



2016 Annual Report



Western Yellowhead
Air Management Zone

Prepared by:
Air & Climate Business Unit - Environment Division
Saskatchewan Research Council
125 – 15 Innovation Blvd.
Saskatoon, SK S7N 2X8
Tel: 306-933-5400
Fax: 306-933-7817

For more information, please contact:
Terry Gibson
Executive Director
Western Yellowhead Air Management Zone
Phone: 306.491.9198
Email: wyamz@sasktel.net

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List of Terms and Definitions

24-hour	A calendar day, average is calculated midnight-to-midnight
8-hour	8-hour running average for O ₃ Canada-Wide Standards
SAAQS	Saskatchewan Ambient Air Quality Standard
AQHI	Air Quality Health Index
AQI	Air Quality Index
CAAQS	Canadian Ambient Air Quality Standard
Calm	1-hour average wind speed lower than 1 km/hour
CO	Carbon monoxide
H ₂ S	Hydrogen sulphide
NH ₃	Ammonia
NO ₂	Nitrogen dioxide
NO	Nitric oxide
NO _x	Oxides of nitrogen
O ₃	Ozone
PM _{2.5}	Particulate matter with aerodynamic diameter less than 2.5 µm, referred to as fine or respirable particles
RH	Relative humidity
SO ₂	Sulphur dioxide
WD	Wind direction
WS	Wind speed

Units of Measurement

m/s	meter per second
km/hr	kilometer per hour
µg/m ³	microgram per cubic meter
ppb	part per billion by volume
mm	millimeter
°C	degrees Celsius
%	percent of relative humidity, instrument uptime, etc.
Degree	angle of wind direction from the north

MESSAGE FROM THE EXECUTIVE DIRECTOR

2016 was an excellent year for Western Yellowhead Air Management Zone (WYAMZ) and for air quality monitoring in the western Yellowhead region of Saskatchewan. Monitoring was made easier as we did not face the heavy smoke that was experienced in 2015. WYAMZ is very pleased to inform our members that seven (7) continuous air monitoring sites recording criteria air contaminant measurements are now operating in the region and providing real time data. Four of these stations are operated by WYAMZ. We also have the data from the two air monitoring stations operated and independently calibrated by Husky and the data from the National Air Pollution Surveillance Program (NAPS) Station in Saskatoon. We are exploring every opportunity to collaborate with other agencies in bringing additional monitoring into the region.

This monitoring initiative is multi-purpose. It: a) collects real time air quality data throughout the WYAMZ region, b) demonstrates companies are operating in a safe, environmentally sound manner that is enabling sustainable growth, and c) provides companies considering to invest in operations in Saskatchewan with data that shows it is a safe place to invest being that the air quality is well understood and not an impediment to growth. The credibility and strength of the continuous monitoring network is scientifically and financially sound. The continuous data is available live on the internet; it includes hourly concentrations of SO₂, H₂S, NO/NO₂/NO_x, PM_{2.5} and O₃. The data is available on the WYAMZ website: <http://www.wyamz.ca>

The WYAMZ Science Committee is currently reviewing the data gathered over the past three years and will make a determination of the positioning of the instruments and the equipment needs for our area.

We have and are continuing to communicate the work we do in many ways. When we do a presentation or place an article or a story in a newspaper we highlight our members wherever possible. We list our members on our website and do as much as we can to inform the public the names of our member companies. WYAMZ also encourages comments and questions from the public. This communication work is very important to WYAMZ and to its members.

Here are some of our recent and upcoming communication initiatives:

- CBC Radio, Saskatoon Star Phoenix, Lloydminster Meridian Booster interviews, Jan 2014
- Air Symposium in concert with SEIMA, Saskatoon Jan 2014
- Clean Air Day newspaper Campaign, Leader-Post and StarPhoenix, Wednesday June 4, 2014
- The Lloydminster Heavy Oil Show, Lloydminster September of 2014 and 2016. This once again provided us with an excellent showcase to inform the public of the work we do and highlight the names of our members and their participation in transparent reporting of air quality

- Saskatchewan Association of Rural Municipalities (SARM) the Councillor Newsletter Article
- In 2016 the WYAMZ Communications Committee and Board of Directors worked with a communications consultant to review our communications strategy, review our website and is looking at the possibility of utilizing social media such as Facebook and Twitter accounts in 2017.

All of these showcase the work we do and our members' involvement. It is important that the public is comfortable and welcoming of well-run industry in their municipalities as public acceptance plays a large role in helping to foster a business-friendly environment that promotes future industrial growth. Future plans include determining the need for additional air monitoring stations, development of more communication materials, presentations to municipalities, Chambers of Commerce, high school classes, home and school meetings, etc.

WYAMZ is pleased with the excellent response we received from our members. We have had a very good year financially and with our data monitoring capabilities. This is excellent news for the people of the western Yellowhead area of Saskatchewan and for all of our valued members. We now have data to help inform our decision making process. The Science committee will review all of this data and bring recommendations to the Board as to how we should proceed with managing our monitoring capabilities. The data will direct our decisions as to how to improve our monitoring network.

Real-time air monitoring data can be seen at www.wyamz.ca. Real time and long-term historical data that can be used to evaluate future development scenarios is available to WYAMZ members and can be obtained from WYAMZ by request.

Our objective is to collaboratively identify regional air quality issues, and to develop and operate appropriate monitoring programs. Through diverse stakeholder representation WYAMZ recognizes concerns specific to the region, and encourages solutions that are tailored to address the needs of its members. Our goal is to collect credible and defensible air quality data and provide excellent service to our members. WYAMZ thanks all of our members for their participation.

EXECUTIVE SUMMARY

The Western Yellowhead Air Management Zone (WYAMZ), established in 2012, was the second air management association operating in Saskatchewan. WYAMZ is a collaborative group of industry, government, non-government organizations, and private citizens. The WYAMZ design is in-line with the directive from the Canadian Council of Ministers of the Environment under the Canada-wide Air Quality Management System. The association is designed to collect credible, continuous real-time air quality information through collaborative efforts.

WYAMZ manages a continuous air monitoring network. The network consists of four airpointer® compact air monitoring stations near Kindersley, Maidstone, Meadow Lake and Unity. Two additional stations, located near Lloydminster, are operated by Husky Energy and provide data to WYAMZ. The stations measure real-time data, including hourly concentrations of sulphur dioxide (SO₂), hydrogen sulphide (H₂S), nitrogen oxides (NO/NO₂/NO_x), fine particulate matter (PM_{2.5}) and ozone (O₃), as well as precipitation, ambient temperature, relative humidity (RH), wind speed (WS) and wind direction (WD). The data can be viewed on the WYAMZ website (Reference 1).

Quarterly calibrations and routine maintenance were performed in accordance with a Quality Assurance Plan provided to WYAMZ by contractors responsible for the maintenance, calibration and data management for the airshed. Calibrations were performed in February, May, July-August, and October-November of 2016.

The measured air quality was within the Saskatchewan Ambient Air Quality Standards (SAAQS) (Reference 3), with the exception of H₂S and PM_{2.5}. There were a total of 9 exceedance events for 1-hour average H₂S, 2 exceedance events for 24-hour average H₂S, and 17 exceedance events for 24-hour average PM_{2.5}. The air quality within the WYAMZ network was rated Low Risk or Good for more than 97% of the time according to both the Air Quality Health Index-rated stations and the Air Quality Index-rated stations.

Annual average concentrations for the monitored parameters at each station are contained in Table ES-1. Detailed monthly and annual instrument uptimes can be found in the station summary tables in Appendices B-E.

Table ES-1 Annual Average Concentrations for Continuous Parameters for 2016

Pollutant	Conc. Unit	Annual Average Concentrations for Continuous Data			
		Meadow Lake	Maidstone	Unity	Kindersley
SO ₂	ppb	^a	0.4	^a	0.2
H ₂ S	ppb	^a	0.5	^a	0.4
NO	ppb	0.3	1.1	0.6	^a
NO ₂	ppb	0.9	3.6	2.3	^a
NO _x	ppb	1.2	4.8	2.9	^a
O ₃	ppb	27.8	^a	26.2	^a
PM _{2.5}	µg/m ³	5.0	4.9	6.3	4.8

^a Parameter was not monitored

1 INTRODUCTION

1.1 History

The Western Yellowhead Air Management Zone (WYAMZ) is a collaborative group of industry, non-government organizations, government and private citizens. WYAMZ was established in 2012 with a mandate to collect credible, scientifically defensible air quality data and to make this data available to the public. Figure 1 illustrates the WYAMZ area which covers the west central region of the province. The air management zone encompasses an area from east of Saskatoon to the Alberta border, and from north of Meadow Lake to south of Rosetown. Major economic activities in the region include agriculture, oil and gas, mining, power generation, and transportation.

Membership in WYAMZ is currently voluntary. The current membership includes members of the agriculture, chemical, oil and gas, mining and power generation sectors, as well as the public. The Government of Saskatchewan Ministry of Environment and Ministry of the Economy, as well as representatives of the City of Saskatoon, University of Saskatchewan, Prairie North Regional Health Authority and the Saskatchewan Environmental Society also participate as members of the Board of Directors. WYAMZ's budget consists of membership fees, environmental footprint, and emissions-based fees assessed to facilities operating within the air management zone.

1.2 WYAMZ Mission

The WYAMZ mission is to collect credible, scientifically defensible air quality data for west central Saskatchewan, and to make this data freely available to all stakeholders. The objective is to bring together stakeholders from all backgrounds to identify significant air quality issues and to develop innovative solutions for managing these issues.

1.3 WYAMZ Air Monitoring Network

Figure 1 illustrates the locations of the air monitoring stations in the WYAMZ region. Real-time data for these stations is available through the WYAMZ website or the Saskatchewan Ministry of Environment. There are six continuous air monitoring stations in the region that report data to WYAMZ: the Kindersley, Maidstone, Meadow Lake, and Unity airpointer® stations are owned and operated by WYAMZ and have been operating since December 1, 2013; the Lloydminster East and Lloydminster West stations are owned and operated by Husky Energy.

The network measures continuous data for sulphur dioxide (SO₂), hydrogen sulphide (H₂S), nitrogen oxides (NO, NO₂, NO_x), ozone (O₃), fine particulate matter (PM_{2.5}), ambient temperature, relative humidity (RH), precipitation, wind speed (WS) and wind direction (WD). Table 1 shows the measured parameters at each station. Please note, climatic factors presented

in this report have not been calibrated. Publically available real-time air monitoring data is available on the WYAMZ website at: www.wyamz.ca.

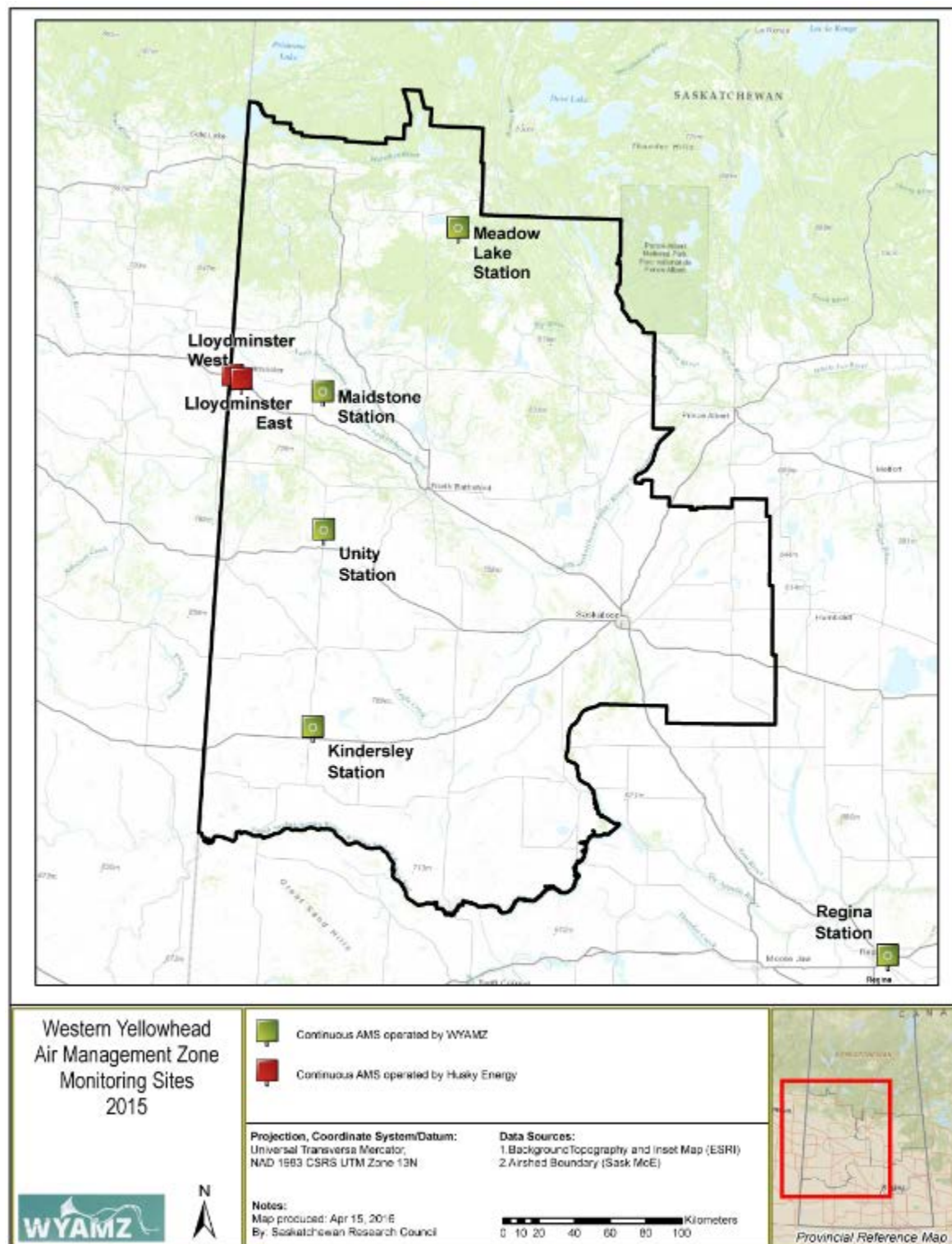


Figure 1 Ambient air monitoring sites of WYAMZ

Table 1 WYAMZ Monitoring Stations and Measurement Parameters

Monitoring Parameter	Continuous Air Quality Parameters Measured in the WYAMZ Network			
	Meadow Lake	Maidstone	Unity	Kindersley
SO ₂	a	✓	a	✓
H ₂ S	a	✓	a	✓
NO	✓	✓	✓	a
NO ₂	✓	✓	✓	a
NO _x	✓	✓	✓	a
O ₃	✓	a	✓	a
PM _{2.5}	✓	✓	✓	✓
Precipitation	✓	✓	✓	✓
Ambient Temperature	✓	✓	✓	✓
Relative Humidity	✓	✓	✓	✓
Wind Speed	✓	✓	✓	✓
Wind Direction	✓	✓	✓	✓

^a Parameter was not monitored

2 AIR QUALITY MONITORING

2.1 Exceedances above the SAAQS

The WYAMZ ambient air monitoring network measures air pollutant concentrations to indicate the general quality of air in the management zone. Comparing measured air quality data with the Saskatchewan Ambient Air Quality Standards and Federal guidelines ensures public and environmental health is not impaired. Air quality data is used to evaluate the trends in air quality resulting from emissions of anthropogenic sources (industry, motor vehicles, etc.) and natural processes (such as forest fires, decomposition of organic matter, etc.).

Table 2 summarizes the Saskatchewan Ambient Air Quality Standards (SAAQS) and the number of exceedances recorded in 2016. Nine exceedance events for 1-hour average H₂S, two exceedance events for 24-hour average H₂S and 17 exceedance events for 24-hour average PM_{2.5} were recorded for the WYAMZ air monitoring network.

Table 2 Summary of Exceedances in 2016

Parameter	No. of Stations Showing Exceedances	Average Type	SAAQS (ppb)	No. of Exceedances ^a
SO ₂		1-hour	172	0
		24-hour	48	0
		Annual	8	0
H ₂ S	1	1-hour	11	9
	1	24-hour	3.6	2
NO ₂		1-hour	159	0
		24-hour	106	0
		Annual	24	0
O ₃		1-hour	82	0
		8-hour	63	0 ^b
PM _{2.5}	4	24-hour	28 µg/m ³	17
		Annual	10 µg/m ³	0

^a Represents a single 24-hour period per station

^b These events do not necessarily constitute an exceedance because the standard applies to 3-year average of the annual 4th-highest daily maximum 8-hour average concentration

2.1.1 Canadian Ambient Air Quality Standards

Under the Air Quality Management System, Environment Canada and Health Canada established air quality standards for fine particulate matter and ground-level ozone (Reference 6). The air quality standards were established as objectives under sections 54 and 55 of the Canadian Environmental Protection Act, 1999 on May 25, 2013. The provinces and territories are required to implement actions to achieve the air quality standards to ensure that the air quality objectives are met. For the first time in Canada, the standards also include a long-term (annual) target for fine particulate matter (Reference 11), shown in Table 3.

As a part of the continuing implementation of the Air Quality Management System, on October 3, 2016, Ministers announced new Canadian Ambient Air Quality Standards (CAAQS) for sulphur dioxide that will drive the improvement of air quality across the country, shown in Table 4. The standards were developed through a collaborative process that included industry associations, non-governmental organizations, Indigenous organizations and governments (Reference 12).

Table 3 Future CAAQS for Fine Particulate Matter and Ground-Level Ozone

Pollutants	Old Standards	New Standards	
		2015	2020
PM _{2.5} Annual	-	10 µg/m ³	8.8 µg/m ³
PM _{2.5} for 24-hour	30 µg/m ³	28 µg/m ³	27 µg/m ³
Ozone for 8-hour	65 ppb	63 ppb	62 ppb

Table 4 Future CAAQS for Sulphur Dioxide

Averaging time	Numerical Value in parts per billion (ppb)		Statistical form of the standards (metric)
	Effective 2020	Effective 2025	
1-hour	70	65	The 3-year average of the annual 99 th percentile of the SO ₂ daily maximum 1-hour average concentrations.
1-calendar year (annual)	5.0	4.0	The arithmetic average over a single calendar year of all 1-hour average SO ₂ concentrations.

Work is currently underway to develop standards for nitrogen dioxide.

2.2 Wind Speed and Direction

Wind speed and wind direction, as well as other meteorological parameters, are important factors that influence regional air quality. The diffusion and dispersion of air pollutant emissions are greatly impacted by variations in wind speed and corresponding air turbulence. Different degrees of turbulence are created by variable mixing conditions due to the vertical gradient of ambient temperatures and terrain roughness unique to each station.

Figure 3 shows the wind roses at the WYAMZ continuous monitoring stations for 2016. According to the Beaufort Wind Scale (Reference 2), prevailing wind primarily consisted of Light Air (<1.4 m/s or 5.0 km/hr) Light Breeze (<3.1 m/s or 11.2 km/hr), and Gentle to Moderate Breeze (<7.8 m/s or 28.1 km/hr). Fresh to Strong breezes (>7.8 m/s) were primarily recorded at the Kindersley station, for 3.1% of time. The frequency of calm wind (≤0.3 m/s or 1.1 km/hr) ranged from 0.1% (Kindersley) to 2.4% (Unity).

The prevailing wind direction was not consistent among the four air monitoring stations. The Meadow Lake station was characterized with winds from the southwest and southeast quadrants. Maidstone and Unity stations were characterized with a prevalent wind from the northwest quadrant and southeast quadrant. Kindersley station reported stronger winds than reported at the other station from all directions, with somewhat more prevalent winds coming from northwest and southeast quadrants.

The height of the meteorological towers at each station is approximately 2-3 m. This accounts for the lighter winds reported in comparison to Environment and Climate Change Canada, where the towers are set at 10 m high.

The detailed frequency distribution table and wind roses are presented in the Appendices: Table B-8, Table C-11, Table D-10, and Table E-11.

