

2018 Annual Air Monitoring Report

Village of Ryley

The logo for Clean Harbors, featuring the company name in a white, bold, sans-serif font. The word "Clean" is on the top line and "Harbors" is on the bottom line. A stylized white wave graphic is positioned below the word "Harbors".

CleanHarbors®

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.

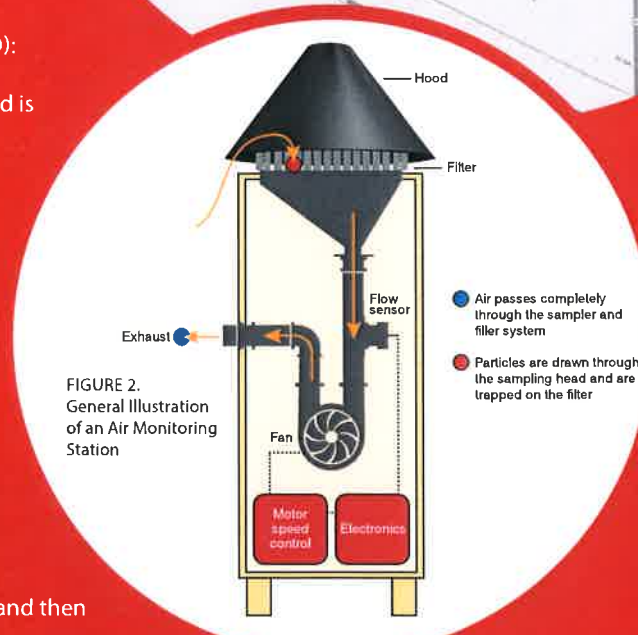
Clean Harbors goes above and beyond the minimum requirements to conduct a community Air Monitoring Program that is designed specifically to evaluate the ambient air impacts of Facility operations on the Village of Ryley. The details of this program are presented in the Air Monitoring Program for the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

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

2018 Air Monitoring Data

The results from the air monitoring program conducted in 2018 are presented as follows:

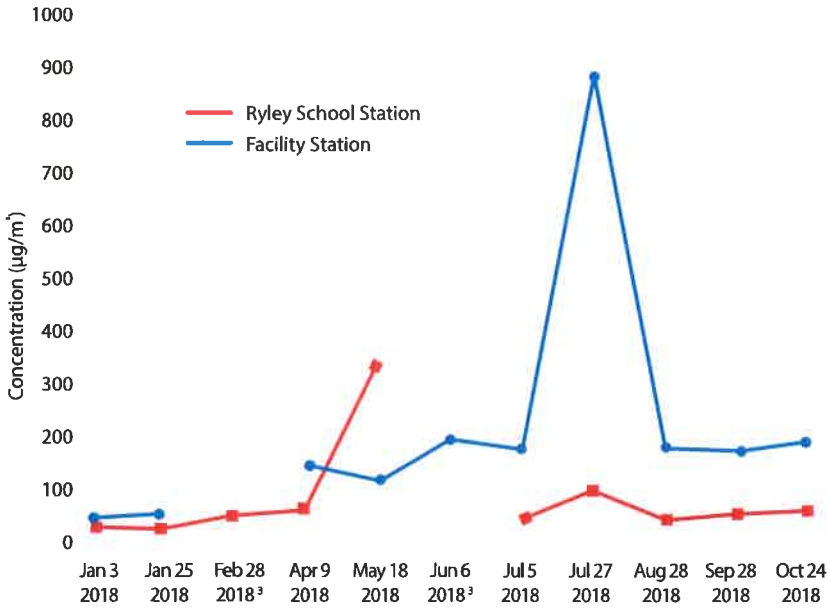
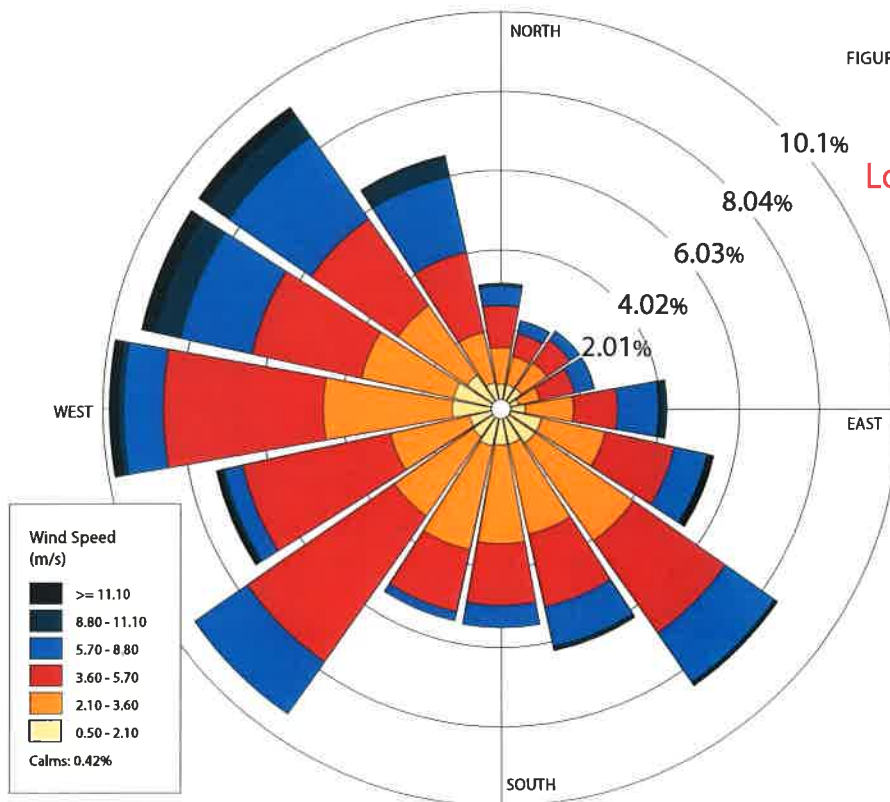


