



February 22, 2022

Alberta Environment and Parks (AEP)
Monitoring Branch
11th Floor Oxbridge Place
9820-106 Street
Edmonton, Alberta
T5K 2J6

RE: Annual Ambient Air Monitoring Report (IAM-00010348-2021)
Calendar Year 2021
Clean Harbors Canada, Inc. Approval 10348-03-00

To whom it may concern:

Clean Harbors Canada, Inc. (Clean Harbors) is presenting this Annual Ambient Air Monitoring Report, which was prepared by GHD Limited (Consultant), for the 2021 calendar year to Alberta Environment and Parks (AEP). The Clean Harbors Ryley Industrial Waste Management Facility (Facility) is located in SE 09-050-17 W4M near Ryley, Alberta.

This ambient air-monitoring program at the Facility is conducted in accordance with the requirements outlined in the Facility's Environmental Protection and Enhancement Act (EPEA) Approval, Approval Number: 10348-02-00 (Approval). As part of the Approval requirements, the Facility submitted a Proposal for a new Ambient Air Monitoring Program, which was subsequently approved on June 24, 2009 by the AEP (formally AENV). Operating under the Approval and the approved proposal, Clean Harbors operates two ambient air-monitoring stations: AEP Station ID 00010348-I-1 and AEP Station ID 00010348-C-1. There have been no changes to the monitoring locations, monitoring methods or significant changes to monitoring equipment during the 2021 calendar year.

During the 2021 calendar year, the meteorological station (AEP Station ID 00010348-C-1) operated at 93.78% percent annual uptime, which is above the 90 percent uptime threshold required by the Air Monitoring Directive, 2016.

Included in this report are the following:

- Summary of the ambient air monitoring program undertaken at the Facility for 2021
- Summary of AMD Electronic Transfer System Submittals
- Results for Particulate Matter ≤ 10 microns (PM₁₀) reported in ug/m³
- Results for water-soluble cations; metals or anions if the PM₁₀ results were >50 ug/m³
- Results for Total Non-Methane Organic Compounds (TNMOC) and Volatile Organic Compounds (VOC)
- 5-year average plots for measured compounds outlined in the approval
- Annual wind rose and monthly uptime summary
- Any sampling issues or data issues that occurred during the 2021 calendar year



Should there be any questions and comments regarding this report, please do not hesitate to contact the undersigned.

Yours truly,

CLEAN HARBORS CANADA INC.

A handwritten signature in blue ink that reads "Stan Yuha". The signature is written in a cursive, flowing style.

Stan Yuha

Plant Manager



Alberta Environment and Parks (AEP) 2021 Annual Ambient Air Monitoring Report (IAM-00010348-2021)

Approval Number: 10348-03-00
Ryley Facility, Alberta

Clean Harbors
Environmental Services Inc.

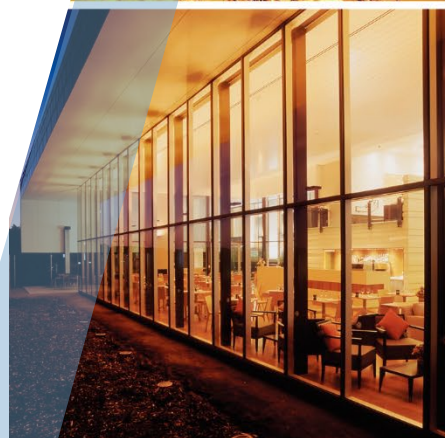




Table of Contents

- 1. Introduction1
 - 1.1 Background.....1
 - 1.2 Contact Information1
 - 1.3 Summary of Electronic Transfer System (ETS) Submittals.....2
 - 1.4 Monitoring Locations and Methodology.....2
 - 1.4.1 Clean Harbors AEP Mandated Air Monitoring Program2
 - 1.4.2 Clean Harbors Voluntary Air Monitoring Program5
- 2. Results and Discussions5
 - 2.1 Meteorological Data for Wind Speed and Direction (AEP Station ID 00010348-C-1) Results and Discussion.....5
 - 2.1.1 Meteorological Data Verification, Validation and Uptime.....6
 - 2.2 PM10 Monitoring Station (AEP Station ID 00010348-I-1) Results and Discussion6
 - 2.3 Metal Concentrations.....6
 - 2.4 VOC and TNMOC Station (AEP Station ID 00010348-I-1) Results and Discussion6
 - 2.5 Dust Suppression Activities7
- 3. Certification.....7

Figure Index

Figure 1 Site Location and Air Monitoring Location Map

Table Index

- Table 1.1 Metal Parameters..... 3
- Table 1.2 VOCs..... 4

Table Index (Following Text)

- Table 1 2021 Calendar Year - Particulate Matter Results
- Table 2 2021 Calendar Year - Volatile Organic Compounds and Total Non-Methane Organic Compounds Analytical Results
- Table 3 2021 Calendar Year – Metal Analysis Results
- Table 4 2021 Calendar Year – Meteorological Station Uptime Summary



Appendix Index

- Appendix A Annual Wind Rose
- Appendix B Quarterly Calibration Records for Partisol
- Appendix C 5-Year Averages for PM₁₀, VOC and TNMOC Concentrations



1. Introduction

1.1 Background

GHD Limited (GHD), on behalf of Clean Harbors Canada (Clean Harbors), is presenting to Alberta Environment and Parks (AEP) the Annual Clean Harbors Ambient Air Monitoring Report for the 2021 calendar year. The Clean Harbors Ryley Industrial Waste Management Facility (Facility) is located in SE 09-050-17 W4M near Ryley, Alberta. Figure 1 presents the site location and air monitoring station location map.

The ambient air monitoring program at the Facility is conducted in accordance with the requirements outlined in the Facility's Environmental Protection and Enhancement Act (EPEA) Approval, Approval Number: 10348-03-00 (Approval). As part of the Approval requirements, the Facility submitted a proposal for a new ambient air monitoring program, which was subsequently approved on June 24, 2009 by the AEP (formally AENV).

1.2 Contact Information

As required by AMD Chapter 9, Section 2, contact information is provided for the following Facility personnel and Contractors that assisted with the performance of the Facility's Air Monitoring Program.

Name: Mr. Stan Yuha
Title: Plant Manager
Company: Clean Harbors
Responsibilities: ETS Submitter/Report Certifier
Address: PO Box 390, Ryley, AB T0B 4A0
Phone: 780-663-2509
Email: yuha.stan@cleanharbors.com

Name: Mr. Todd Webb
Title: Laboratory Chemist
Company: Clean Harbors
Responsibilities: Station Field Operator and Field Sampler
Address: PO Box 390, Ryley, AB T0B 4A0
Phone: 780-663-2513
Email: webb.todd@cleanharbors.com



Name: Mr. Pooya Shariaty
Title: Senior Air Quality Engineer
Company: GHD Limited
Responsibilities: Senior QA/QC
Address: 3445-114th Ave. SE, Suite 103 Calgary, AB
Phone: 403-271-2000
Email: pooya.shariaty@ghd.com

Name: Mr. Trevor Lewis
Title: Air Quality Scientist/Project Manager
Company: GHD Limited
Responsibilities: Maintenance/Calibration Services/Report Preparer/Project Manager
Address: 3445-114th Ave. SE, Suite 103 Calgary, AB
Phone: 403-271-2000
Email: trevor.lewis@ghd.com

Company: InnoTech
Responsibilities: Laboratory Analytical Services
Address: PO Bag 4000, Vegreville, Alberta
Phone: 780-632-8211
Email: EAS.Results@albertainnovates.ca

1.3 Summary of Electronic Transfer System (ETS) Submittals

The “Alberta Environment and Parks (AEP) 2021 Annual Ambient Air Monitoring Report for Approval Number: 10348-03-00” for the Clean Harbors, Ryley Alberta Facility was submitted to the ETS as IAM-00010348-2021.pdf, by March 31, 2022.

1.4 Monitoring Locations and Methodology

Clean Harbors undertakes ambient air monitoring at three locations to assess ambient air quality at and around the Facility. These locations include two AEP mandated stations; AEP Station ID 00010348-I-1 and AEP Station ID 00010348-C-1 and one voluntary ambient air monitoring station. The locations of the air monitoring stations are identified on Figure 1.

A full description of the monitoring locations and methodology for the AEP mandated air monitoring program is outlined in Section 1.4.

In addition to the two AEP mandated stations, Clean Harbors operates a voluntary air monitoring program for the Village of Ryley. The voluntary air monitoring program utilizes a hi-volume sampler station located at the same location as AEP Station ID 00010348-C-1, and an additional hi-volume sampler/meteorological station that is located at the Ryley School and is described in Section 1.4.2.

1.4.1 Clean Harbors AEP Mandated Air Monitoring Program

The intermittent monitoring station, known as the Ryley Lift Station (AEP Station ID 00010348-I-1), is located on Secondary Road 854, approximately 350 metres southeast of the Facility. At this location, samples are collected and analyzed for the following: particulate matter less than or equal to 10 micrometers (μm) in diameter (PM_{10}), volatile organic compounds (VOCs), and total non-methane organic compounds (TNMOC). Additionally, PM_{10} samples that exceed 50 micrograms per



cubic metre ($50 \mu\text{g}/\text{m}^3$) are analyzed for a target list of metals, anions, and cations. Sampling is conducted every 12-days as required by the Facility's Approval.

The second station, located on the roof of the administration building at the Facility (AEP Station ID 00010348-C-1), is a continuous meteorological station that collects wind speed and wind direction data.

1.4.1.1 **PM₁₀ Sampling Station (AEP Station ID 00010348-I-1)**

PM₁₀ is sampled over a 24-hour period at a volumetric flow rate of 16.7 litres per minute. PM₁₀ samples are collected on a Teflon® filter using a federal reference method (FRM) sampler called a Partisol air sampler. Calibration of the Partisol sampler is conducted and documented on a quarterly basis. The filter samples are collected and sent to InnoTech Alberta (Laboratory) under chain of custody procedures. The filters are analyzed gravimetrically utilizing laboratory method AC-029. Should it be determined that the PM₁₀ threshold of $50 \mu\text{g}/\text{m}^3$ is exceeded, the laboratory would proceed with the metal analysis using accepted methodology. The following is a list of the metal parameters that are analyzed when the PM₁₀ threshold is exceeded.

Table 1.1 Metal Parameters

Parameter	CAS No.
Particulate Matter (PM ₁₀)	Not available
Antimony	7440-36-0
Arsenic	7440-38-2
Beryllium	7440-41-4
Cadmium	7440-43-9
Chromium	7440-47-3
Cobalt	7440-48-4
Copper	7440-50-8
Lead	7439-92-1
Manganese	7439-96-5
Mercury	7439-97-6
Nickel	7440-02-0
Silver	7782-49-2
Thallium	7440-28-0
Tin	7440-31-5
Ammonia-N	Not available
Calcium Ion	Not available
Chloride	Not available
Magnesium Ion	Not available
Nitrate	Not available
Potassium Ion	Not available
Sodium Ion	Not available
Sulphate	Not available



1.4.1.2 Volatile Organic Compound (VOC) and Total Non-Methane Organic Compound (TNMOC) Station (AEP Station ID 00010348-I-1)

For VOC and TNMOC sampling and analysis, 6 litre evacuated SUMMA® canisters are used to collect the sample over a 24-hour period. Flow controllers and pressure gauges supplied by the laboratory are used to maintain a constant sample flowrate over the 24-hour sampling period. The VOC analysis is conducted utilizing laboratory method AC-058 by gas chromatography mass spectrometry. The TNMOC analysis is conducted utilizing laboratory method NA-028 by gas chromatography flame ionization detector. The following is a list of VOCs that are analyzed:

Table 1.2 VOCs

Compound	CAS No.	Compound	CAS No.
1,2,3-Trimethylbenzene	526-73-8	Isoprene	78-79-5
1,2,4-Trimethylbenzene	95-63-6	Isopropylbenzene	98-82-8
1,3,5-Trimethylbenzene	108-67-8	m, p-Xylene	108-38-3/ 106-42-3
1-Butene/Isobutylene	106-98-9	m-Diethylbenzene	141-93-5
1-Hexene/2-Methyl-1-pentene	592-41-6	Methylcyclohexane	108-87-2
1-Pentene	109-67-1	Methylcyclopentane	96-37-7
2,2,4-Trimethylpentane	540-84-1	m-Ethyltoluene	620-14-4
2,2-Dimethylbutane	75-83-2	n-Butane	106-97-8
2,3,4-Trimethylpentane	565-75-3	n-Decane	124-18-5
2,3-Dimethylbutane	79-29-8	n-Dodecane	112-40-3
2,3-Dimethylpentane	565-59-3	n-Heptane	142-82-5
2,4-Dimethylpentane	108-08-7	n-Hexane	110-54-3
2-Methylheptane	592-27-8	n-Nonane	111-84-2
2-Methylhexane	591-76-4	n-Octane	111-65-9
2-Methylpentane	107-83-5	n-Pentane	109-66-0
3-Methylheptane	589-81-1	n-Propylbenzene	103-65-1
3-Methylhexane	589-34-4	n-Undecane	1120-21-4
3-Methylpentane	96-14-0	o-Ethyltoluene	611-14-3
Benzene	71-43-2	o-Xylene	95-47-6
cis-2-Butene	590-18-1	p-Ethyltoluene	622-96-8
cis-2-Pentene	627-20-3	Styrene	100-42-5
Cyclohexane	110-82-7	Toluene	108-88-3
Cyclopentane	287-92-3	trans-2-Butene	624-64-6
Ethylbenzene	100-41-4	trans-2-Pentene	646-04-8
Isobutane	75-28-5	p-Diethylbenzene	105-05-5
Isopentane	78-78-4		



Meteorological Station (AEP Station ID 00010348-C-1)

Clean Harbors operates a RM Young 05305-10A meteorological station at the Facility. The meteorological station continuously collects wind speed and wind direction at the site. Reporting for this station is conducted on a monthly and annual basis where 24-hour wind speed and wind direction, wind class frequency distribution and wind roses are presented. As part of the Approval Clean Harbors is also required to ensure that operation of the station is maintained at no less than 90 percent uptime. The uptime data is also presented on a monthly and annual basis.

1.4.2 Clean Harbors Voluntary Air Monitoring Program

Clean Harbors operates two hi-volume sampler stations that collect total particulate matter. One hi-volume sampler station is located on the roof of the administration building at the Facility, near the AEP Station ID 00010348-C-1, and is intended to collect background ambient air data. The second hi-volume sampler station is located at the Ryley School with a meteorological station and is intended to collect sample data. The samples collected are measured gravimetrically for total particulate and then analyzed for metals by the laboratory when the particulate weight is greater than 50 mg. The two air monitoring stations are configured such that the stations only collect air samples when the wind direction is oriented in a north-east to south-west direction and the wind speed is greater than 5 km/hour. The objective of the voluntary program is to determine airborne particulates from landfill operations that could potentially impact the Village of Ryley.

The results of this voluntary air monitoring program are communicated in a letter presented to the Village of Ryley on an annual basis.

2. Results and Discussions

The following section presents the results from the ambient air monitoring program that was conducted by Clean Harbors in 2021. Where applicable, comparisons were made to Alberta Ambient Air Quality Objectives (AAAQO) for parameters that had 24-hour average objectives and annual objectives. These parameters include m,p,o-xylene, hexane, toluene and benzene. For all other parameters, AAAQO have not been established limits or the limits have averaging periods other than 24-hours or annual.

2.1 Meteorological Data for Wind Speed and Direction (AEP Station ID 00010348-C-1) Results and Discussion

In accordance with the Approval, the Facility is required to collect wind data continuously when operations are occurring at the Facility. In 2021, the wind station collected 93.78 percent of usable data. Appendix A presents the wind data that was collected and also wind rose plots. As illustrated in the wind rose and frequency distribution chart for 2021, the predominant wind direction is from the Northwest, which is consistent with historical information and data.

The 2021 annual wind rose and frequency distribution chart is presented in Appendix A.



2.1.1 Meteorological Data Verification, Validation and Uptime

In the 2021 calendar year, the meteorological station had an annual uptime of 93.78 percent, above the 90 percent uptime required. The station maintained an uptime above 90 percent for 10 out of the 12-months in the calendar year.

2.2 PM₁₀ Monitoring Station (AEP Station ID 00010348-I-1) Results and Discussion

In 2021, 31 samples were collected for PM₁₀ analysis at 12-day intervals. No samples were discarded during the year.

The PM₁₀ samples in 2021 had a minimum concentration of 1.67 µg/m³, a maximum concentration of 80.99 µg/m³, and an average concentration of 22.05 µg/m³. There is currently no AAAQO is specified for PM₁₀ over a 24-hour or 1-hour averaging period; however, the Facility is required to analyze for metals should the PM₁₀ concentration exceed 50 µg/m³. Test 772, 780 and 782 that occurred on July 15, October 19, and November 12 respectively required metals analysis due to elevated PM₁₀ results above 50 µg/m³. Metal results are discussed in Section 2.3. The 2021 test results from the PM₁₀ monitoring are presented in Table 1 and include maximum, minimum, and average values for the reporting period. The previous 5-year averages for PM₁₀ concentrations can be found in Appendix C.

The Partisol sampling instrument was calibrated on a quarterly basis in 2021. The quarterly calibration records are included in Appendix B.

2.3 Metal Concentrations

28 of the 31 samples collected in 2021 returned concentrations of PM₁₀ below the 50 µg/m³ threshold. Test 772, 780, and 782 returned PM₁₀ concentrations of 66.97 µg/m³, 80.99 µg/m³, 64.75 µg/m³ respectively. These samples were sent for additional analysis and the results can be found in Table 3 of this report.

AAAQO are specified for arsenic (0.01 µg/m³ annual average and 0.1 µg/m³ 1-hour average) and chromium (1.00 µg/m³ 1-hour average) but there are currently no AAAQO for either substance for a 24-hour averaging period in Alberta. The lab results for all samples were the result of a 24-hour sampling period and therefore could not be directly compared to an AAAQO. However, when comparing the 24-hour results for both arsenic and chromium to the hourly AAAQO, both were still below the thresholds.

2.4 VOC and TNMOC Station (AEP Station ID 00010348-I-1) Results and Discussion

In 2021, 31 samples were collected for VOC and TNMOC analysis at 12-day intervals. All samples were deemed valid.

