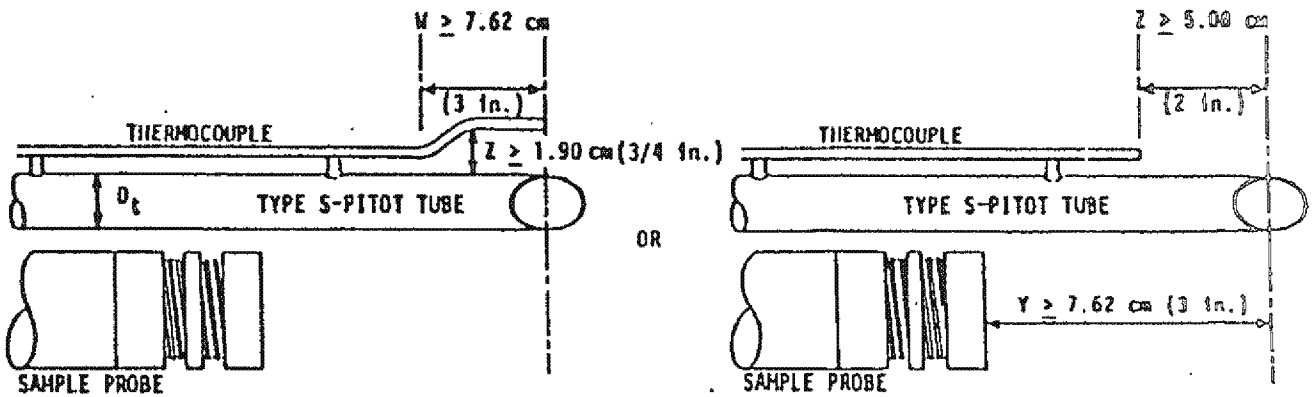


Figure 5. Required thermocouple and probe placement to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

ED_012958_00010534-00188

The EPA has not specified a measurement technique to verify proper construction. The following procedures provide a quick and accurate method of checking construction specifications for Type-S pitot tubes. The apparatus is inexpensive and available in most hardware stores. The method can be used in the laboratory by testers and easily adapted to field use by agency personnel while witnessing tests or performing quality assurance checks.

1. Obtain a section of angle aluminum approximately 20 cm (8 in.) by 1.3 x 2.5 cm (0.5 x 1.0 in.). Mount a bull's-eye level (with ±1 degree accuracy) to the angle aluminum, as shown in Figure 6. After mounting the bull's-eye level to the angle aluminum, level the angle aluminum and place the degree-indicating level in the parallel and perpendicular positions. The indicating level should not read more than 1 degree in either position.

2. Place the pitot tube in the angle aluminum as shown in Figure 6, and level the pitot tube as indicated by the bull's-eye level. A vise may be used to hold the angle aluminum and pitot tube in the laboratory and a C-clamp in the field.
Note: A permanently mounted pitot tube and probe assembly may require a shorter section of angle aluminum to allow proper mounting on the assembly.

3. Place a degree-indicating level in the various positions, as illustrated in Figures 7 and 8.

4. Measure distances P_A and P_B with a micrometer.

ED_012958_00010534-00189

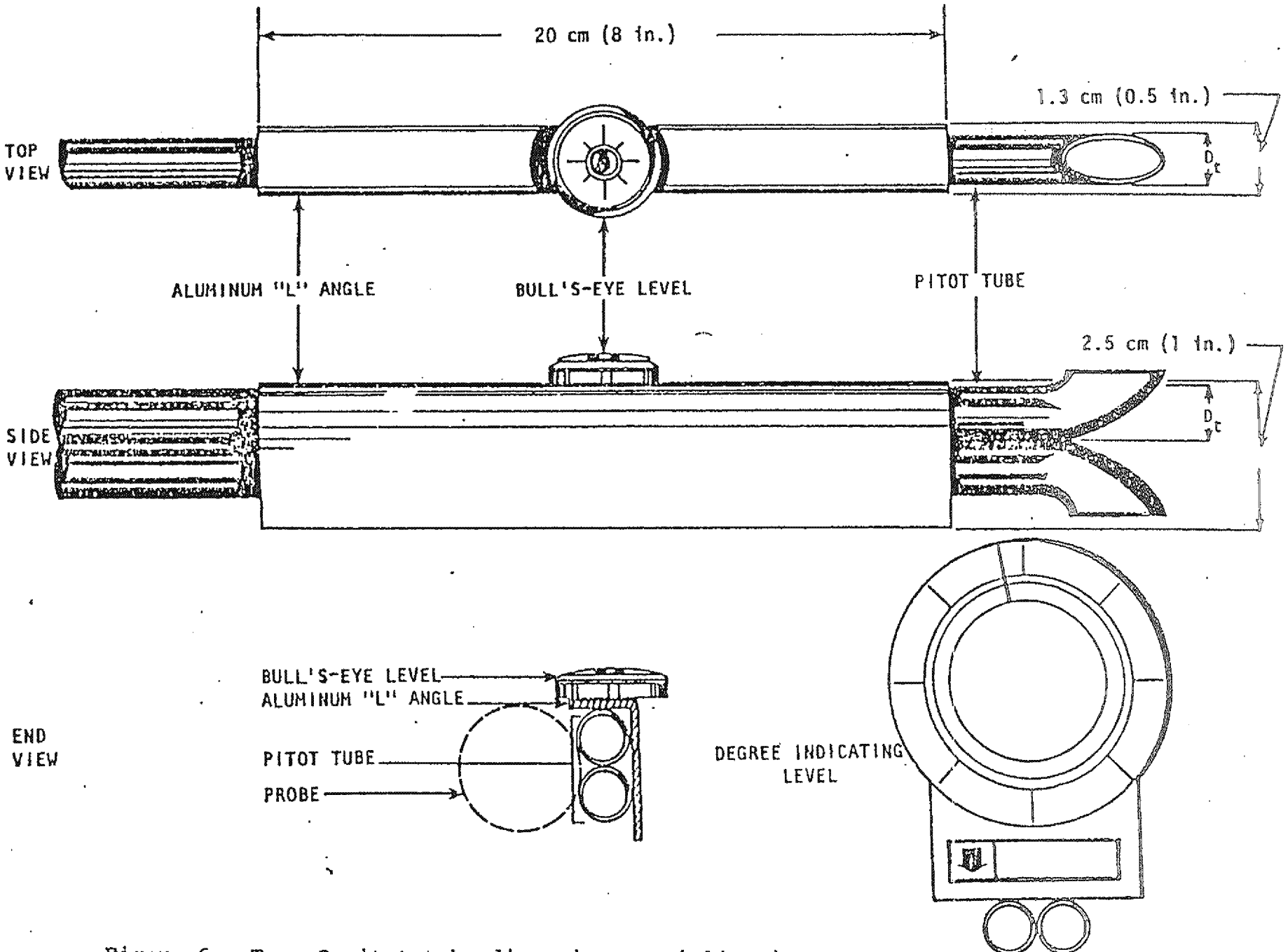


Figure 6. Type S pitot tube dimension specialization measurements.

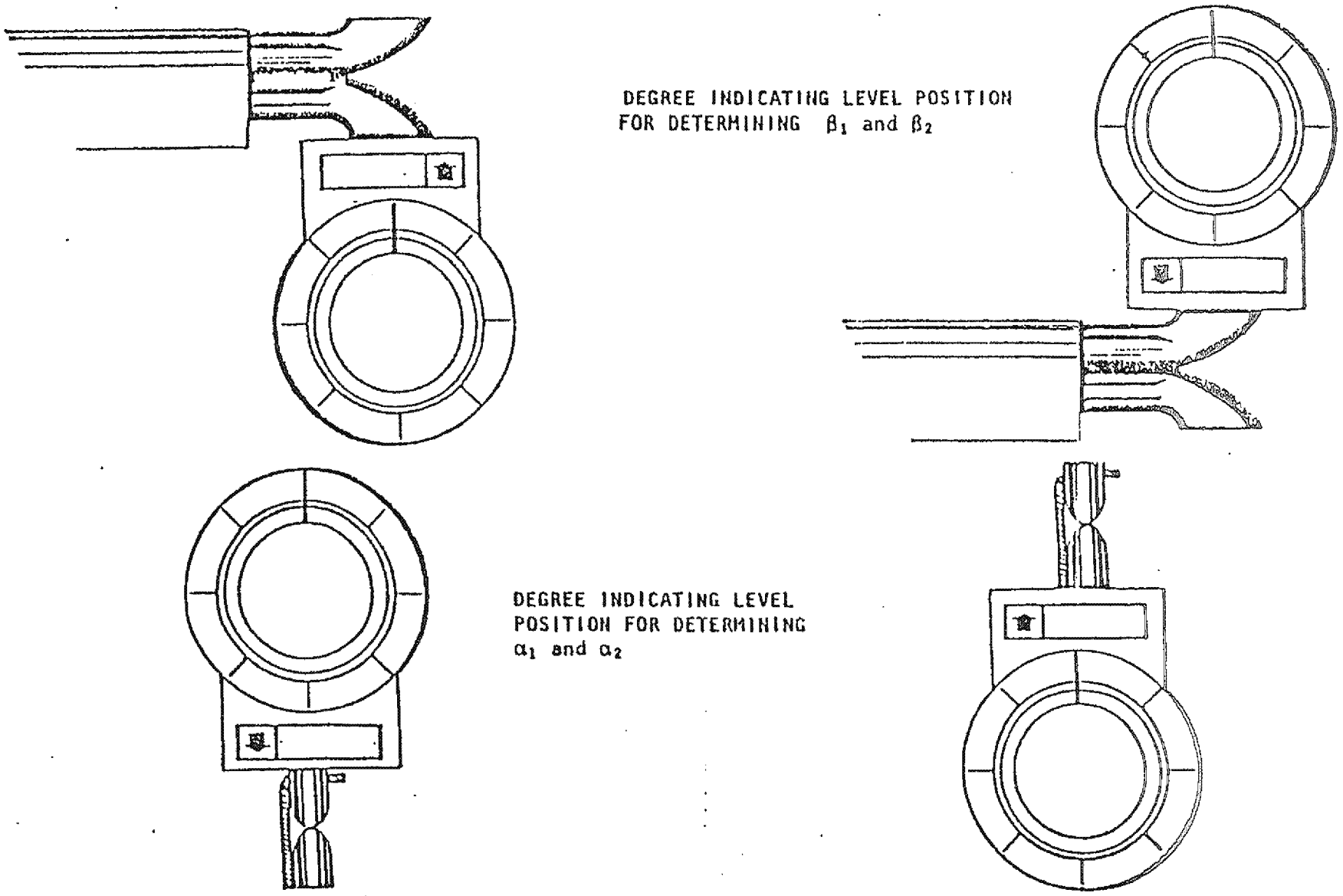
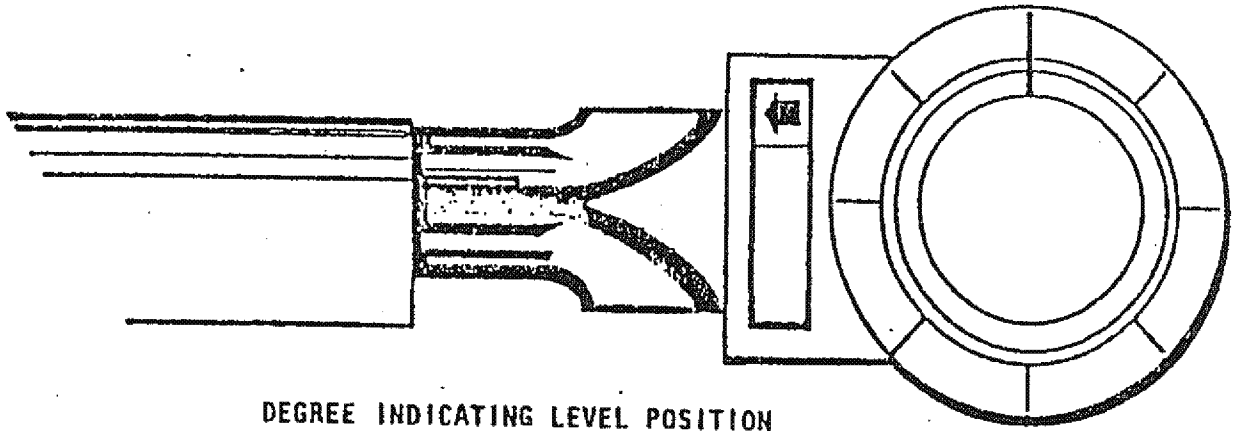


Figure 7. Position of dimension measurement.

ED_012958_00010534-00191



DEGREE INDICATING LEVEL POSITION
FOR DETERMINING γ, THEN CALCULATING Z.

DEGREE INDICATING LEVEL
POSITION FOR DETERMINING
θ, THEN CALCULATE W.

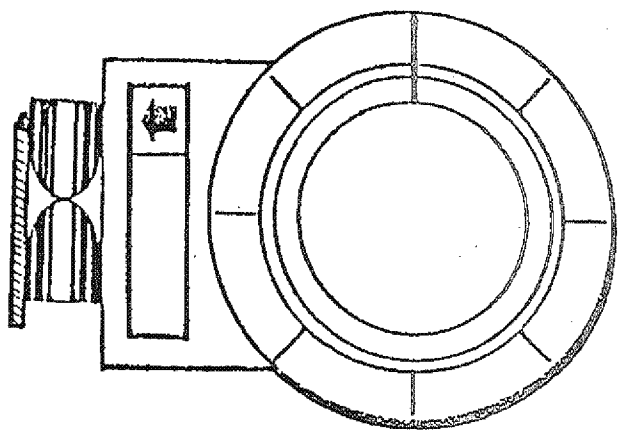


Figure 8. Position of dimension measurement.

ED_012958_00010534-00192

5. Measure the external tube diameter (D_t). Record all data on a data sheet such as Figure 9.

6. Calculate dimensions w and z using the following equations:

$$w = A \sin \theta \qquad \text{Equation 1}$$

$$z = A \sin \gamma \qquad \text{Equation 2}$$

where,

w = alignment dimension, cm (in.)

z = alignment dimension, cm (in.)

A = distance between tips, ($P_A + P_B$), cm (in.)

θ = angle in degrees

γ = angle in degrees.

Note: Pitot tubes with bent or damaged tubing may be difficult to check using this procedure.

If the Type-S pitot tube meets the face alignment criteria, an identification number should be assigned and permanently marked or engraved on the body of the tube.

References

1. Federal Register, Vol. 42. No. 160, August 18, 1977.

ED_012958_00010534-00193

Advanced Industrial Resources, Inc.
Type-S Pitot Tube Assembly Inspection Data Sheet

Date: 3/23/2020

Pitot Tube Assembly: P3-02 Caliper ID: CL-04

Performed by: WB

Pitot tube assembly level? x yes _____ no

Pitot tube openings damaged? _____ yes (explain below) x no

$_1$= 3 ^{o}(<10°) $_1$= 2 ^{o}(<5°)

$_2$= 3 ^{o}(<10°) $_2$= 2 ^{o}(<5°)

= 1 = 1 ^{o} A= 0.95 in.

z = A sin γ = 0.0166 in. <1/8 in. (0.125 in.)

w = A sin θ = 0.0166 in. <1/32 in. (0.03125 in.)

$\mathbf{P_A}$= 0.475 in. $\mathbf{P_B}$= 0.475 in.

D_t = 0.38 in. **P / $\mathbf{D_t}$** = 1.25 (1.05 </= and </= 1.50)

$P_a = P_b = P$

X = 1.97 (>0.75 in.) (Dist. between pitot and nozzle)

Y = 3.62 (>3.0 in.) (Dist. from nozzle union to pitot tube openings)

Z = 1.69 (>0.75 in.) (Dist. between pitot and stack thermocouple)

Does the pitot tube assembly meet the Method 2 requiremnets? x yes

_____ no (explain below)

If the Method 2 requirements are met then a coefficient of **0.84** is assigned to the pitot tube assembly being inspected.

Comments : _____

REV112712

Advanced Industrial Resources, Inc.
Type-S Pitot Tube Assembly Inspection Data Sheet

Date: 3/23/2020

Pitot Tube Assembly: P4-02 Caliper ID: CL-04

Performed by: WB

Pitot tube assembly level? X yes _____ no

Pitot tube openings damaged? _____ yes (explain below) X no

$_1$= 5 ^{o}(<10°) $_1$= 0 ^{o}(<5°)

$_2$= 5 ^{o}(<10°) $_2$= 0 ^{o}(<5°)

= 0 = 0 ^{o} A= 0.98 in.

z = A sin γ = 0.0000 in. <1/8 in. (0.125 in.)

w = A sin θ = 0.0000 in. <1/32 in. (0.03125 in.)

P_A= 0.490 in. **P_B**= 0.490 in.

D_t = 0.35 in. **P / D_t** = 1.4 (1.05 </= and </= 1.50)

$P_a = P_b = P$

X = 1.1 (>0.75 in.) (Dist. between pitot and nozzle)

Y = 3.5 (>3.0 in.) (Dist. from nozzle union to pitot tube openings)

Z = 2.1 (>0.75 in.) (Dist. between pitot and stack thermocouple)

Does the pitot tube assembly meet the Method 2 requiremnets? X yes

_____ no (explain below)

If the Method 2 requirements are met then a coefficient of **0.84** is assigned to the pitot tube assembly being inspected.

Comments : _____

REV112712

Advanced Industrial Resources, Inc.

Nozzle Calibration Data

Client: Green Bay MSD

Date: 3-19-2020

Location: Green Bay, WI

Performed By: JML

Caliper ID: CAL-06

Source	Nozzle ID JML	Nozzle Description	Measurements (inches) 1	2	3	Average (inches)
FBI Stack (M29)	~~GN-05-01~~ GN-04-01	glass	0.200	0.200	0.200	0.200
FBI Stack (M23)	GN-05-02	glass	0.210	0.210	0.210	0.210
GAC Inlet	GN-05-01	glass	0.200	0.200	0.200	0.200

Test Team Leader Review: _____

Data Entry Review: _____

REV021717

Advanced Industrial Resources, Inc.

