2024 COMPLIANCE TEST REPORT OF TWO ROTOR CONCENTRATOR THERMAL OXIDIZER AT MICROCHIP'S GRESHAM FACILITY

ODEQ Permit 26-3240-ST-01

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Date Prepared:

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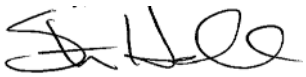
ACRONYMS AND ABBREVIATIONS

acfm	actual cubic feet per minutes
ASTM	American Society for Testing and Materials International
cal	calibration
CO	Carbon monoxide
CO_2	Carbon dioxide
CH_4	Methane
DL	Detection Limit
DRE	Destruction or Removal Efficiency
dscfm	dry standard cubic feet per minute
EPA	U.S. Environmental Protection Agency
^oF	degrees Fahrenheit
FID	Flame Ionization Detector
FTIR	Fourier Transform Infrared Spectroscopy
H_2O	Water or moisture
lb/hr	pounds per hour
lb/day	pounds per day
MDL	Minimum Detection Limit
MDC	Minimum Detectable Concentration
Microchip	Microchip Technology Incorporated
NIST	National Institute of Standards and Technology
NMVOC	Non-methane Volatile Organic Compounds
NMNEVOC	Non-Methane Non-Ethane Volatile Organic Compounds
O_2	Oxygen
ODEQ	Oregon Department of Environmental Quality
ppmv	parts per million by volume
QA/QC	Quality Assurance/Quality Control
RCO	Rotor Concentrator Outlet
RCTO	Rotor Concentrator Thermal Oxidizer
scfm	standard cubic feet per minute
Spectrum	Spectrum Environmental Solutions
THC	Total Hydrocarbon
TO	Thermal Oxidizer
UHP	Ultra High Purity
VOC	Volatile Organic Compound

PROJECT REPORT COMPLIANCE REVIEW

Project Title: COMPLAINCE TEST REPORT for Two New Rotor Concentrator Thermal Oxidizer at Microchip's Gresham Facility, Gresham, Oregon ODEQ Permit 26-3240-ST-01

To the best of my knowledge, I certify that all data collected for this project are accurate and authentic and were taken in accordance with the appropriate source test methods. All data have been audited for entry accuracy, and all computer spreadsheets have been validated.



Date: 11/1/24

Steven E. Hall
VP – Monitoring
Spectrum Environmental Solutions

STATEMENT OF LIMITATIONS

Final Report:
This report is intended for the sole use of Microchip Technology Incorporated. The scope of services performed for this work may not be appropriate to satisfy the needs of other users, and any use or re-use of this document or of the findings, conclusions, or recommendations presented herein is at the sole risk of said user.

1.0 INTRODUCTION

Microchip Incorporation (Microchip) contracted Spectrum Environmental Solutions (Spectrum) to perform compliance testing on the two newly installed Rotor Concentrator Thermal Oxidizers (RCTO) located at their Oregon facility in Gresham, Oregon. This compliance testing was completed in accordance with Permit 26-3240-ST-01 and include Destruction or Removal Efficiency (DRE) determination for volatile organic compounds (VOC) emissions. The compliance testing occurred on September 25, 2024 and consisted of three runs with the duration of each run lasting a minimum of 1-hour for each RCTO unit.

1.1 ANALYTES MONITORED

The RCTO compliance testing required measuring volatile organic compound (VOC) emissions at the RCTO inlet and the two RCTO outlets (thermal oxidizer outlet (TO) and rotor concentrator outlet (RCO)). Since methane and ethane are not considered VOCs per EPA definition[1], the methane and ethane concentrations were subtracted from the total hydrocarbon (THC) concentration measured using a flame ionization analyzer or FID. All THC concentrations were measured as propane in accordance with EPA Reference Method 25A. Methane and ethane were measured at the inlet, TO, and RCO using a Fourier Transform Infrared spectrometer (FTIR) in accordance with ASTM Method D6348-12. All flow measurements were performed in accordance to EPA Methods 1, 2 (or 2F), and a modified EPA Method 3. This testing was performed to demonstrate compliance with the VOC requirements for RCTO units as defined in Permit 26-3240-ST-01. The cumulation of the collected data was used for determination of total emitted concentration, mass emission rate, and VOC DRE. Table 1-1 presents a summary of the monitoring test parameters and methods used for this test program. Additional discussion of the sampling methods and the results are presented in Sections 3.0 and 4.0 of this document.

[1] The EPA definition of VOC excludes methane and ethane per 40 CFR Part 51 Subpart F (s) (1).
https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-51/subpart-F/section-51.100

TABLE 1-1. PARAMETERS TESTED

Parameter	Units	Sample Location	Method
Volumetric Flow Rate	dscfm, acfm, scfm	Inlet, RCO and TO	EPA RM 1-2, 2F
Gas Molecular Weight (O_2)	Percent by volume	Inlet, RCO and TO	Modified EPA RM 3A
Total Hydrocarbon (THC)	ppmv, ppmvd, lb/hr	Inlet, RCO and TO	EPA RM 25a
Methane and Ethane	ppmv	Inlet, RCO, and TO	FTIR by ASTM D6348-12
Moisture	Percent by Volume	Inlet, RCO, and TO	FTIR by ASTM D6348-12
Carbon Dioxide (CO_2)	ppmv	Inlet, RCO, and TO	FTIR by ASTM D6348-12

RM – Reference Method
dscfm – dry standard cubic feet per minute
acfm – actual cubic feet per minute
scfm – standard cubic feet per minute
lb/hr – pounds per hour
ppmv – parts per million by volume

1.2 APPLICABLE PERMIT REGULATIONS

Microchip operates under air Permit 26-3240-ST-01 originally issued in 2019 and modified in June 2023. The cumulation of data was used to determine compliance with Microchip's air permit criteria as follows:

- 90% destruction or removal efficiency (DRE) of VOCs when inlet loading to the RCTO is ≥ 90 ppmv (as propane) or
- A total outlet, flow-weighted[2] VOC concentration of ≤ 10 ppmv (as propane) or less when inlet loading to the RCTO is less than 90 ppmv (as propane).

The following are applicable excerpts from the permit pertinent to the RCTO compliance testing.

This data will be used for the limitations prescribed in the Microchip Technology Standard Air Contaminant Discharge Permit (ACDP), Permit 26-3240-ST-01 Section 3.1 of the 2023 permit modification, which states:

3.1. VOC Emissions

The permittee must control Volatile Organic Compound (VOC) emissions from Building 1 and Building 2 manufacturing operations with rotor concentrator thermal oxidizers (RCTOs) that must each achieve a minimum 90% destruction removal efficiency (DRE) of VOCs entering the RCTOs when the inlet VOC concentration (measured as propane) is 90

[2] VOC outlet concentration weighted using flows from both outlets

ppmv or greater. If/when the inlet VOC concentration falls below 90 ppmv, the outlet VOC concentration (measured as propane) must not exceed 10 ppmv.

The operation of the facility and the RCTO unit as well as the RCTO unit parameters to be collected during the compliance testing are listed in Microchip's 2023 permit modification, Section 6.1 (c), (e)(i)(ii)(iii)(v), (f), (g), (h), (i), and (j) which state:

6.1. Testing Requirements

The permittee must conduct a source test of the control devices as specified below: [OAR 340-212-0120]

c. Source testing must be conducted while the facility is operating within 90% its normal operating capacity at the time of the test. Sampling must take place under worst case operating conditions observed during normal operations (i.e., redundant control devices should not be operating during testing);

e. During each source test the following parameters must be monitored and recorded:

i. RCTO oxidizer and desorption chamber temperatures;

ii. Pressure drop across concentrator wheel of the RCTO;

iii. RCTO natural gas usage;

v. Other facility/process operating parameters identified prior to the test.

f. Only regular operating staff may adjust the combustion system or production processes and emission control parameters during the source test and within two hours prior to the tests. Any operating adjustments made during the source test, which are a result of consultation during the tests with source testing personnel, equipment vendors or consultants, may render the source test invalid;

g. A pretest plan for each source test required above must be submitted for approval to DEQ's Source Test Coordinator at the ODEQ Northwest Regional Office, at least 30 days prior to testing;

h. The reference test methods identified in the table below must be utilized in the source tests identified above. A test method modification/variance or substitution of an alternative test method must be pre-approved by the DEQ's Source Test Coordinator and

i. All tests must be conducted in accordance with the DEQ's Source Sampling Manual and with the pretest plan. All test data and results must be submitted to the Source Test Coordinator for review within 60 days after completion of the testing cycle unless an alternate submission date or extension is approved by DEQ.

j.

Reference Test Method	***Tested pollutant/parameter***
EPA 1&2	*Flow Rate*
EPA 3	*Dry Molecular Weight*
EPA 4 or ODEQ Method	*Moisture*
EPA 25A	*Total VOC*
EPA 26, 26A, 320 or ASTM D6348-12	*HF & HCl*

1.3 PROJECT LEADS

Table 1-2 summarizes the responsible parties involved with this test campaign.

TABLE 1-2. TEST PROGRAM SUMMARY

Category	Description
Project Name	Compliance Testing of Microchip's 2 New RCTO Units
Equipment Owner	Microchip Technology Incorporation 21015 Stark Street Gresham, OR 97030
Facility Contact	Becky Kim Environmental Engineer Microchip Technology, Inc. 21015 Stark Street Gresham, OR 97030 (971)-266-7887
Equipment Tested	Two Munters RCTO Units
Equipment Location	Microchip Technology Inc. 21015 Stark Street Gresham, OR 97030
Regulatory Agency	ODEQ
ODEQ Permit No.	26-3240-ST-01
Source Test Firm	Spectrum Environmental Solutions 2340 West Braker Lane, Suite A Austin, TX 78758
Source Testing Project Manager	Steve Hall Phone (512) 587-1386 steve@spectrumenvsoln.com

1.4 SOURCE TEST PROTOCOL

A source test protocol was submitted, reviewed by, and approved (after edits) by ODEQ ahead of the onsite testing. Appendix E contains the protocol and documentation regarding the approval process and notification.

There are no limitations on the results reported herein that would prohibit them from use for compliance with applicable parts of Microchip's Air Contaminant Discharge Permit. No deviations to the mentioned reference methods or the Test Protocol that were not discussed with ODEQ and agreed upon were required.

2.0 EQUIPMENT AND PROCESS DESCRIPTION

2.1 FACILITY DESCRIPTION

Microchip's facility conducts semiconductor manufacturing operations and processes. The two newly installed RCTO units are used to abate VOCs from process exhaust streams. Future plans include a third unit to be brought online in late 2024. The RCTOs are equipped with a single zeolite concentrator and thermal oxidizer operated concurrently. Microchip operates its facilities and RCTO on a 365 x 24 schedule

2.2 SOURCE DESCRIPTION

Microchip owns and operates two newly installed RCTO units. The RCTOs are equipped with a single zeolite concentrator wheel followed by a thermal oxidizer. The RCTO Make/Model and other pertinent information is presented in Table 2-1. Figure 2-1 depicts normal operation of an RCTO unit.

The process operates as follows:

- Solvent-laden air is drawn through the rotor wheel where VOCs are removed from the air stream by adsorption onto the hydrophobic zeolite. After passing through the rotor, the cleaned air is discharged into the atmosphere through the rotor concentrator outlet stack.

- The Zeolite rotor turns continuously and transports the adsorbed VOCs into a regeneration zone. In that zone, the VOCs are removed by a small heated air stream and the regenerated zeolite is then rotated back into the process air stream.

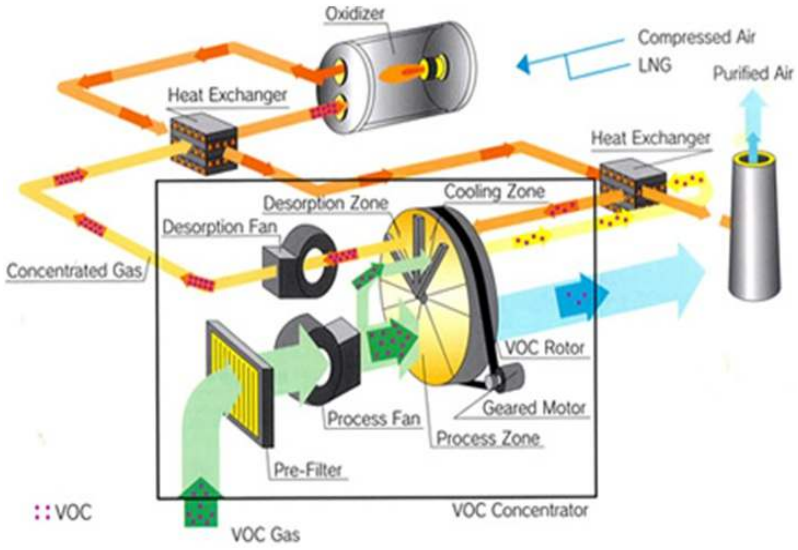
- The heated air is then passed into the thermal oxidizer combustion chamber, where it is further heated to approximately 1,400 °F (1,375 °F minimum), oxidizing the VOCs.

- The treated air is forwarded to the TO exhaust stack where it is discharged into the atmosphere.

TABLE 2-1. 2024 RCTO UNITS TESTED

Unit Name	Identification	Make	Model	Mfd Date	Capacity
RCTO 2	RCTO	Munters	IZS-3546-TH	08/03/2023	34,000 CFM
RCTO 3	RCTO	Munters	IZS-3546-TH	08/03/2023	34,000 CFM

Figure 2-1. Basic Design of Rotor Concentrator Thermal Oxidizer



2.3 SUMMARY OF UNIT OPERATING PARAMETERS

The RCTO units operated in normal operating conditions during the compliance testing. Per the Microchip permit, several RCTO operational parameters are required to be monitored during the compliance testing to demonstrate the RCTO was operating in a normal fashion. These were submitted with the test protocol and Table 2-2 summarizes the average operating data for the unit during the performance testing. A complete minute-by-minute listing of the operations data for the tests is presented in Appendix F.

Per Condition 6.1. of Microchip's Standards ACDP, compliance testing must be conducted while the facility is operating within 90% of its normal operating capacity at the time of the test. As part of a previous compliance testing campaign for Microchip for one RCTO unit, Microchip verified with Oregon DEQ that a 12-month rolling period of production could be used to represent normal operating capacity.

TABLE 2-2. RCTO UNITS OPERATING PARAMETERS

RCTO ID	Date	Run	Pressure Differential ("H2O)	Natural Gas Usage (c ft^3)	Desorption Chamber Temperature (°F)	Oxidizer Temperature (°F)
RCTO 2	9/25/24	1	0.433	2005	390.02	1400.23
		2	0.439	936	389.93	1400.20
		3	0.437	1727	390.04	1400.20
	Average		**0.436**	**1556**	**390.00**	**1400.21**
RCTO 3	9/25/24	1	0.448	1397	389.90	1399.98
		2	0.445	1363	398.92	1399.97
		3	0.444	1597	389.95	1399.89
	Average		**0.446**	**1452**	**389.92**	**1399.95**

2.4 TEST CHRONOLOGY

Table 2-4 presents the sampling times for collection of all samples during the compliance test runs performed at the RCTO units.

TABLE 2-4. SUMMARY OF SAMPLE COLLECTION TIMES

RCTO ID	Date	Run	RCTO VOC Sample Times
RCTO 2	9/25/24	Run 1	14:14-15:14
		Run 2[1]	16:51-17:51
		Run 3[2]	18:17-18:47, 19:07-19:29
RCTO 3	9/25/24	Run 1	10:19-11:19
		Run 2	11:30-12:30
		Run 3	12:40-13:40

[1]The approximately 1 hour and 40-minute gap in between Run 1 and Run 2 for the RCTO 2 unit was caused due to the unit going down during the original testing times for Run 2 (15:29-16:49). All data within this original test run was omitted.
[2]Data omitted between the times 18:48-19:07 due to the TO probe being removed from the TO stack sampling port for filter replacement. Test was extended for an extra 10 minutes to account for this event.

2.5 SAMPLING LOCATION DESCRIPTIONS

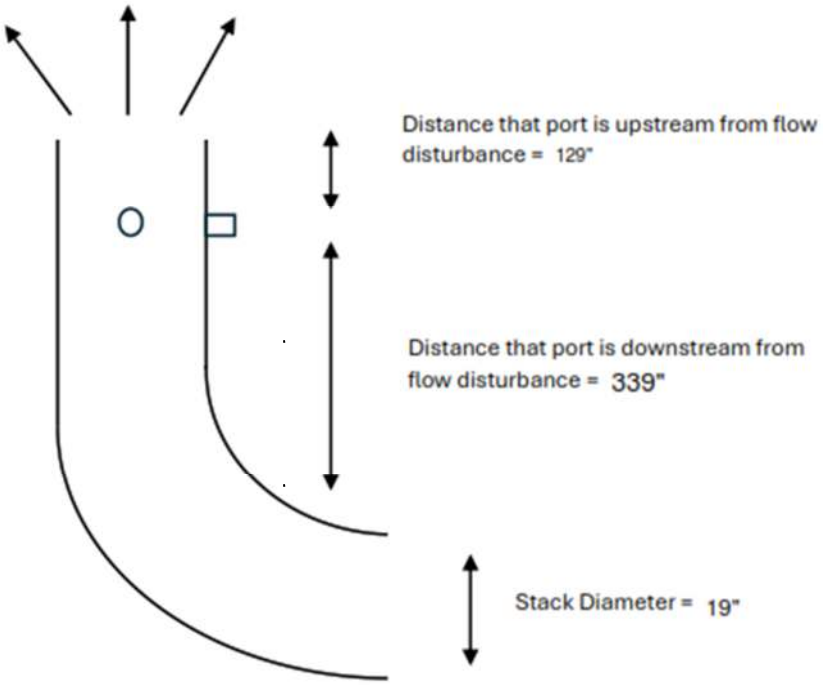
Table 2-5 lists the EPA Method 1 measurements used to determine the flow traverse points. A 16-point traverse was performed at each inlet and TO outlet for volumetric flow. Due to the location of the sampling ports relative to flow disturbances for each RCO outlet, a 3-dimensional probe was used in accordance with Section 11.5 of EPA Method 1, and a 40-point traverse was performed for volumetric flow.

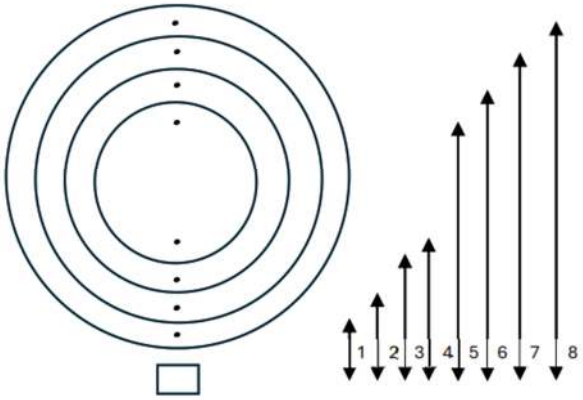
Figure 2-2, presents an example schematic of the sampling locations and traverse points for a TO source.

TABLE 2-5. SUMMARY OF RCTO SOURCE MEASUREMENTS

Port Location	Internal Diameter (inches)	Cross Sectional Area (square inches)	Upstream Distance		Downstream Distance	
			Inches	Equivalent Diameter	Inches	Equivalent Diameter
Inlet	44	1520.5	70.02	1.59	151.94	3.45
RCO	44	1520.5	81.91	1.86	33.91	0.77
TO	19	283.5	128.96	6.79	339.19	17.89

Figure 2-2. RCTO TO Sampling Locations and Traverse Points





Traverse Point	Distance from Wall (in.)
1	5/8"
2	2"
3	3 5/8"
4	6 1/8"
5	12 7/8"
6	15 2/8"
7	17"
8	18 3/8"

2.6 SAMPLING EQUIPMENT DESCRIPTIONS

This section provides additional detail on the sampling and analytical systems used for the compliance testing. It should be noted that the THC and FTIR analyzers, at each independent location, shared the same sample extractive system. The THC and FTIR were positioned in series as related to the sample flow path. Figure 2-3 depicts the RCTO sampling system. A portion of the extracted sample was delivered to each analyzer. Since the THC analyzers only require a small volume of flow, the larger proportion of the extracted sample gas was delivered to the FTIR.

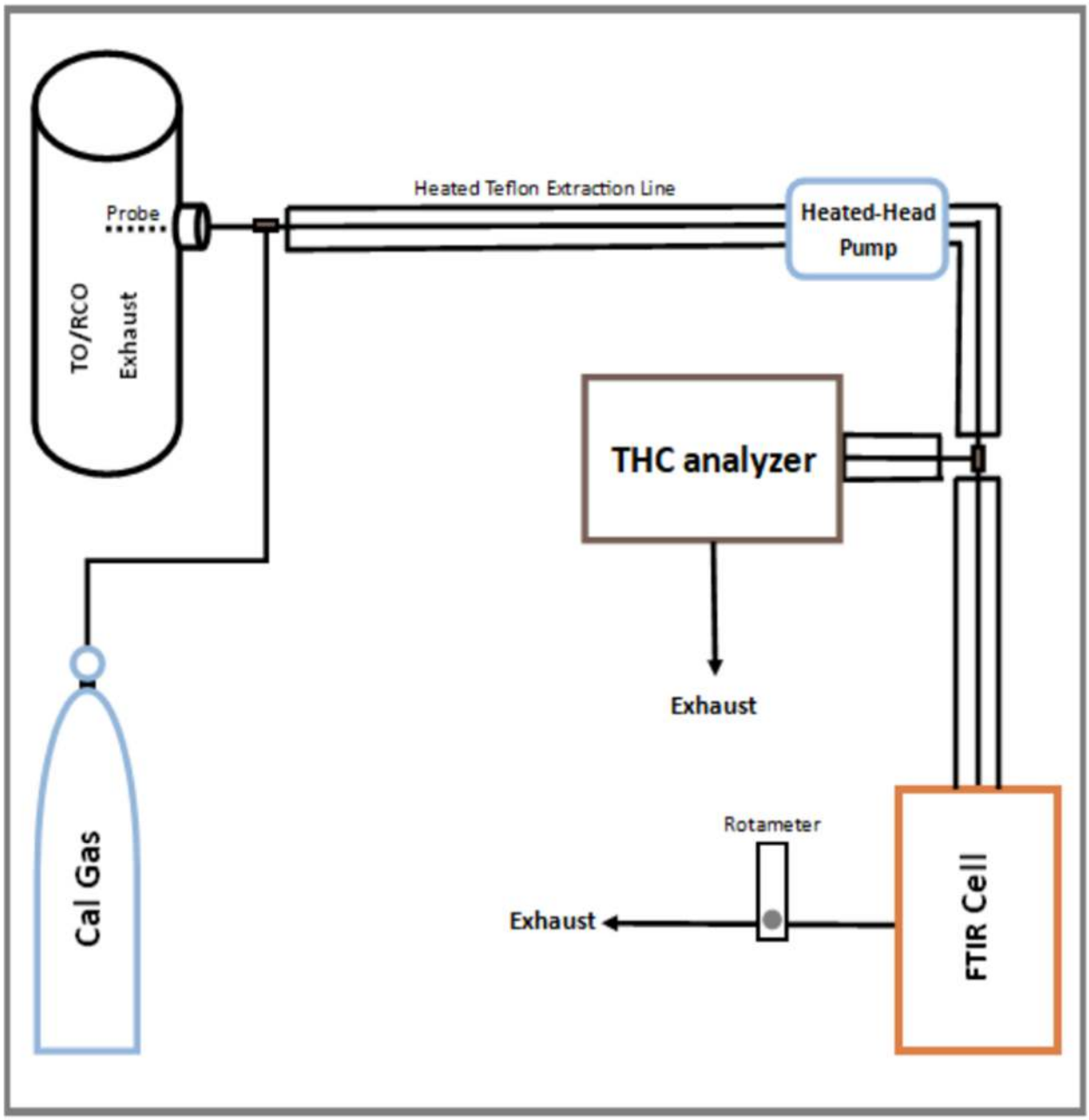
2.6.1 EXTRACTIVE SAMPLING SYSTEMS

Sample gas was continuously pulled at ~5 lpm through a heated sample system using heated-head diaphragm pumps. Three extraction systems were employed for the testing each comprised of the flowing parts ordered in the flow-path the gas traversed through the systems:

- Unheated 3/8" OD stainless steel sample probe,
- Unheated 3/8" OD spike/calibration "T",
- Heated (≥250 °F) 3/8" OD Teflon™ sample extraction line (150-200'),
- Heated-head (≥250 °F) sample pump,
- Heated (≥250 °F) 3/8" OD Teflon™ jumper line (6'),
- Insulated tee at the back of the THC analyzer,
- 2nd heated (≥250 °F) 3/8" OD 6' Teflon™ jumper line,
- Heated (150 °C) FTIR sample cell,
- Unheated rotameter, and
- Unheated exhaust line.

All wetted parts of the heated sample system were constructed using Teflon™ tubing and stainless-steel fittings. The sample probe was connected to a calibration/spiking "T" to which the calibration line and the heated extraction line were also connected. This allowed for the propane calibration gases to be delivered to each THC analyzer as well as the spike gas and CTS (calibration transfer standard) gas to be delivered to the FTIRs. The FTIRs at the inlet, TO, and RCO provided moisture, carbon dioxide, methane, and ethane concentration and a THC analyzer provided a total hydrocarbon concentration from each location.

Figure 2-3. Inlet, TO, and RCO Extractive Sampling System



2.6.2 GAS VELOCITY MONITORING EQUIPMENT

The flow monitoring equipment for each location consisted of an S-Type Pitot tube connected to an electronic manometer and a K-type thermocouple. The gas velocity was measured as a pressure differential on the manometer at each traverse point. Since the thermocouple probe was positioned at the Pitot tubes, the gas temperature was also recorded at each traverse point. The gas velocity measurements for the inlet, TO, and RCO were conducted once per each run for a total of three measurements per unit (six measurements in total). It should be noted that a 3-dimensional probe was used for the RCO ports at each RCTO unit. Additionally, a barometric pressure measurement was also required as it is used in the flow calculation. The barometric pressure sensor was manufactured by Traceable (MarketLab model) and is NIST traceable. The applicable calibration documentation is presented in Appendix G.

2.6.3 THC MONITORS

The inlet, TO, and RCO exhausts were analyzed for THC concentration using three VIG Industries Model 20/2 THC analyzers. A slip-stream of the sample was pulled through each analyzer using the analyzer's internal pump. These instruments are based on the principal of the flame ionization detection (FID) where the number of ions produced in a flame is proportional to the number of reduced carbon atoms in the sample. UHP Hydrogen was supplied to each THC analyzer to fuel the FIDs and oxygen (from ambient air) was provided using a 2nd internal pump. The THC analyzers were calibrated using appropriate propane gas standards suitable for the expected concentration range for each location. All propane calibrations gas standards were EPA Protocol 1 quality gas standards and the certifications can be found in Appendix G. Although calibrated with propane, the analyzers may have differing responses to unsaturated or cyclic carbons commonly found in semiconductor exhausts; however, the THC analyzers are a good overall tool for estimating the total hydrocarbon number as they have strong linear responses to alkanes/alkenes/alkynes and aromatics. Additional information regarding the operation of the VIG THC analyzers can be found at the vendor website.[3]

A Data Acquisition System was developed within Spectrums NuWave software suite and used to record the THC instrument response/concentration results in one (1) minute averages. The data was continuously stored as a *.CSV file in Excel format on the hard drive of the onsite computer.

[3] https://www.vigindustries.com/model-20-2

At the completion of testing, the data was also saved to the Spectrum server. All data was reviewed by the Field Team Leader before leaving the facility.

2.6.4 FTIR SPECTROMETER

Three Spectrum Environmental Solutions produced WaveRunner™-EXT FTIRs containing fixed-path 10 m heated (150°C) sample cells were employed to quantify the concentration of methane, ethane, water, and carbon dioxide at the inlet, TO, and RCO outlets. Since the gas samples were delivered to the FTIR sample cell at levels slightly above ambient pressure, cell pressure was continuously recorded during measurement periods using a pressure sensor calibrated over the 0 – 1000 torr range. These pressures, along with the cell temperature as read by a K-Type thermocouple were used in the quantification of each spectrum collected.

An infrared spectrum analysis is performed by matching the features of an observed spectrum to those of reference standards. If more than one feature is present in the same region, a linear combination of references is used to match the compound features. The standards are scaled to match the observed band intensities; this scaling also matches the unknown concentrations.

The scaled references are added together to produce a composite that represents the best match with the sample. A classical least squares mathematical technique is used to match the reference standards' absorption profiles with those of the observed sample spectrum in specified spectral regions. Compounds of interest and any known compounds expected to present spectral interference (water for this data set) are included in the analysis regions. The analysis method for this sampling was optimized for methane and ethane analysis during sampling and later refined to best fit the interferences within the sample matrix.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

All compliance testing was performed in accordance with the approved Test Protocol. Compliance testing was performed over three runs with each run at a minimum runtime of 1 hour. Some runs lasted longer than 1 hour due to the time required to perform the flow measurements at each location or due to technical issues.

Sample gas was extracted and delivered to the THC and FTIR analyzers on a continuous basis at approximately 5-10 lpm. The FTIR and THC analyzers produced concentration results at a 1-minute frequency and each 1-minute data point is the average of several individual concentration measurements collected (co-added) at much shorter frequencies. Since mass emissions rates were required to determine the DRE of the RCTO, the total volumetric flowrate at the inlet, RCO, and TO was also measured.

3.1 TOTAL VOLUMETRIC FLOW MEASUREMENTS

Flow measurements were performed once per run at the inlet, RCO, and TO locations concurrent with the FTIR measurements. Sections 3.1.1 through 3.1.4 describe in detail all the measurements performed for the volumetric flow calculations.

3.1.1 EPA METHOD 1: SAMPLING AND VELOCITY TRAVERSE POINT LOCATIONS

EPA Method 1, "Sampling and Velocity Traverse Point Locations," was used to determine the number and position of the traverse points within the inlet, TO and RCO ducts. Figure 1-2 and Table 1-2 of the EPA Method 1 were followed to determine the number and location of each traverse point for each sample location of the RCTO. The complete data sheets are in Appendix B.

It was determined prior to testing that each unit's RCO duct sample ports did not meet the Method 1 criteria for positioning relative to flow disturbances. Therefore, Methd 2F was performed at those locations for gas velocity measurements in lieu of Method 2.

Each inlet and TO sample location was checked for the absence of cyclonic flow per EPA Method 1. In summary, the Pitot tube was placed at each traverse point perpendicular to the flow then rotated into and out of the flow until a null reading of differential pressure was measured. The angle of rotation (yaw angle) was then recorded for each traverse point and the absolute average of the yaw angles was calculated. An average of less than 20° is verification that the flow is not cyclonic and EPA Method 2 can be used. Each inlet and TO sample location demonstrated an average yaw angle less than 20°, allowing for the use of EPA Method 2. Documentation of the

cyclonic flow (or absence thereof) at each sample location of each RCTO can be found in Appendix B.

3.1.2 EPA Method 2: Determination of Stack Gas Velocity and Volumetric Flow Rate

The stack gas velocity at each inlet and TO exhaust outlet and was determined in accordance to EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (S-Type Pitot Tube)". An S-Type Pitot tube was positioned parallel to the gas flow at each traverse point and the pressure differential was read/recorded using an electronic manometer (Gray Wolf Model Zephyr™III) and transcribed onto a flow data sheet. The temperature was also read (using a K-Type thermocouple) at each point during the velocity traverse and recorded on the velocity data sheet. The Pitot tube used for this testing was assigned the default correction factor of 0.84. The flow-associated data sheets are presented in Appendix B.

The barometric pressure was measured using a handheld barometric pressure sensor. The sensor reports the barometric pressure in inHg (inches of mercury) and was read and written on the data sheet at the time of the flow measurement.

3.1.3 EPA Method 2F: Determination of Stack Gas Velocity and Volumetric Flow Rate With Three-Dimensional Probe

The gas velocity at each RCO exhaust outlet was determined in accordance to EPA Method 2F, "Determination of Stack Gas Velocity and Volumetric Flow Rate with Three-Dimensional Probe". A 3-D probe (5-hole prism-shaped/DAT probe) was positioned parallel to the gas flow at each traverse point and determined the velocity pressure and the yaw and pitch angles of the duct. The pressure differentials were read and recorded using an electric manometer and transcribed onto a flow data sheet. The yaw angle was directly measured by rotating the probe and the pitch angle was calculated using the probe-specific calibration curves. These values were recorded into the flow velocity data sheet. The average axial velocity of the stack gas was calculated and was used to determine the average gas volumetric flow rate in the stack. The temperature was also read at each point during the velocity traverse and recorded onto the velocity data sheet. The flow-associated data sheets are presented in Appendix B.

3.1.4 Molecular Weight – Oxygen and Carbon Dioxide Concentrations

Oxygen (O_2) and Carbon Dioxide (CO_2) concentrations were used for molecular weight determination of the outlet. The CO_2 concentrations were measured by FTIR and were used to calculate the oxygen (O_2) level stoichiometrically using natural gas combustion as a basis. For the inlet and RCO sources, an assumed molecular weight of 29.0 g/mol was used as stated in EPA Method 2, Section 8.6: "For processes emitting essentially air, an analysis need not be conducted;

use a dry molecular weight of 29.0". These approaches were approved by ODEQ in an email dated September 24, 2024. A copy of the email is in Appendix E.

3.2 EPA METHOD 25A: TOTAL GASEOUS ORGANIC COMPOUNDS

All total hydrocarbon measurements were performed in accordance with EPA Method 25a *"Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer"*. Since neither methane or ethane are considered a VOC by EPA definition, they were subtracted (as measured by FTIR) from the total hydrocarbon concentration (as measured by 25a).

Stack gas was extracted from the center of each source duct through a stainless-steel probe and heated sample line and delivered to the three THC analyzers. The RCTO exhaust source (TO and RCO) THC analyzers were calibrated over a 0-12 ppm range (as propane) whereas the inlet THC analyzer was calibrated over a 0-225 ppm range (as propane). Prior to testing each THC analyzer was calibrated using EPA Protocol 1 propane gas standards. Three calibration gas standards and a zero (UHP nitrogen) were used and the concentrations of the propane standards (low, mid and high) met the criteria specified by Method 25a. Upon completing the calibration, the system bias and drift (zero and appropriate calibration gas) were checked after each run. All THC concentration data were simultaneously and continuously recorded by the data acquisition system. Although each analyzer collected data nearly instantaneously, data were averaged into 1-minute data points as specified in the Test Protocol. All THC data can be found in Appendix C and a log of the activities and calibrations is located in Appendix B. Additionally, the gas certification for all propane calibration gases used are located in Appendix G.

3.3 ASTM METHOD D6348-12: FTIR DETERMINATION OF METHANE, ETHANE. CO_2 AND MOISTURE CONCENTRATION

The CO_2, methane, ethane, and moisture concentrations were determined at each RCTO outlet exhaust in accordance with ASTM D6348-12 *"Standard Test Method for Determination of Gaseous Compounds by Direct Interface Fourier Transform Infrared (FTIR) Spectroscopy"*. Per the accepted source test protocol, methane was the analyte chosen for the analyte spiking and served as a surrogate for CO_2, ethane and water. A quality assurance matrix spike (QA Spike) was performed prior to testing to qualify the FTIRs for the testing. A further detailed description of the QA Spike procedure and the spike results are presented in Section 5.1.

A WaveRunIR™-EXT FTIR continuously measured (data point every ~1 minute) an extracted sample from the center of each inlet, TO, and RCO outlet. Prior to sampling, the FTIR was aligned and optimized as a function of signal throughput, resolution, and laser signal. The integrity of the FTIR cell and sample system was leak-checked as part of the mechanical response challenges by flowing the CTS gas up to the spike "T" (essentially flooding the T and probe) and extracting it

back through the sample system. A low concentration measurement of the CTS analyte (ethylene) indicates a leak in the system. The CTS gas was injected at a rate that was greater than the sample pump draw, yet not so significant that it changed the sample pressure of the system (as read from the cell pressure). A passing CTS is indicative of a leak-free system.

The FTIR analytical analysis method used for the performance testing was optimized for methane, carbon dioxide, ethane and water detection in this particular sample matrix. Methane was selected as the analyte to perform ASTM QA spiking as it was to be subtracted from the THC concentrations.

The FTIR references used to build the analysis method were commercially available. A linear combination of individual references was incorporated to develop the calibration ranges for each analyte monitored. These references have been used reliably on many other test campaigns.

The averaged VOC and methane FTIR results are presented in Table 4-3. Ethane was never detected throughout testing. The entirety of the FTIR data is presented in Appendix C.

4.0 RCTO EFFLUENT EMISSIONS AND DRE TEST RESULTS

4.1 TEST RESULTS SUMMARY

All the run and test results reported in this section were collected and analyzed compliant with the approved Test Protocol and are deemed suitable for demonstration of compliance with Microchip's permitted VOC levels. No deviations from the approved Test Protocol or reference methods were required. The tables below summarize the data results for this compliance test. Table 4-1 displays the emissions and DRE results as it relates to the Microchip's applicable permit limit(s). Tables 4-2 and 4-3 present the individual and averaged results for each run at each location. The compliance test results successfully demonstrated compliance with Microchip's permitted levels.

TABLE 4-1. RCTO 2 INLET VOC RESULTS

	Run 1	**Run 2**	**Run 3**	**Average**
Date	9/25/24	9/25/24	9/25/24	
Time	14:14-15:14	16:51-17:51	18:17-18:47 19:07-19:29	
Flow Rate (scfm)	16,891	18,170	17,249	17,436
THC (ppmv as propane)	36.8	33.0	41.6	37.1
Methane (ppmv)	1.79	1.81	1.79	1.79
Ethane (ppmv)	BDL	BDL	BDL	BDL
VOC (ppmv as propane)	36.2	32.4	41.0	36.5
VOC Input Rate (lb/hr as propane)	**4.20**	**4.04**	**4.86**	**4.37**

BDL – Below Detection Limit

TABLE 4-2. RCTO 2 OUTLET VOC RESULTS

	Run 1		Run 2		Run 3		Average	
Date	9/25/24		9/25/24		9/25/24			
Time	14:14-15:14		16:51-17:51		18:17-18:47 19:07-19:29			
RCTO Stream	TO	RCO	TO	RCO	TO	RCO	TO	RCO
Flow Rate (scfm)	1,553	14,909	2,169	13,880	2,518	14,404	2,080	14,398
THC (ppmv as propane)	0.38	1.22	0.41	1.00	0.36	1.14	0.38	1.12
Methane (ppmv)	BDL	1.78	BDL	1.76	BDL	1.76	BDL	1.77
Ethane (ppmv)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
VOC (ppmv as propane)	0.38	0.63	0.41	0.42	0.36	0.56	0.38	0.53
Combined Outlet VOC (ppmv as propane)	**0.60**		**0.41**		**0.53**		**0.52**	
Combined VOC Emission Rate (lb/hr as propane)	**0.068**		**0.046**		**0.061**		**0.058**	

BDL – Below Detection Limit

TABLE 4-3. SUMMARY OF RCTO 2 VOC DRE

	Run 1	Run 2	Run 3	Average	Permit Limit
Date	9/25/2024	9/25/2024	9/25/2024		
Time	14:14-15:14	16:51-17:51	18:17-18:47 19:07-19:29		
Inlet VOC Conc. (ppmv, as propane)	36.17	32.39	41.01	36.52	NA
VOC Input Rate (lb/hr)	**4.20**	**4.04**	**4.86**	**4.37**	**NA**
Combined Outlet VOC Conc. (ppmv, as propane)	0.60	0.41	0.53	0.52	**<10[1]**
VOC Emission Rate (lb/hr)	**0.07**	**0.05**	**0.06**	**0.06**	**NA**
VOC DRE (%)	**98.4**	**98.9**	**98.7**	**98.7**	**>90[1]**

[1]Dependent on inlet loading – 90 ppm or less triggers a flow weighted outlet concentration limit of <10ppmv. If inlet loading is > 90 ppmv then DRE must be 90% or greater.

TABLE 4-4. SUMMARY OF RCTO 3 INLET VOC RESULTS

	Run 1	Run 2	Run 3	Average
Date	9/25/24	9/25/24	9/25/24	
Time	10:19-11:19	11:30-12:30	12:40-13:40	
Flow Rate (scfm)	14,880	15,708	14,625	15,071
THC (ppmv as propane)	37.45	45.32	34.67	39.1
Methane (ppmv)	1.78	1.77	1.78	1.78
Ethane (ppmv)	BDL	BDL	BDL	BDL
VOC (ppmv as propane)	36.85	44.73	34.08	38.6
VOC Input Rate (lb/hr as propane)	**3.77**	**4.83**	**3.43**	**4.01**

TABLE 4-5. SUMMARY OF RCTO 3 OUTLETS VOC EMISSIONS

	Run 1		Run 2		Run 3		Average	
Date	9/25/24		9/25/24		9/25/24			
Time	10:19-11:19		11:30-12:30		12:40-13:40			
RCTO Stream	TO	RCO	TO	RCO	TO	RCO	TO	RCO
Flow Rate (scfm)	1,529	15,569	1,551	15,729	1,465	14,631	1,515	15,310
THC (ppmv as propane)	0.22	1.00	0.18	1.00	0.22	1.33	0.21	1.11
Methane (ppmv)	BDL	1.79	BDL	1.78	BDL	1.76	BDL	1.78
Ethane (ppmv)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
VOC (ppmv as propane)	0.22	0.40	0.18	0.40	0.22	0.75	0.21	0.52
Combined Outlet VOC (ppmv as propane)	**0.39**		**0.38**		**0.70**		**0.49**	
Combined VOC Emission Rate (lb/hr as propane)	**0.045**		**0.045**		**0.077**		**0.056**	

TABLE 4-6. SUMMARY OF RCTO 3 VOC DRE

	Run 1	Run 2	Run 3	Average	Permit Limit
Date	9/25/2024	9/25/2024	9/25/2024		
Time	10:19-11:19	11:30-12:30	12:40-13:40		
Inlet VOC Conc. (ppmv, as propane)	36.85	44.73	34.08	38.55	NA
VOC Input Rate (lb/hr)	**3.77**	**4.83**	**3.43**	**4.01**	**NA**
Combined Outlet VOC Conc. (ppmv, as propane)	0.39	0.38	0.70	0.49	**<10[1]**
VOC Emission Rate (lb/hr)	**0.05**	**0.05**	**0.08**	**0.06**	**NA**
VOC DRE (%)	**98.8**	**99.1**	**97.7**	**98.5**	**>90[1]**

4.1.1 CALCULATIONS

This section presents the calculations used in generating the finalized data sets.

The O_2 concentration of the outlet gas based on measured CO_2 concentration and the stochiometric maximum CO_2 concentration was calculated as:

$$O_2 = 20.95 - \left(\frac{CO_2 - CO_{2\,bkg}}{\frac{CO_{2\,Max}}{20.95}} \right)$$

Where:

O_2 = Calculated Oxygen concentration (%, dry);
20.95 = Ambient air oxygen concentration (%);
CO_2 = Measured Carbon Dioxide concentration (%, dry);
$CO_{2\,bkg}$ = 0.04%
$CO_{2\,Max}$ = Stoichiometric maximum concentration of Carbon Dioxide based on natural gas fuel (11.737%, dry).

The actual velocity of the outlet gas based on EPA Method 2 was calculated as:

$$v_s = K_p \times C_p \times \sqrt{\frac{\Delta P_{avg} \times T_s}{P_s \times M_s}}$$

Where:

V_S = Velocity of the outlet duct (ft/sec);
ΔP = Root mean square average differential pressure measured by S-Type pitot (in. H_2O);
T_s = Average gas temperature in duct (^oR);
P_s = Absolute duct pressure (in. Hg);
M_w = Wet gas molecular weight (lb/lb-mole); and
C_p = Type-S pitot correction factor (0.84).

The volumetric flow rate of the outlet duct at actual conditions based on EPA Method 2 was calculated as:

$$Q_{ac} = 60\ (V_s)(A)$$

Where:

Q_{ac} = Actual volumetric flowrate (acfm);
V_s = Velocity of the outlet gas (ft/sec);
A = Cross-sectional area of the outlet duct (ft^2); and
60 = Conversion from second to minutes.

The volumetric flow rate of the outlet duct at standard conditions based on EPA Method 2 was calculated as:

$$Q_s = (Q_{ac})\left(\frac{528}{T_s}\right)\left(\frac{P_s}{29.92}\right)$$

Where:

Q_s	=	Dry volumetric flowrate at standard conditions (scfm);
Q_{ac}	=	Actual volumetric flowrate (acfm);
528	=	Standard temperature (°R);
T_s	=	Average gas temperature in outlet duct (°R);
29.92	=	Standard pressure (in. Hg); and
P_s	=	Absolute stack pressure (in. Hg).

The mass emission rate (MER) of total NMVOCs, in pounds per hour was calculated as follows:

$$MER_{NMVOC} = NMVOC_{ppmv} \times Q_s\left(\frac{44.1 \times 60}{1{,}000{,}000 \times 385.24}\right)$$

Where:

$NMVOC_{ppmv}$	= NMVOC Concentration in ppm by volume;
Q_s	= Volumetric flowrate at standard conditions (scfm);
1,000,000	= Conversion from ppm;
44.1	= Molecular weight of propane;
60	= Conversion from hours to minutes; and
385.24	= molar volume in standard cubic feet per lb-mole.

The flow-weighted outlet concentration for the combined VOC concentration of the RCTO outlets was calculated as follows:

$$FWAC = \frac{(F_T \times C_T) + (F_R \times C_R)}{(F_T + F_R)} \times 100$$

Where:

FWAC	= flow-weighted outlet VOC concentration (ppmv)
F_T	= Thermal oxidizer flow rate (scfm)
C_T	= Thermal oxidizer VOC concentration (ppm, as propane)
F_R	= Rotor concentrator flow rate (scfm)
C_R	= Rotor concentrator VOC concentration (ppm, as propane)

The destruction or removal efficiency (DRE) for Microchip's permit compliance was calculated as follows:

$$\mathbf{DRE} = \frac{\mathbf{I} - \mathbf{O}}{\mathbf{I}} \times \mathbf{100}$$

Where:

DRE = Destruction or removal efficiency (%)
I = Inlet emission rate (lb/hr)
O = Outlet Emission rate (lb/hr)

4.2 TEST CRITIQUE

All calculations are performed using unrounded data. The results presented in these tables are rounded to present meaningful levels of uncertainty. To reproduce values exactly may require using the raw data presented in the appendices.

All reported data are within method guidelines unless otherwise noted. The data herein are considered to be usable for the intended purpose of demonstrating ongoing compliance with the emission limits listed in the Microchip Permit 26-3240-ST-01.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

5.1 ASTM D6348-12 QA/QC

As part of quality assurance procedures of the FTIR ASTM methodology, system recovery checks or QA spikes of the target analyte (CH_4) were performed. The methane QA spikes also acted as a surrogate for moisture, CO_2 and ethane analysis by FTIR. The ASTM Method requires this once per source type. These QA spikes challenge the instrumentation for accuracy of target analyte quantification while simultaneously verifying that the extractive system and analyzer are unreactive with the target compound(s). The spiking procedure for the system recovery is described in detail in the ASTM FTIR method and summarized as follows.

A direct inject test (DI) was performed. This is a once-only test in which the gas standard is introduced directly into the heated sample cell (bypassing the extractive assembly). In addition to the target analyte, the gas cylinder also contained a spectroscopic tracer (a broad, strong IR absorber which behaves linearly over a large concentration range) used to calculate the dilution factor. Chlorodifluoromethane (R22) was the tracer contained in the QA spike gas cylinder. After the cell was sufficiently purged with the gas standard, the analysis method returned values ($R22_{cylinder}$ & $CH_{4\ cylinder}$) which represent the concentration of R22 and CH_4 in the gas cylinder as measured by the FTIR.

The gas standard was then injected into the spiking "T" downstream of the probe as the stack effluent was drawn through the extractive and FTIR systems. The gas standard injection flow was maintained at a constant rate using the cylinder regulator and a metering valve. After the FTIR cell was sufficiently purged with the gas standard/stack effluent mix, the FTIR analysis produced a stable tracer concentration which represents the concentration of R22 after dilution by the stack effluent ($R22_{sample}$). The dilution factor (DF) was determined by dividing the $R22_{sample}$ by the $R22_{direct}$.

The expected concentration of CH_4 ($CH_{4\ Theoretical}$) was calculated using the DF as well. The contribution from the cylinder was calculated as the product of the DF and the DI $CH_{4\ direct}$ and the contribution from the native gas stream calculated as (1-DF) times the native concentration. The equation used to calculate the expected CH_4 concentration is as follows:

$$CH_{4\ Theoretical} = \left(\frac{R22\ sample}{R22\ direct}\right)(CH_{4\ direct}) + \left[1 - \left(\frac{R22\ sample}{R22\ direct}\right)\right](CH_{4\ Stack})$$

Where:

$CH_{4\ Theoretical}$ = Expected CH_4 concentration (ppm);

$R22_{sample}$ = R22 concentration (ppm) as seen by the FTIR during QA spiking;

$R22_{direct}$ = R22 concentration (ppm) recorded during direct injection of the QA standard gas into the FTIR cell;

$CH_{4\ direct}$ = CH_4 concentration (ppm) recorded during direct injection of the QA standard gas into the FTIR cell; and

$CH_{4\ stack}$ = Methane concentration (ppm) of the stack gas during stable conditions.

The criterion for a successful recovery, per the ASTM D6348-12, is a measured concentration within 0.7-1.3 times the calculated theoretical concentration. Table 5-1 presents the direct inject results for both FTIRs used as well as the certified concentration of the cylinder. All QA CH_4 spikes passed and Table 5-2 summarizes the results of the ASTM D6348-12 QA recovery spikes performed. All the raw concentration data is presented in Appendix H and the QA standard certificate of analysis in in Appendix G.

TABLE 5-1. SUMMARY OF DIRECT INJECTION RESULTS

Date	RCTO Source	Cylinder Certificated Concentration[1]		Direct Inject FTIR Concentration Result	
		R22 (ppm)	CH_4 (ppm)	R22 (ppm)	CH_4 (ppm)
9/24/2024	Inlet	20.24	20.56	20.10	19.40
	RCO			19.95	18.47
	TO			18.85	17.96

[1]Airgas Cylinder number CC105191

TABLE 5-2. SUMMARY OF CH_4 ASTM D6348-12 QA SPIKES

Unit ID	Date	RCTO Source	Dilution Factor	CH_4 Observed Spike (ppmv)	CH_4 Expected Spike (ppmv)	Percent Recovery (%)	Comment
RCTO 3	9/24/2024	Inlet	0.09	3.22	3.24	99.28	Pass
		RCO	0.09	3.19	3.15	101.29	Pass
		TO	0.10	1.60	1.61	99.94	Pass
RCTO 2	9/24/2024	Inlet	0.11	3.51	3.34	105.00	Pass
		RCO	0.10	3.26	3.25	100.30	Pass
		TO	0.08	1.68	1.39	120.24	Pass

5.1.1 ASTM CTS Challenges

ASTM D6348-12 also requires a calibration transfer standard (CTS) challenge to be performed daily, at a minimum. The CTS challenge was performed before and after the RCTO was tested. This was performed by flowing the CTS gas (ethylene) in excess to the spike "T" and pulling it to the FTIR cell via diaphragm pump. This test also provides a method valid leak check of the system as any significant leak would bias the CTS results low. Table 5-3 presents the results of the CTS challenge results. All CTS challenges passed and the raw data are presented in Appendix H.

TABLE 5-3. SUMMARY OF CTS RESULTS

Cylinder No. CC105191			Ethylene		
			Certified Value (ppmv)	Measured Value (ppmv)	Difference (%)[1]
RCTO 3	Inlet	Pre-Test	9.718	9.85	1.33
		Post Test		9.78	0.59
	RCO	Pre-Test		9.60	1.26
		Post Test		9.58	1.40
	TO	Pre-Test		9.63	0.94
		Post Test		9.30	4.28
RCTO 2	Inlet	Pre-Test		9.78	0.59
		Post Test		9.85	1.40
	RCO	Pre-Test		9.58	1.40
		Post Test		9.61	1.09
	TO	Pre-Test		9.30	4.28
		Post Test		9.84	1.24

[1]< 5% is considered acceptable by ASTM 6348

5.1.2 FTIR Mechanical and Equilibrium Response Checks

Two response time checks are required per the ASTM method:

1. A Mechanical Response Time determination in which the CTS (ethylene) is injected through the system and the time to reach 95% of bottle value is determined.
2. An Equilibrium Response Time determination in which the time to reach 95% of spike analyte is determined.

These response time checks were performed simultaneously since both the CTS and spike analytes were contained in the same calibration gas. The calibration gas was injected into the spike tee at a rate slightly greater than the sample pump was pulling gas thereby flooding the probe and tee. The time it took to reach 95% of the bottle value was recorded and the results are as follows:

- Mechanical response time for the TO and RCO systems = <2 minutes.
- Equilibrium response time for the TO and RCO systems was also <2minutes.

The response time raw FTIR data is presented in Appendix H and is the same data as the CTS results.

5.1.3 FTIR Background or Zero Spectra

A background spectrum of each FTIR is collected by purging UHP nitrogen through the system. Since nitrogen does not absorb IR radiation (is IR inactive), the collected background provides a system zero and is subtracted from each sample or QA spectra. The FTIR cell was first purged with UHP nitrogen to take a background.

5.2 EPA Reference Method 25A QA/QC

Three THC monitors (one for each exhaust stream and the third for the inlet stream) were operated and calibrated in accordance with EPA Method 25A. For the two outlet streams, analyzers with a range of 0-12 ppm as propane were used. The inlet THC analyzer used a 0-225 ppm range as propane. The analyzers were calibrated using a four-point (including a zero gas) calibration procedure performed before testing. All calibration gases used we EPA Protocol 1 certified propane standards. System bias and drift checks were performed between each run, on each Method 25a analyzer to ensure that the measuring systems remained within required performance specifications. This consisted of directing the zero gas and the mid-point propane calibration through the system and verifying the response was within method tolerance. All method performance specifications (drift checks and calibration error) were met. Additionally, a system, negative pressure leak check was performed on each THC analyzer. All QA results are documented in Appendix H. EPA Protocol 1 gas certification documentation for cylinders used during this testing are also included in Appendix G.

5.2.1 THC Analyzer Calibration Error Test

The THC analyzer was calibrated at the onset of testing of the RCTO and as needed thereafter. The calibration procedure is as follows:

1. The zero-concentration gas was introduced through the entire sampling system to the analyzer. After adjusting the analyzer to the zero-concentration gas and once the analyzer reading was stable, the analyzer value was recorded.
2. This process was repeated for the high-level concentration gas.
3. For the Calibration Error Test, low, mid, and high-level calibration gases were sequentially introduced through sampling system to the analyzer and recorded. All values were within the Method 25a required 5.0% of the bottle value.

5.2.2 THC Analyzer Measurement Response Time and initial system bias

The measurement response time and initial system bias data were performed at the start of testing. The measurement response time procedure is as follow:

1. Mid-level gas was introduced at the probe and the time required for the analyzer reading to reach 95 percent of the gas concentration was recorded. The analyzer reading was observed until it reached a stable value and this value was recorded.
2. Next, zero-level gas was introduced at the probe and the time required for the analyzer reading to decrease to a value within 5.0% of the upscale gas concentration. The analyzer reading was observed until it reached a stable value and this value was recorded.

5.2.3 THC Analyzer Calibration Drift Test

The drift determination test was performed to ensure the THC analyzers did not exceed the drift limits set in Method 25A between each run and at the end of testing. The calibration drift test procedure is as follows:

1. Mid-level gas was introduced at the probe through the sampling system to the analyzer. The analyzer reading was observed until it reached a stable value, and this value was recorded. The value was within 3% of span
2. Next, zero-level gas was introduced at the probe through the sampling system. The analyzer reading was observed until it reached a stable value and this value was recorded. The value was within 3% of span.

5.3 Calibrations and Documentation

Emissions testing was conducted on the RCTO streams consistent with the applicable requirements of ODEQ Permit and the approved Test Protocol. This test was conducted under the ODEQ Permit No. 26-3240-ST-01 which is presented in Appendix D.

To ensure accurate and defensible results, strict quality assurance and control measures were followed. All testing was performed following the Test Protocol and standard EPA or ASTM reference methods. All test criteria were thoroughly documented and checked for completeness.

6.0 REFERENCES

1. EPA Title 40, Code of Federal Regulations, Part 60 ”Standards of Performance New Stationary Sources”, Appendix A to Part 60 “Test Methods”

2. EPA-600/R93/224, “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards”

3. ASTM Method 6348-03 Standard Test Method for Determination of Gaseous Compounds by Extractive Direct Interface Fourier Transform Infrared (FTIR) Spectroscopy

4. Source Sampling Manual, ODEQ “https://www.oregon.gov/deq/FilterDocs/SSMI.pdf”

Appendix A

Summary Data and Calculations

TO Flow Summary

Project Name	**Microchip Gresham Two New RCTO Units Compliance Testing**
Project Number	**225-01-2401M**
Facility	**Gresham**

Sample Type	Flow	Flow	Flow	Averages
Source	RCTO 2 TO	RCTO 2 TO	RCTO 2 TO	
Run	1	2	3	
Date	9/25/2024	9/25/2024	9/25/2024	
Time Start	00:01	00:01	00:01	
Time Stop	00:01	00:01	00:01	
	00:01-00:01	00:01-00:01	00:01-00:01	
Duct Diameter (ft)	1.58	1.58	1.58	
Pitot Tube Correction Factor	0.84	0.84	0.84	
Standard Temperature (°F)	68	68	68	
Barometric Pressure Measured (" Hg)	29.90	29.90	29.90	
Stack Elevation (ft) (relative to Barometer)	40	40	40	
Barometric Pressure ("Hg)	29.86	29.86	29.86	
Average Stack Temperature (°F)	714.8	723.5	722.4	720.2
Test Duration (minutes)	0	0.004166667	0.011111111	
Static Pressure ("H_2O)	-0.13	-0.11	-0.13	
Carbon Dioxide (CO_2) Content (%)	1.56	1.56	1.56	
Oxygen (O_2) Content (%)	18.24	18.24	18.24	
Nitrogen (N_2) Content (%)	80.20	80.20	80.20	
Average square root of ΔP ($(\sqrt{\Delta P})_{avg}$)	0.348	0.487	0.565	
Absolute Stack Pressure ("Hg)	29.85	29.85	29.85	
Absolute Stack Temperature (°R)	1174.8	1183.5	1182.4	1180.2
Flue Gas Moisture (%)	4.36	4.36	4.36	4.36
Moisture at saturation	N/A	N/A	N/A	
Moisture used in Calculation	4.36	4.36	4.36	4.36
Gas Molecular Weight (Wet) (g/g-mole)	28.50	28.50	28.50	
Average Gas Velocity (ft/sec)	29.35	41.23	47.83	39.47
Avg Flow Rate (acfh)	207,172	291,009	337,601	278,594
Avg Flow Rate (acfm)	3,453	4,850	5,627	4,643
Avg Flow Rate (scfh)	92,896	129,531	150,401	124,276
Avg Flow Rate (scfm)	1,548	2,159	2,507	2,071
Avg Flow Rate (dscfh)	88,846	123,884	143,844	118,858
Avg Flow Rate (dscfm)	1,481	2,065	2,397	1,981

TO Flow Summary

Data Entry Area

Sample Type	Flow	Nozzle Diameter (in)			
Source	RCTO 2 TO	Std Temp (°F)	68		
Condition		Bar Press ("Hg, meas)	29.9	Entered By (initials)	***KNB***
Run	1	Meter Elev (ft) (rel to Brmtr)	40	Checked by (initials)	
Date	25-Sep	Static Press ("H_2O)	-0.129	Corrected by (initials)	
Duct Diameter (ft)	1.580	% CO			
Duct Depth (ft)		% CO_2	1.56		
Duct Width (ft)		% O_2	18.24		
Pitot Tube Correction Factor	0.84	% H_2			
DGMCF		% CH_4			

Times		DGM Volumes (as read)		Impinger Catch (g)		
					Initial	Final
start	2:44:00 PM	start		1		
stop	2:57:00 PM	stop		2		
start		start		3		
stop		stop		4		
start		start		5		
stop		stop		6		
start		start		7		
stop		stop		8		
start		start		9		
stop		stop		10		
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
				Total Wt Gain		0.0
Duration	0	Total	0.000			

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	$(\sqrt{\Delta P})_{avg}$
Averages	0.122	#DIV/0!	714.8	#DIV/0!	0.3478
Individual Readings	0.146		607.9		0.38209946
	0.138		652.2		0.37148351
	0.136		672.2		0.36878178
	0.140		692.3		0.37416574
	0.117		695.3		0.34205263
	0.109		701.3		0.33015148
	0.094		704.1		0.30659419
	0.081		680.8		0.28460499
	0.141		749.9		0.37549967
	0.142		755.1		0.37682887
	0.144		757.4		0.37947332
	0.127		759.1		0.35637059
	0.143		759.7		0.37815341
	0.121		742.2		0.34785054
	0.110		741.9		0.331662479
	0.104		742.0		0.32249031
	0.081		738.0		0.284604989

TO Flow Summary

Data Entry Area

Sample Type	Flow	Nozzle Diameter (in)			
Source	RCTO 2 TO	Std Temp (°F)	68		
Condition		Bar Press ("Hg, meas)	29.9	Entered By (initials)	***KNB***
Run	2	Meter Elev (ft) (rel to Brmtr)	40	Checked by (initials)	
Date	25-Sep	Static Press ("H_2O)	-0.108	Corrected by (initials)	
Duct Diameter (ft)	1.580	% CO			
Duct Depth (ft)		% CO_2	1.56		
Duct Width (ft)		% O_2	18.24		
Pitot Tube Correction Factor	0.84	% H_2			
DGMCF		% CH_4			

Times		DGM Volumes (as read)		Impinger Catch (g)		
					Initial	Final
start	5:55:00 PM	start		1		
stop	6:01:00 PM	stop		2		
start		start		3		
stop		stop		4		
start		start		5		
stop		stop		6		
start		start		7		
stop		stop		8		
start		start		9		
stop		stop		10		
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
				Total Wt Gain		0.0
Duration	0	Total	0.000			

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	$(\sqrt{\Delta P})_{avg}$
Averages	0.247	#DIV/0!	723.5	#DIV/0!	0.4868
Individual Readings	0.207		713.4		0.45497253
	0.223		721.3		0.47222876
	0.228		726.7		0.47749346
	0.235		731.5		0.48476799
	0.276		717.2		0.52535702
	0.300		716.1		0.54772256
	0.298		716.4		0.54589376
	0.333		710.5		0.57706152
	0.489		691.9		0.69928535
	0.494		703.4		0.70285134
	0.125		740.6		0.35355339
	0.138		743.6		0.37148351
	0.147		746.3		0.38340579
	0.150		746.7		0.38729833
	0.158		745.4		0.397492138
	0.179		732.3		0.423083916
	0.222		696.7		0.47116876

TO Flow Summary

Data Entry Area

Sample Type	Flow	Nozzle Diameter (in)	
Source	RCTO 2 TO	Std Temp (°F)	68
Condition		Bar Press ("Hg, meas)	29.9
Run	3	Meter Elev (ft) (rel to Brmtr)	40
Date	25-Sep	Static Press ("H_2O)	-0.133
Duct Diameter (ft)	1.580	% CO	
Duct Depth (ft)		% CO_2	1.56
Duct Width (ft)		% O_2	18.24
Pitot Tube Correction Factor	0.84	% H_2	
DGMCF		% CH_4	

Entered By (initials)	***KNB***
Checked by (initials)	
Corrected by (initials)	

Times		DGM Volumes (as read)		Impinger Catch (g)		
					Initial	Final
start	6:27:00 PM	start		1		
stop	6:43:00 PM	stop		2		
start		start		3		
stop		stop		4		
start		start		5		
stop		stop		6		
start		start		7		
stop		stop		8		
start		start		9		
stop		stop		10		
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
				Total Wt Gain		0.0
Duration	0	Total	0.000			

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	$(\sqrt{\Delta P})_{avg}$
Averages	0.326	#DIV/0!	722.4	#DIV/0!	0.5650
Individual Readings	0.180		756.4		0.42426407
	0.219		756.7		0.46797436
	0.218		756.8		0.4669047
	0.228		757.3		0.47749346
	0.265		743.7		0.51478151
	0.253		728.3		0.50299105
	0.286		685.3		0.53478968
	0.260		672.9		0.50990195
	0.362		687.7		0.60166436
	0.384		699.7		0.61967734
	0.365		74.2.3		0.6041523
	0.408		756.1		0.63874878
	0.379		751.9		0.61562976
	0.408		729.6		0.63874878
	0.379		673.3		0.615629759
	0.451		647.0		0.671565336
	0.49		756.1		0.699285349

Inlet Flow Summary

Project Name	**Microchip Gresham Two New RCTO Units Compliance Testing**
Project Number	**225-01-2401M**
Facility	**Gresham**

Sample Type	Flow	Flow	Flow	Averages
Source	RCTO 2 Inlet	RCTO 2 Inlet	RCTO 2 Inlet	
Run	1	2	3	
Date	9/25/2024	9/25/2024	9/25/2024	
Time Start	00:01	00:01	00:01	
Time Stop	00:01	00:01	00:01	
	00:01-00:01	00:01-00:01	00:01-00:01	
Duct Diameter (ft)	3.67	3.67	3.67	
Pitot Tube Correction Factor	0.84	0.84	0.84	
Standard Temperature (°F)	68	68	68	
Barometric Pressure Measured (" Hg)	29.90	29.90	29.90	
Stack Elevation (ft) (relative to Barometer)	40	40	40	
Barometric Pressure ("Hg)	29.86	29.86	29.86	
Average Stack Temperature (°F)	70.6	65.4	67.9	68.0
Test Duration (minutes)	0	0.007638889	0.004861111	
Static Pressure ("H_2O)	-4.29	-4.21	-4.15	
Carbon Dioxide (CO_2) Content (%)	431.21	431.21	431.21	
Oxygen (O_2) Content (%)	21.02	21.02	21.02	
Nitrogen (N_2) Content (%)	-352.23	-352.23	-352.23	
Average square root of ΔP ($(\sqrt{\Delta P})_{avg}$)	0.479	0.513	0.488	
Absolute Stack Pressure ("Hg)	29.54	29.55	29.56	
Absolute Stack Temperature (°R)	530.6	525.4	527.9	528.0
Flue Gas Moisture (%)	1.24	1.24	1.24	1.24
Moisture at saturation	2.65	2.31	2.46	
Moisture used in Calculation	1.24	1.24	1.24	1.24
Gas Molecular Weight (Wet) (g/g-mole)	96.85	96.85	96.85	
Average Gas Velocity (ft/sec)	14.81	15.77	15.04	15.21
Avg Flow Rate (acfh)	564,096	600,711	572,908	579,238
Avg Flow Rate (acfm)	9,402	10,012	9,548	9,654
Avg Flow Rate (scfh)	554,246	596,272	566,028	572,182
Avg Flow Rate (scfm)	9,237	9,938	9,434	9,536
Avg Flow Rate (dscfh)	547,378	588,884	559,014	565,092
Avg Flow Rate (dscfm)	9,123	9,815	9,317	9,418

Inlet Flow Summary

Data Entry Area

Sample Type	Flow	Nozzle Diameter (in)			
Source	RCTO 2 Inlet	Std Temp (°F)	68		
Condition		Bar Press ("Hg, meas)	29.9	Entered By (initials)	***KNB***
Run	1	Meter Elev (ft) (rel to Brmtr)	40	Checked by (initials)	
Date	25-Sep	Static Press ("H_2O)	-4.29	Corrected by (initials)	
Duct Diameter (ft)	3.670	% CO			
Duct Depth (ft)		% CO_2	431.21		
Duct Width (ft)		% O_2	21.02		
Pitot Tube Correction Factor	0.84	% H_2			
DGMCF		% CH_4			

Times		DGM Volumes (as read)		Impinger Catch (g)		
					Initial	Final
start	3:07:00 PM	start		1		
stop	3:15:00 PM	stop		2		
start		start		3		
stop		stop		4		
start		start		5		
stop		stop		6		
start		start		7		
stop		stop		8		
start		start		9		
stop		stop		10		
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
				Total Wt Gain		0.0
Duration	0	Total	0.000			

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	$(\sqrt{\Delta P})_{avg}$
Averages	0.235	#DIV/0!	70.6	#DIV/0!	0.4790
Individual Readings	0.277		69.4		0.52630789
	0.328		70.1		0.57271284
	0.333		72.8		0.57706152
	0.286		73.6		0.53478968
	0.137		72.9		0.37013511
	0.111		73.7		0.33316662
	0.135		73.9		0.36742346
	0.168		71.7		0.40987803
	0.207		65.6		0.45497253
	0.304		66.5		0.55136195
	0.302		67.4		0.54954527
	0.280		68.4		0.52915026
	0.201		69.8		0.44833024
	0.232		70.9		0.48166378
	0.229		71.6		0.478539445
	0.229		72.0		0.478539445

Inlet Flow Summary

Data Entry Area

Sample Type	Flow	Nozzle Diameter (in)			
Source	RCTO 2 Inlet	Std Temp (°F)	68		
Condition		Bar Press ("Hg, meas)	29.9	Entered By (initials)	***KNB***
Run	2	Meter Elev (ft) (rel to Brmtr)	40	Checked by (initials)	
Date	25-Sep	Static Press ("H_2O)	-4.208	Corrected by (initials)	
Duct Diameter (ft)	3.670	% CO			
Duct Depth (ft)		% CO_2	431.21		
Duct Width (ft)		% O_2	21.02		
Pitot Tube Correction Factor	0.84	% H_2			
DGMCF		% CH_4			

Times		DGM Volumes (as read)		Impinger Catch (g)		
					Initial	Final
start	5:39:00 PM	start		1		
stop	5:50:00 PM	stop		2		
start		start		3		
stop		stop		4		
start		start		5		
stop		stop		6		
start		start		7		
stop		stop		8		
start		start		9		
stop		stop		10		
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
				Total Wt Gain		0.0
Duration	0	Total	0.000			

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	$(\sqrt{\Delta P})_{avg}$
Averages	0.270	#DIV/0!	65.4	#DIV/0!	0.5127
Individual Readings	0.235		64.0		0.48476799
	0.338		65.7		0.58137767
	0.364		66.5		0.60332413
	0.312		67.1		0.5585696
	0.176		68.0		0.41952354
	0.159		68.2		0.39874804
	0.145		67.3		0.38078866
	0.218		64.7		0.4669047
	0.263		62.9		0.51283526
	0.202		63.1		0.4494441
	0.158		63.8		0.39749214
	0.431		64.6		0.6565059
	0.288		63.9		0.53665631
	0.320		65.1		0.56568542
	0.408		65.8		0.638748777
	0.304		65.1		0.55136195

Inlet Flow Summary

Data Entry Area

Sample Type	Flow	Nozzle Diameter (in)	
Source	RCTO 2 Inlet	Std Temp (°F)	68
Condition		Bar Press ("Hg, meas)	29.9
Run	3	Meter Elev (ft) (rel to Brmtr)	40
Date	25-Sep	Static Press ("H_2O)	-4.147
Duct Diameter (ft)	3.670	% CO	
Duct Depth (ft)		% CO_2	431.21
Duct Width (ft)		% O_2	21.02
Pitot Tube Correction Factor	0.84	% H_2	
DGMCF		% CH_4	

Entered By (initials)	***KNB***
Checked by (initials)	
Corrected by (initials)	

Times		DGM Volumes (as read)		Impinger Catch (g)		
					Initial	Final
start	7:09:00 PM	start		1		
stop	7:16:00 PM	stop		2		
start		start		3		
stop		stop		4		
start		start		5		
stop		stop		6		
start		start		7		
stop		stop		8		
start		start		9		
stop		stop		10		
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
				Total Wt Gain		0.0
Duration	0	Total	0.000			

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	$(\sqrt{\Delta P})_{avg}$
Averages	0.247	#DIV/0!	67.9	#DIV/0!	0.4878
Individual Readings	0.232		62.0		0.48166378
	0.316		63.8		0.56213877
	0.283		64.8		0.53197744
	0.208		65.8		0.45607017
	0.121		67.0		0.34785054
	0.430		64.8		0.65574385
	0.222		65.6		0.47116876
	0.228		67.6		0.47749346
	0.211		68.8		0.45934736
	0.307		71.8		0.55407581
	0.369		70.7		0.6074537
	0.328		70.9		0.57271284
	0.333		71.3		0.57706152
	0.129		71.5		0.3591657
	0.111		71.8		0.333166625
	0.128		68.2		0.357770876

Client:	Spectrum Environmental Solutions LLC.	
Facility:	Microchip Technology - Fab 4	
Test Location:	RCTO #2	
Project #:	M243410	
Test Method:	2F (RATA)	
Test Engineer:	RMF	
Test Technician:	JAD	
Temp ID:	N/A	
Meter ID:	3D4	
Probe ID:	DAT 3D062	
Probe Type:	3D	
Pitot Tube Coefficient:	N/A	
Probe Length:	6.5	**ft**
Sample Plane:	Horizontal	
Port Length:	4.00	**in.**
Port Size (diameter):	3.50	**in.**
Port Type:	Nipple	
Duct Shape:	Circular	
Diameter:	3.67	**ft**
Duct Area:	10.58	**Sq. Ft.**
Upstream Diameters:	1.860	
Downstream Diameters:	0.770	
Number of Ports Sampled:	2	
Number of Points per Port:	20	
Total Number of Traverse Points:	40	
Operating Level:	Normal	

Point Markings (including port length):

Point #	Inches
1	4.573
2	5.718
3	6.951
4	8.272
5	9.681
6	11.267
7	12.984
8	15.010
9	17.476
10	17.873
11	30.952
12	34.564
13	37.030
14	39.056
15	40.773
16	42.359
17	43.768
18	45.089
19	46.322
20	47.467

Probe Type:	**DAT**		
Probe ID:	**3D062**		
	yyyy	**mm**	**dd**
Probe Cal Date:	**2024**	**05**	**22**
Probe Cal Velocities:	**60 & 90 fps**		

Calibration Polynomials (60-90 fps)

Pitch Angle vs F1 $$\Theta p_{(i)} = A(F1_{(i)})^5 + B(F1_{(i)})^4 + C(F1_{(i)})^3 + D(F1_{(i)})^2 + E(F1_{(i)}) + F$$

F2 vs Pitch Angle $$F2_{(i)} = G(\Theta p_{(i)})^5 + H(\Theta p_{(i)})^4 + I(\Theta p_{(i)})^3 + J(\Theta p_{(i)})^2 + K(\Theta p_{(i)}) + L$$

Coefficients

			-2.546E-11
A=	4.223E+01	**G=**	-1.140E-09
B=	9.800E+00	**H=**	3.062E-08
C=	-5.850E+01	**I=**	2.961E-06
D=	-7.543E+00	**J=**	6.762E-05
E=	6.591E+01	**K=**	-2.322E-03
F=	3.647E+00	**L=**	1.066E+00

METHOD 2F VOLUMETRIC FLOW DATA

Project Number:	M243410	**Operating Level:**	Normal
Client:	Spectrum Environmental Solutions LL(	**Run No.:**	1
Facility:	Microchip Technology - Fab 4	**Test Date:**	9/25/2024
Test Location:	RCTO #2	**Start Time:**	14:14
Probe ID:	DAT 3D062	**End Time:**	15:04
Probe Length, Feet:	6.5	**Test Engineer:**	RMF
Port Length, Inches:	4	**Test Technician:**	JAD

Port	Point	P1-P2 (in. H_2O)	P4-P5 (in. H_2O)	Temp (^oF)	YAW (θ_Y)	F_1	Pitch (θ_P)	$\cos\theta_Y$	$\cos\theta_P$	F_2	Velocity (V_a)	Ri
A	01	0.17	-0.06	64.0	7.7	-0.3529	-18.06	0.9910	0.9507	1.12	29.2788	19.58
A	02	0.17	-0.02	64.0	7.9	-0.1176	-4.12	0.9905	0.9974	1.08	29.5861	8.90
A	3	0.16	-0.02	66.0	8.9	-0.1250	-4.59	0.9880	0.9968	1.08	28.7003	10.01
A	4	0.15	-0.02	67.0	7.6	-0.1333	-5.14	0.9912	0.9960	1.08	27.9236	9.16
A	5	0.15	-0.02	67.0	8.9	-0.1333	-5.14	0.9880	0.9960	1.08	27.8319	10.26
A	6	0.15	-0.02	68.0	8.7	-0.1333	-5.14	0.9885	0.9960	1.08	27.8734	10.09
A	7	0.14	-0.01	68.0	9.2	-0.0714	-1.08	0.9871	0.9998	1.07	26.7259	9.26
A	8	0.15	-0.02	69.0	8.5	-0.1333	-5.14	0.9890	0.9960	1.08	27.9145	9.92
A	9	0.14	-0.02	69.0	8.4	-0.1429	-5.75	0.9893	0.9950	1.08	26.9906	10.17
A	10	0.13	-0.02	70.0	11.1	-0.1538	-6.46	0.9813	0.9937	1.08	25.8374	12.82
A	11	0.09	-0.02	71.0	15.5	-0.2222	-10.73	0.9636	0.9825	1.10	21.1351	18.78
A	12	0.09	-0.02	71.0	16.9	-0.2222	-10.73	0.9568	0.9825	1.10	20.9856	19.93
A	13	0.10	-0.02	72.0	17.6	-0.2000	-9.37	0.9532	0.9867	1.09	22.0696	19.87
A	14	0.09	-0.02	72.0	19.5	-0.2222	-10.73	0.9426	0.9825	1.10	20.6942	22.16
A	15	0.09	-0.02	72.0	15.2	-0.2222	-10.73	0.9650	0.9825	1.10	21.1854	18.53
A	16	0.08	-0.02	72.0	11.2	-0.2500	-12.39	0.9810	0.9767	1.10	20.2741	16.64
A	17	0.07	-0.02	72.0	14.2	-0.2857	-14.45	0.9694	0.9684	1.11	18.6847	20.15
A	18	0.09	-0.03	72.0	13.8	-0.3333	-17.05	0.9711	0.9561	1.11	21.0979	21.80
A	19	0.09	-0.02	72.0	11.0	-0.2222	-10.73	0.9816	0.9825	1.10	21.5501	15.32
A	20	0.07	-0.02	72.0	9.5	-0.2857	-14.45	0.9863	0.9684	1.11	19.0093	17.24
B	1	0.14	-0.02	70.0	11.9	-0.1429	-5.75	0.9785	0.9950	1.08	26.7222	13.20
B	2	0.14	-0.02	70.0	6.0	-0.1429	-5.75	0.9945	0.9950	1.08	27.1595	8.30
B	3	0.15	-0.02	70.0	8.0	-0.1333	-5.14	0.9903	0.9960	1.08	27.9762	9.50
B	4	0.14	-0.02	70.0	4.2	-0.1429	-5.75	0.9973	0.9950	1.08	27.2358	7.12
B	5	0.14	-0.02	70.0	5.2	-0.1429	-5.75	0.9959	0.9950	1.08	27.1967	7.75
B	6	0.14	-0.02	70.0	4.9	-0.1429	-5.75	0.9963	0.9950	1.08	27.2093	7.55
B	7	0.13	-0.02	70.0	5.6	-0.1538	-6.46	0.9952	0.9937	1.08	26.2043	8.54
B	8	0.13	-0.01	70.0	5.7	-0.0769	-1.44	0.9951	0.9997	1.07	26.0277	5.88
B	9	0.11	-0.01	71.0	5.3	-0.0909	-2.36	0.9957	0.9991	1.07	24.0205	5.80
B	10	0.11	-0.01	71.0	6.5	-0.0909	-2.36	0.9936	0.9991	1.07	23.9686	6.91
B	11	0.11	-0.01	71.0	5.9	-0.0909	-2.36	0.9947	0.9991	1.07	23.9959	6.35
B	12	0.10	-0.01	72.0	7.3	-0.1000	-2.96	0.9919	0.9987	1.07	22.8583	7.87
B	13	0.12	-0.01	72.0	6.9	-0.0833	-1.86	0.9928	0.9995	1.07	25.0155	7.15
B	14	0.10	-0.01	72.0	9.4	-0.1000	-2.96	0.9866	0.9987	1.07	22.7357	9.85
B	15	0.09	-0.01	72.0	7.6	-0.1111	-3.69	0.9912	0.9979	1.08	21.6938	8.44
B	16	0.09	-0.01	71.0	0.0	-0.1111	-3.69	1.0000	0.9979	1.08	21.8655	3.69
B	17	0.10	-0.01	71.0	7.8	-0.1000	-2.96	0.9907	0.9987	1.07	22.8104	8.34
B	18	0.09	-0.01	71.0	3.2	-0.1111	-3.69	0.9984	0.9979	1.08	21.8314	4.88
B	19	0.08	-0.01	71.0	3.3	-0.1250	-4.59	0.9983	0.9968	1.08	20.6047	5.65
B	20	0.05	-0.01	71.0	12.3	-0.2000	-9.37	0.9770	0.9867	1.09	15.9811	15.42

Test Parameters

P_{bar} - Barometric pressure, inches Hg	29.51			
P_g - Stack Pressure, inches of H_2O	-5.00			
P_s - Absolute stack pressure, inches Hg	29.14			
t_s - Average stack temperature, ^oF	70.2	Md - dry basis lb/lb mole	29.00	
Duct Shape:	Circular	Ms - wet basis lb/lb mole	28.868	
Diameter, Feet	3.67	Wet Bulb Temp(t'):		
		Dry Bulb Temp(t):		ECO
		Bws - Moisture content fraction	**0.012**	Moisture ru
Cross Sectional Area of Stack, Ft^2	10.58	Moisture determined by wb/db?	N	
		Supersaturation Value, Bws:	**0.025**	

Method 2F Results

Average Velocity $V_{a(avg)}$	24.212	Q - ACFM	15,369
No WAF Applied to this Test		Qsd - DSCFM	14,730
		Qs - SCFM	14,909
Site Acceptability Results		Qs - SCFH	894,559
Average Ri	11.47		
Standard Deviation	3.40		
%RMS	3.35		

METHOD 2F VOLUMETRIC FLOW DATA

Project Number:	M243410	**Operating Level:**	Normal
Client:	Spectrum Environmental Solutions LL(	**Run No.:**	2
Facility:	Microchip Technology - Fab 4	**Test Date:**	9/25/2024
Test Location:	RCTO #2	**Start Time:**	17:08
Probe ID:	DAT 3D062	**End Time:**	17:42
Probe Length, Feet:	6.5	**Test Engineer:**	RMF
Port Length, Inches:	4	**Test Technician:**	JAD

Port	Point	P1-P2 (in. H_2O)	P4-P5 (in. H_2O)	Temp (^oF)	YAW (θ_Y)	F_1	Pitch (θ_P)	$\cos\theta_Y$	$\cos\theta_P$	F_2	Velocity (V_a)
A	01	0.15	-0.04	68.0	9.5	-0.2667	-13.36	0.9863	0.9729	1.10	27.7718
A	02	0.18	-0.04	68.0	8.0	-0.2222	-10.73	0.9903	0.9825	1.10	30.6289
A	3	0.14	-0.04	68.0	-4.3	-0.2857	-14.45	0.9972	0.9684	1.11	27.0779
A	4	0.15	-0.04	68.0	6.4	-0.2667	-13.36	0.9938	0.9729	1.10	27.9825
A	5	0.13	-0.03	68.0	-6.2	-0.2462	-12.16	0.9942	0.9775	1.10	26.1001
A	6	0.16	-0.03	69.0	5.7	-0.2000	-9.37	0.9951	0.9867	1.09	29.0599
A	7	0.15	-0.03	69.0	7.8	-0.2133	-10.19	0.9907	0.9842	1.09	28.0082
A	8	0.14	-0.03	69.0	6.5	-0.2286	-11.11	0.9936	0.9812	1.10	27.1209
A	9	0.13	-0.03	69.0	6.4	-0.2462	-12.16	0.9938	0.9775	1.10	26.1148
A	10	0.11	-0.03	69.0	9.8	-0.2909	-14.74	0.9854	0.9671	1.11	23.7279
A	11	0.07	-0.03	69.0	0.8	-0.4571	-22.89	0.9999	0.9213	1.13	18.6862
A	12	0.07	-0.03	70.0	7.2	-0.4571	-22.89	0.9921	0.9213	1.13	18.5581
A	13	0.07	-0.03	70.0	20.9	-0.4571	-22.89	0.9342	0.9213	1.13	17.4749
A	14	0.08	-0.03	70.0	10.0	-0.4000	-20.36	0.9848	0.9375	1.12	19.9127
A	15	0.06	-0.03	70.0	-14.3	-0.5333	-25.81	0.9690	0.9003	1.14	16.5179
A	16	0.05	-0.03	70.0	24.0	-0.6400	-29.18	0.9135	0.8731	1.15	13.8975
A	17	0.05	-0.04	70.0	4.7	-0.8000	-33.78	0.9966	0.8312	1.16	14.5755
A	18	0.08	-0.04	70.0	-7.7	-0.5000	-24.59	0.9910	0.9093	1.14	19.6427
A	19	0.03	-0.02	70.0	19.0	-0.6667	-29.94	0.9455	0.8666	1.15	11.0777
A	20	0.06	-0.05	70.0	-11.5	-0.8333	-34.91	0.9799	0.8201	1.16	15.5206
B	1	0.18	-0.03	69.0	8.0	-0.1667	-7.27	0.9903	0.9920	1.09	30.6659
B	2	0.15	-0.04	69.0	4.0	-0.2667	-13.36	0.9976	0.9729	1.10	28.1160
B	3	0.13	-0.04	70.0	4.2	-0.3077	-15.67	0.9973	0.9628	1.11	26.0804
B	4	0.14	-0.04	70.0	0.0	-0.2857	-14.45	1.0000	0.9684	1.11	27.2057
B	5	0.13	-0.04	70.0	-2.9	-0.3077	-15.67	0.9987	0.9628	1.11	26.1172
B	6	0.13	-0.04	71.0	0.0	-0.3077	-15.67	1.0000	0.9628	1.11	26.1753
B	7	0.13	-0.04	71.0	4.0	-0.3077	-15.67	0.9976	0.9628	1.11	26.1116
B	8	0.13	-0.04	71.0	5.6	-0.3077	-15.67	0.9952	0.9628	1.11	26.0504
B	9	0.09	-0.04	71.0	6.2	-0.4444	-22.35	0.9942	0.9249	1.13	21.1599
B	10	0.10	-0.04	71.0	10.7	-0.4000	-20.36	0.9826	0.9375	1.12	22.2344
B	11	0.09	-0.03	71.0	0.0	-0.3333	-17.05	1.0000	0.9561	1.11	21.7045
B	12	0.08	-0.03	71.0	9.0	-0.3750	-19.16	0.9877	0.9446	1.12	20.0786
B	13	0.07	-0.03	71.0	11.7	-0.4286	-21.66	0.9792	0.9294	1.13	18.4385
B	14	0.08	-0.03	71.0	-8.6	-0.3750	-19.16	0.9888	0.9446	1.12	20.1003
B	15	0.06	-0.03	71.0	-4.7	-0.5000	-24.59	0.9966	0.9093	1.14	17.1243
B	16	0.09	-0.03	71.0	0.0	-0.3333	-17.05	1.0000	0.9561	1.11	21.7045
B	17	0.09	-0.03	71.0	-11.0	-0.3333	-17.05	0.9816	0.9561	1.11	21.3058
B	18	0.09	-0.03	71.0	-8.8	-0.3333	-17.05	0.9882	0.9561	1.11	21.4490
B	19	0.06	-0.03	70.0	-9.0	-0.5000	-24.59	0.9877	0.9093	1.14	16.9545
B	20	0.10	-0.02	69.0	-8.2	-0.2000	-9.37	0.9898	0.9867	1.09	22.8520

Test Parameters

P_{bar} - Barometric pressure, inches Hg	29.51			
P_g - Stack Pressure, inches of H_2O	-5.00			
P_s - Absolute stack pressure, inches Hg	29.14			
t_s - Average stack temperature, ^oF	69.9	Md - dry basis lb/lb mole	29.00	
Duct Shape:	Circular	Ms - wet basis lb/lb mole	28.868	
Diameter, Feet	3.67	Wet Bulb Temp(t'):		
		Dry Bulb Temp(t):		
		Bws - Moisture content fraction		0.012
Cross Sectional Area of Stack, Ft^2	10.58	Moisture determined by wb/db?		N
		Supersaturation Value, Bws:		**0.025**

Method 2F Results

Average Velocity $V_{a(avg)}$	22.527	Q - ACFM	14,300
No WAF Applied to this Test		Qsd - DSCFM	13,713
		Qs - SCFM	13,880
		Qs - SCFH	832,795

METHOD 2F VOLUMETRIC FLOW DATA

Project Number:	M243410	**Operating Level:**	Normal
Client:	Spectrum Environmental Solutions LL(	**Run No.:**	3
Facility:	Microchip Technology - Fab 4	**Test Date:**	9/25/2024
Test Location:	RCTO #2	**Start Time:**	18:45
Probe ID:	DAT 3D062	**End Time:**	19:10
Probe Length, Feet:	6.5	**Test Engineer:**	RMF
Port Length, Inches:	4	**Test Technician:**	JAD

Port	Point	P1-P2 (in. H_2O)	P4-P5 (in. H_2O)	Temp (^oF)	YAW (θ_Y)	F_1	Pitch (θ_P)	$\cos\theta_Y$	$\cos\theta_P$	F_2	Velocity (V_a)
A	**01**	0.17	-0.05	72.0	10.8	-0.2941	-14.92	0.9823	0.9663	1.11	29.4771
A	**02**	0.18	-0.05	72.0	9.5	-0.2778	-14.00	0.9863	0.9703	1.11	30.5068
A	**3**	0.17	-0.04	72.0	8.6	-0.2353	-11.52	0.9888	0.9799	1.10	29.8156
A	**4**	0.16	-0.04	72.0	7.3	-0.2500	-12.39	0.9919	0.9767	1.10	28.9917
A	**5**	0.16	-0.03	72.0	8.4	-0.1875	-8.59	0.9893	0.9888	1.09	28.9742
A	**6**	0.16	-0.03	72.0	7.8	-0.1875	-8.59	0.9907	0.9888	1.09	29.0175
A	**7**	0.15	-0.03	72.0	8.2	-0.2000	-9.37	0.9898	0.9867	1.09	28.0671
A	**8**	0.17	-0.03	72.0	7.5	-0.1765	-7.90	0.9914	0.9905	1.09	29.9283
A	**9**	0.15	-0.03	72.0	9.2	-0.2000	-9.37	0.9871	0.9867	1.09	27.9922
A	**10**	0.12	-0.03	72.0	9.1	-0.2500	-12.39	0.9874	0.9767	1.10	24.9941
A	**11**	0.08	-0.03	72.0	14.5	-0.3750	-19.16	0.9681	0.9446	1.12	19.6999
A	**12**	0.08	-0.03	72.0	14.5	-0.3750	-19.16	0.9681	0.9446	1.12	19.6999
A	**13**	0.09	-0.03	72.0	11.7	-0.3333	-17.05	0.9792	0.9561	1.11	21.2736
A	**14**	0.08	-0.03	72.0	14.0	-0.3750	-19.16	0.9703	0.9446	1.12	19.7436
A	**15**	0.08	-0.04	72.0	5.0	-0.5000	-24.59	0.9962	0.9093	1.14	19.7832
A	**16**	0.08	-0.04	72.0	0.0	-0.5000	-24.59	1.0000	0.9093	1.14	19.8588
A	**17**	0.08	-0.05	72.0	-6.0	-0.6250	-28.74	0.9945	0.8768	1.15	19.2350
A	**18**	0.11	-0.06	71.0	-12.0	-0.5455	-26.23	0.9781	0.8971	1.14	22.5397
A	**19**	0.07	-0.05	70.0	-21.0	-0.7143	-31.26	0.9336	0.8548	1.15	16.5293
A	**20**	0.07	-0.05	71.0	7.5	-0.7143	-31.26	0.9914	0.8548	1.15	17.5704
B	**1**	0.12	-0.03	72.0	4.0	-0.2500	-12.39	0.9976	0.9767	1.10	25.2510
B	**2**	0.14	-0.04	72.0	3.4	-0.2857	-14.45	0.9982	0.9684	1.11	27.2090
B	**3**	0.15	-0.04	72.0	3.0	-0.2667	-13.36	0.9986	0.9729	1.10	28.2257
B	**4**	0.13	-0.05	72.0	0.0	-0.3846	-19.63	1.0000	0.9419	1.12	25.8955
B	**5**	0.13	-0.04	72.0	-2.0	-0.3077	-15.67	0.9994	0.9628	1.11	26.1840
B	**6**	0.13	-0.04	72.0	0.0	-0.3077	-15.67	1.0000	0.9628	1.11	26.2000
B	**7**	0.12	-0.04	72.0	0.0	-0.3333	-17.05	1.0000	0.9561	1.11	25.0858
B	**8**	0.12	-0.04	72.0	4.0	-0.3333	-17.05	0.9976	0.9561	1.11	25.0247
B	**9**	0.10	-0.04	72.0	3.0	-0.4000	-20.36	0.9986	0.9375	1.12	22.6181
B	**10**	0.10	-0.04	72.0	6.9	-0.4000	-20.36	0.9928	0.9375	1.12	22.4851
B	**11**	0.08	-0.03	72.0	4.6	-0.3750	-19.16	0.9968	0.9446	1.12	20.2825
B	**12**	0.08	-0.03	72.0	0.0	-0.3750	-19.16	1.0000	0.9446	1.12	20.3480
B	**13**	0.09	-0.03	72.0	9.0	-0.3333	-17.05	0.9877	0.9561	1.11	21.4575
B	**14**	0.08	-0.03	72.0	10.3	-0.3750	-19.16	0.9839	0.9446	1.12	20.0201
B	**15**	0.09	-0.03	72.0	6.0	-0.3333	-17.05	0.9945	0.9561	1.11	21.6060
B	**16**	0.08	-0.03	72.0	-14.8	-0.3750	-19.16	0.9668	0.9446	1.12	19.6730
B	**17**	0.09	-0.03	71.0	-5.0	-0.3333	-17.05	0.9962	0.9561	1.11	21.6219
B	**18**	0.07	-0.04	71.0	-13.8	-0.5714	-27.09	0.9711	0.8903	1.14	17.7537
B	**19**	0.07	-0.03	71.0	-16.8	-0.4286	-21.66	0.9573	0.9294	1.13	18.0261
B	**20**	0.08	-0.03	71.0	-11.6	-0.3750	-19.16	0.9796	0.9446	1.12	19.9137

Test Parameters

P_{bar} - Barometric pressure, inches Hg	29.51			
P_g - Stack Pressure, inches of H_2O	-5.00			
P_s - Absolute stack pressure, inches Hg	29.14			
t_s - Average stack temperature, ^oF	71.8	Md - dry basis lb/lb mole	29.00	
Duct Shape:	Circular	Ms - wet basis lb/lb mole	28.868	
Diameter, Feet	3.67	Wet Bulb Temp(t'):		
		Dry Bulb Temp(t):		
		Bws - Moisture content fraction		0.012
Cross Sectional Area of Stack, Ft^2	10.58	Moisture determined by wb/db?		N
		Supersaturation Value, Bws:		**0.027**

Method 2F Results

Average Velocity $V_{a(avg)}$	23.464	Q - ACFM	14,895
No WAF Applied to this Test		Qsd - DSCFM	14,232
		Qs - SCFM	14,404
		Qs - SCFH	864,267

TO Flow Summary

Project Name	**Microchip Gresham Two New RCTO Units Compliance Testing**
Project Number	**225-01-2401M**
Facility	**Gresham**

Sample Type	Flow	Flow	Flow	Averages
Source	RCTO 3 TO	RCTO 3 TO	RCTO 3 TO	
Run	1	2	3	
Date	9/25/2024	9/25/2024	9/25/2024	
Time Start	11:31:00 AM	11:58:00 AM	1:27:00 PM	
Time Stop	11:38:00 AM	12:02:00 PM	1:34:00 PM	
	00:00-00:00	00:00-00:01	00:01-00:01	
Duct Diameter (ft)	1.58	1.58	1.58	
Pitot Tube Correction Factor	0.84	0.84	0.84	
Standard Temperature (°F)	68	68	68	
Barometric Pressure Measured (" Hg)	29.90	29.90	29.90	
Stack Elevation (ft) (relative to Barometer)	40	40	40	
Barometric Pressure ("Hg)	29.86	29.86	29.86	
Average Stack Temperature (°F)	728.6	735.3	719.9	727.9
Test Duration (minutes)	0	0.002777778	0.004861111	
Static Pressure ("H_2O)	-0.15	0.00	-0.11	
Carbon Dioxide (CO_2) Content (%)	1.63	1.63	1.63	
Oxygen (O_2) Content (%)	18.11	18.11	18.11	
Nitrogen (N_2) Content (%)	80.26	80.26	80.26	
Average square root of ΔP ($(\sqrt{\Delta P})_{avg}$)	0.344	0.350	0.329	
Absolute Stack Pressure ("Hg)	29.85	29.86	29.85	
Absolute Stack Temperature (°R)	1188.6	1195.3	1179.9	1187.9
Flue Gas Moisture (%)	4.50	4.50	4.50	4.50
Moisture at saturation	N/A	N/A	N/A	
Moisture used in Calculation	4.50	4.50	4.50	4.50
Gas Molecular Weight (Wet) (g/g-mole)	28.49	28.49	28.49	
Average Gas Velocity (ft/sec)	29.20	29.78	27.80	28.93
Avg Flow Rate (acfh)	206,123	210,168	196,215	204,169
Avg Flow Rate (acfm)	3,435	3,503	3,270	3,403
Avg Flow Rate (scfh)	91,350	92,648	87,603	90,534
Avg Flow Rate (scfm)	1,522	1,544	1,460	1,509
Avg Flow Rate (dscfh)	87,241	88,481	83,663	86,462
Avg Flow Rate (dscfm)	1,454	1,475	1,394	1,441

TO Flow Summary

Data Entry Area

Sample Type	Flow	Nozzle Diameter (in)			
Source	RCTO 3 TO	Std Temp (°F)	68		
Condition		Bar Press ("Hg, meas)	29.9	Entered By (initials)	***KNB***
Run	1	Meter Elev (ft) (rel to Brmtr)	40	Checked by (initials)	
Date	25-Sep	Static Press ("H_2O)	-0.152	Corrected by (initials)	
Duct Diameter (ft)	1.580	% CO			
Duct Depth (ft)		% CO_2	1.63		
Duct Width (ft)		% O_2	18.11		
Pitot Tube Correction Factor	0.84	% H_2			
DGMCF		% CH_4			

Times		DGM Volumes (as read)		Impinger Catch (g)		
					Initial	Final
start	11:31:00 AM	start		1		
stop	11:38:00 AM	stop		2		
start		start		3		
stop		stop		4		
start		start		5		
stop		stop		6		
start		start		7		
stop		stop		8		
start		start		9		
stop		stop		10		
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
				Total Wt Gain		0.0
Duration	0	Total	0.000			

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	$(\sqrt{\Delta P})_{avg}$
Averages	0.119	#DIV/0!	728.6	#DIV/0!	0.3440

Individual Readings			
	0.115	733.4	0.3391165
	0.121	742.3	0.34785054
	0.127	757.9	0.35637059
	0.112	757.8	0.33466401
	0.115	750.4	0.3391165
	0.112	733.9	0.33466401
	0.105	709.8	0.32403703
	0.133	669.1	0.36469165
	0.134	693.7	0.3660601
	0.143	711.7	0.37815341
	0.131	725.2	0.36193922
	0.124	734.1	0.35213634
	0.110	734.1	0.33166248
	0.100	739.5	0.316227766
	0.10	735.4	0.313049517

TO Flow Summary

Data Entry Area

Sample Type	Flow	Nozzle Diameter (in)			
Source	RCTO 3 TO	Std Temp (°F)	68		
Condition		Bar Press ("Hg, meas)	29.9	Entered By (initials)	***KNB***
Run	2	Meter Elev (ft) (rel to Brmtr)	40	Checked by (initials)	
Date	25-Sep	Static Press ("H_2O)		Corrected by (initials)	
Duct Diameter (ft)	1.580	% CO			
Duct Depth (ft)		% CO_2	1.630939145		
Duct Width (ft)		% O_2	18.11026908		
Pitot Tube Correction Factor	0.84	% H_2			
DGMCF		% CH_4			

Times		DGM Volumes (as read)		Impinger Catch (g)		
					Initial	Final
start	11:58:00 AM	start		1		
stop	12:02:00 PM	stop		2		
start		start		3		
stop		stop		4		
start		start		5		
stop		stop		6		
start		start		7		
stop		stop		8		
start		start		9		
stop		stop		10		
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
				Total Wt Gain		0.0
Duration	0	Total	0.000			

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	$(\sqrt{\Delta P})_{avg}$
Averages	0.123	#DIV/0!	735.3	#DIV/0!	0.3498
Individual Readings	0.116		704.4		0.34058773
	0.116		713.6		0.34058773
	0.127		722.2		0.35637059
	0.126		731.9		0.35496479
	0.135		747.7		0.36742346
	0.131		751.1		0.36193922
	0.122		752.8		0.34928498
	0.114		750.7		0.33763886
	0.116		724.5		0.34058773
	0.130		725.3		0.36055513
	0.129		731.1		0.3591657
	0.126		735.3		0.35496479
	0.141		741.7		0.37549967
	0.119		743.9		0.34496377
	0.114		744.7		0.33763886
	0.099		744.5		0.314642654

TO Flow Summary

Data Entry Area

Sample Type	Flow	Nozzle Diameter (in)			
Source	RCTO 3 TO	Std Temp (°F)	68		
Condition		Bar Press ("Hg, meas)	29.9	Entered By (initials)	***KNB***
Run	3	Meter Elev (ft) (rel to Brmtr)	40	Checked by (initials)	
Date	25-Sep	Static Press ("H_2O)	-0.111	Corrected by (initials)	
Duct Diameter (ft)	1.580	% CO			
Duct Depth (ft)		% CO_2	1.630939145		
Duct Width (ft)		% O_2	18.11026908		
Pitot Tube Correction Factor	0.84	% H_2			
DGMCF		% CH_4			

Times		DGM Volumes (as read)		Impinger Catch (g)		
					Initial	Final
start	1:27:00 PM	start		1		
stop	1:34:00 PM	stop		2		
start		start		3		
stop		stop		4		
start		start		5		
stop		stop		6		
start		start		7		
stop		stop		8		
start		start		9		
stop		stop		10		
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
				Total Wt Gain		0.0
Duration	0	Total	0.000			

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	$(\sqrt{\Delta P})_{avg}$
Averages	0.111	#DIV/0!	719.9	#DIV/0!	0.3287
Individual Readings	0.125		716.1		0.35355339
	0.120		727.1		0.34641016
	0.121		733.6		0.34785054
	0.128		741.9		0.35777088
	0.133		747.7		0.36469165
	0.122		704.3		0.34928498
	0.110		696.1		0.33166248
	0.056		678.5		0.23664319
	0.033		632.9		0.18165902
	0.128		716.7		0.35777088
	0.134		724.5		0.3660601
	0.122		735.8		0.34928498
	0.150		738.9		0.38729833
	0.119		744.0		0.34496377
	0.103		744.3		0.320936131
	0.069		736.5		0.262678511

Inlet Flow Summary

Project Name	**Microchip Gresham Two New RCTO Units Compliance Testing**
Project Number	**225-01-2401M**
Facility	**Gresham**

Sample Type	Flow	Flow	Flow	Averages
Source	RCTO 3 Inlet	RCTO 3 Inlet	RCTO 3 Inlet	
Run	1	2	3	
Date	9/25/2024	9/25/2024	9/25/2024	
Time Start	11:03:00 AM	12:10:00 PM	1:09:00 PM	
Time Stop	11:12:00 AM	12:17:00 PM	1:13:00 PM	
	00:00-00:00	00:01-00:01	00:01-00:01	
Duct Diameter (ft)	3.67	3.67	3.67	
Pitot Tube Correction Factor	0.84	0.84	0.84	
Standard Temperature (°F)	68	68	68	
Barometric Pressure Measured (" Hg)	29.92	29.92	29.92	
Stack Elevation (ft) (relative to Barometer)	40	40	40	
Barometric Pressure ("Hg)	29.88	29.88	29.88	
Average Stack Temperature (°F)	75.7	74.5	68.8	73.0
Test Duration (minutes)	0	0.004861111	0.002777778	
Static Pressure ("H_2O)	-4.23	-4.24	-4.23	
Carbon Dioxide (CO_2) Content (%)	0.04	0.04	0.04	
Oxygen (O_2) Content (%)	20.95	20.95	20.95	
Nitrogen (N_2) Content (%)	79.01	79.01	79.01	
Average square root of ΔP ($(\sqrt{\Delta P})_{avg}$)	0.424	0.447	0.414	
Absolute Stack Pressure ("Hg)	29.57	29.57	29.57	
Absolute Stack Temperature (°R)	535.7	534.5	528.8	533.0
Flue Gas Moisture (%)	1.26	1.26	1.26	1.26
Moisture at saturation	3.07	2.96	2.51	
Moisture used in Calculation	1.26	1.26	1.26	1.26
Gas Molecular Weight (Wet) (g/g-mole)	28.71	28.71	28.71	
Average Gas Velocity (ft/sec)	24.18	25.46	23.45	24.36
Avg Flow Rate (acfh)	920,683	969,710	893,139	927,844
Avg Flow Rate (acfm)	15,345	16,162	14,886	15,464
Avg Flow Rate (scfh)	896,831	946,727	881,399	908,319
Avg Flow Rate (scfm)	14,947	15,779	14,690	15,139
Avg Flow Rate (dscfh)	885,494	934,759	870,257	896,837
Avg Flow Rate (dscfm)	14,758	15,579	14,504	14,947

Inlet Flow Summary

Data Entry Area

Sample Type	Flow	Nozzle Diameter (in)			
Source	RCTO 3 Inlet	Std Temp (°F)	68		
Condition		Bar Press ("Hg, meas)	29.92	Entered By (initials)	***KNB***
Run	1	Meter Elev (ft) (rel to Brmtr)	40	Checked by (initials)	
Date	25-Sep	Static Press ("H_2O)	-4.227	Corrected by (initials)	
Duct Diameter (ft)	3.670	% CO			
Duct Depth (ft)		% CO_2	0.04		
Duct Width (ft)		% O_2	20.95		
Pitot Tube Correction Factor	0.84	% H_2			
DGMCF		% CH_4			

Times		DGM Volumes (as read)		Impinger Catch (g)		
					Initial	Final
start	11:03:00 AM	start		1		
stop	11:12:00 AM	stop		2		
start		start		3		
stop		stop		4		
start		start		5		
stop		stop		6		
start		start		7		
stop		stop		8		
start		start		9		
stop		stop		10		
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
				Total Wt Gain		0.0
Duration	0	Total	0.000			

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	$(\sqrt{\Delta P})_{avg}$
Averages	0.182	#DIV/0!	75.7	#DIV/0!	0.4238
Individual Readings	0.201		78.8		0.44833024
	0.208		75.2		0.45607017
	0.207		75.8		0.45497253
	0.141		75.9		0.37549967
	0.110		75.5		0.33166248
	0.179		75.8		0.42308392
	0.140		75.2		0.37416574
	0.263		75.0		0.51283526
	0.185		74.3		0.43011626
	0.209		75.0		0.45716518
	0.208		75.9		0.45607017
	0.213		76.3		0.46151923
	0.125		76.6		0.35355339
	0.136		76.5		0.36878178
	0.225		75.0		0.474341649
	0.162		74.2		0.402492236

Inlet Flow Summary

Data Entry Area

Sample Type	Flow	Nozzle Diameter (in)			
Source	RCTO 3 Inlet	Std Temp (°F)	68		
Condition		Bar Press ("Hg, meas)	29.92	Entered By (initials)	***KNB***
Run	2	Meter Elev (ft) (rel to Brmtr)	40	Checked by (initials)	
Date	25-Sep	Static Press ("H_2O)	-4.238	Corrected by (initials)	
Duct Diameter (ft)	3.670	% CO			
Duct Depth (ft)		% CO_2	0.04091016		
Duct Width (ft)		% O_2	20.94837542		
Pitot Tube Correction Factor	0.84	% H_2			
DGMCF		% CH_4			

Times		DGM Volumes (as read)		Impinger Catch (g)		
					Initial	Final
start	12:10:00 PM	start		1		
stop	12:17:00 PM	stop		2		
start		start		3		
stop		stop		4		
start		start		5		
stop		stop		6		
start		start		7		
stop		stop		8		
start		start		9		
stop		stop		10		
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
				Total Wt Gain		0.0
Duration	0	Total	0.000			

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	$(\sqrt{\Delta P})_{avg}$
Averages	0.202	#DIV/0!	74.5	#DIV/0!	0.4469
Individual Readings	0.242		76.9		0.49193496
	0.188		76.6		0.43358967
	0.126		76.5		0.35496479
	0.121		76.4		0.34785054
	0.218		76.1		0.4669047
	0.225		76.0		0.47434165
	0.246		75.9		0.49598387
	0.241		75.8		0.49091751
	0.198		71.5		0.44497191
	0.196		71.8		0.44271887
	0.217		72.4		0.46583259
	0.141		72.7		0.37549967
	0.171		73.2		0.41352146
	0.177		73.5		0.42071368
	0.238		73.3		0.487852437
	0.294		72.8		0.542217668

Inlet Flow Summary

Data Entry Area

Sample Type	Flow	Nozzle Diameter (in)			
Source	RCTO 3 Inlet	Std Temp (°F)	68		
Condition		Bar Press ("Hg, meas)	29.92	Entered By (initials)	***KNB***
Run	3	Meter Elev (ft) (rel to Brmtr)	40	Checked by (initials)	
Date	25-Sep	Static Press ("H_2O)	-4.225	Corrected by (initials)	
Duct Diameter (ft)	3.670	% CO			
Duct Depth (ft)		% CO_2	0.04091016		
Duct Width (ft)		% O_2	20.94837542		
Pitot Tube Correction Factor	0.84	% H_2			
DGMCF		% CH_4			

Times		DGM Volumes (as read)		Impinger Catch (g)		
					Initial	Final
start	1:09:00 PM	start		1		
stop	1:13:00 PM	stop		2		
start		start		3		
stop		stop		4		
start		start		5		
stop		stop		6		
start		start		7		
stop		stop		8		
start		start		9		
stop		stop		10		
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
start		start				
stop		stop				
				Total Wt Gain		0.0
Duration	0	Total	0.000			

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	$(\sqrt{\Delta P})_{avg}$
Averages	0.174	#DIV/0!	68.8	#DIV/0!	0.4138
Individual Readings	0.187		65.4		0.43243497
	0.224		66.5		0.47328638
	0.203		67.2		0.45055521
	0.214		68.1		0.46260134
	0.133		69.1		0.36469165
	0.141		69.9		0.37549967
	0.150		70.3		0.38729833
	0.264		68.6		0.5138093
	0.186		66.4		0.43127717
	0.166		66.8		0.40743098
	0.121		67.5		0.34785054
	0.137		69.7		0.37013511
	0.114		70.3		0.33763886
	0.168		71.2		0.40987803
	0.162		71.6		0.402492236
	0.206		71.6		0.453872229

Client:	Spectrum Environmental Solutions LLC.	
Facility:	Microchip Technology - Fab 4	
Test Location:	RCTO#3	
Project #:	M243410	
Test Method:	2F (RATA)	
Test Engineer:	RMF	
Test Technician:	JAD	
Temp ID:	N/A	
Meter ID:	3D4	
Probe ID:	DAT 3D062	
Probe Type:	3D	
Pitot Tube Coefficient:	N/A	
Probe Length:	6.5	**ft**
Sample Plane:	Horizontal	
Port Length:	4.00	**in.**
Port Size (diameter):	3.50	**in.**
Port Type:	Nipple	
Duct Shape:	Circular	
Diameter:	3.67	**ft**
Duct Area:	10.58	**Sq. Ft.**
Upstream Diameters:	1.860	
Downstream Diameters:	0.770	
Number of Ports Sampled:	2	
Number of Points per Port:	20	
Total Number of Traverse Points:	40	
Operating Level:	Normal	

Point Markings (including port length):

Point #	Inches
1	4.57252
2	5.71756
3	6.95068
4	8.27188
5	9.68116
6	11.2666
7	12.98416
8	15.01
9	17.47624
10	17.8726
11	30.95248
12	34.56376
13	37.03
14	39.05584
15	40.7734
16	42.35884
17	43.76812
18	45.08932
19	46.32244
20	47.46748

Probe Type:	**DAT**		
Probe ID:	**3D062**		
	yyyy	**mm**	**dd**
Probe Cal Date:	**2024**	**05**	**22**
Probe Cal Velocities:	**60 & 90 fps**		

Calibration Polynomials (60-90 fps)

Pitch Angle vs F1 $$\Theta p_{(i)} = A(F1_{(i)})^5 + B(F1_{(i)})^4 + C(F1_{(i)})^3 + D(F1_{(i)})^2 + E(F1_{(i)}) + F$$

F2 vs Pitch Angle $$F2_{(i)} = G(\Theta p_{(i)})^5 + H(\Theta p_{(i)})^4 + I(\Theta p_{(i)})^3 + J(\Theta p_{(i)})^2 + K(\Theta p_{(i)}) + L$$

Coefficients

			-2.546E-11
A=	4.223E+01	**G=**	-1.140E-09
B=	9.800E+00	**H=**	3.062E-08
C=	-5.850E+01	**I=**	2.961E-06
D=	-7.543E+00	**J=**	6.762E-05
E=	6.591E+01	**K=**	-2.322E-03
F=	3.647E+00	**L=**	1.066E+00

METHOD 2F VOLUMETRIC FLOW DATA

Project Number:	M243410	**Operating Level:**	Normal
Client:	Spectrum Environmental Solutions LL(	**Run No.:**	1
Facility:	Microchip Technology - Fab 4	**Test Date:**	9/25/2024
Test Location:	RCTO#3	**Start Time:**	10:24
Probe ID:	DAT 3D062	**End Time:**	11:00
Probe Length, Feet:	6.5	**Test Engineer:**	RMF
Port Length, Inches:	4	**Test Technician:**	JAD