There are three VOC parameters that have corresponding AAAQO with 24-hour averaging periods including o,p,m-xylene, hexane and toluene. There is one VOC parameter (benzene) that



has a corresponding annual AAAQO. The annual AAAQO for benzene is 0.9 ppbv. The annual result for benzene samples at the lift station was 0.63 ppbv.

The 2021 sample results from the VOC and TNMOC monitoring are presented in Table 2 and include maximum, minimum, and average values. The previous 5-year averages for VOC and TNMOC parameters can be found in Appendix C.

2.5 Dust Suppression Activities

In 2021, Clean Harbors did not conduct dust suppression activities at the Facility.

3. Certification

Per the requirements of AMD, Chapter 9, the following certification is provided for the 2021 Annual Ambient Air Monitoring Report.

"I certify that I have reviewed and verified this report and that the information is complete, accurate and representative of the monitoring results, reporting timeframe and the specified analysis, summarization and reporting requirements."

A handwritten signature in blue ink that reads "Stan Yuha". The signature is written in a cursive, flowing style.

Stan Yuha

Plant Manager/Report Certifier

Table 1
2021
Calendar Year
PM₁₀ Analytical Results
AEP Station ID 00010348-I-1
Clean Harbors Canada, Inc.

Date	Parameter Units	PM ₁₀ µg/m ³ ⁽¹⁾⁽²⁾	Particulate Weight mg
	Test ID		
21/01/04	756	7.82	0.19
21/01/16	757	7.60	0.18
21/01/28	758	20.00	0.52
21/02/09	759	33.03	0.90
21/02/21	760	2.31	0.05
3/5/2021	761	1.67	0.04
3/17/2021	762	21.42	0.51
3/29/2021	763	15.87	0.39
4/10/2021	764	15.84	0.38
4/22/2021	765	9.22	0.23
5/4/2021	766	21.71	0.51
5/16/2021	767	24.18	0.54
5/28/2021	768	26.04	0.60
6/9/2021	769	7.04	0.16
6/21/2021	770	23.29	0.52
7/3/2021	771	17.94	0.4
7/15/2021	772	66.97	1.48
7/27/2021	773	22.88	0.52
8/8/2021	774	17.94	0.41
8/20/2021	775	20.31	0.47
9/1/2021	776	6.70	0.15
9/13/2021	777	16.54	0.38
9/25/2021	778	18.07	0.41
10/7/2021	779	46.84	1.11
10/19/2021	780	80.99	1.96
10/31/2021	781	9.55	0.24
11/12/2021	782	64.75	1.58
11/24/2021	783	18.24	0.47
12/6/2021	784	13.66	0.35
12/18/2021	785	12.65	0.33
12/30/2021	786	12.35	0.33
	Maximum	80.99	1.96
	Minimum	1.67	0.04
	Average	22.05	0.53

Note:

(1) Alberta Ambient Air Quality Objectives do not currently provide an objective for PM₁₀.

(2) In accordance with the Facility's Approval, PM₁₀ samples that exceed 50 µg/m³ are analyzed for a target list of metals, anions, and cations.

Table 2
2021 Calendar Year
VOC and TNMOC Analytical Results
AEP Station ID 00010348-I-1
Clean Harbors Canada, Inc.

	Date	1/4/2021	1/16/2021	1/28/2021	2/9/2021	2/21/2021	3/5/2021	3/17/2021	3/29/2021	4/10/2021	4/22/2021	5/4/2021	5/16/2021	5/28/2021	6/9/2021	6/21/2021	7/3/2021	7/15/2021	7/27/2021	8/8/2021	
	Test ID	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	
Parameter	Units	AAAQO ⁽¹⁾⁽²⁾																			
1,2,3-Trimethylbenzene	ppbv	-	< 0.06	0.19	< 0.09	< 0.09	< 0.10	< 0.10	< 0.08	< 0.08	< 0.08	0.15	< 0.09	< 0.08	< 0.08	< 0.09	< 0.09	< 0.10	< 0.08	< 0.08	
1,2,4-Trimethylbenzene	ppbv	-	< 0.06	< 0.08	< 0.09	< 0.09	< 0.10	< 0.10	< 0.08	< 0.08	< 0.08	0.59	< 0.05	0.49	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	< 0.05	
1,3,5-Trimethylbenzene	ppbv	-	< 0.02	< 0.03	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03	< 0.03	< 0.03	0.42	< 0.05	0.30	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	< 0.05	
1-Butene/Isobutylene	ppbv	-	0.56	0.54	0.72	0.95	1.26	1.41	0.96	0.95	< 0.03	1.03	0.86	1.11	1.24	1.21	< 0.11	< 0.11	< 0.12	1.56	1.48
1-Hexene/2-Methyl-1-pentene	ppbv	-	< 0.02	< 0.03	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03	< 0.03	< 0.03	0.18	< 0.12	< 0.11	< 0.11	< 0.13	< 0.13	< 0.14	< 0.12	< 0.12	
1-Pentene	ppbv	-	< 0.01	0.25	0.18	< 0.02	0.11	0.21	< 0.02	< 0.02	< 0.02	0.29	< 0.05	0.24	< 0.05	< 0.05	0.22	0.29	0.13	< 0.05	
2,2,4-Trimethylpentane	ppbv	-	< 0.01	0.24	< 0.02	< 0.02	< 0.02	0.2	< 0.02	< 0.02	< 0.02	0.16	0.09	0.11	3.91	< 0.03	< 0.04	< 0.04	0.12	0.12	0.16
2,2-Dimethylbutane	ppbv	-	< 0.01	0.15	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.08	< 0.04	< 0.03	< 0.03	0.19	< 0.04	< 0.04	< 0.03	0.07	
2,3,4-Trimethylpentane	ppbv	-	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.06	0.13	< 0.03	< 0.03	< 0.04	< 0.04	< 0.04	< 0.03	< 0.03	
2,3-Dimethylbutane	ppbv	-	< 0.02	0.24	< 0.04	0.2	< 0.04	0.27	< 0.03	< 0.03	< 0.03	< 0.03	< 0.16	< 0.15	< 0.15	< 0.16	0.23	0.36	< 0.15	< 0.15	
2,3-Dimethylpentane	ppbv	-	< 0.02	< 0.03	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03	< 0.03	< 0.03	0.10	0.14	0.94	< 0.03	0.21	< 0.04	< 0.04	0.07	< 0.03	
2,4-Dimethylpentane	ppbv	-	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.04	0.07	0.34	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	< 0.05	
2-Methylheptane	ppbv	-	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.04	< 0.03	< 0.03	< 0.04	< 0.04	< 0.04	< 0.03	< 0.03	
2-Methylhexane	ppbv	-	< 0.01	0.26	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05	0.68	< 0.05	0.24	< 0.05	< 0.06	< 0.05	0.1	
2-Methylpentane	ppbv	-	< 0.01	0.68	0.24	0.21	< 0.02	0.41	< 0.02	0.08	< 0.02	0.23	0.18	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03	< 0.03	< 0.03	
3-Methylheptane	ppbv	-	< 0.02	< 0.03	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03	0.08	< 0.03	< 0.03	0.10	< 0.05	0.33	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	
3-Methylhexane	ppbv	-	< 0.02	0.31	< 0.04	0.2	< 0.04	0.25	< 0.03	0.06	< 0.03	< 0.03	0.08	< 0.04	0.58	< 0.03	0.28	< 0.04	< 0.03	< 0.03	
3-Methylpentane	ppbv	-	< 0.01	1.24	0.21	0.26	< 0.02	0.35	< 0.02	0.07	< 0.02	0.21	0.10	0.13	0.61	0.14	0.27	< 0.04	0.21	0.17	
Benzene	ppbv	0.9	< 0.01	0.4	< 0.02	0.31	0.24	0.28	< 0.02	0.22	< 0.02	< 0.02	0.04	0.13	0.45	< 0.05	0.17	0.22	0.38	0.16	0.15
cis-2-Butene	ppbv	-	< 0.02	0.13	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03	< 0.03	< 0.03	< 0.03	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	< 0.05	
cis-2-Pentene	ppbv	-	< 0.02	< 0.03	< 0.04	< 0.03	< 0.04	< 0.04	< 0.03	< 0.03	< 0.03	< 0.03	< 0.04	< 0.03	< 0.03	< 0.03	< 0.04	< 0.04	< 0.04	< 0.03	< 0.03
Cyclohexane	ppbv	-	< 0.02	0.81	< 0.04	0.41	< 0.04	0.45	< 0.03	0.15	0.43	< 0.03	0.22	0.16	0.36	< 0.06	0.20	0.16	0.29	< 0.07	0.23
Cyclopentane	ppbv	-	< 0.01	0.2	< 0.02	< 0.02	0.21	0.28	< 0.02	< 0.02	< 0.02	< 0.02	< 0.04	< 0.03	< 0.03	< 0.04	0.15	< 0.04	< 0.03	0.1	
Ethylbenzene	ppbv	-	< 0.01	1.24	< 0.02	0.24	< 0.02	< 0.02	< 0.02	0.21	< 0.02	< 0.02	0.59	< 0.05	0.57	< 0.05	0.20	0.45	< 0.06	< 0.05	0.18
Isobutane	ppbv	-	1.75	0.92	1.87	1.16	1.6	3.65	1.5	0.54	< 0.03	0.62	0.58	0.74	0.52	0.73	2.68	1.78	1.78	0.94	0.55
Isopentane	ppbv	-	1.05	1.23	1.14	0.94	0.71	2.08	0.61	0.39	< 0.05	0.49	0.88	1.02	2.65	0.23	1.28	0.92	0.87	0.43	0.29
Isoprene	ppbv	-	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.04	0.12	< 0.03	2.85	0.73	2.66	0.35	0.25	
Isopropylbenzene	ppbv	-	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.20	< 0.07	< 0.07	< 0.06	< 0.07	< 0.07	< 0.08	< 0.07	< 0.07
m,p-Xylene	ppbv	161	< 0.04	5.39	< 0.05	0.81	< 0.06	< 0.06	< 0.05	0.47	< 0.05	0.5	1.76	< 0.07	1.77	< 0.06	0.38	1.28	0.54	< 0.07	0.3
m-Diethylbenzene	ppbv	-	< 0.05	0.15	< 0.07	< 0.07	< 0.08	< 0.08	< 0.06	< 0.07	< 0.07	< 0.06	< 0.04	< 0.03	< 0.03	< 0.04	< 0.04	< 0.04	< 0.03	< 0.03	< 0.03
Methylcyclohexane	ppbv	-	< 0.10	0.48	< 0.14	< 0.14	< 0.16	< 0.16	< 0.13	< 0.12	< 0.13	0.20	< 0.05	0.29	< 0.05	< 0.05	< 0.05	< 0.06	< 0.05	0.11	
Methylcyclopentane	ppbv	-	0.11	0.47	< 0.02	< 0.02	< 0.02	0.17	< 0.02	0.1	< 0.02	0.12	0.16	< 0.04	0.44	< 0.03	1.01	0.19	0.20	0.10	< 0.03
m-Ethyltoluene	ppbv	-	< 0.02	0.79	0.2	0.24	0.17	0.33	< 0.03	0.08	< 0.03	0.2	0.09	0.13	0.58	0.15	0.21	0.17	0.21	0.20	0.11
n-Butane	ppbv	-	2.14	0.94	2.46	1.42	1.55	4.28	2	0.45	< 0.05	0.31	0.49	0.74	0.56	0.45	0.91	0.95	0.73	0.53	0.33
n-Decane	ppbv	-	< 0.07	< 0.10	< 0.10	< 0.10	< 0.12	< 0.12	< 0.10	< 0.09	< 0.10	< 0.10	0.16	< 0.11	< 0.10	< 0.10	< 0.11	< 0.11	< 0.12	< 0.10	0.13
n-Dodecane	ppbv	-	< 0.5	< 0.7	< 0.7	< 0.7	< 0.8	< 0.8	< 0.6	< 0.6	< 0.7	< 0.7	< 0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.6	< 0.5	< 0.5
n-Heptane	ppbv	-	< 0.01	0.61	< 0.02	< 0.02	< 0.02	0.42	< 0.02	0.2	< 0.02	< 0.02	0.20	0.24	0.58	< 0.06	< 0.07	0.22	0.31	< 0.07	< 0.07
n-Hexane	ppbv	1990	0.46	3.06	0.4	0.58	< 0.02	0.75	0.02	0.2	< 0.02	0.48	0.20	< 0.05	0.62	0.26	0.27	0.30	0.34	0.49	0.2
n-Nonane	ppbv	-	< 0.01	0.39	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.11	< 0.02	< 0.02	0.13	< 0.07	0.20	< 0.06	0.19	< 0.07	< 0.08	< 0.07	0.09
n-Octane	ppbv	-	< 0.02	0.43	< 0.04	< 0.03	< 0.04	0.23	0.04	0.09	< 0.03	0.12	0.11	< 0.04	< 0.03	0.36	0.20	0.23	0.14	< 0.03	< 0.03
n-Pentane	ppbv	-	0.8	1.2	0.8	0.8	0.7	1.7	0.2	0.2	< 0.2	0.4	1.00	0.60	1.30	< 0.1	0.40	0.50	0.44	0.27	0.1
n-Propylbenzene	ppbv	-	< 0.06	< 0.08	< 0.09	< 0.09	< 0.10	< 0.10	< 0.08	< 0.08	< 0.08	0.11	< 0.11	0.18	< 0.10	< 0.06	< 0.11	< 0.12	< 0.10	< 0.10	< 0.10
n-Undecane	ppbv	-	< 0.6	< 0.8	< 0.9	< 0.9	< 1.0	< 1.0	< 0.8	< 0.8	< 0.8	< 0.8	< 0.9	< 0.8	< 0.8	< 0.8	< 0.9	< 1.0	< 0.8	< 0.8	< 0.8
o-Ethyltoluene	ppbv	-	< 0.01	0.23	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.04	< 0.02	< 0.02	0.15	< 0.04	0.21	< 0.03	< 0.02	< 0.04	< 0.04	< 0.03	< 0.03
o-Xylene	ppbv	161	< 0.01	1.7	< 0.02	0.23	< 0.02	< 0.02	< 0.02	0.24	< 0.02	0.28	0.66	< 0.05	0.68	< 0.05	< 0.03	0.59	0.30	< 0.05	0.16
p-Ethyltoluene	ppbv	-	< 0.05	0.32	< 0.07	< 0.07	< 0.08	< 0.08	< 0.06	< 0.06	< 0.07	< 0.07	< 0.06	< 0.04	0.59	< 0.03	< 0.02	< 0.04	< 0.04	< 0.03	< 0.03
Styrene	ppbv	-	< 0.08	< 0.12	< 0.12	< 0.12	< 0.14	< 0.14	< 0.11	< 0.11	< 0.11	< 0.11	0.42	< 0.07	< 0.07	< 0.06	< 0.04	< 0.07	< 0.08	< 0.07	< 0.07
Toluene	ppbv	106	< 0.05	0.59	< 0.07	< 0.07	< 0.08	< 0.08	< 0.06	< 0.06	< 0.07	< 0.07	< 0.06	< 0.07	0.52	< 0.06	< 0.04	< 0.07	< 0.08	< 0.07	< 0.07
trans-2-Butene	ppbv	-	0.16	5.78	< 0.02	6.54	< 0.02	0.35	< 0.02	0.16	0.74	0.17	0.36	1.54	0.59	3.26	0.21	0.21	1.02	0.29	0.30
trans-2-Pentene	ppbv	-	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.05	0.14	< 0.05	< 0.03	< 0.05	< 0.06	< 0.05	< 0.05
p-Diethylbenzene	ppbv	-	< 0.02	< 0.03	< 0.04	< 0.03	< 0.04														

Table 2
2020 Calendar Year
VOC and TNMOC Analytical Results
AEP Station ID 00010348-I-1
Clean Harbors Canada, Inc.