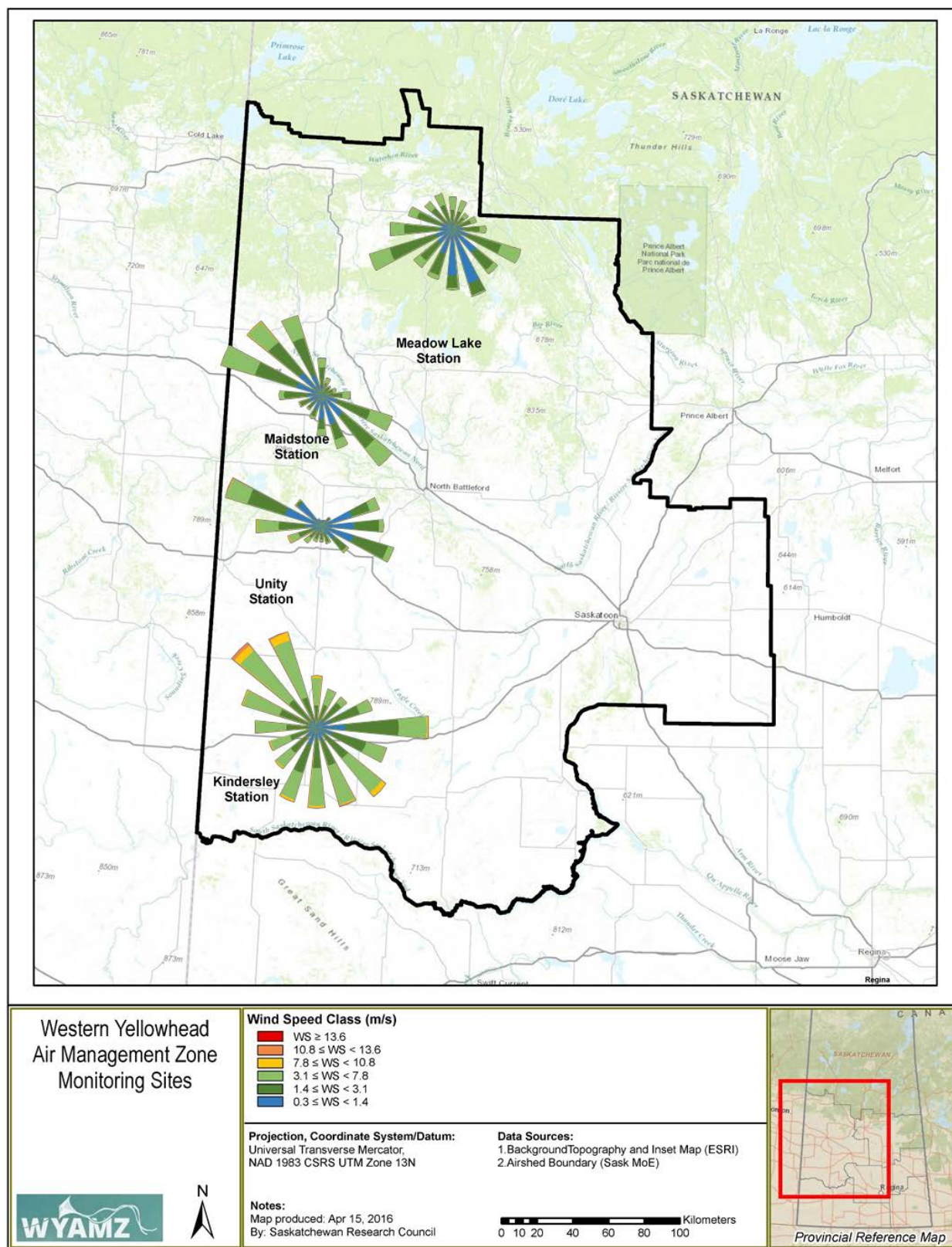


Figure 2 Wind Roses for 1-Hour Average Wind Data for 2016

2.3 Continuous Air Quality Data

2.3.1 Sulphur Dioxide (SO₂)

Sulphur dioxide (SO₂) is a colourless gas with a pungent irritating odour at high concentrations. At concentrations above 300 ppb, it can be detected by taste and odour. Short-term exposures to SO₂ can harm the human respiratory system and make breathing difficult (Reference 5). SO₂ affects sensitive individuals with pre-existing respiratory conditions such as asthma or bronchitis (Reference 6). At high concentrations, gaseous SO₂ can harm trees and plants by damaging foliage and decreasing growth (Reference 5).

SO₂ along with nitrogen oxides are the main precursors of acid rain, which contributes to the acidification of lakes and streams, accelerated corrosion of buildings, and reduced visibility. SO₂ in the air may deposit onto surfaces (water bodies, vegetation, buildings) quickly or may react during atmospheric transport to form larger particles that can be harmful to human health (Reference 7).

Anthropogenic SO₂ emission sources are primarily from combustion of sulphur-containing fuels (e.g. gasoline, natural gas and coal) and processing of sulphur-containing ores. The major emission sources for SO₂ include large industrial sources (e.g., power plants, petroleum refineries, iron and steel mills, fertilizer plants, pulp and paper mills, smelters) as well as small industries (e.g., small oil and gas plants, battery and well flares).

Table 5 presents the summary statistics for SO₂ measurement results. The measured concentration was low at both stations. The annual average concentration was 0.4 ppb and 0.2 ppb at the Maidstone and Kindersley stations, respectively. The maximum 1-hour average concentration of 13.1 ppb and the maximum 24-hour average concentration of 1.4 ppb were detected at the Maidstone station. There was no exceedance of the SAAQS for 1-hour, 24-hour, and annual average concentrations (see Table 6).

Figures 3 and 4 present the pollutant roses for 1-hour average concentration for SO₂. For more than 99% of the time, SO₂ concentration was less than or equal to 1 ppb (blue petals) at the Kindersley station. The SO₂ concentration was less than or equal to 5 ppb 99.9% of the time at the Maidstone station. No obvious pattern exists that indicates a stronger contribution of SO₂ from a particular direction.

The detailed frequency distribution tables for the pollutant roses are presented in the Appendices: Table B-2 and Table C-2.

Table 5 Summary of Statistics for SO₂ Measurement Results for 2016

Monitoring Station	Annual Average	Instrument Uptime	Maximum SO ₂ Conc. and Occurrence Time			
	ppb	%	1-Hr Max		24-Hr Max	
Maidstone	0.4	94.8	13.1	12/17/2016 13:00	1.4	12/17/2016
Kindersley	0.2	92.1	3.1	6/18/2016 00:00	1.0	6/18/2016

Table 6 Number of Exceedance Events for SO₂ in 2016

Monitoring Station	Number of Exceedance Events for Saskatchewan SO ₂ Ambient Air Quality Standard (SAAQS)		
	1-hr SAAQS (172 ppb)	24-hr SAAQS (48 ppb)	Annual SAAQS (8 ppb)
Maidstone	0	0	0
Kindersley	0	0	0

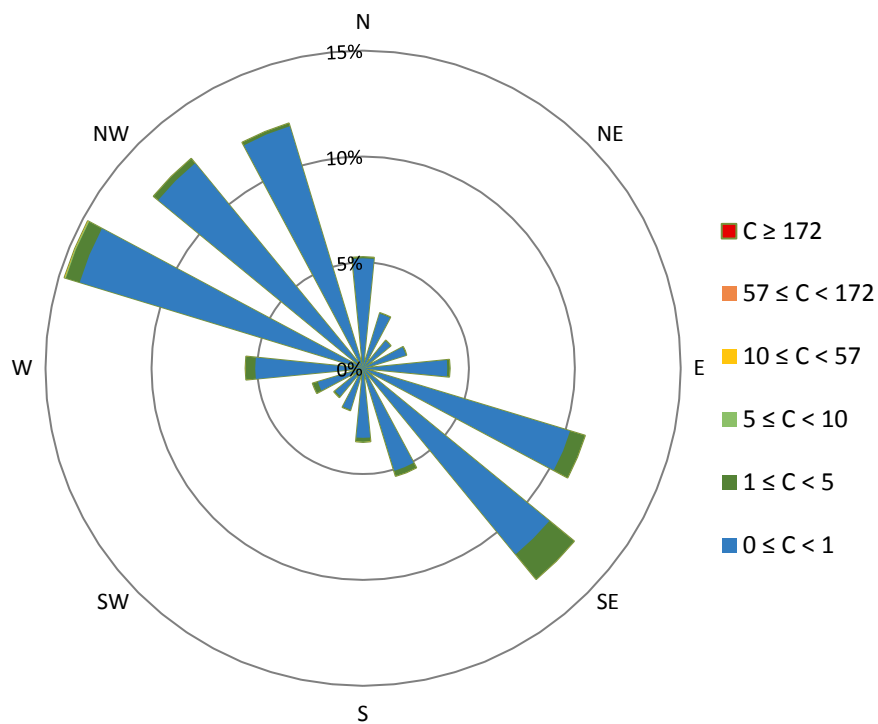


Figure 3 Pollutant Rose for 1-Hour Average SO₂ Data at Maidstone Station (ppb)

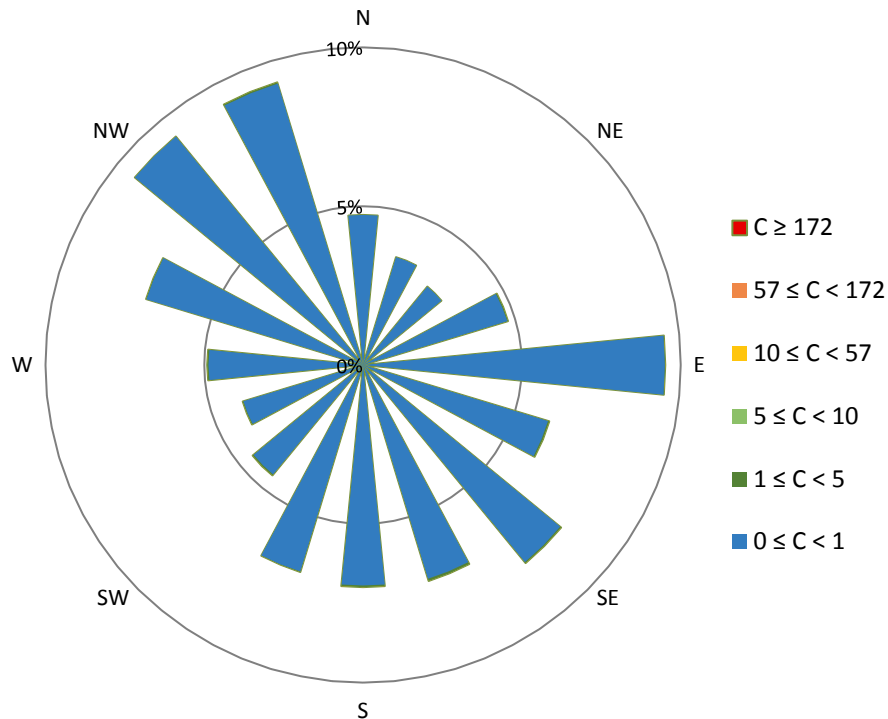


Figure 4 Pollutant Rose for 1-Hour Average SO₂ Data at Kindersley Station (ppb)

2.3.2 Hydrogen Sulphide (H₂S)

Hydrogen sulphide (H₂S) is a colourless gas with a characteristic “rotten egg” odour. It is produced both naturally and through anthropogenic emission sources. H₂S occurs naturally in coal, crude oil, natural gas, sulphur hot springs, volcanic gases, sloughs, swamps and lakes. The major anthropogenic emission sources include natural gas and petroleum production, wastewater treatment, pulp and paper mills, rayon textile manufacturing, and tar and asphalt manufacturing. Decomposition of organic matter by bacteria under anaerobic conditions releases H₂S as well, forming the characteristic odour commonly associated with sewers, sewage lagoons, and swamps.

Hydrogen sulfide is a highly toxic and flammable gas. It is heavier than air and tends to accumulate at the bottom of poorly ventilated spaces and in low-lying topography. Exposure to H₂S can have serious health impacts at various concentrations. Although very pungent at first, it quickly deadens the sense of smell at concentrations of 100,000-200,000 ppb (Reference 4). Potential victims of H₂S poisoning may be unaware of its presence until it is too late.

Table 7 presents the summary statistics for H₂S measurement results. The measured concentration was low at both stations; the annual average concentration was 0.5 ppb and 0.4 ppb at the Maidstone and Kindersley stations, respectively. The maximum 1-hour average concentration of 26.0 ppb and the maximum 24-hour average concentration of 3.7 ppb were

both measured at the Maidstone station. There were 9 exceedances of the SAAQS for 1-hour average concentration and 2 exceedances for the 24-hour concentration at the Maidstone station (see Table 8).

Figures 5 and 6 present the pollutant roses for 1-hour average H₂S. For more than 92% of time, the H₂S concentration was less than or equal to 1 ppb (blue petals) at the Maidstone station, and below 3.6 ppb more than 99% of the time. The H₂S concentration was less than or equal to 1 ppb more than 97% of the time at the Kindersley station.

The detailed frequency distribution tables for the pollutant roses are presented in the Appendices: Table B-3 and Table C-6.

Table 7 Summary of Statistics for H₂S Measurement Results for 2016

Monitoring Station	Annual Average	Instrument Uptime	Maximum H ₂ S Conc. and Occurrence Time			
	ppb	%	1-Hr Max		24-Hr Max	
Maidstone	0.5	92.8	26.0	7/26/2016 06:00	3.7	7/26/2016
Kindersley	0.4	93.9	7.7	7/22/2016 04:00	1.5	6/18/2016

Table 8 Number of Exceedance Events for H₂S in 2016

Monitoring Station	Number of Exceedance Events for Saskatchewan H ₂ S Ambient Air Quality Standard (SAAQS)	
	1-hr SAAQS (11 ppb)	24-hr SAAQS (3.6 ppb)
Maidstone	9	2
Kindersley	0	0

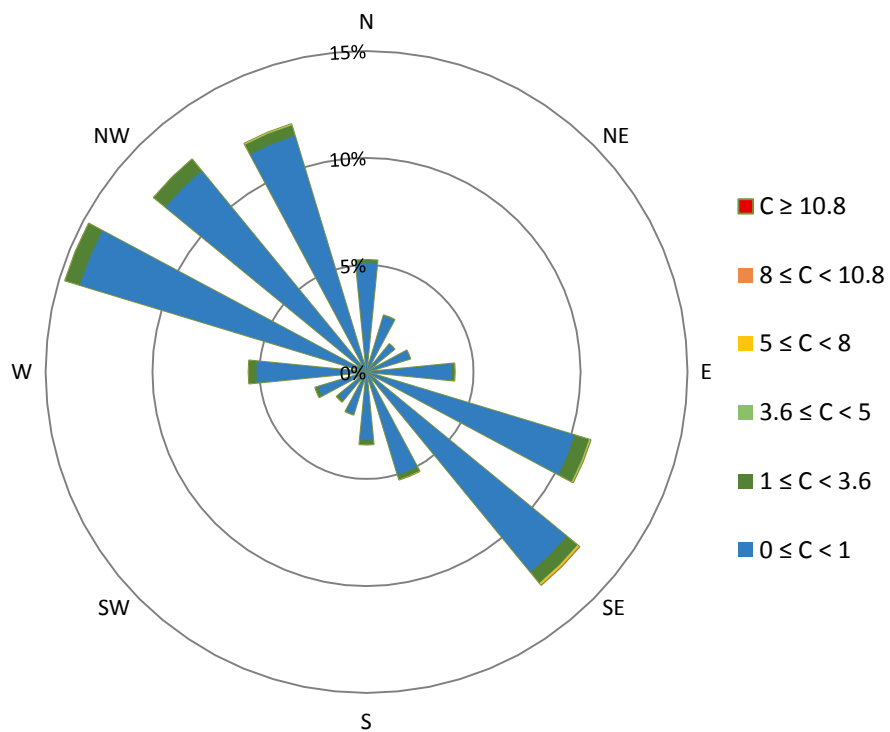


Figure 5 Pollutant Rose for 1-Hour Average H₂S Data at Maidstone Station (ppb)

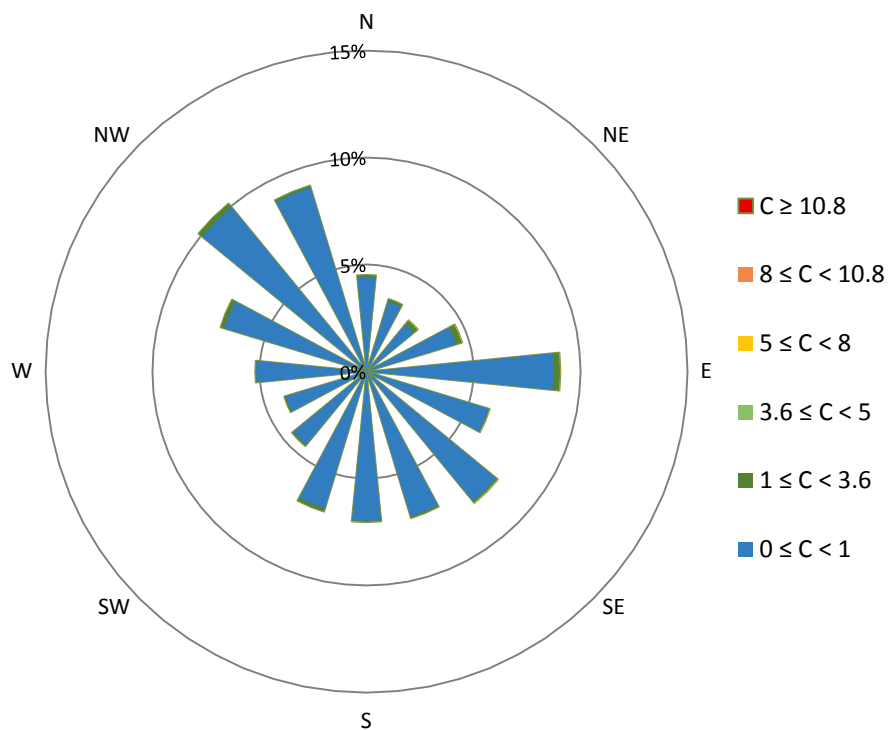


Figure 6 Pollutant Rose for 1-Hour Average H₂S Data at Kindersley Station (ppb)

2.3.3 Nitrogen Dioxide (NO₂)

Nitrogen oxides, also known as oxides of nitrogen (NO_x), is a collective term for nitric oxide (NO) and nitrogen dioxide (NO₂). NO is a colorless gas with a slight odour. NO₂ is a reddish brown, non-flammable gas with a pungent irritating odour. NO₂ is of more interest than NO from both a health and acid rain perspective.

Both NO₂ in its untransformed state, and the acid and nitrate transformation products of NO₂, can have adverse effects on human health or the environment. NO₂ itself can cause adverse effects on respiratory systems of humans and animals and damage to vegetation. When NO₂ is transformed into nitrate particles that are subsequently deposited on aquatic and terrestrial ecosystems, acidification can result. NO₂ is one of the primary contributing pollutants to the formation of ground-level ozone (Reference 8).

NO_x emissions are mainly produced by fossil fuel combustion. High temperature conditions during combustion result in the formation of NO_x as a by-product. NO emitted during combustion quickly oxidizes to NO₂ in the atmosphere (Reference 9). The major anthropogenic emission sources for NO_x are associated with fuel combustion, including both stationary (e.g., power plants, oil & gas operations, incinerators) and mobile (e.g., automobiles and trains) sources and residential heating. Non-combustion sources (e.g., nitric acid manufacture, welding processes, and use of explosives) comprise the smaller emission sources. In large cities, motor vehicle emissions are the major source of NO_x, as well as space heating emissions in the winter. The Saskatchewan Ministry of Environment regulates ambient air concentration for nitrogen dioxide but not nitric oxide.

Table 9 presents the summary statistics for NO₂ measurement results. The Maidstone station measured a higher concentration than the other two stations, with an annual average of 3.6 ppb. The annual average concentration recorded at the Unity station was 2.3 ppb, and the Meadow Lake station was 0.9 ppb. Both the maximum 1-hour and 24-hour concentrations were detected at the Maidstone station. There were no exceedances of the 1-hour, 24-hour, or annual SAAQS, as shown in Table 10.