Port	Point	P1-P2 (in. H_2O)	P4-P5 (in. H_2O)	Temp (^oF)	YAW (θ_Y)	F_1	Pitch (θ_P)	$\cos\theta_Y$	$\cos\theta_P$	F_2	Velocity (V_a)	R1
A	1	0.17	0.00	69.0	11.0	0.0000	3.65	0.9816	0.9980	1.06	29.0363	11.58
A	2	0.17	0.00	70.0	13.0	0.0000	3.65	0.9744	0.9980	1.06	28.8488	13.49
A	3	0.17	0.00	71.0	8.9	0.0000	3.65	0.9880	0.9980	1.06	29.2788	9.61
A	4	0.18	0.00	72.0	12.3	0.0000	3.65	0.9770	0.9980	1.06	29.8228	12.82
A	5	0.17	0.00	72.0	9.3	0.0000	3.65	0.9869	0.9980	1.06	29.2736	9.98
A	6	0.15	0.00	72.0	12.4	0.0000	3.65	0.9767	0.9980	1.06	27.2140	12.92
A	7	0.15	0.00	73.0	9.2	0.0000	3.65	0.9871	0.9980	1.06	27.5314	9.89
A	8	0.13	0.00	73.0	11.9	0.0000	3.65	0.9785	0.9980	1.06	25.4063	12.44
A	9	0.13	0.00	73.0	11.4	0.0000	3.65	0.9803	0.9980	1.06	25.4521	11.96
A	10	0.13	0.00	73.0	7.6	0.0000	3.65	0.9912	0.9980	1.06	25.7363	8.43
A	11	0.14	0.00	73.0	9.9	0.0000	3.65	0.9851	0.9980	1.06	26.5433	10.54
A	12	0.14	0.00	73.0	11.0	0.0000	3.65	0.9816	0.9980	1.06	26.4494	11.58
A	13	0.15	0.00	73.0	10.2	0.0000	3.65	0.9842	0.9980	1.06	27.4494	10.83
A	14	0.15	0.00	73.0	11.1	0.0000	3.65	0.9813	0.9980	1.06	27.3684	11.68
A	15	0.13	0.00	73.0	9.2	0.0000	3.65	0.9871	0.9980	1.06	25.6303	9.89
A	16	0.13	0.00	73.0	8.8	0.0000	3.65	0.9882	0.9980	1.06	25.6587	9.52
A	17	0.12	0.00	73.0	3.6	0.0000	3.65	0.9980	0.9980	1.06	24.8965	5.12
A	18	0.09	0.00	73.0	5.1	0.0000	3.65	0.9960	0.9980	1.06	21.5181	6.27
A	19	0.03	0.00	71.0	37.0	0.0000	3.65	0.7986	0.9980	1.06	9.9426	37.15
A	20	0.09	0.00	70.0	13.5	0.0000	3.65	0.9724	0.9980	1.06	20.9475	13.98
B	1	0.12	0.00	75.0	9.5	0.0000	3.65	0.9863	0.9980	1.06	24.6497	10.17
B	2	0.14	-0.01	75.0	11.1	-0.0714	-1.08	0.9813	0.9998	1.07	26.7897	11.15
B	3	0.14	-0.01	75.0	7.7	-0.0714	-1.08	0.9910	0.9998	1.07	27.0543	7.77
B	4	0.15	0.00	75.0	9.3	0.0000	3.65	0.9869	0.9980	1.06	27.5752	9.98
B	5	0.16	0.00	75.0	7.2	0.0000	3.65	0.9921	0.9980	1.06	28.6313	8.07
B	6	0.14	0.01	75.0	9.0	0.0714	8.30	0.9877	0.9895	1.05	26.3022	12.22
B	7	0.15	0.01	75.0	7.7	0.0667	7.99	0.9910	0.9903	1.05	27.3417	11.08
B	8	0.16	0.01	75.0	7.6	0.0625	7.72	0.9912	0.9909	1.05	28.2681	10.82
B	9	0.15	0.01	75.0	8.2	0.0667	7.99	0.9898	0.9903	1.05	27.3084	11.43
B	10	0.16	0.01	75.0	8.7	0.0625	7.72	0.9885	0.9909	1.05	28.1905	11.61
B	11	0.14	0.01	74.0	10.6	0.0714	8.30	0.9829	0.9895	1.05	26.1511	13.43
B	12	0.13	0.01	74.0	14.2	0.0769	8.65	0.9694	0.9886	1.05	24.8272	16.58
B	13	0.12	0.01	73.0	10.3	0.0833	9.05	0.9839	0.9875	1.05	24.1554	13.68
B	14	0.11	0.01	73.0	12.8	0.0909	9.53	0.9751	0.9862	1.05	22.8877	15.91
B	15	0.12	0.01	73.0	10.5	0.0833	9.05	0.9833	0.9875	1.05	24.1400	13.83
B	16	0.11	0.01	73.0	8.3	0.0909	9.53	0.9895	0.9862	1.05	23.2252	12.62
B	17	0.11	0.01	73.0	9.7	0.0909	9.53	0.9857	0.9862	1.05	23.1354	13.57
B	18	0.10	0.01	72.0	6.4	0.1000	10.11	0.9938	0.9845	1.05	22.1790	11.94
B	19	0.09	0.01	72.0	0.0	0.1111	10.80	1.0000	0.9823	1.05	21.1271	10.80
B	20	0.10	0.01	72.0	9.3	0.1000	10.11	0.9869	0.9845	1.05	22.0247	13.70

Test Parameters

P_{bar} - Barometric pressure, inches Hg	29.42			
P_g - Stack Pressure, inches of H_2O	-5.00			
P_s - Absolute stack pressure, inches Hg	29.05			
t_s - Average stack temperature, ^oF	73.1	Md - dry basis lb/lb mole	29.00	
Duct Shape:	Circular	Ms - wet basis lb/lb mole	28.857	
Diameter, Feet	3.67	Wet Bulb Temp(t'):		
		Dry Bulb Temp(t):		
		Bws - Moisture content fraction		**0.013**
Cross Sectional Area of Stack, Ft^2	10.58	Moisture determined by wb/db?		N
		Supersaturation Value, Bws:		**0.028**

Method 2F Results

Average Velocity $V_{a(avg)}$	25.499	Q - ACFM	16,187
No WAF Applied to this Test		Qsd - DSCFM	15,366
		Qs - SCFM	15,569
Site Acceptability Results		Qs - SCFH	934,116
Average R1	12.00		
Standard Deviation	3.48		
%RMS	3.43		

METHOD 2F VOLUMETRIC FLOW DATA

Project Number:	M243410	**Operating Level:**	Normal
Client:	Spectrum Environmental Solutions LL(	**Run No.:**	2
Facility:	Microchip Technology - Fab 4	**Test Date:**	9/25/2024
Test Location:	RCTO#3	**Start Time:**	11:40
Probe ID:	DAT 3D062	**End Time:**	12:15
Probe Length, Feet:	6.5	**Test Engineer:**	RMF
Port Length, Inches:	4	**Test Technician:**	JAD

Port	Point	P1-P2 (in. H_2O)	P4-P5 (in. H_2O)	Temp (^oF)	YAW (θ_Y)	F_1	Pitch (θ_P)	$\cos\theta_Y$	$\cos\theta_P$	F_2	Velocity (V_a)
A	01	0.16	-0.01	71.0	13.8	-0.0625	-0.49	0.9711	1.0000	1.07	28.1922
A	02	0.16	-0.01	71.0	16.3	-0.0625	-0.49	0.9598	1.0000	1.07	27.8633
A	3	0.17	-0.01	71.0	10.0	-0.0588	-0.24	0.9848	1.0000	1.07	29.4539
A	4	0.16	-0.01	71.0	11.0	-0.0625	-0.49	0.9816	1.0000	1.07	28.4968
A	5	0.16	-0.01	71.0	12.4	-0.0625	-0.49	0.9767	1.0000	1.07	28.3530
A	6	0.15	-0.02	71.0	11.0	-0.1333	-5.14	0.9816	0.9960	1.08	27.7959
A	7	0.14	-0.02	72.0	12.5	-0.1429	-5.75	0.9763	0.9950	1.08	26.7483
A	8	0.13	-0.02	72.0	11.6	-0.1538	-6.46	0.9796	0.9937	1.08	25.8759
A	9	0.14	-0.02	72.0	10.6	-0.1429	-5.75	0.9829	0.9950	1.08	26.9302
A	10	0.11	-0.02	72.0	9.4	-0.1818	-8.23	0.9866	0.9897	1.09	23.9902
A	11	0.12	-0.01	72.0	10.2	-0.0833	-1.86	0.9842	0.9995	1.07	24.8334
A	12	0.13	-0.01	72.0	12.3	-0.0769	-1.44	0.9770	0.9997	1.07	25.6395
A	13	0.14	-0.01	72.0	12.2	-0.0714	-1.08	0.9774	0.9998	1.07	26.5988
A	14	0.13	-0.01	72.0	12.6	-0.0769	-1.44	0.9759	0.9997	1.07	25.6099
A	15	0.13	-0.01	73.0	16.0	-0.0769	-1.44	0.9613	0.9997	1.07	25.2490
A	16	0.13	-0.01	73.0	8.8	-0.0769	-1.44	0.9882	0.9997	1.07	25.9574
A	17	0.12	-0.01	73.0	12.7	-0.0833	-1.86	0.9755	0.9995	1.07	24.6380
A	18	0.12	-0.01	73.0	12.3	-0.0833	-1.86	0.9770	0.9995	1.07	24.6761
A	19	0.12	0.00	72.0	15.6	0.0000	3.65	0.9632	0.9980	1.06	23.9951
A	20	0.04	0.02	72.0	4.7	0.5000	29.34	0.9966	0.8718	1.11	13.1601
B	1	0.16	-0.01	71.0	13.8	-0.0625	-0.49	0.9711	1.0000	1.07	28.1922
B	2	0.16	-0.01	71.0	16.3	-0.0625	-0.49	0.9598	1.0000	1.07	27.8633
B	3	0.17	-0.01	71.0	10.0	-0.0588	-0.24	0.9848	1.0000	1.07	29.4539
B	4	0.16	-0.01	71.0	11.0	-0.0625	-0.49	0.9816	1.0000	1.07	28.4968
B	5	0.16	-0.01	71.0	12.4	-0.0625	-0.49	0.9767	1.0000	1.07	28.3530
B	6	0.15	-0.02	71.0	11.0	-0.1333	-5.14	0.9816	0.9960	1.08	27.7959
B	7	0.14	-0.02	72.0	12.5	-0.1429	-5.75	0.9763	0.9950	1.08	26.7483
B	8	0.13	-0.02	72.0	11.6	-0.1538	-6.46	0.9796	0.9937	1.08	25.8759
B	9	0.14	-0.02	72.0	10.6	-0.1429	-5.75	0.9829	0.9950	1.08	26.9302
B	10	0.11	-0.02	72.0	9.4	-0.1818	-8.23	0.9866	0.9897	1.09	23.9902
B	11	0.12	-0.02	72.0	10.2	-0.1667	-7.27	0.9842	0.9920	1.09	24.9894
B	12	0.13	-0.01	72.0	12.3	-0.0769	-1.44	0.9770	0.9997	1.07	25.6395
B	13	0.14	-0.01	72.0	12.2	-0.0714	-1.08	0.9774	0.9998	1.07	26.5988
B	14	0.13	-0.01	72.0	12.6	-0.0769	-1.44	0.9759	0.9997	1.07	25.6099
B	15	0.13	-0.01	73.0	16.0	-0.0769	-1.44	0.9613	0.9997	1.07	25.2490
B	16	0.13	-0.01	73.0	8.8	-0.0769	-1.44	0.9882	0.9997	1.07	25.9574
B	17	0.12	-0.01	73.0	12.7	-0.0833	-1.86	0.9755	0.9995	1.07	24.6380
B	18	0.12	-0.01	73.0	12.3	-0.0833	-1.86	0.9770	0.9995	1.07	24.6761
B	19	0.12	0.00	72.0	15.6	0.0000	3.65	0.9632	0.9980	1.06	23.9951
B	20	0.04	0.02	72.0	4.7	0.5000	29.34	0.9966	0.8718	1.11	13.1601

Test Parameters

P_{bar} - Barometric pressure, inches Hg	29.42			
P_g - Stack Pressure, inches of H_2O	-5.00			
P_s - Absolute stack pressure, inches Hg	29.05			
t_s - Average stack temperature, ^oF	71.9	Md - dry basis lb/lb mole	29.00	
Duct Shape:	Circular	Ms - wet basis lb/lb mole	28.879	
Diameter, Feet	3.67	Wet Bulb Temp(t'):		
		Dry Bulb Temp(t):		
		Bws - Moisture content fraction		0.011
Cross Sectional Area of Stack, Ft^2	10.58	Moisture determined by wb/db?		N
		Supersaturation Value, Bws:		**0.027**

Method 2F Results

Average Velocity $V_{a(avg)}$	25.707	Q - ACFM	16,319
No WAF Applied to this Test		Qsd - DSCFM	15,556
		Qs - SCFM	15,729
		Qs - SCFH	943,754

METHOD 2F VOLUMETRIC FLOW DATA

Project Number:	M243410	**Operating Level:**	Normal
Client:	Spectrum Environmental Solutions LL(	**Run No.:**	3
Facility:	Microchip Technology - Fab 4	**Test Date:**	9/25/2024
Test Location:	RCTO#3	**Start Time:**	12:44
Probe ID:	DAT 3D062	**End Time:**	13:14
Probe Length, Feet:	6.5	**Test Engineer:**	RMF
Port Length, Inches:	4	**Test Technician:**	JAD

Port	Point	P1-P2 (in. H_2O)	P4-P5 (in. H_2O)	Temp (^oF)	YAW (θ_Y)	F_1	Pitch (θ_P)	$\cos\theta_Y$	$\cos\theta_P$	F_2	Velocity (V_a)
A	1	0.12	-0.02	71.0	10.2	-0.1667	-7.27	0.9842	0.9920	1.09	24.9706
A	2	0.12	-0.02	71.0	10.2	-0.1667	-7.27	0.9842	0.9920	1.09	24.9706
A	3	0.14	-0.02	71.0	7.5	-0.1429	-5.75	0.9914	0.9950	1.08	27.1430
A	4	0.14	-0.02	71.0	10.1	-0.1429	-5.75	0.9845	0.9950	1.08	26.9529
A	5	0.13	-0.02	71.0	8.0	-0.1538	-6.46	0.9903	0.9937	1.08	26.1387
A	6	0.14	-0.02	71.0	8.8	-0.1429	-5.75	0.9882	0.9950	1.08	27.0549
A	7	0.14	-0.02	71.0	7.8	-0.1429	-5.75	0.9907	0.9950	1.08	27.1239
A	8	0.14	-0.02	71.0	9.5	-0.1429	-5.75	0.9863	0.9950	1.08	27.0017
A	9	0.12	-0.02	71.0	9.2	-0.1667	-7.27	0.9871	0.9920	1.09	25.0452
A	10	0.12	-0.02	71.0	9.4	-0.1667	-7.27	0.9866	0.9920	1.09	25.0309
A	11	0.11	-0.02	71.0	18.0	-0.1818	-8.23	0.9511	0.9897	1.09	23.1092
A	12	0.11	-0.01	70.0	25.0	-0.0909	-2.36	0.9063	0.9991	1.07	21.8767
A	13	0.10	-0.01	70.0	26.0	-0.1000	-2.96	0.8988	0.9987	1.07	20.7058
A	14	0.12	-0.01	70.0	23.0	-0.0833	-1.86	0.9205	0.9995	1.07	23.1871
A	15	0.09	0.00	70.0	13.6	0.0000	3.65	0.9720	0.9980	1.06	20.9347
A	16	0.08	0.00	70.0	8.0	0.0000	3.65	0.9903	0.9980	1.06	20.1092
A	17	0.06	0.00	70.0	-13.5	0.0000	3.65	0.9724	0.9980	1.06	17.1003
A	18	0.07	0.00	70.0	-7.0	0.0000	3.65	0.9925	0.9980	1.06	18.8537
A	19	0.05	0.00	70.0	4.2	0.0000	3.65	0.9973	0.9980	1.06	16.0108
A	20	0.04	0.00	70.0	-8.2	0.0000	3.65	0.9898	0.9980	1.06	14.2123
B	1	0.16	-0.02	70.0	11.0	-0.1250	-4.59	0.9816	0.9968	1.08	28.6689
B	2	0.15	-0.02	70.0	9.9	-0.1333	-5.14	0.9851	0.9960	1.08	27.8735
B	3	0.15	-0.02	70.0	10.7	-0.1333	-5.14	0.9826	0.9960	1.08	27.8029
B	4	0.14	-0.02	70.0	12.4	-0.1429	-5.75	0.9767	0.9950	1.08	26.7133
B	5	0.14	-0.02	70.0	9.9	-0.1429	-5.75	0.9851	0.9950	1.08	26.9441
B	6	0.13	-0.02	70.0	10.9	-0.1538	-6.46	0.9820	0.9937	1.08	25.8950
B	7	0.15	-0.02	70.0	11.5	-0.1333	-5.14	0.9799	0.9960	1.08	27.7269
B	8	0.14	-0.02	70.0	11.7	-0.1429	-5.75	0.9792	0.9950	1.08	26.7831
B	9	0.12	-0.02	70.0	14.9	-0.1667	-7.27	0.9664	0.9920	1.09	24.4954
B	10	0.13	-0.02	70.0	8.0	-0.1538	-6.46	0.9903	0.9937	1.08	26.1141
B	11	0.12	-0.02	70.0	6.0	-0.1667	-7.27	0.9945	0.9920	1.09	25.2089
B	12	0.13	-0.01	70.0	10.1	-0.0769	-1.44	0.9845	0.9997	1.07	25.7915
B	13	0.09	-0.01	70.0	13.1	-0.1111	-3.69	0.9740	0.9979	1.08	21.3093
B	14	0.09	-0.01	70.0	7.6	-0.1111	-3.69	0.9912	0.9979	1.08	21.6865
B	15	0.09	-0.01	70.0	9.5	-0.1111	-3.69	0.9863	0.9979	1.08	21.5787
B	16	0.09	-0.01	70.0	9.8	-0.1111	-3.69	0.9854	0.9979	1.08	21.5595
B	17	0.08	-0.01	70.0	7.7	-0.1250	-4.59	0.9910	0.9968	1.08	20.4652
B	18	0.09	-0.01	70.0	4.4	-0.1111	-3.69	0.9971	0.9979	1.08	21.8142
B	19	0.11	-0.01	70.0	8.6	-0.0909	-2.36	0.9888	0.9991	1.07	23.8668
B	20	0.11	-0.01	71.0	10.2	-0.0909	-2.36	0.9842	0.9991	1.07	23.7791

Test Parameters

P_{bar} - Barometric pressure, inches Hg	29.42			
P_g - Stack Pressure, inches of H_2O	-5.00			
P_s - Absolute stack pressure, inches Hg	29.05			
t_s - Average stack temperature, ^oF	70.3	Md - dry basis lb/lb mole	29.00	
Duct Shape:	Circular	Ms - wet basis lb/lb mole	28.868	
Diameter, Feet	3.67	Wet Bulb Temp(t'):		
		Dry Bulb Temp(t):		
		Bws - Moisture content fraction		0.012
Cross Sectional Area of Stack, Ft^2	10.58	Moisture determined by wb/db?		N
		Supersaturation Value, Bws:		**0.026**

Method 2F Results

Average Velocity $V_{a(avg)}$	23.840	Q - ACFM	15,134
No WAF Applied to this Test		Qsd - DSCFM	14,456
		Qs - SCFM	14,631
		Qs - SCFH	877,871

Volumetric Flow Rate Example Calculations

Client: Spectrum Environmental Solutions LLC.
Facility: Microchip Technology - Fab 4
Test Location: RCTO #2
Run: 1
Test Date: 9/25/2024

Moisture Content

Bws = 0.012

Dry Molecular Weight

Md = 29.00

Wet Molecular Weight

Ms = Md x (1-Bws) + (18.0 x Bws)

Md = 29.00 Bws = 0.012

Ms = 28.87

Single Point Axial Velocity

$$V_{a(i)} = K_p \times F_{2(i)} \sqrt{\frac{(P_1 - P_2)_{(i)}(460 + T_{s(i)})}{P_s \times M_s}} (\cos\theta_{y(i)})(\cos\theta_{p(i)})$$

Kp = 85.49 F_2 = 1.12
$(P_1 - P_2)$ = 0.17 Cos(θy)= 0.9909832
Ts = 290.927778 Cos(θp)= 0.9507204
Ps = 29.14 Ms = 28.87

Va = 29.28

Average Axial Velocity

$$V_{a(avg)} = \frac{\sum_{i=1}^{n} V_{a(i)}}{n}$$

Va (avg)= 24.21

Volumetric Flow Rate

Q (Actual Basis)= Vs x A x 60

Vs = 24.21 A = 10.580

Q = 15369 acfm

Qs (Standard Basis)= 17.647 x Q x $\frac{Ps}{460 + Ts\ (avg)}$

Q = 15369 Ps = 29.14 Ts (avg) = 70.2

Qs = 14909 scfm

Qs (Standard Basis)= scfm x 60 min/hr

Qs = 894559 scfh

Volumetric Flow Rate Example Calculations

Client: Spectrum Environmental Solutions LLC.
Facility: Microchip Technology - Fab 4
Test Location: RCTO #2
Run: 1
Test Date: 9/25/2024

Site Acceptability

$$R_i = arc\ cosine[(cosine Y_i)(cosine P_i)]$$

Yi=	7.7	Cos(Yi)=	0.1533739
Pi=	-18.06	Cos(Pi)=	0.7057377

Ri= 19.58

$$R_{avg} = \frac{\sum R_i}{n}$$

n= 40
Ravg= 11.47

$$S_d = \sqrt{\frac{\sum_{i=1}^{n}(R_i - R_{avg})^2}{(n-1)}}$$

Sd= 3.40

Appendix B

Field Data Sheets and Site Logbooks

2024 Microchip Compliance Testing of 2 New RCTO Units, 9/25/24 JD SEH

0902 beginning collection, allowing FIDs to stabilize before cal

0920 FID stablized, inlet cal error low

0923 adjusting inlet FID

0929 FID adjusted

0936 adjusting RCO FID

0939 cal error RCO and TO low

0946 cal error RCO and TO mid

0954 TO fails, adjusting analyzer

0956 RCO cal error high, adjusting TO analyzer

0959 inlet cal error high, adjusting analyzer

1001 inlet adjusted and stabilized, flowing high cal error, use 189 ppm data point

1002 TO cal error mid

1006 inlet cal error mid

1007 TO cal error low

1009 inlet cal error low

1012 TO and inlet cal error zero

1019 begin compliance run 1 RCTO3

1121 drift check zero

1122 RCO and TO drift low

1125 inlet drift low

1130 begin RCTO3 compliance run 2

1231 drift zero

1233 RCO and TO drift low

1235 inlet drift low

1240 begin RCTO3 compliance run 3

1342 end run, flowing CTS gas for FTIR QA/QC

1347 drift zero

1348 RCO and TO drift low

1412 Start Run1 on RCTO2 Note FTIR clock is ~90 seconds ahead of this CPU clock

1519 drift zero

1522 RCO and TO drift low

1525 inlet drift low

1529 beginning RCTO2 compliance run 2

1541 RCTO2 tripped, abort run 2 until normal function returns

1636 normal function returned, will redo drift check before restarting run 2

1637 drift zero

1640 RCO and TO drift low

1642 inlet drift low

1650 begin RCTO2 run 2

1758 FID computer crashed, run 2 still over an hour, will do drift check on new file

1806 started collection on new file, drift zero

1809 RCO and TO drift low

1811 inlet drift low

1817 start RCTO2 run 3

1848-1854 omit data - probe out of stack for filter replacement will run 10 min longer

1930 end RCTO2 run 3, will begin FTIR and FID post QA/QC

1930 drift zero

1933 RCO and TO drift low

1936 inlet drift low

1941 stop FID collection, will perform FTIR QA/QC

1049 CTS ON direct to cells

9.718 Ethylene

20.56 Methane

20.24 R22

using ethylene for pathlength (+-5% requirement)

1107 adjusted pathlengths to set Ethylene quant.

10.0 = RCO

10.3 = TO

10.4 = Inlet

1120 cts off

114540 start response time

looks about 13 second response time. The inlet could collect faster

1155 starting engineering test run

1347 THC cals

we are actually on RCTO#2 PEC-VOC-002 (munters #2 1E-MCC-3A3-B-MB6-7RE)

~1445-1645 Eng Testing at RCTO#3

9/25/2024

0723 Collected new N2 Bkgs and a few zero spectra

0733 sampling ambient air

0737 pre-test CTS through sample systems

RCO and inlet are good - adjusted TO PL (set to 9.9m) as it barely passed

0817 increased sample flow on TO

0820 Began spike gas

0838 spike off all look good

****Saved all TO spike data in teh CTS folder****

1019 begin run 1 compliance RCTO3 strat point 3

1030 Strat point 2

1052 Strat point 3 TO only

1120 stop collection, end run 1

1130 begin RCTO3 compliance run 2

1231 stop collection, end run 2

1240 Began Run 3

1340 end run 3

ran CTS all good but TO was close

1414 Began Run 1 at RCTO2

1515 End Run 1 at RCTO2

1529 Start Run 2 at RCTO2

1541 Unit went down

1601 stopped collection on RTO and Inlet. Will collect a new background on TO

1601 purging N2 up through the TO extractive system

1606 collected N2 BKG at to

1612 began purging RCO and Inlet through system with N2

1618 collecting N2 BKG through system on RCO and inlet...and a zero spectrum

1650 Began Run 2 -post unit down. will nor use previous data

1758 end run 2

1817 Begin Run 3

1850-1950 - omit data - TO probe out for filter replacement and better running 10 min longer

1944 began spike flow

1956 spike gas off

2002 Began collection for CTS - large negative bias on TO -3.7 ppm

2006 began CTS flow

2008 CTS off on Inlet and RCO

2009 CTS off with bias correction TO passes - will reprocess quickly

Just for safety going to collect a new bkg on TO to reprocess and ran a CTS after

2027 CTS flowing Now passing with new BKG - Will have to reporocess with new bkg

Three Dimensional Volumetric Flow Rate Determination Field Data Sheet

Project Number: M243410
Client: Spectrum Environmental Solutions LLC
Test Location: RCTO #3
Source Condition: Normal
Test Engineer: RMF

Date: 9-25-24
Test Number: 1
Start Time: 10:24
End Time: 11:00
Test Tech: JAD

Duct Diameter ~~6.78~~ 5.67 ft RMF 9-25-24
Flue Area 16.58 ft²
Port Length 4 "
P_{bar} 29.42 "Hg
Static -5.0 "H_2O
Static ____ "Hg
P_s 29.05 "Hg

CO_2 % .03
O_2 % 20.7
N_2 % 79.0
Meter ID 5D-4

Upstream Disturbance, Diameters 1.860
Downstream Disturbance, Diameters 1.770
Probe ID DAT 3D-062
Wet Bulb Temp ____
Dry Bulb Temp ____
B_{ws} .013
Umbilical ID ____

Leak Checks Passed @
Pre 3.5 Inches H_2O
Post 4 Inches H_2O

Port/Point	P_1-P_2	P_4-P_5	Stack Temp.	Yaw Angle
A 1	.17	0	69	11.0
A 2	.17	0	70	13.0
A 3	.17	0	71	8.9
A 4	.18	0	72	12.3
A 5	.17	0	72	9.3
A 6	.15	0	72	10.4
A 7	.15	0	73	9.2
A 8	.13	0	73	11.9
A 9	.13	0	73	11.4
A 10	.13	0	73	7.6
A 11	.14	0	73	9.9
A 12	.14	0	73	11.0
A 13	.15	0	73	10.2
A 14	.15	0	73	11.8
A 15	.13	0	73	9.2
A 16	.13	0	73	8.8
A 17	.12	0	73	3.6
A 18	.09	0	73	5.1
A 19	.03	0	71	37.0
A 20	.09	0	70	13.5

SCFH _____

Three Dimensional Volumetric Flow Rate Determination Field Data Sheet

Project Number: M243410
Client: Spectrum
Test Location: RCTO #3
Source Condition: Normal
Test Engineer: RMF

Date: 9-25-24
Test Number: 1
Start Time: 10:24
End Time: 11:00
Test Tech: JAD

Duct Diameter 3.67 ft
Flue Area 10.55 ft²
Port Length 4 "
P_{bar} 29.92 "Hg
Static -5.0 "H_2O
Static ____ "Hg
P_s 29.05 "Hg

CO_2 % .03
O_2 % 20.9
N_2 % 79.0
Meter ID 3D-4

Upstream Disturbance, Diameters 1.860
Downstream Disturbance, Diameters 770
Probe ID D&T 3D-062
Wet Bulb Temp ____
Dry Bulb Temp ____
B_{ws} .013
Umbilical ID ____

Leak Checks Passed @
Pre 3.5 Inches H_2O
Post 4 Inches H_2O

Port/Point	P_1-P_2	P_4-P_5	Stack Temp.	Yaw Angle
B 1	.12	0	75	9.5
B 2	.14	-.01	75	11.1
B 3	.14	-.01	75	7.7
B 4	.15	0	75	9.3
B 5	.16	0	75	7.2
B 6	.14	.01	75	9.0
B 7	.15	.01	75	7.7
B 8	.16	.01	75	7.6
B 9	.15	.01	75	8.2
B 10	.16	.01	75	7.7
B 11	.14	.01	74	10.6
B 12	.13	.01	74	14.2
B 13	.12	.01	73	10.3
B 14	.11	.01	73	12.8
B 15	.12	.01	73	10.5
B 16	.11	.01	73	8.3
B 17	.11	.01	73	9.7
B 18	.10	.01	72	6.4
B 19	.09	.01	72	0
B 20	.10	.01	72	9.3

SCFH ____

Three Dimensional Volumetric Flow Rate Determination Field Data Sheet

Project Number: M27341.0 | Date: 9-25-24

Client: Spectrum Environmental Solutions LLC | Test Number: 2

Test Location: RCTO#3 | Start Time: 11:40

Source Condition: Normal | End Time: 12:15

Test Engineer: RMF | Test Tech: JAD

Duct Diameter 3.67 ft | Upstream Disturbance, Diameters 1.860

Flue Area 10.58 ft² | Downstream Disturbance, Diameters 7.70

Port Length M " | Probe ID DAT 3D-062

P_{bar} 29.42 "Hg | CO_2 % 10.3 | Wet Bulb Temp ____ | Leak Checks Passed @

Static -5.0 "H_2O | O_2 % 20.97 | Dry Bulb Temp ____ | Pre 3 Inches H_2O

Static ____ "Hg | N_2 % 74.0 | B_{ws} .011 | Post 4 Inches H_2O

P_s 29.05 "Hg | Meter ID 3D-4 | Umbilical ID ____

Port/Point	P_1-P_2	P_4-P_5	Stack Temp.	Yaw Angle
A 1	.16	-.01	71	13.8
A 2	.16	-.01	71	16.3
A 3	.17	-.01	71	10.0
A 4	.16	-.01	71	11.0
A 5	.16	-.01	71	12.4
A 6	.15	-.02	71	11.0
A 7	.14	-.02	72	12.5
A 8	.13	-.02	72	11.6
A 9	.14	-.02	72	10.6
A 10	.11	-.02	72	9.4
A 11	.12	-.02	72	10.2
A 12	.13	-.01	72	12.3
A 13	.14	-.01	72	12.2
A 14	.13	-.01	72	12.6
A 15	.13	-.01	73	16.0
A 16	.13	-.01	73	8.8
A 17	.12	-.01	73	12.7
A 18	.12	-.01	73	12.3
A 19	.12	0	72	15.6
A 20	.04	.02	72	4.7

SCFH _____

Three Dimensional Volumetric Flow Rate Determination Field Data Sheet

Project Number: 23410
Client: Spectrum Environmental Solutions LLC
Test Location: RCTO #3
Source Condition: Normal
Test Engineer: BMF

Date: 9-25-24
Test Number: 2
Start Time: 11:40
End Time: 12:15
Test Tech: JAD

Duct Diameter 3.67 ft
Flue Area 10.58 ft²
Port Length 4 "
P_{bar} 24.02 "Hg
Static -5.0 "H_2O
Static ___ "Hg
P_s 29.65 "Hg

CO_2 % .03
O_2 % 20.97
N_2 % 79.0
Meter ID 3D-7

Upstream Disturbance, Diameters 1.860
Downstream Disturbance, Diameters .770
Probe ID DAT 3D-062
Wet Bulb Temp ___
Dry Bulb Temp ___
B_{ws} .011
Umbilical ID ___

Leak Checks Passed @
Pre 3.5 Inches H_2O
Post 4 Inches H_2O

Port/Point	P_1-P_2	P_4-P_5	Stack Temp.	Yaw Angle
B 1	.12	-.02	71	9.6
B 2	.14	-.02	71	9.1
B 3	.13	-.02	71	11.2
B 4	.14	-.02	71	10.1
B 5	.15	-.02	71	10.2
B 6	.14	-.02	71	9.1
B 7	.13	-.02	71	8.6
B 8	.14	-.02	71	8.1
B 9	.14	-.02	71	9.2
B 10	.14	-.02	71	10.5
B 11	.13	-.02	71	12.3
B 12	.12	-.02	71	11.1
B 13	.10	-.02	71	11.9
B 14	.09	-.02	71	7.4
B 15	.09	-.02	71	6.9
B 16	.09	-.02	71	7.2
B 17	.08	-.02	71	0
B 18	.04	-.02	71	-16.2
B 19	.07	-.03	71	-2.2
B 20	.06	-.03	71	2.8

SCFH ___

Three Dimensional Volumetric Flow Rate Determination Field Data Sheet

Project Number: M2734/0
Client: Spectrum
Test Location: RCTO #3
Source Condition: normal
Test Engineer: RMF

Date: 9-25-24
Test Number: 3
Start Time: 12:44
End Time: 13:14
Test Tech: JAD

Duct Diameter 3.67 ft
Flue Area 10.58 ft²
Port Length 4 "
P_{bar} 29.42 "Hg
Static -5.0 "H_2O
Static _____ "Hg
P_s .905 "Hg

CO_2 % .03
O_2 % 20.97
N_2 % 79.0
Meter ID 30-4

Upstream Disturbance, Diameters 4.86o
Downstream Disturbance, Diameters .770
Probe ID DAT 3D-002
Wet Bulb Temp _____
Dry Bulb Temp _____
B_{ws} .012
Umbilical ID _____

Leak Checks Passed @
Pre 3.5 Inches H_2O
Post 4 Inches H_2O

Port/Point	P_1-P_2	P_4-P_5	Stack Temp.	Yaw Angle
A 1	.12	-.02	71	10.2
A 2	.12	-.02	71	10.2
A 3	.14	-.02	71	7.5
A 4	.14	-.02	71	10.1
A 5	.13	-.02	71	8.0
A 6	.14	-.02	71	8.8
A 7	.14	-.02	71	7.8
A 8	.14	-.02	71	9.5
A 9	.12	-.02	71	9.2
A 10	.12	-.02	71	9.4
A 11	.11	-.02	71	15.0
A 12	.11	-.01	70	25.0
A 13	.10	-.01	70	26.0
A 14	.12	-.01	70	23.0
A 15	.09	0	70	13.6
A 16	.08	0	70	8.0
A 17	.06	0	70	-13.5
A 18	.07	0	70	-7.0
A 19	.05	0	70	4.2
A 20	.04	0	70	-8.2

SCFH _____

Three Dimensional Volumetric Flow Rate Determination Field Data Sheet

Project Number:	M243410	Date:	9-25-24
Client:	Spectrum Environmental Solutions LLC	Test Number:	3
Test Location:	RTO #3	Start Time:	12:44
Source Condition:	Normal	End Time:	13:14
Test Engineer:	RMF	Test Tech:	JAD

Duct Diameter 3.67 ft
Flue Area 10.58 ft²
Port Length 4 "
P_{bar} 29.42 "Hg
Static -5.0 "H_2O
Static _____ "Hg
P_s 29.05 "Hg

CO_2 % .03
O_2 % 20.97
N_2 % 14.0
Meter ID 3D-4

Upstream Disturbance, Diameters 1.860
Downstream Disturbance, Diameters .770
Probe ID DAT3D-062
Wet Bulb Temp _____
Dry Bulb Temp _____
B_{ws} .012
Umbilical ID _____

Leak Checks Passed @
Pre 3.7 Inches H_2O
Post 4 Inches H_2O

Port/Point	P_1-P_2	P_4-P_5	Stack Temp.	Yaw Angle
B 1	.16	-.02	70	11.0
B 2	.15	-.02	70	9.9
B 3	.15	-.02	70	10.7
B 4	.14	-.02	70	10.4
B 5	.14	-.02	70	4.9
B 6	.13	-.02	70	10.9
B 7	.15	-.02	70	11.5
B 8	.14	-.02	70	11.7
B 9	.12	-.02	70	14.9
B 10	.13	-.02	70	8.0
B 11	.12	-.02	70	6.0
B 12	.13	-.01	70	10.1
B 13	.09	-.01	70	17.1
B 14	.09	-.01	70	7.6
B 15	.09	-.01	70	9.5
B 16	.09	-.01	70	9.8
B 17	.08	-.01	70	7.7
B 18	.09	-.01	70	4.4
B 19	.11	-.01	70	8.6
B 20	.11	-.01	71	10.2

SCFH _____

Three Dimensional Volumetric Flow Rate Determination Field Data Sheet

Project Number: M243410
Client: Spectrum Environmental Solutions LLC
Test Location: RCTO #2
Source Condition: Normal
Test Engineer: RMF

Date: 9-25-24
Test Number: 1
Start Time: 14:14
End Time: 15:04
Test Tech: JAD

Duct Diameter 3.67 ft
Flue Area 10.58 ft²
Port Length 4 "
P_{bar} 29.51 "Hg
Static -3.0 "H_2O
Static ____ "Hg
P_s 29.14 "Hg

CO_2 % .63
O_2 % 20.92
N_2 % 74.0
Meter ID 3D-4

Upstream Disturbance, Diameters 1.860
Downstream Disturbance, Diameters .770
Probe ID DAT 3D-062
Wet Bulb Temp ____
Dry Bulb Temp ____
B_{ws} .012
Umbilical ID ____

Leak Checks Passed @
Pre 3 Inches H_2O
Post 4 Inches H_2O

Port/Point	P_1-P_2	P_4-P_5	Stack Temp.	Yaw Angle
A 1	.17	-.06	64	7.7
A 2	.17	-.02	64	7.9
A 3	.16	-.02	66	8.9
A 4	.15	-.02	67	7.6
A 5	.15	-.02	67	8.9
A 6	.15	-.02	68	8.7
A 7	.14	-.01	68	9.2
A 8	.15	-.02	69	8.5
A 9	.14	-.02	69	8.4
A 10	.13	-.02	70	11.1
A 11	.09	-.02	71	19.5
A 12	.09	-.02	71	16.9
A 13	.10	-.02	72	17.6
A 14	.09	-.02	72	14.5
A 15	.09	-.03	72	15.2
A 16	.08	-.02	72	11.2
A 17	.07	-.02	72	14.2
A 18	.09	-.02	72	13.8
A 19	.09	-.02	72	11.0
A 20	.07	-.02	72	9.5

SCFH _____

Three Dimensional Volumetric Flow Rate Determination Field Data Sheet

Project Number: M243410
Client: Spectrum Environmental Solutions LLC.
Test Location: PCTO #2
Source Condition: Normal
Test Engineer: RMF

Date: 9-25-24
Test Number: 1
Start Time: 14:14
End Time: 15:04
Test Tech: JAD

Duct Diameter 3.57 ft
Flue Area 10.58 ft²
Port Length 4 "
P_{bar} 29.51 "Hg
Static −5.0 "H_2O
Static ____ "Hg
P_s 29.17 "Hg

CO_2 % .03
O_2 % 20.96
N_2 % 79.00
Meter ID 3D-4

Upstream Disturbance, Diameters 1.86O
Downstream Disturbance, Diameters .77O
Probe ID DAT 3D-062
Wet Bulb Temp ____
Dry Bulb Temp ____
B_{ws} .012
Umbilical ID ____

Leak Checks Passed @
Pre 3 Inches H_2O
Post 4 Inches H_2O

Port/Point	P_1-P_2	P_4-P_5	Stack Temp.	Yaw Angle
B 1	.14	−.02	70	11.9
B 2	.14	−.02	70	6.0
B 3	.15	−.02	70	8.0
B 4	.14	−.02	70	4.2
B 5	.14	−.02	70	5.2
B 6	.14	−.02	70	4.9
B 7	.13	−.02	70	5.6
B 8	.13	−.01	70	5.7
B 9	.11	−.01	71	5.3
B 10	.11	−.01	71	6.5
B 11	.11	−.01	71	5.9
B 12	.10	−.01	72	7.3
B 13	.12	−.01	72	6.9
B 14	.10	−.01	72	9.4
B 15	.09	−.01	72	7.8
B 16	.09	−.01	71	0
B 17	.10	−.01	71	2.8
B 18	.09	−.01	71	3.2
B 19	.08	−.01	71	7.3
B 20	.05	−.01	71	12.3

SCFH ____

Three Dimensional Volumetric Flow Rate Determination Field Data Sheet

Project Number: M24314/10
Client: Spectrum Environmental Solutions LLC
Test Location: RTO #2
Source Condition: Normal
Test Engineer: RMF

Date: 9-25-24
Test Number: 2
Start Time: RMF 9-25-24 ~~17:08~~ 17:08
End Time: 17:42
Test Tech: JAD

Duct Diameter 7.67 ft
Flue Area 10.58 ft²
Port Length 4 "
P_{bar} 27.51 "Hg
Static -5.0 "H_2O
Static ____ "Hg
P_s 29.14 "Hg

CO_2 % .03
O_2 % 20.96
N_2 % 79.01
Meter ID 3D-4

Upstream Disturbance, Diameters 1.86
Downstream Disturbance, Diameters 1.770
Probe ID 3D-062
Wet Bulb Temp ____
Dry Bulb Temp ____
B_{ws} .012
Umbilical ID ____

Leak Checks Passed @
Pre 3 Inches H_2O
Post 4 Inches H_2O

Port/Point	P_1-P_2	P_4-P_5	Stack Temp.	Yaw Angle
A 1	.15	-.04	68	9.5
A 2	.18	-.04	68	8.6
A 3	.14	-.04	67	-4.3
A 4	.15	-.04	68	6.4
A 5	.13	-.03	67	-6.2
A 6	.16	-.03	69	5.7
A 7	.15	-.03	69	~~7.5~~
A 8	.14	-.03	69	6.5
A 9	.13	-.03	69	6.4
A 10	.11	-.03	69	9.8
A 11	.07	-.03	69	8.5
A 12	.07	-.03	70	7.3
A 13	.07	-.03	70	20.9
A 14	.08	-.03	70	10.0
A 15	.06	-.03	70	-14.3
A 16	.05	-.03	70	24.0
A 17	.05	-.04	70	4.7
A 18	.08	-.04	70	-7.7
A 19	.03	-.03	70	-19.0
A 20	.06	-.05	70	-11.5

SCFH ____

Pg. 2 of 2

Three Dimensional Volumetric Flow Rate Determination Field Data Sheet

Project Number: MD43610
Client: Spectrum Environmental Solutions LLC
Test Location: RTO #2
Source Condition: Normal
Test Engineer: RMF

Date: 9-25-24
Test Number: 2
Start Time: RMF 5:08 17:08
End Time: 9-25-24 5:42 17:42
Test Tech: JAD

Duct Diameter 9.67 ft
Flue Area 16.58 ft²
Port Length 4 "
P_{bar} 29.54 "Hg
Static -5.0 "H_2O
Static ____ "Hg
P_s 29.14 "Hg

CO_2 % .03
O_2 % 20.96
N_2 % 79.01
Meter ID 3D-4

Upstream Disturbance, Diameters 1.86
Downstream Disturbance, Diameters 7.70
Probe ID DAT3D-02

Wet Bulb Temp ____
Dry Bulb Temp ____
B_{ws} .012
Umbilical ID ____

Leak Checks Passed @
Pre 5 Inches H_2O
Post 4 Inches H_2O

Port/Point	P_1-P_2	P_4-P_5	Stack Temp.	Yaw Angle
B 1	.08	-.03	69	8.0
B 2	.15	-.04	69	4.0
B 3	.13	-.04	70	4.2
B 4	.14	-.04	70	0
B 5	.13	-.04	70	-2.9
B 6	.13	-.04	71	0.0
B 7	.13	-.04	71	4.0
B 8	.13	-.04	71	5.6
B 9	.09	-.04	71	6.2
B 10	.10	-.04	71	10.7
B 11	.09	-.03	71	0.0
B 12	.08	-.03	71	9.0
B 13	.07	-.03	71	10.7
B 14	.08	-.03	71	-8.6
B 15	.06	-.03	71	-4.7
B 16	.09	-.03	71	0.0
B 17	.09	-.03	71	-14.0
B 18	.09	-.03	71	-8.8
B 19	.06	-.03	70	-9.0
B 20	.10	.02	69	-8.2

SCFH ____

Three Dimensional Volumetric Flow Rate Determination Field Data Sheet

Project Number: M2484/10
Client: Spectrum Environmental Solutions LLC
Test Location: RCTO #2
Source Condition: Normal
Test Engineer: RMF

Date: 9-25-24
Test Number: 3
Start Time: ~~6:45~~ 18:45
End Time: 19:10
Test Tech: JAD

Duct Diameter 3.67 ft
Flue Area 10.58 ft²
Port Length 4 "
P_{bar} 29.51 "Hg
Static 5.0 "H_2O
Static ____ "Hg
P_s 27.14 "Hg

CO_2 % .04
O_2 % 20.96
N_2 % 79.01
Meter ID 2D-4

Upstream Disturbance, Diameters 1.860
Downstream Disturbance, Diameters .770
Probe ID DAT3D-062
Wet Bulb Temp ____
Dry Bulb Temp ____
B_{ws} .012
Umbilical ID ____

Leak Checks Passed @
Pre ~~5~~ Inches H_2O
Post 4 Inches H_2O

Port/Point	P_1-P_2	P_4-P_5	Stack Temp.	Yaw Angle
A-1	.17	-.05	72	10.8
A-2	.18	-.05	72	9.5
A-3	.17	-.04	72	8.6
A-4	.16	-.04	72	7.3
A-5	.16	-.03	72	8.4
A-6	.16	-.05	72	7.8
A-7	.15	-.05	72	8.2
A-8	.17	-.03	72	7.5
A-9	.15	-.03	72	4.2
A-10	.12	-.03	72	9.1
A-11	.09	-.03	72	14.5
A-12	.08	-.03	72	14.5
A-13	.09	-.03	72	11.7
A-14	.08	-.03	72	14.0
A-15	.08	-.04	72	5.0
A-16	.08	-.04	72	0.0
A-17	.08	-.05	72	-6.0
A-18	.11	-.06	71	-12.0
A-19	.07	-.05	70	-21.0
A-20	.07	-.05	71	7.5

SCFH _____

Three Dimensional Volumetric Flow Rate Determination Field Data Sheet

Project Number: M243410
Client: Spectrum Environmental Solutions LLC
Test Location: PCI #2
Source Condition: Normal
Test Engineer: RMF

Date: 9-25-24
Test Number: 3
Start Time: 18:45
End Time: 19:10
Test Tech: JAD

Duct Diameter 3.67 ft
Flue Area 10.58 ft²
Port Length 4 "
P_{bar} 29.51 "Hg
Static -5.0 "H_2O
Static ____ "Hg
P_s 29.14 "Hg

CO_2 % .04
O_2 % 20.96
N_2 % 79.01
Meter ID 3D-4

Upstream Disturbance, Diameters 1.860
Downstream Disturbance, Diameters 7.70
Probe ID DAT3D-06

Wet Bulb Temp ____
Dry Bulb Temp ____
B_{ws} .012
Umbilical ID ____

Leak Checks Passed @
Pre 3 Inches H_2O
Post 4 Inches H_2O

Port/Point	P_1-P_2	P_4-P_5	Stack Temp.	Yaw Angle
B 1	.12	-.03	72	4.0
B 2	.14	-.04	72	3.4
B 3	.15	-.04	72	5.0
B 4	.13	-.05	72	0.0
B 5	.13	-.04	72	-2.0
B 6	.13	-.04	72	0.0
B 7	.12	-.04	72	0.0
B 8	.12	-.04	72	4.0
B 9	.10	-.04	72	3.0
B 10	.10	-.04	72	6.2
B 11	.08	-.03	72	4.6
B 12	.08	-.03	72	0.0
B 13	.09	-.03	72	4.0
B 14	.08	-.03	72	10.3
B 15	.08	-.03	72	6.0
B 16	.08	-.02	72	-14.8
B 17	.09	-.03	71	-5.0
B 18	.07	-.04	71	-13.8
B 19	.07	-.03	71	-16.8
B 20	.08	-.03	71	-11.6

SCFH _____

Determination of Cyclonic Flow
EPA Method 1

Project	225-01-2401 M
Facility	Microchip Gresham
Source	RCTO 2 Inlet
Operator	JD & SEH
Date	9/25/24
Pitot Tube No.	PTO2

Pitot Tube Leak Check ("H_2O@"H_2O)			
Initial (-)	0	@	> 3
Initial (+)	0	@	> 3
Final (-)	0	@	> 3
Final (+)	0	@	> 3

Bottom Port

Traverse Point	Yaw Angle (°)
1	-5
2	-10
3	0
4	15
5	10
6	15
7	12
8	8

Side port

Traverse Point	Yaw Angle (°)
1	5
2	10
3	15
4	0
5	-15
6	-15
7	-10
8	-10

Spectrum ENVIRONMENTAL SOLUTIONS

Determination of Cyclonic Flow
EPA Method 1

Project	225-01-2401M
Facility	Microchip Gresham
Source	RCTO 2 TO
Operator	JD & SEH
Date	9/25/24
Pitot Tube No.	PT02

Pitot Tube Leak Check ("H_2O@"H_2O)			
Initial (-)	0	@	>3
Initial (+)	0	@	>3
Final (-)	0	@	>3
Final (+)	0	@	>3

NE Port

Traverse Point	Yaw Angle (°)
1	5
2	4
3	3
4	0
5	0
6	0
7	0
8	0

NW Port

Traverse Point	Yaw Angle (°)
1	3
2	5
3	5
4	0
5	0
6	0
7	0
8	0

Spectrum ENVIRONMENTAL SOLUTIONS

Determination of Cyclonic Flow
EPA Method 1

Project	225-01-2401M
Facility	Microchip Gresham
Source	RCTO 3 TO
Operator	JD & SEH
Date	9/25/24
Pitot Tube No.	PTO2

Pitot Tube Leak Check ("H_2O@"H_2O)			
Initial (-)	0	@	>3
Initial (+)	0	@	>3
Final (-)	0	@	>3
Final (+)	0	@	>3

NE Port

Traverse Point	Yaw Angle (°)
1	4
2	5
3	0
4	3
5	0
6	0
7	0
8	0

NW Port

Traverse Point	Yaw Angle (°)
1	3
2	5
3	4
4	0
5	0
6	0
7	0
8	0

Spectrum ENVIRONMENTAL SOLUTIONS

Determination of Cyclonic Flow
EPA Method 1

Project	225-01-2401 M
Facility	Microchip Gresham
Source	RCTO 3 Inlet
Operator	JD & SEH
Date	9/25/24
Pitot Tube No.	PTO2

Pitot Tube Leak Check ("H_2O@"H_2O)			
Initial (-)	0	@	>3
Initial (+)	0	@	>3
Final (-)	0	@	>3
Final (+)	0	@	>3

Bottom Port

Traverse Point	Yaw Angle (°)
1	10
2	5
3	5
4	0
5	-5
6	5
7	10
8	8

Side port

Traverse Point	Yaw Angle (°)
1	0
2	0
3	0
4	0
5	5
6	5
7	25
8	15

Spectrum
ENVIRONMENTAL SOLUTIONS

EPA Method 1
Circular Duct – Determination of Traverse Points

Project 225-01-2401M	
Facility Microchip Gresham	
Source **RCTO 2 and RCTO 3 TOs**	
Operator **SEH and JD**	
Date **9/25/24**	

□ Velocity Only □ Isokinetic Sampling	Upstream Distance (ft/in) _____129"_____ Upstream Distance (diameters) ___6.79_____ □ Measurement □ Plant Information
Number of Ports to be sampled _____	
Duct Diameter (in) ___19____ □ Measurement □ Plant Information	Downstream Distance (ft/in) ____339"_____ Downstream Distance (diameters) ___17.84____ □ Measurement □ Plant Information

Total number of Traverse Points (from Figure 2 (velocity) or 1 (all isokinetic sampling))	16
Number of traverse points per port	8
Port Depth	4"

Traverse Point	Percent of Diameter	Distance from Wall [1] (in)	Marking Location (in)
1	3.2	5/8	4 5/8
2	10.5	2	6
3	19.4	3 5/8	7 5/8
4	32.3	6 1/8	10 1/8
5	67.7	12 7/8	16 7/8
6	80.6	15 2/8	19 2/8
7	89.5	17	21
8	96.8	18 3/8	22 3/8
9			
10			
11			
12			

Traverse Point	Percent of Diameter	Distance from Wall (in)	Marking Location (in)
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			

Prepare a drawing of the source, showing the ports, disturbances, and the distances

[1] According to Method 1, for stacks between 12 and 24", no point may be within ½ inch of the wall. For stacks greater than 24", no point may be within 1 inch of the wall.

Spectrum ENVIRONMENTAL SOLUTIONS

EPA Method 1
Circular Duct – Determination of Traverse Points

Project 225-01-2401M	
Facility Microchip Gresham	
Source **RCTO 2 and RCTO 3 Inlets**	
Operator **SEH and JD**	
Date **9/25/24**	

□ Velocity Only □ Isokinetic Sampling	Upstream Distance (ft/in) _____70"_____ Upstream Distance (diameters) ___1.59_____ □ Measurement □ Plant Information
Number of Ports to be sampled _____	
Duct Diameter (in) ___44____ □ Measurement □ Plant Information	Downstream Distance (ft/in) ____152"_____ Downstream Distance (diameters) ___3.45____ □ Measurement □ Plant Information

Total number of Traverse Points (from Figure 2 (velocity) or 1 (all isokinetic sampling))	16
Number of traverse points per port	8
Port Depth	4"

Traverse Point	Percent of Diameter	Distance from Wall [1] (in)	Marking Location (in)
1	3.2	1 3/8	5 3/8
2	10.5	4 5/8	8 5/8
3	19.4	8 4/8	12 4/8
4	32.3	14 2/8	18 2/8
5	67.7	29 7/8	33 7/8
6	80.6	35 4/8	39 4/8
7	89.5	39 3/8	43 3/8
8	96.8	42 5/8	49 5/8
9			
10			
11			
12			

Traverse Point	Percent of Diameter	Distance from Wall (in)	Marking Location (in)
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			

Prepare a drawing of the source, showing the ports, disturbances, and the distances

[1] According to Method 1, for stacks between 12 and 24", no point may be within ½ inch of the wall. For stacks greater than 24", no point may be within 1 inch of the wall.

Spectrum ENVIRONMENTAL SOLUTIONS

Appendix C

FTIR Data

RCTO 2
THC Raw Data

# NuWave - analyzer file								
# LabJack Voltage Ranges:		10	10	10				
# Channels:		AIN0	AIN1	AIN2				
# Client / Site / Source:		Microchip	Gresham	RCTO2				
Timestamp		Date	Time	Epoch Time	Inlet_CONC	RCO_CONC	TO_CONC	QAQC
Drift Check								
	9/25/2024 13:47	25-Sep-24	0.5745718	1.727E+09	15.4399	1.25516	5.94479	0
	9/25/2024 13:48	25-Sep-24	0.5752664	1.727E+09	0.0558014	-0.118317	-0.101608	0 zero
	9/25/2024 13:49	25-Sep-24	0.575961	1.727E+09	17.8861	1.6691	1.9112	0
	9/25/2024 13:50	25-Sep-24	0.5766553	1.727E+09	35.899	3.23378	3.40754	0 RCO and TO low
	9/25/2024 13:51	25-Sep-24	0.5773496	1.727E+09	41.888	1.78471	1.14995	0
	9/25/2024 13:52	25-Sep-24	0.5780441	1.727E+09	55.3441	0.945013	0.430498	0
	9/25/2024 13:53	25-Sep-24	0.5787386	1.727E+09	63.3137	0.914084	0.247602	0 inlet low
	9/25/2024 13:54	25-Sep-24	0.5794329	1.727E+09	57.7877	0.911498	0.18153	0
	9/25/2024 13:55	25-Sep-24	0.5801274	1.727E+09	31.7384	0.888852	0.290123	0
	9/25/2024 13:56	25-Sep-24	0.5808218	1.727E+09	34.7284	0.885439	0.224458	0
	9/25/2024 13:57	25-Sep-24	0.5815164	1.727E+09	38.0054	0.879886	0.167287	0
	9/25/2024 13:58	25-Sep-24	0.5822108	1.727E+09	43.9931	0.876867	0.343211	0
	9/25/2024 13:59	25-Sep-24	0.5829053	1.727E+09	44.8925	0.887933	0.341649	0
	9/25/2024 14:00	25-Sep-24	0.5835997	1.727E+09	43.9522	0.903122	0.165265	0
	9/25/2024 14:01	25-Sep-24	0.584294	1.727E+09	41.5174	0.882407	0.239857	0
	9/25/2024 14:02	25-Sep-24	0.5849885	1.727E+09	24.4966	0.860995	0.441722	0
	9/25/2024 14:03	25-Sep-24	0.585683	1.727E+09	29.163	0.862452	0.222804	0
	9/25/2024 14:04	25-Sep-24	0.5863774	1.727E+09	38.9157	0.826693	0.145915	0
	9/25/2024 14:05	25-Sep-24	0.5870719	1.727E+09	46.9259	1.09355	0.403376	0
	9/25/2024 14:06	25-Sep-24	0.5877663	1.727E+09	41.3138	1.29128	0.415007	0
	9/25/2024 14:07	25-Sep-24	0.5884608	1.727E+09	35.9322	1.32112	0.119042	0
	9/25/2024 14:08	25-Sep-24	0.5891553	1.727E+09	31.7473	1.31818	0.41523	0
	9/25/2024 14:09	25-Sep-24	0.5898497	1.727E+09	29.9773	1.33841	0.439635	0
	9/25/2024 14:10	25-Sep-24	0.590544	1.727E+09	29.9727	1.37172	0.134585	0
	9/25/2024 14:11	25-Sep-24	0.5912386	1.727E+09	26.7917	1.40909	0.324334	0
Run 1 - RCTO 2								
	9/25/2024 14:12	25-Sep-24	0.591933	1.727E+09	27.1453	1.47271	0.489796	Y
	9/25/2024 14:13	25-Sep-24	0.5926275	1.727E+09	26.4066	1.50947	0.170766	Y
	9/25/2024 14:14	25-Sep-24	0.593322	1.727E+09	26.0813	1.40179	0.237546	Y
	9/25/2024 14:15	25-Sep-24	0.5940163	1.727E+09	26.984	1.3458	0.50249	Y
	9/25/2024 14:16	25-Sep-24	0.5947107	1.727E+09	28.4155	1.29719	0.295781	Y
	9/25/2024 14:17	25-Sep-24	0.5954052	1.727E+09	30.0101	1.2637	0.156666	Y
	9/25/2024 14:18	25-Sep-24	0.5960996	1.727E+09	30.0269	1.24778	0.570203	Y
	9/25/2024 14:19	25-Sep-24	0.5967941	1.727E+09	27.5367	1.24778	0.423225	Y
	9/25/2024 14:20	25-Sep-24	0.5974885	1.727E+09	25.7527	1.25585	0.132196	Y
	9/25/2024 14:21	25-Sep-24	0.598183	1.727E+09	26.1309	1.24461	0.517351	Y
	9/25/2024 14:22	25-Sep-24	0.5988775	1.727E+09	26.2629	1.18954	0.52083	Y
	9/25/2024 14:23	25-Sep-24	0.599572	1.727E+09	26.7758	1.14367	0.168087	Y
	9/25/2024 14:24	25-Sep-24	0.6002664	1.727E+09	29.8049	1.09215	0.369467	Y
	9/25/2024 14:25	25-Sep-24	0.6009609	1.727E+09	31.1264	1.09193	0.50547	Y
	9/25/2024 14:26	25-Sep-24	0.6016552	1.727E+09	30.0481	1.11339	0.31651	Y
	9/25/2024 14:27	25-Sep-24	0.6023497	1.727E+09	30.6736	1.11758	0.215886	Y
	9/25/2024 14:28	25-Sep-24	0.6030441	1.727E+09	31.1104	1.11898	0.575598	Y
	9/25/2024 14:29	25-Sep-24	0.6037386	1.727E+09	31.1705	1.10858	0.388489	Y
	9/25/2024 14:30	25-Sep-24	0.604433	1.727E+09	39.1552	1.11641	0.180821	Y
	9/25/2024 14:31	25-Sep-24	0.6051275	1.727E+09	35.3274	1.13354	0.50316	Y
	9/25/2024 14:32	25-Sep-24	0.6058219	1.727E+09	33.4617	1.15793	0.509842	Y
	9/25/2024 14:33	25-Sep-24	0.6065164	1.727E+09	30.2133	1.16557	0.215623	Y
	9/25/2024 14:34	25-Sep-24	0.6072109	1.727E+09	33.04	1.1657	0.392755	Y
	9/25/2024 14:35	25-Sep-24	0.6079052	1.727E+09	35.7591	1.16913	0.542425	Y
	9/25/2024 14:36	25-Sep-24	0.6085996	1.727E+09	35.8336	1.20545	0.25817	Y
	9/25/2024 14:37	25-Sep-24	0.6092941	1.727E+09	35.936	1.24939	0.254087	Y
	9/25/2024 14:38	25-Sep-24	0.6099886	1.727E+09	36.3285	1.29348	0.560593	Y
	9/25/2024 14:39	25-Sep-24	0.6106831	1.727E+09	37.9058	1.36087	0.333011	Y
	9/25/2024 14:40	25-Sep-24	0.6113775	1.727E+09	38.0884	1.34579	0.179141	Y
	9/25/2024 14:41	25-Sep-24	0.612072	1.727E+09	38.0624	1.33176	0.492671	Y
	9/25/2024 14:42	25-Sep-24	0.6127663	1.727E+09	39.5549	1.31302	0.529783	Y
	9/25/2024 14:43	25-Sep-24	0.6134608	1.727E+09	39.824	1.27486	0.163598	Y
	9/25/2024 14:44	25-Sep-24	0.6141552	1.727E+09	50.9792	1.24296	0.386612	Y
	9/25/2024 14:45	25-Sep-24	0.6148497	1.727E+09	50.9633	1.25846	0.621073	Y
	9/25/2024 14:46	25-Sep-24	0.6155442	1.727E+09	48.2187	1.27415	0.20218	Y
	9/25/2024 14:47	25-Sep-24	0.6162385	1.727E+09	47.7541	1.25151	0.315958	Y
	9/25/2024 14:48	25-Sep-24	0.616933	1.727E+09	43.5448	1.23752	0.621926	Y
	9/25/2024 14:49	25-Sep-24	0.6176274	1.727E+09	43.0441	1.19779	0.222108	Y
	9/25/2024 14:50	25-Sep-24	0.6183219	1.727E+09	46.4699	1.14584	0.197664	Y
	9/25/2024 14:51	25-Sep-24	0.6190164	1.727E+09	42.7398	1.14289	0.498591	Y
	9/25/2024 14:52	25-Sep-24	0.6197109	1.727E+09	39.2771	1.1678	0.328942	Y
	9/25/2024 14:53	25-Sep-24	0.6204051	1.727E+09	34.49	1.17304	0.125107	Y
	9/25/2024 14:54	25-Sep-24	0.6210996	1.727E+09	35.9372	1.15724	0.535638	Y
	9/25/2024 14:55	25-Sep-24	0.6217941	1.727E+09	34.8885	1.14382	0.361866	Y
	9/25/2024 14:56	25-Sep-24	0.6224886	1.727E+09	32.2926	1.1534	0.123506	Y
	9/25/2024 14:57	25-Sep-24	0.6231831	1.727E+09	29.3079	1.17619	0.4648	Y
	9/25/2024 14:58	25-Sep-24	0.6238775	1.727E+09	31.356	1.19177	0.385837	Y

RCTO 2
THC Raw Data

# NuWave - analyzer file									
# LabJack Voltage Ranges:		10	10	10					
# Channels:		AIN0	AIN1	AIN2					
# Client / Site / Source:		Microchip	Gresham	RCTO2					
Timestamp		Date	Time	Epoch Time	Inlet_CONC	RCO_CONC	TO_CONC	QAQC	
	9/25/2024 14:59	25-Sep-24	0.6245719	1.727E+09	30.5514	1.20425	0.218183	Y	
	9/25/2024 15:00	25-Sep-24	0.6252663	1.727E+09	28.1037	1.19214	0.25179	Y	
	9/25/2024 15:01	25-Sep-24	0.6259608	1.727E+09	28.2002	1.20485	0.465089	Y	
	9/25/2024 15:02	25-Sep-24	0.6266553	1.727E+09	29.8207	1.2242	0.363993	Y	
	9/25/2024 15:03	25-Sep-24	0.6273497	1.727E+09	37.672	1.25319	0.157283	Y	
	9/25/2024 15:04	25-Sep-24	0.6280442	1.727E+09	47.9543	1.2726	0.387741	Y	
	9/25/2024 15:05	25-Sep-24	0.6287387	1.727E+09	47.0117	1.32427	0.595421	Y	
	9/25/2024 15:06	25-Sep-24	0.629433	1.727E+09	46.1633	1.35263	0.325161	Y	
	9/25/2024 15:07	25-Sep-24	0.6301274	1.727E+09	46.3951	1.31241	0.316076	Y	
	9/25/2024 15:08	25-Sep-24	0.6308219	1.727E+09	45.546	1.27989	0.650925	Y	
	9/25/2024 15:09	25-Sep-24	0.6315164	1.727E+09	45.4414	1.26231	0.25796	Y	
	9/25/2024 15:10	25-Sep-24	0.6322109	1.727E+09	42.4133	1.24599	0.264327	Y	
	9/25/2024 15:11	25-Sep-24	0.6329053	1.727E+09	43.2332	1.23126	0.718428	Y	
	9/25/2024 15:12	25-Sep-24	0.6335996	1.727E+09	46.0993	1.25004	0.295991	Y	
	9/25/2024 15:13	25-Sep-24	0.634294	1.727E+09	46.5255	1.25336	0.286093	Y	
	9/25/2024 15:14	25-Sep-24	0.6349886	1.727E+09	42.9551	1.23595	0.799951	Y	
	9/25/2024 15:15	25-Sep-24	0.635683	1.727E+09	46.1337	1.19325	0.208954	Y	
	9/25/2024 15:16	25-Sep-24	0.6363775	1.727E+09	44.4815	1.15485	0.252656	Y	
	9/25/2024 15:17	25-Sep-24	0.6370719	1.727E+09	40.7171	1.15053	0.626613	Y	
	9/25/2024 15:18	25-Sep-24	0.6377664	1.727E+09	38.7957	1.16898	0.275932	Y	
Drift Check									
	9/25/2024 15:19	25-Sep-24	0.6384607	1.727E+09	37.895	1.14626	0.271534	0	zero
	9/25/2024 15:20	25-Sep-24	0.6391552	1.727E+09	0.327544	-0.141314	-0.00833417	0	
	9/25/2024 15:21	25-Sep-24	0.6398497	1.727E+09	-0.258843	-0.202349	-0.0400603	0	
	9/25/2024 15:22	25-Sep-24	0.6405442	1.727E+09	-0.206846	-0.23364	-0.0542363	0	RCO and TO low
	9/25/2024 15:23	25-Sep-24	0.6412385	1.727E+09	30.781	2.60666	2.86685	0	
	9/25/2024 15:24	25-Sep-24	0.641933	1.727E+09	33.1012	3.2149	3.31347	0	
	9/25/2024 15:25	25-Sep-24	0.6426275	1.727E+09	37.9729	2.52585	2.4035	0	Inlet low
	9/25/2024 15:26	25-Sep-24	0.6433219	1.727E+09	64.682	1.25116	0.111783	0	
	9/25/2024 15:27	25-Sep-24	0.6440164	1.727E+09	55.9619	1.23046	0.394987	0	
	9/25/2024 15:28	25-Sep-24	0.6447109	1.727E+09	37.5206	1.23381	0.457777	0	
Run 2 - RCTO 2									
	9/25/2024 15:29	25-Sep-24	0.6454052	1.727E+09	34.4883	1.25594	0.109551	Y	
	9/25/2024 15:30	25-Sep-24	0.6460996	1.727E+09	32.687	1.29161	0.375952	Y	
	9/25/2024 15:31	25-Sep-24	0.6467941	1.727E+09	32.6921	1.34118	0.481354	Y	
	9/25/2024 15:32	25-Sep-24	0.6474886	1.727E+09	31.8838	1.36929	0.113568	Y	
	9/25/2024 15:33	25-Sep-24	0.648183	1.727E+09	33.0466	1.3418	0.332289	Y	
	9/25/2024 15:34	25-Sep-24	0.6488775	1.727E+09	34.3763	1.30538	0.542083	Y	
	9/25/2024 15:35	25-Sep-24	0.649572	1.727E+09	35.5298	1.30331	0.227989	Y	
	9/25/2024 15:36	25-Sep-24	0.6502663	1.727E+09	37.2401	1.28966	0.252709	Y	
	9/25/2024 15:37	25-Sep-24	0.6509608	1.727E+09	36.6546	1.26287	0.605385	Y	
	9/25/2024 15:38	25-Sep-24	0.6516553	1.727E+09	34.405	1.27444	0.273569	Y	
	9/25/2024 15:39	25-Sep-24	0.6523496	1.727E+09	34.422	1.28683	0.190313	Y	
	9/25/2024 15:40	25-Sep-24	0.6530441	1.727E+09	41.7413	1.24094	0.715461	Y	
FTIR Tripped - aborting run 2									
	9/25/2024 15:41	25-Sep-24	0.6537386	1.727E+09	39.1701	1.22975	0.253982		
	9/25/2024 15:42	25-Sep-24	0.654433	1.727E+09	33.9461	1.18436	78.1558		
	9/25/2024 15:43	25-Sep-24	0.6551275	1.727E+09	31.7837	1.16402	66.7409		
	9/25/2024 15:44	25-Sep-24	0.6558218	1.727E+09	31.8412	1.1296	67.148		
	9/25/2024 15:45	25-Sep-24	0.6565163	1.727E+09	32.6722	1.03297	84.007		
	9/25/2024 15:46	25-Sep-24	0.6572108	1.727E+09	31.6356	0.870933	80.6666		
	9/25/2024 15:47	25-Sep-24	0.6579053	1.727E+09	33.1977	0.726449	76.1257		
	9/25/2024 15:48	25-Sep-24	0.6585996	1.727E+09	22.3727	0.651083	72.5363		
	9/25/2024 15:49	25-Sep-24	0.6592941	1.727E+09	19.7311	0.620797	64.7798		
	9/25/2024 15:50	25-Sep-24	0.6599886	1.727E+09	19.0683	0.608917	57.5645		
	9/25/2024 15:51	25-Sep-24	0.660683	1.727E+09	19.5159	0.607013	51.3121		
	9/25/2024 15:52	25-Sep-24	0.6613775	1.727E+09	20.3695	0.601224	46.4229		
	9/25/2024 15:53	25-Sep-24	0.662072	1.727E+09	20.5185	0.613643	41.7056		
	9/25/2024 15:54	25-Sep-24	0.6627663	1.727E+09	21.0435	0.612317	37.8402		
	9/25/2024 15:55	25-Sep-24	0.6634607	1.727E+09	20.697	0.60507	41.8349		
	9/25/2024 15:56	25-Sep-24	0.6641552	1.727E+09	20.4467	0.592454	30.8779		
	9/25/2024 15:57	25-Sep-24	0.6648497	1.727E+09	19.8985	0.586731	27.4013		
	9/25/2024 15:58	25-Sep-24	0.6655442	1.727E+09	18.9385	0.599583	25.8262		
	9/25/2024 15:59	25-Sep-24	0.6662386	1.727E+09	19.3843	0.586547	25.9195		
	9/25/2024 16:00	25-Sep-24	0.666933	1.727E+09	21.5064	0.589579	26.0977		
	9/25/2024 16:01	25-Sep-24	0.6676275	1.727E+09	18.0837	0.585602	17.1533		
	9/25/2024 16:02	25-Sep-24	0.6683219	1.727E+09	17.664	0.582057	13.2894		
	9/25/2024 16:03	25-Sep-24	0.6690164	1.727E+09	17.4808	0.58295	11.5372		
	9/25/2024 16:04	25-Sep-24	0.6697108	1.727E+09	18.5507	0.579563	9.97239		
	9/25/2024 16:05	25-Sep-24	0.6704053	1.727E+09	17.8254	0.581729	8.16536		
	9/25/2024 16:06	25-Sep-24	0.6710997	1.727E+09	16.3772	0.563363	6.65835		
	9/25/2024 16:07	25-Sep-24	0.6717942	1.727E+09	15.8752	0.564597	6.18909		
	9/25/2024 16:08	25-Sep-24	0.6724886	1.727E+09	14.7171	0.579799	6.02509		
	9/25/2024 16:09	25-Sep-24	0.6731831	1.727E+09	13.9759	0.558152	5.97085		

RCTO 2
THC Raw Data

# NuWave - analyzer file								
# LabJack Voltage Ranges:		10	10	10				
# Channels:		AIN0	AIN1	AIN2				
# Client / Site / Source:		Microchip	Gresham	RCTO2				
Timestamp		Date	Time	Epoch Time	Inlet_CONC	RCO_CONC	TO_CONC	QAQC
	9/25/2024 16:10	25-Sep-24	0.6738775	1.727E+09	15.9371	0.561972	5.7338	
	9/25/2024 16:11	25-Sep-24	0.6745718	1.727E+09	10.0975	0.233045	21.6439	
	9/25/2024 16:12	25-Sep-24	0.6752663	1.727E+09	-0.289426	-0.227695	20.491	
	9/25/2024 16:13	25-Sep-24	0.6759608	1.727E+09	-0.376189	-0.267178	12.2648	
	9/25/2024 16:14	25-Sep-24	0.6766553	1.727E+09	-0.413072	-0.286211	8.07558	
	9/25/2024 16:15	25-Sep-24	0.6773498	1.727E+09	-0.45665	-0.294847	8.73538	
	9/25/2024 16:16	25-Sep-24	0.6780441	1.727E+09	-0.376582	-0.315586	5.76779	
	9/25/2024 16:17	25-Sep-24	0.6787385	1.727E+09	-0.456257	-0.316282	4.26285	
	9/25/2024 16:18	25-Sep-24	0.679433	1.727E+09	-0.456913	-0.319498	4.39959	
	9/25/2024 16:19	25-Sep-24	0.6801275	1.727E+09	-0.495241	-0.322162	3.9112	
	9/25/2024 16:20	25-Sep-24	0.680822	1.727E+09	-0.498522	-0.32572	2.94183	
	9/25/2024 16:21	25-Sep-24	0.6815163	1.727E+09	19.1593	0.204137	2.87107	
	9/25/2024 16:22	25-Sep-24	0.6822107	1.727E+09	37.1695	0.722104	3.11016	
	9/25/2024 16:23	25-Sep-24	0.6829052	1.727E+09	37.278	0.82857	1.66278	
	9/25/2024 16:24	25-Sep-24	0.6835996	1.727E+09	36.9081	0.898226	1.67935	
	9/25/2024 16:25	25-Sep-24	0.6842941	1.727E+09	45.734	0.923588	1.81558	
	9/25/2024 16:26	25-Sep-24	0.6849885	1.727E+09	50.0457	0.943188	1.10211	
	9/25/2024 16:27	25-Sep-24	0.685683	1.727E+09	45.8322	0.970638	1.18106	
	9/25/2024 16:28	25-Sep-24	0.6863775	1.727E+09	51.3699	1.01655	1.08902	
	9/25/2024 16:29	25-Sep-24	0.687072	1.727E+09	50.3803	0.998942	0.813539	
	9/25/2024 16:30	25-Sep-24	0.6877663	1.727E+09	46.7282	0.940313	0.929102	
	9/25/2024 16:31	25-Sep-24	0.6884607	1.727E+09	45.1633	0.893434	0.998075	
	9/25/2024 16:32	25-Sep-24	0.6891552	1.727E+09	44.3485	0.888367	0.450202	
	9/25/2024 16:33	25-Sep-24	0.6898497	1.727E+09	40.2587	0.901718	0.394869	
	9/25/2024 16:34	25-Sep-24	0.6905441	1.727E+09	40.2265	0.926306	0.898422	
	9/25/2024 16:35	25-Sep-24	0.6912386	1.727E+09	40.2273	0.918639	0.292171	
Normal function returned, drift check								
	9/25/2024 16:36	25-Sep-24	0.6919329	1.727E+09	39.7141	0.92431	0.279424	
	9/25/2024 16:37	25-Sep-24	0.6926274	1.727E+09	37.1402	0.870841	0.769101	zero
	9/25/2024 16:38	25-Sep-24	0.6933219	1.727E+09	1.06715	-0.190562	-0.0776529	
	9/25/2024 16:39	25-Sep-24	0.6940163	1.727E+09	-0.237973	-0.243866	-0.153416	
	9/25/2024 16:40	25-Sep-24	0.6947108	1.727E+09	0.421327	-0.217598	-0.0789695	RCO and TO low
	9/25/2024 16:41	25-Sep-24	0.6954052	1.727E+09	36.9481	2.61999	3.27289	
	9/25/2024 16:42	25-Sep-24	0.6960997	1.727E+09	36.5857	3.19637	3.42676	Inlet low
	9/25/2024 16:43	25-Sep-24	0.6967942	1.727E+09	41.518	2.30617	2.28044	
	9/25/2024 16:44	25-Sep-24	0.6974886	1.727E+09	63.4652	1.05149	0.324334	
	9/25/2024 16:45	25-Sep-24	0.698183	1.727E+09	52.8173	1.00213	0.230877	
	9/25/2024 16:46	25-Sep-24	0.6988774	1.727E+09	33.6386	1.00154	0.744867	
	9/25/2024 16:47	25-Sep-24	0.699572	1.727E+09	33.3179	1.02869	0.197021	
	9/25/2024 16:48	25-Sep-24	0.7002664	1.727E+09	32.9343	1.03326	0.16155	
	9/25/2024 16:49	25-Sep-24	0.7009607	1.727E+09	32.9822	1.02125	0.698343	
Restart RCTO 2 - Run 2								
	9/25/2024 16:50	25-Sep-24	0.7016552	1.727E+09	33.7406	1.00442	0.185547	Y
	9/25/2024 16:51	25-Sep-24	0.7023496	1.727E+09	33.6539	0.968367	0.172971	Y
	9/25/2024 16:52	25-Sep-24	0.7030442	1.727E+09	33.1735	0.945092	0.564611	Y
	9/25/2024 16:53	25-Sep-24	0.7037385	1.727E+09	30.9165	0.952929	0.208534	Y
	9/25/2024 16:54	25-Sep-24	0.704433	1.727E+09	33.5546	0.960871	0.201865	Y
	9/25/2024 16:55	25-Sep-24	0.7051274	1.727E+09	37.121	0.967277	0.368312	Y
	9/25/2024 16:56	25-Sep-24	0.7058219	1.727E+09	36.222	0.962328	0.397009	Y
	9/25/2024 16:57	25-Sep-24	0.7065164	1.727E+09	31.3509	0.954806	0.282482	Y
	9/25/2024 16:58	25-Sep-24	0.7072107	1.727E+09	30.6874	0.971675	0.204228	Y
	9/25/2024 16:59	25-Sep-24	0.7079052	1.727E+09	31.542	0.983674	0.310313	Y
	9/25/2024 17:00	25-Sep-24	0.7085997	1.727E+09	32.6957	1.00251	0.590262	Y
	9/25/2024 17:01	25-Sep-24	0.7092942	1.727E+09	35.5672	0.998128	0.241038	Y
	9/25/2024 17:02	25-Sep-24	0.7099887	1.727E+09	34.3851	1.00061	0.240671	Y
	9/25/2024 17:03	25-Sep-24	0.7106829	1.727E+09	35.7041	0.992693	0.56637	Y
	9/25/2024 17:04	25-Sep-24	0.7113774	1.727E+09	47.5293	1.00813	0.360501	Y
	9/25/2024 17:05	25-Sep-24	0.712072	1.727E+09	45.8655	1.01069	0.148094	Y
	9/25/2024 17:06	25-Sep-24	0.7127664	1.727E+09	43.6723	1.02773	0.501007	Y
	9/25/2024 17:07	25-Sep-24	0.7134607	1.727E+09	41.6364	1.05735	0.506271	Y
	9/25/2024 17:08	25-Sep-24	0.7141553	1.727E+09	41.0112	1.05153	0.135347	Y
	9/25/2024 17:09	25-Sep-24	0.7148497	1.727E+09	38.658	1.03313	0.473517	Y
	9/25/2024 17:10	25-Sep-24	0.715544	1.727E+09	38.8002	1.01057	0.68616	Y
	9/25/2024 17:11	25-Sep-24	0.7162387	1.727E+09	37.769	1.00137	0.133837	Y
	9/25/2024 17:12	25-Sep-24	0.716933	1.727E+09	32.5523	1.01059	0.513399	Y
	9/25/2024 17:13	25-Sep-24	0.7176275	1.727E+09	32.107	1.02616	0.645701	Y
	9/25/2024 17:14	25-Sep-24	0.718322	1.727E+09	32.9469	1.04442	0.126302	Y
	9/25/2024 17:15	25-Sep-24	0.7190164	1.727E+09	32.1669	1.03924	0.663174	Y
	9/25/2024 17:16	25-Sep-24	0.7197107	1.727E+09	29.9638	1.02967	0.500547	Y
	9/25/2024 17:17	25-Sep-24	0.7204052	1.727E+09	30.499	1.01045	0.15093	Y
	9/25/2024 17:18	25-Sep-24	0.7210997	1.727E+09	31.2624	0.969365	0.468647	Y
	9/25/2024 17:19	25-Sep-24	0.7217941	1.727E+09	29.2614	0.983372	0.433412	Y
	9/25/2024 17:20	25-Sep-24	0.7224886	1.727E+09	25.2558	0.990999	0.218511	Y
	9/25/2024 17:21	25-Sep-24	0.7231831	1.727E+09	24.6898	0.989936	0.293654	Y

RCTO 2
THC Raw Data

# NuWave - analyzer file								
# LabJack Voltage Ranges:		10	10	10				
# Channels:		AIN0	AIN1	AIN2				
# Client / Site / Source:		Microchip	Gresham	RCTO2				
Timestamp		Date	Time	Epoch Time	Inlet_CONC	RCO_CONC	TO_CONC	QAQC
	9/25/2024 17:22	25-Sep-24	0.7238775	1.727E+09	23.8379	0.976152	0.557338	Y
	9/25/2024 17:23	25-Sep-24	0.7245718	1.727E+09	23.5488	0.952246	0.267084	Y
	9/25/2024 17:24	25-Sep-24	0.7252663	1.727E+09	23.239	0.938055	0.199699	Y
	9/25/2024 17:25	25-Sep-24	0.7259608	1.727E+09	22.4257	0.957812	0.405791	Y
	9/25/2024 17:26	25-Sep-24	0.7266552	1.727E+09	22.1133	0.968078	0.416215	Y
	9/25/2024 17:27	25-Sep-24	0.7273497	1.727E+09	21.4722	0.966372	0.223381	Y
	9/25/2024 17:28	25-Sep-24	0.7280442	1.727E+09	20.4102	0.965938	0.261898	Y
	9/25/2024 17:29	25-Sep-24	0.7287386	1.727E+09	20.6609	0.954005	0.493616	Y
	9/25/2024 17:30	25-Sep-24	0.7294331	1.727E+09	21.127	0.95495	0.398702	Y
	9/25/2024 17:31	25-Sep-24	0.7301274	1.727E+09	24.2129	0.965033	0.176739	Y
	9/25/2024 17:32	25-Sep-24	0.7308218	1.727E+09	26.1151	0.987258	0.3963	Y
	9/25/2024 17:33	25-Sep-24	0.7315163	1.727E+09	28.5627	1.02148	0.592139	Y
	9/25/2024 17:34	25-Sep-24	0.7322108	1.727E+09	30.8994	1.0413	0.189761	Y
	9/25/2024 17:35	25-Sep-24	0.7329052	1.727E+09	31.3281	1.03063	0.350208	Y
	9/25/2024 17:36	25-Sep-24	0.7335997	1.727E+09	42.0194	1.04184	0.745327	Y
	9/25/2024 17:37	25-Sep-24	0.7342941	1.727E+09	39.8508	1.03314	0.272729	Y
	9/25/2024 17:38	25-Sep-24	0.7349885	1.727E+09	39.7392	1.04053	0.312361	Y
	9/25/2024 17:39	25-Sep-24	0.735683	1.727E+09	38.9316	1.06012	0.743056	Y
	9/25/2024 17:40	25-Sep-24	0.7363774	1.727E+09	39.5822	1.09328	0.452106	Y
	9/25/2024 17:41	25-Sep-24	0.7370718	1.727E+09	36.8807	1.10679	0.30157	Y
	9/25/2024 17:42	25-Sep-24	0.7377663	1.727E+09	37.0597	1.07059	0.908531	Y
	9/25/2024 17:43	25-Sep-24	0.7384607	1.727E+09	36.8191	1.05605	0.338643	Y
	9/25/2024 17:44	25-Sep-24	0.7391552	1.727E+09	39.6719	1.00339	0.306021	Y
	9/25/2024 17:45	25-Sep-24	0.7398496	1.727E+09	37.7645	0.997222	0.81518	Y
	9/25/2024 17:46	25-Sep-24	0.7405442	1.727E+09	36.7431	1.00976	0.486645	Y
	9/25/2024 17:47	25-Sep-24	0.7412387	1.727E+09	35.7561	1.01439	0.319214	Y
	9/25/2024 17:48	25-Sep-24	0.741933	1.727E+09	35.3005	0.985341	0.866128	Y
	9/25/2024 17:49	25-Sep-24	0.7426274	1.727E+09	32.8426	0.973657	0.496373	Y
	9/25/2024 17:50	25-Sep-24	0.7433219	1.727E+09	34.6882	0.984488	0.290871	Y
	9/25/2024 17:51	25-Sep-24	0.7440164	1.727E+09	37.6309	0.99348	0.666442	Y
	9/25/2024 17:52	25-Sep-24	0.7447109	1.727E+09	38.3368	1.01107	0.603403	Y
	9/25/2024 17:53	25-Sep-24	0.7454052	1.727E+09	37.5292	1.02566	0.404295	Y
	9/25/2024 17:54	25-Sep-24	0.7460997	1.727E+09	36.8736	1.0134	0.367747	Y
	9/25/2024 17:55	25-Sep-24	0.7467941	1.727E+09	36.3823	1.00854	0.585707	Y
	9/25/2024 17:56	25-Sep-24	0.7474886	1.727E+09	37.6611	1.00707	0.528969	Y
	9/25/2024 17:57	25-Sep-24	0.748183	1.727E+09	36.7045	1.02064	0.233503	Y
	9/25/2024 17:58	25-Sep-24	0.7488775	1.727E+09	36.5553	1.04544	0.406001	Y
FID Computer crash - data on new file								
Drift Check								
	9/25/2024 18:06	25-Sep-24	0.7544099	1.727E+09	44.3314	1.18353	0.417961	
	9/25/2024 18:07	25-Sep-24	0.7551043	1.727E+09	1.08502	0.07322	-0.0505512	
	9/25/2024 18:08	25-Sep-24	0.7557988	1.727E+09	-0.386558	-0.182621	-0.107632	zero
	9/25/2024 18:09	25-Sep-24	0.7564931	1.727E+09	4.40204	-0.060795	0.153022	
	9/25/2024 18:10	25-Sep-24	0.7571877	1.727E+09	40.2996	2.93625	3.38626	
	9/25/2024 18:11	25-Sep-24	0.7578821	1.727E+09	41.5497	3.2047	3.38797	RCO and TO low
	9/25/2024 18:12	25-Sep-24	0.7585765	1.727E+09	42.5759	2.42398	2.19598	
	9/25/2024 18:13	25-Sep-24	0.7592709	1.727E+09	67.4778	1.05584	0.154264	inlet low
	9/25/2024 18:14	25-Sep-24	0.7599655	1.727E+09	58.2813	1.02818	0.487078	
	9/25/2024 18:15	25-Sep-24	0.7606598	1.727E+09	47.0218	1.00392	0.333471	
	9/25/2024 18:16	25-Sep-24	0.7613542	1.727E+09	51.2203	1.01687	0.128914	
	9/25/2024 18:17	25-Sep-24	0.7620488	1.727E+09	47.9152	1.02954	0.192571	
RCTO 2 - Run 3								
	9/25/2024 18:18	25-Sep-24	0.7627431	1.727E+09	54.4912	1.06151	0.343868	Y
	9/25/2024 18:19	25-Sep-24	0.7634375	1.727E+09	58.829	1.08402	0.540941	Y
	9/25/2024 18:20	25-Sep-24	0.7641321	1.727E+09	59.3112	1.08451	0.104549	Y
	9/25/2024 18:21	25-Sep-24	0.7648264	1.727E+09	58.3006	1.0932	0.326145	Y
	9/25/2024 18:22	25-Sep-24	0.7655209	1.727E+09	56.2962	1.09781	0.590446	Y
	9/25/2024 18:23	25-Sep-24	0.7662154	1.727E+09	51.6365	1.13147	0.105468	Y
	9/25/2024 18:24	25-Sep-24	0.7669098	1.727E+09	46.9429	1.15029	0.305863	Y
	9/25/2024 18:25	25-Sep-24	0.7676043	1.727E+09	45.6164	1.19697	0.62442	Y
	9/25/2024 18:26	25-Sep-24	0.7682987	1.727E+09	49.1076	1.23592	0.100138	Y
	9/25/2024 18:27	25-Sep-24	0.7689931	1.727E+09	49.6207	1.22371	0.285843	Y
	9/25/2024 18:28	25-Sep-24	0.7696876	1.727E+09	51.0646	1.19264	0.576649	Y
	9/25/2024 18:29	25-Sep-24	0.7703822	1.727E+09	52.1067	1.19485	0.185705	Y
	9/25/2024 18:30	25-Sep-24	0.7710764	1.727E+09	49.6148	1.20083	0.265128	Y
	9/25/2024 18:31	25-Sep-24	0.771771	1.727E+09	48.9869	1.19764	0.623226	Y
	9/25/2024 18:32	25-Sep-24	0.7724653	1.727E+09	49.9505	1.20988	0.175938	Y
	9/25/2024 18:33	25-Sep-24	0.7731598	1.727E+09	49.353	1.21438	0.125711	Y
	9/25/2024 18:34	25-Sep-24	0.7738542	1.727E+09	51.2404	1.2048	0.576176	Y
	9/25/2024 18:35	25-Sep-24	0.7745487	1.727E+09	52.0683	1.18759	0.180388	Y
	9/25/2024 18:36	25-Sep-24	0.7752432	1.727E+09	48.2655	1.1301	0.0909489	Y
	9/25/2024 18:37	25-Sep-24	0.7759376	1.727E+09	46.0756	1.113	0.498946	Y
	9/25/2024 18:38	25-Sep-24	0.776632	1.727E+09	43.366	1.12241	0.231521	Y
	9/25/2024 18:39	25-Sep-24	0.7773265	1.727E+09	42.4395	1.14637	0.0950316	Y

RCTO 2
THC Raw Data

# NuWave - analyzer file								
# LabJack Voltage Ranges:		10	10	10				
# Channels:		AIN0	AIN1	AIN2				
# Client / Site / Source:		Microchip	Gresham	RCTO2				
Timestamp		Date	Time	Epoch Time	Inlet_CONC	RCO_CONC	TO_CONC	QAQC
	9/25/2024 18:40	25-Sep-24	0.778021	1.727E+09	39.188	1.14079	0.25158	Y
	9/25/2024 18:41	25-Sep-24	0.7787153	1.727E+09	35.7115	1.13127	0.397508	Y
	9/25/2024 18:42	25-Sep-24	0.7794098	1.727E+09	32.2484	1.11683	0.123414	Y
	9/25/2024 18:43	25-Sep-24	0.7801044	1.727E+09	36.9652	1.12618	0.161931	Y
	9/25/2024 18:44	25-Sep-24	0.7807987	1.727E+09	33.5512	1.1507	0.441682	Y
	9/25/2024 18:45	25-Sep-24	0.7814932	1.727E+09	32.4746	1.19393	0.218997	Y
	9/25/2024 18:46	25-Sep-24	0.7821876	1.727E+09	36.9729	1.18232	0.0733578	Y
	9/25/2024 18:47	25-Sep-24	0.782882	1.727E+09	38.7735	1.18404	0.473425	Y
Probe out of stack								
	9/25/2024 18:48	25-Sep-24	0.7835764	1.727E+09	35.2098	1.18052	0.473347	0
	9/25/2024 18:49	25-Sep-24	0.7842709	1.727E+09	32.6859	1.22404	0.625234	0
	9/25/2024 18:50	25-Sep-24	0.7849653	1.727E+09	32.9056	1.2496	0.613971	0
	9/25/2024 18:51	25-Sep-24	0.7856598	1.727E+09	33.107	1.27859	0.60658	0
	9/25/2024 18:52	25-Sep-24	0.7863544	1.727E+09	31.3511	1.31269	0.612816	0
	9/25/2024 18:53	25-Sep-24	0.7870487	1.727E+09	31.2231	1.29643	0.618421	0
	9/25/2024 18:54	25-Sep-24	0.7877431	1.727E+09	31.2131	1.26327	0.659406	0
Probe back in stack								
	9/25/2024 18:55	25-Sep-24	0.7884376	1.727E+09	33.0548	1.22987	0.506376	Y
	9/25/2024 18:56	25-Sep-24	0.789132	1.727E+09	33.5416	1.22201	0.3503	Y
	9/25/2024 18:57	25-Sep-24	0.7898265	1.727E+09	32.9355	1.20947	0.75579	Y
	9/25/2024 18:58	25-Sep-24	0.7905209	1.727E+09	37.3123	1.23229	0.528575	Y
	9/25/2024 18:59	25-Sep-24	0.7912153	1.727E+09	37.8076	1.24976	0.398847	Y
	9/25/2024 19:00	25-Sep-24	0.7919098	1.727E+09	35.8652	1.2404	0.731477	Y
	9/25/2024 19:01	25-Sep-24	0.7926044	1.727E+09	37.2631	1.21202	0.571503	Y
	9/25/2024 19:02	25-Sep-24	0.7932987	1.727E+09	42.2758	1.16698	0.288456	Y
	9/25/2024 19:03	25-Sep-24	0.7939931	1.727E+09	35.3991	1.13493	0.616911	Y
	9/25/2024 19:04	25-Sep-24	0.7946876	1.727E+09	33.0787	1.13418	0.577318	Y
	9/25/2024 19:05	25-Sep-24	0.7953822	1.727E+09	34.9624	1.14864	0.33242	Y
	9/25/2024 19:06	25-Sep-24	0.7960764	1.727E+09	34.1413	1.13068	0.418709	Y
	9/25/2024 19:07	25-Sep-24	0.7967709	1.727E+09	34.5371	1.11057	0.679964	Y
	9/25/2024 19:08	25-Sep-24	0.7974655	1.727E+09	32.7957	1.09555	0.402536	Y
	9/25/2024 19:09	25-Sep-24	0.7981598	1.727E+09	33.8865	1.09359	0.284005	Y
	9/25/2024 19:10	25-Sep-24	0.7988543	1.727E+09	31.025	1.10802	0.542346	Y
	9/25/2024 19:11	25-Sep-24	0.7995487	1.727E+09	31.8758	1.14592	0.601815	Y
	9/25/2024 19:12	25-Sep-24	0.8002431	1.727E+09	30.4163	1.13312	0.262436	Y
	9/25/2024 19:13	25-Sep-24	0.8009376	1.727E+09	31.0907	1.12855	0.493826	Y
	9/25/2024 19:14	25-Sep-24	0.8016321	1.727E+09	32.0033	1.11415	0.692133	Y
	9/25/2024 19:15	25-Sep-24	0.8023264	1.727E+09	32.9895	1.12091	0.269657	Y
	9/25/2024 19:16	25-Sep-24	0.803021	1.727E+09	33.8653	1.12383	0.344393	Y
	9/25/2024 19:17	25-Sep-24	0.8037155	1.727E+09	35.9739	1.14526	0.677246	Y
	9/25/2024 19:18	25-Sep-24	0.8044099	1.727E+09	37.6835	1.19771	0.340507	Y
	9/25/2024 19:19	25-Sep-24	0.8051042	1.727E+09	36.6654	1.19356	0.281314	Y
	9/25/2024 19:20	25-Sep-24	0.8057987	1.727E+09	35.2788	1.16713	0.558926	Y
	9/25/2024 19:21	25-Sep-24	0.8064931	1.727E+09	33.9419	1.13342	0.586494	Y
	9/25/2024 19:22	25-Sep-24	0.8071876	1.727E+09	33.589	1.12318	0.212407	Y
	9/25/2024 19:23	25-Sep-24	0.8078821	1.727E+09	33.1713	1.11498	0.564085	Y
	9/25/2024 19:24	25-Sep-24	0.8085765	1.727E+09	34.9733	1.10324	0.646698	Y
	9/25/2024 19:25	25-Sep-24	0.8092709	1.727E+09	38.7331	1.14597	0.202062	Y
	9/25/2024 19:26	25-Sep-24	0.8099653	1.727E+09	38.2172	1.13752	0.512165	Y
	9/25/2024 19:27	25-Sep-24	0.8106598	1.727E+09	39.3313	1.12589	0.673636	Y
	9/25/2024 19:28	25-Sep-24	0.8113542	1.727E+09	38.5953	1.09966	0.25708	Y
	9/25/2024 19:29	25-Sep-24	0.8120487	1.727E+09	37.0501	1.06202	0.405752	Y
FTIR and FID post QA/QC								
	9/25/2024 19:30	25-Sep-24	0.8127431	1.727E+09	39.1162	1.18227	0.749265	0
	9/25/2024 19:31	25-Sep-24	0.8134377	1.727E+09	7.74826	0.122237	-0.105215	0
	9/25/2024 19:32	25-Sep-24	0.8141321	1.727E+09	-0.310034	-0.151867	-0.161068	0
	9/25/2024 19:33	25-Sep-24	0.8148265	1.727E+09	-0.438012	-0.21852	-0.170755	0
	9/25/2024 19:34	25-Sep-24	0.815521	1.727E+09	33.5001	2.11103	2.60901	0
	9/25/2024 19:35	25-Sep-24	0.8162153	1.727E+09	40.9264	3.20225	3.42047	0
	9/25/2024 19:36	25-Sep-24	0.8169098	1.727E+09	41.3392	2.44824	2.31844	0
	9/25/2024 19:37	25-Sep-24	0.8176042	1.727E+09	66.8922	1.14823	0.627873	0
	9/25/2024 19:38	25-Sep-24	0.8182987	1.727E+09	67.0961	1.14315	0.339588	0
	9/25/2024 19:39	25-Sep-24	0.8189932	1.727E+09	46.8241	1.13589	0.380035	0
	9/25/2024 19:40	25-Sep-24	0.8196876	1.727E+09	43.6174	1.1387	0.558782	0
	9/25/2024 19:41	25-Sep-24	0.820382	1.727E+09	40.3008	1.1682	0.48952	0

zero
RCO and TO low
inlet low

RCTO 3
THC Raw Data

NuWave - analyzer file
LabJack Voltage Ranges: 10 10 10
Channels: AIN0 AIN1 AIN2
Client / Site / Source: Microchip Gresham RCTO2

Timestamp	Date	Time	Epoch Time	Inlet_V	RCO_V	TO_V	Inlet_CONC	RCO_CONC	TO_CONC	QAQC	
9/25/2024 9:02	25-Sep-24	0.376655	1727280000	0.011308	0.093665	0.119561	1.13082	0.93665	1.19561	0	
9/25/2024 9:03	25-Sep-24	0.37735	1727280000	0.010506	0.118484	0.117154	1.05061	1.18484	1.17154	0	
9/25/2024 9:04	25-Sep-24	0.378044	1727280000	0.009976	0.121223	0.113208	0.997576	1.21223	1.13208	0	
9/25/2024 9:05	25-Sep-24	0.378739	1727280000	0.01015	0.120237	0.109389	1.01504	1.20237	1.09389	0	
9/25/2024 9:06	25-Sep-24	0.379433	1727280000	0.010404	0.117921	0.106278	1.04037	1.17921	1.06278	0	
9/25/2024 9:07	25-Sep-24	0.380127	1727280000	0.010212	0.115693	0.104615	1.02121	1.15693	1.04615	0	
9/25/2024 9:08	25-Sep-24	0.380822	1727280000	0.010497	0.112384	0.102474	1.04969	1.12384	1.02474	0	
9/25/2024 9:09	25-Sep-24	0.381516	1727280000	0.010882	0.110097	0.101199	1.08816	1.10097	1.01199	0	
9/25/2024 9:10	25-Sep-24	0.382211	1727280000	0.01023	0.109177	0.0995	1.02304	1.09177	0.995003	0	
9/25/2024 9:11	25-Sep-24	0.382905	1727280000	0.010077	0.107389	0.098731	1.00768	1.07389	0.98731	0	
9/25/2024 9:12	25-Sep-24	0.3836	1727280000	0.01074	0.105708	0.097536	1.07398	1.05708	0.975364	0	
9/25/2024 9:13	25-Sep-24	0.384294	1727280000	0.010868	0.105485	0.096313	1.08684	1.05485	0.963129	0	
9/25/2024 9:14	25-Sep-24	0.384989	1727280000	0.010765	0.104312	0.095901	1.07647	1.04312	0.959007	0	
9/25/2024 9:15	25-Sep-24	0.385683	1727280000	0.009612	0.103831	0.095482	0.961212	1.03831	0.954819	0	
9/25/2024 9:16	25-Sep-24	0.386377	1727280000	0.010904	0.102046	0.094887	1.09039	1.02046	0.948872	0	
9/25/2024 9:17	25-Sep-24	0.387072	1727280000	0.010731	0.101248	0.093936	1.07306	1.01248	0.939355	0	
9/25/2024 9:18	25-Sep-24	0.387766	1727280000	0.0109	0.10028	0.093064	1.09	1.0028	0.930638	0	
9/25/2024 9:19	25-Sep-24	0.388461	1727280000	0.009275	0.100556	0.092885	0.927474	1.00556	0.928853	0	
Cal Error											
9/25/2024 9:20	25-Sep-24	0.389155	1727280000	0.010778	0.098932	0.092562	1.07779	0.989319	0.925623	0	
9/25/2024 9:21	25-Sep-24	0.38985	1727280000	0.225277	0.099569	0.090959	22.5277	0.995686	0.909594	0	
9/25/2024 9:22	25-Sep-24	0.390544	1727280000	0.651873	0.097353	0.058573	65.1873	0.973526	0.585733	0	
9/25/2024 9:23	25-Sep-24	0.391239	1727280000	0.523005	0.097946	0.047366	52.3005	0.97946	0.473662	0	
9/25/2024 9:24	25-Sep-24	0.391933	1727280000	0.458015	0.122352	0.033717	45.8015	1.22352	0.337173	0	
9/25/2024 9:25	25-Sep-24	0.392627	1727280000	0.654076	0.142218	0.03403	65.4076	1.42218	0.340297	0	
9/25/2024 9:26	25-Sep-24	0.393322	1727280000	0.528496	0.143161	0.047306	52.8496	1.43161	0.473058	0	
9/25/2024 9:27	25-Sep-24	0.394016	1727280000	0.423867	0.14568	0.044495	42.3867	1.4568	0.444951	0	
9/25/2024 9:28	25-Sep-24	0.394711	1727280000	0.400343	0.145308	0.037816	40.0343	1.45308	0.378157	0	
9/25/2024 9:29	25-Sep-24	0.395405	1727280000	0.035961	0.138856	0.033766	3.59608	1.38856	0.337658	0	
9/25/2024 9:30	25-Sep-24	0.3961	1727280000	-0.001677	0.141502	0.035722	-0.167737	1.41502	0.357219	0	
9/25/2024 9:31	25-Sep-24	0.396794	1727280000	0.000389	0.150096	0.03391	0.0388595	1.50096	0.339102	0	
9/25/2024 9:32	25-Sep-24	0.397489	1727280000	0.287948	0.288624	0.252054	28.7948	2.88624	2.52054	0	
9/25/2024 9:33	25-Sep-24	0.398183	1727280000	0.326287	0.380839	0.37163	32.6287	3.80839	3.7163	0	
9/25/2024 9:34	25-Sep-24	0.398877	1727280000	0.312384	0.316097	0.263471	31.2384	3.16097	2.63471	0	
9/25/2024 9:35	25-Sep-24	0.399572	1727280000	0.293273	0.1642	0.03498	29.3273	1.642	0.349801	0	
9/25/2024 9:36	25-Sep-24	0.400266	1727280000	0.278082	0.122348	0.089823	27.8082	1.22348	0.898226	0	
9/25/2024 9:37	25-Sep-24	0.400961	1727280000	0.274569	0.006388	0.003569	27.4569	0.0638817	0.0356943	0	
9/25/2024 9:38	25-Sep-24	0.401655	1727280000	0.265642	-0.006278	0.002876	26.5642	-0.0627812	0.0287629	0	
9/25/2024 9:39	25-Sep-24	0.40235	1727280000	0.26209	0.083355	0.047227	26.209	0.833547	0.47227	0	RCO and TO low
9/25/2024 9:40	25-Sep-24	0.403044	1727280000	0.262443	0.240576	0.256908	26.2443	2.40576	2.56908	0	
9/25/2024 9:41	25-Sep-24	0.403739	1727280000	0.284255	0.342848	0.365991	28.4255	3.42848	3.65991	0	
9/25/2024 9:42	25-Sep-24	0.404433	1727280000	0.284647	0.200516	0.13593	28.4647	2.00516	1.3593	0	
9/25/2024 9:43	25-Sep-24	0.405128	1727280000	0.300654	0.124195	0.042375	30.0654	1.24195	0.42375	0	
9/25/2024 9:44	25-Sep-24	0.405822	1727280000	0.333893	0.119679	0.0371	33.3893	1.19679	0.371003	0	
9/25/2024 9:45	25-Sep-24	0.406516	1727280000	0.287056	0.116544	0.038447	28.7056	1.16544	0.384472	0	
9/25/2024 9:46	25-Sep-24	0.407211	1727280000	0.268176	0.113025	0.056356	26.8176	1.13025	0.56356	0	
9/25/2024 9:47	25-Sep-24	0.407905	1727280000	0.11419	0.26449	0.231409	11.419	2.6449	2.31409	0	
9/25/2024 9:48	25-Sep-24	0.4086	1727280000	0.242473	0.611147	0.631487	24.2473	6.11147	6.31487	0	
9/25/2024 9:49	25-Sep-24	0.409294	1727280000	0.227313	0.622408	0.632501	22.7313	6.22408	6.32501	0	RCO and TO mid
9/25/2024 9:50	25-Sep-24	0.409989	1727280000	0.241096	0.320444	0.265008	24.1096	3.20444	2.65008	0	
9/25/2024 9:51	25-Sep-24	0.410683	1727280000	0.253892	0.131926	0.040468	25.3892	1.31926	0.404675	0	
9/25/2024 9:52	25-Sep-24	0.411377	1727280000	0.273629	0.120727	0.045406	27.3629	1.20727	0.454062	0	
9/25/2024 9:53	25-Sep-24	0.412072	1727280000	0.282599	0.115842	0.036998	28.2599	1.15842	0.369979	0	
9/25/2024 9:54	25-Sep-24	0.412766	1727280000	0.281613	0.116522	0.041259	28.1613	1.16522	0.412591	0	
9/25/2024 9:55	25-Sep-24	0.413461	1727280000	0.265921	0.99039	1.00921	26.5921	9.9039	10.0921	0	
9/25/2024 9:56	25-Sep-24	0.414155	1727280000	0.238621	1.04168	1.04634	23.8621	10.4168	10.4634	0	
9/25/2024 9:57	25-Sep-24	0.41485	1727280000	0.235597	1.0466	1.04697	23.5597	10.466	10.4697	0	
9/25/2024 9:58	25-Sep-24	0.415544	1727280000	0.245137	1.04857	1.03937	24.5137	10.4857	10.3937	0	
9/25/2024 9:59	25-Sep-24	0.416239	1727280000	0.630596	0.337179	0.090543	63.0596	3.37179	0.905433	0	
9/25/2024 10:00	25-Sep-24	0.416933	1727280000	1.7537	0.114707	0.03466	175.37	1.14707	0.346598	0	
9/25/2024 10:01	25-Sep-24	0.417628	1727280000	1.84772	0.105132	0.036101	184.772	1.05132	0.361013	0	
9/25/2024 10:02	25-Sep-24	0.418322	1727280000	1.89151	0.101097	0.045536	189.151	1.01097	0.455362	0	TO cal error mid
9/25/2024 10:03	25-Sep-24	0.419016	1727280000	0.82868	0.104594	0.037208	82.868	1.04594	0.372079	0	
9/25/2024 10:04	25-Sep-24	0.419711	1727280000	0.514144	0.462837	0.789939	51.4144	4.62837	7.89939	0	
9/25/2024 10:05	25-Sep-24	0.420405	1727280000	0.515561	0.61243	0.616506	51.5561	6.1243	6.16506	0	
9/25/2024 10:06	25-Sep-24	0.4211	1727280000	0.787435	0.201697	0.117938	78.7435	2.01697	1.17938	0	Inlet mid
9/25/2024 10:07	25-Sep-24	0.421794	1727280000	1.13726	0.118071	0.030219	113.726	1.18071	0.302187	0	TO low
9/25/2024 10:08	25-Sep-24	0.422489	1727280000	0.735566	0.298091	0.336325	73.5566	2.98091	3.36325	0	
9/25/2024 10:09	25-Sep-24	0.423183	1727280000	0.519974	0.117182	0.354256	51.9974	1.17182	3.54256	0	Inlet low
9/25/2024 10:10	25-Sep-24	0.423877	1727280000	0.659746	0.111319	0.227664	65.9746	1.11319	2.27664	0	
9/25/2024 10:11	25-Sep-24	0.424572	1727280000	0.676476	0.108938	0.050023	67.6476	1.08938	0.500232	0	
9/25/2024 10:12	25-Sep-24	0.425266	1727280000	0.605039	0.108927	0.030781	60.5039	1.08927	0.307806	0	TO and inlet zero
9/25/2024 10:13	25-Sep-24	0.425961	1727280000	0.336688	0.10705	0.034575	33.6688	1.0705	0.345749	0	
9/25/2024 10:14	25-Sep-24	0.426655	1727280000	0.001742	0.105599	-0.009739	0.174209	1.05599	-0.0973943	0	
9/25/2024 10:15	25-Sep-24	0.42735	1727280000	0.199199	0.10703	0.009668	19.9199	1.0703	0.0966781	0	
9/25/2024 10:16	25-Sep-24	0.428044	1727280000	0.467086	0.109706	0.02319	46.7086	1.09706	0.231901	0	
9/25/2024 10:17	25-Sep-24	0.428739	1727280000	0.465679	0.106908	0.023621	46.5679	1.06908	0.236207	0	
9/25/2024 10:18	25-Sep-24	0.429433	1727280000	0.459908	0.108032	0.032047	45.9908	1.08032	0.320474	0	
Run 1 - RCTO 3											
9/25/2024 10:19	25-Sep-24	0.430127	1727280000	0.435696	0.108505	0.020155	43.5696	1.08505	0.20155	0	Y
9/25/2024 10:20	25-Sep-24	0.430822	1727280000	0.416689	0.104498	0.021536	41.6689	1.04498	0.21536	0	Y
9/25/2024 10:21	25-Sep-24	0.431516	1727280000	0.413713	0.103045	0.025333	41.3713	1.03045	0.253326	0	Y

RCTO 3
THC Raw Data

NuWave - analyzer file
LabJack Voltage Ranges: 10 10 10
Channels: AIN0 AIN1 AIN2
Client / Site / Source: Microchip Gresham RCTO2