Analyzer Pretest Data Worksheet

Operator Name:	Dan Kirk	**Source ID:**	**Stack Exhaust**
Facility Name, Location:	GBMSD	**Date:**	**3/18/20**

Analyte 1:	Oxygen	O2	**EPA Method:**	3A
Analyte 2:	Carbon Dioxide	CO2	**EPA Method:**	3A
Analyte 3:	Sulfur Dioxide	SO2	**EPA Method:**	6C
Analyte 4:	Carbon Monoxide	CO2	**EPA Method:**	10
Analyte 5:	Oxides Of N2	Nox	**EPA Method:**	7E

Calibration Gas Serial Numbers & Concentrations

Gas (Zero, Low, Mid and High)	**Analyzer I.D.**	**Concentration** (% or ppm)	**Cylinder ID #**	**Expiration Date**	**Manufacturer**
Zero (N_2 or Air)	NA	0.00	0	0	0
O2 (Mid)	15	11.28	CC424618	9/23/2027	Airgas
O2 (High)	15	19.77	CC716961	9/24/2027	Airgas
SO2 Mid	5	10.00	CC403955	4/19/2027	Airgas
SO2 High	5	20.00	CC403955	4/19/2027	Airgas
CO Mid	5	9.98	CC403955	4/19/2027	Airgas
CO High	5	19.96	CC403955	4/19/2027	Airgas
Nox Mid	5	9.98	CC403955	4/19/2027	Airgas
Nox High	5	19.97	CC403955	4/19/2027	Airgas
NO2	14	51.11	CC506338	10/2/2022	Airgas

System Response Times

	O2	**CO2**	**SO2**	**CO**	**Nox**
	Minutes & Seconds				
Zero to 95% Response Time	00:32	00:34	00:46	00:33	00:34
High to 5% Response Time	00:33	00:34	00:45	00:33	00:33
Maximum Response Time	00:33	00:34	00:46	00:33	00:34
2 x Max. Response Time	01:06	01:08	01:32	01:06	01:08

				Response & "2 x" Max Response Time to be used during
	Minutes & Seconds			
Zero to 95% Response Time				

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
630 United Drive
Durham, NC 27713
Airgas.com

2

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E15A01W2	Reference Number:	122-401472873-1
Cylinder Number:	CC403955	Cylinder Volume:	144.4 CF
Laboratory:	124 - Durham (SAP) - NC	Cylinder Pressure:	2015 PSIG
PGVP Number:	B22019	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Apr 19, 2019

Expiration Date: Apr 19, 2027

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	75.00 PPM	75.20 PPM	G1	+/- 1.0% NIST Traceable	04/12/2019, 04/19/2019
CARBON MONOXIDE	75.00 PPM	75.18 PPM	G1	+/- 0.7% NIST Traceable	04/12/2019
NITRIC OXIDE	75.00 PPM	75.20 PPM	G1	+/- 1.0% NIST Traceable	04/12/2019, 04/19/2019
SULFUR DIOXIDE	75.00 PPM	75.33 PPM	G1	+/- 0.8% NIST Traceable	04/12/2019, 04/19/2019
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12062259	CC366866	97.56 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	May 10, 2024
PRM	PRM	D562879	10.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.9%	Aug 17, 2018
NTRM	13010412	KAL004012	97.60 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	May 09, 2019
GMIS	124206889114	CC322698	4.432 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Aug 15, 2021
NTRM	17060406	CC484557	98.32 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 07, 2022

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801549 CO	FTIR	Apr 10, 2019
Nicolet 6700 AHR0801549 NO	FTIR	Apr 10, 2019
Nicolet 6700 AHR0801549 NO	FTIR	Apr 10, 2019
Nicolet 6700 AHR0801549 SO2	FTIR	Apr 10, 2019

Triad Data Available Upon Request

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
630 United Drive
Durham, NC 27713
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02AI99E15W0021	Reference Number:	122-401602282-1
Cylinder Number:	CC506338	Cylinder Volume:	146.2 CF
Laboratory:	124 - Durham (SAP) - NC	Cylinder Pressure:	2015 PSIG
PGVP Number:	B22019	Valve Outlet:	660
Gas Code:	NO2,BALA	Certification Date:	Oct 02, 2019

Expiration Date: Oct 02, 2022

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NITROGEN DIOXIDE	50.00 PPM	51.11 PPM	G1	+/- 2.0% NIST Traceable	09/24/2019, 10/02/2019
AIR	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	415201406	CC345246	49.66 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.8%	Aug 28, 2022
PRM	12388	D685030	59.5 PPM NITROGEN DIOXIDE/AIR	+/- 1.7%	Feb 20, 2020

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
MKS FTIR NO2 018176583	FTIR	Sep 12, 2019

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Airgas
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Airgas Specialty Gases
Airgas USA, LLC
630 United Drive
Durham, NC 27713
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI80E15A0007	Reference Number:	122-401602294-1
Cylinder Number:	CC424618	Cylinder Volume:	150.4 CF
Laboratory:	124 - Durham (SAP) - NC	Cylinder Pressure:	2015 PSIG
PGVP Number:	B22019	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Sep 23, 2019

Expiration Date: Sep 23, 2027

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	9.000 %	8.584 %	G1	+/- 0.7% NIST Traceable	09/23/2019
OXYGEN	11.00 %	11.28 %	G1	+/- 0.4% NIST Traceable	09/23/2019
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060638	CC414571	13.359 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025
NTRM	09060212	CC262381	9.961 % OXYGEN/NITROGEN	+/- 0.3%	Nov 05, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA510 CO2 2L6YXWY0	Nondispersive Infrared (NDIR)	Sep 05, 2019
Horiba MPA510 O2 41499150042	Paramagnetic	Sep 05, 2019

Triad Data Available Upon Request

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Airgas Specialty Gases
Airgas USA, LLC
630 United Drive
Durham, NC 27713
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI62E15A1071	Reference Number:	122-401601514-1
Cylinder Number:	CC716961	Cylinder Volume:	157.9 CF
Laboratory:	124 - Durham (SAP) - NC	Cylinder Pressure:	2015 PSIG
PGVP Number:	B22019	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Sep 24, 2019

Expiration Date: Sep 24, 2027

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	18.00 %	18.05 %	G1	+/- 0.6% NIST Traceable	09/24/2019
OXYGEN	20.00 %	19.77 %	G1	+/- 0.5% NIST Traceable	09/24/2019
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12061508	CC354696	19.87 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jan 11, 2024
NTRM	08010202	1D003076	23.20 % OXYGEN/NITROGEN	+/- 0.4%	Jun 01, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA510 CO2 2L6YXWY0	Nondispersive Infrared (NDIR)	Sep 05, 2019
Horiba MPA510 O2 41499150042	Paramagnetic	Sep 05, 2019

Triad Data Available Upon Request

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Advanced Industrial Resources, Inc.

Stratification Worksheet

Stack Dimension & 3-pt Traverse Point Location

Stack Diameter (D_s) ⟶		24
Traverse Point No.	**% of D_s**	**Actual Inches**
1	16.7%	4.01
2	50.0%	12.00
3	83.3%	19.99

Traverse Point Concentrations & Start/Stop Times

Traverse Point Location	Average Concentration (ppm)	Start Time (hh:mm:ss)	Stop time (hh:mm:ss)
Point 1	7.787	11:51:00	11:52:00
Point 2	8.170	11:53:00	11:54:00
Point 3	8.203	11:55:00	11:56:00
Average Concentration:	8.053		

Stratification Absence or Verification

3-Point Stratification Check Table

Standard	Point 1 (%) of Average	Point 2 (%) of Average	Point 3 (%) of Average	1 pt. or 3pts.
5% of average	3.31%	1.45%	1.86%	1 pt.
0.5 ppm	0.266	0.117	0.150	1 pt.
Recommended Sample Pt.	NO	Point 2	NO	

Final Decision Indication: Use single Traverse Point if a Recommended Sample Pt. is indicated otherwise Use 3 Traverse Points

Note: Only one of the "1-Point" requirements (i.e. <5% or <0.5 ppm) has to be met in order to sample from one point

Advanced Industrial Resources, Inc.
Method 205 Field Data Sheet

	Analyte/Gas	Concentration	CC No.
Upscale Cal Gas Info:	O2	19.77	CC716961
Check Gas Informaiton:	O2	11.28	CC424618

	MFC 5000 ccm Evaluation					
	Dilution Conc.	Cal Gas ccm	Dil Gas ccm	Cal Gas	Check Gas	Total Flow
	11.2	2827.51644	2172.48356	19.77	11.28	**5000**
	7.7	1942.33687	3057.66313			
	Dilution Level No.1		**Dilution Level No.2**		**Check Gas**	
Low Tolerance	**10.956**		**7.526**		**11.054**	
Evaluation No.1	11.244	**PASS**	7.676	**PASS**	11.196	**PASS**
Evaluation No.2	11.183	**PASS**	7.716	**PASS**	11.218	**PASS**
Evaluation No.3	11.199	**PASS**	7.710	**PASS**	11.229	**PASS**
High Tolerance	**11.404**		**7.834**		**11.506**	
	Dil Level No.1 Avg		**Dil Level No.2 Avg**		**Check Gas Avg**	
	11.209		7.701		11.214	
Evaluation No.1 (% diff Mean)	0.32%	**PASS**	0.32%	**PASS**	0.16%	**PASS**
Evaluation No.2 (% diff Mean)	0.23%	**PASS**	0.20%	**PASS**	0.03%	**PASS**
Evaluation No.3 (% diff Mean)	0.09%	**PASS**	0.12%	**PASS**	0.13%	**PASS**

Advanced Industrial Resources, Inc.

Method 205 Worksheet

	Concentrations Strata (ppm)	Selected Times (hh:mm:ss)
Test No.1 Dilution No.1	11.244	17:31:54
Test No.1 Dilution No.2	7.676	17:33:29
Test No.1 C/G	11.196	17:34:34
Test No.2 Dilution No.1	11.183	17:35:01
Test No.2 Dilution No.2	7.716	17:36:26
Test No.2 C/G	11.218	17:37:25
Test No.3 Dilution No.1	11.199	17:37:47
Test No.3 Dilution No.2	7.710	17:39:02
Test No.3 C/G	11.229	17:40:02

Method 205 Worksheet

		O2 %	O2 Volts
3/17/2020	17:30:07	11.20	4.478
3/17/2020	17:30:09	11.25	4.500
3/17/2020	17:30:13	11.37	4.547
3/17/2020	17:30:16	11.41	4.564
3/17/2020	17:30:18	11.44	4.574
3/17/2020	17:30:20	11.46	4.584
3/17/2020	17:30:22	11.47	4.588
3/17/2020	17:30:25	11.49	4.596
3/17/2020	17:30:27	11.49	4.596
3/17/2020	17:30:29	11.49	4.596
3/17/2020	17:30:31	11.49	4.596
3/17/2020	17:30:34	11.50	4.599
3/17/2020	17:30:36	11.50	4.599
3/17/2020	17:30:38	11.50	4.598
3/17/2020	17:30:40	11.50	4.598
3/17/2020	17:30:42	11.51	4.604
3/17/2020	17:30:45	11.51	4.604
3/17/2020	17:30:47	10.99	4.397
3/17/2020	17:30:49	8.61	3.444
3/17/2020	17:30:52	6.77	2.706
3/17/2020	17:30:54	7.96	3.184
3/17/2020	17:30:56	10.30	4.118
3/17/2020	17:30:58	12.28	4.913
3/17/2020	17:31:01	12.32	4.927
3/17/2020	17:31:03	11.97	4.787
3/17/2020	17:31:05	11.60	4.640
3/17/2020	17:31:07	11.30	4.521
3/17/2020	17:31:09	11.12	4.448
3/17/2020	17:31:12	11.03	4.413
3/17/2020	17:31:14	11.03	4.412
3/17/2020	17:31:16	11.06	4.422

Method 205 Worksheet

		O2 %	O2 Volts
3/17/2020	17:31:19	11.09	4.435
3/17/2020	17:31:21	11.13	4.452
3/17/2020	17:31:23	11.16	4.464
3/17/2020	17:31:25	11.19	4.476
3/17/2020	17:31:27	11.20	4.481
3/17/2020	17:31:30	11.22	4.489
3/17/2020	17:31:32	11.23	4.492
3/17/2020	17:31:34	11.24	4.495
3/17/2020	17:31:37	11.24	4.495
3/17/2020	17:31:39	11.23	4.493
3/17/2020	17:31:41	11.23	4.492
3/17/2020	17:31:43	11.24	4.496
3/17/2020	17:31:45	11.25	4.498
3/17/2020	17:31:48	11.24	4.495
3/17/2020	17:31:50	11.24	4.495
3/17/2020	17:31:52	11.24	4.495
3/17/2020	17:31:54	11.24	4.498
3/17/2020	17:31:57	11.24	4.495
3/17/2020	17:31:59	11.24	4.495
3/17/2020	17:32:01	11.24	4.494
3/17/2020	17:32:03	11.24	4.495
3/17/2020	17:32:06	11.24	4.495
3/17/2020	17:32:08	11.24	4.495
3/17/2020	17:32:10	11.24	4.495
3/17/2020	17:32:12	10.62	4.249
3/17/2020	17:32:15	8.21	3.285
3/17/2020	17:32:17	5.76	2.305
3/17/2020	17:32:19	4.27	1.708
3/17/2020	17:32:21	5.83	2.333
3/17/2020	17:32:24	4.78	1.912
3/17/2020	17:32:26	5.10	2.039
3/17/2020	17:32:28	5.98	2.392
3/17/2020	17:32:30	6.61	2.643
3/17/2020	17:32:33	7.00	2.798
3/17/2020	17:32:35	7.23	2.892
3/17/2020	17:32:37	7.35	2.942
3/17/2020	17:32:39	7.45	2.982
3/17/2020	17:32:42	7.50	2.998
3/17/2020	17:32:44	7.52	3.010
3/17/2020	17:32:46	7.54	3.016
3/17/2020	17:32:48	7.55	3.019
3/17/2020	17:32:51	7.55	3.021
3/17/2020	17:32:53	7.56	3.024
3/17/2020	17:32:55	7.58	3.030
3/17/2020	17:32:57	7.57	3.028
3/17/2020	17:33:00	7.21	2.883
3/17/2020	17:33:02	6.06	2.426
3/17/2020	17:33:04	5.31	2.122
3/17/2020	17:33:06	6.65	2.660
3/17/2020	17:33:09	7.41	2.966
3/17/2020	17:33:11	7.52	3.006

Method 205 Worksheet

		O2 %	O2 Volts
3/17/2020	17:33:13	7.52	3.009
3/17/2020	17:33:15	7.55	3.019
3/17/2020	17:33:18	7.58	3.030
3/17/2020	17:33:20	7.60	3.040
3/17/2020	17:33:22	7.64	3.054
3/17/2020	17:33:24	7.66	3.062
3/17/2020	17:33:27	7.67	3.069
3/17/2020	17:33:29	7.68	3.070
3/17/2020	17:33:31	7.69	3.076
3/17/2020	17:33:33	7.70	3.080
3/17/2020	17:33:35	7.71	3.082
3/17/2020	17:33:38	7.70	3.081
3/17/2020	17:33:40	7.70	3.082
3/17/2020	17:33:42	7.70	3.081
3/17/2020	17:33:44	7.71	3.084
3/17/2020	17:33:47	7.39	2.955
3/17/2020	17:33:49	5.46	2.183
3/17/2020	17:33:51	6.14	2.455
3/17/2020	17:33:53	8.99	3.594
3/17/2020	17:33:56	12.29	4.916
3/17/2020	17:33:58	13.85	5.539
3/17/2020	17:34:00	13.90	5.560
3/17/2020	17:34:02	13.31	5.323
3/17/2020	17:34:05	12.24	4.898
3/17/2020	17:34:07	11.72	4.688
3/17/2020	17:34:09	11.37	4.548
3/17/2020	17:34:11	11.18	4.470
3/17/2020	17:34:14	11.09	4.435
3/17/2020	17:34:16	11.07	4.427
3/17/2020	17:34:18	11.07	4.427
3/17/2020	17:34:20	11.11	4.444
3/17/2020	17:34:23	11.15	4.459
3/17/2020	17:34:25	11.16	4.466
3/17/2020	17:34:27	11.18	4.472
3/17/2020	17:34:29	11.19	4.476
3/17/2020	17:34:32	11.19	4.476
3/17/2020	17:34:34	11.20	4.478
3/17/2020	17:34:36	11.20	4.481
3/17/2020	17:34:38	11.20	4.478
3/17/2020	17:34:41	11.20	4.478
3/17/2020	17:34:43	11.20	4.479
3/17/2020	17:34:45	11.20	4.479
3/17/2020	17:34:47	11.19	4.476
3/17/2020	17:34:50	11.19	4.476
3/17/2020	17:34:52	11.19	4.475
3/17/2020	17:34:54	11.19	4.476
3/17/2020	17:34:57	11.18	4.473
3/17/2020	17:34:59	11.18	4.473
3/17/2020	17:35:01	11.18	4.473
3/17/2020	17:35:03	11.18	4.471
3/17/2020	17:35:06	11.19	4.476

Method 205 Worksheet

		O2 %	O2 Volts
3/17/2020	17:35:08	11.18	4.471
3/17/2020	17:35:10	11.18	4.471
3/17/2020	17:35:12	11.19	4.475
3/17/2020	17:35:15	11.19	4.476
3/17/2020	17:35:17	11.16	4.463
3/17/2020	17:35:19	10.06	4.023
3/17/2020	17:35:21	7.46	2.982
3/17/2020	17:35:24	5.22	2.089
3/17/2020	17:35:26	5.24	2.094
3/17/2020	17:35:28	6.17	2.468
3/17/2020	17:35:30	5.16	2.063
3/17/2020	17:35:32	5.63	2.250
3/17/2020	17:35:35	6.36	2.545
3/17/2020	17:35:37	6.88	2.752
3/17/2020	17:35:39	7.19	2.875
3/17/2020	17:35:41	7.38	2.952
3/17/2020	17:35:44	7.53	3.013
3/17/2020	17:35:46	7.58	3.033
3/17/2020	17:35:48	7.62	3.047
3/17/2020	17:35:50	7.64	3.056
3/17/2020	17:35:53	7.66	3.062
3/17/2020	17:35:55	7.67	3.068
3/17/2020	17:35:57	7.68	3.071
3/17/2020	17:35:59	7.68	3.070
3/17/2020	17:36:02	7.68	3.073
3/17/2020	17:36:04	7.69	3.076
3/17/2020	17:36:06	7.70	3.079
3/17/2020	17:36:08	7.70	3.080
3/17/2020	17:36:11	7.70	3.082
3/17/2020	17:36:13	7.71	3.082
3/17/2020	17:36:15	7.71	3.084
3/17/2020	17:36:17	7.70	3.082
3/17/2020	17:36:20	7.71	3.084
3/17/2020	17:36:22	7.71	3.084
3/17/2020	17:36:24	7.72	3.087
3/17/2020	17:36:26	7.72	3.086
3/17/2020	17:36:29	7.72	3.086
3/17/2020	17:36:31	7.72	3.087
3/17/2020	17:36:33	7.72	3.087
3/17/2020	17:36:35	7.73	3.090
3/17/2020	17:36:38	7.73	3.090
3/17/2020	17:36:40	7.70	3.082
3/17/2020	17:36:42	7.06	2.823
3/17/2020	17:36:44	5.72	2.286
3/17/2020	17:36:47	5.86	2.342
3/17/2020	17:36:49	8.62	3.446
3/17/2020	17:36:51	13.15	5.260
3/17/2020	17:36:53	13.96	5.584
3/17/2020	17:36:56	13.67	5.466
3/17/2020	17:36:58	12.98	5.191
3/17/2020	17:37:00	12.30	4.921

Method 205 Worksheet

		O2 %	O2 Volts
3/17/2020	17:37:02	11.76	4.702
3/17/2020	17:37:05	11.42	4.567
3/17/2020	17:37:07	11.20	4.481
3/17/2020	17:37:09	11.09	4.435
3/17/2020	17:37:11	11.08	4.432
3/17/2020	17:37:14	11.10	4.441
3/17/2020	17:37:16	11.14	4.455
3/17/2020	17:37:18	11.16	4.462
3/17/2020	17:37:20	11.18	4.470
3/17/2020	17:37:23	11.20	4.478
3/17/2020	17:37:25	11.22	4.487
3/17/2020	17:37:27	11.21	4.485
3/17/2020	17:37:29	11.22	4.487
3/17/2020	17:37:32	11.21	4.484
3/17/2020	17:37:34	11.21	4.485
3/17/2020	17:37:36	11.22	4.487
3/17/2020	17:37:38	11.21	4.483
3/17/2020	17:37:41	11.21	4.484
3/17/2020	17:37:43	11.21	4.484
3/17/2020	17:37:45	11.20	4.482
3/17/2020	17:37:47	11.20	4.480
3/17/2020	17:37:50	11.20	4.481
3/17/2020	17:37:52	11.19	4.476
3/17/2020	17:37:54	11.20	4.480
3/17/2020	17:37:56	11.21	4.484
3/17/2020	17:37:59	11.20	4.479
3/17/2020	17:38:01	11.19	4.476
3/17/2020	17:38:03	11.19	4.476
3/17/2020	17:38:05	10.48	4.192
3/17/2020	17:38:08	7.99	3.195
3/17/2020	17:38:10	5.61	2.242
3/17/2020	17:38:12	4.33	1.734
3/17/2020	17:38:14	5.54	2.215
3/17/2020	17:38:17	4.78	1.910
3/17/2020	17:38:19	5.49	2.194
3/17/2020	17:38:21	6.31	2.523
3/17/2020	17:38:23	6.85	2.738
3/17/2020	17:38:26	7.18	2.871
3/17/2020	17:38:28	7.38	2.950
3/17/2020	17:38:30	7.52	3.010
3/17/2020	17:38:32	7.58	3.033
3/17/2020	17:38:35	7.63	3.052
3/17/2020	17:38:37	7.64	3.056
3/17/2020	17:38:39	7.66	3.062
3/17/2020	17:38:41	7.67	3.068
3/17/2020	17:38:44	7.68	3.072
3/17/2020	17:38:46	7.69	3.076
3/17/2020	17:38:48	7.69	3.074
3/17/2020	17:38:50	7.69	3.076
3/17/2020	17:38:53	7.70	3.080
3/17/2020	17:38:55	7.71	3.085