FIGURE 3. 2018 Particulate Concentrations

Date	Facility Station		Ryley School Station	
	Total Suspended Particles ¹	Total Metals ²	Total Suspended Particles ¹	Total Metals ²
Jan 3 2018	42.00	19.75	22.11	20.44
Jan 25 2018	49.84	6.21	22.56	0.45
Feb 28 2018	—	—	46.91	0.69
Apr 9 2018	146.75	4.19	60.05	2.55
May 8 2018	110.69	5.34	342.96	2.66
Jun 6 2018	195.44	17.36	—	—
Jul 5 2018	173.66	12.95	43.48	2.53
Jul 27 2018	882.03	13.08	97.67	2.95
Aug 28 2018	175.64	0.82	38.08	1.56
Sep 18 2018	173.66	0.81	50.10	2.05
Oct 24 2018	192.33	1.09	59.55	1.62
Average	214.20	8.16	78.35	3.75

- Appendix A provides a detailed table with the particulate and metal results
- Measured in $\mu\text{g}/\text{m}^3$ – micrograms per cubic metres.
- In the months of February and June, equipment issues caused sampling times less than the required 12 hours. Because of this, the samples were discarded and the data was not used.

FIGURE 4. Summary of Analytical Results



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 2018 is presented in the illustration to the left called a “Wind Rose” diagram.

In 2018, 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.

FIGURE 5. Wind Rose for 2018 Calendar Year



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 ($\mu\text{g}/\text{m}^3$) over a 24 hour averaging period.
- 2 Due to equipment malfunctions during the sampling periods in February and June, the sample times were less than the 12 hours required. Because of these issues, the samples were discarded and the data was not used.
- 3 In 2018, (11) samples were collected at the Ryley School and facility. The concentrations of TSP measured at the Ryley School were below the AAAQO limited of $100 \mu\text{g}/\text{m}^3$ for all but one of the samples collected (May). The concentrations ranged from $22.11 \mu\text{g}/\text{m}^3$ to $342.96 \mu\text{g}/\text{m}^3$.
- 4 There were eight (8) periods in April, May, June, July (2), August, September and October where the TSP concentrations were over $100 \mu\text{g}/\text{m}^3$ 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.)
- 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. Two anomalies occur in this trend, one in the month of May and one in the month of July. In May of 2018, TSP concentrations at the school rose to $342.96 \mu\text{g}/\text{m}^3$ while the facility only reached $110.69 \mu\text{g}/\text{m}^3$. This spike at the school sampler was most likely from an external source, as only 10% of the wind occurred in the Northeast to Southwest direction during the month. In addition, the particulate concentrations decrease as they travel so the school would not have seen as high of concentrations if they were caused by the facility. During the month of July, the Facility station saw a large spike in TSP concentrations ($882.03 \mu\text{g}/\text{m}^3$) while the school did not ($97.67 \mu\text{g}/\text{m}^3$). This was most likely caused by road construction near the facility, which created large amounts of dust and particulates.
- 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:

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Appendix A

Appendix A 2018 Analytical Results

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

Test Number	Test 1			Test 2			Test 3 ⁽¹⁾			Test 4	
	Starting Date	3-Jan-18	3-Jan-18	25-Jan-18	25-Jan-18	28-Feb-18	28-Feb-18	28-Feb-18	28-Feb-18	9-Apr-18	9-Apr-18
Location	Ryley Facility	Ryley School	Ryley Facility	Ryley Facility	Ryley School	Ryley Facility	Ryley School	Ryley Facility	Ryley School	Ryley Facility	Ryley School
Run Time in hours	24.93	26.00	25.11	25.60	25.60	1.78	28.05	24.80	28.05	24.80	25.92
Flow Rate m ³ /hour	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92
Volume in m ³	1843	1922	1856	1875	1875	132	1936	1833	1936	1833	1915
Concentration (µg/m ³)	AAAQO Limit (µg/m ³) ⁽⁵⁾										
Antimony	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic	0.00	0.00	0.00	ND ⁽⁶⁾	ND ⁽⁶⁾	ND	ND	ND	ND	0.00	0.00
Barium	9.06	9.31	0.44	ND	ND	ND	ND	ND	ND	ND	ND
Beryllium	0.00	0.00	0.00	ND	ND	0.00	0.00	0.00	0.00	0.00	0.00
Boron	2.43	4.44	2.63	ND	ND	18.48	ND	0.22	ND	0.22	1.27
Cadmium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chromium	0.02	0.00	0.01	0.00	0.00	0.05	0.00	0.01	0.00	0.01	0.00
Cobalt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	0.15	0.18	0.22	0.16	0.16	0.44	0.18	0.16	0.18	0.16	0.16
Iron	1.40	0.35	1.10	0.08	0.08	6.74	0.50	3.73	0.50	3.73	1.11
Lead	0.05	0.00	0.03	0.00	0.00	0.16	0.00	0.02	0.00	0.02	0.00
Mercury	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel	0.01	0.00	0.01	0.00	0.00	0.03	0.00	0.02	0.00	0.02	0.00
Selenium	0.00	0.00	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00
Silver	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thallium	0.00	0.00	0.00	ND	ND	ND	ND	ND	ND	ND	0.00
Uranium	0.00	0.00	0.00	ND	ND	0.00	ND	0.00	ND	0.00	0.00
Vanadium	0.01	0.00	0.01	0.00	0.00	0.05	0.00	0.02	0.00	0.02	0.00
Zinc	6.62	6.14	1.75	0.22	0.22	ND	ND	ND	ND	ND	ND
Zirconium	0.01	0.00	ND	ND	ND	0.02	0.00	ND	0.00	ND	ND
Sum of Metals	19.75	20.44	6.21	0.45	0.45	25.98	0.69	4.19	0.69	4.19	2.55
Total suspended Particulates ⁽³⁾⁽⁴⁾	42.00	22.11	49.84	22.56	22.56	411.36	46.91	146.75	46.91	146.75	60.05

Notes:

- (1) During Test 3, the vacuum motor on the high volume sampler located at the facility failed 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 6, the school sampler only ran for 11 hours and 47 minutes while the facility completed its 24 hour cycle. The station was confirmed to be working properly when the sample was collected
- (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/m³ = 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 2018 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 ²			Test 7			Test 8	
	8-May-18	8-May-18	6-Jun-18	6-Jun-18	6-Jun-18	5-Jul-18	5-Jul-18	5-Jul-18	27-Jul-18	27-Jul-18	27-Jul-18
Starting Date	Ryley Facility	Ryley School	Ryley Facility	Ryley Facility	Ryley School	Ryley Facility	Ryley School	Ryley Facility	Ryley School	Ryley Facility	Ryley School
Location	24.81	25.76	24.91	24.91	11.79	25.16	33.91	25.00	33.91	25.00	56.80
Run Time in hours	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92
Flow Rate m ³ /hour	1834	1904	1842	1842	871	1860	2507	1848	2507	1848	4198
Volume in m ³											
Concentration (µg/m³)	AAAQO Limit (µg/m³)⁽⁵⁾										
Antimony	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium	ND	ND	0.88	0.88	ND	2.30	ND	ND	ND	ND	ND
Beryllium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron	1.33	0.21	12.05	12.05	25.03	4.37	2.27	ND	2.27	ND	1.45
Cadmium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chromium	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.02	0.00	0.02	0.00
Cobalt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
Copper	0.14	0.16	0.18	0.18	0.19	0.16	0.18	0.12	0.18	0.12	0.20
Iron	3.81	2.27	3.52	3.52	1.97	3.88	0.07	12.77	0.07	12.77	1.28
Lead	0.02	0.00	0.02	0.02	0.00	0.02	0.00	0.05	0.00	0.05	0.00
Mercury	0.00	0.00	ND	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.04	0.00	0.04	0.00
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	0.00	0.00	ND	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thallium	0.00	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00
Uranium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vanadium	0.02	0.01	0.02	0.02	0.00	0.02	0.00	0.06	0.00	0.06	0.00
Zinc	ND	ND	0.66	0.66	ND	2.18	ND	ND	ND	ND	ND
Zirconium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sum of Metals	5.34	2.66	17.36	17.36	27.21	12.95	2.53	13.08	2.53	13.08	2.95
Total suspended Particulates ⁽⁶⁾⁽⁴⁾	110.69	342.96	195.44	195.44	98.97	173.66	43.48	882.03	43.48	882.03	97.67