Timestamp	Date	Time	Epoch Time	Inlet_V	RCO_V	TO_V	Inlet_CONC	RCO_CONC	TO_CONC	QAQC	
9/25/2024 10:22	25-Sep-24	0.432211	1727280000	0.38117	0.107651	0.018651	38.117	1.07651	0.186506	0	Y
9/25/2024 10:23	25-Sep-24	0.432905	1727290000	0.382172	0.103553	0.0148	38.2172	1.03553	0.148002	0	Y
9/25/2024 10:24	25-Sep-24	0.4336	1727290000	0.410348	0.100284	0.035102	41.0348	1.00284	0.351022	0	Y
9/25/2024 10:25	25-Sep-24	0.434294	1727290000	0.445935	0.100536	0.01987	44.5935	1.00536	0.198701	0	Y
9/25/2024 10:26	25-Sep-24	0.434988	1727290000	0.47348	0.099926	0.015521	47.348	0.999257	0.155209	0	Y
9/25/2024 10:27	25-Sep-24	0.435683	1727290000	0.475673	0.099166	0.027312	47.5673	0.991656	0.273122	0	Y
9/25/2024 10:28	25-Sep-24	0.436377	1727290000	0.450974	0.100536	0.017487	45.0974	1.00536	0.174874	0	Y
9/25/2024 10:29	25-Sep-24	0.437072	1727290000	0.443967	0.102932	0.01503	44.3967	1.02932	0.150299	0	Y
9/25/2024 10:30	25-Sep-24	0.437766	1727290000	0.464232	0.104304	0.023161	46.4232	1.04304	0.231613	0	Y
9/25/2024 10:31	25-Sep-24	0.438461	1727290000	0.473932	0.104566	0.01964	47.3932	1.04566	0.196404	0	Y
9/25/2024 10:32	25-Sep-24	0.439155	1727290000	0.47261	0.105714	0.014578	47.261	1.05714	0.145783	0	Y
9/25/2024 10:33	25-Sep-24	0.43985	1727290000	0.492016	0.104006	0.019231	49.2016	1.04006	0.192308	0	Y
9/25/2024 10:34	25-Sep-24	0.440544	1727290000	0.560197	0.103978	0.021256	56.0197	1.03978	0.212564	0	Y
9/25/2024 10:35	25-Sep-24	0.441239	1727290000	0.526935	0.106328	0.015434	52.6935	1.06328	0.154343	0	Y
9/25/2024 10:36	25-Sep-24	0.441933	1727290000	0.497446	0.104002	0.013218	49.7446	1.04002	0.132183	0	Y
9/25/2024 10:37	25-Sep-24	0.442627	1727290000	0.493449	0.102241	0.03149	49.3449	1.02241	0.314895	0	Y
9/25/2024 10:38	25-Sep-24	0.443322	1727290000	0.461906	0.104088	0.017494	46.1906	1.04088	0.17494	0	Y
9/25/2024 10:39	25-Sep-24	0.444016	1727290000	0.41156	0.102416	0.015233	41.156	1.02416	0.152334	0	Y
9/25/2024 10:40	25-Sep-24	0.444711	1727290000	0.361027	0.104533	0.033733	36.1027	1.04533	0.33733	0	Y
9/25/2024 10:41	25-Sep-24	0.445405	1727290000	0.329661	0.109676	0.018241	32.9661	1.09676	0.18241	0	Y
9/25/2024 10:42	25-Sep-24	0.4461	1727290000	0.281713	0.108104	0.014526	28.1713	1.08104	0.145258	0	Y
9/25/2024 10:43	25-Sep-24	0.446794	1727290000	0.266086	0.104224	0.025948	26.6086	1.04224	0.259483	0	Y
9/25/2024 10:44	25-Sep-24	0.447489	1727290000	0.261264	0.105235	0.019556	26.1264	1.05235	0.195564	0	Y
9/25/2024 10:45	25-Sep-24	0.448183	1727290000	0.26172	0.104056	0.017074	26.172	1.04056	0.170739	0	Y
9/25/2024 10:46	25-Sep-24	0.448877	1727290000	0.260645	0.0991	0.01815	26.0645	0.990999	0.181504	0	Y
9/25/2024 10:47	25-Sep-24	0.449572	1727290000	0.274142	0.103229	0.016839	27.4142	1.03229	0.168389	0	Y
9/25/2024 10:48	25-Sep-24	0.450266	1727290000	0.272134	0.1043	0.017414	27.2134	1.043	0.174139	0	Y
9/25/2024 10:49	25-Sep-24	0.450961	1727290000	0.313666	0.099395	0.018771	31.3666	0.993953	0.187713	0	Y
9/25/2024 10:50	25-Sep-24	0.451655	1727290000	0.352489	0.097364	0.027832	35.2489	0.973644	0.278321	0	Y
9/25/2024 10:51	25-Sep-24	0.45235	1727290000	0.359038	0.097544	0.023665	35.9038	0.975443	0.236654	0	Y
9/25/2024 10:52	25-Sep-24	0.453044	1727290000	0.417051	0.097652	0.016425	41.7051	0.976519	0.164254	0	Y
9/25/2024 10:53	25-Sep-24	0.453739	1727290000	0.423562	0.099436	0.031931	42.3562	0.99436	0.319306	0	Y
9/25/2024 10:54	25-Sep-24	0.454433	1727290000	0.411943	0.103187	0.016777	41.1943	1.03187	0.167772	0	Y
9/25/2024 10:55	25-Sep-24	0.455127	1727290000	0.41264	0.103934	0.01497	41.264	1.03934	0.149696	0	Y
9/25/2024 10:56	25-Sep-24	0.455822	1727290000	0.416207	0.104159	0.039918	41.6207	1.04159	0.399175	0	Y
9/25/2024 10:57	25-Sep-24	0.456516	1727290000	0.372566	0.102948	0.02269	37.2566	1.02948	0.2269	0	Y
9/25/2024 10:58	25-Sep-24	0.457211	1727290000	0.329552	0.099415	0.019974	32.9552	0.99415	0.199738	0	Y
9/25/2024 10:59	25-Sep-24	0.457905	1727290000	0.326393	0.095919	0.024633	32.6393	0.959191	0.246329	0	Y
9/25/2024 11:00	25-Sep-24	0.4586	1727290000	0.321222	0.095658	0.020037	32.1222	0.956578	0.200369	0	Y
9/25/2024 11:01	25-Sep-24	0.459294	1727290000	0.320791	0.095343	0.020721	32.0791	0.953428	0.207208	0	Y
9/25/2024 11:02	25-Sep-24	0.459989	1727290000	0.313534	0.092102	0.031856	31.3534	0.921015	0.318558	0	Y
9/25/2024 11:03	25-Sep-24	0.460683	1727290000	0.29069	0.092323	0.024475	29.069	0.923234	0.244753	0	Y
9/25/2024 11:04	25-Sep-24	0.461377	1727290000	0.27951	0.092579	0.015962	27.951	0.925794	0.15962	0	Y
9/25/2024 11:05	25-Sep-24	0.462072	1727290000	0.284943	0.09171	0.021679	28.4943	0.917103	0.216791	0	Y
9/25/2024 11:06	25-Sep-24	0.462766	1727290000	0.285666	0.092443	0.043038	28.5666	0.924429	0.43038	0	Y
9/25/2024 11:07	25-Sep-24	0.463461	1727290000	0.298504	0.096674	0.026397	29.8504	0.966739	0.263972	0	Y
9/25/2024 11:08	25-Sep-24	0.464155	1727290000	0.333464	0.094518	0.019275	33.3464	0.945183	0.192754	0	Y
9/25/2024 11:09	25-Sep-24	0.46485	1727290000	0.350198	0.09632	0.025222	35.0198	0.963195	0.252223	0	Y
9/25/2024 11:10	25-Sep-24	0.465544	1727290000	0.390494	0.099649	0.016386	39.0494	0.996487	0.16386	0	Y
9/25/2024 11:11	25-Sep-24	0.466239	1727290000	0.381349	0.097358	0.019374	38.1349	0.973579	0.193739	0	Y
9/25/2024 11:12	25-Sep-24	0.466933	1727290000	0.352021	0.096371	0.026715	35.2021	0.963707	0.267149	0	Y
9/25/2024 11:13	25-Sep-24	0.467627	1727290000	0.353532	0.100913	0.016599	35.3532	1.00913	0.165987	0	Y
9/25/2024 11:14	25-Sep-24	0.468322	1727290000	0.361294	0.099637	0.016718	36.1294	0.996368	0.167182	0	Y
9/25/2024 11:15	25-Sep-24	0.469016	1727290000	0.362101	0.095411	0.03428	36.2101	0.95411	0.342804	0	Y
9/25/2024 11:16	25-Sep-24	0.469711	1727290000	0.335293	0.094349	0.022068	33.5293	0.94349	0.220677	0	Y
9/25/2024 11:17	25-Sep-24	0.470405	1727290000	0.332094	0.092973	0.018143	33.2094	0.929732	0.181425	0	Y
9/25/2024 11:18	25-Sep-24	0.4711	1727290000	0.334478	0.09151	0.023482	33.4478	0.915095	0.234816	0	Y
9/25/2024 11:19	25-Sep-24	0.471794	1727290000	0.335251	0.092843	0.024738	33.5251	0.928432	0.247379	0	Y
9/25/2024 11:20	25-Sep-24	0.472489	1727290000	0.271151	0.123737	0.012991	27.1151	1.23737	0.129914	0	Y
Drift check											
9/25/2024 11:21	25-Sep-24	0.473183	1727290000	-0.000121	-0.011418	-0.012206	-0.0120578	-0.114182	-0.122058	0	drift zero
9/25/2024 11:22	25-Sep-24	0.473878	1727290000	0.011268	-0.011334	-0.010516	1.1268	-0.113337	-0.105163	0	RCO and TO low
9/25/2024 11:23	25-Sep-24	0.474572	1727290000	0.336922	0.260423	0.293575	33.6922	2.60423	2.93575	0	
9/25/2024 11:24	25-Sep-24	0.475266	1727290000	0.372835	0.330109	0.349212	37.2835	3.30109	3.49212	0	
9/25/2024 11:25	25-Sep-24	0.475961	1727290000	0.463408	0.326262	0.334571	46.3408	3.26262	3.34571	0	inlet low
9/25/2024 11:26	25-Sep-24	0.476655	1727290000	0.612947	0.112023	0.022301	61.2947	1.12023	0.223014	0	
9/25/2024 11:27	25-Sep-24	0.47735	1727290000	0.67536	0.101765	0.018538	67.536	1.01765	0.185377	0	
9/25/2024 11:28	25-Sep-24	0.478044	1727290000	0.551018	0.098772	0.039211	55.1018	0.987717	0.392112	0	
9/25/2024 11:29	25-Sep-24	0.478739	1727290000	0.453406	0.099049	0.023806	45.3406	0.990487	0.238058	0	
Run 2 - RCTO 3											
9/25/2024 11:30	25-Sep-24	0.479433	1727290000	0.449067	0.096064	0.01778	44.9067	0.960635	0.177802	0	Y
9/25/2024 11:31	25-Sep-24	0.480128	1727290000	0.459679	0.096881	0.029203	45.9679	0.968813	0.292026	0	Y
9/25/2024 11:32	25-Sep-24	0.480822	1727290000	0.473473	0.101333	0.019793	47.3473	1.01333	0.197927	0	Y
9/25/2024 11:33	25-Sep-24	0.481516	1727290000	0.481507	0.103834	0.019654	48.1507	1.03834	0.196535	0	Y
9/25/2024 11:34	25-Sep-24	0.482211	1727290000	0.432773	0.101441	0.019593	43.2773	1.01441	0.195931	0	Y
9/25/2024 11:35	25-Sep-24	0.482905	1727290000	0.403512	0.102409	0.017414	40.3512	1.02409	0.174139	0	Y
9/25/2024 11:36	25-Sep-24	0.4836	1727290000	0.408119	0.100615	0.014879	40.8119	1.00615	0.14879	0	Y
9/25/2024 11:37	25-Sep-24	0.484294	1727290000	0.410806	0.096615	0.016205	41.0806	0.966148	0.162049	0	Y
9/25/2024 11:38	25-Sep-24	0.484988	1727290000	0.409863	0.099893	0.020897	40.9863	0.998928	0.208967	0	Y
9/25/2024 11:39	25-Sep-24	0.485683	1727290000	0.392892	0.103021	0.016185	39.2892	1.03021	0.161852	0	Y
9/25/2024 11:40	25-Sep-24	0.486377	1727290000	0.38077	0.098596	0.014219	38.077	0.985958	0.142186	0	Y
9/25/2024 11:41	25-Sep-24	0.487072	1727290000	0.374784	0.094088	0.028284	37.4784	0.940878	0.282837	0	Y

RCTO 3
THC Raw Data

NuWave - analyzer file
LabJack Voltage Ranges: 10 10 10
Channels: AIN0 AIN1 AIN2
Client / Site / Source: Microchip Gresham RCTO2

Timestamp	Date	Time	Epoch Time	Inlet_V	RCO_V	TO_V	Inlet_CONC	RCO_CONC	TO_CONC	QAQC		
9/25/2024 11:42	25-Sep-24	0.487766	1727290000	0.399784	0.094496	0.012982	39.9784	0.94496	0.12982	0	Y	
9/25/2024 11:43	25-Sep-24	0.488461	1727290000	0.413646	0.094106	0.011849	41.3646	0.941061	0.118491	0	Y	
9/25/2024 11:44	25-Sep-24	0.489155	1727290000	0.506595	0.094593	0.036099	50.6595	0.945932	0.360986	0	Y	
9/25/2024 11:45	25-Sep-24	0.48985	1727290000	0.555422	0.100511	0.01581	55.5422	1.00511	0.158097	0	Y	
9/25/2024 11:46	25-Sep-24	0.490544	1727290000	0.549413	0.102836	0.013925	54.9413	1.02836	0.139246	0	Y	
9/25/2024 11:47	25-Sep-24	0.491239	1727290000	0.508592	0.103096	0.024553	50.8592	1.03096	0.245528	0	Y	
9/25/2024 11:48	25-Sep-24	0.491933	1727290000	0.458361	0.102916	0.013876	45.8361	1.02916	0.13876	0	Y	
9/25/2024 11:49	25-Sep-24	0.492627	1727290000	0.446427	0.101485	0.012574	44.6427	1.01485	0.125737	0	Y	
9/25/2024 11:50	25-Sep-24	0.493322	1727290000	0.449161	0.097899	0.018758	44.9161	0.978987	0.187582	0	Y	
9/25/2024 11:51	25-Sep-24	0.494016	1727290000	0.443816	0.097195	0.015111	44.3816	0.971951	0.151113	0	Y	
9/25/2024 11:52	25-Sep-24	0.494711	1727290000	0.436028	0.098174	0.012364	43.6028	0.981744	0.123637	0	Y	
9/25/2024 11:53	25-Sep-24	0.495405	1727290000	0.454384	0.095976	0.022266	45.4384	0.959755	0.222659	0	Y	
9/25/2024 11:54	25-Sep-24	0.4961	1727290000	0.485855	0.095296	0.034972	48.5855	0.952955	0.349723	0	Y	
9/25/2024 11:55	25-Sep-24	0.496794	1727290000	0.525317	0.099832	0.01098	52.5317	0.998324	0.1098	0	Y	
9/25/2024 11:56	25-Sep-24	0.497489	1727290000	0.53614	0.100809	0.009893	53.614	1.00809	0.0989306	0	Y	
9/25/2024 11:57	25-Sep-24	0.498183	1727290000	0.581218	0.10255	0.028907	58.1218	1.0255	0.289073	0	Y	
9/25/2024 11:58	25-Sep-24	0.498877	1727290000	0.59612	0.109618	0.017052	59.612	1.09618	0.170516	0	Y	
9/25/2024 11:59	25-Sep-24	0.499572	1727290000	0.623824	0.108054	0.013675	62.3824	1.08054	0.136752	0	Y	
9/25/2024 12:00	25-Sep-24	0.500266	1727290000	0.603222	0.109781	0.020155	60.3222	1.09781	0.20155	0	Y	
9/25/2024 12:01	25-Sep-24	0.500961	1727290000	0.552162	0.11092	0.011551	55.2162	1.1092	0.115511	0	Y	
9/25/2024 12:02	25-Sep-24	0.501655	1727290000	0.474574	0.105368	0.013162	47.4574	1.05368	0.131619	0	Y	
9/25/2024 12:03	25-Sep-24	0.50235	1727290000	0.418608	0.100104	0.020376	41.8608	1.00104	0.203755	0	Y	
9/25/2024 12:04	25-Sep-24	0.503044	1727290000	0.442691	0.104858	0.010893	44.2691	1.04858	0.108934	0	Y	
9/25/2024 12:05	25-Sep-24	0.503739	1727290000	0.449588	0.105416	0.008844	44.9588	1.05416	0.0884415	0	Y	
9/25/2024 12:06	25-Sep-24	0.504433	1727290000	0.41787	0.100723	0.030548	41.787	1.00723	0.305482	0	Y	
9/25/2024 12:07	25-Sep-24	0.505127	1727290000	0.409908	0.097227	0.01905	40.9908	0.972266	0.190496	0	Y	
9/25/2024 12:08	25-Sep-24	0.505822	1727290000	0.416119	0.095692	0.008089	41.6119	0.95692	0.0808931	0	Y	
9/25/2024 12:09	25-Sep-24	0.506516	1727290000	0.415936	0.093662	0.009736	41.5936	0.936624	0.0973552	0	Y	
9/25/2024 12:10	25-Sep-24	0.507211	1727290000	0.437117	0.094056	0.018886	43.7117	0.940562	0.188856	0	Y	
9/25/2024 12:11	25-Sep-24	0.507905	1727290000	0.482205	0.099261	0.010985	48.2205	0.992614	0.109853	0	Y	
9/25/2024 12:12	25-Sep-24	0.5086	1727290000	0.485912	0.100426	0.013535	48.5912	1.00426	0.135347	0	Y	
9/25/2024 12:13	25-Sep-24	0.509294	1727290000	0.467675	0.101416	0.034308	46.7675	1.01416	0.34308	0	Y	
9/25/2024 12:14	25-Sep-24	0.509989	1727290000	0.425783	0.101376	0.010098	42.5783	1.01376	0.100979	0	Y	
9/25/2024 12:15	25-Sep-24	0.510683	1727290000	0.399792	0.09911	0.009998	39.9792	0.991104	0.0999808	0	Y	
9/25/2024 12:16	25-Sep-24	0.511377	1727290000	0.417768	0.095439	0.014005	41.7768	0.954386	0.140047	0	Y	
9/25/2024 12:17	25-Sep-24	0.512072	1727290000	0.447688	0.095567	0.010559	44.7688	0.955673	0.105586	0	Y	
9/25/2024 12:18	25-Sep-24	0.512766	1727290000	0.436015	0.097263	0.01122	43.6015	0.972634	0.112203	0	Y	
9/25/2024 12:19	25-Sep-24	0.513461	1727290000	0.406688	0.093459	0.037621	40.6688	0.934589	0.376214	0	Y	
9/25/2024 12:20	25-Sep-24	0.514155	1727290000	0.409172	0.095944	0.018725	40.9172	0.95944	0.187254	0	Y	
9/25/2024 12:21	25-Sep-24	0.51485	1727290000	0.419197	0.096686	0.010582	41.9197	0.966857	0.105823	0	Y	
9/25/2024 12:22	25-Sep-24	0.515544	1727290000	0.40791	0.095834	0.020914	40.791	0.958337	0.209138	0	Y	
9/25/2024 12:23	25-Sep-24	0.516239	1727290000	0.389158	0.09877	0.021994	38.9158	0.987704	0.219942	0	Y	
9/25/2024 12:24	25-Sep-24	0.516933	1727290000	0.43174	0.101603	0.017141	43.174	1.01603	0.171409	0	Y	
9/25/2024 12:25	25-Sep-24	0.517627	1727290000	0.432297	0.100125	0.013133	43.2297	1.00125	0.13133	0	Y	
9/25/2024 12:26	25-Sep-24	0.518322	1727290000	0.423059	0.10062	0.021052	42.3059	1.0062	0.210516	0	Y	
9/25/2024 12:27	25-Sep-24	0.519016	1727290000	0.415151	0.099667	0.015753	41.5151	0.99667	0.157533	0	Y	
9/25/2024 12:28	25-Sep-24	0.519711	1727290000	0.405145	0.095239	0.014767	40.5145	0.952391	0.147674	0	Y	
9/25/2024 12:29	25-Sep-24	0.520405	1727290000	0.414905	0.094062	0.020861	41.4905	0.940615	0.208613	0	Y	
9/25/2024 12:30	25-Sep-24	0.5211	1727290000	0.439174	0.098101	0.013335	43.9174	0.981009	0.133351	0	Y	
Drift Check												
9/25/2024 12:31	25-Sep-24	0.521794	1727290000	0.441714	0.14725	0.027231	44.1714	1.4725	0.272309	0		drift zero
9/25/2024 12:32	25-Sep-24	0.522489	1727290000	0.16744	0.000932	-0.003197	16.744	0.00932012	-0.031967	0		
9/25/2024 12:33	25-Sep-24	0.523183	1727290000	-0.001385	0.021524	0.001529	-0.138473	0.215242	0.0152894	0		RCO and TO low
9/25/2024 12:34	25-Sep-24	0.523877	1727290000	0.068914	0.119156	0.087851	6.89142	1.19156	0.878508	0		
9/25/2024 12:35	25-Sep-24	0.524572	1727290000	0.355985	0.319343	0.337069	35.5985	3.19343	3.37069	0		inlet low
9/25/2024 12:36	25-Sep-24	0.525266	1727290000	0.380213	0.261248	0.231578	38.0213	2.61248	2.31578	0		
9/25/2024 12:37	25-Sep-24	0.525961	1727290000	0.655833	0.102623	0.013713	65.5833	1.02623	0.137132	0		
9/25/2024 12:38	25-Sep-24	0.526655	1727290000	0.627933	0.099626	0.01762	62.7933	0.996263	0.1762	0		
9/25/2024 12:39	25-Sep-24	0.52735	1727290000	0.363918	0.096405	0.021326	36.3918	0.964048	0.21326	0		
Run 3 - RCTO 3												
9/25/2024 12:40	25-Sep-24	0.528044	1727290000	0.387776	0.095741	0.015839	38.7776	0.957405	0.158386	0	Y	
9/25/2024 12:41	25-Sep-24	0.528739	1727290000	0.379835	0.094138	0.015331	37.9835	0.941376	0.153306	0	Y	
9/25/2024 12:42	25-Sep-24	0.529433	1727290000	0.389838	0.091264	0.01577	38.9838	0.91264	0.157703	0	Y	
9/25/2024 12:43	25-Sep-24	0.530128	1727290000	0.38368	0.093987	0.015307	38.368	0.939867	0.153069	0	Y	
9/25/2024 12:44	25-Sep-24	0.530822	1727290000	0.397941	0.095447	0.011623	39.7941	0.954465	0.116233	0	Y	
9/25/2024 12:45	25-Sep-24	0.531516	1727290000	0.394243	0.130634	0.031774	39.4243	1.30634	0.317744	0	Y	
9/25/2024 12:46	25-Sep-24	0.532211	1727290000	0.366701	0.139318	0.016638	36.6701	1.39318	0.166381	0	Y	
9/25/2024 12:47	25-Sep-24	0.532905	1727290000	0.348062	0.138721	0.015274	34.8062	1.38721	0.152741	0	Y	
9/25/2024 12:48	25-Sep-24	0.5336	1727290000	0.37307	0.139508	0.027526	37.307	1.39508	0.275262	0	Y	
9/25/2024 12:49	25-Sep-24	0.534294	1727290000	0.385617	0.144952	0.010794	38.5617	1.44952	0.107936	0	Y	
9/25/2024 12:50	25-Sep-24	0.534989	1727290000	0.369942	0.145043	0.013485	36.9942	1.45043	0.134848	0	Y	
9/25/2024 12:51	25-Sep-24	0.535683	1727290000	0.356105	0.143956	0.032363	35.6105	1.43956	0.323625	0	Y	
9/25/2024 12:52	25-Sep-24	0.536377	1727290000	0.412293	0.145731	0.022531	41.2293	1.45731	0.225311	0	Y	
9/25/2024 12:53	25-Sep-24	0.537072	1727290000	0.36362	0.14354	0.017821	36.362	1.4354	0.178209	0	Y	
9/25/2024 12:54	25-Sep-24	0.537766	1727290000	0.384099	0.139129	0.019279	38.4099	1.39129	0.192794	0	Y	
9/25/2024 12:55	25-Sep-24	0.538461	1727290000	0.411298	0.143486	0.016118	41.1298	1.43486	0.161182	0	Y	
9/25/2024 12:56	25-Sep-24	0.539155	1727290000	0.347903	0.144783	0.013314	34.7903	1.44783	0.133141	0	Y	
9/25/2024 12:57	25-Sep-24	0.53985	1727290000	0.354082	0.140053	0.01402	35.4082	1.40053	0.140204	0	Y	
9/25/2024 12:58	25-Sep-24	0.540544	1727290000	0.335889	0.137984	0.032852	33.5889	1.37984	0.328521	0	Y	
9/25/2024 12:59	25-Sep-24	0.541239	1727290000	0.324812	0.138513	0.019391	32.4812	1.38513	0.19391	0	Y	
9/25/2024 13:00	25-Sep-24	0.541933	1727290000	0.309988	0.136148	0.014574	30.9988	1.36148	0.145744	0	Y	
9/25/2024 13:01	25-Sep-24	0.542627	1727290000	0.305904	0.135002	0.03343	30.5904	1.35002	0.334298	0	Y	

RCTO 3
THC Raw Data

# NuWave - analyzer file													
# LabJack Voltage Ranges:		10	10	10									
# Channels:		AIN0	AIN1	AIN2									
# Client / Site / Source:		Microchip	Gresham	RCTO2									
Timestamp		Date	Time	Epoch Time	Inlet_V	RCO_V	TO_V	Inlet_CONC	RCO_CONC	TO_CONC	QAQC		
	9/25/2024 13:02	25-Sep-24	0.543322	1727290000	0.335739	0.136945	0.017913	33.5739	1.36945	0.179128	0	Y	
	9/25/2024 13:03	25-Sep-24	0.544016	1727290000	0.366254	0.138421	0.01492	36.6254	1.38421	0.149197	0	Y	
	9/25/2024 13:04	25-Sep-24	0.544711	1727290000	0.342055	0.139247	0.03034	34.2055	1.39247	0.303395	0	Y	
	9/25/2024 13:05	25-Sep-24	0.545405	1727290000	0.30467	0.139199	0.020285	30.467	1.39199	0.20285	0	Y	
	9/25/2024 13:06	25-Sep-24	0.5461	1727290000	0.301807	0.137753	0.016058	30.1807	1.37753	0.160578	0	Y	
	9/25/2024 13:07	25-Sep-24	0.546794	1727290000	0.305277	0.135519	0.0239	30.5277	1.35519	0.239003	0	Y	
	9/25/2024 13:08	25-Sep-24	0.547489	1727290000	0.309056	0.136192	0.017511	30.9056	1.36192	0.175111	0	Y	
	9/25/2024 13:09	25-Sep-24	0.548183	1727290000	0.332384	0.136606	0.022791	33.2384	1.36606	0.227911	0	Y	
	9/25/2024 13:10	25-Sep-24	0.548877	1727300000	0.328667	0.134186	0.032138	32.8667	1.34186	0.32138	0	Y	
	9/25/2024 13:11	25-Sep-24	0.549572	1727300000	0.356359	0.133442	0.036017	35.6359	1.33442	0.360172	0	Y	
	9/25/2024 13:12	25-Sep-24	0.550266	1727300000	0.482296	0.13685	0.020574	48.2296	1.3685	0.205738	0	Y	
	9/25/2024 13:13	25-Sep-24	0.550961	1727300000	0.478633	0.13793	0.021196	47.8633	1.3793	0.21196	0	Y	
	9/25/2024 13:14	25-Sep-24	0.551655	1727300000	0.450763	0.13912	0.032678	45.0763	1.3912	0.326775	0	Y	
	9/25/2024 13:15	25-Sep-24	0.55235	1727300000	0.435205	0.140162	0.022328	43.5205	1.40162	0.223276	0	Y	
	9/25/2024 13:16	25-Sep-24	0.553044	1727300000	0.411119	0.139369	0.020353	41.1119	1.39369	0.203532	0	Y	
	9/25/2024 13:17	25-Sep-24	0.553739	1727300000	0.38922	0.138839	0.028752	38.922	1.38839	0.287524	0	Y	
	9/25/2024 13:18	25-Sep-24	0.554433	1727300000	0.339813	0.140184	0.022003	33.9813	1.40184	0.220034	0	Y	
	9/25/2024 13:19	25-Sep-24	0.555128	1727300000	0.321624	0.136389	0.020882	32.1624	1.36389	0.208823	0	Y	
	9/25/2024 13:20	25-Sep-24	0.555822	1727300000	0.294968	0.134255	0.023959	29.4968	1.34255	0.239594	0	Y	
	9/25/2024 13:21	25-Sep-24	0.556516	1727300000	0.292079	0.136514	0.016425	29.2079	1.36514	0.164254	0	Y	
	9/25/2024 13:22	25-Sep-24	0.557211	1727300000	0.281833	0.134835	0.020427	28.1833	1.34835	0.204267	0	Y	
	9/25/2024 13:23	25-Sep-24	0.557905	1727300000	0.247853	0.133644	0.033027	24.7853	1.33644	0.330267	0	Y	
	9/25/2024 13:24	25-Sep-24	0.5586	1727300000	0.240816	0.132983	0.023549	24.0816	1.32983	0.235485	0	Y	
	9/25/2024 13:25	25-Sep-24	0.559294	1727300000	0.252517	0.132014	0.021367	25.2517	1.32014	0.213667	0	Y	
	9/25/2024 13:26	25-Sep-24	0.559989	1727300000	0.273256	0.130962	0.021393	27.3256	1.30962	0.213929	0	Y	
	9/25/2024 13:27	25-Sep-24	0.560683	1727300000	0.28465	0.132154	0.026995	28.465	1.32154	0.269946	0	Y	
	9/25/2024 13:28	25-Sep-24	0.561378	1727300000	0.335491	0.133644	0.021046	33.5491	1.33644	0.210464	0	Y	
	9/25/2024 13:29	25-Sep-24	0.562072	1727300000	0.374153	0.136161	0.018917	37.4153	1.36161	0.189171	0	Y	
	9/25/2024 13:30	25-Sep-24	0.562766	1727300000	0.363453	0.137136	0.033901	36.3453	1.37136	0.339011	0	Y	
	9/25/2024 13:31	25-Sep-24	0.563461	1727300000	0.346529	0.137812	0.018882	34.6529	1.37812	0.188816	0	Y	
	9/25/2024 13:32	25-Sep-24	0.564155	1727300000	0.328964	0.136948	0.018643	32.8964	1.36948	0.186427	0	Y	
	9/25/2024 13:33	25-Sep-24	0.56485	1727300000	0.335974	0.135384	0.022043	33.5974	1.35384	0.220428	0	Y	
	9/25/2024 13:34	25-Sep-24	0.565544	1727300000	0.352562	0.136375	0.02395	35.2562	1.36375	0.239502	0	Y	
	9/25/2024 13:35	25-Sep-24	0.566239	1727300000	0.337291	0.136031	0.022404	33.7291	1.36031	0.224038	0	Y	
	9/25/2024 13:36	25-Sep-24	0.566933	1727300000	0.330295	0.134973	0.042181	33.0295	1.34973	0.421807	0	Y	
	9/25/2024 13:37	25-Sep-24	0.567627	1727300000	0.310219	0.13542	0.023787	31.0219	1.3542	0.237874	0	Y	
	9/25/2024 13:38	25-Sep-24	0.568322	1727300000	0.310807	0.13552	0.021888	31.0807	1.3552	0.218879	0	Y	
	9/25/2024 13:39	25-Sep-24	0.569016	1727300000	0.316662	0.103537	0.032419	31.6662	1.03537	0.324189	0	Y	
	9/25/2024 13:40	25-Sep-24	0.569711	1727300000	0.307833	0.090575	0.028491	30.7833	0.905748	0.284911	0	Y	
	9/25/2024 13:41	25-Sep-24	0.570405	1727300000	0.294425	0.326044	0.070306	29.4425	3.26044	0.703058	0	Y	
	9/25/2024 13:42	25-Sep-24	0.5711	1727300000	0.036435	0.010621	0.001213	3.64347	0.106212	0.0121266	0	Y	
	9/25/2024 13:43	25-Sep-24	0.571794	1727300000	0.281099	0.755703	0.72532	28.1099	7.55703	7.2532	0	Y	
	9/25/2024 13:44	25-Sep-24	0.572489	1727300000	0.177831	1.95144	1.87585	17.7831	19.5144	18.7585	0	Y	
	9/25/2024 13:45	25-Sep-24	0.573183	1727300000	0.17387	1.96614	1.88266	17.387	19.6614	18.8266	0	Y	
	9/25/2024 13:46	25-Sep-24	0.573878	1727300000	0.172509	1.27882	1.88708	17.2509	12.7882	18.8708	0	Y	
Drift Check													
	9/25/2024 13:47	25-Sep-24	0.574572	1727300000	0.154399	0.125516	0.594479	15.4399	1.25516	5.94479	0		
	9/25/2024 13:48	25-Sep-24	0.575266	1727300000	0.000558	-0.011832	-0.010161	0.0558014	-0.118317	-0.101608	0		zero
	9/25/2024 13:49	25-Sep-24	0.575961	1727300000	0.178861	0.16691	0.19112	17.8861	1.6691	1.9112	0		
	9/25/2024 13:50	25-Sep-24	0.576655	1727300000	0.35899	0.323378	0.340754	35.899	3.23378	3.40754	0		RCO and TO low
	9/25/2024 13:51	25-Sep-24	0.57735	1727300000	0.41888	0.178471	0.114995	41.888	1.78471	1.14995	0		
	9/25/2024 13:52	25-Sep-24	0.578044	1727300000	0.553441	0.094501	0.04305	55.3441	0.945013	0.430498	0		
	9/25/2024 13:53	25-Sep-24	0.578739	1727300000	0.633137	0.091408	0.02476	63.3137	0.914084	0.247602	0		inlet low
	9/25/2024 13:54	25-Sep-24	0.579433	1727300000	0.577877	0.09115	0.018153	57.7877	0.911498	0.18153	0		
	9/25/2024 13:55	25-Sep-24	0.580127	1727300000	0.317384	0.088885	0.029012	31.7384	0.888852	0.290123	0		
	9/25/2024 13:56	25-Sep-24	0.580822	1727300000	0.347284	0.088544	0.022446	34.7284	0.885439	0.224458	0		
	9/25/2024 13:57	25-Sep-24	0.581516	1727300000	0.380054	0.087989	0.016729	38.0054	0.879886	0.167287	0		
	9/25/2024 13:58	25-Sep-24	0.582211	1727300000	0.439931	0.087687	0.034321	43.9931	0.876867	0.343211	0		
	9/25/2024 13:59	25-Sep-24	0.582905	1727300000	0.448925	0.088793	0.034165	44.8925	0.887933	0.341649	0		
	9/25/2024 14:00	25-Sep-24	0.5836	1727300000	0.439522	0.090312	0.016527	43.9522	0.903122	0.165265	0		
	9/25/2024 14:01	25-Sep-24	0.584294	1727300000	0.415174	0.088241	0.023986	41.5174	0.882407	0.239857	0		
	9/25/2024 14:02	25-Sep-24	0.584989	1727300000	0.244966	0.0861	0.044172	24.4966	0.860995	0.441722	0		
	9/25/2024 14:03	25-Sep-24	0.585683	1727300000	0.29163	0.086245	0.02228	29.163	0.862452	0.222804	0		
	9/25/2024 14:04	25-Sep-24	0.586377	1727300000	0.389157	0.082669	0.014592	38.9157	0.826693	0.145915	0		
	9/25/2024 14:05	25-Sep-24	0.587072	1727300000	0.469259	0.109355	0.040338	46.9259	1.09355	0.403376	0		
	9/25/2024 14:06	25-Sep-24	0.587766	1727300000	0.413138	0.129128	0.041501	41.3138	1.29128	0.415007	0		
	9/25/2024 14:07	25-Sep-24	0.588461	1727300000	0.359322	0.132112	0.011904	35.9322	1.32112	0.119042	0		
	9/25/2024 14:08	25-Sep-24	0.589155	1727300000	0.317473	0.131818	0.041523	31.7473	1.31818	0.41523	0		
	9/25/2024 14:09	25-Sep-24	0.58985	1727300000	0.299773	0.133841	0.043964	29.9773	1.33841	0.439635	0		
	9/25/2024 14:10	25-Sep-24	0.590544	1727300000	0.299727	0.137172	0.013459	29.9727	1.37172	0.134585	0		
	9/25/2024 14:11	25-Sep-24	0.591239	1727300000	0.267917	0.140909	0.032433	26.7917	1.40909	0.324334	0		

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	TO				
Run Length 62.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	12271	42854
			Maximum	BDL	BDL	17002	47827
			(BDL = 0) Average	0.0000	0.0000	16183	46426
			MDL	0.14	0.24	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	15456	42470
			Maximum	BDL	BDL	16928	47990
			(BDL = 0) Average	0.0000	0.0000	16275	45506
			MDL	0.14	0.24	NA	NA
Run Length 67.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	15463	31648
			Maximum				
				0.0000	0.0000	16470	42996
			MDL	0.14	0.24	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12271	31648
			Maximum	BDL	BDL	17002	62509
			(BDL = 0) Average	0.0000	0.0000	16309	44976
			MDL	0.14	0.24	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	10:19:03	R1	1.00	0.0000	0.0000	12271	42854
	9/25/24	10:20:03	R1	1.00	0.0000	0.0000	16078	45101
	9/25/24	10:20:59	R1	0.93	0.0000	0.0000	16478	45282
	9/25/24	10:21:57	R1	0.97	0.0000	0.0000	16208	45251
	9/25/24	10:22:55	R1	0.97	0.0000	0.0000	16085	45831
	9/25/24	10:23:56	R1	1.02	0.0000	0.0000	16182	46516
	9/25/24	10:24:51	R1	0.92	0.0000	0.0000	16241	46288
	9/25/24	10:25:49	R1	0.97	0.0000	0.0000	15674	45925
	9/25/24	10:26:48	R1	0.98	0.0000	0.0000	16021	46551
	9/25/24	10:27:45	R1	0.95	0.0000	0.0000	16255	46420
	9/25/24	10:28:43	R1	0.97	0.0000	0.0000	16082	46468
	9/25/24	10:29:43	R1	1.00	0.0000	0.0000	16300	47124
	9/25/24	10:30:40	R1	0.95	0.0000	0.0000	16617	47153
	9/25/24	10:31:37	R1	0.95	0.0000	0.0000	16947	46877
	9/25/24	10:32:36	R1	0.98	0.0000	0.0000	16088	46943
	9/25/24	10:33:33	R1	0.95	0.0000	0.0000	16736	46908
	9/25/24	10:34:31	R1	0.97	0.0000	0.0000	16545	46625
	9/25/24	10:35:29	R1	0.97	0.0000	0.0000	15649	46325
	9/25/24	10:36:28	R1	0.98	0.0000	0.0000	16236	46978
	9/25/24	10:37:25	R1	0.95	0.0000	0.0000	16560	47265
	9/25/24	10:38:23	R1	0.97	0.0000	0.0000	16340	47030
	9/25/24	10:39:21	R1	0.97	0.0000	0.0000	16246	47085

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	TO				
Run Length 62.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	12271	42854
			Maximum	BDL	BDL	17002	47827
			(BDL = 0) Average	0.0000	0.0000	16183	46426
			MDL	0.14	0.24	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	15456	42470
			Maximum	BDL	BDL	16928	47990
			(BDL = 0) Average	0.0000	0.0000	16275	45506
			MDL	0.14	0.24	NA	NA
Run Length 67.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	15463	31648
			Maximum				
				0.0000	0.0000	16470	42996
			MDL	0.14	0.24	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12271	31648
			Maximum	BDL	BDL	17002	62509
			(BDL = 0) Average	0.0000	0.0000	16309	44976
			MDL	0.14	0.24	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	10:40:19	R1	0.97	0.0000	0.0000	16596	46800
	9/25/24	10:41:19	R1	1.00	0.0000	0.0000	16186	46637
	9/25/24	10:42:15	R1	0.93	0.0000	0.0000	15551	47010
	9/25/24	10:43:13	R1	0.97	0.0000	0.0000	16725	47422
	9/25/24	10:44:11	R1	0.97	0.0000	0.0000	16498	46936
	9/25/24	10:45:12	R1	1.02	0.0000	0.0000	15658	46677
	9/25/24	10:46:08	R1	0.93	0.0000	0.0000	16319	47019
	9/25/24	10:47:05	R1	0.95	0.0000	0.0000	16491	47133
	9/25/24	10:48:06	R1	1.02	0.0000	0.0000	16581	46893
	9/25/24	10:49:03	R1	0.95	0.0000	0.0000	16509	47060
	9/25/24	10:49:59	R1	0.93	0.0000	0.0000	16412	46843
	9/25/24	10:50:57	R1	0.97	0.0000	0.0000	16345	46037
	9/25/24	10:51:55	R1	0.97	0.0000	0.0000	15820	46297
	9/25/24	10:52:53	R1	0.97	0.0000	0.0000	15740	46235
	9/25/24	10:53:53	R1	1.00	0.0000	0.0000	16300	45902
	9/25/24	10:54:49	R1	0.93	0.0000	0.0000	15964	46411
	9/25/24	10:55:48	R1	0.98	0.0000	0.0000	16513	46860
	9/25/24	10:56:45	R1	0.95	0.0000	0.0000	16759	46523
	9/25/24	10:57:43	R1	0.97	0.0000	0.0000	15625	45888
	9/25/24	10:58:44	R1	1.02	0.0000	0.0000	15870	46136
	9/25/24	10:59:39	R1	0.92	0.0000	0.0000	16144	46108
	9/25/24	11:00:37	R1	0.97	0.0000	0.0000	16155	45851
	9/25/24	11:01:37	R1	1.00	0.0000	0.0000	15960	45925

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	TO				
Run Length 62.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	12271	42854
			Maximum	BDL	BDL	17002	47827
			(BDL = 0) Average	0.0000	0.0000	16183	46426
			MDL	0.14	0.24	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	15456	42470
			Maximum	BDL	BDL	16928	47990
			(BDL = 0) Average	0.0000	0.0000	16275	45506
			MDL	0.14	0.24	NA	NA
Run Length 67.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	15463	31648
			Maximum				
				0.0000	0.0000	16470	42996
			MDL	0.14	0.24	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12271	31648
			Maximum	BDL	BDL	17002	62509
			(BDL = 0) Average	0.0000	0.0000	16309	44976
			MDL	0.14	0.24	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	11:02:33	R1	0.93	0.0000	0.0000	16236	45458
	9/25/24	11:03:31	R1	0.97	0.0000	0.0000	16102	45576
	9/25/24	11:04:31	R1	1.00	0.0000	0.0000	16056	45964
	9/25/24	11:05:29	R1	0.97	0.0000	0.0000	16644	46926
	9/25/24	11:06:25	R1	0.93	0.0000	0.0000	17002	46781
	9/25/24	11:07:23	R1	0.97	0.0000	0.0000	15866	46593
	9/25/24	11:08:21	R1	0.97	0.0000	0.0000	16139	47217
	9/25/24	11:09:19	R1	0.97	0.0000	0.0000	16534	47827
	9/25/24	11:10:20	R1	1.02	0.0000	0.0000	16761	47484
	9/25/24	11:11:17	R1	0.95	0.0000	0.0000	16577	47641
	9/25/24	11:12:13	R1	0.93	0.0000	0.0000	16765	47299
	9/25/24	11:13:14	R1	1.02	0.0000	0.0000	16149	46089
	9/25/24	11:14:09	R1	0.92	0.0000	0.0000	15954	46046
	9/25/24	11:15:07	R1	0.97	0.0000	0.0000	16265	46176
	9/25/24	11:16:05	R1	0.97	0.0000	0.0000	16179	45727
	9/25/24	11:17:03	R1	0.97	0.0000	0.0000	15632	45693
	9/25/24	11:18:01	R1	0.97	0.0000	0.0000	16178	46323
	9/25/24	11:19:01	R1	1.00	0.0000	0.0000	16359	46078
	9/25/24	11:19:57	R1	0.93	0.0000	0.0000	15951	45414
	9/25/24	11:20:55	R1	0.97	0.0000	0.0000	15982	45963
	9/25/24	11:30:36	R2	9.68	0.0000	0.0000	15770	45835
	9/25/24	11:31:31	R2	0.92	0.0000	0.0000	16006	45478
	9/25/24	11:32:29	R2	0.97	0.0000	0.0000	16417	45130

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	TO				
Run Length 62.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	12271	42854
			Maximum	BDL	BDL	17002	47827
			(BDL = 0) Average	0.0000	0.0000	16183	46426
			MDL	0.14	0.24	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	15456	42470
			Maximum	BDL	BDL	16928	47990
			(BDL = 0) Average	0.0000	0.0000	16275	45506
			MDL	0.14	0.24	NA	NA
Run Length 67.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	15463	31648
			Maximum				
				0.0000	0.0000	16470	42996
			MDL	0.14	0.24	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12271	31648
			Maximum	BDL	BDL	17002	62509
			(BDL = 0) Average	0.0000	0.0000	16309	44976
			MDL	0.14	0.24	NA	NA

Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
9/25/24	11:33:27	R2	0.97	0.0000	0.0000	15873	45615
9/25/24	11:34:25	R2	0.97	0.0000	0.0000	16002	45722
9/25/24	11:35:23	R2	0.97	0.0000	0.0000	16268	45914
9/25/24	11:36:24	R2	1.02	0.0000	0.0000	16190	45713
9/25/24	11:37:21	R2	0.95	0.0000	0.0000	16119	45524
9/25/24	11:38:17	R2	0.93	0.0000	0.0000	16344	44446
9/25/24	11:39:15	R2	0.97	0.0000	0.0000	16115	44096
9/25/24	11:40:13	R2	0.97	0.0000	0.0000	16176	44093
9/25/24	11:41:13	R2	1.00	0.0000	0.0000	16182	43898
9/25/24	11:42:09	R2	0.93	0.0000	0.0000	16221	43517
9/25/24	11:43:07	R2	0.97	0.0000	0.0000	15972	43910
9/25/24	11:44:05	R2	0.97	0.0000	0.0000	16558	44347
9/25/24	11:45:03	R2	0.97	0.0000	0.0000	16330	44115
9/25/24	11:46:01	R2	0.97	0.0000	0.0000	15570	43837
9/25/24	11:46:59	R2	0.97	0.0000	0.0000	16443	44271
9/25/24	11:47:58	R2	0.98	0.0000	0.0000	16318	46062
9/25/24	11:48:55	R2	0.95	0.0000	0.0000	15898	46551
9/25/24	11:49:53	R2	0.97	0.0000	0.0000	16532	47430
9/25/24	11:50:52	R2	0.98	0.0000	0.0000	16680	47833
9/25/24	11:51:49	R2	0.95	0.0000	0.0000	16487	47601
9/25/24	11:52:47	R2	0.97	0.0000	0.0000	16333	47830
9/25/24	11:53:45	R2	0.97	0.0000	0.0000	16928	47990
9/25/24	11:54:43	R2	0.97	0.0000	0.0000	16374	47048

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	TO				
Run Length 62.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	12271	42854
			Maximum	BDL	BDL	17002	47827
			(BDL = 0) Average	0.0000	0.0000	16183	46426
			MDL	0.14	0.24	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	15456	42470
			Maximum	BDL	BDL	16928	47990
			(BDL = 0) Average	0.0000	0.0000	16275	45506
			MDL	0.14	0.24	NA	NA
Run Length 67.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	15463	31648
			Maximum				
				0.0000	0.0000	16470	42996
			MDL	0.14	0.24	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12271	31648
			Maximum	BDL	BDL	17002	62509
			(BDL = 0) Average	0.0000	0.0000	16309	44976
			MDL	0.14	0.24	NA	NA

Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
9/25/24	11:55:41	R2	0.97	0.0000	0.0000	15677	46077
9/25/24	11:56:42	R2	1.02	0.0000	0.0000	16443	46327
9/25/24	11:57:38	R2	0.93	0.0000	0.0000	16357	46324
9/25/24	11:58:35	R2	0.95	0.0000	0.0000	15881	46521
9/25/24	11:59:34	R2	0.98	0.0000	0.0000	16285	46860
9/25/24	12:00:32	R2	0.97	0.0000	0.0000	16664	47094
9/25/24	12:01:29	R2	0.95	0.0000	0.0000	16664	47285
9/25/24	12:02:27	R2	0.97	0.0000	0.0000	16542	47819
9/25/24	12:03:27	R2	1.00	0.0000	0.0000	16745	47696
9/25/24	12:04:26	R2	0.98	0.0000	0.0000	16600	47109
9/25/24	12:05:21	R2	0.92	0.0000	0.0000	16280	46872
9/25/24	12:06:19	R2	0.97	0.0000	0.0000	16837	46677
9/25/24	12:07:20	R2	1.02	0.0000	0.0000	16275	45967
9/25/24	12:08:15	R2	0.92	0.0000	0.0000	15456	45075
9/25/24	12:09:14	R2	0.98	0.0000	0.0000	16461	45903
9/25/24	12:10:11	R2	0.95	0.0000	0.0000	16392	45661
9/25/24	12:11:09	R2	0.97	0.0000	0.0000	16291	45281
9/25/24	12:12:13	R2	1.07	0.0000	0.0000	16252	45595
9/25/24	12:13:05	R2	0.87	0.0000	0.0000	16398	45160
9/25/24	12:14:03	R2	0.97	0.0000	0.0000	16204	44350
9/25/24	12:15:01	R2	0.97	0.0000	0.0000	15742	44599
9/25/24	12:15:59	R2	0.97	0.0000	0.0000	16577	44655
9/25/24	12:16:57	R2	0.97	0.0000	0.0000	16696	44353

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	TO				
Run Length 62.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	12271	42854
			Maximum	BDL	BDL	17002	47827
			(BDL = 0) Average	0.0000	0.0000	16183	46426
			MDL	0.14	0.24	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	15456	42470
			Maximum	BDL	BDL	16928	47990
			(BDL = 0) Average	0.0000	0.0000	16275	45506
			MDL	0.14	0.24	NA	NA
Run Length 67.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	15463	31648
			Maximum				
				0.0000	0.0000	16470	42996
			MDL	0.14	0.24	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12271	31648
			Maximum	BDL	BDL	17002	62509
			(BDL = 0) Average	0.0000	0.0000	16309	44976
			MDL	0.14	0.24	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	12:17:55	R2	0.97	0.0000	0.0000	16115	45037
	9/25/24	12:18:53	R2	0.97	0.0000	0.0000	16657	45023
	9/25/24	12:19:51	R2	0.97	0.0000	0.0000	16147	44092
	9/25/24	12:20:49	R2	0.97	0.0000	0.0000	15773	42944
	9/25/24	12:21:49	R2	1.00	0.0000	0.0000	16068	42716
	9/25/24	12:22:46	R2	0.95	0.0000	0.0000	16642	42581
	9/25/24	12:23:45	R2	0.98	0.0000	0.0000	16600	42470
	9/25/24	12:24:41	R2	0.93	0.0000	0.0000	15965	42532
	9/25/24	12:25:41	R2	1.00	0.0000	0.0000	16365	43518
	9/25/24	12:26:37	R2	0.93	0.0000	0.0000	16427	46020
	9/25/24	12:27:35	R2	0.97	0.0000	0.0000	15968	46302
	9/25/24	12:28:33	R2	0.97	0.0000	0.0000	16168	46576
	9/25/24	12:29:31	R2	0.97	0.0000	0.0000	16577	46887
	9/25/24	12:30:29	R2	0.97	0.0000	0.0000	16268	46640
	9/25/24	12:31:27	R2	0.97	0.0000	0.0000	16028	46015
	9/25/24	12:41:20	R3	9.88	0.0000	0.0000	16776	31648
	9/25/24	12:42:18	R3	0.97	0.0000	0.0000	16468	32103
	9/25/24	12:43:18	R3	1.00	0.0000	0.0000	16405	32661
	9/25/24	12:44:14	R3	0.93	0.0000	0.0000	16658	33303
	9/25/24	12:45:12	R3	0.97	0.0000	0.0000	16671	34188
	9/25/24	12:46:15	R3	1.05	0.0000	0.0000	16784	34880
	9/25/24	12:47:08	R3	0.88	0.0000	0.0000	16186	35939
	9/25/24	12:48:06	R3	0.97	0.0000	0.0000	16730	37071

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	TO				
Run Length 62.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	12271	42854
			Maximum	BDL	BDL	17002	47827
			(BDL = 0) Average	0.0000	0.0000	16183	46426
			MDL	0.14	0.24	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	15456	42470
			Maximum	BDL	BDL	16928	47990
			(BDL = 0) Average	0.0000	0.0000	16275	45506
			MDL	0.14	0.24	NA	NA
Run Length 67.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	15463	31648
			Maximum				
				0.0000	0.0000	16470	42996
			MDL	0.14	0.24	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12271	31648
			Maximum	BDL	BDL	17002	62509
			(BDL = 0) Average	0.0000	0.0000	16309	44976
			MDL	0.14	0.24	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	12:49:05	R3	0.98	0.0000	0.0000	16942	38255
	9/25/24	12:50:02	R3	0.95	0.0000	0.0000	16468	39727
	9/25/24	12:51:00	R3	0.97	0.0000	0.0000	16977	42672
	9/25/24	12:51:58	R3	0.97	0.0000	0.0000	16804	47362
	9/25/24	12:52:56	R3	0.97	0.0000	0.0000	16071	60053
	9/25/24	12:53:54	R3	0.97	0.0000	0.0000	16324	46564
	9/25/24	12:54:52	R3	0.97	0.0000	0.0000	16408	44816
	9/25/24	12:55:50	R3	0.97	0.0000	0.0000	16472	43450
	9/25/24	12:56:48	R3	0.97	0.0000	0.0000	16310	42451
	9/25/24	12:57:46	R3	0.97	0.0000	0.0000	16722	42730
	9/25/24	12:58:44	R3	0.97	0.0000	0.0000	16789	42033
	9/25/24	12:59:42	R3	0.97	0.0000	0.0000	16167	42189
	9/25/24	13:00:40	R3	0.97	0.0000	0.0000	16584	41987
	9/25/24	13:01:38	R3	0.97	0.0000	0.0000	16558	41981
	9/25/24	13:02:38	R3	1.00	0.0000	0.0000	16168	42107
	9/25/24	13:03:36	R3	0.97	0.0000	0.0000	16483	41805
	9/25/24	13:04:32	R3	0.93	0.0000	0.0000	16288	55125
	9/25/24	13:05:30	R3	0.97	0.0000	0.0000	16740	42186
	9/25/24	13:06:28	R3	0.97	0.0000	0.0000	16158	41866
	9/25/24	13:07:26	R3	0.97	0.0000	0.0000	16583	41914
	9/25/24	13:08:24	R3	0.97	0.0000	0.0000	16597	41695
	9/25/24	13:09:23	R3	0.98	0.0000	0.0000	16425	41148
	9/25/24	13:10:20	R3	0.95	0.0000	0.0000	16743	41398

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	TO				
Run Length 62.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	12271	42854
			Maximum	BDL	BDL	17002	47827
			(BDL = 0) Average	0.0000	0.0000	16183	46426
			MDL	0.14	0.24	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	15456	42470
			Maximum	BDL	BDL	16928	47990
			(BDL = 0) Average	0.0000	0.0000	16275	45506
			MDL	0.14	0.24	NA	NA
Run Length 67.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	15463	31648
			Maximum				
				0.0000	0.0000	16470	42996
			MDL	0.14	0.24	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12271	31648
			Maximum	BDL	BDL	17002	62509
			(BDL = 0) Average	0.0000	0.0000	16309	44976
			MDL	0.14	0.24	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	13:11:18	R3	0.97	0.0000	0.0000	16530	40949
	9/25/24	13:12:16	R3	0.97	0.0000	0.0000	16233	40260
	9/25/24	13:13:14	R3	0.97	0.0000	0.0000	16680	40050
	9/25/24	13:14:12	R3	0.97	0.0000	0.0000	16339	54240
	9/25/24	13:15:10	R3	0.97	0.0000	0.0000	16833	42802
	9/25/24	13:16:08	R3	0.97	0.0000	0.0000	16572	41069
	9/25/24	13:17:09	R3	1.02	0.0000	0.0000	16758	41638
	9/25/24	13:18:04	R3	0.92	0.0000	0.0000	16772	40963
	9/25/24	13:19:02	R3	0.97	0.0000	0.0000	16590	41272
	9/25/24	13:20:00	R3	0.97	0.0000	0.0000	16051	59145
	9/25/24	13:20:58	R3	0.97	0.0000	0.0000	16796	46379
	9/25/24	13:21:56	R3	0.97	0.0000	0.0000	16303	43078
	9/25/24	13:22:57	R3	1.02	0.0000	0.0000	16681	41958
	9/25/24	13:23:52	R3	0.92	0.0000	0.0000	16209	41852
	9/25/24	13:24:50	R3	0.97	0.0000	0.0000	16197	41912
	9/25/24	13:25:48	R3	0.97	0.0000	0.0000	16216	42390
	9/25/24	13:26:46	R3	0.97	0.0000	0.0000	16012	62509
	9/25/24	13:27:44	R3	0.97	0.0000	0.0000	16662	46407
	9/25/24	13:28:42	R3	0.97	0.0000	0.0000	16089	44880
	9/25/24	13:29:40	R3	0.97	0.0000	0.0000	16525	44212
	9/25/24	13:30:39	R3	0.98	0.0000	0.0000	16543	43615
	9/25/24	13:31:36	R3	0.95	0.0000	0.0000	16181	42196
	9/25/24	13:32:36	R3	1.00	0.0000	0.0000	16532	43068

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	TO				
Run Length 62.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	12271	42854
			Maximum	BDL	BDL	17002	47827
			(BDL = 0) Average	0.0000	0.0000	16183	46426
			MDL	0.14	0.24	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	15456	42470
			Maximum	BDL	BDL	16928	47990
			(BDL = 0) Average	0.0000	0.0000	16275	45506
			MDL	0.14	0.24	NA	NA
Run Length 67.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	15463	31648
			Maximum				
				0.0000	0.0000	16470	42996
			MDL	0.14	0.24	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12271	31648
			Maximum	BDL	BDL	17002	62509
			(BDL = 0) Average	0.0000	0.0000	16309	44976
			MDL	0.14	0.24	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	13:33:32	R3	0.93	0.0000	0.0000	16419	42555
	9/25/24	13:34:30	R3	0.97	0.0000	0.0000	16716	42602
	9/25/24	13:35:31	R3	1.02	0.0000	0.0000	15463	61538
	9/25/24	13:36:26	R3	0.92	0.0000	0.0000	16546	47563
	9/25/24	13:37:24	R3	0.97	0.0000	0.0000	16227	41276
	9/25/24	13:38:22	R3	0.97	0.0000	0.0000	15892	41386
	9/25/24	13:39:20	R3	0.97	0.0000	0.0000	16669	41684

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	RCO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	1.74	390	11004
			Maximum	BDL	1.83	401	11532
			(BDL = 0) Average	0.0000	1.79	392	11327
			MDL	0.15	NA	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	1.74	391	11103
			Maximum	BDL	1.82	406	12016
			(BDL = 0) Average	0.0000	1.78	395	11357
			MDL	0.15	NA	NA	NA
Run Length 69.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	1.73	389	11602
			Maximum				
				0.0000	1.76	395	11816
			MDL	0.15	NA	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	1.73	389	11004
			Maximum	BDL	1.83	409	12016
			(BDL = 0) Average	0.0000	1.78	394	11500
			MDL	0.15	NA	NA	NA

					C2H6 1-min data	CH4 1-min data	CO2 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	10:20:03	R1	0.98	0.0000	1.75	392	11244
	9/25/24	10:21:03	R1	1.00	0.0000	1.76	392	11206
	9/25/24	10:22:01	R1	0.97	0.0000	1.77	391	11141
	9/25/24	10:23:03	R1	1.03	0.0000	1.75	391	11156
	9/25/24	10:23:59	R1	0.93	0.0000	1.78	392	11225
	9/25/24	10:24:58	R1	0.98	0.0000	1.75	393	11258
	9/25/24	10:25:57	R1	0.98	0.0000	1.77	393	11265
	9/25/24	10:26:59	R1	1.03	0.0000	1.77	394	11338
	9/25/24	10:27:55	R1	0.93	0.0000	1.77	397	11327
	9/25/24	10:28:54	R1	0.98	0.0000	1.81	394	11330
	9/25/24	10:29:53	R1	0.98	0.0000	1.77	393	11343
	9/25/24	10:30:52	R1	0.98	0.0000	1.79	392	11315
	9/25/24	10:31:51	R1	0.98	0.0000	1.81	391	11260
	9/25/24	10:32:50	R1	0.98	0.0000	1.80	391	11263
	9/25/24	10:33:52	R1	1.03	0.0000	1.77	390	11219
	9/25/24	10:34:49	R1	0.95	0.0000	1.80	390	11121
	9/25/24	10:35:47	R1	0.97	0.0000	1.79	390	11128
	9/25/24	10:36:46	R1	0.98	0.0000	1.77	391	11074
	9/25/24	10:37:45	R1	0.98	0.0000	1.76	391	11015
	9/25/24	10:38:44	R1	0.98	0.0000	1.80	392	11004
	9/25/24	10:39:43	R1	0.98	0.0000	1.80	397	11108
	9/25/24	10:40:42	R1	0.98	0.0000	1.77	401	11179

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	RCO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	1.74	390	11004
			Maximum	BDL	1.83	401	11532
			(BDL = 0) Average	0.0000	1.79	392	11327
			MDL	0.15	NA	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	1.74	391	11103
			Maximum	BDL	1.82	406	12016
			(BDL = 0) Average	0.0000	1.78	395	11357
			MDL	0.15	NA	NA	NA
Run Length 69.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	1.73	389	11602
			Maximum				
				0.0000	1.76	395	11816
			MDL	0.15	NA	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	1.73	389	11004
			Maximum	BDL	1.83	409	12016
			(BDL = 0) Average	0.0000	1.78	394	11500
			MDL	0.15	NA	NA	NA

					C2H6 1-min data	CH4 1-min data	CO2 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	10:41:41	R1	0.98	0.0000	1.78	401	11341
	9/25/24	10:42:40	R1	0.98	0.0000	1.74	395	11430
	9/25/24	10:43:39	R1	0.98	0.0000	1.77	393	11393
	9/25/24	10:44:41	R1	1.03	0.0000	1.76	391	11357
	9/25/24	10:45:37	R1	0.93	0.0000	1.80	391	11404
	9/25/24	10:46:39	R1	1.03	0.0000	1.81	392	11349
	9/25/24	10:47:35	R1	0.93	0.0000	1.82	392	11307
	9/25/24	10:48:34	R1	0.98	0.0000	1.82	391	11347
	9/25/24	10:49:33	R1	0.98	0.0000	1.80	390	11412
	9/25/24	10:50:33	R1	1.00	0.0000	1.82	390	11421
	9/25/24	10:51:31	R1	0.97	0.0000	1.81	390	11457
	9/25/24	10:52:30	R1	0.98	0.0000	1.82	391	11522
	9/25/24	10:53:29	R1	0.98	0.0000	1.76	391	11504
	9/25/24	10:54:28	R1	0.98	0.0000	1.82	391	11482
	9/25/24	10:55:27	R1	0.98	0.0000	1.78	392	11532
	9/25/24	10:56:26	R1	0.98	0.0000	1.80	391	11440
	9/25/24	10:57:25	R1	0.98	0.0000	1.82	391	11430
	9/25/24	10:58:24	R1	0.98	0.0000	1.80	391	11454
	9/25/24	10:59:23	R1	0.98	0.0000	1.80	391	11407
	9/25/24	11:00:22	R1	0.98	0.0000	1.81	392	11360
	9/25/24	11:01:21	R1	0.98	0.0000	1.81	391	11390
	9/25/24	11:02:20	R1	0.98	0.0000	1.78	391	11314

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	RCO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	1.74	390	11004
			Maximum	BDL	1.83	401	11532
			(BDL = 0) Average	0.0000	1.79	392	11327
			MDL	0.15	NA	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	1.74	391	11103
			Maximum	BDL	1.82	406	12016
			(BDL = 0) Average	0.0000	1.78	395	11357
			MDL	0.15	NA	NA	NA
Run Length 69.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	1.73	389	11602
			Maximum				
				0.0000	1.76	395	11816
			MDL	0.15	NA	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	1.73	389	11004
			Maximum	BDL	1.83	409	12016
			(BDL = 0) Average	0.0000	1.78	394	11500
			MDL	0.15	NA	NA	NA

					C2H6 1-min data	CH4 1-min data	CO2 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	11:03:19	R1	0.98	0.0000	1.81	390	11281
	9/25/24	11:04:18	R1	0.98	0.0000	1.82	391	11247
	9/25/24	11:05:17	R1	0.98	0.0000	1.83	391	11337
	9/25/24	11:06:16	R1	0.98	0.0000	1.81	391	11367
	9/25/24	11:07:15	R1	0.98	0.0000	1.79	390	11402
	9/25/24	11:08:14	R1	0.98	0.0000	1.83	390	11457
	9/25/24	11:09:13	R1	0.98	0.0000	1.77	390	11394
	9/25/24	11:10:12	R1	0.98	0.0000	1.81	391	11437
	9/25/24	11:11:11	R1	0.98	0.0000	1.83	392	11448
	9/25/24	11:12:10	R1	0.98	0.0000	1.83	391	11382
	9/25/24	11:13:09	R1	0.98	0.0000	1.78	391	11325
	9/25/24	11:14:08	R1	0.98	0.0000	1.82	391	11328
	9/25/24	11:15:07	R1	0.98	0.0000	1.79	391	11353
	9/25/24	11:16:06	R1	0.98	0.0000	1.77	391	11339
	9/25/24	11:17:05	R1	0.98	0.0000	1.83	391	11363
	9/25/24	11:18:04	R1	0.98	0.0000	1.80	392	11413
	9/25/24	11:19:03	R1	0.98	0.0000	1.80	390	11428
	9/25/24	11:20:02	R1	0.98	0.0000	1.82	391	11426
	9/25/24	11:30:34	R2	10.53	0.0000	1.81	394	11290
	9/25/24	11:31:33	R2	0.98	0.0000	1.78	394	11316
	9/25/24	11:32:32	R2	0.98	0.0000	1.80	393	11324
	9/25/24	11:33:31	R2	0.98	0.0000	1.77	392	11391

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	RCO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	1.74	390	11004
			Maximum	BDL	1.83	401	11532
			(BDL = 0) Average	0.0000	1.79	392	11327
			MDL	0.15	NA	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	1.74	391	11103
			Maximum	BDL	1.82	406	12016
			(BDL = 0) Average	0.0000	1.78	395	11357
			MDL	0.15	NA	NA	NA
Run Length 69.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	1.73	389	11602
			Maximum				
				0.0000	1.76	395	11816
			MDL	0.15	NA	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	1.73	389	11004
			Maximum	BDL	1.83	409	12016
			(BDL = 0) Average	0.0000	1.78	394	11500
			MDL	0.15	NA	NA	NA

					C2H6 1-min data	CH4 1-min data	CO2 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	11:34:33	R2	1.03	0.0000	1.77	391	11382
	9/25/24	11:35:29	R2	0.93	0.0000	1.77	391	11394
	9/25/24	11:36:28	R2	0.98	0.0000	1.82	392	11340
	9/25/24	11:37:27	R2	0.98	0.0000	1.79	392	11337
	9/25/24	11:38:26	R2	0.98	0.0000	1.80	392	11240
	9/25/24	11:39:25	R2	0.98	0.0000	1.80	392	11250
	9/25/24	11:40:27	R2	1.03	0.0000	1.80	392	11306
	9/25/24	11:41:23	R2	0.93	0.0000	1.78	392	11282
	9/25/24	11:42:22	R2	0.98	0.0000	1.79	392	11279
	9/25/24	11:43:21	R2	0.98	0.0000	1.80	391	11351
	9/25/24	11:44:20	R2	0.98	0.0000	1.79	392	11387
	9/25/24	11:45:19	R2	0.98	0.0000	1.80	392	11375
	9/25/24	11:46:18	R2	0.98	0.0000	1.77	391	11397
	9/25/24	11:47:17	R2	0.98	0.0000	1.77	391	11403
	9/25/24	11:48:16	R2	0.98	0.0000	1.80	391	11331
	9/25/24	11:49:15	R2	0.98	0.0000	1.79	391	11347
	9/25/24	11:50:14	R2	0.98	0.0000	1.79	392	11327
	9/25/24	11:51:13	R2	0.98	0.0000	1.80	392	11264
	9/25/24	11:52:12	R2	0.98	0.0000	1.79	392	11236
	9/25/24	11:53:11	R2	0.98	0.0000	1.74	392	11221
	9/25/24	11:54:10	R2	0.98	0.0000	1.79	392	11153
	9/25/24	11:55:09	R2	0.98	0.0000	1.79	393	11103

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	RCO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	1.74	390	11004
			Maximum	BDL	1.83	401	11532
			(BDL = 0) Average	0.0000	1.79	392	11327
			MDL	0.15	NA	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	1.74	391	11103
			Maximum	BDL	1.82	406	12016
			(BDL = 0) Average	0.0000	1.78	395	11357
			MDL	0.15	NA	NA	NA
Run Length 69.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	1.73	389	11602
			Maximum				
				0.0000	1.76	395	11816
			MDL	0.15	NA	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	1.73	389	11004
			Maximum	BDL	1.83	409	12016
			(BDL = 0) Average	0.0000	1.78	394	11500
			MDL	0.15	NA	NA	NA

					C2H6 1-min data	CH4 1-min data	CO2 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	11:56:08	R2	0.98	0.0000	1.76	395	11186
	9/25/24	11:57:07	R2	0.98	0.0000	1.76	393	11256
	9/25/24	11:58:06	R2	0.98	0.0000	1.76	393	11287
	9/25/24	11:59:08	R2	1.03	0.0000	1.77	392	11361
	9/25/24	12:00:04	R2	0.93	0.0000	1.77	391	11336
	9/25/24	12:01:03	R2	0.98	0.0000	1.79	391	11241
	9/25/24	12:02:02	R2	0.98	0.0000	1.79	392	11259
	9/25/24	12:03:01	R2	0.98	0.0000	1.78	392	11250
	9/25/24	12:04:00	R2	0.98	0.0000	1.77	392	11191
	9/25/24	12:04:59	R2	0.98	0.0000	1.78	392	11124
	9/25/24	12:06:00	R2	1.02	0.0000	1.78	392	11223
	9/25/24	12:06:57	R2	0.95	0.0000	1.80	392	11201
	9/25/24	12:07:56	R2	0.98	0.0000	1.78	392	11248
	9/25/24	12:08:55	R2	0.98	0.0000	1.80	392	11314
	9/25/24	12:09:54	R2	0.98	0.0000	1.77	392	11323
	9/25/24	12:10:53	R2	0.98	0.0000	1.76	393	11283
	9/25/24	12:11:52	R2	0.98	0.0000	1.79	393	11312
	9/25/24	12:12:51	R2	0.98	0.0000	1.79	393	11323
	9/25/24	12:13:50	R2	0.98	0.0000	1.80	393	11305
	9/25/24	12:14:49	R2	0.98	0.0000	1.78	395	11389
	9/25/24	12:15:48	R2	0.98	0.0000	1.79	402	11455
	9/25/24	12:16:49	R2	1.02	0.0000	1.76	406	11441

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	RCO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	1.74	390	11004
			Maximum	BDL	1.83	401	11532
			(BDL = 0) Average	0.0000	1.79	392	11327
			MDL	0.15	NA	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	1.74	391	11103
			Maximum	BDL	1.82	406	12016
			(BDL = 0) Average	0.0000	1.78	395	11357
			MDL	0.15	NA	NA	NA
Run Length 69.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	1.73	389	11602
			Maximum				
				0.0000	1.76	395	11816
			MDL	0.15	NA	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	1.73	389	11004
			Maximum	BDL	1.83	409	12016
			(BDL = 0) Average	0.0000	1.78	394	11500
			MDL	0.15	NA	NA	NA

					C2H6 1-min data	CH4 1-min data	CO2 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	12:17:46	R2	0.95	0.0000	1.76	406	11395
	9/25/24	12:18:45	R2	0.98	0.0000	1.77	405	11423
	9/25/24	12:19:46	R2	1.02	0.0000	1.78	405	11349
	9/25/24	12:20:43	R2	0.95	0.0000	1.76	403	11343
	9/25/24	12:21:42	R2	0.98	0.0000	1.80	402	11434
	9/25/24	12:22:41	R2	0.98	0.0000	1.79	402	11520
	9/25/24	12:23:40	R2	0.98	0.0000	1.78	402	11582
	9/25/24	12:24:39	R2	0.98	0.0000	1.76	401	11664
	9/25/24	12:25:38	R2	0.98	0.0000	1.77	400	11606
	9/25/24	12:26:37	R2	0.98	0.0000	1.76	400	11619
	9/25/24	12:27:36	R2	0.98	0.0000	1.77	400	12016
	9/25/24	12:28:36	R2	1.00	0.0000	1.76	400	11884
	9/25/24	12:29:34	R2	0.97	0.0000	1.79	400	11494
	9/25/24	12:30:33	R2	0.98	0.0000	1.77	400	11495
	9/25/24	12:41:27	R3	10.90	0.0000	1.77	401	11742
	9/25/24	12:42:26	R3	0.98	0.0000	1.75	400	11714
	9/25/24	12:43:25	R3	0.98	0.0000	1.77	399	11664
	9/25/24	12:44:24	R3	0.98	0.0000	1.77	397	11659
	9/25/24	12:45:23	R3	0.98	0.0000	1.78	396	11606
	9/25/24	12:46:22	R3	0.98	0.0000	1.80	397	11602
	9/25/24	12:47:21	R3	0.98	0.0000	1.76	395	11616
	9/25/24	12:48:20	R3	0.98	0.0000	1.80	397	11713

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	RCO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	1.74	390	11004
			Maximum	BDL	1.83	401	11532
			(BDL = 0) Average	0.0000	1.79	392	11327
			MDL	0.15	NA	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	1.74	391	11103
			Maximum	BDL	1.82	406	12016
			(BDL = 0) Average	0.0000	1.78	395	11357
			MDL	0.15	NA	NA	NA
Run Length 69.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	1.73	389	11602
			Maximum				
				0.0000	1.76	395	11816
			MDL	0.15	NA	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	1.73	389	11004
			Maximum	BDL	1.83	409	12016
			(BDL = 0) Average	0.0000	1.78	394	11500
			MDL	0.15	NA	NA	NA

					C2H6 1-min data	CH4 1-min data	CO2 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	12:49:19	R3	0.98	0.0000	1.78	398	11816
	9/25/24	12:50:21	R3	1.03	0.0000	1.79	399	11866
	9/25/24	12:51:17	R3	0.93	0.0000	1.79	399	11859
	9/25/24	12:52:16	R3	0.98	0.0000	1.79	398	11838
	9/25/24	12:53:15	R3	0.98	0.0000	1.76	398	11793
	9/25/24	12:54:16	R3	1.02	0.0000	1.78	398	11787
	9/25/24	12:55:13	R3	0.95	0.0000	1.75	396	11738
	9/25/24	12:56:12	R3	0.98	0.0000	1.79	396	11688
	9/25/24	12:57:11	R3	0.98	0.0000	1.75	395	11739
	9/25/24	12:58:10	R3	0.98	0.0000	1.75	397	11705
	9/25/24	12:59:09	R3	0.98	0.0000	1.78	395	11718
	9/25/24	13:00:09	R3	1.00	0.0000	1.78	396	11806
	9/25/24	13:01:07	R3	0.97	0.0000	1.75	395	11866
	9/25/24	13:02:06	R3	0.98	0.0000	1.74	395	11830
	9/25/24	13:03:05	R3	0.98	0.0000	1.75	396	11856
	9/25/24	13:04:04	R3	0.98	0.0000	1.77	394	11857
	9/25/24	13:05:03	R3	0.98	0.0000	1.76	393	11798
	9/25/24	13:06:02	R3	0.98	0.0000	1.75	392	11791
	9/25/24	13:07:02	R3	1.00	0.0000	1.77	394	11805
	9/25/24	13:08:00	R3	0.97	0.0000	1.76	395	11792
	9/25/24	13:09:00	R3	1.00	0.0000	1.79	393	11785
	9/25/24	13:09:58	R3	0.97	0.0000	1.77	392	11777

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	RCO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	1.74	390	11004
			Maximum	BDL	1.83	401	11532
			(BDL = 0) Average	0.0000	1.79	392	11327
			MDL	0.15	NA	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	1.74	391	11103
			Maximum	BDL	1.82	406	12016
			(BDL = 0) Average	0.0000	1.78	395	11357
			MDL	0.15	NA	NA	NA
Run Length 69.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	1.73	389	11602
			Maximum				
				0.0000	1.76	395	11816
			MDL	0.15	NA	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	1.73	389	11004
			Maximum	BDL	1.83	409	12016
			(BDL = 0) Average	0.0000	1.78	394	11500
			MDL	0.15	NA	NA	NA

					C2H6 1-min data	CH4 1-min data	CO2 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	13:10:57	R3	0.98	0.0000	1.78	392	11721
	9/25/24	13:11:57	R3	1.00	0.0000	1.77	394	11682
	9/25/24	13:12:55	R3	0.97	0.0000	1.73	392	11762
	9/25/24	13:13:54	R3	0.98	0.0000	1.76	391	11876
	9/25/24	13:14:53	R3	0.98	0.0000	1.76	391	11858
	9/25/24	13:15:52	R3	0.98	0.0000	1.74	390	11941
	9/25/24	13:16:52	R3	1.00	0.0000	1.74	390	11950
	9/25/24	13:17:53	R3	1.02	0.0000	1.78	390	11868
	9/25/24	13:18:49	R3	0.93	0.0000	1.74	390	11845
	9/25/24	13:19:48	R3	0.98	0.0000	1.75	390	11824
	9/25/24	13:20:47	R3	0.98	0.0000	1.74	390	11795
	9/25/24	13:21:46	R3	0.98	0.0000	1.76	390	11718
	9/25/24	13:22:45	R3	0.98	0.0000	1.75	390	11766
	9/25/24	13:23:44	R3	0.98	0.0000	1.77	391	11798
	9/25/24	13:24:44	R3	1.00	0.0000	1.75	390	11805
	9/25/24	13:25:42	R3	0.97	0.0000	1.75	390	11873
	9/25/24	13:26:41	R3	0.98	0.0000	1.78	390	11957
	9/25/24	13:27:40	R3	0.98	0.0000	1.73	389	11946
	9/25/24	13:28:39	R3	0.98	0.0000	1.76	389	11975
	9/25/24	13:29:38	R3	0.98	0.0000	1.73	389	12009
	9/25/24	13:30:37	R3	0.98	0.0000	1.78	390	11927
	9/25/24	13:31:36	R3	0.98	0.0000	1.74	389	11931

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO3	Outlet	RCO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	1.74	390	11004
			Maximum	BDL	1.83	401	11532
			(BDL = 0) Average	0.0000	1.79	392	11327
			MDL	0.15	NA	NA	NA
Run Length 70.5 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	1.74	391	11103
			Maximum	BDL	1.82	406	12016
			(BDL = 0) Average	0.0000	1.78	395	11357
			MDL	0.15	NA	NA	NA
Run Length 69.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	1.73	389	11602
			Maximum				
				0.0000	1.76	395	11816
			MDL	0.15	NA	NA	NA
Test Length 201 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	1.73	389	11004
			Maximum	BDL	1.83	409	12016
			(BDL = 0) Average	0.0000	1.78	394	11500
			MDL	0.15	NA	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	13:32:35	R3	0.98	0.0000	1.76	391	11969
	9/25/24	13:33:34	R3	0.98	0.0000	1.75	398	11934
	9/25/24	13:34:33	R3	0.98	0.0000	1.75	402	11906
	9/25/24	13:35:32	R3	0.98	0.0000	1.73	409	11910
	9/25/24	13:36:31	R3	0.98	0.0000	1.75	407	11846
	9/25/24	13:37:30	R3	0.98	0.0000	1.78	399	11771
	9/25/24	13:38:29	R3	0.98	0.0000	1.76	397	11870
	9/25/24	13:39:28	R3	0.98	0.0000	1.77	397	11950
	9/25/24	13:40:27	R3	0.98	0.0000	1.75	404	11957

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO3	Inlet					
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	397	1.69	12173
			Maximum	BDL	415	1.86	12758
			(BDL = 0) Average	0.0000	406	1.78	12462
			MDL	0.15	NA	NA	NA
Run Length 71.7 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	399	1.68	11933
			Maximum	BDL	417	1.83	12723
			(BDL = 0) Average	0.0000	408	1.77	12457
			MDL	0.15	NA	NA	NA
Run Length 68.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	399	1.69	11876
			Maximum				
				0.0000	414	1.78	13004
			MDL	0.15	NA	NA	NA
Test Length 202 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	397	1.68	11876
			Maximum	BDL	422	1.86	13220
			(BDL = 0) Average	0.0000	409	1.78	12641
			MDL	0.15	NA	NA	NA

				C2H6 0.9-min data	Carbon 0.9-min data	CH4 0.9-min data	H2O 0.9-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	10:19:57	R1	1.02	0.0000	409	1.72	12497
	9/25/24	10:20:54	R1	0.95	0.0000	408	1.78	12344
	9/25/24	10:21:53	R1	0.98	0.0000	405	1.74	12673
	9/25/24	10:22:52	R1	0.98	0.0000	408	1.69	12390
	9/25/24	10:23:54	R1	1.03	0.0000	412	1.72	12517
	9/25/24	10:24:50	R1	0.93	0.0000	397	1.85	12374
	9/25/24	10:25:52	R1	1.03	0.0000	405	1.76	12424
	9/25/24	10:26:48	R1	0.93	0.0000	415	1.76	12429
	9/25/24	10:27:47	R1	0.98	0.0000	410	1.71	12341
	9/25/24	10:28:46	R1	0.98	0.0000	409	1.75	12617
	9/25/24	10:29:45	R1	0.98	0.0000	402	1.75	12569
	9/25/24	10:30:44	R1	0.98	0.0000	411	1.74	12212
	9/25/24	10:31:43	R1	0.98	0.0000	403	1.77	12400
	9/25/24	10:32:43	R1	1.00	0.0000	405	1.78	12431
	9/25/24	10:33:41	R1	0.97	0.0000	408	1.72	12270
	9/25/24	10:34:40	R1	0.98	0.0000	404	1.76	12299
	9/25/24	10:35:40	R1	1.00	0.0000	409	1.75	12520
	9/25/24	10:36:38	R1	0.97	0.0000	407	1.73	12452
	9/25/24	10:37:37	R1	0.98	0.0000	399	1.75	12339
	9/25/24	10:38:39	R1	1.03	0.0000	400	1.77	12462
	9/25/24	10:39:35	R1	0.93	0.0000	400	1.83	12395
	9/25/24	10:40:34	R1	0.98	0.0000	407	1.79	12173

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO3	Inlet					
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	397	1.69	12173
			Maximum	BDL	415	1.86	12758
			(BDL = 0) Average	0.0000	406	1.78	12462
			MDL	0.15	NA	NA	NA
Run Length 71.7 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	399	1.68	11933
			Maximum	BDL	417	1.83	12723
			(BDL = 0) Average	0.0000	408	1.77	12457
			MDL	0.15	NA	NA	NA
Run Length 68.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	399	1.69	11876
			Maximum				
				0.0000	414	1.78	13004
			MDL	0.15	NA	NA	NA
Test Length 202 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	397	1.68	11876
			Maximum	BDL	422	1.86	13220
			(BDL = 0) Average	0.0000	409	1.78	12641
			MDL	0.15	NA	NA	NA

				C2H6 0.9-min data	Carbon 0.9-min data	CH4 0.9-min data	H2O 0.9-min data
				Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	Date	Time	Run	Scan Length			
	9/25/24	10:41:33	R1	0.98	0.0000	411	1.81	12639
	9/25/24	10:42:32	R1	0.98	0.0000	408	1.77	12546
	9/25/24	10:43:31	R1	0.98	0.0000	403	1.79	12231
	9/25/24	10:44:32	R1	1.02	0.0000	411	1.79	12541
	9/25/24	10:45:29	R1	0.95	0.0000	408	1.79	12407
	9/25/24	10:46:28	R1	0.98	0.0000	404	1.78	12453
	9/25/24	10:47:28	R1	1.00	0.0000	403	1.82	12652
	9/25/24	10:48:27	R1	0.98	0.0000	405	1.77	12564
	9/25/24	10:49:25	R1	0.97	0.0000	402	1.79	12270
	9/25/24	10:50:26	R1	1.02	0.0000	404	1.79	12544
	9/25/24	10:51:23	R1	0.95	0.0000	405	1.80	12499
	9/25/24	10:52:22	R1	0.98	0.0000	401	1.82	12438
	9/25/24	10:53:21	R1	0.98	0.0000	407	1.81	12635
	9/25/24	10:54:20	R1	0.98	0.0000	403	1.73	12437
	9/25/24	10:55:19	R1	0.98	0.0000	408	1.74	12467
	9/25/24	10:56:18	R1	0.98	0.0000	408	1.78	12702
	9/25/24	10:57:17	R1	0.98	0.0000	410	1.78	12640
	9/25/24	10:58:17	R1	1.00	0.0000	398	1.78	12361
	9/25/24	10:59:15	R1	0.97	0.0000	404	1.77	12503
	9/25/24	11:00:14	R1	0.98	0.0000	410	1.80	12480
	9/25/24	11:01:15	R1	1.02	0.0000	407	1.76	12555
	9/25/24	11:02:12	R1	0.95	0.0000	412	1.78	12593

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO3	Inlet					
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	397	1.69	12173
			Maximum	BDL	415	1.86	12758
			(BDL = 0) Average	0.0000	406	1.78	12462
			MDL	0.15	NA	NA	NA
Run Length 71.7 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	399	1.68	11933
			Maximum	BDL	417	1.83	12723
			(BDL = 0) Average	0.0000	408	1.77	12457
			MDL	0.15	NA	NA	NA
Run Length 68.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	399	1.69	11876
			Maximum				
				0.0000	414	1.78	13004
			MDL	0.15	NA	NA	NA
Test Length 202 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	397	1.68	11876
			Maximum	BDL	422	1.86	13220
			(BDL = 0) Average	0.0000	409	1.78	12641
			MDL	0.15	NA	NA	NA

					C2H6 0.9-min data	Carbon 0.9-min data	CH4 0.9-min data	H2O 0.9-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	11:03:11	R1	0.98	0.0000	404	1.85	12407
	9/25/24	11:04:10	R1	0.98	0.0000	406	1.82	12324
	9/25/24	11:05:11	R1	1.02	0.0000	412	1.80	12294
	9/25/24	11:06:08	R1	0.95	0.0000	402	1.82	12758
	9/25/24	11:07:07	R1	0.98	0.0000	402	1.85	12366
	9/25/24	11:08:06	R1	0.98	0.0000	410	1.79	12465
	9/25/24	11:09:08	R1	1.03	0.0000	406	1.73	12378
	9/25/24	11:10:04	R1	0.93	0.0000	403	1.82	12454
	9/25/24	11:11:03	R1	0.98	0.0000	400	1.82	12429
	9/25/24	11:12:02	R1	0.98	0.0000	399	1.82	12585
	9/25/24	11:13:04	R1	1.03	0.0000	403	1.80	12737
	9/25/24	11:14:02	R1	0.97	0.0000	401	1.80	12330
	9/25/24	11:14:59	R1	0.95	0.0000	408	1.77	12521
	9/25/24	11:15:58	R1	0.98	0.0000	413	1.81	12527
	9/25/24	11:16:57	R1	0.98	0.0000	408	1.85	12654
	9/25/24	11:17:56	R1	0.98	0.0000	403	1.81	12352
	9/25/24	11:18:55	R1	0.98	0.0000	399	1.86	12344
	9/25/24	11:19:54	R1	0.98	0.0000	402	1.82	12455
	9/25/24	11:30:39	R2	10.75	0.0000	403	1.81	11933
	9/25/24	11:31:38	R2	0.98	0.0000	405	1.78	12400
	9/25/24	11:32:37	R2	0.98	0.0000	411	1.78	12422
	9/25/24	11:33:36	R2	0.98	0.0000	400	1.80	12461

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO3	Inlet					
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	397	1.69	12173
			Maximum	BDL	415	1.86	12758
			(BDL = 0) Average	0.0000	406	1.78	12462
			MDL	0.15	NA	NA	NA
Run Length 71.7 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	399	1.68	11933
			Maximum	BDL	417	1.83	12723
			(BDL = 0) Average	0.0000	408	1.77	12457
			MDL	0.15	NA	NA	NA
Run Length 68.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	399	1.69	11876
			Maximum				
				0.0000	414	1.78	13004
			MDL	0.15	NA	NA	NA
Test Length 202 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	397	1.68	11876
			Maximum	BDL	422	1.86	13220
			(BDL = 0) Average	0.0000	409	1.78	12641
			MDL	0.15	NA	NA	NA

				C2H6 0.9-min data	Carbon 0.9-min data	CH4 0.9-min data	H2O 0.9-min data
				Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	Date	Time	Run	Scan Length			
	9/25/24	11:34:35	R2	0.98	0.0000	407	1.77	12503
	9/25/24	11:35:34	R2	0.98	0.0000	405	1.73	12723
	9/25/24	11:36:33	R2	0.98	0.0000	403	1.82	12295
	9/25/24	11:37:32	R2	0.98	0.0000	414	1.77	12420
	9/25/24	11:38:31	R2	0.98	0.0000	400	1.83	12205
	9/25/24	11:39:32	R2	1.02	0.0000	411	1.79	12585
	9/25/24	11:40:29	R2	0.95	0.0000	399	1.82	12411
	9/25/24	11:41:28	R2	0.98	0.0000	405	1.78	12255
	9/25/24	11:42:27	R2	0.98	0.0000	401	1.79	12339
	9/25/24	11:43:26	R2	0.98	0.0000	402	1.79	12662
	9/25/24	11:44:25	R2	0.98	0.0000	404	1.78	12553
	9/25/24	11:45:27	R2	1.03	0.0000	405	1.76	12510
	9/25/24	11:46:26	R2	0.98	0.0000	402	1.78	12485
	9/25/24	11:47:22	R2	0.93	0.0000	413	1.76	12606
	9/25/24	11:48:21	R2	0.98	0.0000	402	1.77	12629
	9/25/24	11:49:20	R2	0.98	0.0000	411	1.74	12270
	9/25/24	11:50:20	R2	1.00	0.0000	414	1.75	12546
	9/25/24	11:51:18	R2	0.97	0.0000	417	1.77	12399
	9/25/24	11:52:20	R2	1.03	0.0000	407	1.76	12609
	9/25/24	11:53:16	R2	0.93	0.0000	407	1.75	12500
	9/25/24	11:54:15	R2	0.98	0.0000	405	1.78	12354
	9/25/24	11:55:14	R2	0.98	0.0000	403	1.77	12648

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO3	Inlet					
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	397	1.69	12173
			Maximum	BDL	415	1.86	12758
			(BDL = 0) Average	0.0000	406	1.78	12462
			MDL	0.15	NA	NA	NA
Run Length 71.7 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	399	1.68	11933
			Maximum	BDL	417	1.83	12723
			(BDL = 0) Average	0.0000	408	1.77	12457
			MDL	0.15	NA	NA	NA
Run Length 68.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	399	1.69	11876
			Maximum				
				0.0000	414	1.78	13004
			MDL	0.15	NA	NA	NA
Test Length 202 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	397	1.68	11876
			Maximum	BDL	422	1.86	13220
			(BDL = 0) Average	0.0000	409	1.78	12641
			MDL	0.15	NA	NA	NA

					C2H6 0.9-min data	Carbon 0.9-min data	CH4 0.9-min data	H2O 0.9-min data
					Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	Date	Time	Run	Scan Length				
	9/25/24	11:56:13	R2	0.98	0.0000	406	1.76	12320
	9/25/24	11:57:12	R2	0.98	0.0000	399	1.80	12362
	9/25/24	11:58:12	R2	1.00	0.0000	404	1.78	12595
	9/25/24	11:59:13	R2	1.02	0.0000	410	1.80	12479
	9/25/24	12:00:09	R2	0.93	0.0000	406	1.75	12309
	9/25/24	12:01:11	R2	1.03	0.0000	408	1.70	12321
	9/25/24	12:02:07	R2	0.93	0.0000	411	1.73	12332
	9/25/24	12:03:06	R2	0.98	0.0000	403	1.76	12395
	9/25/24	12:04:08	R2	1.03	0.0000	407	1.70	12250
	9/25/24	12:05:04	R2	0.93	0.0000	413	1.72	12460
	9/25/24	12:06:03	R2	0.98	0.0000	410	1.78	12491
	9/25/24	12:07:03	R2	1.00	0.0000	402	1.75	12159
	9/25/24	12:08:01	R2	0.97	0.0000	406	1.77	12359
	9/25/24	12:09:00	R2	0.98	0.0000	406	1.76	12509
	9/25/24	12:09:59	R2	0.98	0.0000	413	1.78	12344
	9/25/24	12:10:58	R2	0.98	0.0000	406	1.75	12139
	9/25/24	12:11:57	R2	0.98	0.0000	409	1.78	12229
	9/25/24	12:12:56	R2	0.98	0.0000	407	1.79	12388
	9/25/24	12:13:55	R2	0.98	0.0000	402	1.77	12640
	9/25/24	12:14:54	R2	0.98	0.0000	409	1.81	12516
	9/25/24	12:15:53	R2	0.98	0.0000	413	1.74	12312
	9/25/24	12:16:52	R2	0.98	0.0000	413	1.79	12551

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO3	Inlet					
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	397	1.69	12173
			Maximum	BDL	415	1.86	12758
			(BDL = 0) Average	0.0000	406	1.78	12462
			MDL	0.15	NA	NA	NA
Run Length 71.7 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	399	1.68	11933
			Maximum	BDL	417	1.83	12723
			(BDL = 0) Average	0.0000	408	1.77	12457
			MDL	0.15	NA	NA	NA
Run Length 68.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	399	1.69	11876
			Maximum				
				0.0000	414	1.78	13004
			MDL	0.15	NA	NA	NA
Test Length 202 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	397	1.68	11876
			Maximum	BDL	422	1.86	13220
			(BDL = 0) Average	0.0000	409	1.78	12641
			MDL	0.15	NA	NA	NA

					C2H6 0.9-min data	Carbon 0.9-min data	CH4 0.9-min data	H2O 0.9-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	12:17:51	R2	0.98	0.0000	403	1.76	12383
	9/25/24	12:18:50	R2	0.98	0.0000	406	1.74	12502
	9/25/24	12:19:49	R2	0.98	0.0000	415	1.72	12490
	9/25/24	12:20:48	R2	0.98	0.0000	413	1.78	12677
	9/25/24	12:21:47	R2	0.98	0.0000	414	1.79	12643
	9/25/24	12:22:46	R2	0.98	0.0000	407	1.78	12547
	9/25/24	12:23:47	R2	1.02	0.0000	416	1.76	12577
	9/25/24	12:24:44	R2	0.95	0.0000	407	1.78	12428
	9/25/24	12:25:43	R2	0.98	0.0000	407	1.79	12651
	9/25/24	12:26:42	R2	0.98	0.0000	413	1.76	12567
	9/25/24	12:27:43	R2	1.02	0.0000	411	1.78	12669
	9/25/24	12:28:40	R2	0.95	0.0000	414	1.68	12565
	9/25/24	12:29:39	R2	0.98	0.0000	410	1.79	12668
	9/25/24	12:30:38	R2	0.98	0.0000	417	1.78	12558
	9/25/24	12:31:37	R2	0.98	0.0000	412	1.74	12685
	9/25/24	12:41:29	R3	9.87	0.0000	399	1.69	11876
	9/25/24	12:42:28	R3	0.98	0.0000	418	1.73	12845
	9/25/24	12:43:27	R3	0.98	0.0000	413	1.75	12926
	9/25/24	12:44:26	R3	0.98	0.0000	415	1.76	12967
	9/25/24	12:45:25	R3	0.98	0.0000	413	1.77	12868
	9/25/24	12:46:27	R3	1.03	0.0000	418	1.72	12898
	9/25/24	12:47:23	R3	0.93	0.0000	411	1.79	12999

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO3	Inlet					
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	397	1.69	12173
			Maximum	BDL	415	1.86	12758
			(BDL = 0) Average	0.0000	406	1.78	12462
			MDL	0.15	NA	NA	NA
Run Length 71.7 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	399	1.68	11933
			Maximum	BDL	417	1.83	12723
			(BDL = 0) Average	0.0000	408	1.77	12457
			MDL	0.15	NA	NA	NA
Run Length 68.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	399	1.69	11876
			Maximum				
				0.0000	414	1.78	13004
			MDL	0.15	NA	NA	NA
Test Length 202 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	397	1.68	11876
			Maximum	BDL	422	1.86	13220
			(BDL = 0) Average	0.0000	409	1.78	12641
			MDL	0.15	NA	NA	NA

	Date	Time	Run	Scan Length	C2H6 0.9-min data Conc. (ppm) BDL=0	Carbon 0.9-min data Conc. (ppm) BDL=0	CH4 0.9-min data Conc. (ppm) BDL=0	H2O 0.9-min data Conc. (ppm) BDL=0
	9/25/24	12:48:22	R3	0.98	0.0000	414	1.78	12973
	9/25/24	12:49:21	R3	0.98	0.0000	421	1.80	12961
	9/25/24	12:50:20	R3	0.98	0.0000	421	1.80	12954
	9/25/24	12:51:19	R3	0.98	0.0000	418	1.81	13007
	9/25/24	12:52:18	R3	0.98	0.0000	422	1.80	13068
	9/25/24	12:53:17	R3	0.98	0.0000	417	1.80	12978
	9/25/24	12:54:19	R3	1.03	0.0000	419	1.81	12951
	9/25/24	12:55:15	R3	0.93	0.0000	422	1.83	12982
	9/25/24	12:56:14	R3	0.98	0.0000	407	1.83	13014
	9/25/24	12:57:17	R3	1.05	0.0000	415	1.83	12993
	9/25/24	12:58:12	R3	0.92	0.0000	416	1.78	12983
	9/25/24	12:59:11	R3	0.98	0.0000	415	1.76	13046
	9/25/24	13:00:10	R3	0.98	0.0000	415	1.82	12936
	9/25/24	13:01:09	R3	0.98	0.0000	411	1.80	12984
	9/25/24	13:02:11	R3	1.03	0.0000	418	1.78	13042
	9/25/24	13:03:07	R3	0.93	0.0000	412	1.79	12902
	9/25/24	13:04:06	R3	0.98	0.0000	415	1.78	13017
	9/25/24	13:05:05	R3	0.98	0.0000	414	1.81	13060
	9/25/24	13:06:04	R3	0.98	0.0000	414	1.80	12928
	9/25/24	13:07:03	R3	0.98	0.0000	418	1.83	13036
	9/25/24	13:08:02	R3	0.98	0.0000	417	1.81	12891
	9/25/24	13:09:01	R3	0.98	0.0000	414	1.76	12983

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO3	Inlet					
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	397	1.69	12173
			Maximum	BDL	415	1.86	12758
			(BDL = 0) Average	0.0000	406	1.78	12462
			MDL	0.15	NA	NA	NA
Run Length 71.7 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	399	1.68	11933
			Maximum	BDL	417	1.83	12723
			(BDL = 0) Average	0.0000	408	1.77	12457
			MDL	0.15	NA	NA	NA
Run Length 68.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	399	1.69	11876
			Maximum				
				0.0000	414	1.78	13004
			MDL	0.15	NA	NA	NA
Test Length 202 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	397	1.68	11876
			Maximum	BDL	422	1.86	13220
			(BDL = 0) Average	0.0000	409	1.78	12641
			MDL	0.15	NA	NA	NA

	Date	Time	Run	Scan Length	C2H6 0.9-min data Conc. (ppm) BDL=0	Carbon 0.9-min data Conc. (ppm) BDL=0	CH4 0.9-min data Conc. (ppm) BDL=0	H2O 0.9-min data Conc. (ppm) BDL=0
	9/25/24	13:10:00	R3	0.98	0.0000	412	1.76	12913
	9/25/24	13:10:59	R3	0.98	0.0000	412	1.78	12934
	9/25/24	13:11:58	R3	0.98	0.0000	412	1.79	13008
	9/25/24	13:12:57	R3	0.98	0.0000	407	1.76	13103
	9/25/24	13:13:56	R3	0.98	0.0000	417	1.76	13161
	9/25/24	13:14:55	R3	0.98	0.0000	418	1.75	13042
	9/25/24	13:15:54	R3	0.98	0.0000	415	1.76	13084
	9/25/24	13:16:53	R3	0.98	0.0000	409	1.73	13093
	9/25/24	13:17:52	R3	0.98	0.0000	413	1.73	13127
	9/25/24	13:18:51	R3	0.98	0.0000	415	1.78	12951
	9/25/24	13:19:50	R3	0.98	0.0000	408	1.75	13024
	9/25/24	13:20:49	R3	0.98	0.0000	411	1.77	12958
	9/25/24	13:21:48	R3	0.98	0.0000	415	1.77	12849
	9/25/24	13:22:50	R3	1.03	0.0000	416	1.77	13050
	9/25/24	13:23:46	R3	0.93	0.0000	412	1.78	13024
	9/25/24	13:24:45	R3	0.98	0.0000	412	1.77	13004
	9/25/24	13:25:45	R3	1.00	0.0000	413	1.78	13027
	9/25/24	13:26:43	R3	0.97	0.0000	416	1.78	12974
	9/25/24	13:27:42	R3	0.98	0.0000	411	1.79	13047
	9/25/24	13:28:41	R3	0.98	0.0000	413	1.77	13141
	9/25/24	13:29:40	R3	0.98	0.0000	412	1.77	13057
	9/25/24	13:30:39	R3	0.98	0.0000	410	1.77	13098

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO3	Inlet					
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	397	1.69	12173
			Maximum	BDL	415	1.86	12758
			(BDL = 0) Average	0.0000	406	1.78	12462
			MDL	0.15	NA	NA	NA
Run Length 71.7 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	399	1.68	11933
			Maximum	BDL	417	1.83	12723
			(BDL = 0) Average	0.0000	408	1.77	12457
			MDL	0.15	NA	NA	NA
Run Length 68.9 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	399	1.69	11876
			Maximum				
				0.0000	414	1.78	13004
			MDL	0.15	NA	NA	NA
Test Length 202 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	397	1.68	11876
			Maximum	BDL	422	1.86	13220
			(BDL = 0) Average	0.0000	409	1.78	12641
			MDL	0.15	NA	NA	NA

Date	Time	Run	Scan Length	C2H6 0.9-min data Conc. (ppm) BDL=0	Carbon 0.9-min data Conc. (ppm) BDL=0	CH4 0.9-min data Conc. (ppm) BDL=0	H2O 0.9-min data Conc. (ppm) BDL=0
9/25/24	13:31:38	R3	0.98	0.0000	406	1.77	13061
9/25/24	13:32:37	R3	0.98	0.0000	414	1.77	13078
9/25/24	13:33:36	R3	0.98	0.0000	414	1.80	13188
9/25/24	13:34:35	R3	0.98	0.0000	417	1.79	13113
9/25/24	13:35:36	R3	1.02	0.0000	414	1.79	13189
9/25/24	13:36:33	R3	0.95	0.0000	418	1.77	13157
9/25/24	13:37:32	R3	0.98	0.0000	412	1.82	13151
9/25/24	13:38:31	R3	0.98	0.0000	413	1.83	13220
9/25/24	13:39:32	R3	1.02	0.0000	413	1.78	13187
9/25/24	13:40:29	R3	0.95	0.0000	420	1.82	13164

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO2	Outlet	TO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	14115	30736
			Maximum	BDL	BDL	17038	99305
			(BDL = 0) Average	0.0000	0.0000	15679	36560
			MDL	0.14	0.18	NA	NA
Run Length 106 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	14207	32848
			Maximum	BDL	BDL	17173	70868
			(BDL = 0) Average	0.0000	0.0000	15539	48642
			MDL	0.14	0.18	NA	NA
Run Length 71.8 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	12651	39225
			Maximum				
				0.0000	0.0000	15456	45593
			MDL	0.14	0.18	NA	NA
Test Length 239 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12651	30736
			Maximum	BDL	BDL	17334	99305
			(BDL = 0) Average	0.0000	0.0000	15558	43598
			MDL	0.14	0.18	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	14:14:53	R1	0.98	0.0000	0.0000	16207	33956
	9/25/24	14:15:52	R1	0.98	0.0000	0.0000	16412	33726
	9/25/24	14:16:51	R1	0.98	0.0000	0.0000	14670	33617
	9/25/24	14:17:50	R1	0.98	0.0000	0.0000	15602	33256
	9/25/24	14:18:51	R1	1.02	0.0000	0.0000	16831	36413
	9/25/24	14:19:49	R1	0.97	0.0000	0.0000	14847	37939
	9/25/24	14:20:49	R1	1.00	0.0000	0.0000	14945	37028
	9/25/24	14:21:46	R1	0.95	0.0000	0.0000	16808	36451
	9/25/24	14:22:45	R1	0.98	0.0000	0.0000	15692	35833
	9/25/24	14:23:44	R1	0.98	0.0000	0.0000	14659	35451
	9/25/24	14:24:43	R1	0.98	0.0000	0.0000	16510	35005
	9/25/24	14:25:42	R1	0.98	0.0000	0.0000	16159	34214
	9/25/24	14:26:41	R1	0.98	0.0000	0.0000	14769	33788
	9/25/24	14:27:40	R1	0.98	0.0000	0.0000	15447	32941
	9/25/24	14:28:39	R1	0.98	0.0000	0.0000	16795	32114
	9/25/24	14:29:38	R1	0.98	0.0000	0.0000	15259	31997
	9/25/24	14:30:37	R1	0.98	0.0000	0.0000	15207	32186
	9/25/24	14:31:36	R1	0.98	0.0000	0.0000	16617	32624
	9/25/24	14:32:36	R1	1.00	0.0000	0.0000	15839	32739
	9/25/24	14:33:34	R1	0.97	0.0000	0.0000	14921	32592
	9/25/24	14:34:33	R1	0.98	0.0000	0.0000	15740	32791
	9/25/24	14:35:32	R1	0.98	0.0000	0.0000	16635	32491

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO2	Outlet	TO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	14115	30736
			Maximum	BDL	BDL	17038	99305
			(BDL = 0) Average	0.0000	0.0000	15679	36560
			MDL	0.14	0.18	NA	NA
Run Length 106 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	14207	32848
			Maximum	BDL	BDL	17173	70868
			(BDL = 0) Average	0.0000	0.0000	15539	48642
			MDL	0.14	0.18	NA	NA
Run Length 71.8 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	12651	39225
			Maximum				
				0.0000	0.0000	15456	45593
			MDL	0.14	0.18	NA	NA
Test Length 239 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12651	30736
			Maximum	BDL	BDL	17334	99305
			(BDL = 0) Average	0.0000	0.0000	15558	43598
			MDL	0.14	0.18	NA	NA

Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
9/25/24	14:36:31	R1	0.98	0.0000	0.0000	14980	32277
9/25/24	14:37:30	R1	0.98	0.0000	0.0000	15339	32938
9/25/24	14:38:29	R1	0.98	0.0000	0.0000	16817	33370
9/25/24	14:39:28	R1	0.98	0.0000	0.0000	15460	33698
9/25/24	14:40:27	R1	0.98	0.0000	0.0000	14922	33983
9/25/24	14:41:26	R1	0.98	0.0000	0.0000	16567	33585
9/25/24	14:42:25	R1	0.98	0.0000	0.0000	15998	33311
9/25/24	14:43:26	R1	1.02	0.0000	0.0000	14884	33274
9/25/24	14:44:24	R1	0.97	0.0000	0.0000	15796	33455
9/25/24	14:45:22	R1	0.97	0.0000	0.0000	16818	32752
9/25/24	14:46:23	R1	1.02	0.0000	0.0000	14957	31875
9/25/24	14:47:20	R1	0.95	0.0000	0.0000	15215	32079
9/25/24	14:48:22	R1	1.03	0.0000	0.0000	17038	32018
9/25/24	14:49:18	R1	0.93	0.0000	0.0000	15511	32009
9/25/24	14:50:17	R1	0.98	0.0000	0.0000	14993	31851
9/25/24	14:51:16	R1	0.98	0.0000	0.0000	16820	31201
9/25/24	14:52:16	R1	1.00	0.0000	0.0000	16065	31211
9/25/24	14:53:17	R1	1.02	0.0000	0.0000	14903	31192
9/25/24	14:54:13	R1	0.93	0.0000	0.0000	16047	31060
9/25/24	14:55:12	R1	0.98	0.0000	0.0000	16788	31032
9/25/24	14:56:11	R1	0.98	0.0000	0.0000	14880	30905
9/25/24	14:57:10	R1	0.98	0.0000	0.0000	15673	30736

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO2	Outlet	TO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	14115	30736
			Maximum	BDL	BDL	17038	99305
			(BDL = 0) Average	0.0000	0.0000	15679	36560
			MDL	0.14	0.18	NA	NA
Run Length 106 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	14207	32848
			Maximum	BDL	BDL	17173	70868
			(BDL = 0) Average	0.0000	0.0000	15539	48642
			MDL	0.14	0.18	NA	NA
Run Length 71.8 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	12651	39225
			Maximum				
				0.0000	0.0000	15456	45593
			MDL	0.14	0.18	NA	NA
Test Length 239 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12651	30736
			Maximum	BDL	BDL	17334	99305
			(BDL = 0) Average	0.0000	0.0000	15558	43598
			MDL	0.14	0.18	NA	NA

Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
9/25/24	14:58:09	R1	0.98	0.0000	0.0000	16873	31719
9/25/24	14:59:08	R1	0.98	0.0000	0.0000	15042	34928
9/25/24	15:00:07	R1	0.98	0.0000	0.0000	15204	34785
9/25/24	15:01:08	R1	1.02	0.0000	0.0000	16252	34998
9/25/24	15:02:06	R1	0.97	0.0000	0.0000	15909	38082
9/25/24	15:03:04	R1	0.97	0.0000	0.0000	14760	43602
9/25/24	15:04:03	R1	0.98	0.0000	0.0000	15470	41111
9/25/24	15:05:02	R1	0.98	0.0000	0.0000	16558	40210
9/25/24	15:06:02	R1	1.00	0.0000	0.0000	15158	39820
9/25/24	15:07:03	R1	1.02	0.0000	0.0000	14651	47116
9/25/24	15:07:59	R1	0.93	0.0000	0.0000	14884	99305
9/25/24	15:08:58	R1	0.98	0.0000	0.0000	15648	52406
9/25/24	15:09:57	R1	0.98	0.0000	0.0000	14525	46093
9/25/24	15:10:56	R1	0.98	0.0000	0.0000	15681	45669
9/25/24	15:11:57	R1	1.02	0.0000	0.0000	16244	45406
9/25/24	15:12:54	R1	0.95	0.0000	0.0000	14115	44933
9/25/24	15:13:53	R1	0.98	0.0000	0.0000	15434	44552
9/25/24	15:14:53	R1	1.00	0.0000	0.0000	16664	43036
9/25/24	16:51:11	R2	39.35	0.0000	0.0000	14390	35710
9/25/24	16:52:10	R2	0.98	0.0000	0.0000	16774	37075
9/25/24	16:53:12	R2	1.03	0.0000	0.0000	15761	41162
9/25/24	16:54:08	R2	0.93	0.0000	0.0000	14585	42537

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO2	Outlet	TO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	14115	30736
			Maximum	BDL	BDL	17038	99305
			(BDL = 0) Average	0.0000	0.0000	15679	36560
			MDL	0.14	0.18	NA	NA
Run Length 106 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	14207	32848
			Maximum	BDL	BDL	17173	70868
			(BDL = 0) Average	0.0000	0.0000	15539	48642
			MDL	0.14	0.18	NA	NA
Run Length 71.8 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	12651	39225
			Maximum				
				0.0000	0.0000	15456	45593
			MDL	0.14	0.18	NA	NA
Test Length 239 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12651	30736
			Maximum	BDL	BDL	17334	99305
			(BDL = 0) Average	0.0000	0.0000	15558	43598
			MDL	0.14	0.18	NA	NA

					C2H6 1-min data	CH4 1-min data	CO2 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	16:55:07	R2	0.98	0.0000	0.0000	16157	41967
	9/25/24	16:56:07	R2	1.00	0.0000	0.0000	16023	40906
	9/25/24	16:57:05	R2	0.97	0.0000	0.0000	15347	38522
	9/25/24	16:58:05	R2	1.00	0.0000	0.0000	15582	37440
	9/25/24	16:59:05	R2	1.00	0.0000	0.0000	16340	36695
	9/25/24	17:00:02	R2	0.95	0.0000	0.0000	16327	35498
	9/25/24	17:01:01	R2	0.98	0.0000	0.0000	15726	34397
	9/25/24	17:02:00	R2	0.98	0.0000	0.0000	15281	33477
	9/25/24	17:02:59	R2	0.98	0.0000	0.0000	16555	32848
	9/25/24	17:04:01	R2	1.03	0.0000	0.0000	16382	33004
	9/25/24	17:04:57	R2	0.93	0.0000	0.0000	15253	34058
	9/25/24	17:05:56	R2	0.98	0.0000	0.0000	15781	35830
	9/25/24	17:06:55	R2	0.98	0.0000	0.0000	16907	36571
	9/25/24	17:07:54	R2	0.98	0.0000	0.0000	15353	37324
	9/25/24	17:08:53	R2	0.98	0.0000	0.0000	15269	37081
	9/25/24	17:09:53	R2	1.00	0.0000	0.0000	17081	38654
	9/25/24	17:10:51	R2	0.97	0.0000	0.0000	15123	47705
	9/25/24	17:11:50	R2	0.98	0.0000	0.0000	14735	41719
	9/25/24	17:12:50	R2	1.00	0.0000	0.0000	17173	43443
	9/25/24	17:13:51	R2	1.02	0.0000	0.0000	15452	42904
	9/25/24	17:14:47	R2	0.93	0.0000	0.0000	14471	42249
	9/25/24	17:15:46	R2	0.98	0.0000	0.0000	17067	42533

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO2	Outlet	TO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	14115	30736
			Maximum	BDL	BDL	17038	99305
			(BDL = 0) Average	0.0000	0.0000	15679	36560
			MDL	0.14	0.18	NA	NA
Run Length 106 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	14207	32848
			Maximum	BDL	BDL	17173	70868
			(BDL = 0) Average	0.0000	0.0000	15539	48642
			MDL	0.14	0.18	NA	NA
Run Length 71.8 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	12651	39225
			Maximum				
				0.0000	0.0000	15456	45593
			MDL	0.14	0.18	NA	NA
Test Length 239 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12651	30736
			Maximum	BDL	BDL	17334	99305
			(BDL = 0) Average	0.0000	0.0000	15558	43598
			MDL	0.14	0.18	NA	NA

				C2H6 1-min data	CH4 1-min data	CO2 1-min data	H2O 1-min data
				Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	Date	Time	Run	Scan Length			
	9/25/24	17:16:45	R2	0.98	0.0000	0.0000	15481	43887
	9/25/24	17:17:44	R2	0.98	0.0000	0.0000	14467	44413
	9/25/24	17:18:44	R2	1.00	0.0000	0.0000	16586	48833
	9/25/24	17:19:42	R2	0.97	0.0000	0.0000	15708	47020
	9/25/24	17:20:41	R2	0.98	0.0000	0.0000	14472	47824
	9/25/24	17:21:40	R2	0.98	0.0000	0.0000	16066	49195
	9/25/24	17:22:39	R2	0.98	0.0000	0.0000	15943	56448
	9/25/24	17:23:38	R2	0.98	0.0000	0.0000	14626	55018
	9/25/24	17:24:39	R2	1.02	0.0000	0.0000	15307	54967
	9/25/24	17:25:39	R2	1.00	0.0000	0.0000	16194	57002
	9/25/24	17:26:36	R2	0.95	0.0000	0.0000	15119	56448
	9/25/24	17:27:34	R2	0.97	0.0000	0.0000	14830	55340
	9/25/24	17:28:33	R2	0.98	0.0000	0.0000	15307	55647
	9/25/24	17:29:32	R2	0.98	0.0000	0.0000	16126	55315
	9/25/24	17:30:31	R2	0.98	0.0000	0.0000	14878	54545
	9/25/24	17:31:30	R2	0.98	0.0000	0.0000	14300	70868
	9/25/24	17:32:30	R2	1.00	0.0000	0.0000	16182	54435
	9/25/24	17:33:28	R2	0.97	0.0000	0.0000	15505	48682
	9/25/24	17:34:27	R2	0.98	0.0000	0.0000	14485	55156
	9/25/24	17:35:26	R2	0.98	0.0000	0.0000	15446	64955
	9/25/24	17:36:25	R2	0.98	0.0000	0.0000	16270	52877
	9/25/24	17:37:24	R2	0.98	0.0000	0.0000	14750	51053

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO2	Outlet	TO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	14115	30736
			Maximum	BDL	BDL	17038	99305
			(BDL = 0) Average	0.0000	0.0000	15679	36560
			MDL	0.14	0.18	NA	NA
Run Length 106 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	14207	32848
			Maximum	BDL	BDL	17173	70868
			(BDL = 0) Average	0.0000	0.0000	15539	48642
			MDL	0.14	0.18	NA	NA
Run Length 71.8 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	12651	39225
			Maximum				
				0.0000	0.0000	15456	45593
			MDL	0.14	0.18	NA	NA
Test Length 239 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12651	30736
			Maximum	BDL	BDL	17334	99305
			(BDL = 0) Average	0.0000	0.0000	15558	43598
			MDL	0.14	0.18	NA	NA

					C2H6 1-min data	CH4 1-min data	CO2 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	17:38:26	R2	1.03	0.0000	0.0000	14847	57546
	9/25/24	17:39:22	R2	0.93	0.0000	0.0000	16648	49656
	9/25/24	17:40:21	R2	0.98	0.0000	0.0000	15153	46543
	9/25/24	17:41:23	R2	1.03	0.0000	0.0000	14573	43892
	9/25/24	17:42:19	R2	0.93	0.0000	0.0000	17079	41556
	9/25/24	17:43:18	R2	0.98	0.0000	0.0000	15474	41515
	9/25/24	17:44:20	R2	1.03	0.0000	0.0000	14772	42474
	9/25/24	17:45:16	R2	0.93	0.0000	0.0000	16956	43870
	9/25/24	17:46:18	R2	1.03	0.0000	0.0000	15488	44938
	9/25/24	17:47:16	R2	0.97	0.0000	0.0000	14286	61339
	9/25/24	17:48:13	R2	0.95	0.0000	0.0000	15965	61567
	9/25/24	17:49:14	R2	1.02	0.0000	0.0000	15551	66625
	9/25/24	17:50:11	R2	0.95	0.0000	0.0000	14207	62884
	9/25/24	17:51:10	R2	0.98	0.0000	0.0000	15654	64746
	9/25/24	17:52:09	R2	0.98	0.0000	0.0000	15946	66747
	9/25/24	17:53:08	R2	0.98	0.0000	0.0000	14367	67707
	9/25/24	17:54:07	R2	0.98	0.0000	0.0000	14889	66169
	9/25/24	17:55:06	R2	0.98	0.0000	0.0000	15847	63659
	9/25/24	17:56:05	R2	0.98	0.0000	0.0000	15488	62010
	9/25/24	17:57:04	R2	0.98	0.0000	0.0000	14802	60074
	9/25/24	17:58:03	R2	0.98	0.0000	0.0000	15283	59529
	9/25/24	18:18:43	R3	11.82	0.0000	0.0000	15967	50029

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO2	Outlet	TO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	14115	30736
			Maximum	BDL	BDL	17038	99305
			(BDL = 0) Average	0.0000	0.0000	15679	36560
			MDL	0.14	0.18	NA	NA
Run Length 106 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	14207	32848
			Maximum	BDL	BDL	17173	70868
			(BDL = 0) Average	0.0000	0.0000	15539	48642
			MDL	0.14	0.18	NA	NA
Run Length 71.8 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	12651	39225
			Maximum				
				0.0000	0.0000	15456	45593
			MDL	0.14	0.18	NA	NA
Test Length 239 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12651	30736
			Maximum	BDL	BDL	17334	99305
			(BDL = 0) Average	0.0000	0.0000	15558	43598
			MDL	0.14	0.18	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	18:19:42	R3	0.98	0.0000	0.0000	15113	48604
	9/25/24	18:20:41	R3	0.98	0.0000	0.0000	14849	48976
	9/25/24	18:21:40	R3	0.98	0.0000	0.0000	16458	51904
	9/25/24	18:22:45	R3	1.08	0.0000	0.0000	15559	50630
	9/25/24	18:23:42	R3	0.95	0.0000	0.0000	14560	48210
	9/25/24	18:24:37	R3	0.92	0.0000	0.0000	16274	50977
	9/25/24	18:25:36	R3	0.98	0.0000	0.0000	16181	50650
	9/25/24	18:26:35	R3	0.98	0.0000	0.0000	14469	46504
	9/25/24	18:27:36	R3	1.02	0.0000	0.0000	15915	50103
	9/25/24	18:28:36	R3	1.00	0.0000	0.0000	16445	50510
	9/25/24	18:29:34	R3	0.97	0.0000	0.0000	14326	45741
	9/25/24	18:30:31	R3	0.95	0.0000	0.0000	15499	48833
	9/25/24	18:31:30	R3	0.98	0.0000	0.0000	16994	51012
	9/25/24	18:32:29	R3	0.98	0.0000	0.0000	14254	45741
	9/25/24	18:33:28	R3	0.98	0.0000	0.0000	15267	47235
	9/25/24	18:34:28	R3	1.00	0.0000	0.0000	16685	50837
	9/25/24	18:35:26	R3	0.97	0.0000	0.0000	15147	47563
	9/25/24	18:36:26	R3	1.00	0.0000	0.0000	14905	46259
	9/25/24	18:37:27	R3	1.02	0.0000	0.0000	16474	49096
	9/25/24	18:38:23	R3	0.93	0.0000	0.0000	15557	46513
	9/25/24	18:39:22	R3	0.98	0.0000	0.0000	14528	44289
	9/25/24	18:40:21	R3	0.98	0.0000	0.0000	15927	48285