Method 205 Worksheet

		O2 %	O2 Volts
3/17/2020	17:38:57	7.70	3.081
3/17/2020	17:38:59	7.70	3.082
3/17/2020	17:39:02	7.71	3.084
3/17/2020	17:39:04	7.72	3.087
3/17/2020	17:39:06	7.72	3.086
3/17/2020	17:39:08	7.72	3.088
3/17/2020	17:39:11	7.72	3.087
3/17/2020	17:39:13	7.73	3.090
3/17/2020	17:39:15	7.73	3.090
3/17/2020	17:39:17	7.35	2.938
3/17/2020	17:39:20	6.01	2.404
3/17/2020	17:39:22	6.42	2.567
3/17/2020	17:39:24	9.34	3.735
3/17/2020	17:39:26	12.44	4.977
3/17/2020	17:39:28	13.99	5.594
3/17/2020	17:39:31	14.00	5.600
3/17/2020	17:39:33	13.36	5.343
3/17/2020	17:39:35	12.63	5.052
3/17/2020	17:39:37	12.00	4.799
3/17/2020	17:39:40	11.41	4.564
3/17/2020	17:39:42	11.21	4.484
3/17/2020	17:39:44	11.13	4.452
3/17/2020	17:39:46	11.10	4.441
3/17/2020	17:39:49	11.10	4.441
3/17/2020	17:39:51	11.13	4.452
3/17/2020	17:39:53	11.16	4.465
3/17/2020	17:39:55	11.20	4.482
3/17/2020	17:39:58	11.22	4.487
3/17/2020	17:40:00	11.22	4.487
3/17/2020	17:40:02	11.23	4.492
3/17/2020	17:40:04	11.24	4.495
3/17/2020	17:40:07	11.24	4.495
3/17/2020	17:40:09	11.23	4.492
3/17/2020	17:40:11	11.23	4.493
3/17/2020	17:40:13	11.23	4.493
3/17/2020	17:40:16	11.23	4.493
3/17/2020	17:40:18	11.00	4.400
3/17/2020	17:40:20	9.07	3.626
3/17/2020	17:40:22	6.54	2.616
3/17/2020	17:40:25	4.67	1.867
3/17/2020	17:40:27	5.31	2.124
3/17/2020	17:40:29	9.52	3.808
3/17/2020	17:40:31	12.10	4.840
3/17/2020	17:40:34	14.11	5.644
3/17/2020	17:40:36	15.58	6.233
3/17/2020	17:40:38	16.59	6.637

CO2 Interference Tests Model 200AH
05/01/02

Reaction cell Pressure dependence of CO2 interference

Method:
The method chosen was to make 80 ppm NO at a flow of 2000 cc/min. Then add 200 cc/min of 100% pure CO2 interferent. The interferent dilutes the original flow by about 10%. In calculation of the data the initial 80 ppm is reduced by the dilution factor:

(80 PPM)(.9035) = 72.28 PPM

To calculate the interferent effect, the concentration of diluted NO plus CO2 is measured. For example 68.28 ppm. Then:

72.28 ppm - 68.28 ppm = 4 ppm CO2 interferent

Experiment #1 - Rx cell pressure dependence of CO2 interference with a 500 cc/min Ozone flow

Reaction cell pressure	CO2 Interferant Effect
2.42 in Hg A	-2.26 ppm
3.62	-2.5
6.02	-2.45
10.0	-3.37

Experiment #2 - Rx cell pressure dependence of CO2 interference with a 50 cc/min Ozone flow

Reaction cell pressure	Interferant Effect
1.42 in Hg A	-4.80 ppm
2.72	-4.86
5.32	-5.46
10.0	-6.3

The following is the first attempt to measure CO2 interference in the M200AH. 80 cc/min ozone flow. This set of data used the 24% CO2 bottle and diluted 50% CO2 gas 50% zero gas. This method is not very accurate since the flow rates involved are fairly large(1000cc/min) and not very repeatable.

Rx Cell press	12% CO2 Intf
1.5 In Hg A	-3.9 ppm
2.5	-3.8
5	-4.1
7.5	-6.1
10	-5.6
15	-6.4

CO2 interference as a function of NO gas concentration.

NO concentration	12% CO2 Intf
40 ppm	-1.1 ppm
80	-4.0
160	-12.5

CO2 interference as a function of Ozone flow rate

Ozone flow	12% CO2 Intf
500	-2.75
250	-3.91
50	-4.75

Diluter QA/QC
Check
AMP Cherokee

Instrument Type Diluter
Analyzer Model API 700E
RMA No. 3163
Serial number 538-S
Firmware C.3

Analyzer Set-up Data

MFC-1	10,000	cc	T-Hastings
MFC-2	5,000	cc	T-Hastings
MFC-3	1,000	cc	T-Hastings

10LPM

This flow controller was calibrated using a CM2-C1 a NIST traceable Primary Flow Standard Calibration System. This calibration is referenced to dry air at a temperature of 32 degrees F and a pressure of 29.92 in.HG (760 Torr).

	Bench Flow (CC)	Diluter Flow (CC)	% Difference
5%	590	590	0.000
10%	1090	1095	0.050
15%	1590	1596	0.060
20%	2080	2085	0.050
25%	2590	2602	0.120
30%	3085	3099	0.140
35%	3550	3571	0.210
40%	4050	4060	0.100
45%	4550	4570	0.200
50%	5045	5067	0.220
55%	5550	5581	0.310
60%	6060	6085	0.250
65%	6560	6579	0.190
70%	7070	7085	0.150
75%	7580	7593	0.130
80%	8110	8123	0.130
85%	8625	8621	-0.040
90%	9120	9119	-0.010
95%	9650	9623	-0.270
97%	9870	9849	-0.210

Verified by: DM Date: 2/20/2018

Diluter QA/QC
Check
AMP Cherokee

Instrument Type Diluter
Analyzer Model API 700E
RMA No. 3163
Serial number 538-S
Firmware C.3

Analyzer Set-up Data

MFC-1	10,000	cc	T-Hastings
MFC-2	5,000	cc	T-Hastings
MFC-3	1,000	cc	T-Hastings

5LPM

This flow controller was calibrated using a CM2-C1 a NIST traceable Primary Flow Standard Calibration System. This calibration is referenced to dry air at a temperature of 32 degrees F and a pressure of 29.92 in.HG (760 Torr).

	Bench Flow (CC)	Diluter Flow (CC)	% Difference
5%	N/A	N/A	N/A
10%	N/A	N/A	N/A
15%	N/A	N/A	N/A
20%	N/A	N/A	N/A
25%	1240	1241	0.020
30%	1545	1544	-0.020
35%	1745	1744	-0.020
40%	2050	2049	-0.020
45%	2265	2264	-0.020
50%	2575	2575	0.000
55%	2775	2776	0.020
60%	3080	3076	-0.080
65%	3285	3276	-0.180
70%	3585	3577	-0.160
75%	3785	3778	-0.140
80%	4080	4070	-0.200
85%	4270	4260	-0.200
90%	4555	4555	0.000
95%	4745	4750	0.100
100%	4930	4940	0.200

Verified by: DM Date: 2/20/2018

Diluter QA/QC
Check
AMP Cherokee

Instrument Type Diluter
Analyzer Model API 700E
RMA No. 3136
Serial number 538-S
Firmware C.3

Analyzer Set-up Data

MFC-1	10,000	cc	T-Hastings
MFC-2	5,000	cc	T-Hastings
MFC-3	1,000	cc	T-Hastings

1LPM

This flow controller was calibrated using a CM2-C1 a NIST traceable Primary Flow Standard Calibration System. This calibration is referenced to dry air at a temperature of 32 degrees F and a pressure of 29.92 in.HG (760 Torr).

	Bench Flow (CC)	Diluter Flow (CC)	% Difference
5%	57	57	0.000
10%	109	109	0.000
15%	160	159	-0.100
20%	210	209	-0.100
25%	261	259	-0.200
30%	312	310	-0.200
35%	361	359	-0.200
40%	413	410	-0.300
45%	462	459	-0.300
50%	512	510	-0.200
55%	562	560	-0.200
60%	611	610	-0.100
65%	661	660	-0.100
70%	711	710	-0.100
75%	761	760	-0.100
80%	810	810	0.000
85%	860	860	0.000
90%	910	910	0.000
95%	960	960	0.000
97%	980	980	0.000

Verified by: DM Date: 2/20/2018

Diluter QA/QC
Check
AMP Cherokee

Instrument Type Diluter
Analyzer Model API 700
RMA No. 2159
Serial number 890
Firmware D.9

Analyzer Set-up Data

MFC-1	10,000	cc	T-Hastings
MFC-2	5,000	cc	T-Hastings

10LPM

This flow controller was calibrated using a CM2-C1 a NIST traceable Primary Flow Standard Calibration System. This calibration is referenced to dry air at a temperature of 32 degrees F and a pressure of 29.92 in.HG (760 Torr).

	Bench Flow (CC)	Diluter Flow (CC)	% Difference
5%	460	490	0.300
10%	1000	1000	0.000
15%	1500	1500	0.000
20%	2000	2000	0.000
25%	2510	2505	-0.050
30%	3000	3009	0.090
35%	3500	3507	0.070
40%	4000	4013	0.130
45%	4500	4513	0.130
50%	5000	5020	0.200
55%	5500	5523	0.230
60%	6000	6024	0.240
65%	6500	6527	0.270
70%	7000	7034	0.340
75%	7505	7530	0.250
80%	8000	8019	0.190
85%	8500	8516	0.160
90%	9040	9042	0.020
95%	9500	9524	0.240
97%	9690	9720	0.300

Verified by: DM Date: 3/5/2018

Diluter QA/QC
Check
AMP Cherokee

Instrument Type Diluter
Analyzer Model API 700
RMA No. 2159
Serial number 890
Firmware D.9

Analyzer Set-up Data

MFC-1	10,000	cc	T-Hastings
MFC-2	5,000	cc	T-Hastings

5LPM

This flow controller was calibrated using a CM2-C1 a NIST traceable Primary Flow Standard Calibration System. This calibration is referenced to dry air at a temperature of 32 degrees F and a pressure of 29.92 in.HG (760 Torr).

	Bench Flow (CC)	Diluter Flow (CC)	% Difference
5%	N/A	N/A	N/A
10%	470	483	0.260
15%	730	740	0.200
20%	990	989	-0.020
25%	1250	1241	-0.180
30%	1500	1494	-0.120
35%	1750	1744	-0.120
40%	2000	1996	-0.080
45%	2260	2246	-0.280
50%	2500	2497	-0.060
55%	2760	2750	-0.200
60%	3000	2999	-0.020
65%	3250	3249	-0.020
70%	3500	3501	0.020
75%	3750	3751	0.020
80%	4000	4003	0.060
85%	4250	4253	0.060
90%	4500	4498	-0.040
95%	4750	4753	0.060
100%	5010	5000	-0.200

Verified by: DM Date: 3/5/2018

Interference Tests
(Per US EPA 40CFR Part 53.23)

Analyzer	Parameter	Interferent	Concentration	Response	%Interference
M100A	SO2 [140 ppb]	NO	500 ppb	<2.5 ppb	<0.5%
		NO2	500 ppb	<0.3 ppb	<0.06%
		O3	500 ppb	-0-	0%
		m-Xylene	200 ppb	<4.1 ppb	<2.05%
		H2O	2%	<5.1 ppb	<0.0000255%
M200A	NO2 [100 ppb]	NH3	100 ppb	<0.9 ppb	<0.9%
		SO2	500 ppb	<0.3 ppb	<0.06%
		NO	500 ppb	<6 ppb	<1.2%
		H2O	2%	<2.2 ppb	<0.00000011%
M300	CO [10 ppm]	CO2	750 ppm	<0.1 ppm	<0.013%
		H2O	2%	<0.22 ppm	<0.0011%
M400A	O3 [80 ppb]	NO	500 ppb	<0.01 ppb	<0.002%
		NO2	500 ppb	<0.9 ppb	<0.18%
		SO2	500 ppb	<5.4 ppb	<1.08%
		m-Xylene	200 ppb	<3.2 ppb	<1.6%
		H2O	2%	<3.7 ppb	<0.000000185%

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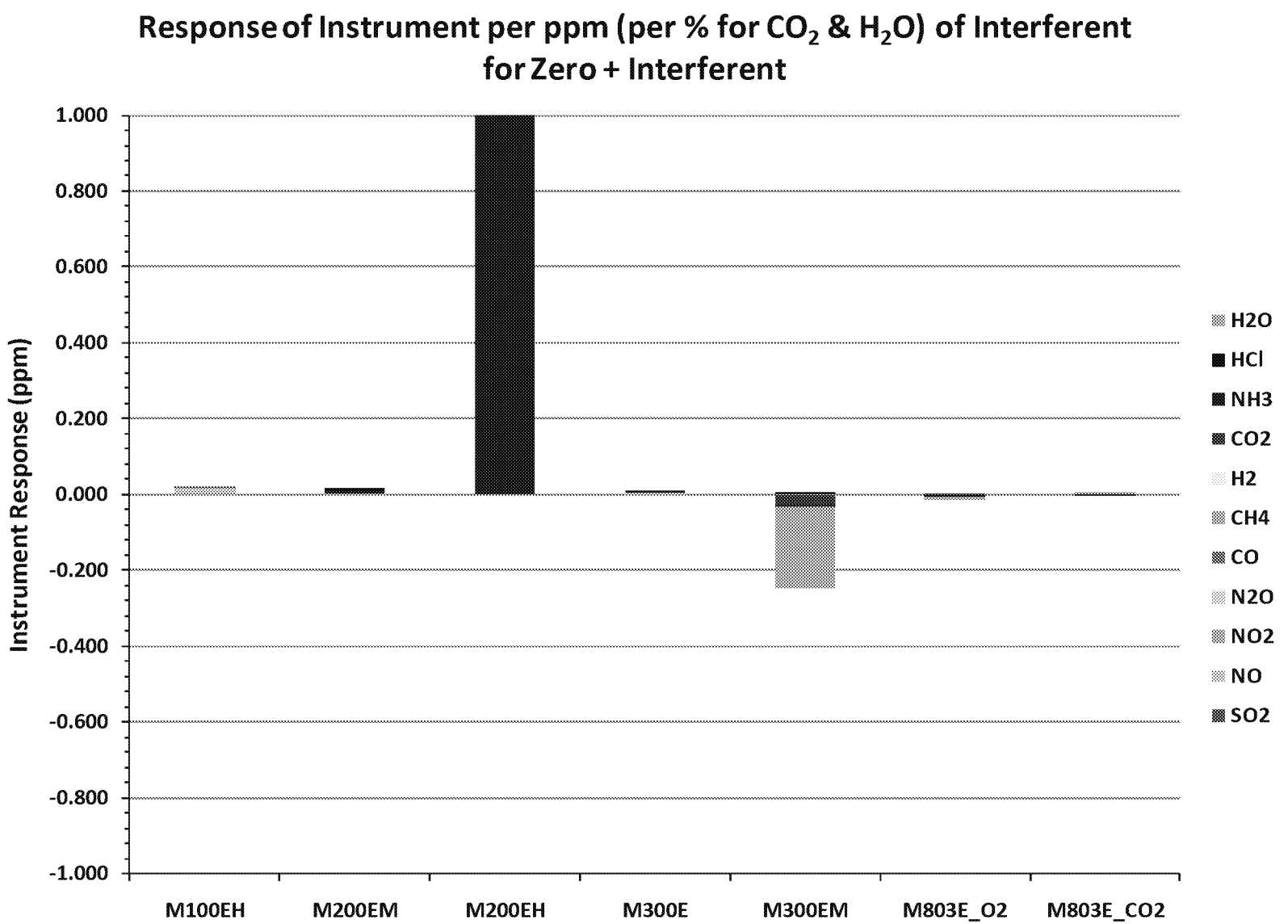
Zero + Interferent: Instrument Response / ppm



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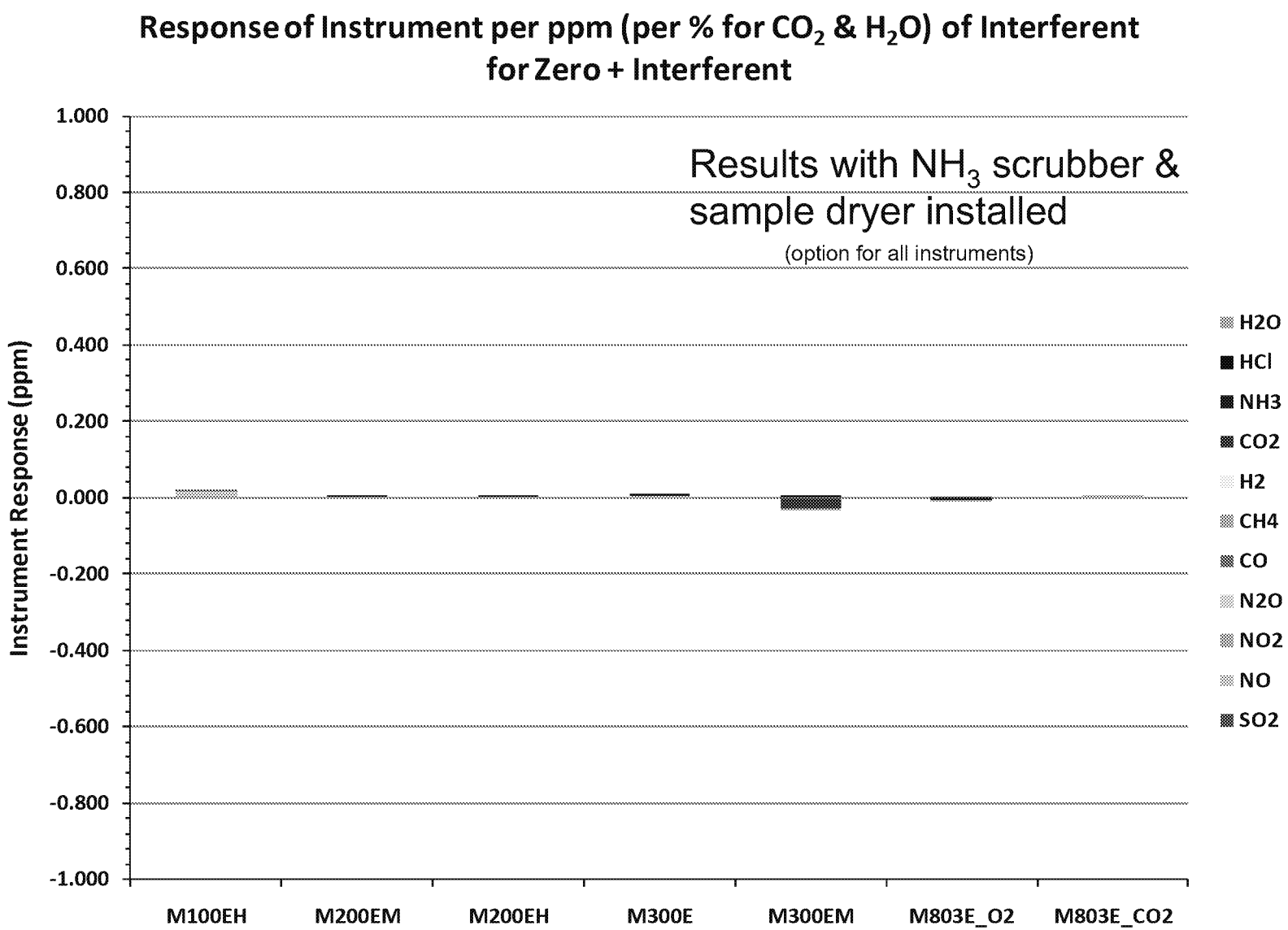