Notes:

- (1) During Test 3, the vacuum motor on the high volume sampler located at the facility failed 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 6, the school sampler only ran for 11 hours and 47 minutes while the facility completed it's 24 hour cycle. The station was confirmed to be working properly when the sample was collected
- (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/m³ = 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 2018 Analytical Results

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

Test Number	Test 9			Test 10			Test 11		
	Starting Date	28-Aug-18	28-Aug-18	28-Sep-18	28-Sep-18	28-Sep-18	24-Oct-18	24-Oct-18	24-Oct-18
Location	Ryley Facility	Ryley School	Ryley School	Ryley Facility	Ryley School	Ryley School	Ryley Facility	Ryley Facility	Ryley School
Run Time in hours	24.89	34.90	34.90	25.16	26.52	26.52	25.75	27.13	27.13
Flow Rate m ³ /hour	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92
Volume in m ³	1839	2579	2579	1860	1960	1960	1903	1931	1931
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	ND	0.00	ND	ND	0.00	0.00	0.00
Barium	NA	ND	ND	ND	ND	ND	ND	ND	ND
Beryllium	NA	0.00	ND	0.00	ND	ND	0.00	0.00	0.00
Boron	NA	ND	1.43	ND	1.89	1.89	ND	1.14	1.14
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	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	NA	0.04	0.04	0.04	0.04	0.05	0.03	0.07	0.07
Iron	NA	0.76	0.09	0.75	0.11	0.11	1.05	0.41	0.41
Lead	1.50 (1-Hour Average)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00
Selenium	NA	0.00	0.00	0.00	0.00	0.00	ND	ND	ND
Silver	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thallium	NA	ND	ND	ND	ND	ND	0.00	0.00	0.00
Uranium	NA	0.00	ND	0.00	ND	ND	0.00	0.00	0.00
Vanadium	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc	NA	ND	ND	ND	ND	ND	ND	ND	ND
Zirconium	NA	ND	ND	ND	ND	ND	ND	ND	ND
Sum of Metals		0.82	1.56	0.81	2.05	2.05	1.09	1.62	1.62
Total suspended Particulates ⁽⁸⁾⁽⁹⁾		175.64	38.08	173.66	50.10	50.10	192.33	59.55	59.55

Notes:

- (1) During Test 3, the vacuum motor on the high volume sampler located at the facility failed as a result the instrument did not complete at least a 12 hour sampling period. Therefore, these results are not presented in this table.
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Appendix A 2018 Analytical Results

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Test Number	Maximum ⁽⁸⁾			Minimum ⁽⁸⁾			Average ⁽⁹⁾									
	Starting Date	Location	Run Time in hours	Flow Rate m ³ /hour	Volume in m ³	Concentration (µg/m ³)	AAAQO Limit (µg/m ³) ⁽⁵⁾	NA	Ryley Facility	NA	Ryley School	NA	Ryley Facility	NA	Ryley School	NA
Antimony						0.00	NA ⁽⁷⁾	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic						0.00	0.01 (Annual Average)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium						9.06	NA	9.31	0.44	9.31	9.31	0.93	1.15	0.00	0.93	0.00
Beryllium						0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron						18.48	NA	25.03	0.22	0.21	0.21	3.56	3.77	0.00	3.56	0.00
Cadmium						0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chromium						0.05	1.00 (1-Hour Average)	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Cobalt						0.01	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper						0.44	NA	0.20	0.03	0.04	0.04	0.14	0.15	0.00	0.14	0.00
Iron						12.77	NA	2.27	0.75	0.07	0.07	0.75	3.59	0.00	0.75	0.00
Lead						0.16	1.50 (1-Hour Average)	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
Mercury						0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel						0.04	0.05 (Annual Average)	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Selenium						0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silver						0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thallium						0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uranium						0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vanadium						0.06	NA	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
Zinc						6.62	NA	6.14	0.66	0.22	0.22	0.58	1.02	0.00	0.58	0.00
Zirconium						0.02	NA	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum of Metals						25.98		27.21	0.81	0.45	0.45	6.31	9.78	0.00	6.31	0.00
Total suspended Particulates ⁽³⁾⁽⁴⁾						882.03		342.96	42.00	22.11	22.11	84.44	232.13	0.00	84.44	0.00

Notes:

- (1) During Test 3, the vacuum motor on the high volume sampler located at the facility failed 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 6, the school sampler only ran for 11 hours and 47 minutes while the facility completed its 24 hour cycle. The station was confirmed to be working properly when the sample was collected
- (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/m³ = 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