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO2	Outlet	TO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	14115	30736
			Maximum	BDL	BDL	17038	99305
			(BDL = 0) Average	0.0000	0.0000	15679	36560
			MDL	0.14	0.18	NA	NA
Run Length 106 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	14207	32848
			Maximum	BDL	BDL	17173	70868
			(BDL = 0) Average	0.0000	0.0000	15539	48642
			MDL	0.14	0.18	NA	NA
Run Length 71.8 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	12651	39225
			Maximum				
				0.0000	0.0000	15456	45593
			MDL	0.14	0.18	NA	NA
Test Length 239 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12651	30736
			Maximum	BDL	BDL	17334	99305
			(BDL = 0) Average	0.0000	0.0000	15558	43598
			MDL	0.14	0.18	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	18:41:20	R3	0.98	0.0000	0.0000	16205	48651
	9/25/24	18:42:19	R3	0.98	0.0000	0.0000	14706	46068
	9/25/24	18:43:18	R3	0.98	0.0000	0.0000	15384	46948
	9/25/24	18:44:19	R3	1.02	0.0000	0.0000	16484	48733
	9/25/24	18:45:16	R3	0.95	0.0000	0.0000	15088	45715
	9/25/24	18:46:15	R3	0.98	0.0000	0.0000	15060	44495
	9/25/24	18:47:14	R3	0.98	0.0000	0.0000	16341	48752
	9/25/24	18:48:15	R3	1.02	0.0000	0.0000	16258	48529
	9/25/24	18:59:02	R3	0.98	0.0000	0.0000	14206	42084
	9/25/24	19:00:01	R3	0.98	0.0000	0.0000	15778	44053
	9/25/24	19:01:00	R3	0.98	0.0000	0.0000	12651	41379
	9/25/24	19:01:59	R3	0.98	0.0000	0.0000	13654	43059
	9/25/24	19:02:58	R3	0.98	0.0000	0.0000	14977	43498
	9/25/24	19:03:57	R3	0.98	0.0000	0.0000	16319	45177
	9/25/24	19:04:56	R3	0.98	0.0000	0.0000	15118	43100
	9/25/24	19:05:55	R3	0.98	0.0000	0.0000	13723	39225
	9/25/24	19:06:54	R3	0.98	0.0000	0.0000	16619	45169
	9/25/24	19:07:53	R3	0.98	0.0000	0.0000	15761	43221
	9/25/24	19:08:52	R3	0.98	0.0000	0.0000	14485	41015
	9/25/24	19:09:54	R3	1.03	0.0000	0.0000	15552	43096
	9/25/24	19:10:50	R3	0.93	0.0000	0.0000	16332	43905
	9/25/24	19:11:49	R3	0.98	0.0000	0.0000	14597	40648

	Unitname	Location	Condition	C2H6 Summary	CH4 Summary	CO2 Summary	H2O Summary
	RCTO2	Outlet	TO				
Run Length 61.0 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	BDL	14115	30736
			Maximum	BDL	BDL	17038	99305
			(BDL = 0) Average	0.0000	0.0000	15679	36560
			MDL	0.14	0.18	NA	NA
Run Length 106 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	BDL	14207	32848
			Maximum	BDL	BDL	17173	70868
			(BDL = 0) Average	0.0000	0.0000	15539	48642
			MDL	0.14	0.18	NA	NA
Run Length 71.8 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	BDL	12651	39225
			Maximum				
				0.0000	0.0000	15456	45593
			MDL	0.14	0.18	NA	NA
Test Length 239 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	BDL	12651	30736
			Maximum	BDL	BDL	17334	99305
			(BDL = 0) Average	0.0000	0.0000	15558	43598
			MDL	0.14	0.18	NA	NA

					C2H6 1-min data	CH4 1-min data	CO2 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	19:12:49	R3	1.00	0.0000	0.0000	15032	41325
	9/25/24	19:13:47	R3	0.97	0.0000	0.0000	16688	46115
	9/25/24	19:14:47	R3	1.00	0.0000	0.0000	14831	42161
	9/25/24	19:15:46	R3	0.98	0.0000	0.0000	14650	41093
	9/25/24	19:16:44	R3	0.97	0.0000	0.0000	16652	45153
	9/25/24	19:17:43	R3	0.98	0.0000	0.0000	16664	44756
	9/25/24	19:18:44	R3	1.02	0.0000	0.0000	14007	39554
	9/25/24	19:19:41	R3	0.95	0.0000	0.0000	16308	43984
	9/25/24	19:20:40	R3	0.98	0.0000	0.0000	16084	43793
	9/25/24	19:21:39	R3	0.98	0.0000	0.0000	14249	40455
	9/25/24	19:22:38	R3	0.98	0.0000	0.0000	14956	41254
	9/25/24	19:23:38	R3	1.00	0.0000	0.0000	17334	46047
	9/25/24	19:24:36	R3	0.97	0.0000	0.0000	15262	42115
	9/25/24	19:25:38	R3	1.03	0.0000	0.0000	14326	39915
	9/25/24	19:26:34	R3	0.93	0.0000	0.0000	17195	46652
	9/25/24	19:27:34	R3	1.00	0.0000	0.0000	17050	46192
	9/25/24	19:28:32	R3	0.97	0.0000	0.0000	14371	41196

	Unitname	Location	Condition	C2H6 Summary	CO2 Summary	H2O Summary	CH4 Summary
	RCTO2	Outlet	RCO				
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	348	12167	1.73
			Maximum	BDL	412	12563	1.94
			(BDL = 0) Average	0.0000	362	12334	1.78
			MDL	0.14	NA	NA	NA
Run Length 96.1 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	407	11893	1.69
			Maximum	BDL	473	12531	1.96
			(BDL = 0) Average	0.0000	430	12182	1.76
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	408	11851	1.71
			Maximum				
				0.0000	437	12311	1.76
			MDL	0.14	NA	NA	NA
Test Length 229 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	348	11851	1.69
			Maximum	BDL	496	13045	1.96
			(BDL = 0) Average	0.0000	410	12276	1.77
			MDL	0.14	NA	NA	NA

				C2H6 1-min data	CO2 1-min data	H2O 1-min data	CH4 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	14:14:56	R1	0.97	0.0000	351	12252	1.94
	9/25/24	14:15:54	R1	0.97	0.0000	350	12215	1.76
	9/25/24	14:16:53	R1	0.98	0.0000	352	12171	1.78
	9/25/24	14:17:52	R1	0.98	0.0000	352	12213	1.79
	9/25/24	14:18:51	R1	0.98	0.0000	349	12330	1.76
	9/25/24	14:19:50	R1	0.98	0.0000	350	12372	1.75
	9/25/24	14:20:49	R1	0.98	0.0000	349	12399	1.79
	9/25/24	14:21:51	R1	1.03	0.0000	348	12430	1.75
	9/25/24	14:22:47	R1	0.93	0.0000	352	12440	1.74
	9/25/24	14:23:46	R1	0.98	0.0000	353	12421	1.76
	9/25/24	14:24:45	R1	0.98	0.0000	355	12481	1.76
	9/25/24	14:25:46	R1	1.02	0.0000	354	12351	1.76
	9/25/24	14:26:43	R1	0.95	0.0000	353	12268	1.79
	9/25/24	14:27:42	R1	0.98	0.0000	352	12330	1.78
	9/25/24	14:28:41	R1	0.98	0.0000	352	12295	1.79
	9/25/24	14:29:40	R1	0.98	0.0000	351	12277	1.79
	9/25/24	14:30:39	R1	0.98	0.0000	351	12275	1.75
	9/25/24	14:31:38	R1	0.98	0.0000	350	12288	1.75
	9/25/24	14:32:37	R1	0.98	0.0000	350	12317	1.77
	9/25/24	14:33:36	R1	0.98	0.0000	351	12340	1.78
	9/25/24	14:34:35	R1	0.98	0.0000	350	12354	1.77
	9/25/24	14:35:34	R1	0.98	0.0000	351	12353	1.82

	Unitname	Location	Condition	C2H6 Summary	CO2 Summary	H2O Summary	CH4 Summary
	RCTO2	Outlet	RCO				
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	348	12167	1.73
			Maximum	BDL	412	12563	1.94
			(BDL = 0) Average	0.0000	362	12334	1.78
			MDL	0.14	NA	NA	NA
Run Length 96.1 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	407	11893	1.69
			Maximum	BDL	473	12531	1.96
			(BDL = 0) Average	0.0000	430	12182	1.76
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	408	11851	1.71
			Maximum				
				0.0000	437	12311	1.76
			MDL	0.14	NA	NA	NA
Test Length 229 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	348	11851	1.69
			Maximum	BDL	496	13045	1.96
			(BDL = 0) Average	0.0000	410	12276	1.77
			MDL	0.14	NA	NA	NA

					C2H6 1-min data	CO2 1-min data	H2O 1-min data	CH4 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	14:36:33	R1	0.98	0.0000	351	12293	1.75
	9/25/24	14:37:32	R1	0.98	0.0000	351	12297	1.79
	9/25/24	14:38:33	R1	1.02	0.0000	352	12296	1.77
	9/25/24	14:39:30	R1	0.95	0.0000	351	12252	1.81
	9/25/24	14:40:29	R1	0.98	0.0000	351	12207	1.80
	9/25/24	14:41:28	R1	0.98	0.0000	352	12253	1.80
	9/25/24	14:42:27	R1	0.98	0.0000	349	12167	1.73
	9/25/24	14:43:26	R1	0.98	0.0000	350	12258	1.78
	9/25/24	14:44:25	R1	0.98	0.0000	350	12299	1.78
	9/25/24	14:45:24	R1	0.98	0.0000	358	12367	1.82
	9/25/24	14:46:23	R1	0.98	0.0000	368	12441	1.74
	9/25/24	14:47:22	R1	0.98	0.0000	376	12515	1.78
	9/25/24	14:48:21	R1	0.98	0.0000	384	12563	1.75
	9/25/24	14:49:20	R1	0.98	0.0000	386	12520	1.77
	9/25/24	14:50:19	R1	0.98	0.0000	394	12554	1.78
	9/25/24	14:51:18	R1	0.98	0.0000	403	12546	1.74
	9/25/24	14:52:17	R1	0.98	0.0000	407	12391	1.80
	9/25/24	14:53:16	R1	0.98	0.0000	412	12374	1.78
	9/25/24	14:54:15	R1	0.98	0.0000	408	12345	1.79
	9/25/24	14:55:16	R1	1.02	0.0000	404	12299	1.77
	9/25/24	14:56:13	R1	0.95	0.0000	404	12252	1.75
	9/25/24	14:57:14	R1	1.02	0.0000	386	12286	1.76

	Unitname	Location	Condition	C2H6 Summary	CO2 Summary	H2O Summary	CH4 Summary
	RCTO2	Outlet	RCO				
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	348	12167	1.73
			Maximum	BDL	412	12563	1.94
			(BDL = 0) Average	0.0000	362	12334	1.78
			MDL	0.14	NA	NA	NA
Run Length 96.1 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	407	11893	1.69
			Maximum	BDL	473	12531	1.96
			(BDL = 0) Average	0.0000	430	12182	1.76
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	408	11851	1.71
			Maximum				
				0.0000	437	12311	1.76
			MDL	0.14	NA	NA	NA
Test Length 229 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	348	11851	1.69
			Maximum	BDL	496	13045	1.96
			(BDL = 0) Average	0.0000	410	12276	1.77
			MDL	0.14	NA	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0
	9/25/24	14:58:11	R1	0.95	0.0000	391	12264	1.77
	9/25/24	14:59:10	R1	0.98	0.0000	375	12237	1.78
	9/25/24	15:00:09	R1	0.98	0.0000	363	12246	1.78
	9/25/24	15:01:08	R1	0.98	0.0000	361	12280	1.77
	9/25/24	15:02:07	R1	0.98	0.0000	360	12242	1.77
	9/25/24	15:03:06	R1	0.98	0.0000	360	12248	1.77
	9/25/24	15:04:05	R1	0.98	0.0000	359	12284	1.77
	9/25/24	15:05:04	R1	0.98	0.0000	359	12320	1.75
	9/25/24	15:06:03	R1	0.98	0.0000	359	12224	1.78
	9/25/24	15:07:02	R1	0.98	0.0000	365	12304	1.78
	9/25/24	15:08:01	R1	0.98	0.0000	367	12357	1.75
	9/25/24	15:09:00	R1	0.98	0.0000	359	12318	1.80
	9/25/24	15:09:59	R1	0.98	0.0000	353	12292	1.80
	9/25/24	15:10:58	R1	0.98	0.0000	352	12376	1.80
	9/25/24	15:11:57	R1	0.98	0.0000	351	12442	1.80
	9/25/24	15:12:56	R1	0.98	0.0000	350	12407	1.80
	9/25/24	15:13:55	R1	0.98	0.0000	350	12456	1.78
	9/25/24	15:14:54	R1	0.98	0.0000	352	12491	1.79
	9/25/24	16:51:17	R2	29.27	0.0000	473	12021	1.96
	9/25/24	16:52:16	R2	0.98	0.0000	468	12101	1.76
	9/25/24	16:53:15	R2	0.98	0.0000	462	12023	1.77
	9/25/24	16:54:14	R2	0.98	0.0000	458	11893	1.76

	Unitname	Location	Condition	C2H6 Summary	CO2 Summary	H2O Summary	CH4 Summary
	RCTO2	Outlet	RCO				
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	348	12167	1.73
			Maximum	BDL	412	12563	1.94
			(BDL = 0) Average	0.0000	362	12334	1.78
			MDL	0.14	NA	NA	NA
Run Length 96.1 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	407	11893	1.69
			Maximum	BDL	473	12531	1.96
			(BDL = 0) Average	0.0000	430	12182	1.76
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	408	11851	1.71
			Maximum				
				0.0000	437	12311	1.76
			MDL	0.14	NA	NA	NA
Test Length 229 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	348	11851	1.69
			Maximum	BDL	496	13045	1.96
			(BDL = 0) Average	0.0000	410	12276	1.77
			MDL	0.14	NA	NA	NA

				C2H6 1-min data	CO2 1-min data	H2O 1-min data	CH4 1-min data
Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
9/25/24	16:55:13	R2	0.98	0.0000	453	11950	1.78
9/25/24	16:56:12	R2	0.98	0.0000	453	12014	1.77
9/25/24	16:57:11	R2	0.98	0.0000	446	12028	1.79
9/25/24	16:58:10	R2	0.98	0.0000	443	12070	1.75
9/25/24	16:59:09	R2	0.98	0.0000	445	12105	1.76
9/25/24	17:00:08	R2	0.98	0.0000	445	12162	1.78
9/25/24	17:01:07	R2	0.98	0.0000	441	12169	1.78
9/25/24	17:02:07	R2	1.00	0.0000	436	12172	1.74
9/25/24	17:03:05	R2	0.97	0.0000	431	12330	1.74
9/25/24	17:04:04	R2	0.98	0.0000	437	12459	1.74
9/25/24	17:05:03	R2	0.98	0.0000	448	12472	1.74
9/25/24	17:06:04	R2	1.02	0.0000	450	12531	1.76
9/25/24	17:07:01	R2	0.95	0.0000	449	12504	1.75
9/25/24	17:08:00	R2	0.98	0.0000	454	12381	1.76
9/25/24	17:09:02	R2	1.03	0.0000	456	12366	1.77
9/25/24	17:09:58	R2	0.93	0.0000	459	12335	1.80
9/25/24	17:10:57	R2	0.98	0.0000	462	12281	1.80
9/25/24	17:11:56	R2	0.98	0.0000	459	12287	1.78
9/25/24	17:12:55	R2	0.98	0.0000	451	12301	1.75
9/25/24	17:13:54	R2	0.98	0.0000	443	12314	1.80
9/25/24	17:14:53	R2	0.98	0.0000	436	12287	1.77
9/25/24	17:15:52	R2	0.98	0.0000	432	12267	1.79

	Unitname	Location	Condition	C2H6 Summary	CO2 Summary	H2O Summary	CH4 Summary
	RCTO2	Outlet	RCO				
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	348	12167	1.73
			Maximum	BDL	412	12563	1.94
			(BDL = 0) Average	0.0000	362	12334	1.78
			MDL	0.14	NA	NA	NA
Run Length 96.1 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	407	11893	1.69
			Maximum	BDL	473	12531	1.96
			(BDL = 0) Average	0.0000	430	12182	1.76
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	408	11851	1.71
			Maximum				
				0.0000	437	12311	1.76
			MDL	0.14	NA	NA	NA
Test Length 229 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	348	11851	1.69
			Maximum	BDL	496	13045	1.96
			(BDL = 0) Average	0.0000	410	12276	1.77
			MDL	0.14	NA	NA	NA

					C2H6 1-min data	CO2 1-min data	H2O 1-min data	CH4 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	17:16:51	R2	0.98	0.0000	426	12202	1.78
	9/25/24	17:17:50	R2	0.98	0.0000	425	12141	1.74
	9/25/24	17:18:50	R2	1.00	0.0000	421	12233	1.80
	9/25/24	17:19:48	R2	0.97	0.0000	419	12135	1.76
	9/25/24	17:20:47	R2	0.98	0.0000	417	12043	1.79
	9/25/24	17:21:46	R2	0.98	0.0000	414	12067	1.79
	9/25/24	17:22:45	R2	0.98	0.0000	412	12135	1.77
	9/25/24	17:23:46	R2	1.02	0.0000	411	12109	1.74
	9/25/24	17:24:43	R2	0.95	0.0000	415	12118	1.76
	9/25/24	17:25:42	R2	0.98	0.0000	420	12215	1.74
	9/25/24	17:26:41	R2	0.98	0.0000	425	12213	1.75
	9/25/24	17:27:40	R2	0.98	0.0000	423	12154	1.77
	9/25/24	17:28:39	R2	0.98	0.0000	420	12132	1.73
	9/25/24	17:29:38	R2	0.98	0.0000	417	12115	1.78
	9/25/24	17:30:37	R2	0.98	0.0000	415	12078	1.73
	9/25/24	17:31:36	R2	0.98	0.0000	414	12079	1.78
	9/25/24	17:32:35	R2	0.98	0.0000	412	12046	1.78
	9/25/24	17:33:34	R2	0.98	0.0000	410	11989	1.74
	9/25/24	17:34:33	R2	0.98	0.0000	409	11976	1.76
	9/25/24	17:35:32	R2	0.98	0.0000	408	11989	1.71
	9/25/24	17:36:31	R2	0.98	0.0000	407	11969	1.73
	9/25/24	17:37:30	R2	0.98	0.0000	408	12013	1.75

	Unitname	Location	Condition	C2H6 Summary	CO2 Summary	H2O Summary	CH4 Summary
	RCTO2	Outlet	RCO				
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	348	12167	1.73
			Maximum	BDL	412	12563	1.94
			(BDL = 0) Average	0.0000	362	12334	1.78
			MDL	0.14	NA	NA	NA
Run Length 96.1 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	407	11893	1.69
			Maximum	BDL	473	12531	1.96
			(BDL = 0) Average	0.0000	430	12182	1.76
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	408	11851	1.71
			Maximum				
				0.0000	437	12311	1.76
			MDL	0.14	NA	NA	NA
Test Length 229 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	348	11851	1.69
			Maximum	BDL	496	13045	1.96
			(BDL = 0) Average	0.0000	410	12276	1.77
			MDL	0.14	NA	NA	NA

					C2H6 1-min data	CO2 1-min data	H2O 1-min data	CH4 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	17:38:29	R2	0.98	0.0000	413	12071	1.74
	9/25/24	17:39:28	R2	0.98	0.0000	417	12182	1.78
	9/25/24	17:40:27	R2	0.98	0.0000	423	12273	1.75
	9/25/24	17:41:26	R2	0.98	0.0000	429	12431	1.74
	9/25/24	17:42:25	R2	0.98	0.0000	434	12437	1.74
	9/25/24	17:43:24	R2	0.98	0.0000	435	12341	1.77
	9/25/24	17:44:24	R2	1.00	0.0000	438	12327	1.74
	9/25/24	17:45:22	R2	0.97	0.0000	432	12338	1.73
	9/25/24	17:46:21	R2	0.98	0.0000	430	12241	1.69
	9/25/24	17:47:20	R2	0.98	0.0000	428	12221	1.74
	9/25/24	17:48:19	R2	0.98	0.0000	425	12245	1.73
	9/25/24	17:49:18	R2	0.98	0.0000	420	12246	1.74
	9/25/24	17:50:17	R2	0.98	0.0000	416	12159	1.76
	9/25/24	17:51:18	R2	1.02	0.0000	413	12165	1.74
	9/25/24	17:52:15	R2	0.95	0.0000	412	12201	1.70
	9/25/24	17:53:14	R2	0.98	0.0000	412	12154	1.71
	9/25/24	17:54:13	R2	0.98	0.0000	410	12133	1.74
	9/25/24	17:55:12	R2	0.98	0.0000	409	12190	1.77
	9/25/24	17:56:11	R2	0.98	0.0000	408	12114	1.77
	9/25/24	17:57:12	R2	1.02	0.0000	407	12052	1.77
	9/25/24	17:58:09	R2	0.95	0.0000	407	12072	1.77
	9/25/24	18:18:45	R3	11.75	0.0000	489	13045	1.71

	Unitname	Location	Condition	C2H6 Summary	CO2 Summary	H2O Summary	CH4 Summary
	RCTO2	Outlet	RCO				
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	348	12167	1.73
			Maximum	BDL	412	12563	1.94
			(BDL = 0) Average	0.0000	362	12334	1.78
			MDL	0.14	NA	NA	NA
Run Length 96.1 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	407	11893	1.69
			Maximum	BDL	473	12531	1.96
			(BDL = 0) Average	0.0000	430	12182	1.76
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	408	11851	1.71
			Maximum				
				0.0000	437	12311	1.76
			MDL	0.14	NA	NA	NA
Test Length 229 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	348	11851	1.69
			Maximum	BDL	496	13045	1.96
			(BDL = 0) Average	0.0000	410	12276	1.77
			MDL	0.14	NA	NA	NA

				C2H6 1-min data	CO2 1-min data	H2O 1-min data	CH4 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	18:19:44	R3	0.98	0.0000	496	12964	1.73
	9/25/24	18:20:43	R3	0.98	0.0000	478	13024	1.74
	9/25/24	18:21:42	R3	0.98	0.0000	464	13040	1.74
	9/25/24	18:22:41	R3	0.98	0.0000	464	12971	1.74
	9/25/24	18:23:40	R3	0.98	0.0000	465	12994	1.74
	9/25/24	18:24:39	R3	0.98	0.0000	462	12987	1.76
	9/25/24	18:25:38	R3	0.98	0.0000	461	12939	1.77
	9/25/24	18:26:37	R3	0.98	0.0000	462	12650	1.74
	9/25/24	18:27:36	R3	0.98	0.0000	459	12616	1.74
	9/25/24	18:28:35	R3	0.98	0.0000	456	12558	1.77
	9/25/24	18:29:34	R3	0.98	0.0000	449	12434	1.75
	9/25/24	18:30:33	R3	0.98	0.0000	434	12437	1.73
	9/25/24	18:31:32	R3	0.98	0.0000	425	12513	1.75
	9/25/24	18:32:31	R3	0.98	0.0000	422	12448	1.76
	9/25/24	18:33:30	R3	0.98	0.0000	419	12436	1.75
	9/25/24	18:34:29	R3	0.98	0.0000	417	12413	1.71
	9/25/24	18:35:28	R3	0.98	0.0000	415	12382	1.75
	9/25/24	18:36:27	R3	0.98	0.0000	414	12373	1.77
	9/25/24	18:37:26	R3	0.98	0.0000	413	12444	1.78
	9/25/24	18:38:25	R3	0.98	0.0000	411	12314	1.73
	9/25/24	18:39:24	R3	0.98	0.0000	411	12217	1.75
	9/25/24	18:40:23	R3	0.98	0.0000	409	12268	1.75

	Unitname	Location	Condition	C2H6 Summary	CO2 Summary	H2O Summary	CH4 Summary
	RCTO2	Outlet	RCO				
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	348	12167	1.73
			Maximum	BDL	412	12563	1.94
			(BDL = 0) Average	0.0000	362	12334	1.78
			MDL	0.14	NA	NA	NA
Run Length 96.1 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	407	11893	1.69
			Maximum	BDL	473	12531	1.96
			(BDL = 0) Average	0.0000	430	12182	1.76
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	408	11851	1.71
			Maximum				
				0.0000	437	12311	1.76
			MDL	0.14	NA	NA	NA
Test Length 229 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	348	11851	1.69
			Maximum	BDL	496	13045	1.96
			(BDL = 0) Average	0.0000	410	12276	1.77
			MDL	0.14	NA	NA	NA

				C2H6 1-min data	CO2 1-min data	H2O 1-min data	CH4 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	18:41:22	R3	0.98	0.0000	408	12263	1.74
	9/25/24	18:42:21	R3	0.98	0.0000	408	12246	1.78
	9/25/24	18:43:20	R3	0.98	0.0000	409	12244	1.77
	9/25/24	18:44:19	R3	0.98	0.0000	410	12270	1.75
	9/25/24	18:45:18	R3	0.98	0.0000	410	12243	1.75
	9/25/24	18:46:17	R3	0.98	0.0000	410	12266	1.77
	9/25/24	18:47:16	R3	0.98	0.0000	410	12318	1.72
	9/25/24	18:48:15	R3	0.98	0.0000	410	12331	1.74
	9/25/24	19:00:03	R3	0.98	0.0000	415	12261	1.76
	9/25/24	19:01:02	R3	0.98	0.0000	415	12247	1.76
	9/25/24	19:02:01	R3	0.98	0.0000	420	12196	1.74
	9/25/24	19:03:00	R3	0.98	0.0000	423	12179	1.72
	9/25/24	19:03:59	R3	0.98	0.0000	423	12194	1.74
	9/25/24	19:04:58	R3	0.98	0.0000	423	12033	1.77
	9/25/24	19:05:57	R3	0.98	0.0000	417	12040	1.75
	9/25/24	19:06:56	R3	0.98	0.0000	419	12138	1.75
	9/25/24	19:07:55	R3	0.98	0.0000	431	12247	1.76
	9/25/24	19:08:54	R3	0.98	0.0000	449	12260	1.76
	9/25/24	19:09:53	R3	0.98	0.0000	446	12289	1.77
	9/25/24	19:10:52	R3	0.98	0.0000	448	12366	1.75
	9/25/24	19:11:51	R3	0.98	0.0000	447	12321	1.75
	9/25/24	19:12:50	R3	0.98	0.0000	453	12319	1.76

	Unitname	Location	Condition	C2H6 Summary	CO2 Summary	H2O Summary	CH4 Summary
	RCTO2	Outlet	RCO				
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	348	12167	1.73
			Maximum	BDL	412	12563	1.94
			(BDL = 0) Average	0.0000	362	12334	1.78
			MDL	0.14	NA	NA	NA
Run Length 96.1 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	407	11893	1.69
			Maximum	BDL	473	12531	1.96
			(BDL = 0) Average	0.0000	430	12182	1.76
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	408	11851	1.71
			Maximum				
				0.0000	437	12311	1.76
			MDL	0.14	NA	NA	NA
Test Length 229 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	348	11851	1.69
			Maximum	BDL	496	13045	1.96
			(BDL = 0) Average	0.0000	410	12276	1.77
			MDL	0.14	NA	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	CO2 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0
	9/25/24	19:13:49	R3	0.98	0.0000	458	12280	1.78
	9/25/24	19:14:49	R3	1.00	0.0000	459	12170	1.77
	9/25/24	19:15:47	R3	0.97	0.0000	457	12071	1.78
	9/25/24	19:16:46	R3	0.98	0.0000	457	12060	1.79
	9/25/24	19:17:45	R3	0.98	0.0000	458	11998	1.80
	9/25/24	19:18:46	R3	1.02	0.0000	462	11901	1.82
	9/25/24	19:19:43	R3	0.95	0.0000	460	11912	1.79
	9/25/24	19:20:42	R3	0.98	0.0000	455	11993	1.81
	9/25/24	19:21:41	R3	0.98	0.0000	453	11925	1.76
	9/25/24	19:22:42	R3	1.02	0.0000	442	11883	1.80
	9/25/24	19:23:39	R3	0.95	0.0000	441	11891	1.78
	9/25/24	19:24:38	R3	0.98	0.0000	439	11874	1.80
	9/25/24	19:25:37	R3	0.98	0.0000	434	11851	1.81
	9/25/24	19:26:36	R3	0.98	0.0000	430	11926	1.80
	9/25/24	19:27:35	R3	0.98	0.0000	425	11964	1.78
	9/25/24	19:28:34	R3	0.98	0.0000	423	11900	1.78
	9/25/24	19:29:33	R3	0.98	0.0000	419	11969	1.81

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO2	Inlet					
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	402	1.71	12389
			Maximum	BDL	458	1.85	12951
			(BDL = 0) Average	0.0000	416	1.79	12636
			MDL	0.14	NA	NA	NA
Run Length 66.9 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	422	1.73	11975
			Maximum	BDL	450	1.90	12584
			(BDL = 0) Average	0.0000	436	1.81	12267
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	419	1.71	11981
			Maximum				
				0.0000	442	1.79	12271
			MDL	0.14	NA	NA	NA
Test Length 199 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	402	1.71	11975
			Maximum	BDL	467	1.90	12951
			(BDL = 0) Average	0.0000	431	1.79	12391
			MDL	0.14	NA	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	Carbon 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	14:15:49	R1	0.95	0.0000	403	1.80	12494
	9/25/24	14:16:47	R1	0.97	0.0000	410	1.80	12666
	9/25/24	14:17:46	R1	0.98	0.0000	410	1.79	12646
	9/25/24	14:18:45	R1	0.98	0.0000	405	1.84	12664
	9/25/24	14:19:44	R1	0.98	0.0000	410	1.80	12669
	9/25/24	14:20:43	R1	0.98	0.0000	408	1.77	12611
	9/25/24	14:21:42	R1	0.98	0.0000	411	1.80	12782
	9/25/24	14:22:42	R1	1.00	0.0000	406	1.84	12674
	9/25/24	14:23:40	R1	0.97	0.0000	407	1.84	12674
	9/25/24	14:24:39	R1	0.98	0.0000	404	1.84	12597
	9/25/24	14:25:41	R1	1.03	0.0000	410	1.84	12579
	9/25/24	14:26:37	R1	0.93	0.0000	410	1.79	12686
	9/25/24	14:27:36	R1	0.98	0.0000	407	1.85	12675
	9/25/24	14:28:35	R1	0.98	0.0000	409	1.77	12674
	9/25/24	14:29:38	R1	1.05	0.0000	407	1.83	12453
	9/25/24	14:30:36	R1	0.97	0.0000	408	1.80	12401
	9/25/24	14:31:32	R1	0.93	0.0000	408	1.81	12567
	9/25/24	14:32:31	R1	0.98	0.0000	412	1.78	12589
	9/25/24	14:33:31	R1	1.00	0.0000	408	1.84	12449
	9/25/24	14:34:29	R1	0.97	0.0000	412	1.80	12547
	9/25/24	14:35:28	R1	0.98	0.0000	408	1.81	12558
	9/25/24	14:36:27	R1	0.98	0.0000	411	1.79	12701

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO2	Inlet					
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	402	1.71	12389
			Maximum	BDL	458	1.85	12951
			(BDL = 0) Average	0.0000	416	1.79	12636
			MDL	0.14	NA	NA	NA
Run Length 66.9 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	422	1.73	11975
			Maximum	BDL	450	1.90	12584
			(BDL = 0) Average	0.0000	436	1.81	12267
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	419	1.71	11981
			Maximum				
				0.0000	442	1.79	12271
			MDL	0.14	NA	NA	NA
Test Length 199 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	402	1.71	11975
			Maximum	BDL	467	1.90	12951
			(BDL = 0) Average	0.0000	431	1.79	12391
			MDL	0.14	NA	NA	NA

					C2H6 1-min data	Carbon 1-min data	CH4 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	14:37:26	R1	0.98	0.0000	409	1.77	12624
	9/25/24	14:38:25	R1	0.98	0.0000	404	1.78	12389
	9/25/24	14:39:24	R1	0.98	0.0000	412	1.77	12598
	9/25/24	14:40:23	R1	0.98	0.0000	415	1.74	12538
	9/25/24	14:41:22	R1	0.98	0.0000	409	1.84	12604
	9/25/24	14:42:21	R1	0.98	0.0000	409	1.85	12518
	9/25/24	14:43:21	R1	1.00	0.0000	407	1.73	12676
	9/25/24	14:44:22	R1	1.02	0.0000	404	1.76	12589
	9/25/24	14:45:19	R1	0.95	0.0000	415	1.75	12684
	9/25/24	14:46:17	R1	0.97	0.0000	415	1.75	12584
	9/25/24	14:47:16	R1	0.98	0.0000	418	1.77	12867
	9/25/24	14:48:15	R1	0.98	0.0000	422	1.75	12867
	9/25/24	14:49:14	R1	0.98	0.0000	427	1.71	12756
	9/25/24	14:50:13	R1	0.98	0.0000	436	1.77	12640
	9/25/24	14:51:14	R1	1.02	0.0000	440	1.79	12708
	9/25/24	14:52:11	R1	0.95	0.0000	452	1.75	12822
	9/25/24	14:53:10	R1	0.98	0.0000	454	1.74	12730
	9/25/24	14:54:09	R1	0.98	0.0000	456	1.81	12643
	9/25/24	14:55:10	R1	1.02	0.0000	458	1.81	12743
	9/25/24	14:56:07	R1	0.95	0.0000	455	1.81	12465
	9/25/24	14:57:06	R1	0.98	0.0000	441	1.79	12598
	9/25/24	14:58:05	R1	0.98	0.0000	448	1.82	12502

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO2	Inlet					
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	402	1.71	12389
			Maximum	BDL	458	1.85	12951
			(BDL = 0) Average	0.0000	416	1.79	12636
			MDL	0.14	NA	NA	NA
Run Length 66.9 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	422	1.73	11975
			Maximum	BDL	450	1.90	12584
			(BDL = 0) Average	0.0000	436	1.81	12267
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	419	1.71	11981
			Maximum				
				0.0000	442	1.79	12271
			MDL	0.14	NA	NA	NA
Test Length 199 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	402	1.71	11975
			Maximum	BDL	467	1.90	12951
			(BDL = 0) Average	0.0000	431	1.79	12391
			MDL	0.14	NA	NA	NA

					C2H6 1-min data	Carbon 1-min data	CH4 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	14:59:04	R1	0.98	0.0000	417	1.81	12544
	9/25/24	15:00:06	R1	1.03	0.0000	413	1.77	12700
	9/25/24	15:01:02	R1	0.93	0.0000	413	1.80	12444
	9/25/24	15:02:01	R1	0.98	0.0000	414	1.83	12498
	9/25/24	15:03:03	R1	1.03	0.0000	413	1.82	12563
	9/25/24	15:03:59	R1	0.93	0.0000	418	1.81	12473
	9/25/24	15:04:58	R1	0.98	0.0000	412	1.77	12512
	9/25/24	15:05:57	R1	0.98	0.0000	410	1.73	12825
	9/25/24	15:06:56	R1	0.98	0.0000	411	1.80	12675
	9/25/24	15:07:55	R1	0.98	0.0000	417	1.77	12512
	9/25/24	15:08:54	R1	0.98	0.0000	414	1.77	12519
	9/25/24	15:09:54	R1	1.00	0.0000	406	1.78	12944
	9/25/24	15:10:52	R1	0.97	0.0000	411	1.75	12572
	9/25/24	15:11:54	R1	1.03	0.0000	407	1.77	12822
	9/25/24	15:12:54	R1	1.00	0.0000	412	1.74	12782
	9/25/24	15:13:49	R1	0.92	0.0000	404	1.74	12872
	9/25/24	15:14:48	R1	0.98	0.0000	402	1.72	12740
	9/25/24	15:15:47	R1	0.98	0.0000	408	1.80	12951
	9/25/24	16:52:20	R2	1.05	0.0000	446	1.79	12254
	9/25/24	16:53:15	R2	0.92	0.0000	443	1.81	12236
	9/25/24	16:54:14	R2	0.98	0.0000	441	1.80	12330
	9/25/24	16:55:15	R2	1.02	0.0000	443	1.81	12254

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO2	Inlet					
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	402	1.71	12389
			Maximum	BDL	458	1.85	12951
			(BDL = 0) Average	0.0000	416	1.79	12636
			MDL	0.14	NA	NA	NA
Run Length 66.9 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	422	1.73	11975
			Maximum	BDL	450	1.90	12584
			(BDL = 0) Average	0.0000	436	1.81	12267
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	419	1.71	11981
			Maximum				
				0.0000	442	1.79	12271
			MDL	0.14	NA	NA	NA
Test Length 199 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	402	1.71	11975
			Maximum	BDL	467	1.90	12951
			(BDL = 0) Average	0.0000	431	1.79	12391
			MDL	0.14	NA	NA	NA

Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	Carbon 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
9/25/24	16:56:12	R2	0.95	0.0000	444	1.84	12161
9/25/24	16:57:11	R2	0.98	0.0000	439	1.78	12355
9/25/24	16:58:10	R2	0.98	0.0000	442	1.80	12218
9/25/24	16:59:09	R2	0.98	0.0000	443	1.83	12222
9/25/24	17:00:08	R2	0.98	0.0000	440	1.77	12131
9/25/24	17:01:07	R2	0.98	0.0000	433	1.80	12172
9/25/24	17:02:06	R2	0.98	0.0000	433	1.81	12387
9/25/24	17:03:06	R2	1.00	0.0000	434	1.77	12199
9/25/24	17:04:04	R2	0.97	0.0000	432	1.81	12410
9/25/24	17:05:03	R2	0.98	0.0000	441	1.78	12443
9/25/24	17:06:02	R2	0.98	0.0000	447	1.79	12274
9/25/24	17:07:01	R2	0.98	0.0000	441	1.77	12451
9/25/24	17:08:00	R2	0.98	0.0000	444	1.86	12490
9/25/24	17:08:59	R2	0.98	0.0000	448	1.77	12584
9/25/24	17:10:01	R2	1.03	0.0000	442	1.74	12308
9/25/24	17:10:57	R2	0.93	0.0000	450	1.85	12462
9/25/24	17:11:56	R2	0.98	0.0000	446	1.78	12371
9/25/24	17:12:55	R2	0.98	0.0000	445	1.82	12206
9/25/24	17:13:54	R2	0.98	0.0000	444	1.81	12301
9/25/24	17:14:55	R2	1.02	0.0000	440	1.82	12297
9/25/24	17:15:52	R2	0.95	0.0000	436	1.86	12173
9/25/24	17:16:51	R2	0.98	0.0000	430	1.82	12202

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO2	Inlet					
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	402	1.71	12389
			Maximum	BDL	458	1.85	12951
			(BDL = 0) Average	0.0000	416	1.79	12636
			MDL	0.14	NA	NA	NA
Run Length 66.9 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	422	1.73	11975
			Maximum	BDL	450	1.90	12584
			(BDL = 0) Average	0.0000	436	1.81	12267
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	419	1.71	11981
			Maximum				
				0.0000	442	1.79	12271
			MDL	0.14	NA	NA	NA
Test Length 199 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	402	1.71	11975
			Maximum	BDL	467	1.90	12951
			(BDL = 0) Average	0.0000	431	1.79	12391
			MDL	0.14	NA	NA	NA

					C2H6 1-min data	Carbon 1-min data	CH4 1-min data	H2O 1-min data
	Date	Time	Run	Scan Length	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	9/25/24	17:17:52	R2	1.02	0.0000	435	1.78	12334
	9/25/24	17:18:49	R2	0.95	0.0000	432	1.82	12523
	9/25/24	17:19:48	R2	0.98	0.0000	424	1.83	12343
	9/25/24	17:20:50	R2	1.03	0.0000	432	1.80	12031
	9/25/24	17:21:46	R2	0.93	0.0000	429	1.90	12179
	9/25/24	17:22:45	R2	0.98	0.0000	435	1.85	12183
	9/25/24	17:23:44	R2	0.98	0.0000	429	1.77	12094
	9/25/24	17:24:43	R2	0.98	0.0000	432	1.80	12247
	9/25/24	17:25:42	R2	0.98	0.0000	434	1.79	12360
	9/25/24	17:26:41	R2	0.98	0.0000	430	1.81	12381
	9/25/24	17:27:43	R2	1.03	0.0000	437	1.83	12241
	9/25/24	17:28:41	R2	0.97	0.0000	436	1.83	12264
	9/25/24	17:29:38	R2	0.95	0.0000	427	1.82	12229
	9/25/24	17:30:37	R2	0.98	0.0000	428	1.83	12103
	9/25/24	17:31:37	R2	1.00	0.0000	433	1.84	12282
	9/25/24	17:32:35	R2	0.97	0.0000	432	1.81	12129
	9/25/24	17:33:34	R2	0.98	0.0000	432	1.85	12139
	9/25/24	17:34:33	R2	0.98	0.0000	427	1.84	12230
	9/25/24	17:35:32	R2	0.98	0.0000	425	1.84	12130
	9/25/24	17:36:31	R2	0.98	0.0000	431	1.81	12170
	9/25/24	17:37:32	R2	1.02	0.0000	422	1.73	12264
	9/25/24	17:38:29	R2	0.95	0.0000	427	1.85	12169

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO2	Inlet					
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	402	1.71	12389
			Maximum	BDL	458	1.85	12951
			(BDL = 0) Average	0.0000	416	1.79	12636
			MDL	0.14	NA	NA	NA
Run Length 66.9 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	422	1.73	11975
			Maximum	BDL	450	1.90	12584
			(BDL = 0) Average	0.0000	436	1.81	12267
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	419	1.71	11981
			Maximum				
				0.0000	442	1.79	12271
			MDL	0.14	NA	NA	NA
Test Length 199 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	402	1.71	11975
			Maximum	BDL	467	1.90	12951
			(BDL = 0) Average	0.0000	431	1.79	12391
			MDL	0.14	NA	NA	NA

Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	Carbon 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
9/25/24	17:39:28	R2	0.98	0.0000	428	1.79	12224
9/25/24	17:40:29	R2	1.02	0.0000	437	1.75	12195
9/25/24	17:41:28	R2	0.98	0.0000	435	1.83	12500
9/25/24	17:42:25	R2	0.95	0.0000	443	1.79	12380
9/25/24	17:43:24	R2	0.98	0.0000	443	1.78	12456
9/25/24	17:44:23	R2	0.98	0.0000	439	1.78	12508
9/25/24	17:45:24	R2	1.02	0.0000	438	1.80	12419
9/25/24	17:46:21	R2	0.95	0.0000	439	1.86	12362
9/25/24	17:47:20	R2	0.98	0.0000	446	1.77	12262
9/25/24	17:48:20	R2	1.00	0.0000	436	1.77	12057
9/25/24	17:49:18	R2	0.97	0.0000	433	1.76	12229
9/25/24	17:50:17	R2	0.98	0.0000	430	1.78	12084
9/25/24	17:51:16	R2	0.98	0.0000	430	1.84	12151
9/25/24	17:52:15	R2	0.98	0.0000	429	1.80	12119
9/25/24	17:53:16	R2	1.02	0.0000	430	1.79	12323
9/25/24	17:54:13	R2	0.95	0.0000	431	1.79	12281
9/25/24	17:55:12	R2	0.98	0.0000	435	1.80	11975
9/25/24	17:56:11	R2	0.98	0.0000	429	1.84	12137
9/25/24	17:57:10	R2	0.98	0.0000	428	1.83	12360
9/25/24	17:58:09	R2	0.98	0.0000	428	1.82	12201
9/25/24	18:18:42	R3	11.70	0.0000	466	1.75	12524
9/25/24	18:19:41	R3	0.98	0.0000	462	1.77	12437

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO2	Inlet					
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	402	1.71	12389
			Maximum	BDL	458	1.85	12951
			(BDL = 0) Average	0.0000	416	1.79	12636
			MDL	0.14	NA	NA	NA
Run Length 66.9 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	422	1.73	11975
			Maximum	BDL	450	1.90	12584
			(BDL = 0) Average	0.0000	436	1.81	12267
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	419	1.71	11981
			Maximum				
				0.0000	442	1.79	12271
			MDL	0.14	NA	NA	NA
Test Length 199 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	402	1.71	11975
			Maximum	BDL	467	1.90	12951
			(BDL = 0) Average	0.0000	431	1.79	12391
			MDL	0.14	NA	NA	NA

					C2H6 1-min data	Carbon 1-min data	CH4 1-min data	H2O 1-min data
					Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0	Conc. (ppm) BDL=0
	Date	Time	Run	Scan Length				
	9/25/24	18:20:42	R3	1.02	0.0000	467	1.71	12491
	9/25/24	18:21:39	R3	0.95	0.0000	451	1.79	12382
	9/25/24	18:22:38	R3	0.98	0.0000	451	1.72	12483
	9/25/24	18:23:37	R3	0.98	0.0000	450	1.77	12575
	9/25/24	18:24:37	R3	1.00	0.0000	452	1.76	12541
	9/25/24	18:25:35	R3	0.97	0.0000	445	1.79	12440
	9/25/24	18:26:34	R3	0.98	0.0000	448	1.76	12626
	9/25/24	18:27:33	R3	0.98	0.0000	447	1.78	12313
	9/25/24	18:28:32	R3	0.98	0.0000	445	1.81	12418
	9/25/24	18:29:31	R3	0.98	0.0000	446	1.78	12272
	9/25/24	18:30:30	R3	0.98	0.0000	441	1.77	12307
	9/25/24	18:31:29	R3	0.98	0.0000	435	1.77	12221
	9/25/24	18:32:29	R3	1.00	0.0000	439	1.75	12308
	9/25/24	18:33:29	R3	1.00	0.0000	436	1.77	12171
	9/25/24	18:34:28	R3	0.98	0.0000	439	1.77	12044
	9/25/24	18:35:25	R3	0.95	0.0000	430	1.77	12185
	9/25/24	18:36:24	R3	0.98	0.0000	430	1.74	12044
	9/25/24	18:37:23	R3	0.98	0.0000	419	1.79	12136
	9/25/24	18:38:22	R3	0.98	0.0000	425	1.81	12127
	9/25/24	18:39:21	R3	0.98	0.0000	428	1.75	12237
	9/25/24	18:40:20	R3	0.98	0.0000	430	1.84	12244
	9/25/24	18:41:22	R3	1.03	0.0000	423	1.80	12295

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO2	Inlet					
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	402	1.71	12389
			Maximum	BDL	458	1.85	12951
			(BDL = 0) Average	0.0000	416	1.79	12636
			MDL	0.14	NA	NA	NA
Run Length 66.9 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	422	1.73	11975
			Maximum	BDL	450	1.90	12584
			(BDL = 0) Average	0.0000	436	1.81	12267
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	419	1.71	11981
			Maximum				
				0.0000	442	1.79	12271
			MDL	0.14	NA	NA	NA
Test Length 199 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	402	1.71	11975
			Maximum	BDL	467	1.90	12951
			(BDL = 0) Average	0.0000	431	1.79	12391
			MDL	0.14	NA	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	Carbon 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	18:42:18	R3	0.93	0.0000	424	1.84	12190
	9/25/24	18:43:17	R3	0.98	0.0000	431	1.80	12162
	9/25/24	18:44:16	R3	0.98	0.0000	428	1.80	12270
	9/25/24	18:45:15	R3	0.98	0.0000	439	1.81	12089
	9/25/24	18:46:15	R3	1.00	0.0000	432	1.80	12317
	9/25/24	18:47:13	R3	0.97	0.0000	430	1.79	12211
	9/25/24	18:48:12	R3	0.98	0.0000	434	1.80	12156
	9/25/24	19:00:00	R3	0.98	0.0000	433	1.78	12216
	9/25/24	19:00:59	R3	0.98	0.0000	432	1.76	12398
	9/25/24	19:01:58	R3	0.98	0.0000	447	1.79	12034
	9/25/24	19:03:00	R3	1.03	0.0000	450	1.78	12024
	9/25/24	19:03:56	R3	0.93	0.0000	452	1.80	12137
	9/25/24	19:04:58	R3	1.03	0.0000	447	1.82	12011
	9/25/24	19:05:54	R3	0.93	0.0000	439	1.78	12002
	9/25/24	19:06:53	R3	0.98	0.0000	449	1.79	12152
	9/25/24	19:07:52	R3	0.98	0.0000	441	1.78	12224
	9/25/24	19:08:51	R3	0.98	0.0000	451	1.83	12174
	9/25/24	19:09:50	R3	0.98	0.0000	450	1.77	12230
	9/25/24	19:10:52	R3	1.03	0.0000	447	1.80	12290
	9/25/24	19:11:48	R3	0.93	0.0000	450	1.84	12364
	9/25/24	19:12:47	R3	0.98	0.0000	448	1.80	12327
	9/25/24	19:13:46	R3	0.98	0.0000	454	1.76	12572

	Unitname	Location	Condition	C2H6 Summary	Carbon Summary	CH4 Summary	H2O Summary
	RCTO2	Inlet					
Run Length 60.9 (min)	Run 1	Conc. (ppmv)	Minimum	BDL	402	1.71	12389
			Maximum	BDL	458	1.85	12951
			(BDL = 0) Average	0.0000	416	1.79	12636
			MDL	0.14	NA	NA	NA
Run Length 66.9 (min)	Run 2	Conc. (ppmv)	Minimum	BDL	422	1.73	11975
			Maximum	BDL	450	1.90	12584
			(BDL = 0) Average	0.0000	436	1.81	12267
			MDL	0.14	NA	NA	NA
Run Length 71.7 (min)	Run 3	Conc. (ppmv)	Minimum	BDL	419	1.71	11981
			Maximum				
				0.0000	442	1.79	12271
			MDL	0.14	NA	NA	NA
Test Length 199 (min)	Test Results	Conc. (ppmv)	Minimum	BDL	402	1.71	11975
			Maximum	BDL	467	1.90	12951
			(BDL = 0) Average	0.0000	431	1.79	12391
			MDL	0.14	NA	NA	NA

	Date	Time	Run	Scan Length	C2H6 1-min data Conc. (ppm) BDL=0	Carbon 1-min data Conc. (ppm) BDL=0	CH4 1-min data Conc. (ppm) BDL=0	H2O 1-min data Conc. (ppm) BDL=0
	9/25/24	19:14:45	R3	0.98	0.0000	446	1.80	12473
	9/25/24	19:15:44	R3	0.98	0.0000	444	1.77	12416
	9/25/24	19:16:44	R3	1.00	0.0000	449	1.77	12215
	9/25/24	19:17:42	R3	0.97	0.0000	450	1.81	12448
	9/25/24	19:18:41	R3	0.98	0.0000	447	1.82	12457
	9/25/24	19:19:40	R3	0.98	0.0000	454	1.81	12386
	9/25/24	19:20:39	R3	0.98	0.0000	445	1.79	12379
	9/25/24	19:21:38	R3	0.98	0.0000	448	1.82	12406
	9/25/24	19:22:37	R3	0.98	0.0000	446	1.73	12169
	9/25/24	19:23:36	R3	0.98	0.0000	441	1.82	12391
	9/25/24	19:24:35	R3	0.98	0.0000	434	1.79	12318
	9/25/24	19:25:34	R3	0.98	0.0000	440	1.77	11981
	9/25/24	19:26:36	R3	1.03	0.0000	439	1.76	12035
	9/25/24	19:27:33	R3	0.95	0.0000	433	1.84	12127
	9/25/24	19:28:31	R3	0.97	0.0000	438	1.83	12154
	9/25/24	19:29:30	R3	0.98	0.0000	434	1.84	12100

Appendix D

Permit to Operate

State of Oregon
Department of
Environmental
Quality

STANDARD
AIR CONTAMINANT DISCHARGE PERMIT

Department of Environmental Quality
Northwest Region
700 NE Multnomah St., Suite 600
Portland, OR 97232

This permit is being issued in accordance with the provisions of ORS 468A.040 and based on the land use compatibility findings included in the permit record.

ISSUED TO:

Microchip Technology Incorporated
Gresham Fab 4
21015 SE Stark Street
Gresham, OR 97030

PLANT SITE LOCATION:

21015 SE Stark Street
Gresham, OR 97030

INFORMATION RELIED UPON:

Application No.: 029474
Date Received: 12/22/2017

LAND USE COMPATIBILITY FINDING:

Approving Authority: City of Gresham
Approval Date: 06/29/1995

ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL QUALITY

Matt Hoffman, Northwest Region Air Quality Manager

6/21/2019
Dated

Sources Permitted to Discharge Air Contaminants (OAR 340-216-8010):

Table 1 Code	Source Description	SIC (NAICS)
Part B, 85	Sources which would have actual emissions, if they source were to operate uncontrolled, of 10 or more tons of any single criteria pollutant. Semiconductor manufacturing.	3674 (334413)
Part B, 13	Boilers over 10 mmBtu/hr heat input with oil back-up, or NG fired over 30 mmBtu/hr heat input with or without oil back-up (for database tracking purposes only, not a separate emission unit)	4961 (221330)

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1.0 GENERAL EMISSION STANDARDS AND LIMITS

1.1. Visible Emissions

The permittee must comply with the following visible emission limits from air contaminant sources other than fugitive emission sources, as applicable.

a. Emissions from any air contaminant source must not equal or exceed 20% opacity.

b. Opacity must be measured as a six-minute block average using EPA Method 9, a continuous opacity monitoring system (COMS) installed and operated in accordance with the DEQ Continuous Monitoring Manual or 40 CFR part 60, or an alternative monitoring method approved by DEQ that is equivalent to EPA Method 9.

1.2. Particulate Matter Emissions

The permittee must comply with the following particulate matter emission limits, as applicable:

a. Particulate matter emissions from any fuel burning equipment installed on or after April 16, 2015 must not exceed 0.10 grains per dry standard cubic foot, corrected to 12% CO_2 or 50% excess air.

b. Particulate matter emissions from any fuel burning equipment installed, constructed, or modified before April 16, 2015 must not exceed 0.14 grains per dry standard cubic foot, corrected to 12% CO_2 or 50% excess air.

c. Particulate matter emissions from any air contaminant source installed, constructed, or modified before April 16, 2015 other than fuel burning equipment and fugitive emission sources must not exceed 0.14 grains per dry standard cubic foot.

d. Particulate matter emissions from any air contaminant source installed, constructed, or modified on or after April 16, 2015 other than fuel burning equipment and fugitive emission sources must not exceed 0.10 grains per dry standard cubic foot.

1.3. Fugitive Emissions

The permittee must take reasonable precautions to prevent fugitive dust emissions, as measured by EPA method 22, by:

a. Using, where possible, water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads or the clearing of land;

b. Applying water or other suitable chemicals on unpaved roads, materials stockpiles, and other surfaces which can create airborne dusts;

c. Enclosing (full or partial) materials stockpiles in cases where application of water or other suitable chemicals are not sufficient to prevent particulate matter from becoming airborne;

d. Installing and using hoods, fans, and fabric filters to enclose and vent the handling of dusty materials;
e. Installing adequate containment during sandblasting or other similar operations;
f. Covering, at all times when in motion, open bodied trucks transporting materials likely to become airborne;
g. Promptly removing earth or other material that does or may become airborne from paved streets; and
h. Developing a DEQ approved fugitive emission control plan upon request by DEQ if the above precautions are not adequate and implementing the plan whenever fugitive emissions leave the property for more than 18 seconds in a six-minute period.

1.4. Particulate Matter Fallout

The permittee must not cause or permit the deposition of any particulate matter larger than 250 microns in size at sufficient duration or quantity, as to create an observable deposition upon the real property of another person.

1.5. Nuisance and Odors

The permittee must not cause or allow air contaminants from any source to cause a nuisance. Nuisance conditions will be verified by DEQ personnel.

1.6. Fuels and Fuel Sulfur Content

The permittee must not use any fuel other than natural gas, propane, butane, ASTM grade 1 or 2 fuel oils, or a DEQ approved equivalent (e.g. biodiesel). Fuel oils must not contain more than:

a. 0.3% sulfur by weight for ASTM Grade 1 distillate oil; or
b. 0.5% sulfur by weight for ASTM Grade 2 distillate oil.

1.7. Emergency Stationary RICE

The permittee must comply with the following requirements for emergency stationary reciprocating internal combustion engines (RICE): [40 CFR 63.6640(f)]

For each emergency stationary RICE, the permittee must:

a. Change oil and filter every 500 hours of operation or annually, whichever comes first; [40 CFR 63. 6603(a), table 2d(4)(a)]
b. Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first; [40 CFR 63. 6603(a), table 2d(4)(b)]
c. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary; [40 CFR 63. 6603(a), table 2d(4)(c)]
d. During periods of startup, minimize the engine's time spent at idle and minimize the engine's startup time at startup to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the non-startup emission limitations apply; and [40 CFR 63. 6603(a), table 2d]
e. The permittee must install a non-resettable hour meter on each emergency stationary RICE, if one is not already installed. [40 CFR 63.6625(f)]

1.8. Operating Conditions for Emergency Stationary RICE

The permittee must operate any emergency stationary RICE in compliance with the following conditions: [40 CFR 63.6640(f)]

a. There is no time limit on the use of emergency stationary RICE in emergency situations.

b. Emergency stationary RICE may be operated for the purpose of maintenance checks and readiness testing, provided that the tests are recommended by the manufacturer, the vendor, or the insurance company associated with the engine. Required maintenance and testing of such units is limited to 50 hours per year.

c. The permittee is prohibited from using its emergency stationary RICE for any non-emergency use including but not limited to peak shaving, demand response operation, and/or generation of income from the sale of power. To perform such activity the permittee must first obtain a modified permit in accordance with Condition 13.2 or a separate permit for power generation that appropriately addresses and allows this activity.

1.9. Operating Conditions for Emergency Stationary RICE

The permittee must keep records of the hours of operation of each emergency stationary RICE that is recorded through the non-resettable hour meter. The permittee must document how many hours are spent for emergency operation, including what classified the operation as emergency and how many hours are spent for non-emergency operation used for maintenance checks and readiness testing. [40 CFR 63.6655(f)]

2.0 NEW SOURCE PERFORMANCE STANDARDS (NSPS)

2.1. Boilers

The permittee must comply with 40 CFR 60 Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units, 10 – 100 million Btu per hour heat input, including:

a. Notifications - Date of construction, anticipated startup, and actual startup of each new boiler, subsequent to the effective date of this permit.

b. Recordkeeping - Monthly natural gas combusted per boiler, unless an alternative boiler monitoring schedule is approved by the EPA Administrator.

3.0 TYPICALLY ACHIEVABLE CONTROL TECHNOLOGY (TACT)

3.1. VOC Emissions

The permittee must control Volatile Organic Compound (VOC) emissions from Building 1 and Building 2 manufacturing operations with a concentrator thermal oxidizer that must achieve a minimum 90% destruction removal efficiency (DRE) of VOCs entering the concentrator thermal oxidizer (CTO).

3.2. Acid Gas Emissions

The permittee must control acid gases from Building 1 and Building 2 manufacturing operations with wet scrubber systems that achieves a minimum 90% DRE. As an alternative, the permittee may meet a facility-wide volumetric flow-weighted average emission concentration of 1 part per million by volume (ppmv) of HF and 1 ppmv of HCl, using results of a performance source test.

4.0 OPERATION AND MAINTENANCE REQUIREMENTS

4.1. O&M plan

The permittee must establish and maintain an O & M plan that addresses both short and long-term activities to ensure that all air pollution control devices are operating as efficient as possible at all times.

5.0 PLANT SITE EMISSION LIMITS

5.1. Plant Site Emission Limits (PSEL)

The permittee must not cause or allow plant site emissions to exceed the following:

Pollutant	Limit	Units
PM	24	tons per year
PM_{10}	14	tons per year
$PM_{2.5}$	9	tons per year
SO_2	39	tons per year
NO_X	39	tons per year
CO	99	tons per year
VOC	39	tons per year
GHGs (CO2e)	181,000	tons per year
Single HAP	9	tons per year
Combined HAPs	24	tons per year
Fluorides	2.9	tons per year

All PM is assumed to be PM10 and all PM10 is assumed to be PM2.5. Fluorides are calculated using the site specific fluorides emission factor based on 2015 emission testing results (see review report). HAP PSELs are included because uncontrolled PTE is greater than the major source threshold.

5.2. Annual Period

The annual plant site emissions limits apply to any 12-consecutive calendar month period.

6.0 COMPLIANCE DEMONSTRATION AND SOURCE TESTING

6.1. Testing Requirements

The permittee must conduct a source test of the control devices as specified below:

a. Once during this permit cycle the permittee must perform a performance test of each wet scrubber system to determine the HF and HCl destruction removal efficiency (DRE).

b. Once during this permit cycle the permittee must perform a performance test of the CTO to determine the VOC DRE.

c. Stack exhaust gas during each source test must be sampled while the facility is operating within 90% its normal operating capacity at the time of the test.

d. Exhaust gas concentrations must be sampled before and after each wet scrubber system and the CTO to demonstrate the system's DRE. The source test report must include the DRE demonstrated during each test run as well as the average DRE for the three test runs.

e. During each source test the following parameters must be monitored and recorded:

   i. Combustion temperature of the CTO; and

   ii. Recirculation flow rate and pH of the wet scrubbers.

   iii. Other facility/process operating parameters identified prior to the test.

f. Only regular operating staff may adjust the combustion system or production processes and emission control parameters during the source test and within two hours prior to the tests. Any operating adjustments made during the source test, which are a result of consultation during the tests with source testing personnel, equipment vendors or consultants, may render the source test invalid.

g. A pretest plan for each source test required above must be submitted for approval to DEQ's Source Test Coordinator at the ODEQ Northwest Regional Office, at least 15 days prior to testing.

h. The reference test methods identified in the table below must be utilized in the source tests identified above. A test method modification/variance or substitution of an alternative test method must be pre-approved by the DEQ's Source Test Coordinator.

i. All tests must be conducted in accordance with the DEQ's Source Sampling Manual and with the pretest plan. All test data and results must be submitted to the Source Test Coordinator for review within 45 days after completion of the testing cycle unless an alternate submission date or extension is approved by DEQ.

Reference Test Method	Tested pollutant/parameter	
EPA 1&2	Flow Rate	
EPA 3	Dry Molecular Weight	
EPA 4 or ODEQ Method	Moisture	
EPA 25A	Total VOC	
EPA 26, 26A or 320	Acid Gases	

7.0 PSEL COMPLIANCE DEMONSTRATION

7.1. Boiler Emissions

On a monthly basis, the permittee must calculate $PM_{2.5}$, SO_2, CO, NO_x, and VOC using the formula below:

$$\mathbf{E = EF_{NG\text{-}1} \times NG\text{-}1 + EF_{OIL\text{-}1} \times OIL\text{-}1 + EF_{NG\text{-}2} \times NG\text{-}2 + EF_{OIL\text{-}2} \times OIL\text{-}2}$$

Where:

E = Emissions, pounds per month

$EF_{NG\text{-}1}$ and $EF_{OIL\text{-}1}$ and $EF_{NG\text{-}2}$ and $EF_{OIL\text{-}2}$ = see Condition 0

NG-1 and NG-2 = Amount of natural gas combusted in Bldg 1 and Bldg 2

OIL-1 and OIL-2 = Amount of fuel oil combusted in Bldg 1 and Bldg 2

7.2. Generator Emissions

On a monthly basis, the permittee must calculate $PM_{2.5}$, SO_2, CO, NOx, and VOC using the formula below:

$$\mathbf{E = EF_G \times G}$$

Where:

E = Emissions, pounds per month

EF_G = see Condition 0

G = Number of hours of operation per month

7.3. CTO Emissions

On a monthly basis, the permittee must calculate $PM_{2.5}$, SO_2, CO, NO_x and VOC resulting from natural gas combustion in the CTO using the formula below:

$$\mathbf{E = EF_{NG} \times NG}$$

Where:

E = Emissions, pounds per month

EF_{NG} = see Condition 0

NG = Amount of natural gas combusted in the CTO

7.4. VOC Fab Emissions

On a monthly basis, the permittee must calculate VOC emissions from the Building 1 and Building 2 manufacturing processes as described below.

a. VOC emissions are determined as follows:

$$\mathbf{E = \sum [Q \times EF \times (1\text{-}DRE)]}$$

Where:

E = Emissions, pounds per month

$\sum$ = Summation of VOC contributions (pounds of emissions) of each VOC-containing material

Q = Amount of VOC-containing material used, pounds per month

Material used = Amount of material issued minus the amount transferred off-site or disposed of as waste

EF = Emission factor for VOCs, pounds VOC emitted per pound of material used

DRE = (see 7.7.b.)

b. VOC emissions will be calculated by assuming that the CTO DRE is 90%, unless demonstrated otherwise through DEQ-approved stack testing results.

c. Fugitive emissions that do not pass through the CTO have a DRE equal to zero.

d. The representative VOC content of waste must be measured by EPA Method 8015M GC/FID or other method approved by DEQ.

7.5. VOC Emission Factors

The permittee must use the VOC EFs in the permit application for calculating emissions. If the permittee uses a different VOC-containing material, which current equipment is capable of accommodating, the emission factor must be adjusted in direct proportion to the ratio of VOC content. Any changes in emissions factors must follow Condition 8.3.

7.6. Acid Gas Fab Emissions

On a monthly basis, the permittee must calculate HCl and HF emissions from the Building 1 and Building 2 manufacturing processes as described below.

a. HCl emissions are determined as follows:

$$\mathbf{E_{HCl} = \sum [Q_{HCl} \times EF_{HCl}]}$$

Where:

E_{HCl} = Emissions, pounds per month

$\sum$ = Summation of HCl contributions (pounds of emissions) of each HCl-containing material and each HCl-precursor material

Q_{HCl} = Amount of HCl-containing and HCl-precursor material used, pound per month

Material used = Amount of material issued minus the amount transferred off-site or disposed of as waste

EF_{HCl} = Emission factor, pounds HCl emitted per pound of HCl-containing and HCl-precursor material used per month

b. HF emissions are determined as follows:

$$E_{HF} = \sum [Q_{HF} \times EF_{HF}]$$

Where:

E_{HF} = Emissions, pounds per month

$\sum$ = Summation of HF contributions (pounds of emissions) of each HF-containing material and each HF-precursor material

Q_{HF} = Amount of HF-containing and HF-precursor material used, pounds per month

Material used = Amount of material issued minus the amount transferred off-site or disposed of as waste

EF_{HF} = Emission factor, pounds HF emitted per pound of HF-containing and HF-precursor material used per month

7.7. Acid Gas Emission Factors The permittee must use the HCl and HF EFs in the permit application for calculating emissions. If the permittee uses a different HCL or HF- containing material, which current equipment is capable of accommodating, the emission factor must be adjusted in direct proportion to the ratio of HCl or HF content. Any changes in emission factors must follow Condition 8.3.

7.8. Alternate Methods Alternate methods may be used for emissions calculations if demonstrated by the permittee to be equivalent to or more accurate than the above methods. An alternate method must be reviewed and approved by DEQ prior to use.

7.9. GHG emissions On a monthly basis the permittee must determine compliance with the GHG PSEL in accordance with OAR 340 division 215 and the calculation protocols in 40 CFR Part 98 Subparts A, C and I. Point of use (POU) abatement devices are used primarily for safety and facilities protection purposes; a portion of the facility's POU abatement devices may be used for GHG abatement provided they meet the conditions below. POU abatement device GHG destruction or removal efficiency (DRE) may be used to calculate actual greenhouse gas emissions once a site maintenance plan is submitted to Oregon DEQ. Installation, maintenance and operation of POU abatement devices claiming a GHG DRE must follow a site maintenance plan that meets the requirements of 40 CFR Part 98 Subpart I made effective January 1, 2014. If the site maintenance plan is modified, the permittee must submit a copy to Oregon DEQ. (Note: the GHG PSEL is in tons/year and not metric-tons/year). GHGs are defined in OAR 340-200-0020 for PSEL compliance, and in OAR 340-215-0020 for GHG reporting purposes.

7.10. Fluorides emissions

On a monthly basis the permittee must determine compliance with the fluorides PSEL by calculating fluorides emissions using fluorides specific emission factors from source testing conducted in June 2015 as detailed in the review report of this permit renewal. Condition 0 includes a ratio to HF emissions that may be used for this calculation.

8.0 SPECIAL CONDITIONS

8.1. Installation of Additional Control Devices

The permittee must notify DEQ in writing of the date any additional VOC or acid gas control device begins treating process exhaust, within seven (7) days.

8.2. Emission factor adjustments

In the event the permittee exchanges the use of a material for a similar material, which the existing equipment is capable of accommodating and which has higher or lower emission potential (VOC, HCl, HF, GHG), the permittee must adjust the associated emission factor using the ratio of the content of the new material to the content of the material used to establish the original emission factor. The permittee must include a summary of these changes in the annual report.

8.3. Change of Emission Factors

Except as allowed in Condition 8.2, the permittee must notify DEQ in writing of a change in the recipe of chemicals that changes the emission factors. This notification must include an analysis of how the changes in the emission factors affect plant site emissions relative to the PSEL.

9.0 MONITORING CONDITIONS

9.1. Continuous Monitoring

The permittee must monitor and maintain the following records related to the operation of control devices continuously during all hours of operation:

a. CTO combustion chamber temperature; and

b. Wet scrubber recirculation flow rate and pH.

c. The permittee is presumed to be in compliance with the 20% visible emissions standard and the 0.10 gr/dscf particulate emissions standard as long as the boilers burn natural gas.

9.2. Fuel Monitoring

The permittee must record and maintain records of the amounts of each fuel combusted monthly for each boiler that is an affected facility under 40 CFR 60 Subpart Dc, unless an alternate monitoring schedule is approved by the EPA Administrator.

9.3. Monthly Monitoring

The permittee must monitor and maintain the following records related to the operation and maintenance of the facility and associated air contaminant control devices monthly:

a. The amount and type of fuel combusted in the Building 1 boilers (combined) and the Building 2 boilers (individual, unless combining is approved by EPA).

b. The hours of non-emergency generator operation (combined).

c. The amount of natural gas combusted in the CTO.

d. The quantity of VOC, HCl- and HF-containing, and HCl- or HF-precursor, fluoride-containing, GHG-containing, or GHG-precursor material issued.

e. The quantity of VOC, HCl- and HF-containing, and HCl- or HF-precursor, fluoride-containing, GHG-containing, or GHG-precursor raw material shipped off-site or disposed of as waste.

f. Any change in emission factors of VOC, HCl, HF, fluorides, or GHG.

10.0 RECORDKEEPING REQUIREMENTS

10.1. Excess Emissions

The permittee must maintain records of excess emissions as defined in OAR 340-214-0300 through 340-214-0340 (recorded on occurrence). Typically, excess emissions are caused by process upsets, startups, shutdowns, or scheduled maintenance. In many cases, excess emissions are evident when visible emissions are greater than 20% opacity as a six-minute block average. If there is an ongoing excess emission caused by an upset or breakdown, the permittee must cease operation of the equipment or facility no later than 48 hours after the beginning of the excess emissions, unless continued operation is approved by DEQ in accordance with OAR 340-214-0330(4).

10.2. Complaint Log

The permittee must maintain a log of all written complaints and complaints received via telephone that specifically refer to air pollution concerns associated to the permitted facility. The log must include a record of the permittee's actions to investigate the validity of each complaint and a record of actions taken for complaint resolution.

10.3. Maintenance Log

The permittee must maintain records of major maintenance performed on air pollution control equipment as described in Section 4. See also O & M Plan on file for logs of routine maintenance.

10.4. Retention of Records Unless otherwise specified, the permittee must retain all records for a period of at least five (5) years from the date of the monitoring sample, measurement, report, or application and make them available to DEQ upon request. The permittee must maintain the two (2) most recent years of records onsite.

11.0 REPORTING REQUIREMENTS

11.1. Excess Emissions The permittee must notify DEQ of excess emissions events if the excess emission is of a nature that could endanger public health.

a. Such notice must be provided as soon as possible, but never more than one hour after becoming aware of the problem. Notice must be made to the regional office identified in Condition 15.0 by email, telephone, facsimile, or in person.

b. If the excess emissions occur during non-business hours, the permittee must notify DEQ by calling the Oregon Emergency Response System (OERS). The current number is 1-800-452-0311.

c. The permittee must also submit follow-up reports when required by DEQ.

11.2. Semi-annual The permittee must submit a report to the Administrator, United States Environmental Protection Agency, Region X a report of the fuel sulfur content of fuel oil received at the facility during the previous six months for use in any NSPS-affected boiler. The report must be submitted no later than the 30th day after the end of the reporting period. The reporting period begins on January 1 and July 1 of each year.

11.3. Annual Report For each year this permit is in effect, the permittee must submit to DEQ by **March 15** two (2) copies of the following information for the previous calendar year:

a. A letter stating the facility's compliance status with permit conditions for the calendar year. Any violations or exceedances must be explained in detail including corrective actions taken.

b. Operating parameters:

i. A summary of the monthly amount (therms, gallons, or cubic feet) of fuel (natural gas, propane, oil, or other) combusted in the boilers.

ii. A summary of the rolling 12-month amount (therms, gallons or cubic feet) of fuel (natural gas, propane, oil, or other) combusted in the boilers.

iii. A summary of the monthly hours of non-emergency generator operation.

iv. A summary of the rolling 12-month hours of non-emergency generator operation.

v. A summary of the monthly amount (pounds) of VOC, HCl- and HF-containing, and HCl- and HF-precursor, fluorides-containing, GHG-containing, or GHG precursor materials received on site for use in the fab.

vi. A summary of the monthly amount (pounds) of VOC, HCl- and HF-containing, and HCl- and HF-precursor, fluorides-containing, GHG-containing, or GHG precursor materials shipped off-site or disposed of as waste.

vii. A summary of any changes in material content that affect emission factor values.

viii. A summary of the rolling 12-month amount (pounds) of VOC, HCl- and HF-containing, and HCl- and HF-precursor fluorides-containing, GHG-containing, or GHG precursor materials used.

Material used = Amount of material issued minus the amount transferred off-site or disposed of as waste

ix. Revisions of the DRE of the CTO used for compliance emission calculations in Condition 7.4.b.

x. A summary of the rolling 12-month emissions of $PM_{2.5}$, SO_2, CO, NO_x, VOC, HCl, HF and PSEL fluorides.

c. Greenhouse gas emissions in accordance with OAR 340 division 215

d. A summary of all planned and unplanned excess emissions events as recorded in the Excess Emissions Log.

e. A summary of any emission factors which were changed.

f. A summary of complaints relating to air quality received by the permittee during the previous calendar year, as recorded in the Complaint Log.

12.0 NOTIFICATIONS

12.1. Notice of Change of Ownership or Company Name

The permittee must notify DEQ in writing using a DEQ "Permit Application Form" within 60 days after the following:

a. Legal change of the name of the company as registered with the Corporations Division of the State of Oregon; or

b. Sale or exchange of the activity or facility.

12.2. Construction or Modification Notices

The permittee must notify DEQ in writing using a DEQ "Notice of Construction Form," or "Permit Application Form," and obtain approval in accordance with OAR 340-210-0205 through 340-210-0250 before:

a. Constructing, installing, or establishing a new stationary source that will cause an increase in any regulated pollutant emissions;

b. Making any physical change or change in operation of an existing stationary source that will cause an increase, on an hourly basis at full production, in any regulated pollutant emissions; or

c. Constructing or modifying any air pollution control equipment.

12.3. Where to Send Reports and Notices The reports, with the permit number prominently displayed, must be sent to the Permit Coordinator for the region where the source is located as identified in Condition 15.3

13.0 ADMINISTRATIVE REQUIREMENTS

13.1. Permit Renewal Application The permittee must submit the completed application package for renewal of this permit **180 days prior to the expiration date**. Two (2) copies of the application must be submitted to the DEQ Permit Coordinator listed in Condition 15.0.

13.2. Permit Modifications Application for a modification of this permit must be submitted within **60 days** prior to the source modification. When preparing an application, the applicant should also consider submitting the application 180 days prior to allow DEQ adequate time to process the application and issue a permit before it is needed. A special activity fee must be submitted with an application for the permit modification. The fees and two (2) copies of the application must be submitted to the DEQ Business Office.

14.0 FEES

14.1. Annual Compliance Fee The permittee must pay the annual fee specified in OAR 340-216-8020, Table 2, Part 2 for a Standard ACDP on **December 1** of each year this permit is in effect. An invoice indicating the amount, as determined by DEQ regulations will be mailed prior to the above date. **Late fees in accordance with Part 4 of the table will be assessed as appropriate.**

14.2. Change of Ownership or Company Name Fee The permittee must pay the non-technical permit modification fee specified in OAR 340-216-8020, Table 2, Part 3(a) with an application for changing the ownership or the name of the company.

14.3. Special Activity Fees The permittee must pay the special activity fees specified in OAR 340-216-8020, Table 2, Part 3 (b through k) with an application to modify the permit.

15.0 DEQ CONTACTS / ADDRESSES

15.1. Business Office

The permittee must submit payments for invoices, applications to modify the permit, and any other payments to DEQ's Business Office:

Department of Environmental Quality
Accounting / Revenue
700 NE Multnomah St., Suite 600
Portland, Oregon 97232

15.2. Permit Coordinator

The permittee must submit all notices and applications that do not include payment to the Northwest Region Air Quality Permit Coordinator:

Department of Environmental Quality
Northwest Region Air Quality PC
700 NE Multnomah St., Suite 600
Portland OR 97232

15.3. Report Submittals

Unless otherwise notified, the permittee must submit all reports (annual reports, source test plans and reports, etc.) to DEQ's Region. If you know the name of the Air Quality staff member responsible for your permit, please include it.

15.4. Web Site

Information about air quality permits and DEQ's regulations may be obtained from the DEQ web page at www.oregon.gov/deq

16.0 GENERAL CONDITIONS AND DISCLAIMERS

16.1. Permitted Activities

This permit allows the permittee to discharge air contaminants from processes and activities related to the air contaminant source(s) listed on the first page of this permit until this permit expires, is modified, or is revoked.

16.2. Other Regulations

In addition to the specific requirements listed in this permit, the permittee must comply with all other legal requirements enforceable by DEQ.

16.3. Conflicting Conditions

In any instance in which there is an apparent conflict relative to conditions in this permit, the most stringent conditions apply.

16.4. Masking of Emissions

The permittee must not cause or permit the installation of any device or use any means designed to mask the emissions of an air contaminant that causes or is likely to cause detriment to health, safety, or welfare of any person or otherwise violate any other regulation or requirement.

16.5. DEQ Access

The permittee must allow DEQ's representatives access to the plant site and pertinent records at all reasonable times for the purposes of performing inspections, surveys, collecting samples, obtaining data, reviewing and copying air contaminant emissions discharge records and conducting all necessary functions related to this permit in accordance with ORS 468-095.

16.6. Permit Availability

The permittee must have a copy of the permit available at the facility at all times.

16.7. Open Burning

The permittee may not conduct any open burning except as allowed by OAR 340, division 264.

16.8. Asbestos

The permittee must comply with the asbestos abatement requirements in OAR 340, division 248 for all activities involving asbestos-containing materials, including, but not limited to, demolition, renovation, repair, construction, and maintenance.

16.9. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.

16.10. Permit Expiration

a. A source may not be operated after the expiration date of the permit, unless any of the following occur prior to the expiration date of the permit:

   i. A timely and complete application for renewal or for an Oregon Title V Operating Permit has been submitted, or

   ii. Another type of permit (ACDP or Oregon Title V Operating Permit) has been issued authorizing operation of the source.

b. For a source operating under an ACDP or Oregon Title V Operating Permit, a requirement established in an earlier ACDP remains in effect notwithstanding expiration of the ACDP, unless the provision expires by its terms or unless the provision is modified or terminated according to the procedures used to establish the requirement initially.

16.11. Permit Termination, Revocation, or Modification

DEQ may modify or revoke this permit pursuant to OAR 340-216-0082 and 340-216-0084.

17.0 EMISSION FACTORS

Combustion emission factor table

Emissions device or activity	Pollutant	Emission Factor (EF)	EF units	EF Reference
Boilers B1, B2, B3 Natural gas (Building 1)	$PM/PM_{10}/PM_{2.5}$	0.0075	Lbs/mmBtu	AP-42 Tbl 1.4-2
	CO	0.040	Lbs/mmBtu	Manufacturer
	NO_x	0.04	Lbs/mmBtu	Manufacturer
	SO_2	0.0017	Lbs/mmBtu	ODEQ AQ-EF05
	VOC	0.016	Lbs/mmBtu	Manufacturer
Boilers B4, B5, B6 Natural gas (Building 2)	$PM/PM_{10}/PM_{2.5}$	0.0075	Lbs/mmBtu	AP-42 Tbl 1.4-2
	CO	0.037	Lbs/mmBtu	Manufacturer
	NO_x	0.035	Lbs/mmBtu	Manufacturer
	SO_2	0.0017	Lbs/mmBtu	ODEQ AQ-EF05
	VOC	0.016	Lbs/mmBtu	Manufacturer
Boilers B1, B2, B3 Fuel oil (Building 1)	$PM/PM_{10}/PM_{2.5}$	4.2	Lbs/mgal	Manufacturer
	CO	9.8	Lbs/mgal	Manufacturer
	NO_x	16.8	Lbs/mgal	Manufacturer
	SO_2	50.26	Lbs/mgal	Manufacturer
	VOC	4.06	Lbs/mgal	Manufacturer
Boilers B4, B5, B6 Fuel oil (Building 2)	$PM/PM_{10}/PM_{2.5}$	3.36	Lbs/mgal	Manufacturer
	CO	9.8	Lbs/mgal	Manufacturer
	NO_x	26.6	Lbs/mgal	Manufacturer
	SO_2	57.68	Lbs/mgal	Manufacturer
	VOC	4.2	Lbs/mgal	Manufacturer
Fire pump	$PM/PM_{10}/PM_{2.5}$	0.0022	Lbs/hp-hr	AP-42 Table 3.3-1
	CO	0.00668	Lbs/hp-hr	AP-42 Table 3.3-1
	NO_x	0.031	Lbs/hp-hr	AP-42 Table 3.3-1
	SO_2	0.00205	Lbs/hp-hr	AP-42 Table 3.3-1
	VOC	0.00247	Lbs/hp-hr	AP-42 Table 3.3-1
Building 1 diesel generators (2 each) [Full load/weekly testing]	$PM/PM_{10}/PM_{2.5}$	0.8/0.1	Lbs/hr	Manufacturer
	CO	3.5/0.4	Lbs/hr	Manufacturer
	NO_x	26.5/3.2	Lbs/hr	Manufacturer
	SO_2	1.7/0.2	Lbs/hr	Manufacturer
	VOC	0.6/0.1	Lbs/hr	Manufacturer

Emissions device or activity	**Pollutant**	**Emission Factor (EF)**	**EF units**	**EF Reference**
Building 2 diesel generators (3 each) [Full load/weekly testing]	$PM/PM_{10}/PM_{2.5}$	0.6/0.1	Lbs/hr	Manufacturer
	CO	5.2/0.6	Lbs/hr	Manufacturer
	NO_x	32.0/3.8	Lbs/hr	Manufacturer
	SO_2	1.9/0.2	Lbs/hr	Manufacturer
	VOC	0.8/0.1	Lbs/hr	Manufacturer
CTO on NG	$PM/PM_{10}/PM_{2.5}$	0.0073	Lbs/mmBtu	Manufacturer
	CO	0.0808	Lbs/mmBtu	Manufacturer
	NO_x	0.06	Lbs/mmBtu	Manufacturer
	SO_2	0.00058	Lbs/mmBtu	Manufacturer
	VOC	0.0053	Lbs/mmBtu	Manufacturer
Facility wide	Fluorides	0.583	Lbs F/lbs HF	Source test and empirical calcs.

Gas and Liquid Precursors – Emission factor Table

Chemical/Precursor	Pollutant	Emissions factor	Units
01000-060643, 01000-003985	NOx	0.270	Lb/lb
01000-065355	CO	1	Lb/lb
01000-060020	CO	0.269	Lb/lb
01000-060005	CO	0.203	Lb/lb
01000-060644 Process 1	CO NO_x	0.008 0.648	Lb/lb
01000-060644 Process 2	CO NO_x	0.00239 0.011	Lb/lb
01000-064403	NO_x	0.209	Lb/lb
01000-060014	CO	0.280	Lb/lb
01000-062718	CO	0.330	Lb/lb
01000-062689	CO	0.223	Lb/lb
01000-060018 Process 1	SO_2	0.439	Lb/lb
01000-060045	CO	0.269	Lb/lb
01000-064404	CO	0.159	Lb/lb
01000-064404, 01000-060007	CO	0.159	Lb/lb
01000-060006	CO	0.200	Lb/lb

Emission factors are based on an evaluation of the site specific emissions from the various chemicals and precursor

18.0 ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

ACDP	Air Contaminant Discharge Permit
ASTM	American Society for Testing and Materials
AQMA	Air Quality Maintenance Area
calendar year	The 12-month period beginning January 1st and ending December 31st
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
DEQ	Oregon Department of Environmental Quality
dscf	dry standard cubic foot
EPA	US Environmental Protection Agency
FCAA	Federal Clean Air Act
Gal	gallon(s)
GHG	greenhouse gas
gr/dscf	grains per dry standard cubic foot
HAP	Hazardous Air Pollutant as defined by OAR 340-244-0040
I&M	inspection and maintenance
lb	pound(s)
MMBtu	million British thermal units
NA	not applicable
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NO_X	nitrogen oxides
NSPS	New Source Performance Standard
NSR	New Source Review
O_2	oxygen
OAR	Oregon Administrative Rules
ORS	Oregon Revised Statutes
O&M	operation and maintenance
Pb	lead
PCD	pollution control device
PM	particulate matter
PM_{10}	particulate matter less than 10 microns in size
$PM_{2.5}$	particulate matter less than 2.5 microns in size
ppm	part per million
PSD	Prevention of Significant Deterioration
PSEL	Plant Site Emission Limit
PTE	Potential to Emit
RACT	Reasonably Available Control Technology
scf	standard cubic foot
SER	Significant Emission Rate
SIC	Standard Industrial Code
SIP	State Implementation Plan
SO_2	sulfur dioxide
Special Control Area	as defined in OAR 340-204-0070
VE	visible emissions
VOC	volatile organic compound
year	A period consisting of any 12-consecutive calendar months

State of Oregon
Department of
Environmental
Quality

Department of Environmental Quality
Northwest Region
Air Quality Program

Standard AIR CONTAMINANT DISCHARGE PERMIT REVIEW REPORT

Source Information:

SIC	3674, 4961
NAICS	221330, 334413

Source Categories (Table 1 Part, code)	B13, B85
Public Notice Category	III

Compliance and Emissions Monitoring Requirements:

FCE	
Compliance schedule	
Unassigned emissions	
Emission credits	
Special Conditions	

Source test	once
COMS	
CEMS	
PEMS	
Ambient monitoring	

Reporting Requirements

Annual report	March 15
Quarterly report	

Monthly report	
Excess emissions report	
Other (Semi-annual)	July 30

Air Programs

Synthetic Minor (SM)	
SM -80	
NSPS (list subparts)	Dc
NESHAP (list subparts)	ZZZZ
Part 68 Risk Management	
CFC	

NSR	
PSD	
RACT	
TACT	
Other (specify)	

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PERMITTING

GENERAL BACKGROUND INFORMATION

1. Microchip Technology Incorporated ("Microchip") owns and operates an existing semiconductor manufacturing facility located at 21015 SE Stark Street, Gresham, Oregon, referred to as the Microchip Gresham Fab 4. There are two main buildings at the facility, Building 1 and Building 2, within which semiconductor manufacturing occurs. The manufacturing-related emissions from both buildings are controlled by numerous wet scrubber systems and a concentrator thermal oxidizer (CTO). The wet scrubber systems and the CTO remove approximately 90% of the potential emissions. There are several support buildings (e.g., water and wastewater treatment, emergency generators, boilers) also located at the facility.

   Microchip Gresham Fab 4 ("facility") was previously owned and operated by Fujitsu Microelectronics, Incorporated ("Fujitsu"), and the existing permit for the facility was transferred to Microchip upon closing of the sale to Microchip (approximately August 23, 2002). Prior to the sale to Microchip, Fujitsu discontinued semiconductor manufacturing and removed many of the individual process tools that are used in the semiconductor manufacturing process. However, Fujitsu did not remove the various control devices. Microchip subsequently brought the manufacturing process back on-line by installing the process tools necessary to produce Microchip's products.

PERMIT HISTORY

2. DEQ issued Air Contaminant Discharge Permit Number 26-3240 ("permit") to Fujitsu on June 11, 1997 and was originally scheduled to expire on September 1, 2000. Fujitsu made timely application for permit renewal on June 2, 2000; however, Fujitsu subsequently discontinued semiconductor manufacturing operations and DEQ halted its review of the renewal application prior to issuing a renewal permit.

3. Microchip purchased the Fujitsu facility on August 23, 2002, and, at Microchip's request, DEQ transferred Fujitsu's permit to Microchip. DEQ also authorized Microchip to replace Fujitsu's permit renewal application with one more closely reflecting Microchip's semiconductor manufacturing process emissions. Microchip submitted a modified permit application on November 26, 2002.

4. The old ACDP was converted to a Standard ACDP in accordance with the rules adopted in May 2001.

5. This permit renewal updates the existing permit to include current applicable conditions, increases the GHG PSEL that was previously set to keep the facility out of Title V permitting and modifies emission factors to be based on chemical usage instead of production parameters. A moderate technical modification is included in this permit renewal, under the same application number, to increase the GHG PSEL.

OTHER PERMITS AND REGISTRATION

6. Other permits issued or required by DEQ for this source include a No Exposure Certification for Stormwater. Microchip is also registered as a Large Quantity Generator (LQG) of hazardous waste with DEQ.

ATTAINMENT STATUS

7. The source is located in maintenance areas for carbon monoxide (CO) and ozone (O_3). The permittee is a small source of volatile organic compounds (VOCs) and nitrogen oxides (NOx), both ozone precursors, and of CO. The area is in attainment for all other pollutants.

COMPLIANCE

8. The facility was inspected on March 17, 2016, and found to be in compliance with permit conditions. No enforcement actions have been taken during this last permit cycle.

9. During the prior permit period there were no complaints recorded for this facility.

SOURCE DESCRIPTION

10. The general layout of the air contaminant sources at the facility consist of the following:

Amount	Equipment/Process	Capacity	Control Equipment	Installed
Building 1				
1	Semiconductor Fab	N/A	Wet scrubber systems	1988
3	Boilers 1, 2, 3	12.565 mmBtu/hr each	low-NOx burners	1988
2	Emergency Generators	1,456 hp each	N/A	1988
Building 2				
1	Semiconductor Fab	N/A	Wet scrubber systems	1996
1	Semiconductor Fab	N/A	CTO*	1996
3	Boilers 4, 5, 6	29.291 mmBtu/hr each	Low-NOx burners	1996
3	Emergency Generators	1,582 hp each	N/A	1996

* The CTO is physically located at Building 2, but serves both Building 1 and Building 2.

11. The facility emissions are controlled by several wet scrubber systems (for ammonia and acid gas emission control) and a CTO for VOC emission control. A single CTO treats VOC emissions from both Building 1 and Building 2.

The wet scrubber systems are variously manifolded into common exhaust manifolds and individual as well as combined emission stacks. A given combination of wet scrubbers, their associated exhaust fans, and stacks results in a "discharge point" or "wet scrubber system." A wet scrubber system can have several or single "stacks" and several or single wet scrubbers/manifolded exhaust fans serving it. The following table shows that there are six wet scrubber discharge points (1-3 through 2-3) and one CTO discharge point (2-4). Therefore, for purposes of the ACDP, there are six "wet scrubber systems."

Air Emission Discharge Points

Common Name	Microchip ID	DEQ ID	Exhaust Discharge Point ID	# of Fans*	Design Flow Rate (cfm)
Ammonia Scrubber	S-4	DEQ-4	1-3	2	13,500
Acid Scrubber	S-2	DEQ-2	1-4	2	28,000
Acid Scrubber	S-5	DEQ-5	1-4	2	36,000
Acid Scrubber	S-6	DEQ-6	1-5	2	16,000
Ion Implant Scrubber	S-9	DEQ-16	2-1	7	14,500
CVD Scrubber	S-11	DEQ-16	2-1	7	30,000
Acid Scrubber	S-13	DEQ-16	2-1	7	42,300
CVD Scrubber	S-14	DEQ-16	2-1	7	30,000
Acid Scrubber	S-15	DEQ-16	2-1	7	42,300
Acid Scrubber	S-16	DEQ-16	2-1	7	42,300
Nitric Scrubber	S-10	NA	2-2	2	7,400
Ammonia Scrubber	S-12	NA	2-3	2	26,900
CTO	C-1	NA	2-4	2	29,000

* Note: Number of exhaust fans pulling air through discharge point.

CONTINUOUS MONITORING DEVICES

12. The facility has the following continuous monitoring devices:
    a. The CTO is continuously monitored for the temperature in its combustion chamber.
    b. The wet scrubber systems are continuously monitored for the flow rate of recirculation water and pH.

SPECIAL CONDITIONS

13. The permittee must notify DEQ in writing of the date any additional VOC or acid gas control device begins treating process exhaust, within seven (7) days.

14. Except for change of materials that existing equipment is capable accommodating, the permittee must notify DEQ in writing of a change in the recipe of chemicals that changes the emission factors and the revised emission factors used in the Fab processes. This notification must include an analysis of how the changes in the emission factors affect plant site emissions relative to the PSEL.

EMISSIONS

15. The Baseline Emission Rate for the facility is zero since it was constructed after 1978.

16. The Microchip permit renewal application projects maximum potential emissions at full operation of the facility using Microchip's proprietary processes.

17. The following table shows the current (2013) PSEL and the proposed (2019) PSEL:

Pollutant	Current (2013) PSEL (tpy)	Proposed (2019) PSEL (tpy)
PM	24	24
PM_{10}	14	14
$PM_{2.5}$	9	9
SO_2	39	39
NOx	39	39
CO	99	99
VOC	39	39
Single HAP	9	9
Combined HAPs	24	24
Fluorides	2.9	2.9
GHG	74,000	181,000

SIGNIFICANT EMISSION RATE ANALYSIS

18. For each pollutant, the proposed Plant Site Emission Limit is less than the Netting Basis plus the significant emission rate, thus no further air quality analysis is required.

CALCULATION METHODOLOGY

19. The PSELs for the Microchip permit were calculated by using a set of emission factors (EFs) provided by manufacturers and the permittee and using the following methodology:

a. Boilers Combustion Emissions –Boilers 1 through 3 serve Building 1 and Boilers 4 through 6 serve Building 2. All of the boilers are capable of combusting both natural gas and #2 oil. The boilers are considered "gas-fired boilers" that burn gaseous fuels not combined with any solid fuels and burn liquid fuel only during periods of gas curtailment, gas supply interruption, startups, or for periodic testing, maintenance or operator training on liquid fuel. Periodic testing, maintenance, or operator training on liquid fuel does not exceed a combined total of 48 hours per boiler during any calendar year.

In addition, although there are six boilers on site, typically at least one of the boilers in each building is in hot standby and is not used. Therefore, in order to calculate potential emissions from the boilers, assumptions regarding annual load factor and the amount of oil versus natural gas burned were made.

The maximum annual emissions from boiler natural gas combustion is calculated based on a load factor of 35% across all boilers operating simultaneously. (This is roughly equivalent to one of three boilers serving each building at full load and the other two boilers serving each building in standby).

The EFs were provided by the manufacturers of the boilers and are contained in the permit and the application.

b. Generator Combustion Emissions – All of the generators combust ultra low sulfur distillate oil. These units are used for emergency power only when electricity is curtailed from the manufacturing facility.

c. CTO Combustion Emissions - Criteria pollutant emissions from natural gas combustion in the CTO are calculated in the same manner as the boilers. The emission factors were provided by the manufacturer and are shown in the permit and the application.

d. Building 1 and Building 2 Fab Emissions – Emissions from semiconductor manufacturing processes are calculated based on the use of materials containing air pollutants or precursors for air pollutants. The quantities of materials are determined by reviewing Microchip's parts inventory, locating the materials of interest by part number, and computing the quantity of air pollutant or precursor used based on the material's composition determined by analytical testing, vendor statement, SDS, or other appropriate method.

Emission factors (EF) for the Fab processes are in units of lb / lb chemical or precursor. The factors are calculated based on the following information: Amount of chemical consumed in the process tool and any built-in point-of-use abatement (POU); Percent weight of each chemical and/or precursor in the material; Chemistry of conversion of the chemical into air pollutants. Emissions are determined by multiplying the total pounds of chemical or precursor used by the associated EF. Control efficiencies for the centralized scrubber system or RCTO are applied if the pollutant is removed in either system.

The emission factors used for calculating Fab emissions are provided in detail in the air contaminant discharge permit renewal application. These emissions may include pollutant classes such as: hazardous air pollutants (HAPs), particulate matter (PM) emissions from non-combustion sources, volatile organic compounds (VOCs), carbon dioxide (CO2), greenhouse gases and other miscellaneous criterial pollutants. The emission factors are derived from a number of sources including: Microchip's knowledge and experience with these or similar tools and processes; specific chemistries or recipes of chemicals from multiple processes; professional engineering consultation and industry specific knowledge. If there is a change in the formulation of chemicals in the manufacturing process, the facility will recalculate the emission factors and analyze whether they will cause an increase in emissions that may exceed the PSEL. The facility must notify DEQ of any change in emission factors.

Total fluorides are calculated by multiplying total calculated HF emissions by the empirically determined ratio of fluorides to HF. This EF is based on previous fluorides source testing results and is specified in Section 17 Emission Factors.

The EFs are for emissions that pass through an emission point. Fugitive VOC emissions are also emitted from Fab processes, and are calculated based on a mass balance methodology.

SOURCE TESTING

20. Microchip is required to conduct a source test of the wet scrubber systems, in accordance with a DEQ-approved pretest plan, to confirm that the HF and HCl destruction removal efficiency is at least 90% or that the facility-wide volumetric flow-weighted average outlet concentration of HF and HCl in the wet scrubber systems is less than 1 part per million by volume (ppmv) each.

The source test will be conducted for each of the wet scrubber systems in accordance with the DEQ-approved pretest plan. The removal efficiency will be determined by measuring the inlet HF and HCl mass and the outlet HF and HCl mass at the same time.

Source testing must be completed once during this permit cycle at least 180 days prior to the scheduled expiration date.

At semiconductor facilities, it is common for the inlet concentration of acid gases and other pollutants of interest to have very low (less than 1 ppmv) inlet concentrations. At low concentrations, measuring removal efficiency is problematic and the scrubbers themselves may not be as efficient. Therefore, if the facility-wide volumetric flow-weighted average outlet concentration of HF and HCl is found to be less than 1 ppmv each during the source test, but the HF or HCl removal efficiency for one or more wet scrubber systems is less than 90%, the facility is deemed compliant.

To determine the facility-wide volumetric flow-weighted average HF and HCl concentrations, the following equation is used.

$$C_x = \sum VF_n \times C_{xn} / \sum VF_n$$

Where:

C = Volumetric flow-weighted average concentration of pollutant x (HF or HCl)
VF_n = volumetric flow rate of wet scrubber system n
C_{xn} = Concentration of pollutant x in each of the n wet scrubber systems
n = facility wet scrubber systems 1 through 6
x = pollutant HF or HCl

PRIOR TESTING RESULTS

21. The results of the most recent source tests are listed below:

Emission Device	Test Date	Production Rate	Pollutant	Measured Value
PEI-001	6/3/2015	6433 WIP 9864 WM	HF	$<2.8\times10^{-7}$lbs/WIP $<1.9\times10^{-7}$lbs/WM <0.0017 lbs/hr
			HCl	$<1.5\times10^{-6}$lbs/WIP $<9.7\times10^{-7}$lbs/WM <0.0091 lbs/hr
			Fluorides	$<2.6\times10^{-7}$lbs/WIP $<1.7\times10^{-7}$lbs/WM <0.0016 lbs/hr
PES-003	6/4/2015	7285 WIP 10,404 WM	HF	$<4.8\times10^{-7}$lbs/WIP $<3.4\times10^{-7}$lbs/WM <0.0032 lbs/hr
			HCl	$<1.8\times10^{-6}$lbs/WIP $<1.3\times10^{-6}$lbs/WM

Emission Device	Test Date	Production Rate	Pollutant	Measured Value
				<0.012 lbs/hr
			Fluorides	$3.3x10^{-7}$lbs/WIP $2.3x10^{-7}$lbs/WM 0.0055 lbs/hr
PES-002	6/4/2015	6914 WIP 9800 WM	HF	$<5.5x10^{-7}$lbs/WIP $<3.9x10^{-7}$lbs/WM 0.0036 lbs/hr
			HCl	$<1.9x10^{-6}$lbs/WIP $<1.4x10^{-6}$lbs/WM <0.012 lbs/hr
			Fluorides	$<3.6x10^{-7}$lbs/WIP $<2.8x10^{-7}$lbs/WM <0.0059 lbs/hr
PES-001	6/5/2015	6441 WIP 9356 WM	HF	$<5.4x10^{-7}$lbs/WIP $<3.7x10^{-7}$lbs/WM <0.0033 lbs/hr
			HCl	$<2.1x10^{-6}$lbs/WIP $<1.4x10^{-6}$lbs/WM <0.013 lbs/hr
			Fluorides	$<5.8x10^{-8}$lbs/WIP $<3.5x10^{-8}$lbs/WM <0.0036 lbs/hr
PEC-002	6/6/2015	6376 WIP 9586 WM	HF	$<4.5x10^{-7}$lbs/WIP $<3.0x10^{-7}$lbs/WM <0.0027 lbs/hr
			HCl	$<1.6x10^{-6}$lbs/WIP $<1.1x10^{-6}$lbs/WM <0.0097 lbs/hr
			Fluorides	$<1.2x10^{-7}$lbs/WIP $<8.1x10^{-8}$lbs/WM <0.0034 lbs/hr
PEC-001	6/7/2015	6439 WIP 9072 WM	HF	$<4.1x10^{-7}$lbs/WIP $<2.9x10^{-7}$lbs/WM <0.0025 lbs/hr
			HCl	$<1.5x10^{-6}$lbs/WIP $<1.1x10^{-6}$lbs/WM <0.0093 lbs/hr

Emission Device	Test Date	Production Rate	Pollutant	Measured Value
			Fluorides	<1.7x10^{-7}lbs/WIP <1.2x10^{-7}lbs/WM <0.0035 lbs/hr
PEA-001	6/8/2015	7015 WIP 10,242 WM	HF	<7.9x10^{-7}lbs/WIP <5.4x10^{-7}lbs/WM <0.0051 lbs/hr
			HCl	<2.0x10^{-6}lbs/WIP <1.4x10^{-6}lbs/WM <0.013 lbs/hr
			Fluorides	<6.1x10^{-7}lbs/WIP <4.2x10^{-7}lbs/WM <0.0039 lbs/hr
PEN-001	6/9/2015	6813 WIP 9721 WM	HF	1.0x10^{-7}lbs/WIP 7.0x10^{-8}lbs/WM 0.0006 lbs/hr
			HCl	<7.8x10^{-7}lbs/WIP <5.5x10^{-7}lbs/WM <0.0048 lbs/hr
			Fluorides	<1.6x10^{-8}lbs/WIP <1.2x10^{-8}lbs/WM <0.0007 lbs/hr
PEA-004	6/10/2015	7077 WIP 10,324 WM	HF	<1.1x10^{-7}lbs/WIP <7.8x10^{-8}lbs/WM <0.0008 lbs/hr
			HCl	<4.3x10^{-7}lbs/WIP <2.9x10^{-7}lbs/WM <0.0029 lbs/hr
			Fluorides	<4.3x10^{-8}lbs/WIP <2.9x10^{-8}lbs/WM <0.0008 lbs/hr
PES-005	6/10/2015	7084 WIP 8990 WM	HF	<2.2x10^{-6}lbs/WIP <1.7x10^{-6}lbs/WM 0.014 lbs/hr
			HCl	<2.6x10^{-6}lbs/WIP <2.1x10^{-6}lbs/WM <0.018 lbs/hr
			Fluorides	<1.6x10^{-6}lbs/WIP

Emission Device	Test Date	Production Rate	Pollutant	Measured Value
				<1.3x10^{-6}lbs/WM 0.025 lbs/hr
PES-006	6/11/2015	6694 WIP 9038 WM	HF	3.0x10^{-7}lbs/WIP 2.2x10^{-7}lbs/WM 0.0019 lbs/hr
			HCl	<7.4x10^{-7}lbs/WIP <5.4x10^{-7}lbs/WM <0.0048 lbs/hr
			Fluorides	5.9x10^{-8}lbs/WIP 4.4x10^{-8}lbs/WM 0.0023 lbs/hr
Concentrator Inlet	6/4/2015	6847 WIP 8803 WM	VOC as propane	6.4 lbs/hr 47.5 ppmvd
Concentrator outlet	6/4/2015	6847 WIP 8803 WM	VOC as propane	0.18 lbs/hr 1.6 ppmvd
CTO Exhaust	6/4/2015	6847 WIP 8803 WM	VOC as propane	0.033 lbs/hr 2.1 ppmvd

WIP = Wafers in process
WM = Wafer moves
ppmvd = parts per million volume dry

MAJOR SOURCE APPLICABILITY

POLLUTANTS

Pollutant	Proposed PSEL (tons per year)	Major Source Threshold (tons per year)
PM	24	25
PM_{10}	14	15
$PM_{2.5}$	9	10
SO_2	39	40
NOx	39	40
CO	99	100
VOC	39	40
Single HAP	9	10
Combined HAPs	24	25
Fluorides	2.9	3.0
GHG	181,000	75,000

* Note: All PM emissions are assumed to be PM_{10} and $PM_{2.5}$.

22. A major source is a facility that has the potential to emit more than 100 tons per year of any criteria pollutant. Although the Fab emissions of this facility have the potential to produce in excess of 100 tons of VOCs uncontrolled, the presence of control devices which are intrinsic to the manufacturing process limits its potential-to-emit.

23. In addition, the permittee has elected to request federally enforceable PSELs below the major source threshold levels. Therefore, this facility is not a major source of criteria pollutants.

24. GHG emissions in excess of the significant emission rate do not trigger any additional program requirements (NSR or Title V) on their own, only if another pollutant triggers one of these programs. In other words, GHG does not make the facility a major source.

HAZARDOUS AIR POLLUTANTS

Pollutant	Annual Emissions (tons per year)	Major Source Threshold (tons per year)
Hydrogen Chloride	0.3	10
Hydrogen Fluoride	2.1	10
Other minor HAPs	0.3	10
Total HAPs	2.7	25

25. A major source is a facility that has the potential to emit 10 or more tons/year of any single HAP or 25 or more tons/year of combined HAPs. Although the Fab emissions of this facility has the potential to produce in excess 10 tons of individual HAPs or 25 tons of combined HAPs uncontrolled, the presence of control devices which are intrinsic to the manufacturing process limits its potential-to-emit.

26. In addition, the permittee has elected to request federally enforceable PSELs below the major source threshold levels. Therefore, this facility is not a major source of individual or combined HAPs.

ADDITIONAL REQUIREMENTS

NSPS APPLICABILITY

27. 40 CFR Part 60, Subpart Dc is applicable to all three boilers in Building 2 since they were constructed after June 9, 1989 and are greater than 10 mmBtu/hr in capacity.

28. 40 CFR 60, Subpart IIII does not apply to the Compression ignition engines at the facility because they all predate the subpart applicability date.

NESHAPS/MACT APPLICABILITY

29. A National Emission Standard for Hazardous Air Pollutants (NESHAP Subpart BBBBB) for semiconductor manufacturing facilities was proposed by EPA on February 2, 2003. This facility is not subject to this NESHAP since it is not a major source of HAPs.

30. NESHAP Subpart ZZZZ is applicable to the reciprocating internal combustion engines at the facility and the subpart requirements have been included in the permit.

RACT APPLICABILITY

31. The facility is located in the Portland AQMA, but it is not one of the listed source categories in OAR 340-232-0010, thus the categorical RACT rules do not apply.

32. The pre-control emissions of VOC are greater than 100 tons per year, and, per OAR 340-232-0020(4) and 340-232-0040(1), the facility is subject to case by case Reasonably Available Control Technology (RACT) requirements. However, the CTO controls VOC emissions by a minimum of 90%. In addition, the permittee has requested a federally enforceable PSEL below the RACT threshold level.

TACT APPLICABILITY

33. A formal TACT analysis has not be conducted, but the source is likely meeting the state's TACT by conducting the following activities:
    a. VOC emissions are controlled by the CTO to a minimum DRE of 90%;
    b. Acid gas emissions are controlled by the wet scrubber systems to a DRE of 90% or a facility-wide volumetric flow-weighted outlet concentration of HF and HCl of less than 1 ppmv each; and
    c. All boilers are equipped with low-NO_x burners and are primarily fueled with natural gas.

GREENHOUSE GASES

34. This permit renewal increases the PSEL for Greenhouse Gases (GHG). The PSEL was previously set at 98,000 tons/year to keep the facility below the Title V threshold, because actual emissions are greater than the reporting threshold (deminimis level) of 2,756 tons/year (2,500 metric tons/year) of carbon dioxide equivalent (CO_2e). The GHG PSEL is being increased in this permit renewal to allow the facility to utilize existing capacity. GHG emissions do not trigger either New Source Review or Title V permitting on their own, only if another pollutant triggers one of those programs. A Baseline for GHG emissions has not been established, but could be reviewed in the future.

PUBLIC NOTICE

35. Pursuant to OAR 340-216-0066(4)(a)(A), issuance of Standard Air Contaminant Discharge Permits require public notice in accordance with OAR 340-209-0030(3)(c), which requires DEQ to provide notice of the proposed permit action and a minimum of 35 days for interested persons to submit written comments. In addition, a hearing will be scheduled to allow interested persons to submit oral or written comments. If DEQ receives written request for a hearing from ten persons, or from an organization representing at least ten persons, within 35 days of the mailing of the public notice. If a hearing is scheduled, DEQ will provide a minimum of 30 days notice for the hearing. **The public notice was emailed/mailed on Friday May 17, 2019 and the comment period ended on Friday June 21, 2019 at 5 p.m.**

- One comment was received during the public notice. That comment and DEQs response is attached below.

Microchip Technology Standard ACDP 26-3240-ST-01

Response to Comments

Public Comment from Gregg Lande of Northwest Portland lande.gregg@gmail.com

Comment
It appears the Public Notice is missing the usual Table 2 of Emissions for HAP. This is a significant oversight.
In addition, the information about specific HAP covered in the permit is extremely limited. Aside from HF, what are other fluorides being released; as particles or gases? Are there no metal HAP emissions? Since HAP emissions are associated more with local impacts than area-wide impacts as are the criteria pollutants, it would be preferable to have a site map which shows where these emissions are located.
The public deserves to be given this information, and I believe the Department may even be required to provide it.

DEQ response
Table 2 for HAPs was not included in the public notice cover page because of the level of emissions expected from the facility. However, the HAP information is included in the review report, that was attached as part of the public notice package, along with source test data to support the emission estimates.

Under the current DEQ air quality program additional requirements are only triggered if a HAP is emitted at major source threshold levels (10 tons/year of individual HAP or 25 tons/year of combined HAPs). Since the total estimated HAP emissions are 2.7 tons/year, and there are no

area source NESHAPs that apply to the manufacturing process at Microchip, DEQ did not repeat the information from the review report into the public notice cover page.

Current DEQ regulations are for airshed management and do not address localized impacts or the form fluorides and HAPs are emitted. Localized impacts of toxic air pollutants will be addressed when Microchip is called into the Cleaner Air Oregon program or they make a major modification that triggers CAO requirements. Note: Fluorides are included in the list of toxic air pollutants.

The public notice cover page along with the permit and review report provide the information that is required by the DEQ regulations. If additional information is desired all of DEQs records are open for public inspection. If an individual wants to refer to a site map or other detailed information they could review the files for such an item.

Oregon
Kate Brown, Governor

Department of Environmental Quality
Northwest Region
700 NE Multnomah St Ste 600
Portland, OR 97232-4100
(503) 229-5263
FAX (503) 229-6945
TTY 711

June 21, 2019

Bret Herbert
Microchip Technology Inc
21015 SE Stark Street
Gresham OR 9730 2015

Re: Renewal of a Standard Air Contaminant Discharge Permit
Permit Number **26-3240-ST-01** Application Number **029474**

The Department of Environmental Quality has completed its review and public notice for Microchip Technology's Standard permit renewal. The facility is located at 21015 SE Stark Street in Portland. Based on the information in the renewal application and public notice, DEQ has issued the enclosed permit.

The effective date of the permit modification is the date it was signed by the regional Air Quality Manager. The signature and date appear on the first page of the document. The permit modification is issued pursuant to Oregon Revised Statutes 468A and Oregon Administrative Rules (OAR) 340-14-005 through 340-14-050, and 216-0010 through 216-0100.

You may appeal conditions or limitations contained in the attached permit modification by applying to the Environmental Quality Commission, or its authorized representative, within twenty days from the date of this letter. Appeals are pursuant to ORS Chapter 183 and OAR Chapter 340, Division 14-025 (6). Appeal procedures are contained in OAR Division 11-005 through 11-140.

A copy of the current permit along with the modification must be available at the facility at all times. Failure to comply with permit conditions may result in civil penalties. **You are expected to read the permit carefully and comply with all conditions** to protect the environment of Oregon.

If you have any questions, please contact Dave Kauth at 503-229-5053.

Sincerely,

Matt Hoffman, Air Quality Manager
DEQ Northwest Region

Enclosure
Cc: HQ/AQ

State of Oregon
Department of
Environmental
Quality

STANDARD
AIR CONTAMINANT DISCHARGE PERMIT

Department of Environmental Quality
Northwest Region
700 NE Multnomah St., Suite 600
Portland, OR 97232

This permit is being issued in accordance with the provisions of ORS 468A.040 and based on the land use compatibility findings included in the permit record.