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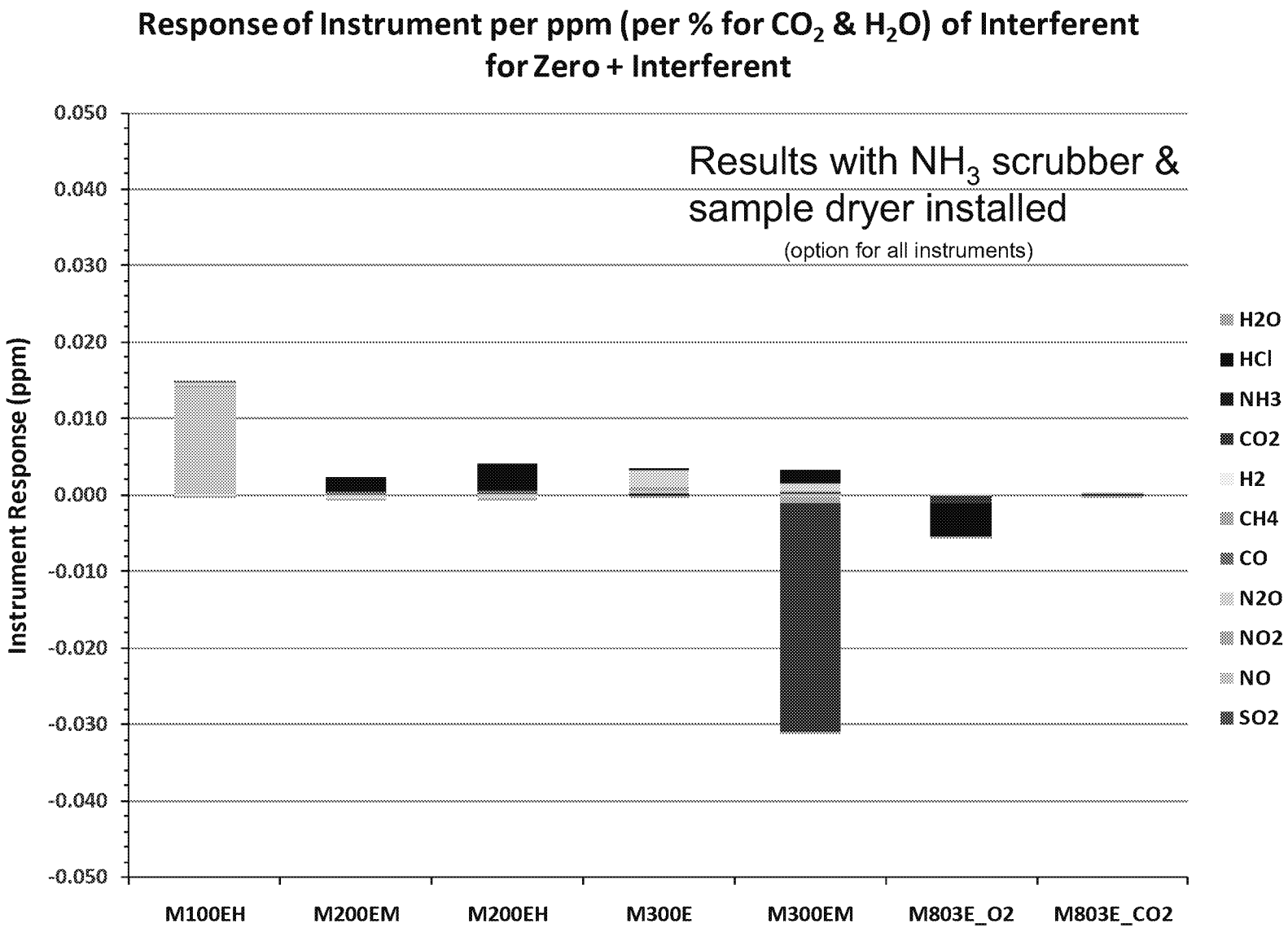

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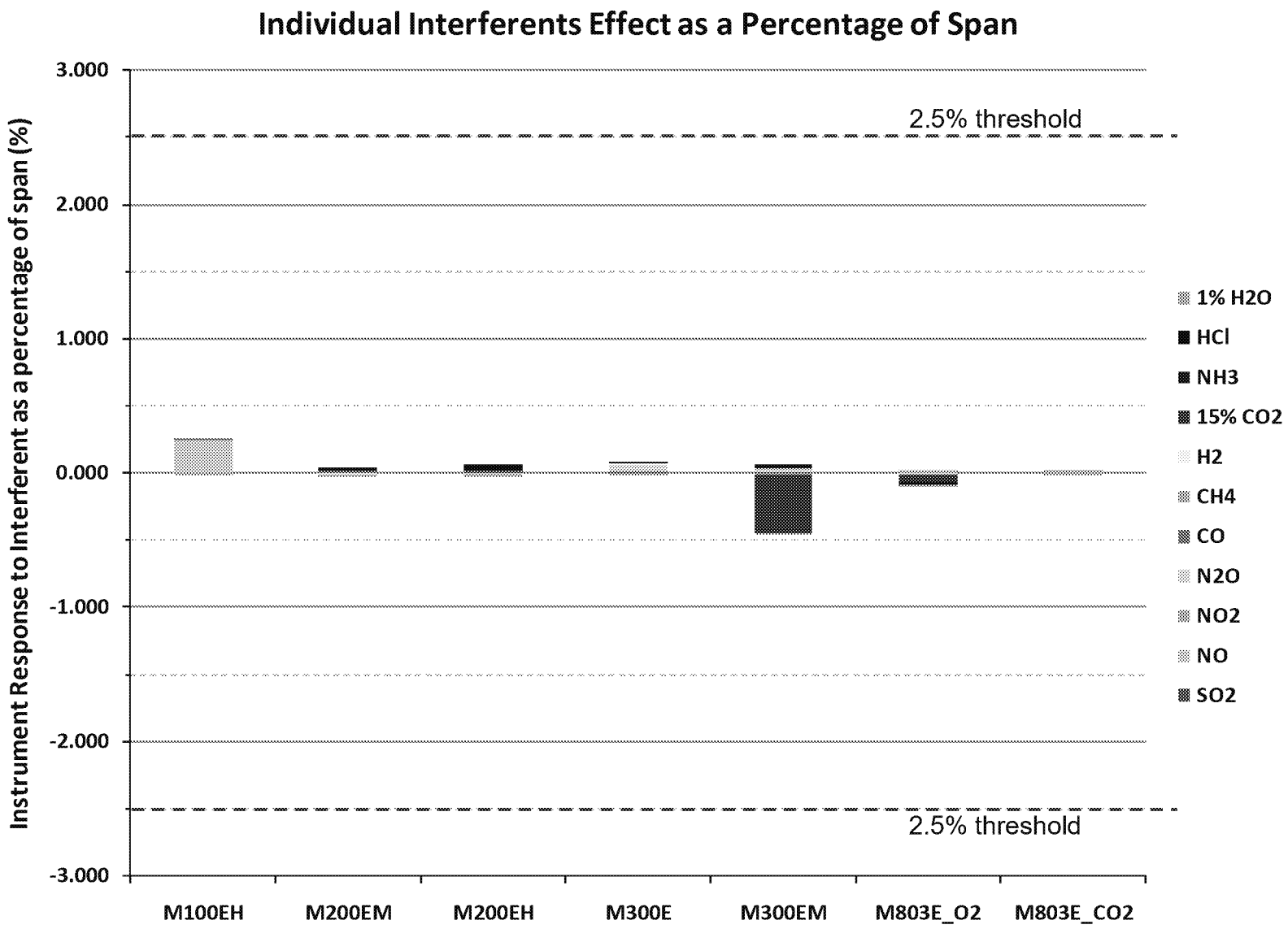
Zero + Interferent: 40CFR60 App. 4-A Method 7E



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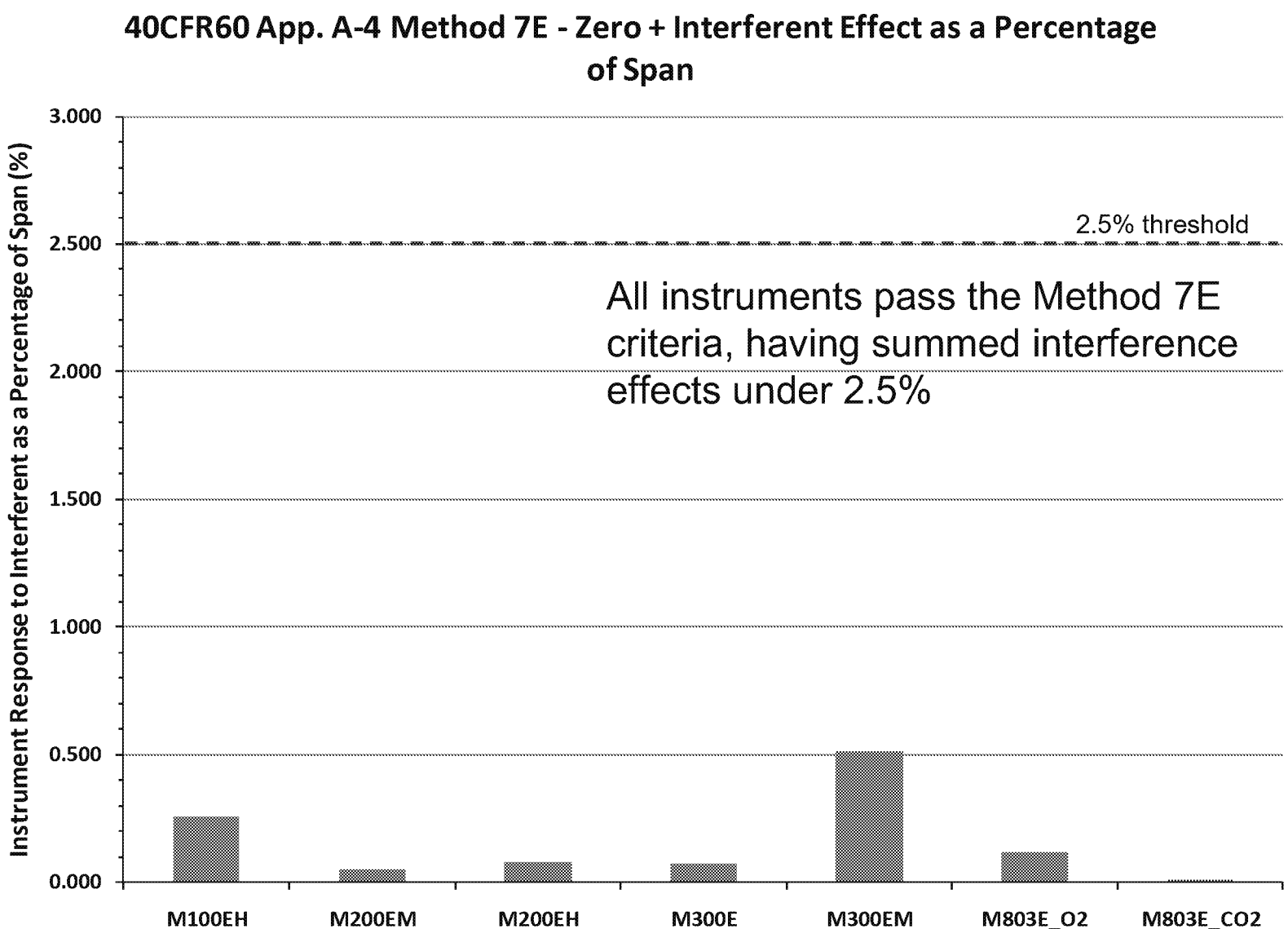
Zero + Interferent: 40CFR60 App. 4-A Method 7E



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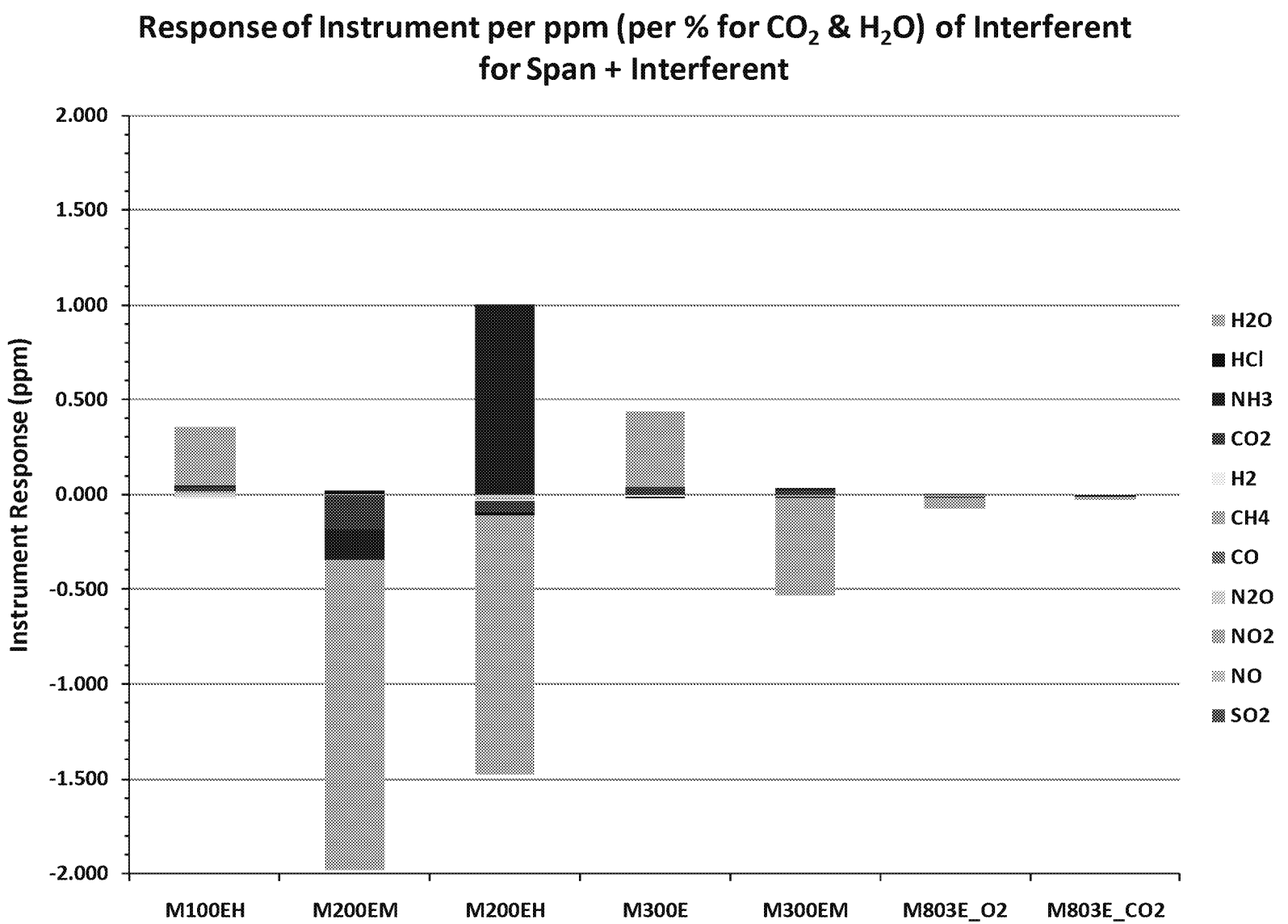

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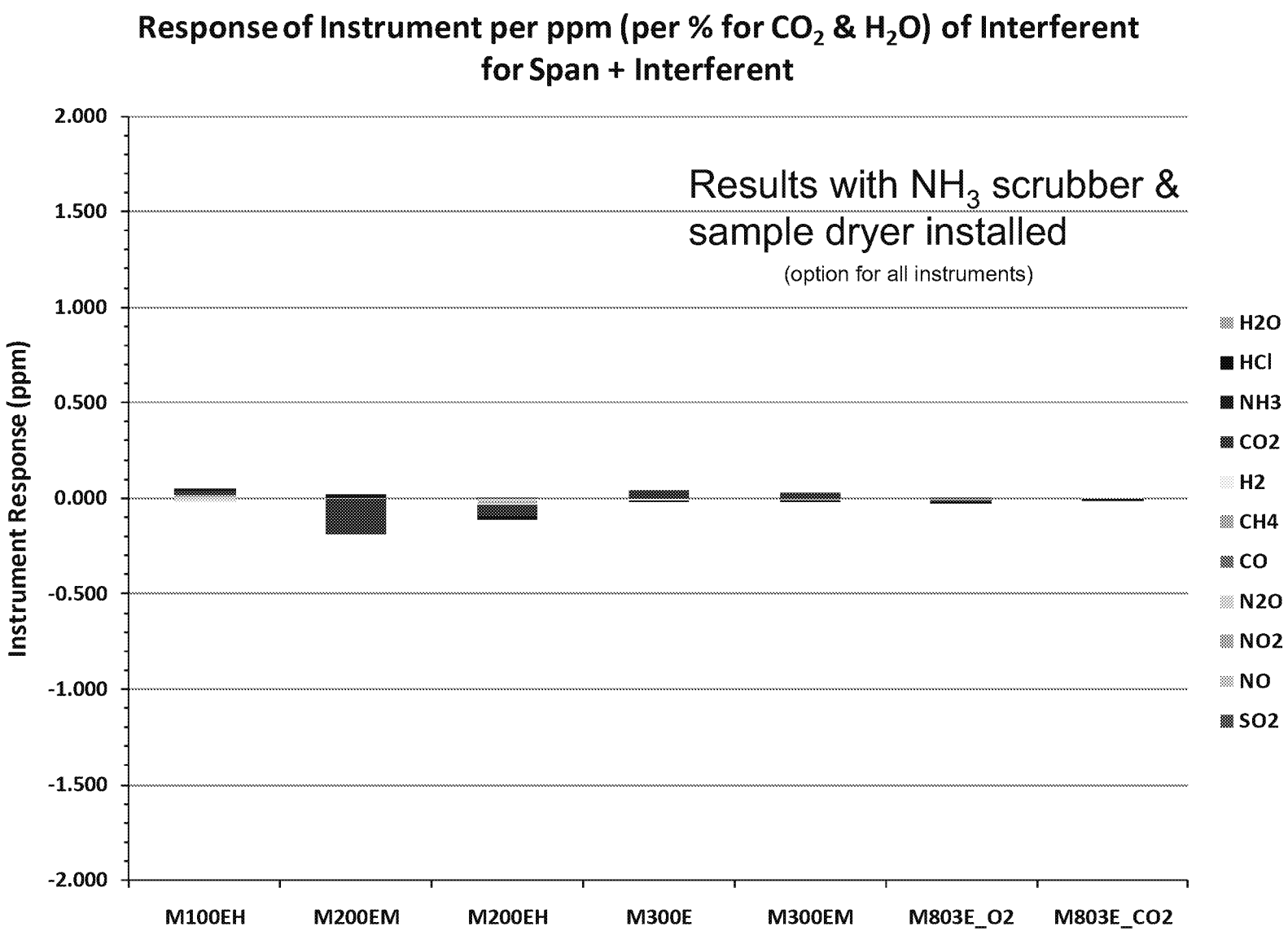