Figures 7 to 9 present the pollutant roses for 1-hour average concentrations for NO₂. The concentration at the Meadow Lake station was the lowest among the three stations. 99.7% of the time NO₂ concentration was less than 5 ppb. At the Unity station, the NO₂ concentration was higher than 5 ppb 9.3% of time. The NO₂ concentration at the Maidstone station tended to be the highest among the three stations and was greater than 5 ppb 23.5% of the time. These events tend to be more frequent when wind was from the northwest quadrant. In addition to the directional trends, a seasonal trend was observed at all stations; NO₂ concentration tends to be higher during the winter months.

The detailed frequency distribution tables for the NO, NO₂ and NO_x pollutant roses are presented in the Appendices: Tables C-3 to C-5, Tables D-2 to D-4, and Tables E-2 to E-4.

Table 9 Summary of Statistics for NO₂ Measurement Results for 2016

Monitoring Station	Annual Average	Instrument Uptime	Maximum NO ₂ Conc. and Occurrence Time			
	ppb	%		1-Hr Max	24-Hr Max	
Meadow Lake	0.9	94.9	12.0	1/10/2016 18	5.7	1/10/2016
Maidstone	3.6	94.8	27.2	2/25/2016 01:00	15.0	1/17/2016
Unity	2.3	93.8	24.7	6/5/2016 22:00	9.3	1/24/2016

Table 10 Number of Exceedance Events for NO₂ in 2016

Monitoring Station	Number of Exceedance Events for Saskatchewan NO ₂ Ambient Air Quality Standard (SAAQS)		
	1-hr SAAQS	24-hr SAAQS	Annual SAAQS
	159	106	24
Meadow Lake	0	0	0
Maidstone	0	0	0
Unity	0	0	0

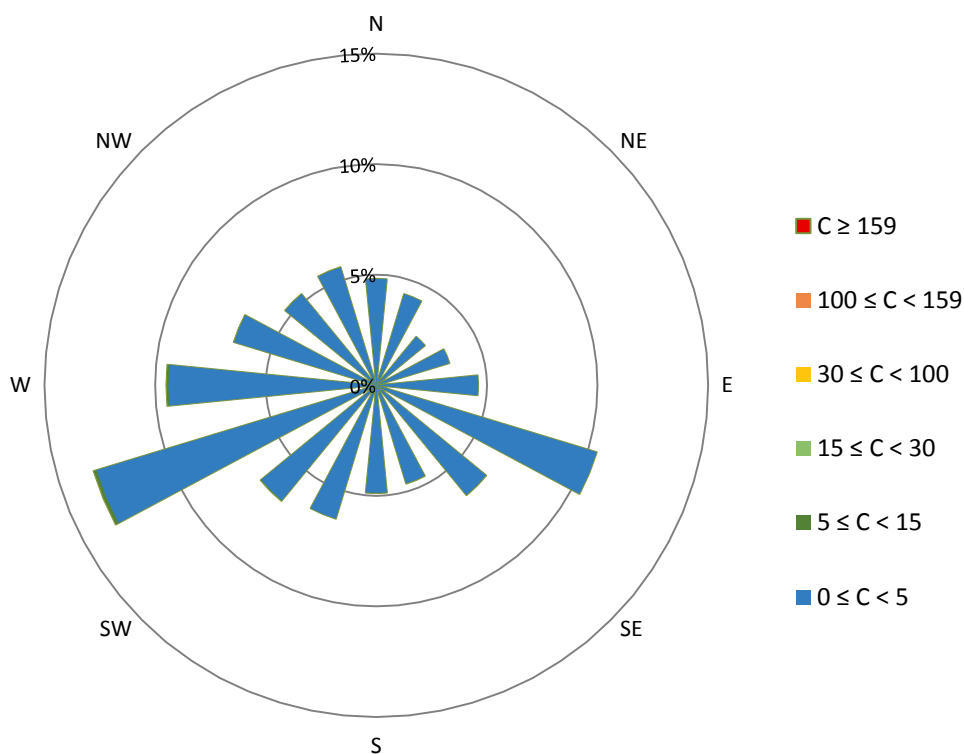


Figure 7 Pollutant Rose for 1-Hour Average NO₂ Data at Meadow Lake Station (units are ppb)

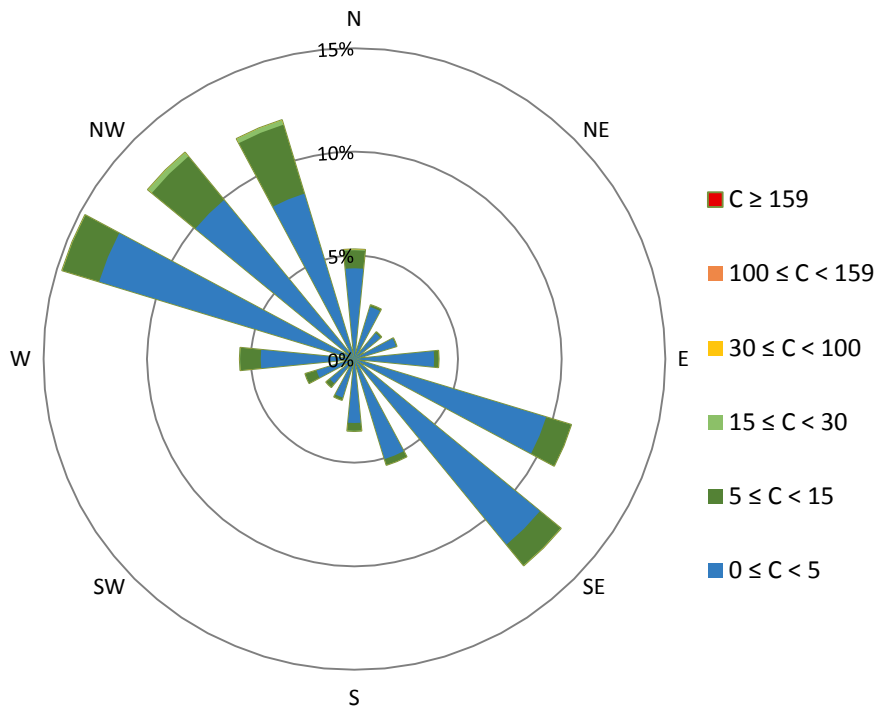


Figure 8 Pollutant Rose for 1-Hour Average NO₂ Data at Maidstone Station (units are ppb)

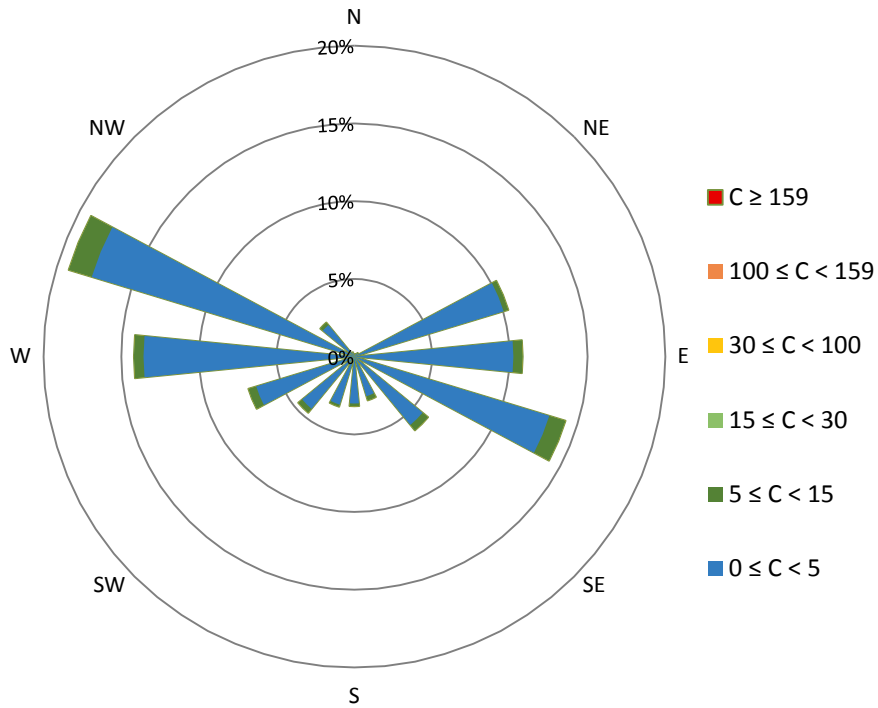


Figure 9 Pollutant Rose for 1-Hour Average NO₂ Data at Unity Station (units are ppb)

2.3.4 Ozone (O₃)

Ozone (O₃) in the upper atmosphere (10 to 50 kilometres above the earth's surface) protects the earth from the sun's harmful ultraviolet radiation. In the lower atmosphere and at ground level, O₃ is harmful to human health as it can cause breathing problems, reduce lung function and aggravate asthma and other lung diseases (Reference 9). Ground-level O₃ is a colourless, odourless gas at ambient concentrations and is one of two major components of summertime smog. Ozone can significantly impact vegetation and decrease the productivity of some crops. It damages cotton, acetate, nylon, polyester and other textile materials. Ozone can also damage other synthetic materials, cause cracks in rubber, accelerate fading of dyes, and speed deterioration of some paints and coatings.

In the ambient air, O₃ is a "secondary" pollutant, meaning it is not directly emitted from a source. Instead, ozone is produced from photochemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight. Ground-level ozone could be from intrusion of ozone from the stratosphere, mixing from the upper troposphere, local photochemistry and the medium and long-range transport. There is no scientific consensus on the relative importance of these mechanisms.

Ozone can be formed by electrical discharges and high-energy electromagnetic radiation. In indoor environments, ozone can be present as a result of electronic equipment such as ionic air purifiers, laser printers, photocopiers, and arc welders.

Table 11 presents the summary statistics for O₃ measurement results. The annual average concentration was 27.8 ppb and 26.2 ppb for the Meadow Lake Station and Unity Station respectively. The maximum 1-hour concentration of 64.1 ppb was detected at the Unity Station. The 4th highest 8-hour running average at the Meadow Lake Station was 59.9 ppb.

Figures 10 and 11 present the pollutant roses for 1-hour average concentration of O₃. The measured concentration was within 20 ppb to 40 ppb range for more than 66% of the time at both stations. There was no apparent directional trend for the higher concentration events (>40 ppb). At both stations, the concentration of O₃ tended to be higher from February to late June.

The detailed frequency distribution table for the pollutant roses are presented in the Appendices: Table D-5 and Table E-5.

Table 11 Summary of Statistics for O₃ Measurement Results for 2016

Monitoring Station	Annual Average	Instrument Uptime	Maximum O ₃ Conc. and Occurrence Time					
	ppb	%	1-Hr Max		8-Hr Max		24-Hr Max	
Meadow Lake	27.8	94.9	62.1	5/4/2016 15:00	58.5	5/4/2016	48.4	5/8/2016
Unity	26.2	93.7	64.1	5/7/2016 12:00	61.4	5/7/2016	45.2	5/19/2016

Table 12 Number of Exceedance Events for O₃ in 2016

Monitoring Station	Number of Exceedance Events for Saskatchewan O ₃ Ambient Air Quality Standard (SAAQS)	
	1-hr SAAQS	8-hr SAAQS ^{ab}
	(82 ppb)	(63 ppb)
Meadow Lake	0	0
Unity	0	0

^a These events do not necessarily constitute an exceedance because the standard applies to 3-year average of the annual 4th-highest daily maximum 8-hour average concentration

^b Number of days with 8-hour period exceeding SAAQS threshold for O₃

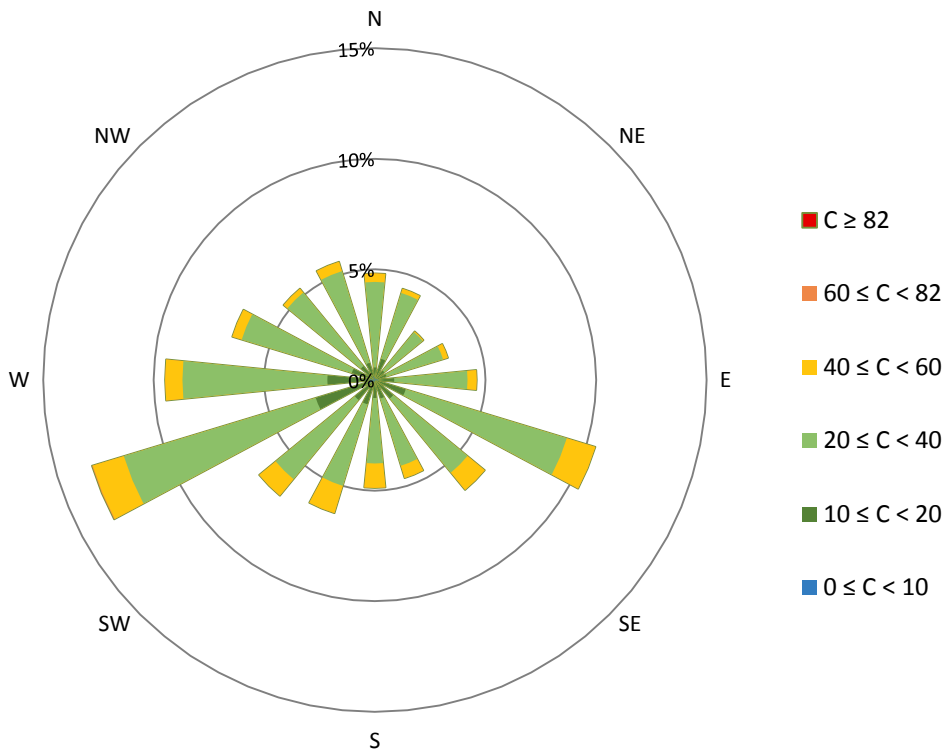


Figure 10 Pollutant Rose for 1-Hour Average O₃ Data at Meadow Lake Station (ppb)

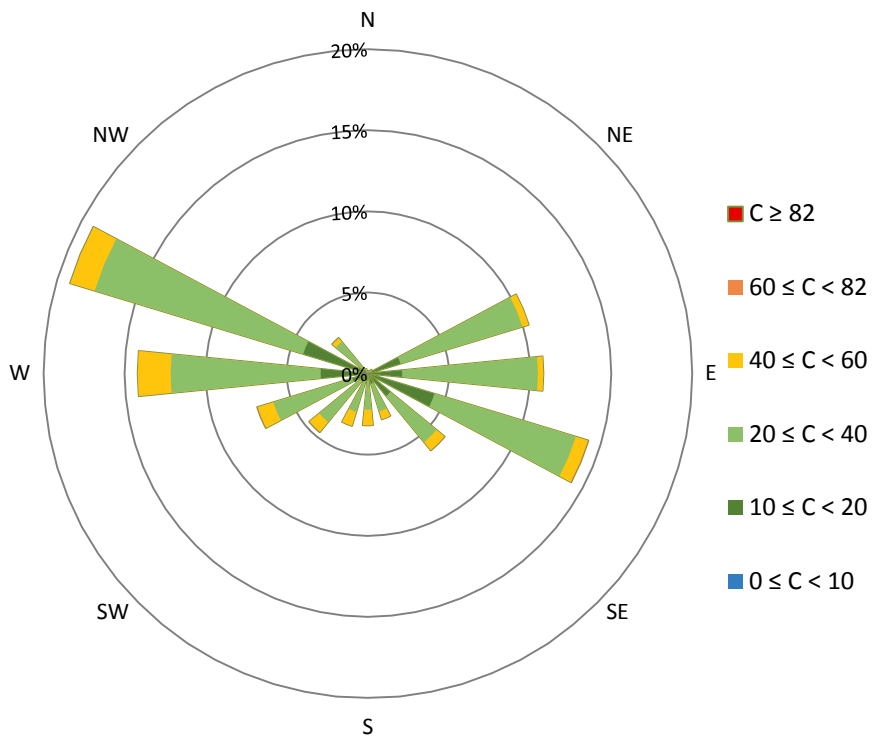


Figure 11 Pollutant Rose for 1-Hour Average O₃ Data at Unity Station (ppb)

2.3.5 Fine Particulate Matter (PM_{2.5})

Particulate matter is unique among air pollutants, as it is identified by its size rather than by its composition. The primary particulate contaminants of concern are fine particles referred to as PM_{2.5}.

Fine particles are generally emitted from activities such as industrial and residential combustion, and from vehicle exhaust. Fine particles are also formed in the atmosphere when gases such as sulphur dioxide, nitrogen oxides, and volatile organic compounds are transformed by chemical and photochemical reactions in the air. The largest natural contribution of PM_{2.5} comes from forest fires.

When inhaled deeply into the lungs, even small amounts of PM_{2.5} can cause serious health problems such as cardiovascular and respiratory diseases. Along with ground-level ozone, PM_{2.5} is one of the two major components of smog. Fine particulate matter can damage vegetation and structures, contribute to haze, and reduce visibility (Reference 10).

Table 13 presents the summary statistics for PM_{2.5} measurement results. The annual average concentrations ranged from 4.8 µg/m³ to 6.3 µg/m³. The maximum 1-hour concentration of 661.6 µg/m³ and the maximum 24-hour concentration of 117.7 µg/m³ were both detected at the Maidstone station.

Figures 12 through 15 present the pollutant roses for PM_{2.5} measurement results. The measured concentrations were mostly less than 10 µg/m³ (84.8% to 91.6% of the time for the four stations). There was no apparent directional trend for the higher concentration events (>10 µg/m³). All sites experienced peak concentrations in May, which coincides with spring tillage.

The detailed frequency distribution tables for the pollutant roses are presented in the Appendices: Table B-4, Table C-7, Table D-6, and Table E-6.