ISSUED TO:

Microchip Technology Incorporated
21015 SE Stark Street
Gresham, OR 97030

INFORMATION RELIED UPON:

Application No.: 034318
Date Received: 09/21/2022

PLANT SITE LOCATION:

Gresham Fab 4
21015 SE Stark Street
Gresham, OR 97030

LAND USE COMPATIBILITY FINDING:

Approving Authority: City of Gresham
Approval Date: 06/29/1995

ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL QUALITY

Joshua Alexander

Joshua Alexander, Northwest Region Air Quality Permit Manager

06/06/2023

Dated

Sources Permitted to Discharge Air Contaminants (OAR 340-216-8010):

Table 1 Code	Source Description	SIC (NAICS)
Part B, 85	Sources which would have the emission capacity of 10 or more tons of any single criteria pollutant. Semiconductor manufacturing.	3674 (334413)
Part B, 13	Oil-fired boilers whose total heat input rating at the source is over 10 MMBtu/hr; or individual natural gas boilers over 30 MMBtu/hr or greater heat input rating.	4961 (221330)

Addendum Number R-01

In accordance with OAR 340-216-0020, Conditions 1.7, 3.1, 4.2, 5.1, 6.1 and 9.1 are the only changes and now read as follows:

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3.0 TYPICALLY ACHIEVABLE CONTROL TECHNOLOGY (TACT) 3
4.0 OPERATION AND MAINTENANCE REQUIREMENTS 3
5.0 PLANT SITE EMISSION LIMITS 4
6.0 COMPLIANCE DEMONSTRATION AND SOURCE TESTING 5
9.0 MONITORING CONDITIONS 6

1.0 GENERAL EMISSION STANDARDS AND LIMITS

1.7. Emergency Stationary RICE

The permittee must comply with the following requirements for each emergency stationary reciprocating internal combustion engine (RICE): [40 CFR 63.6640(f)]

a. Change oil and filter every 500 hours of operation or annually, whichever comes first. [40 CFR 63. 6603(a), table 2d(4)(a)] The permittee may elect to comply with the oil analysis requirements of 40 CFR 63.6625(i) in lieu of the oil change requirement. Oil analyses must be conducted at the same frequency as the oil change requirement;

b. Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first; [40 CFR 63.6603(a), table 2d(4)(b)]

c. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary; [40 CFR 63.6603(a), table 2d(4)(c)]

d. During periods of startup, minimize the engine's time spent at idle and minimize the engine's startup time at startup to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the non-startup emission limitations apply; and [40 CFR 63.6603(a), table 2d]

e. The permittee must install a non-resettable hour meter on each emergency stationary RICE, if one is not already installed. [40 CFR 63.6625(f)]

3.0 TYPICALLY ACHIEVABLE CONTROL TECHNOLOGY (TACT)

3.1. VOC Emissions

The permittee must control Volatile Organic Compound (VOC) emissions from Building 1 and Building 2 manufacturing operations with rotor concentrator thermal oxidizers (RCTOs) that must each achieve a minimum 90% destruction removal efficiency (DRE) of VOCs entering the RCTOs when the inlet VOC concentration (measured as propane) is 90 ppmv or greater. If/when the inlet VOC concentration falls below 90 ppmv, the outlet VOC concentration (measured as propane) must not exceed 10 ppmv.

4.0 OPERATION AND MAINTENANCE REQUIREMENTS

4.2. Highest and Best Practicable Treatment and Control

The permittee must comply with the following conditions pertaining to the operation of its thermal oxidizer(s): [OAR 340-226-0120]

a. The oxidizer temperature and desorption chamber temperature of each RCTO unit must be maintained such that the temperatures of the unit are sustained and do not drift more than 25 °F below the required minimum temperatures or the temperatures recorded during the most recent DEQ approved source test demonstrating compliance with

applicable emissions limits in Condition 3.1 based on a three-hour average:

i. The required minimum oxidizer temperature is 1,375 °F;

ii. The required minimum desorption chamber temperature is 360 °F;

iii. If the oxidizer or desorption chamber temperatures drop to more than 25 °F below the required temperatures or the temperatures recorded during the most recent DEQ approved source test demonstrating compliance with applicable emissions limits in Condition 3.1 based on a three-hour average, the permittee must immediately investigate and commence corrective action to return the temperatures to the established operating range; and

iv. The temperature falling below this emission action level is not a violation of this permit condition; however, it is a violation of this permit condition if the permittee fails to immediately investigate and commence corrective actions to correct the operating temperature after it has fallen below the range.

b. A continuous temperature monitoring system must be used to monitor and record the oxidizer temperature and desorption chamber temperature of each RCTO unit at all times the unit is operating.

5.0 PLANT SITE EMISSION LIMITS

5.1. Plant Site Emission Limits (PSEL)

The permittee must not cause or allow plant site emissions to exceed the following: [OAR 340-222-0041 and OAR 340-222-0060]

Pollutant	Limit	Units
PM	9	tons per year
PM_{10}	9	tons per year
$PM_{2.5}$	9	tons per year
SO_2	3	tons per year
NO_X	39	tons per year
CO	84	tons per year
VOC	34	tons per year
GHGs (CO2e)	279,300	tons per year
Single HAP	5	tons per year
Combined HAPs	9	tons per year
Fluorides	2.9	tons per year

All PM is assumed to be PM_{10} and all PM_{10} is assumed to be $PM_{2.5}$. Fluorides are calculated using the site specific fluorides emission factor based on 2015 emission testing results. HAP PSELs are included because uncontrolled PTE is greater than the major source threshold.

6.0 COMPLIANCE DEMONSTRATION AND SOURCE TESTING

6.1. Testing Requirements

The permittee must conduct a source test of the control devices as specified below: [OAR 340-212-0120]

a. Once during this permit cycle the permittee must perform a performance test of each wet scrubber system to determine the HF and HCl destruction removal efficiency (DRE);

b. Within 180 days after two of the new RCTO units are brought into normal operation the permittee must perform a performance test of each RCTO to determine the VOC DRE, unless an alternative date is approved by Oregon DEQ. Normal operation is defined when the RCTOs are fully operational and when VOC process exhaust is routed to two of the new RCTOs;

c. Source testing must be conducted while the facility is operating within 90% its normal operating capacity at the time of the test. Sampling must take place under worst case operating conditions observed during normal operations (i.e., redundant control devices should not be operating during testing);

d. Gas concentrations must be sampled at the inlet and outlet of each wet scrubber system and each RCTO to demonstrate the system's DRE. The source test report must include the DRE demonstrated during each test run as well as the average DRE for the three test runs. As an alternative, the permittee can sample only the outlet of the wet scrubber systems to demonstrate compliance with the 1 ppmv HF and HCl limitations as listed in Condition 3.2;

e. During each source test the following parameters must be monitored and recorded:
   i. RCTO oxidizer and desorption chamber temperatures;
   ii. Pressure drop across concentrator wheel of the RCTO;
   iii. RCTO natural gas usage;
   iv. Recirculation flow rate and pH of the wet scrubbers; and
   v. Other facility/process operating parameters identified prior to the test.

f. Only regular operating staff may adjust the combustion system or production processes and emission control parameters during the source test and within two hours prior to the tests. Any operating adjustments made during the source test, which are a result of consultation during the tests with source testing personnel, equipment vendors or consultants, may render the source test invalid;

g. A pretest plan for each source test required above must be submitted for approval to DEQ’s Source Test Coordinator at the ODEQ Northwest Regional Office, at least 30 days prior to testing;

h. The reference test methods identified in the table below must be utilized in the source tests identified above. A test method modification/variance or substitution of an alternative test method must be pre-approved by the DEQ’s Source Test Coordinator and

i. All tests must be conducted in accordance with the DEQ’s Source Sampling Manual and with the pretest plan. All test data and results must be submitted to the Source Test

Coordinator for review within 60 days after completion of the testing cycle unless an

j. alternate submission date or extension is approved by DEQ.

Reference Test Method	Tested pollutant/parameter
EPA 1&2	Flow Rate
EPA 3	Dry Molecular Weight
EPA 4 or ODEQ Method	Moisture
EPA 25A	Total VOC
EPA 26, 26A, 320 or ASTM D6348-12	HF & HCl

9.0 MONITORING CONDITIONS

9.1. Continuous Monitoring

The permittee must monitor and maintain the following records related to the operation of control devices continuously during all hours of operation: [OAR 340-226-0120]

a. The oxidizer and desorption chamber temperature of each RCTO must be continuously monitored and reduced to an hourly average (one hour block average). For the purpose of this condition, "continuously monitored" means that measurements are taken at a frequency of not less than once every 15 minutes;

b. Wet scrubber recirculation flow rate and pH; and

c. The permittee is presumed to be in compliance with the 20% visible emissions standard and the 0.10 gr/dscf particulate emissions standard as long as the boilers burn natural gas.

Appendix E

Source Test Protocol and Acceptance

2024 COMPLIANCE TEST PROTOCOL FOR PERFORMANCE TESTING OF TWO NEWLY INSTALLED ROTOR CONCENTRATOR THERMAL OXIDIZERS AT MICROCHIP'S GRESHAM, OR FACILITY

PERMIT 26-3240-ST-01

Prepared for:
Microchip Technology, Inc.
21015 Stark Street
Gresham, OR 97030

Date Prepared:
July 19, 2024
Prepared by:

2340 W Braker Lane, Suite A
Austin, TX 78727

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APPENDICES

A Field Data Sheets and Example Calculations
B Standard Air Contaminant Discharge Permit

LIST OF ACRONYMS AND ABBREVIATIONS

acfm	actual cubic feet per minute
ASTM	American Society for Testing and Materials
cal	calibration (gases)
CO	carbon monoxide
CO_2	carbon dioxide
CH_4	Methane
dscfm	dry standard cubic feet per minute
EPA	U.S. Environmental Protection Agency
°F	degrees Fahrenheit
FTIR	Fourier Transform Infrared
lb/hr	pounds per hour
lb/day	pounds per day
MDL	Minimum detection limit
MDC	Minimum detectable concentration
Microchip	Microchip Incorporated Technology
ml	milliliter
NIST	National Institute of Standards and Technology
NMNEVOC	Non-methane, non-ethane volatile organic compounds
O_2	oxygen
ppmv	parts per million by volume
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
RCO	Rotor Concentrator Outlet
RCTO	Rotor concentrator thermal oxidizer
Spectrum	Spectrum Environmental Solutions
THC	Total Hydrocarbon
TO	Thermal Oxidizer or Thermal Oxidizer Outlet
VOC	volatile organic compounds

1.0 INTRODUCTION

Microchip Technology Incorporated (Microchip) has contracted Spectrum to perform compliance testing on two newly installed Rotor Concentrator Thermal Oxidizer (RCTO) units located at their facility in Gresham, Oregon. These units were manufactured by Munters Corporation. This compliance testing will be completed in accordance with Permit 26-3240-ST-01.

The RCTO compliance testing requires measuring total volatile organic compound (VOC) emissions at each RCTO inlet and RCTO outlet (thermal oxidizer outlet (TO) and rotor concentrator outlet (RCO)). Since methane and ethane are not considered VOCs per EPA definition[1], the methane and ethane concentrations will be subtracted from the total hydrocarbon (THC) concentration as measured by EPA Method 25A (Flame ionization detector or FID). All THC concentrations will be measured as propane in accordance with EPA Reference Method 25A. Methane and ethane will be measured at each location using a Fourier Transform Infrared spectrometer in accordance with ASTM Method D6348-12. Additionally, volumetric flowrate will also be measured at each location in accordance with EPA Methods 1-2 and a modified EPA Method 3. The cumulation of data will be used to determine compliance with Microchip's air permit criteria as follows:

- 90% destruction removal efficiency (DRE) of VOCs when inlet loading to the RCTO is ≥ 90 ppmv (as propane) or
- A total outlet emission VOC concentration of ≤ 10 ppmv (as propane) when inlet loading to the RCTO is less than 90 ppmv (as propane).

It should be noted that the ≤10 ppmv (as propane) criterion is based on a flow weighted average of the TO and RCO. For reference, Microchip's air permit as issued in 2019 and the permit modification issued in June 2023 (Permit Number 26-3240-ST-01) are both provided in Appendix B. This test protocol was developed to satisfy the requirements of the 2023 permit modification, where it supersedes the 2019 permit, and the 2019 permit where the modification it is not applicable.

To determine the VOC DRE, VOC mass emissions will be determined at the inlet, TO and RCO of the RCTO units. This data will be used for the limitations prescribed in the Microchip Technology Standard Air Contaminant Discharge Permit (ACDP), Permit 26-3240-ST-01 Section 3.1 of the 2023 permit modification, which states:

3.1. VOC Emissions

The permittee must control Volatile Organic Compound (VOC) emissions from Building 1 and Building 2 manufacturing operations with rotor concentrator thermal oxidizers (RCTOs) that must each achieve a minimum 90% destruction removal efficiency (DRE) of VOCs entering the RCTOs when the inlet VOC concentration (measured as propane) is 90 ppmv or greater. If/when the inlet VOC

[1] The EPA definition of VOC excludes methane and ethane per 40 CFR Part 51 Subpart F (s) (1). https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-51/subpart-F/section-51.100

concentration falls below 90 ppmv, the outlet VOC concentration (measured as propane) must not exceed 10 ppmv.

The operating conditions of the facility and the RCTO units during the compliance testing, the RCTO units' parameters to be collected during the compliance testing, and requirements for this test plant and a resultant test report are listed in Microchip's 2023 permit modification, Section 6.1 (b), (c), (e)(i)(ii)(iii)(v), (d), (f), (g), (h), (i), and (j) which state:

6.1. Testing Requirements

The permittee must conduct a source test of the control devices as specified below: [OAR 340-212-0120]

b. Within 180 days after two of the new RCTO units are brought into normal operation the permittee must perform a performance test of each RCTO to determine the VOC DRE, unless an alternative date is approved by Oregon DEQ. Normal operation is defined when the RCTOs are fully operational and when VOC process exhaust is routed to two of the new RCTOs;

c. Source testing must be conducted while the facility is operating within 90% its normal operating capacity at the time of the test. Sampling must take place under worst case operating conditions observed during normal operations (i.e., redundant control devices should not be operating during testing);

d. Gas concentrations must be sampled at the inlet and outlet of each wet scrubber system and each RCTO to demonstrate the system's DRE. The source test report must include the DRE demonstrated during each test run as well as the average DRE for the three test runs. As an alternative, the permittee can sample only the outlet of the wet scrubber systems to demonstrate compliance with the 1 ppmv HF and HCl limitations as listed in Condition 3.2;

e. During each source test the following parameters must be monitored and recorded:
- *i. RCTO oxidizer and desorption chamber temperatures;*
- *ii. Pressure drop across concentrator wheel of the RCTO;*
- *iii. RCTO natural gas usage;*
- *v. Other facility/process operating parameters identified prior to the test.*

f. Only regular operating staff may adjust the combustion system or production processes and emission control parameters during the source test and within two hours prior to the tests. Any operating adjustments made during the source test, which are a result of consultation during the tests with source testing personnel, equipment vendors or consultants, may render the source test invalid;

g. A pretest plan for each source test required above must be submitted for approval to DEQ's Source Test Coordinator at the ODEQ Northwest Regional Office, at least 30 days prior to testing;

h. The reference test methods identified in the table below must be utilized in the source tests identified above. A test method modification/variance or substitution of an alternative test method must be pre-approved by the DEQ's Source Test Coordinator and

i. All tests must be conducted in accordance with the DEQ's Source Sampling Manual and with the pretest plan. All test data and results must be submitted to the Source Test Coordinator for review within 60 days after completion of the testing cycle unless an alternate submission date or extension is approved by DEQ.

j.

Reference Test Method	***Tested pollutant/parameter***
EPA 1&2	*Flow Rate*
EPA 3	*Dry Molecular Weight*
EPA 4 or ODEQ Method	*Moisture*
EPA 25A	*Total VOC*
EPA 26, 26A, 320 or ASTM D6348-12	*HF & HCl*

1.1 TEST PROGRAM OPERATIONS SUMMARY

A summary of the test program is provided in Table 1-1 below. A list of the parameters to be tested along with reporting units is presented in Table 1-2. Testing will be performed in accordance with ODEQ and Environmental Protection Agency (EPA) test methodology with exception to the proposed deviations listed in section 3.2 of this Test Protocol.

Table 1-1. Test Program Operations Summary

Category	Description
Project Name	Compliance Testing of Microchip's New RCTO Units
Equipment Owner	Microchip Technology, Inc. 21015 Stark Street Gresham, OR 97030
Project Contact	Becky Kim Environmental Engineer Microchip Technology, Inc. 21015 Stark Street Gresham, OR 97030 (971)-266-7887
Equipment Tested	Two Munters RCTO Units
Equipment Location	Microchip Technology, Inc. 21015 Stark Street Gresham, OR 97030
Regulatory Agency	ODEQ
ODEQ Permit No.	26-3240-ST-01
Source Test Firm	Spectrum Environmental Solutions 2340 West Braker Lane, Suite A Austin, Tx 78758
Source Testing Project Manager	Steve Hall Phone (512) 587-1386 Steve@spectrumenvsoln.com

Table 1-2. Reporting Units of Parameters to be Tested

Parameter	Units	Location
Volumetric Flow Rate	dscfm, acfm	RCTO Inlet, Oxidizer Exhaust, Concentrator Exhaust
Moisture	Percent by Volume	RCTO Inlets, Oxidizer Exhaust, Concentrator Exhaust
O_2	Percent by Volume	RCTO Inlets, Oxidizer Exhaust, Concentrator Exhaust
CO_2	ppmv	RCTO Inlets, Oxidizer Exhaust, Concentrator Exhaust
Volatile Organic Compounds (VOC)	ppmv, lb/hr	RCTO Inlet, Oxidizer Exhaust, Concentrator Exhaust
Methane (CH_4)	ppmv	RCTO Inlet, Oxidizer Exhaust, Concentrator Exhaust
Ethane (C_2H_6)	ppmv	RCTO Inlet, Oxidizer Exhaust, Concentrator Exhaust

dscfm – dry standard cubic feet per minute
acfm – actual cubic feet per minute
lb/hr – pounds per hour
ppmv – parts per million by volume

2.0 FACILITY AND UNIT DESCRIPTIONS

2.1 FACILITY DESCRIPTION

Microchip's facility conducts semiconductor manufacturing operations and processes. Currently Microchip has a single RCTO unit that is used to abate VOCs from process exhaust streams with two units that will replace this single unit being brought online in the summer of 2024 and a third unit to be brought online in late 2024. The single old RCTO will be decommissioned following the commissioning of the initial two new RCTO units. The two newly installed Munters RCTO units will be monitored for compliance as a part of this testing campaign. Each RCTO is equipped with a single zeolite concentrator and thermal oxidizer operated concurrently. Microchip operates its facilities and RCTOs on a 365 x 24 schedule.

2.2 UNIT DESCRIPTION

Microchip owns and operates two newly installed RCTO units. The RCTOs are equipped with a single zeolite concentrator wheel followed by a thermal oxidizer. Figure 2-1 depicts normal operation of an RCTO unit.

The process operates as follows:

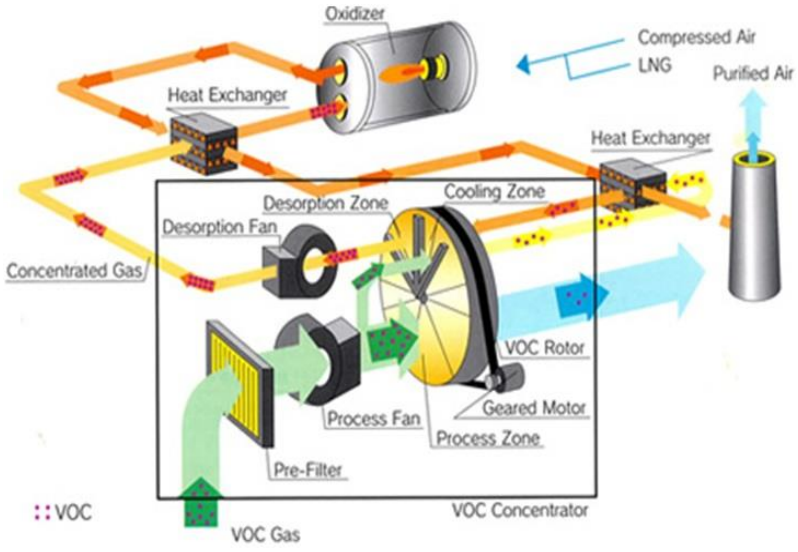
- Solvent-laden air is drawn through the rotor wheel where VOCs are removed from the air stream by adsorption onto the hydrophobic zeolite. After passing through the rotor, the cleaned air is discharged to a common exhaust line shared by the three RCTOs where it is then discharged to the atmosphere through one of five outlet stacks.

- The Zeolite rotor turns continuously and transports the adsorbed VOCs into a regeneration zone. In that zone, the VOCs are removed by a small heated air stream and the regenerated zeolite is then rotated back into the process air stream.

- The heated air is then passed into the thermal oxidizer combustion chamber, where it is further heated to approximately 1,400 °F (1,375 °F minimum), oxidizing the VOCs.

- The treated air is forwarded to the TO exhaust stack where it is discharged into the atmosphere.

Figure 2-1. Basic Design of Rotor Concentrator Thermal Oxidizer



2.3 UNIT OPERATION

The control systems will be operated under normal conditions during testing. Per Condition 6.1. of Microchip's Standard ACDP, compliance testing must be conducted while the facility is operating within 90% of its normal operating capacity at the time of testing. As part of a previous compliance testing campaign for Microchip for one RCTO unit, Microchip reported and verified that the facility was operating at approximately 90% capacity of the normal daily production for the previous 12-month period. Table 2-1 summarizes the average operating data recorded during that previous compliance testing campaign. The operating parameters to be recorded by Microchip during testing and submitted with the source test report are presented in Table 2-2.

Table 2-1. RCTO 1 Operating Parameters

RCTO ID	Date	Run	Pressure Differential ("H2O)	Natural Gas Usage (c ft^3)	Desorption Chamber Temperature (°F)	Oxidizer Temperature (°F)
RCTO 1	2/27/24	1	1.95	44	356	1423
		2	1.94	22	356	1423
		3	1.95	47	358	1424
Three-run average			**1.95**	**38**	**357**	**1423**

Table 2-2. Operating Parameters to be Recorded

Parameter	Units
RCTO Oxidizer Temperature	°F
Desorption Chamber Temperature	°F
Zeolite Differential Pressure	In. H_2O
Production Moves	Total Number
Natural Gas Usage	Cf

2.4 SAMPLING LOCATION

The exact sampling location and dimensions will be measured as part of the testing and provided in the final report. However, it is known that the RCO ports do not meet the EPA Method 1 criteria for upstream and downstream distances from flow disturbances. As such, the flow measurements will be performed in accordance with Section 11.5 of EPA Method 1 using a 3-dimensional probe. The number of traverse points will be determined onsite based on actual measurements in accordance with EPA Reference Method 1 and to be used solely for gas flow measurements. All inlet THC concentration measurements may be extracted using a small (3/8”) port at the inlet into the RCTO.

3.0 TECHNICAL APPROACH

The number of samples and sample duration are designed to meet applicable permit requirements. Testing will be performed during normal RCTO operations and is expected to be completed in four days. Three THC analyzers, three FTIRs, and three heated extractive systems will be utilized to perform the monitoring. The three RCTO sources (Inlet, RCO and TO) for each unit will be analyzed for total hydrocarbons (as propane) using three THC analyzers. The THC analyzers will provide a total hydrocarbon concentration and the FTIR will provide methane and ethane concentration at each location. Three FTIRs will be used to simultaneously monitor the three gas streams for methane, ethane, CO_2 and moisture. CO_2 and moisture concentrations as determined by FTIR will be used for calculation of molecular weight of the gas in lieu of EPA Methods 3 and 4, respectively. All gas samples will be delivered to the THC analyzers and the FTIR on a hot, wet basis using heated sample lines (250 F˚or higher) and the compliance test will consist of three, 1-hour runs. The methane and ethane concentrations from all sources will be subtracted from their respective THC concentrations to determine the total VOCs concentration (as propane) using Equation 1 below:

$$VOC\ (ppm\ as\ propane) = THC - \left(CH_4(ppm) * \frac{1}{3}\right) - \left(C_2H_6(ppm) * \frac{2}{3}\right) \qquad \textbf{Equation 1}$$

Should the concentrations of methane and/or ethane fall below the detection limit of the FTIR and any data point, 0 ppm will be used to calculate the average concentration during the run.

Following a modified EPA Method 3, the O_2 concentration will be analyzed at each location. A grab sample with be collected from the Inlet, TO and RCO ducts and delivered to a Testo combustion gas analyzer and quantified for O_2 concentration. This will be performed as part of the flow measurements at each RCTO location for each run and used in the molecular weight calculation for the gas flowrate. The Testo response will be verified pre-test using nitrogen (zero) and ambient air (20.9%) prior to use. Since the O_2 data is only to be used for molecular weight of the gas, this approach is method compliant.

In accordance with the ASTM D6348-12 method, Spectrum will perform an analyte spike of the target analyte to demonstrate the FTIR is accurately quantifying the analyte(s) and the extractive system is properly transporting the gas samples without loss. Spectrum will perform the analyte spike using methane (CH_4) at each sample location (Inlet, TO, and RCO). This QA spike is a matrix spike where a known volume of spike gas is injected into the extracted sample system, at no more than 10% of the sampling rate. The CH_4 spike will serve as a surrogate for ethane, CO_2 and moisture which are also quantified by each FTIR. A calibration transfer standard (CTS) gas will be injected to the FTIR before commencement of testing and at the end of the 3-run test. The CTS may be injected through the sample system to also demonstrate a leak check as a sample system, that is slightly under vacuum, would not recover the CTS accurately were there a significant leak.

Three THC analyzers will be employed using two distinct measurement ranges. Owing to the anticipated low concentrations of VOCs at the RCO and TO, a lower range of 0-12 ppm (as propane) will be utilized. Conversely, a higher range of 0-250 ppm (as propane) will be employed at the RCTO inlet to accommodate the expected elevated VOC concentrations. All calibration gases will adhere to the EPA 25A requirements

for their respective measurement ranges. A 3-point linearity check will be conducted at the beginning of the test for each THC analyzer using EPA Protocol 1 calibration gases. A drift check will also be conducted after each test run using a zero and a midpoint calibration gas.

A single volumetric flowrate measurement will be performed at each of the RCTO locations during the test run. Stack traverse points will be determined, and a gas velocity measured at each point, in accordance with EPA Methods 1 & 2. Moisture (per FTIR) will be measured at the TO and RCO exhaust and included in the volumetric flow determination.

3.1 SAMPLING MATRIX

The sampling matrix, including the methods used, number of runs, analytical device, etc., is presented in Table 3-1 for the compliance test. Using this aggregate of measurements, a VOC mass in and combined mass out of the RCTOs will be determined and subsequently used for calculation of VOC DRE.

Table 3-1. Performance Testing Sampling Matrix

Location	# of Runs	Sample/Type Pollutant	Sampling Method	Run Time (hr)	Analytical Method
Thermal Oxidizer Exhaust	3	Volumetric Flow Rate	EPA 1-2	NA[1]	Pitot/Temp
	3	Moisture[2]	ASTM D6348-12	1 hr	FTIR
	3	O_2	Modified EPA 3	Spot sample once/run	Testo Model 340
	3	THCs	EPA 25A	1 hr	Flame Ionization
	3	Methane, Ethane, CO_2	ASTM D6348-12	1 hr	FTIR
Concentrator Exhaust	3	Volumetric Flow Rate	EPA 1-2	NA[1]	Pitot/Temp
	3	Moisture	ASTM D6348-12	1 hr	FTIR
	3	O_2	Modified EPA 3	Spot sample once/run	Testo Model 340
	3	THCs	EPA 25A	1 hr	Flame Ionization
	3	Methane, Ethane, CO_2	ASTM D6348-12	NA[1]	FTIR
Inlet	3	Volumetric Flow Rate	EPA 1-2	NA[1]	Pitot/Temp
	3	Moisture	ODEQ Method 4	1 hr	Wet-bulb/Dry-bulb
	3	O_2	Modified EPA 3	Spot sample once/run	Testo Model 340
	3	THCs	EPA 25A	1 hr	Flame Ionization
	3	Methane, Ethane	ASTM D6348-12	NA[1]	FTIR

[1]Not Applicable - Sample time is not fixed for flow measurements.
[2]Moisture samples will be collected by FTIR in 1-minute increments.

3.2 METHOD MODIFICATIONS

A number of sampling and analytical method deviations are proposed for use during the Performance Test of Microchip's RCTOs. The requested method modifications and the justification for each are as follows:

1. Spectrum is proposing using FTIR results in accordance with ASTM D6348-12 for moisture and CO_2 concentration in lieu of EPA Methods 3 and 4 at each sample location. Since the FTIR is already onsite and can measure moisture and CO_2 concentration every minute, it is logical to use this data in lieu of redundant measurements.

2. Spectrum will perform the ASTM required QA Spike using methane which will be used as a surrogate for ethane, moisture, and CO_2. Methane was chosen as it is likely to be present at the locations whereas ethane will likely be below the detection limit of the FTIR.

3. Although not necessarily a deviation, Spectrum is requesting using a Testo Model 340 portable analyzer to quantify oxygen in each of the three runs at each of the three locations. The O_2, as read by the Testo analyzer will only be used for molecular weight determination of the sample gas. Spectrum will perform analysis of each gas stream during each 1-hour run. The sample will be taken directly from each location (via ports at the TOs and at the sample system exhausts in the trailer for the RCO and TO.) The Testo Model 340 analyzer will be challenged with nitrogen (0% O_2) and ambient air (20.9% O_2) prior to use. This O_2 analysis would be in lieu of using a conventional O_2 continuous analyzer (EPA Method 3A). EPA has run a comprehensive verification study with the Testo analyzer against the reference method (3A) and observed excellent agreement for O_2[2,3].

[2] https://archive.epa.gov/nrmrl/archive-etv/web/pdf/01_vs_testo_350.pdf
[3] https://archive.epa.gov/nrmrl/archive-etv/web/pdf/01_vr_testo_350.pdf

4.0 SAMPLING AND ANALYTICAL METHODS

Source emission testing will be performed according to EPA, ODEQ or ASTM reference methods. The test methods are available online and discussed in the following subsections.

4.1 EPA METHOD 1: SAMPLING AND VELOCITY TRAVERSE POINT LOCATIONS

EPA Method 1, "Sampling and Velocity Traverse Point Locations," will be used to position the velocity traverse point locations at the sample locations. Additionally, EPA Method 1 will be used to determine the number of traverse points for flow at each location. Additionally, it is known that the RCO sample ports will not meet Method 1 minimum requirements. Microchip has notified ODEQ of this and has agreed to perform the flow measurements at this location in accordance with section 11.5 of Method 1 using a 3-dimensional probe and manometer setup. The Method 1 measurements will be documented on their respective data sheet of which an example is presented in Appendix A.

4.2 EPA METHOD 2: DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE

EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)," will be used to measure exhaust gas velocity. A Type S Pitot tube, constructed according to Method 2 criteria will be connected to either an inclined or electronic manometer (e.g. Grey Wolf or Shortridge manometer). The Pitot tube will be inserted into the gas stream at the pre-determined traverse points and the velocity, as a function of differential pressure (delta p), recorded. The effluent gas temperature will be recorded using a Type-K thermocouple. The Method 2 measurement will be documented on a data sheet of which an example is presented in Appendix A.

4.3 EPA METHODS 3: DRY MOLECULAR WEIGHT

A modified EPA Method 3 "Gas Analysis for the Determination of Dry Molecular Weight," shall be used for determination molecular weight at each sample location. CO_2 and moisture will be determined from the FTIR, and O_2 will be analyzed by a Testo Model 340 analyzer at each location. A spot sample will be collected from each location and delivered to the Testo combustion analyzer and quantified for O_2 concentration.

4.4 ASTM D6348-12: DETERMINATION OF METHANE, ETHANE, MOISTURE AND CO_2 EMISSIONS FROM STATIONARY SOURCES

Three FTIRs will be used during the RCTO performance test to determine the concentrations CH_4, C_2H_6, CO_2 and moisture of each gas stream. The analyte concentration used in all calculations will be the average from three, 1-hour runs. An analyte spike recovery test will be performed using methane at each sample location. This is further described in Section 3.0 of this document, Annex A5 of the ASTM method, and Table 5-1.

4.5 EPA METHOD 25A: DETERMINATION OF TOTAL GASEOUS ORGANIC CONCENTRATION USING A FLAME IONIZATION ANALYZER

THC sampling will be conducted according to EPA Method 25A using a VIG Model 20/2 or equivalent THC analyzer. Discrete 1-minute THC concentrations (as propane) will be collected and reported. Field calibrations will be conducted using EPA Protocol 1 propane in air standards.

The samples will be extracted from the sources through heated sample lines approximately 100-200 feet long. The sample lines will be maintained at approximately 250°F during sampling. The average of each 1-hour run will be used in all calculations and reported as ppm (as propane) in the final report.

Calibrations of the instrumentation will be conducted by injecting calibration gas into the sampling system before and after each test run as stipulated in the method. A high, mid, low, and zero gas will be used for calibrations. Certified calibration gas values will be recorded on the field data sheets. EPA Protocol 1 calibration gases in current certification will be used for all calibration purposes. Copies of the certificates will be included in the final report. Should a drift fail, the data between the failed drift and the previous passing drift will be invalid and retested.

5.0 QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

The Spectrum QA/QC program for source test projects includes the following areas of focus: sampling, sample analysis, documentation, equipment maintenance, calibration, data reduction, and reporting. The program specifies procedures that ensure that work performed in each one of these areas is performed in a manner consistent with providing emission test data that are accurate and legally defensible. This section provides details on the procedures that are followed to accomplish this assurance of data quality. Spectrum QA objectives for precision and accuracy are based on the Reference Methods or published precision and accuracy data.

The usefulness and validity of all data are contingent upon 1) the results being representative of the source being tested, and 2) comparable with other results (either calculated or directly measured) generated by Spectrum, Microchip , or another source test organization. Spectrum has adopted the objective that all measurements will be representative and comparable. These objectives will be met by performing tests while the process is operating under known and documented conditions, following published reference methods, using standard data reduction techniques and reporting formats, and proper training of personnel.

5.1 DATA PRECISION, ACCURACY, AND COMPLETENESS

The QA/QC procedures described in this section are provided to ensure data precision, accuracy, and completeness. All data sheets and calculation spreadsheets used as part of this project will be controlled. Should any edits to controlled documents be required, they must be reviewed for accuracy and require signature approval by a Spectrum QA Officer. It is the responsibility of each project team member to: 1) complete all pertinent sections of the data sheets, 2) make comments, where appropriate, 3) notify Project Managers of sampling difficulties that may lead to invalid data, and 4) follow chain-of-custody procedures for all samples, data sheets, and documents. Additionally, it is the responsibility of the FTIR operator(s) to correctly perform all pertinent ASTM QA procedures, document (electronically or other) all issues and sampling narratives and perform validation of a select set of spectra from the testing.

Each test report is reviewed before release by a designated independent technical reviewer. Procedures, results, and data are reviewed to verify adherence to method requirements, that proper procedures were followed, and that calculations were performed properly. These reviews are conducted independently from any project-related data reduction and reporting activities.

5.2 TRAINING

Training is an ongoing process for all Spectrum personnel. Personnel completing any task will be properly trained in such task, or be under direct supervision of someone trained in the task. There are certain skills that all technical personnel are expected to acquire and perform professionally and safely. All source test personnel must review the applicable portions of the following technical documents before being involved in any capacity in any program:

- EPA 40 Code of Federal Regulations Part 60;
- Developed SOPs;
- EPA QA Handbook for Air Pollution Measurement Systems, Volume III; and
- Air Pollution Districts' Specific Source Test Methods.

In addition to the general awareness training discussed previously, each person responsible for the performance of a test procedure is required to demonstrate proficiency in the method involved. This demonstration will be accomplished through: 1) reading the source test method involved, 2) reading the manual of the equipment being used, 3) reading and understanding of the SOP associated with each method and 4) demonstrating aptitude and knowledge of the methodology via performance under a mentor or field lead(s). Qualified testing individuals are documented on a per method/SOP basis. Information related to training for specific methods is provided below.

- Monitoring of Emissions: EPA Methods
    1. Understanding of the sampling schematic drawing;
    2. Understanding of the sampling systems;
    3. Leak checks;
    4. Analyzer adjustments and calibrations;
    5. Sample system bias calibration checks;
    6. Strip chart recorder operation and documentation;
    7. Data Acquisition System operation and access;
    8. Gaseous stratification checks; and
    9. Correction for sample system bias and analyzer drift.
- Sampling Location Criteria: EPA Method 1
    1. Identify sampling locations;
    2. Inspect inside of duct to identify any obstructions;
    3. Determine upstream and downstream distances;
    4. Perform stack area calculations;
    5. Determine number and location of sample points; and
    6. Perform cyclonic flow checks and determine sample location acceptability.
- Stack Gas Velocity and Volumetric Flow Rate: EPA Method 2
    1. Assemble pitot tube/thermocouple;
    2. Perform leak checks;
    3. Record differential pressure and temperature;
    4. Record static pressure;
    5. Record barometric pressure; and
    6. Calculate stack gas velocity and volumetric flow rate.
- Total Organic Carbon Emissions Testing: EPA Method 25a
    1. Assemble sampling system;
    2. Light the FID;

3. Verify data recording times and data flow;
4. Calibration of analyzer;
5. Perform calibration error check;
6. Perform response time check (also constitutes a leak check);
7. Collect test data;
8. Perform post-run drift determination.

- FTIR Emissions Monitoring: ASTM D6348-12, Spectrum Developed SOP, and Protocol
  1. Perform complete FTIR operational checks in Spectrum laboratory;
  2. Assemble sample extractive system;
  3. Perform leak checks;
  4. Collect FTIR background;
  5. Collect "zero" FTIR spectrum;
  6. Perform ASTM required QA/QC; and
  7. Perform routine spectral analysis during and after collection.

5.3 SAMPLING PROCEDURES

Spectrum maintains complete copies of federal, state, and local regulatory agency source test methods that serve as the final authority on sampling procedures. Spectrum strives to follow the appropriate source test methods whenever possible. Source test methods are listed in all Source Test Protocols for review by both clients and regulatory agencies.

The steps listed below are taken to ensure that the source test method sampling procedures are followed:

1. Training of personnel;
2. Copies of reference methods are available to all personnel and are taken to every job site;
3. Appropriate selection of Project Managers; and
4. QA reviews of test programs.

Occasionally, due to the sample location limitations, or other factors, variations from the standard methods will sometimes be necessary. Any variations from the methods will be assessed to determine the effect that the variation will have on data quality. On all occasions, variations will be included in the Source Test Protocol and receive approval prior to implementation of the program. Any variations will be clearly documented in the source test report.

5.4 CHAIN-OF-CUSTODY PROCEDURES

The Project Manager collects and maintains possession of all data sheets or keeps them in secure storage. Upon return to the office, a copy of all field data sheets is made and placed in a locked file. The original field data sheets are used for report preparation and are kept with the final report. Data sheets, test plans, and reports are kept in files, organized by client and project.

5.5 CALIBRATION PROCEDURES AND FREQUENCY

All major equipment components are calibrated according to the procedures established by EPA which are presumed to meet any that may be specified by ODEQ or Microchip. When regulations differ, the stricter of the regulation will be followed. Table 5-1 summarizes the procedures and frequency of the calibration performed on the major equipment components.

5.6 EXTRACTIVE SAMPLING SYSTEM EQUIPMENT QUALITY CONTROL

The calibration gases are certified according to EPA Protocol 1, certified to an analytical accuracy of ±2 percent, certified to an accuracy of ±5 percent for particularly reactive or corrosive compounds, or certified to an accuracy of ±5 percent where custom blends cannot be manufactured with a higher accuracy.

On-site calibration checks include THC calibration error, THC analyzer drift checks, n, FTIR analysis accuracy and FTIR optical alignment checks.

5.7 PERFORMANCE AND SYSTEM AUDITS

The appropriate regulatory agency will be notified of all scheduled compliance test programs. The regulatory agency will be allowed the opportunity to perform side-by-side tests and/or observe the sampling test program. Spectrum will cooperate fully in any pre-arranged regulatory agency audit.

5.8 EQUIPMENT MAINTENANCE

Routine and preventative maintenance is performed on all major sampling equipment. These procedures are in addition to method-specific requirements. Table 5-2 summarizes the equipment maintenance schedule. This preventative maintenance schedule should minimize equipment failures and downtime in the field. On the occasion where equipment does break down in the field, a replacement is used or the equipment will be repaired in the field.

Table 5-1. Calibration Requirements for Source Test Sampling Equipment

Sampling Equipment	Calibration Frequency	Calibration Procedure	Acceptable Calibration Criteria
Analyzer Span	As needed	Before and after each test	Measured emissions between 20-100% of span
Extractive (THC)	Before each test series	4-point calibration error check	± 5% of certified calibration gas value
Extractive (THC)	Before and after each test run	Analyzer drift test	≤ 3% of Span
Extractive (THC)	Before each test series	Response Time Test	None Stated
Extractive FTIR	Minimum of daily during testing	Calibration Transfer Standard (CTS)	± 5% certified calibration gas value
FTIR Mechanical Response Time	Once per test campaign unless extractive system is altered	Flow CTS through entire sample system	None stated
FTIR Equilibration Response Time	Once per test campaign unless extractive system is altered	Flow analyte through entire sample system	None stated
FTIR System Recovery Check (analyte matrix spike)	Once prior to testing and at the conclusion of the test campaign.[4]	Annex A5 of the ASTM D6348 Methodology	± 30% recovery
FTIR System Zero	Once per test campaign unless extractive system is altered	Direct N_2 through the entire sample system	None stated
Extractive Sampling	During set-up at each RCTO	Leak Check	Successful recovery of calibration gas sent up and down the extraction line. or <0.25 lpm on FTIR sample system or <0.20 cfm or <4% of sample system volume
Temperature Sensors	Semi-annually	3-point calibration vs. NIST traceable standard	Agree within ±1.5% absolute
Pitot Tubes	Prior to first field use	Dimension calibration	Meets Method 2 dimensional criteria

[4] ASTM D6348-12 only requires an initial spike assuming all sample matrices are similar. However, ODEQ has historically required an analyte spike at the conclusion of testing.

Table 5-2. Test Equipment Maintenance Schedule

Equipment	Acceptance Limits	Frequency of Service	Methods of Service
Pump	1. Absence of leaks 2. Ability to draw within reported specifications	Every 500 hours of operation or 6 months, whichever is less	Visual inspection
Flow Meter	1. Free mechanical movement 2. Absence of malfunction	Every 500 hours of operation or 5 months, whichever is less	1. Visual inspection 2. Clean 3. Calibrate
Emission Analyzers	1. Absence of malfunction 2. Proper response to zero, span gas	As recommended by manufacturer	As recommended by manufacturer
Sampling System	Absence of leaks	Depends on nature of use	1. Change filters 2. Change gas dryer 3. Leak check 4. Check for system contamination
FTIR Pressure Sensor	± 2% f.s.	Checked in-lab as part of prep work for each project	Adjust pressure offset to remain consistent with Hg manometer or local barometric pressure
Detector Linearity	Not specified	Checked in-lab as part of prep work for each project	Re-set linearity
Resolution Checks	Not specified	Checked in-lab as part of prep work for each project	Clean/replace optics
Line Position	± 15% of resolution	Checked in-lab as part of prep work for each project	Clean/replace optics – verify laser operation
Sampling Line	Sampling degradation after each test less than 1% of test series		Clean with solvent. Flush with gas until dry.

5.9 DATA REDUCTION, VALIDATION, AND REPORTING

Data reduction generally occurs in two phases. Phase I consists of preliminary data reduction on the job site. On-site data reduction may be performed by sampling technicians or the Project Manager. Preliminary calculations may include velocity, moisture, stack flow, emission measurements, and DRE results. Preliminary test results are normally available prior to leaving the job site. Calculations are performed manually, with a calculator or computer. Whenever possible, controlled spreadsheets are used to reduce data.

The second phase of data reduction occurs during the preparation of the source test report. All data are reduced, entered into controlled spreadsheets, or checked for accuracy from the prior entry. Final results are generated after the Project Manager has reviewed the data entry, calculations, and reporting units. The

standard calculations are available in the test method references and in sample calculations included in the report appendices.

All data, data entry, and calculations are double-checked by the originator and reviewed by a second person. Reviews can include re-calculation of results, data entry checks, and calculation audit of known and accepted data sets using the existing spreadsheet. Spectrum promotes the use of a standard reporting format. The format has been developed to be effective in documentation of source test projects.

Spectrum uses audited and controlled spreadsheets to calculate all source test results. Data reduction QA is simplified to ensure proper numerical data entry.

The final report will include the test results of all parameters measured in comparison to the applicable permit limits. Facility process data detailing unit operation during testing will also be included in the final report.

Spectrum promotes the use of a standard reporting format. The format has been developed to be effective in documentation of source test projects.

6.0 REPORTING

6.1 TEST REPORT FORMAT

The Test Report will include the applicable information as described in Appendix A-2 of the ODEQ Source Sampling Manual Volume 1. The Spectrum example source test report format generally consists of the following:

- Cover Page;
- Table of Contents;
- Executive Summary;
- Introduction;
- Equipment and Process Description;
- Sampling Methods and Analytical Procedures;
- Test Results and Test Critique;
- QA/QC; and
- Appendix data (i.e., example calculations, field data sheets, test results, source test results, preliminary data and calculation sheets, laboratory data, and QA/QC data).

The Introduction will include applicable rules, permit conditions, and the comparison source test data computed to satisfy permit requirements. The test critique will also include a summary of the test events and a detailed account of any problems encountered during the testing. A brief equipment and process description will be included in the final report, indicating equipment operating parameters during the testing. A simple schematic of the process will show all sampling locations, including upstream and downstream disturbances.

All sampling and analytical procedures will be described specifically detailing all aspects of sampling and analysis. Diagrams of test equipment will be shown.

The appendix to the final report will include complete raw field data, including production data indicative of the testing interval, lab analysis, and test results. All calculations will be shown. The appendix will also contain current calibration data for all applicable equipment and calibration gases used for the testing.

6.2 DATA REDUCTION

Spectrum uses controlled spreadsheets that have been audited for accuracy to calculate all test results. Data reduction QA is simplified to ensure proper numerical data entry. The final report will include the test results of all parameters measured in comparison to the applicable permit limits. Facility process data detailing unit operation during testing will also be included in the final report.

7.0 PERSONNEL RESPONSIBILITIES AND TEST SCHEDULE

7.1 TEST SITE ORGANIZATION

Spectrum will perform all FTIR analysis, THC measurements and flow measurements associated with this compliance test.

Steve Hall will serve a dual role as project manager and principal investigator for the project. Alex Bellon and Sean Springer will share the principal investigator role with Steve depending on schedules. In this role Steve, Sean, and Alex will be the leads onsite and will communicate the test progress and any sampling issues encountered onsite. Dr. Paul Garrett or Kiersten Barnett will also serve as a project scientist and will provide support throughout testing.

Several pre-test preparations are required to be in place before commencement of the compliance testing. This section discusses what is required from the facility for successful the testing occur.

7.1.1 SERVICES PROVIDED BY FACILITY

Microchip will record process operations data during testing. A copy of this data will be included in the test report.

7.1.2 ACCESS TO SAMPLING SITES

The facility will provide safe access to the sampling locations. Spectrum will inspect the proposed sampling locations and determine that they are acceptable.

7.2 TEST SCHEDULE

A test date will be arranged following ODEQ approval of the test protocol. The RCTO compliance testing is currently anticipated to begin on or about August 21, 2024. Testing is expected to be performed over 4 day period onsite.

Appendix A

Field Data Sheets and Example Calculations

SAMPLED VOLUME OF METERED GAS SAMPLE, DRY STANDARD CUBIC FEET
Vmstd = [(Tstd + 460)/Pstd] * Y * Vm * (Pbar + Delta-H/13.6) / (460 + tm)
= [60 + 460)/29.92] * 1.000 * 37.866 * (28.44 + 1.65/13.6) / (460 + 80.0)
= 34.80773

VOLUME OF WATER VAPOR, STANDARD CUBIC FEET
Vwstd = 0.04707 * Vlc * (460 + Tstd) / 528
= 0.04707 * 1073.9 * (460 + 60) / 528
= 49.78259

MOISTURE CONTENT, PERCENT BY VOLUME
%H2O = Vwstd / (Vwstd + Vmstd)
= 49.783 / (49.783 + 34.808)
= 58.851

DRY MOLE FRACTION, LB-MOLE/LB-MOLE
Mfd = 1 - %H2O / 100
= 1 - 58.9 / 100
= 0.41149

DRY MOLECULAR WEIGHT OF FLUE GAS, LB/LB-MOLE
Md = (%CO2 * (fwtCO2/100) + (%O2 * (fwtO2/100))) + ((100-%CO2-%O2) * (fwtCO&N2/100))
= (0.00 * (44/100) + (20.90 * (32/100))) + ((100-0.00-20.90) * (28/100))
= 28.836

WET MOLECULAR WEIGHT OF FLUE GAS, LB/LB-MOLE
Ms = (Md * Mfd) + (fwtH2O) * (%H20/100)
= (28.84 * 0.411) + ((18.0) * (58.85/100))
= 22.459

ABSOLUTE FLUE GAS PRESSURE, INCHES MERCURY
Ps = Pbar + (Pg/13.6)
= 28.4 + (-0.44/13.6)
= 28.41

FLUE GAS VELOCITY AT SAMPLE POINT, FEET PER SECOND. FOR EXAMPLE, POINT N-8
vp = 2.9 * Cp * SQRT[dP * (460+ts) * (29.92/Ps) * (28.95/Ms)]
= 2.9 * 0.84 * SQRT[0.18 *(460+100) * (29.92/28.4) * (28.95/22.5)]
= 28.50

AVERAGE FLUE GAS VELOCITY, FEET PER SECOND
vs = ∑(vp at each point)/Number of Traversing Points
= (28.50 + 28.50 + 32.18 + …)/16
= 27.24

FLUE GAS VOLUMETRIC FLOW RATE, ACTUAL CUBIC FEET PER MINUTE (ACFM)
Q = (60/144) * vs * A
= (60/144) * 27.24 * 153.9
= 1747

FLUE GAS VOLUMETRIC FLOW RATE, WET STANDARD CUBIC FEET PER MINUTE (WSCFM)

Qws = Q * (Tstd+460) / (ts+460) * (Ps/Pstd)
= 1747 * (60+460) / (100+460) * (28.41/29.92)
= 1541

FLUE GAS VOLUMETRIC FLOW RATE, DRY STANDARD CUBIC FEET PER MINUTE (DSCFM)

Qsd = Qws * Mfd
= 1541 * 0.411
= 634

Wet to Dry Correction (for THC)

PPM, dry = PPM / (1 - (Measured% Moisture / 100))

Conversion of THC to VOC (subtraction of methane concentration from THC results)

THC concentration (ppmv) - (CH_4 concentration (ppmv)/3) - (C_2H_6 concentration (ppmv)*2/3) = VOC Concentration (ppmv)

CEMS Operation Log

Project Name	Page of
Project Number	Operator
Facility	Date
Source	

Time	Activity	Analyzer Response						Sample Flow Rate
	Turn on Analyzers [1]	--	--	--	--	--	--	--

Comments

[1] "Turn On Analyzers" is to document sufficient warm-up time. If applicable, "yesterday" is an acceptable entry.

Project	Page of
Project Number	Operator
Facility	Date
Source	

Calibration Gases

Component(s) [1]	Supplier [2]	Concentration(s)	Cylinder ID

[1] Indicate multi-component standards appropriately

[2] Code: AG-Airgas; AL-Air Liquide; S-Scott; P-Praxair

Instrument Identification

Analyte	Manufac-turer [3]	Model Number	Serial Number	Instrument Name

[3] Code: T-Thermo; W-Western; C-California; S-Servomex; O-Omega

Calibration Drift

Project Name: _____ **Monitor Make:** _____

Project Number: _____ **Monitor Model:** _____

Location: _____ **Monitor SN:** _____

Source: _____ **Span:** _____

	Day	Date	Time	Calibration Value	Monitor Response	Difference	Percent of Span
Zero/Low Level	1						
	2						
	3						
	4						
	5						
	6						
	7						
High Level	1						
	2						
	3						
	4						
	5						
	6						
	7						

	Cylinder Number	Actual Value
High		
Zero/Low		

Method Performance Checks

Activity	Method	Criterion	Initials
Span Selection	3A, 6C, 7E, 10	Emissions between 20% and 100% of calibration span	
	25A	Span 1.5-2.5 times the emission limit; if no emission limit, span 1.5-2.5 times expected level	
Calibration Gas Selection	3A, 6C, 7E, 10	Protocol gas; calibration span, 40-60% of calibration span, and <20% of calibration span (or zero gas)	
	25A	Protocol gas: 25-35%, 45-55% and 80-90% of span, zero grade air	
Calibration Error	3A, 6C, 7E, 10	Span gas within ±2.0% of calibration span	
		Mid-range gas within ±2.0% of calibration span	
		Zero gas within ±2.0% of calibration span	
	25A	Low-range gas within 5% of certified value	
		Mid-range gas within 5% of certified value	
		Span gas within 5% of certified value	
Converter Check	7E	≥90% converter efficiency	
System Bias Check	3A, 6C, 7E, 10	Gas through system agrees with calibration error value for that gas within ±5.0% of calibration span	
Response Time	3A, 6C, 7E, 10, 25A	No criteria, evaluated to determine duration at sample points	
Sample Flow Rate	3A, 6C, 7E, 10	Stable sample flow rate within 10% of flow rate established during system response time check and bias check	
3 Point Stratification Check [2,3]	3A, 6C, 7E, 10	± 5% of mean at each point – single point ± 5-10% of mean at each point – 3 points > ± 10% of mean at each point 12 points	
Post-Test Calibration Drift Check	3A, 6C, 7E, 10	Selected gas reading within ±3.0% of calibration span of pre-test reading	
		Zero gas within ±3.0% of calibration span of pre-test reading	
	25A	Selected gas reading within ±3% of span of pre-test reading	
		Zero gas within ±3% of span of previous reading	
Hourly Calibration Drift Check	25A	Selected gas reading within ±3% of span of pre-test reading	
		Zero gas within ±3% of span of previous reading	

[2] The stratification check criteria do not apply to RATA.

[3] The stratification check is not required for stacks or ducts <4 inches in diameter

Method 1 – Circular Duct – Determination of Traverse Points

Project _____

Project Number _____

Facility _____

Source _____

Operator _____

Date _____

□ Velocity Only □ Isokinetic Sampling	Upstream Distance (ft/in) _____ □ Measurement □ Plant Information
Number of Ports to be sampled _____	
Duct Diameter (in) _____ □ Measurement □ Plant Information	Downstream Distance (ft/in) _____ □ Measurement □ Plant Information

Total number of Traverse Points (from Figure 2 (velocity) or 1 (all isokinetic sampling))	
Number of traverse points per port	
Port Depth	

Traverse Point	Percent of Diameter	Distance from Wall [6] (in)	Marking Location (in)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Traverse Point	Percent of Diameter	Distance from Wall (in)	Marking Location (in)
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			

[6] According to Method 1, for stacks between 12 and 24", no point may be within ½ inch of the wall. For stacks greater than 24", no point may be within 1 inch of the wall.

Determination of Cyclonic Flow
Preliminary Velocity/Temperature Traverse
EPA Methods 1 and 2

Project _____ Console (or Temperature Readout) ID _____

Project Number _____ Barometric Pressure (" Hg) _____

Facility _____ Elevation (Relative to Barometer) (ft) _____

Source _____ Static Pressure (" wc) _____

Operator _____

Date _____

Time _____ **Pitot Tube Leak Check**

Pitot Tube No. _____ Initial (+) _____ (-) _____

PTCF _____ Final (+) _____ (-) _____

Traverse Point	Yaw Angle (°)	Velocity Head (ΔP) (in. wc)	Temperature (°F)

Traverse Point	Yaw Angle (°)	Velocity Head (ΔP) (in. wc)	Temperature (°F)

Average Yaw Angle: _____.(This is the average of the absolute value of the measurements)

If the average yaw angle exceeds 20°, Method 2 is not applicable for the determination of gas velocity.

Method 1– Determination of Cyclonic Flow

Project _____

Project Number _____ Pitot Tube No. _____

Facility _____ PTCF _____

Source _____ **Pitot Tube Leak Check**

Operator _____ Initial (+) _____ (-) _____

Date _____ Final (+) _____ (-) _____

Time _____

Traverse Point	Yaw Angle (°)

Traverse Point	Yaw Angle (°)

Average Yaw Angle: _____.(This is the average of the absolute value of the measurements)

If the average yaw angle exceeds 20°, Method 2 is not applicable for the determination of gas velocity.

Velocity/Temperature Traverse
EPA Method 2

Project _____ Pitot Tube No. _____

Project Number _____ PTCF _____

Facility _____ Console (or Temperature Readout) ID _____

Source _____ Barometric Pressure (" Hg) _____

Operator _____ Elevation (Relative to Barometer) (ft) _____

Date _____ Static Pressure (" wc) _____

Time _____ **Pitot Tube Leak Check**

Condition _____ Initial (+) _____ (-) _____

Run _____ Final (+) _____ (-) _____

Traverse Point	Velocity Head (ΔP) (in. wc)	Temperature (°F)

Traverse Point	Velocity Head (ΔP) (in. wc)	Temperature (°F)

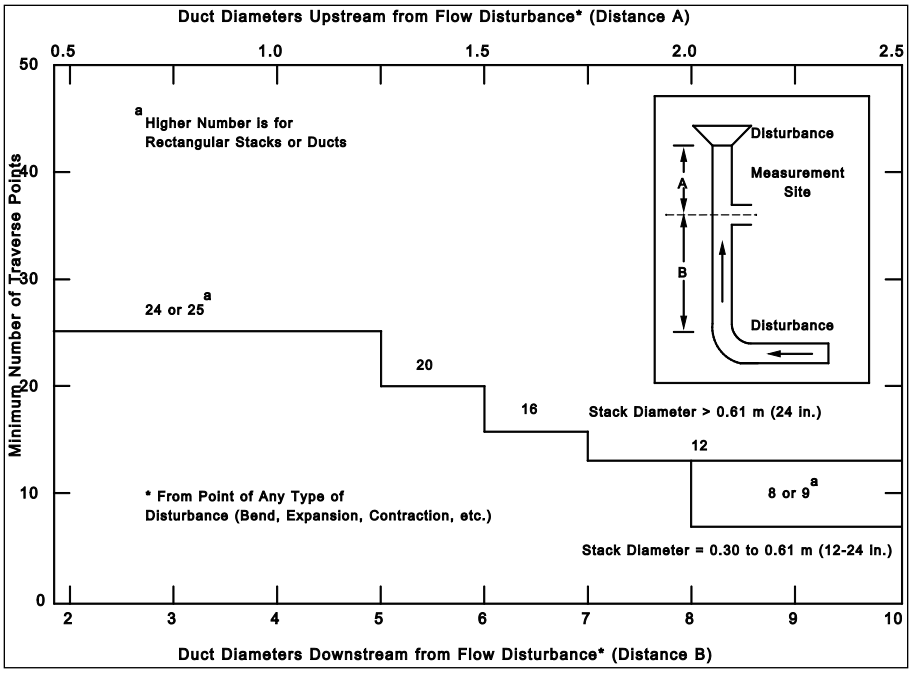


Figure 1 - Traverse Points for Isokinetic Sampling

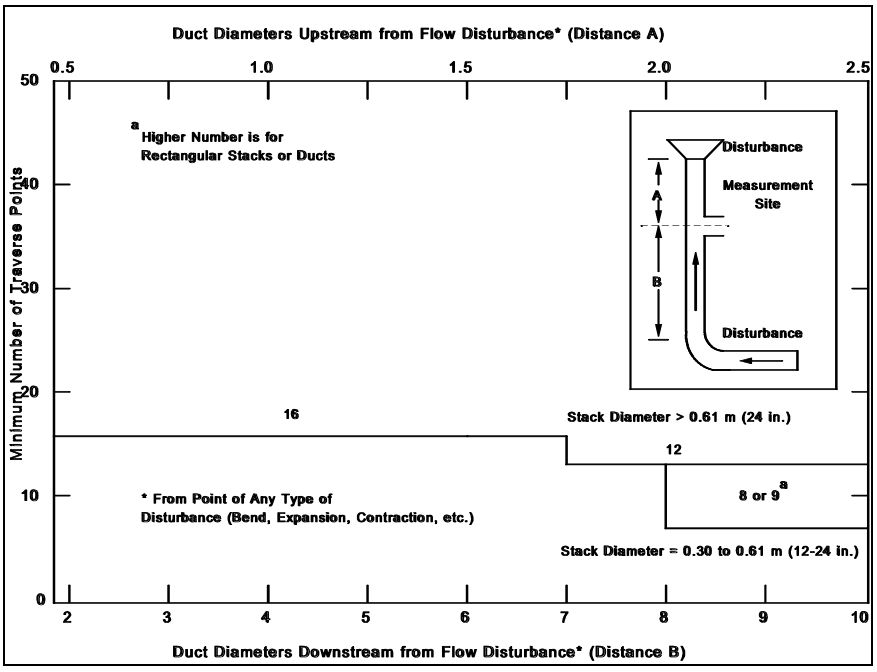


Figure 2 - Traverse Points for Velocity Determination

Traverse Point Number on a Diameter	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8
13							94.3	87.5	81.2	75.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.8
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	85.4	80.6
18									98.6	93.3	88.4	83.9
19										96.1	91.3	86.8
20										98.7	94.0	89.5
21											96.5	92.1
22											98.9	94.5
23												96.8
24												99.9

Figure 3. Location Of Traverse Points In Circular Stacks

Appendix B

Standard Air Contaminant Discharge Permit

State of Oregon
Department of
Environmental
Quality

STANDARD
AIR CONTAMINANT DISCHARGE PERMIT

Department of Environmental Quality
Northwest Region
700 NE Multnomah St., Suite 600
Portland, OR 97232

This permit is being issued in accordance with the provisions of ORS 468A.040 and based on the land use compatibility findings included in the permit record.

ISSUED TO:

Microchip Technology Incorporated
Gresham Fab 4
21015 SE Stark Street
Gresham, OR 97030

PLANT SITE LOCATION:

21015 SE Stark Street
Gresham, OR 97030

INFORMATION RELIED UPON:

Application No.: 029474
Date Received: 12/22/2017

LAND USE COMPATIBILITY FINDING:

Approving Authority: City of Gresham
Approval Date: 06/29/1995

ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL QUALITY

Matt Hoffman, Northwest Region Air Quality Manager

6/21/2019
Dated

Sources Permitted to Discharge Air Contaminants (OAR 340-216-8010):

Table 1 Code	Source Description	SIC (NAICS)
Part B, 85	Sources which would have actual emissions, if they source were to operate uncontrolled, of 10 or more tons of any single criteria pollutant. Semiconductor manufacturing.	3674 (334413)
Part B, 13	Boilers over 10 mmBtu/hr heat input with oil back-up, or NG fired over 30 mmBtu/hr heat input with or without oil back-up (for database tracking purposes only, not a separate emission unit)	4961 (221330)

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1.0 GENERAL EMISSION STANDARDS AND LIMITS

1.1. Visible Emissions

The permittee must comply with the following visible emission limits from air contaminant sources other than fugitive emission sources, as applicable.

a. Emissions from any air contaminant source must not equal or exceed 20% opacity.

b. Opacity must be measured as a six-minute block average using EPA Method 9, a continuous opacity monitoring system (COMS) installed and operated in accordance with the DEQ Continuous Monitoring Manual or 40 CFR part 60, or an alternative monitoring method approved by DEQ that is equivalent to EPA Method 9.

1.2. Particulate Matter Emissions

The permittee must comply with the following particulate matter emission limits, as applicable:

a. Particulate matter emissions from any fuel burning equipment installed on or after April 16, 2015 must not exceed 0.10 grains per dry standard cubic foot, corrected to 12% CO_2 or 50% excess air.

b. Particulate matter emissions from any fuel burning equipment installed, constructed, or modified before April 16, 2015 must not exceed 0.14 grains per dry standard cubic foot, corrected to 12% CO_2 or 50% excess air.

c. Particulate matter emissions from any air contaminant source installed, constructed, or modified before April 16, 2015 other than fuel burning equipment and fugitive emission sources must not exceed 0.14 grains per dry standard cubic foot.

d. Particulate matter emissions from any air contaminant source installed, constructed, or modified on or after April 16, 2015 other than fuel burning equipment and fugitive emission sources must not exceed 0.10 grains per dry standard cubic foot.

1.3. Fugitive Emissions

The permittee must take reasonable precautions to prevent fugitive dust emissions, as measured by EPA method 22, by:

a. Using, where possible, water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads or the clearing of land;

b. Applying water or other suitable chemicals on unpaved roads, materials stockpiles, and other surfaces which can create airborne dusts;

c. Enclosing (full or partial) materials stockpiles in cases where application of water or other suitable chemicals are not sufficient to prevent particulate matter from becoming airborne;

d. Installing and using hoods, fans, and fabric filters to enclose and vent the handling of dusty materials;
e. Installing adequate containment during sandblasting or other similar operations;
f. Covering, at all times when in motion, open bodied trucks transporting materials likely to become airborne;
g. Promptly removing earth or other material that does or may become airborne from paved streets; and
h. Developing a DEQ approved fugitive emission control plan upon request by DEQ if the above precautions are not adequate and implementing the plan whenever fugitive emissions leave the property for more than 18 seconds in a six-minute period.

1.4. Particulate Matter Fallout

The permittee must not cause or permit the deposition of any particulate matter larger than 250 microns in size at sufficient duration or quantity, as to create an observable deposition upon the real property of another person.

1.5. Nuisance and Odors

The permittee must not cause or allow air contaminants from any source to cause a nuisance. Nuisance conditions will be verified by DEQ personnel.

1.6. Fuels and Fuel Sulfur Content

The permittee must not use any fuel other than natural gas, propane, butane, ASTM grade 1 or 2 fuel oils, or a DEQ approved equivalent (e.g. biodiesel). Fuel oils must not contain more than:

a. 0.3% sulfur by weight for ASTM Grade 1 distillate oil; or
b. 0.5% sulfur by weight for ASTM Grade 2 distillate oil.

1.7. Emergency Stationary RICE

The permittee must comply with the following requirements for emergency stationary reciprocating internal combustion engines (RICE): [40 CFR 63.6640(f)]

For each emergency stationary RICE, the permittee must:

a. Change oil and filter every 500 hours of operation or annually, whichever comes first; [40 CFR 63. 6603(a), table 2d(4)(a)]
b. Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first; [40 CFR 63. 6603(a), table 2d(4)(b)]
c. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary; [40 CFR 63. 6603(a), table 2d(4)(c)]
d. During periods of startup, minimize the engine's time spent at idle and minimize the engine's startup time at startup to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the non-startup emission limitations apply; and [40 CFR 63. 6603(a), table 2d]
e. The permittee must install a non-resettable hour meter on each emergency stationary RICE, if one is not already installed. [40 CFR 63.6625(f)]

1.8. Operating Conditions for Emergency Stationary RICE

The permittee must operate any emergency stationary RICE in compliance with the following conditions: [40 CFR 63.6640(f)]

a. There is no time limit on the use of emergency stationary RICE in emergency situations.

b. Emergency stationary RICE may be operated for the purpose of maintenance checks and readiness testing, provided that the tests are recommended by the manufacturer, the vendor, or the insurance company associated with the engine. Required maintenance and testing of such units is limited to 50 hours per year.

c. The permittee is prohibited from using its emergency stationary RICE for any non-emergency use including but not limited to peak shaving, demand response operation, and/or generation of income from the sale of power. To perform such activity the permittee must first obtain a modified permit in accordance with Condition 13.2 or a separate permit for power generation that appropriately addresses and allows this activity.

1.9. Operating Conditions for Emergency Stationary RICE

The permittee must keep records of the hours of operation of each emergency stationary RICE that is recorded through the non-resettable hour meter. The permittee must document how many hours are spent for emergency operation, including what classified the operation as emergency and how many hours are spent for non-emergency operation used for maintenance checks and readiness testing. [40 CFR 63.6655(f)]

2.0 NEW SOURCE PERFORMANCE STANDARDS (NSPS)

2.1. Boilers

The permittee must comply with 40 CFR 60 Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units, 10 – 100 million Btu per hour heat input, including:

a. Notifications - Date of construction, anticipated startup, and actual startup of each new boiler, subsequent to the effective date of this permit.

b. Recordkeeping - Monthly natural gas combusted per boiler, unless an alternative boiler monitoring schedule is approved by the EPA Administrator.

3.0 TYPICALLY ACHIEVABLE CONTROL TECHNOLOGY (TACT)

3.1. VOC Emissions

The permittee must control Volatile Organic Compound (VOC) emissions from Building 1 and Building 2 manufacturing operations with a concentrator thermal oxidizer that must achieve a minimum 90% destruction removal efficiency (DRE) of VOCs entering the concentrator thermal oxidizer (CTO).

3.2. Acid Gas Emissions

The permittee must control acid gases from Building 1 and Building 2 manufacturing operations with wet scrubber systems that achieves a minimum 90% DRE. As an alternative, the permittee may meet a facility-wide volumetric flow-weighted average emission concentration of 1 part per million by volume (ppmv) of HF and 1 ppmv of HCl, using results of a performance source test.

4.0 OPERATION AND MAINTENANCE REQUIREMENTS

4.1. O&M plan

The permittee must establish and maintain an O & M plan that addresses both short and long-term activities to ensure that all air pollution control devices are operating as efficient as possible at all times.

5.0 PLANT SITE EMISSION LIMITS

5.1. Plant Site Emission Limits (PSEL)

The permittee must not cause or allow plant site emissions to exceed the following:

Pollutant	Limit	Units
PM	24	tons per year
PM_{10}	14	tons per year
$PM_{2.5}$	9	tons per year
SO_2	39	tons per year
NO_X	39	tons per year
CO	99	tons per year
VOC	39	tons per year
GHGs (CO2e)	181,000	tons per year
Single HAP	9	tons per year
Combined HAPs	24	tons per year
Fluorides	2.9	tons per year

All PM is assumed to be PM10 and all PM10 is assumed to be PM2.5. Fluorides are calculated using the site specific fluorides emission factor based on 2015 emission testing results (see review report). HAP PSELs are included because uncontrolled PTE is greater than the major source threshold.

5.2. Annual Period

The annual plant site emissions limits apply to any 12-consecutive calendar month period.

6.0 COMPLIANCE DEMONSTRATION AND SOURCE TESTING

6.1. Testing Requirements

The permittee must conduct a source test of the control devices as specified below:

a. Once during this permit cycle the permittee must perform a performance test of each wet scrubber system to determine the HF and HCl destruction removal efficiency (DRE).

b. Once during this permit cycle the permittee must perform a performance test of the CTO to determine the VOC DRE.

c. Stack exhaust gas during each source test must be sampled while the facility is operating within 90% its normal operating capacity at the time of the test.

d. Exhaust gas concentrations must be sampled before and after each wet scrubber system and the CTO to demonstrate the system's DRE. The source test report must include the DRE demonstrated during each test run as well as the average DRE for the three test runs.

e. During each source test the following parameters must be monitored and recorded:

   i. Combustion temperature of the CTO; and

   ii. Recirculation flow rate and pH of the wet scrubbers.

   iii. Other facility/process operating parameters identified prior to the test.

f. Only regular operating staff may adjust the combustion system or production processes and emission control parameters during the source test and within two hours prior to the tests. Any operating adjustments made during the source test, which are a result of consultation during the tests with source testing personnel, equipment vendors or consultants, may render the source test invalid.

g. A pretest plan for each source test required above must be submitted for approval to DEQ's Source Test Coordinator at the ODEQ Northwest Regional Office, at least 15 days prior to testing.

h. The reference test methods identified in the table below must be utilized in the source tests identified above. A test method modification/variance or substitution of an alternative test method must be pre-approved by the DEQ's Source Test Coordinator.

i. All tests must be conducted in accordance with the DEQ's Source Sampling Manual and with the pretest plan. All test data and results must be submitted to the Source Test Coordinator for review within 45 days after completion of the testing cycle unless an alternate submission date or extension is approved by DEQ.

Reference Test Method	Tested pollutant/parameter	
EPA 1&2	Flow Rate	
EPA 3	Dry Molecular Weight	
EPA 4 or ODEQ Method	Moisture	
EPA 25A	Total VOC	
EPA 26, 26A or 320	Acid Gases	

7.0 PSEL COMPLIANCE DEMONSTRATION

7.1. Boiler Emissions

On a monthly basis, the permittee must calculate $PM_{2.5}$, SO_2, CO, NO_x, and VOC using the formula below:

$$\mathbf{E = EF_{NG\text{-}1} \times NG\text{-}1 + EF_{OIL\text{-}1} \times OIL\text{-}1 + EF_{NG\text{-}2} \times NG\text{-}2 + EF_{OIL\text{-}2} \times OIL\text{-}2}$$

Where:

E = Emissions, pounds per month

$EF_{NG\text{-}1}$ and $EF_{OIL\text{-}1}$ and $EF_{NG\text{-}2}$ and $EF_{OIL\text{-}2}$ = see Condition 0

NG-1 and NG-2 = Amount of natural gas combusted in Bldg 1 and Bldg 2

OIL-1 and OIL-2 = Amount of fuel oil combusted in Bldg 1 and Bldg 2

7.2. Generator Emissions

On a monthly basis, the permittee must calculate $PM_{2.5}$, SO_2, CO, NOx, and VOC using the formula below:

$$\mathbf{E = EF_G \times G}$$

Where:

E = Emissions, pounds per month

EF_G = see Condition 0

G = Number of hours of operation per month

7.3. CTO Emissions

On a monthly basis, the permittee must calculate $PM_{2.5}$, SO_2, CO, NO_x and VOC resulting from natural gas combustion in the CTO using the formula below:

$$\mathbf{E = EF_{NG} \times NG}$$

Where:

E = Emissions, pounds per month

EF_{NG} = see Condition 0

NG = Amount of natural gas combusted in the CTO

7.4. VOC Fab Emissions

On a monthly basis, the permittee must calculate VOC emissions from the Building 1 and Building 2 manufacturing processes as described below.

a. VOC emissions are determined as follows:

$$\mathbf{E = \sum [Q \times EF \times (1\text{-}DRE)]}$$

Where:

E = Emissions, pounds per month

$\sum$ = Summation of VOC contributions (pounds of emissions) of each VOC-containing material

Q = Amount of VOC-containing material used, pounds per month

Material used = Amount of material issued minus the amount transferred off-site or disposed of as waste

EF = Emission factor for VOCs, pounds VOC emitted per pound of material used

DRE = (see 7.7.b.)

b. VOC emissions will be calculated by assuming that the CTO DRE is 90%, unless demonstrated otherwise through DEQ-approved stack testing results.

c. Fugitive emissions that do not pass through the CTO have a DRE equal to zero.

d. The representative VOC content of waste must be measured by EPA Method 8015M GC/FID or other method approved by DEQ.

7.5. VOC Emission Factors

The permittee must use the VOC EFs in the permit application for calculating emissions. If the permittee uses a different VOC-containing material, which current equipment is capable of accommodating, the emission factor must be adjusted in direct proportion to the ratio of VOC content. Any changes in emissions factors must follow Condition 8.3.

7.6. Acid Gas Fab Emissions

On a monthly basis, the permittee must calculate HCl and HF emissions from the Building 1 and Building 2 manufacturing processes as described below.

a. HCl emissions are determined as follows:

$$\mathbf{E_{HCl} = \sum [Q_{HCl} \times EF_{HCl}]}$$

Where:

E_{HCl} = Emissions, pounds per month

$\sum$ = Summation of HCl contributions (pounds of emissions) of each HCl-containing material and each HCl-precursor material

Q_{HCl} = Amount of HCl-containing and HCl-precursor material used, pound per month

Material used = Amount of material issued minus the amount transferred off-site or disposed of as waste

EF_{HCl} = Emission factor, pounds HCl emitted per pound of HCl-containing and HCl-precursor material used per month

b. HF emissions are determined as follows:

$$E_{HF} = \sum [Q_{HF} \times EF_{HF}]$$

Where:

E_{HF} = Emissions, pounds per month

$\sum$ = Summation of HF contributions (pounds of emissions) of each HF-containing material and each HF-precursor material

Q_{HF} = Amount of HF-containing and HF-precursor material used, pounds per month

Material used = Amount of material issued minus the amount transferred off-site or disposed of as waste

EF_{HF} = Emission factor, pounds HF emitted per pound of HF-containing and HF-precursor material used per month

7.7. Acid Gas Emission Factors The permittee must use the HCl and HF EFs in the permit application for calculating emissions. If the permittee uses a different HCL or HF- containing material, which current equipment is capable of accommodating, the emission factor must be adjusted in direct proportion to the ratio of HCl or HF content. Any changes in emission factors must follow Condition 8.3.

7.8. Alternate Methods Alternate methods may be used for emissions calculations if demonstrated by the permittee to be equivalent to or more accurate than the above methods. An alternate method must be reviewed and approved by DEQ prior to use.

7.9. GHG emissions On a monthly basis the permittee must determine compliance with the GHG PSEL in accordance with OAR 340 division 215 and the calculation protocols in 40 CFR Part 98 Subparts A, C and I. Point of use (POU) abatement devices are used primarily for safety and facilities protection purposes; a portion of the facility's POU abatement devices may be used for GHG abatement provided they meet the conditions below. POU abatement device GHG destruction or removal efficiency (DRE) may be used to calculate actual greenhouse gas emissions once a site maintenance plan is submitted to Oregon DEQ. Installation, maintenance and operation of POU abatement devices claiming a GHG DRE must follow a site maintenance plan that meets the requirements of 40 CFR Part 98 Subpart I made effective January 1, 2014. If the site maintenance plan is modified, the permittee must submit a copy to Oregon DEQ. (Note: the GHG PSEL is in tons/year and not metric-tons/year). GHGs are defined in OAR 340-200-0020 for PSEL compliance, and in OAR 340-215-0020 for GHG reporting purposes.

7.10. Fluorides emissions

On a monthly basis the permittee must determine compliance with the fluorides PSEL by calculating fluorides emissions using fluorides specific emission factors from source testing conducted in June 2015 as detailed in the review report of this permit renewal. Condition 0 includes a ratio to HF emissions that may be used for this calculation.

8.0 SPECIAL CONDITIONS

8.1. Installation of Additional Control Devices

The permittee must notify DEQ in writing of the date any additional VOC or acid gas control device begins treating process exhaust, within seven (7) days.

8.2. Emission factor adjustments

In the event the permittee exchanges the use of a material for a similar material, which the existing equipment is capable of accommodating and which has higher or lower emission potential (VOC, HCl, HF, GHG), the permittee must adjust the associated emission factor using the ratio of the content of the new material to the content of the material used to establish the original emission factor. The permittee must include a summary of these changes in the annual report.

8.3. Change of Emission Factors

Except as allowed in Condition 8.2, the permittee must notify DEQ in writing of a change in the recipe of chemicals that changes the emission factors. This notification must include an analysis of how the changes in the emission factors affect plant site emissions relative to the PSEL.

9.0 MONITORING CONDITIONS

9.1. Continuous Monitoring

The permittee must monitor and maintain the following records related to the operation of control devices continuously during all hours of operation:

a. CTO combustion chamber temperature; and

b. Wet scrubber recirculation flow rate and pH.

c. The permittee is presumed to be in compliance with the 20% visible emissions standard and the 0.10 gr/dscf particulate emissions standard as long as the boilers burn natural gas.

9.2. Fuel Monitoring

The permittee must record and maintain records of the amounts of each fuel combusted monthly for each boiler that is an affected facility under 40 CFR 60 Subpart Dc, unless an alternate monitoring schedule is approved by the EPA Administrator.

9.3. Monthly Monitoring

The permittee must monitor and maintain the following records related to the operation and maintenance of the facility and associated air contaminant control devices monthly:

a. The amount and type of fuel combusted in the Building 1 boilers (combined) and the Building 2 boilers (individual, unless combining is approved by EPA).

b. The hours of non-emergency generator operation (combined).

c. The amount of natural gas combusted in the CTO.

d. The quantity of VOC, HCl- and HF-containing, and HCl- or HF-precursor, fluoride-containing, GHG-containing, or GHG-precursor material issued.

e. The quantity of VOC, HCl- and HF-containing, and HCl- or HF-precursor, fluoride-containing, GHG-containing, or GHG-precursor raw material shipped off-site or disposed of as waste.

f. Any change in emission factors of VOC, HCl, HF, fluorides, or GHG.

10.0 RECORDKEEPING REQUIREMENTS

10.1. Excess Emissions

The permittee must maintain records of excess emissions as defined in OAR 340-214-0300 through 340-214-0340 (recorded on occurrence). Typically, excess emissions are caused by process upsets, startups, shutdowns, or scheduled maintenance. In many cases, excess emissions are evident when visible emissions are greater than 20% opacity as a six-minute block average. If there is an ongoing excess emission caused by an upset or breakdown, the permittee must cease operation of the equipment or facility no later than 48 hours after the beginning of the excess emissions, unless continued operation is approved by DEQ in accordance with OAR 340-214-0330(4).

10.2. Complaint Log

The permittee must maintain a log of all written complaints and complaints received via telephone that specifically refer to air pollution concerns associated to the permitted facility. The log must include a record of the permittee's actions to investigate the validity of each complaint and a record of actions taken for complaint resolution.

10.3. Maintenance Log

The permittee must maintain records of major maintenance performed on air pollution control equipment as described in Section 4. See also O & M Plan on file for logs of routine maintenance.

10.4. Retention of Records Unless otherwise specified, the permittee must retain all records for a period of at least five (5) years from the date of the monitoring sample, measurement, report, or application and make them available to DEQ upon request. The permittee must maintain the two (2) most recent years of records onsite.

11.0 REPORTING REQUIREMENTS

11.1. Excess Emissions The permittee must notify DEQ of excess emissions events if the excess emission is of a nature that could endanger public health.

a. Such notice must be provided as soon as possible, but never more than one hour after becoming aware of the problem. Notice must be made to the regional office identified in Condition 15.0 by email, telephone, facsimile, or in person.

b. If the excess emissions occur during non-business hours, the permittee must notify DEQ by calling the Oregon Emergency Response System (OERS). The current number is 1-800-452-0311.

c. The permittee must also submit follow-up reports when required by DEQ.

11.2. Semi-annual The permittee must submit a report to the Administrator, United States Environmental Protection Agency, Region X a report of the fuel sulfur content of fuel oil received at the facility during the previous six months for use in any NSPS-affected boiler. The report must be submitted no later than the 30th day after the end of the reporting period. The reporting period begins on January 1 and July 1 of each year.

11.3. Annual Report For each year this permit is in effect, the permittee must submit to DEQ by **March 15** two (2) copies of the following information for the previous calendar year:

a. A letter stating the facility's compliance status with permit conditions for the calendar year. Any violations or exceedances must be explained in detail including corrective actions taken.

b. Operating parameters:

i. A summary of the monthly amount (therms, gallons, or cubic feet) of fuel (natural gas, propane, oil, or other) combusted in the boilers.

ii. A summary of the rolling 12-month amount (therms, gallons or cubic feet) of fuel (natural gas, propane, oil, or other) combusted in the boilers.

iii. A summary of the monthly hours of non-emergency generator operation.

iv. A summary of the rolling 12-month hours of non-emergency generator operation.

v. A summary of the monthly amount (pounds) of VOC, HCl- and HF-containing, and HCl- and HF-precursor, fluorides-containing, GHG-containing, or GHG precursor materials received on site for use in the fab.

vi. A summary of the monthly amount (pounds) of VOC, HCl- and HF-containing, and HCl- and HF-precursor, fluorides-containing, GHG-containing, or GHG precursor materials shipped off-site or disposed of as waste.

vii. A summary of any changes in material content that affect emission factor values.

viii. A summary of the rolling 12-month amount (pounds) of VOC, HCl- and HF-containing, and HCl- and HF-precursor fluorides-containing, GHG-containing, or GHG precursor materials used.

Material used = Amount of material issued minus the amount transferred off-site or disposed of as waste

ix. Revisions of the DRE of the CTO used for compliance emission calculations in Condition 7.4.b.

x. A summary of the rolling 12-month emissions of $PM_{2.5}$, SO_2, CO, NO_x, VOC, HCl, HF and PSEL fluorides.

c. Greenhouse gas emissions in accordance with OAR 340 division 215

d. A summary of all planned and unplanned excess emissions events as recorded in the Excess Emissions Log.

e. A summary of any emission factors which were changed.

f. A summary of complaints relating to air quality received by the permittee during the previous calendar year, as recorded in the Complaint Log.

12.0 NOTIFICATIONS

12.1. Notice of Change of Ownership or Company Name

The permittee must notify DEQ in writing using a DEQ "Permit Application Form" within 60 days after the following:

a. Legal change of the name of the company as registered with the Corporations Division of the State of Oregon; or

b. Sale or exchange of the activity or facility.

12.2. Construction or Modification Notices

The permittee must notify DEQ in writing using a DEQ "Notice of Construction Form," or "Permit Application Form," and obtain approval in accordance with OAR 340-210-0205 through 340-210-0250 before:

a. Constructing, installing, or establishing a new stationary source that will cause an increase in any regulated pollutant emissions;

b. Making any physical change or change in operation of an existing stationary source that will cause an increase, on an hourly basis at full production, in any regulated pollutant emissions; or

c. Constructing or modifying any air pollution control equipment.

12.3. Where to Send Reports and Notices The reports, with the permit number prominently displayed, must be sent to the Permit Coordinator for the region where the source is located as identified in Condition 15.3

13.0 ADMINISTRATIVE REQUIREMENTS

13.1. Permit Renewal Application The permittee must submit the completed application package for renewal of this permit **180 days prior to the expiration date**. Two (2) copies of the application must be submitted to the DEQ Permit Coordinator listed in Condition 15.0.

13.2. Permit Modifications Application for a modification of this permit must be submitted within **60 days** prior to the source modification. When preparing an application, the applicant should also consider submitting the application 180 days prior to allow DEQ adequate time to process the application and issue a permit before it is needed. A special activity fee must be submitted with an application for the permit modification. The fees and two (2) copies of the application must be submitted to the DEQ Business Office.

14.0 FEES

14.1. Annual Compliance Fee The permittee must pay the annual fee specified in OAR 340-216-8020, Table 2, Part 2 for a Standard ACDP on **December 1** of each year this permit is in effect. An invoice indicating the amount, as determined by DEQ regulations will be mailed prior to the above date. **Late fees in accordance with Part 4 of the table will be assessed as appropriate.**

14.2. Change of Ownership or Company Name Fee The permittee must pay the non-technical permit modification fee specified in OAR 340-216-8020, Table 2, Part 3(a) with an application for changing the ownership or the name of the company.

14.3. Special Activity Fees The permittee must pay the special activity fees specified in OAR 340-216-8020, Table 2, Part 3 (b through k) with an application to modify the permit.

15.0 DEQ CONTACTS / ADDRESSES

15.1. Business Office

The permittee must submit payments for invoices, applications to modify the permit, and any other payments to DEQ's Business Office:

Department of Environmental Quality
Accounting / Revenue
700 NE Multnomah St., Suite 600
Portland, Oregon 97232

15.2. Permit Coordinator

The permittee must submit all notices and applications that do not include payment to the Northwest Region Air Quality Permit Coordinator:

Department of Environmental Quality
Northwest Region Air Quality PC
700 NE Multnomah St., Suite 600
Portland OR 97232

15.3. Report Submittals

Unless otherwise notified, the permittee must submit all reports (annual reports, source test plans and reports, etc.) to DEQ's Region. If you know the name of the Air Quality staff member responsible for your permit, please include it.

15.4. Web Site

Information about air quality permits and DEQ's regulations may be obtained from the DEQ web page at www.oregon.gov/deq

16.0 GENERAL CONDITIONS AND DISCLAIMERS

16.1. Permitted Activities

This permit allows the permittee to discharge air contaminants from processes and activities related to the air contaminant source(s) listed on the first page of this permit until this permit expires, is modified, or is revoked.

16.2. Other Regulations

In addition to the specific requirements listed in this permit, the permittee must comply with all other legal requirements enforceable by DEQ.

16.3. Conflicting Conditions

In any instance in which there is an apparent conflict relative to conditions in this permit, the most stringent conditions apply.

16.4. Masking of Emissions

The permittee must not cause or permit the installation of any device or use any means designed to mask the emissions of an air contaminant that causes or is likely to cause detriment to health, safety, or welfare of any person or otherwise violate any other regulation or requirement.

16.5. DEQ Access

The permittee must allow DEQ's representatives access to the plant site and pertinent records at all reasonable times for the purposes of performing inspections, surveys, collecting samples, obtaining data, reviewing and copying air contaminant emissions discharge records and conducting all necessary functions related to this permit in accordance with ORS 468-095.

16.6. Permit Availability

The permittee must have a copy of the permit available at the facility at all times.

16.7. Open Burning

The permittee may not conduct any open burning except as allowed by OAR 340, division 264.

16.8. Asbestos

The permittee must comply with the asbestos abatement requirements in OAR 340, division 248 for all activities involving asbestos-containing materials, including, but not limited to, demolition, renovation, repair, construction, and maintenance.

16.9. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.

16.10. Permit Expiration

a. A source may not be operated after the expiration date of the permit, unless any of the following occur prior to the expiration date of the permit:

   i. A timely and complete application for renewal or for an Oregon Title V Operating Permit has been submitted, or

   ii. Another type of permit (ACDP or Oregon Title V Operating Permit) has been issued authorizing operation of the source.

b. For a source operating under an ACDP or Oregon Title V Operating Permit, a requirement established in an earlier ACDP remains in effect notwithstanding expiration of the ACDP, unless the provision expires by its terms or unless the provision is modified or terminated according to the procedures used to establish the requirement initially.

16.11. Permit Termination, Revocation, or Modification

DEQ may modify or revoke this permit pursuant to OAR 340-216-0082 and 340-216-0084.

17.0 EMISSION FACTORS

Combustion emission factor table

Emissions device or activity	Pollutant	Emission Factor (EF)	EF units	EF Reference
Boilers B1, B2, B3 Natural gas (Building 1)	$PM/PM_{10}/PM_{2.5}$	0.0075	Lbs/mmBtu	AP-42 Tbl 1.4-2
	CO	0.040	Lbs/mmBtu	Manufacturer
	NO_x	0.04	Lbs/mmBtu	Manufacturer
	SO_2	0.0017	Lbs/mmBtu	ODEQ AQ-EF05
	VOC	0.016	Lbs/mmBtu	Manufacturer
Boilers B4, B5, B6 Natural gas (Building 2)	$PM/PM_{10}/PM_{2.5}$	0.0075	Lbs/mmBtu	AP-42 Tbl 1.4-2
	CO	0.037	Lbs/mmBtu	Manufacturer
	NO_x	0.035	Lbs/mmBtu	Manufacturer
	SO_2	0.0017	Lbs/mmBtu	ODEQ AQ-EF05
	VOC	0.016	Lbs/mmBtu	Manufacturer
Boilers B1, B2, B3 Fuel oil (Building 1)	$PM/PM_{10}/PM_{2.5}$	4.2	Lbs/mgal	Manufacturer
	CO	9.8	Lbs/mgal	Manufacturer
	NO_x	16.8	Lbs/mgal	Manufacturer
	SO_2	50.26	Lbs/mgal	Manufacturer
	VOC	4.06	Lbs/mgal	Manufacturer
Boilers B4, B5, B6 Fuel oil (Building 2)	$PM/PM_{10}/PM_{2.5}$	3.36	Lbs/mgal	Manufacturer
	CO	9.8	Lbs/mgal	Manufacturer
	NO_x	26.6	Lbs/mgal	Manufacturer
	SO_2	57.68	Lbs/mgal	Manufacturer
	VOC	4.2	Lbs/mgal	Manufacturer
Fire pump	$PM/PM_{10}/PM_{2.5}$	0.0022	Lbs/hp-hr	AP-42 Table 3.3-1
	CO	0.00668	Lbs/hp-hr	AP-42 Table 3.3-1
	NO_x	0.031	Lbs/hp-hr	AP-42 Table 3.3-1
	SO_2	0.00205	Lbs/hp-hr	AP-42 Table 3.3-1
	VOC	0.00247	Lbs/hp-hr	AP-42 Table 3.3-1
Building 1 diesel generators (2 each) [Full load/weekly testing]	$PM/PM_{10}/PM_{2.5}$	0.8/0.1	Lbs/hr	Manufacturer
	CO	3.5/0.4	Lbs/hr	Manufacturer
	NO_x	26.5/3.2	Lbs/hr	Manufacturer
	SO_2	1.7/0.2	Lbs/hr	Manufacturer
	VOC	0.6/0.1	Lbs/hr	Manufacturer

Emissions device or activity	**Pollutant**	**Emission Factor (EF)**	**EF units**	**EF Reference**
Building 2 diesel generators (3 each) [Full load/weekly testing]	$PM/PM_{10}/PM_{2.5}$	0.6/0.1	Lbs/hr	Manufacturer
	CO	5.2/0.6	Lbs/hr	Manufacturer
	NO_x	32.0/3.8	Lbs/hr	Manufacturer
	SO_2	1.9/0.2	Lbs/hr	Manufacturer
	VOC	0.8/0.1	Lbs/hr	Manufacturer
CTO on NG	$PM/PM_{10}/PM_{2.5}$	0.0073	Lbs/mmBtu	Manufacturer
	CO	0.0808	Lbs/mmBtu	Manufacturer
	NO_x	0.06	Lbs/mmBtu	Manufacturer
	SO_2	0.00058	Lbs/mmBtu	Manufacturer
	VOC	0.0053	Lbs/mmBtu	Manufacturer
Facility wide	Fluorides	0.583	Lbs F/lbs HF	Source test and empirical calcs.

Gas and Liquid Precursors – Emission factor Table

Chemical/Precursor	Pollutant	Emissions factor	Units
01000-060643, 01000-003985	NOx	0.270	Lb/lb
01000-065355	CO	1	Lb/lb
01000-060020	CO	0.269	Lb/lb
01000-060005	CO	0.203	Lb/lb
01000-060644 Process 1	CO NO_x	0.008 0.648	Lb/lb
01000-060644 Process 2	CO NO_x	0.00239 0.011	Lb/lb
01000-064403	NO_x	0.209	Lb/lb
01000-060014	CO	0.280	Lb/lb
01000-062718	CO	0.330	Lb/lb
01000-062689	CO	0.223	Lb/lb
01000-060018 Process 1	SO_2	0.439	Lb/lb
01000-060045	CO	0.269	Lb/lb
01000-064404	CO	0.159	Lb/lb
01000-064404, 01000-060007	CO	0.159	Lb/lb
01000-060006	CO	0.200	Lb/lb

Emission factors are based on an evaluation of the site specific emissions from the various chemicals and precursor

18.0 ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

ACDP	Air Contaminant Discharge Permit
ASTM	American Society for Testing and Materials
AQMA	Air Quality Maintenance Area
calendar year	The 12-month period beginning January 1st and ending December 31st
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
DEQ	Oregon Department of Environmental Quality
dscf	dry standard cubic foot
EPA	US Environmental Protection Agency
FCAA	Federal Clean Air Act
Gal	gallon(s)
GHG	greenhouse gas
gr/dscf	grains per dry standard cubic foot
HAP	Hazardous Air Pollutant as defined by OAR 340-244-0040
I&M	inspection and maintenance
lb	pound(s)
MMBtu	million British thermal units
NA	not applicable
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NO_X	nitrogen oxides
NSPS	New Source Performance Standard
NSR	New Source Review
O_2	oxygen
OAR	Oregon Administrative Rules
ORS	Oregon Revised Statutes
O&M	operation and maintenance
Pb	lead
PCD	pollution control device
PM	particulate matter
PM_{10}	particulate matter less than 10 microns in size
$PM_{2.5}$	particulate matter less than 2.5 microns in size
ppm	part per million
PSD	Prevention of Significant Deterioration
PSEL	Plant Site Emission Limit
PTE	Potential to Emit
RACT	Reasonably Available Control Technology
scf	standard cubic foot
SER	Significant Emission Rate
SIC	Standard Industrial Code
SIP	State Implementation Plan
SO_2	sulfur dioxide
Special Control Area	as defined in OAR 340-204-0070
VE	visible emissions
VOC	volatile organic compound
year	A period consisting of any 12-consecutive calendar months

State of Oregon
Department of
Environmental
Quality

Department of Environmental Quality
Northwest Region
Air Quality Program

Standard AIR CONTAMINANT DISCHARGE PERMIT REVIEW REPORT

Source Information:

SIC	3674, 4961
NAICS	221330, 334413

Source Categories (Table 1 Part, code)	B13, B85
Public Notice Category	III

Compliance and Emissions Monitoring Requirements:

FCE	
Compliance schedule	
Unassigned emissions	
Emission credits	
Special Conditions	

Source test	once
COMS	
CEMS	
PEMS	
Ambient monitoring	

Reporting Requirements

Annual report	March 15
Quarterly report	

Monthly report	
Excess emissions report	
Other (Semi-annual)	July 30

Air Programs

Synthetic Minor (SM)	
SM -80	
NSPS (list subparts)	Dc
NESHAP (list subparts)	ZZZZ
Part 68 Risk Management	
CFC	

NSR	
PSD	
RACT	
TACT	
Other (specify)	

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PERMITTING

GENERAL BACKGROUND INFORMATION

1. Microchip Technology Incorporated ("Microchip") owns and operates an existing semiconductor manufacturing facility located at 21015 SE Stark Street, Gresham, Oregon, referred to as the Microchip Gresham Fab 4. There are two main buildings at the facility, Building 1 and Building 2, within which semiconductor manufacturing occurs. The manufacturing-related emissions from both buildings are controlled by numerous wet scrubber systems and a concentrator thermal oxidizer (CTO). The wet scrubber systems and the CTO remove approximately 90% of the potential emissions. There are several support buildings (e.g., water and wastewater treatment, emergency generators, boilers) also located at the facility.

   Microchip Gresham Fab 4 ("facility") was previously owned and operated by Fujitsu Microelectronics, Incorporated ("Fujitsu"), and the existing permit for the facility was transferred to Microchip upon closing of the sale to Microchip (approximately August 23, 2002). Prior to the sale to Microchip, Fujitsu discontinued semiconductor manufacturing and removed many of the individual process tools that are used in the semiconductor manufacturing process. However, Fujitsu did not remove the various control devices. Microchip subsequently brought the manufacturing process back on-line by installing the process tools necessary to produce Microchip's products.

PERMIT HISTORY

2. DEQ issued Air Contaminant Discharge Permit Number 26-3240 ("permit") to Fujitsu on June 11, 1997 and was originally scheduled to expire on September 1, 2000. Fujitsu made timely application for permit renewal on June 2, 2000; however, Fujitsu subsequently discontinued semiconductor manufacturing operations and DEQ halted its review of the renewal application prior to issuing a renewal permit.

3. Microchip purchased the Fujitsu facility on August 23, 2002, and, at Microchip's request, DEQ transferred Fujitsu's permit to Microchip. DEQ also authorized Microchip to replace Fujitsu's permit renewal application with one more closely reflecting Microchip's semiconductor manufacturing process emissions. Microchip submitted a modified permit application on November 26, 2002.

4. The old ACDP was converted to a Standard ACDP in accordance with the rules adopted in May 2001.

5. This permit renewal updates the existing permit to include current applicable conditions, increases the GHG PSEL that was previously set to keep the facility out of Title V permitting and modifies emission factors to be based on chemical usage instead of production parameters. A moderate technical modification is included in this permit renewal, under the same application number, to increase the GHG PSEL.

OTHER PERMITS AND REGISTRATION

6. Other permits issued or required by DEQ for this source include a No Exposure Certification for Stormwater. Microchip is also registered as a Large Quantity Generator (LQG) of hazardous waste with DEQ.

ATTAINMENT STATUS

7. The source is located in maintenance areas for carbon monoxide (CO) and ozone (O_3). The permittee is a small source of volatile organic compounds (VOCs) and nitrogen oxides (NOx), both ozone precursors, and of CO. The area is in attainment for all other pollutants.

COMPLIANCE

8. The facility was inspected on March 17, 2016, and found to be in compliance with permit conditions. No enforcement actions have been taken during this last permit cycle.

9. During the prior permit period there were no complaints recorded for this facility.

SOURCE DESCRIPTION

10. The general layout of the air contaminant sources at the facility consist of the following:

Amount	Equipment/Process	Capacity	Control Equipment	Installed
Building 1				
1	Semiconductor Fab	N/A	Wet scrubber systems	1988
3	Boilers 1, 2, 3	12.565 mmBtu/hr each	low-NOx burners	1988
2	Emergency Generators	1,456 hp each	N/A	1988
Building 2				
1	Semiconductor Fab	N/A	Wet scrubber systems	1996
1	Semiconductor Fab	N/A	CTO*	1996
3	Boilers 4, 5, 6	29.291 mmBtu/hr each	Low-NOx burners	1996
3	Emergency Generators	1,582 hp each	N/A	1996

* The CTO is physically located at Building 2, but serves both Building 1 and Building 2.

11. The facility emissions are controlled by several wet scrubber systems (for ammonia and acid gas emission control) and a CTO for VOC emission control. A single CTO treats VOC emissions from both Building 1 and Building 2.

The wet scrubber systems are variously manifolded into common exhaust manifolds and individual as well as combined emission stacks. A given combination of wet scrubbers, their associated exhaust fans, and stacks results in a "discharge point" or "wet scrubber system." A wet scrubber system can have several or single "stacks" and several or single wet scrubbers/manifolded exhaust fans serving it. The following table shows that there are six wet scrubber discharge points (1-3 through 2-3) and one CTO discharge point (2-4). Therefore, for purposes of the ACDP, there are six "wet scrubber systems."

Air Emission Discharge Points

Common Name	Microchip ID	DEQ ID	Exhaust Discharge Point ID	# of Fans*	Design Flow Rate (cfm)
Ammonia Scrubber	S-4	DEQ-4	1-3	2	13,500
Acid Scrubber	S-2	DEQ-2	1-4	2	28,000
Acid Scrubber	S-5	DEQ-5	1-4	2	36,000
Acid Scrubber	S-6	DEQ-6	1-5	2	16,000
Ion Implant Scrubber	S-9	DEQ-16	2-1	7	14,500
CVD Scrubber	S-11	DEQ-16	2-1	7	30,000
Acid Scrubber	S-13	DEQ-16	2-1	7	42,300
CVD Scrubber	S-14	DEQ-16	2-1	7	30,000
Acid Scrubber	S-15	DEQ-16	2-1	7	42,300
Acid Scrubber	S-16	DEQ-16	2-1	7	42,300
Nitric Scrubber	S-10	NA	2-2	2	7,400
Ammonia Scrubber	S-12	NA	2-3	2	26,900
CTO	C-1	NA	2-4	2	29,000

* Note: Number of exhaust fans pulling air through discharge point.

CONTINUOUS MONITORING DEVICES

12. The facility has the following continuous monitoring devices:
    a. The CTO is continuously monitored for the temperature in its combustion chamber.
    b. The wet scrubber systems are continuously monitored for the flow rate of recirculation water and pH.

SPECIAL CONDITIONS

13. The permittee must notify DEQ in writing of the date any additional VOC or acid gas control device begins treating process exhaust, within seven (7) days.

14. Except for change of materials that existing equipment is capable accommodating, the permittee must notify DEQ in writing of a change in the recipe of chemicals that changes the emission factors and the revised emission factors used in the Fab processes. This notification must include an analysis of how the changes in the emission factors affect plant site emissions relative to the PSEL.

EMISSIONS

15. The Baseline Emission Rate for the facility is zero since it was constructed after 1978.

16. The Microchip permit renewal application projects maximum potential emissions at full operation of the facility using Microchip's proprietary processes.

17. The following table shows the current (2013) PSEL and the proposed (2019) PSEL:

Pollutant	Current (2013) PSEL (tpy)	Proposed (2019) PSEL (tpy)
PM	24	24
PM_{10}	14	14
$PM_{2.5}$	9	9
SO_2	39	39
NOx	39	39
CO	99	99
VOC	39	39
Single HAP	9	9
Combined HAPs	24	24
Fluorides	2.9	2.9
GHG	74,000	181,000

SIGNIFICANT EMISSION RATE ANALYSIS

18. For each pollutant, the proposed Plant Site Emission Limit is less than the Netting Basis plus the significant emission rate, thus no further air quality analysis is required.

CALCULATION METHODOLOGY

19. The PSELs for the Microchip permit were calculated by using a set of emission factors (EFs) provided by manufacturers and the permittee and using the following methodology:

a. Boilers Combustion Emissions –Boilers 1 through 3 serve Building 1 and Boilers 4 through 6 serve Building 2. All of the boilers are capable of combusting both natural gas and #2 oil. The boilers are considered "gas-fired boilers" that burn gaseous fuels not combined with any solid fuels and burn liquid fuel only during periods of gas curtailment, gas supply interruption, startups, or for periodic testing, maintenance or operator training on liquid fuel. Periodic testing, maintenance, or operator training on liquid fuel does not exceed a combined total of 48 hours per boiler during any calendar year.

In addition, although there are six boilers on site, typically at least one of the boilers in each building is in hot standby and is not used. Therefore, in order to calculate potential emissions from the boilers, assumptions regarding annual load factor and the amount of oil versus natural gas burned were made.

The maximum annual emissions from boiler natural gas combustion is calculated based on a load factor of 35% across all boilers operating simultaneously. (This is roughly equivalent to one of three boilers serving each building at full load and the other two boilers serving each building in standby).

The EFs were provided by the manufacturers of the boilers and are contained in the permit and the application.

b. Generator Combustion Emissions – All of the generators combust ultra low sulfur distillate oil. These units are used for emergency power only when electricity is curtailed from the manufacturing facility.

c. CTO Combustion Emissions - Criteria pollutant emissions from natural gas combustion in the CTO are calculated in the same manner as the boilers. The emission factors were provided by the manufacturer and are shown in the permit and the application.

d. Building 1 and Building 2 Fab Emissions – Emissions from semiconductor manufacturing processes are calculated based on the use of materials containing air pollutants or precursors for air pollutants. The quantities of materials are determined by reviewing Microchip's parts inventory, locating the materials of interest by part number, and computing the quantity of air pollutant or precursor used based on the material's composition determined by analytical testing, vendor statement, SDS, or other appropriate method.

Emission factors (EF) for the Fab processes are in units of lb / lb chemical or precursor. The factors are calculated based on the following information: Amount of chemical consumed in the process tool and any built-in point-of-use abatement (POU); Percent weight of each chemical and/or precursor in the material; Chemistry of conversion of the chemical into air pollutants. Emissions are determined by multiplying the total pounds of chemical or precursor used by the associated EF. Control efficiencies for the centralized scrubber system or RCTO are applied if the pollutant is removed in either system.

The emission factors used for calculating Fab emissions are provided in detail in the air contaminant discharge permit renewal application. These emissions may include pollutant classes such as: hazardous air pollutants (HAPs), particulate matter (PM) emissions from non-combustion sources, volatile organic compounds (VOCs), carbon dioxide (CO2), greenhouse gases and other miscellaneous criterial pollutants. The emission factors are derived from a number of sources including: Microchip's knowledge and experience with these or similar tools and processes; specific chemistries or recipes of chemicals from multiple processes; professional engineering consultation and industry specific knowledge. If there is a change in the formulation of chemicals in the manufacturing process, the facility will recalculate the emission factors and analyze whether they will cause an increase in emissions that may exceed the PSEL. The facility must notify DEQ of any change in emission factors.

Total fluorides are calculated by multiplying total calculated HF emissions by the empirically determined ratio of fluorides to HF. This EF is based on previous fluorides source testing results and is specified in Section 17 Emission Factors.

The EFs are for emissions that pass through an emission point. Fugitive VOC emissions are also emitted from Fab processes, and are calculated based on a mass balance methodology.

SOURCE TESTING

20. Microchip is required to conduct a source test of the wet scrubber systems, in accordance with a DEQ-approved pretest plan, to confirm that the HF and HCl destruction removal efficiency is at least 90% or that the facility-wide volumetric flow-weighted average outlet concentration of HF and HCl in the wet scrubber systems is less than 1 part per million by volume (ppmv) each.

The source test will be conducted for each of the wet scrubber systems in accordance with the DEQ-approved pretest plan. The removal efficiency will be determined by measuring the inlet HF and HCl mass and the outlet HF and HCl mass at the same time.

Source testing must be completed once during this permit cycle at least 180 days prior to the scheduled expiration date.

At semiconductor facilities, it is common for the inlet concentration of acid gases and other pollutants of interest to have very low (less than 1 ppmv) inlet concentrations. At low concentrations, measuring removal efficiency is problematic and the scrubbers themselves may not be as efficient. Therefore, if the facility-wide volumetric flow-weighted average outlet concentration of HF and HCl is found to be less than 1 ppmv each during the source test, but the HF or HCl removal efficiency for one or more wet scrubber systems is less than 90%, the facility is deemed compliant.

To determine the facility-wide volumetric flow-weighted average HF and HCl concentrations, the following equation is used.

$$C_x = \sum VF_n \times C_{xn} / \sum VF_n$$

Where:

C = Volumetric flow-weighted average concentration of pollutant x (HF or HCl)
VF_n = volumetric flow rate of wet scrubber system n
C_{xn} = Concentration of pollutant x in each of the n wet scrubber systems
n = facility wet scrubber systems 1 through 6
x = pollutant HF or HCl

PRIOR TESTING RESULTS

21. The results of the most recent source tests are listed below:

Emission Device	Test Date	Production Rate	Pollutant	Measured Value
PEI-001	6/3/2015	6433 WIP 9864 WM	HF	$<2.8\times10^{-7}$lbs/WIP $<1.9\times10^{-7}$lbs/WM <0.0017 lbs/hr
			HCl	$<1.5\times10^{-6}$lbs/WIP $<9.7\times10^{-7}$lbs/WM <0.0091 lbs/hr
			Fluorides	$<2.6\times10^{-7}$lbs/WIP $<1.7\times10^{-7}$lbs/WM <0.0016 lbs/hr
PES-003	6/4/2015	7285 WIP 10,404 WM	HF	$<4.8\times10^{-7}$lbs/WIP $<3.4\times10^{-7}$lbs/WM <0.0032 lbs/hr
			HCl	$<1.8\times10^{-6}$lbs/WIP $<1.3\times10^{-6}$lbs/WM

Emission Device	Test Date	Production Rate	Pollutant	Measured Value
				<0.012 lbs/hr
			Fluorides	$3.3x10^{-7}$lbs/WIP $2.3x10^{-7}$lbs/WM 0.0055 lbs/hr
PES-002	6/4/2015	6914 WIP 9800 WM	HF	$<5.5x10^{-7}$lbs/WIP $<3.9x10^{-7}$lbs/WM 0.0036 lbs/hr
			HCl	$<1.9x10^{-6}$lbs/WIP $<1.4x10^{-6}$lbs/WM <0.012 lbs/hr
			Fluorides	$<3.6x10^{-7}$lbs/WIP $<2.8x10^{-7}$lbs/WM <0.0059 lbs/hr
PES-001	6/5/2015	6441 WIP 9356 WM	HF	$<5.4x10^{-7}$lbs/WIP $<3.7x10^{-7}$lbs/WM <0.0033 lbs/hr
			HCl	$<2.1x10^{-6}$lbs/WIP $<1.4x10^{-6}$lbs/WM <0.013 lbs/hr
			Fluorides	$<5.8x10^{-8}$lbs/WIP $<3.5x10^{-8}$lbs/WM <0.0036 lbs/hr
PEC-002	6/6/2015	6376 WIP 9586 WM	HF	$<4.5x10^{-7}$lbs/WIP $<3.0x10^{-7}$lbs/WM <0.0027 lbs/hr
			HCl	$<1.6x10^{-6}$lbs/WIP $<1.1x10^{-6}$lbs/WM <0.0097 lbs/hr
			Fluorides	$<1.2x10^{-7}$lbs/WIP $<8.1x10^{-8}$lbs/WM <0.0034 lbs/hr
PEC-001	6/7/2015	6439 WIP 9072 WM	HF	$<4.1x10^{-7}$lbs/WIP $<2.9x10^{-7}$lbs/WM <0.0025 lbs/hr
			HCl	$<1.5x10^{-6}$lbs/WIP $<1.1x10^{-6}$lbs/WM <0.0093 lbs/hr

Emission Device	Test Date	Production Rate	Pollutant	Measured Value
			Fluorides	<1.7x10^{-7}lbs/WIP <1.2x10^{-7}lbs/WM <0.0035 lbs/hr
PEA-001	6/8/2015	7015 WIP 10,242 WM	HF	<7.9x10^{-7}lbs/WIP <5.4x10^{-7}lbs/WM <0.0051 lbs/hr
			HCl	<2.0x10^{-6}lbs/WIP <1.4x10^{-6}lbs/WM <0.013 lbs/hr
			Fluorides	<6.1x10^{-7}lbs/WIP <4.2x10^{-7}lbs/WM <0.0039 lbs/hr
PEN-001	6/9/2015	6813 WIP 9721 WM	HF	1.0x10^{-7}lbs/WIP 7.0x10^{-8}lbs/WM 0.0006 lbs/hr
			HCl	<7.8x10^{-7}lbs/WIP <5.5x10^{-7}lbs/WM <0.0048 lbs/hr
			Fluorides	<1.6x10^{-8}lbs/WIP <1.2x10^{-8}lbs/WM <0.0007 lbs/hr
PEA-004	6/10/2015	7077 WIP 10,324 WM	HF	<1.1x10^{-7}lbs/WIP <7.8x10^{-8}lbs/WM <0.0008 lbs/hr
			HCl	<4.3x10^{-7}lbs/WIP <2.9x10^{-7}lbs/WM <0.0029 lbs/hr
			Fluorides	<4.3x10^{-8}lbs/WIP <2.9x10^{-8}lbs/WM <0.0008 lbs/hr
PES-005	6/10/2015	7084 WIP 8990 WM	HF	<2.2x10^{-6}lbs/WIP <1.7x10^{-6}lbs/WM 0.014 lbs/hr
			HCl	<2.6x10^{-6}lbs/WIP <2.1x10^{-6}lbs/WM <0.018 lbs/hr
			Fluorides	<1.6x10^{-6}lbs/WIP

Emission Device	Test Date	Production Rate	Pollutant	Measured Value
				<1.3x10^{-6}lbs/WM 0.025 lbs/hr
PES-006	6/11/2015	6694 WIP 9038 WM	HF	3.0x10^{-7}lbs/WIP 2.2x10^{-7}lbs/WM 0.0019 lbs/hr
			HCl	<7.4x10^{-7}lbs/WIP <5.4x10^{-7}lbs/WM <0.0048 lbs/hr
			Fluorides	5.9x10^{-8}lbs/WIP 4.4x10^{-8}lbs/WM 0.0023 lbs/hr
Concentrator Inlet	6/4/2015	6847 WIP 8803 WM	VOC as propane	6.4 lbs/hr 47.5 ppmvd
Concentrator outlet	6/4/2015	6847 WIP 8803 WM	VOC as propane	0.18 lbs/hr 1.6 ppmvd
CTO Exhaust	6/4/2015	6847 WIP 8803 WM	VOC as propane	0.033 lbs/hr 2.1 ppmvd

WIP = Wafers in process
WM = Wafer moves
ppmvd = parts per million volume dry

MAJOR SOURCE APPLICABILITY

POLLUTANTS

Pollutant	Proposed PSEL (tons per year)	Major Source Threshold (tons per year)
PM	24	25
PM_{10}	14	15
$PM_{2.5}$	9	10
SO_2	39	40
NOx	39	40
CO	99	100
VOC	39	40
Single HAP	9	10
Combined HAPs	24	25
Fluorides	2.9	3.0
GHG	181,000	75,000

* Note: All PM emissions are assumed to be PM_{10} and $PM_{2.5}$.

22. A major source is a facility that has the potential to emit more than 100 tons per year of any criteria pollutant. Although the Fab emissions of this facility have the potential to produce in excess of 100 tons of VOCs uncontrolled, the presence of control devices which are intrinsic to the manufacturing process limits its potential-to-emit.

23. In addition, the permittee has elected to request federally enforceable PSELs below the major source threshold levels. Therefore, this facility is not a major source of criteria pollutants.

24. GHG emissions in excess of the significant emission rate do not trigger any additional program requirements (NSR or Title V) on their own, only if another pollutant triggers one of these programs. In other words, GHG does not make the facility a major source.

HAZARDOUS AIR POLLUTANTS

Pollutant	Annual Emissions (tons per year)	Major Source Threshold (tons per year)
Hydrogen Chloride	0.3	10
Hydrogen Fluoride	2.1	10
Other minor HAPs	0.3	10
Total HAPs	2.7	25

25. A major source is a facility that has the potential to emit 10 or more tons/year of any single HAP or 25 or more tons/year of combined HAPs. Although the Fab emissions of this facility has the potential to produce in excess 10 tons of individual HAPs or 25 tons of combined HAPs uncontrolled, the presence of control devices which are intrinsic to the manufacturing process limits its potential-to-emit.