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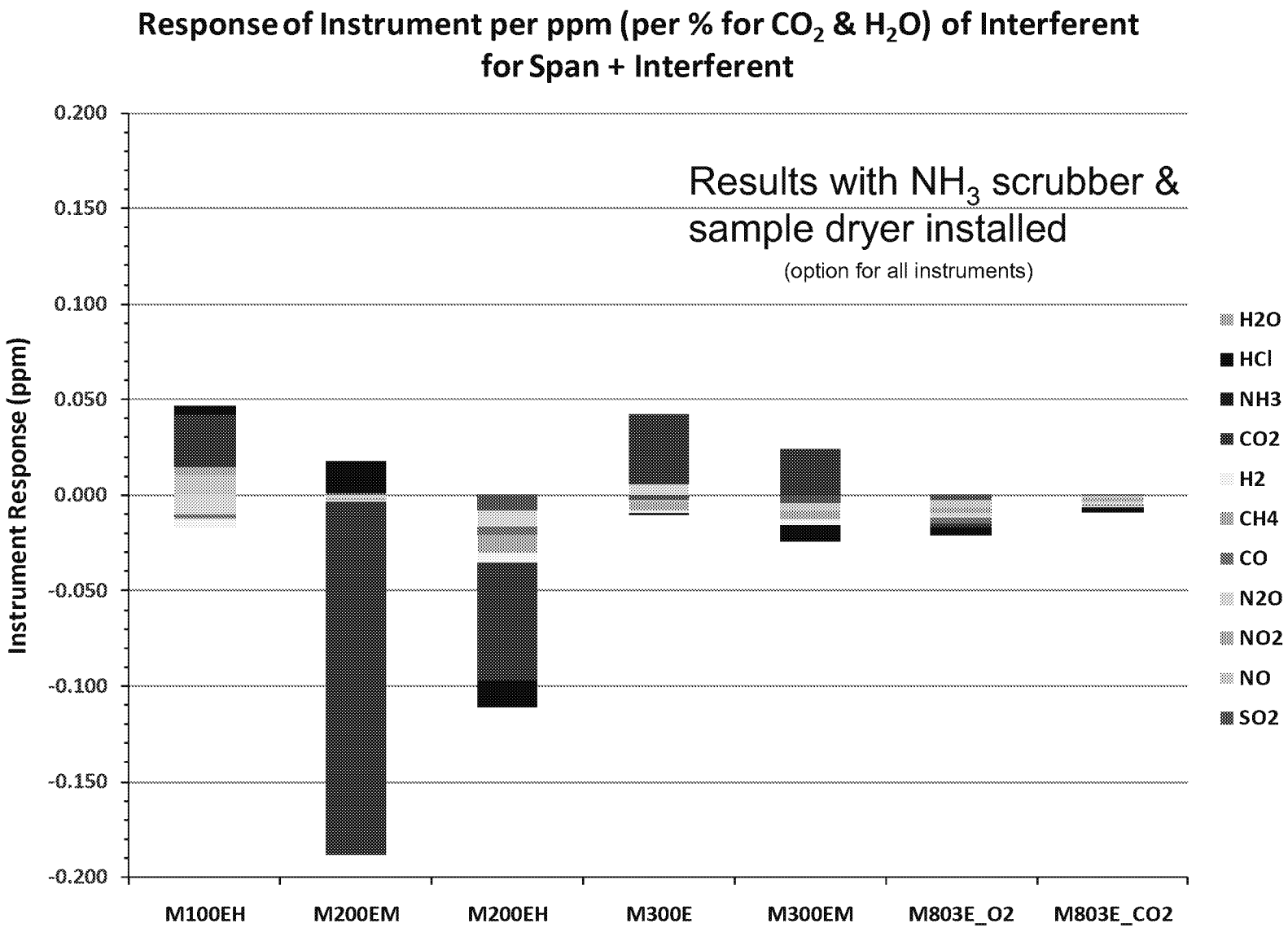

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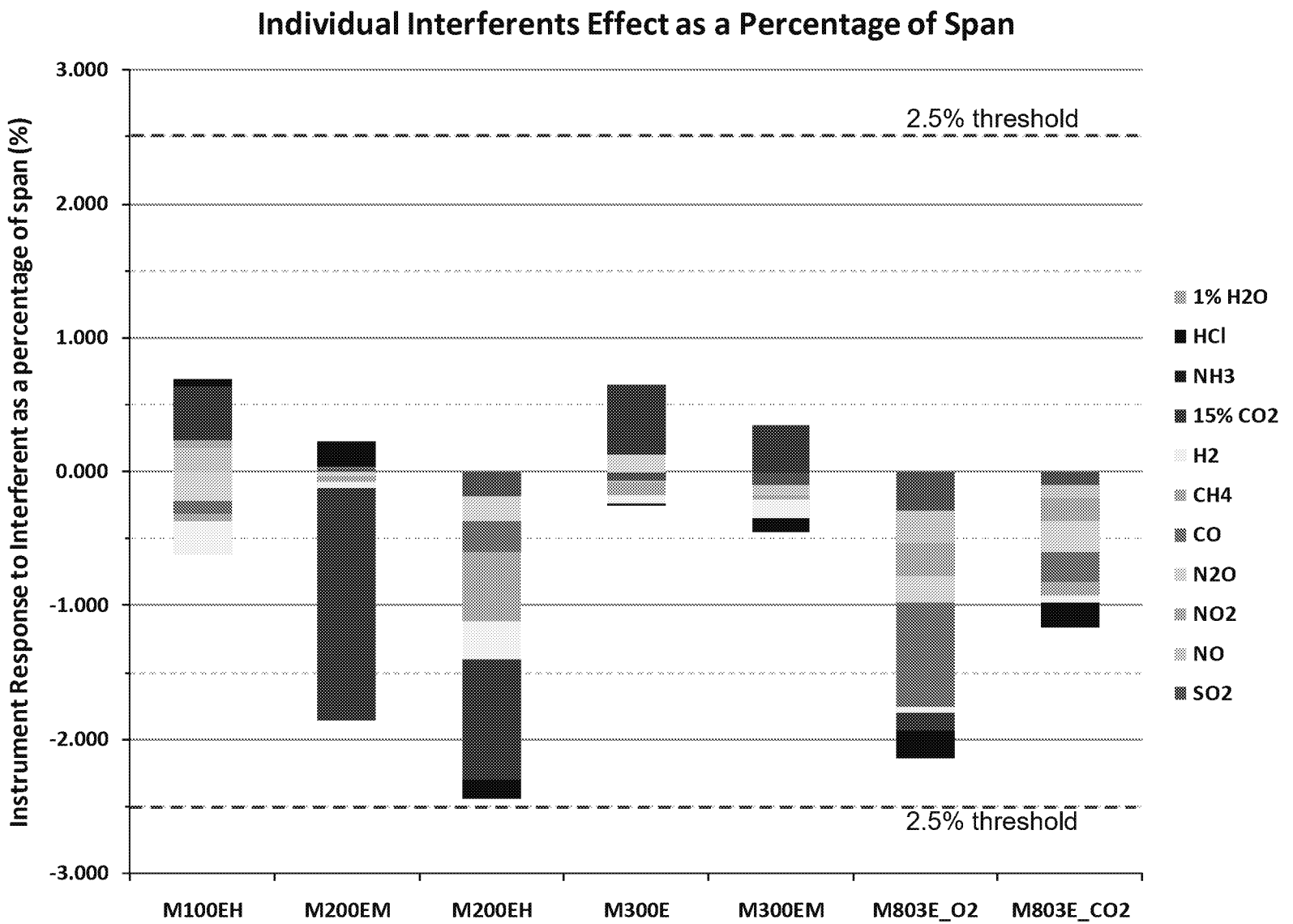
Span + Interferent: 40CFR60 App. 4-A Method 7E



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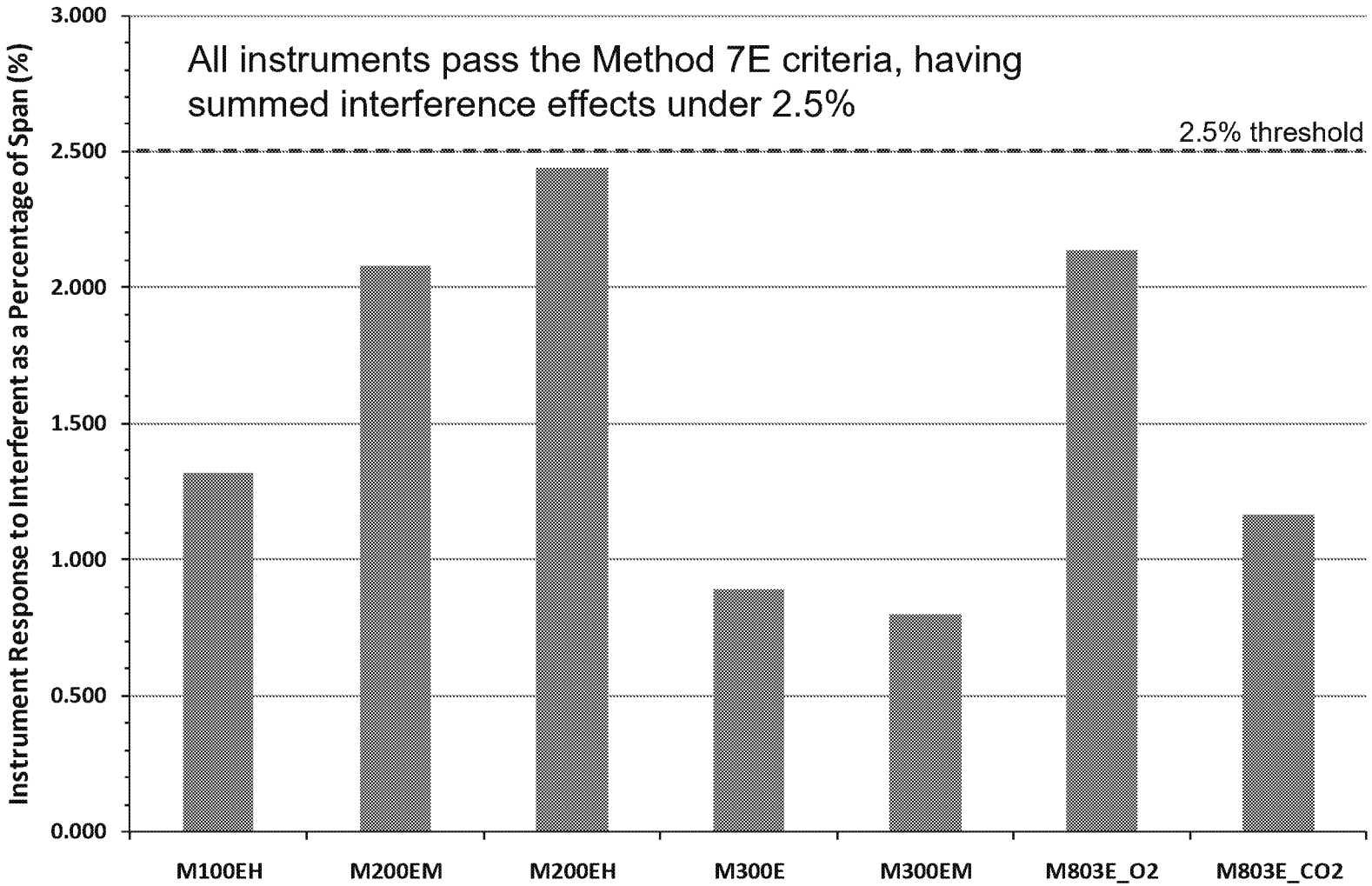

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Conclusions

- 40CFR60 App. A-4 Method 7E interference testing
  - Relatively straightforward to perform
  - Huge investment in the time & resources involved to ensure quality experimental setup, execution, and data analysis
- Interference test results
  - Show that the Teledyne – API instruments common to RATA and CEMS applications meet the interference effect criteria defined by 40CFR60 App. A-4 Method 7E
- For the Zero + Interferent tests
  - The instruments perform well within the criteria
    - Shows that the primary effect of interferences is not due to the interferent gas producing a signal on its own

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Conclusions

- For the Span + Interferent tests
  - Some of the instruments (M100EH, M300E, M300EM, M803E(CO_2), perform well within the criteria
  - The NO_x instruments (especially the M200EH) are close to the threshold
    - It should be noted that this is for all interferent gasses combined at their max (worst case scenerio)
  - Shows why RATA analyzers need to be calibrated under the same conditions as the CEMS instruments for proper comparison
- Future Directions
  - Further investigate the cause of specific interferences and how to reduce their effect

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Acknowledgements

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  - Jeff Franks
  - Bill Taylor
  - Martin Abbott

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APPENDIX G

PROCESS OPERATION DATA

GBMSD Stack Testing Results

Green Bay Facility - Fluid Bed Incinerator

FBI Feed

3/18/2020

DATE	Run	LAB NO.	SAMPLE	%TS	%VS	Wet gal/hr	Wet lbs/hr	Dry lbs/hr	Dry ton/hr
3/18/2020	Run #1	T2000501-001	TEST 1	32.82	67.06	1162	11782.7	3867	1.934
3/18/2020	Run #2	T2000501-002	TEST 2	34.4	67.4	1086.0	11012	3788	1.894
3/18/2020	Run #3	T2000501-003	TEST 3	35.07	32.0	1162.2	11784.7	4133	2.066

GBMSD Stack Testing Results

Green Bay Facility - Fluid Bed Incinerator

FBI Feed

3/19/2020

DATE	Run	LAB NO.	SAMPLE	%TS	%VS	Wet gal/hr	Wet lbs/hr	Dry lbs/hr	Dry ton/hr
3/19/2020	Run #1	T2000501-004	TEST 1	36.49	66.5	1075.1	10901.51	3978	1.989
3/19/2020	Run #2	T2000501-005	TEST 2	36.16	65.3	1081.5	10966.41	3965	1.983
3/19/2020	Run #3	T2000501-006	TEST 3	34.52	67.1	1089.8	11050.57	3815	1.907

Fluidized Bed Incinerator (Process 108)

Date: 3/18/20

Test 1

Start Time: 11:50 AM
Stop Time: 12:53 PM

Time	Sludge Feed Calibration (in/min)	Bed Height (in)	Sludge Feed (lb/hr)	Freeboard Temp (°F)	Freeboard Temperatures				Bed Temperatures					Pressure Drop (in H2O)	Pressure Drop (in H2O)	Pressure Drop (in H2O)	Pressure Differential (in H2O)	Pressure Differential (in H2O)	Incident Heat						Primary Air Flow (scfm)	Secondary Air Flow (scfm)	Secondary Air Temp (°F)	Secondary Air Pressure (psig)	Secondary Air Dew Point (°F)	Secondary Air Flow (scfm)	Secondary Air Temp (°F)	Secondary Air Pressure (psig)	Secondary Air Dew Point (°F)	Sludge Feed Rate (gpm)	Sludge Feed Temp (°F)	Sludge Feed Rate (lb/hr)	Diesel Rate (gph)	Diesel Temp (°F)
					FT-1004 (°F)	FT-1005 (°F)	FT-1006 (°F)	Freeboard Average Temperature (°F)	FT-1001 (°F)	FT-1002 (°F)	FT-1003 (°F)	FT-1007 (°F)	Bed Average Temperature (°F)						Incident Heat Sensor Power (kgcal)	Incident Heat Sensor Temperature (°F)	Incident Heat Sensor Flow (gpm)	Incident Heat Sensor Pressure (psig)	Incident Heat Sensor Time (sec)	Total (kgcal)														
11:50 AM	27.20	61.8	4.11	1600.0	1617.9	1589.2	1601.0	1601.9	1399.7	1389.2	1393.3	1394.9	1392.2	-0.03	6723	136.5	0.90	461.0	93.6	11.7	304.9	44.8	28.3	483.4	0.0	40.7	2.1	114.7	5.63	N	N	0.00	46.24	3.23	81.6	51.1	0.0	19.0	36.70	37.7	12.78	13.56
12:05 PM	26.58	61.7	4.66	1587.0	1597.3	1576.0	1591.4	1588.6	1390.2	1380.3	1385.6	1385.3	1385.3	-0.12	6732	135.4	0.86	456.0	88.9	11.2	291.1	44.8	29.2	465.3	0.0	40.5	2.1	115.0	5.56	N	N	0.00	46.46	3.24	79.8	51.1	0.0	19.3		37.8	12.74	13.59
12:20 PM	27.42	61.7	5.18	1593.3	1614.6	1571.4	1587.5	1591.0	1376.1	1366.3	1372.1	1373.2	1372.0	0.21	6752	135.9	0.87	456.8	89.9	11.3	292.9	44.8	29.1	466.0	0.0	41.0	2.1	114.7	5.52	N	N	0.00	47.21	3.22	82.1	51.1	0.0	19.3	37.41	37.8	12.64	13.35
12:35 PM	26.51	61.6	4.80	1591.6	1597.2	1575.4	1599.2	1590.5	1366.8	1356.3	1362.2	1356.8	1361.2	-0.19	6727	136.1	0.91	458.2	91.9	11.6	299.1	45.0	28.9	476.4	0.0	39.8	2.1	114.4	5.64	N	N	0.00	46.77	3.23	84.0	51.1	0.0	18.8	35.97	37.8	12.29	13.05
12:50 PM	26.42	61.7	5.10	1581.7	1589.2	1565.3	1582.5	1578.3	1364.5	1354.2	1359.5	1361.3	1359.6	-0.28	6666	135.8	0.88	456.4	91.1	11.5	300.4	45.0	29.5	477.5	0.0	40.5	2.1	114.9	5.63	N	N	0.00	46.60	3.23	83.8	51.1	0.0	19.2	36.53	37.8	12.11	13.06

Sludge Gallons Tot. Start:	7414.6	Sludge Tons tot. Start:	12.77	Diesel Tot. (Kgal) Start:	251.05
Sludge Gallons Tot. Stop:	8635.0	Sludge Tons tot. Stop:	14.80	Diesel Tot. (Kgal) Stop:	251.05
Total	1220.4	Total	2.03	Diesel Fuel Fed (gal)	0.00
Gal/hr	1162.2	Tons/Hr	1.93		
		Tons/Day	46.40		

Natural Gas Tot. Start:	25335.2
Natural Gas Tot. Stop:	25340.4
Natural Gas Fed (KSCF)	5.20