	Date	8/20/2021	9/1/2021	9/13/2021	9/25/2021	10/7/2021	10/19/2021	10/31/2021	11/12/2021	11/24/2021	12/6/2021	12/18/2021	12/30/2021	Maximum	Minimum ⁽³⁾	Average ⁽⁴⁾	Median	% of AAAQO	
	Test ID	775	776	777	778	779	780	781	782	783	784	785	786						
Parameter	Units	AAAQO ⁽¹⁾⁽²⁾																	
1,2,3-Trimethylbenzene	ppbv	-	< 0.08	< 0.07	0.27	< 0.08	< 0.08	< 0.08	< 0.08	0.18	< 0.08	< 0.08	< 0.08	0.27	0.06	0.10	0.08		
1,2,4-Trimethylbenzene	ppbv	-	< 0.05	0.27	0.66	< 0.05	< 0.05	< 0.05	< 0.05	0.32	< 0.05	0.23	< 0.05	0.66	0.05	0.14	0.08		
1,3,5-Trimethylbenzene	ppbv	-	< 0.05	0.15	0.42	< 0.05	< 0.05	< 0.05	< 0.05	0.22	< 0.05	< 0.05	< 0.05	0.42	0.02	0.09	0.05		
1-Butene/Isobutylene	ppbv	-	2.05	0.39	0.90	0.15	2.48	1.24	2.68	0.19	2.29	0.35	< 0.09	0.21	2.68	0.03	0.94	0.93	
1-Hexene/2-Methyl-1-pentene	ppbv	-	< 0.12	0.26	< 0.12	< 0.11	< 0.12	< 0.12	< 0.11	< 0.12	< 0.11	< 0.11	< 0.11	0.26	0.02	0.10	0.11		
1-Pentene	ppbv	-	0.44	0.16	0.36	0.10	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.44	0.01	0.12	0.05		
2,2,4-Trimethylpentane	ppbv	-	0.17	0.53	1.20	< 0.03	0.12	< 0.03	0.22	0.15	0.14	0.17	< 0.03	0.19	3.91	0.01	0.27	0.12	
2,2-Dimethylbutane	ppbv	-	0.30	0.07	< 0.03	0.12	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.13	0.30	0.01	0.06	0.03	
2,3,4-Trimethylpentane	ppbv	-	0.14	0.1	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.32	0.01	0.05	0.03		
2,3-Dimethylbutane	ppbv	-	< 0.15	< 0.13	< 0.15	< 0.14	< 0.15	< 0.15	< 0.15	< 0.15	< 0.14	< 0.14	0.14	0.36	0.02	0.14	0.15		
2,3-Dimethylpentane	ppbv	-	< 0.03	0.38	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.13	< 0.03	0.13	0.94	0.02	0.09	0.03		
2,4-Dimethylpentane	ppbv	-	< 0.05	0.12	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.13	< 0.05	< 0.05	0.34	0.01	0.05	0.05		
2-Methylheptane	ppbv	-	< 0.03	0.77	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.77	0.01	0.05	0.03		
2-Methylhexane	ppbv	-	< 0.05	1.03	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.14	0.18	0.14	< 0.05	1.03	0.01	0.12	0.05	
2-Methylpentane	ppbv	-	0.33	0.34	0.23	< 0.03	0.27	< 0.03	0.23	0.14	0.14	0.24	0.18	0.23	0.68	0.01	0.15	0.08	
3-Methylheptane	ppbv	-	< 0.05	0.17	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.33	0.02	0.06	0.05		
3-Methylhexane	ppbv	-	0.17	1.48	0.27	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.2	0.16	0.19	1.48	0.02	0.16	0.04		
3-Methylpentane	ppbv	-	0.26	0.69	0.29	0.23	0.17	0.13	0.24	0.19	0.27	0.18	0.26	1.24	0.01	0.24	0.21		
Benzene	ppbv	0.9	12.90	0.9	< 0.05	0.21	0.27	< 0.05	0.32	0.21	0.24	0.36	0.3	0.32	12.90	0.01	0.63	0.22	69.61%
cis-2-Butene	ppbv	-	< 0.05	< 0.04	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.13	0.02	0.05	0.05		
cis-2-Pentene	ppbv	-	< 0.03	0.11	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.11	0.02	0.03	0.03		
Cyclohexane	ppbv	-	0.26	0.28	0.43	0.45	0.33	0.41	< 0.07	< 0.07	0.35	0.31	0.36	0.81	0.02	0.25	0.26		
Cyclopentane	ppbv	-	150.00	0.13	0.24	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.16	< 0.03	0.15	150.00	0.01	4.91	0.03		
Ethylbenzene	ppbv	-	0.45	0.54	1.19	< 0.05	0.44	< 0.05	0.38	0.32	0.28	0.25	0.2	0.50	0.01	0.28	0.20		
Isobutane	ppbv	-	0.76	0.77	0.40	0.72	1.07	0.31	1.26	0.94	0.92	1.32	1.1	1.22	3.65	0.03	1.12	0.94	
Isopentane	ppbv	-	5.95	0.9	0.84	1.03	0.60	0.24	0.94	0.62	0.57	0.95	0.75	1.07	5.95	0.05	1.02	0.88	
Isoprene	ppbv	-	0.51	0.16	0.14	0.10	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	2.85	0.01	0.27	0.03		
Isopropylbenzene	ppbv	-	< 0.07	< 0.06	< 0.07	< 0.06	< 0.07	< 0.07	< 0.06	< 0.07	< 0.07	< 0.06	< 0.06	0.41	0.01	0.07	0.06		
m,p-Xylene	ppbv	161	0.98	1.99	7.04	1.94	0.77	< 0.07	< 0.06	0.43	0.39	0.49	0.36	0.90	7.04	0.04	0.94	0.43	4.37%
m-Diethylbenzene	ppbv	-	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.15	0.03	0.05	0.03		
Methylcyclohexane	ppbv	-	0.19	0.18	0.38	0.27	< 0.05	< 0.05	< 0.05	< 0.05	0.17	< 0.05	< 0.05	0.48	0.05	0.13	0.12		
Methylcyclopentane	ppbv	-	0.16	0.93	0.31	0.22	0.18	< 0.03	< 0.03	< 0.03	0.18	0.29	0.19	0.24	1.01	0.02	0.20	0.16	
m-Ethyltoluene	ppbv	-	0.30	0.91	0.26	0.19	0.18	0.15	0.22	< 0.08	0.32	0.26	0.18	0.24	0.91	0.02	0.23	0.20	
n-Butane	ppbv	-	0.65	1.22	0.64	0.68	0.93	0.30	2.06	1.11	1.17	4.6	1.61	2.10	4.60	0.05	1.24	0.93	
n-Decane	ppbv	-	0.40	< 0.09	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.19	< 0.10	< 0.09	< 0.09	0.40	0.07	0.12	0.10		
n-Dodecane	ppbv	-	< 0.5	< 0.4	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.80	0.40	0.56	0.50		
n-Heptane	ppbv	-	0.31	3.26	< 0.07	< 0.06	< 0.07	< 0.07	< 0.06	< 0.07	0.28	0.38	0.3	0.34	3.26	0.01	0.27	0.07	
n-Hexane	ppbv	1990	0.86	3.38	< 0.05	0.21	0.37	0.23	0.39	0.42	0.85	0.5	0.31	0.47	3.38	0.02	0.54	0.37	0.17%
n-Nonane	ppbv	-	0.18	0.15	0.30	0.22	< 0.07	< 0.07	< 0.06	< 0.07	0.19	< 0.06	< 0.06	0.39	0.01	0.10	0.07		
n-Octane	ppbv	-	0.23	0.21	0.31	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.19	0.24	0.19	< 0.03	0.43	0.02	0.12	0.04	
n-Pentane	ppbv	-	1.40	0.71	0.88	0.42	0.44	0.24	0.74	0.57	0.50	0.81	0.67	0.89	1.70	0.10	0.64	0.60	
n-Propylbenzene	ppbv	-	< 0.10	0.13	0.25	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.09	< 0.09	0.25	0.06	0.10	0.10	
n-Undecane	ppbv	-	< 0.8	< 0.7	< 0.9	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	1.00	0.50	0.82	0.80		
o-Ethyltoluene	ppbv	-	< 0.03	0.13	0.26	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.26	0.01	0.05	0.03		
o-Xylene	ppbv	161	0.45	0.62	1.75	0.66	0.36	< 0.05	< 0.05	0.27	0.25	0.24	0.18	0.38	1.75	0.01	0.34	0.24	1.09%
p-Ethyltoluene	ppbv	-	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.59	0.02	0.07	0.03	
Styrene	ppbv	-	< 0.07	< 0.06	0.26	0.13	< 0.07	< 0.07	< 0.06	< 0.07	0.10	< 0.06	< 0.06	< 0.06	0.42	0.04	0.10	0.07	
Toluene	ppbv	106	0.97	0.37	< 0.07	< 0.06	< 0.07	< 0.07	< 0.06	< 0.07	0.36	< 0.06	< 0.06	< 0.06	0.97	0.04	0.15	0.07	0.92%
trans-2-Butene	ppbv	-	3.81	1.44	4.37	0.69	0.55	< 0.05	0.84	0.32	0.34	0.7	0.33	0.74	6.54	0.02	1.22	0.57	
trans-2-Pentene	ppbv	-	< 0.05	< 0.04	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.14	0.01	0.04	0.05		
p-Diethylbenzene	ppbv	-	< 0.03	0.11	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.57	0.02	0.05	0.03		
Total Non-Methane Organic Compounds	ppmv	-	< 0.08	< 0.07	< 0.09	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08						
Total VOCs	ppbv	-	188.03	28.09	27.46	11.54	14.04	14.85	14.05	9.37	13.43	16.48	10.72	14.38	188.03	4.05	20.17	13.20	

Notes:

- (1) Alberta Ambient Air Quality Objectives (Over a 24 hour averaging period)
- (2) Alberta Ambient Air Quality Objectives (Over an Annual period)
- (3) Minimum values are the lowest values above the lab detection limit
- (4) Averages are taken with the assumption that values under the lab detection limit are zero

TABLE 3

Metals Analytical Results
 AEP Station ID 00010348-I-1
 Clean Harbors Canada, Inc.
 Annual Ambient Air Monitoring Report
 2021 Metal Analysis Results

Date		15-Jul-21			19-Oct-21			12-Nov-21		
Sample ID		772			780			782		
Parameter	AAAQO ⁽²⁾ (ug/m ³)	Lab Results ⁽¹⁾		(ug/m ³)	Lab Results ⁽¹⁾		(ug/m ³)	Lab Results ⁽¹⁾		(ug/m ³)
Antimony	-	3.3	ng/Filter	1.49E-04	2.74	ng/Filter	0.00	3.54	ng/Filter	1.45E-04
Arsenic	0.01 (Annual Average)	12.8	ng/Filter	5.79E-04	15.8	ng/Filter	0.00	11.2	ng/Filter	4.59E-04
Barium	-	560	ng/Filter	2.53E-02	1700	ng/Filter	0.07	1340	ng/Filter	5.49E-02
Beryllium	-	0.86	ng/Filter	3.89E-05	1.94	ng/Filter	0.00	1.12	ng/Filter	4.59E-05
Boron	-	285	ng/Filter	1.29E-02	232	ng/Filter	0.01	176	ng/Filter	7.21E-03
Cadmium	-	3.4	ng/Filter	1.54E-04	1.16	ng/Filter	0.00	1.78	ng/Filter	7.30E-05
Chromium	1.00 (1-Hour Average)	357	ng/Filter	1.62E-02	2	ng/Filter	0.00	37	ng/Filter	1.52E-03
Cobalt	-	11.7	ng/Filter	5.29E-04	13.4	ng/Filter	0.00	11.3	ng/Filter	4.63E-04
Copper	-	2.00	ng/Filter	9.05E-05	46	ng/Filter	0.00	37	ng/Filter	1.52E-03
Ammonium	-	10.6	ug/Filter	4.80E-04	6	ug/Filter	0.00	15.4	ug/Filter	6.31E-04
Chloride	-	0.224	ug/Filter	1.01E-05	0.461	ug/Filter	0.00	0.63	ug/Filter	2.58E-05
Nitrate	-	8.96	ug/Filter	4.05E-04	5.35	ug/Filter	0.00	23.8	ug/Filter	9.75E-04
Sulfate	-	21.9	ug/Filter	9.91E-04	23.2	ug/Filter	0.00	29.6	ug/Filter	1.21E-03
Iron	-	38500	ng/Filter	1.74E+00	40500	ng/Filter	1.67	27200	ng/Filter	1.11E+00
Lead	-	41.5	ng/Filter	1.88E-03	32.6	ng/Filter	0.00	29.3	ng/Filter	1.20E-03
Magnesium	-	9.89	ug/Filter	4.48E-04	-	-	-	2.58	ug/Filter	1.06E-04
Mercury	-	0.07	ng/Filter	3.17E-06	0.09	ug/Filter	0.00	0.09	ug/Filter	3.69E-06
Nickel	-	37.7	ng/Filter	1.71E-03	44.3	ng/Filter	0.00	44.9	ng/Filter	1.84E-03
Selenium	-	26.8	ng/Filter	1.21E-03	7.4	ng/Filter	0.00	1.8	ng/Filter	7.38E-05
Silver	-	0.64	ng/Filter	2.90E-05	0.56	ng/Filter	0.00	0.57	ng/Filter	2.34E-05
Thallium	-	0.32	ng/Filter	1.45E-05	0.59	ng/Filter	0.00	0.51	ng/Filter	2.09E-05
Tin	-	3.42	ng/Filter	1.55E-04	-	-	-	-	-	-
Uranium	-	1.79	ng/Filter	8.10E-05	3.5	ng/Filter	0.00	2.69	ng/Filter	1.10E-04
Vanadium	-	93.1	ng/Filter	4.21E-03	104	ng/Filter	0.00	78.1	ng/Filter	3.20E-03
Calcium	-	26.3	ug/Filter	1.19E-03	7.94	ug/Filter	0.00	8.16	ug/Filter	3.34E-04
Magnesium	-	4.31	ug/Filter	1.95E-04	2.9	ug/Filter	0.00	2.58	ug/Filter	1.06E-04
Potassium	-	5.58	ug/Filter	2.52E-04	4.24	ug/Filter	0.00	3.47	ug/Filter	1.42E-04
Sodium	-	2.02	ug/Filter	9.14E-05	3.32	ug/Filter	0.00	2.73	ug/Filter	1.12E-04
Zinc	-	480	ng/Filter	2.17E-02	322	ng/Filter	0.01	322	ng/Filter	1.32E-02
Zirconium	-	53	ng/Filter	2.40E-03	116	ng/Filter	0.00	95.3	ng/Filter	3.91E-03
Sampling Time (hours)		24			24			24		
Flow Rate (l/min)		16.7			16.7			16.7		
Volume Sampled (m³)		23			24.2			24.4		

Notes:

(1) These results are from a 24 hour averaging period

(2) Alberta Ambient Air Quality Objectives

**2020 Calendar Year
 Meteorological Station Uptime Summary
 AEP Station ID 00010348-C-1
 Clean Harbors Canada, Inc.**

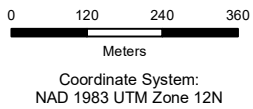
Reporting Month	Hours Expected	Hours Reported	% Uptime
January	744	744	100.0%
February	672	672	100.0%
March	744	744	100.0%
April	720	720	100.0%
May	744	744	100.0%
June	720	720	100.0%
July	744	740	99.5%
August	744	662	89.0%
September	720	681	94.6%
October	744	743	99.9%
November	720	720	100.0%
December	744	325	43.7%
Total	8760	8215	93.78%

Note:

The meteorological station monitors wind speed and direction.



Image Source: © (2020) Google. Image Acquisition Date: 09/17/2019.



CLEAN HARBORS CANADA, INC.
 RANGE ROAD 854, RYLEY, ALBERTA

11114644
 Mar 27, 2020

SITE LOCATION AND AIR MONITORING LOCATION MAP FIGURE 1

Appendix A

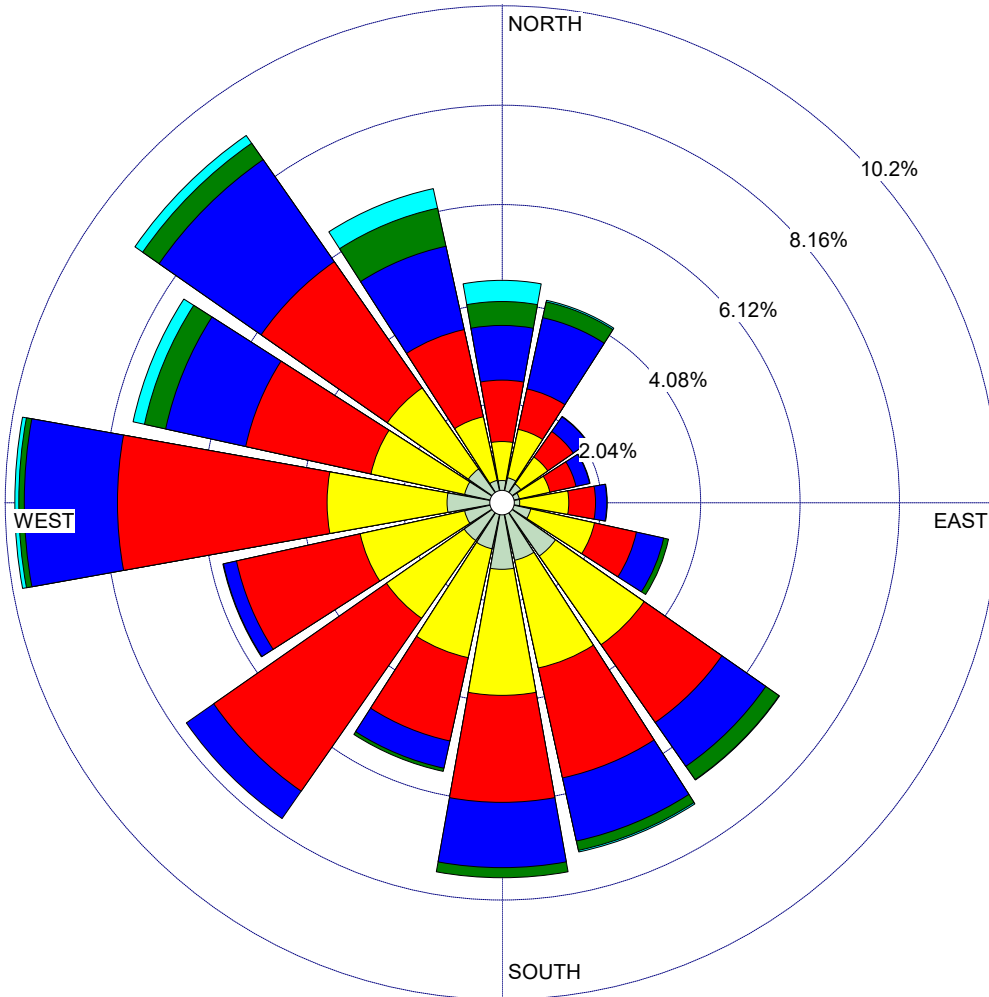
Annual Wind Rose

WIND ROSE PLOT:

**Wind Rose - 2021, Annual
Clean Harbors, Ryley, Alberta**

DISPLAY:

**Wind Speed
Direction (blowing from)**



WIND SPEED
(m/s)

- >= 11.10
 - 8.80 - 11.10
 - 5.70 - 8.80
 - 3.60 - 5.70
 - 2.10 - 3.60
 - 0.50 - 2.10
- Calms: 0.55%

COMMENTS:

Source: Clean Harbors (Ryley)
on-site meteorological station.

DATA PERIOD:

**Start Date: 1/1/2021 - 00:00
End Date: 12/30/2021 - 23:00**

COMPANY NAME:

Clean Harbors

MODELER:

GHD

CALM WINDS:

0.55%

TOTAL COUNT:

8217 hrs.