26. In addition, the permittee has elected to request federally enforceable PSELs below the major source threshold levels. Therefore, this facility is not a major source of individual or combined HAPs.

ADDITIONAL REQUIREMENTS

NSPS APPLICABILITY

27. 40 CFR Part 60, Subpart Dc is applicable to all three boilers in Building 2 since they were constructed after June 9, 1989 and are greater than 10 mmBtu/hr in capacity.

28. 40 CFR 60, Subpart IIII does not apply to the Compression ignition engines at the facility because they all predate the subpart applicability date.

NESHAPS/MACT APPLICABILITY

29. A National Emission Standard for Hazardous Air Pollutants (NESHAP Subpart BBBBB) for semiconductor manufacturing facilities was proposed by EPA on February 2, 2003. This facility is not subject to this NESHAP since it is not a major source of HAPs.

30. NESHAP Subpart ZZZZ is applicable to the reciprocating internal combustion engines at the facility and the subpart requirements have been included in the permit.

RACT APPLICABILITY

31. The facility is located in the Portland AQMA, but it is not one of the listed source categories in OAR 340-232-0010, thus the categorical RACT rules do not apply.

32. The pre-control emissions of VOC are greater than 100 tons per year, and, per OAR 340-232-0020(4) and 340-232-0040(1), the facility is subject to case by case Reasonably Available Control Technology (RACT) requirements. However, the CTO controls VOC emissions by a minimum of 90%. In addition, the permittee has requested a federally enforceable PSEL below the RACT threshold level.

TACT APPLICABILITY

33. A formal TACT analysis has not be conducted, but the source is likely meeting the state's TACT by conducting the following activities:
    a. VOC emissions are controlled by the CTO to a minimum DRE of 90%;
    b. Acid gas emissions are controlled by the wet scrubber systems to a DRE of 90% or a facility-wide volumetric flow-weighted outlet concentration of HF and HCl of less than 1 ppmv each; and
    c. All boilers are equipped with low-NO_x burners and are primarily fueled with natural gas.

GREENHOUSE GASES

34. This permit renewal increases the PSEL for Greenhouse Gases (GHG). The PSEL was previously set at 98,000 tons/year to keep the facility below the Title V threshold, because actual emissions are greater than the reporting threshold (deminimis level) of 2,756 tons/year (2,500 metric tons/year) of carbon dioxide equivalent (CO_2e). The GHG PSEL is being increased in this permit renewal to allow the facility to utilize existing capacity. GHG emissions do not trigger either New Source Review or Title V permitting on their own, only if another pollutant triggers one of those programs. A Baseline for GHG emissions has not been established, but could be reviewed in the future.

PUBLIC NOTICE

35. Pursuant to OAR 340-216-0066(4)(a)(A), issuance of Standard Air Contaminant Discharge Permits require public notice in accordance with OAR 340-209-0030(3)(c), which requires DEQ to provide notice of the proposed permit action and a minimum of 35 days for interested persons to submit written comments. In addition, a hearing will be scheduled to allow interested persons to submit oral or written comments. If DEQ receives written request for a hearing from ten persons, or from an organization representing at least ten persons, within 35 days of the mailing of the public notice. If a hearing is scheduled, DEQ will provide a minimum of 30 days notice for the hearing. **The public notice was emailed/mailed on Friday May 17, 2019 and the comment period ended on Friday June 21, 2019 at 5 p.m.**

- One comment was received during the public notice. That comment and DEQs response is attached below.

Microchip Technology Standard ACDP 26-3240-ST-01

Response to Comments

Public Comment from Gregg Lande of Northwest Portland lande.gregg@gmail.com

Comment
It appears the Public Notice is missing the usual Table 2 of Emissions for HAP. This is a significant oversight.
In addition, the information about specific HAP covered in the permit is extremely limited. Aside from HF, what are other fluorides being released; as particles or gases? Are there no metal HAP emissions? Since HAP emissions are associated more with local impacts than area-wide impacts as are the criteria pollutants, it would be preferable to have a site map which shows where these emissions are located.
The public deserves to be given this information, and I believe the Department may even be required to provide it.

DEQ response
Table 2 for HAPs was not included in the public notice cover page because of the level of emissions expected from the facility. However, the HAP information is included in the review report, that was attached as part of the public notice package, along with source test data to support the emission estimates.

Under the current DEQ air quality program additional requirements are only triggered if a HAP is emitted at major source threshold levels (10 tons/year of individual HAP or 25 tons/year of combined HAPs). Since the total estimated HAP emissions are 2.7 tons/year, and there are no

area source NESHAPs that apply to the manufacturing process at Microchip, DEQ did not repeat the information from the review report into the public notice cover page.

Current DEQ regulations are for airshed management and do not address localized impacts or the form fluorides and HAPs are emitted. Localized impacts of toxic air pollutants will be addressed when Microchip is called into the Cleaner Air Oregon program or they make a major modification that triggers CAO requirements. Note: Fluorides are included in the list of toxic air pollutants.

The public notice cover page along with the permit and review report provide the information that is required by the DEQ regulations. If additional information is desired all of DEQs records are open for public inspection. If an individual wants to refer to a site map or other detailed information they could review the files for such an item.

Oregon
Kate Brown, Governor

Department of Environmental Quality
Northwest Region
700 NE Multnomah St Ste 600
Portland, OR 97232-4100
(503) 229-5263
FAX (503) 229-6945
TTY 711

June 21, 2019

Bret Herbert
Microchip Technology Inc
21015 SE Stark Street
Gresham OR 9730 2015

Re: Renewal of a Standard Air Contaminant Discharge Permit
Permit Number **26-3240-ST-01** Application Number **029474**

The Department of Environmental Quality has completed its review and public notice for Microchip Technology's Standard permit renewal. The facility is located at 21015 SE Stark Street in Portland. Based on the information in the renewal application and public notice, DEQ has issued the enclosed permit.

The effective date of the permit modification is the date it was signed by the regional Air Quality Manager. The signature and date appear on the first page of the document. The permit modification is issued pursuant to Oregon Revised Statutes 468A and Oregon Administrative Rules (OAR) 340-14-005 through 340-14-050, and 216-0010 through 216-0100.

You may appeal conditions or limitations contained in the attached permit modification by applying to the Environmental Quality Commission, or its authorized representative, within twenty days from the date of this letter. Appeals are pursuant to ORS Chapter 183 and OAR Chapter 340, Division 14-025 (6). Appeal procedures are contained in OAR Division 11-005 through 11-140.

A copy of the current permit along with the modification must be available at the facility at all times. Failure to comply with permit conditions may result in civil penalties. **You are expected to read the permit carefully and comply with all conditions** to protect the environment of Oregon.

If you have any questions, please contact Dave Kauth at 503-229-5053.

Sincerely,

Matt Hoffman, Air Quality Manager
DEQ Northwest Region

Enclosure
Cc: HQ/AQ

State of Oregon
Department of
Environmental
Quality

STANDARD
AIR CONTAMINANT DISCHARGE PERMIT

Department of Environmental Quality
Northwest Region
700 NE Multnomah St., Suite 600
Portland, OR 97232

This permit is being issued in accordance with the provisions of ORS 468A.040 and based on the land use compatibility findings included in the permit record.

ISSUED TO:

Microchip Technology Incorporated
21015 SE Stark Street
Gresham, OR 97030

INFORMATION RELIED UPON:

Application No.: 034318
Date Received: 09/21/2022

PLANT SITE LOCATION:

Gresham Fab 4
21015 SE Stark Street
Gresham, OR 97030

LAND USE COMPATIBILITY FINDING:

Approving Authority: City of Gresham
Approval Date: 06/29/1995

ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL QUALITY

Joshua Alexander — 06/06/2023

Joshua Alexander, Northwest Region Air Quality Permit Manager — Dated

Sources Permitted to Discharge Air Contaminants (OAR 340-216-8010):

Table 1 Code	Source Description	SIC (NAICS)
Part B, 85	Sources which would have the emission capacity of 10 or more tons of any single criteria pollutant. Semiconductor manufacturing.	3674 (334413)
Part B, 13	Oil-fired boilers whose total heat input rating at the source is over 10 MMBtu/hr; or individual natural gas boilers over 30 MMBtu/hr or greater heat input rating.	4961 (221330)

Addendum Number R-01

In accordance with OAR 340-216-0020, Conditions 1.7, 3.1, 4.2, 5.1, 6.1 and 9.1 are the only changes and now read as follows:

wl/DEQ:HQ:file

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1.0 GENERAL EMISSION STANDARDS AND LIMITS

1.7. Emergency Stationary RICE

The permittee must comply with the following requirements for each emergency stationary reciprocating internal combustion engine (RICE): [40 CFR 63.6640(f)]

a. Change oil and filter every 500 hours of operation or annually, whichever comes first. [40 CFR 63. 6603(a), table 2d(4)(a)] The permittee may elect to comply with the oil analysis requirements of 40 CFR 63.6625(i) in lieu of the oil change requirement. Oil analyses must be conducted at the same frequency as the oil change requirement;

b. Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first; [40 CFR 63.6603(a), table 2d(4)(b)]

c. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary; [40 CFR 63.6603(a), table 2d(4)(c)]

d. During periods of startup, minimize the engine's time spent at idle and minimize the engine's startup time at startup to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the non-startup emission limitations apply; and [40 CFR 63.6603(a), table 2d]

e. The permittee must install a non-resettable hour meter on each emergency stationary RICE, if one is not already installed. [40 CFR 63.6625(f)]

3.0 TYPICALLY ACHIEVABLE CONTROL TECHNOLOGY (TACT)

3.1. VOC Emissions

The permittee must control Volatile Organic Compound (VOC) emissions from Building 1 and Building 2 manufacturing operations with rotor concentrator thermal oxidizers (RCTOs) that must each achieve a minimum 90% destruction removal efficiency (DRE) of VOCs entering the RCTOs when the inlet VOC concentration (measured as propane) is 90 ppmv or greater. If/when the inlet VOC concentration falls below 90 ppmv, the outlet VOC concentration (measured as propane) must not exceed 10 ppmv.

4.0 OPERATION AND MAINTENANCE REQUIREMENTS

4.2. Highest and Best Practicable Treatment and Control

The permittee must comply with the following conditions pertaining to the operation of its thermal oxidizer(s): [OAR 340-226-0120]

a. The oxidizer temperature and desorption chamber temperature of each RCTO unit must be maintained such that the temperatures of the unit are sustained and do not drift more than 25 °F below the required minimum temperatures or the temperatures recorded during the most recent DEQ approved source test demonstrating compliance with

applicable emissions limits in Condition 3.1 based on a three-hour average:

i. The required minimum oxidizer temperature is 1,375 °F;

ii. The required minimum desorption chamber temperature is 360 °F;

iii. If the oxidizer or desorption chamber temperatures drop to more than 25 °F below the required temperatures or the temperatures recorded during the most recent DEQ approved source test demonstrating compliance with applicable emissions limits in Condition 3.1 based on a three-hour average, the permittee must immediately investigate and commence corrective action to return the temperatures to the established operating range; and

iv. The temperature falling below this emission action level is not a violation of this permit condition; however, it is a violation of this permit condition if the permittee fails to immediately investigate and commence corrective actions to correct the operating temperature after it has fallen below the range.

b. A continuous temperature monitoring system must be used to monitor and record the oxidizer temperature and desorption chamber temperature of each RCTO unit at all times the unit is operating.

5.0 PLANT SITE EMISSION LIMITS

5.1. Plant Site Emission Limits (PSEL)

The permittee must not cause or allow plant site emissions to exceed the following: [OAR 340-222-0041 and OAR 340-222-0060]

Pollutant	Limit	Units
PM	9	tons per year
PM_{10}	9	tons per year
$PM_{2.5}$	9	tons per year
SO_2	3	tons per year
NO_X	39	tons per year
CO	84	tons per year
VOC	34	tons per year
GHGs (CO2e)	279,300	tons per year
Single HAP	5	tons per year
Combined HAPs	9	tons per year
Fluorides	2.9	tons per year

All PM is assumed to be PM_{10} and all PM_{10} is assumed to be $PM_{2.5}$. Fluorides are calculated using the site specific fluorides emission factor based on 2015 emission testing results. HAP PSELs are included because uncontrolled PTE is greater than the major source threshold.

6.0 COMPLIANCE DEMONSTRATION AND SOURCE TESTING

6.1. Testing Requirements

The permittee must conduct a source test of the control devices as specified below: [OAR 340-212-0120]

a. Once during this permit cycle the permittee must perform a performance test of each wet scrubber system to determine the HF and HCl destruction removal efficiency (DRE);

b. Within 180 days after two of the new RCTO units are brought into normal operation the permittee must perform a performance test of each RCTO to determine the VOC DRE, unless an alternative date is approved by Oregon DEQ. Normal operation is defined when the RCTOs are fully operational and when VOC process exhaust is routed to two of the new RCTOs;

c. Source testing must be conducted while the facility is operating within 90% its normal operating capacity at the time of the test. Sampling must take place under worst case operating conditions observed during normal operations (i.e., redundant control devices should not be operating during testing);

d. Gas concentrations must be sampled at the inlet and outlet of each wet scrubber system and each RCTO to demonstrate the system's DRE. The source test report must include the DRE demonstrated during each test run as well as the average DRE for the three test runs. As an alternative, the permittee can sample only the outlet of the wet scrubber systems to demonstrate compliance with the 1 ppmv HF and HCl limitations as listed in Condition 3.2;

e. During each source test the following parameters must be monitored and recorded:
   i. RCTO oxidizer and desorption chamber temperatures;
   ii. Pressure drop across concentrator wheel of the RCTO;
   iii. RCTO natural gas usage;
   iv. Recirculation flow rate and pH of the wet scrubbers; and
   v. Other facility/process operating parameters identified prior to the test.

f. Only regular operating staff may adjust the combustion system or production processes and emission control parameters during the source test and within two hours prior to the tests. Any operating adjustments made during the source test, which are a result of consultation during the tests with source testing personnel, equipment vendors or consultants, may render the source test invalid;

g. A pretest plan for each source test required above must be submitted for approval to DEQ's Source Test Coordinator at the ODEQ Northwest Regional Office, at least 30 days prior to testing;

h. The reference test methods identified in the table below must be utilized in the source tests identified above. A test method modification/variance or substitution of an alternative test method must be pre-approved by the DEQ's Source Test Coordinator and

i. All tests must be conducted in accordance with the DEQ's Source Sampling Manual and with the pretest plan. All test data and results must be submitted to the Source Test

Coordinator for review within 60 days after completion of the testing cycle unless an

j. alternate submission date or extension is approved by DEQ.

Reference Test Method	Tested pollutant/parameter
EPA 1&2	Flow Rate
EPA 3	Dry Molecular Weight
EPA 4 or ODEQ Method	Moisture
EPA 25A	Total VOC
EPA 26, 26A, 320 or ASTM D6348-12	HF & HCl

9.0 MONITORING CONDITIONS

9.1. Continuous Monitoring

The permittee must monitor and maintain the following records related to the operation of control devices continuously during all hours of operation: [OAR 340-226-0120]

a. The oxidizer and desorption chamber temperature of each RCTO must be continuously monitored and reduced to an hourly average (one hour block average). For the purpose of this condition, "continuously monitored" means that measurements are taken at a frequency of not less than once every 15 minutes;

b. Wet scrubber recirculation flow rate and pH; and

c. The permittee is presumed to be in compliance with the 20% visible emissions standard and the 0.10 gr/dscf particulate emissions standard as long as the boilers burn natural gas.

Oregon
Tina Kotek, Governor

Department of Environmental Quality
Northwest Region
700 NE Multnomah Street, Suite 600
Portland, OR 97232
(503) 229-5263
FAX (503) 229-6945
TTY 711

July 29, 2024

Becky Kim
Microchip Technology, Inc.
21015 Stark Street
Gresham, OR 97030

Steve Hall
Spectrum Environmental Solutions
2340 West Braker Lane, Suite A
Austin, TX 78758

Microchip Technology Inc.
Permit Number 26-3240-ST-01
New RCTO Units 1 & 2 Initial Compliance
2024 Test Plan Approval

Becky Kim and Steve Hall:

The source test plan received on July 22, 2024 for source testing at the Microchip Technology, Inc. (Microchip) facility located in Gresham has been reviewed. The test plan states that two newly installed Munters rotor concentrator thermal oxidizer (RCTO) units will be tested for emissions of volatile organic compounds (VOC) and VOC destruction and removal efficiency (DRE). The new RCTO units control VOC emissions from Fab 4 Buildings 1 & 2. Emission measurement locations for RCTO testing are identified as the rotor concentrator outlet (RCO), thermal oxidizer exhaust (TO) and concentrator inlet. Testing is being conducted to show initial compliance with the VOC typically achievable control technology (TACT) limit of Permit Condition 3.1 and satisfy testing requirements of Permit Condition 6.1.b. The source test plan is approved with the following conditions:

GENERAL CONDITIONS

1. Only regular operating staff may adjust the production process and emission control parameters during the source performance tests and within two (2) hours prior to the tests. Any operating adjustments made during the source performance tests, which are a result of consultation during the tests with source testing personnel, equipment vendors or consultants, may render the source performance test invalid.

2. It is acceptable to postpone a scheduled test or suspend a test in progress if the discontinuation is due to equipment failure beyond the facility's control, construction delays beyond the facility's control, severe meteorological conditions, and situations that would jeopardize the safety of the testing contractors and/or operators. If the test is underway, the permittee should make every effort to complete the test run. All recoverable test information (process & sample data) must be available for DEQ review.

   It is unacceptable to postpone or suspend a test run in progress if it is discontinued because the source is not able to comply with an emission limit or verify an emission factor. The permittee must provide DEQ written documentation explaining the reasons for the postponement or stoppage, and any data collected prior to the stoppage.

3. Source testing must be conducted while the facility is operating within 90% its normal operating capacity at the time of the test. Production data supporting that the conditions tested are representative maximum operating capacity must be included in the source test report. Supporting production data should be from the 12-month period immediately preceding testing.

4. If desired, Microchip may use this testing to establish lower minimum oxidizer temperatures and desorption chamber temperatures to those specified in Condition 4.2.i-ii.

5. During the source test the following process parameters shall be monitored and recorded. All process parameters are to be reported for each individual test run and averaged for all test runs if appropriate. Information deemed proprietary may remain in control of Intel, but must be made accessible to DEQ upon request.
    - RCTO temperature of the oxidizer and desorption temperature (°F)
    - Pressure drop across the rotor concentrator wheel (inches of water column)
    - Natural gas consumption rate (scf/hr or MMBtu/hr)
    - Applicable production rate(s) (wafer moves, wafer starts or wafers in progress per day)

EPA METHODS 1-3 CONDITIONS

6. Whenever possible, sampling locations must meet EPA Method 1 criteria. Documentation including clear diagrams must be provided in the source test report. DEQ understands that the RCO sampling locations do not meet the EPA Method 1 disturbance free flow criteria and a 3-dimensiona probe will be used to assess suitability of the planned sampling locations. This approach is approved so long as the procedures of Section 11.5 of EPA Method 1 are followed. If a sampling location is determined not to meet the acceptability criteria of the test method (R_{avg} ≤20˚ and S_d ≤10˚), DEQ must be consulted prior to proceeding with testing to decide on an agreeable testing approach.

7. Sampling locations must be checked for cyclonic flow prior to starting testing. Documentation of this must be provided in the test report.

8. The proposed approach for determination of stack gas molecular weight as outlined in section 3.0 of the test plan is approved. DEQ understands a grab sample will be taken to determine stack percent oxygen using a handheld combustion analyzer, while carbon dioxide will be continuously monitored using a FTIR following procedures of ASTM D-6348-12.

ODEQ METHOD 4 CONDITIONS

9. Moisture content of from each sampling location must be determined by ASTM D6348-12 or ODEQ Method 4 for each test run. For sampling locations where moisture will be determined using ODEQ Method 4 (wet bulb and dry bulb), a minimum of two measurements of moisture content (Bws) shall be made for each run and averaged.

EPA METHOD 25A CONDITIONS

10. Each Method 25A sampling system must be leak-checked before and after the testing program (before the first run and after the last run). Results of the leak check are to be documented within the test report.

11. Methane and ethane measured by FTIR may be subtracted from EPA Method 25A total hydrocarbon (THC) results to determine VOC emissions. Methane and ethane must be converted to a propane basis prior to performing the subtraction from THC (as propane). The use of Equation 1 (section 3.0 of the test plan) for converting to measured THC to non-methane non-ethane VOC is approved.

12. The in-stack detection limit (ISDL) for Method 25A is equal to the sensitivity of the instrument, which is two percent (2%) of the span value. If run average emissions are below the ISDL, they should be reported as less than the ISDL.

13. Results may not be drift corrected.

14. If the calibration drift is more than 3% of the span value the test must be repeated.

15. Non-methane non-ethane VOC emissions must be reported as indicated below for each individual test run and averaged for all three test runs. Hand calculations must be provided for at least one test run.
    - ppmvd as propane
    - lb/hour as propane
    - % destruction efficiency on a mass basis

EPA METHOD 205 CONDITIONS

16. If a gas dilution system is used to provide calibration gases for source test methods, the dilution system shall be evaluated once during the source test program in accordance with the requirements of EPA Method 205.

ASTM D6348-12 CONDITIONS - Methane, Ethane, Moisture & CO_2

17. Spectra collected during testing must be provided to DEQ.

18. The sampling system(s) must be leak-checked before and after the testing program (before the first run and after the last run). Results of the leaks check are to be documented within the test report.

19. Prior to starting testing, the most reactive target analyte must be used for the analyte spiking technique outlined in section A5 of the method. DEQ understands that methane will be spiked for as a surrogate for ethane and CO_2.

20. If the concentration of a target compound is below the detection limit, the value should be reported as less than detection limit. Run average methane and ethane concentrations that are below the detection limit cannot be used for purposes of subtraction from THC.

21. Methane, ethane, CO_2 and moisture must be reported as indicated below for each individual test run and averaged for all three test runs. Hand calculations must be provided for at least one test run.
    - ppmvd or % volume dry

GENERAL REPORTING CONDITIONS

22. The DEQ must be notified of any changes in the source test plan and/or the specified methods prior to testing. Significant changes not acknowledged by the DEQ could be the basis for invalidating a test run and potentially the entire testing program. Documentation of any deviations must include an evaluation of the impact of the deviation on the test data.

23. Method-specific quality assurance/quality control (QA/QC) procedures must be performed to ensure that the data is valid for determining source compliance. This must be done whether or not DEQ representatives are on-site to observe the testing and whether or not a QA/QC requirement has been specifically acknowledged and approved by DEQ. Only method-specific requirements explicitly exempted by the EPA and/or DEQ need not be performed. Documentation of the procedures and results shall be presented in the source test report for review. Omission of this critical information will result in rejection of the data, requiring a retest.

24. STAR Reports: The Certification Form (only) of the Source Test Audit Reports (STAR) shall be completed and submitted with the Source Test Report. The Certification Form can either be bound in the report or it can be submitted separately. Submittal of the method-specific STAR reports is no longer required. Copies of all of the STAR forms are available electronically.

25. To conserve natural resources and to minimize storage space requirements, DEQ no longer requires hard copy source test report submittals. An electronic test report (searchable PDF) may be emailed to the regional source test coordinator as an alternative to the required paper copy test report submittal. Electronic test report submittals must be sent to joshua.muswieck@deq.oregon.gov within 60 days following the completion of testing. DEQ can require a paper copy of the source test report upon request.

DEQ understands source testing is scheduled to begin on August 21, 2024.

Please contact me at (971) 349-0956 if you have any questions or concerns.

Sincerely,

Josh Muswieck

Josh Muswieck
Source Test Coordinator
Environmental Engineer
DEQ Portland Office

cc: Weston Li, DEQ: AQ File

Gmail

Steve Hall <shall@spectrumenvsoln.com>

FW: Microchip RCTO Source Testing 8/21/24

1 message

Becky.Kim@microchip.com <Becky.Kim@microchip.com> Tue, Sep 24, 2024 at 5:54 PM
To: steve@spectrumenvsoln.com

From: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Sent: Tuesday, September 24, 2024 2:28 PM
To: Becky Kim - G66880 <Becky.Kim@microchip.com>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri Oghoghomeh - G77603 <Oteri.Oghoghomeh@microchip.com>; Dana Corkill - G77231 <Dana.Corkill@microchip.com>
Subject: RE: Microchip RCTO Source Testing 8/21/24

EXTERNAL EMAIL: Do not click links or open attachments unless you know the content is safe

Hi Becky,

Thanks for reaching out. Because Inlet Ducts 4-1 & 4-2 were verified to have ambient levels of O2 earlier this year and combustion of natural gas at the oxidizer is the only source CO2, the stoichiometric approach is approved if Spectrum can't source a O2 analyzer by tomorrow. Please use the equation below to calculate percent O2 at the oxidizer outlet. O2 may be assumed to be ambient at the inlet and concentrator outlet.

Please let me know if you have any questions.

The purpose of this equation is to calculate the oxygen concentration from the measured carbon dioxide concentration. The stoichiometric approach assumes natural gas as the fuel and an excess of oxygen present. The equation for the calculation of the O_2 concentration follows:

$$O_2 \text{ Concentration (\%)} = 20.95 - (CO_2 \text{ Concentration} - \text{Bkg } CO_2) / (\text{Ratio (Max } CO_2/\text{Theo Bkg } O_2)$$
$$20.95 - (CO_2 \text{ Concentration} - 0.04)/0.56024292$$

where;

Fuel Type is natural gas (CH_4)
The theoretical background of CO_2 = 0.04%
The theoretical background of O_2 =20.95%
Max Theoretical CO_2% = 11.737%
Ratio Max Theo CO_2/Bkg Theo O_2 = 0.56024292

-Josh Muswieck

(971) 349-0956

From: Becky.Kim@microchip.com <Becky.Kim@microchip.com>
Sent: Tuesday, September 24, 2024 1:33 PM
To: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri.Oghoghomeh@microchip.com; Dana.Corkill@microchip.com
Subject: RE: Microchip RCTO Source Testing 8/21/24

Hi Josh,

Our testers encountered a small problem during set up. Their O2 measuring device has failed and they have been unable to get it working again. They are trying to get one over-nighted for the testing tomorrow, but in the event they can't, they proposed two alternative solutions:

Preferred Method: Measure stoichiometrically. Assume inlet and concentrator outlet are at ambient levels, and measure CO2 with the FTIR in the oxidizer outlet, assuming (during combustion) CO2 is proportional to O2 minus ambient levels.

Alternate Method: Take samples in tedlar bags and analyze off site.

As a reminder, this O2 measurement is only to get a molecular weight to do the flow calculation and is not an adjustment or correction factor.

Please let me know your thoughts or concerns.

Thank you,

Becky

Becky Kim

Environmental Engineer

Microchip Technology Inc.

21015 SE Stark Street, Gresham, OR 97030

Office (503) 669-6012 Mobile (971) 266-7887

From: Becky Kim - G66880
Sent: Tuesday, September 24, 2024 11:28 AM
To: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri Oghoghomeh - G77603 <Oteri.Oghoghomeh@microchip.com>; Dana Corkill - G77231 <Dana.Corkill@microchip.com>
Subject: RE: Microchip RCTO Source Testing 8/21/24

Hi Josh,

Thank you for letting me know. We are excited to have you both on site.

Thank you,

Becky

From: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Sent: Tuesday, September 24, 2024 10:27 AM
To: Becky Kim - G66880 <Becky.Kim@microchip.com>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri Oghoghomeh - G77603 <Oteri.Oghoghomeh@microchip.com>; Dana Corkill - G77231 <Dana.Corkill@microchip.com>
Subject: RE: Microchip RCTO Source Testing 8/21/24

EXTERNAL EMAIL: Do not click links or open attachments unless you know the content is safe

Hi Becky,

Weston and I are planning on coming on-site tomorrow early afternoon, probably around 1 pm to see the new RCTO units and observe testing. Please let us know if you run into any significant delays in the morning.

Thank you.

-Josh Muswieck

(971) 349-0956

From: Becky.Kim@microchip.com <Becky.Kim@microchip.com>
Sent: Monday, September 23, 2024 4:12 PM
To: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri.Oghoghomeh@microchip.com; Dana.Corkill@microchip.com
Subject: RE: Microchip RCTO Source Testing 8/21/24

Hi Josh,

The testers will perform the cyclonic flow check using the 3-D probe at the beginning of each unit (twice during the day). They plan to start the first test around 7:30 am and estimate each “hour-long run” will take anywhere from 1.5-2 hours. I expect the second flow measurement to happen somewhere between 11am and 2 pm. Please let me know if you are able to make it on site to observe so I can let security know.

Thank you,

Becky

Becky Kim

Environmental Engineer

Microchip Technology Inc.

21015 SE Stark Street, Gresham, OR 97030

Office (503) 669-6012 Mobile (971) 266-7887

From: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Sent: Monday, September 23, 2024 7:30 AM
To: Becky Kim - G66880 <Becky.Kim@microchip.com>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri Oghoghomeh - G77603 <Oteri.Oghoghomeh@microchip.com>; Dana Corkill - G77231 <Dana.Corkill@microchip.com>
Subject: RE: Microchip RCTO Source Testing 8/21/24

EXTERNAL EMAIL: Do not click links or open attachments unless you know the content is safe

Hi Becky,

Thank you for the update. DEQ doesn't have any issues with the revised test schedule. Can you let me know when the testers plan to conduct the cyclonic flow check using the 3-D probe at the RCO sampling location? Schedule permitting, I was hoping to come out and observe this.

Thank you.

-Josh Muswieck

(971) 349-0956

From: Becky.Kim@microchip.com <Becky.Kim@microchip.com>
Sent: Thursday, September 19, 2024 10:29 AM
To: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri.Oghoghomeh@microchip.com; Dana.Corkill@microchip.com
Subject: RE: Microchip RCTO Source Testing 8/21/24

Hello Josh and Weston,

Things have fallen into place very quickly the last day or so and we are preparing to perform our compliance test next Wednesday, September 25th. We appreciate your patience in anticipation of this testing.

Please let me know if you have questions or concerns. I am available for a meeting or phone call if needed.

Thank you,

Becky

Becky Kim

Environmental Engineer

Microchip Technology Inc.

21015 SE Stark Street, Gresham, OR 97030

Office (503) 669-6012 Mobile (971) 266-7887

From: Becky Kim - G66880
Sent: Tuesday, August 27, 2024 8:16 AM
To: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri Oghoghomeh - G77603 <Oteri.Oghoghomeh@microchip.com>; Dana Corkill - G77231 <Dana.Corkill@microchip.com>
Subject: RE: Microchip RCTO Source Testing 8/21/24

Hi Josh,

Thank you for your patience as we work through our connectivity issues. While we've regained wifi access and some internal functionalities, we don't yet have a timeline for when production will resume. Given that our testers have another project the week of September 9th and need the equipment shipped the week before, it's uncertain when we'll be able to start production or conduct any testing.

I will update once we have more information about production being back online.

I apologize for the inconvenience this may cause. Please let me know if you have any questions or need further information.

Thank you,

Becky

Becky Kim

Environmental Engineer

Microchip Technology Inc.

21015 SE Stark Street, Gresham, OR 97030

Office (503) 669-6012 Mobile (971) 266-7887

From: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Sent: Tuesday, August 27, 2024 7:26 AM
To: Becky Kim - G66880 <Becky.Kim@microchip.com>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri Oghoghomeh - G77603 <Oteri.Oghoghomeh@microchip.com>; Dana Corkill - G77231 <Dana.Corkill@microchip.com>
Subject: RE: Microchip RCTO Source Testing 8/21/24

EXTERNAL EMAIL: Do not click links or open attachments unless you know the content is safe

Hello Becky,

Are you able to provide a status update on the RCTO testing?

Thank you.

-Josh Muswieck

(971) 349-0956

From: Becky.Kim@microchip.com <Becky.Kim@microchip.com>
Sent: Tuesday, August 20, 2024 9:04 AM
To: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri.Oghoghomeh@microchip.com; Dana.Corkill@microchip.com
Subject: RE: Microchip RCTO Source Testing 8/21/24

Good morning, Josh and Weston,

The decision was made this morning to cancel the source testing for tomorrow. This is based in a couple of reasonings:

1. One of the two Munters units went down over the weekend. This is believed to have been caused by power bumps from the lighting storm. The flow has been diverted to the other unit and is below the design capacity. There is no flow in bypass and all emissions are being controlled.

Our internal team worked yesterday to get it back up and running but were unsuccessful. The Munters technical manager and team is here today and will hopefully be able to troubleshoot.

2. Early Monday morning, Microchip lost our global network worldwide. This means we do not have access to internet or monitoring systems across the site. Facilities is completing rounds every 2-3 hours to monitor pH/recirculation flow in the scrubbers and desorb/oxidation temperatures in the Munters units. We have no reason to believe systems are not working as intended.

Due to these complications, the fab is not currently running production.

We believe it will take Munters the entirety of today to get the unit back up and running. Additionally, while corporate has informed us of a path forward to restore the global network, we don't expect production to be up and running until later in the week. We are tentatively hoping to complete the testing next week.

I apologize for the inconvenience. Please let me know if you have any questions, concerns, or would like to discuss in a meeting or phone call.

Thank you,

Becky

Becky Kim

Environmental Engineer

Microchip Technology Inc.

21015 SE Stark Street, Gresham, OR 97030

Office (503) 669-6012 Mobile (971) 266-7887

From: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Sent: Monday, August 19, 2024 8:45 AM
To: Becky Kim - G66880 <Becky.Kim@microchip.com>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri Oghoghomeh - G77603 <Oteri.Oghoghomeh@microchip.com>; Dana Corkill - G77231 <Dana.Corkill@microchip.com>
Subject: RE: Microchip RCTO Source Testing 8/21/24

EXTERNAL EMAIL: Do not click links or open attachments unless you know the content is safe

Hello Becky,

I wanted to let you know that Weston and I are planning on coming onsite Wednesday morning to observe a portion of testing on the new RCTO units. Do you have an anticipated start time for testing?

Thank you.

-Josh Muswieck

(971) 349-0956

From: Becky.Kim@microchip.com <Becky.Kim@microchip.com>
Sent: Tuesday, July 30, 2024 8:18 AM
To: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri.Oghoghomeh@microchip.com; Dana.Corkill@microchip.com
Subject: RE: Microchip RCTO Source Testing 8/21/24

Hi Josh,

Thank you for providing the test plan approval letter. I wanted to mention, as I don't think it's stated in the test plan, that Spectrum will be bringing in a third party (Mostardi Platt) to perform the EPA Method 1 Section 11.5 alternate flow measurements.

Please let me know if you have any questions.

Thank you,

Becky

Becky Kim

Environmental Engineer

Microchip Technology Inc.

21015 SE Stark Street, Gresham, OR 97030

Office (503) 669-6012 Mobile (971) 266-7887

From: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Sent: Monday, July 29, 2024 7:27 AM
To: Becky Kim - G66880 <Becky.Kim@microchip.com>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri Oghoghomeh - G77603 <Oteri.Oghoghomeh@microchip.com>; Dana Corkill - G77231 <Dana.Corkill@microchip.com>
Subject: RE: Microchip RCTO Source Testing 8/21/24

EXTERNAL EMAIL: Do not click links or open attachments unless you know the content is safe

Hello Becky,

Attached is the test plan approval letter for next months testing on the new Munters RCTO units. Please review the approval conditions and let me know if you have any questions or concerns. Note that DEQ has updated its policy and no longer requires hard copy submittals for test reports (Approval Condition 25).

Thank you.

-Josh Muswieck

(971) 349-0956

From: Becky.Kim@microchip.com <Becky.Kim@microchip.com>
Sent: Monday, July 22, 2024 11:26 AM
To: MUSWIECK Joshua * DEQ <Joshua.MUSWIECK@deq.oregon.gov>
Cc: LI Weston * DEQ <Weston.LI@deq.oregon.gov>; Oteri.Oghoghomeh@microchip.com; Dana.Corkill@microchip.com
Subject: Microchip RCTO Source Testing 8/21/24

Hi Josh,

Microchip is planning on completing source testing on the two new VOC abatement units on 8/21/24. Pursuant of permit condition 6.1(g), a test plan is attached for your review. As a note, the new system was put online on 6/17/24 and has been treating the entirety of Microchip's solvent emissions since.

Please reach out with any questions or concerns about the attached plan.

Thank you,

Becky

Becky Kim

Environmental Engineer

Microchip Technology Inc.

21015 SE Stark Street, Gresham, OR 97030

Office (503) 669-6012 Mobile (971) 266-7887

Appendix F

Operations Data

Year				2024								
Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Moves	9,778,535	9,291,105	8,878,248	6,330,703	7,947,589	4,132,514	7,678,453	7,866,008	3,868,458	7,007,379	4,132,142	5,362,939
F Days	31	30	31	31	29	31	30	31	30	31	31	30
Moves/day	315,437	309,704	286,395	204,216	274,055	133,307	255,948	253,742	128,949	226,044	133,295	178,765
Avg	224,988											

Test day	9/25/2024
Moves	208,793
% of annual manufacturing capacity	93%
(90% is requirement)	

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 00:00:53.9235168	1386	386	0.440125018
2024-09-25 00:01:53.9142894	1399	387	0.439625025
2024-09-25 00:02:53.9144219	1413	392	0.442250013
2024-09-25 00:03:53.9231931	1392	393	0.440000027
2024-09-25 00:04:53.9246272	1397	392	0.44175002
2024-09-25 00:05:53.9132738	1412	391	0.441125035
2024-09-25 00:06:53.9239106	1395	389	0.438125014
2024-09-25 00:07:53.9155822	1395	387	0.440750033
2024-09-25 00:08:53.9150714	1407	388	0.439125031
2024-09-25 00:09:53.9225375	1401	389	0.440500021
2024-09-25 00:10:53.9219805	1395	388	0.440750033
2024-09-25 00:11:53.9146305	1398	395	0.437625021
2024-09-25 00:12:53.9217276	1401	395	0.441000015
2024-09-25 00:13:53.9177634	1405	386	0.440750033
2024-09-25 00:14:53.9224540	1400	385	0.438500017
2024-09-25 00:15:53.9188728	1392	392	0.442750007
2024-09-25 00:16:53.9167122	1407	394	0.440750033
2024-09-25 00:17:53.9235224	1403	391	0.441125035
2024-09-25 00:18:53.9224871	1384	389	0.442000031
2024-09-25 00:19:53.9251950	1413	388	0.440125018
2024-09-25 00:20:53.9147676	1401	387	0.439875007
2024-09-25 00:21:53.9199286	1383	390	0.439875007
2024-09-25 00:22:53.9242857	1415	392	0.439750016
2024-09-25 00:23:53.9252430	1398	391	0.439875007
2024-09-25 00:24:53.9211883	1388	392	0.438750029
2024-09-25 00:25:53.9212858	1417	392	0.441625029
2024-09-25 00:26:53.9147308	1393	388	0.441250026
2024-09-25 00:27:53.9165993	1393	386	0.440625012
2024-09-25 00:28:53.9143132	1412	389	0.441125035
2024-09-25 00:29:53.9275562	1396	392	0.441250026
2024-09-25 00:30:53.9188009	1392	391	0.442250013
2024-09-25 00:31:53.9248101	1411	393	0.440000027
2024-09-25 00:32:53.9142610	1397	390	0.442000031
2024-09-25 00:33:53.9225100	1392	386	0.442000031
2024-09-25 00:34:53.9148278	1410	387	0.441000015
2024-09-25 00:35:53.9197126	1398	390	0.441625029
2024-09-25 00:36:53.9257124	1394	390	0.439125031
2024-09-25 00:37:53.9140011	1407	393	0.436625034
2024-09-25 00:38:53.9157609	1401	395	0.439750016
2024-09-25 00:39:53.9210921	1397	390	0.439500034
2024-09-25 00:40:53.9162125	1400	385	0.440750033
2024-09-25 00:41:53.9200895	1399	388	0.440625012
2024-09-25 00:42:53.9181958	1404	393	0.440125018
2024-09-25 00:43:53.9251446	1403	392	0.441125035
2024-09-25 00:44:53.9203956	1389	391	0.441250026
2024-09-25 00:45:53.9142992	1404	390	0.441125035
2024-09-25 00:46:53.9214085	1410	387	0.440125018
2024-09-25 00:47:53.9154660	1383	388	0.438250035
2024-09-25 00:48:53.9147965	1406	389	0.439375013
2024-09-25 00:49:53.9176747	1411	390	0.440250009
2024-09-25 00:50:53.9180362	1381	391	0.438250035
2024-09-25 00:51:53.9224279	1412	393	0.439625025
2024-09-25 00:52:53.9281006	1403	393	0.439875007
2024-09-25 00:53:53.9175706	1386	389	0.441625029
2024-09-25 00:54:53.9175632	1409	388	0.441000015
2024-09-25 00:55:53.9250480	1403	389	0.439625025
2024-09-25 00:56:53.9153009	1387	387	0.441250026
2024-09-25 00:57:53.9211509	1407	391	0.440625012
2024-09-25 00:58:53.9152677	1405	393	0.439500034
2024-09-25 00:59:53.9223359	1389	391	0.439125031
2024-09-25 01:00:53.9275575	1406	391	0.437125027
2024-09-25 01:01:53.9154683	1404	389	0.437750012
2024-09-25 01:02:53.9224810	1393	387	0.439875007
2024-09-25 01:03:53.9269898	1401	387	0.438000023
2024-09-25 01:04:53.9271125	1405	395	0.437875032

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 01:05:53.9141503	1400	393	0.440000027
2024-09-25 01:06:53.9187804	1398	386	0.439500034
2024-09-25 01:07:53.9214957	1396	387	0.439500034
2024-09-25 01:08:53.9250107	1403	391	0.442125022
2024-09-25 01:09:53.9269184	1406	391	0.440875024
2024-09-25 01:10:53.9158266	1392	391	0.438500017
2024-09-25 01:11:53.9215101	1398	390	0.439375013
2024-09-25 01:12:53.9252630	1414	389	0.440625012
2024-09-25 01:13:53.9182648	1386	389	0.438125014
2024-09-25 01:14:53.9157263	1401	389	0.438375026
2024-09-25 01:15:53.9177838	1415	390	0.440000027
2024-09-25 01:16:53.9257520	1381	389	0.440125018
2024-09-25 01:17:53.9137071	1408	393	0.43900001
2024-09-25 01:18:53.9219519	1408	392	0.438625008
2024-09-25 01:19:53.9250582	1383	390	0.440875024
2024-09-25 01:20:53.9248236	1409	390	0.439500034
2024-09-25 01:21:53.9172057	1404	390	0.440125018
2024-09-25 01:22:53.9144722	1387	388	0.439500034
2024-09-25 01:23:53.9254679	1410	389	0.43750003
2024-09-25 01:24:53.9212120	1402	390	0.43900001
2024-09-25 01:25:53.9274106	1388	389	0.43887502
2024-09-25 01:26:53.9288191	1411	389	0.440250009
2024-09-25 01:27:53.9304669	1398	391	0.439250022
2024-09-25 01:28:53.9420700	1392	390	0.437625021
2024-09-25 01:29:53.9326569	1410	389	0.439125031
2024-09-25 01:30:53.9321423	1396	396	0.436750025
2024-09-25 01:31:53.9365124	1394	392	0.438750029
2024-09-25 01:32:53.9294634	1413	385	0.440250009
2024-09-25 01:33:53.9332844	1394	386	0.43750003
2024-09-25 01:34:53.9297960	1394	393	0.440875024
2024-09-25 01:35:53.9379849	1416	393	0.440000027
2024-09-25 01:36:53.9348389	1390	392	0.438375026
2024-09-25 01:37:53.9318525	1396	388	0.440125018
2024-09-25 01:38:53.9288890	1419	387	0.440125018
2024-09-25 01:39:53.9343336	1382	387	0.438500017
2024-09-25 01:40:53.9394918	1402	392	0.437250018
2024-09-25 01:41:53.9385554	1415	394	0.437125027
2024-09-25 01:42:53.9370616	1380	390	0.439125031
2024-09-25 01:43:53.9351016	1409	391	0.438250035
2024-09-25 01:44:53.9328286	1407	390	0.439375013
2024-09-25 01:45:53.9390383	1383	386	0.440625012
2024-09-25 01:46:53.9352373	1411	387	0.437625021
2024-09-25 01:47:53.9409997	1401	391	0.439750016
2024-09-25 01:48:53.9416253	1389	392	0.439500034
2024-09-25 01:49:53.9418129	1409	392	0.43887502
2024-09-25 01:50:53.9294479	1401	392	0.439625025
2024-09-25 01:51:53.9335508	1389	389	0.439375013
2024-09-25 01:52:53.9402154	1410	386	0.441000015
2024-09-25 01:53:53.9416771	1397	386	0.439125031
2024-09-25 01:54:53.9311242	1391	391	0.438000023
2024-09-25 01:55:53.9345851	1410	391	0.436875015
2024-09-25 01:56:53.9383590	1397	394	0.437125027
2024-09-25 01:57:53.9325687	1391	392	0.438000023
2024-09-25 01:58:53.9353848	1414	385	0.439125031
2024-09-25 01:59:53.9325327	1395	387	0.437250018
2024-09-25 02:00:53.9290756	1391	393	0.438625008
2024-09-25 02:01:53.9392711	1417	394	0.441000015
2024-09-25 02:02:53.9432909	1390	390	0.438750029
2024-09-25 02:03:53.9366006	1395	387	0.43887502
2024-09-25 02:04:53.9325467	1418	387	0.438625008
2024-09-25 02:05:53.9309717	1384	389	0.43900001
2024-09-25 02:06:53.9304631	1400	393	0.43750003
2024-09-25 02:07:53.9375010	1415	394	0.438750029
2024-09-25 02:08:53.9375813	1385	388	0.44037503
2024-09-25 02:09:53.9382573	1402	389	0.438500017

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 02:10:53.9387224	1412	391	0.44037503
2024-09-25 02:11:53.9354468	1387	391	0.438000023
2024-09-25 02:12:53.9414522	1403	390	0.438500017
2024-09-25 02:13:53.9455177	1409	389	0.44037503
2024-09-25 02:14:53.9525808	1394	390	0.43887502
2024-09-25 02:15:53.9577263	1395	389	0.439375013
2024-09-25 02:16:53.9591796	1408	390	0.439625025
2024-09-25 02:17:53.9539226	1400	391	0.438375026
2024-09-25 02:18:53.9575360	1392	389	0.439125031
2024-09-25 02:19:53.9609311	1401	389	0.440125018
2024-09-25 02:20:53.9658405	1405	389	0.438000023
2024-09-25 02:21:53.9703479	1399	387	0.436500013
2024-09-25 02:22:53.9621501	1395	391	0.436500013
2024-09-25 02:23:53.9602802	1399	395	0.438750029
2024-09-25 02:24:53.9624861	1407	391	0.439250022
2024-09-25 02:25:53.9646093	1400	387	0.438750029
2024-09-25 02:26:53.9613500	1391	387	0.437375009
2024-09-25 02:27:53.9636006	1408	390	0.438750029
2024-09-25 02:28:53.9618716	1403	391	0.439500034
2024-09-25 02:29:53.9629106	1385	391	0.437625021
2024-09-25 02:30:53.9606455	1412	390	0.440000027
2024-09-25 02:31:53.9710094	1401	389	0.437000006
2024-09-25 02:32:53.9715515	1384	389	0.435500026
2024-09-25 02:33:53.9709758	1417	390	0.43887502
2024-09-25 02:34:53.9702933	1396	389	0.43750003
2024-09-25 02:35:53.9631686	1390	391	0.435500026
2024-09-25 02:36:53.9616215	1417	393	0.437625021
2024-09-25 02:37:53.9695304	1393	392	0.439125031
2024-09-25 02:38:53.9713295	1394	391	0.438750029
2024-09-25 02:39:53.9635269	1412	390	0.439250022
2024-09-25 02:40:53.9612819	1395	390	0.43887502
2024-09-25 02:41:53.9680328	1393	388	0.439375013
2024-09-25 02:42:53.9637075	1408	389	0.439500034
2024-09-25 02:43:53.9619490	1402	390	0.441125035
2024-09-25 02:44:53.9625555	1391	389	0.43750003
2024-09-25 02:45:53.9653940	1405	389	0.437625021
2024-09-25 02:46:53.9611699	1404	390	0.437625021
2024-09-25 02:47:53.9679218	1396	391	0.437125027
2024-09-25 02:48:53.9668189	1396	392	0.435500026
2024-09-25 02:49:53.9720535	1402	395	0.437875032
2024-09-25 02:50:53.9755050	1406	390	0.436875015
2024-09-25 02:51:53.9829614	1399	385	0.438750029
2024-09-25 02:52:53.9834214	1394	388	0.43887502
2024-09-25 02:53:53.9859786	1402	393	0.439875007
2024-09-25 02:54:53.9834415	1407	392	0.438500017
2024-09-25 02:55:53.9778961	1392	391	0.438375026
2024-09-25 02:56:53.9813537	1396	389	0.43900001
2024-09-25 02:57:53.9851850	1412	387	0.43887502
2024-09-25 02:58:53.9886374	1393	388	0.43612501
2024-09-25 02:59:53.9770969	1393	391	0.438375026
2024-09-25 03:00:53.9807892	1416	391	0.436250031
2024-09-25 03:01:53.9842477	1391	391	0.437625021
2024-09-25 03:02:53.9877043	1395	392	0.436875015
2024-09-25 03:03:53.9911601	1415	392	0.440000027
2024-09-25 03:04:53.9936174	1388	389	0.438625008
2024-09-25 03:05:53.9970759	1397	388	0.436375022
2024-09-25 03:06:54.0005274	1415	388	0.438125014
2024-09-25 03:07:54.0039859	1389	387	0.438250035
2024-09-25 03:08:53.9924449	1397	391	0.437625021
2024-09-25 03:09:53.9958983	1413	394	0.439375013
2024-09-25 03:10:53.9933589	1393	392	0.439625025
2024-09-25 03:11:53.9999764	1395	390	0.438500017
2024-09-25 03:12:53.9924328	1408	389	0.438375026
2024-09-25 03:13:53.9966420	1400	387	0.436875015
2024-09-25 03:14:54.0003702	1392	387	0.436375022

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 03:15:54.0345938	1402	394	0.435875028
2024-09-25 03:16:54.0630811	1408	395	0.436750025
2024-09-25 03:17:54.1025775	1397	386	0.43750003
2024-09-25 03:18:54.1510817	1392	385	0.437125027
2024-09-25 03:19:54.1838397	1407	393	0.43900001
2024-09-25 03:20:54.2074670	1404	393	0.438625008
2024-09-25 03:21:54.2083872	1388	391	0.43900001
2024-09-25 03:22:54.2283152	1404	388	0.438000023
2024-09-25 03:23:54.2432355	1411	387	0.436750025
2024-09-25 03:24:54.2511616	1388	389	0.436750025
2024-09-25 03:25:54.2572488	1399	391	0.435875028
2024-09-25 03:26:54.2638851	1415	392	0.436750025
2024-09-25 03:27:54.2703548	1388	390	0.438625008
2024-09-25 03:28:54.2768184	1399	392	0.436500013
2024-09-25 03:29:54.2742895	1414	392	0.437250018
2024-09-25 03:30:54.2755313	1386	388	0.438000023
2024-09-25 03:31:54.2794900	1399	387	0.436375022
2024-09-25 03:32:54.2880393	1412	389	0.437625021
2024-09-25 03:33:54.2823090	1391	390	0.437375009
2024-09-25 03:34:54.2897012	1398	391	0.439125031
2024-09-25 03:35:54.2944398	1412	392	0.43887502
2024-09-25 03:36:54.2842895	1393	392	0.438500017
2024-09-25 03:37:54.2871350	1397	390	0.438000023
2024-09-25 03:38:54.2981353	1407	389	0.436250031
2024-09-25 03:39:54.2962374	1398	388	0.436000019
2024-09-25 03:40:54.3004779	1394	386	0.436625034
2024-09-25 03:41:54.2909611	1400	395	0.435250014
2024-09-25 03:42:54.2928959	1405	395	0.435750008
2024-09-25 03:43:54.2887679	1402	385	0.437125027
2024-09-25 03:44:54.2948573	1393	386	0.437750012
2024-09-25 03:45:54.2991900	1400	394	0.440000027
2024-09-25 03:46:54.2957287	1410	394	0.437750012
2024-09-25 03:47:54.2995628	1393	390	0.439875007
2024-09-25 03:48:54.2909386	1394	388	0.43750003
2024-09-25 03:49:54.2938275	1416	388	0.438375026
2024-09-25 03:50:54.2874246	1388	387	0.438750029
2024-09-25 03:51:54.2940487	1395	391	0.43750003
2024-09-25 03:52:54.2896668	1417	392	0.437125027
2024-09-25 03:53:54.2924722	1387	390	0.438125014
2024-09-25 03:54:54.2994028	1399	393	0.436500013
2024-09-25 03:55:54.2969263	1415	391	0.438625008
2024-09-25 03:56:54.2902351	1384	386	0.437875032
2024-09-25 03:57:54.2934879	1403	387	0.435625017
2024-09-25 03:58:54.2986409	1410	392	0.437875032
2024-09-25 03:59:54.2881911	1390	393	0.438000023
2024-09-25 04:00:54.3001707	1401	392	0.438375026
2024-09-25 04:01:54.2897298	1410	390	0.43887502
2024-09-25 04:02:54.2935574	1390	389	0.43887502
2024-09-25 04:03:54.2888392	1401	388	0.438375026
2024-09-25 04:04:54.3017374	1406	388	0.43750003
2024-09-25 04:05:54.2956774	1392	387	0.43750003
2024-09-25 04:06:54.2885392	1400	390	0.436250031
2024-09-25 04:07:54.2928977	1407	396	0.433500022
2024-09-25 04:08:54.3022557	1389	392	0.43325001
2024-09-25 04:09:54.2990155	1403	384	0.438125014
2024-09-25 04:10:54.2896495	1409	388	0.435125023
2024-09-25 04:11:54.2938135	1389	394	0.436375022
2024-09-25 04:12:54.2982564	1404	393	0.437000006
2024-09-25 04:13:54.2917028	1409	389	0.436750025
2024-09-25 04:14:54.2991368	1383	388	0.436000019
2024-09-25 04:15:54.2896845	1412	388	0.435500026
2024-09-25 04:16:54.2951693	1403	387	0.437125027
2024-09-25 04:17:54.3015507	1382	392	0.433500022
2024-09-25 04:18:54.2880539	1418	393	0.434875011
2024-09-25 04:19:54.2964779	1395	391	0.435625017

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
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2024-09-25 04:21:54.2883833	1418	390	0.437000006
2024-09-25 04:22:54.2983703	1389	389	0.436750025
2024-09-25 04:23:54.2908579	1397	388	0.436750025
2024-09-25 04:24:54.2961602	1412	389	0.437250018
2024-09-25 04:25:54.2896421	1395	389	0.436625034
2024-09-25 04:26:54.2931976	1393	388	0.436250031
2024-09-25 04:27:54.2879681	1411	392	0.43750003
2024-09-25 04:28:54.2874437	1399	393	0.436750025
2024-09-25 04:29:54.2911649	1391	390	0.437000006
2024-09-25 04:30:54.2880189	1405	389	0.435625017
2024-09-25 04:31:54.2940621	1404	388	0.437125027
2024-09-25 04:32:54.2915656	1395	386	0.434250027
2024-09-25 04:33:54.2887439	1397	392	0.430875033
2024-09-25 04:34:54.2935592	1403	396	0.435125023
2024-09-25 04:35:54.2985415	1406	389	0.435750008
2024-09-25 04:36:54.2936740	1397	386	0.435500026
2024-09-25 04:37:54.2894162	1393	388	0.435125023
2024-09-25 04:38:54.2934766	1407	391	0.436000019
2024-09-25 04:39:54.2944951	1405	391	0.43750003
2024-09-25 04:40:54.2980800	1386	390	0.435000032
2024-09-25 04:41:54.2972477	1406	389	0.434875011
2024-09-25 04:42:54.2963118	1409	387	0.43612501
2024-09-25 04:43:54.2951328	1382	391	0.432500035
2024-09-25 04:44:54.2984827	1409	392	0.434375018
2024-09-25 04:45:54.3020126	1407	391	0.435625017
2024-09-25 04:46:54.2886105	1384	392	0.434750021
2024-09-25 04:47:54.2946369	1414	391	0.435125023
2024-09-25 04:48:54.2990057	1399	389	0.43612501
2024-09-25 04:49:54.2872986	1389	387	0.43612501
2024-09-25 04:50:54.2897969	1410	388	0.436375022
2024-09-25 04:51:54.2903932	1401	389	0.436625034
2024-09-25 04:52:54.2997199	1389	389	0.437250018
2024-09-25 04:53:54.3015605	1406	392	0.435625017
2024-09-25 04:54:54.2934472	1405	393	0.435875028
2024-09-25 04:55:54.2990943	1391	391	0.435875028
2024-09-25 04:56:54.2996271	1400	389	0.434500009
2024-09-25 04:57:54.2977021	1406	388	0.432875007
2024-09-25 04:58:54.3005168	1399	386	0.433125019
2024-09-25 04:59:54.3019510	1395	392	0.433125019
2024-09-25 05:00:54.2937103	1399	397	0.433000028
2024-09-25 05:01:54.2899215	1407	389	0.435125023
2024-09-25 05:02:54.2954417	1400	385	0.436000019
2024-09-25 05:03:54.2948384	1390	388	0.435125023
2024-09-25 05:04:54.2893266	1406	394	0.435125023
2024-09-25 05:05:54.3014909	1407	393	0.437875032
2024-09-25 05:06:54.2960449	1385	390	0.435250014
2024-09-25 05:07:54.3013062	1407	387	0.437125027
2024-09-25 05:08:54.2878509	1408	387	0.435500026
2024-09-25 05:09:54.2948883	1384	389	0.432500035
2024-09-25 05:10:54.2882046	1407	392	0.436625034
2024-09-25 05:11:54.3017643	1409	392	0.433375031
2024-09-25 05:12:54.2979097	1384	391	0.435375035
2024-09-25 05:13:54.2922845	1410	392	0.434750021
2024-09-25 05:14:54.2934691	1405	389	0.433375031
2024-09-25 05:15:54.2995151	1386	386	0.43612501
2024-09-25 05:16:54.2968754	1406	387	0.437125027
2024-09-25 05:17:54.2954258	1407	393	0.43612501
2024-09-25 05:18:54.2988918	1388	391	0.437375009
2024-09-25 05:19:54.2954795	1403	392	0.435750008
2024-09-25 05:20:54.2985279	1409	391	0.435375035
2024-09-25 05:21:54.2906623	1388	388	0.432500035
2024-09-25 05:22:54.2902504	1403	387	0.435500026
2024-09-25 05:23:54.2892842	1406	388	0.435625017
2024-09-25 05:24:54.2902196	1394	390	0.433750033

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
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2024-09-25 05:26:54.2956133	1405	394	0.434250027
2024-09-25 05:27:54.3015884	1402	393	0.435125023
2024-09-25 05:28:54.2957678	1397	385	0.435750008
2024-09-25 05:29:54.2992230	1396	387	0.435875028
2024-09-25 05:30:54.2914237	1405	392	0.435625017
2024-09-25 05:31:54.2926414	1404	392	0.435125023
2024-09-25 05:32:54.2972794	1391	392	0.434375018
2024-09-25 05:33:54.2916388	1401	389	0.434750021
2024-09-25 05:34:54.2947306	1412	388	0.434750021
2024-09-25 05:35:54.2883762	1389	387	0.434375018
2024-09-25 05:36:54.2955028	1396	390	0.433000028
2024-09-25 05:37:54.2995893	1416	392	0.433625013
2024-09-25 05:38:54.2954869	1387	391	0.435500026
2024-09-25 05:39:54.2890495	1399	392	0.435375035
2024-09-25 05:40:54.2923153	1413	392	0.434875011
2024-09-25 05:41:54.2966682	1388	388	0.435750008
2024-09-25 05:42:54.2962604	1398	387	0.436375022
2024-09-25 05:43:54.3010696	1410	389	0.435125023
2024-09-25 05:44:54.2926605	1397	390	0.435000032
2024-09-25 05:45:54.2953577	1393	391	0.436625034
2024-09-25 05:46:54.2937238	1408	392	0.43612501
2024-09-25 05:47:54.2985292	1403	392	0.436375022
2024-09-25 05:48:54.3013416	1393	391	0.435500026
2024-09-25 05:49:54.2954813	1397	389	0.435500026
2024-09-25 05:50:54.2880142	1410	388	0.434125006
2024-09-25 05:51:54.2923848	1398	386	0.433375031
2024-09-25 05:52:54.2952004	1390	393	0.431250006
2024-09-25 05:53:54.2886118	1406	395	0.433500022
2024-09-25 05:54:54.2957122	1407	390	0.435750008
2024-09-25 05:55:54.2896881	1387	387	0.434375018
2024-09-25 05:56:54.2883697	1404	389	0.434875011
2024-09-25 05:57:54.2894404	1411	389	0.436250031
2024-09-25 05:58:54.2905760	1389	390	0.435875028
2024-09-25 05:59:54.2947040	1398	390	0.435250014
2024-09-25 06:00:54.3011414	1415	390	0.433875024
2024-09-25 06:01:54.2940658	1388	389	0.434875011
2024-09-25 06:02:54.2903740	1397	390	0.433500022
2024-09-25 06:03:54.2919570	1416	391	0.43462503
2024-09-25 06:04:54.2926936	1386	389	0.434375018
2024-09-25 06:05:54.3014097	1401	391	0.433125019
2024-09-25 06:06:54.2937690	1413	392	0.432750016
2024-09-25 06:07:54.2956334	1385	391	0.435000032
2024-09-25 06:08:54.2935054	1404	390	0.433500022
2024-09-25 06:09:54.2914573	1410	389	0.437125027
2024-09-25 06:10:54.2960257	1389	388	0.437125027
2024-09-25 06:11:54.2981518	1401	388	0.436375022
2024-09-25 06:12:54.2931331	1410	389	0.435500026
2024-09-25 06:13:54.3000418	1391	390	0.435125023
2024-09-25 06:14:54.3003152	1399	390	0.436000019
2024-09-25 06:15:54.2969192	1407	390	0.431750029
2024-09-25 06:16:54.2909562	1396	390	0.433875024
2024-09-25 06:17:54.2923684	1395	388	0.434375018
2024-09-25 06:18:54.2933085	1405	396	0.432500035
2024-09-25 06:19:54.2908997	1402	395	0.435875028
2024-09-25 06:20:54.2954043	1398	385	0.435500026
2024-09-25 06:21:54.2962343	1398	386	0.436750025
2024-09-25 06:22:54.2998864	1399	393	0.435500026
2024-09-25 06:23:54.2902732	1405	394	0.436750025
2024-09-25 06:24:54.2884979	1402	391	0.437375009
2024-09-25 06:25:54.2872882	1390	388	0.434875011
2024-09-25 06:26:54.2976148	1403	388	0.43612501
2024-09-25 06:27:54.2989248	1409	387	0.435875028
2024-09-25 06:28:54.2913453	1386	391	0.434375018
2024-09-25 06:29:54.3012254	1403	392	0.435000032

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
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2024-09-25 06:31:54.3006025	1386	392	0.432625026
2024-09-25 06:32:54.2918389	1404	392	0.436250031
2024-09-25 06:33:54.2995785	1411	390	0.435875028
2024-09-25 06:34:54.2989015	1387	388	0.437250018
2024-09-25 06:35:54.2910229	1402	388	0.436250031
2024-09-25 06:36:54.2922854	1411	388	0.437000006
2024-09-25 06:37:54.2918851	1386	390	0.436750025
2024-09-25 06:38:54.2877039	1402	393	0.435875028
2024-09-25 06:39:54.2878849	1412	393	0.437125027
2024-09-25 06:40:54.2882777	1389	390	0.43612501
2024-09-25 06:41:54.2969835	1397	388	0.436000019
2024-09-25 06:42:54.2907929	1409	387	0.433500022
2024-09-25 06:43:54.2978065	1399	387	0.435125023
2024-09-25 06:44:54.2874118	1392	394	0.432500035
2024-09-25 06:45:54.3002199	1403	396	0.435500026
2024-09-25 06:46:54.3012398	1409	388	0.434750021
2024-09-25 06:47:54.2963028	1395	384	0.435125023
2024-09-25 06:48:54.2959855	1394	391	0.434875011
2024-09-25 06:49:54.2946461	1409	394	0.43750003
2024-09-25 06:50:54.2897931	1402	391	0.436875015
2024-09-25 06:51:54.2997492	1386	389	0.436375022
2024-09-25 06:52:54.2968230	1407	388	0.436750025
2024-09-25 06:53:54.2953646	1408	387	0.435250014
2024-09-25 06:54:54.2890970	1386	390	0.434750021
2024-09-25 06:55:54.3021561	1404	392	0.436250031
2024-09-25 06:56:54.2995518	1411	391	0.435125023
2024-09-25 06:57:54.2964278	1385	392	0.435125023
2024-09-25 06:58:54.3016560	1405	393	0.437000006
2024-09-25 06:59:54.3029306	1410	390	0.438125014
2024-09-25 07:00:54.3031620	1388	387	0.438250035
2024-09-25 07:01:54.3125326	1399	387	0.43750003
2024-09-25 07:02:54.3160648	1412	389	0.437375009
2024-09-25 07:03:54.3113630	1391	390	0.438250035
2024-09-25 07:04:54.3162244	1396	393	0.436750025
2024-09-25 07:05:54.3166643	1412	393	0.437125027
2024-09-25 07:06:54.3131573	1396	390	0.436875015
2024-09-25 07:07:54.3137979	1392	389	0.434375018
2024-09-25 07:08:54.3196321	1406	388	0.434875011
2024-09-25 07:09:54.3249171	1406	387	0.434375018
2024-09-25 07:10:54.3260760	1391	392	0.434375018
2024-09-25 07:11:54.3217035	1398	397	0.434250027
2024-09-25 07:12:54.3221192	1412	389	0.435500026
2024-09-25 07:13:54.3341020	1395	384	0.438125014
2024-09-25 07:14:54.3360368	1391	390	0.435750008
2024-09-25 07:15:54.3371990	1412	394	0.437000006
2024-09-25 07:16:54.3442145	1400	391	0.438000023
2024-09-25 07:17:54.3366904	1387	389	0.435750008
2024-09-25 07:18:54.3405129	1410	388	0.436000019
2024-09-25 07:19:54.3419503	1406	388	0.435125023
2024-09-25 07:20:54.3433812	1384	389	0.434875011
2024-09-25 07:21:54.3358115	1408	391	0.43462503
2024-09-25 07:22:54.3413755	1408	392	0.433125019
2024-09-25 07:23:54.3414656	1385	391	0.435750008
2024-09-25 07:24:54.3362570	1406	393	0.43612501
2024-09-25 07:25:54.3456430	1409	390	0.435750008
2024-09-25 07:26:54.3356430	1388	387	0.435875028
2024-09-25 07:27:54.3369461	1397	388	0.436250031
2024-09-25 07:28:54.3340190	1411	389	0.438000023
2024-09-25 07:29:54.3398723	1395	389	0.435875028
2024-09-25 07:30:54.3429599	1392	391	0.436000019
2024-09-25 07:31:54.3389681	1411	392	0.434000015
2024-09-25 07:32:54.3426912	1401	392	0.435750008
2024-09-25 07:33:54.3357835	1390	390	0.436250031
2024-09-25 07:34:54.3450892	1403	388	0.435375035

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
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2024-09-25 07:36:54.3379562	1392	388	0.433875024
2024-09-25 07:37:54.3395186	1395	394	0.435000032
2024-09-25 07:38:54.3351732	1412	395	0.434750021
2024-09-25 07:39:54.3472311	1397	387	0.435250014
2024-09-25 07:40:54.3456104	1389	387	0.433500022
2024-09-25 07:41:54.3441776	1410	390	0.437875032
2024-09-25 07:42:54.3391356	1403	392	0.43750003
2024-09-25 07:43:54.3476524	1388	391	0.435625017
2024-09-25 07:44:54.3410517	1407	390	0.436375022
2024-09-25 07:45:54.3493539	1408	390	0.436500013
2024-09-25 07:46:54.3460974	1386	389	0.436500013
2024-09-25 07:47:54.3399152	1402	389	0.435500026
2024-09-25 07:48:54.3645059	1413	390	0.435000032
2024-09-25 07:49:54.4039178	1387	389	0.434875011
2024-09-25 07:50:54.4422910	1399	394	0.435625017
2024-09-25 07:51:54.4783365	1413	394	0.43750003
2024-09-25 07:52:54.5174052	1391	388	0.437125027
2024-09-25 07:53:54.5439583	1394	387	0.442750007
2024-09-25 07:54:54.5532541	1410	387	0.443500012
2024-09-25 07:55:54.5700391	1400	390	0.442000031
2024-09-25 07:56:54.5862413	1391	392	0.443875015
2024-09-25 07:57:54.5921104	1405	394	0.44312501
2024-09-25 07:58:54.6106555	1408	391	0.442875028
2024-09-25 07:59:54.6154702	1393	386	0.443875015
2024-09-25 08:00:54.6099640	1393	386	0.441875011
2024-09-25 08:01:54.6189533	1411	391	0.44325003
2024-09-25 08:02:54.6255457	1399	390	0.442375034
2024-09-25 08:03:54.6329137	1390	393	0.441625029
2024-09-25 08:04:54.6286763	1406	393	0.442500025
2024-09-25 08:05:54.6240126	1408	388	0.443500012
2024-09-25 08:06:54.6362687	1391	387	0.442125022
2024-09-25 08:07:54.6276830	1399	389	0.444500029
2024-09-25 08:08:54.6336250	1412	391	0.443000019
2024-09-25 08:09:54.6357310	1392	391	0.445125014
2024-09-25 08:10:54.6408798	1393	390	0.443500012
2024-09-25 08:11:54.6279573	1417	390	0.443625033
2024-09-25 08:12:54.6287014	1391	388	0.443500012
2024-09-25 08:13:54.6317849	1391	389	0.441875011
2024-09-25 08:14:54.6396789	1418	391	0.443750024
2024-09-25 08:15:54.6405290	1391	389	0.44325003
2024-09-25 08:16:54.6430511	1393	392	0.441250026
2024-09-25 08:17:54.6417649	1416	392	0.444875032
2024-09-25 08:18:54.6450656	1392	392	0.445500016
2024-09-25 08:19:54.6444759	1394	390	0.445125014
2024-09-25 08:20:54.6461560	1410	390	0.444875032
2024-09-25 08:21:54.6502187	1400	390	0.445500016
2024-09-25 08:22:54.6534831	1390	388	0.446250021
2024-09-25 08:23:54.6550824	1406	389	0.444750011
2024-09-25 08:24:54.6554001	1407	389	0.443625033
2024-09-25 08:25:54.6482466	1391	388	0.443750024
2024-09-25 08:26:54.6502005	1395	391	0.44175002
2024-09-25 08:27:54.6623862	1410	392	0.443625033
2024-09-25 08:28:54.6650017	1400	389	0.443750024
2024-09-25 08:29:54.6771641	1389	392	0.442000031
2024-09-25 08:30:54.6797955	1406	393	0.443625033
2024-09-25 08:31:54.6816789	1409	388	0.443625033
2024-09-25 08:32:54.6881994	1389	386	0.446250021
2024-09-25 08:33:54.6800581	1400	389	0.445625007
2024-09-25 08:34:54.6783874	1414	392	0.445375025
2024-09-25 08:35:54.6798384	1389	391	0.444875032
2024-09-25 08:36:54.6822556	1394	390	0.444750011
2024-09-25 08:37:54.6916547	1418	389	0.445500016
2024-09-25 08:38:54.6848566	1389	387	0.443625033
2024-09-25 08:39:54.6853777	1392	392	0.442875028

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
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2024-09-25 08:41:54.6872355	1393	391	0.443875015
2024-09-25 08:42:54.6900842	1393	390	0.442125022
2024-09-25 08:43:54.6900171	1416	391	0.445125014
2024-09-25 08:44:54.6806040	1392	391	0.444375008
2024-09-25 08:45:54.6826661	1395	389	0.44600001
2024-09-25 08:46:54.6845151	1409	389	0.444250017
2024-09-25 08:47:54.6878653	1399	389	0.44462502
2024-09-25 08:48:54.6923106	1390	388	0.446500033
2024-09-25 08:49:54.6788731	1408	390	0.445625007
2024-09-25 08:50:54.6771338	1404	391	0.444000036
2024-09-25 08:51:54.6816551	1391	390	0.445625007
2024-09-25 08:52:54.6858195	1399	391	0.445125014
2024-09-25 08:53:54.6823769	1404	390	0.444375008
2024-09-25 08:54:54.6886211	1404	389	0.444750011
2024-09-25 08:55:54.6867088	1398	389	0.443000019
2024-09-25 08:56:54.6809767	1394	392	0.444375008
2024-09-25 08:57:54.6797367	1406	392	0.446250021
2024-09-25 08:58:54.6773922	1405	390	0.445125014
2024-09-25 08:59:54.6788353	1388	390	0.447000027
2024-09-25 09:00:54.6879759	1407	390	0.447750032
2024-09-25 09:01:54.6860341	1407	389	0.447375029
2024-09-25 09:02:54.6904313	1381	388	0.447125018
2024-09-25 09:03:54.6801654	1412	389	0.445125014
2024-09-25 09:04:54.6781327	1406	388	0.446250021
2024-09-25 09:05:54.6908941	1380	390	0.443500012
2024-09-25 09:06:54.6870171	1416	391	0.446125031
2024-09-25 09:07:54.6829241	1402	391	0.44600001
2024-09-25 09:08:54.6890032	1384	391	0.446625024
2024-09-25 09:09:54.6798015	1416	393	0.44750002
2024-09-25 09:10:54.6810630	1398	390	0.447250009
2024-09-25 09:11:54.6886020	1389	386	0.446875036
2024-09-25 09:12:54.6786034	1408	387	0.447125018
2024-09-25 09:13:54.6835679	1405	391	0.44750002
2024-09-25 09:14:54.6848551	1388	389	0.448375016
2024-09-25 09:15:54.6786622	1405	391	0.446250021
2024-09-25 09:16:54.6787303	1408	392	0.448500007
2024-09-25 09:17:54.6829819	1389	391	0.448000014
2024-09-25 09:18:54.6809567	1403	390	0.446250021
2024-09-25 09:19:54.6869112	1405	390	0.447125018
2024-09-25 09:20:54.6916924	1400	388	0.445250034
2024-09-25 09:21:54.6776866	1395	387	0.446625024
2024-09-25 09:22:54.6822299	1398	391	0.445625007
2024-09-25 09:23:54.6834140	1408	393	0.447000027
2024-09-25 09:24:54.6836309	1401	391	0.447625011
2024-09-25 09:25:54.6886897	1390	390	0.446875036
2024-09-25 09:26:54.6871169	1405	390	0.44887501
2024-09-25 09:27:54.6903371	1408	389	0.448625028
2024-09-25 09:28:54.6904761	1386	389	0.445375025
2024-09-25 09:29:54.6810555	1404	388	0.447625011
2024-09-25 09:30:54.6824146	1412	387	0.444000036
2024-09-25 09:31:54.6821991	1382	392	0.445125014
2024-09-25 09:32:54.6823381	1406	393	0.445625007
2024-09-25 09:33:54.6920106	1412	392	0.445000023
2024-09-25 09:34:54.6792813	1381	388	0.447000027
2024-09-25 09:35:54.6813653	1410	390	0.445875019
2024-09-25 09:36:54.6775723	1405	392	0.446500033
2024-09-25 09:37:54.6879525	1385	389	0.447125018
2024-09-25 09:38:54.6797329	1407	389	0.446875036
2024-09-25 09:39:54.6916070	1405	390	0.445875019
2024-09-25 09:40:54.6851957	1389	388	0.446875036
2024-09-25 09:41:54.6880174	1403	389	0.446125031
2024-09-25 09:42:54.6801528	1408	390	0.44600001
2024-09-25 09:43:54.6865776	1396	391	0.445750028
2024-09-25 09:44:54.6888763	1395	390	0.445875019

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 09:45:54.6841245	1399	389	0.447250009
2024-09-25 09:46:54.6816574	1405	388	0.444250017
2024-09-25 09:47:54.6910364	1402	389	0.446375012
2024-09-25 09:48:54.6824836	1393	397	0.444750011
2024-09-25 09:49:54.6869401	1399	391	0.44600001
2024-09-25 09:50:54.6830211	1408	384	0.446750015
2024-09-25 09:51:54.6903235	1395	388	0.445875019
2024-09-25 09:52:54.6816868	1394	393	0.448125035
2024-09-25 09:53:54.6886561	1411	393	0.448250026
2024-09-25 09:54:54.6772541	1399	391	0.446375012
2024-09-25 09:55:54.6772121	1388	389	0.446625024
2024-09-25 09:56:54.6873115	1414	388	0.446375012
2024-09-25 09:57:54.6831261	1398	387	0.44312501
2024-09-25 09:58:54.6811404	1385	390	0.445625007
2024-09-25 09:59:54.6878755	1420	392	0.446500033
2024-09-25 10:00:54.6901355	1391	390	0.44600001
2024-09-25 10:01:54.6812375	1393	392	0.444750011
2024-09-25 10:02:54.6921580	1417	392	0.44750002
2024-09-25 10:03:54.6870474	1389	388	0.447625011
2024-09-25 10:04:54.6773185	1395	388	0.444875032
2024-09-25 10:05:54.6819564	1413	389	0.446375012
2024-09-25 10:06:54.6770805	1394	389	0.448125035
2024-09-25 10:07:54.6820908	1393	391	0.448750019
2024-09-25 10:08:54.6772242	1411	392	0.449125022
2024-09-25 10:09:54.6790974	1400	393	0.449500024
2024-09-25 10:10:54.6790955	1391	389	0.450625032
2024-09-25 10:11:54.6808390	1400	389	0.448125035
2024-09-25 10:12:54.6853683	1407	388	0.447250009
2024-09-25 10:13:54.6856197	1401	386	0.445750028
2024-09-25 10:14:54.6893185	1393	394	0.442375034
2024-09-25 10:15:54.6839565	1399	395	0.445000023
2024-09-25 10:16:54.6822718	1409	387	0.444875032
2024-09-25 10:17:54.6901620	1398	386	0.44600001
2024-09-25 10:18:54.6776189	1391	390	0.445125014
2024-09-25 10:19:54.6820362	1413	393	0.445500016
2024-09-25 10:20:54.6898392	1399	392	0.445875019
2024-09-25 10:21:54.6802628	1386	390	0.446250021
2024-09-25 10:22:54.6875391	1418	390	0.445625007
2024-09-25 10:23:54.6899376	1394	388	0.446125031
2024-09-25 10:24:54.6840820	1387	388	0.44462502
2024-09-25 10:25:54.6783210	1421	389	0.445125014
2024-09-25 10:26:54.6876371	1389	388	0.446625024
2024-09-25 10:27:54.6785273	1395	393	0.445625007
2024-09-25 10:28:54.6831843	1418	395	0.44600001
2024-09-25 10:29:54.6915855	1385	389	0.448125035
2024-09-25 10:30:54.6918491	1400	386	0.448000014
2024-09-25 10:31:54.6852348	1411	387	0.44750002
2024-09-25 10:32:54.6860811	1394	392	0.448750019
2024-09-25 10:33:54.6815500	1394	391	0.448750019
2024-09-25 10:34:54.6912617	1409	393	0.44600001
2024-09-25 10:35:54.6910704	1400	391	0.445875019
2024-09-25 10:36:54.6783332	1391	387	0.448250026
2024-09-25 10:37:54.6829739	1402	387	0.446125031
2024-09-25 10:38:54.6843358	1406	388	0.44600001
2024-09-25 10:39:54.6850584	1398	389	0.44600001
2024-09-25 10:40:54.6902138	1395	395	0.440875024
2024-09-25 10:41:54.6822335	1401	396	0.44312501
2024-09-25 10:42:54.6872834	1408	387	0.443750024
2024-09-25 10:43:54.6903365	1397	385	0.445625007
2024-09-25 10:44:54.6810723	1391	391	0.444875032
2024-09-25 10:45:54.6912155	1410	393	0.446375012
2024-09-25 10:46:54.6833737	1403	392	0.446500033
2024-09-25 10:47:54.6910914	1382	389	0.445125014
2024-09-25 10:48:54.6893712	1414	388	0.444375008
2024-09-25 10:49:54.6921112	1401	387	0.44462502

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 10:50:54.6852880	1382	389	0.442625016
2024-09-25 10:51:54.6911212	1417	392	0.44462502
2024-09-25 10:52:54.6772843	1398	391	0.442750007
2024-09-25 10:53:54.6781591	1387	391	0.444000036
2024-09-25 10:54:54.6868528	1416	393	0.445875019
2024-09-25 10:55:54.6837806	1397	391	0.447125018
2024-09-25 10:56:54.6859281	1390	387	0.445500016
2024-09-25 10:57:54.6800556	1408	388	0.44750002
2024-09-25 10:58:54.6855800	1404	389	0.446375012
2024-09-25 10:59:54.6920179	1388	389	0.447250009
2024-09-25 11:00:54.6839084	1403	392	0.446750015
2024-09-25 11:01:54.6870315	1409	393	0.446375012
2024-09-25 11:02:54.6780387	1395	391	0.448000014
2024-09-25 11:03:54.6825097	1393	389	0.443625033
2024-09-25 11:04:54.6881992	1404	388	0.444375008
2024-09-25 11:05:54.6790908	1407	387	0.445125014
2024-09-25 11:06:54.6834759	1395	391	0.441875011
2024-09-25 11:07:54.6867529	1394	396	0.449625015
2024-09-25 11:08:54.6880947	1410	390	0.451625019
2024-09-25 11:09:54.6861039	1401	385	0.450375021
2024-09-25 11:10:54.6851004	1387	389	0.450750023
2024-09-25 11:11:54.6862966	1411	393	0.448375016
2024-09-25 11:12:54.6870613	1403	392	0.446875036
2024-09-25 11:13:54.6890586	1384	391	0.445125014
2024-09-25 11:14:54.6874215	1411	389	0.445500016
2024-09-25 11:15:54.6872904	1406	387	0.44600001
2024-09-25 11:16:54.6913157	1383	388	0.442750007
2024-09-25 11:17:54.6776123	1409	390	0.445625007
2024-09-25 11:18:54.6862691	1408	392	0.443375021
2024-09-25 11:19:54.6920515	1384	391	0.446250021
2024-09-25 11:20:54.6911595	1409	392	0.446750015
2024-09-25 11:21:54.6808366	1406	391	0.444875032
2024-09-25 11:22:54.6881740	1386	388	0.445500016
2024-09-25 11:23:54.6871476	1404	388	0.445125014
2024-09-25 11:24:54.6876272	1408	388	0.447750032
2024-09-25 11:25:54.6920254	1391	388	0.446500033
2024-09-25 11:26:54.6925120	1398	393	0.445625007
2024-09-25 11:27:54.6892111	1411	395	0.447750032
2024-09-25 11:28:54.6894920	1397	388	0.445125014
2024-09-25 11:29:54.6814725	1393	386	0.446750015
2024-09-25 11:30:54.6816829	1403	387	0.445125014
2024-09-25 11:31:54.6812476	1408	391	0.445375025
2024-09-25 11:32:54.6789942	1397	392	0.444375008
2024-09-25 11:33:54.6856220	1393	394	0.441625029
2024-09-25 11:34:54.6919488	1405	391	0.444500029
2024-09-25 11:35:54.6880853	1407	386	0.445250034
2024-09-25 11:36:54.6820356	1390	387	0.444125026
2024-09-25 11:37:54.6788957	1400	390	0.448250026
2024-09-25 11:38:54.6865103	1411	391	0.446125031
2024-09-25 11:39:54.6853593	1392	391	0.443875015
2024-09-25 11:40:54.6844407	1396	390	0.446625024
2024-09-25 11:41:54.6838472	1416	389	0.446500033
2024-09-25 11:42:54.6900518	1391	388	0.445875019
2024-09-25 11:43:54.6875810	1393	391	0.446250021
2024-09-25 11:44:54.6819362	1419	392	0.445000023
2024-09-25 11:45:54.6884362	1386	390	0.446125031
2024-09-25 11:46:54.6793935	1399	392	0.446125031
2024-09-25 11:47:54.6786275	1415	391	0.447375029
2024-09-25 11:48:54.6840264	1385	387	0.446625024
2024-09-25 11:49:54.6796982	1398	387	0.445750028
2024-09-25 11:50:54.6905632	1413	389	0.447625011
2024-09-25 11:51:54.6858375	1392	390	0.448750019
2024-09-25 11:52:54.6879192	1395	391	0.44750002
2024-09-25 11:53:54.6906583	1411	392	0.446125031
2024-09-25 11:54:54.6902450	1398	392	0.443875015

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
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2024-09-25 11:56:54.6790744	1403	388	0.443750024
2024-09-25 11:57:54.6794010	1408	388	0.443625033
2024-09-25 11:58:54.6893669	1393	387	0.443000019
2024-09-25 11:59:54.6823566	1394	395	0.441625029
2024-09-25 12:00:54.6779412	1410	395	0.442750007
2024-09-25 12:01:54.6901591	1402	385	0.444125026
2024-09-25 12:02:54.6926743	1388	385	0.444875032
2024-09-25 12:03:54.6893431	1405	393	0.445125014
2024-09-25 12:04:54.6790553	1411	394	0.445250034
2024-09-25 12:05:54.6836820	1388	390	0.443375021
2024-09-25 12:06:54.6891360	1399	388	0.441375017
2024-09-25 12:07:54.6783624	1416	388	0.441125035
2024-09-25 12:08:54.6883405	1384	387	0.44037503
2024-09-25 12:09:54.6771853	1398	390	0.439750016
2024-09-25 12:10:54.6834996	1418	392	0.439875007
2024-09-25 12:11:54.6801946	1384	390	0.440500021
2024-09-25 12:12:54.6821895	1400	392	0.443375021
2024-09-25 12:13:54.6879309	1415	391	0.448000014
2024-09-25 12:14:54.6863381	1387	387	0.450750023
2024-09-25 12:15:54.6780410	1399	387	0.445125014
2024-09-25 12:16:54.6888700	1411	389	0.448250026
2024-09-25 12:17:54.6787791	1394	392	0.445375025
2024-09-25 12:18:54.6920957	1395	391	0.446375012
2024-09-25 12:19:54.6859914	1409	392	0.444000036
2024-09-25 12:20:54.6794490	1400	391	0.44325003
2024-09-25 12:21:54.7081633	1391	388	0.442750007
2024-09-25 12:22:54.7412637	1399	387	0.443375021
2024-09-25 12:23:54.7839288	1406	388	0.440750033
2024-09-25 12:24:54.8233563	1403	390	0.440875024
2024-09-25 12:25:54.8626890	1392	395	0.438000023
2024-09-25 12:26:54.8876461	1399	393	0.440875024
2024-09-25 12:27:54.8998795	1409	386	0.442750007
2024-09-25 12:28:54.9105346	1397	386	0.441250026
2024-09-25 12:29:54.9195210	1391	391	0.442500025
2024-09-25 12:30:54.9357196	1411	393	0.443000019
2024-09-25 12:31:54.9504660	1402	392	0.442875028
2024-09-25 12:32:54.9481111	1384	389	0.443000019
2024-09-25 12:33:54.9602452	1417	388	0.442500025
2024-09-25 12:34:54.9596745	1397	387	0.442125022
2024-09-25 12:35:54.9591837	1383	389	0.440875024
2024-09-25 12:36:54.9645990	1420	391	0.440125018
2024-09-25 12:37:54.9628624	1393	390	0.440750033
2024-09-25 12:38:54.9695674	1391	392	0.441375017
2024-09-25 12:39:54.9774420	1417	393	0.440875024
2024-09-25 12:40:54.9730409	1392	389	0.441125035
2024-09-25 12:41:54.9769714	1394	386	0.441875011
2024-09-25 12:42:54.9804538	1409	388	0.444000036
2024-09-25 12:43:54.9800115	1400	393	0.444500029
2024-09-25 12:44:54.9740158	1390	391	0.44462502
2024-09-25 12:45:54.9774114	1406	392	0.442750007
2024-09-25 12:46:54.9788149	1406	391	0.442000031
2024-09-25 12:47:54.9716688	1390	387	0.442625016
2024-09-25 12:48:54.9726136	1399	387	0.442000031
2024-09-25 12:49:54.9846440	1405	389	0.441875011
2024-09-25 12:50:54.9742829	1404	390	0.439125031
2024-09-25 12:51:54.9822786	1394	392	0.438000023
2024-09-25 12:52:54.9790995	1396	395	0.440750033
2024-09-25 12:53:54.9858267	1410	390	0.441125035
2024-09-25 12:54:54.9722221	1399	386	0.442125022
2024-09-25 12:55:54.9782336	1389	387	0.44312501
2024-09-25 12:56:54.9809181	1413	391	0.444375008
2024-09-25 12:57:54.9837851	1400	391	0.444125026
2024-09-25 12:58:54.9737132	1384	391	0.444000036
2024-09-25 12:59:54.9778226	1417	390	0.444250017

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
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2024-09-25 13:01:54.9787795	1386	389	0.442250013
2024-09-25 13:02:54.9835709	1416	390	0.44325003
2024-09-25 13:03:54.9747191	1398	392	0.442125022
2024-09-25 13:04:54.9780638	1389	391	0.445750028
2024-09-25 13:05:54.9769100	1414	393	0.443625033
2024-09-25 13:06:54.9846024	1398	391	0.449500024
2024-09-25 13:07:54.9779980	1391	387	0.450500011
2024-09-25 13:08:54.9729686	1404	387	0.451125026
2024-09-25 13:09:54.9802985	1407	389	0.451250017
2024-09-25 13:10:54.9837440	1394	389	0.450875014
2024-09-25 13:11:54.9758122	1396	391	0.450625032
2024-09-25 13:12:54.9744615	1407	392	0.45175001
2024-09-25 13:13:54.9844900	1404	391	0.451250017
2024-09-25 13:14:54.9770042	1391	391	0.448375016
2024-09-25 13:15:54.9779392	1399	389	0.448750019
2024-09-25 13:16:54.9723234	1412	387	0.447875023
2024-09-25 13:17:54.9758355	1393	388	0.447625011
2024-09-25 13:18:54.9757497	1393	394	0.44750002
2024-09-25 13:19:54.9778981	1414	394	0.447625011
2024-09-25 13:20:54.9802859	1395	389	0.449125022
2024-09-25 13:21:54.9723322	1390	388	0.447625011
2024-09-25 13:22:54.9767598	1413	389	0.447750032
2024-09-25 13:23:54.9828902	1399	389	0.449625015
2024-09-25 13:24:54.9814565	1386	389	0.448625028
2024-09-25 13:25:54.9731454	1412	391	0.450625032
2024-09-25 13:26:54.9728650	1404	390	0.448500007
2024-09-25 13:27:54.9797545	1385	391	0.448375016
2024-09-25 13:28:54.9767635	1408	391	0.44750002
2024-09-25 13:29:54.9836880	1408	390	0.449125022
2024-09-25 13:30:54.9794653	1384	390	0.44887501
2024-09-25 13:31:54.9830502	1407	392	0.450875014
2024-09-25 13:32:54.9763753	1407	392	0.450000018
2024-09-25 13:33:54.9794359	1387	388	0.45025003
2024-09-25 13:34:54.9766039	1399	388	0.450125009
2024-09-25 13:35:54.9734990	1409	388	0.451625019
2024-09-25 13:36:54.9802467	1398	388	0.450625032
2024-09-25 13:37:54.9759736	1392	391	0.451250017
2024-09-25 13:38:54.9832098	1406	393	0.450000018
2024-09-25 13:39:54.9745040	1406	392	0.449250013
2024-09-25 13:40:54.9778221	1393	390	0.451250017
2024-09-25 13:41:54.9741615	1394	388	0.450000018
2024-09-25 13:42:54.9794914	1413	388	0.447250009
2024-09-25 13:43:54.9795329	1396	387	0.447625011
2024-09-25 13:44:54.9796239	1389	395	0.448625028
2024-09-25 13:45:54.9783091	1413	393	0.448125035
2024-09-25 13:46:54.9761350	1401	386	0.448750019
2024-09-25 13:47:54.9740439	1387	386	0.449000031
2024-09-25 13:48:54.9872487	1411	392	0.449125022
2024-09-25 13:49:54.9953367	1404	393	0.448750019
2024-09-25 13:50:54.9948884	1387	392	0.45025003
2024-09-25 13:51:54.9887500	1407	389	0.44887501
2024-09-25 13:52:54.9985317	1409	388	0.450125009
2024-09-25 13:53:55.0000353	1387	387	0.44887501
2024-09-25 13:54:54.9874138	1399	390	0.446625024
2024-09-25 13:55:54.9911042	1414	393	0.448625028
2024-09-25 13:56:54.9871208	1389	389	0.448750019
2024-09-25 13:57:54.9961858	1397	391	0.448000014
2024-09-25 13:58:55.0021315	1413	393	0.449875027
2024-09-25 13:59:54.9958719	1395	390	0.449125022
2024-09-25 14:00:54.9890505	1391	388	0.44887501
2024-09-25 14:01:54.9873867	1409	388	0.451250017
2024-09-25 14:02:54.9881850	1404	388	0.450375021
2024-09-25 14:03:54.9941428	1390	391	0.452875018
2024-09-25 14:04:54.9891176	1402	394	0.455750018

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 14:05:54.9941675	1410	392	0.453375012
2024-09-25 14:06:55.0012460	1393	388	0.451250017
2024-09-25 14:07:55.0002644	1391	388	0.451250017
2024-09-25 14:08:54.9974422	1414	388	0.436250031
2024-09-25 14:09:55.0012581	1396	387	0.436875015
2024-09-25 14:10:54.9938204	1389	394	0.436375022
2024-09-25 14:11:54.9940402	1413	396	0.434750021
2024-09-25 14:12:54.9891825	1400	387	0.437000006
2024-09-25 14:13:55.0017839	1388	385	0.435875028
2024-09-25 14:14:54.9908914	1410	391	0.438375026
2024-09-25 14:15:54.9883861	1406	394	0.438375026
2024-09-25 14:16:54.9868483	1388	391	0.437250018
2024-09-25 14:17:54.9892921	1401	388	0.437875032
2024-09-25 14:18:54.9991437	1412	387	0.437250018
2024-09-25 14:19:54.9888316	1389	387	0.436500013
2024-09-25 14:20:54.9948790	1393	392	0.431250006
2024-09-25 14:21:54.9869748	1415	392	0.431375027
2024-09-25 14:22:54.9913276	1395	389	0.43037501
2024-09-25 14:23:54.9948114	1390	391	0.430125028
2024-09-25 14:24:54.9888335	1412	392	0.432250023
2024-09-25 14:25:54.9963794	1400	389	0.431125015
2024-09-25 14:26:54.9955317	1389	387	0.432750016
2024-09-25 14:27:54.9944120	1403	388	0.434000015
2024-09-25 14:28:54.9975514	1408	389	0.432375014
2024-09-25 14:29:55.0010594	1391	390	0.433625013
2024-09-25 14:30:54.9875589	1398	392	0.433375031
2024-09-25 14:31:54.9879685	1411	391	0.431500018
2024-09-25 14:32:54.9873755	1395	390	0.431250006
2024-09-25 14:33:54.9982498	1391	389	0.431750029
2024-09-25 14:34:55.0033273	1411	389	0.431500018
2024-09-25 14:35:55.0051006	1401	387	0.428625017
2024-09-25 14:36:55.0049061	1389	394	0.425875008
2024-09-25 14:37:55.0077319	1407	396	0.429875016
2024-09-25 14:38:55.0113794	1406	388	0.43187502
2024-09-25 14:39:55.0085871	1389	386	0.431750029
2024-09-25 14:40:55.0142893	1402	389	0.43037501
2024-09-25 14:41:55.0098836	1411	392	0.430875033
2024-09-25 14:42:55.0120554	1392	391	0.431125015
2024-09-25 14:43:55.0044138	1392	390	0.429625034
2024-09-25 14:44:55.0159306	1414	389	0.429500014
2024-09-25 14:45:55.0168604	1398	388	0.429625034
2024-09-25 14:46:55.0025187	1387	389	0.428250015
2024-09-25 14:47:55.0137247	1411	391	0.429500014
2024-09-25 14:48:55.0042743	1404	391	0.429875016
2024-09-25 14:49:55.0041852	1388	391	0.430625021
2024-09-25 14:50:55.0037742	1407	393	0.432750016
2024-09-25 14:51:55.0052354	1407	391	0.433000028
2024-09-25 14:52:55.0137355	1389	388	0.43325001
2024-09-25 14:53:55.0072336	1398	387	0.433875024
2024-09-25 14:54:55.0090396	1413	389	0.433500022
2024-09-25 14:55:55.0043238	1391	389	0.433875024
2024-09-25 14:56:55.0071693	1395	392	0.434000015
2024-09-25 14:57:55.0060108	1414	392	0.433750033
2024-09-25 14:58:55.0166691	1393	391	0.429875016
2024-09-25 14:59:55.0159478	1392	390	0.426750034
2024-09-25 15:00:55.0173181	1408	389	0.429250032
2024-09-25 15:01:55.0139962	1404	388	0.431625009
2024-09-25 15:02:55.0069472	1391	389	0.430500031
2024-09-25 15:03:55.0102041	1400	392	0.433500022
2024-09-25 15:04:55.0034648	1412	393	0.436875015
2024-09-25 15:05:55.0145841	1395	390	0.437750012
2024-09-25 15:06:55.0113378	1392	389	0.435500026
2024-09-25 15:07:55.0171095	1411	391	0.44037503
2024-09-25 15:08:55.0161326	1401	390	0.439125031
2024-09-25 15:09:55.0068189	1385	390	0.438250035

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 15:10:55.0104155	1410	390	0.433000028
2024-09-25 15:11:55.0168478	1406	388	0.429875016
2024-09-25 15:12:55.0028163	1384	389	0.438625008
2024-09-25 15:13:55.0059305	1410	390	0.438250035
2024-09-25 15:14:55.0167447	1407	391	0.436375022
2024-09-25 15:15:55.0027286	1384	390	0.444000036
2024-09-25 15:16:55.0032050	1409	392	0.44325003
2024-09-25 15:17:55.0134130	1406	392	0.444375008
2024-09-25 15:18:55.0127944	1387	387	0.445000023
2024-09-25 15:19:55.0139426	1401	387	0.440750033
2024-09-25 15:20:55.0053585	1409	389	0.439125031
2024-09-25 15:21:55.0168464	1395	389	0.440000027
2024-09-25 15:22:55.0058536	1394	392	0.438125014
2024-09-25 15:23:55.0157290	1406	392	0.438500017
2024-09-25 15:24:55.0166378	1406	392	0.438375026
2024-09-25 15:25:55.0116798	1393	390	0.437250018
2024-09-25 15:26:55.0052923	1395	388	0.438000023
2024-09-25 15:27:55.0039304	1414	387	0.436625034
2024-09-25 15:28:55.0159935	1393	388	0.435375035
2024-09-25 15:29:55.0090191	1392	396	0.435000032
2024-09-25 15:30:55.0147026	1415	392	0.438750029
2024-09-25 15:31:55.0178970	1395	384	0.438750029
2024-09-25 15:32:55.0178989	1389	388	0.438750029
2024-09-25 15:33:55.0032936	1414	395	0.439625025
2024-09-25 15:34:55.0092132	1399	392	0.440250009
2024-09-25 15:35:55.0079721	1386	387	0.436750025
2024-09-25 15:36:55.0029595	1411	387	0.43900001
2024-09-25 15:37:55.0158409	1405	390	0.43900001
2024-09-25 15:38:55.0028172	1386	393	0.438000023
2024-09-25 15:39:55.0141656	1405	393	0.437750012
2024-09-25 15:40:55.0030015	1411	391	0.43750003
2024-09-25 15:41:55.0166602	1385	387	0.43750003
2024-09-25 15:42:55.0058876	1401	385	0.471375018
2024-09-25 15:43:55.0078788	1216	311	0.470875025
2024-09-25 15:44:55.0095029	1054	278	0.438375026
2024-09-25 15:45:55.0048854	929	253	0.368125021
2024-09-25 15:46:55.0032012	825	231	0.239125013
2024-09-25 15:47:55.0026185	735	214	0.073250003
2024-09-25 15:48:55.0058647	658	200	0.002125
2024-09-25 15:49:55.0144012	592	187	-0.000625
2024-09-25 15:50:55.0097081	535	176	-0.002625
2024-09-25 15:51:55.0027976	485	167	-0.003125
2024-09-25 15:52:55.0078233	443	161	-0.005125
2024-09-25 15:53:55.0086663	407	155	-0.006
2024-09-25 15:54:55.0153660	375	150	-0.005625
2024-09-25 15:55:55.0081578	348	145	-0.00625
2024-09-25 15:56:55.0046974	382	140	-0.0055
2024-09-25 15:57:55.0170180	431	139	-0.006125
2024-09-25 15:58:55.0062426	465	190	-0.003875
2024-09-25 15:59:55.0134111	491	224	-0.001375
2024-09-25 16:00:55.0138063	515	235	0
2024-09-25 16:01:55.0064432	555	238	0.000875
2024-09-25 16:02:55.0120273	820	268	0.0005
2024-09-25 16:03:55.0160415	790	290	0.001375
2024-09-25 16:04:55.0143498	832	296	0.0015
2024-09-25 16:05:55.0170343	966	321	0.002625
2024-09-25 16:06:55.0053958	944	337	0.002875
2024-09-25 16:07:55.0114166	1064	357	0.003875
2024-09-25 16:08:55.0158106	1101	379	0.005125
2024-09-25 16:09:55.0159977	1146	397	0.005875
2024-09-25 16:10:55.0098891	1236	421	0.006375
2024-09-25 16:11:55.0139887	1272	429	0.013875001
2024-09-25 16:12:55.0097977	1323	405	0.060625002
2024-09-25 16:13:55.0139294	1393	392	0.209875017
2024-09-25 16:14:55.0120455	1437	392	0.347375005

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 16:15:55.0111945	1410	391	0.416625023
2024-09-25 16:16:55.0127131	1382	389	0.408000022
2024-09-25 16:17:55.0072410	1405	389	0.411625028
2024-09-25 16:18:55.0170264	1408	390	0.410750031
2024-09-25 16:19:55.0097851	1396	395	0.410750031
2024-09-25 16:20:55.0036630	1396	387	0.412125021
2024-09-25 16:21:55.0161777	1407	390	0.415000021
2024-09-25 16:22:55.0046325	1404	391	0.415500015
2024-09-25 16:23:55.0074239	1394	390	0.421500027
2024-09-25 16:24:55.0110882	1413	390	0.421000034
2024-09-25 16:25:55.0102689	1409	391	0.425500005
2024-09-25 16:26:55.0125778	1400	393	0.426625013
2024-09-25 16:27:55.0038982	1412	391	0.433000028
2024-09-25 16:28:55.0025928	1402	389	0.437250018
2024-09-25 16:29:55.0132511	1400	388	0.43900001
2024-09-25 16:30:55.0167898	1406	389	0.439500034
2024-09-25 16:31:55.0075624	1398	390	0.442000031
2024-09-25 16:32:55.0121257	1393	391	0.442125022
2024-09-25 16:33:55.0035492	1407	391	0.440750033
2024-09-25 16:34:55.0131204	1404	389	0.441625029
2024-09-25 16:35:55.0143111	1388	388	0.439500034
2024-09-25 16:36:55.0034484	1406	388	0.440125018
2024-09-25 16:37:55.0029511	1408	391	0.437125027
2024-09-25 16:38:55.0049348	1386	395	0.438375026
2024-09-25 16:39:55.0087964	1406	392	0.439125031
2024-09-25 16:40:55.0096292	1409	386	0.439875007
2024-09-25 16:41:55.0053440	1385	387	0.438750029
2024-09-25 16:42:55.0082133	1406	390	0.44037503
2024-09-25 16:43:55.0127570	1410	392	0.440875024
2024-09-25 16:44:55.0033924	1383	390	0.438125014
2024-09-25 16:45:55.0118271	1408	389	0.439500034
2024-09-25 16:46:55.0166088	1409	388	0.437250018
2024-09-25 16:47:55.0171066	1383	390	0.437125027
2024-09-25 16:48:55.0173576	1405	393	0.437000006
2024-09-25 16:49:55.0090092	1411	393	0.438500017
2024-09-25 16:50:55.0039317	1385	387	0.438000023
2024-09-25 16:51:55.0037638	1404	388	0.436875015
2024-09-25 16:52:55.0054420	1410	390	0.438500017
2024-09-25 16:53:55.0063153	1388	389	0.437375009
2024-09-25 16:54:55.0261832	1401	389	0.435250014
2024-09-25 16:55:55.0710815	1407	390	0.435500026
2024-09-25 16:56:55.1152151	1397	390	0.438375026
2024-09-25 16:57:55.1410012	1394	389	0.436875015
2024-09-25 16:58:55.1875292	1402	390	0.439875007
2024-09-25 16:59:55.2098760	1407	391	0.441125035
2024-09-25 17:00:55.2285953	1400	390	0.442250013
2024-09-25 17:01:55.2425631	1389	389	0.440750033
2024-09-25 17:02:55.2479866	1404	388	0.438000023
2024-09-25 17:03:55.2630212	1407	390	0.439125031
2024-09-25 17:04:55.2725160	1391	396	0.436750025
2024-09-25 17:05:55.2721992	1397	393	0.438375026
2024-09-25 17:06:55.2762235	1412	387	0.439125031
2024-09-25 17:07:55.2928452	1394	387	0.43900001
2024-09-25 17:08:55.2971639	1394	390	0.439375013
2024-09-25 17:09:55.2961955	1414	391	0.442375034
2024-09-25 17:10:55.2987313	1396	391	0.44175002
2024-09-25 17:11:55.2996990	1389	390	0.440250009
2024-09-25 17:12:55.2967260	1415	390	0.438625008
2024-09-25 17:13:55.2941175	1397	388	0.44037503
2024-09-25 17:14:55.3084697	1387	389	0.441000015
2024-09-25 17:15:55.2984221	1417	391	0.44037503
2024-09-25 17:16:55.3078095	1395	389	0.43900001
2024-09-25 17:17:55.3082052	1391	391	0.439250022
2024-09-25 17:18:55.2992978	1414	392	0.439875007
2024-09-25 17:19:55.2970625	1397	393	0.441125035

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 17:20:55.3003704	1391	390	0.442000031
2024-09-25 17:21:55.3005220	1407	390	0.44175002
2024-09-25 17:22:55.3072091	1405	390	0.443375021
2024-09-25 17:23:55.3017262	1390	389	0.444375008
2024-09-25 17:24:55.3120017	1401	391	0.439250022
2024-09-25 17:25:55.3120059	1410	391	0.442000031
2024-09-25 17:26:55.3023824	1395	390	0.439500034
2024-09-25 17:27:55.3102018	1391	389	0.436625034
2024-09-25 17:28:55.3104556	1406	388	0.438250035
2024-09-25 17:29:55.3141128	1406	387	0.437125027
2024-09-25 17:30:55.2990242	1391	391	0.434125006
2024-09-25 17:31:55.2996988	1398	395	0.436750025
2024-09-25 17:32:55.3121477	1411	390	0.436375022
2024-09-25 17:33:55.3044030	1397	386	0.439125031
2024-09-25 17:34:55.3035875	1391	387	0.43900001
2024-09-25 17:35:55.2987466	1410	390	0.440750033
2024-09-25 17:36:55.2995873	1402	391	0.441125035
2024-09-25 17:37:55.3043345	1387	391	0.438375026
2024-09-25 17:38:55.3087214	1406	390	0.441625029
2024-09-25 17:39:55.2987237	1407	388	0.440000027
2024-09-25 17:40:55.3016378	1388	388	0.436875015
2024-09-25 17:41:55.3023073	1401	391	0.437000006
2024-09-25 17:42:55.3090447	1411	391	0.441000015
2024-09-25 17:43:55.3002750	1386	391	0.436875015
2024-09-25 17:44:55.3077319	1404	391	0.439125031
2024-09-25 17:45:55.2986915	1410	392	0.435750008
2024-09-25 17:46:55.3001616	1388	389	0.43887502
2024-09-25 17:47:55.3013490	1400	388	0.441625029
2024-09-25 17:48:55.3055769	1412	389	0.432625026
2024-09-25 17:49:55.3095710	1390	387	0.43462503
2024-09-25 17:50:55.3060999	1398	391	0.437125027
2024-09-25 17:51:55.3009296	1412	393	0.43750003
2024-09-25 17:52:55.3026236	1395	391	0.437125027
2024-09-25 17:53:55.2988730	1392	391	0.434000015
2024-09-25 17:54:55.3011726	1405	389	0.435625017
2024-09-25 17:55:55.3042080	1407	388	0.434375018
2024-09-25 17:56:55.3102447	1394	388	0.434750021
2024-09-25 17:57:55.3089738	1396	392	0.434750021
2024-09-25 17:58:55.3118277	1410	394	0.434375018
2024-09-25 17:59:55.2998780	1400	390	0.435750008
2024-09-25 18:00:55.3052465	1389	389	0.436375022
2024-09-25 18:01:55.3082688	1407	390	0.436000019
2024-09-25 18:02:55.3050314	1406	388	0.436250031
2024-09-25 18:03:55.3112757	1386	389	0.434375018
2024-09-25 18:04:55.3075447	1406	389	0.435875028
2024-09-25 18:05:55.3106860	1410	388	0.435000032
2024-09-25 18:06:55.3120698	1385	390	0.436000019
2024-09-25 18:07:55.3048108	1404	392	0.434375018
2024-09-25 18:08:55.3039761	1412	392	0.435000032
2024-09-25 18:09:55.3066546	1384	392	0.437000006
2024-09-25 18:10:55.3008992	1407	391	0.435625017
2024-09-25 18:11:55.3014642	1409	390	0.436875015
2024-09-25 18:12:55.3038156	1385	387	0.438125014
2024-09-25 18:13:55.3097804	1402	388	0.438500017
2024-09-25 18:14:55.3137540	1410	389	0.439500034
2024-09-25 18:15:55.3124234	1393	389	0.439125031
2024-09-25 18:16:55.3099055	1395	392	0.434750021
2024-09-25 18:17:55.3058759	1407	392	0.439375013
2024-09-25 18:18:55.3078158	1404	392	0.439750016
2024-09-25 18:19:55.3103230	1394	390	0.438250035
2024-09-25 18:20:55.3000879	1393	389	0.438375026
2024-09-25 18:21:55.3007098	1412	388	0.43750003
2024-09-25 18:22:55.3015654	1398	387	0.436375022
2024-09-25 18:23:55.3107732	1389	392	0.436750025
2024-09-25 18:24:55.3040097	1412	395	0.436000019

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 18:25:55.3033099	1401	389	0.438125014
2024-09-25 18:26:55.2997548	1386	388	0.436250031
2024-09-25 18:27:55.3019167	1413	390	0.438750029
2024-09-25 18:28:55.3035352	1402	390	0.438500017
2024-09-25 18:29:55.3021155	1385	390	0.436750025
2024-09-25 18:30:55.2996512	1411	389	0.437750012
2024-09-25 18:31:55.3116895	1405	389	0.436750025
2024-09-25 18:32:55.3068687	1385	388	0.439125031
2024-09-25 18:33:55.2987722	1405	390	0.435375035
2024-09-25 18:34:55.3001900	1411	391	0.437625021
2024-09-25 18:35:55.3116601	1387	390	0.437875032
2024-09-25 18:36:55.3075386	1400	393	0.436750025
2024-09-25 18:37:55.3126203	1413	393	0.438625008
2024-09-25 18:38:55.3118519	1389	388	0.437875032
2024-09-25 18:39:55.3023590	1395	387	0.438125014
2024-09-25 18:40:55.3124966	1410	389	0.437625021
2024-09-25 18:41:55.3094296	1399	390	0.438000023
2024-09-25 18:42:55.3114306	1391	390	0.438625008
2024-09-25 18:43:55.3025666	1408	392	0.438000023
2024-09-25 18:44:55.2999320	1406	393	0.437625021
2024-09-25 18:45:55.3028190	1388	391	0.438000023
2024-09-25 18:46:55.3051541	1399	388	0.439125031
2024-09-25 18:47:55.2987461	1412	387	0.433875024
2024-09-25 18:48:55.3062178	1392	386	0.435375035
2024-09-25 18:49:55.3079361	1394	394	0.434500009
2024-09-25 18:50:55.3053113	1411	396	0.436000019
2024-09-25 18:51:55.3111054	1400	387	0.438375026
2024-09-25 18:52:55.2995079	1388	386	0.437250018
2024-09-25 18:53:55.3082132	1407	389	0.438750029
2024-09-25 18:54:55.3073114	1407	391	0.437750012
2024-09-25 18:55:55.3002031	1388	391	0.440750033
2024-09-25 18:56:55.2995308	1401	391	0.437125027
2024-09-25 18:57:55.3104839	1412	391	0.438500017
2024-09-25 18:58:55.2986117	1388	389	0.436250031
2024-09-25 18:59:55.2990717	1396	390	0.436750025
2024-09-25 19:00:55.2989565	1415	390	0.43612501
2024-09-25 19:01:55.3113811	1392	388	0.437125027
2024-09-25 19:02:55.3048116	1394	391	0.436500013
2024-09-25 19:03:55.3003813	1413	392	0.436375022
2024-09-25 19:04:55.3072913	1395	391	0.43750003
2024-09-25 19:05:55.3007620	1392	389	0.435250014
2024-09-25 19:06:55.3125549	1408	388	0.43750003
2024-09-25 19:07:55.3094827	1404	388	0.437750012
2024-09-25 19:08:55.3030980	1390	388	0.441625029
2024-09-25 19:09:55.3002208	1401	391	0.442750007
2024-09-25 19:10:55.3068994	1410	392	0.437875032
2024-09-25 19:11:55.3012155	1395	391	0.442625016
2024-09-25 19:12:55.3050370	1391	390	0.441375017
2024-09-25 19:13:55.3135641	1411	390	0.439125031
2024-09-25 19:14:55.3007111	1400	387	0.438375026
2024-09-25 19:15:55.3014039	1388	391	0.431750029
2024-09-25 19:16:55.3052348	1408	392	0.435500026
2024-09-25 19:17:55.3096931	1406	392	0.433500022
2024-09-25 19:18:55.3023361	1388	390	0.435000032
2024-09-25 19:19:55.3053449	1404	389	0.432750016
2024-09-25 19:20:55.3129991	1410	390	0.435500026
2024-09-25 19:21:55.3036144	1392	389	0.434750021
2024-09-25 19:22:55.3117552	1393	388	0.435250014
2024-09-25 19:23:55.3050598	1414	388	0.434000015
2024-09-25 19:24:55.3087493	1395	388	0.433875024
2024-09-25 19:25:55.3057965	1389	391	0.434375018
2024-09-25 19:26:55.3134287	1414	392	0.434125006
2024-09-25 19:27:55.3052558	1399	391	0.434125006
2024-09-25 19:28:55.3036662	1389	392	0.434125006
2024-09-25 19:29:55.3028768	1410	392	0.434875011

