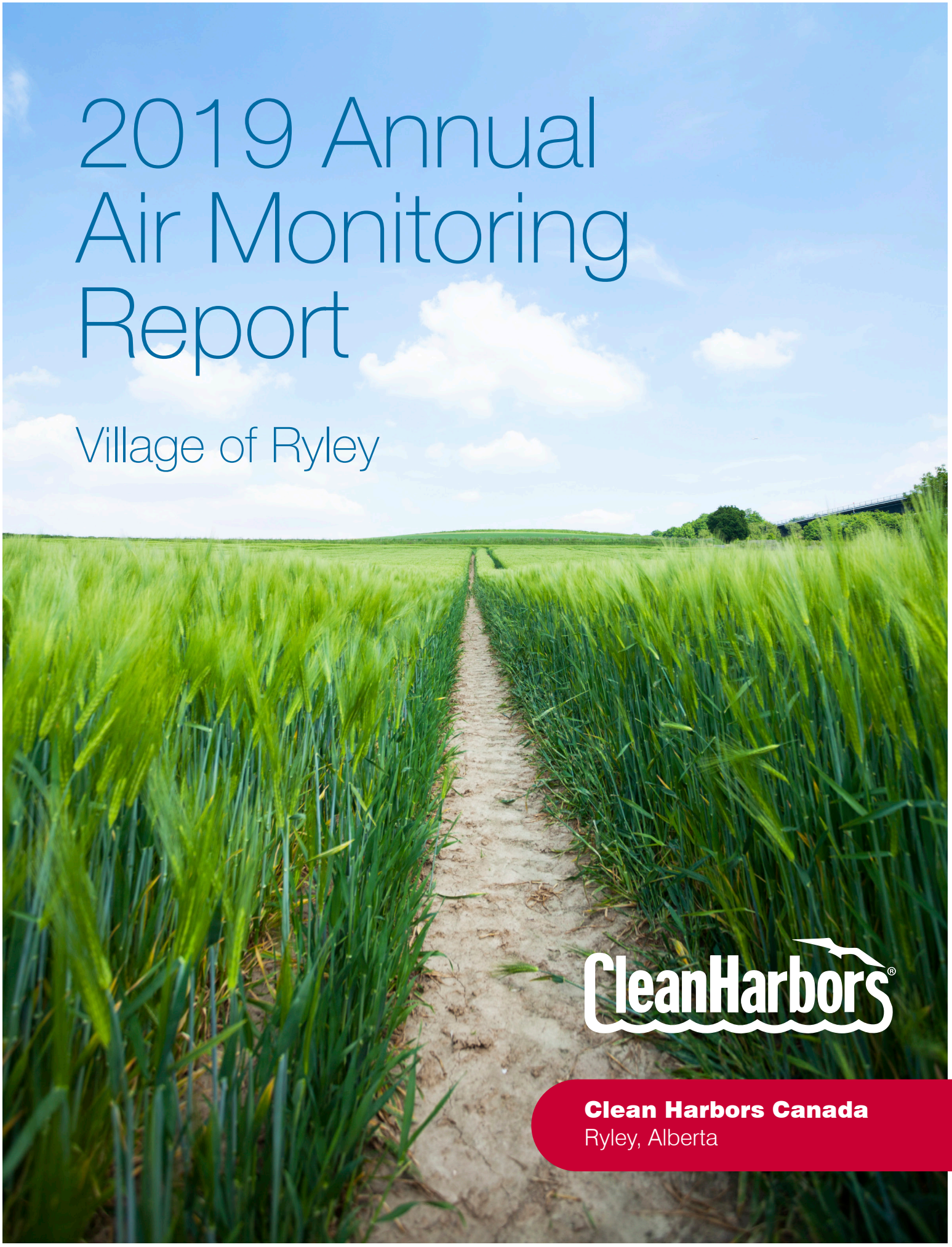
2019 Annual Air Monitoring Report

Village of Ryley



Clean Harbors Canada
Ryley, Alberta

about Clean Harbors

Clean Harbors is one of North America's leading providers of environmental, energy and industrial services, serving a diverse customer base that includes many of North America's leading companies and numerous federal and provincial government agencies. Services that Clean Harbors provides include hazardous material management and disposal, industrial cleaning, used oil recycling and re-refining, and various other technical and environmental services.