AVG. WIND SPEED:

4.35 m/s

DATE:

1/31/2022

PROJECT NO.:

11114644.007-03



Frequency Distribution Report: Ryley, Alberta - 2021 Summary

Direction	Angle	Wind Speed (m/s) and Number of Occurrences						%	Total Occurrences by Direction
		< 0.5	0.5 to < 1.5	1.5 to < 2.5	2.5 to < 3.5	3.5 to < 4.5	>= 4.5		
North	> 337.5 - 22.5	8	35	96	122	112	488	9.8%	861
Northeast	> 22.5 - 67.5	2	39	75	73	62	165	4.7%	416
East	> 67.5 - 112.5	2	33	67	121	75	84	4.4%	382
Southeast	> 112.5 - 157.5	6	73	222	240	183	399	12.8%	1123
South	> 157.5 - 202.5	6	103	245	272	223	419	14.5%	1268
Southwest	> 202.5 - 247.5	4	66	160	257	303	383	13.4%	1173
West	> 247.5 - 292.5	10	84	182	289	344	618	17.4%	1527
Northwest	> 292.5 - 337.5	10	52	130	232	265	778	16.7%	1467
Missing/Invalid Hours								6.20%	543
Total Occurences by Speed		48	485	1177	1606	1567	3334		8760
Occurences by %		0.5%	5.5%	13.4%	18.3%	17.9%	38.1%	100.00%	

Appendix B

Quarterly Calibration Records for Partisol



Quarterly Audit Partisol FRM Model 2000

Clean Harbors
50114 Range Rd. 173
Ryley, Alberta T0B 4A0
Quarterly Audit Date: January 20, 2021

Clean Harbors

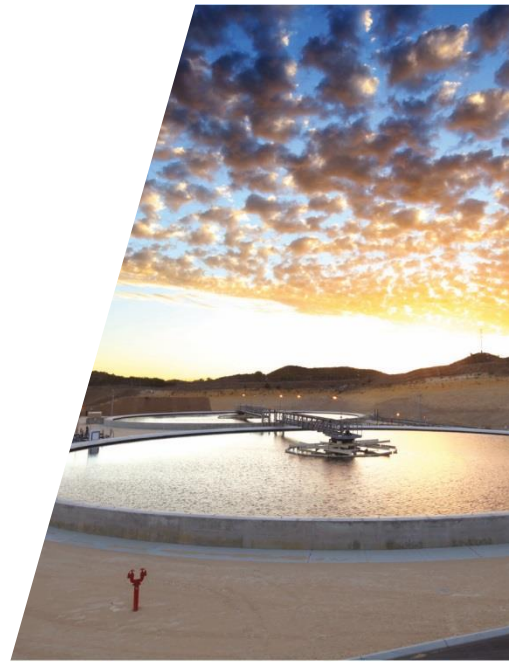




Table of Contents

1.	Introduction.....	1
2.	Audit Procedure.....	1
3.	Audit Results	1
3.1	Siting Location Audit Results (AEP Station ID 00010348-I-1).....	1
3.2	Pressure and Temperature Audit Results (AEP Station ID 00010348-I-1)	2
3.3	Leak Check Results (AEP Station ID 00010348-I-1).....	2
3.3.1	Automatic Leak Check.....	2
3.3.2	External Manual Leak Check.....	2
3.4	Flow Audit (AEP Station ID 00010348-I-1)	3
3.5	Instrument Condition and Recommendations (AEP Station ID 00010348-I-1)	3
3.5.1	Recommendations.....	3

Table Index

Table 3.1	AMD Requirements vs. Current Partisol Sampler Location	2
Table 3.2	Reference Results vs. Partisol Sampler Readings.....	2

Appendix Index

Appendix A	Quarterly Audit Form
Appendix B	Calibration Certificates



1. Introduction

GHD Limited (GHD) was retained by Clean Harbors to conduct a Quarterly Audit at 50114 Range Road 173 Ryley, Alberta (Facility) on January 20, 2021. The Quarterly Audit was conducted on the Partisol FRM 2000 Particulate Matter less than 10 microns (PM₁₀) Sampler (Partisol Sampler), located on the roof of the Ryley Lift Station (AEP Station ID 00010348-I-1), which is southeast of the Facility. The coordinates of the lift station are 53.297961, -112.416076.

2. Audit Procedure

The Partisol Sampler was audited in accordance with the instrument manual and the Alberta Air Monitoring Directive, 2016 (AMD). Siting location, ambient pressure, ambient temperature, filter temperature, leakage rate and flow rate were audited, as well as overall instrument condition to ensure compliance with the instrument manual and the AMD. Below is a summary of the tasks performed on the Partisol Sampler:

- Siting Location Audit
- Ambient Pressure Audit
- Ambient Temperature Audit
- Filter Temperature Audit
- Leakage Rate Audit
- Flow Rate Audit
- Instrument Condition and Recommendations

GHD verified all of these parameters using calibrated reference instruments. GHD reference instruments either have National Institute of Standards and Technology (NIST) Traceable Certifications, current manufacturer certification, or were verified by a primary standard. The GHD quarterly audit field form can be found in Appendix A. All calibrations and certifications can be found in Appendix B.

3. Audit Results

3.1 Siting Location Audit Results (AEP Station ID 00010348-I-1)

The siting location of the Partisol Sampler meets the requirements of Chapter 3, of the AMD. Table 3.1 of this report compares the AMD Siting Requirements for Intermittent Samplers versus the current Partisol sampler location.

- The current coordinates of the Partisol Sampler are 53.297961, -112.416076.
- The distance from the nearest roadway is 21 m.



Table 3.1 AMD Requirements vs. Current Partisol Sampler Location

Site Characteristics	AMD Requirements	Current Location	Specification
Sampler Inlet-height above ground (abg)	Minimum 2 m, Maximum 15 m	Meets Requirement	4.63 m abg
Other Requirements	a. Distance from an obstacle greater than 2.5 times the height of the obstacle above the sampler.	Meets Requirement	>2.5 times
	b. At least 2 m from any other samplers or inlets with flow rates greater than 200 litres (L) per minute,	Meets Requirement	None
	Or at least 1 m apart from any other samplers or inlets with flow rates less than or equal of 200 L per minute.	Meets Requirement	None
	c. Unrestricted air flow in three to four wind quadrants.	Meets Requirement	4/4 Unrestricted Quadrants

3.2 Pressure and Temperature Audit Results (AEP Station ID 00010348-I-1)

The pressure and temperature audit results of the Partisol Sampler meet the requirements of Chapter 4, of the AMD. Table 3.2 of this report compares the reference results versus the Partisol Sampler readings.

Table 3.2 Reference Results vs. Partisol Sampler Readings

Parameter	Partisol	Reference	Difference	Limit	Pass/Fail
Ambient Temperature (°C)	1.5	0.92	0.58	±2°C	Pass
Barometric Pressure (mmHg)	692.7	693.0	0.3	±10 mmHg	Pass
Filter Temperature (°C)	2.5	3.2	0.7	±2°C	Pass
Flow	16.7 L/min	16.8 L/min	0.1	±1.0 L/min	Pass

3.3 Leak Check Results (AEP Station ID 00010348-I-1)

3.3.1 Automatic Leak Check

The Partisol firmware performs leak checks in automatic mode and indicates either a "pass" or "fail" based on a pressure drop threshold of 127 mmHg per minute. The Partisol Sampler passed the requirements outlined in the service manual with a pressure drop of 9 mmHg per minute during the audit.

3.3.2 External Manual Leak Check

GHD also performs an external manual leak check on the Partisol Sampler as part of the quarterly audit. The external manual leak check measures the pressure drop on a vacuum gauge located on



the sampler. The pressure drop may not exceed more than 8.5 inHg (216 mmHg) over a 30-second span. The Partisol Sampler passed the requirements of the service manual with a pressure drop of 0.0 inHg in a 30-second span.

3.4 Flow Audit (AEP Station ID 00010348-I-1)

The flow audit results of the Partisol Sampler meet the requirements of Chapter 4 of the AMD, refer to Table 3.2.

3.5 Instrument Condition and Recommendations (AEP Station ID 00010348-I-1)

The Partisol Sampler was visually and functionally inspected on the audit day. Audit recommendations and instrument conditions are listed below:

- Liquid crystal display screen is functioning.
- Filter exchange cabinet has been cleaned.
- Ventilation fan filters are clean.
- Filter exchange mechanism is operating normally.
- Filter v-seals are in good condition.
- Ambient temperature and pressure sensor wires in good condition.
- Main power connection wire in good condition.

3.5.1 Recommendations

GHD recommends opening and cleaning PM₁₀ sampling inlet prior to next sampling event.

Appendices

Appendix A

Quarterly Audit Form



GHD Quarterly Audit Form

Date	1/20/2021	Weather Cond.:	Overcast/2°C
Owner	Clean Harbors	Start Time:	10:25
Station Name	Ryley Lift Station	End Time:	11:15
Parameter	PM ₁₀	Performed By:	Trevor Lewis

Partisol FRM Model 2000 Identification		Sampler Data	
Make/Model:	R & P Partisol FRM 2000	Temperature:	1.5°C
Unit ID:	Ryley Lift Station	Pressure:	693 mmHg
S/N:	200FB209860905	Flow Set Point:	16.7 L/min

GHD Reference Standards				
	Flow	Pressure	Temperature	Manometer
Make:	AirMetrics	TSI	Fluke	Dwyer
Model:	FRM	9565-P	1551A Ex	475-0-FM
Serial Number:	FRM1218	9565P1818024	3520009	MAN-CAL-001
Calibration Date:	5/17/2016	5/19/2020	12/14/2020	12/14/2020

Audit Data					
	Sampler Data	Reference Data	Difference	Pass/Fail	Units
Ambient Temperature (+/- 2 °C)	1.5	0.5	1.0	Pass	°C
Barometric Pressure (+/- 10 mmHg)	693	692.7	0.3	Pass	mmHg
Filter Temperature (+/- 2 °C)	2.5	3.2	0.7	Pass	°C
Flow (+/- 1.0 Litres/min)	16.7	16.8	0.1	Pass	Litres/min

Leak Check					
Manual Check (-8.5 inHg)					
	Initial Pressure	Final Pressure	Pressure Drop	Pass/Fail	Units
	14.00	14.00	0.00	Pass	inHG
Automatic Check (-127 mmHg)					
Leak check was performed in automatic mode, sampler indicated:			4 mmHg/min	Pass	mmHg/min

As Found/As Left		Yes/No	As Found	As Left	Pass/Fail
Did the ambient temperature require adjustment?		No	1.5	1.5	Pass
Did the barometric pressure require adjustment?		No	693	693	Pass
Did the filter temperature require adjustment?		No	2.5	2.5	Pass
Did the flow audit require adjustment?		No	16.7	16.7	Pass

Comments
Partisol sampler was moderately dirty, GHD cleaned the components of the sampling inlet, inside the cabinet, all filters and wiped down all seals.

Flow Equation						
Set Point	Actual Flow (<i>Q_{act}</i>)	Absolute Difference	Pass/Fail	Manometer (<i>DH</i>)	4.51 "H ₂ O	
(lpm)	(lpm)	(lpm)	(± 1 lpm)	Actual Temp (<i>T_{act}</i>)	274.65 °K	1.5°C
16.7	16.8	0.1	Pass	Actual Pres (<i>P_{act}</i>)	0.924 bar	
				Actual Pres (<i>P_{act}</i>)	27.28 inHg	

FTS Linear Regression Constants

(*m_{flo}*) = 0.4452

(*b_{flo}*) = 0.4430

$$Q_{act} = m_{flo} \times \frac{\sqrt{\Delta H} \times T_{act}}{P_{act}} + b_{flo}$$

Appendix B

Calibration Certificates



ITM INSTRUMENTS INC.

TORONTO
16975 Leslie Street
Newmarket, ON L3Y 9A1
Tel: (905) 952-3750
Fax: (905) 952-3751

MONTREAL
20800 Boul. Industriel
Ste-Anne-de-Bellevue, QC H9X 0A1
Tel: (514) 457-7280
Fax: (514) 457-4329

CALGARY
#209, 4615 112 Ave SE
Calgary, AB T2C 5J3
Tel: (403) 272-9332
Fax: (403) 248-5194

VANCOUVER
1282 Cliveden Av
Delta, BC V3M 6G4
Tel: (604) 254-9622
Fax: (604) 254-3123

www.itm.com - information@itm.com

Calibration Certificate

Customer: *GHD Ltd.*

Certificate: C378442-00-02

Unit Identification

Manufacturer: **Fluke**
Model: **1551A Ex**
Description: **Stik Thermometer**

Serial: **3520009**
Unit ID: **THM-CAL-001**

Calibration Date

Calibration Date: **14-Dec-2020**
Due Date: **14-Dec-2021**

Calibration Conditions

Temperature: **20.9°C**
Humidity: **15 %**
Barometric Pressure: **N/A**

General Information

Remark: **N/A**

Standards Used

<u>Unit ID</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Cal Date</u>	<u>Due Date</u>
CAL0080	Burns Engineering	12001-A-12-6-2-A	4-Jun-2018	4-Jun-2021
CAL0124	Hart Scientific	1502A	1-Apr-2020	1-Apr-2021
CAL0223	Ametek	RTC-158B	27-Oct-2020	27-Oct-2021

The calibration was performed using measurement standards traceable to the National Measurement Institute Standards (NMIS) part of the National Research Council of Canada (NRC) or the National Institute of Standards and Technology (NIST), or to accepted intrinsic standards or measurement, or is derived by ratio type self-calibration techniques. Measurement uncertainties given in this report are based on a coverage factor of $k=2$ corresponding to a confidence level of approximately 95%.

Calibrated by: *A. Atton*

Approved by:

Certificate: C378442-00-02
Asset: ITM0003733

Calibration Certificate

Page 1 2



ITM INSTRUMENTS INC.

TORONTO

16975 Leslie Street
Newmarket, ON L3Y 9A1
Tel: (905) 952-3750
Fax: (905) 952-3751

MONTREAL

20800 Boul. Industriel
Ste-Anne-de-Bellevue, QC H9X 0A1
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Calgary, AB T2C 5J3
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Delta, BC V3M 6G4
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Fax: (604) 254-3123

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Test Results

Procedure: Fluke Stik Thermometer /RTC-158B,1502,PRT Rev: 1.0

Data Type: As Found Results: Pass

<u>Test Description</u>	<u>True Value</u>	<u>Reading</u>	<u>Lower Limit</u>	<u>Upper Limit</u>	<u>Test Status</u>	<u>Exp Uncert</u>
0.060 °C		0.02 °C	0.01 °C	0.11 °C	Pass	8.3e-003 °C
25.075 °C		25.04 °C	25.02 °C	25.13 °C	Pass	8.8e-003 °C
100.025 °C		100.01 °C	99.98 °C	100.08 °C	Pass	1.0e-002 °C
150.085 °C		150.04 °C	150.03 °C	150.14 °C	Pass	1.2e-002 °C

Certificate: C378442-00-02
Asset: ITM0003733

Calibration Certificate

Page 22

NIST Traceable Transfer Standard Calibration

Calibration Date: 05/17/2016
 Ambient Temp, °K: 295.5
 Amb Press, Atm: 1.0000

Orifice # FRM1218-
 Pri Std # LFE774300
 Manometer # FRM1218

By:
 Chk:

Std ΔH (inH ₂ O)	Manometer ΔH (inH ₂ O)	Actual Flow (alpm)	Calc Flow (alpm)	Difference* (%diff)
6.67	6.67	20.179	20.209	-0.15
5.86	5.86	18.988	18.970	0.09
5.10	5.10	17.733	17.727	0.03
4.39	4.39	16.490	16.479	0.07
3.73	3.73	15.233	15.224	0.06
3.12	3.12	13.964	13.962	0.02
2.56	2.56	12.683	12.688	-0.04
2.05	2.05	11.390	11.401	-0.10

**Manometer ΔH vs Act Flow
 Linear Regression Results:**
 m_{flo} = 0.4452
 b_{flo} = 0.4430
 r² = 1.0000

* all points must be within ± 2%

The MiniFlo calibration is performed with an NIST-traceable standard. Each unit has a unique pair of calibration constants derived from the calibration which are used to calculate the actual air flow rate at all ambient conditions. The unit's calibration should be recertified annually.

The actual flow rate is a function of the pressure drop across the device, the ambient temperature, and the ambient pressure. The relationship of these variables and the unique calibration constants ("m" and "b") for each device is presented in the following equation (Eq.A):

$$Q_{act} = m_{flo} \times \sqrt{\frac{\Delta H \times T_{act}}{P_{act}}} + b_{flo}$$

Q_{act} = actual flowrate, liters per min
 ΔH = manometer reading, inches of water
 T_{act} = ambient temperature, °K
 P_{act} = ambient pressure, atmospheres

CAUTION: The weather service, most airports, etc, reduce the atmospheric pressure to a common reference (sea level). The equation above requires the atmospheric pressure at the location where the MiniFlo is being used.

The equation below may be used to estimate the ambient atmospheric pressure at any elevation if the sea level pressure is known.

$$P_{act} = P_{sea} \times \left(1 - \frac{E}{145300} \right)^{5.25}$$

P_{act} = Ambient Atmospheric Pressure
 P_{sea} = Sea Level Atmospheric Pressure
 E = Site elevation, feet

Airmetrics

1940 Don St., Suite 300
 Springfield, OR 97477
 (541) 683-5420



ITM INSTRUMENTS INC.

TORONTO

16975 Leslie Street
Newmarket, ON L3Y 9A1
Tel: (905) 952-3750
Fax: (905) 952-3751

MONTREAL

20800 Boul. Industriel
Ste-Anne-de-Bellevue, QC H9X 0A1
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1282 Cliveden Av
Delta, BC V3M 6G4
Tel: (604) 254-9622
Fax: (604) 254-3123

www.itm.com - information@itm.com

Calibration Certificate

Customer: *GHD Ltd.*

Certificate: C378442-00-01

Unit Identification

Manufacturer: Dwyer

Serial: N/A

Model: 475-0-FM

Unit ID: MAN-CAL-001

Description: Digital Manometer

Calibration Date

Calibration Date: 14-Dec-2020

Due Date: 14-Dec-2021

Calibration Conditions

Temperature: 20.9°C

Humidity: 15 %

Barometric Pressure: N/A

General Information

Remark: N/A

Standards Used

<u>Unit ID</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Cal Date</u>	<u>Due Date</u>
CAL0224	Fluke	750P01	24-Aug-2020	24-Feb-2021

The calibration was performed using measurement standards traceable to the National Measurement Institute Standards (NMIS) part of the National Research Council of Canada (NRC) or the National Institute of Standards and Technology (NIST), or to accepted intrinsic standards or measurement, or is derived by ratio type self-calibration techniques. Measurement uncertainties given in this report are based on a coverage factor of k=2 corresponding to a confidence level of approximately 95%.