Test 2

Start Time: 1:15 PM
Stop Time: 2:18 PM

Time	Sludge Feed Calibration (in/min)	Bed Height (in)	Sludge Feed (lb/hr)	Freeboard Temp (°F)	Freeboard Temperatures				Bed Temperatures					Pressure Drop (in H2O)	Pressure Drop (in H2O)	Pressure Drop (in H2O)	Pressure Differential (in H2O)	Pressure Differential (in H2O)	Incident Heat						Primary Air Flow (scfm)	Secondary Air Flow (scfm)	Secondary Air Temp (°F)	Secondary Air Pressure (psig)	Secondary Air Dew Point (°F)	Secondary Air Flow (scfm)	Secondary Air Temp (°F)	Secondary Air Pressure (psig)	Secondary Air Dew Point (°F)	Sludge Feed Rate (gpm)	Sludge Feed Temp (°F)	Sludge Feed Rate (lb/hr)	Diesel Rate (gph)	Diesel Temp (°F)
					FT-1004 (°F)	FT-1005 (°F)	FT-1006 (°F)	Freeboard Average Temperature (°F)	FT-1001 (°F)	FT-1002 (°F)	FT-1003 (°F)	FT-1007 (°F)	Bed Average Temperature (°F)						Incident Heat Sensor Power (kgcal)	Incident Heat Sensor Temperature (°F)	Incident Heat Sensor Flow (gpm)	Incident Heat Sensor Pressure (psig)	Incident Heat Sensor Time (sec)	Total (kgcal)														
1:15 PM	26.61	61.9	5.05	1582.1	1584.7	1564.0	1592.2	1579.2	1361.1	1352.3	1358.3	1357.3	1357.5	0.23	6734	136.1	0.86	453.9	91.2	11.6	299.0	45.0	29.5	476.3	0.0	40.7	2.2	114.1	5.55	N	N	0.00	46.04	3.21	81.6	51.1	0.0	19.3		37.8	12.14	13.03
1:30 PM	27.09	61.8	5.07	1584.4	1587.2	1572.2	1592.1	1583.8	1364.6	1354.5	1359.3	1356.9	1357.8	-0.96	6669	136.2	0.82	456.8	88.2	11.2	290.1	44.8	29.6	464.2	0.0	40.7	2.1	114.7	5.54	N	N	0.00	45.95	3.27	77.5	51.1	0.0	17.8	37.63	37.9	12.09	13.01
1:45 PM	26.60	61.6	5.47	1577.9	1590.8	1554.6	1577.7	1574.4	1366.3	1359.4	1362.4	1364.3	1363.6	0.24	6732	137.8	0.85	453.5	91.4	11.5	299.5	45.0	29.8	477.2	0.0	40.6	2.1	114.7	5.57	N	N	0.00	45.58	3.23	80.3	51.1	0.0	17.6		38.0	11.97	12.98
2:00 PM	27.08	61.7	5.55	1575.5	1588.9	1553.6	1584.5	1568.4	1369.4	1359.2	1365.2	1366.5	1364.2	0.28	6664	137.6	0.85	457.7	90.7	11.5	298.1	45.0	29.9	475.2	0.0	40.5	2.1	114.4	5.53	N	N	0.00	44.92	3.23	76.9	51.1	0.0	18.3	38.04	38.1	11.95	12.94
2:15 PM	26.12	61.6	5.47	1577.3	1586.7	1558.9	1580.5	1575.2	1366.3	1360.4	1362.3	1363.0	1363.6	0.19	6645	137.2	0.83	456.1	90.3	11.5	297.5	44.9	29.8	474.0	0.0	41.6	2.1	114.2	5.43	N	N	0.00	45.10	3.22	74.7	51.1	0.0	18.7		38.1	11.76	13.05

Sludge Gallons Tot. Start:	9047.9	Sludge Tons tot. Start:	15.49	Diesel Tot. (Kgal) Start:	251.05
Sludge Gallons Tot. Stop:	10188.0	Sludge Tons tot. Stop:	17.42	Diesel Tot. (Kgal) Stop:	251.05
Total	1140.1	Total	1.93	Diesel Fuel Fed (gal)	0.00
Gal/hr	1085.8	Tons/Hr	1.84		
		Tons/Day	44.11		

Natural Gas Tot. Start:	25342.2
Natural Gas Tot. Stop:	25346.9
Natural Gas Fed (KSCF)	4.7

Test 3

Start Time: 2:50 PM
Stop Time: 3:54 PM

Time	Sludge Feed Calibration (in/min)	Bed Height (in)	Sludge Feed (lb/hr)	Freeboard Temp (°F)	Freeboard Temperatures				Bed Temperatures					Pressure Drop (in H2O)	Pressure Drop (in H2O)	Pressure Drop (in H2O)	Pressure Differential (in H2O)	Pressure Differential (in H2O)	Incident Heat						Primary Air Flow (scfm)	Secondary Air Flow (scfm)	Secondary Air Temp (°F)	Secondary Air Pressure (psig)	Secondary Air Dew Point (°F)	Secondary Air Flow (scfm)	Secondary Air Temp (°F)	Secondary Air Pressure (psig)	Secondary Air Dew Point (°F)	Sludge Feed Rate (gpm)	Sludge Feed Temp (°F)	Sludge Feed Rate (lb/hr)	Diesel Rate (gph)	Diesel Temp (°F)
					FT-1004 (°F)	FT-1005 (°F)	FT-1006 (°F)	Freeboard Average Temperature (°F)	FT-1001 (°F)	FT-1002 (°F)	FT-1003 (°F)	FT-1007 (°F)	Bed Average Temperature (°F)						Incident Heat Sensor Power (kgcal)	Incident Heat Sensor Temperature (°F)	Incident Heat Sensor Flow (gpm)	Incident Heat Sensor Pressure (psig)	Incident Heat Sensor Time (sec)	Total (kgcal)														
2:50 PM	25.53	61.7	5.17	1503.9	1506.6	1483.0	1507.3	1511.0	1342.9	1333.4	1338.2	1339.0	1338.3	0.64	6720	136.7	0.83	450.4	91.1	11.6	296.7	45.0	30.0	476.3	0.0	41.7	2.1	114.9	5.61	N	N	0.00	44.96	3.21	87.3	51.1	0.0	17.8	36.33	38.6	11.84	12.84
3:05 PM	26.56	61.8	5.05	1582.1	1578.8	1540.7	1552.2	1557.5	1333.0	1322.3	1326.6	1331.6	1327.7	0.05	6710	136.8	0.85	465.9	85.0	10.9	280.9	44.8	29.0	450.5	0.0	42.3	2.1	114.7	5.19	N	N	0.00	44.19	3.23	76.9	51.1	0.0	19.8	37.75	38.4	11.76	12.91
3:20 PM	27.99	61.7	4.15	1601.2	1586.2	1591.6	1622.1	1605.3	1343.4	1335.1	1337.8	1335.4	1338.0	1.12	6727	135.5	0.95	467.3	89.9	11.5	297.8	45.0	29.7	473.9	0.0	42.3	2.1	115.0	4.41	N	N	0.00	46.70	3.23	84.1	51.1	0.0	20.2	38.12	38.2	11.58	12.61
3:35 PM	27.07	61.7	4.50	1598.2	1629.8	1580.9	1558.9	1581.4	1349.0	1339.5	1346.4	1349.0	1346.0	-0.22	6674	135.6	0.81	460.3	89.7	11.4	296.3	44.9	29.8	472.1	0.0	41.7	2.1	115.2	5.11	N	N	0.00	46.03	3.23	71.9	51.1	0.0	19.0	38.98	38.0	11.32	12.61
3:50 PM	25.50	61.8	4.66	1588.5	1625.3	1558.8	1540.7	1575.3	1369.4	1361.2	1363.7	1370.4	1366.3	-0.43	6741	137.3	0.86	459.0	91.2	11.6	300.0	45.0	29.1	478.8	0.0	41.7	2.2	114.7	5.41	N	N	0.00	45.80	3.36	76.2	51.1	0.0	17.2	38.29	38.0	11.33	12.48

Sludge Gallons Tot. Start:	10643.8	Sludge Tons tot. Start:	18.18	Diesel Tot. (Kgal) Start:	251.05
Sludge Gallons Tot. Stop:	11883.5	Sludge Tons tot. Stop:	20.30	Diesel Tot. (Kgal) Stop:	251.05
Total	1239.6	Total	2.12	Diesel Fuel Fed (gal)	0.00
Gal/hr	1162.2	Tons/Hr	1.99		
		Tons/Day	47.70		

Natural Gas Tot. Start:	25348.8
Natural Gas Tot. Stop:	25353.7
Natural Gas Fed (KSCF)	4.9

Fluidized Bed Incinerator (Process 108)

Date: 3/19/20

Test 1

Start Time: 7:30 AM
Stop Time: 10:36 AM

Time	PDI-0303 Dome Differential (in/wc)	Bed Height (in/wc)	AI-0146 O2 Flue Gas (%)	TI-0202 Flue Gas Outlet Temp. (°F)	Free Board Temperature TI-0350 (°F)	TI-0351 (°F)	TI-0352 (°F)	TI-0353 Average Temperature (°F)	Bed Temperature TI-0354 (°F)	TI-0355 (°F)	TI-0356 (°F)	TI-0357 (°F)	TI-0358 Average Temperature (°F)	FI-0360 Free Board Pressure (in/wc)	FI-0111 Airflow (scfm)	PI-0111 FAN Discharge Pressure (in/wc)	PDI-157 Economizer DP Pressure (in/wc)	TI-0162 Economizer Outlet Temp. (°F)	Scrubber Flows FI-0612 Quench Water Flow (gpm)	FI-0613 Fly Irrigation Water Flow (gpm)	FI-0613 Scrubber Tray Flow (gpm)	FI-0615 Venturi Inlet Water Flow (gpm)	FI-0616 Venturi Throat Flow (gpm)	Total (gpm)	FI-0650 Mist Eliminator Flow (gpm)	PDI-0658 Scrubber Pressure Drop (in/wc)	PDI-0621 Venturi Pressure Drop (in/wc)	FI-0157 Caustic Basic Flow (gpm)	AI-0521 Venturi Stack pH	Ammonia Pump Online (Y/N)	Ammonia Feed Valve Open (Y/N)	Ammonia Tank (gpm) - 3 Rotameters	DI-7008 GAC Scrubber Temp. DF (°F)	PDI-0703 Dry GAC Pressure Drop (in/wc)	FI-0556 WESP Current (mA)	FI-0556 WESP Voltage (kV)	FI-0561 WESP Backwash Flow (GPM)	FI-0652 or FI-0672 Sludge Flow (gpm)	Sludge Microwave Sample (%)	AI-7513 Vibrant Sludge Feed Meter (%)	SG-1 #1 Level (ft)	SG-1 #2 Level (ft)
7:30 AM	20.97	62.2	5.64	1604.2	1627.3	1583.1	1601.0	1603.8	1458.9	1444.9	1439.2	1452.5	1449.3	1.55	6719	138.4	0.85	454.7	89.7	11.5	299.9	44.9	28.5	474.5	5.8	40.0	2.1	115.3	5.37	N	N	0.00	45.90	3.13	67.2	51.1	0.0	18.4	39.49	38.4	9.37	7.50
7:45 AM	22.85	62.2	5.12	1594.3	1621.8	1567.4	1554.2	1582.3	1447.9	1434.5	1443.6	1443.6	1442.2	0.66	6735	135.3	0.95	457.9	88.6	11.3	291.9	44.8	28.3	464.9	5.9	39.6	2.2	114.3	5.27	N	N	0.00	44.99	3.31	66.6	51.1	0.0	17.7	40.05	38.2	9.23	7.19
8:00 AM	21.66	62.4	5.07	1593.1	1618.3	1575.1	1590.1	1596.2	1440.9	1429.3	1434.1	1435.6	1435.2	0.49	6582	138.0	0.90	453.1	92.6	12.0	312.3	45.2	28.8	490.9	5.9	40.0	2.1	113.5	5.37	N	N	0.00	45.87	3.25	55.7	51.1	0.0	18.2	40.45	38.2	9.43	6.60
8:15 AM	22.75	62.3	5.01	1579.1	1595.4	1565.8	1544.0	1568.0	1437.8	1424.1	1434.2	1433.7	1432.6	-1.66	6706	134.8	0.85	459.0	88.7	11.5	295.7	44.8	29.2	469.9	6.0	38.1	2.1	114.8	5.42	N	N	0.00	45.35	3.25	58.1	51.1	0.0	17.6	40.06	38.0	9.35	6.21
8:30 AM	21.88	62.4	5.19	1587.9	1646.0	1553.6	1517.1	1568.8	1436.0	1421.7	1431.4	1433.3	1430.2	0.66	6773	137.8	0.88	457.2	94.0	12.0	311.9	45.3	28.7	491.9	5.9	40.4	2.1	114.5	5.48	N	N	0.00	45.81	3.25	70.8	51.1	0.0	17.1	39.94	38.1	9.30	5.67
8:45 AM	22.08	62.5	4.88	1592.7	1649.1	1553.3	1528.2	1577.1	1425.1	1411.6	1421.7	1424.1	1420.6	-0.34	6813	135.8	0.78	461.0	89.9	11.5	300.1	45.0	29.5	476.0	6.2	41.5	2.1	114.2	5.29	N	N	0.00	45.15	3.23	70.5	51.1	0.0	17.7	40.32	38.1	9.20	4.70
9:00 AM	23.19	62.6	5.85	1592.6	1576.5	1583.9	1635.4	1599.1	1423.0	1411.6	1413.7	1411.9	1412.6	-0.99	6647	132.9	0.84	455.7	88.4	11.4	296.8	44.9	29.5	471.1	6.1	40.8	2.2	115.0	5.50	N	N	0.00	45.49	3.29	70.4	51.1	0.0	17.2	39.79	38.0	9.19	3.81
9:15 AM	22.58	62.4	5.53	1585.3	1615.2	1569.5	1568.8	1585.8	1405.7	1405.6	1408.9	1409.7	1407.8	-0.37	6726	135.7	0.89	455.2	90.4	11.7	302.3	45.0	29.8	479.1	5.8	41.3	2.1	115.6	5.44	N	N	0.00	45.43	3.21	64.3	21.1	0.0	17.6	39.33	38.1	9.20	3.26
9:30 AM	20.00	62.4	5.64	1588.5	1591.7	1573.7	1606.7	1590.1	1404.3	1397.2	1396.3	1395.5	1398.1	0.12	6742	135.8	0.86	457.1	92.8	12.0	310.1	45.2	29.9	489.9	5.8	41.1	2.1	114.7	5.55	N	N	0.00	45.65	3.23	72.2	51.1	0.0	17.5	38.18	38.0	8.06	4.02
9:45 AM	22.19	62.4	5.17	1578.0	1629.2	1529.3	1519.8	1560.0	1395.7	1383.1	1392.0	1393.1	1390.4	-0.15	6800	136.9	0.80	459.8	89.8	11.6	301.0	45.0	29.5	476.7	6.2	40.5	2.2	115.1	5.38	N	N	0.00	45.19	3.21	62.1	51.1	0.0	18.0	38.92	38.0	6.62	4.75
10:00 AM	23.02	62.5	5.50	1594.2	1579.4	1582.4	1624.0	1594.5	1395.8	1384.8	1382.1	1381.4	1396.9	-0.06	6691	134.8	0.84	456.1	89.4	11.6	299.7	44.9	30.0	475.5	6.0	41.3	2.1	115.3	5.49	N	N	0.00	45.66	3.13	66.2	51.1	0.0	17.3	39.84	37.9	6.02	5.10
10:15 AM	19.09	62.4	5.36	1590.1	1635.7	1552.1	1542.7	1576.9	1391.1	1378.2	1387.2	1390.5	1386.7	-0.50	6565	133.0	0.93	460..9	89.3	11.5	298.0	44.9	29.3	473.0	6.1	41.1	2.2	114.5	5.35	N	N	0.00	46.03	3.24	59.9	51.1	0.0	17.7	38.65	37.9	5.77	5.27
10:30 AM	22.23	62.3	5.67	1588.5	1601.5	1566.0	1590.4	1585.4	1385.7	1369.5	1380.0	1378.0	1378.7	0.18	6580	134.9	0.84	455.1	90.0	11.6	300.1	45.0	29.1	475.8	6.0	41.1	2.2	115.2	5.49	N	N	0.00	46.44	3.29	78.5	51.1	0.0	18.0	39.05	38.0	5.64	5.32

Sludge Gallons Tot. Start:	7078.7	Sludge Tons tot. Start:	13.99	Diesel Tot. (Kgal) Start:	251.05	Natural Gas Tot. Start:	25409.6
Sludge Gallons Tot. Stop:	10411.6	Sludge Tons tot. Stop:	19.99	Diesel Tot. (Kgal) Stop:	251.05	Natural Gas Tot. Stop:	25414.5
Total	3332.9	Total	6.00	Diesel Fuel Fed (gal)	0.00	Natural Gas Fed (KSCF)	4.90
Gal/hr	1075.1	Tons/Hr	1.94				
		Tons/Day	46.45				