The Clean Harbors facility in Ryley, Alberta is classified as a hazardous waste transfer station and landfill. This Facility receives waste from a variety of customers, including oil companies, chemical producers, and other manufacturers. The materials received at the landfill include oils, spent solvents, paint residues, process fluids, and various other types of materials. The materials are stored on-site, and then disposed within the landfill.

Environmental and Social Commitment

Clean Harbors is committed to providing services in a safe and environmentally and socially responsible way. As part of this commitment, Clean Harbors has developed and implemented several programs to ensure that the Facility is compliant with all regulatory requirements. These programs include:

- Village of Ryley Air Monitoring Program
- Odour Response Program
- Groundwater Monitoring Program
- Health and Safety Program
- Emergency Response Program
- Dust Suppression Program

As an active member of the Ryley community, we provide annual updates on the Air Monitoring Program that is conducted and reach out to community members who are interested in learning more or have any questions about the Facility.

overview

Ryley Community Air Monitoring Program

Clean Harbors is required by Alberta Environment and Parks (AEP) to conduct ambient air monitoring to measure the concentration of key compounds off-site such as particulate matter, metals, and volatile organic compounds (VOCs). Currently, AEP requires the monitoring to be conducted at one monitoring station that is located along Highway 854, southeast of the Facility.

Clean Harbors goes above and beyond the minimum requirements to conduct a community Air Monitoring Program that is designed specifically to evaluate the ambient air impacts of Facility operations on the Village of Ryley. The details of this program are presented in the Air Monitoring Program for the Village of Ryley (June 2013).

- **FACILITY AIR MONITORING STATION (BACKGROUND):** This air monitoring station is located on the Facility's administration building (northeast part of Facility) and is intended to collect background ambient air data.
- **RYLEY SCHOOL:** This air monitoring station is located at the Ryley School and is intended to collect data when the wind is blowing directly from the Facility towards the Village of Ryley (i.e. from the northeast to southwest).

FIGURE 1.
Site Location Map

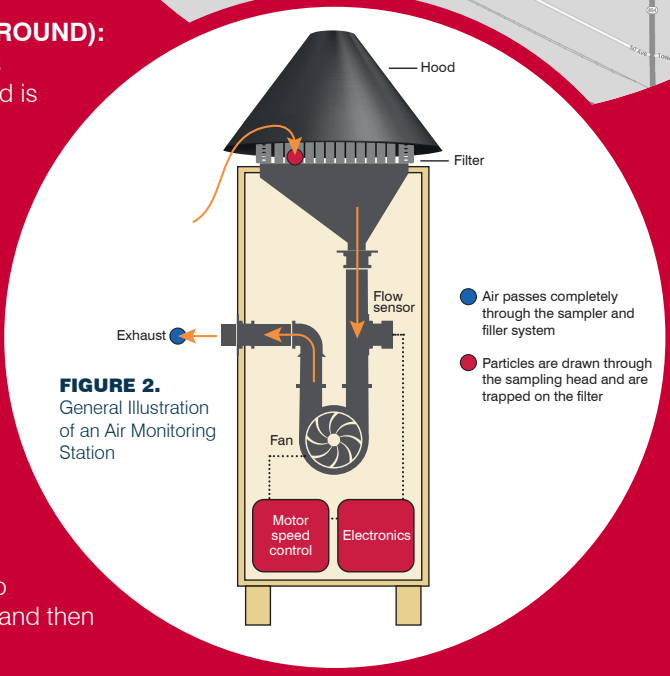


FIGURE 2.
General Illustration of an Air Monitoring Station

Air Sampling Methodology

A sample of ambient air is drawn into the air monitoring station at a certain flow rate and time period, in this case, 24-hours. A specially designed filter installed in the air monitoring station collects the particulates in the air sample. The filter is then sent to a local laboratory for analysis. The filter is weighed to determine the amount of particulates in the air sample and then analysed for metals.