Calibrated by: *A. Atton*

Approved by:

Certificate: C378442-00-01
Asset: ITM0017905

Calibration Certificate

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16975 Leslie Street
Newmarket, ON L3Y 9A1
Tel: (905) 952-3750
Fax: (905) 952-3751

MONTREAL

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Ste-Anne-de-Bellevue, QC H9X 0A1
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Tel: (604) 254-9622
Fax: (604) 254-3123

ITM INSTRUMENTS INC.**www.itm.com - information@itm.com****Test Results**

Procedure: Pressure Gauge 10.00 IN.W.C 0.5% FS /750P01 Rev: 1.1

Data Type: As Found Results: Pass

<u>Test Description</u>	<u>True Value</u>	<u>Reading</u>	<u>Lower Limit</u>	<u>Upper Limit</u>	<u>Test Status</u>	<u>Exp Uncert</u>
Tolerance used (additive if more than one listed):						
0.5% of full scale						
UUT is set to the nominal value, Reading is the actual pressure read by the system instrument.						
1.000 inH2O		1.008 inH2O	0.950 inH2O	1.050 inH2O	Pass	1.6e-002 inH2O
2.000 inH2O		2.003 inH2O	1.950 inH2O	2.050 inH2O	Pass	1.6e-002 inH2O
4.000 inH2O		3.984 inH2O	3.950 inH2O	4.050 inH2O	Pass	1.6e-002 inH2O
6.000 inH2O		5.981 inH2O	5.950 inH2O	6.050 inH2O	Pass	1.6e-002 inH2O
8.000 inH2O		7.985 inH2O	7.950 inH2O	8.050 inH2O	Pass	1.6e-002 inH2O
10.000 inH2O		9.965 inH2O	9.950 inH2O	10.050 inH2O	Pass	1.6e-002 inH2O

Certificate: C378442-00-01
Asset: ITM0017905

Calibration Certificate

Page 2/2

INSTRUMENT CALIBRATION REPORT



Advanced Labs, Inc.

Pine Environmental Services, Inc

Instrument ID 42307
 Description TSI 9565P VelociCalc
 Calibrated 5/19/2020

Manufacturer TSI Model Number 9565P Serial Number 9565P1818024 Location New Jersey Temp 72	Classification Status pass Frequency Yearly Department Lab Humidity 22
--	--

Calibration Specifications

<u>Nom In Val / In Val</u>	<u>In Type</u>	<u>Out Val</u>	<u>Out Type</u>	<u>Fnd As</u>	<u>Lft As</u>	<u>Dev%</u>	<u>Pass/Fail</u>
Group # 1 Group Name Barometric Pressure Stated Accy Pct of Reading				Range Acc % 0.0000 Reading Acc % 2.0000 Plus/Minus 0.000			
30.000 / 30.120	inHg	30.120	inHg	30.110	30.120	0.00%	Pass
Group # 2 Group Name Differential Pressure Stated Accy Pct of Reading				Range Acc % 0.0000 Reading Acc % 1.0000 Plus/Minus 0.00			
-4.00 / -4.00	inH2O	-4.00	inH2O	-4.03	-4.03	0.75%	Pass
4.00 / 4.00	inH2O	4.00	inH2O	4.04	4.04	1.00%	Pass
8.00 / 8.00	inH2O	8.00	inH2O	8.08	8.08	1.00%	Pass
12.00 / 12.00	inH2O	12.00	inH2O	12.10	12.10	0.83%	Pass

Test Instruments Used During the Calibration

<u>Test Instrument ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Serial Number</u>	<u>(As Of Cal Entry Date)</u>	
				<u>Last Cal Date</u>	<u>Next Cal Date</u>
DWYER 477AV-1	Dwyer 477AV-1 Digital Manometer	Dwyer	005PM2	10/2/2019	10/2/2020
OMEGA HX93AC/DP25- E	Omega HX93AC/DP25-E	Omega Engineering	1010368 035025 035026	10/11/2018	10/11/2020

Notes about this calibration

Calibration Result Calibration Successful
 Who Calibrated David Galego

Advanced Labs, Inc. hereby certifies that this instrument is calibrated and functions to meet the manufacture's specifications using NIST traceable standards, or is derived from accepted values of physical constants.



about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

Brandon Lawrence
Brandon.lawrence@ghd.com
403.538.8605

www.ghd.com



Quarterly Audit Partisol FRM Model 2000

Clean Harbors
50114 Range Rd. 173
Ryley, Alberta T0B 4A0
Quarterly Audit Date: April 13, 2021

Clean Harbors

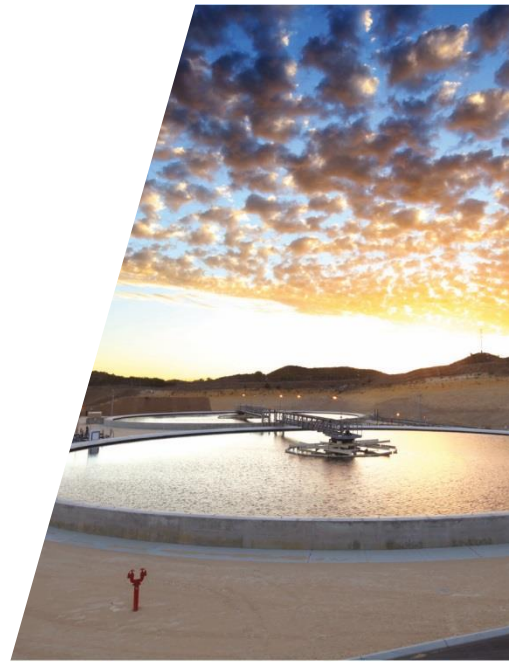




Table of Contents

1.	Introduction.....	1
2.	Audit Procedure.....	1
3.	Audit Results	1
3.1	Siting Location Audit Results (AEP Station ID 00010348-I-1).....	1
3.2	Pressure and Temperature Audit Results (AEP Station ID 00010348-I-1)	2
3.3	Leak Check Results (AEP Station ID 00010348-I-1).....	2
3.3.1	Automatic Leak Check.....	2
3.3.2	External Manual Leak Check.....	2
3.4	Flow Audit (AEP Station ID 00010348-I-1)	3
3.5	Instrument Condition and Recommendations (AEP Station ID 00010348-I-1)	3
3.5.1	Recommendations.....	3

Table Index

Table 3.1	AMD Requirements vs. Current Partisol Sampler Location	2
Table 3.2	Reference Results vs. Partisol Sampler Readings.....	2

Appendix Index

Appendix A	Quarterly Audit Form
Appendix B	Calibration Certificates



1. Introduction

GHD Limited (GHD) was retained by Clean Harbors to conduct a Quarterly Audit at 50114 Range Road 173 Ryley, Alberta (Facility) on April 13, 2021. The Quarterly Audit was conducted on the Partisol FRM 2000 Particulate Matter less than 10 microns (PM₁₀) Sampler (Partisol Sampler), located on the roof of the Ryley Lift Station (AEP Station ID 00010348-I-1), which is southeast of the Facility. The coordinates of the lift station are 53.297961, -112.416076.

2. Audit Procedure

The Partisol Sampler was audited in accordance with the instrument manual and the Alberta Air Monitoring Directive, 2016 (AMD). Siting location, ambient pressure, ambient temperature, filter temperature, leakage rate and flow rate were audited, as well as overall instrument condition to ensure compliance with the instrument manual and the AMD. Below is a summary of the tasks performed on the Partisol Sampler:

- Siting Location Audit
- Ambient Pressure Audit
- Ambient Temperature Audit
- Filter Temperature Audit
- Leakage Rate Audit
- Flow Rate Audit
- Instrument Condition and Recommendations

GHD verified all of these parameters using calibrated reference instruments. GHD reference instruments either have National Institute of Standards and Technology (NIST) Traceable Certifications, current manufacturer certification, or were verified by a primary standard. The GHD quarterly audit field form can be found in Appendix A. All calibrations and certifications can be found in Appendix B.

3. Audit Results

3.1 Siting Location Audit Results (AEP Station ID 00010348-I-1)

The siting location of the Partisol Sampler meets the requirements of Chapter 3, of the AMD. Table 3.1 of this report compares the AMD Siting Requirements for Intermittent Samplers versus the current Partisol sampler location.

- The current coordinates of the Partisol Sampler are 53.297961, -112.416076.
- The distance from the nearest roadway is 21 m.



Table 3.1 AMD Requirements vs. Current Partisol Sampler Location

Site Characteristics	AMD Requirements	Current Location	Specification
Sampler Inlet-height above ground (abg)	Minimum 2 m, Maximum 15 m	Meets Requirement	4.63 m abg
Other Requirements	a. Distance from an obstacle greater than 2.5 times the height of the obstacle above the sampler.	Meets Requirement	>2.5 times
	b. At least 2 m from any other samplers or inlets with flow rates greater than 200 litres (L) per minute,	Meets Requirement	None
	Or at least 1 m apart from any other samplers or inlets with flow rates less than or equal of 200 L per minute.	Meets Requirement	None
	c. Unrestricted air flow in three to four wind quadrants.	Meets Requirement	4/4 Unrestricted Quadrants

3.2 Pressure and Temperature Audit Results (AEP Station ID 00010348-I-1)

The pressure and temperature audit results of the Partisol Sampler meet the requirements of Chapter 4, of the AMD. Table 3.2 of this report compares the reference results versus the Partisol Sampler readings.

Table 3.2 Reference Results vs. Partisol Sampler Readings

Parameter	Partisol	Reference	Difference	Limit	Pass/Fail
Ambient Temperature (°C)	9.1	8.4	0.70	±2°C	Pass
Barometric Pressure (mmHg)	714	710	4.0	±10 mmHg	Pass
Filter Temperature (°C)	12.7	12.6	0.1	±2°C	Pass
Flow	16.7 L/min	16.6 L/min	0.1	±1.0 L/min	Pass

3.3 Leak Check Results (AEP Station ID 00010348-I-1)

3.3.1 Automatic Leak Check

The Partisol firmware performs leak checks in automatic mode and indicates either a "pass" or "fail" based on a pressure drop threshold of 127 mmHg per minute. The Partisol Sampler passed the requirements outlined in the service manual with a pressure drop of 4 mmHg per minute during the audit.

3.3.2 External Manual Leak Check

GHD also performs an external manual leak check on the Partisol Sampler as part of the quarterly audit. The external manual leak check measures the pressure drop on a vacuum gauge located on



the sampler. The pressure drop may not exceed more than 8.5 inHg (216 mmHg) over a 30-second span. The Partisol Sampler passed the requirements of the service manual with a pressure drop of 0.0 inHg in a 30-second span.

3.4 Flow Audit (AEP Station ID 00010348-I-1)

The flow audit results of the Partisol Sampler meet the requirements of Chapter 4 of the AMD, refer to Table 3.2.

3.5 Instrument Condition and Recommendations (AEP Station ID 00010348-I-1)

The Partisol Sampler was visually and functionally inspected on the audit day. Audit recommendations and instrument conditions are listed below:

- Liquid crystal display screen is functioning.
- Filter exchange cabinet has been cleaned.
- Ventilation fan filters are clean.
- Filter exchange mechanism is operating normally.
- Filter v-seals are in good condition.
- Ambient temperature and pressure sensor wires in good condition.
- Main power connection wire in good condition.

3.5.1 Recommendations

GHD recommends opening and cleaning PM₁₀ sampling inlet prior to next sampling event.

Appendices

Appendix A

Quarterly Audit Form



GHD Quarterly Audit Form

Date	4/13/2021	Weather Cond.:	Overcast/9.1°C
Owner	Clean Harbors	Start Time:	12:00
Station Name	Ryley Lift Station	End Time:	12:45
Parameter	PM ₁₀	Performed By:	Trevor Lewis

Partisol FRM Model 2000 Identification		Sampler Data	
Make/Model:	R & P Partisol FRM 2000	Temperature:	8.4°C
Unit ID:	Ryley Lift Station	Pressure:	710 mmHg
S/N:	200FB209860905	Flow Set Point:	16.7 L/min

<u>GHD Reference Standards</u>				
	Flow	Pressure	Temperature	Manometer
Make:	AirMetrics	TSI	Fluke	Dwyer
Model:	FRM	9565-P	1551A Ex	475-0-FM
Serial Number:	FRM1218	9565P1710006	3520009	MAN-CAL-001
Calibration Date:	5/17/2016	10/31/2020	12/14/2020	12/14/2020

<u>Audit Data</u>					
	Sampler Data	Reference Data	Difference	Pass/Fail	Units
Ambient Temperature (+/- 2 °C)	9.1	8.4	0.7	Pass	°C
Barometric Pressure (+/- 10 mmHg)	714	710	4.0	Pass	mmHg
Filter Temperature (+/- 2 °C)	12.7	12.6	0.1	Pass	°C
Flow (+/- 1.0 Litres/min)	16.7	16.6	0.1	Pass	Litres/min

<u>Leak Check</u>					
Manual Check (-8.5 inHg)					
	Initial Pressure	Final Pressure	Pressure Drop	Pass/Fail	Units
	-15.00	-15.00	0.00	Pass	inHG
Automatic Check (-127 mmHg)					
Leak check was performed in automatic mode, sampler indicated:			4 mmHg/min	Pass	mmHg/min

<u>As Found/As Left</u>	Yes/No	As Found	As Left	Pass/Fail
Did the ambient temperature require adjustment?	No	9.1	9.1	Pass
Did the barometric pressure require adjustment?	No	714	714	Pass
Did the filter temperature require adjustment?	No	12.7	12.7	Pass
Did the flow audit require adjustment?	No	16.7	16.7	Pass

Comments
Partisol sampler was moderately dirty, GHD cleaned the components of the sampling inlet, inside the cabinet, all filters and wiped down all seals.

<u>Flow Equation</u>						
Set Point	Actual Flow (<i>Qact</i>)	Absolute Difference	Pass/Fail	Manometer (<i>DH</i>)	4.42 "H2O	
(lpm)	(lpm)	(lpm)	(± 1 lpm)	Actual Temp (<i>Tact</i>)	282.25 °K	9.1°C
16.7	16.6	0.1	Pass	Actual Pres (<i>Pact</i>)	0.952 bar	
				Actual Pres (<i>Pact</i>)	28.11 inHg	

FTS Linear Regression Constants

(*mflo*) = 0.4452
(*bflo*) = 0.4430

$$Q_{act} = m_{flo} \times \frac{\sqrt{\Delta H \times T_{act}}}{P_{act}} + b_{flo}$$

Appendix B

Calibration Certificates



ITM INSTRUMENTS INC.

TORONTO

16975 Leslie Street
Newmarket, ON L3Y 9A1
Tel: (905) 952-3750
Fax: (905) 952-3751

MONTREAL

20800 Boul. Industriel
Ste-Anne-de-Bellevue, QC H9X 0A1
Tel: (514) 457-7280
Fax: (514) 457-4329

CALGARY

#209, 4615 112 Ave SE
Calgary, AB T2C 5J3
Tel: (403) 272-9332
Fax: (403) 248-5194

VANCOUVER

1282 Cliveden Av
Delta, BC V3M 6G4
Tel: (604) 254-9622
Fax: (604) 254-3123

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Test Results

Procedure: Fluke Stik Thermometer /RTC-158B,1502,PRT Rev: 1.0

Data Type: As Found Results: Pass

<u>Test Description</u>	<u>True Value</u>	<u>Reading</u>	<u>Lower Limit</u>	<u>Upper Limit</u>	<u>Test Status</u>	<u>Exp Uncert</u>
0.060 °C		0.02 °C	0.01 °C	0.11 °C	Pass	8.3e-003 °C
25.075 °C		25.04 °C	25.02 °C	25.13 °C	Pass	8.8e-003 °C
100.025 °C		100.01 °C	99.98 °C	100.08 °C	Pass	1.0e-002 °C
150.085 °C		150.04 °C	150.03 °C	150.14 °C	Pass	1.2e-002 °C

Certificate: C378442-00-02
Asset: ITM0003733

Calibration Certificate

Page 22

NIST Traceable Transfer Standard Calibration

Calibration Date: 05/17/2016
 Ambient Temp, °K: 295.5
 Amb Press, Atm: 1.0000

Orifice # FRM1218-
 Pri Std # LFE774300
 Manometer # FRM1218

By:
 Chk:

Std ΔH (inH ₂ O)	Manometer ΔH (inH ₂ O)	Actual Flow (alpm)	Calc Flow (alpm)	Difference* (%diff)
6.67	6.67	20.179	20.209	-0.15
5.86	5.86	18.988	18.970	0.09
5.10	5.10	17.733	17.727	0.03
4.39	4.39	16.490	16.479	0.07
3.73	3.73	15.233	15.224	0.06
3.12	3.12	13.964	13.962	0.02
2.56	2.56	12.683	12.688	-0.04
2.05	2.05	11.390	11.401	-0.10

**Manometer ΔH vs Act Flow
 Linear Regression Results:**
 m_{flo} = 0.4452
 b_{flo} = 0.4430
 r² = 1.0000

* all points must be within ± 2%

The MiniFlo calibration is performed with an NIST-traceable standard. Each unit has a unique pair of calibration constants derived from the calibration which are used to calculate the actual air flow rate at all ambient conditions. The unit's calibration should be recertified annually.

The actual flow rate is a function of the pressure drop across the device, the ambient temperature, and the ambient pressure. The relationship of these variables and the unique calibration constants ("m" and "b") for each device is presented in the following equation (Eq.A):

$$Q_{act} = m_{flo} \times \sqrt{\frac{\Delta H \times T_{act}}{P_{act}}} + b_{flo}$$

Q_{act} = actual flowrate, liters per min
 ΔH = manometer reading, inches of water
 T_{act} = ambient temperature, °K
 P_{act} = ambient pressure, atmospheres

CAUTION: The weather service, most airports, etc, reduce the atmospheric pressure to a common reference (sea level). The equation above requires the atmospheric pressure at the location where the MiniFlo is being used.