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 19:30:55.3060489	1403	389	0.436250031
2024-09-25 19:31:55.3103990	1389	388	0.43612501
2024-09-25 19:32:55.3022871	1403	387	0.437750012
2024-09-25 19:33:55.3114100	1409	389	0.438375026
2024-09-25 19:34:55.3000010	1391	390	0.436750025
2024-09-25 19:35:55.3006500	1398	392	0.436625034
2024-09-25 19:36:55.3064524	1410	393	0.436250031
2024-09-25 19:37:55.3091505	1399	391	0.433750033
2024-09-25 19:38:55.3065770	1389	390	0.436000019
2024-09-25 19:39:55.3025731	1407	388	0.436000019
2024-09-25 19:40:55.3059957	1406	386	0.432625026
2024-09-25 19:41:55.3087110	1393	391	0.432750016
2024-09-25 19:42:55.3130312	1396	395	0.434375018
2024-09-25 19:43:55.3040931	1410	390	0.435125023
2024-09-25 19:44:55.3087838	1400	386	0.43462503
2024-09-25 19:45:55.3108207	1389	387	0.437250018
2024-09-25 19:46:55.3045578	1409	392	0.435875028
2024-09-25 19:47:55.3010134	1405	392	0.437125027
2024-09-25 19:48:55.3117436	1382	392	0.435000032
2024-09-25 19:49:55.3120781	1412	390	0.436625034
2024-09-25 19:50:55.3114095	1405	388	0.435625017
2024-09-25 19:51:55.3099795	1382	388	0.432500035
2024-09-25 19:52:55.3032505	1415	389	0.435625017
2024-09-25 19:53:55.3019148	1401	388	0.432750016
2024-09-25 19:54:55.2986760	1386	392	0.433625013
2024-09-25 19:55:55.3122213	1415	395	0.435375035
2024-09-25 19:56:55.3029449	1398	391	0.435000032
2024-09-25 19:57:55.3063974	1390	386	0.437000006
2024-09-25 19:58:55.3131422	1406	386	0.436500013
2024-09-25 19:59:55.3003677	1405	389	0.43612501
2024-09-25 20:00:55.3002189	1389	389	0.437250018
2024-09-25 20:01:55.3114249	1402	392	0.435375035
2024-09-25 20:02:55.3029804	1409	392	0.435875028
2024-09-25 20:03:55.3104064	1394	392	0.436500013
2024-09-25 20:04:55.3118807	1394	391	0.433625013
2024-09-25 20:05:55.3123346	1404	388	0.434750021
2024-09-25 20:06:55.3129421	1407	387	0.433625013
2024-09-25 20:07:55.3018858	1395	389	0.43187502
2024-09-25 20:08:55.3054008	1394	395	0.434125006
2024-09-25 20:09:55.3053929	1410	393	0.434500009
2024-09-25 20:10:55.3121359	1401	386	0.436375022
2024-09-25 20:11:55.3069969	1387	387	0.437625021
2024-09-25 20:12:55.3130988	1408	389	0.43750003
2024-09-25 20:13:55.3117323	1406	390	0.43750003
2024-09-25 20:14:55.3065788	1382	391	0.435875028
2024-09-25 20:15:55.3003271	1412	391	0.436500013
2024-09-25 20:16:55.3065140	1404	389	0.436000019
2024-09-25 20:17:55.3069213	1383	389	0.435625017
2024-09-25 20:18:55.2999086	1411	390	0.434375018
2024-09-25 20:19:55.3018979	1405	390	0.434000015
2024-09-25 20:20:55.3045517	1385	389	0.434375018
2024-09-25 20:21:55.3088206	1410	391	0.434375018
2024-09-25 20:22:55.3005645	1404	393	0.436500013
2024-09-25 20:23:55.2988406	1388	391	0.435875028
2024-09-25 20:24:55.3049767	1404	390	0.436250031
2024-09-25 20:25:55.3031394	1407	390	0.438250035
2024-09-25 20:26:55.3093926	1391	388	0.435750008
2024-09-25 20:27:55.3086368	1400	389	0.434125006
2024-09-25 20:28:55.3111543	1410	390	0.435500026
2024-09-25 20:29:55.3137329	1394	390	0.435500026
2024-09-25 20:30:55.3033559	1396	389	0.436625034
2024-09-25 20:31:55.2997719	1403	388	0.435250014
2024-09-25 20:32:55.3115695	1405	389	0.434375018
2024-09-25 20:33:55.3022100	1398	391	0.434875011
2024-09-25 20:34:55.3073570	1393	395	0.433125019

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 20:35:55.3005869	1403	392	0.433625013
2024-09-25 20:36:55.3003625	1407	386	0.434375018
2024-09-25 20:37:55.3054045	1391	386	0.435500026
2024-09-25 20:38:55.3046478	1399	390	0.437000006
2024-09-25 20:39:55.3040254	1412	391	0.437125027
2024-09-25 20:40:55.3126225	1389	391	0.435375035
2024-09-25 20:41:55.2994126	1400	391	0.437000006
2024-09-25 20:42:55.3090361	1415	390	0.437000006
2024-09-25 20:43:55.3005062	1384	389	0.433625013
2024-09-25 20:44:55.3074148	1402	389	0.435250014
2024-09-25 20:45:55.3081879	1414	390	0.43462503
2024-09-25 20:46:55.3013465	1381	388	0.434375018
2024-09-25 20:47:55.3090818	1408	393	0.434500009
2024-09-25 20:48:55.2988621	1408	395	0.435125023
2024-09-25 20:49:55.2994705	1385	389	0.433875024
2024-09-25 20:50:55.3015718	1407	387	0.43187502
2024-09-25 20:51:55.3055314	1405	388	0.433625013
2024-09-25 20:52:55.3084412	1390	388	0.432000011
2024-09-25 20:53:55.3074853	1404	392	0.434500009
2024-09-25 20:54:55.3125310	1408	395	0.431500018
2024-09-25 20:55:55.2997075	1392	391	0.431500018
2024-09-25 20:56:55.3121746	1400	387	0.434375018
2024-09-25 20:57:55.2985882	1404	387	0.432375014
2024-09-25 20:58:55.3132052	1400	388	0.432750016
2024-09-25 20:59:55.3127535	1397	390	0.431625009
2024-09-25 21:00:55.2990823	1397	395	0.429500014
2024-09-25 21:01:55.3073500	1401	394	0.432625026
2024-09-25 21:02:55.3099286	1406	386	0.432250023
2024-09-25 21:03:55.3037977	1397	386	0.432375014
2024-09-25 21:04:55.3120607	1394	390	0.432500035
2024-09-25 21:05:55.2996795	1410	393	0.435500026
2024-09-25 21:06:55.3044144	1399	392	0.434125006
2024-09-25 21:07:55.3056937	1388	391	0.433125019
2024-09-25 21:08:55.3117649	1415	389	0.432625026
2024-09-25 21:09:55.3122310	1395	386	0.432375014
2024-09-25 21:10:55.3059573	1388	388	0.432250023
2024-09-25 21:11:55.3079915	1420	391	0.432250023
2024-09-25 21:12:55.3075944	1390	391	0.431125015
2024-09-25 21:13:55.3016431	1394	392	0.431125015
2024-09-25 21:14:55.2988592	1418	393	0.432375014
2024-09-25 21:15:55.3091672	1385	389	0.435125023
2024-09-25 21:16:55.3105006	1401	388	0.433125019
2024-09-25 21:17:55.3037267	1412	388	0.43462503
2024-09-25 21:18:55.3068997	1390	389	0.432750016
2024-09-25 21:19:55.2994793	1400	389	0.434375018
2024-09-25 21:20:55.3117626	1410	393	0.434375018
2024-09-25 21:21:55.3052440	1390	393	0.433500022
2024-09-25 21:22:55.3131771	1402	390	0.434875011
2024-09-25 21:23:55.3018162	1405	390	0.430875033
2024-09-25 21:24:55.3140421	1391	389	0.43187502
2024-09-25 21:25:55.3079056	1405	387	0.432250023
2024-09-25 21:26:55.3068801	1403	390	0.429625034
2024-09-25 21:27:55.3378641	1389	393	0.431000024
2024-09-25 21:28:55.3700327	1410	393	0.43187502
2024-09-25 21:29:55.4055387	1402	391	0.432000011
2024-09-25 21:30:55.4406228	1387	389	0.432500035
2024-09-25 21:31:55.4812968	1415	389	0.433875024
2024-09-25 21:32:55.5088020	1396	389	0.434500009
2024-09-25 21:33:55.5250074	1387	388	0.432750016
2024-09-25 21:34:55.5376799	1420	389	0.432000011
2024-09-25 21:35:55.5502076	1389	389	0.432250023
2024-09-25 21:36:55.5549073	1393	392	0.431250006
2024-09-25 21:37:55.5724871	1417	393	0.432000011
2024-09-25 21:38:55.5757704	1390	390	0.432875007
2024-09-25 21:39:55.5822555	1397	391	0.432750016

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 21:40:55.5860102	1415	391	0.432500035
2024-09-25 21:41:55.5807970	1387	389	0.433375031
2024-09-25 21:42:55.5903211	1402	388	0.433000028
2024-09-25 21:43:55.5821032	1409	388	0.433125019
2024-09-25 21:44:55.5842624	1391	389	0.433750033
2024-09-25 21:45:55.5972239	1399	389	0.43325001
2024-09-25 21:46:55.5882151	1409	393	0.432750016
2024-09-25 21:47:55.5943130	1393	394	0.433125019
2024-09-25 21:48:55.5911707	1398	390	0.431750029
2024-09-25 21:49:55.5928415	1408	390	0.431000024
2024-09-25 21:50:55.5930640	1394	388	0.43187502
2024-09-25 21:51:55.5924015	1397	386	0.429875016
2024-09-25 21:52:55.5962378	1408	393	0.430125028
2024-09-25 21:53:55.5957018	1396	397	0.430750012
2024-09-25 21:54:55.5998471	1396	388	0.432000011
2024-09-25 21:55:55.5992863	1406	384	0.432250023
2024-09-25 21:56:55.5920282	1400	389	0.432500035
2024-09-25 21:57:55.5932417	1397	393	0.433500022
2024-09-25 21:58:55.6054592	1401	392	0.434125006
2024-09-25 21:59:55.6053061	1399	391	0.432375014
2024-09-25 22:00:55.5940283	1399	391	0.431625009
2024-09-25 22:01:55.5964291	1402	388	0.43325001
2024-09-25 22:02:55.6004242	1402	388	0.429625034
2024-09-25 22:03:55.6058791	1394	388	0.433000028
2024-09-25 22:04:55.5980690	1404	390	0.432125032
2024-09-25 22:05:55.6018359	1405	392	0.433875024
2024-09-25 22:06:55.5955319	1392	395	0.432875007
2024-09-25 22:07:55.5930574	1402	391	0.433125019
2024-09-25 22:08:55.5977326	1408	386	0.432250023
2024-09-25 22:09:55.5995839	1387	387	0.433125019
2024-09-25 22:10:55.5983009	1405	389	0.434125006
2024-09-25 22:11:55.6023393	1408	390	0.43462503
2024-09-25 22:12:55.6056117	1385	392	0.431250006
2024-09-25 22:13:55.6036681	1408	392	0.434500009
2024-09-25 22:14:55.5941202	1406	392	0.433375031
2024-09-25 22:15:55.6053467	1385	390	0.433500022
2024-09-25 22:16:55.6036816	1407	388	0.432250023
2024-09-25 22:17:55.5995494	1407	387	0.430625021
2024-09-25 22:18:55.5949319	1386	387	0.430875033
2024-09-25 22:19:55.5933284	1405	395	0.43187502
2024-09-25 22:20:55.5989737	1409	394	0.432750016
2024-09-25 22:21:55.5953056	1387	387	0.434250027
2024-09-25 22:22:55.5953630	1403	387	0.432875007
2024-09-25 22:23:55.5918135	1410	389	0.434250027
2024-09-25 22:24:55.5918028	1389	390	0.434750021
2024-09-25 22:25:55.6001750	1400	390	0.43187502
2024-09-25 22:26:55.5975474	1410	390	0.434000015
2024-09-25 22:27:55.5934105	1396	389	0.432625026
2024-09-25 22:28:55.6052469	1393	391	0.43325001
2024-09-25 22:29:55.6020421	1405	393	0.432250023
2024-09-25 22:30:55.5989536	1405	393	0.432750016
2024-09-25 22:31:55.5949431	1389	389	0.434000015
2024-09-25 22:32:55.6037772	1405	391	0.433500022
2024-09-25 22:33:55.5971896	1406	391	0.435375035
2024-09-25 22:34:55.5967011	1387	388	0.435500026
2024-09-25 22:35:55.6025651	1405	388	0.432750016
2024-09-25 22:36:55.5957381	1405	388	0.435875028
2024-09-25 22:37:55.6020519	1389	389	0.433375031
2024-09-25 22:38:55.6049795	1406	392	0.433500022
2024-09-25 22:39:55.5946016	1407	393	0.433375031
2024-09-25 22:40:55.6008930	1388	392	0.433375031
2024-09-25 22:41:55.5933060	1408	390	0.433750033
2024-09-25 22:42:55.5943641	1400	389	0.434750021
2024-09-25 22:43:55.6011020	1392	388	0.432625026
2024-09-25 22:44:55.5960605	1408	386	0.430750012

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 22:45:55.6051423	1399	393	0.43187502
2024-09-25 22:46:55.5971919	1392	395	0.432250023
2024-09-25 22:47:55.5966614	1412	390	0.432750016
2024-09-25 22:48:55.5985099	1394	389	0.431750029
2024-09-25 22:49:55.5979551	1394	389	0.43187502
2024-09-25 22:50:55.6022395	1416	389	0.434375018
2024-09-25 22:51:55.6018326	1387	389	0.43187502
2024-09-25 22:52:55.6038542	1399	389	0.433125019
2024-09-25 22:53:55.6024093	1418	391	0.431500018
2024-09-25 22:54:55.5912354	1381	390	0.432250023
2024-09-25 22:55:55.5984963	1402	391	0.432750016
2024-09-25 22:56:55.5979537	1415	391	0.431125015
2024-09-25 22:57:55.5918200	1381	389	0.431500018
2024-09-25 22:58:55.6039932	1407	391	0.43187502
2024-09-25 22:59:55.5926253	1409	393	0.433125019
2024-09-25 23:00:55.5952729	1383	390	0.433125019
2024-09-25 23:01:55.6032948	1409	388	0.430625021
2024-09-25 23:02:55.5914421	1403	388	0.434250027
2024-09-25 23:03:55.5925422	1388	387	0.43187502
2024-09-25 23:04:55.6045414	1407	391	0.432500035
2024-09-25 23:05:55.6025366	1405	393	0.432125032
2024-09-25 23:06:55.5921704	1388	393	0.433125019
2024-09-25 23:07:55.5953760	1407	390	0.432375014
2024-09-25 23:08:55.5920962	1400	390	0.431750029
2024-09-25 23:09:55.5908631	1392	389	0.430250019
2024-09-25 23:10:55.6027531	1405	386	0.43187502
2024-09-25 23:11:55.5918811	1403	391	0.430125028
2024-09-25 23:12:55.5932257	1391	395	0.431500018
2024-09-25 23:13:55.5958263	1406	391	0.432750016
2024-09-25 23:14:55.5977050	1405	389	0.432625026
2024-09-25 23:15:55.6047826	1388	389	0.433375031
2024-09-25 23:16:55.6056933	1408	389	0.434375018
2024-09-25 23:17:55.6054045	1405	389	0.434125006
2024-09-25 23:18:55.5917617	1384	388	0.433875024
2024-09-25 23:19:55.5935173	1414	389	0.434375018
2024-09-25 23:20:55.5927410	1399	390	0.432250023
2024-09-25 23:21:55.5909000	1384	391	0.432375014
2024-09-25 23:22:55.5992194	1422	392	0.430750012
2024-09-25 23:23:55.5933708	1389	390	0.432500035
2024-09-25 23:24:55.5936601	1395	392	0.430750012
2024-09-25 23:25:55.5981580	1418	392	0.434750021
2024-09-25 23:26:55.6008127	1383	389	0.433375031
2024-09-25 23:27:55.6002608	1404	387	0.432125032
2024-09-25 23:28:55.5937478	1411	388	0.43325001
2024-09-25 23:29:55.5947275	1388	390	0.434000015
2024-09-25 23:30:55.5986288	1404	390	0.432125032
2024-09-25 23:31:55.5952920	1408	392	0.435000032
2024-09-25 23:32:55.5915764	1390	392	0.432750016
2024-09-25 23:33:55.5962396	1404	390	0.432375014
2024-09-25 23:34:55.6038588	1403	390	0.432250023
2024-09-25 23:35:55.6037799	1391	389	0.432750016
2024-09-25 23:36:55.5943062	1407	386	0.43187502
2024-09-25 23:37:55.5924773	1401	391	0.429625034
2024-09-25 23:38:55.5925039	1389	396	0.433125019
2024-09-25 23:39:55.5917383	1414	391	0.432250023
2024-09-25 23:40:55.5974190	1397	387	0.43325001
2024-09-25 23:41:55.6007665	1389	388	0.434125006
2024-09-25 23:42:55.6014528	1418	390	0.433750033
2024-09-25 23:43:55.6020131	1392	389	0.433875024
2024-09-25 23:44:55.5920346	1389	390	0.433875024
2024-09-25 23:45:55.5909886	1421	391	0.433875024
2024-09-25 23:46:55.6015120	1386	389	0.432625026
2024-09-25 23:47:55.6021531	1396	390	0.431000024
2024-09-25 23:48:55.5925249	1418	391	0.431125015
2024-09-25 23:49:55.6001362	1388	390	0.43187502

timestamp	HVAC_1PE_MU_001_TIT_200_3_VAL0	HVAC_1PE_MU_001_TIT_200_5_VAL0	HVAC_1PE_MU_001_PDT_200_2_VAL0
2024-09-25 23:50:55.5937790	1398	391	0.432375014
2024-09-25 23:51:55.5913865	1415	392	0.432375014
2024-09-25 23:52:55.5921895	1387	392	0.431375027
2024-09-25 23:53:55.5917411	1402	390	0.432250023
2024-09-25 23:54:55.6047811	1408	390	0.432750016
2024-09-25 23:55:55.5918937	1391	389	0.433000028
2024-09-25 23:56:55.6018120	1400	387	0.432250023
2024-09-25 23:57:55.5965508	1409	389	0.433375031
2024-09-25 23:58:55.6011360	1391	390	0.432875007
2024-09-25 23:59:55.6036446	1400	388	0.433750033

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 00:00:53.9235168	1402	389	0.445875019
2024-09-25 00:01:53.9142894	1397	392	0.444375008
2024-09-25 00:02:53.9144219	1399	393	0.446750015
2024-09-25 00:03:53.9231931	1402	390	0.446750015
2024-09-25 00:04:53.9246272	1401	391	0.446375012
2024-09-25 00:05:53.9132738	1402	391	0.446750015
2024-09-25 00:06:53.9239106	1403	389	0.447625011
2024-09-25 00:07:53.9155822	1396	389	0.448375016
2024-09-25 00:08:53.9150714	1399	388	0.449250013
2024-09-25 00:09:53.9225375	1403	387	0.44887501
2024-09-25 00:10:53.9219805	1401	389	0.444750011
2024-09-25 00:11:53.9146305	1397	391	0.450000018
2024-09-25 00:12:53.9217276	1401	390	0.446625024
2024-09-25 00:13:53.9177634	1403	391	0.446375012
2024-09-25 00:14:53.9224540	1398	390	0.444500029
2024-09-25 00:15:53.9188728	1401	390	0.450875014
2024-09-25 00:16:53.9167122	1403	389	0.444375008
2024-09-25 00:17:53.9235224	1397	391	0.448250026
2024-09-25 00:18:53.9224871	1399	391	0.446500033
2024-09-25 00:19:53.9251950	1401	390	0.448750019
2024-09-25 00:20:53.9147676	1401	392	0.448500007
2024-09-25 00:21:53.9199286	1401	391	0.448000014
2024-09-25 00:22:53.9242857	1402	388	0.449875027
2024-09-25 00:23:53.9252430	1395	388	0.449500024
2024-09-25 00:24:53.9211883	1395	388	0.446625024
2024-09-25 00:25:53.9212858	1399	388	0.448375016
2024-09-25 00:26:53.9147308	1402	392	0.448750019
2024-09-25 00:27:53.9165993	1400	392	0.44600001
2024-09-25 00:28:53.9143132	1401	392	0.452750027
2024-09-25 00:29:53.9275562	1402	391	0.446875036
2024-09-25 00:30:53.9188009	1400	392	0.44887501
2024-09-25 00:31:53.9248101	1402	390	0.444500029
2024-09-25 00:32:53.9142610	1401	388	0.446125031
2024-09-25 00:33:53.9225100	1397	388	0.447625011
2024-09-25 00:34:53.9148278	1401	389	0.448375016
2024-09-25 00:35:53.9197126	1404	388	0.448250026
2024-09-25 00:36:53.9257124	1396	390	0.44462502
2024-09-25 00:37:53.9140011	1399	390	0.442875028
2024-09-25 00:38:53.9157609	1402	390	0.447250009
2024-09-25 00:39:53.9210921	1399	391	0.44600001
2024-09-25 00:40:53.9162125	1398	391	0.447625011
2024-09-25 00:41:53.9200895	1402	389	0.444750011
2024-09-25 00:42:53.9181958	1403	391	0.443500012
2024-09-25 00:43:53.9251446	1398	392	0.446375012
2024-09-25 00:44:53.9203956	1402	390	0.44750002
2024-09-25 00:45:53.9142992	1401	390	0.446375012
2024-09-25 00:46:53.9214085	1397	391	0.451125026
2024-09-25 00:47:53.9154660	1401	389	0.44887501
2024-09-25 00:48:53.9147965	1403	388	0.445125014
2024-09-25 00:49:53.9176747	1393	388	0.447625011
2024-09-25 00:50:53.9180362	1398	388	0.446375012
2024-09-25 00:51:53.9224279	1400	389	0.447000027
2024-09-25 00:52:53.9281006	1397	392	0.443625033
2024-09-25 00:53:53.9175706	1400	392	0.446125031
2024-09-25 00:54:53.9175632	1402	391	0.442000031
2024-09-25 00:55:53.9250480	1399	391	0.444000036
2024-09-25 00:56:53.9153009	1399	391	0.445000023
2024-09-25 00:57:53.9211509	1400	389	0.445750028
2024-09-25 00:58:53.9152677	1401	389	0.446625024
2024-09-25 00:59:53.9223359	1400	388	0.444000036
2024-09-25 01:00:53.9275575	1401	388	0.445875019
2024-09-25 01:01:53.9154683	1403	390	0.445500016
2024-09-25 01:02:53.9224810	1398	391	0.446375012
2024-09-25 01:03:53.9269898	1400	390	0.450375021
2024-09-25 01:04:53.9271125	1401	389	0.446875036

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 01:05:53.9141503	1397	390	0.444750011
2024-09-25 01:06:53.9187804	1400	389	0.445000023
2024-09-25 01:07:53.9214957	1403	390	0.445500016
2024-09-25 01:08:53.9250107	1399	392	0.448125035
2024-09-25 01:09:53.9269184	1399	392	0.448750019
2024-09-25 01:10:53.9158266	1400	390	0.449750036
2024-09-25 01:11:53.9215101	1401	391	0.445125014
2024-09-25 01:12:53.9252630	1400	391	0.448375016
2024-09-25 01:13:53.9182648	1402	389	0.452750027
2024-09-25 01:14:53.9157263	1399	389	0.442750007
2024-09-25 01:15:53.9177838	1395	388	0.445625007
2024-09-25 01:16:53.9257520	1399	387	0.445125014
2024-09-25 01:17:53.9137071	1403	391	0.449000031
2024-09-25 01:18:53.9219519	1399	392	0.445875019
2024-09-25 01:19:53.9250582	1401	392	0.444000036
2024-09-25 01:20:53.9248236	1402	391	0.442125022
2024-09-25 01:21:53.9172057	1400	391	0.443375021
2024-09-25 01:22:53.9144722	1401	390	0.444750011
2024-09-25 01:23:53.9254679	1401	388	0.44312501
2024-09-25 01:24:53.9212120	1398	389	0.444000036
2024-09-25 01:25:53.9274106	1400	388	0.446875036
2024-09-25 01:26:53.9288191	1402	387	0.447875023
2024-09-25 01:27:53.9304669	1399	390	0.441250026
2024-09-25 01:28:53.9420700	1397	391	0.44462502
2024-09-25 01:29:53.9326569	1400	390	0.447625011
2024-09-25 01:30:53.9321423	1401	391	0.442125022
2024-09-25 01:31:53.9365124	1399	390	0.443750024
2024-09-25 01:32:53.9294634	1403	389	0.445750028
2024-09-25 01:33:53.9332844	1403	390	0.441250026
2024-09-25 01:34:53.9297960	1395	391	0.446250021
2024-09-25 01:35:53.9379849	1400	390	0.44325003
2024-09-25 01:36:53.9348389	1402	390	0.444375008
2024-09-25 01:37:53.9318525	1400	391	0.44600001
2024-09-25 01:38:53.9288890	1404	391	0.447250009
2024-09-25 01:39:53.9343336	1400	389	0.444000036
2024-09-25 01:40:53.9394918	1393	390	0.443875015
2024-09-25 01:41:53.9385554	1397	389	0.445625007
2024-09-25 01:42:53.9370616	1402	387	0.444125026
2024-09-25 01:43:53.9351016	1402	389	0.44312501
2024-09-25 01:44:53.9328286	1400	391	0.443500012
2024-09-25 01:45:53.9390383	1400	389	0.446500033
2024-09-25 01:46:53.9352373	1400	391	0.441375017
2024-09-25 01:47:53.9409997	1398	391	0.447250009
2024-09-25 01:48:53.9416253	1399	391	0.442625016
2024-09-25 01:49:53.9418129	1401	391	0.444500029
2024-09-25 01:50:53.9294479	1400	391	0.442875028
2024-09-25 01:51:53.9335508	1402	390	0.444875032
2024-09-25 01:52:53.9402154	1403	389	0.442875028
2024-09-25 01:53:53.9416771	1397	389	0.44600001
2024-09-25 01:54:53.9311242	1398	389	0.444000036
2024-09-25 01:55:53.9345851	1401	389	0.44312501
2024-09-25 01:56:53.9383590	1399	389	0.446750015
2024-09-25 01:57:53.9325687	1401	390	0.443875015
2024-09-25 01:58:53.9353848	1403	389	0.443375021
2024-09-25 01:59:53.9325327	1400	392	0.442750007
2024-09-25 02:00:53.9290756	1398	392	0.440875024
2024-09-25 02:01:53.9392711	1399	390	0.447000027
2024-09-25 02:02:53.9432909	1399	392	0.44312501
2024-09-25 02:03:53.9366006	1400	391	0.448625028
2024-09-25 02:04:53.9325467	1400	389	0.44462502
2024-09-25 02:05:53.9309717	1401	388	0.447000027
2024-09-25 02:06:53.9304631	1398	388	0.444125026
2024-09-25 02:07:53.9375010	1401	389	0.447625011
2024-09-25 02:08:53.9375813	1402	390	0.446375012
2024-09-25 02:09:53.9382573	1398	392	0.442625016

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 02:10:53.9387224	1398	392	0.443500012
2024-09-25 02:11:53.9354468	1400	390	0.446375012
2024-09-25 02:12:53.9414522	1398	391	0.44325003
2024-09-25 02:13:53.9455177	1401	391	0.442375034
2024-09-25 02:14:53.9525808	1404	388	0.443000019
2024-09-25 02:15:53.9577263	1403	388	0.444500029
2024-09-25 02:16:53.9591796	1400	388	0.441250026
2024-09-25 02:17:53.9539226	1398	388	0.445000023
2024-09-25 02:18:53.9575360	1401	390	0.442000031
2024-09-25 02:19:53.9609311	1400	391	0.44462502
2024-09-25 02:20:53.9658405	1400	389	0.446500033
2024-09-25 02:21:53.9703479	1401	390	0.442000031
2024-09-25 02:22:53.9621501	1395	391	0.442125022
2024-09-25 02:23:53.9602802	1399	389	0.442625016
2024-09-25 02:24:53.9624861	1401	390	0.442375034
2024-09-25 02:25:53.9646093	1397	392	0.441875011
2024-09-25 02:26:53.9613500	1401	391	0.44600001
2024-09-25 02:27:53.9636006	1402	390	0.445625007
2024-09-25 02:28:53.9618716	1401	391	0.444375008
2024-09-25 02:29:53.9629106	1402	392	0.448625028
2024-09-25 02:30:53.9606455	1401	390	0.442750007
2024-09-25 02:31:53.9710094	1396	390	0.443750024
2024-09-25 02:32:53.9715515	1395	390	0.444000036
2024-09-25 02:33:53.9709758	1401	388	0.441125035
2024-09-25 02:34:53.9702933	1402	390	0.441625029
2024-09-25 02:35:53.9631686	1397	391	0.44325003
2024-09-25 02:36:53.9616215	1400	391	0.443625033
2024-09-25 02:37:53.9695304	1402	391	0.439500034
2024-09-25 02:38:53.9713295	1399	392	0.442875028
2024-09-25 02:39:53.9635269	1401	390	0.442750007
2024-09-25 02:40:53.9612819	1401	388	0.445750028
2024-09-25 02:41:53.9680328	1399	388	0.446625024
2024-09-25 02:42:53.9637075	1401	388	0.444375008
2024-09-25 02:43:53.9619490	1402	388	0.441875011
2024-09-25 02:44:53.9625555	1399	390	0.443625033
2024-09-25 02:45:53.9653940	1398	391	0.441625029
2024-09-25 02:46:53.9611699	1398	390	0.444125026
2024-09-25 02:47:53.9679218	1397	391	0.44312501
2024-09-25 02:48:53.9668189	1400	390	0.441625029
2024-09-25 02:49:53.9720535	1404	389	0.441625029
2024-09-25 02:50:53.9755050	1403	391	0.439500034
2024-09-25 02:51:53.9829614	1398	391	0.444125026
2024-09-25 02:52:53.9834214	1401	391	0.443875015
2024-09-25 02:53:53.9859786	1403	391	0.445500016
2024-09-25 02:54:53.9834415	1400	392	0.440625012
2024-09-25 02:55:53.9778961	1400	390	0.445125014
2024-09-25 02:56:53.9813537	1401	388	0.443375021
2024-09-25 02:57:53.9851850	1396	388	0.443500012
2024-09-25 02:58:53.9886374	1398	388	0.446875036
2024-09-25 02:59:53.9770969	1401	389	0.443625033
2024-09-25 03:00:53.9807892	1398	392	0.443000019
2024-09-25 03:01:53.9842477	1398	392	0.440875024
2024-09-25 03:02:53.9877043	1401	390	0.444375008
2024-09-25 03:03:53.9911601	1402	391	0.44312501
2024-09-25 03:04:53.9936174	1400	391	0.442000031
2024-09-25 03:05:53.9970759	1400	389	0.442875028
2024-09-25 03:06:54.0005274	1401	389	0.440000027
2024-09-25 03:07:54.0039859	1401	388	0.442875028
2024-09-25 03:08:53.9924449	1402	388	0.44312501
2024-09-25 03:09:53.9958983	1403	390	0.44312501
2024-09-25 03:10:53.9933589	1396	391	0.449375033
2024-09-25 03:11:53.9999764	1399	390	0.439125031
2024-09-25 03:12:53.9924328	1403	389	0.444750011
2024-09-25 03:13:53.9966420	1400	390	0.442500025
2024-09-25 03:14:54.0003702	1401	389	0.441500008

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 03:15:54.0345938	1400	390	0.43900001
2024-09-25 03:16:54.0630811	1397	392	0.441500008
2024-09-25 03:17:54.1025775	1400	392	0.440250009
2024-09-25 03:18:54.1510817	1403	390	0.441500008
2024-09-25 03:19:54.1838397	1398	392	0.44325003
2024-09-25 03:20:54.2074670	1398	391	0.44600001
2024-09-25 03:21:54.2083872	1402	388	0.442250013
2024-09-25 03:22:54.2283152	1402	388	0.441500008
2024-09-25 03:23:54.2432355	1398	388	0.443000019
2024-09-25 03:24:54.2511616	1401	389	0.43900001
2024-09-25 03:25:54.2572488	1403	391	0.442500025
2024-09-25 03:26:54.2638851	1396	392	0.440500021
2024-09-25 03:27:54.2703548	1400	391	0.442375034
2024-09-25 03:28:54.2768184	1404	391	0.442750007
2024-09-25 03:29:54.2742895	1398	391	0.442625016
2024-09-25 03:30:54.2755313	1400	391	0.442375034
2024-09-25 03:31:54.2794900	1402	389	0.441375017
2024-09-25 03:32:54.2880393	1396	389	0.444125026
2024-09-25 03:33:54.2823090	1401	388	0.442375034
2024-09-25 03:34:54.2897012	1403	388	0.442625016
2024-09-25 03:35:54.2944398	1396	390	0.441000015
2024-09-25 03:36:54.2842895	1396	391	0.442250013
2024-09-25 03:37:54.2871350	1399	389	0.445000023
2024-09-25 03:38:54.2981353	1402	391	0.438375026
2024-09-25 03:39:54.2962374	1400	390	0.446375012
2024-09-25 03:40:54.3004779	1402	389	0.442375034
2024-09-25 03:41:54.2909611	1403	391	0.438375026
2024-09-25 03:42:54.2928959	1396	392	0.443625033
2024-09-25 03:43:54.2887679	1399	390	0.439625025
2024-09-25 03:44:54.2948573	1398	390	0.442375034
2024-09-25 03:45:54.2991900	1398	391	0.445500016
2024-09-25 03:46:54.2957287	1405	391	0.444750011
2024-09-25 03:47:54.2995628	1405	389	0.44325003
2024-09-25 03:48:54.2909386	1394	389	0.443500012
2024-09-25 03:49:54.2938275	1395	389	0.447625011
2024-09-25 03:50:54.2874246	1403	388	0.443500012
2024-09-25 03:51:54.2940487	1402	392	0.441125035
2024-09-25 03:52:54.2896668	1401	391	0.442375034
2024-09-25 03:53:54.2924722	1402	390	0.44175002
2024-09-25 03:54:54.2994028	1400	390	0.442375034
2024-09-25 03:55:54.2969263	1397	391	0.442750007
2024-09-25 03:56:54.2902351	1401	391	0.438375026
2024-09-25 03:57:54.2934879	1402	391	0.443000019
2024-09-25 03:58:54.2986409	1401	391	0.443000019
2024-09-25 03:59:54.2881911	1400	390	0.445500016
2024-09-25 04:00:54.3001707	1401	389	0.445375025
2024-09-25 04:01:54.2897298	1396	388	0.443750024
2024-09-25 04:02:54.2935574	1398	389	0.442750007
2024-09-25 04:03:54.2888392	1401	390	0.443625033
2024-09-25 04:04:54.3017374	1399	391	0.441500008
2024-09-25 04:05:54.2956774	1401	389	0.444000036
2024-09-25 04:06:54.2885392	1405	389	0.441875011
2024-09-25 04:07:54.2928977	1398	392	0.442000031
2024-09-25 04:08:54.3022557	1398	391	0.439250022
2024-09-25 04:09:54.2990155	1401	390	0.441250026
2024-09-25 04:10:54.2896495	1402	391	0.443625033
2024-09-25 04:11:54.2938135	1398	392	0.442750007
2024-09-25 04:12:54.2982564	1400	390	0.440625012
2024-09-25 04:13:54.2917028	1401	389	0.446375012
2024-09-25 04:14:54.2991368	1396	389	0.442125022
2024-09-25 04:15:54.2896845	1398	387	0.444875032
2024-09-25 04:16:54.2951693	1400	390	0.442125022
2024-09-25 04:17:54.3015507	1397	392	0.438625008
2024-09-25 04:18:54.2880539	1402	391	0.442250013
2024-09-25 04:19:54.2964779	1402	390	0.444000036

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
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2024-09-25 04:21:54.2883833	1399	392	0.438250035
2024-09-25 04:22:54.2983703	1401	389	0.441875011
2024-09-25 04:23:54.2908579	1400	389	0.44600001
2024-09-25 04:24:54.2961602	1400	389	0.444375008
2024-09-25 04:25:54.2896421	1402	387	0.44462502
2024-09-25 04:26:54.2931976	1401	390	0.441625029
2024-09-25 04:27:54.2879681	1398	391	0.443750024
2024-09-25 04:28:54.2874437	1401	390	0.442375034
2024-09-25 04:29:54.2911649	1401	390	0.44175002
2024-09-25 04:30:54.2880189	1397	391	0.445250034
2024-09-25 04:31:54.2940621	1400	389	0.438375026
2024-09-25 04:32:54.2915656	1403	390	0.440750033
2024-09-25 04:33:54.2887439	1396	391	0.439625025
2024-09-25 04:34:54.2935592	1400	390	0.444500029
2024-09-25 04:35:54.2985415	1402	389	0.444250017
2024-09-25 04:36:54.2936740	1403	391	0.443375021
2024-09-25 04:37:54.2894162	1402	390	0.441125035
2024-09-25 04:38:54.2934766	1398	389	0.440625012
2024-09-25 04:39:54.2944951	1396	390	0.444125026
2024-09-25 04:40:54.2980800	1399	390	0.442750007
2024-09-25 04:41:54.2972477	1402	389	0.439375013
2024-09-25 04:42:54.2963118	1403	392	0.440750033
2024-09-25 04:43:54.2951328	1397	391	0.439500034
2024-09-25 04:44:54.2984827	1401	390	0.442500025
2024-09-25 04:45:54.3020126	1402	390	0.441500008
2024-09-25 04:46:54.2886105	1398	391	0.442875028
2024-09-25 04:47:54.2946369	1401	391	0.439500034
2024-09-25 04:48:54.2990057	1403	391	0.442000031
2024-09-25 04:49:54.2872986	1398	391	0.436375022
2024-09-25 04:50:54.2897969	1400	390	0.444375008
2024-09-25 04:51:54.2903932	1402	388	0.439500034
2024-09-25 04:52:54.2997199	1396	388	0.441250026
2024-09-25 04:53:54.3015605	1397	389	0.440750033
2024-09-25 04:54:54.2934472	1401	389	0.440750033
2024-09-25 04:55:54.2990943	1400	392	0.443875015
2024-09-25 04:56:54.2996271	1400	390	0.439625025
2024-09-25 04:57:54.2977021	1403	389	0.440875024
2024-09-25 04:58:54.3005168	1402	392	0.437625021
2024-09-25 04:59:54.3019510	1397	391	0.438500017
2024-09-25 05:00:54.2937103	1398	390	0.44325003
2024-09-25 05:01:54.2899215	1400	390	0.438750029
2024-09-25 05:02:54.2954417	1399	391	0.442875028
2024-09-25 05:03:54.2948384	1402	391	0.441625029
2024-09-25 05:04:54.2893266	1404	389	0.444750011
2024-09-25 05:05:54.3014909	1397	389	0.439375013
2024-09-25 05:06:54.2960449	1398	390	0.444250017
2024-09-25 05:07:54.3013062	1400	389	0.440875024
2024-09-25 05:08:54.2878509	1397	392	0.440125018
2024-09-25 05:09:54.2948883	1402	391	0.44175002
2024-09-25 05:10:54.2882046	1403	389	0.437625021
2024-09-25 05:11:54.3017643	1402	391	0.444375008
2024-09-25 05:12:54.2979097	1399	392	0.43900001
2024-09-25 05:13:54.2922845	1402	390	0.44175002
2024-09-25 05:14:54.2934691	1401	390	0.438750029
2024-09-25 05:15:54.2995151	1398	390	0.443000019
2024-09-25 05:16:54.2968754	1400	389	0.441250026
2024-09-25 05:17:54.2954258	1403	388	0.440875024
2024-09-25 05:18:54.2988918	1399	389	0.44037503
2024-09-25 05:19:54.2954795	1400	390	0.439625025
2024-09-25 05:20:54.2985279	1401	390	0.439875007
2024-09-25 05:21:54.2906623	1398	390	0.441375017
2024-09-25 05:22:54.2902504	1402	389	0.442750007
2024-09-25 05:23:54.2892842	1402	390	0.44175002
2024-09-25 05:24:54.2902196	1392	392	0.438750029

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
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2024-09-25 05:26:54.2956133	1401	390	0.438500017
2024-09-25 05:27:54.3015884	1400	392	0.439375013
2024-09-25 05:28:54.2957678	1400	390	0.442125022
2024-09-25 05:29:54.2992230	1402	388	0.441875011
2024-09-25 05:30:54.2914237	1401	391	0.438625008
2024-09-25 05:31:54.2926414	1397	390	0.441000015
2024-09-25 05:32:54.2972794	1399	388	0.437875032
2024-09-25 05:33:54.2916388	1401	392	0.437875032
2024-09-25 05:34:54.2947306	1398	391	0.441125035
2024-09-25 05:35:54.2883762	1404	390	0.440500021
2024-09-25 05:36:54.2955028	1404	389	0.438125014
2024-09-25 05:37:54.2995893	1398	391	0.437250018
2024-09-25 05:38:54.2954869	1399	391	0.437625021
2024-09-25 05:39:54.2890495	1400	390	0.436625034
2024-09-25 05:40:54.2923153	1399	390	0.43750003
2024-09-25 05:41:54.2966682	1402	390	0.443000019
2024-09-25 05:42:54.2962604	1401	389	0.437000006
2024-09-25 05:43:54.3010696	1397	389	0.440875024
2024-09-25 05:44:54.2926605	1397	389	0.439250022
2024-09-25 05:45:54.2953577	1399	389	0.439375013
2024-09-25 05:46:54.2937238	1401	391	0.439375013
2024-09-25 05:47:54.2985292	1399	390	0.438500017
2024-09-25 05:48:54.3013416	1402	389	0.434375018
2024-09-25 05:49:54.2954813	1405	392	0.435875028
2024-09-25 05:50:54.2880142	1397	391	0.441250026
2024-09-25 05:51:54.2923848	1401	390	0.439125031
2024-09-25 05:52:54.2952004	1402	390	0.440000027
2024-09-25 05:53:54.2886118	1398	391	0.445250034
2024-09-25 05:54:54.2957122	1402	391	0.442375034
2024-09-25 05:55:54.2896881	1402	389	0.438500017
2024-09-25 05:56:54.2883697	1394	389	0.440250009
2024-09-25 05:57:54.2894404	1397	389	0.441375017
2024-09-25 05:58:54.2905760	1400	388	0.440875024
2024-09-25 05:59:54.2947040	1398	392	0.440750033
2024-09-25 06:00:54.3011414	1401	391	0.438250035
2024-09-25 06:01:54.2940658	1403	389	0.439875007
2024-09-25 06:02:54.2903740	1403	391	0.436500013
2024-09-25 06:03:54.2919570	1399	391	0.438750029
2024-09-25 06:04:54.2926936	1400	391	0.436000019
2024-09-25 06:05:54.3014097	1401	391	0.434750021
2024-09-25 06:06:54.2937690	1399	390	0.439125031
2024-09-25 06:07:54.2956334	1401	390	0.439250022
2024-09-25 06:08:54.2935054	1402	389	0.43750003
2024-09-25 06:09:54.2914573	1396	389	0.441125035
2024-09-25 06:10:54.2960257	1396	388	0.439625025
2024-09-25 06:11:54.2981518	1400	389	0.439125031
2024-09-25 06:12:54.2931331	1400	391	0.438375026
2024-09-25 06:13:54.3000418	1401	388	0.440000027
2024-09-25 06:14:54.3003152	1403	390	0.437875032
2024-09-25 06:15:54.2969192	1401	392	0.436000019
2024-09-25 06:16:54.2909562	1399	390	0.437625021
2024-09-25 06:17:54.2923684	1399	388	0.437375009
2024-09-25 06:18:54.2933085	1400	392	0.436750025
2024-09-25 06:19:54.2908997	1400	391	0.437875032
2024-09-25 06:20:54.2954043	1402	389	0.443625033
2024-09-25 06:21:54.2962343	1402	390	0.440750033
2024-09-25 06:22:54.2998864	1394	390	0.44175002
2024-09-25 06:23:54.2902732	1398	389	0.443625033
2024-09-25 06:24:54.2884979	1403	391	0.442750007
2024-09-25 06:25:54.2872882	1399	391	0.438500017
2024-09-25 06:26:54.2976148	1399	390	0.438750029
2024-09-25 06:27:54.2989248	1399	389	0.438750029
2024-09-25 06:28:54.2913453	1399	391	0.438625008
2024-09-25 06:29:54.3012254	1403	392	0.438000023

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
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2024-09-25 06:31:54.3006025	1400	391	0.437375009
2024-09-25 06:32:54.2918389	1400	390	0.439500034
2024-09-25 06:33:54.2995785	1402	388	0.442375034
2024-09-25 06:34:54.2989015	1401	388	0.440625012
2024-09-25 06:35:54.2910229	1395	388	0.445125014
2024-09-25 06:36:54.2922854	1397	389	0.442375034
2024-09-25 06:37:54.2918851	1403	391	0.441875011
2024-09-25 06:38:54.2877039	1399	390	0.438000023
2024-09-25 06:39:54.2878849	1402	389	0.437375009
2024-09-25 06:40:54.2882777	1403	391	0.440125018
2024-09-25 06:41:54.2969835	1400	392	0.440500021
2024-09-25 06:42:54.2907929	1401	391	0.437250018
2024-09-25 06:43:54.2978065	1399	390	0.440500021
2024-09-25 06:44:54.2874118	1395	391	0.439125031
2024-09-25 06:45:54.3002199	1398	391	0.438750029
2024-09-25 06:46:54.3012398	1400	389	0.44175002
2024-09-25 06:47:54.2963028	1400	389	0.437125027
2024-09-25 06:48:54.2959855	1398	389	0.440000027
2024-09-25 06:49:54.2946461	1403	387	0.439750016
2024-09-25 06:50:54.2897931	1402	391	0.436750025
2024-09-25 06:51:54.2997492	1399	392	0.44175002
2024-09-25 06:52:54.2968230	1401	391	0.439125031
2024-09-25 06:53:54.2953646	1403	391	0.439750016
2024-09-25 06:54:54.2890970	1400	391	0.438500017
2024-09-25 06:55:54.3021561	1401	391	0.43900001
2024-09-25 06:56:54.2995518	1401	389	0.441125035
2024-09-25 06:57:54.2964278	1396	389	0.439500034
2024-09-25 06:58:54.3016560	1397	388	0.441125035
2024-09-25 06:59:54.3029306	1402	388	0.441125035
2024-09-25 07:00:54.3031620	1399	390	0.44037503
2024-09-25 07:01:54.3125326	1400	391	0.442750007
2024-09-25 07:02:54.3160648	1404	388	0.44312501
2024-09-25 07:03:54.3113630	1398	391	0.438000023
2024-09-25 07:04:54.3162244	1395	390	0.439125031
2024-09-25 07:05:54.3166643	1401	389	0.43887502
2024-09-25 07:06:54.3131573	1402	393	0.439125031
2024-09-25 07:07:54.3137979	1399	391	0.440000027
2024-09-25 07:08:54.3196321	1400	389	0.440000027
2024-09-25 07:09:54.3249171	1402	390	0.440000027
2024-09-25 07:10:54.3260760	1399	391	0.441500008
2024-09-25 07:11:54.3217035	1403	391	0.441625029
2024-09-25 07:12:54.3221192	1404	390	0.439750016
2024-09-25 07:13:54.3341020	1393	390	0.440875024
2024-09-25 07:14:54.3360368	1398	390	0.442500025
2024-09-25 07:15:54.3371990	1401	388	0.44037503
2024-09-25 07:16:54.3442145	1398	391	0.442000031
2024-09-25 07:17:54.3366904	1400	391	0.442000031
2024-09-25 07:18:54.3405129	1402	390	0.438000023
2024-09-25 07:19:54.3419503	1400	392	0.440750033
2024-09-25 07:20:54.3433812	1399	392	0.438000023
2024-09-25 07:21:54.3358115	1402	390	0.439750016
2024-09-25 07:22:54.3413755	1400	390	0.438375026
2024-09-25 07:23:54.3414656	1399	389	0.441500008
2024-09-25 07:24:54.3362570	1400	388	0.43750003
2024-09-25 07:25:54.3456430	1402	388	0.441000015
2024-09-25 07:26:54.3356430	1399	390	0.44175002
2024-09-25 07:27:54.3369461	1398	391	0.438750029
2024-09-25 07:28:54.3340190	1403	390	0.442000031
2024-09-25 07:29:54.3398723	1399	390	0.443375021
2024-09-25 07:30:54.3429599	1401	390	0.436375022
2024-09-25 07:31:54.3389681	1402	390	0.43900001
2024-09-25 07:32:54.3426912	1398	391	0.441125035
2024-09-25 07:33:54.3357835	1399	391	0.439125031
2024-09-25 07:34:54.3450892	1401	389	0.441125035

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
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2024-09-25 07:36:54.3379562	1401	391	0.442375034
2024-09-25 07:37:54.3395186	1402	390	0.438000023
2024-09-25 07:38:54.3351732	1401	389	0.442375034
2024-09-25 07:39:54.3472311	1398	388	0.440750033
2024-09-25 07:40:54.3456104	1397	388	0.441625029
2024-09-25 07:41:54.3441776	1400	391	0.44312501
2024-09-25 07:42:54.3391356	1399	392	0.442750007
2024-09-25 07:43:54.3476524	1408	391	0.436500013
2024-09-25 07:44:54.3410517	1402	391	0.441250026
2024-09-25 07:45:54.3493539	1394	392	0.43900001
2024-09-25 07:46:54.3460974	1396	391	0.438375026
2024-09-25 07:47:54.3399152	1400	388	0.439500034
2024-09-25 07:48:54.3645059	1399	388	0.440125018
2024-09-25 07:49:54.4039178	1402	388	0.442125022
2024-09-25 07:50:54.4422910	1401	388	0.437750012
2024-09-25 07:51:54.4783365	1400	391	0.437250018
2024-09-25 07:52:54.5174052	1400	390	0.439250022
2024-09-25 07:53:54.5439583	1402	388	0.445875019
2024-09-25 07:54:54.5532541	1402	392	0.444750011
2024-09-25 07:55:54.5700391	1396	389	0.444500029
2024-09-25 07:56:54.5862413	1400	389	0.443000019
2024-09-25 07:57:54.5921104	1403	392	0.444000036
2024-09-25 07:58:54.6106555	1399	391	0.447250009
2024-09-25 07:59:54.6154702	1402	390	0.445750028
2024-09-25 08:00:54.6099640	1400	390	0.445250034
2024-09-25 08:01:54.6189533	1397	391	0.446125031
2024-09-25 08:02:54.6255457	1401	391	0.444750011
2024-09-25 08:03:54.6329137	1403	390	0.443500012
2024-09-25 08:04:54.6286763	1396	390	0.445375025
2024-09-25 08:05:54.6240126	1398	391	0.445500016
2024-09-25 08:06:54.6362687	1400	388	0.445625007
2024-09-25 08:07:54.6276830	1399	390	0.447000027
2024-09-25 08:08:54.6336250	1398	391	0.446250021
2024-09-25 08:09:54.6357310	1401	389	0.445750028
2024-09-25 08:10:54.6408798	1402	390	0.442750007
2024-09-25 08:11:54.6279573	1400	392	0.441500008
2024-09-25 08:12:54.6287014	1402	391	0.441125035
2024-09-25 08:13:54.6317849	1403	390	0.447250009
2024-09-25 08:14:54.6396789	1399	389	0.447125018
2024-09-25 08:15:54.6405290	1401	389	0.44462502
2024-09-25 08:16:54.6430511	1403	387	0.446875036
2024-09-25 08:17:54.6417649	1395	389	0.443625033
2024-09-25 08:18:54.6450656	1398	391	0.445625007
2024-09-25 08:19:54.6444759	1400	389	0.44750002
2024-09-25 08:20:54.6461560	1398	390	0.443625033
2024-09-25 08:21:54.6502187	1401	390	0.445875019
2024-09-25 08:22:54.6534831	1403	388	0.442875028
2024-09-25 08:23:54.6550824	1402	393	0.441000015
2024-09-25 08:24:54.6554001	1400	391	0.449375033
2024-09-25 08:25:54.6482466	1401	389	0.448000014
2024-09-25 08:26:54.6502005	1400	390	0.445625007
2024-09-25 08:27:54.6623862	1398	391	0.445625007
2024-09-25 08:28:54.6650017	1403	390	0.446250021
2024-09-25 08:29:54.6771641	1401	390	0.445625007
2024-09-25 08:30:54.6797955	1394	389	0.44600001
2024-09-25 08:31:54.6816789	1399	389	0.447875023
2024-09-25 08:32:54.6881994	1400	390	0.446875036
2024-09-25 08:33:54.6800581	1397	391	0.444875032
2024-09-25 08:34:54.6783874	1402	390	0.447250009
2024-09-25 08:35:54.6798384	1405	389	0.445125014
2024-09-25 08:36:54.6822556	1400	391	0.445375025
2024-09-25 08:37:54.6916547	1400	391	0.443375021
2024-09-25 08:38:54.6848566	1402	389	0.445875019
2024-09-25 08:39:54.6853777	1397	390	0.443875015

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 08:40:54.6879671	1401	390	0.448750019
2024-09-25 08:41:54.6872355	1403	389	0.447625011
2024-09-25 08:42:54.6900842	1397	390	0.440750033
2024-09-25 08:43:54.6900171	1397	390	0.447125018
2024-09-25 08:44:54.6806040	1401	390	0.444375008
2024-09-25 08:45:54.6826661	1403	391	0.446375012
2024-09-25 08:46:54.6845151	1399	389	0.448625028
2024-09-25 08:47:54.6878653	1404	390	0.443500012
2024-09-25 08:48:54.6923106	1401	391	0.446875036
2024-09-25 08:49:54.6788731	1394	391	0.446250021
2024-09-25 08:50:54.6771338	1400	391	0.443750024
2024-09-25 08:51:54.6816551	1404	390	0.448750019
2024-09-25 08:52:54.6858195	1399	392	0.45175001
2024-09-25 08:53:54.6823769	1400	391	0.450375021
2024-09-25 08:54:54.6886211	1401	389	0.449625015
2024-09-25 08:55:54.6867088	1396	389	0.44600001
2024-09-25 08:56:54.6809767	1397	388	0.44600001
2024-09-25 08:57:54.6797367	1402	388	0.444500029
2024-09-25 08:58:54.6773922	1404	392	0.44600001
2024-09-25 08:59:54.6788353	1399	392	0.449625015
2024-09-25 09:00:54.6879759	1402	391	0.448000014
2024-09-25 09:01:54.6860341	1401	391	0.444250017
2024-09-25 09:02:54.6904313	1395	391	0.448000014
2024-09-25 09:03:54.6801654	1400	390	0.445875019
2024-09-25 09:04:54.6781327	1401	389	0.448375016
2024-09-25 09:05:54.6908941	1400	388	0.444375008
2024-09-25 09:06:54.6870171	1403	388	0.448625028
2024-09-25 09:07:54.6829241	1404	388	0.447250009
2024-09-25 09:08:54.6890032	1393	390	0.448375016
2024-09-25 09:09:54.6798015	1396	391	0.448750019
2024-09-25 09:10:54.6810630	1402	389	0.448500007
2024-09-25 09:11:54.6886020	1401	390	0.448000014
2024-09-25 09:12:54.6786034	1401	390	0.448500007
2024-09-25 09:13:54.6835679	1404	389	0.445875019
2024-09-25 09:14:54.6848551	1401	392	0.445875019
2024-09-25 09:15:54.6786622	1395	391	0.446750015
2024-09-25 09:16:54.6787303	1399	390	0.447375029
2024-09-25 09:17:54.6829819	1402	390	0.450125009
2024-09-25 09:18:54.6809567	1401	391	0.451000035
2024-09-25 09:19:54.6869112	1403	390	0.446250021
2024-09-25 09:20:54.6916924	1404	390	0.449375033
2024-09-25 09:21:54.6776866	1393	390	0.448000014
2024-09-25 09:22:54.6822299	1398	389	0.444375008
2024-09-25 09:23:54.6834140	1400	388	0.446375012
2024-09-25 09:24:54.6836309	1396	391	0.448375016
2024-09-25 09:25:54.6886897	1405	391	0.449750036
2024-09-25 09:26:54.6871169	1407	389	0.45025003
2024-09-25 09:27:54.6903371	1396	391	0.450000018
2024-09-25 09:28:54.6904761	1395	393	0.444750011
2024-09-25 09:29:54.6810555	1399	390	0.447875023
2024-09-25 09:30:54.6824146	1402	390	0.449625015
2024-09-25 09:31:54.6821991	1402	390	0.445625007
2024-09-25 09:32:54.6823381	1403	389	0.451125026
2024-09-25 09:33:54.6920106	1402	388	0.447125018
2024-09-25 09:34:54.6792813	1395	389	0.452375025
2024-09-25 09:35:54.6813653	1397	390	0.450375021
2024-09-25 09:36:54.6775723	1402	390	0.448375016
2024-09-25 09:37:54.6879525	1398	390	0.450375021
2024-09-25 09:38:54.6797329	1401	390	0.448750019
2024-09-25 09:39:54.6916070	1402	389	0.446250021
2024-09-25 09:40:54.6851957	1398	392	0.448250026
2024-09-25 09:41:54.6880174	1399	392	0.448750019
2024-09-25 09:42:54.6801528	1401	390	0.445625007
2024-09-25 09:43:54.6865776	1398	392	0.449375033
2024-09-25 09:44:54.6888763	1399	391	0.450125009

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 09:45:54.6841245	1401	388	0.452250034
2024-09-25 09:46:54.6816574	1400	388	0.448125035
2024-09-25 09:47:54.6910364	1398	388	0.450750023
2024-09-25 09:48:54.6824836	1405	389	0.449125022
2024-09-25 09:49:54.6869401	1405	392	0.446375012
2024-09-25 09:50:54.6830211	1395	392	0.447250009
2024-09-25 09:51:54.6903235	1396	391	0.450375021
2024-09-25 09:52:54.6816868	1400	390	0.448375016
2024-09-25 09:53:54.6886561	1400	391	0.449625015
2024-09-25 09:54:54.6772541	1402	391	0.446500033
2024-09-25 09:55:54.6772121	1400	389	0.449125022
2024-09-25 09:56:54.6873115	1397	389	0.452375025
2024-09-25 09:57:54.6831261	1400	388	0.447625011
2024-09-25 09:58:54.6811404	1404	388	0.448000014
2024-09-25 09:59:54.6878755	1401	390	0.450000018
2024-09-25 10:00:54.6901355	1399	391	0.449625015
2024-09-25 10:01:54.6812375	1400	389	0.451250017
2024-09-25 10:02:54.6921580	1399	391	0.446875036
2024-09-25 10:03:54.6870474	1398	390	0.454375029
2024-09-25 10:04:54.6773185	1399	388	0.442750007
2024-09-25 10:05:54.6819564	1402	392	0.445125014
2024-09-25 10:06:54.6770805	1399	392	0.448500007
2024-09-25 10:07:54.6820908	1401	391	0.446125031
2024-09-25 10:08:54.6772242	1402	391	0.455250025
2024-09-25 10:09:54.6790974	1399	391	0.452625036
2024-09-25 10:10:54.6790955	1403	390	0.453250021
2024-09-25 10:11:54.6808390	1405	388	0.44887501
2024-09-25 10:12:54.6853683	1395	388	0.451125026
2024-09-25 10:13:54.6856197	1397	388	0.449250013
2024-09-25 10:14:54.6893185	1401	389	0.446375012
2024-09-25 10:15:54.6839565	1400	392	0.448500007
2024-09-25 10:16:54.6822718	1402	392	0.447875023
2024-09-25 10:17:54.6901620	1402	390	0.445625007
2024-09-25 10:18:54.6776189	1401	391	0.443750024
2024-09-25 10:19:54.6820362	1399	392	0.447000027
2024-09-25 10:20:54.6898392	1402	390	0.447250009
2024-09-25 10:21:54.6802628	1401	389	0.445375025
2024-09-25 10:22:54.6875391	1399	388	0.449750036
2024-09-25 10:23:54.6899376	1401	388	0.446625024
2024-09-25 10:24:54.6840820	1403	389	0.44312501
2024-09-25 10:25:54.6783210	1395	390	0.446500033
2024-09-25 10:26:54.6876371	1398	390	0.452250034
2024-09-25 10:27:54.6785273	1401	389	0.445625007
2024-09-25 10:28:54.6831843	1398	391	0.444000036
2024-09-25 10:29:54.6915855	1400	389	0.446750015
2024-09-25 10:30:54.6918491	1403	389	0.449875027
2024-09-25 10:31:54.6852348	1400	392	0.448125035
2024-09-25 10:32:54.6860811	1401	390	0.449500024
2024-09-25 10:33:54.6815500	1403	389	0.449500024
2024-09-25 10:34:54.6912617	1398	390	0.445500016
2024-09-25 10:35:54.6910704	1397	391	0.447875023
2024-09-25 10:36:54.6783332	1401	389	0.446750015
2024-09-25 10:37:54.6829739	1403	390	0.447875023
2024-09-25 10:38:54.6843358	1397	391	0.448250026
2024-09-25 10:39:54.6850584	1399	389	0.449250013
2024-09-25 10:40:54.6902138	1402	390	0.448750019
2024-09-25 10:41:54.6822335	1395	391	0.45025003
2024-09-25 10:42:54.6872834	1400	391	0.447625011
2024-09-25 10:43:54.6903365	1403	390	0.445000023
2024-09-25 10:44:54.6810723	1399	391	0.44750002
2024-09-25 10:45:54.6912155	1400	392	0.443750024
2024-09-25 10:46:54.6833737	1401	389	0.445625007
2024-09-25 10:47:54.6910914	1400	389	0.445500016
2024-09-25 10:48:54.6893712	1400	388	0.445625007
2024-09-25 10:49:54.6921112	1400	387	0.447375029

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
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2024-09-25 10:51:54.6911212	1398	391	0.445625007
2024-09-25 10:52:54.6772843	1397	389	0.450875014
2024-09-25 10:53:54.6781591	1400	391	0.44887501
2024-09-25 10:54:54.6868528	1400	390	0.448750019
2024-09-25 10:55:54.6837806	1404	389	0.445250034
2024-09-25 10:56:54.6859281	1406	391	0.45025003
2024-09-25 10:57:54.6800556	1396	392	0.450000018
2024-09-25 10:58:54.6855800	1398	391	0.449250013
2024-09-25 10:59:54.6920179	1400	389	0.449250013
2024-09-25 11:00:54.6839084	1398	391	0.449625015
2024-09-25 11:01:54.6870315	1400	391	0.446250021
2024-09-25 11:02:54.6780387	1400	389	0.448500007
2024-09-25 11:03:54.6825097	1396	389	0.448000014
2024-09-25 11:04:54.6881992	1401	389	0.447875023
2024-09-25 11:05:54.6790908	1405	388	0.445250034
2024-09-25 11:06:54.6834759	1402	391	0.446375012
2024-09-25 11:07:54.6867529	1395	391	0.449500024
2024-09-25 11:08:54.6880947	1398	390	0.452000022
2024-09-25 11:09:54.6861039	1402	390	0.450875014
2024-09-25 11:10:54.6851004	1401	391	0.450125009
2024-09-25 11:11:54.6862966	1404	391	0.446125031
2024-09-25 11:12:54.6870613	1402	391	0.445000023
2024-09-25 11:13:54.6890586	1397	390	0.449000031
2024-09-25 11:14:54.6874215	1402	390	0.447750032
2024-09-25 11:15:54.6872904	1402	389	0.447375029
2024-09-25 11:16:54.6913157	1395	388	0.44600001
2024-09-25 11:17:54.6776123	1399	389	0.448250026
2024-09-25 11:18:54.6862691	1401	389	0.445375025
2024-09-25 11:19:54.6920515	1400	391	0.444875032
2024-09-25 11:20:54.6911595	1400	390	0.446750015
2024-09-25 11:21:54.6808366	1403	389	0.445500016
2024-09-25 11:22:54.6881740	1397	392	0.442875028
2024-09-25 11:23:54.6871476	1394	392	0.44462502
2024-09-25 11:24:54.6876272	1400	390	0.446250021
2024-09-25 11:25:54.6920254	1403	391	0.446875036
2024-09-25 11:26:54.6925120	1401	391	0.452125013
2024-09-25 11:27:54.6892111	1402	391	0.446750015
2024-09-25 11:28:54.6894920	1403	390	0.445500016
2024-09-25 11:29:54.6814725	1395	389	0.449625015
2024-09-25 11:30:54.6816829	1397	389	0.451125026
2024-09-25 11:31:54.6812476	1401	388	0.446250021
2024-09-25 11:32:54.6789942	1398	389	0.446500033
2024-09-25 11:33:54.6856220	1399	390	0.444000036
2024-09-25 11:34:54.6919488	1400	389	0.444875032
2024-09-25 11:35:54.6880853	1401	392	0.44600001
2024-09-25 11:36:54.6820356	1402	393	0.446750015
2024-09-25 11:37:54.6788957	1403	391	0.446875036
2024-09-25 11:38:54.6865103	1402	390	0.447125018
2024-09-25 11:39:54.6853593	1400	389	0.445875019
2024-09-25 11:40:54.6844407	1400	388	0.444750011
2024-09-25 11:41:54.6838472	1400	388	0.442375034
2024-09-25 11:42:54.6900518	1397	390	0.448000014
2024-09-25 11:43:54.6875810	1402	390	0.444750011
2024-09-25 11:44:54.6819362	1403	390	0.443625033
2024-09-25 11:45:54.6884362	1395	390	0.444250017
2024-09-25 11:46:54.6793935	1400	389	0.446375012
2024-09-25 11:47:54.6786275	1402	390	0.446375012
2024-09-25 11:48:54.6840264	1398	391	0.446875036
2024-09-25 11:49:54.6796982	1402	390	0.444375008
2024-09-25 11:50:54.6905632	1403	389	0.444125026
2024-09-25 11:51:54.6858375	1398	392	0.443000019
2024-09-25 11:52:54.6879192	1401	390	0.449375033
2024-09-25 11:53:54.6906583	1402	388	0.450000018
2024-09-25 11:54:54.6902450	1395	391	0.448000014

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 11:55:54.6894155	1394	391	0.445500016
2024-09-25 11:56:54.6790744	1404	388	0.446250021
2024-09-25 11:57:54.6794010	1406	391	0.44600001
2024-09-25 11:58:54.6893669	1397	390	0.445125014
2024-09-25 11:59:54.6823566	1399	389	0.446625024
2024-09-25 12:00:54.6779412	1402	391	0.444750011
2024-09-25 12:01:54.6901591	1399	391	0.442750007
2024-09-25 12:02:54.6926743	1403	391	0.445625007
2024-09-25 12:03:54.6893431	1401	390	0.442375034
2024-09-25 12:04:54.6790553	1396	391	0.441625029
2024-09-25 12:05:54.6836820	1401	390	0.44462502
2024-09-25 12:06:54.6891360	1404	389	0.439875007
2024-09-25 12:07:54.6783624	1393	388	0.441125035
2024-09-25 12:08:54.6883405	1396	389	0.44037503
2024-09-25 12:09:54.6771853	1403	389	0.443500012
2024-09-25 12:10:54.6834996	1404	391	0.446375012
2024-09-25 12:11:54.6801946	1400	389	0.441625029
2024-09-25 12:12:54.6821895	1402	389	0.445125014
2024-09-25 12:13:54.6879309	1399	392	0.44887501
2024-09-25 12:14:54.6863381	1393	391	0.452125013
2024-09-25 12:15:54.6780410	1402	390	0.453875035
2024-09-25 12:16:54.6888700	1404	389	0.448500007
2024-09-25 12:17:54.6787791	1401	390	0.445625007
2024-09-25 12:18:54.6920957	1402	390	0.447250009
2024-09-25 12:19:54.6859914	1401	389	0.449375033
2024-09-25 12:20:54.6794490	1391	390	0.449500024
2024-09-25 12:21:54.7081633	1397	390	0.447625011
2024-09-25 12:22:54.7412637	1403	389	0.444125026
2024-09-25 12:23:54.7839288	1400	392	0.442750007
2024-09-25 12:24:54.8233563	1397	389	0.44312501
2024-09-25 12:25:54.8626890	1400	390	0.445125014
2024-09-25 12:26:54.8876461	1403	392	0.444125026
2024-09-25 12:27:54.8998795	1400	390	0.442500025
2024-09-25 12:28:54.9105346	1401	389	0.440000027
2024-09-25 12:29:54.9195210	1401	391	0.439125031
2024-09-25 12:30:54.9357196	1398	389	0.44037503
2024-09-25 12:31:54.9504660	1401	390	0.443500012
2024-09-25 12:32:54.9481111	1404	391	0.444375008
2024-09-25 12:33:54.9602452	1397	389	0.44312501
2024-09-25 12:34:54.9596745	1398	391	0.44462502
2024-09-25 12:35:54.9591837	1400	389	0.441125035
2024-09-25 12:36:54.9645990	1396	391	0.44312501
2024-09-25 12:37:54.9628624	1399	389	0.443625033
2024-09-25 12:38:54.9695674	1404	390	0.442500025
2024-09-25 12:39:54.9774420	1401	392	0.441875011
2024-09-25 12:40:54.9730409	1399	389	0.446875036
2024-09-25 12:41:54.9769714	1400	390	0.445875019
2024-09-25 12:42:54.9804538	1399	391	0.444000036
2024-09-25 12:43:54.9800115	1400	390	0.446625024
2024-09-25 12:44:54.9740158	1400	389	0.442000031
2024-09-25 12:45:54.9774114	1402	391	0.44037503
2024-09-25 12:46:54.9788149	1397	388	0.442750007
2024-09-25 12:47:54.9716688	1398	390	0.444000036
2024-09-25 12:48:54.9726136	1400	391	0.443500012
2024-09-25 12:49:54.9846440	1397	390	0.442250013
2024-09-25 12:50:54.9742829	1406	390	0.44037503
2024-09-25 12:51:54.9822786	1405	390	0.436750025
2024-09-25 12:52:54.9790995	1396	391	0.440750033
2024-09-25 12:53:54.9858267	1398	389	0.441250026
2024-09-25 12:54:54.9722221	1400	389	0.440750033
2024-09-25 12:55:54.9782336	1399	391	0.443625033
2024-09-25 12:56:54.9809181	1401	389	0.442750007
2024-09-25 12:57:54.9837851	1403	390	0.443625033
2024-09-25 12:58:54.9737132	1402	391	0.441250026
2024-09-25 12:59:54.9778226	1397	389	0.446375012

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 13:00:54.9778104	1399	390	0.442000031
2024-09-25 13:01:54.9787795	1401	391	0.436375022
2024-09-25 13:02:54.9835709	1396	389	0.441625029
2024-09-25 13:03:54.9747191	1401	390	0.440875024
2024-09-25 13:04:54.9780638	1404	391	0.442125022
2024-09-25 13:05:54.9769100	1399	390	0.440875024
2024-09-25 13:06:54.9846024	1400	389	0.445625007
2024-09-25 13:07:54.9779980	1402	390	0.445625007
2024-09-25 13:08:54.9729686	1400	391	0.44600001
2024-09-25 13:09:54.9802985	1402	390	0.448625028
2024-09-25 13:10:54.9837440	1400	388	0.44750002
2024-09-25 13:11:54.9758122	1395	390	0.446375012
2024-09-25 13:12:54.9744615	1395	390	0.446375012
2024-09-25 13:13:54.9844900	1401	389	0.445375025
2024-09-25 13:14:54.9770042	1402	392	0.445500016
2024-09-25 13:15:54.9779392	1399	390	0.445250034
2024-09-25 13:16:54.9723234	1400	389	0.442375034
2024-09-25 13:17:54.9758355	1402	392	0.441625029
2024-09-25 13:18:54.9757497	1399	390	0.44325003
2024-09-25 13:19:54.9778981	1401	389	0.444000036
2024-09-25 13:20:54.9802859	1402	390	0.442875028
2024-09-25 13:21:54.9723322	1400	390	0.444125026
2024-09-25 13:22:54.9767598	1403	388	0.447625011
2024-09-25 13:23:54.9828902	1399	391	0.447625011
2024-09-25 13:24:54.9814565	1394	389	0.444000036
2024-09-25 13:25:54.9731454	1397	390	0.444000036
2024-09-25 13:26:54.9728650	1401	389	0.447125018
2024-09-25 13:27:54.9797545	1401	391	0.448750019
2024-09-25 13:28:54.9767635	1401	389	0.450000018
2024-09-25 13:29:54.9836880	1402	389	0.442000031
2024-09-25 13:30:54.9794653	1402	393	0.442750007
2024-09-25 13:31:54.9830502	1398	389	0.443625033
2024-09-25 13:32:54.9763753	1400	389	0.44462502
2024-09-25 13:33:54.9794359	1402	392	0.443875015
2024-09-25 13:34:54.9766039	1401	390	0.449250013
2024-09-25 13:35:54.9734990	1402	389	0.446625024
2024-09-25 13:36:54.9802467	1399	391	0.446750015
2024-09-25 13:37:54.9759736	1393	389	0.446625024
2024-09-25 13:38:54.9832098	1398	390	0.447125018
2024-09-25 13:39:54.9745040	1402	390	0.447125018
2024-09-25 13:40:54.9778221	1399	391	0.444875032
2024-09-25 13:41:54.9741615	1398	389	0.445625007
2024-09-25 13:42:54.9794914	1401	389	0.440875024
2024-09-25 13:43:54.9795329	1401	392	0.442500025
2024-09-25 13:44:54.9796239	1400	390	0.44325003
2024-09-25 13:45:54.9783091	1402	389	0.440750033
2024-09-25 13:46:54.9761350	1401	390	0.441500008
2024-09-25 13:47:54.9740439	1397	391	0.448000014
2024-09-25 13:48:54.9872487	1401	389	0.44312501
2024-09-25 13:49:54.9953367	1404	390	0.444375008
2024-09-25 13:50:54.9948884	1401	390	0.447375029
2024-09-25 13:51:54.9887500	1402	390	0.444375008
2024-09-25 13:52:54.9985317	1402	390	0.444750011
2024-09-25 13:53:55.0000353	1393	390	0.445750028
2024-09-25 13:54:54.9874138	1398	390	0.443875015
2024-09-25 13:55:54.9911042	1403	390	0.444000036
2024-09-25 13:56:54.9871208	1399	393	0.446375012
2024-09-25 13:57:54.9961858	1399	393	0.44600001
2024-09-25 13:58:55.0021315	1402	389	0.44600001
2024-09-25 13:59:54.9958719	1401	390	0.449500024
2024-09-25 14:00:54.9890505	1400	390	0.444375008
2024-09-25 14:01:54.9873867	1402	389	0.446750015
2024-09-25 14:02:54.9881850	1398	389	0.444750011
2024-09-25 14:03:54.9941428	1394	389	0.448625028
2024-09-25 14:04:54.9891176	1400	387	0.450625032

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 14:05:54.9941675	1404	391	0.449875027
2024-09-25 14:06:55.0012460	1399	392	0.446375012
2024-09-25 14:07:55.0002644	1400	391	0.454375029
2024-09-25 14:08:54.9974422	1402	390	0.442375034
2024-09-25 14:09:55.0012581	1399	391	0.445500016
2024-09-25 14:10:54.9938204	1401	391	0.439250022
2024-09-25 14:11:54.9940402	1401	388	0.445375025
2024-09-25 14:12:54.9891825	1400	389	0.44600001
2024-09-25 14:13:55.0017839	1403	388	0.442250013
2024-09-25 14:14:54.9908914	1400	388	0.443500012
2024-09-25 14:15:54.9883861	1396	390	0.442250013
2024-09-25 14:16:54.9868483	1397	391	0.446625024
2024-09-25 14:17:54.9892921	1400	390	0.443000019
2024-09-25 14:18:54.9991437	1402	390	0.444750011
2024-09-25 14:19:54.9888316	1397	390	0.445375025
2024-09-25 14:20:54.9948790	1402	389	0.440875024
2024-09-25 14:21:54.9869748	1402	391	0.437250018
2024-09-25 14:22:54.9913276	1395	391	0.438000023
2024-09-25 14:23:54.9948114	1401	390	0.440250009
2024-09-25 14:24:54.9888335	1402	389	0.440250009
2024-09-25 14:25:54.9963794	1399	391	0.440875024
2024-09-25 14:26:54.9955317	1400	390	0.442750007
2024-09-25 14:27:54.9944120	1400	389	0.438750029
2024-09-25 14:28:54.9975514	1397	390	0.440125018
2024-09-25 14:29:55.0010594	1402	390	0.441500008
2024-09-25 14:30:54.9875589	1404	388	0.440125018
2024-09-25 14:31:54.9879685	1403	392	0.43887502
2024-09-25 14:32:54.9873755	1399	391	0.443625033
2024-09-25 14:33:54.9982498	1399	389	0.440125018
2024-09-25 14:34:55.0033273	1399	390	0.437875032
2024-09-25 14:35:55.0051006	1398	391	0.442500025
2024-09-25 14:36:55.0049061	1399	390	0.438750029
2024-09-25 14:37:55.0077319	1403	390	0.442125022
2024-09-25 14:38:55.0113794	1401	389	0.440875024
2024-09-25 14:39:55.0085871	1402	389	0.443000019
2024-09-25 14:40:55.0142893	1401	390	0.445625007
2024-09-25 14:41:55.0098836	1395	390	0.442000031
2024-09-25 14:42:55.0120554	1398	390	0.443875015
2024-09-25 14:43:55.0044138	1400	389	0.440750033
2024-09-25 14:44:55.0159306	1401	390	0.441375017
2024-09-25 14:45:55.0168604	1402	391	0.439750016
2024-09-25 14:46:55.0025187	1403	388	0.442375034
2024-09-25 14:47:55.0137247	1400	392	0.437750012
2024-09-25 14:48:55.0042743	1398	391	0.442250013
2024-09-25 14:49:55.0041852	1402	389	0.439500034
2024-09-25 14:50:55.0037742	1403	391	0.440875024
2024-09-25 14:51:55.0052354	1398	391	0.442750007
2024-09-25 14:52:55.0137355	1401	390	0.447250009
2024-09-25 14:53:55.0072336	1403	389	0.438750029
2024-09-25 14:54:55.0090396	1395	389	0.444250017
2024-09-25 14:55:55.0043238	1400	390	0.44325003
2024-09-25 14:56:55.0071693	1404	390	0.446625024
2024-09-25 14:57:55.0060108	1396	392	0.441625029
2024-09-25 14:58:55.0166691	1398	391	0.446750015
2024-09-25 14:59:55.0159478	1400	389	0.441125035
2024-09-25 15:00:55.0173181	1399	391	0.443375021
2024-09-25 15:01:55.0139962	1400	391	0.443000019
2024-09-25 15:02:55.0069472	1402	390	0.441625029
2024-09-25 15:03:55.0102041	1402	391	0.449625015
2024-09-25 15:04:55.0034648	1399	390	0.448000014
2024-09-25 15:05:55.0145841	1402	389	0.45025003
2024-09-25 15:06:55.0113378	1400	389	0.445625007
2024-09-25 15:07:55.0171095	1396	389	0.450875014
2024-09-25 15:08:55.0161326	1398	390	0.449250013
2024-09-25 15:09:55.0068189	1401	390	0.446250021

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
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2024-09-25 15:11:55.0168478	1404	390	0.44312501
2024-09-25 15:12:55.0028163	1406	389	0.454250008
2024-09-25 15:13:55.0059305	1396	391	0.450875014
2024-09-25 15:14:55.0167447	1399	391	0.449750036
2024-09-25 15:15:55.0027286	1399	390	0.453750014
2024-09-25 15:16:55.0032050	1400	392	0.456250012
2024-09-25 15:17:55.0134130	1403	391	0.455000013
2024-09-25 15:18:55.0127944	1403	389	0.456250012
2024-09-25 15:19:55.0139426	1396	389	0.451625019
2024-09-25 15:20:55.0053585	1394	389	0.448625028
2024-09-25 15:21:55.0168464	1404	387	0.452875018
2024-09-25 15:22:55.0058536	1406	391	0.450375021
2024-09-25 15:23:55.0157290	1398	392	0.45175001
2024-09-25 15:24:55.0166378	1401	392	0.450875014
2024-09-25 15:25:55.0116798	1402	391	0.448125035
2024-09-25 15:26:55.0052923	1396	391	0.448375016
2024-09-25 15:27:55.0039304	1400	390	0.447625011
2024-09-25 15:28:55.0159935	1401	389	0.447000027
2024-09-25 15:29:55.0090191	1400	389	0.450375021
2024-09-25 15:30:55.0147026	1402	389	0.451625019
2024-09-25 15:31:55.0178970	1402	388	0.449250013
2024-09-25 15:32:55.0178989	1395	388	0.451500028
2024-09-25 15:33:55.0032936	1398	391	0.450000018
2024-09-25 15:34:55.0092132	1401	390	0.452375025
2024-09-25 15:35:55.0079721	1403	392	0.451375008
2024-09-25 15:36:55.0029595	1400	391	0.451500028
2024-09-25 15:37:55.0158409	1401	390	0.450875014
2024-09-25 15:38:55.0028172	1400	391	0.447125018
2024-09-25 15:39:55.0141656	1397	392	0.449500024
2024-09-25 15:40:55.0030015	1400	390	0.451875031
2024-09-25 15:41:55.0166602	1401	390	0.452750027
2024-09-25 15:42:55.0058876	1399	391	0.468250036
2024-09-25 15:43:55.0078788	1401	390	0.487375021
2024-09-25 15:44:55.0095029	1404	389	0.515125036
2024-09-25 15:45:55.0048854	1397	389	0.56675005
2024-09-25 15:46:55.0032012	1400	390	0.694500029
2024-09-25 15:47:55.0026185	1404	388	0.867250025
2024-09-25 15:48:55.0058647	1398	391	0.942000031
2024-09-25 15:49:55.0144012	1395	392	0.949750066
2024-09-25 15:50:55.0097081	1399	391	0.946500063
2024-09-25 15:51:55.0027976	1403	392	0.935625017
2024-09-25 15:52:55.0078233	1402	392	0.939375043
2024-09-25 15:53:55.0086663	1405	389	0.947625041
2024-09-25 15:54:55.0153660	1400	389	0.940000057
2024-09-25 15:55:55.0081578	1397	389	0.94750005
2024-09-25 15:56:55.0046974	1404	390	0.946125031
2024-09-25 15:57:55.0170180	1401	390	0.946875036
2024-09-25 15:58:55.0062426	1394	390	0.946625054
2024-09-25 15:59:55.0134111	1401	390	0.957625031
2024-09-25 16:00:55.0138063	1406	389	0.94600004
2024-09-25 16:01:55.0064432	1394	390	0.945750058
2024-09-25 16:02:55.0120273	1398	389	0.942375064
2024-09-25 16:03:55.0160415	1403	388	0.944875062
2024-09-25 16:04:55.0143498	1401	390	0.942750037
2024-09-25 16:05:55.0170343	1400	391	0.948000073
2024-09-25 16:06:55.0053958	1403	390	0.957000017
2024-09-25 16:07:55.0114166	1400	392	0.944750071
2024-09-25 16:08:55.0158106	1400	392	0.95462507
2024-09-25 16:09:55.0159977	1402	390	0.952250063
2024-09-25 16:10:55.0098891	1397	389	0.950750053
2024-09-25 16:11:55.0139887	1392	389	0.935875058
2024-09-25 16:12:55.0097977	1404	390	0.881875038
2024-09-25 16:13:55.0139294	1406	390	0.738250017
2024-09-25 16:14:55.0120455	1391	391	0.596375048

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
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2024-09-25 16:16:55.0127131	1404	389	0.461250007
2024-09-25 16:17:55.0072410	1400	389	0.446750015
2024-09-25 16:18:55.0170264	1403	390	0.446125031
2024-09-25 16:19:55.0097851	1401	389	0.449750036
2024-09-25 16:20:55.0036630	1395	390	0.446625024
2024-09-25 16:21:55.0161777	1398	390	0.446875036
2024-09-25 16:22:55.0046325	1400	389	0.446875036
2024-09-25 16:23:55.0074239	1399	390	0.44600001
2024-09-25 16:24:55.0110882	1399	389	0.450375021
2024-09-25 16:25:55.0102689	1402	389	0.451250017
2024-09-25 16:26:55.0125778	1402	390	0.447250009
2024-09-25 16:27:55.0038982	1396	390	0.449875027
2024-09-25 16:28:55.0025928	1402	389	0.450875014
2024-09-25 16:29:55.0132511	1406	390	0.452000022
2024-09-25 16:30:55.0167898	1397	392	0.446625024
2024-09-25 16:31:55.0075624	1400	392	0.445250034
2024-09-25 16:32:55.0121257	1402	391	0.447625011
2024-09-25 16:33:55.0035492	1400	391	0.447625011
2024-09-25 16:34:55.0131204	1400	391	0.448000014
2024-09-25 16:35:55.0143111	1401	388	0.449375033
2024-09-25 16:36:55.0034484	1396	389	0.446375012
2024-09-25 16:37:55.0029511	1396	389	0.447000027
2024-09-25 16:38:55.0049348	1400	387	0.446625024
2024-09-25 16:39:55.0087964	1401	390	0.445625007
2024-09-25 16:40:55.0096292	1399	391	0.445250034
2024-09-25 16:41:55.0053440	1404	391	0.449500024
2024-09-25 16:42:55.0082133	1404	392	0.445125014
2024-09-25 16:43:55.0127570	1400	392	0.444875032
2024-09-25 16:44:55.0033924	1400	390	0.446500033
2024-09-25 16:45:55.0118271	1400	389	0.444375008
2024-09-25 16:46:55.0166088	1397	389	0.447250009
2024-09-25 16:47:55.0171066	1401	388	0.448000014
2024-09-25 16:48:55.0173576	1403	388	0.452125013
2024-09-25 16:49:55.0090092	1397	390	0.448125035
2024-09-25 16:50:55.0039317	1398	390	0.448500007
2024-09-25 16:51:55.0037638	1399	390	0.448625028
2024-09-25 16:52:55.0054420	1396	390	0.448625028
2024-09-25 16:53:55.0063153	1401	390	0.449750036
2024-09-25 16:54:55.0261832	1407	389	0.446250021
2024-09-25 16:55:55.0710815	1400	391	0.448125035
2024-09-25 16:56:55.1152151	1396	390	0.454375029
2024-09-25 16:57:55.1410012	1399	388	0.450625032
2024-09-25 16:58:55.1875292	1400	391	0.454000026
2024-09-25 16:59:55.2098760	1397	390	0.454875022
2024-09-25 17:00:55.2285953	1403	389	0.454875022
2024-09-25 17:01:55.2425631	1403	391	0.453875035
2024-09-25 17:02:55.2479866	1395	389	0.452000022
2024-09-25 17:03:55.2630212	1399	390	0.456500024
2024-09-25 17:04:55.2725160	1403	389	0.455250025
2024-09-25 17:05:55.2721992	1398	391	0.452250034
2024-09-25 17:06:55.2762235	1398	389	0.450500011
2024-09-25 17:07:55.2928452	1401	389	0.450750023
2024-09-25 17:08:55.2971639	1402	392	0.453875035
2024-09-25 17:09:55.2961955	1400	389	0.447625011
2024-09-25 17:10:55.2987313	1402	390	0.450000018
2024-09-25 17:11:55.2996990	1401	391	0.450000018
2024-09-25 17:12:55.2967260	1402	389	0.454375029
2024-09-25 17:13:55.2941175	1403	391	0.454125017
2024-09-25 17:14:55.3084697	1401	390	0.450375021
2024-09-25 17:15:55.2984221	1397	390	0.451875031
2024-09-25 17:16:55.3078095	1402	390	0.456750035
2024-09-25 17:17:55.3082052	1403	390	0.452125013
2024-09-25 17:18:55.2992978	1395	391	0.451875031
2024-09-25 17:19:55.2970625	1401	389	0.450625032

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 17:20:55.3003704	1405	390	0.455250025
2024-09-25 17:21:55.3005220	1394	391	0.451250017
2024-09-25 17:22:55.3072091	1396	389	0.451625019
2024-09-25 17:23:55.3017262	1402	391	0.455625027
2024-09-25 17:24:55.3120017	1402	391	0.455625027
2024-09-25 17:25:55.3120059	1402	390	0.457875013
2024-09-25 17:26:55.3023824	1403	389	0.457500011
2024-09-25 17:27:55.3102018	1399	390	0.455625027
2024-09-25 17:28:55.3104556	1394	391	0.456875026
2024-09-25 17:29:55.3141128	1401	389	0.454875022
2024-09-25 17:30:55.2990242	1402	391	0.454750031
2024-09-25 17:31:55.2996988	1397	392	0.45462501
2024-09-25 17:32:55.3121477	1400	391	0.455500036
2024-09-25 17:33:55.3044030	1401	390	0.45462501
2024-09-25 17:34:55.3035875	1397	392	0.450750023
2024-09-25 17:35:55.2987466	1402	391	0.453500032
2024-09-25 17:36:55.2995873	1403	389	0.449375033
2024-09-25 17:37:55.3043345	1399	388	0.450500011
2024-09-25 17:38:55.3087214	1398	388	0.455125034
2024-09-25 17:39:55.2987237	1399	387	0.45450002
2024-09-25 17:40:55.3016378	1399	390	0.451375008
2024-09-25 17:41:55.3023073	1399	390	0.455375016
2024-09-25 17:42:55.3090447	1405	389	0.453250021
2024-09-25 17:43:55.3002750	1406	391	0.445500016
2024-09-25 17:44:55.3077319	1394	389	0.452875018
2024-09-25 17:45:55.2986915	1397	389	0.45025003
2024-09-25 17:46:55.3001616	1403	391	0.44887501
2024-09-25 17:47:55.3013490	1398	390	0.453250021
2024-09-25 17:48:55.3055769	1400	389	0.445375025
2024-09-25 17:49:55.3095710	1402	391	0.445125014
2024-09-25 17:50:55.3060999	1400	391	0.451125026
2024-09-25 17:51:55.3009296	1403	390	0.447000027
2024-09-25 17:52:55.3026236	1404	389	0.448250026
2024-09-25 17:53:55.2988730	1396	390	0.44600001
2024-09-25 17:54:55.3011726	1397	390	0.447375029
2024-09-25 17:55:55.3042080	1400	388	0.446125031
2024-09-25 17:56:55.3102447	1399	392	0.445625007
2024-09-25 17:57:55.3089738	1398	390	0.446375012
2024-09-25 17:58:55.3118277	1402	388	0.447125018
2024-09-25 17:59:55.2998780	1403	392	0.44312501
2024-09-25 18:00:55.3052465	1401	391	0.447625011
2024-09-25 18:01:55.3082688	1403	390	0.443875015
2024-09-25 18:02:55.3050314	1400	390	0.44600001
2024-09-25 18:03:55.3112757	1396	390	0.445250034
2024-09-25 18:04:55.3075447	1400	389	0.445375025
2024-09-25 18:05:55.3106860	1404	389	0.44887501
2024-09-25 18:06:55.3120698	1397	390	0.445625007
2024-09-25 18:07:55.3048108	1399	391	0.448750019
2024-09-25 18:08:55.3039761	1401	389	0.44462502
2024-09-25 18:09:55.3066546	1399	390	0.445500016
2024-09-25 18:10:55.3008992	1399	391	0.444000036
2024-09-25 18:11:55.3014642	1403	388	0.445125014
2024-09-25 18:12:55.3038156	1400	392	0.443500012
2024-09-25 18:13:55.3097804	1395	392	0.44600001
2024-09-25 18:14:55.3137540	1399	390	0.450500011
2024-09-25 18:15:55.3124234	1400	391	0.446875036
2024-09-25 18:16:55.3099055	1400	392	0.447375029
2024-09-25 18:17:55.3058759	1403	390	0.450500011
2024-09-25 18:18:55.3078158	1406	389	0.448625028
2024-09-25 18:19:55.3103230	1396	389	0.449375033
2024-09-25 18:20:55.3000879	1398	389	0.449500024
2024-09-25 18:21:55.3007098	1401	388	0.45025003
2024-09-25 18:22:55.3015654	1398	391	0.450375021
2024-09-25 18:23:55.3107732	1401	391	0.44750002
2024-09-25 18:24:55.3040097	1402	390	0.448250026

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 18:25:55.3033099	1400	392	0.449000031
2024-09-25 18:26:55.2997548	1401	392	0.44600001
2024-09-25 18:27:55.3019167	1402	389	0.447250009
2024-09-25 18:28:55.3035352	1397	389	0.443500012
2024-09-25 18:29:55.3021155	1397	388	0.449375033
2024-09-25 18:30:55.2996512	1403	388	0.444750011
2024-09-25 18:31:55.3116895	1402	390	0.450375021
2024-09-25 18:32:55.3068687	1396	391	0.453375012
2024-09-25 18:33:55.2987722	1400	391	0.450000018
2024-09-25 18:34:55.3001900	1404	391	0.451625019
2024-09-25 18:35:55.3116601	1399	391	0.449750036
2024-09-25 18:36:55.3075386	1403	390	0.451875031
2024-09-25 18:37:55.3126203	1401	390	0.44750002
2024-09-25 18:38:55.3118519	1392	391	0.448625028
2024-09-25 18:39:55.3023590	1398	391	0.451875031
2024-09-25 18:40:55.3124966	1402	389	0.449250013
2024-09-25 18:41:55.3094296	1400	390	0.45175001
2024-09-25 18:42:55.3114306	1401	391	0.447625011
2024-09-25 18:43:55.3025666	1402	390	0.449250013
2024-09-25 18:44:55.2999320	1400	390	0.443625033
2024-09-25 18:45:55.3028190	1396	390	0.447375029
2024-09-25 18:46:55.3051541	1399	388	0.44750002
2024-09-25 18:47:55.2987461	1400	390	0.442875028
2024-09-25 18:48:55.3062178	1399	391	0.451500028
2024-09-25 18:49:55.3079361	1406	391	0.447625011
2024-09-25 18:50:55.3053113	1404	391	0.443625033
2024-09-25 18:51:55.3111054	1396	392	0.446250021
2024-09-25 18:52:55.2995079	1400	391	0.447000027
2024-09-25 18:53:55.3082132	1401	389	0.446750015
2024-09-25 18:54:55.3073114	1399	389	0.45025003
2024-09-25 18:55:55.3002031	1402	389	0.450875014
2024-09-25 18:56:55.2995308	1402	388	0.449875027
2024-09-25 18:57:55.3104839	1395	388	0.447000027
2024-09-25 18:58:55.2986117	1396	389	0.44750002
2024-09-25 18:59:55.2990717	1398	390	0.448750019
2024-09-25 19:00:55.2989565	1402	391	0.452500015
2024-09-25 19:01:55.3113811	1403	391	0.446250021
2024-09-25 19:02:55.3048116	1402	390	0.450875014
2024-09-25 19:03:55.3003813	1401	392	0.446375012
2024-09-25 19:04:55.3072913	1396	393	0.447250009
2024-09-25 19:05:55.3007620	1398	390	0.447875023
2024-09-25 19:06:55.3125549	1401	389	0.449000031
2024-09-25 19:07:55.3094827	1399	391	0.450375021
2024-09-25 19:08:55.3030980	1402	391	0.453875035
2024-09-25 19:09:55.3002208	1402	389	0.455375016
2024-09-25 19:10:55.3068994	1396	389	0.450875014
2024-09-25 19:11:55.3012155	1399	389	0.458000034
2024-09-25 19:12:55.3050370	1402	387	0.460500032
2024-09-25 19:13:55.3135641	1398	390	0.455250025
2024-09-25 19:14:55.3007111	1398	391	0.447625011
2024-09-25 19:15:55.3014039	1401	389	0.449000031
2024-09-25 19:16:55.3052348	1402	391	0.448250026
2024-09-25 19:17:55.3096931	1399	392	0.44600001
2024-09-25 19:18:55.3023361	1399	391	0.449375033
2024-09-25 19:19:55.3053449	1400	391	0.44887501
2024-09-25 19:20:55.3129991	1400	390	0.452125013
2024-09-25 19:21:55.3036144	1404	389	0.450375021
2024-09-25 19:22:55.3117552	1404	389	0.450000018
2024-09-25 19:23:55.3050598	1396	389	0.455125034
2024-09-25 19:24:55.3087493	1397	389	0.452125013
2024-09-25 19:25:55.3057965	1398	389	0.451250017
2024-09-25 19:26:55.3134287	1398	390	0.449750036
2024-09-25 19:27:55.3052558	1405	389	0.451375008
2024-09-25 19:28:55.3036662	1405	389	0.448000014
2024-09-25 19:29:55.3028768	1394	392	0.447250009

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
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2024-09-25 19:31:55.3103990	1402	390	0.449125022
2024-09-25 19:32:55.3022871	1404	391	0.448000014
2024-09-25 19:33:55.3114100	1402	391	0.450375021
2024-09-25 19:34:55.3000010	1401	389	0.451000035
2024-09-25 19:35:55.3006500	1399	388	0.444125026
2024-09-25 19:36:55.3064524	1393	388	0.449125022
2024-09-25 19:37:55.3091505	1399	388	0.44750002
2024-09-25 19:38:55.3065770	1403	389	0.446375012
2024-09-25 19:39:55.3025731	1398	391	0.448750019
2024-09-25 19:40:55.3059957	1400	392	0.447375029
2024-09-25 19:41:55.3087110	1401	391	0.447125018
2024-09-25 19:42:55.3130312	1398	392	0.448625028
2024-09-25 19:43:55.3040931	1401	391	0.445250034
2024-09-25 19:44:55.3087838	1404	389	0.445125014
2024-09-25 19:45:55.3108207	1402	389	0.446625024
2024-09-25 19:46:55.3045578	1401	390	0.451500028
2024-09-25 19:47:55.3010134	1402	389	0.450500011
2024-09-25 19:48:55.3117436	1396	389	0.446750015
2024-09-25 19:49:55.3120781	1395	389	0.449250013
2024-09-25 19:50:55.3114095	1400	389	0.448000014
2024-09-25 19:51:55.3099795	1404	391	0.447875023
2024-09-25 19:52:55.3032505	1399	391	0.445250034
2024-09-25 19:53:55.3019148	1403	391	0.447125018
2024-09-25 19:54:55.2986760	1404	391	0.448250026
2024-09-25 19:55:55.3122213	1395	392	0.447125018
2024-09-25 19:56:55.3029449	1400	390	0.447625011
2024-09-25 19:57:55.3063974	1403	388	0.449125022
2024-09-25 19:58:55.3131422	1401	390	0.447125018
2024-09-25 19:59:55.3003677	1402	391	0.449375033
2024-09-25 20:00:55.3002189	1399	390	0.451125026
2024-09-25 20:01:55.3114249	1395	389	0.449625015
2024-09-25 20:02:55.3029804	1397	389	0.449250013
2024-09-25 20:03:55.3104064	1402	388	0.448500007
2024-09-25 20:04:55.3118807	1402	390	0.447750032
2024-09-25 20:05:55.3123346	1399	391	0.446875036
2024-09-25 20:06:55.3129421	1400	390	0.446375012
2024-09-25 20:07:55.3018858	1401	391	0.445625007
2024-09-25 20:08:55.3054008	1399	392	0.447375029
2024-09-25 20:09:55.3053929	1402	391	0.448750019
2024-09-25 20:10:55.3121359	1403	391	0.446125031
2024-09-25 20:11:55.3069969	1397	390	0.450000018
2024-09-25 20:12:55.3130988	1400	390	0.449625015
2024-09-25 20:13:55.3117323	1402	388	0.445750028
2024-09-25 20:14:55.3065788	1398	389	0.448000014
2024-09-25 20:15:55.3003271	1399	389	0.450750023
2024-09-25 20:16:55.3065140	1401	388	0.450625032
2024-09-25 20:17:55.3069213	1399	390	0.450750023
2024-09-25 20:18:55.2999086	1399	390	0.447625011
2024-09-25 20:19:55.3018979	1402	388	0.448125035
2024-09-25 20:20:55.3045517	1400	392	0.445375025
2024-09-25 20:21:55.3088206	1398	393	0.450125009
2024-09-25 20:22:55.3005645	1400	391	0.450750023
2024-09-25 20:23:55.2988406	1402	391	0.448625028
2024-09-25 20:24:55.3049767	1401	391	0.451625019
2024-09-25 20:25:55.3031394	1402	390	0.452000022
2024-09-25 20:26:55.3093926	1401	389	0.452375025
2024-09-25 20:27:55.3086368	1394	389	0.451125026
2024-09-25 20:28:55.3111543	1398	389	0.450375021
2024-09-25 20:29:55.3137329	1401	388	0.447000027
2024-09-25 20:30:55.3033559	1399	390	0.450000018
2024-09-25 20:31:55.2997719	1400	391	0.448000014
2024-09-25 20:32:55.3115695	1401	390	0.450000018
2024-09-25 20:33:55.3022100	1398	391	0.447125018
2024-09-25 20:34:55.3073570	1400	392	0.443375021

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
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2024-09-25 20:36:55.3003625	1404	390	0.446250021
2024-09-25 20:37:55.3054045	1402	390	0.444250017
2024-09-25 20:38:55.3046478	1399	389	0.44887501
2024-09-25 20:39:55.3040254	1398	389	0.444250017
2024-09-25 20:40:55.3126225	1398	389	0.44887501
2024-09-25 20:41:55.2994126	1403	389	0.448625028
2024-09-25 20:42:55.3090361	1405	389	0.443750024
2024-09-25 20:43:55.3005062	1393	389	0.448125035
2024-09-25 20:44:55.3074148	1398	390	0.449625015
2024-09-25 20:45:55.3081879	1402	390	0.445125014
2024-09-25 20:46:55.3013465	1398	393	0.449125022
2024-09-25 20:47:55.3090818	1402	393	0.447750032
2024-09-25 20:48:55.2988621	1404	389	0.448375016
2024-09-25 20:49:55.2994705	1399	391	0.442000031
2024-09-25 20:50:55.3015718	1398	391	0.442000031
2024-09-25 20:51:55.3055314	1402	388	0.44312501
2024-09-25 20:52:55.3084412	1399	389	0.44037503
2024-09-25 20:53:55.3074853	1396	389	0.438000023
2024-09-25 20:54:55.3125310	1399	388	0.440000027
2024-09-25 20:55:55.2997075	1401	390	0.440500021
2024-09-25 20:56:55.3121746	1398	392	0.441250026
2024-09-25 20:57:55.2985882	1405	393	0.44037503
2024-09-25 20:58:55.3132052	1406	391	0.438000023
2024-09-25 20:59:55.3127535	1394	391	0.439750016
2024-09-25 21:00:55.2990823	1397	390	0.437875032
2024-09-25 21:01:55.3073500	1401	388	0.437625021
2024-09-25 21:02:55.3099286	1399	389	0.441500008
2024-09-25 21:03:55.3037977	1400	389	0.442500025
2024-09-25 21:04:55.3120607	1403	388	0.438375026
2024-09-25 21:05:55.2996795	1399	388	0.440750033
2024-09-25 21:06:55.3044144	1399	391	0.439500034
2024-09-25 21:07:55.3056937	1400	390	0.437625021
2024-09-25 21:08:55.3117649	1401	391	0.437000006
2024-09-25 21:09:55.3122310	1399	390	0.436750025
2024-09-25 21:10:55.3059573	1403	390	0.442500025
2024-09-25 21:11:55.3079915	1404	391	0.435750008
2024-09-25 21:12:55.3075944	1398	392	0.441000015
2024-09-25 21:13:55.3016431	1403	391	0.438250035
2024-09-25 21:14:55.2988592	1401	390	0.439875007
2024-09-25 21:15:55.3091672	1395	391	0.442500025
2024-09-25 21:16:55.3105006	1399	391	0.440625012
2024-09-25 21:17:55.3037267	1402	389	0.442375034
2024-09-25 21:18:55.3068997	1397	389	0.442375034
2024-09-25 21:19:55.2994793	1399	389	0.438250035
2024-09-25 21:20:55.3117626	1400	387	0.439500034
2024-09-25 21:21:55.3052440	1396	390	0.439250022
2024-09-25 21:22:55.3131771	1403	391	0.439875007
2024-09-25 21:23:55.3018162	1408	390	0.437625021
2024-09-25 21:24:55.3140421	1400	392	0.439625025
2024-09-25 21:25:55.3079056	1397	392	0.437125027
2024-09-25 21:26:55.3068801	1400	390	0.43900001
2024-09-25 21:27:55.3378641	1402	389	0.43750003
2024-09-25 21:28:55.3700327	1400	389	0.440125018
2024-09-25 21:29:55.4055387	1401	389	0.437375009
2024-09-25 21:30:55.4406228	1401	389	0.439500034
2024-09-25 21:31:55.4812968	1394	388	0.439500034
2024-09-25 21:32:55.5088020	1397	389	0.442375034
2024-09-25 21:33:55.5250074	1400	390	0.43750003
2024-09-25 21:34:55.5376799	1399	391	0.440000027
2024-09-25 21:35:55.5502076	1401	391	0.437125027
2024-09-25 21:36:55.5549073	1405	390	0.441625029
2024-09-25 21:37:55.5724871	1400	392	0.440250009
2024-09-25 21:38:55.5757704	1399	392	0.441500008
2024-09-25 21:39:55.5822555	1401	389	0.440500021

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
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2024-09-25 21:41:55.5807970	1400	391	0.436750025
2024-09-25 21:42:55.5903211	1401	390	0.440625012
2024-09-25 21:43:55.5821032	1400	390	0.441625029
2024-09-25 21:44:55.5842624	1393	389	0.440000027
2024-09-25 21:45:55.5972239	1399	389	0.440250009
2024-09-25 21:46:55.5882151	1403	389	0.439125031
2024-09-25 21:47:55.5943130	1396	391	0.43887502
2024-09-25 21:48:55.5911707	1400	391	0.440750033
2024-09-25 21:49:55.5928415	1401	390	0.437750012
2024-09-25 21:50:55.5930640	1398	392	0.436375022
2024-09-25 21:51:55.5924015	1400	392	0.442125022
2024-09-25 21:52:55.5962378	1403	389	0.438375026
2024-09-25 21:53:55.5957018	1401	388	0.440750033
2024-09-25 21:54:55.5998471	1399	389	0.441500008
2024-09-25 21:55:55.5992863	1400	388	0.437875032
2024-09-25 21:56:55.5920282	1401	389	0.43750003
2024-09-25 21:57:55.5932417	1398	390	0.439125031
2024-09-25 21:58:55.6054592	1399	390	0.440000027
2024-09-25 21:59:55.6053061	1402	391	0.43750003
2024-09-25 22:00:55.5940283	1399	391	0.438000023
2024-09-25 22:01:55.5964291	1403	390	0.436750025
2024-09-25 22:02:55.6004242	1404	390	0.441250026
2024-09-25 22:03:55.6058791	1397	392	0.437750012
2024-09-25 22:04:55.5980690	1400	391	0.441125035
2024-09-25 22:05:55.6018359	1401	389	0.438750029
2024-09-25 22:06:55.5955319	1398	390	0.43900001
2024-09-25 22:07:55.5930574	1402	391	0.44037503
2024-09-25 22:08:55.5977326	1402	390	0.438625008
2024-09-25 22:09:55.5995839	1397	389	0.440875024
2024-09-25 22:10:55.5983009	1397	389	0.439625025
2024-09-25 22:11:55.6023393	1400	388	0.444125026
2024-09-25 22:12:55.6056117	1402	389	0.437625021
2024-09-25 22:13:55.6036681	1399	391	0.439500034
2024-09-25 22:14:55.5941202	1401	390	0.439125031
2024-09-25 22:15:55.6053467	1401	391	0.44037503
2024-09-25 22:16:55.6036816	1400	392	0.435875028
2024-09-25 22:17:55.5995494	1402	392	0.439500034
2024-09-25 22:18:55.5949319	1403	390	0.438125014
2024-09-25 22:19:55.5933284	1398	389	0.441625029
2024-09-25 22:20:55.5989737	1400	389	0.440000027
2024-09-25 22:21:55.5953056	1403	388	0.443000019
2024-09-25 22:22:55.5953630	1394	388	0.439500034
2024-09-25 22:23:55.5918135	1397	389	0.442375034
2024-09-25 22:24:55.5918028	1400	389	0.442625016
2024-09-25 22:25:55.6001750	1400	391	0.437875032
2024-09-25 22:26:55.5975474	1401	391	0.439500034
2024-09-25 22:27:55.5934105	1403	390	0.440750033
2024-09-25 22:28:55.6052469	1400	392	0.435875028
2024-09-25 22:29:55.6020421	1395	392	0.439500034
2024-09-25 22:30:55.5989536	1399	389	0.44037503
2024-09-25 22:31:55.5949431	1402	390	0.43750003
2024-09-25 22:32:55.6037772	1400	390	0.440875024
2024-09-25 22:33:55.5971896	1403	390	0.442250013
2024-09-25 22:34:55.5967011	1404	390	0.440750033
2024-09-25 22:35:55.6025651	1393	389	0.440000027
2024-09-25 22:36:55.5957381	1397	389	0.440625012
2024-09-25 22:37:55.6020519	1402	388	0.443000019
2024-09-25 22:38:55.6049795	1400	391	0.44037503
2024-09-25 22:39:55.5946016	1400	392	0.438625008
2024-09-25 22:40:55.6008930	1403	391	0.438125014
2024-09-25 22:41:55.5933060	1402	392	0.440000027
2024-09-25 22:42:55.5943641	1402	391	0.436750025
2024-09-25 22:43:55.6011020	1400	389	0.438375026
2024-09-25 22:44:55.5960605	1397	389	0.438500017

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 22:45:55.6051423	1398	389	0.442750007
2024-09-25 22:46:55.5971919	1402	388	0.438125014
2024-09-25 22:47:55.5966614	1404	388	0.441375017
2024-09-25 22:48:55.5985099	1397	389	0.43750003
2024-09-25 22:49:55.5979551	1400	390	0.439500034
2024-09-25 22:50:55.6022395	1404	390	0.438375026
2024-09-25 22:51:55.6018326	1395	391	0.43900001
2024-09-25 22:52:55.6038542	1401	391	0.440875024
2024-09-25 22:53:55.6024093	1404	390	0.442375034
2024-09-25 22:54:55.5912354	1394	391	0.442000031
2024-09-25 22:55:55.5984963	1398	391	0.437625021
2024-09-25 22:56:55.5979537	1400	389	0.438750029
2024-09-25 22:57:55.5918200	1398	390	0.436500013
2024-09-25 22:58:55.6039932	1401	391	0.438750029
2024-09-25 22:59:55.5926253	1403	389	0.438000023
2024-09-25 23:00:55.5952729	1401	390	0.436750025
2024-09-25 23:01:55.6032948	1396	389	0.441375017
2024-09-25 23:02:55.5914421	1399	388	0.439375013
2024-09-25 23:03:55.5925422	1401	390	0.437875032
2024-09-25 23:04:55.6045414	1398	391	0.44175002
2024-09-25 23:05:55.6025366	1403	392	0.441000015
2024-09-25 23:06:55.5921704	1401	391	0.439500034
2024-09-25 23:07:55.5953760	1397	391	0.442875028
2024-09-25 23:08:55.5920962	1400	391	0.440750033
2024-09-25 23:09:55.5908631	1402	389	0.43750003
2024-09-25 23:10:55.6027531	1398	389	0.438625008
2024-09-25 23:11:55.5918811	1400	389	0.438375026
2024-09-25 23:12:55.5932257	1401	388	0.438750029
2024-09-25 23:13:55.5958263	1399	389	0.43887502
2024-09-25 23:14:55.5977050	1399	390	0.441250026
2024-09-25 23:15:55.6047826	1402	390	0.43900001
2024-09-25 23:16:55.6056933	1402	391	0.442000031
2024-09-25 23:17:55.6054045	1400	391	0.440875024
2024-09-25 23:18:55.5917617	1400	390	0.439375013
2024-09-25 23:19:55.5935173	1401	391	0.438000023
2024-09-25 23:20:55.5927410	1397	392	0.436750025
2024-09-25 23:21:55.5909000	1402	390	0.441000015
2024-09-25 23:22:55.5992194	1406	389	0.44325003
2024-09-25 23:23:55.5933708	1399	390	0.439375013
2024-09-25 23:24:55.5936601	1401	390	0.439500034
2024-09-25 23:25:55.5981580	1402	389	0.439500034
2024-09-25 23:26:55.6008127	1393	389	0.440500021
2024-09-25 23:27:55.6002608	1397	389	0.444250017
2024-09-25 23:28:55.5937478	1401	388	0.442000031
2024-09-25 23:29:55.5947275	1401	391	0.437875032
2024-09-25 23:30:55.5986288	1401	392	0.441875011
2024-09-25 23:31:55.5952920	1403	391	0.439500034
2024-09-25 23:32:55.5915764	1401	391	0.438750029
2024-09-25 23:33:55.5962396	1397	392	0.437000006
2024-09-25 23:34:55.6038588	1402	390	0.440125018
2024-09-25 23:35:55.6037799	1402	389	0.440000027
2024-09-25 23:36:55.5943062	1397	389	0.436375022
2024-09-25 23:37:55.5924773	1401	388	0.438750029
2024-09-25 23:38:55.5925039	1403	388	0.44312501
2024-09-25 23:39:55.5917383	1395	390	0.440000027
2024-09-25 23:40:55.5974190	1401	391	0.438125014
2024-09-25 23:41:55.6007665	1404	390	0.440750033
2024-09-25 23:42:55.6014528	1395	391	0.43887502
2024-09-25 23:43:55.6020131	1398	391	0.43612501
2024-09-25 23:44:55.5920346	1401	389	0.440000027
2024-09-25 23:45:55.5909886	1399	391	0.43900001
2024-09-25 23:46:55.6015120	1399	391	0.438250035
2024-09-25 23:47:55.6021531	1401	389	0.438250035
2024-09-25 23:48:55.5925249	1402	390	0.442125022
2024-09-25 23:49:55.6001362	1399	390	0.438750029

timestamp	HVAC_1PE_MU_002_TIT_200_3_VAL0	HVAC_1PE_MU_002_TIT_200_5_VAL0	HVAC_1PE_MU_002_PDT_200_2_VAL0
2024-09-25 23:50:55.5937790	1400	390	0.436375022
2024-09-25 23:51:55.5913865	1402	389	0.43887502
2024-09-25 23:52:55.5921895	1395	389	0.437250018
2024-09-25 23:53:55.5917411	1397	389	0.440500021
2024-09-25 23:54:55.6047811	1400	389	0.437625021
2024-09-25 23:55:55.5918937	1397	392	0.437625021
2024-09-25 23:56:55.6018120	1405	392	0.439625025
2024-09-25 23:57:55.5965508	1405	391	0.439750016
2024-09-25 23:58:55.6011360	1399	391	0.437250018
2024-09-25 23:59:55.6036446	1400	391	0.440000027

Appendix G

Calibration Documentation

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
12722 S. Wentworth Ave.
Chicago, IL 60628
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Part Number:	E02AI99E15A0PY5	Reference Number:	54-402944630-1
Cylinder Number:	CC409652	Cylinder Volume:	146.0 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12024	Valve Outlet:	590
Gas Code:	PPN,BALA	Certification Date:	Jan 23, 2024

Expiration Date: Jan 23, 2032

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 mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory.