Test 2

Start Time: 11:15 AM
Stop Time: 2:20 PM

Time	PDI-0303 Dome Differential (in/wc)	Bed Height (in/wc)	AI-0146 O2 Flue Gas (%)	TI-0202 Flue Gas Outlet Temp. (°F)	Free Board Temperature TI-0350 (°F)	TI-0351 (°F)	TI-0352 (°F)	TI-0353 Average Temperature (°F)	Bed Temperature TI-0354 (°F)	TI-0355 (°F)	TI-0356 (°F)	TI-0357 (°F)	TI-0358 Average Temperature (°F)	FI-0360 Free Board Pressure (in/wc)	FI-0111 Airflow (scfm)	PI-0111 FAN Discharge Pressure (in/wc)	PDI-157 Economizer DP Pressure (in/wc)	TI-0162 Economizer Outlet Temp. (°F)	Scrubber Flows FI-0612 Quench Water Flow (gpm)	FI-0613 Fly Irrigation Water Flow (gpm)	FI-0613 Scrubber Tray Flow (gpm)	FI-0615 Venturi Inlet Water Flow (gpm)	FI-0616 Venturi Throat Flow (gpm)	Total (gpm)	FI-0650 Mist Eliminator Flow (gpm)	PDI-0658 Scrubber Pressure Drop (in/wc)	PDI-0621 Venturi Pressure Drop (in/wc)	FI-0157 Caustic Basic Flow (gpm)	AI-0521 Venturi Stack pH	Ammonia Pump Online (Y/N)	Ammonia Feed Valve Open (Y/N)	Ammonia Tank (gpm) - 3 Rotameters	DI-7008 GAC Scrubber Temp. DF (°F)	PDI-0703 Dry GAC Pressure Drop (in/wc)	FI-0556 WESP Current (mA)	FI-0556 WESP Voltage (kV)	FI-0561 WESP Backwash Flow (GPM)	FI-0652 or FI-0672 Sludge Flow (gpm)	Sludge Microwave Sample (%)	AI-7513 Vibrant Sludge Feed Meter (%)	SG-1 #1 Level (ft)	SG-1 #2 Level (ft)
11:15 AM	21.74	62.5	5.97	1581.3	1595.8	1551.6	1576.4	1574.0	1367.0	1355.4	1361.9	1359.6	1361.7	0.10	6784	135.6	0.78	454.8	87.7	11.4	297.9	44.9	29.5	471.5	6.0	40.8	2.1	114.9	5.43	N	N	0.00	45.50	3.21	78.1	51.1	0.0	17.6	39.66	38.2	5.31	5.19
11:30 AM	22.27	61.9	5.20	1604.1	1648.0	1557.7	1562.0	1589.1	1367.5	1353.6	1363.5	1366.1	1362.0	1.07	6619	137.0	0.91	459.2	87.7	11.4	294.4	44.8	30.4	468.6	6.1	41.9	2.2	115.7	5.38	N	N	0.00	45.53	3.23	74.3	51.1	0.0	17.6	38.95	38.2	5.24	5.19
11:45 AM	22.68	61.8	5.28	1580.7	1564.1	1569.7	1616.2	1584.2	1375.6	1366.1	1367.7	1366.9	1368.5	0.16	6593	137.5	0.85	457.7	90.3	11.7	306.3	45.1	29.5	482.8	6.1	40.6	2.1	114.6	5.40	N	N	0.00	45.27	3.22	71.1	51.1	0.0	17.9	39.86	38.1	5.18	5.12
12:00 PM	18.46	62.1	5.76	1586.6	1607.8	1548.3	1561.4	1573.2	1380.4	1363.8	1376.3	1377.5	1376.7	-0.76	6804	134.1	0.84	455.8	92.9	12.0	312.9	45.3	29.9	492.9	6.2	41.9	2.3	115.6	5.52	N	N	0.00	45.93	3.40	51.1	51.1	0.0	17.2	39.71	38.1	5.34	5.16
12:15 PM	22.57	62.1	5.77	1575.6	1573.3	1554.2	1583.6	1570.9	1380.3	1368.2	1374.7	1372.0	1373.3	-0.04	6753	132.6	0.83	456.6	87.8	11.4	294.5	44.7	28.3	466.7	5.8	40.3	2.1	115.2	5.51	N	N	0.00	45.08	3.28	67.5	51.0	0.0	18.6	38.47	38.2	5.50	5.26
12:30 PM	22.44	62.3	5.40	1588.6	1577.5	1572.6	1616.6	1587.8	1377.9	1365.1	1369.3	1360.3	1368.1	-0.42	6763	134.6	0.78	456.6	88.0	11.4	296.6	44.9	29.3	470.2	5.9	40.6	2.1	115.7	5.57	N	N	0.00	45.89	3.22	76.0	51.1	0.0	17.9	39.51	38.2	5.57	5.44
12:45 PM	22.45	62.3	5.45	1602.3	1631.4	1560.8	1568.5	1585.4	1367.4	1358.9	1365.2	1372.6	1366.8	0.56	6605	134.4	0.81	456.3	89.2	11.6	302.0	45.0	28.9	476.7	6.2	41.1	2.1	115.8	5.46	N	N	0.00	46.66	3.23	73.9	51.1	0.0	17.0	38.63	38.1	5.48	5.47
1:00 PM	21.06	62.2	6.26	1574.6	1576.6	1550.1	1585.1	1570.9	1371.1	1362.5	1632.8	1355.6	1363.0	0.30	6545	135.8	0.90	454.5	88.3	11.6	300.9	45.0	29.5	475.1	6.1	40.8	2.2	115.7	5.50	N	N	0.00	45.94	3.26	72.8	51.1	0.0	18.7	38.87	38.2	5.46	5.45
1:15 PM	22.06	62.3	5.11	1588.3	1575.4	1573.6	1621.9	1589.5	1365.2	1353.4	1359.0	1355.5	1358.4	-0.43	6759	133.8	0.86	458.2	88.6	11.6	300.0	44.9	29.4	474.4	6.0	41.9	2.2	115.4	5.52	N	N	0.00	45.66	3.22	70.6	51.1	0.0	18.0	40.05	38.1	5.43	5.39
1:30 PM	21.61	61.8	5.45	1602.9	1624.3	1551.8	1566.7	1581.4	1358.2	1351.5	1357.2	1359.9	1356.3	-0.96	6612	136.7	0.93	454.9	85.9	11.3	289.0	44.7	30.4	461.3	6.1	41.1	2.2	115.8	5.38	N	N	0.00	46.76	3.27	71.2	51.1	0.0	17.7	39.26	38.1	5.38	5.36
1:45 PM	21.82	62.1	5.16	1589.4	1561.0	1579.1	1631.2	1590.2	1358.4	1354.9	1356.8	1353.1	1356.4	1.26	6654	137.1	0.90	459.8	87.6	11.5	295.5	44.9	29.2	468.7	6.0	42.1	2.2	115.6	5.40	N	N	0.00	45.59	3.27	67.9	51.0	0.0	17.8	39.19	38.0	5.28	5.30
2:00 PM	22.60	61.8	5.29	1596.0	1633.9	1542.1	1554.7	1577.3	1362.0	1351.2	1358.4	1361.1	1358.0	0.16	6701	136.0	0.84	456.1	87.8	11.4	296.2	44.8	29.2	469.5	6.0	41.4	2.2	115.6	5.36	N	N	0.00	45.70	3.32	70.4	51.1	0.0	18.1	39.59	37.8	5.04	5.14
2:15 PM	23.22	61.9	5.21	1585.2	1570.1	1561.4	1600.1	1581.3	1367.9	1357.3	1362.9	1364.1	1363.3	0.33	6742	136.1	0.78	453.7	85.6	11.2	290.7	44.7	29.9	462.1	6.2	41.5	2.2	116.1	5.60	N	N	0.00	45.99	3.38	75.3	51.1	0.0	18.0	40.01	37.9	4.80	4.87

Sludge Gallons Tot. Start:	11085.2	Sludge Tons tot. Start:	21.20	Diesel Tot. (Kgal) Start:	251.05	Natural Gas Tot. Start:	25415.5
Sludge Gallons Tot. Stop:	14419.8	Sludge Tons tot. Stop:	27.17	Diesel Tot. (Kgal) Stop:	251.05	Natural Gas Tot. Stop:	25422.4
Total	3334.5	Total	5.97	Diesel Fuel Fed (gal)	0.00	Natural Gas Fed (KSCF)	6.9
Gal/hr	1081.5	Tons/Hr	1.94				
		Tons/Day	46.47				

Start Time:	2:50 PM
Stop Time:	5:57 PM

Test 3

Time	PT-0263 Scrbr Differential (in/wc)	Bed Height (in/sec)	A-0164 O2 Flue Gas (%)	TT-0292 Flue Gas Outlet Temp. (°F)	Free Board Temperatures				Bed Temperature					PT-0264 Free Board Pressure (in/wc)	FT-0411 Flue Airflow (scfm)	PT-0111 Air Distributor Pressure (in/wc)	PT-1xx Economizer Air Pressure (in/wc)	TT-0266 Economizer Outlet Temp. (°F)	Scrubber Flows						Total (gpm)	PT-0535 Mist Eliminator Flow (gpm)	PT-0538 Scrubber Pressure Drop (in/wc)	PT-0539 Demister Pressure Drop (in/wc)	FT-0537 Caustic Recirc Flow (gpm)	A-0521 Venturi Water pH	Ammonia Pump Online (Y/N)	Ammonia Vent Valve Open (Y/N)	Ammonia Flow (gpm) - Ammonia	TT-0268 GAS Scrubber Temp. OH (°F)	PT-0270/0269 GAS Pressure Drop (in/wc)	LT-0536 Alkali Control (mA)	TT-0550 Alkali Voltage (kV)	FT-0561 WCS Backwash Flow (GPM)	FT-6657 or FT-6672 Sludge Flow (gpm)	Sludge Microwave Sample (%)	A-7160 Calmer Sludge Level Meter (%)	SPT #1 Level (ft)	SPT #2 Level (ft)
					TT-0269 (°F)	TT-0251 (°F)	TT-0257 (°F)	TT-0508 Average Temperature (°F)	TT-0254 (°F)	TT-0255 (°F)	TT-0256 (°F)	TT-0257 (°F)	TT-0258 Average Temperature (°F)						Quench Water Flow (gpm)	Ex-situ Alkali Water Flow (gpm)	Scrubber Feed Flow (gpm)	Venturi Water Flow (gpm)	Venturi Throat Flow (gpm)	Total (gpm)																			
2:50 PM	22.01	62.0	6.24	1570.0	1579.0	1542.3	1562.1	1561.3	1372.8	1364.6	1371.8	1370.7	1370.3	1.30	6735	134.9	0.81	452.6	83.5	11.0	284.6	44.6	29.9	453.5	5.9	41.3	2.2	114.2	5.54	N	N	0.00	45.83	3.40	69.7	51.1	0.0	18.1	38.36	37.8	4.31	4.34
3:05 PM	20.72	62.1	5.21	1598.5	1627.3	1549.8	1562.8	1585.4	1374.4	1362.2	1371.1	1369.8	1369.0	-0.31	6702	136.6	0.89	459.2	86.2	11.3	290.8	44.8	29.4	462.4	6.0	42.1	2.2	116.8	5.31	N	N	0.00	45.81	3.15	66.6	51.1	0.0	18.4	38.82	37.9	4.18	4.14
3:20 PM	21.53	62.1	5.31	1581.1	1575.8	1562.1	1610.5	1583.1	1375.3	1366.2	1370.1	1368.2	1370.0	0.21	6691	136.1	0.83	458.3	87.9	11.6	300.5	45.0	29.3	474.2	6.1	41.6	2.1	116.0	5.33	N	N	0.00	46.61	3.42	65.1	51.1	0.0	18.7	37.95	37.9	4.02	4.01
3:35 PM	22.84	62.1	4.61	1575.2	1625.2	1546.8	1541.3	1572.2	1377.2	1366.7	1374.1	1376.3	1373.7	2.20	6670	136.0	0.87	460.4	87.2	11.4	296.4	44.9	28.1	468.0	6.2	37.1	2.1	116.3	5.27	N	N	0.00	45.49	3.22	69.6	51.1	0.0	17.6	37.79	37.5	4.09	3.95
3:50 PM	23.52	62.0	4.51	1591.4	1582.0	1574.5	1621.0	1591.6	1376.2	1367.5	1370.4	1370.3	1371.1	1.20	6560	137.0	0.86	461.5	89.0	11.5	301.2	45.0	29.5	476.2	5.9	41.9	2.1	116.2	5.46	N	N	0.00	46.04	3.31	75.9	51.2	0.0	18.7	38.80	37.4	4.28	3.92
4:05 PM	23.88	62.0	5.39	1581.1	1602.6	1552.0	1567.2	1572.4	1379.4	1368.7	1372.4	1375.6	1374.0	1.36	6697	135.2	0.88	453.1	81.7	10.8	281.6	44.6	29.9	448.6	5.8	41.5	2.2	115.6	5.44	N	N	0.00	45.91	3.28	74.2	51.1	0.0	18.2	38.37	37.4	5.15	3.78
4:20 PM	23.97	62.0	5.49	1573.3	1594.1	1547.7	1563.7	1568.1	1378.2	1367.5	1373.4	1373.1	1373.0	0.14	6673	137.5	0.88	454.0	85.2	11.2	289.7	44.7	29.6	460.4	6.0	41.2	2.1	116.8	5.55	N	N	0.00	45.83	3.26	76.0	51.1	0.0	18.4	37.94	37.5	5.77	3.69
4:35 PM	24.42	61.9	5.92	1562.4	1578.5	1535.8	1554.4	1574.3	1371.3	1364.4	1369.4	1365.7	1367.8	-1.12	6720	135.7	0.82	455.8	84.1	11.0	287.0	44.6	29.7	456.5	5.9	41.2	2.1	116.3	5.65	N	N	0.00	46.12	3.23	85.9	51.0	0.0	17.0	38.23	37.8	6.82	3.58
4:50 PM	23.81	61.9	6.10	1552.7	1564.2	1530.6	1549.7	1548.3	1370.0	1361.4	1364.8	1366.7	1365.1	-0.18	6750	136.1	0.81	451.6	86.0	11.3	290.5	44.8	29.8	462.4	6.0	40.4	2.1	116.0	5.68	N	N	0.00	45.72	3.25	83.4	51.1	0.0	16.8	36.21	37.9	6.82	3.48
5:05 PM	23.94	61.9	6.57	1542.5	1554.6	1521.3	1539.5	1538.7	1363.4	1350.4	1357.7	1358.0	1357.5	-0.39	6690	137.1	0.83	452.8	85.2	11.2	288.1	44.7	29.3	458.5	6.1	40.5	1.8	116.0	5.74	N	N	0.00	45.39	3.25	85.1	51.1	0.0	17.8	37.62	37.9	6.84	3.55
5:20 PM	23.57	61.9	5.69	1560.6	1578.1	1531.0	1545.0	1552.6	1365.1	1345.7	1350.3	1352.4	1351.3	0.26	6723	136.7	0.88	457.5	86.8	11.4	295.2	44.8	29.8	468.1	5.9	41.9	2.1	116.1	5.47	N	N	0.00	45.24	3.27	74.2	51.1	0.0	17.8	36.95	38.0	6.79	3.67
5:35 PM	23.54	61.8	5.91	1565.9	1592.1	1529.6	1541.0	1554.6	1348.0	1338.0	1335.7	1348.2	1342.9	0.19	6741	136.4	0.85	452.8	87.1	11.4	293.7	44.8	29.2	466.2	6.0	42.0	2.2	116.6	5.53	N	N	0.00	45.96	3.27	75.6	51.1	0.0	18.9	38.36	37.9	6.79	3.81
5:50 PM	23.82	61.8	4.04	1595.1	1612.7	1561.3	1591.6	1588.7	1367.2	1357.6	1365.0	1364.2	1363.8	-0.10	6646	136.6	0.93	459.4	85.1	11.2	289.2	44.7	29.2	459.4	6.1	51.7	2.1	116.1	5.31	N	N	0.00	45.60	3.21	73.4	51.1	0.0	19.5	37.43	37.7	6.79	3.81

Sludge Gallons Tot. Start:	14966.1	Sludge Tons tot. Start:	28.17	Diesel Tot. (Kgal) Start:	251.05	Natural Gas Tot. Start:	25423.5
Sludge Gallons Tot. Stop:	18362.6	Sludge Tons tot. Stop:	34.06	Diesel Tot. (Kgal) Stop:	251.06	Natural Gas Tot. Stop:	25432.6
Total	3396.5	Total	5.89	Diesel Fuel Fed (gal)	10.00	Natural Gas Fed (KSCF)	9.1
Gal/hr	1089.8	Tons/Hr	1.89				
		Tons/Day	45.36				

Executive Director
Thomas W. Sigmund, P.E.
Commissioners
Kathryn Hasselblad, President
James Blumreich, Secretary
Thomas P. Meinz, Vice President
Mark D. Tumpach, Vice President
Lee D. Hoffmann, Vice President

NEW Water
The brand of the Green Bay Metropolitan Sewerage District

May 15, 2020

APPENDIX 2

Ms. Tania Taff
Air Management Engineer
Division of Environmental Management
Wisconsin Department of Natural Resources
2984 Shawano Avenue
Green Bay, WI 54313-6727

cc: Mr. Andy Seeber, WDNR - Air Management

STACK TEST REPORT

Source: Green Bay Metropolitan Sewerage District (FID No. 405004600)
2231 N. Quincy Street, Green Bay, Wisconsin 54302

Test: Visible Emissions Testing of Fluidized Bed Incinerator (Process I08)

Source Contact: Ms. Julie Maas, Environmental Compliance Specialist, (920) 438-1045

Test Date: March 18, 2020

Executive Summary

On March 18, 2020, Green Bay Metropolitan Sewerage District (GBMSD) personnel completed air emissions testing for visible emissions on a fluidized bed incinerator. The purpose of the testing was to demonstrate compliance with the emission limit set forth in Wisconsin Department of Natural Resources (WDNR) Air Pollution Control Construction Permit No. 14-JJW-051-R1 (FID 405004600). Testing was done while the unit combusted sewage sludge. Visible emissions from the incinerator were zero percent opacity and in compliance with the permit limit.

1.0 GENERAL

On March 18, 2020, GBMSD personnel completed air emissions testing for visible emissions on a fluid bed incinerator. The purpose of the testing was to demonstrate compliance with the emission limit set forth in Wisconsin Department of Natural Resources (WDNR) Air Pollution Control Construction Permit No. 14-JJW-051 (FID 405004600). Testing was done in conjunction with emissions testing for particulate matter while the unit combusted sewage sludge. Visible emissions from the incinerator were in compliance with the permit limit. Visible emissions testing was completed as part of GBMSD's annual emissions testing for particulate matter, sulfur dioxide, nitrogen oxides, hydrogen chloride, dioxins and furans, mercury, cadmium, and lead. Emissions of beryllium were also tested. Emissions testing for all pollutants other than visible emissions was conducted by Advanced Industrial Resources, Inc., and reported under separate cover.

Mr. Kevin Johnson of GBMSD performed the field observations. Ms. Tania Taff of the WDNR – Northeast Region – Green Bay and Mr. Andy Seeber of the WDNR Bureau of Air Management in Madison reviewed the test notice and proposed protocol.

2.0 RESULTS

Testing to determine visible emissions was performed using EPA Method 9. Field observation records and testing conditions are included in Appendix A. Three test runs were conducted. Each test consisted of sixty minutes of observation time. No visible emissions above zero percent were observed.

The visible emission results can be summarized as follows:

Operation Tested	Observation Period Duration (minutes:seconds)	Average Opacity (%)
Fluidized Bed Incinerator (I08)	60:00	0
	60:00	0
	60:00	0
	Average	**0**
	Permit Limit -	**20%**

3.0 TEST METHODS

Visible emissions were determined using EPA Method 9.

Please contact me by phone at (920) 438-1045 or email at jmaas@newwater.us with any questions or concerns you have regarding this report.

SIGNED:

GREEN BAY METROPOLITAN SEWERAGE DISTRICT

Julie C. Maas

Julie Maas
Environmental Compliance Specialist

APPENDIX A

FIELD OBSERVATION RECORDS

METHOD 9 - VISUAL DETERMINATION OF THE OPACITY OF EMISSIONS FROM STATIONARY SOURCES - RECORDS

Figure 9-1. Record of visual determination of opacity.

Company **Green Bay Metropolitan Sewerage District**	
Location **2231 N. Quincy St., Green Bay, WI 54302**	
Test No. 1	
Date 3/18/2020	
Type of Facility **Municipal wastewater treatment plant**	
Control Devices **N/A**	
Hours of Observation 1	
Observer **Kevin Johnson**	
Observer Certification Date 10/4/19	Observer Affiliation **GBMSD**
Points of Emissions **108**	Height of Discharge Point **130 feet**

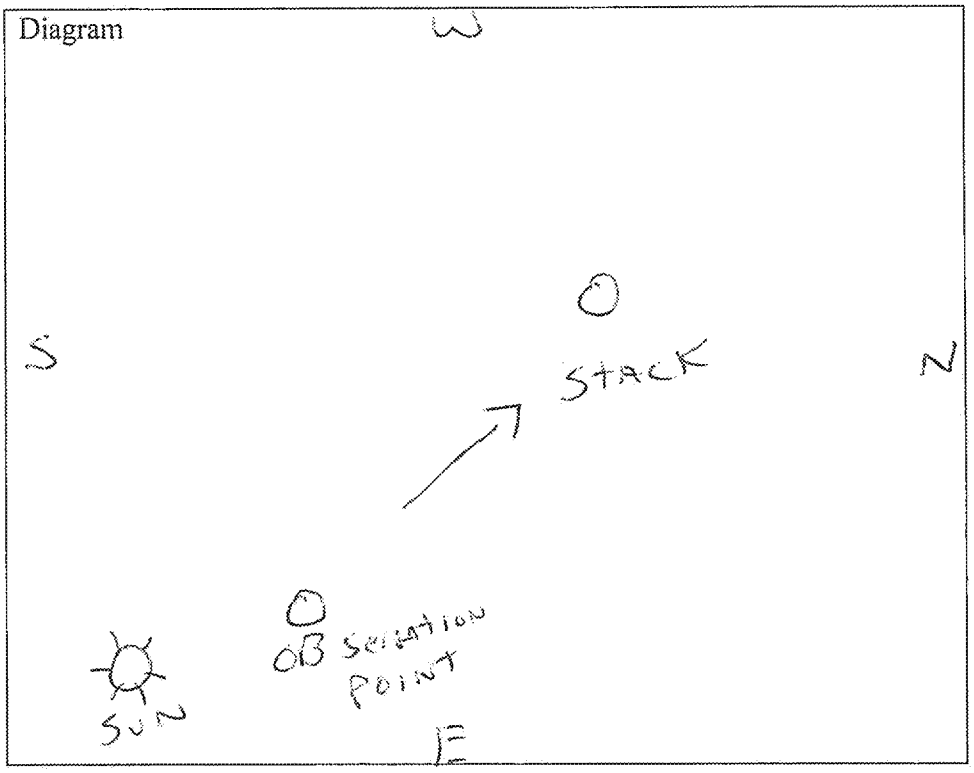
	Initial	Final
CLOCK TIME	1150	1253
OBSERVATION LOCATION	Ground level	Ground level
Distance to Discharge	100 Yards	100 Yards
Direction from Discharge	southeast	southeast
Height of Observation Point	Ground level	Ground level
BACKGROUND DESCRIPTION (Vegetation, Sky, etc.)	SKY	SKY
WEATHER CONDITIONS		
Wind Direction	South	South
Wind Speed	15	15
Ambient Temperature	38°	40°
SKY CONDITIONS (clear, overcast, %clouds, etc.)	100% clouds	100% clouds
PLUME DESCRIPTION		
Color		
Distance Visible		
OTHER INFORMATION		

SUMMARY OF AVERAGE OPACITY

Set Number	Time	Opacity	
	Start – End	Sum	Average
	1150 - 1253	0	0

Readings ranged from 0 to 0% opacity.