The equation below may be used to estimate the ambient atmospheric pressure at any elevation if the sea level pressure is known.

$$P_{act} = P_{sea} \times \left(1 - \frac{E}{145300} \right)^{5.25}$$

P_{act} = Ambient Atmospheric Pressure
 P_{sea} = Sea Level Atmospheric Pressure
 E = Site elevation, feet

Airmetrics

1940 Don St., Suite 300
 Springfield, OR 97477
 (541) 683-5420



ITM INSTRUMENTS INC.

TORONTO

16975 Leslie Street
Newmarket, ON L3Y 9A1
Tel: (905) 952-3750
Fax: (905) 952-3751

MONTREAL

20800 Boul. Industriel
Ste-Anne-de-Bellevue, QC H9X 0A1
Tel: (514) 457-7280
Fax: (514) 457-4329

CALGARY

#209, 4615 112 Ave SE
Calgary, AB T2C 5J3
Tel: (403) 272-9332
Fax: (403) 248-5194

VANCOUVER

1282 Cliveden Av
Delta, BC V3M 6G4
Tel: (604) 254-9622
Fax: (604) 254-3123

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Calibration Certificate

Customer: *GHD Ltd.*

Certificate: C378442-00-01

Unit Identification

Manufacturer: Dwyer

Serial: N/A

Model: 475-0-FM

Unit ID: MAN-CAL-001

Description: Digital Manometer

Calibration Date

Calibration Date: 14-Dec-2020

Due Date: 14-Dec-2021

Calibration Conditions

Temperature: 20.9°C

Humidity: 15 %

Barometric Pressure: N/A

General Information

Remark: N/A

Standards Used

<u>Unit ID</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Cal Date</u>	<u>Due Date</u>
CAL0224	Fluke	750P01	24-Aug-2020	24-Feb-2021

The calibration was performed using measurement standards traceable to the National Measurement Institute Standards (NMIS) part of the National Research Council of Canada (NRC) or the National Institute of Standards and Technology (NIST), or to accepted intrinsic standards or measurement, or is derived by ratio type self-calibration techniques. Measurement uncertainties given in this report are based on a coverage factor of k=2 corresponding to a confidence level of approximately 95%.

Calibrated by: *A. Atton*

Approved by:

Certificate: C378442-00-01
Asset: ITM0017905

Calibration Certificate

Page 1 2



TORONTO
 16975 Leslie Street
 Newmarket, ON L3Y 9A1
 Tel: (905) 952-3750
 Fax: (905) 952-3751

MONTREAL
 20800 Boul. Industriel
 Ste-Anne-de-Bellevue, QC H9X 0A1
 Tel: (514) 457-7280
 Fax: (514) 457-4329

CALGARY
 #209, 4615 112 Ave SE
 Calgary, AB T2C 5J3
 Tel: (403) 272-9332
 Fax: (403) 248-5194

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 1282 Cliveden Av
 Delta, BC V3M 6G4
 Tel: (604) 254-9622
 Fax: (604) 254-3123

ITM INSTRUMENTS INC.

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Test Results

Procedure: Pressure Gauge 10.00 IN.W.C 0.5% FS /750P01 Rev: 1.1

Data Type: As Found Results: Pass

<u>Test Description</u>	<u>True Value</u>	<u>Reading</u>	<u>Lower Limit</u>	<u>Upper Limit</u>	<u>Test Status</u>	<u>Exp Uncert</u>
Tolerance used (additive if more than one listed):						
0.5% of full scale						
UUT is set to the nominal value, Reading is the actual pressure read by the system instrument.						
1.000 inH2O		1.008 inH2O	0.950 inH2O	1.050 inH2O	Pass	1.6e-002 inH2O
2.000 inH2O		2.003 inH2O	1.950 inH2O	2.050 inH2O	Pass	1.6e-002 inH2O
4.000 inH2O		3.984 inH2O	3.950 inH2O	4.050 inH2O	Pass	1.6e-002 inH2O
6.000 inH2O		5.981 inH2O	5.950 inH2O	6.050 inH2O	Pass	1.6e-002 inH2O
8.000 inH2O		7.985 inH2O	7.950 inH2O	8.050 inH2O	Pass	1.6e-002 inH2O
10.000 inH2O		9.965 inH2O	9.950 inH2O	10.050 inH2O	Pass	1.6e-002 inH2O

Certificate: C378442-00-01
 Asset: ITM0017905

Calibration Certificate

Page 2/2



about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

Brandon Lawrence
Brandon.lawrence@ghd.com
403.538.8605

www.ghd.com



Quarterly Audit Partisol FRM Model 2000

Clean Harbors

50114 Range Rd. 173

Ryley Alberta T0B 4A0

Quarterly Audit Date, September 23, 2021

Clean Harbors Environmental Service

25 October 2021

GHD 11114644



3445 - 114th Avenue SE, Suite 103

Calgary, Alberta T2Z 0K6, Canada

T +1 403 271 2000 | F +1 403 271 3013 | E info-northamerica@ghd.com | **ghd.com**

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Document title	Quarterly Audit Partisol FRM Model 2000 Clean Harbors
Revision version	Rev 0
Project number	11114644

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Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S0	A	Trevor Lewis	Trevor Lewis		Brandon Lawrence		Oct. 18, 2021
S2	0	Trevor Lewis	Trevor Lewis		Brandon Lawrence		Oct. 25, 2021
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[Status code]							
[Status code]							

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Contents

1. Introduction	1
1.1 Scope and limitations	1
2. Audit Procedure	1
3. Audit Results	2
3.1 Siting Location Audit Results (AEP Station ID 00010348-I-1)	2
3.2 Pressure and Temperature Audit Results (AEP Station ID 00010348-I-1)	2
3.3 Leak Check Results (AEP Station ID 00010348-I-1)	3
3.3.1 Automatic Leak Check	3
3.3.2 External Manual Leak Check	3
3.4 Flow Audit (AEP Station ID 00010348-I-1)	3
3.5 Instrument Condition and Recommendations (AEP Station ID 00010348-I-1)	3
3.5.1 Recommendations	3

Table index

Table 3.1	AMD Requirements vs. Current Partisol Sampler Location	2
Table 3.2	Reference Results vs. Partisol Sampler Readings	2

Appendices

Appendix A	Quarterly Audit Form
Appendix B	Calibration Certificates

1. Introduction

GHD Limited (GHD) was retained by Clean Harbors to conduct a Quarterly Audit at 50114 Range Road 173 Ryley, Alberta (Facility) on September 23, 2021. The Quarterly Audit was conducted on the Partisol FRM 2000 Particulate Matter less than 10 microns (PM₁₀) Sampler (Partisol Sampler), located on the roof of the Ryley Lift Station (AEP Station ID 00010348-I-1), which is southeast of the Facility. The coordinates of the lift station are 53.297961, -112.416076.

1.1 Scope and limitations

This report: has been prepared by GHD for Clean Harbors Environmental Service and may only be used and relied on by Clean Harbors Environmental Service for the purpose agreed between GHD and Clean Harbors Environmental Service as set out in Section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Clean Harbors Environmental Service arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer Section(s) 3.5.1 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

2. Audit Procedure

The Partisol Sampler was audited in accordance with the instrument manual and the Alberta Air Monitoring Directive, 2016 (AMD). Siting location, ambient pressure, ambient temperature, filter temperature, leakage rate and flow rate were audited, as well as overall instrument condition to ensure compliance with the instrument manual and the AMD. Below is a summary of the tasks performed on the Partisol Sampler:

- Siting Location Audit
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3. Audit Results

3.1 Siting Location Audit Results (AEP Station ID 00010348-I-1)

The siting location of the Partisol Sampler meets the requirements of Chapter 3, of the AMD. Table 3.1 of this report compares the AMD Siting Requirements for Intermittent Samplers versus the current Partisol sampler location.

- The current coordinates of the Partisol Sampler are 53.297961, -112.416076.
- The distance from the nearest roadway is 21 m.

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Site Characteristics	AMD Requirements	Current Location	Specification
Sampler Inlet-height above ground (abg)	Minimum 2 m, Maximum 15 m	Meets Requirement	4.63 m abg
Other Requirements	1. Distance from an obstacle greater than 2.5 times the height of the obstacle above the sampler.	Meets Requirement	>2.5 times
	2. At least 2 m from any other samplers or inlets with flow rates greater than 200 litres (L) per minute,	Meets Requirement	None
	Or at least 1 m apart from any other samplers or inlets with flow rates less than or equal of 200 L per minute.	Meets Requirement	None
	3. Unrestricted air flow in three to four wind quadrants.	Meets Requirement	4/4 Unrestricted Quadrants

3.2 Pressure and Temperature Audit Results (AEP Station ID 00010348-I-1)

The pressure and temperature audit results of the Partisol Sampler meet the requirements of Chapter 4, of the AMD. Table 3.2 of this report compares the reference results versus the Partisol Sampler readings.

Table 3.2 Reference Results vs. Partisol Sampler Readings

Parameter	Partisol	Reference	Difference	Limit	Pass/Fail
Ambient Temperature (°C)	8.7	8.3	0.4	±2°C	Pass
Barometric Pressure (mmHg)	704	703.5	0.5	±10 mmHg	Pass
Filter Temperature (°C)	8.3	8.9	0.6	±2°C	Pass
Flow (L/min)	16.7	16.6	0.1	±1.0 L/min	Pass

3.3 Leak Check Results (AEP Station ID 00010348-I-1)

3.3.1 Automatic Leak Check

The Partisol firmware performs leak checks in automatic mode and indicates either a "pass" or "fail" based on a pressure drop threshold of 127 mmHg per minute. The Partisol Sampler passed the requirements outlined in the service manual with a pressure drop of 5 mmHg per minute during the audit.

3.3.2 External Manual Leak Check

GHD also performs an external manual leak check on the Partisol Sampler as part of the quarterly audit. The external manual leak check measures the pressure drop on a vacuum gauge located on the sampler. The pressure drop may not exceed more than 8.5 inHg (216 mmHg) over a 30-second span. The Partisol Sampler passed the requirements of the service manual with a pressure drop of 0.0 inHg in a 30-second span.

3.4 Flow Audit (AEP Station ID 00010348-I-1)

The flow audit results of the Partisol Sampler meet the requirements of Chapter 4 of the AMD, refer to Table 3.2.

3.5 Instrument Condition and Recommendations (AEP Station ID 00010348-I-1)

The Partisol Sampler was visually and functionally inspected on the audit day. Audit recommendations and instrument conditions are listed below:

- Liquid crystal display screen is functioning.
- Filter exchange cabinet has been cleaned.
- Ventilation fan filters are clean.
- Filter exchange mechanism is operating normally.
- Filter v-seals are in good condition.
- Ambient temperature and pressure sensor wires in good condition.
- Main power connection wire in good condition.

3.5.1 Recommendations

GHD recommends opening and cleaning PM₁₀ sampling inlet prior to next sampling event.

Appendices

Appendix A

Quarterly Audit Form



GHD Quarterly Audit Form

Date	9/23/2021	Weather Cond.:	Sunny/8.3°C
Owner	Clean Harbors	Start Time:	9:00:00 AM
Station Name	Ryley Lift Station	End Time:	10:34:00 AM
Parameter	PM ₁₀	Performed By:	Trevor Lewis

Partisol FRM Model 2000 Identification		Sampler Data	
Make/Model:	R & P Partisol FRM 2000	Temperature:	8.3°C
Unit ID:	Ryley Lift Station	Pressure:	703.5 mmHg
S/N:	200FB209860905	Flow Set Point:	16.7 L/min

GHD Reference Standards				
	Flow	Pressure	Temperature	Manometer
Make:	AirMetrics	TSI	Fluke	Dwyer
Model:	FRM	9565-P	1551A Ex	475-0-FM
Serial Number:	FRM1218	9565P1223002	3520009	MAN-CAL-001
Calibration Date:	5/17/2016	12/18/2020	12/14/2020	12/14/2020

Audit Data					
	Sampler Data	Reference Data	Difference	Pass/Fail	Units
Ambient Temperature (+/- 2 °C)	8.7	8.3	0.4	Pass	°C
Barometric Pressure (+/- 10 mmHg)	704	703.5	0.5	Pass	mmHg
Filter Temperature (+/- 2 °C)	8.3	8.9	0.6	Pass	°C
Flow (+/- 1.0 Litres/min)	16.7	16.6	0.1	Pass	Litres/min

Leak Check					
Manual Check (-8.5 inHg)					
	Initial Pressure	Final Pressure	Pressure Drop	Pass/Fail	Units
	-14.00	-14.00	0.00	Pass	inHG
Automatic Check (-127 mmHg)					
Leak check was performed in automatic mode, sampler indicated:			5 mmHg/min	Pass	mmHg/min

As Found/As Left		Yes/No	As Found	As Left	Pass/Fail
Did the ambient temperature require adjustment?		No	8.7	8.3	Pass
Did the barometric pressure require adjustment?		No	704	703.5	Pass
Did the filter temperature require adjustment?		No	8.3	8.9	Pass
Did the flow audit require adjustment?		No	16.7	16.6	Pass

Comments
Partisol sampler was moderately dirty, GHD cleaned the components of the sampling inlet, inside the cabinet, all filters and wiped down all seals.

Flow Equation						
Set Point	Actual Flow (<i>Qact</i>)	Absolute Difference	Pass/Fail	Manometer (<i>DH</i>)	4.35 "H2O	
(lpm)	(lpm)	(lpm)	(± 1 lpm)	Actual Temp (<i>Tact</i>)	281.45 °K	8.3°C
16.7	16.6	0.1	Pass	Actual Pres (<i>Pact</i>)	0.952 bar	
				Actual Pres (<i>Pact</i>)	28.11 inHg	
FTS Linear Regression Constants						
(<i>mflo</i>) =	0.4452	$Q_{act} = m_{flo} \times \frac{\sqrt{\Delta H \times T_{act}}}{P_{act}} + b_{flo}$				
(<i>bflo</i>) =	0.4430					

Appendix B

Calibration Certificates



ITM INSTRUMENTS INC.

TORONTO
16975 Leslie Street
Newmarket, ON L3Y 9A1
Tel: (905) 952-3750
Fax: (905) 952-3751

MONTREAL
20800 Boul. Industriel
Ste-Anne-de-Bellevue, QC H9X 0A1
Tel: (514) 457-7280
Fax: (514) 457-4329

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Calgary, AB T2C 5J3
Tel: (403) 272-9332
Fax: (403) 248-5194

VANCOUVER
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Delta, BC V3M 6G4
Tel: (604) 254-9622
Fax: (604) 254-3123

www.itm.com - information@itm.com

Calibration Certificate

Customer: *GHD Ltd.*

Certificate: C378442-00-02

Unit Identification

Manufacturer: **Fluke**
Model: **1551A Ex**
Description: **Stik Thermometer**

Serial: **3520009**
Unit ID: **THM-CAL-001**

Calibration Date

Calibration Date: **14-Dec-2020**
Due Date: **14-Dec-2021**

Calibration Conditions

Temperature: **20.9°C**
Humidity: **15 %**
Barometric Pressure: **N/A**

General Information

Remark: **N/A**

Standards Used

<u>Unit ID</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Cal Date</u>	<u>Due Date</u>
CAL0080	Burns Engineering	12001-A-12-6-2-A	4-Jun-2018	4-Jun-2021
CAL0124	Hart Scientific	1502A	1-Apr-2020	1-Apr-2021
CAL0223	Ametek	RTC-158B	27-Oct-2020	27-Oct-2021

The calibration was performed using measurement standards traceable to the National Measurement Institute Standards (NMIS) part of the National Research Council of Canada (NRC) or the National Institute of Standards and Technology (NIST), or to accepted intrinsic standards or measurement, or is derived by ratio type self-calibration techniques. Measurement uncertainties given in this report are based on a coverage factor of k=2 corresponding to a confidence level of approximately 95%.

Calibrated by: *A. Atton*

Approved by:

Certificate: C378442-00-02
Asset: ITM0003733

Calibration Certificate

Page 1 2



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Fax: (905) 952-3751

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20800 Boul. Industriel
Ste-Anne-de-Bellevue, QC H9X 0A1
Tel: (514) 457-7280
Fax: (514) 457-4329

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#209, 4615 112 Ave SE
Calgary, AB T2C 5J3
Tel: (403) 272-9332
Fax: (403) 248-5194

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Delta, BC V3M 6G4
Tel: (604) 254-9622
Fax: (604) 254-3123

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Test Results

Procedure: Fluke Stik Thermometer /RTC-158B,1502,PRT Rev: 1.0

Data Type: As Found Results: Pass

<u>Test Description</u>	<u>True Value</u>	<u>Reading</u>	<u>Lower Limit</u>	<u>Upper Limit</u>	<u>Test Status</u>	<u>Exp Uncert</u>
0.060 °C		0.02 °C	0.01 °C	0.11 °C	Pass	8.3e-003 °C
25.075 °C		25.04 °C	25.02 °C	25.13 °C	Pass	8.8e-003 °C
100.025 °C		100.01 °C	99.98 °C	100.08 °C	Pass	1.0e-002 °C
150.085 °C		150.04 °C	150.03 °C	150.14 °C	Pass	1.2e-002 °C

Certificate: C378442-00-02
Asset: ITM0003733

Calibration Certificate

Page 22

NIST Traceable Transfer Standard Calibration

Calibration Date: 05/17/2016
 Ambient Temp, °K: 295.5
 Amb Press, Atm: 1.0000

Orifice # FRM1218-
 Pri Std # LFE774300
 Manometer # FRM1218

By:
 Chk:

Std ΔH (inH ₂ O)	Manometer ΔH (inH ₂ O)	Actual Flow (alpm)	Calc Flow (alpm)	Difference* (%diff)
6.67	6.67	20.179	20.209	-0.15
5.86	5.86	18.988	18.970	0.09
5.10	5.10	17.733	17.727	0.03
4.39	4.39	16.490	16.479	0.07
3.73	3.73	15.233	15.224	0.06
3.12	3.12	13.964	13.962	0.02
2.56	2.56	12.683	12.688	-0.04
2.05	2.05	11.390	11.401	-0.10

**Manometer ΔH vs Act Flow
 Linear Regression Results:**
 m_{flo} = 0.4452
 b_{flo} = 0.4430
 r² = 1.0000

* all points must be within ± 2%

The MiniFlo calibration is performed with an NIST-traceable standard. Each unit has a unique pair of calibration constants derived from the calibration which are used to calculate the actual air flow rate at all ambient conditions. The unit's calibration should be recertified annually.