Table 13 Summary of Statistics for PM_{2.5} Measurement Results for 2016

Monitoring Station	Annual Average	Instrument Uptime	Maximum PM _{2.5} Conc. and Occurrence Time			
	µg/m ³	%	1-Hr Max		24-Hr Max	
Meadow Lake	5.0	89.9	172.9	5/6/2016 11:00	55.5	5/16/2016
Maidstone	4.9	97.1	661.6	5/5/2016 14:00	117.7	5/5/2016
Unity	6.3	93.2	261.7	5/5/2016 15:00	86.7	5/15/2016
Kindersley	4.8	96.0	298.1	5/5/2016 17:00	53.3	5/15/2016

Table 14 **Number of Exceedance Events for PM_{2.5} in 2016**

Monitoring Station	Number of Exceedance Events for Saskatchewan PM _{2.5}	
	Ambient Air Quality Standard (SAAQS)	
	24-hr SAAQS ^a (28 µg/m ³)	Annual SAAQS (10 µg/m ³)
Meadow Lake	7	0
Maidstone	3	0
Unity	4	0
Kindersley	3	0

^a SAAQS applies to 3-year average of the annual 98th percentile of the 24-hour average concentrations

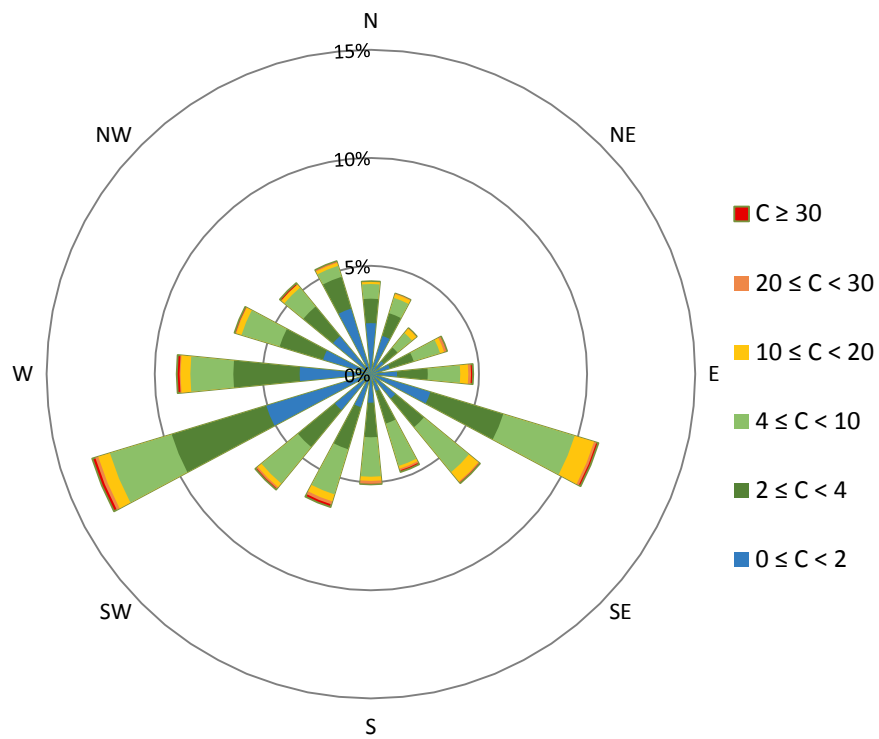


Figure 12 **Pollutant Rose for 1-Hour Average PM_{2.5} Data at Meadow Lake Station (µg/m³)**

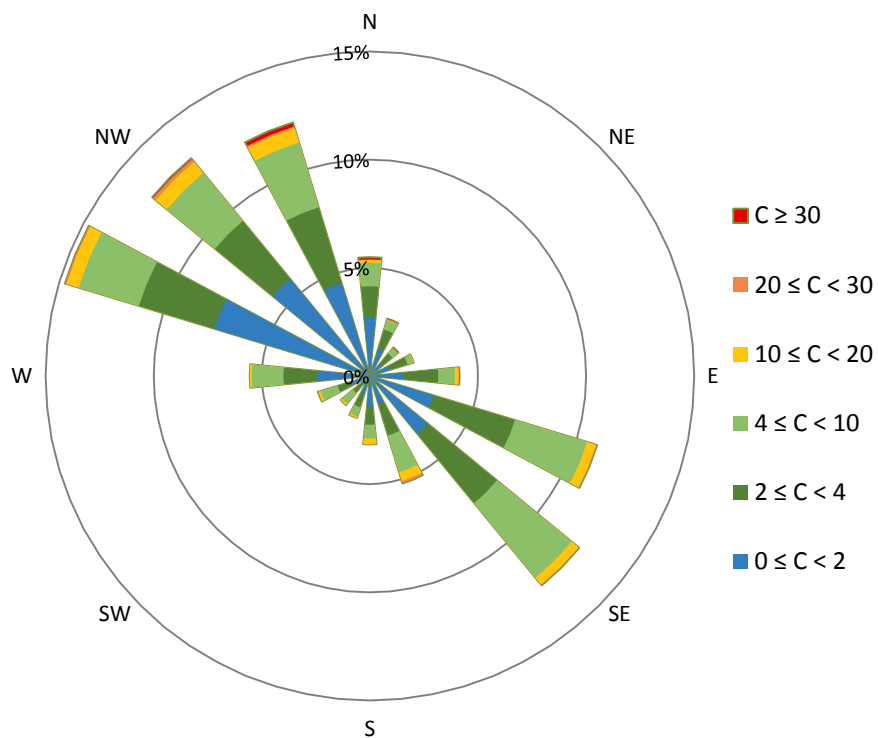


Figure 13 Pollutant Rose for 1-Hour Average PM_{2.5} Data at Maidstone Station (µg/m³)

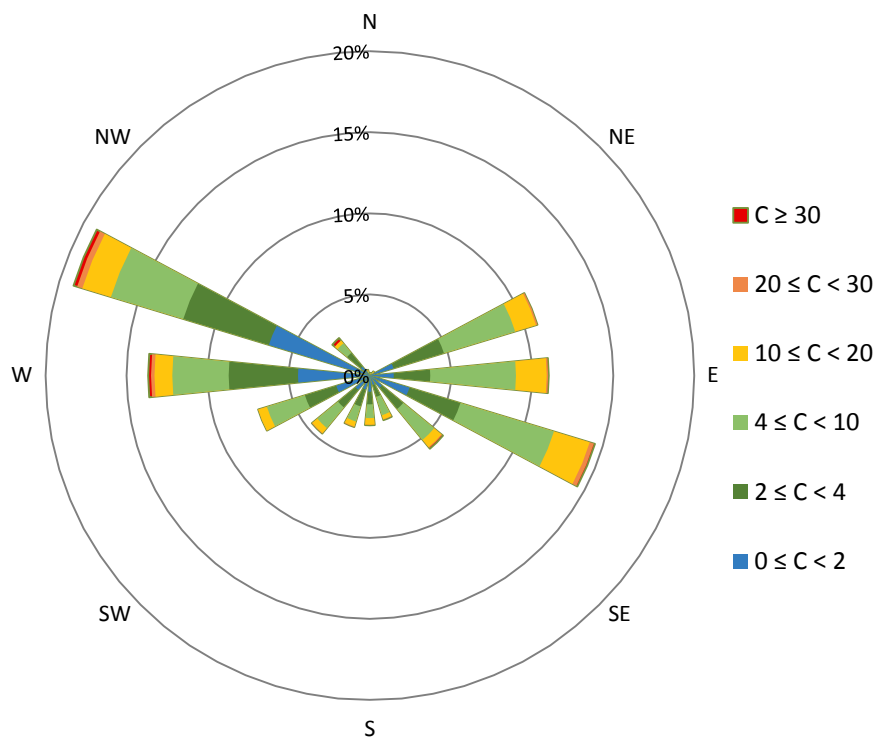


Figure 14 Pollutant Rose for 1-Hour Average PM_{2.5} Data at Unity Station (µg/m³)

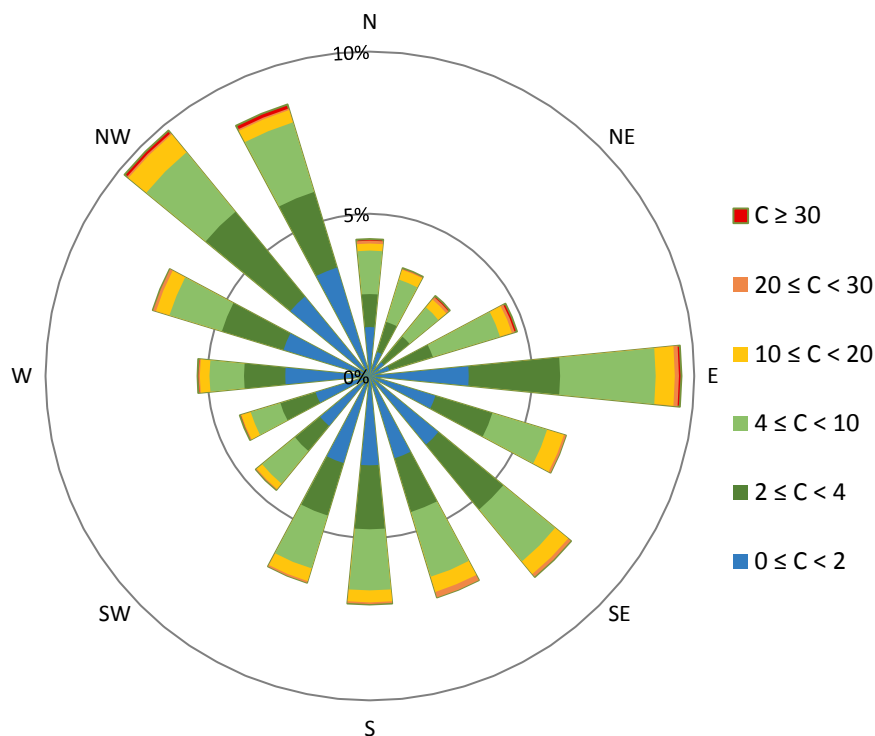


Figure 15 Pollutant Rose for 1-Hour Average PM_{2.5} Data at Kindersley Station (µg/m³)

2.4 Air Quality Health Index (AQHI)

The Air Quality Health Index (AQHI) is a health protection tool that is designed to help the public make decisions to protect their health by limiting short-term exposure to air pollution and adjusting their activity levels during increased levels of air pollution. The AQHI uses readings from three air pollutants to calculate a single numerical value to evaluate the health risk associated with air pollution. The three pollutants are fine particulate matter (PM_{2.5}), nitrogen dioxide (NO₂), and ground-level ozone (O₃). All three pollutants are required to calculate AQHI. Among the WYAMZ air monitoring stations, Meadow Lake and Unity are eligible for AQHI reporting.

Figure 16 illustrates the risk categories and the health messages for the AQHI system. The health risk is classified in four categories: Low Risk (1 to 3), Moderate Risk (4 to 6), High Risk (7 to 10), and Very High Risk (higher than 10).

Table 15 summarizes the summary statistics for AQHI rating. The air quality at both stations was rated Low Risk most of the time. The Meadow Lake station had a 1.4% occurrence frequency at the Moderate Risk rating. Moderate Risk events were primarily associated with an increased concentration of O₃. The Unity station had a 1.3% occurrence frequency at the Moderate Risk rating, which was primarily associated with an increased concentration of PM_{2.5} or O₃.

Health Risk	Air Quality Health Index	Health Messages	
		At Risk Population	General Population
Low	1-3	Enjoy your usual outdoor activities.	Ideal air quality for outdoor activities.
Moderate	4-6	Consider reducing or rescheduling strenuous activities outdoors if you are experiencing symptoms.	No need to modify your usual outdoor activities unless you experience symptoms such as coughing and throat irritation.
High	7-10	Reduce or reschedule strenuous activities outdoors. Children and the elderly should also avoid outdoor physical exertion.	Consider reducing or rescheduling strenuous activities outdoors if you experience symptoms such as coughing and throat irritation.
Very High	Above 10	Avoid strenuous activities outdoors. Children and the elderly should also avoid outdoor physical exertion.	Reduce or reschedule strenuous activities outdoors, especially if you experience symptoms such as coughing and throat irritation.

Figure 16 Health Risk Classification and Health Messages for Air Quality Health Index (Environment Canada)

Table 15 Summary of Occurrence Statistics for AQHI Rating

Monitoring Station	Occurrence Statistics	Occurrence Hours and Frequency by AQHI Risk Rating			
		Low Risk	Moderate Risk	High Risk	Very High Risk
Meadow Lake	Occurrence Hours	7417	103	3	0
	Occurrence Frequency	98.6%	1.4%	0.0%	0.0%
Unity	Occurrence Hours	7683	98	5	7
	Occurrence Frequency	98.6%	1.3%	0.1%	0.1%

2.5 Air Quality Index (AQI)

The Maidstone station does not meet the reporting requirements for AQHI. The Air Quality Index (AQI) is used as an alternative index. The Air Quality Index (AQI) is a system developed to provide the public with a meaningful and comparable measure of air quality. The AQI index is calculated from readings of five major air pollutants: SO₂, NO₂, O₃, PM_{2.5}, and carbon monoxide (CO). H₂S is not included as part of the AQI due to the fact that at low concentrations H₂S is a nuisance (odour) pollutant and not a health effect pollutant. A minimum of three pollutants is required. The AQI is rated in four categories: Good (0 to 25), Fair (26 to 50), Poor (51 to 100), and Very Poor (>100). Table 16 summarizes the effects associated with the AQI ratings.

Table 17 summarizes the occurrence statistics for AQI rating. The air quality at the Maidstone station was rated Good for 97.9% of the time; 1.7% was rated Fair, 0.3% was rated Poor and 0.1% was rated Very Poor. The Fair and Poor air quality was associated with increased PM_{2.5} concentrations. The Kindersley station is excluded from index analysis because this station does not meet the reporting requirements of either index system.

Table 16 AQI Rating and Effect Description

AQI	Air Quality Rating	Effect Description
0-25	Good	<u>Desirable Range</u> : No known harmful effects to soil, water, vegetation, animals, materials, visibility or human health. The long-term goal is for air quality to be in this range all of the time in Canada.
26-50	Fair	<u>Acceptable Range</u> : Adequate protection against harmful effects to soil, water, vegetation, animals, materials, visibility and human health.
51-100	Poor	<u>Tolerable Range</u> : Not all aspects of human health or the environment are adequately protected from possible adverse effects. Long-term control action may be necessary, depending on the frequency, duration and circumstances of the readings.
>100	Very Poor	<u>Intolerable Range</u> : Continued high readings could pose a risk to public health.



Table 17 Summary of Occurrence Statistics for AQI Rating

Monitoring Station	Occurrence Statistics	Occurrence Hours and Frequency by AQHI Risk Rating			
		Good	Fair	Poor	Very Poor
Maidstone	Occurrence Hours	7931	141	25	6
	Occurrence Frequency	97.9%	1.7%	0.3%	0.1%

3 AUDITED FINANCIAL STATEMENT

The 2016 audited financial summary for the WYAMZ is presented in the following table. The complete audited report is presented in Appendix G.

Table 18 WYAMZ Financial Summary for the Year 2016

Western Yellowhead Air Management Zone Inc.		
Statement of Financial Position		
<i>As at December 31, 2016</i>		
	2016	2015
Assets		
Current		
Cash resources	121,851	182,417
Short term investment (Note 4)	100,000	-
Prepaid expenses	3,806	3,806
	225,657	186,223
Capital assets (Note 3)	199,932	249,915
	425,589	436,138
Liabilities		
Current		
Accounts payable and accruals	17,756	18,656
Goods and Services Tax payable	3,050	2,862
Current portion of deferred contributions (Note 5)	40,000	40,000
	60,806	61,518
Deferred contributions (Note 5)	20,000	60,000
	80,806	121,518
Net Assets		
Unrestricted net assets	344,783	314,620
	425,589	436,138
Approved on behalf of the Board of Directors		
		

4 REFERENCES

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APPENDIX A SASKATCHEWAN AMBIENT AIR QUALITY STANDARDS

Table A-1 Saskatchewan Ambient Air Quality Standards

TABLE 20: SASKATCHEWAN AMBIENT AIR QUALITY STANDARDS ($\mu\text{g}/\text{m}^3$)				
Air Pollutant	1 Hour	8 Hours	24 Hours	Annual
Particulate Matter ($\text{PM}_{2.5}$)			28 ^a	10
Particulate Matter (PM_{10})			50	
Total Suspended Particulates (TSP)			100	60 ^b
Nitrogen Dioxide (NO_2)	300 (159 ppb)		200 (106 ppb)	45 ^c (24 ppb)
Sulphur Dioxide (SO_2)	450 (172 ppb)		125 (48 ppb)	20 ^c (8 ppb)
Hydrogen Sulphide (H_2S)	15 (11 ppb)		5 (3.6 ppb)	
Ozone (O_3)	160 (82 ppb)	124 ^d (63 ppb)		
Carbon Monoxide (CO)	15,000 (13,000 ppb)	6,000 (5,000 ppb)		

Footnotes

(a) The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.

(b) Geometric means

(c) Arithmetic means

(d) The 3-year average of the annual 4th-highest daily maximum 8-hour average concentrations.

APPENDIX B KINDERSLEY STATION: CONTINUOUS MONITORING DATA

Table B-1 Kindersley Station: Summary Statistics for Continuous Air Monitoring Results for 2016

Parameter	Unit	Calibration Hours	Hours of Valid Data	Annual Percent Uptime	Summary Statistics for 1-Hour Data		
					Average	Minimum	Maximum
SO ₂	ppb	424	8086	92.1%	0.2	< 0.1	3.1
H ₂ S	ppb	424	8245	93.9%	0.4	< 0.1	7.7
PM _{2.5}	µg/m ³	2	8437	96.0%	4.8	< 0.1	298.1
Precipitation (total)	mm	0	8762	99.7%	563.2*	< 0.1	46.8
Ambient Temperature	°C	0	8762	99.7%	4.8	-34.0	31.4
Relative Humidity	%	0	8762	99.7%	68.2	7.4	91.9
Wind Speed	m/s	0	8762	99.7%	3.3	<1	14.9

*value is total precipitation, not the average

Table B-2 Kindersley Station: Summary of Airpointer SO₂ Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance (no.)	Percent of Data in each Concentration Range					
								0 ≤ C < 1	1 ≤ C < 5	5 ≤ C < 10	10 ≤ C < 57	57 ≤ C < 172	C ≥ 172
January	711	95.6%	0.3	1.9	-	0.7	-	98.0%	2.0%	0.0%	0.0%	0.0%	0.0%
February	662	95.1%	0.2	0.8	-	0.3	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
March	712	95.7%	0.2	0.8	-	0.3	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
April	687	95.4%	0.2	0.9	-	0.3	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
May	706	94.9%	0.2	1.1	-	0.5	-	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%
June	688	95.6%	0.2	3.1	-	1.0	-	98.4%	1.6%	0.0%	0.0%	0.0%	0.0%
July	706	94.9%	0.2	0.8	-	0.3	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
August	706	94.9%	0.2	1.1	-	0.4	-	99.9%	0.1%	0.0%	0.0%	0.0%	0.0%
September	689	95.7%	0.1	0.9	-	0.2	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
October	672	90.3%	0.1	1.1	-	0.2	-	99.9%	0.1%	0.0%	0.0%	0.0%	0.0%
November	678	94.2%	0.2	1.2	-	0.3	-	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%
December	469	63.0%	0.2	0.9	-	0.6	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Annual	8086	92.1%	0.2	3.1	0	1.0	0	99.6%	0.4%	0.0%	0.0%	0.0%	0.0%

Table B-3 Kindersley Station: Summary of Airpointer H₂S Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance (no.)	Percent of Data in each Concentration Range					
								0 ≤ C < 1	1 ≤ C < 3.6	3.6 ≤ C < 5	5 ≤ C < 8	8 ≤ C < 10.8	C ≥ 10.8
January	711	95.6%	0.4	1.6	-	0.6	-	99.4%	0.6%	0.0%	0.0%	0.0%	0.0%
February	662	95.1%	0.3	0.8	-	0.5	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
March	712	95.7%	0.3	0.9	-	0.4	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
April	687	95.4%	0.3	1.9	-	0.4	-	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%
May	706	94.9%	0.4	2.6	-	1.2	-	96.5%	3.5%	0.0%	0.0%	0.0%	0.0%
June	688	95.6%	0.5	4.7	-	1.5	-	94.8%	4.7%	0.6%	0.0%	0.0%	0.0%
July	706	94.9%	0.6	7.7	-	1.2	-	91.8%	7.5%	0.4%	0.3%	0.0%	0.0%
August	706	94.9%	0.5	3.3	-	0.8	-	93.2%	6.8%	0.0%	0.0%	0.0%	0.0%
September	689	95.7%	0.4	2.0	-	0.5	-	98.8%	1.2%	0.0%	0.0%	0.0%	0.0%
October	591	79.4%	0.3	2.8	-	0.7	-	98.5%	1.5%	0.0%	0.0%	0.0%	0.0%
November	678	94.2%	0.3	2.7	-	0.6	-	99.0%	1.0%	0.0%	0.0%	0.0%	0.0%
December	709	95.3%	0.3	1.3	-	0.4	-	99.6%	0.4%	0.0%	0.0%	0.0%	0.0%
Annual	8245	93.9%	0.4	7.7	0	1.5	0	97.6%	2.3%	0.1%	0.0%	0.0%	0.0%