The source was/was not in compliance with _____ at the time evaluation was made.



From NSPS Method 9:

2. PROCEDURES

The observer qualified in accordance with Section 3 of this method shall use the following procedures for visually determining the opacity of emissions.

2.1 Position. The qualified observer shall stand at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140° sector to his back. Consistent with maintaining the above requirement, the observer shall, as much as possible, make his observations from a position such that his line of vision is approximately perpendicular to the plume direction and, when observing opacity of emissions from rectangular outlets (e.g., roof monitors, open baghouses, noncircular stacks), approximately perpendicular to the longer axis of the outlet. The observer's line of sight should not include more than one plume at a time when multiple stacks are involved, and in any case the observer should make his observations with his line of sight perpendicular to the longer axis of such a set of multiple stacks (e.g., stub stacks on baghouses).

2.2 Field Records. The observer shall record the name of the plant, emission location, facility type, observer's name and affiliation, and the date on a field data sheet (Figure 9-1). The time, estimated distance to the emission location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds), and plume background are recorded on a field data sheet at the time opacity readings are initiated and completed.

2.3 Observations. Opacity observations shall be made at the point of greatest opacity in that portion of the plume where condensed water vapor is not present. The observer shall not look continuously at the plume but instead shall observe the plume momentarily at 15-second intervals.

2.3.1 Attached Steam Plumes. When condensed water vapor is present within the plume as it emerges from the emission outlet, opacity observations shall be made beyond the point in the plume at which condensed water vapor is no longer visible. The observer shall record the approximate distance from the emission outlet to the point in the plume at which the observations are made.

2.3.2 Detached Steam Plume. When water vapor in the plume condenses and becomes visible at a distinct distance from the emission outlet, the opacity of emissions should be evaluated at the emission outlet prior to the condensation of water vapor and the formation of the steam plume.

2.4 Recording Observations. Opacity observations shall be recorded to the nearest 5 percent at 15-second intervals on an observational record sheet. (See Figure 9-2 for an example.) A minimum of 24 observations shall be recorded. Each momentary observation recorded shall be deemed to represent the average opacity of emissions for a 15-second period.

2.5 Data Reduction. Opacity shall be determined as an average of 24 consecutive observations recorded at 15-second intervals. Divide the observations recorded on the record sheet into sets of 24 consecutive observations. A set is composed of any 24 consecutive observations. Sets need not be consecutive in time and in no case shall two sets overlap. For each set of 24 observations, calculate the average by summing the opacity of the 24 observations and dividing this sum by 24. If an applicable standard specifies an averaging time requiring more than 24 observations, calculate the average for all observations made during the specified time period. Record the average opacity on a record sheet. (See Figure 9-1 for an example.)

Figure 9-2. Observation record.

Company Green Bay Metropolitan Sewerage District Observer Kevin Johnson

Location 2231 N. Quincy Street, Green Bay WI Type facility POTW

Test Number 1 Point of emissions Fluid Bed Incinerator S08

		Seconds				Steam Plume (check if applicable)		Comments
Hr	Min	0	15	30	45	Attached	Detached	
1150 ~~1100~~	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	0			
	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	22	0	0	0	0			
	23	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			

Figure 9-2. Observation record.

Page ___ of ___

Company Green Bay Metropolitan Sewerage District Observer Kevin Johnson

Location 2231 N. Quincy Street, Green Bay WI Type facility POTW

Test Number 1 Point of emissions _Fluid Bed Incinerator S08_____

		Seconds				Steam Plume (check if applicable)		Comments
Hr	Min	0	15	30	45	Attached	Detached	
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	33	0	0	0	0			
	34	0	0	0	0			
	35	0	0	0	0			
	36	0	0	0	0			
	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	45	0	0	0	0			
	46	0	0	0	0			
	47	0	0	0	0			
	48	0	0	0	0			
	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
	57	0	0	0	0			
	58	0	0	0	0			
	59	0	0	0	0			

1253

METHOD 9 - VISUAL DETERMINATION OF THE OPACITY OF EMISSIONS FROM STATIONARY SOURCES - RECORDS

Figure 9-1. Record of visual determination of opacity.

Company **Green Bay Metropolitan Sewerage District**	
Location **2231 N. Quincy St., Green Bay, WI 54302**	
Test No. 2	
Date 3/18/2020	
Type of Facility **Municipal wastewater treatment plant**	
Control Devices **N/A**	
Hours of Observation 1	
Observer **Kevin Johnson**	
Observer Certification Date 10/4/19	Observer Affiliation **GBMSD**
Points of Emissions **108**	Height of Discharge Point **130 feet**

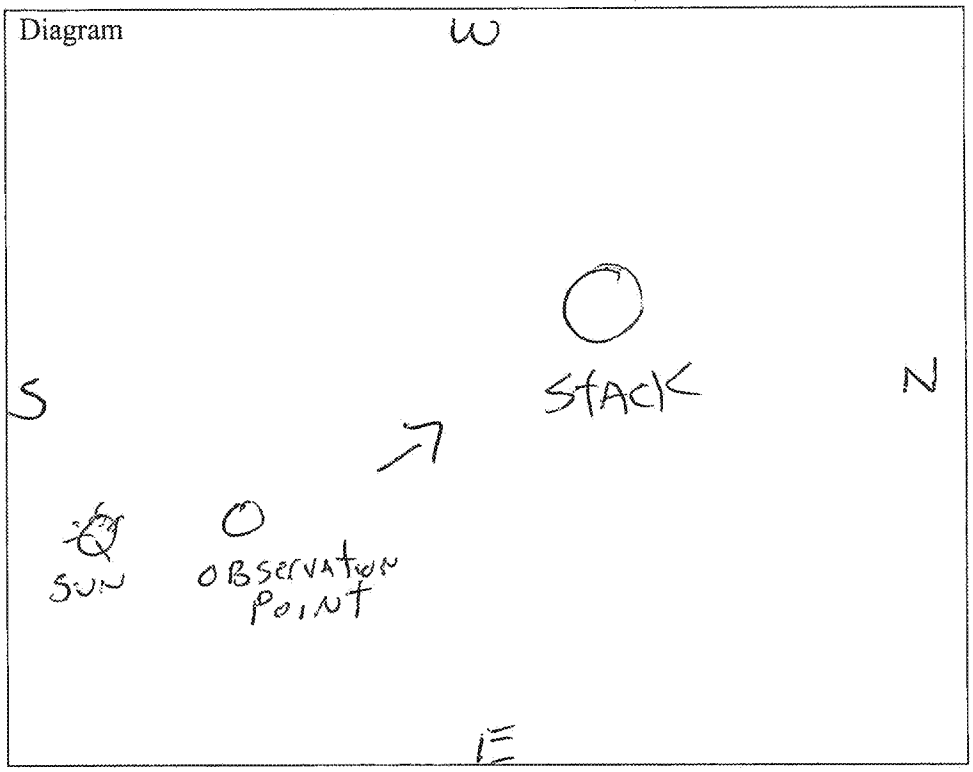
	Initial	Final
CLOCK TIME	1315	1418
OBSERVATION LOCATION	Ground Level	Ground Level
Distance to Discharge	110 yards	110 yards
Direction from Discharge	Southeast	Southeast
Height of Observation Point	Ground Level	Ground Level
BACKGROUND DESCRIPTION (Vegetation, Sky, etc.)	Sky	Sky
WEATHER CONDITIONS		
Wind Direction	South	South
Wind Speed	16-17	16-17
Ambient Temperature	42	43
SKY CONDITIONS (clear, overcast, %clouds, etc.)	100% clouds	100% clouds
PLUME DESCRIPTION		
Color		
Distance Visible		
OTHER INFORMATION		

SUMMARY OF AVERAGE OPACITY

Set Number	Time	Opacity	
	Start – End	Sum	Average
	1315-1418	0	0

Readings ranged from 0 to 0 % opacity.

The source was/was not in compliance with _____ at the time evaluation was made.



From NSPS Method 9:

2. PROCEDURES

The observer qualified in accordance with Section 3 of this method shall use the following procedures for visually determining the opacity of emissions.

2.1 Position. The qualified observer shall stand at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140° sector to his back. Consistent with maintaining the above requirement, the observer shall, as much as possible, make his observations from a position such that his line of vision is approximately perpendicular to the plume direction and, when observing opacity of emissions from rectangular outlets (e.g., roof monitors, open baghouses, noncircular stacks), approximately perpendicular to the longer axis of the outlet. The observer's line of sight should not include more than one plume at a time when multiple stacks are involved, and in any case the observer should make his observations with his line of sight perpendicular to the longer axis of such a set of multiple stacks (e.g., stub stacks on baghouses).

2.2 Field Records. The observer shall record the name of the plant, emission location, facility type, observer's name and affiliation, and the date on a field data sheet (Figure 9-1). The time, estimated distance to the emission location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds), and plume background are recorded on a field data sheet at the time opacity readings are initiated and completed.

2.3 Observations. Opacity observations shall be made at the point of greatest opacity in that portion of the plume where condensed water vapor is not present. The observer shall not look continuously at the plume but instead shall observe the plume momentarily at 15-second intervals.

2.3.1 Attached Steam Plumes. When condensed water vapor is present within the plume as it emerges from the emission outlet, opacity observations shall be made beyond the point in the plume at which condensed water vapor is no longer visible. The observer shall record the approximate distance from the emission outlet to the point in the plume at which the observations are made.

2.3.2 Detached Steam Plume. When water vapor in the plume condenses and becomes visible at a distinct distance from the emission outlet, the opacity of emissions should be evaluated at the emission outlet prior to the condensation of water vapor and the formation of the steam plume.

2.4 Recording Observations. Opacity observations shall be recorded to the nearest 5 percent at 15-second intervals on an observational record sheet. (See Figure 9-2 for an example.) A minimum of 24 observations shall be recorded. Each momentary observation recorded shall be deemed to represent the average opacity of emissions for a 15-second period.

2.5 Data Reduction. Opacity shall be determined as an average of 24 consecutive observations recorded at 15-second intervals. Divide the observations recorded on the record sheet into sets of 24 consecutive observations. A set is composed of any 24 consecutive observations. Sets need not be consecutive in time and in no case shall two sets overlap. For each set of 24 observations, calculate the average by summing the opacity of the 24 observations and dividing this sum by 24. If an applicable standard specifies an averaging time requiring more than 24 observations, calculate the average for all observations made during the specified time period. Record the average opacity on a record sheet. (See Figure 9-1 for an example.)

Figure 9-2. Observation record.

Page ___ of ___

Company **Green Bay Metropolitan Sewerage District** Observer **Kevin Johnson**

Location **2231 N. Quincy Street, Green Bay WI** Type facility **POTW**

Test Number 2 Point of emissions _Fluid Bed Incinerator S08

		Seconds				Steam Plume (check if applicable)		Comments
Hr	Min	0	15	30	45	Attached	Detached	
1315	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	0			
	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	22	0	0	0	0			
	23	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			

Figure 9-2. Observation record.

Page ___ of ___

Company **Green Bay Metropolitan Sewerage District** Observer **Kevin Johnson**

Location **2231 N. Quincy Street, Green Bay WI** Type facility **POTW**

Test Number 2 Point of emissions _Fluid Bed Incinerator S08_____

		Seconds				Steam Plume (check if applicable)		Comments
Hr	Min	0	15	30	45	Attached	Detached	
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	33	0	0	0	0			
	34	0	0	0	0			
	35	0	0	0	0			
	36	0	0	0	0			
	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	45	0	0	0	0			
	46	0	0	0	0			
	47	0	0	0	0			
	48	0	0	0	0			
	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
	57	0	0	0	0			
	58	0	0	0	0			
1418	59	0	0	0	0			

METHOD 9 - VISUAL DETERMINATION OF THE OPACITY OF EMISSIONS FROM STATIONARY SOURCES - RECORDS

Figure 9-1. Record of visual determination of opacity.

Company **Green Bay Metropolitan Sewerage District**	
Location **2231 N. Quincy St., Green Bay, WI 54302**	
Test No. 3	
Date 3/18/2020	
Type of Facility **Municipal wastewater treatment plant**	
Control Devices **N/A**	
Hours of Observation 1	
Observer **Kevin Johnson**	
Observer Certification Date 10/4/19	Observer Affiliation **GBMSD**
Points of Emissions **I08**	Height of Discharge Point **130 feet**

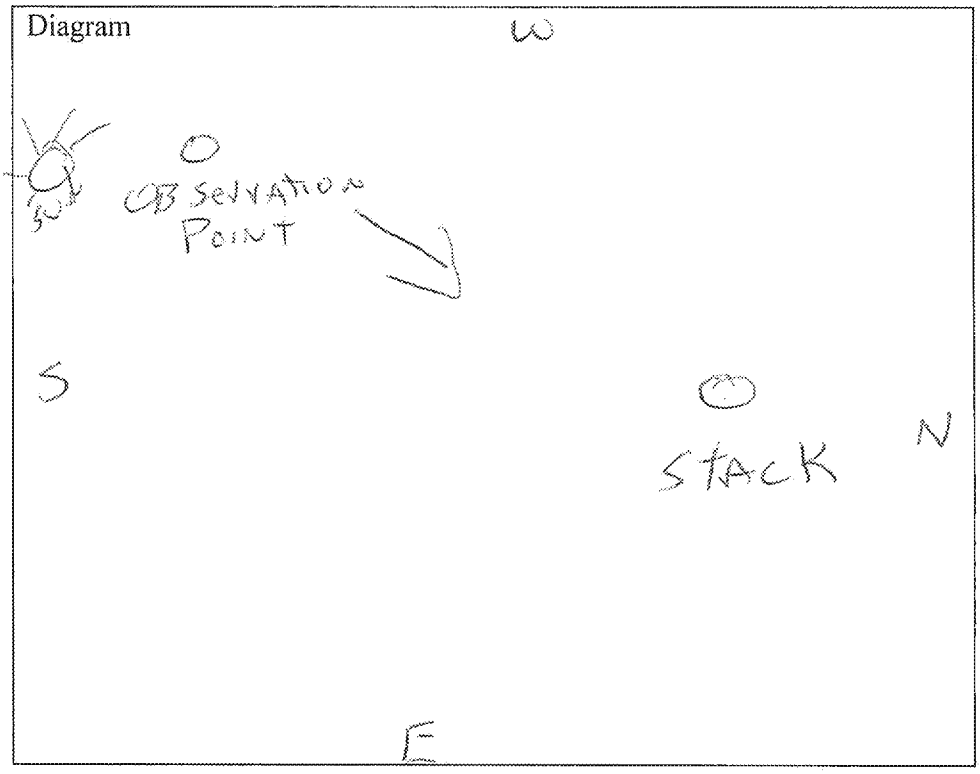
	Initial	Final
CLOCK TIME	1450	1554
OBSERVATION LOCATION	Ground level	Ground Level
Distance to Discharge	120 yards	120 yards
Direction from Discharge	south west	South west
Height of Observation Point	Ground Level	Ground level
BACKGROUND DESCRIPTION (Vegetation, Sky, etc.)	sky	sky
WEATHER CONDITIONS		
Wind Direction	South	South
Wind Speed	16-18	16-18
Ambient Temperature	44	44
SKY CONDITIONS (clear, overcast, %clouds, etc.)	100% clouds overcast	100% clouds
PLUME DESCRIPTION		
Color		
Distance Visible		
OTHER INFORMATION		

SUMMARY OF AVERAGE OPACITY

Set Number	Time	Opacity	
	Start – End	Sum	Average
	1450 1554	0	0

Readings ranged from 0 to 0 % opacity.

The source was/was not in compliance with _____ at the time evaluation was made.



From NSPS Method 9:

2. PROCEDURES

The observer qualified in accordance with Section 3 of this method shall use the following procedures for visually determining the opacity of emissions.

2.1 Position. The qualified observer shall stand at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140° sector to his back. Consistent with maintaining the above requirement, the observer shall, as much as possible, make his observations from a position such that his line of vision is approximately perpendicular to the plume direction and, when observing opacity of emissions from rectangular outlets (e.g., roof monitors, open baghouses, noncircular stacks), approximately perpendicular to the longer axis of the outlet. The observer's line of sight should not include more than one plume at a time when multiple stacks are involved, and in any case the observer should make his observations with his line of sight perpendicular to the longer axis of such a set of multiple stacks (e.g., stub stacks on baghouses).

2.2 Field Records. The observer shall record the name of the plant, emission location, facility type, observer's name and affiliation, and the date on a field data sheet (Figure 9-1). The time, estimated distance to the emission location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds), and plume background are recorded on a field data sheet at the time opacity readings are initiated and completed.

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2.3.2 Detached Steam Plume. When water vapor in the plume condenses and becomes visible at a distinct distance from the emission outlet, the opacity of emissions should be evaluated at the emission outlet prior to the condensation of water vapor and the formation of the steam plume.

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Figure 9-2. Observation record.

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Company **Green Bay Metropolitan Sewerage District** Observer **Kevin Johnson**

Location **2231 N. Quincy Street, Green Bay WI** Type facility **POTW**

Test Number 3 Point of emissions _Fluid Bed Incinerator S08

		Seconds				Steam Plume (check if applicable)		Comments
Hr	Min	0	15	30	45	Attached	Detached	
1450	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	0			
	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	22	0	0	0	0			
	23	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			

Figure 9-2. Observation record.

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Company **Green Bay Metropolitan Sewerage District** Observer **Kevin Johnson**

Location **2231 N. Quincy Street, Green Bay WI** Type facility **POTW**

Test Number 3 Point of emissions _Fluid Bed Incinerator S08_____

		Seconds				Steam Plume (check if applicable)		Comments
Hr	Min	0	15	30	45	Attached	Detached	
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	33	0	0	0	0			
	34	0	0	0	0			
	35	0	0	0	0			
	36	0	0	0	0			
	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	45	0	0	0	0			
	46	0	0	0	0			
	47	0	0	0	0			
	48	0	0	0	0			
	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
	57	0	0	0	0			
	58	0	0	0	0			
	59	0	0	0	0			

1534