The actual flow rate is a function of the pressure drop across the device, the ambient temperature, and the ambient pressure. The relationship of these variables and the unique calibration constants ("m" and "b") for each device is presented in the following equation (Eq.A):

$$Q_{act} = m_{flo} \times \sqrt{\frac{\Delta H \times T_{act}}{P_{act}}} + b_{flo}$$

Q_{act} = actual flowrate, liters per min
 ΔH = manometer reading, inches of water
 T_{act} = ambient temperature, °K
 P_{act} = ambient pressure, atmospheres

CAUTION: The weather service, most airports, etc, reduce the atmospheric pressure to a common reference (sea level). The equation above requires the atmospheric pressure at the location where the MiniFlo is being used.

The equation below may be used to estimate the ambient atmospheric pressure at any elevation if the sea level pressure is known.

$$P_{act} = P_{sea} \times \left(1 - \frac{E}{145300} \right)^{5.25}$$

P_{act} = Ambient Atmospheric Pressure
 P_{sea} = Sea Level Atmospheric Pressure
 E = Site elevation, feet

Airmetrics

1940 Don St., Suite 300
 Springfield, OR 97477
 (541) 683-5420



ITM INSTRUMENTS INC.

TORONTO

16975 Leslie Street
Newmarket, ON L3Y 9A1
Tel: (905) 952-3750
Fax: (905) 952-3751

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20800 Boul. Industriel
Ste-Anne-de-Bellevue, QC H9X 0A1
Tel: (514) 457-7280
Fax: (514) 457-4329

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Tel: (403) 272-9332
Fax: (403) 248-5194

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1282 Cliveden Av
Delta, BC V3M 6G4
Tel: (604) 254-9622
Fax: (604) 254-3123

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Calibration Certificate

Customer: *GHD Ltd.*

Certificate: C378442-00-01

Unit Identification

Manufacturer: Dwyer

Serial: N/A

Model: 475-0-FM

Unit ID: MAN-CAL-001

Description: Digital Manometer

Calibration Date

Calibration Date: 14-Dec-2020

Due Date: 14-Dec-2021

Calibration Conditions

Temperature: 20.9°C

Humidity: 15 %

Barometric Pressure: N/A

General Information

Remark: N/A

Standards Used

<u>Unit ID</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Cal Date</u>	<u>Due Date</u>
CAL0224	Fluke	750P01	24-Aug-2020	24-Feb-2021

The calibration was performed using measurement standards traceable to the National Measurement Institute Standards (NMIS) part of the National Research Council of Canada (NRC) or the National Institute of Standards and Technology (NIST), or to accepted intrinsic standards or measurement, or is derived by ratio type self-calibration techniques. Measurement uncertainties given in this report are based on a coverage factor of k=2 corresponding to a confidence level of approximately 95%.

Calibrated by: *A. Atton*

Approved by:

Certificate: C378442-00-01
Asset: ITM0017905

Calibration Certificate

Page 1 2

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16975 Leslie Street
Newmarket, ON L3Y 9A1
Tel: (905) 952-3750
Fax: (905) 952-3751

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Ste-Anne-de-Bellevue, QC H9X 0A1
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ITM INSTRUMENTS INC.**www.itm.com - information@itm.com****Test Results**

Procedure: Pressure Gauge 10.00 IN.W.C 0.5% FS /750P01 Rev: 1.1

Data Type: As Found Results: Pass

<u>Test Description</u>	<u>True Value</u>	<u>Reading</u>	<u>Lower Limit</u>	<u>Upper Limit</u>	<u>Test Status</u>	<u>Exp Uncert</u>
Tolerance used (additive if more than one listed): 0.5% of full scale						
UUT is set to the nominal value, Reading is the actual pressure read by the system instrument.						
1.000 inH2O		1.008 inH2O	0.950 inH2O	1.050 inH2O	Pass	1.6e-002 inH2O
2.000 inH2O		2.003 inH2O	1.950 inH2O	2.050 inH2O	Pass	1.6e-002 inH2O
4.000 inH2O		3.984 inH2O	3.950 inH2O	4.050 inH2O	Pass	1.6e-002 inH2O
6.000 inH2O		5.981 inH2O	5.950 inH2O	6.050 inH2O	Pass	1.6e-002 inH2O
8.000 inH2O		7.985 inH2O	7.950 inH2O	8.050 inH2O	Pass	1.6e-002 inH2O
10.000 inH2O		9.965 inH2O	9.950 inH2O	10.050 inH2O	Pass	1.6e-002 inH2O

Certificate: C378442-00-01
Asset: ITM0017905

Calibration Certificate

Page 2/2

INSTRUMENT CALIBRATION REPORT



Advanced Labs, Inc.

Pine Environmental Services, Inc

Instrument ID 20628
Description TSI 9565P VelociCalc
Calibrated 12/18/2020

Manufacturer TSI Model Number 9565P Serial Number 9565P1223002 Location New Jersey Temp 66	Classification Status pass Frequency Yearly EOM Department Lab Humidity 24
---	---

Calibration Specifications

<u>Nom In Val / In Val</u>	<u>In Type</u>	<u>Out Val</u>	<u>Out Type</u>	<u>Fnd As</u>	<u>Lft As</u>	<u>Dev%</u>	<u>Pass/Fail</u>
Group # 1				Range Acc % 0.0000			
Group Name Barometric Pressure				Reading Acc % 2.0000			
Stated Accy Pct of Reading				Plus/Minus 0.000			
30.000 / 30.170	inHg	30.170	inHg	30.130	30.170	0.00%	Pass
Group # 2				Range Acc % 0.0000			
Group Name Differential Pressure				Reading Acc % 1.0000			
Stated Accy Pct of Reading				Plus/Minus 0.00			
-4.00 / -3.98	inH2O	-3.98	inH2O	-4.01	-4.01	0.75%	Pass
4.00 / 4.01	inH2O	4.01	inH2O	4.05	4.05	1.00%	Pass
8.00 / 8.00	inH2O	8.00	inH2O	8.05	8.05	0.63%	Pass
12.00 / 12.03	inH2O	12.03	inH2O	12.07	12.07	0.33%	Pass

Test Instruments Used During the Calibration

<u>Test Instrument ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Serial Number</u>	<u>(As Of Cal Entry Date)</u>	
				<u>Last Cal Date</u>	<u>Next Cal Date</u>
DWYER 477AV	Dwyer 477AV-000 Digital Manometer	Dwyer	005TRQ	10/12/2020	10/12/2021
DWYER 477AV-1	Dwyer 477AV-1 Digital Manometer	Dwyer	005PM2	10/12/2020	10/12/2021
DWYER 477AV-3	Dwyer 477AV-3 Digital Manometer	Dwyer	005PM1	10/12/2020	10/12/2021
OMEGA HX93AC/DP25-E	Omega HX93AC/DP25-E	Omega Engineering	1010368 035025 035026	11/25/2020	11/25/2022
OMEGA PX02K1-16A5T /DP25-E-A	Omega PX02K1-16A5T/DP25-E-A	Omega Engineering	168377/8375030	11/25/2020	11/25/2022
OMEGA WT4401-D	Omega WT4401-D	Omega Engineering	101105	11/25/2020	11/25/2022

Notes about this calibration





Quarterly Audit Partisol FRM Model 2000

Clean Harbors
50114 Range Rd. 173
Ryley, Alberta T0B 4A0
Quarterly Audit Date: December 10, 2021

Clean Harbors

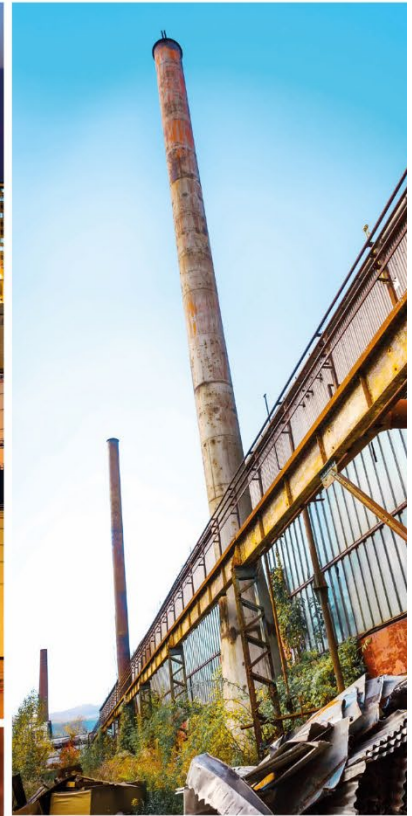
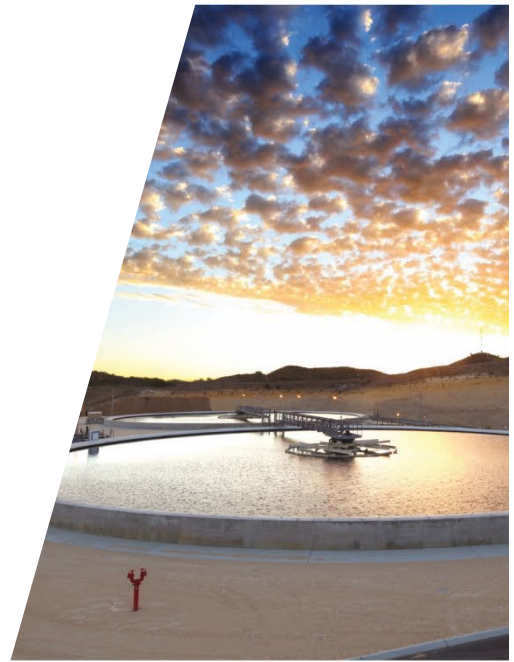




Table of Contents

1.	Introduction	1
2.	Audit Procedure	1
3.	Audit Results	1
3.1	Siting Location Audit Results (AEP Station ID 00010348-I-1)	1
3.2	Pressure and Temperature Audit Results (AEP Station ID 00010348-I-1)	2
3.3	Leak Check Results (AEP Station ID 00010348-I-1)	2
3.3.1	Automatic Leak Check	2
3.3.2	External Manual Leak Check	2
3.4	Flow Audit (AEP Station ID 00010348-I-1)	3
3.5	Instrument Condition and Recommendations (AEP Station ID 00010348-I-1).....	3
3.5.1	Recommendations.....	3

Table Index

Table 3.1	AMD Requirements vs. Current Partisol Sampler Location	2
Table 3.2	Reference Results vs. Partisol Sampler Readings	2

Appendix Index

Appendix A	Quarterly Audit Form
Appendix B	Calibration Certificates



1. Introduction

GHD Limited (GHD) was retained by Clean Harbors to conduct a Quarterly Audit at 50114 Range Road 173 Ryley, Alberta (Facility) on September 23, 2021. The Quarterly Audit was conducted on the Partisol FRM 2000 Particulate Matter less than 10 microns (PM₁₀) Sampler (Partisol Sampler), located on the roof of the Ryley Lift Station (AEP Station ID 00010348-I-1), which is southeast of the Facility. The coordinates of the lift station are 53.297961, -112.416076.

2. Audit Procedure

The Partisol Sampler was audited in accordance with the instrument manual and the Alberta Air Monitoring Directive, 2016 (AMD). Siting location, ambient pressure, ambient temperature, filter temperature, leakage rate and flow rate were audited, as well as overall instrument condition to ensure compliance with the instrument manual and the AMD. Below is a summary of the tasks performed on the Partisol Sampler:

- Siting Location Audit
- Ambient Pressure Audit
- Ambient Temperature Audit
- Filter Temperature Audit
- Leakage Rate Audit
- Flow Rate Audit
- Instrument Condition and Recommendations

GHD verified all of these parameters using calibrated reference instruments. GHD reference instruments either have National Institute of Standards and Technology (NIST) Traceable Certifications, current manufacturer certification, or were verified by a primary standard. The GHD quarterly audit field form can be found in Appendix A. All calibrations and certifications can be found in Appendix B.

3. Audit Results

3.1 Siting Location Audit Results (AEP Station ID 00010348-I-1)

The siting location of the Partisol Sampler meets the requirements of Chapter 3, of the AMD. Table 3.1 of this report compares the AMD Siting Requirements for Intermittent Samplers versus the current Partisol sampler location.

- The current coordinates of the Partisol Sampler are 53.297961, -112.416076.
- The distance from the nearest roadway is 21 m.



Table 3.1 AMD Requirements vs. Current Partisol Sampler Location

Site Characteristics	AMD Requirements	Current Location	Specification
Sampler Inlet-height above ground (abg)	Minimum 2 m, Maximum 15 m	Meets Requirement	4.63 m abg
Other Requirements	a. Distance from an obstacle greater than 2.5 times the height of the obstacle above the sampler.	Meets Requirement	>2.5 times
	b. At least 2 m from any other samplers or inlets with flow rates greater than 200 litres (L) per minute,	Meets Requirement	None
	Or at least 1 m apart from any other samplers or inlets with flow rates less than or equal of 200 L per minute.	Meets Requirement	None
	c. Unrestricted air flow in three to four wind quadrants.	Meets Requirement	4/4 Unrestricted Quadrants

3.2 Pressure and Temperature Audit Results (AEP Station ID 00010348-I-1)

The pressure and temperature audit results of the Partisol Sampler meet the requirements of Chapter 4, of the AMD. Table 3.2 of this report compares the reference results versus the Partisol Sampler readings.

Table 3.2 Reference Results vs. Partisol Sampler Readings

Parameter	Partisol	Reference	Difference	Limit	Pass/Fail
Ambient Temperature (°C)	-4.0	-4.0	0.0	±2°C	Pass
Barometric Pressure (mmHg)	690	688.8	0.2	±10 mmHg	Pass
Filter Temperature (°C)	-3.3	-3.7	0.4	±2°C	Pass
Flow (L/min)	16.7	16.3	0.4	±1.0 L/min	Pass

3.3 Leak Check Results (AEP Station ID 00010348-I-1)

3.3.1 Automatic Leak Check

The Partisol firmware performs leak checks in automatic mode and indicates either a "pass" or "fail" based on a pressure drop threshold of 127 mmHg per minute. The Partisol Sampler passed the requirements outlined in the service manual with a pressure drop of 15 mmHg per minute during the audit.

3.3.2 External Manual Leak Check

GHD also performs an external manual leak check on the Partisol Sampler as part of the quarterly audit. The external manual leak check measures the pressure drop on a vacuum gauge located on



the sampler. The pressure drop may not exceed more than 8.5 inHg (216 mmHg) over a 30-second span. The Partisol Sampler passed the requirements of the service manual with a pressure drop of 0.5 inHg in a 30-second span.

3.4 Flow Audit (AEP Station ID 00010348-I-1)

The flow audit results of the Partisol Sampler meet the requirements of Chapter 4 of the AMD, refer to Table 3.2.

3.5 Instrument Condition and Recommendations (AEP Station ID 00010348-I-1)

The Partisol Sampler was visually and functionally inspected on the audit day. Audit recommendations and instrument conditions are listed below:

- Liquid crystal display screen is functioning.
- Filter exchange cabinet has been cleaned.
- Ventilation fan filters are clean.
- Filter exchange mechanism is operating normally.
- Filter v-seals are in good condition.
- Ambient temperature and pressure sensor wires in good condition.
- Main power connection wire in good condition.

3.5.1 Recommendations

GHD recommends opening and cleaning PM₁₀ sampling inlet prior to next sampling event.

Appendix A

Quarterly Audit Form



GHD Quarterly Audit Form

Date	12/10/2021	Weather Cond.:	- 4°C
Owner	Clean Harbors	Start Time:	10:45:00 AM
Station Name	Ryley Lift Station	End Time:	11:30:00 AM
Parameter	PM ₁₀	Performed By:	Trevor Lewis

Partisol FRM Model 2000 Identification		Sampler Data	
Make/Model:	R & P Partisol FRM 2000	Temperature:	- 4°C
Unit ID:	Ryley Lift Station	Pressure:	688.8 mmhg
S/N:	200FB209860905	Flow Set Point:	16.7 L/min

GHD Reference Standards				
	Flow	Pressure	Temperature	Manometer
Make:	AirMetrics	TSI	Fluke	Dwyer
Model:	FRM	9565-P	1551A Ex	475-0-FM
Serial Number:	FRM1218	9565P1223002	3520009	MAN-CAL-001
Calibration Date:	5/17/2016	12/18/2020	12/14/2020	12/14/2020

Audit Data					
	Sampler Data	Reference Data	Difference	Pass/Fail	Units
Ambient Temperature (+/- 2 °C)	-4.00	-4.00	0.0	Pass	°C
Barometric Pressure (+/- 10 mmHg)	690.00	688.80	1.2	Pass	mmHg
Filter Temperature (+/- 2 °C)	-3.30	-3.70	0.4	Pass	°C
Flow (+/- 1.0 Litres/min)	16.70	16.60	0.1	Pass	Litres/min

Leak Check					
Manual Check (-8.5 inHg)					
	Initial Pressure	Final Pressure	Pressure Drop	Pass/Fail	Units
	-17.00	-16.50	-0.50	Pass	inHG
Automatic Check (-127 mmHg)					
Leak check was performed in automatic mode, sampler indicated:			15 mmHg/min	Pass	mmHg/min

As Found/As Left		Yes/No	As Found As Left		Pass/Fail
Did the ambient temperature require adjustment?		No	-4.0	-4.0	Pass
Did the barometric pressure require adjustment?		No	690	690	Pass
Did the filter temperature require adjustment?		No	-3.3	-3.3	Pass
Did the flow audit require adjustment?		No	16.7	16.7	Pass

Comments
Partisol sampler was moderately dirty, GHD cleaned the components of the sampling inlet, inside the cabinet, all filters and wiped down all seals.