Table B-4 Kindersley Station: Summary of Airpointer PM_{2.5} Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (µg/m ³)	Maximum 1-Hr Conc. (µg/m ³)	Maximum 24-Hr Conc. (µg/m ³)	24-Hour Exceedance (no.)	Percent of Data in each Concentration Range					
							0 ≤ C < 2	2 ≤ C < 4	4 ≤ C < 10	10 ≤ C < 20	20 ≤ C < 30	C ≥ 30
January	743	99.9%	5.7	32.1	14.9	-	27.6%	19.2%	36.5%	14.9%	1.3%	0.4%
February	694	99.7%	4.0	33.1	12.7	-	32.3%	33.1%	27.4%	6.6%	0.4%	0.1%
March	743	99.9%	3.3	13.9	6.9	-	39.8%	29.2%	28.1%	2.8%	0.0%	0.0%
April	717	99.6%	3.5	18.1	6.4	-	26.9%	37.8%	34.0%	1.3%	0.0%	0.0%
May	560	75.3%	10.4	298.1	53.3	3	27.7%	22.1%	28.2%	10.7%	4.5%	6.8%
June	679	94.3%	4.0	114.8	17.9	-	45.2%	25.0%	21.1%	6.9%	1.2%	0.6%
July	703	94.5%	4.5	49.1	16.7	-	30.4%	28.9%	34.4%	3.7%	1.4%	1.1%
August	714	96.0%	5.9	65.7	15.8	-	29.7%	23.4%	30.8%	10.9%	3.6%	1.5%
September	691	96.0%	6.5	79.4	15.1	-	25.2%	25.8%	30.1%	13.7%	3.0%	2.2%
October	731	98.3%	3.1	21.2	8.1	-	48.4%	25.2%	22.0%	4.1%	0.3%	0.0%
November	720	100.0%	4.2	23.1	9.2	-	32.2%	35.0%	24.3%	7.5%	1.0%	0.0%
December	742	99.7%	3.4	26.3	9.5	-	41.0%	31.0%	23.3%	4.6%	0.1%	0.0%
Annual	8437	96.0%	4.8	298.1	53.3	3	34.0%	28.1%	28.4%	7.2%	1.3%	0.9%

Table B-5 Kindersley Station: Summary of Airpointer Precipitation Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Total Precip. (mm)	Maximum 1-Hr Precip. (mm)	Maximum 24-Hr Precip. (mm)	Percent of Data in each Precipitation Range					
						<=5	5 ~ 10	10 ~ 25	25 ~ 50	50 ~ 75	>75
January	743	99.9%	1.1	0.4	0.89	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
February	694	99.7%	0.4	0.2	0.28	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
March	743	99.9%	9.8	5.3	8.15	99.9%	0.1%	0.0%	0.0%	0.0%	0.0%
April	717	99.6%	13.1	3.3	12.11	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
May	742	99.7%	41.2	4.0	15.93	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
June	718	99.7%	115.8	46.8	65.91	99.7%	0.1%	0.0%	0.1%	0.0%	0.0%
July	743	99.9%	200.3	21.6	28.82	98.7%	0.8%	0.5%	0.0%	0.0%	0.0%
August	739	99.3%	140.8	14.5	30.62	98.6%	0.9%	0.4%	0.0%	0.0%	0.0%
September	720	100.0%	24.7	3.3	8.61	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
October	741	99.6%	14.3	3.3	6.66	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
November	720	100.0%	1.7	0.8	0.88	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
December	742	99.7%	-	-	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Annual	8762	99.7%	563.2	46.8	65.9	99.7%	0.2%	0.1%	0.0%	0.0%	0.0%

Table B-6 Kindersley Station: Summary of Airpointer Ambient Temperature Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Temp. (°C)	Minimum 1-Hr Temp. (°C)	Maximum 1-Hr Temp. (°C)	Percent of Data in each Temperature Range					
						<=-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
January	743	99.9%	(10.5)	(34.0)	4.9	1.6%	21.1%	69.7%	7.5%	0.0%	0.0%
February	694	99.7%	(5.3)	(17.5)	4.3	0.0%	2.6%	80.3%	17.1%	0.0%	0.0%
March	743	99.9%	0.3	(12.4)	15.7	0.0%	0.0%	49.5%	50.2%	0.3%	0.0%
April	717	99.6%	6.8	(8.1)	25.2	0.0%	0.0%	12.8%	76.7%	10.5%	0.0%
May	742	99.7%	12.9	(4.7)	29.6	0.0%	0.0%	1.6%	64.3%	34.1%	0.0%
June	718	99.7%	16.9	5.7	29.9	0.0%	0.0%	0.0%	42.3%	57.7%	0.0%
July	743	99.9%	17.7	9.7	26.8	0.0%	0.0%	0.0%	29.2%	70.8%	0.0%
August	739	99.3%	16.3	5.2	28.7	0.0%	0.0%	0.0%	47.1%	52.9%	0.0%
September	720	100.0%	11.5	(0.0)	31.4	0.0%	0.0%	0.1%	76.0%	23.1%	0.8%
October	741	99.6%	2.6	(6.1)	15.2	0.0%	0.0%	30.9%	68.8%	0.3%	0.0%
November	720	100.0%	1.7	(9.3)	19.9	0.0%	0.0%	45.3%	51.9%	2.8%	0.0%
December	742	99.7%	(13.5)	(29.1)	1.3	0.0%	51.3%	47.7%	0.9%	0.0%	0.0%
Annual	8762	99.7%	4.8	(34.0)	31.4	0.1%	6.3%	28.0%	44.3%	21.1%	0.1%

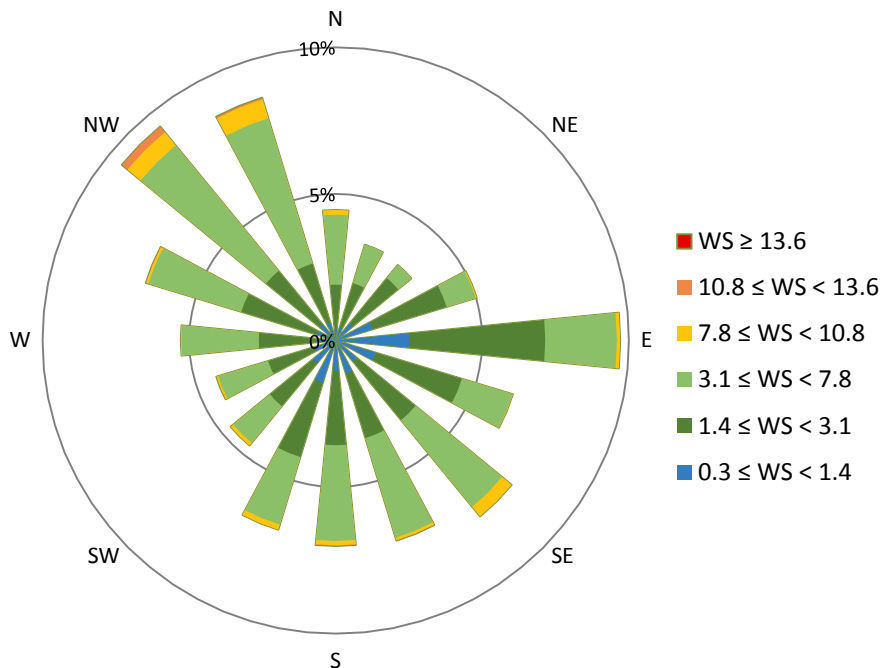
Table B-7 Kindersley Station: Summary of Airpointer Relative Humidity Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average RH (%)	Minimum 1-Hr RH (%)	Maximum 1-Hr RH (%)	Percent of Data in each Relative Humidity Range					
						<=15	15 ~ 30	30 ~ 60	60 ~ 80	80 ~ 90	>90
January	743	99.9%	75	52	86	0.0%	0.0%	2.4%	77.0%	20.6%	0.0%
February	694	99.7%	76	51	89	0.0%	0.0%	0.9%	66.9%	32.3%	0.0%
March	743	99.9%	73	34	89	0.0%	0.0%	15.6%	50.3%	34.1%	0.0%
April	717	99.6%	51	7	89	1.5%	17.4%	42.7%	30.3%	8.1%	0.0%
May	742	99.7%	52	14	90	0.7%	20.1%	40.0%	20.9%	18.3%	0.0%
June	718	99.7%	58	19	91	0.0%	9.7%	40.3%	33.1%	15.2%	1.7%
July	743	99.9%	73	38	92	0.0%	0.0%	22.5%	35.9%	38.1%	3.5%
August	739	99.3%	70	27	92	0.0%	0.5%	27.7%	31.0%	35.6%	5.1%
September	720	100.0%	65	21	91	0.0%	3.2%	30.7%	38.6%	25.7%	1.8%
October	741	99.6%	79	33	91	0.0%	0.0%	5.7%	36.0%	56.5%	1.8%
November	720	100.0%	73	25	89	0.0%	0.4%	16.1%	48.3%	35.1%	0.0%
December	742	99.7%	72	56	87	0.0%	0.0%	3.9%	85.4%	10.6%	0.0%
Annual	8762	99.7%	68	7	92	0.2%	4.3%	20.7%	46.1%	27.6%	1.2%

Table B-8. Kindersley Station: Airpointer Wind Frequency Table for the Year 2016

Wind Direction Sector	Percent Data in each Wind Speed Range, wind speed unit m/s						Totals
	$0.3 \leq WS < 1.4$	$1.4 \leq WS < 3.1$	$3.1 \leq WS < 7.8$	$7.8 \leq WS < 10.8$	$10.8 \leq WS < 13.6$	$WS \geq 13.6$	
North NorthEast	0.5%	1.6%	1.4%	0.0%	0.0%	0.0%	3.4%
NorthEast	0.8%	2.0%	0.6%	0.0%	0.0%	0.0%	3.3%
East NorthEast	1.3%	2.6%	1.0%	0.0%	0.0%	0.0%	5.0%
East	2.5%	4.6%	2.4%	0.1%	0.0%	0.0%	9.7%
East SouthEast	1.4%	3.1%	1.8%	0.0%	0.0%	0.0%	6.3%
SouthEast	0.9%	2.6%	3.8%	0.4%	0.0%	0.0%	7.8%
South SouthEast	1.2%	2.3%	3.5%	0.1%	0.0%	0.0%	7.1%
South	1.0%	2.5%	3.3%	0.1%	0.0%	0.0%	7.0%
South SouthWest	1.5%	2.6%	2.4%	0.2%	0.0%	0.0%	6.7%
Southwest	1.0%	1.9%	1.6%	0.1%	0.0%	0.0%	4.6%
West SouthWest	0.8%	1.7%	1.8%	0.1%	0.0%	0.0%	4.3%
West	0.7%	2.0%	2.6%	0.0%	0.0%	0.0%	5.3%
West NorthWest	0.7%	2.7%	3.3%	0.1%	0.0%	0.0%	6.8%
NorthWest	0.7%	2.4%	5.5%	0.6%	0.3%	0.0%	9.4%
North NorthWest	0.6%	2.1%	5.2%	0.7%	0.0%	0.0%	8.7%
North	0.4%	1.5%	2.4%	0.2%	0.0%	0.0%	4.5%
Total	15.9%	38.2%	42.7%	2.7%	0.4%	0.0%	99.9%

Percent Calm (<0.3 m/s)	0.1%
Number of Valid Hourly-Average Data	8762
Total Workable Hours in Time Period	8784



APPENDIX C MAIDSTONE STATION: CONTINUOUS MONITORING DATA

Table C-1 Maidstone Station: Summary Statistics for Continuous Air Monitoring Results for 2016

Parameter	Unit	Calibration Hours	Hours of Valid Data	Annual Percent Uptime	Summary Statistics for 1-Hour Data		
					Average	Minimum	Maximum
SO ₂	ppb	433	8326	94.8%	0.4	<0.1	13.1
NO	ppb	434	8330	94.8%	1.1	<0.1	32.6
NO ₂	ppb	434	8331	94.8%	3.6	<0.1	27.2
NO _x	ppb	434	8330	94.8%	4.8	0.2	43.4
H ₂ S	ppb	434	8155	92.8%	0.5	<0.1	26.0
PM _{2.5}	µg/m ³	2	8528	97.1%	4.9	<0.1	661.6
Precipitation (total)	mm	0	8761	99.7%	431.7	<0.1	24.0
Ambient Temperature	°C	0	8761	99.7%	3.9	(34.5)	30.1
Relative Humidity	%	0	8761	99.7%	68.3	12.5	91.6
Wind Speed	m/s	0	8761	99.7%	2.2	Calm	8.9

Table C-2 Maidstone Station: Summary of Airpointer SO₂ Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Max 1-Hr Conc. (ppb)	1-Hr Exceedance (no.)	Max 24-Hr Conc. (ppb)	24-Hr Exceedance (no.)	Percent of Data in each Concentration Range					
								0 ≤ C < 1	1 ≤ C < 5	5 ≤ C < 10	10 ≤ C < 57	57 ≤ C < 172	C ≥ 172
January	705	94.8%	0.4	4.0	-	0.9	-	94.2%	5.8%	0.0%	0.0%	0.0%	0.0%
February	662	95.1%	0.4	3.4	-	1.0	-	94.7%	5.3%	0.0%	0.0%	0.0%	0.0%
March	704	94.6%	0.4	4.0	-	0.8	-	94.2%	5.8%	0.0%	0.0%	0.0%	0.0%
April	689	95.7%	0.4	4.2	-	0.9	-	96.4%	3.6%	0.0%	0.0%	0.0%	0.0%
May	701	94.2%	0.3	4.5	-	0.8	-	98.3%	1.7%	0.0%	0.0%	0.0%	0.0%
June	689	95.7%	0.3	3.0	-	0.8	-	97.4%	2.6%	0.0%	0.0%	0.0%	0.0%
July	702	94.4%	0.5	5.8	-	1.0	-	95.3%	4.6%	0.1%	0.0%	0.0%	0.0%
August	712	95.7%	0.5	2.1	-	0.7	-	95.4%	4.6%	0.0%	0.0%	0.0%	0.0%
September	689	95.7%	0.5	6.4	-	1.0	-	96.8%	3.0%	0.1%	0.0%	0.0%	0.0%
October	694	93.3%	0.3	1.2	-	0.5	-	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%
November	674	93.6%	0.4	3.5	-	0.7	-	96.0%	4.0%	0.0%	0.0%	0.0%	0.0%
December	705	94.8%	0.5	13.1	-	1.4	-	94.0%	5.2%	0.4%	0.3%	0.0%	0.0%
Annual	8326	94.8%	0.4	13.1	0	1.4	0	96.0%	3.9%	0.1%	0.0%	0.0%	0.0%

Table C-3 Maidstone Station: Summary of Airpointer NO Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Max 1-Hr Conc. (ppb)	Max 24-Hr Conc. (ppb)	Percent of Data in each Concentration Range					
						0 ≤ C < 5	5 ≤ C < 15	15 ≤ C < 30	30 ≤ C < 100	100 ≤ C < 159	C ≥ 159
January	704	94.6%	1.7	19.0	5.5	90.6%	8.8%	0.6%	0.0%	0.0%	0.0%
February	662	95.1%	1.4	25.7	6.2	94.4%	5.0%	0.6%	0.0%	0.0%	0.0%
March	704	94.6%	1.1	27.7	3.7	96.0%	3.4%	0.6%	0.0%	0.0%	0.0%
April	689	95.7%	0.8	27.9	3.6	98.1%	1.5%	0.4%	0.0%	0.0%	0.0%
May	701	94.2%	1.1	26.8	3.1	96.0%	3.6%	0.4%	0.0%	0.0%	0.0%
June	689	95.7%	1.1	28.9	4.6	96.4%	3.2%	0.4%	0.0%	0.0%	0.0%
July	702	94.4%	0.9	18.7	2.3	98.7%	1.1%	0.1%	0.0%	0.0%	0.0%
August	712	95.7%	1.4	32.6	4.6	94.2%	4.9%	0.7%	0.1%	0.0%	0.0%
September	689	95.7%	1.2	25.7	4.1	95.4%	4.4%	0.3%	0.0%	0.0%	0.0%
October	694	93.3%	1.0	21.3	4.2	96.3%	3.6%	0.1%	0.0%	0.0%	0.0%
November	675	93.8%	1.2	13.3	3.0	96.4%	3.6%	0.0%	0.0%	0.0%	0.0%
December	709	95.3%	0.8	14.1	3.1	98.3%	1.7%	0.0%	0.0%	0.0%	0.0%
Annual	8330	94.8%	1.1	32.6	6.2	95.9%	3.7%	0.4%	0.0%	0.0%	0.0%

Table C-4 Maidstone Station: Summary of Airpointer NO₂ Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Max 1-Hr Conc. (ppb)	1-Hr Exceedance (no.)	Max 24-Hr Conc. (ppb)	24-Hr Exceedance (no.)	Percent of Data in each Concentration Range					
								0 ≤ C < 5	5 ≤ C < 15	15 ≤ C < 30	30 ≤ C < 100	100 ≤ C < 159	C ≥ 159
January	705	94.8%	7.1	23.0	-	15.0	-	37.6%	56.7%	5.7%	0.0%	0.0%	0.0%
February	662	95.1%	6.1	27.2	-	12.0	-	51.8%	42.0%	6.2%	0.0%	0.0%	0.0%
March	704	94.6%	3.7	20.8	-	7.8	-	76.8%	21.4%	1.7%	0.0%	0.0%	0.0%
April	689	95.7%	2.3	11.0	-	4.8	-	90.4%	9.6%	0.0%	0.0%	0.0%	0.0%
May	701	94.2%	3.8	18.8	-	7.7	-	74.8%	23.8%	1.4%	0.0%	0.0%	0.0%
June	689	95.7%	3.5	20.0	-	6.2	-	77.1%	22.4%	0.6%	0.0%	0.0%	0.0%
July	702	94.4%	2.2	11.1	-	4.1	-	93.4%	6.6%	0.0%	0.0%	0.0%	0.0%
August	712	95.7%	2.2	9.0	-	3.6	-	91.2%	8.8%	0.0%	0.0%	0.0%	0.0%
September	689	95.7%	2.5	11.9	-	4.2	-	86.8%	13.2%	0.0%	0.0%	0.0%	0.0%
October	694	93.3%	2.2	11.4	-	5.3	-	90.1%	9.9%	0.0%	0.0%	0.0%	0.0%
November	675	93.8%	3.8	17.9	-	7.5	-	77.5%	22.4%	0.1%	0.0%	0.0%	0.0%
December	709	95.3%	4.4	24.0	-	12.2	-	70.0%	27.9%	2.1%	0.0%	0.0%	0.0%
Annual	8331	94.8%	3.6	27.2	0	15.0	0	76.5%	22.0%	1.5%	0.0%	0.0%	0.0%

Table C-5 Maidstone Station: Summary of Airpointer NO_x Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Max 1-Hr Conc. (ppb)	Max 24-Hr Conc. (ppb)	Percent of Data in each Concentration Range					
						0 ≤ C < 5	5 ≤ C < 15	15 ≤ C < 30	30 ≤ C < 100	100 ≤ C < 159	C ≥ 159
January	704	94.6%	8.8	32.1	20.5	29.8%	57.5%	12.1%	0.6%	0.0%	0.0%
February	662	95.1%	7.4	38.0	18.1	44.3%	43.8%	11.5%	0.5%	0.0%	0.0%
March	704	94.6%	4.8	43.4	11.4	70.5%	25.3%	3.8%	0.4%	0.0%	0.0%
April	689	95.7%	3.1	38.3	6.6	84.2%	14.5%	1.0%	0.3%	0.0%	0.0%
May	701	94.2%	4.9	37.1	9.3	69.5%	26.2%	3.9%	0.4%	0.0%	0.0%
June	689	95.7%	4.6	40.0	8.9	69.5%	27.1%	2.9%	0.4%	0.0%	0.0%
July	702	94.4%	3.1	26.8	5.8	83.6%	15.8%	0.6%	0.0%	0.0%	0.0%
August	712	95.7%	3.6	38.0	7.9	78.7%	19.0%	2.2%	0.1%	0.0%	0.0%
September	689	95.7%	3.7	30.4	7.8	77.6%	20.3%	1.9%	0.1%	0.0%	0.0%
October	694	93.3%	3.2	28.7	7.8	82.0%	16.6%	1.4%	0.0%	0.0%	0.0%
November	675	93.8%	5.0	23.7	10.5	64.0%	32.7%	3.3%	0.0%	0.0%	0.0%
December	709	95.3%	5.2	32.2	15.3	62.9%	33.7%	3.2%	0.1%	0.0%	0.0%
Annual	8330	94.8%	4.8	43.4	20.5	68.1%	27.7%	4.0%	0.3%	0.0%	0.0%