The two air monitoring stations are linked such that the stations only collect air samples when the wind direction is oriented in a northeast to southwest direction and the wind speed is greater than 5 km/hour. This is the only situation when airborne particulates from landfill operations could potentially impact the Village of Ryley (i.e. source-receptor relationship). This is illustrated on Figure 1.

results

2019 Air Monitoring Data

The results from the air monitoring program conducted in 2019 are presented as follows:

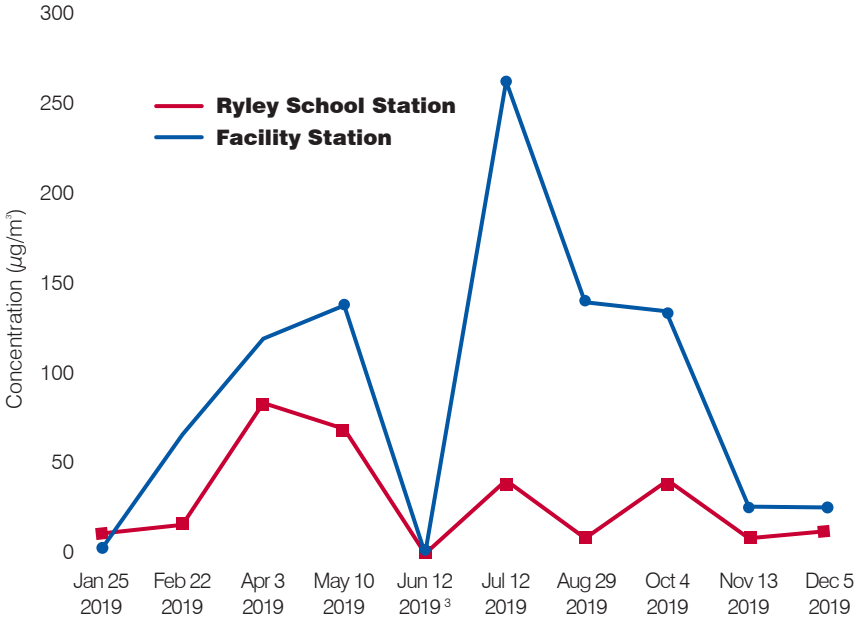


FIGURE 3. 2019 Particulate Concentrations

Date	Facility Station		Ryley School Station	
	Total Suspended Particles[2]	Total Metals[2]	Total Suspended Particles[2]	Total Metals[2]
Jan 25, 2019	**4.34**	**7.75**	**11.75**	**4.66**
Feb 22, 2019	**67.34**	**3.04**	**16.14**	**0.19**
Apr 3, 2019	**120.28**	**4.01**	**83.03**	**1.99**
May 10, 2019	**138.74**	**7.00**	**68.95**	**8.11**
Jun 12, 2019	—	—	—	—
Jul 12, 2019	**262.99**	**9.28**	**40.73**	**5.90**
Aug 29, 2019	**140.99**	**8.31**	**10.15**	**4.54**
Oct 4, 2019	**135.02**	**2.31**	**39.88**	**7.21**
Nov 13, 2019	**26.98**	**0.91**	**9.23**	**5.65**
Dec 5, 2019	**26.58**	**12.73**	**14.21**	**10.63**
Average	**102.59**	**6.15**	**32.67**	**5.43**

1. *Appendix A provides a detailed table with the particulate and metal results*
2. *Measured in µg/m³ – micrograms per cubic metres.*
3. *The missing data on the chart is due to sampling issues that resulted in a sampling time less than the required 12 hours, therefore the samples could not be used*