Flow Equation						
Set Point	Actual Flow (<i>Qact</i>)	Absolute Difference	Pass/Fail	Manometer (<i>DH</i>)	4.35 "H2O	
(lpm)	(lpm)	(lpm)	(± 1 lpm)	Actual Temp (<i>Tact</i>)	269.15 °K	-4.0°C
				Actual Pres (<i>Pact</i>)	0.920 bar	
16.7	16.3	0.4	Pass	Actual Pres (<i>Pact</i>)	27.17 inHg	

FTS Linear Regression Constants

(*mflo*) = 0.4452

(*bflo*) = 0.4430

$$Q_{act} = m_{flo} \times \frac{\sqrt{\Delta H} \times T_{act}}{P_{act}} + b_{flo}$$

Appendix B

Calibration Certificates



ITM INSTRUMENTS INC.

TORONTO

16975 Leslie Street
Newmarket, ON L3Y 9A1
Tel: (905) 952-3750
Fax: (905) 952-3751

MONTREAL

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Ste-Anne-de-Bellevue, QC H9X 0A1
Tel: (514) 457-7280
Fax: (514) 457-4329

CALGARY

#209, 4615 112 Ave SE
Calgary, AB T2C 5J3
Tel: (403) 272-9332
Fax: (403) 248-5194

VANCOUVER

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Delta, BC V3M 6G4
Tel: (604) 254-9622
Fax: (604) 254-3123

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Calibration Certificate

Customer: *GHD Ltd.*

Certificate: C378442-00-02

Unit Identification

Manufacturer: **Fluke**
Model: **1551A Ex**
Description: **Stik Thermometer**

Serial: **3520009**
Unit ID: **THM-CAL-001**

Calibration Date

Calibration Date: **14-Dec-2020**
Due Date: **14-Dec-2021**

Calibration Conditions

Temperature: **20.9°C**
Humidity: **15 %**
Barometric Pressure: **N/A**

General Information

Remark: **N/A**

Standards Used

<u>Unit ID</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Cal Date</u>	<u>Due Date</u>
CAL0080	Burns Engineering	12001-A-12-6-2-A	4-Jun-2018	4-Jun-2021
CAL0124	Hart Scientific	1502A	1-Apr-2020	1-Apr-2021
CAL0223	Ametek	RTC-158B	27-Oct-2020	27-Oct-2021

The calibration was performed using measurement standards traceable to the National Measurement Institute Standards (NMIS) part of the National Research Council of Canada (NRC) or the National Institute of Standards and Technology (NIST), or to accepted intrinsic standards or measurement, or is derived by ratio type self-calibration techniques. Measurement uncertainties given in this report are based on a coverage factor of k=2 corresponding to a confidence level of approximately 95%.

Calibrated by: *A. Atton*

Approved by:

Certificate: C378442-00-02
Asset: ITM0003733

Calibration Certificate

Page 1 2



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Ste-Anne-de-Bellevue, QC H9X 0A1
Tel: (514) 457-7280
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Calgary, AB T2C 5J3
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Test Results

Procedure: Fluke Stik Thermometer /RTC-158B,1502,PRT Rev: 1.0

Data Type: As Found Results: Pass

<u>Test Description</u>	<u>True Value</u>	<u>Reading</u>	<u>Lower Limit</u>	<u>Upper Limit</u>	<u>Test Status</u>	<u>Exp Uncert</u>
0.060 °C		0.02 °C	0.01 °C	0.11 °C	Pass	8.3e-003 °C
25.075 °C		25.04 °C	25.02 °C	25.13 °C	Pass	8.8e-003 °C
100.025 °C		100.01 °C	99.98 °C	100.08 °C	Pass	1.0e-002 °C
150.085 °C		150.04 °C	150.03 °C	150.14 °C	Pass	1.2e-002 °C

Certificate: C378442-00-02
Asset: ITM0003733

Calibration Certificate

Page 22

NIST Traceable Transfer Standard Calibration

Calibration Date: 05/17/2016
 Ambient Temp, °K: 295.5
 Amb Press, Atm: 1.0000

Orifice # FRM1218-
 Pri Std # LFE774300
 Manometer # FRM1218

By:
 Chk:

Std ΔH (inH ₂ O)	Manometer ΔH (inH ₂ O)	Actual Flow (alpm)	Calc Flow (alpm)	Difference* (%diff)
6.67	6.67	20.179	20.209	-0.15
5.86	5.86	18.988	18.970	0.09
5.10	5.10	17.733	17.727	0.03
4.39	4.39	16.490	16.479	0.07
3.73	3.73	15.233	15.224	0.06
3.12	3.12	13.964	13.962	0.02
2.56	2.56	12.683	12.688	-0.04
2.05	2.05	11.390	11.401	-0.10

**Manometer ΔH vs Act Flow
 Linear Regression Results:**
 m_{flo} = 0.4452
 b_{flo} = 0.4430
 r² = 1.0000

* all points must be within ± 2%

The MiniFlo calibration is performed with an NIST-traceable standard. Each unit has a unique pair of calibration constants derived from the calibration which are used to calculate the actual air flow rate at all ambient conditions. The unit's calibration should be recertified annually.

The actual flow rate is a function of the pressure drop across the device, the ambient temperature, and the ambient pressure. The relationship of these variables and the unique calibration constants ("m" and "b") for each device is presented in the following equation (Eq.A):

$$Q_{act} = m_{flo} \times \sqrt{\frac{\Delta H \times T_{act}}{P_{act}}} + b_{flo}$$

Q_{act} = actual flowrate, liters per min
 ΔH = manometer reading, inches of water
 T_{act} = ambient temperature, °K
 P_{act} = ambient pressure, atmospheres

CAUTION: The weather service, most airports, etc, reduce the atmospheric pressure to a common reference (sea level). The equation above requires the atmospheric pressure at the location where the MiniFlo is being used.

The equation below may be used to estimate the ambient atmospheric pressure at any elevation if the sea level pressure is known.

$$P_{act} = P_{sea} \times \left(1 - \frac{E}{145300} \right)^{5.25}$$

P_{act} = Ambient Atmospheric Pressure
 P_{sea} = Sea Level Atmospheric Pressure
 E = Site elevation, feet

Airmetrics

1940 Don St., Suite 300
 Springfield, OR 97477
 (541) 683-5420



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16975 Leslie Street
Newmarket, ON L3Y 9A1
Tel: (905) 952-3750
Fax: (905) 952-3751

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20800 Boul. Industriel
Ste-Anne-de-Bellevue, QC H9X 0A1
Tel: (514) 457-7280
Fax: (514) 457-4329

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Calgary, AB T2C 5J3
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Calibration Certificate

Customer: *GHD Ltd.*

Certificate: C378442-00-01

Unit Identification

Manufacturer: Dwyer

Serial: N/A

Model: 475-0-FM

Unit ID: MAN-CAL-001

Description: Digital Manometer

Calibration Date

Calibration Date: 14-Dec-2020

Due Date: 14-Dec-2021

Calibration Conditions

Temperature: 20.9°C

Humidity: 15 %

Barometric Pressure: N/A

General Information

Remark: N/A

Standards Used

<u>Unit ID</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Cal Date</u>	<u>Due Date</u>
CAL0224	Fluke	750P01	24-Aug-2020	24-Feb-2021

The calibration was performed using measurement standards traceable to the National Measurement Institute Standards (NMIS) part of the National Research Council of Canada (NRC) or the National Institute of Standards and Technology (NIST), or to accepted intrinsic standards or measurement, or is derived by ratio type self-calibration techniques. Measurement uncertainties given in this report are based on a coverage factor of k=2 corresponding to a confidence level of approximately 95%.

Calibrated by: *A. Atton*

Approved by:

Certificate: C378442-00-01
Asset: ITM0017905

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Ste-Anne-de-Bellevue, QC H9X 0A1
Tel: (514) 457-7280
Fax: (514) 457-4329

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Calgary, AB T2C 5J3
Tel: (403) 272-9332
Fax: (403) 248-5194

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1282 Cliveden Av
Delta, BC V3M 6G4
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ITM INSTRUMENTS INC.**www.itm.com - information@itm.com****Test Results**

Procedure: Pressure Gauge 10.00 IN.W.C 0.5% FS /750P01 Rev: 1.1

Data Type: As Found Results: Pass

<u>Test Description</u>	<u>True Value</u>	<u>Reading</u>	<u>Lower Limit</u>	<u>Upper Limit</u>	<u>Test Status</u>	<u>Exp Uncert</u>
Tolerance used (additive if more than one listed): 0.5% of full scale						
UUT is set to the nominal value, Reading is the actual pressure read by the system instrument.						
1.000 inH2O		1.008 inH2O	0.950 inH2O	1.050 inH2O	Pass	1.6e-002 inH2O
2.000 inH2O		2.003 inH2O	1.950 inH2O	2.050 inH2O	Pass	1.6e-002 inH2O
4.000 inH2O		3.984 inH2O	3.950 inH2O	4.050 inH2O	Pass	1.6e-002 inH2O
6.000 inH2O		5.981 inH2O	5.950 inH2O	6.050 inH2O	Pass	1.6e-002 inH2O
8.000 inH2O		7.985 inH2O	7.950 inH2O	8.050 inH2O	Pass	1.6e-002 inH2O
10.000 inH2O		9.965 inH2O	9.950 inH2O	10.050 inH2O	Pass	1.6e-002 inH2O

Certificate: C378442-00-01
Asset: ITM0017905

Calibration Certificate

Page 2/2

INSTRUMENT CALIBRATION REPORT



Advanced Labs, Inc.

Pine Environmental Services, Inc

Instrument ID 20628
Description TSI 9565P VelociCalc
Calibrated 12/18/2020

Manufacturer TSI	Classification
Model Number 9565P	Status pass
Serial Number 9565P1223002	Frequency Yearly EOM
Location New Jersey	Department Lab
Temp 66	Humidity 24

Calibration Specifications

Group # 1				Range Acc % 0.0000			
Group Name Barometric Pressure				Reading Acc % 2.0000			
Stated Accy Pct of Reading				Plus/Minus 0.000			
<u>Nom In Val / In Val</u>	<u>In Type</u>	<u>Out Val</u>	<u>Out Type</u>	<u>Fnd As</u>	<u>Lft As</u>	<u>Dev%</u>	<u>Pass/Fail</u>
30.000 / 30.170	inHg	30.170	inHg	30.130	30.170	0.00%	Pass
Group # 2				Range Acc % 0.0000			
Group Name Differential Pressure				Reading Acc % 1.0000			
Stated Accy Pct of Reading				Plus/Minus 0.00			
<u>Nom In Val / In Val</u>	<u>In Type</u>	<u>Out Val</u>	<u>Out Type</u>	<u>Fnd As</u>	<u>Lft As</u>	<u>Dev%</u>	<u>Pass/Fail</u>
-4.00 / -3.98	inH2O	-3.98	inH2O	-4.01	-4.01	0.75%	Pass
4.00 / 4.01	inH2O	4.01	inH2O	4.05	4.05	1.00%	Pass
8.00 / 8.00	inH2O	8.00	inH2O	8.05	8.05	0.63%	Pass
12.00 / 12.03	inH2O	12.03	inH2O	12.07	12.07	0.33%	Pass

Test Instruments Used During the Calibration

<u>Test Instrument ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Serial Number</u>	<u>(As Of Cal Entry Date)</u>	
				<u>Last Cal Date</u>	<u>Next Cal Date</u>
DWYER 477AV	Dwyer 477AV-000 Digital Manometer	Dwyer	005TRQ	10/12/2020	10/12/2021
DWYER 477AV-1	Dwyer 477AV-1 Digital Manometer	Dwyer	005PM2	10/12/2020	10/12/2021
DWYER 477AV-3	Dwyer 477AV-3 Digital Manometer	Dwyer	005PM1	10/12/2020	10/12/2021
OMEGA HX93AC/DP25-E	Omega HX93AC/DP25-E	Omega Engineering	1010368 035025 035026	11/25/2020	11/25/2022
OMEGA PX02K1-16A5T /DP25-E-A	Omega PX02K1-16A5T/DP25-E-A	Omega Engineering	168377/8375030	11/25/2020	11/25/2022
OMEGA WT4401-D	Omega WT4401-D	Omega Engineering	101105	11/25/2020	11/25/2022

Notes about this calibration



about GHD

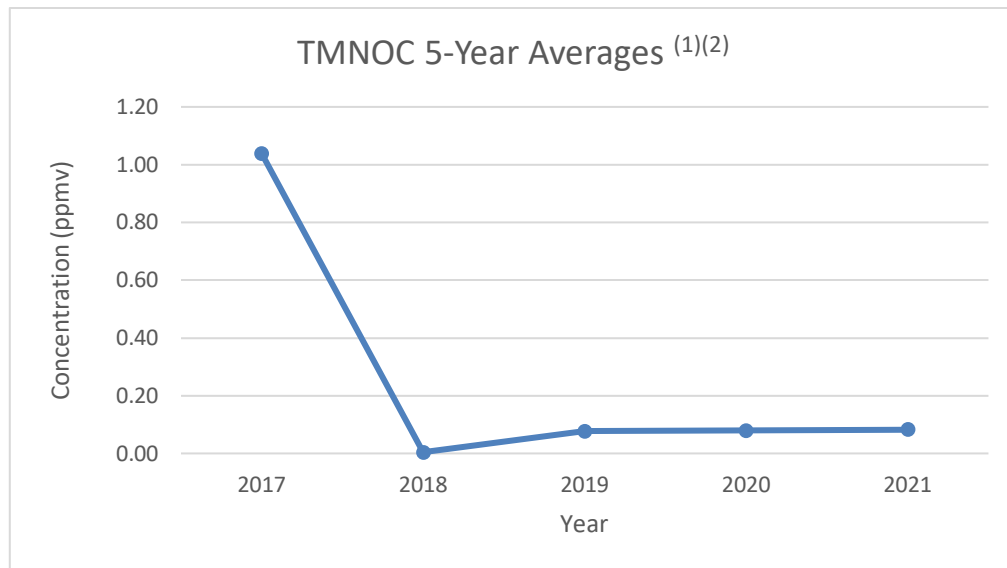
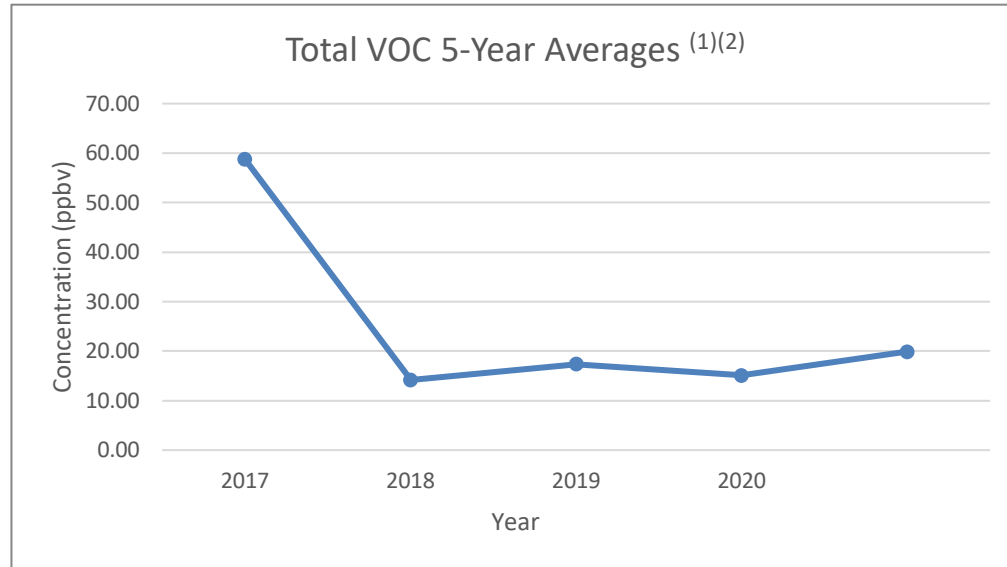
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Trevor Lewis
Trevor.Lewis@ghd.com
587.991.2378

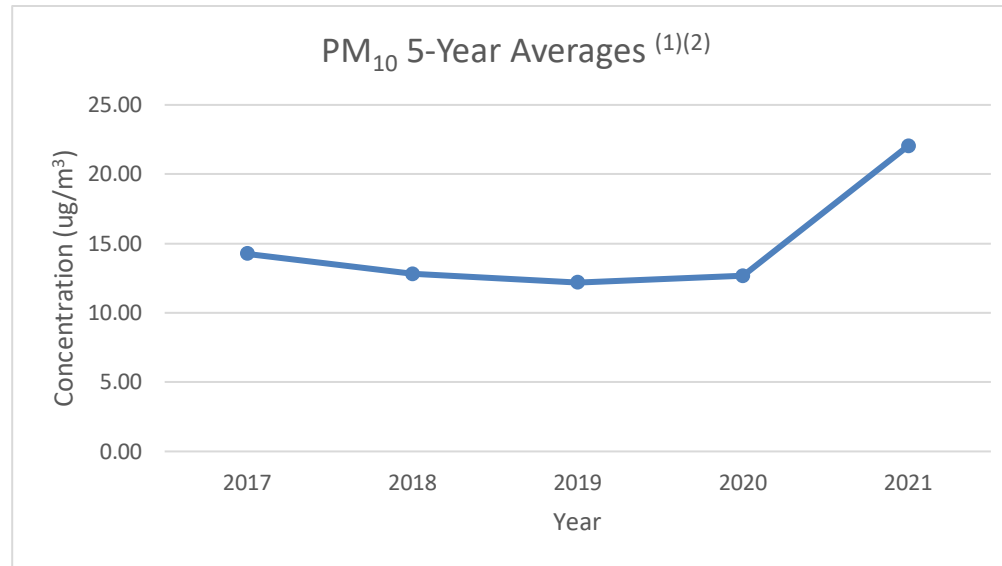
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Appendix C
5-Year Averages for PM10, VOC and
TNMOC Concentrations

Appendix B
5 Year Average Charts



Appendix B
5 Year Average Charts



- Notes:
- (1) All values under the lab method detection limit from 2015-2018 were reported as zero, as per the AMD.
 - (2) Values under the lab method detection limit from 2019 onward were reported as the lab detection limit, as per updated guidance provided by the AEP.



about GHD

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Trevor Lewis

Trevor.lewis@ghd.com
403.271.2000

Pooya Shariaty

Pooya.shariaty@ghd.com
403.271.2000

www.ghd.com