Table C-6 Maidstone Station: Summary of Airpointer H₂S Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Max 1-Hr Conc. (ppb)	1-Hr Exceedance (no.)	Max 24-Hr Conc. (ppb)	24-Hr Exceedance (no.)	Percent of Data in each Concentration Range					
								0 ≤ C < 1	1 ≤ C < 3.6	3.6 ≤ C < 5	5 ≤ C < 8	8 ≤ C < 10.8	C ≥ 10.8
January	705	94.8%	0.4	7.4	-	2.1	-	95.7%	3.8%	0.0%	0.4%	0.0%	0.0%
February	662	95.1%	0.4	3.8	-	0.8	-	96.1%	3.8%	0.2%	0.0%	0.0%	0.0%
March	704	94.6%	0.4	4.7	-	1.1	-	96.7%	3.1%	0.1%	0.0%	0.0%	0.0%
April	675	93.8%	0.3	1.9	-	0.7	-	99.0%	1.0%	0.0%	0.0%	0.0%	0.0%
May	676	90.9%	0.4	1.7	-	0.7	-	96.6%	3.4%	0.0%	0.0%	0.0%	0.0%
June	666	92.5%	0.7	13.5	1	1.9	-	82.9%	14.6%	1.1%	0.9%	0.5%	0.2%
July	689	92.6%	1.0	26.0	7	3.7	2	76.5%	18.6%	1.6%	1.5%	0.9%	1.0%
August	705	94.8%	0.8	16.1	1	3.0	-	76.3%	22.4%	0.4%	0.1%	0.6%	0.1%
September	682	94.7%	0.6	5.1	-	1.2	-	88.4%	11.1%	0.3%	0.1%	0.0%	0.0%
October	668	89.8%	0.4	3.6	-	1.5	-	97.9%	2.1%	0.0%	0.0%	0.0%	0.0%
November	648	90.0%	0.3	1.1	-	0.5	-	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%
December	675	90.7%	0.3	0.8	-	0.5	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Annual	8155	92.8%	0.5	26.0	9	3.7	2	92.1%	7.1%	0.3%	0.3%	0.2%	0.1%

Table C-7 Maidstone Station: Summary of Airpointer PM_{2.5} Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (µg/m ³)	Max 1-Hr Conc. (µg/m ³)	Max 24-Hr Conc. (µg/m ³)	24-Hr Exceedance (no.)	Percent of Data in each Concentration Range					
							0 ≤ C < 2	2 ≤ C < 4	4 ≤ C < 10	10 ≤ C < 20	20 ≤ C < 30	C ≥ 30
January	737	99.1%	6.1	69.5	15.6	-	18.0%	30.9%	36.5%	11.0%	2.4%	1.1%
February	695	99.9%	4.6	87.2	12.3	-	43.3%	24.9%	22.2%	7.5%	1.0%	1.2%
March	737	99.1%	3.9	62.4	9.1	-	38.8%	34.3%	19.9%	5.2%	1.1%	0.7%
April	663	92.1%	3.6	23.4	7.3	-	33.9%	38.3%	21.9%	5.7%	0.2%	0.0%
May	705	94.8%	13.3	661.6	117.7	3	18.6%	17.3%	32.2%	19.0%	5.5%	7.4%
June	671	93.2%	4.1	24.9	7.1	-	31.7%	27.7%	35.3%	5.1%	0.1%	0.0%
July	743	99.9%	4.8	34.7	9.0	-	19.4%	28.4%	45.0%	7.1%	0.0%	0.1%
August	726	97.6%	4.0	23.2	8.5	-	29.2%	31.8%	35.3%	3.6%	0.1%	0.0%
September	720	100.0%	3.9	51.9	7.4	-	33.1%	28.3%	35.6%	2.6%	0.3%	0.1%
October	670	90.1%	2.8	15.9	7.3	-	51.5%	27.5%	19.7%	1.3%	0.0%	0.0%
November	720	100.0%	4.1	18.1	10.7	-	29.4%	26.5%	39.6%	4.4%	0.0%	0.0%
December	741	99.6%	3.5	45.2	8.7	-	48.0%	25.6%	20.2%	4.6%	1.1%	0.4%
Annual	8528	97.1%	4.9	661.6	117.7	3	32.8%	28.5%	30.4%	6.4%	1.0%	0.9%

Table C-8 Maidstone Station: Summary of Airpointer Precipitation Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Total Precip. (mm)	Maximum 1-Hr Precip. (mm)	Maximum 24-Hr Precip. (mm)	Percent of Data in each Precipitation Range					
						≤5	5 ~ 10	10 ~ 25	25 ~ 50	50 ~ 75	>75
January	737	99.1%	5.4	3.0	5.42	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
February	695	99.9%	3.5	1.4	2.34	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
March	737	99.1%	2.1	0.9	1.07	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
April	720	100.0%	3.9	1.8	2.51	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
May	741	99.6%	72.4	17.0	36.38	99.3%	0.4%	0.3%	0.0%	0.0%	0.0%
June	720	100.0%	62.9	6.0	10.20	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%
July	743	99.9%	99.0	14.0	39.70	98.9%	0.9%	0.1%	0.0%	0.0%	0.0%
August	744	100.0%	116.9	24.0	24.70	99.2%	0.5%	0.3%	0.0%	0.0%	0.0%
September	720	100.0%	16.1	4.1	7.35	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
October	743	99.9%	48.7	12.1	21.27	99.7%	0.1%	0.1%	0.0%	0.0%	0.0%
November	720	100.0%	0.8	0.3	0.28	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
December	741	99.6%	-	-	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Annual	8761	99.7%	431.7	24.0	39.7	99.7%	0.2%	0.1%	0.0%	0.0%	0.0%

Table C-9 Maidstone Station: Summary of Airpointer Ambient Temperature Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Temp. (°C)	Minimum 1-Hr Temp. (°C)	Maximum 1-Hr Temp. (°C)	Percent of Data in each Temperature Range					
						<=-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
January	737	99.1%	(12.0)	(34.5)	4.2	2.2%	33.5%	57.8%	6.5%	0.0%	0.0%
February	695	99.9%	(7.1)	(25.3)	5.7	0.0%	10.9%	79.4%	9.6%	0.0%	0.0%
March	737	99.1%	(2.6)	(18.6)	9.0	0.0%	2.4%	65.5%	32.0%	0.0%	0.0%
April	720	100.0%	5.6	(7.8)	26.6	0.0%	0.0%	18.5%	70.8%	10.7%	0.0%
May	741	99.6%	13.3	(2.0)	29.7	0.0%	0.0%	1.9%	61.7%	36.4%	0.0%
June	720	100.0%	16.4	4.5	28.6	0.0%	0.0%	0.0%	43.6%	56.4%	0.0%
July	743	99.9%	17.8	8.5	28.3	0.0%	0.0%	0.0%	28.3%	71.7%	0.0%
August	744	100.0%	16.2	3.4	28.2	0.0%	0.0%	0.0%	46.1%	53.9%	0.0%
September	720	100.0%	10.6	(1.4)	30.1	0.0%	0.0%	0.8%	76.9%	22.1%	0.1%
October	743	99.9%	1.7	(6.9)	15.8	0.0%	0.0%	38.8%	60.8%	0.4%	0.0%
November	720	100.0%	0.5	(11.4)	18.0	0.0%	0.0%	53.6%	44.9%	1.5%	0.0%
December	741	99.6%	(13.8)	(33.7)	1.8	2.0%	49.8%	45.9%	2.3%	0.0%	0.0%
Annual	8761	99.7%	3.9	(34.5)	30.1	0.4%	8.1%	30.0%	40.3%	21.2%	0.0%

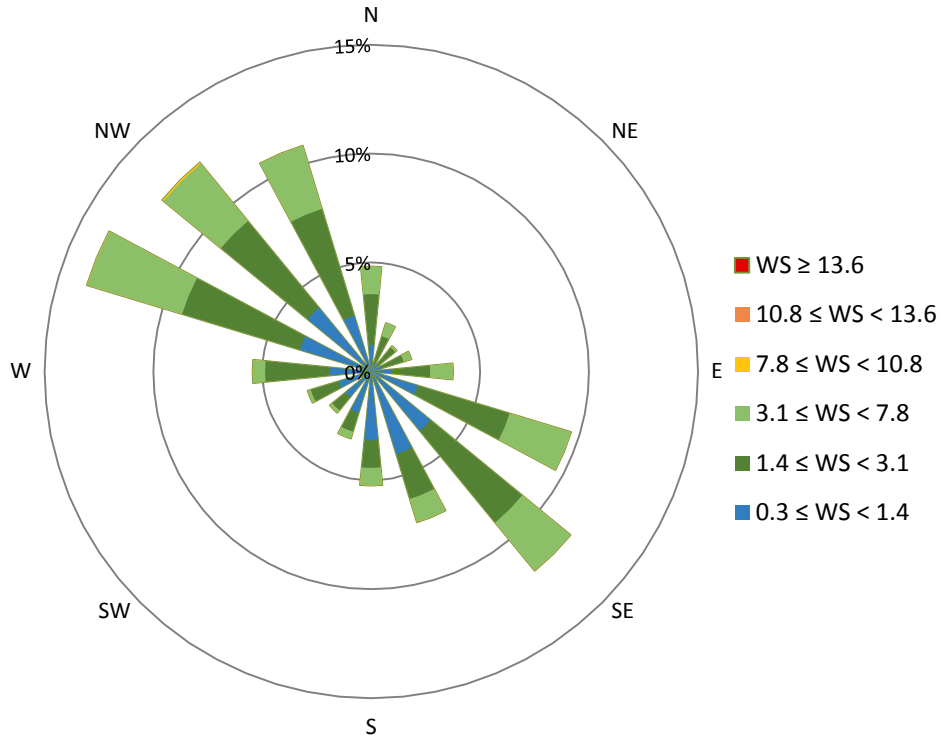
Table C-10 Maidstone Station: Summary of Airpointer Relative Humidity Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average RH (%)	Minimum 1-Hr RH (%)	Maximum 1-Hr RH (%)	Percent of Data in each Relative Humidity Range					
						<=15	15 ~ 30	30 ~ 60	60 ~ 80	80 ~ 90	>90
January	737	99.1%	72	38	85	0.0%	0.0%	5.7%	84.8%	9.5%	0.0%
February	695	99.9%	73	46	88	0.0%	0.0%	10.9%	65.2%	23.9%	0.0%
March	737	99.1%	72	45	88	0.0%	0.0%	10.7%	64.7%	24.6%	0.0%
April	720	100.0%	54	13	88	1.1%	11.0%	45.8%	33.8%	8.3%	0.0%
May	741	99.6%	55	13	91	0.5%	16.6%	38.7%	28.9%	14.4%	0.8%
June	720	100.0%	62	24	91	0.0%	5.1%	39.7%	31.9%	21.0%	2.2%
July	743	99.9%	71	35	92	0.0%	0.0%	26.5%	32.6%	33.9%	7.0%
August	744	100.0%	71	32	91	0.0%	0.0%	28.5%	29.4%	37.4%	4.7%
September	720	100.0%	68	26	91	0.0%	1.4%	30.3%	33.9%	32.5%	1.9%
October	743	99.9%	78	35	90	0.0%	0.0%	3.6%	42.5%	53.7%	0.1%
November	720	100.0%	76	31	89	0.0%	0.0%	10.6%	48.1%	41.4%	0.0%
December	741	99.6%	67	46	84	0.0%	0.0%	14.0%	79.5%	6.5%	0.0%
Annual	8761	99.7%	68	13	92	0.1%	2.8%	22.1%	47.9%	25.6%	1.4%

Table C-11 Maidstone Station: Airpointer Wind Frequency Table for the Year 2016

Wind Direction Sector	Percent Data in each Wind Speed Range, wind speed unit m/s						Totals
	$0.3 \leq WS < 1.4$	$1.4 \leq WS < 3.1$	$3.1 \leq WS < 7.8$	$7.8 \leq WS < 10.8$	$10.8 \leq WS < 13.6$	$WS \geq 13.6$	
North NorthEast	0.4%	1.3%	0.6%	0.0%	0.0%	0.0%	2.3%
NorthEast	0.4%	1.0%	0.1%	0.0%	0.0%	0.0%	1.5%
East NorthEast	0.5%	1.0%	0.4%	0.0%	0.0%	0.0%	1.9%
East	0.9%	1.8%	1.1%	0.0%	0.0%	0.0%	3.8%
East SouthEast	2.2%	4.4%	2.9%	0.0%	0.0%	0.0%	9.6%
SouthEast	3.5%	5.5%	2.9%	0.0%	0.0%	0.0%	11.8%
South SouthEast	4.0%	2.2%	1.1%	0.0%	0.0%	0.0%	7.2%
South	3.2%	1.3%	0.8%	0.0%	0.0%	0.0%	5.2%
South SouthWest	2.0%	0.9%	0.3%	0.0%	0.0%	0.0%	3.2%
Southwest	1.5%	0.8%	0.1%	0.0%	0.0%	0.0%	2.5%
West SouthWest	1.6%	1.3%	0.1%	0.0%	0.0%	0.0%	3.0%
West	1.9%	3.0%	0.6%	0.0%	0.0%	0.0%	5.4%
West NorthWest	3.4%	5.7%	4.6%	0.0%	0.0%	0.0%	13.6%
NorthWest	3.8%	5.1%	3.4%	0.1%	0.0%	0.0%	12.4%
North NorthWest	2.7%	5.1%	3.0%	0.0%	0.0%	0.0%	10.8%
North	1.2%	2.3%	1.3%	0.0%	0.0%	0.0%	4.8%
Total	33.2%	42.6%	23.4%	0.1%	0.0%	0.0%	99.3%

Percent Calm (<0.3 m/s)	0.9%
Number of Valid Hourly-Average Data	8761
Total Workable Hours in Time Period	8784



APPENDIX D. MEADOW LAKE STATION: CONTINUOUS MONITORING DATA

Table D-1 Meadow Lake Station: Summary Statistics for Continuous Air Monitoring Results for 2016

Parameter	Unit	Calibration Hours	Hours of Valid Data	Annual Percent Uptime	Summary Statistics for 1-Hour Data		
					Average	Minimum	Maximum
NO	ppb	401	8331	94.8%	0.3	< 0.1	39.2
NO ₂	ppb	401	8336	94.9%	0.9	< 0.1	12.0
NO _x	ppb	401	8331	94.8%	1.2	0.2	49.2
O ₃	ppb	401	8333	94.9%	27.8	3.0	62.1
PM _{2.5}	µg/m ³	4	7900	89.9%	5.0	< 0.1	172.9
Precipitation (total)	mm	0	8748	99.6%	294.7	< 0.1	12.3
Ambient Temperature	°C	0	8748	99.6%	4.3	(32.6)	31.4
Relative Humidity	%	0	8748	99.6%	65.7	13.1	92.4
Wind Speed	m/s	0	8748	99.6%	2.0	Calm	7.4

Table D-2 Meadow Lake Station: Summary of Airpointer NO Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	Maximum 24-Hr Conc. (ppb)	Percent of Data in each Concentration Range					
						0 ≤ C < 5	5 ≤ C < 15	15 ≤ C < 30	30 ≤ C < 100	100 ≤ C < 159	C ≥ 159
January	708	95.2%	0.3	2.6	0.6	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
February	659	94.7%	0.3	2.2	0.5	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
March	700	94.1%	0.3	1.5	0.5	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
April	688	95.6%	0.2	1.1	0.3	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
May	699	94.0%	0.2	1.6	0.6	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
June	686	95.3%	0.3	5.1	0.7	99.9%	0.1%	0.0%	0.0%	0.0%	0.0%
July	708	95.2%	0.2	1.1	0.4	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
August	705	94.8%	0.3	1.2	0.4	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
September	689	95.7%	0.3	1.6	0.4	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
October	704	94.6%	0.4	39.2	2.3	99.7%	0.1%	0.0%	0.1%	0.0%	0.0%
November	673	93.5%	0.3	7.8	0.8	99.6%	0.4%	0.0%	0.0%	0.0%	0.0%
December	712	95.7%	0.2	1.9	0.4	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Annual	8331	94.8%	0.3	39.2	2.3	99.9%	0.1%	0.0%	0.0%	0.0%	0.0%

Table D-3 Meadow Lake Station: Summary of Airpointer NO₂ Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance (no.)	Percent of Data in each Concentration Range					
								0 ≤ C < 5	5 ≤ C < 15	15 ≤ C < 30	30 ≤ C < 100	100 ≤ C < 159	C ≥ 159
January	708	95.2%	1.7	12.0	-	5.7	-	96.9%	3.1%	0.0%	0.0%	0.0%	0.0%
February	659	94.7%	1.2	4.8	-	3.6	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
March	700	94.1%	0.8	4.6	-	2.1	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
April	689	95.7%	0.5	3.0	-	0.8	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
May	699	94.0%	0.9	3.9	-	1.9	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
June	687	95.4%	0.8	3.0	-	1.2	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
July	709	95.3%	0.6	1.9	-	0.9	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
August	705	94.8%	0.5	1.7	-	0.7	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
September	689	95.7%	0.5	2.1	-	1.0	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
October	705	94.8%	0.6	10.1	-	1.7	-	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%
November	674	93.6%	1.1	5.0	-	2.4	-	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
December	712	95.7%	1.2	6.4	-	3.2	-	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%
Annual	8336	94.9%	0.9	12.0	0	5.7	0	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%

Table D-4 Meadow Lake Station: Summary of Airpointer NO_x Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	Maximum 24-Hr Conc. (ppb)	Percent of Data in each Concentration Range					
						0 ≤ C < 5	5 ≤ C < 15	15 ≤ C < 30	30 ≤ C < 100	100 ≤ C < 159	C ≥ 159
January	708	95.2%	2.0	12.2	6.2	95.6%	4.4%	0.0%	0.0%	0.0%	0.0%
February	659	94.7%	1.6	6.0	4.1	98.6%	1.4%	0.0%	0.0%	0.0%	0.0%
March	700	94.1%	1.1	4.9	2.4	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
April	688	95.6%	0.7	3.3	1.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
May	699	94.0%	1.1	5.0	2.5	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
June	686	95.3%	1.1	7.9	1.9	99.1%	0.9%	0.0%	0.0%	0.0%	0.0%
July	708	95.2%	0.8	2.5	1.2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
August	705	94.8%	0.8	2.2	1.1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
September	689	95.7%	0.8	3.2	1.3	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
October	704	94.6%	1.1	49.2	3.9	99.4%	0.3%	0.1%	0.1%	0.0%	0.0%
November	673	93.5%	1.5	12.4	2.8	99.0%	1.0%	0.0%	0.0%	0.0%	0.0%
December	712	95.7%	1.5	6.7	3.4	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%
Annual	8331	94.8%	1.2	49.2	6.2	99.3%	0.7%	0.0%	0.0%	0.0%	0.0%

Table D-5 Meadow Lake Station: Summary of Airpointer O₃ Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance (no.)	Maximum 24-Hr Conc. (ppb)	Percent of Data in each Concentration Range					
							0 ≤ C < 10	10 ≤ C < 20	20 ≤ C < 40	40 ≤ C < 60	60 ≤ C < 82	C ≥ 82
January	708	95.2%	28.10	41.7	-	37.7	0.0%	10.9%	88.4%	0.7%	0.0%	0.0%
February	659	94.7%	31.16	45.8	-	43.0	0.0%	0.6%	95.1%	4.2%	0.0%	0.0%
March	700	94.1%	34.44	49.8	-	42.1	0.0%	0.9%	80.3%	18.9%	0.0%	0.0%
April	689	95.7%	37.07	54.2	-	47.4	0.0%	0.6%	68.2%	31.2%	0.0%	0.0%
May	699	94.0%	33.21	62.1	-	48.4	1.9%	13.0%	57.1%	27.8%	0.3%	0.0%
June	687	95.4%	32.72	55.9	-	48.0	1.6%	8.3%	67.0%	23.1%	0.0%	0.0%
July	708	95.2%	24.56	50.0	-	35.7	4.1%	26.0%	66.0%	4.0%	0.0%	0.0%
August	705	94.8%	19.95	45.1	-	28.3	9.2%	42.7%	47.1%	1.0%	0.0%	0.0%
September	689	95.7%	22.11	40.9	-	32.3	5.4%	39.6%	54.7%	0.3%	0.0%	0.0%
October	704	94.6%	19.20	36.7	-	28.2	12.2%	43.2%	44.6%	0.0%	0.0%	0.0%
November	673	93.5%	22.28	37.5	-	28.2	0.4%	35.5%	64.0%	0.0%	0.0%	0.0%
December	712	95.7%	28.55	39.8	-	35.9	0.0%	7.2%	92.8%	0.0%	0.0%	0.0%
Annual	8333	94.9%	27.76	62.1	-	48.4	2.9%	19.1%	68.7%	9.2%	0.0%	0.0%