FIGURE 4. Summary of Analytical Results

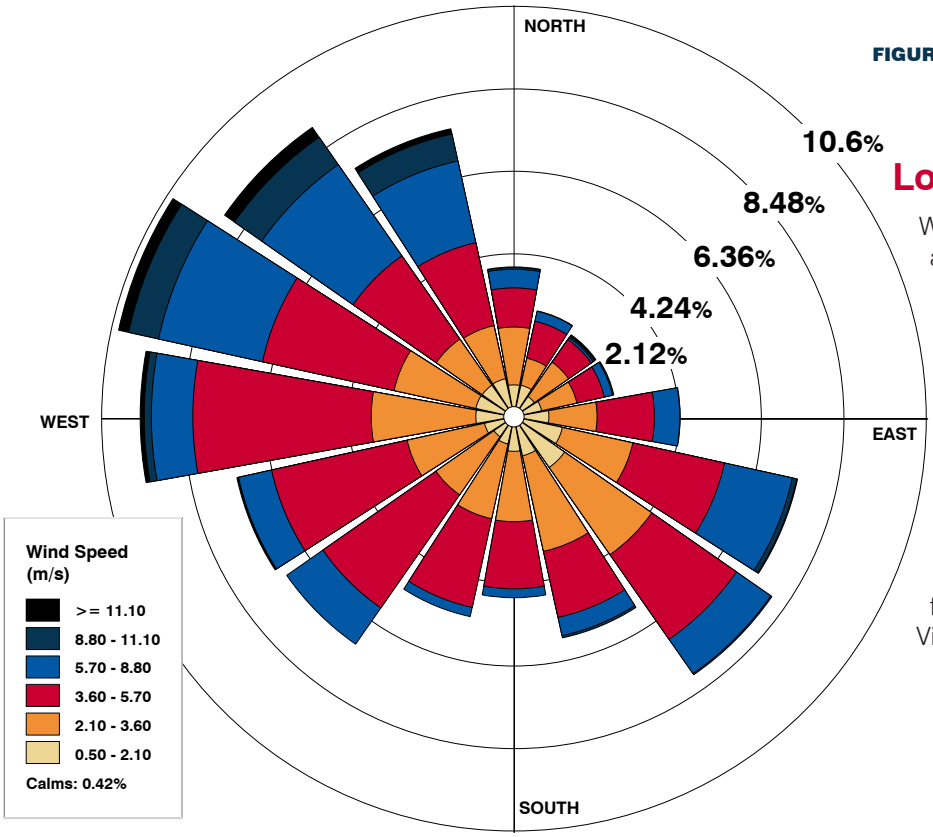


FIGURE 5. Wind Rose for 2019 Calendar Year

Localized Wind Trends

Wind direction and wind data is collected to assess how airborne particulates migrate from one location to another. The data collected in 2019 is presented in the illustration to the left called a "Wind Rose" diagram.

In 2019, the prevailing wind direction around the Facility and Village of Ryley is from the northwest to the southeast. The data suggests that winds from the northeast to southwest occur less frequently and therefore, less potential for particulates from the Facility operations to migrate to the Village of Ryley.

what do the results mean?

1. In Alberta, when evaluating ambient air quality, concentrations of airborne contaminants are compared with the Alberta Ambient Air Quality Objectives (AAAQO). AAAQO provides objectives or guidelines on what is an acceptable limit for various airborne contaminants. For example, the limit for TSP is 100 micrograms per cubic metre ($\mu g/m^3$) over a 24 hour averaging period.

2. Due to an equipment malfunction during the sampling period between June and July, the sample time was less than the 12 hours required. Because of this issue, the sample was discarded and the data was not used.

3. In 2019 (10) samples were collected at the Ryley School and facility. The concentrations of TSP measured at the Ryley School were below the AAAQO limited of 100 $\mu g/m^3$ for all of the samples collected. The concentrations ranged from 9.23 $\mu g/m^3$ to 83.03 $\mu g/m^3$.