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
PROPANE	3.500 PPM	3.586 PPM	G1	+/- 1.0% NIST Traceable	01/23/202
AIR	Balance				

CALIBRATION STANDARDS

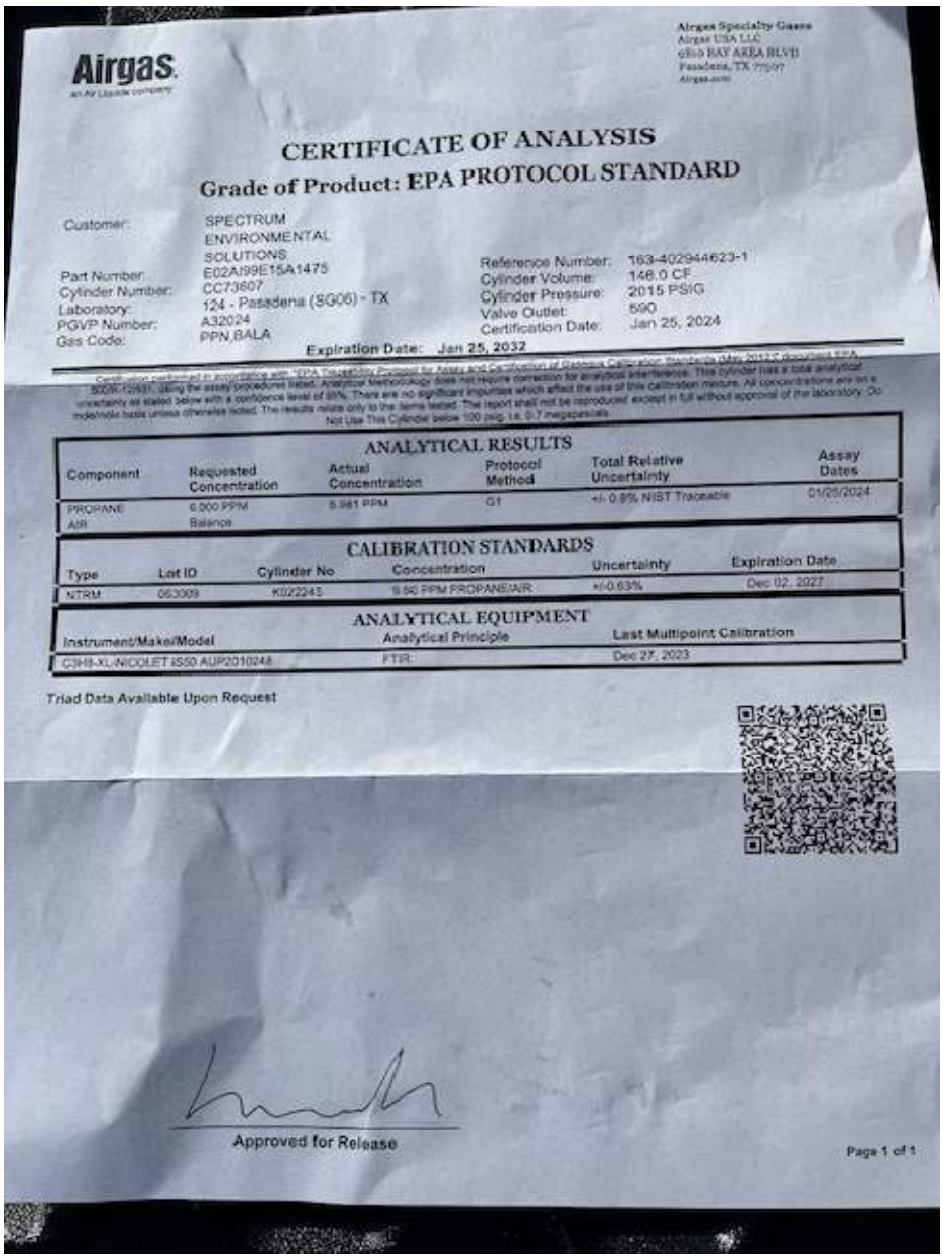
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	10010119	K023771	9.60 PPM PROPANE/AIR	+/- 0.8%	Dec 02, 2027

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 AUP2110277	FTIR	Dec 28, 2023

Triad Data Available Upon Request

Approved for Rel



Airgas

Airgas Specialty Gases
Airgas USA LLC
6510 BAY AREA BLVD
Pasadena, TX 77507
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer:	SPECTRUM ENVIRONMENTAL SOLUTIONS		
Part Number:	E02AI99E15A1475	Reference Number:	163-402944623-1
Cylinder Number:	CC73607	Cylinder Volume:	146.0 CF
Laboratory:	124 - Pasadena (SG06) - TX	Cylinder Pressure:	2015 PSIG
PGVP Number:	A32024	Valve Outlet:	590
Gas Code:	PPN,BALA	Certification Date:	Jan 25, 2024

Expiration Date: Jan 25, 2032

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 technology 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 mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. 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
PROPANE	6.000 PPM	5.981 PPM	G1	+/- 0.8% NIST Traceable	01/25/2024
AIR	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	063009	KI022245	9.90 PPM PROPANE/AIR	+/-0.63%	Dec 02, 2027

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
C3H8-XL-NICOLET 6S50 AUP2010248	FTIR	Dec 27, 2023

Triad Data Available Upon Request

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
9810 BAY AREA BLVD
Pasadena, TX 77507
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: SPECTRUM ENVIRONMENTAL SOLUTIONS

Part Number: E02AI99E15A1734
Cylinder Number: CC49640
Laboratory: 124 - Pasadena (SG06) - TX
PGVP Number: A32024
Gas Code: PPN,BALA

Reference Number: 163-402944624-1
Cylinder Volume: 146.0 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 590
Certification Date: Jan 23, 2024

Expiration Date: Jan 23, 2032

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 mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. 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
PROPANE	10.00 PPM	10.25 PPM	G1	+/- 1.4% NIST Traceable	01/23/2024
AIR	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	083009	K022245	9.60 PPM PROPANE/AIR	+/-0.63%	Dec 02, 2027

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
3H8-XL-NICOLET IS50 AUP2010248	FTIR	Dec 27, 2023

ed Data Available Upon Request

Approved for R

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
9810 BAY AREA BLVD
Pasadena, TX 77507
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer:	SPECTRUM ENVIRONMENTAL SOLUTIONS		
Part Number:	E02AI99E15A00V9	Reference Number:	163-402944620-1
Cylinder Number:	ALM011565	Cylinder Volume:	146.0 CF
Laboratory:	124 - Pasadena (SG06) - TX	Cylinder Pressure:	2015 PSIG
PGVP Number:	A32024	Valve Outlet:	590
Gas Code:	PPN,BALA	Certification Date:	Jan 23, 2024

Expiration Date: Jan 23, 2032

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 mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. D
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
PROPANE	68.00 PPM	69.47 PPM	G1	+/- 0.8% NIST Traceable	01/23/2024
AIR	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	010104-17	ID006278	99.8 PPM PROPANE/	0.6%	May 03, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
C3H8-L-NICOLET iS50 AUP2010248	FTIR	Dec 27, 2023

Triad Data Available Upon Request

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
9810 BAY AREA BLVD
Pasadena, TX 77507
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer:	SPECTRUM ENVIRONMENTAL SOLUTIONS		
Part Number:	E02AI99E15A00V9	Reference Number:	163-402944620-1
Cylinder Number:	ALM011565	Cylinder Volume:	146.0 CF
Laboratory:	124 - Pasadena (SG06) - TX	Cylinder Pressure:	2015 PSIG
PGVP Number:	A32024	Valve Outlet:	590
Gas Code:	PPN,BALA	Certification Date:	Jan 23, 2024

Expiration Date: Jan 23, 2032

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 mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. D
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
PROPANE	68.00 PPM	69.47 PPM	G1	+/- 0.8% NIST Traceable	01/23/2024
AIR	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	010104-17	ID006278	99.8 PPM PROPANE/	0.6%	May 03, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
C3H8-L-NICOLET iS50 AUP2010248	FTIR	Dec 27, 2023

Triad Data Available Upon Request

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
9810 BAY AREA BLVD
Pasadena, TX 77507
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer:	SPECTRUM ENVIRONMENTAL SOLUTIONS	Reference Number:	163-402944622-1
Part Number:	E02AI99E15A00P7	Cylinder Volume:	146.0 CF
Cylinder Number:	CC429302	Cylinder Pressure:	2015 PSIG
Laboratory:	124 - Pasadena (SG06) - TX	Valve Outlet:	590
PGVP Number:	A32024	Certification Date:	Jan 23, 2024
Gas Code:	PR,BALN	Expiration Date:	Jan 23, 2032

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 molar/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. 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
PROPANE	190.0 PPM	191.0 PPM	G1	+/- 0.6% NIST Traceable	01/23/2024
AIR	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	200602-17	61627012Y	243.3 PPM PROPANE/AIR	+/- 0.5%	Mar 17, 2027

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
C3H8-L-NICOLET IS50 AUP2010248	FTIR	Dec 27, 2023

Triad Data Available Upon Request

Approved for Release

Airgas Specialty Gases
Airgas USA LLC
6141 Easton Road
Plumsteadville, PA 18949
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: CERTIFIED STANDARD-SPEC

Part Number:	X04NI99C15A00V5	Reference Number:	160-402710106-1
Cylinder Number:	CC105191	Cylinder Volume:	144.0 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
Analysis Date:	Apr 28, 2023	Valve Outlet:	350
Lot Number:	160-402710106-1		

Expiration Date: Apr 28, 2031

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

ANALYTICAL RESULTS

Component	Req Conc	Actual Concentration (Mole %)	Analytical Uncertainty
ETHYLENE	10.00 PPM	9.718 PPM	+/-5%
METHANE	20.00 PPM	20.56 PPM	+/-5%
R22 CHLORODIFLUOROMETHANE	20.00 PPM	20.24 PPM	+/-5%
NITROGEN	Balance		

Signature on file

Approved for Release

ilac-MRA A2LA ACCREDITED A2LA Certificate No. 1750.01 Calibration

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 6530-14438968

Traceable® Certificate of Calibration for Digital Barometer

Manufactured for and distributed by : MarketLab 6850 Southbelt Dr,Caledonia,MI,49316

Instrument Identification:

Model: 18246, S/N: 230600150 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Digital Barometer	D4540001	05 Dec 2023	1000486629
Chilled Mirror Hygrometer	44654/2H3737	13 Dec 2023	19994
Climate Chamber	W619.0019		
DIGITAL THERMOMETER	210876694	12 May 2024	4000-14169058

Certificate Information:

Technician: 333 Procedure: CAL-31 Cal Date: 06 Sep 2023 Cal Due Date: 06 Sep 2025

Test Conditions: 63.85%RH 24.13°C 1016mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
%RH	N.A.	N.A.		50.03	49	Y	47	53	0.74	>4:1
°C	N.A.	N.A.		25.29	25.0	Y	24.89	25.69	0.05	>4:1
mb/hPa	N.A.	N.A.		807.19	807	Y	803	811	0.62	>4:1
mb/hPa	N.A.	N.A.		909.49	910	Y	905	913	0.62	>4:1
mb/hPa	N.A.	N.A.		1015.35	1016	Y	1011	1019	0.62	>4:1

This certificate indicates Traceability to standards provided by (NIST) National Institute of Standards and Technology and/or a National Standards Laboratory.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement : (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ± U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2, Min=As Left Nominal(Rounded) – Tolerance; Max= As Left Nominal(Rounded) + Tolerance;

Nicol Rodriguez

Nicol Rodriguez, Quality Manager

Michael Pietronicco, Technical Manager

Note :

Maintaining Accuracy:

In our opinion once calibrated your Digital Barometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Barometer change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

Issue Date : 06 Sep 2023

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.traceable.com

Control Company is an ISO/IEC 17025:2017 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2015 Quality Certified by DNV GL, Certificate No. CERT-01805-2006-AQ-HOU-ANAB.
International Laboratory Accreditation Cooperation - Multilateral Recognition Arrangement (ILAC-MRA).

Traceable® is a registered trademark of Control Company

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Stack Temperature Sensor Calibration			
Temperature ID :	T-314718	Name :	REF1
Ambient Temperature, °F :	82.4	Date :	June 3, 2024

Temperature Calibrator			
Model # :	CL23A	Certification Date:	October 20, 2024
Serial # :	T-314718	Expiration Date:	October 19, 2023

Reference Source Temperature (°F)	Test Thermometer Temperature (°F)	Temperature Difference %
0	2	0.4
250	250	0.0
600	602	0.2
1200	1209	0.5

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

Stack Temperature Sensor Calibration			
Temperature ID :	400	Name :	REF
Ambient Temperature, ^{o}F :	66.2	Date :	October 14, 2024

Temperature Calibrator			
Model # :	CL23A	Certification Date:	October 3, 2024
Serial # :	T-314718	Expiration Date:	October 3, 2025

Reference Source Temperature (^{o}F)	Test Thermometer Temperature (^{o}F)	Temperature Difference %
0	1	0.2
250	250	0.0
600	602	0.2
1200	1209	0.5

$$\frac{(\text{Ref. Temp., }^{o}\text{F} + 460) - (\text{Test Therm. Temp., }^{o}\text{F} + 460)}{\text{Ref. Temp., }^{o}\text{F} + 460} * 100 <= 1.5\ \%$$

Method 2F 3-D Probe Inspection Sheet

Probe Type (Circle One): Spherical DAT Probe ID#: 3D-062 Date: 6-3-24

Inspection of Probe Ports

Port ID	Current Inspection (Y=present, N=absent)			Compared to Previous Inspection (Y=changed, N=unchanged)			Briefly describe any "Y" answers and note their location on page 2
	Dents	Scratches	Asymmetries	Dents	Scratches	Asymmetries	
P1	N	N	N	N	N	N	
P2	N	N	N	N	N	N	
P3	N	N	N	N	N	N	
P4	N	N	N	N	N	N	
P5	N	N	N	N	N	N	

Inspection of Probe Surfaces

Surface ID	Current Inspection (Y=present, N=absent)		Compared to Previous Calibration (Y=changed, N=unchanged)		Briefly describe any "Y" answers and note their location on page 2
	Scratches	Dents	Scratches	Dents	
S1	N	N	N	N	
S2	N	N	N	N	
S3	N	N	N	N	
S4	N	N	N	N	
S5	N	N	N		

Surface IDs S1 through S5 refer to the surfaces adjacent to pressure ports with the corresponding numbers, e.g., S3 refers to the surface adjacent to pressure port P3.

Passes Visual Straightness Check: (Yes) No

Requires Calculated Straightness Check (only needed if adding extension to main probe): Yes (No)

Calculated bend angle (if neccessary) _____ (MUST BE LESS THAN 5 DEGREES)

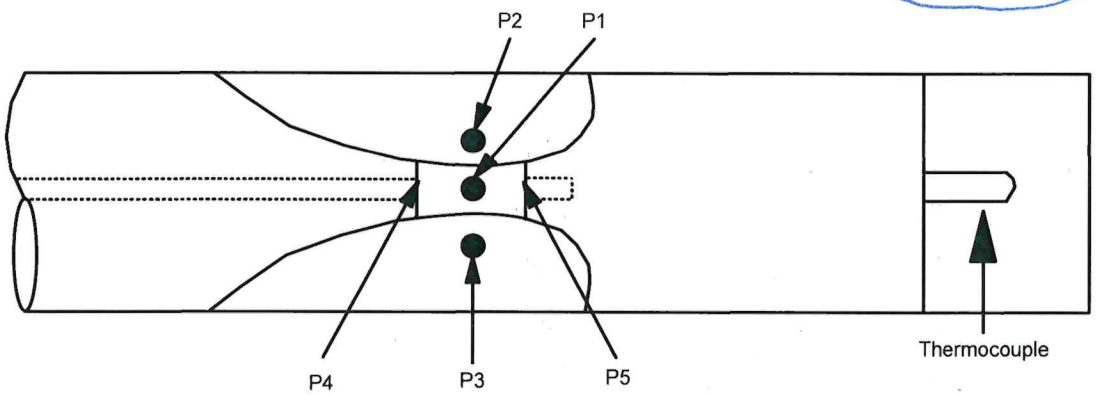
I cerfify that this Probe meets or exceeds all specifications, criteria, and/or applicable design features required under Method 2F.

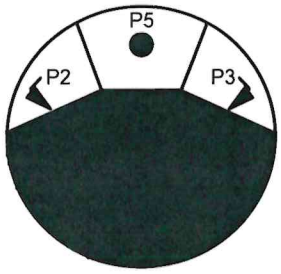
Certified by: SWK Date: 6-3-24

Method 2F 3-D Probe Inspection Sheet

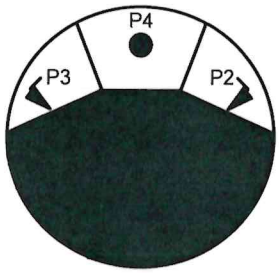
Probe Type (Circle One): Spherical (DAT) Probe ID#: 3D-062 Date: 6-3-24

Illustrate any damage to ports or surfaces below or circle no damage: NO DAMAGE

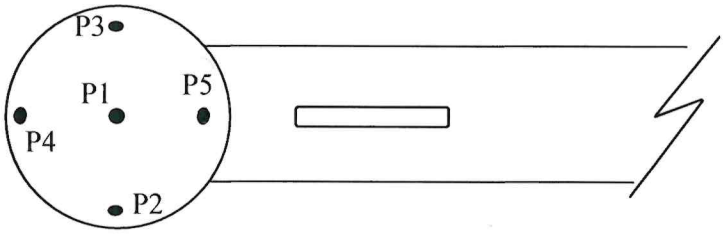




Section X-X



Section X-X



I cerfify that this Probe meets or exceeds all specifications, criteria, and/or applicable design features required under Method 2F.

Certified by: SWK Date: 6-3-24

Appendix H
FTIR QAQC Data

FTIR Pathlength Measurement - RCO

NuWave - concentrations file
Pathlength: 10
Method: C:/Microchip Gresham - RCO/NuWave RCO Method
Client / Site / Pathway:

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/24/2024 11:04	9/24/2024	11:04:23	9.68536	18.4381	19.9527	9.61556	149.812	1.0049
9/24/2024 11:05	9/24/2024	11:05:23	9.68127	18.4962	19.9905	9.59723	149.703	1.0049
9/24/2024 11:06	9/24/2024	11:06:23	9.66093	18.4728	19.9797	9.62028	150.001	1.00532
9/24/2024 11:07	9/24/2024	11:07:24	9.65772	18.4956	19.9908	9.60708	149.958	1.00511
9/24/2024 11:08	9/24/2024	11:08:23	9.68083	18.4699	19.9885	9.59652	149.779	1.00554
9/24/2024 11:09	9/24/2024	11:09:23	9.68921	18.5295	19.9685	9.57813	149.782	1.0049
9/24/2024 11:10	9/24/2024	11:10:23	9.69982	18.5021	19.9981	9.58121	149.839	1.00554
9/24/2024 11:11	9/24/2024	11:11:23	9.64991	18.5072	19.9475	9.58019	149.76	1.00596
9/24/2024 11:12	9/24/2024	11:12:24	9.6856	18.4432	19.9191	9.57919	149.812	1.0068
9/24/2024 11:13	9/24/2024	11:13:23	9.65006	18.4765	19.9531	9.57777	150.029	1.0068
9/24/2024 11:14	9/24/2024	11:14:23	9.66658	18.511	19.9575	9.58244	149.86	1.0068
9/24/2024 11:15	9/24/2024	11:15:23	9.68652	18.4638	19.9788	9.5895	149.883	1.00723
9/24/2024 11:16	9/24/2024	11:16:23	9.64892	18.4909	19.9992	9.59381	149.853	1.00701
9/24/2024 11:17	9/24/2024	11:17:23	9.68541	18.5156	19.9865	9.61016	149.614	1.00701
9/24/2024 11:18	9/24/2024	11:18:23	9.70301	18.4675	19.9799	9.61208	149.799	1.00723
9/24/2024 11:19	9/24/2024	11:19:23	9.70053	18.5203	20.022	9.60655	150.002	1.00701
9/24/2024 11:20	9/24/2024	11:20:23	9.71456	18.5556	20.0887	9.60252	150.36	1.00342
9/24/2024 11:21	9/24/2024	11:21:23	9.64527	18.3772	19.7755	9.60781	150.468	0.973629
9/24/2024 11:22	9/24/2024	11:22:23	9.66203	18.3574	19.7458	9.60952	150.731	0.973629
9/24/2024 11:23	9/24/2024	11:23:25	9.60745	18.3171	19.7082	9.59481	150.653	0.973629
9/24/2024 11:24	9/24/2024	11:24:23	5.66571	11.7236	9.99881	9.11659	150.919	0.97532
9/24/2024 11:25	9/24/2024	11:25:23	0.043663	1.57984	0.061853	8.56445	151.277	0.975742
9/24/2024 11:26	9/24/2024	11:26:23	0.101395	1.28335	0.043492	8.59741	151.089	0.976376
9/24/2024 11:27	9/24/2024	11:27:23	-0.0091	1.27993	0.035428	8.60354	150.652	0.975742
9/24/2024 11:28	9/24/2024	11:28:23	-0.10669	1.23839	0.02867	8.60715	150.497	0.975954

FTIR Pathlength Measurement - TO

NuWave - concentrations file
Pathlength: 10.3
Method: C:/Data/Microchip Compliance 2024 TO/New TOs - TO/NuWave TO Method
Client / Site / Pathway:

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/24/2024 13:04	9/24/2024	13:04:47	9.7001	17.926	18.87	8.7245	151.565	1.04108
9/24/2024 13:05	9/24/2024	13:05:47	9.6876	17.972	18.936	8.7283	151.565	1.04065
9/24/2024 13:06	9/24/2024	13:06:47	9.665	17.974	18.89	8.7459	151.565	1.04216
9/24/2024 13:07	9/24/2024	13:07:47	9.6853	18.018	18.908	8.7297	151.565	1.04173
9/24/2024 13:08	9/24/2024	13:08:47	9.6824	17.982	18.927	8.7302	151.386	1.04259
9/24/2024 13:09	9/24/2024	13:09:47	9.6972	18	18.913	8.729	151.42	1.04216
9/24/2024 13:10	9/24/2024	13:10:48	9.6655	17.991	18.902	8.747	151.465	1.0428
9/24/2024 13:11	9/24/2024	13:11:50	9.6568	17.987	18.926	8.7372	151.47	1.0428
9/24/2024 13:12	9/24/2024	13:12:50	9.6764	18.015	18.923	8.7267	151.475	1.04237
9/24/2024 13:13	9/24/2024	13:13:47	9.7039	18.008	18.923	8.722	151.492	1.0428
9/24/2024 13:14	9/24/2024	13:14:47	9.6809	18	18.947	8.7042	151.438	1.0428
9/24/2024 13:15	9/24/2024	13:15:49	9.6938	17.983	18.932	8.7061	151.414	1.0428
9/24/2024 13:16	9/24/2024	13:16:47	9.7189	17.979	18.928	8.7117	151.486	1.0428
9/24/2024 13:17	9/24/2024	13:17:48	9.6959	17.992	18.934	8.7164	151.532	1.0428
9/24/2024 13:18	9/24/2024	13:18:49	9.6743	18.036	18.939	8.7266	151.608	1.0428
9/24/2024 13:19	9/24/2024	13:19:49	9.7083	18.032	18.948	8.7336	151.631	1.0428
9/24/2024 13:20	9/24/2024	13:20:48	9.6702	18.008	18.887	8.8038	151.726	1.01443
9/24/2024 13:21	9/24/2024	13:21:47	9.5023	17.843	18.669	8.8201	151.959	0.991206
9/24/2024 13:22	9/24/2024	13:22:47	9.4771	17.818	18.631	8.8338	151.87	0.991206
9/24/2024 13:23	9/24/2024	13:23:49	9.452	17.828	18.631	8.8337	151.907	0.990776
9/24/2024 13:24	9/24/2024	13:24:48	9.4074	17.812	18.611	8.832	151.89	0.990776
9/24/2024 13:25	9/24/2024	13:25:50	9.4073	17.834	18.61	8.8326	151.975	0.990991
9/24/2024 13:26	9/24/2024	13:26:47	2.257	5.5964	3.6497	7.5948	152.006	1.00561
9/24/2024 13:27	9/24/2024	13:27:47	0.0143	1.5502	0.0242	7.2291	152.006	1.00712
9/24/2024 13:28	9/24/2024	13:28:47	-0.045	1.7156	0.0246	7.2321	151.916	1.00841

RCTO 2 RCO - Response Time

NuWave - concentrations file
Pathlength: 10
Method: C:/Microchip Gresham - RCO/NuWave RCO Method
Client / Site / Pathway:

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/24/2024 11:35	9/24/2024	11:35:21	-0.04532	1.40462	0.107671	8.67518	150.702	0.975742
9/24/2024 11:35	9/24/2024	11:35:31	-0.03802	1.32787	0.061018	8.67911	150.679	0.976165
9/24/2024 11:35	9/24/2024	11:35:41	-0.14226	1.12987	0.037747	8.70038	150.669	0.976346
9/24/2024 11:35	9/24/2024	11:35:51	0.006969	1.24338	0.046056	8.69597	150.651	0.976212
9/24/2024 11:36	9/24/2024	11:36:01	-0.02639	1.29572	0.061875	8.69344	150.645	0.976165
9/24/2024 11:36	9/24/2024	11:36:11	-0.00455	1.23881	0.070852	8.68705	150.622	0.976165
9/24/2024 11:36	9/24/2024	11:36:21	-0.00151	1.16619	-0.00911	8.68934	150.599	0.976165
9/24/2024 11:36	9/24/2024	11:36:31	-0.06175	1.22719	0.023569	8.68567	150.593	0.976165
9/24/2024 11:36	9/24/2024	11:36:41	0.109466	1.19444	0.021879	8.68812	150.576	0.975954
9/24/2024 11:36	9/24/2024	11:36:51	-0.13258	1.21846	0.040819	8.70068	150.57	0.975954
9/24/2024 11:37	9/24/2024	11:37:01	-0.14022	1.18865	0.048055	8.6896	150.558	0.975954
9/24/2024 11:37	9/24/2024	11:37:11	-0.03239	1.29183	0.029601	8.69607	150.558	0.975742
9/24/2024 11:37	9/24/2024	11:37:21	0.032086	1.29196	-0.00386	8.68156	150.547	0.975742
9/24/2024 11:37	9/24/2024	11:37:31	0.139736	1.2415	0.044019	8.67607	150.547	0.975742
9/24/2024 11:37	9/24/2024	11:37:41	0.154687	1.19987	0.005194	8.65689	150.541	0.975742
9/24/2024 11:37	9/24/2024	11:37:51	-0.03519	1.15297	0.04274	8.65878	150.541	0.975742
9/24/2024 11:38	9/24/2024	11:38:01	-0.1619	1.18936	0.053387	8.66208	150.524	0.975742
9/24/2024 11:38	9/24/2024	11:38:11	-0.10405	1.24076	0.009413	8.66933	150.518	0.975742
9/24/2024 11:38	9/24/2024	11:38:21	-0.00966	1.41325	0.018748	8.74372	150.518	0.975742
9/24/2024 11:38	9/24/2024	11:38:31	0.121703	1.5369	0.036311	8.75772	150.506	0.975742
9/24/2024 11:38	9/24/2024	11:38:41	-0.03109	1.47857	0.013443	8.75527	150.471	0.975742
9/24/2024 11:38	9/24/2024	11:38:51	-0.20946	1.60824	0.028844	8.75164	150.471	0.975742
9/24/2024 11:39	9/24/2024	11:39:04	-0.03953	1.51587	0.02857	8.73244	150.441	0.975531
9/24/2024 11:39	9/24/2024	11:39:11	0.114445	1.49148	0.002003	8.74881	150.405	0.975531
9/24/2024 11:39	9/24/2024	11:39:24	0.059356	1.55196	0.008777	8.73914	150.376	0.975531
9/24/2024 11:39	9/24/2024	11:39:31	0.088066	1.54341	0.045655	8.74202	150.411	0.975531
9/24/2024 11:39	9/24/2024	11:39:41	-0.14008	1.52523	0.045642	8.74021	150.387	0.975531
9/24/2024 11:39	9/24/2024	11:39:51	0.061947	1.58143	0.018304	8.76056	150.357	0.975531
9/24/2024 11:40	9/24/2024	11:40:03	0.075153	1.54815	0.006318	8.75598	150.423	0.975742

RCTO 2 RCO - Response Time

NuWave - concentrations file
Pathlength: 10
Method: C:/Microchip Gresham - RCO/NuWave RCO Method
Client / Site / Pathway:

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/24/2024 11:40	9/24/2024	11:40:11	-0.01111	1.54502	0.014679	8.76206	150.428	0.975742
9/24/2024 11:40	9/24/2024	11:40:21	-0.00489	1.44405	-0.00412	8.75801	150.375	0.975954
9/24/2024 11:40	9/24/2024	11:40:31	-0.04409	1.4509	0.049038	8.76274	150.375	0.975954
9/24/2024 11:40	9/24/2024	11:40:41	0.263017	1.51627	0.031438	8.75243	150.38	0.975954
9/24/2024 11:40	9/24/2024	11:40:51	-0.00799	1.63017	0.031491	8.74243	150.315	0.975954
9/24/2024 11:41	9/24/2024	11:41:01	0.12719	1.53189	0.000484	8.73871	150.315	0.975954
9/24/2024 11:41	9/24/2024	11:41:11	0.043913	1.67398	0.043005	8.74292	150.315	0.975742
9/24/2024 11:41	9/24/2024	11:41:21	-0.0157	1.45256	0.05252	8.73821	150.285	0.975742
9/24/2024 11:41	9/24/2024	11:41:31	-0.02963	1.53506	0.024289	8.74986	150.261	0.975742
9/24/2024 11:41	9/24/2024	11:41:41	-0.07431	1.58156	0.021912	8.76068	150.267	0.975742
9/24/2024 11:41	9/24/2024	11:41:51	0.091158	1.50675	-0.00226	8.76079	150.213	0.975742
9/24/2024 11:42	9/24/2024	11:42:01	-0.16515	1.42847	0.024024	8.74976	150.213	0.975742
9/24/2024 11:42	9/24/2024	11:42:11	-0.00461	1.50029	0.070221	8.74048	150.165	0.975742
9/24/2024 11:42	9/24/2024	11:42:21	-0.18213	1.48614	0.040071	8.73749	150.111	0.975742
9/24/2024 11:42	9/24/2024	11:42:31	-0.08232	1.62114	0.021349	8.7286	150.063	0.975531
9/24/2024 11:42	9/24/2024	11:42:41	-0.12006	1.58332	0.013606	8.73162	150.039	0.975531
9/24/2024 11:42	9/24/2024	11:42:51	0.082469	1.52709	0.062332	8.73755	149.991	0.975531
9/24/2024 11:43	9/24/2024	11:43:01	-0.05647	1.46723	0.010423	8.72003	149.996	0.975531
9/24/2024 11:43	9/24/2024	11:43:11	-0.07302	1.4202	-0.00653	8.74339	149.972	0.975531
9/24/2024 11:43	9/24/2024	11:43:22	0.236037	1.55441	0.011628	8.74481	149.924	0.975742
9/24/2024 11:43	9/24/2024	11:43:31	-0.09792	1.57216	0.007824	8.75509	149.912	0.975742
9/24/2024 11:43	9/24/2024	11:43:41	0.000752	1.46124	0.011373	8.7407	149.875	0.975742
9/24/2024 11:43	9/24/2024	11:43:51	0.046775	1.54984	0.094144	8.7388	149.844	0.975742
9/24/2024 11:44	9/24/2024	11:44:03	-0.10076	1.50521	0.026462	8.73948	149.843	0.975742
9/24/2024 11:44	9/24/2024	11:44:11	-0.02974	1.48194	0.08073	8.73541	149.872	0.975742
9/24/2024 11:44	9/24/2024	11:44:21	0.052342	1.52945	0.045263	8.73021	149.889	0.975742
9/24/2024 11:44	9/24/2024	11:44:31	0.059825	1.45214	0.039012	8.73338	149.882	0.975742
9/24/2024 11:44	9/24/2024	11:44:41	-0.02635	1.45984	-0.02432	8.73671	149.9	0.975742
9/24/2024 11:44	9/24/2024	11:44:51	0.117618	1.42112	0.01573	8.74868	149.905	0.975742

RCTO 2 RCO - Response Time

NuWave - concentrations file
Pathlength: 10
Method: C:/Microchip Gresham - RCO/NuWave RCO Method
Client / Site / Pathway:

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/24/2024 11:45	9/24/2024	11:45:02	-0.06654	1.43987	0.048354	8.73797	149.887	0.975742
9/24/2024 11:45	9/24/2024	11:45:11	-0.0741	1.45764	-0.01496	8.75517	149.857	0.975742
9/24/2024 11:45	9/24/2024	11:45:24	-0.05726	1.48646	0.029254	8.75242	149.798	0.975742
9/24/2024 11:45	9/24/2024	11:45:31	-0.00534	1.44422	0.037239	8.75769	149.768	0.975531
9/24/2024 11:45	9/24/2024	11:45:41	0.020984	1.48262	0.019627	8.74347	149.725	0.975531
9/24/2024 11:45	9/24/2024	11:45:51	0.019333	1.35861	0.058037	8.74409	149.707	0.975531
9/24/2024 11:46	9/24/2024	11:46:03	6.67961	13.1108	13.196	8.95007	149.682	0.975531
9/24/2024 11:46	9/24/2024	11:46:11	9.30481	17.8277	19.12	9.44288	149.694	0.975531
9/24/2024 11:46	9/24/2024	11:46:21	9.6141	18.1546	19.6384	9.52127	149.722	0.975531
9/24/2024 11:46	9/24/2024	11:46:31	9.7319	18.3337	19.7355	9.54028	149.745	0.975531
9/24/2024 11:46	9/24/2024	11:46:41	9.58957	18.3301	19.6272	9.54717	149.769	0.975531
9/24/2024 11:46	9/24/2024	11:46:52	9.53795	18.2682	19.7027	9.54537	149.792	0.975531
9/24/2024 11:47	9/24/2024	11:47:02	9.64246	18.2436	19.703	9.54693	149.809	0.975531
9/24/2024 11:47	9/24/2024	11:47:11	9.64975	18.2357	19.7618	9.55495	149.826	0.975742
9/24/2024 11:47	9/24/2024	11:47:21	9.67843	18.2761	19.6687	9.55278	149.832	0.975742
9/24/2024 11:47	9/24/2024	11:47:31	9.41148	18.2727	19.6988	9.54206	149.843	0.975742
9/24/2024 11:47	9/24/2024	11:47:41	9.51888	18.3337	19.6942	9.54208	149.843	0.975531
9/24/2024 11:47	9/24/2024	11:47:51	4.7376	9.94784	9.6538	9.062	149.849	0.97532
9/24/2024 11:48	9/24/2024	11:48:01	0.272447	2.18099	0.712774	8.75048	149.861	0.97532
9/24/2024 11:48	9/24/2024	11:48:11	0.028762	1.5715	0.108108	8.74105	149.89	0.97532
9/24/2024 11:48	9/24/2024	11:48:21	0.061241	1.50978	0.069409	8.73962	149.918	0.97532
9/24/2024 11:48	9/24/2024	11:48:31	-0.14693	1.57314	0.062592	8.72232	149.953	0.975531
9/24/2024 11:48	9/24/2024	11:48:41	-0.01812	1.55995	0.083805	8.73718	149.958	0.975742
9/24/2024 11:48	9/24/2024	11:48:51	-0.0649	1.6421	0.062136	8.72568	149.986	0.975742
9/24/2024 11:49	9/24/2024	11:49:01	-0.01323	1.46359	0.037322	8.73503	150.01	0.975742
9/24/2024 11:49	9/24/2024	11:49:11	-0.14132	1.50354	0.01675	8.73944	150.027	0.975742
9/24/2024 11:49	9/24/2024	11:49:24	0.047192	1.58087	0.023069	8.73324	150.038	0.975742
9/24/2024 11:49	9/24/2024	11:49:41	-0.18387	1.59199	0.044149	8.74051	150.056	0.975742
9/24/2024 11:49	9/24/2024	11:49:51	-0.1382	1.52827	0.055727	8.74356	150.026	0.975742

RCTO 2 RCO - Response Time

NuWave - concentrations file
Pathlength: 10
Method: C:/Microchip Gresham - RCO/NuWave RCO Method
Client / Site / Pathway:

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/24/2024 11:50	9/24/2024	11:50:01	0.084639	1.52728	0.026766	8.73748	149.966	0.975742

RCTO 2 Response Time - TO

NuWave - concentrations file
Pathlength: 10.3
Method: C:/Data/Microchip Compliance 2024 TO/New TOs - TO/NuWave TO Method
Client / Site / Pathway:

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/24/2024 11:43	45559	0.48875	0.061375	-1.45454	0.115831	5.86671	151.665	1.00697
9/24/2024 11:43	45559	0.488854	0.302614	0.043436	-0.05596	5.86755	151.715	1.00733
9/24/2024 11:44	45559	0.48897	0.07851	-0.15169	-0.07458	5.86442	151.715	1.00733
9/24/2024 11:44	45559	0.48912	0.034696	-0.27278	-0.01995	5.87414	151.698	1.00745
9/24/2024 11:44	45559	0.489201	-0.06142	-0.44123	-0.06453	5.88295	151.715	1.00755
9/24/2024 11:44	45559	0.48934	-0.08403	-0.39946	-0.0498	5.87626	151.685	1.00798
9/24/2024 11:44	45559	0.489444	-0.1233	-0.46178	-0.09507	5.86149	151.625	1.00819
9/24/2024 11:44	45559	0.489549	-0.12062	-0.48523	-0.03315	5.86858	151.625	1.00819
9/24/2024 11:45	45559	0.489664	-0.12661	-0.44556	-0.04137	5.94258	151.625	1.00497
9/24/2024 11:45	45559	0.48978	-0.08528	-0.45783	-0.06184	5.87019	151.595	1.00432
9/24/2024 11:45	45559	0.489896	-0.06324	-0.48281	-0.00145	5.86794	151.595	1.00411
9/24/2024 11:45	45559	0.490012	-0.03733	-0.38202	-0.03783	5.86967	151.595	1.00368
9/24/2024 11:45	45559	0.490139	-0.06072	-0.40893	-0.04789	5.87172	151.595	1.00411
9/24/2024 11:45	45559	0.490243	2.26863	5.57061	5.21191	6.06015	151.595	1.00647
9/24/2024 11:46	45559	0.490359	8.0781	15.8874	16.4125	6.64799	151.565	1.0069
9/24/2024 11:46	45559	0.490475	9.06532	17.5439	18.2043	7.23067	151.565	1.0069
9/24/2024 11:46	45559	0.49059	9.33196	17.7639	18.4024	7.53202	151.565	1.00712
9/24/2024 11:46	45559	0.490741	9.39571	17.8385	18.5039	7.83296	151.565	1.00712
9/24/2024 11:46	45559	0.490822	9.51151	17.9104	18.5336	8.00931	151.565	1.00712
9/24/2024 11:47	45559	0.490972	9.41487	17.7432	18.5753	8.11261	151.535	1.00733
9/24/2024 11:47	45559	0.491053	9.38081	17.8743	18.5377	8.23081	151.535	1.0069
9/24/2024 11:47	45559	0.491238	9.51269	17.8501	18.5646	8.32268	151.476	1.0069
9/24/2024 11:47	45559	0.491412	9.47421	17.9013	18.645	8.39111	151.481	1.00626
9/24/2024 11:47	45559	0.491539	9.63978	17.8961	18.5792	8.42802	151.422	1.00669
9/24/2024 11:47	45559	0.491632	9.43963	17.9369	18.6428	8.47394	151.457	1.0069
9/24/2024 11:48	45559	0.491759	9.57263	17.8638	18.634	8.54779	151.493	1.00712
9/24/2024 11:48	45559	0.491898	9.38482	17.7897	18.5795	8.60662	151.475	1.00819
9/24/2024 11:48	45559	0.492014	9.46569	17.8861	18.6554	8.61781	151.486	1.00819
9/24/2024 11:48	45559	0.492118	9.49861	17.8133	18.5792	8.64168	151.509	1.00841

RCTO 2 Response Time - TO

NuWave - concentrations file
Pathlength: 10.3
Method: C:/Data/Microchip Compliance 2024 TO/New TOs - TO/NuWave TO Method
Client / Site / Pathway:

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/24/2024 11:48	45559	0.492211	5.85939	11.2551	11.7035	7.27838	151.485	1.00841
9/24/2024 11:48	45559	0.492338	0.566391	0.298829	1.29109	6.07996	151.473	1.00819
9/24/2024 11:49	45559	0.492442	-0.11089	-0.2206	0.110827	5.97764	151.484	1.00798
9/24/2024 11:49	45559	0.492558	-0.15463	-0.40865	0.021942	5.96042	151.472	1.00798
9/24/2024 11:49	45559	0.492674	-0.02899	-0.2579	-0.01309	5.96557	151.519	1.00798
9/24/2024 11:49	45559	0.492789	-0.04227	-0.35051	0.021524	5.95306	151.501	1.00798
9/24/2024 11:49	45559	0.492905	-0.00848	-0.32411	-0.0035	5.95405	151.483	1.00819
9/24/2024 11:49	45559	0.493021	0.013119	-0.36728	-0.00659	5.95267	151.494	1.00819

RCTO 2
Direct Inject - RCO

NuWave - concentrations file
Pathlength: 10
Method: C:/Microchip Gresham - RCO/NuWave RCO Method
Client / Site / Pathway:

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/24/2024 11:04	9/24/2024	11:04:23	9.68536	18.4381	19.9527	9.61556	149.812	1.0049
9/24/2024 11:05	9/24/2024	11:05:23	9.68127	18.4962	19.9905	9.59723	149.703	1.0049
9/24/2024 11:06	9/24/2024	11:06:23	9.66093	18.4728	19.9797	9.62028	150.001	1.00532
9/24/2024 11:07	9/24/2024	11:07:24	9.65772	18.4956	19.9908	9.60708	149.958	1.00511
9/24/2024 11:08	9/24/2024	11:08:23	9.68083	18.4699	19.9885	9.59652	149.779	1.00554
9/24/2024 11:09	9/24/2024	11:09:23	9.68921	18.5295	19.9685	9.57813	149.782	1.0049
9/24/2024 11:10	9/24/2024	11:10:23	9.69982	18.5021	19.9981	9.58121	149.839	1.00554
9/24/2024 11:11	9/24/2024	11:11:23	9.64991	18.5072	19.9475	9.58019	149.76	1.00596
9/24/2024 11:12	9/24/2024	11:12:24	9.6856	18.4432	19.9191	9.57919	149.812	1.0068
9/24/2024 11:13	9/24/2024	11:13:23	9.65006	18.4765	19.9531	9.57777	150.029	1.0068
9/24/2024 11:14	9/24/2024	11:14:23	9.66658	18.511	19.9575	9.58244	149.86	1.0068
9/24/2024 11:15	9/24/2024	11:15:23	9.68652	18.4638	19.9788	9.5895	149.883	1.00723
9/24/2024 11:16	9/24/2024	11:16:23	9.64892	18.4909	19.9992	9.59381	149.853	1.00701
9/24/2024 11:17	9/24/2024	11:17:23	9.68541	18.5156	19.9865	9.61016	149.614	1.00701
9/24/2024 11:18	9/24/2024	11:18:23	9.70301	18.4675	19.9799	9.61208	149.799	1.00723
9/24/2024 11:19	9/24/2024	11:19:23	9.70053	18.5203	20.022	9.60655	150.002	1.00701
9/24/2024 11:20	9/24/2024	11:20:23	9.71456	18.5556	20.0887	9.60252	150.36	1.00342
9/24/2024 11:21	9/24/2024	11:21:23	9.64527	18.3772	19.7755	9.60781	150.468	0.973629
9/24/2024 11:22	9/24/2024	11:22:23	9.66203	18.3574	19.7458	9.60952	150.731	0.973629
9/24/2024 11:23	9/24/2024	11:23:25	9.60745	18.3171	19.7082	9.59481	150.653	0.973629
9/24/2024 11:24	9/24/2024	11:24:23	5.66571	11.7236	9.99881	9.11659	150.919	0.97532
9/24/2024 11:25	9/24/2024	11:25:23	0.043663	1.57984	0.061853	8.56445	151.277	0.975742
9/24/2024 11:26	9/24/2024	11:26:23	0.101395	1.28335	0.043492	8.59741	151.089	0.976376
9/24/2024 11:27	9/24/2024	11:27:23	-0.0091	1.27993	0.035428	8.60354	150.652	0.975742
9/24/2024 11:28	9/24/2024	11:28:23	-0.10669	1.23839	0.02867	8.60715	150.497	0.975954
			9.67305	18.47038	19.94653			

RCTO 2
Direct Inject - TO

NuWave - concentrations file
Pathlength: 10.3
Method: C:/Data/Microchip Compliance 2024 TO/New TOs - TO/NuWave TO Method
Client / Site / Pathway:

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/24/2024 13:04	9/24/2024	13:04:47	9.70007	17.926	18.8697	8.72447	151.565	1.04108
9/24/2024 13:05	9/24/2024	13:05:47	9.68763	17.9722	18.9357	8.72829	151.565	1.04065
9/24/2024 13:06	9/24/2024	13:06:47	9.66496	17.9737	18.8896	8.74589	151.565	1.04216
9/24/2024 13:07	9/24/2024	13:07:47	9.68525	18.0178	18.9084	8.72971	151.565	1.04173
9/24/2024 13:08	9/24/2024	13:08:47	9.68244	17.9815	18.9269	8.73024	151.386	1.04259
9/24/2024 13:09	9/24/2024	13:09:47	9.69718	17.9995	18.9132	8.72895	151.42	1.04216
9/24/2024 13:10	9/24/2024	13:10:48	9.66553	17.9908	18.9017	8.74698	151.465	1.0428
9/24/2024 13:11	9/24/2024	13:11:50	9.65679	17.9874	18.9258	8.73718	151.47	1.0428
9/24/2024 13:12	9/24/2024	13:12:50	9.67636	18.0152	18.9231	8.7267	151.475	1.04237
9/24/2024 13:13	9/24/2024	13:13:47	9.70394	18.008	18.9228	8.72195	151.492	1.0428
9/24/2024 13:14	9/24/2024	13:14:47	9.68092	18.0003	18.9474	8.70418	151.438	1.0428
9/24/2024 13:15	9/24/2024	13:15:49	9.69377	17.9825	18.9318	8.70607	151.414	1.0428
9/24/2024 13:16	9/24/2024	13:16:47	9.71894	17.9791	18.9275	8.71168	151.486	1.0428
9/24/2024 13:17	9/24/2024	13:17:48	9.69588	17.9918	18.9335	8.71637	151.532	1.0428
9/24/2024 13:18	9/24/2024	13:18:49	9.67433	18.0357	18.9388	8.72656	151.608	1.0428
9/24/2024 13:19	9/24/2024	13:19:49	9.70826	18.032	18.9482	8.73362	151.631	1.0428
9/24/2024 13:20	9/24/2024	13:20:48	9.67021	18.0077	18.8867	8.80379	151.726	1.01443
9/24/2024 13:21	9/24/2024	13:21:47	9.50226	17.8427	18.6693	8.82007	151.959	0.991206
9/24/2024 13:22	9/24/2024	13:22:47	9.47709	17.8183	18.6309	8.83379	151.87	0.991206
9/24/2024 13:23	9/24/2024	13:23:49	9.45204	17.8275	18.6311	8.83374	151.907	0.990776
9/24/2024 13:24	9/24/2024	13:24:48	9.40739	17.8116	18.6108	8.83199	151.89	0.990776
9/24/2024 13:25	9/24/2024	13:25:50	9.40732	17.8343	18.6102	8.83258	151.975	0.990991
9/24/2024 13:26	9/24/2024	13:26:47	2.257	5.59637	3.64972	7.59483	152.006	1.00561
9/24/2024 13:27	9/24/2024	13:27:47	0.014314	1.55017	0.024157	7.22911	152.006	1.00712
9/24/2024 13:28	9/24/2024	13:28:47	-0.04525	1.71555	0.024633	7.23207	151.916	1.00841
			9.632207	17.95616	18.85378			

RCTO 2 CTS Raw Data

Inlet Pre-CTS

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)
9/25/2024 13:42	9/25/2024	13:42:10	-0.22901	1.25083	0.062014	5.54413	149.8	0.996355
9/25/2024 13:42	9/25/2024	13:42:39	0.089213	1.56944	-0.18307	5.55256	149.8	0.996354
9/25/2024 13:43	9/25/2024	13:43:08	-0.02021	0.920961	-0.05709	5.77541	149.8	0.996359
9/25/2024 13:43	9/25/2024	13:43:37	-0.01783	0.191914	-0.00049	6.26258	149.8	0.996347
9/25/2024 13:44	9/25/2024	13:44:06	-0.06415	0.280764	0.001631	6.32581	149.8	0.996285
9/25/2024 13:44	9/25/2024	13:44:35	-0.16332	1.09464	0.032769	5.74256	149.8	0.996226
9/25/2024 13:45	9/25/2024	13:45:07	2.48451	5.72633	4.46591	5.76915	149.9	0.996245
9/25/2024 13:45	9/25/2024	13:45:33	8.64248	16.8694	17.1268	6.22705	149.9	0.996259
9/25/2024 13:46	9/25/2024	13:46:02	9.60044	19.0084	19.4847	6.36482	149.9	0.996224
9/25/2024 13:46	9/25/2024	13:46:31	9.84548	19.2342	19.7632	6.40288	149.9	0.996208
9/25/2024 13:47	9/25/2024	13:47:00	9.85937	19.2728	19.8954	6.41354	149.9	0.996185
9/25/2024 13:47	9/25/2024	13:47:32	9.83195	19.291	19.8699	6.41834	149.9	0.996155
9/25/2024 13:47	9/25/2024	13:47:58	9.77794	19.3431	19.9753	6.42542	149.9	0.99613
9/25/2024 13:48	9/25/2024	13:48:27	9.73495	19.1401	19.7249	6.4281	149.9	0.996098
9/25/2024 13:48	9/25/2024	13:48:56	4.87987	10.3431	10.0156	6.05375	150	0.996073
9/25/2024 13:49	9/25/2024	13:49:25	1.2281	2.63635	2.58558	6.29157	150	0.996061
9/25/2024 13:49	9/25/2024	13:49:54	0.254502	0.308624	0.389141	6.44855	149.9	0.996058
9/25/2024 13:50	9/25/2024	13:50:23	0.050574	0.079956	0.094869	6.46772	149.9	0.996011
9/25/2024 13:50	9/25/2024	13:50:52	-0.11194	0.804611	0.032551	6.01962	149.9	0.995947
9/25/2024 13:51	9/25/2024	13:51:21	-0.06739	1.30571	-0.01197	5.65843	149.9	0.995916
			9.775022					

Inlet Post-CTS

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)
9/25/2024 20:03	45560	0.835544	-0.2074	1.2883	0.138941	5.44025	149.9	1.00332
9/25/2024 20:03	45560	0.83588	0.059194	1.5732	-0.01673	5.44836	149.9	1.00331
9/25/2024 20:04	45560	0.83625	-0.18901	1.58394	-0.00287	5.45571	149.9	1.00329
9/25/2024 20:04	45560	0.836551	-0.20685	1.56952	-0.02228	5.45985	149.9	1.0033
9/25/2024 20:05	45560	0.836887	-0.08654	1.65217	-0.02397	5.46984	149.9	1.00331
9/25/2024 20:05	45560	0.837222	-0.11334	1.70612	-0.01404	5.44147	149.9	1.00331

RCTO 2 CTS Raw Data

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)
9/25/2024 20:06	45560	0.837558	7.32527	14.9838	14.5558	5.94322	149.9	1.00335
9/25/2024 20:06	45560	0.837894	9.86152	19.438	20.2008	6.25168	149.9	1.00336
9/25/2024 20:07	45560	0.838229	9.84739	19.5311	20.1424	6.26456	149.9	1.00328
9/25/2024 20:07	45560	0.838565	9.95287	19.468	20.0801	6.27404	150	1.00327
9/25/2024 20:08	45560	0.838935	9.75509	19.5124	20.216	6.27955	150	1.00326
9/25/2024 20:08	45560	0.839236	8.05169	15.9922	15.8819	6.16888	150	1.00319
9/25/2024 20:08	45560	0.839572	-0.28502	1.70204	0.446451	5.47543	150	1.00317
9/25/2024 20:09	45560	0.839942	-0.30883	1.64181	-0.08525	5.42783	150	1.00322
			9.854218					

RCO Pre-CTS

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/25/2024 13:42	9/25/2024	13:42:54	-0.096	1.32058	0.031139	8.44341	150.417	0.973629
9/25/2024 13:43	9/25/2024	13:43:23	0.049562	0.060087	-0.0011	9.06936	150.449	0.973629
9/25/2024 13:43	9/25/2024	13:43:54	-0.03314	0.048008	-0.00619	9.16271	150.385	0.973629
9/25/2024 13:44	9/25/2024	13:44:21	0.004087	1.32713	-0.00457	8.51142	150.391	0.973629
9/25/2024 13:44	9/25/2024	13:44:50	0.940295	3.11924	1.63956	8.40298	150.405	0.973629
9/25/2024 13:45	9/25/2024	13:45:19	8.40441	16.1467	16.9343	8.85321	150.431	0.973629
9/25/2024 13:45	9/25/2024	13:45:48	9.60644	18.3559	19.685	9.02388	150.445	0.973629
9/25/2024 13:46	9/25/2024	13:46:17	9.52926	18.4563	19.763	9.06307	150.463	0.973629
9/25/2024 13:46	9/25/2024	13:46:46	9.60218	18.4895	19.7642	9.0947	150.53	0.973629
9/25/2024 13:47	9/25/2024	13:47:15	9.64175	18.4454	19.7922	9.08093	150.579	0.973629
9/25/2024 13:47	9/25/2024	13:47:44	9.52909	18.3959	19.6137	9.07152	150.564	0.973629
9/25/2024 13:48	9/25/2024	13:48:13	2.40493	6.15419	5.00078	8.48206	150.596	0.973629
9/25/2024 13:48	9/25/2024	13:48:42	0.276633	2.09824	0.624267	8.38928	150.603	0.973629
9/25/2024 13:49	9/25/2024	13:49:11	0.474153	1.17971	0.934896	8.96072	150.662	0.973629
9/25/2024 13:49	9/25/2024	13:49:43	-0.00651	0.077995	0.047234	9.27998	150.585	0.973629
9/25/2024 13:50	9/25/2024	13:50:09	-0.08898	0.039349	0.003479	9.3038	150.562	0.973629
9/25/2024 13:50	9/25/2024	13:50:38	-0.06238	0.656649	0.009382	8.86373	150.545	0.973629
9/25/2024 13:51	9/25/2024	13:51:07	-0.02301	0.279353	0.016946	9.03654	150.558	0.973629
9/25/2024 13:51	9/25/2024	13:51:36	0.09388	-0.00765	0.009885	9.27978	150.494	0.973629

RCTO 2 CTS Raw Data

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)
			9.581744					

RCO Post-CTS

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/25/2024 20:03	45560	0.835556	-0.02987	1.772	0.04926	8.30262	150.811	0.977503
9/25/2024 20:03	45560	0.835891	-0.05224	1.60891	0.02535	8.29528	150.698	0.976799
9/25/2024 20:04	45560	0.836227	0.013245	1.58519	0.038451	8.31173	150.546	0.977222
9/25/2024 20:04	45560	0.836563	-0.08617	1.57893	0.041111	8.29249	150.511	0.977433
9/25/2024 20:05	45560	0.836898	-0.01951	1.56724	0.030787	8.29223	150.465	0.977856
9/25/2024 20:05	45560	0.837234	-0.00142	1.65732	0.022529	8.28958	150.372	0.977222
9/25/2024 20:06	45560	0.837569	7.31125	14.4547	14.0476	8.64262	150.303	0.977433
9/25/2024 20:06	45560	0.837905	9.55303	18.3208	19.7158	8.89975	150.327	0.978489
9/25/2024 20:07	45560	0.838241	9.64049	18.467	19.7557	8.97982	150.399	0.978701
9/25/2024 20:07	45560	0.838576	9.60099	18.4713	19.777	9.01508	150.543	0.977644
9/25/2024 20:08	45560	0.838912	9.65392	18.4491	19.7918	9.01842	150.635	0.977644
9/25/2024 20:08	45560	0.839248	7.9591	15.6731	15.765	8.90896	150.583	0.978067
9/25/2024 20:09	45560	0.839583	0.090029	1.98768	0.303482	8.28314	150.555	0.977644
9/25/2024 20:09	45560	0.839919	-0.06571	1.67256	0.069064	8.25729	150.497	0.977856
9/25/2024 20:09	45560	0.840255	0.014829	1.64714	0.06194	8.28588	150.45	0.978701
			9.612108					

TO Pre-CTS

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/25/2024 13:43	45560	0.57206	-0.26789	-1.45184	0.117828	3.50842	151.4	0.999448
9/25/2024 13:44	45560	0.572396	-0.0728	-0.10514	-0.00448	3.29075	151.39	0.999376
9/25/2024 13:44	45560	0.572731	0.630104	1.24368	1.22299	3.27495	151.42	0.999376
9/25/2024 13:45	45560	0.573067	8.46561	15.9389	16.4629	3.41299	151.449	0.998946
9/25/2024 13:45	45560	0.573403	9.25104	17.7243	18.3796	3.53501	151.42	0.999161
9/25/2024 13:46	45560	0.573762	9.35409	17.8789	18.4298	3.57515	151.42	0.999376
9/25/2024 13:46	45560	0.574086	9.20538	17.8806	18.5756	3.60212	151.449	0.999806

RCTO 2 CTS Raw Data

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)
9/25/2024 13:47	45560	0.57441	9.31497	17.9	18.5498	3.61419	151.449	0.999591
9/25/2024 13:47	45560	0.57478	9.36737	17.9128	18.5534	3.62586	151.449	0.999376
9/25/2024 13:48	45560	0.575081	9.32107	17.9208	18.5742	3.64109	151.449	0.999591
9/25/2024 13:48	45560	0.575486	4.98652	9.91353	9.54617	3.49815	151.449	0.999161
9/25/2024 13:49	45560	0.575787	0.015599	0.3186	0.553437	3.61543	151.449	0.998946
9/25/2024 13:49	45560	0.576088	-0.16762	-0.09793	0.084349	3.77356	151.449	0.999376
9/25/2024 13:50	45560	0.576424	-0.24043	-0.14877	0.050999	3.82653	151.449	0.999376
9/25/2024 13:50	45560	0.576771	-0.10442	0.001119	0.068069	3.65043	151.449	0.999376
9/25/2024 13:51	45560	0.577164	-0.18836	-0.08084	0.05043	3.76974	151.449	0.999806
			9.30232					

TO Post-CTS

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/25/2024 20:27	45560	0.852257	-0.00769	-0.02747	0.032328	4.02673	150.984	1.0054
9/25/2024 20:27	45560	0.852593	0.054736	0.016632	0.068474	3.87109	150.954	1.0054
9/25/2024 20:28	45560	0.85294	8.76795	16.7697	16.8311	3.80224	150.966	1.00561
9/25/2024 20:28	45560	0.853264	9.80611	18.6308	19.1578	3.97705	150.925	1.00583
9/25/2024 20:29	45560	0.8536	9.73831	18.5594	19.2569	3.98181	150.985	1.00561
9/25/2024 20:29	45560	0.853935	9.87793	18.5867	19.2272	3.98045	151.009	1.00604
9/25/2024 20:30	45560	0.854271	9.93243	18.5805	19.2829	3.97651	151.038	1.00604
			9.838695					

RCTO 3 CTS Raw Data

Inlet Pre-CTS

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)
9/25/2024 7:26	9/25/2024	7:26:18	-0.05298	-0.02565	-0.01621	6.56938	149.9	1.00021
9/25/2024 7:26	9/25/2024	7:26:47	-0.01495	-0.01667	0.004621	6.55884	149.9	1.00022
9/25/2024 7:27	9/25/2024	7:27:19	0.038188	-0.01072	-0.02695	6.55288	150	1.00021
9/25/2024 7:30	9/25/2024	7:30:15	0.070181	-0.04262	-0.01297	6.53156	150	1.00025
9/25/2024 7:30	9/25/2024	7:30:44	0.004679	0.009887	-0.02453	6.55643	150.1	0.996406
9/25/2024 7:31	9/25/2024	7:31:13	0.024969	-0.00795	-0.01478	6.54959	150.2	0.991216
9/25/2024 7:31	9/25/2024	7:31:42	-0.03774	-0.03319	0.004805	6.5478	150.2	0.989889
9/25/2024 7:32	9/25/2024	7:32:11	0.027641	-0.0829	-0.01122	6.53862	150.2	0.989899
9/25/2024 7:32	9/25/2024	7:32:40	0.029685	0.018104	-0.02029	6.53358	150.2	0.989904
9/25/2024 7:33	9/25/2024	7:33:09	0.001251	-0.02566	0.010014	6.52883	150.2	0.989922
9/25/2024 7:33	9/25/2024	7:33:40	-0.01642	-0.0348	-0.03354	6.52478	150.2	0.989937
9/25/2024 7:34	9/25/2024	7:34:07	-0.02707	-0.05357	-0.02532	6.51195	150.2	0.989947
9/25/2024 7:34	9/25/2024	7:34:39	0.029311	0.807845	0.042437	5.67218	150.2	0.99945
9/25/2024 7:35	9/25/2024	7:35:05	0.067947	1.45305	0.055236	5.47177	150.1	1.00739
9/25/2024 7:35	9/25/2024	7:35:37	-0.07116	1.58653	0.090324	5.49538	150	1.00983
9/25/2024 7:36	9/25/2024	7:36:06	-0.00089	1.51398	-0.01492	5.50572	149.9	1.00991
9/25/2024 7:36	9/25/2024	7:36:32	0.003328	1.48774	0.042203	5.51976	149.9	1.00829
9/25/2024 7:37	9/25/2024	7:37:03	0.005173	1.59723	0.042028	5.53237	149.9	1.0042
9/25/2024 7:37	9/25/2024	7:37:30	0.163611	1.67069	-0.09381	5.53913	149.9	1.00177
9/25/2024 7:38	9/25/2024	7:38:02	6.1302	12.2627	10.9959	5.87794	149.8	1.0018
9/25/2024 7:38	9/25/2024	7:38:28	9.88965	19.2258	20.1085	6.33298	149.8	1.00177
9/25/2024 7:38	9/25/2024	7:38:57	10.0159	19.2125	19.9613	6.36217	149.8	1.00174
9/25/2024 7:39	9/25/2024	7:39:27	9.79911	19.3318	19.9834	6.37862	149.8	1.00176
9/25/2024 7:39	9/25/2024	7:39:55	9.97088	19.3138	20.0128	6.3931	149.8	1.00228
9/25/2024 7:40	9/25/2024	7:40:24	9.8875	19.321	20.0484	6.39998	149.8	1.00282
9/25/2024 7:40	9/25/2024	7:40:53	9.74795	19.3168	20.1368	6.40857	149.8	1.00287
9/25/2024 7:41	9/25/2024	7:41:22	9.71003	19.3723	20.1485	6.40725	149.8	1.00291
9/25/2024 7:41	9/25/2024	7:41:51	9.83602	19.3293	20.1848	6.40744	149.8	1.00295
9/25/2024 7:42	9/25/2024	7:42:20	9.65483	19.3493	20.1075	6.40603	149.9	1.00298
9/25/2024 7:42	9/25/2024	7:42:49	9.92565	19.3763	19.9709	6.39762	149.9	1.00301
9/25/2024 7:43	9/25/2024	7:43:18	9.88273	19.4085	20.1307	6.3949	149.9	1.00303

RCTO 3 CTS Raw Data

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)
9/25/2024 7:43	9/25/2024	7:43:47	4.60553	9.45854	7.30375	5.97909	149.9	1.00882
9/25/2024 7:44	9/25/2024	7:44:16	0.138136	1.51776	0.064269	5.5062	149.8	1.01632
9/25/2024 7:44	9/25/2024	7:44:45	0.078478	1.649	0.077174	5.49825	149.7	1.0181
9/25/2024 7:45	9/25/2024	7:45:14	0.04328	1.65155	0.024307	5.50944	149.8	1.01518
9/25/2024 7:45	9/25/2024	7:45:43	0.195504	1.75105	0.066628	5.5068	149.9	1.01012
9/25/2024 7:46	9/25/2024	7:46:12	-0.00985	1.60498	0.035533	5.5057	150	1.00794
9/25/2024 7:46	9/25/2024	7:46:43	-0.00538	1.71154	-0.00216	5.51395	150	1.00783
9/25/2024 7:47	9/25/2024	7:47:11	0.026684	1.73755	0.149021	5.5153	150	1.00785
9/25/2024 7:47	9/25/2024	7:47:39	0.040276	1.88773	0.008129	5.50133	150	1.00791
9/25/2024 7:48	9/25/2024	7:48:08	-0.00414	1.78926	0.003988	5.50191	150	1.00795
9/25/2024 7:48	9/25/2024	7:48:37	0.132803	1.62017	0.028126	5.5084	150.1	1.00798
9/25/2024 7:49	9/25/2024	7:49:06	0.017393	1.69021	0.004298	5.51756	150	1.008
9/25/2024 7:49	9/25/2024	7:49:38	-0.02743	1.63634	0.007827	5.51564	150	1.00801
9/25/2024 7:50	9/25/2024	7:50:04	0.062313	1.6488	0.092723	5.51149	150	1.00807
9/25/2024 7:50	9/25/2024	7:50:33	0.093698	1.63124	0.046143	5.51757	150	1.00812
			9.847295					

Inlet Post-CTS

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)
9/25/2024 13:42	9/25/2024	13:42:10	-0.22901	1.25083	0.062014	5.54413	149.8	0.996355
9/25/2024 13:42	9/25/2024	13:42:39	0.089213	1.56944	-0.18307	5.55256	149.8	0.996354
9/25/2024 13:43	9/25/2024	13:43:08	-0.02021	0.920961	-0.05709	5.77541	149.8	0.996359
9/25/2024 13:43	9/25/2024	13:43:37	-0.01783	0.191914	-0.00049	6.26258	149.8	0.996347
9/25/2024 13:44	9/25/2024	13:44:06	-0.06415	0.280764	0.001631	6.32581	149.8	0.996285
9/25/2024 13:44	9/25/2024	13:44:35	-0.16332	1.09464	0.032769	5.74256	149.8	0.996226
9/25/2024 13:45	9/25/2024	13:45:07	2.48451	5.72633	4.46591	5.76915	149.9	0.996245
9/25/2024 13:45	9/25/2024	13:45:33	8.64248	16.8694	17.1268	6.22705	149.9	0.996259
9/25/2024 13:46	9/25/2024	13:46:02	9.60044	19.0084	19.4847	6.36482	149.9	0.996224
9/25/2024 13:46	9/25/2024	13:46:31	9.84548	19.2342	19.7632	6.40288	149.9	0.996208
9/25/2024 13:47	9/25/2024	13:47:00	9.85937	19.2728	19.8954	6.41354	149.9	0.996185
9/25/2024 13:47	9/25/2024	13:47:32	9.83195	19.291	19.8699	6.41834	149.9	0.996155
9/25/2024 13:47	9/25/2024	13:47:58	9.77794	19.3431	19.9753	6.42542	149.9	0.99613

RCTO 3 CTS Raw Data

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)
9/25/2024 13:48	9/25/2024	13:48:27	9.73495	19.1401	19.7249	6.4281	149.9	0.996098
9/25/2024 13:48	9/25/2024	13:48:56	4.87987	10.3431	10.0156	6.05375	150	0.996073
9/25/2024 13:49	9/25/2024	13:49:25	1.2281	2.63635	2.58558	6.29157	150	0.996061
9/25/2024 13:49	9/25/2024	13:49:54	0.254502	0.308624	0.389141	6.44855	149.9	0.996058
9/25/2024 13:50	9/25/2024	13:50:23	0.050574	0.079956	0.094869	6.46772	149.9	0.996011
9/25/2024 13:50	9/25/2024	13:50:52	-0.11194	0.804611	0.032551	6.01962	149.9	0.995947
9/25/2024 13:51	9/25/2024	13:51:21	-0.06739	1.30571	-0.01197	5.65843	149.9	0.995916
			9.775022					

RCO Pre-CTS

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/25/2024 7:26	9/25/2024	7:26:16	-0.01373	0.009073	-0.00639	9.81749	149.525	0.998985
9/25/2024 7:26	9/25/2024	7:26:45	-0.00608	0.045144	-0.00826	9.79637	149.518	0.998985
9/25/2024 7:27	9/25/2024	7:27:14	0.006105	0.032975	0.001499	9.79788	149.528	0.998985
9/25/2024 7:27	9/25/2024	7:27:43	0.002755	0.021034	0.005698	9.80923	149.578	0.998985
9/25/2024 7:28	9/25/2024	7:28:12	-0.00972	0.010851	-0.00422	9.80167	149.535	0.998985
9/25/2024 7:28	9/25/2024	7:28:41	0.003591	0.051187	-0.00016	9.78963	149.468	0.998985
9/25/2024 7:29	9/25/2024	7:29:10	-0.01036	-0.00912	0.000733	9.78488	149.466	0.998985
9/25/2024 7:29	9/25/2024	7:29:39	-0.03681	0.030495	0.003823	9.78011	149.594	0.998985
9/25/2024 7:30	9/25/2024	7:30:08	0.018233	0.013453	-0.00473	9.7791	149.646	0.998985
9/25/2024 7:30	9/25/2024	7:30:37	-0.02482	0.006882	0.001154	9.76287	149.662	0.991801
9/25/2024 7:31	9/25/2024	7:31:06	0.006185	0.03662	0.008286	9.7521	149.719	0.972996
9/25/2024 7:31	9/25/2024	7:31:35	0.007176	0.000894	0.000591	9.76407	149.734	0.967924
9/25/2024 7:32	9/25/2024	7:32:04	0.022138	0.011412	0.005069	9.75689	149.613	0.967713
9/25/2024 7:32	9/25/2024	7:32:33	-0.00199	0.034804	0.007054	9.7785	149.554	0.967713
9/25/2024 7:33	9/25/2024	7:33:02	0.018694	0.061542	0.0103	9.7703	149.509	0.967924
9/25/2024 7:33	9/25/2024	7:33:31	-0.02191	1.10271	0.037696	8.83636	149.572	0.970883
9/25/2024 7:34	9/25/2024	7:34:00	0.025311	1.40897	0.059379	8.48368	149.707	0.973841
9/25/2024 7:34	9/25/2024	7:34:29	0.034922	1.36837	0.031446	8.48122	149.76	0.973841
9/25/2024 7:34	9/25/2024	7:34:58	-0.01165	1.36924	0.019741	8.48306	149.73	0.973629
9/25/2024 7:35	9/25/2024	7:35:27	0.086117	1.38453	0.024601	8.49604	149.557	0.973629

RCTO 3 CTS Raw Data

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)
9/25/2024 7:35	9/25/2024	7:35:56	-0.06377	1.35409	0.04351	8.50423	149.436	0.973629
9/25/2024 7:36	9/25/2024	7:36:25	0.065325	1.36316	0.029718	8.50365	149.362	0.973629
9/25/2024 7:36	9/25/2024	7:36:54	-0.11053	1.36871	0.031463	8.50271	149.342	0.973629
9/25/2024 7:37	9/25/2024	7:37:23	-0.06988	1.33961	0.023134	8.49998	149.341	0.972784
9/25/2024 7:37	9/25/2024	7:37:52	1.83001	4.63106	3.35102	8.55349	149.333	0.971728
9/25/2024 7:38	9/25/2024	7:38:21	8.02777	15.5407	16.1798	9.05348	149.468	0.971728
9/25/2024 7:38	9/25/2024	7:38:50	9.43758	18.0938	19.3406	9.36326	149.578	0.971517
9/25/2024 7:39	9/25/2024	7:39:19	9.59605	18.315	19.6489	9.41173	149.613	0.97215
9/25/2024 7:39	9/25/2024	7:39:48	9.60602	18.3356	19.6682	9.41725	149.619	0.971939
9/25/2024 7:40	9/25/2024	7:40:17	9.64204	18.3971	19.6762	9.42348	149.648	0.971305
9/25/2024 7:40	9/25/2024	7:40:46	9.59857	18.3687	19.6648	9.41618	149.717	0.971305
9/25/2024 7:41	9/25/2024	7:41:15	9.6458	18.3969	19.6984	9.4315	149.762	0.971517
9/25/2024 7:41	9/25/2024	7:41:44	9.61914	18.4039	19.7285	9.46317	149.707	0.971517
9/25/2024 7:42	9/25/2024	7:42:13	9.63187	18.3868	19.7372	9.46905	149.605	0.971305
9/25/2024 7:42	9/25/2024	7:42:42	9.62764	18.3731	19.7247	9.46984	149.538	0.971517
9/25/2024 7:43	9/25/2024	7:43:11	9.64124	18.4328	19.7152	9.48737	149.53	0.971728
9/25/2024 7:43	9/25/2024	7:43:40	9.5071	18.1793	19.4758	9.46147	149.563	0.971728
9/25/2024 7:44	9/25/2024	7:44:09	2.34324	5.83924	4.41608	8.6774	149.676	0.972362
9/25/2024 7:44	9/25/2024	7:44:38	-0.00538	1.50322	0.067933	8.46439	149.764	0.974052
9/25/2024 7:45	9/25/2024	7:45:07	-0.09708	1.45899	0.023303	8.4578	149.847	0.974052
9/25/2024 7:45	9/25/2024	7:45:36	0.00382	1.42662	0.050319	8.44989	149.847	0.974052
9/25/2024 7:46	9/25/2024	7:46:05	0.041786	1.4205	0.055408	8.46276	149.728	0.974263
9/25/2024 7:46	9/25/2024	7:46:34	-0.04015	1.38925	0.043792	8.48688	149.62	0.974475
9/25/2024 7:47	9/25/2024	7:47:03	-0.05629	1.57219	0.045803	8.47973	149.457	0.973841
9/25/2024 7:47	9/25/2024	7:47:32	-0.03744	1.71136	0.033243	8.47566	149.336	0.973629
9/25/2024 7:48	9/25/2024	7:48:01	-0.117	1.49726	0.033582	8.4955	149.364	0.973841
9/25/2024 7:48	9/25/2024	7:48:30	-0.11111	1.3889	0.029161	8.5075	149.327	0.974052
9/25/2024 7:48	9/25/2024	7:48:59	-0.0329	1.47385	0.042688	8.51266	149.374	0.974052
9/25/2024 7:49	9/25/2024	7:49:28	-0.0162	1.39384	0.040527	8.51412	149.362	0.974052
9/25/2024 7:49	9/25/2024	7:49:57	0.098563	1.44206	0.043834	8.49002	149.332	0.974475
9/25/2024 7:50	9/25/2024	7:50:26	-0.01959	1.40762	0.027504	8.48555	149.379	0.973841
			9.595732					

RCTO 3 CTS Raw Data

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)

RCO Post-CTS

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/25/2024 13:42	9/25/2024	13:42:54	-0.096	1.32058	0.031139	8.44341	150.417	0.973629
9/25/2024 13:43	9/25/2024	13:43:23	0.049562	0.060087	-0.0011	9.06936	150.449	0.973629
9/25/2024 13:43	9/25/2024	13:43:54	-0.03314	0.048008	-0.00619	9.16271	150.385	0.973629
9/25/2024 13:44	9/25/2024	13:44:21	0.004087	1.32713	-0.00457	8.51142	150.391	0.973629
9/25/2024 13:44	9/25/2024	13:44:50	0.940295	3.11924	1.63956	8.40298	150.405	0.973629
9/25/2024 13:45	9/25/2024	13:45:19	8.40441	16.1467	16.9343	8.85321	150.431	0.973629
9/25/2024 13:45	9/25/2024	13:45:48	9.60644	18.3559	19.685	9.02388	150.445	0.973629
9/25/2024 13:46	9/25/2024	13:46:17	9.52926	18.4563	19.763	9.06307	150.463	0.973629
9/25/2024 13:46	9/25/2024	13:46:46	9.60218	18.4895	19.7642	9.0947	150.53	0.973629
9/25/2024 13:47	9/25/2024	13:47:15	9.64175	18.4454	19.7922	9.08093	150.579	0.973629
9/25/2024 13:47	9/25/2024	13:47:44	9.52909	18.3959	19.6137	9.07152	150.564	0.973629
9/25/2024 13:48	9/25/2024	13:48:13	2.40493	6.15419	5.00078	8.48206	150.596	0.973629
9/25/2024 13:48	9/25/2024	13:48:42	0.276633	2.09824	0.624267	8.38928	150.603	0.973629
9/25/2024 13:49	9/25/2024	13:49:11	0.474153	1.17971	0.934896	8.96072	150.662	0.973629
9/25/2024 13:49	9/25/2024	13:49:43	-0.00651	0.077995	0.047234	9.27998	150.585	0.973629
9/25/2024 13:50	9/25/2024	13:50:09	-0.08898	0.039349	0.003479	9.3038	150.562	0.973629
9/25/2024 13:50	9/25/2024	13:50:38	-0.06238	0.656649	0.009382	8.86373	150.545	0.973629
9/25/2024 13:51	9/25/2024	13:51:07	-0.02301	0.279353	0.016946	9.03654	150.558	0.973629
9/25/2024 13:51	9/25/2024	13:51:36	0.09388	-0.00765	0.009885	9.27978	150.494	0.973629
			9.581744					

TO Pre-CTS

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/25/2024 7:42	45560	0.321516	9.62416	18.3047	19.0104	4.94575	150.593	0.991206
9/25/2024 7:43	45560	0.321852	9.62929	18.4188	19.0984	4.95591	150.645	0.991206
9/25/2024 7:44	45560	0.322222	9.58625	18.4212	19.1108	4.95993	150.721	0.991206
9/25/2024 7:44	45560	0.322535	9.62983	18.4598	19.1765	4.95542	150.75	0.991206
9/25/2024 7:44	45560	0.322859	9.68241	18.4618	19.1584	4.95886	150.808	0.991206

RCTO 3 CTS Raw Data

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)
9/25/2024 7:45	45560	0.323194	9.60766	18.5328	19.197	4.95301	150.901	0.991206
9/25/2024 7:45	45560	0.32353	5.80682	12.4052	11.3109	4.70689	150.894	0.991206
9/25/2024 7:46	45560	0.323866	0.376466	3.0015	1.68344	4.24935	150.928	0.991206
9/25/2024 7:46	45560	0.324236	-0.1215	1.87978	0.236177	4.16635	150.969	0.991206
9/25/2024 7:47	45560	0.324549	-0.03592	2.025	0.081904	4.14993	150.969	0.991206
9/25/2024 7:47	45560	0.324873	-0.08879	2.23333	0.055327	4.14104	150.969	0.991206
9/25/2024 7:48	45560	0.325208	-0.09988	2.40905	0.036868	4.13229	150.975	0.991206
9/25/2024 7:48	45560	0.325567	-0.10911	2.04202	0.043333	4.13605	150.979	0.991206
9/25/2024 7:49	45560	0.32588	-0.03946	1.91546	0.058542	4.13858	151.042	0.991206
9/25/2024 7:49	45560	0.326215	-0.0396	1.93302	0.019927	4.14119	151.088	0.991206
9/25/2024 7:50	45560	0.326551	-0.0612	1.92746	0.036163	4.13763	151.111	0.991206
9/25/2024 7:50	45560	0.326887	-0.14001	1.90622	0.050585	4.1359	151.135	0.991206
			9.6266					

TO Post-CTS

Timestamp	Date	Time	C2H4	CH4	R22	Signal	Temp(C)	Press(atm)
9/25/2024 13:43	45560	0.57206	-0.26789	-1.45184	0.117828	3.50842	151.4	0.999448
9/25/2024 13:44	45560	0.572396	-0.0728	-0.10514	-0.00448	3.29075	151.39	0.999376
9/25/2024 13:44	45560	0.572731	0.630104	1.24368	1.22299	3.27495	151.42	0.999376
9/25/2024 13:45	45560	0.573067	8.46561	15.9389	16.4629	3.41299	151.449	0.998946
9/25/2024 13:45	45560	0.573403	9.25104	17.7243	18.3796	3.53501	151.42	0.999161
9/25/2024 13:46	45560	0.573762	9.35409	17.8789	18.4298	3.57515	151.42	0.999376
9/25/2024 13:46	45560	0.574086	9.20538	17.8806	18.5756	3.60212	151.449	0.999806
9/25/2024 13:47	45560	0.57441	9.31497	17.9	18.5498	3.61419	151.449	0.999591
9/25/2024 13:47	45560	0.57478	9.36737	17.9128	18.5534	3.62586	151.449	0.999376
9/25/2024 13:48	45560	0.575081	9.32107	17.9208	18.5742	3.64109	151.449	0.999591
9/25/2024 13:48	45560	0.575486	4.98652	9.91353	9.54617	3.49815	151.449	0.999161
9/25/2024 13:49	45560	0.575787	0.015599	0.3186	0.553437	3.61543	151.449	0.998946
9/25/2024 13:49	45560	0.576088	-0.16762	-0.09793	0.084349	3.77356	151.449	0.999376
9/25/2024 13:50	45560	0.576424	-0.24043	-0.14877	0.050999	3.82653	151.449	0.999376
9/25/2024 13:50	45560	0.576771	-0.10442	0.001119	0.068069	3.65043	151.449	0.999376

RCTO 3 CTS Raw Data

Timestamp	Date	Time	Ethylene	Methane	R22	Signal	Temp(C)	Press(atm)
9/25/2024 13:51	45560	0.577164	-0.18836	-0.08084	0.05043	3.76974	151.449	0.999806

9.30232

RCTO 2 FTIR Spike Raw Data

Timestamp	Date	Time	Methane	R22	Signal	Temp(C)	Press(atm)	
RCTO 2 - TO								
9/25/2024 19:40	45560	0.819895833	-0.82973	0.233271	2.6758	151.128	1.01464	Native
9/25/2024 19:41	45560	0.820578704	0.09157	0.176663	2.71959	151.133	1.01443	Native
9/25/2024 19:42	45560	0.821261574	0.099107	0.183295	2.71266	150.978	1.01464	Native
9/25/2024 19:43	45560	0.821944444	-0.3939	0.167916	2.66173	151.074	1.014	Native
9/25/2024 19:44	45560	0.822627315	-0.13331	0.213716	2.71734	150.954	1.01443	Native
9/25/2024 19:45	45560	0.823310185	2.30918	2.34236	2.76514	150.865	1.01335	
9/25/2024 19:46	45560	0.823993056	2.08349	2.23898	2.76716	150.865	1.01443	Spike
9/25/2024 19:47	45560	0.824710648	1.80954	2.1854	2.75593	150.865	1.01464	Spike
9/25/2024 19:48	45560	0.825358796	2.01434	2.05324	2.78438	150.924	1.01421	Spike
9/25/2024 19:49	45560	0.826041667	1.75692	1.82475	2.76816	150.912	1.01486	Spike
9/25/2024 19:50	45560	0.826724537	1.39765	1.72272	2.76072	150.929	1.01464	Spike
9/25/2024 19:51	45560	0.827407407	1.6854	1.69699	2.77545	150.964	1.01443	Spike
9/25/2024 19:52	45560	0.828090278	1.65316	1.7415	2.76444	151.023	1.01486	Spike
9/25/2024 19:53	45560	0.82880787	1.31915	1.75299	2.72409	150.985	1.01464	Spike
9/25/2024 19:54	45560	0.829467593	1.89	1.72757	2.77202	151.003	1.01486	Spike
9/25/2024 19:55	45560	0.830138889	1.39677	1.75529	2.73321	150.925	1.01464	Spike
9/25/2024 19:56	45560	0.830821759	1.41957	1.76796	2.74843	150.847	1.01421	Spike
9/25/2024 19:57	45560	0.831539352	0.461247	0.453658	2.75481	150.918	1.01464	
9/25/2024 19:58	45560	0.832210648	-0.33532	0.195568	2.70705	150.864	1.01507	
9/25/2024 19:59	45560	0.83287037	-0.18671	0.188627	2.72987	151.019	1.01421	
9/25/2024 20:00	45560	0.833564815	-0.01996	0.156997	2.75173	151.067	1.01529	
		Average	1.67509	1.860672				
RCTO 2 - RCO								
9/25/2024 19:40	45560	0.81994213	1.7705	0.020738	8.26271	149.618	0.976588	Native
9/25/2024 19:41	45560	0.820625	1.57743	0.043043	8.2798	149.548	0.976165	Native
9/25/2024 19:42	45560	0.82130787	1.61479	0.018799	8.25786	149.605	0.976165	Native
9/25/2024 19:43	45560	0.822025463	1.6088	0.031549	8.23339	149.729	0.975954	Native
9/25/2024 19:44	45560	0.822673611	1.57975	0.029597	8.22618	149.885	0.975954	
9/25/2024 19:45	45560	0.823356481	2.73764	1.34707	8.25864	149.902	0.976588	Spike
9/25/2024 19:46	45560	0.824039352	3.61602	2.33927	8.25315	149.902	0.975954	Spike
9/25/2024 19:47	45560	0.824722222	3.54437	2.26373	8.24459	149.978	0.976588	Spike
9/25/2024 19:48	45560	0.825405093	3.46622	2.16718	8.23903	150.036	0.976165	Spike
9/25/2024 19:49	45560	0.826122685	3.27629	1.93966	8.23188	150.113	0.976165	Spike
9/25/2024 19:50	45560	0.826770833	3.15282	1.83564	8.23916	150.105	0.976165	Spike

RCTO 2 FTIR Spike Raw Data

Timestamp	Date	Time	Methane	R22	Signal	Temp(C)	Press(atm)	
9/25/2024 19:51	45560	0.827453704	3.19243	1.85708	8.24007	150.105	0.976376	Spike
9/25/2024 19:52	45560	0.828136574	3.22239	1.88363	8.25729	150.105	0.975954	Spike
9/25/2024 19:53	45560	0.828819444	3.22909	1.86924	8.25565	150.117	0.976588	Spike
9/25/2024 19:54	45560	0.829502315	3.20351	1.88773	8.37446	150.14	0.976588	Spike
9/25/2024 19:55	45560	0.830196759	3.23333	1.89988	8.4026	150.218	0.976588	Spike
9/25/2024 19:56	45560	0.830891204	3.21284	1.87891	8.43783	150.016	0.97701	Spike
9/25/2024 19:57	45560	0.831550926	1.93579	0.40031	8.41302	149.788	0.977222	
9/25/2024 19:58	45560	0.832233796	1.60718	0.04435	8.49397	149.653	0.976376	
9/25/2024 19:59	45560	0.832928241	1.60908	0.032719	8.43748	149.639	0.97701	
9/25/2024 20:00	45560	0.833599537	1.57209	0.023384	8.34981	150.406	0.977433	
		Average	3.257246	1.930752				
RCTO 2 - Inlet								
9/25/2024 19:40	45560	0.819618056	0.532672	-0.00217	6.17785	149.9	1.00319	Native
9/25/2024 19:40	45560	0.819976852	1.36654	0.016228	5.46315	149.9	1.00317	Native
9/25/2024 19:41	45560	0.820289352	1.61815	-0.14768	5.40402	149.9	1.00316	Native
9/25/2024 19:41	45560	0.820625	1.57588	-0.03856	5.44274	149.9	1.00317	Native
9/25/2024 19:42	45560	0.820960648	1.64373	-0.07683	5.44265	150	1.00317	Native
9/25/2024 19:42	45560	0.821296296	1.63743	-0.0593	5.4419	150	1.00317	Native
9/25/2024 19:43	45560	0.821631944	1.60002	-0.12031	5.42789	150	1.00317	Native
9/25/2024 19:43	45560	0.821967593	1.6538	-0.0912	5.40348	150	1.00317	Native
9/25/2024 19:44	45560	0.822303241	1.63582	-0.05598	5.40956	150	1.0032	Native
9/25/2024 19:44	45560	0.822638889	1.55241	-0.10746	5.40754	150	1.00321	Native
9/25/2024 19:45	45560	0.822974537	1.48326	-0.10265	5.45825	150	1.00323	Native
9/25/2024 19:45	45560	0.823310185	1.39977	-0.02776	5.48823	150	1.00323	
9/25/2024 19:46	45560	0.823645833	2.13317	0.519644	5.47664	150	1.00324	
9/25/2024 19:46	45560	0.823981481	3.83401	2.34409	5.4635	150	1.00322	Spike
9/25/2024 19:47	45560	0.824351852	3.87619	2.43675	5.46441	149.9	1.00323	Spike
9/25/2024 19:47	45560	0.824652778	3.87948	2.55329	5.4778	149.9	1.00326	Spike
9/25/2024 19:47	45560	0.824988426	3.95238	2.53958	5.481	149.9	1.00327	Spike
9/25/2024 19:48	45560	0.825324074	3.9322	2.59116	5.47812	149.9	1.00328	Spike
9/25/2024 19:48	45560	0.825659722	3.89764	2.41005	5.48063	149.9	1.00328	Spike
9/25/2024 19:49	45560	0.82599537	3.59001	2.14189	5.48125	149.9	1.0033	Spike
9/25/2024 19:49	45560	0.826331019	3.53133	2.07889	5.47405	149.9	1.00331	Spike
9/25/2024 19:50	45560	0.826666667	3.47118	2.07954	5.47621	150	1.00332	Spike
9/25/2024 19:50	45560	0.827002315	3.49747	2.07334	5.47111	150	1.00331	Spike
9/25/2024 19:51	45560	0.827337963	3.3659	1.82036	5.47173	150	1.00332	Spike

RCTO 2 FTIR Spike Raw Data

Timestamp	Date	Time	Methane	R22	Signal	Temp(C)	Press(atm)	
9/25/2024 19:51	45560	0.827673611	3.23628	1.78787	5.48013	150	1.00334	Spike
9/25/2024 19:52	45560	0.828020833	3.21943	1.8242	5.47287	150	1.00335	Spike
9/25/2024 19:52	45560	0.828344907	3.2683	1.86039	5.46679	150	1.00336	Spike
9/25/2024 19:53	45560	0.828680556	3.32338	1.79607	5.46647	150	1.00337	Spike
9/25/2024 19:53	45560	0.829016204	3.19658	1.73952	5.46775	150	1.00338	Spike
9/25/2024 19:54	45560	0.829351852	3.21962	1.77702	5.48425	150	1.00339	Spike
9/25/2024 19:54	45560	0.8296875	3.21274	1.69852	5.48205	150	1.00338	Spike
9/25/2024 19:55	45560	0.830023148	3.2668	1.7397	5.4799	150	1.00338	Spike
9/25/2024 19:55	45560	0.830358796	3.34391	1.78484	5.47774	150	1.00339	Spike
9/25/2024 19:56	45560	0.830694444	3.27194	1.80299	5.4741	150	1.00338	
9/25/2024 19:56	45560	0.831064815	3.06638	1.61916	5.47081	150	1.00337	
9/25/2024 19:57	45560	0.831365741	1.65473	-0.02364	5.42326	150	1.00337	
9/25/2024 19:57	45560	0.831701389	1.59692	-0.00269	5.41406	149.9	1.00338	
9/25/2024 19:58	45560	0.832037037	1.56413	-0.06133	5.40576	149.9	1.00339	
9/25/2024 19:58	45560	0.832372685	1.57976	-0.03044	5.3813	149.9	1.00338	
9/25/2024 19:59	45560	0.832719907	1.60296	-0.07648	5.39208	150	1.00338	
9/25/2024 19:59	45560	0.833043981	1.6261	-0.05267	5.40592	150	1.00338	
9/25/2024 20:00	45560	0.833391204	1.63338	-0.05059	5.42565	150	1.00336	
		Average	3.494608	2.053854				

RCTO 3 FTIR Spike Raw Data

Timestamp	Date	Time	Methane	R22	Signal	Temp(C)	Press(atm)	
RCTO 3 - Inlet								
9/25/2024 8:08	9/25/2024	8:08:27	1.27715	0.067682	5.47418	149.9	1.00739	
9/25/2024 8:08	9/25/2024	8:08:53	1.55743	-0.14645	5.46544	150	1.00741	
9/25/2024 8:09	9/25/2024	8:09:25	1.61273	-0.1215	5.4663	150	1.00744	
9/25/2024 8:09	9/25/2024	8:09:51	1.62934	-0.05099	5.47972	150	1.00747	Native
9/25/2024 8:10	9/25/2024	8:10:20	1.58603	-0.11785	5.47514	150	1.00749	Native
9/25/2024 8:10	9/25/2024	8:10:49	1.59171	-0.19093	5.48509	150	1.0075	Native
9/25/2024 8:11	9/25/2024	8:11:19	1.55293	-0.09368	5.47608	150	1.00753	Native
9/25/2024 8:11	9/25/2024	8:11:49	1.5838	-0.17159	5.46995	149.9	1.00755	Native
9/25/2024 8:12	9/25/2024	8:12:16	1.56216	-0.24245	5.4656	150	1.00757	Native
9/25/2024 8:12	9/25/2024	8:12:45	1.57433	-0.2326	5.46835	150	1.00753	Native
9/25/2024 8:13	9/25/2024	8:13:14	1.58888	-0.06039	5.46718	150	1.00742	Native
9/25/2024 8:13	9/25/2024	8:13:43	1.45439	-0.18192	5.46165	150	1.0074	Native
9/25/2024 8:14	9/25/2024	8:14:12	1.60599	-0.18302	5.43976	150	1.00741	Native
9/25/2024 8:14	9/25/2024	8:14:43	1.59087	-0.07401	5.41919	150	1.00742	Native
9/25/2024 8:15	9/25/2024	8:15:10	1.6073	-0.18208	5.41452	150	1.00743	Native
9/25/2024 8:15	9/25/2024	8:15:39	1.64504	-0.29738	5.40903	150	1.00746	Native
9/25/2024 8:16	9/25/2024	8:16:08	1.5217	-0.14864	5.39912	149.9	1.00747	Native
9/25/2024 8:16	9/25/2024	8:16:37	1.66939	-0.04113	5.41927	150	1.00743	Native
9/25/2024 8:17	9/25/2024	8:17:06	1.58964	-0.23211	5.42948	150	1.00738	Native
9/25/2024 8:17	9/25/2024	8:17:38	1.56255	-0.08485	5.42775	150	1.00739	Native
9/25/2024 8:18	9/25/2024	8:18:05	1.59311	-0.16036	5.41919	150	1.00743	
9/25/2024 8:18	9/25/2024	8:18:36	1.5636	-0.15257	5.42475	149.9	1.00746	
9/25/2024 8:19	9/25/2024	8:19:05	1.58644	0.003749	5.41354	149.9	1.0075	
9/25/2024 8:19	9/25/2024	8:19:31	1.55567	-0.2354	5.40512	149.9	1.00752	
9/25/2024 8:20	9/25/2024	8:20:00	1.57655	-0.15714	5.40255	149.9	1.00754	
9/25/2024 8:20	9/25/2024	8:20:29	1.53318	-0.20341	5.3958	149.9	1.00756	
9/25/2024 8:20	9/25/2024	8:20:59	1.90136	0.271117	5.42285	150	1.00759	
9/25/2024 8:21	9/25/2024	8:21:27	2.21654	0.458866	5.43278	150	1.0076	
9/25/2024 8:21	9/25/2024	8:21:56	1.4963	-0.08443	5.40516	150	1.00761	
9/25/2024 8:22	9/25/2024	8:22:25	2.54303	0.92795	5.43063	150	1.00764	
9/25/2024 8:22	9/25/2024	8:22:57	3.43478	2.02192	5.46627	150	1.00764	Spike
9/25/2024 8:23	9/25/2024	8:23:23	3.55094	2.10551	5.47397	150	1.00765	Spike
9/25/2024 8:23	9/25/2024	8:23:52	3.52192	2.06208	5.47927	150	1.00767	Spike
9/25/2024 8:24	9/25/2024	8:24:21	3.5003	2.00209	5.48194	150	1.00768	Spike
9/25/2024 8:24	9/25/2024	8:24:53	3.32457	1.98393	5.4795	150	1.0077	Spike
9/25/2024 8:25	9/25/2024	8:25:19	3.3371	1.86106	5.48723	149.9	1.00772	Spike

RCTO 3 FTIR Spike Raw Data

Timestamp	Date	Time	Methane	R22	Signal	Temp(C)	Press(atm)	
9/25/2024 8:25	9/25/2024	8:25:48	3.35901	1.93995	5.48024	150	1.00773	Spike
9/25/2024 8:26	9/25/2024	8:26:17	3.38419	1.79523	5.49152	150	1.00772	Spike
9/25/2024 8:26	9/25/2024	8:26:46	3.45854	2.00475	5.49329	149.9	1.00773	Spike
9/25/2024 8:27	9/25/2024	8:27:15	3.44261	1.87886	5.49243	149.9	1.00772	Spike
9/25/2024 8:27	9/25/2024	8:27:44	3.45088	2.01326	5.48713	149.9	1.00773	Spike
9/25/2024 8:28	9/25/2024	8:28:13	3.41009	1.97609	5.49385	150	1.00773	Spike
9/25/2024 8:28	9/25/2024	8:28:45	3.40591	1.79559	5.48303	150	1.00774	Spike
9/25/2024 8:29	9/25/2024	8:29:12	3.15555	1.6042	5.46547	150	1.00775	Spike
9/25/2024 8:29	9/25/2024	8:29:40	3.18573	1.63794	5.47288	150	1.00776	Spike
9/25/2024 8:30	9/25/2024	8:30:09	3.12025	1.5136	5.46394	150	1.00775	Spike
9/25/2024 8:30	9/25/2024	8:30:39	3.08547	1.55342	5.45943	150	1.00777	Spike
9/25/2024 8:31	9/25/2024	8:31:07	2.9771	1.63471	5.44939	150	1.00782	Spike
9/25/2024 8:31	9/25/2024	8:31:36	3.05206	1.48131	5.45041	150	1.00783	Spike
9/25/2024 8:32	9/25/2024	8:32:05	3.08474	1.52238	5.44812	150	1.00785	Spike
9/25/2024 8:32	9/25/2024	8:32:34	3.07909	1.56182	5.45115	150	1.00785	Spike
9/25/2024 8:33	9/25/2024	8:33:03	3.08339	1.62029	5.45862	150	1.00787	Spike
9/25/2024 8:33	9/25/2024	8:33:32	3.10593	1.47964	5.44986	149.9	1.00789	Spike
9/25/2024 8:34	9/25/2024	8:34:04	3.13403	1.52359	5.44106	149.9	1.0079	Spike
9/25/2024 8:34	9/25/2024	8:34:30	3.0641	1.48641	5.43055	149.9	1.0079	Spike
9/25/2024 8:34	9/25/2024	8:34:59	3.08086	1.53142	5.43174	149.9	1.0079	Spike
9/25/2024 8:35	9/25/2024	8:35:28	3.01883	1.62696	5.42465	149.9	1.00791	Spike
9/25/2024 8:35	9/25/2024	8:35:59	3.04517	1.54434	5.4065	149.9	1.00792	Spike
9/25/2024 8:36	9/25/2024	8:36:26	3.04536	1.60543	5.41099	149.9	1.00793	Spike
9/25/2024 8:36	9/25/2024	8:36:57	3.01291	1.59612	5.4101	149.9	1.00793	Spike
9/25/2024 8:37	9/25/2024	8:37:24	3.02068	1.54362	5.40939	150	1.00794	Spike
9/25/2024 8:37	9/25/2024	8:37:54	3.09147	1.55647	5.41258	150.1	1.00795	Spike
9/25/2024 8:38	9/25/2024	8:38:22	2.44591	1.15609	5.40684	150.1	1.00795	
9/25/2024 8:38	9/25/2024	8:38:51	1.48049	-0.15594	5.35751	150	1.00797	
9/25/2024 8:39	9/25/2024	8:39:20	1.45279	-0.05539	5.36574	150	1.00799	
9/25/2024 8:39	9/25/2024	8:39:49	1.50417	-0.21699	5.36891	150	1.008	
9/25/2024 8:40	9/25/2024	8:40:18	1.54229	-0.19401	5.37287	150	1.00801	
9/25/2024 8:40	9/25/2024	8:40:48	1.56591	0.043922	5.38042	150	1.00801	
		Average	3.219486	1.72075				

RCTO 3 - RCO

9/25/2024 8:08	9/25/2024	8:08:26	1.68988	0.005298	8.6183	150.248	0.973629
9/25/2024 8:08	9/25/2024	8:08:58	1.54475	0.025203	8.60665	150.271	0.973629

RCTO 3 FTIR Spike Raw Data

Timestamp	Date	Time	Methane	R22	Signal	Temp(C)	Press(atm)	
9/25/2024 8:09	9/25/2024	8:09:24	1.56895	0.022891	8.59727	150.271	0.973629	Native
9/25/2024 8:09	9/25/2024	8:09:53	1.54762	0.03539	8.59616	150.253	0.973629	Native
9/25/2024 8:10	9/25/2024	8:10:22	1.57333	0.021182	8.60087	150.253	0.973629	Native
9/25/2024 8:10	9/25/2024	8:10:51	1.56661	0.038761	8.6083	150.271	0.973629	Native
9/25/2024 8:11	9/25/2024	8:11:23	1.56563	0.036483	8.61317	150.265	0.973629	Native
9/25/2024 8:11	9/25/2024	8:11:49	1.55034	0.021744	8.61575	150.265	0.973629	Native
9/25/2024 8:12	9/25/2024	8:12:18	1.57889	0.045771	8.62109	150.271	0.973629	Native
9/25/2024 8:12	9/25/2024	8:12:47	1.59838	0.017641	8.62566	150.276	0.973629	Native
9/25/2024 8:13	9/25/2024	8:13:16	1.56799	0.024542	8.63582	150.276	0.973629	Native
9/25/2024 8:13	9/25/2024	8:13:45	1.54318	0.023611	8.62348	150.276	0.973629	Native
9/25/2024 8:14	9/25/2024	8:14:14	1.55282	0.039777	8.6243	150.271	0.973629	Native
9/25/2024 8:14	9/25/2024	8:14:43	1.61494	0.014501	8.62525	150.276	0.973629	Native
9/25/2024 8:15	9/25/2024	8:15:12	1.57266	0.027664	8.62128	150.276	0.973629	Native
9/25/2024 8:15	9/25/2024	8:15:41	1.55692	0.004587	8.61955	150.247	0.973629	Native
9/25/2024 8:16	9/25/2024	8:16:10	1.56583	0.025984	8.62379	150.252	0.973629	Native
9/25/2024 8:16	9/25/2024	8:16:39	1.56641	0.038449	8.62104	150.317	0.973841	Native
9/25/2024 8:17	9/25/2024	8:17:10	1.58744	0.040027	8.62874	150.369	0.973841	Native
9/25/2024 8:17	9/25/2024	8:17:37	1.49253	0.03736	8.63335	150.392	0.973629	Native
9/25/2024 8:18	9/25/2024	8:18:06	1.58444	0.021073	8.66727	150.432	0.973629	Native
9/25/2024 8:18	9/25/2024	8:18:35	1.58528	0.033812	8.6197	150.455	0.973629	Native
9/25/2024 8:19	9/25/2024	8:19:04	1.56291	0.044348	8.62214	150.473	0.973629	Native
9/25/2024 8:19	9/25/2024	8:19:33	1.54943	0.048492	8.63959	150.466	0.973629	Native
9/25/2024 8:20	9/25/2024	8:20:02	1.55515	0.061558	8.64996	150.477	0.973841	Native
9/25/2024 8:20	9/25/2024	8:20:31	1.59955	0.05217	8.65699	150.507	0.973841	Native
9/25/2024 8:21	9/25/2024	8:21:00	1.65026	0.125064	8.65189	150.507	0.973629	Native
9/25/2024 8:21	9/25/2024	8:21:29	2.04413	0.522647	8.6463	150.507	0.973629	Native
9/25/2024 8:21	9/25/2024	8:21:58	1.54844	0.040921	8.62342	150.507	0.973629	
9/25/2024 8:22	9/25/2024	8:22:27	2.47977	1.0348	8.63025	150.477	0.973629	
9/25/2024 8:22	9/25/2024	8:22:56	3.86345	2.60317	8.66631	150.507	0.973629	Spike
9/25/2024 8:23	9/25/2024	8:23:25	3.77562	2.59189	8.65884	150.448	0.973629	Spike
9/25/2024 8:23	9/25/2024	8:23:54	3.77723	2.53278	8.65969	150.418	0.973629	Spike
9/25/2024 8:24	9/25/2024	8:24:23	3.67882	2.50398	8.65608	150.448	0.973841	Spike
9/25/2024 8:24	9/25/2024	8:24:52	3.42557	2.1794	8.65036	150.448	0.973841	Spike
9/25/2024 8:25	9/25/2024	8:25:21	3.37419	2.14051	8.64896	150.465	0.973629	Spike
9/25/2024 8:25	9/25/2024	8:25:50	3.39251	2.18872	8.64646	150.547	0.973629	Spike
9/25/2024 8:26	9/25/2024	8:26:19	3.40945	2.16304	8.64459	150.521	0.973629	Spike
9/25/2024 8:26	9/25/2024	8:26:48	3.15962	1.83736	8.64841	150.52	0.973629	Spike
9/25/2024 8:27	9/25/2024	8:27:17	3.003	1.72757	8.65286	150.465	0.973629	Spike

RCTO 3 FTIR Spike Raw Data

Timestamp	Date	Time	Methane	R22	Signal	Temp(C)	Press(atm)	
9/25/2024 8:27	9/25/2024	8:27:46	3.04193	1.75037	8.65561	150.345	0.973629	Spike
9/25/2024 8:28	9/25/2024	8:28:15	3.00612	1.76226	8.661	150.201	0.973629	Spike
9/25/2024 8:28	9/25/2024	8:28:44	3.04638	1.72954	8.67747	150.142	0.973629	Spike
9/25/2024 8:29	9/25/2024	8:29:13	3.06963	1.75029	8.66737	150.075	0.973629	Spike
9/25/2024 8:29	9/25/2024	8:29:42	3.04754	1.74494	8.66195	150.025	0.973629	Spike
9/25/2024 8:30	9/25/2024	8:30:11	3.09705	1.7735	8.66108	150.047	0.973629	Spike
9/25/2024 8:30	9/25/2024	8:30:40	3.0765	1.75119	8.66105	150.082	0.973629	Spike
9/25/2024 8:31	9/25/2024	8:31:09	3.04539	1.75715	8.66613	150.135	0.973629	Spike
9/25/2024 8:31	9/25/2024	8:31:38	3.05404	1.75768	8.64998	150.217	0.973629	Spike
9/25/2024 8:32	9/25/2024	8:32:07	3.07318	1.74832	8.64449	150.223	0.973629	Spike
9/25/2024 8:32	9/25/2024	8:32:36	3.10994	1.75968	8.63855	150.253	0.973629	Spike
9/25/2024 8:33	9/25/2024	8:33:05	3.08089	1.74466	8.64445	150.312	0.973629	Spike
9/25/2024 8:33	9/25/2024	8:33:34	3.065	1.73593	8.65983	150.453	0.973629	Spike
9/25/2024 8:34	9/25/2024	8:34:03	3.07475	1.73198	8.64494	150.369	0.973629	Spike
9/25/2024 8:34	9/25/2024	8:34:32	2.98552	1.74655	8.65366	150.236	0.973629	Spike
9/25/2024 8:35	9/25/2024	8:35:01	3.02615	1.70855	8.6462	150.222	0.973629	Spike
9/25/2024 8:35	9/25/2024	8:35:30	3.0427	1.72627	8.65337	150.09	0.973629	Spike
9/25/2024 8:35	9/25/2024	8:35:59	3.02871	1.7237	8.65317	150.078	0.973629	Spike
9/25/2024 8:36	9/25/2024	8:36:28	3.02498	1.72013	8.64049	150.106	0.973629	Spike
9/25/2024 8:36	9/25/2024	8:36:57	3.07257	1.71936	8.65036	150.145	0.973629	Spike
9/25/2024 8:37	9/25/2024	8:37:26	3.06979	1.71194	8.63806	150.18	0.973629	Spike
9/25/2024 8:37	9/25/2024	8:37:55	3.04174	1.70145	8.64973	150.215	0.973629	Spike
9/25/2024 8:38	9/25/2024	8:38:24	2.41208	0.982645	8.63874	150.238	0.973629	
9/25/2024 8:38	9/25/2024	8:38:53	1.5635	0.031522	8.62522	150.243	0.973629	
9/25/2024 8:39	9/25/2024	8:39:22	1.58737	0.051372	8.61772	150.247	0.973629	
9/25/2024 8:39	9/25/2024	8:39:51	1.59021	0.048741	8.62762	150.203	0.973629	
9/25/2024 8:40	9/25/2024	8:40:20	1.59495	0.017167	8.62255	150.154	0.973629	
9/25/2024 8:40	9/25/2024	8:40:49	1.57397	0.05614	8.61975	150.159	0.973629	
		Average	3.188749	1.897621				
RCTO 3 - TO								
9/25/2024 8:08	9/25/2024	8:08:25	-0.88619	0.05287	3.54651	151.468	0.991206	
9/25/2024 8:08	9/25/2024	8:08:54	-0.10144	0.024624	3.54089	151.468	0.991206	
9/25/2024 8:09	9/25/2024	8:09:23	-0.18062	0.021854	3.53604	151.468	0.991206	Native
9/25/2024 8:09	9/25/2024	8:09:52	-0.21817	0.019891	3.52745	151.533	0.991206	Native
9/25/2024 8:10	9/25/2024	8:10:21	-0.18935	-0.00172	3.52158	151.543	0.991206	Native
9/25/2024 8:10	9/25/2024	8:10:50	-0.23584	0.013498	3.51687	151.548	0.991206	Native

RCTO 3 FTIR Spike Raw Data

Timestamp	Date	Time	Methane	R22	Signal	Temp(C)	Press(atm)	
9/25/2024 8:11	9/25/2024	8:11:20	-0.16906	0.006462	3.50594	151.577	0.991206	Native
9/25/2024 8:11	9/25/2024	8:11:48	-0.1416	0.002201	3.4912	151.606	0.991206	Native
9/25/2024 8:12	9/25/2024	8:12:17	-0.21903	-0.01026	3.48597	151.54	0.991206	Native
9/25/2024 8:12	9/25/2024	8:12:46	-0.29137	0.006319	3.48168	151.419	0.991206	Native
9/25/2024 8:13	9/25/2024	8:13:15	-0.2483	-0.02278	3.48321	151.461	0.991206	Native
9/25/2024 8:13	9/25/2024	8:13:44	-0.22812	-0.04316	3.48307	151.461	0.991206	Native
9/25/2024 8:14	9/25/2024	8:14:14	-0.24699	-0.03331	3.48025	151.461	0.991206	Native
9/25/2024 8:14	9/25/2024	8:14:45	-0.21239	-0.01995	3.47495	151.491	0.991206	Native
9/25/2024 8:15	9/25/2024	8:15:11	-0.20135	-0.0126	3.47151	151.58	0.991206	Native
9/25/2024 8:15	9/25/2024	8:15:40	-0.19457	-0.04122	3.47816	151.52	0.991206	Native
9/25/2024 8:16	9/25/2024	8:16:09	-0.19806	-0.02694	3.48432	151.491	0.991206	Native
9/25/2024 8:16	9/25/2024	8:16:38	-0.20671	-0.02815	3.49209	151.437	0.991206	Native
9/25/2024 8:17	9/25/2024	8:17:07	-0.21274	0.243327	3.19477	151.484	0.999376	Native
9/25/2024 8:17	9/25/2024	8:17:36	-0.37977	0.081995	3.07357	151.484	1.00862	Native
9/25/2024 8:18	9/25/2024	8:18:08	-0.20297	0.011555	3.10617	151.465	1.00841	Native
9/25/2024 8:18	9/25/2024	8:18:35	-0.28959	0.017279	3.13464	151.488	1.00841	Native
9/25/2024 8:19	9/25/2024	8:19:03	-0.37943	-0.02061	3.16407	151.522	1.00841	Native
9/25/2024 8:19	9/25/2024	8:19:32	-0.32388	-0.02347	3.16636	151.527	1.00862	Native
9/25/2024 8:20	9/25/2024	8:20:02	-0.41539	-0.02021	3.158	151.55	1.00862	Native
9/25/2024 8:20	9/25/2024	8:20:32	-0.39427	-0.02809	3.14863	151.532	1.00841	Native
9/25/2024 8:20	9/25/2024	8:20:59	-0.21811	-0.03817	3.1441	151.443	1.00841	Native
9/25/2024 8:21	9/25/2024	8:21:28	0.116474	0.392703	3.14838	151.46	1.00841	Native
9/25/2024 8:21	9/25/2024	8:21:59	-0.39717	-0.0179	3.14494	151.447	1.00841	
9/25/2024 8:22	9/25/2024	8:22:26	0.751272	1.02275	3.15891	151.381	1.00841	
9/25/2024 8:22	9/25/2024	8:22:55	2.03076	2.31043	3.16258	151.499	1.00841	Spike
9/25/2024 8:23	9/25/2024	8:23:24	2.06625	2.33263	3.1833	151.474	1.00884	Spike
9/25/2024 8:23	9/25/2024	8:23:53	2.11217	2.29141	3.20185	151.473	1.00905	Spike
9/25/2024 8:24	9/25/2024	8:24:22	2.09634	2.24322	3.21396	151.502	1.00905	Spike
9/25/2024 8:24	9/25/2024	8:24:52	1.77677	2.05958	3.23018	151.579	1.00905	Spike
9/25/2024 8:25	9/25/2024	8:25:23	1.80086	2.05247	3.22833	151.578	1.00884	Spike
9/25/2024 8:25	9/25/2024	8:25:49	1.81248	2.01789	3.23092	151.565	1.00884	Spike
9/25/2024 8:26	9/25/2024	8:26:18	1.78768	2.04296	3.23583	151.565	1.00884	Spike
9/25/2024 8:26	9/25/2024	8:26:47	1.92647	2.03976	3.24563	151.565	1.00884	Spike
9/25/2024 8:27	9/25/2024	8:27:16	1.95322	2.07917	3.25931	151.506	1.00862	Spike
9/25/2024 8:27	9/25/2024	8:27:45	1.70811	2.10297	3.26649	151.416	1.00884	Spike
9/25/2024 8:28	9/25/2024	8:28:14	1.66293	2.09591	3.26693	151.326	1.00884	Spike
9/25/2024 8:28	9/25/2024	8:28:46	1.62263	2.10409	3.27618	151.326	1.00841	Spike
9/25/2024 8:29	9/25/2024	8:29:12	1.5677	1.94892	3.27138	151.294	1.00862	Spike

RCTO 3 FTIR Spike Raw Data

Timestamp	Date	Time	Methane	R22	Signal	Temp(C)	Press(atm)	
9/25/2024 8:29	9/25/2024	8:29:43	1.53094	1.89234	3.28025	151.292	1.00884	Spike
9/25/2024 8:30	9/25/2024	8:30:10	1.5562	1.85371	3.28157	151.166	1.00862	Spike
9/25/2024 8:30	9/25/2024	8:30:39	1.77994	1.83503	3.28013	151.111	1.00841	Spike
9/25/2024 8:31	9/25/2024	8:31:10	1.52662	1.87247	3.28102	151.164	1.00862	Spike
9/25/2024 8:31	9/25/2024	8:31:41	1.38819	1.80451	3.28444	151.08	1.00862	Spike
9/25/2024 8:32	9/25/2024	8:32:07	1.33757	1.76279	3.29624	151.021	1.00841	Spike
9/25/2024 8:32	9/25/2024	8:32:36	1.33336	1.75736	3.29609	151.032	1.00862	Spike
9/25/2024 8:33	9/25/2024	8:33:04	1.40529	1.75964	3.2961	151.013	1.00884	Spike
9/25/2024 8:33	9/25/2024	8:33:35	1.38775	1.73807	3.29595	151.035	1.00905	Spike
9/25/2024 8:34	9/25/2024	8:34:04	1.4291	1.75565	3.28993	151.033	1.00905	Spike
9/25/2024 8:34	9/25/2024	8:34:31	1.30444	1.75777	3.28903	151.08	1.00905	Spike
9/25/2024 8:35	9/25/2024	8:35:00	1.33475	1.73759	3.28596	150.983	1.00841	Spike
9/25/2024 8:35	9/25/2024	8:35:30	1.35624	1.7404	3.28849	151.006	1.00841	Spike
9/25/2024 8:35	9/25/2024	8:35:58	1.36927	1.7423	3.29961	151.069	1.00862	Spike
9/25/2024 8:36	9/25/2024	8:36:27	1.3366	1.70736	3.31062	151.038	1.00884	Spike
9/25/2024 8:36	9/25/2024	8:36:57	1.48461	1.74612	3.3146	151.001	1.00862	Spike
9/25/2024 8:37	9/25/2024	8:37:25	1.34291	1.7053	3.3206	151.018	1.00862	Spike
9/25/2024 8:37	9/25/2024	8:37:54	1.22315	1.67451	3.30968	151.066	1.00862	Spike
9/25/2024 8:38	9/25/2024	8:38:23	0.354814	0.834001	3.29321	151.036	1.00884	
9/25/2024 8:38	9/25/2024	8:38:55	-0.50973	-0.00621	3.27523	150.91	1.00884	
9/25/2024 8:39	9/25/2024	8:39:22	-0.28933	-0.03696	3.277	150.854	1.00884	
9/25/2024 8:39	9/25/2024	8:39:51	-0.2302	-0.01789	3.28798	150.93	1.00862	
9/25/2024 8:40	9/25/2024	8:40:25	-0.32725	-0.03848	3.28829	151.024	1.00862	
9/25/2024 8:40	9/25/2024	8:40:48	-0.38353	-0.05891	3.28022	150.933	1.00862	
		Average	1.537349	1.923885				