Table D-6 Meadow Lake Station: Summary of Airpointer PM_{2.5} Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (µg/m ³)	Maximum 1-Hr Conc. (µg/m ³)	Maximum 24-Hr Conc. (µg/m ³)	24-Hour Exceedance (no.)	Percent of Data in each Concentration Range					
							0 ≤ C < 2	2 ≤ C < 4	4 ≤ C < 10	10 ≤ C < 20	20 ≤ C < 30	C ≥ 30
January	740	99.5%	4.3	83.3	11.7	-	32.6%	29.2%	31.5%	5.7%	0.5%	0.5%
February	693	99.6%	4.1	128.7	11.8	-	34.2%	33.2%	27.8%	3.5%	0.6%	0.7%
March	711	95.6%	3.6	14.9	7.2	-	36.8%	26.7%	33.5%	3.0%	0.0%	0.0%
April	720	100.0%	4.4	35.9	10.1	-	21.4%	33.9%	38.9%	5.0%	0.7%	0.1%
May	620	83.3%	16.7	172.9	55.5	7	10.5%	12.3%	24.7%	24.4%	14.0%	14.2%
June	590	81.9%	4.9	28.4	14.7	-	22.7%	32.7%	36.1%	7.5%	1.0%	0.0%
July	595	80.0%	5.9	32.4	10.9	-	17.5%	21.0%	47.7%	12.8%	0.8%	0.2%
August	511	68.7%	4.1	18.9	6.2	-	27.2%	32.9%	35.6%	4.3%	0.0%	0.0%
September	606	84.2%	4.0	91.4	12.1	-	27.9%	38.6%	30.2%	2.6%	0.0%	0.7%
October	715	96.1%	2.8	21.6	8.1	-	47.1%	33.4%	18.0%	1.1%	0.3%	0.0%
November	681	94.6%	3.2	16.5	6.9	-	36.6%	35.4%	27.0%	1.0%	0.0%	0.0%
December	718	96.5%	3.5	46.2	7.4	-	35.7%	35.2%	26.0%	2.6%	0.1%	0.3%
Annual	7900	89.9%	5.0	172.9	55.5	7	29.7%	30.5%	31.1%	5.9%	1.4%	1.3%

Table D-7 Meadow Lake Station: Summary of Airpointer Precipitation Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Total Precip. (mm)	Maximum 1-Hr Precip. (mm)	Maximum 24-Hr Precip. (mm)	Percent of Data in each Precipitation Range					
						<=5	5 ~ 10	10 ~ 25	25 ~ 50	50 ~ 75	>75
January	740	99.5%	2.5	1.4	2.45	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
February	693	99.6%	4.9	1.7	4.59	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
March	734	98.7%	0.4	0.2	0.19	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
April	720	100.0%	8.7	3.8	6.49	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
May	740	99.5%	4.1	1.0	1.86	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
June	718	99.7%	62.5	10.7	20.20	99.6%	0.1%	0.3%	0.0%	0.0%	0.0%
July	744	100.0%	97.3	12.3	19.31	99.6%	0.3%	0.1%	0.0%	0.0%	0.0%
August	743	99.9%	52.8	6.8	12.81	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%
September	720	100.0%	17.0	2.6	4.90	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
October	739	99.3%	32.3	9.1	21.01	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%
November	713	99.0%	12.1	5.2	6.10	99.9%	0.1%	0.0%	0.0%	0.0%	0.0%
December	744	100.0%	0.0	0.0	0.01	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Annual	8748	99.6%	294.7	12.3	21.0	99.9%	0.1%	0.0%	0.0%	0.0%	0.0%

Table D-8 Meadow Lake Station: Summary of Airpointer Ambient Temperature Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Temp. (°C)	Minimum 1-Hr Temp. (°C)	Maximum 1-Hr Temp. (°C)	Percent of Data in each Temperature Range					
						<=-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
January	740	99.5%	(11.0)	(31.1)	6.6	0.5%	32.0%	56.9%	10.5%	0.0%	0.0%
February	693	99.6%	(7.0)	(31.6)	8.8	0.6%	11.5%	77.5%	10.4%	0.0%	0.0%
March	734	98.7%	(1.9)	(16.0)	10.6	0.0%	0.4%	63.9%	35.7%	0.0%	0.0%
April	720	100.0%	5.4	(10.4)	25.8	0.0%	0.0%	22.2%	66.0%	11.8%	0.0%
May	740	99.5%	13.8	(2.0)	31.4	0.0%	0.0%	1.1%	57.7%	40.4%	0.8%
June	718	99.7%	16.9	4.3	28.1	0.0%	0.0%	0.0%	39.7%	60.3%	0.0%
July	744	100.0%	18.3	8.2	29.1	0.0%	0.0%	0.0%	21.9%	78.1%	0.0%
August	743	99.9%	16.4	4.4	29.5	0.0%	0.0%	0.0%	45.5%	54.5%	0.0%
September	720	100.0%	11.2	(0.1)	27.5	0.0%	0.0%	0.1%	77.8%	22.1%	0.0%
October	739	99.3%	1.5	(4.2)	15.3	0.0%	0.0%	39.4%	60.2%	0.4%	0.0%
November	713	99.0%	1.2	(11.7)	18.0	0.0%	0.0%	50.1%	48.4%	1.5%	0.0%
December	744	100.0%	(13.6)	(32.6)	4.9	2.3%	48.7%	43.4%	5.6%	0.0%	0.0%
Annual	8748	99.6%	4.3	(32.6)	31.4	0.3%	7.8%	29.3%	39.9%	22.6%	0.1%

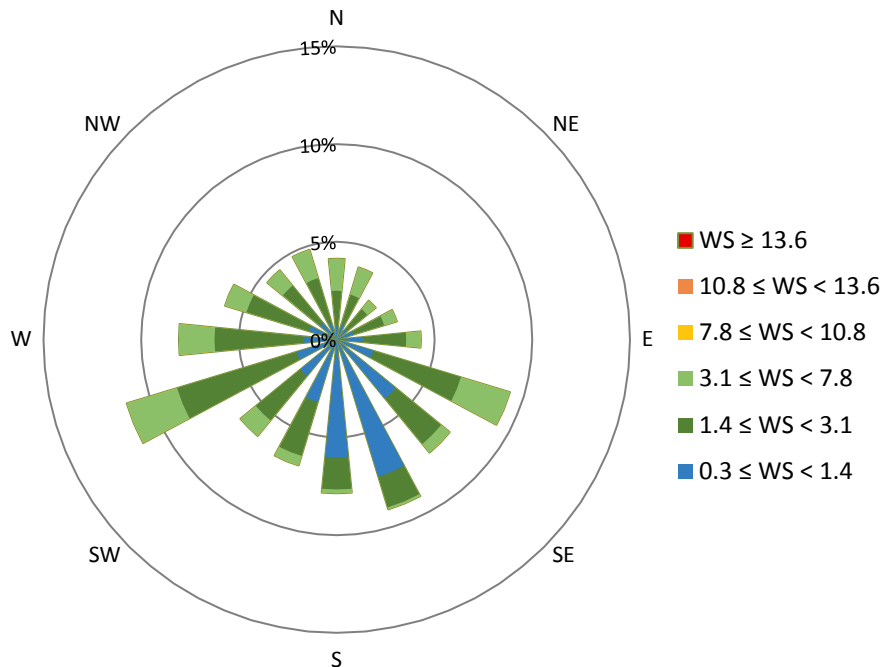
Table D-9 Meadow Lake Station: Summary of Airpointer Relative Humidity Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average RH (%)	Minimum 1-Hr RH (%)	Maximum 1-Hr RH (%)	Percent of Data in each Relative Humidity Range					
						<=15	15 ~ 30	30 ~ 60	60 ~ 80	80 ~ 90	>90
January	740	99.5%	71	37	86	0.0%	0.0%	9.7%	80.1%	10.1%	0.0%
February	693	99.6%	69	33	87	0.0%	0.0%	21.6%	63.2%	15.2%	0.0%
March	734	98.7%	68	29	90	0.0%	0.1%	27.9%	47.0%	24.9%	0.0%
April	720	100.0%	49	15	88	0.0%	19.9%	47.9%	26.3%	6.0%	0.0%
May	740	99.5%	52	13	92	0.5%	15.9%	45.3%	27.8%	7.7%	2.7%
June	718	99.7%	58	23	92	0.0%	6.8%	46.4%	28.0%	17.3%	1.5%
July	744	100.0%	68	27	92	0.0%	0.4%	31.7%	37.4%	23.1%	7.4%
August	743	99.9%	69	30	92	0.0%	0.1%	31.0%	35.8%	28.7%	4.4%
September	720	100.0%	66	29	91	0.0%	1.0%	35.7%	35.0%	23.9%	4.4%
October	739	99.3%	80	44	91	0.0%	0.0%	3.8%	34.2%	59.9%	2.0%
November	713	99.0%	72	28	89	0.0%	0.3%	16.1%	55.3%	28.3%	0.0%
December	744	100.0%	67	34	84	0.0%	0.0%	15.6%	80.1%	4.3%	0.0%
Annual	8748	99.6%	66	13	92	0.0%	3.7%	27.7%	45.9%	20.8%	1.9%

Table D-10 Meadow Lake Station: Airpointer Wind Frequency Table for the Year 2016

Wind Direction Sector	Percent Data in each Wind Speed Range, wind speed unit m/s						Totals
	$0.3 \leq WS < 1.4$	$1.4 \leq WS < 3.1$	$3.1 \leq WS < 7.8$	$7.8 \leq WS < 10.8$	$10.8 \leq WS < 13.6$	$WS \geq 13.6$	
North NorthEast	0.8%	1.6%	1.5%	0.0%	0.0%	0.0%	3.9%
NorthEast	0.7%	1.3%	0.6%	0.0%	0.0%	0.0%	2.6%
East NorthEast	0.9%	1.7%	0.7%	0.0%	0.0%	0.0%	3.2%
East	1.4%	2.1%	0.8%	0.0%	0.0%	0.0%	4.3%
East SouthEast	2.0%	4.7%	2.6%	0.0%	0.0%	0.0%	9.3%
SouthEast	3.9%	3.0%	0.6%	0.0%	0.0%	0.0%	7.5%
South SouthEast	7.3%	1.6%	0.1%	0.0%	0.0%	0.0%	9.1%
South	6.0%	1.6%	0.2%	0.0%	0.0%	0.0%	7.9%
South SouthWest	3.3%	2.9%	0.5%	0.0%	0.0%	0.0%	6.7%
Southwest	2.4%	2.9%	1.0%	0.0%	0.0%	0.0%	6.4%
West SouthWest	2.1%	6.4%	2.7%	0.0%	0.0%	0.0%	11.2%
West	1.7%	4.6%	1.8%	0.0%	0.0%	0.0%	8.1%
West NorthWest	1.5%	3.4%	1.1%	0.0%	0.0%	0.0%	6.0%
NorthWest	1.1%	2.5%	1.0%	0.0%	0.0%	0.0%	4.6%
North NorthWest	0.9%	2.4%	1.5%	0.0%	0.0%	0.0%	4.8%
North	0.7%	1.8%	1.6%	0.0%	0.0%	0.0%	4.1%
Total	36.7%	44.5%	18.3%	0.0%	0.0%	0.0%	99.5%

Percent Calm (<0.3 m/s)	0.5%
Number of Valid Hourly-Average Data	8748
Total Workable Hours in Time Period	8784



APPENDIX E. UNITY STATION: CONTINUOUS MONITORING DATA

Table E-1 Unity Station: Summary Statistics for Continuous Air Monitoring Results for 2016

Parameter	Unit	Calibration Hours	Hours of Valid Data	Annual Percent Uptime	Summary Statistics for 1-Hour Data		
					Average	Minimum	Maximum
NO	ppb	433	8213	93.5%	0.6	< 0.1	30.9
NO ₂	ppb	433	8238	93.8%	2.3	< 0.1	24.7
NO _x	ppb	433	8213	93.5%	2.9	0.2	51.8
O ₃	ppb	433	8234	93.7%	26.2	3.2	64.1
PM _{2.5}	µg/m ³	4	8185	93.2%	6.3	< 0.1	261.7
Precipitation (total)	mm	0	8660	98.6%	376.7	< 0.1	15.0
Ambient Temperature	°C	0	8660	98.6%	4.2	(34.0)	31.0
Relative Humidity	%	0	8660	98.6%	68.9	11.4	92.1
Wind Speed	m/s	0	8660	98.6%	1.9	Calm	11.1

Table E-2 Unity Station: Summary of Airpointer NO Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	Maximum 24-Hr Conc. (ppb)	Percent of Data in each Concentration Range					
						0 ≤ C < 5	5 ≤ C < 15	15 ≤ C < 30	30 ≤ C < 100	100 ≤ C < 159	C ≥ 159
January	664	89.2%	0.7	16.7	2.1	99.4%	0.5%	0.2%	0.0%	0.0%	0.0%
February	626	89.9%	0.6	6.8	1.3	99.8%	0.2%	0.0%	0.0%	0.0%	0.0%
March	683	91.8%	0.5	3.3	1.3	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
April	682	94.7%	0.4	2.6	0.7	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
May	687	92.3%	0.6	5.1	1.2	99.9%	0.1%	0.0%	0.0%	0.0%	0.0%
June	689	95.7%	0.9	30.9	3.7	98.3%	1.5%	0.1%	0.1%	0.0%	0.0%
July	698	93.8%	0.7	5.5	1.0	99.9%	0.1%	0.0%	0.0%	0.0%	0.0%
August	711	95.6%	0.6	3.1	1.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
September	689	95.7%	0.5	2.9	0.8	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
October	699	94.0%	0.6	4.2	1.4	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
November	673	93.5%	0.6	6.0	1.3	99.9%	0.1%	0.0%	0.0%	0.0%	0.0%
December	712	95.7%	0.7	4.9	1.2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Annual	8213	93.5%	0.6	30.9	3.7	99.8%	0.2%	0.0%	0.0%	0.0%	0.0%

Table E-3 Unity Station: Summary of Airpointer NO₂ Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance (no.)	Percent of Data in each Concentration Range					
								0 ≤ C < 5	5 ≤ C < 15	15 ≤ C < 30	30 ≤ C < 100	100 ≤ C < 159	C ≥ 159
January	665	89.4%	4.7	15.1	-	9.3	-	65.0%	34.9%	0.2%	0.0%	0.0%	0.0%
February	629	90.4%	2.9	9.3	-	6.1	-	83.3%	16.7%	0.0%	0.0%	0.0%	0.0%
March	683	91.8%	1.7	5.7	-	3.6	-	99.1%	0.9%	0.0%	0.0%	0.0%	0.0%
April	684	95.0%	1.3	6.0	-	2.2	-	99.4%	0.6%	0.0%	0.0%	0.0%	0.0%
May	701	94.2%	2.8	11.6	-	5.4	-	87.7%	12.3%	0.0%	0.0%	0.0%	0.0%
June	689	95.7%	4.0	24.7	-	8.6	-	71.8%	26.3%	1.9%	0.0%	0.0%	0.0%
July	699	94.0%	1.5	6.5	-	2.2	-	99.9%	0.1%	0.0%	0.0%	0.0%	0.0%
August	712	95.7%	1.0	5.9	-	1.8	-	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%
September	689	95.7%	1.4	13.1	-	2.7	-	98.7%	1.3%	0.0%	0.0%	0.0%	0.0%
October	699	94.0%	1.3	9.0	-	3.4	-	99.1%	0.9%	0.0%	0.0%	0.0%	0.0%
November	676	93.9%	2.5	11.9	-	4.5	-	93.0%	7.0%	0.0%	0.0%	0.0%	0.0%
December	712	95.7%	2.5	9.0	-	5.2	-	89.7%	10.3%	0.0%	0.0%	0.0%	0.0%
Annual	8238	93.8%	2.3	24.7	0	9.3	0	90.7%	9.1%	0.2%	0.0%	0.0%	0.0%

Table E-4 Unity Station: Summary of Airpointer NO_x Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	Maximum 24-Hr Conc. (ppb)	Percent of Data in each Concentration Range					
						0 ≤ C < 5	5 ≤ C < 15	15 ≤ C < 30	30 ≤ C < 100	100 ≤ C < 159	C ≥ 159
January	664	89.2%	5.4	28.5	10.9	53.5%	45.8%	0.8%	0.0%	0.0%	0.0%
February	626	89.9%	3.5	12.3	7.1	73.8%	26.2%	0.0%	0.0%	0.0%	0.0%
March	683	91.8%	2.1	7.5	4.9	96.3%	3.7%	0.0%	0.0%	0.0%	0.0%
April	682	94.7%	1.7	7.5	2.8	98.4%	1.6%	0.0%	0.0%	0.0%	0.0%
May	687	92.3%	3.3	15.6	5.2	81.5%	18.3%	0.1%	0.0%	0.0%	0.0%
June	689	95.7%	5.0	51.8	12.2	67.3%	28.9%	3.5%	0.3%	0.0%	0.0%
July	698	93.8%	2.2	12.0	3.1	98.1%	1.9%	0.0%	0.0%	0.0%	0.0%
August	711	95.6%	1.7	6.7	2.4	99.4%	0.6%	0.0%	0.0%	0.0%	0.0%
September	689	95.7%	2.0	14.3	3.2	97.2%	2.8%	0.0%	0.0%	0.0%	0.0%
October	699	94.0%	1.8	9.4	4.8	95.7%	4.3%	0.0%	0.0%	0.0%	0.0%
November	673	93.5%	3.2	12.2	5.7	85.6%	14.4%	0.0%	0.0%	0.0%	0.0%
December	712	95.7%	3.2	9.3	6.4	82.4%	17.6%	0.0%	0.0%	0.0%	0.0%
Annual	8213	93.5%	2.9	51.8	12.2	86.0%	13.6%	0.4%	0.0%	0.0%	0.0%

Table E-5 Unity Station: Summary of Airpointer O₃ Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance (no.)	Maximum 24-Hr Conc. (ppb)	Percent of Data in each Concentration Range					
							0 ≤ C < 10	10 ≤ C < 20	20 ≤ C < 40	40 ≤ C < 60	60 ≤ C < 82	C ≥ 82
January	665	89.4%	23.32	37.1	-	33.5	0.6%	22.6%	76.8%	0.0%	0.0%	0.0%
February	627	90.1%	27.47	42.7	-	36.7	0.0%	11.6%	86.8%	1.6%	0.0%	0.0%
March	683	91.8%	27.20	43.4	-	32.9	0.0%	2.3%	94.6%	0.0%	0.0%	0.0%
April	683	94.9%	28.28	53.9	-	33.9	0.1%	13.8%	79.2%	6.9%	0.0%	0.0%
May	701	94.2%	30.70	64.1	-	40.4	1.4%	15.3%	61.8%	21.4%	0.0%	0.0%
June	689	95.7%	29.19	61.1	-	37.1	1.9%	18.6%	60.8%	18.0%	0.0%	0.0%
July	698	93.8%	22.31	46.7	-	33.9	4.7%	41.1%	51.9%	2.3%	0.0%	0.0%
August	712	95.7%	24.02	58.0	-	31.7	4.8%	34.4%	54.8%	6.0%	0.0%	0.0%
September	689	95.7%	23.91	55.3	-	32.7	2.5%	35.4%	57.2%	4.9%	0.0%	0.0%
October	699	94.0%	20.87	44.3	-	29.9	8.4%	36.1%	54.9%	0.6%	0.0%	0.0%
November	676	93.9%	19.24	39.1	-	28.5	5.5%	51.9%	42.6%	0.0%	0.0%	0.0%
December	712	95.7%	24.32	39.3	-	30.5	0.3%	17.6%	82.2%	0.0%	0.0%	0.0%
Annual	8234	93.7%	26.22	64.1	-	40.4	2.6%	25.4%	66.8%	5.2%	0.0%	0.0%