4. There were four (4) periods in April, May, August and October where the TSP concentrations were over 100 $\mu g/m^3$ at the facility (background location). This suggests that the background concentrations are being impacted by sources both on-site and off-site (i.e. construction, major road, agricultural land, etc.). The concentrations ranged from 4.34 $\mu g/m^3$ to 262.99 $\mu g/m^3$.

5. A trend is observed between the background TSP concentrations measured at the Facility and the TSP concentrations measured at the Ryley School. In Figure 3, generally the concentrations measured at the Ryley School follow the same pattern as the background concentrations.

6. There are also AAAQO limits for certain airborne metals including arsenic, chromium, lead, and nickel. However, these limits are provided for annual averaging periods or averaging periods of 1-hour instead of 24-hours (which the samples were collected over). For comparison purposes, the concentrations of these metals measured at the Ryley School were below the AAAQO limits for these metals.

Clean Harbors would like to thank the Village of Ryley for reviewing this annual report.
Please check back regularly for updates and information about our Facility.

For more information:

Stan Yuha
Facility Manager, Clean Harbors
PO Box 390, Ryley, AB
phone: 780-663-2509

Appendix A

Appendix A
2019 Analytical Results

Analytical results are reported to a varying degree of significant figures. This table aligns results with the AAAQO limits.

Test Number		Test 1		Test 2		Test 3		Test 4	
Starting Date		25-Jan-19	25-Jan-19	22-Feb-19	22-Feb-19	3-Apr-19	3-Apr-19	10-May-19	10-May-19
Location		Ryley Facility	Ryley School	Ryley Facility	Ryley School	Ryley Facility	Ryley School	Ryley Facility	Ryley School
Run Time in hours		24.92	28.79	25.32	25.24	25.08	26.23	24.86	26.10
Flow Rate m^3/hour		73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92
Volume in m^3		1841	2127	1871	1865	1854	1939	1838	1929
Concentration (µg/m³)	**AAAQO Limit (µg/m³)** [5]								
Antimony	NA [7]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic	0.01 (Annual Average)	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00
Barium	NA	2.10	1.05	ND	ND	nd	5.36	5.88	6.43
Beryllium	NA	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00
Boron	NA	4.19	2.48	1.30	ND	1.75	6.70	3.54	5.91
Cadmium	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chromium	1.00 (1-Hour Average)	0.00	0.00	0.01	ND	0.01	0.00	0.02	0.01
Cobalt	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	NA	0.03	0.24	0.08	0.02	0.10	0.16	0.07	0.11
Iron	NA	0.10	0.20	1.61	0.18	2.13	1.82	3.33	2.07
Lead	1.50 (1-Hour Average)	0.01	0.00	0.02	ND	0.01	0.00	0.02	0.00
Mercury	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel	0.05 (Annual Average)	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
Particulate Weight		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	NA	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00
Silver	NA	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00
Thallium	NA	0.00	ND	0.00	ND	0.00	0.00	0.00	0.00
Uranium	NA	ND	ND	ND	ND	0.00	0.00	0.00	0.00
Vanadium	NA	0.00	0.00	0.01	0.00	0.01	0.00	0.02	0.00
Zinc	NA	1.33	0.67	ND	ND	1.97	5.83	2.21	5.70
Zirconium	NA	ND	0.00	ND	ND	nd	ND	0.02	0.02
Sum of Metals		7.75	4.66	3.04	0.19	4.01	1.99	7.00	8.11
Total suspended Particulates [3][4]		4.34	11.75	67.34	16.14	120.28	83.03	138.74	68.95

Notes:

(1) During Test 6, the vacuum motor on the high volume sampler located at the school failed and as a result the instrument did not complete at least a 12 hour sampling period. Therefore, these results are not presented in this table.

(2) During Test 7, neither high volume sampler ran the full 24 hour cycle but both were greater than 12 hours and are represented in the table

(3) TSP = Total Suspended Particulates. The Alberta Environment air quality objective for TSP is 100 micrograms per cubic metre (µg/m3) over a 24 hour period.

(4) TSP is a generic term for airborne particles including smoke, dust, fly ash, and pollen. Composition varies with place and season but normally includes soil and dust particulates, organic matter and nongaseous sulphur and Nitrogen compounds. Their diameter range varies in size from approximately 0.1 to 100 microns (millionth of a metre)

(5) µg/m^3 = micrograms per cubic meter

(6) ND = Non-detect

(7) NA = Non Applicable

(8) Minimum values are the smallest values above the detection limit

(9) Averages are taken with the assumption that any values below the detection limit are zero, as per the AMD

Appendix A
2019 Analytical Results

Analytical results are reported to a varying degree of significant figures. This table aligns results with the AAAQO limits.

Test Number		Test 5		Test 6[1]		Test 7		Test 8	
Starting Date		12-Jun-19	12-Jun-19	12-Jul-19	12-Jul-19	29-Aug-19	29-Aug-19	4-Oct-19	4-Oct-19
Location		Ryley Facility	Ryley School	Ryley Facility	Ryley School	Ryley Facility	Ryley School	Ryley Facility	Ryley School
Run Time in hours		25.01	6.65	13.02	16.05	24.85	51.32	25.15	30.26
Flow Rate m^3/hour		73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92
Volume in m^3		1849	491	962	1186	1837	3793	1859	2234
Concentration (µg/m^3)	**AAAQO Limit (µg/m^3)** [5]								
Antimony	NA [7]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic	0.01 (Annual Average)	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00
Barium	NA	ND	ND	ND	ND	ND	2.69	ND	ND
Beryllium	NA	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00
Boron	NA	0.00	0.00	1.27	5.14	3.32	3.95	ND	6.36
Cadmium	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chromium	1.00 (1-Hour Average)	0.00	0.00	0.02	0.00	0.01	0.00	0.01	0.00
Cobalt	NA	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Copper	NA	0.00	0.00	0.34	0.08	0.17	0.07	0.17	0.08
Iron	NA	0.00	0.00	7.53	0.67	4.10	0.52	2.10	0.76
Lead	1.50 (1-Hour Average)	0.00	0.00	0.04	0.00	0.01	0.00	0.01	0.00
Mercury	NA	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00
Nickel	0.05 (Annual Average)	0.00	0.00	0.03	0.00	0.01	0.00	0.01	0.00
Particulate Weight		0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	NA	ND	ND	ND	ND	ND	0.00	ND	ND
Silver	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thallium	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uranium	NA	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00
Vanadium	NA	0.00	0.00	0.04	0.00	0.02	0.00	0.01	0.00
Zinc	NA	ND	ND	ND	ND	0.66	2.36	ND	ND
Zirconium	NA	ND	ND	ND	ND	ND	ND	ND	ND
Sum of Metals		0.00	0.00	9.28	5.90	8.31	4.54	2.31	7.21
Total suspended Particulates [3][4]		0.00	0.00	262.99	40.73	140.99	10.15	135.02	39.88

Notes:

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Appendix A
2019 Analytical Results

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Test Number		Test 9		Test 10	
Starting Date		13-Nov-19	13-Nov-19	5-Dec-19	5-Dec-19
Location		Ryley Facility	Ryley School	Ryley Facility	Ryley School
Run Time in hours		25.06	27.14	25.10	26.09
Flow Rate m^3/hour		73.92	73.92	73.92	73.92
Volume in m^3		1853	2005	1855	1928
Concentration (µg/m^3)	**AAAQO Limit (µg/m^3)** [5]				
Antimony	NA [7]	0.00	0.00	0.00	0.00
Arsenic	0.01 (Annual Average)	0.00	0.00	0.00	0.00
Barium	NA	1.32	1.83	1.54	0.53
Beryllium	NA	0.00	ND	ND	ND
Boron	NA	4.17	5.44	9.65	9.28
Cadmium	NA	0.00	0.00	0.00	0.00
Chromium	1.00 (1-Hour Average)	0.01	0.00	0.00	0.00
Cobalt	NA	0.00	0.00	0.00	0.00
Copper	NA	0.20	0.09	0.10	0.06
Iron	NA	0.67	0.12	0.33	0.11
Lead	1.50 (1-Hour Average)	0.02	0.00	0.01	0.00
Mercury	NA	0.00	0.00	0.00	0.00
Nickel	0.05 (Annual Average)	0.01	0.00	0.00	0.00
Particulate Weight		0.00	0.00	0.00	0.00
Selenium	NA	0.00	0.00	0.00	0.00
Silver	NA	0.00	0.00	0.00	0.00
Thallium	NA	0.00	0.00	0.00	0.00
Uranium	NA	0.00	0.00	0.00	ND
Vanadium	NA	0.00	0.00	0.00	0.00
Zinc	NA	1.21	1.01	1.09	0.63
Zirconium	NA	ND	ND	0.00	0.00
Sum of Metals		0.91	5.65	12.73	10.63
Total suspended Particulates [3][4]		26.98	9.23	26.58	14.21

Notes:

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Appendix A
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Test Number		Maximum		Minimum [8]		Average [9]	
Starting Date			NA	NA	NA	NA	NA
Location		Ryley Facility	Ryley School	Ryley Facility	Ryley School	Ryley Facility	Ryley School
Run Time in hours		25.32	51.32	0.00	0.00	19.86	21.52
Flow Rate m^3/hour		73.92	73.92	0.00	0.00	61.60	60.48
Volume in m^3		1871	3793	0	0	1468	1590
Concentration (µg/m^3)	**AAAQO Limit (µg/m^3)** [5]						
Antimony	NA [7]	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic	0.01 (Annual Average)	0.00	0.00	0.00	0.00	0.00	0.00
Barium	NA	5.88	6.43	1.32	0.53	2.71	2.98
Beryllium	NA	0.00	0.00	0.00	0.00	0.00	0.00
Boron	NA	9.65	9.28	1.27	2.48	3.65	5.66
Cadmium	NA	0.00	0.00	0.00	0.00	0.00	0.00
Chromium	1.00 (1-Hour Average)	0.02	0.01	0.00	0.00	0.01	0.00
Cobalt	NA	0.01	0.00	0.00	0.00	0.00	0.00
Copper	NA	0.34	0.24	0.03	0.02	0.14	0.10
Iron	NA	7.53	2.07	0.10	0.11	2.43	0.72
Lead	1.50 (1-Hour Average)	0.04	0.00	0.01	0.00	0.02	0.00
Mercury	NA	0.00	0.00	0.00	0.00	0.00	0.00
Nickel	0.05 (Annual Average)	0.03	0.00	0.00	0.00	0.01	0.00
Particulate Weight		0.00	0.00	0.00	0.00	0.00	0.00
Selenium	NA	0.00	0.00	0.00	0.00	0.00	0.00
Silver	NA	0.00	0.00	0.00	0.00	0.00	0.00
Thallium	NA	0.00	0.00	0.00	0.00	0.00	0.00
Uranium	NA	0.00	0.00	0.00	0.00	0.00	0.00
Vanadium	NA	0.04	0.00	0.00	0.00	0.01	0.00
Zinc	NA	2.21	5.83	0.66	0.63	1.41	2.70
Zirconium	NA	0.02	0.02	0.00	0.00	0.01	0.01
Sum of Metals		12.73	10.63	0.91	0.19	6.15	5.43
Total suspended Particulates [3][4]		262.99	83.03	4.34	9.23	102.59	32.67

Notes:

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