Table E-6 Unity Station: Summary of Airpointer PM_{2.5} Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (µg/m ³)	Maximum 1-Hr Conc. (µg/m ³)	Maximum 24-Hr Conc. (µg/m ³)	24-Hour Exceedance (no.)	Percent of Data in each Concentration Range					
							0 ≤ C < 2	2 ≤ C < 4	4 ≤ C < 10	10 ≤ C < 20	20 ≤ C < 30	C ≥ 30
January	691	92.9%	7.3	43.9	24.5	-	21.6%	14.8%	39.4%	19.8%	3.8%	0.7%
February	663	95.3%	5.8	35.4	12.7	-	19.8%	23.7%	41.5%	13.0%	1.8%	0.3%
March	716	96.2%	5.6	20.3	10.3	-	14.5%	27.0%	46.5%	11.9%	0.1%	0.0%
April	715	99.3%	5.2	18.7	7.1	-	24.3%	24.9%	39.4%	11.3%	0.0%	0.0%
May	742	99.7%	14.4	261.7	86.7	4	8.6%	23.3%	34.0%	17.0%	6.2%	10.9%
June	698	96.9%	4.9	19.5	8.6	-	20.3%	29.7%	42.0%	8.0%	0.0%	0.0%
July	417	56.0%	4.4	15.1	10.8	-	15.1%	38.8%	40.0%	6.0%	0.0%	0.0%
August	620	83.3%	5.0	24.2	15.0	-	28.1%	27.1%	33.1%	11.1%	0.6%	0.0%
September	720	100.0%	7.1	73.8	22.2	-	16.5%	30.6%	34.4%	12.9%	2.8%	2.8%
October	744	100.0%	4.9	20.2	10.5	-	29.7%	24.1%	33.2%	12.9%	0.1%	0.0%
November	715	99.3%	6.5	51.8	11.4	-	15.8%	21.5%	43.9%	16.9%	1.7%	0.1%
December	744	100.0%	3.5	18.5	8.0	-	39.0%	28.9%	26.7%	5.4%	0.0%	0.0%
Annual	8185	93.2%	6.3	261.7	86.7	4	21.3%	25.8%	37.7%	12.4%	1.5%	1.3%

Table E-7 Unity Station: Summary of Airpointer Precipitation Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Total Precip. (mm)	Maximum 1-Hr Precip. (mm)	Maximum 24-Hr Precip. (mm)	Percent of Data in each Precipitation Range					
						<=5	5 ~ 10	10 ~ 25	25 ~ 50	50 ~ 75	>75
January	691	92.9%	2.8	1.0	2.81	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
February	663	95.3%	2.3	0.8	1.15	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
March	716	96.2%	9.3	2.2	4.57	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
April	715	99.3%	11.2	3.9	8.85	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
May	742	99.7%	73.7	10.8	26.11	99.7%	0.0%	0.3%	0.0%	0.0%	0.0%
June	720	100.0%	78.5	15.0	22.78	99.2%	0.4%	0.4%	0.0%	0.0%	0.0%
July	741	99.6%	73.6	6.2	15.07	99.3%	0.7%	0.0%	0.0%	0.0%	0.0%
August	744	100.0%	82.1	12.7	18.67	99.5%	0.4%	0.1%	0.0%	0.0%	0.0%
September	720	100.0%	23.5	4.6	12.19	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
October	744	100.0%	13.9	2.9	4.68	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
November	720	100.0%	5.7	1.7	3.46	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
December	744	100.0%	0.0	0.0	0.01	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Annual	8660	98.6%	376.7	15.0	26.1	99.8%	0.1%	0.1%	0.0%	0.0%	0.0%

Table E-8 Unity Station: Summary of Airpointer Ambient Temperature Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Temp. (°C)	Minimum 1-Hr Temp. (°C)	Maximum 1-Hr Temp. (°C)	Percent of Data in each Temperature Range					
						<=-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
January	691	92.9%	(11.4)	(34.0)	3.4	1.7%	25.6%	66.0%	6.7%	0.0%	0.0%
February	663	95.3%	(6.4)	(20.1)	5.6	0.0%	8.1%	81.1%	10.7%	0.0%	0.0%
March	716	96.2%	(1.4)	(15.6)	11.4	0.0%	0.1%	62.6%	37.3%	0.0%	0.0%
April	715	99.3%	6.0	(9.4)	25.9	0.0%	0.0%	16.4%	72.0%	11.6%	0.0%
May	742	99.7%	13.0	(4.1)	28.8	0.0%	0.0%	2.2%	63.3%	34.5%	0.0%
June	720	100.0%	16.4	4.1	29.2	0.0%	0.0%	0.0%	45.0%	55.0%	0.0%
July	741	99.6%	17.5	7.7	26.9	0.0%	0.0%	0.0%	34.3%	65.7%	0.0%
August	744	100.0%	15.9	2.6	28.1	0.0%	0.0%	0.0%	49.9%	50.1%	0.0%
September	720	100.0%	10.7	(0.4)	31.0	0.0%	0.0%	0.1%	77.9%	21.4%	0.6%
October	744	100.0%	1.6	(8.4)	15.5	0.0%	0.0%	37.9%	61.8%	0.3%	0.0%
November	720	100.0%	0.4	(13.1)	19.3	0.0%	0.0%	49.7%	48.5%	1.8%	0.0%
December	744	100.0%	(14.0)	(30.9)	0.9	1.2%	49.1%	49.3%	0.4%	0.0%	0.0%
Annual	8660	98.6%	4.2	(34.0)	31.0	0.2%	6.9%	29.8%	42.6%	20.4%	0.0%

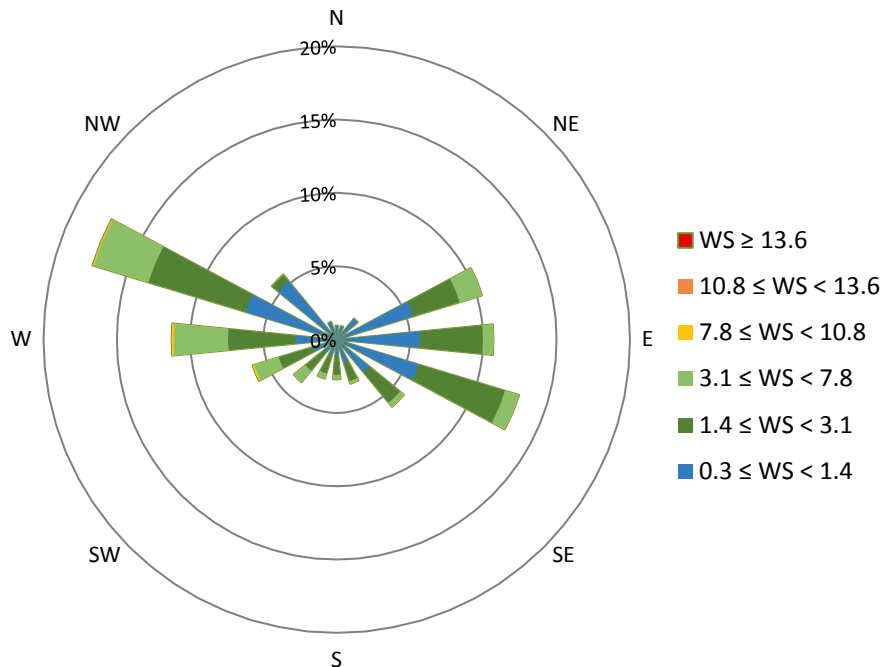
Table E-9 Unity Station: Summary of Airpointer Relative Humidity Monitoring Results for the Year 2016

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average RH (%)	Minimum 1-Hr RH (%)	Maximum 1-Hr RH (%)	Percent of Data in each Relative Humidity Range					
						<=15	15 ~ 30	30 ~ 60	60 ~ 80	80 ~ 90	>90
January	691	92.9%	72	49	86	0.0%	0.0%	6.1%	88.1%	5.8%	0.0%
February	663	95.3%	75	49	89	0.0%	0.0%	5.1%	69.1%	25.8%	0.0%
March	716	96.2%	74	42	89	0.0%	0.0%	6.7%	60.2%	33.1%	0.0%
April	715	99.3%	54	11	89	1.7%	10.8%	46.7%	33.3%	7.6%	0.0%
May	742	99.7%	54	14	91	0.3%	18.7%	40.7%	20.6%	17.4%	2.3%
June	720	100.0%	62	23	92	0.0%	4.6%	40.0%	34.3%	18.8%	2.4%
July	741	99.6%	73	31	92	0.0%	0.0%	25.1%	28.5%	36.7%	9.7%
August	744	100.0%	71	33	91	0.0%	0.0%	27.6%	27.4%	38.6%	6.5%
September	720	100.0%	67	21	91	0.0%	2.4%	31.5%	33.8%	30.6%	1.8%
October	744	100.0%	80	30	91	0.0%	0.0%	3.0%	42.1%	53.1%	1.9%
November	720	100.0%	76	29	89	0.0%	0.3%	9.2%	43.8%	46.8%	0.0%
December	744	100.0%	70	52	85	0.0%	0.0%	8.1%	82.0%	9.9%	0.0%
Annual	8660	98.6%	69	11	92	0.2%	3.1%	20.9%	46.6%	27.1%	2.1%

Table E-11 Unity Station: Airpointer Wind Frequency Table for the Year 2016

Wind Direction Sector	Percent Data in each Wind Speed Range, wind speed unit m/s						Totals
	$0.3 \leq WS < 1.4$	$1.4 \leq WS < 3.1$	$3.1 \leq WS < 7.8$	$7.8 \leq WS < 10.8$	$10.8 \leq WS < 13.6$	$WS \geq 13.6$	
North NorthEast	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%
NorthEast	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%
East NorthEast	5.5%	3.3%	1.6%	0.0%	0.0%	0.0%	10.4%
East	5.7%	4.3%	0.7%	0.0%	0.0%	0.0%	10.7%
East SouthEast	5.8%	6.2%	1.0%	0.0%	0.0%	0.0%	13.0%
SouthEast	2.9%	2.7%	0.4%	0.0%	0.0%	0.0%	5.9%
South SouthEast	1.7%	1.3%	0.2%	0.0%	0.0%	0.0%	3.2%
South	1.1%	1.3%	0.3%	0.0%	0.0%	0.0%	2.7%
South SouthWest	1.1%	1.3%	0.4%	0.0%	0.0%	0.0%	2.8%
Southwest	1.1%	1.7%	1.0%	0.0%	0.0%	0.0%	3.8%
West SouthWest	1.7%	2.5%	1.7%	0.1%	0.0%	0.0%	6.0%
West	2.8%	4.6%	3.7%	0.2%	0.0%	0.0%	11.3%
West NorthWest	6.5%	6.9%	3.9%	0.1%	0.0%	0.0%	17.4%
NorthWest	5.2%	0.6%	0.0%	0.0%	0.0%	0.0%	5.7%
North NorthWest	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%
North	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
Total	45.8%	36.8%	14.9%	0.3%	0.0%	0.0%	97.9%

Percent Calm (<0.3 m/s)	2.4%
Number of Valid Hourly-Average Data	8660
Total Workable Hours in Time Period	8784



APPENDIX F. WYAMZ EXCEEDANCE SUMMARY

Table F-1 Kindersley Station: Summary of Exceedances for 24-hour SAAQS for the Year 2016

24-Hour Exceedance Pollutant			Average of Other Parameters During the Exceedance Event				
Pollutant	Conc.	Exceedance Day dd-mmm-yy	WS m/s	WD deg	Rain* mm	SO ₂ ppb	H ₂ S ppb
PM _{2.5}	36.5	5-May-16	5.8	262.2	-	0.5	0.5
PM _{2.5}	40.8	14-May-16	1.7	253.7	-	0.4	0.3
PM _{2.5}	53.3	15-May-16	1.3	176.0	-	0.3	0.4

*Rain is total, not average

Table F-2 Maidstone Station: Summary of Exceedances for 1-hour SAAQS for the Year 2016

1-Hour Exceedance Pollutant			Average of Other Parameters During the Exceedance Event						
Pollutant	Conc.	Exceedance Time dd-mmm-yy hh:mm	WS m/s	WD deg	AQI -	Rain* mm	SO ₂ ppb	NO ₂ ppb	PM _{2.5} µg/m ³
H ₂ S	13.5	28-Jun-16 06:00	0.6	6.7	10.7	-	0.2	11.6	8.5
H ₂ S	11.3	26-Jul-16 03:00	0.4	279.4	6.5	-	0.3	6.5	5.2
H ₂ S	26.0	26-Jul-16 06:00	0.6	118.0	9.6	-	0.4	5.6	7.7
H ₂ S	16.5	26-Jul-16 07:00	1.1	113.0	9.8	-	0.5	4.9	7.9
H ₂ S	11.4	27-Jul-16 06:00	0.8	140.3	9.1	-	0.3	3.4	7.3
H ₂ S	19.3	28-Jul-16 06:00	0.3	153.4	8.0	-	0.4	6.6	6.4
H ₂ S	20.3	28-Jul-16 07:00	0.4	99.9	7.5	-	0.5	4.2	6.0
H ₂ S	11.2	30-Jul-16 03:00	0.6	182.4	11.6	-	0.4	8.4	9.3
H ₂ S	16.1	16-Aug-16 07:00	0.6	122.5	5.9	-	0.5	4.8	4.7

*Rain is total, not average

Table F-3 Maidstone Station: Summary of Exceedances for 24-hour SAAQS for the Year 2016

24-Hour Exceedance Pollutant			Average of Other Parameters During the Exceedance Event							
Pollutant	Conc.	Exceedance Day dd-mmm-yy	WS m/s	WD deg	AQI -	Rain* mm	SO ₂ ppb	NO ₂ ppb	H ₂ S ppb	PM _{2.5} µg/m ³
PM _{2.5}	117.7	5-May-16	3.2	304.9	129.4	-	0.8	7.7	0.5	-
PM _{2.5}	36.3	15-May-16	1.3	232.5	42.2	-	0.5	5.6	0.3	-
PM _{2.5}	34.4	16-May-16	2.5	184.9	40.7	-	0.4	6.5	0.6	-
H ₂ S	3.7	26-Jul-16	1.5	175.0	3.9	-	0.5	2.8	-	3.1
H ₂ S	3.6	28-Jul-16	1.2	202.4	7.9	2.0	0.6	3.2	-	6.3

*Rain is total, not average

Table F-4 Meadow Lake Station: Summary of Exceedances for 24-hour SAAQS for the Year 2016

24-Hour Exceedance Pollutant			Average of Other Parameters During the Exceedance Event					
Pollutant	Conc.	Exceedance Day dd-mmm-yy	WS m/s	WD deg	AQHI -	Rain* mm	NO ₂ ppb	O ₃ ppb
PM _{2.5}	39.9	5-May-16	2.4	265.0	4.0	0.2	1.5	38.1
PM _{2.5}	33.0	6-May-16	1.9	232.0	3.7	-	1.2	38.7
PM _{2.5}	28.1	14-May-16	1.5	236.3	3.1	-	1.0	32.8
PM _{2.5}	40.0	15-May-16	1.2	207.4	3.7	-	1.2	33.0
PM _{2.5}	55.5	16-May-16	1.6	171.6	5.2	-	1.5	46.8
PM _{2.5}	29.5	17-May-16	1.5	159.9	3.6	-	1.2	41.3
PM _{2.5}	28.0	19-May-16	2.0	96.9	3.5	-	1.0	40.2

*Rain is total, not average

Table F-5 Unity Station: Summary of Exceedances for 24-hour SAAQS for the Year 2016

24-Hour Exceedance Pollutant			Average of Other Parameters During the Exceedance Event					
Pollutant	Conc.	Exceedance Day dd-mmm-yy	WS m/s	WD deg	AQHI -	Rain* mm	NO ₂ ppb	O ₃ ppb
PM _{2.5}	48.1	5-May-16	1.0	215.0	4.5	-	4.8	35.2
PM _{2.5}	46.7	14-May-16	1.7	291.5	4.5	-	3.4	37.6
PM _{2.5}	86.7	15-May-16	1.5	239.7	6.5	-	3.6	40.1
PM _{2.5}	41.6	16-May-16	2.0	143.3	4.2	-	4.2	36.5

*Rain is total, not average

APPENDIX G. 2016 FINANCIAL STATEMENTS

Western Yellowhead Air Management Zone Inc. **Financial Statements** *December 31, 2016*

Western Yellowhead Air Management Zone Inc.

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Management's Responsibility

To the Members of Western Yellowhead Air Management Zone Inc.:

Management is responsible for the preparation and presentation of the accompanying financial statements, including responsibility for significant accounting judgments and estimates in accordance with Canadian accounting standards for not-for-profit organizations and ensuring that all information in the annual report is consistent with the statements. This responsibility includes selecting appropriate accounting principles and methods, and making decisions affecting the measurement of transactions in which objective judgment is required.

In discharging its responsibilities for the integrity and fairness of the financial statements, management designs and maintains the necessary accounting systems and related internal controls to provide reasonable assurance that transactions are authorized, assets are safeguarded and financial records are properly maintained to provide reliable information for the preparation of financial statements.

The Board of Directors is composed primarily of Directors who are neither management nor employees of the Organization. The Board is responsible for overseeing management in the performance of its financial reporting responsibilities, and for approving the financial information included in the annual report. The Board fulfils these responsibilities by reviewing the financial information prepared by management and discussing relevant matters with management and external auditors. The Board is also responsible for recommending the appointment of the Organization's external auditors.

MNP LLP is appointed by the members to audit the financial statements and report directly to them; their report follows. The external auditors have full and free access to, and meet periodically and separately with, both the Board and management to discuss their audit findings.

March 29, 2017



Executive Director

Independent Auditors' Report

To the Members of Western Yellowhead Air Management Zone Inc.:

We have audited the accompanying financial statements of Western Yellowhead Air Management Zone Inc. which comprise the statement of financial position as at December 31, 2016 and the statements of operations and changes in net assets and cash flows for the year then ended, and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditors' judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the evidence we have obtained in our audit is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements present fairly, in all material respects, the financial position of Western Yellowhead Air Management Zone Inc. as at December 31, 2016 and the results of its operations and cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

Saskatoon, Saskatchewan

March 29, 2017

MNP LLP

Chartered Professional Accountants

Western Yellowhead Air Management Zone Inc.
Statement of Financial Position

As at December 31, 2016

	2016	2015
Assets		
Current		
Cash resources	121,851	182,417
Short term investment (Note 4)	100,000	-
Prepaid expenses	3,806	3,806
	225,657	186,223
Capital assets (Note 3)	199,932	249,915
	425,589	436,138
Liabilities		
Current		
Accounts payable and accruals	17,756	18,656
Goods and Services Tax payable	3,050	2,862
Current portion of deferred contributions (Note 5)	40,000	40,000
	60,806	61,518
Deferred contributions (Note 5)	20,000	60,000
	80,806	121,518
Net Assets		
Unrestricted net assets	344,783	314,620
	425,589	436,138

Approved on behalf of the Board of Directors




The accompanying notes are an integral part of these financial statements

Western Yellowhead Air Management Zone Inc.
Statement of Operations and Changes in Net Assets

For the year ended December 31, 2016

	2016	2015
Revenue		
Membership fees	151,476	172,382
Amortization of deferred contributions <i>(Note 5)</i>	40,000	40,000
	191,476	212,382
Expenses		
Amortization	49,983	61,848
Consulting	4,000	-
Insurance	5,511	8,937
Management fees	39,800	34,950
Meetings	1,644	1,142
Monitoring	47,598	65,913
Office supplies	1,276	1,501
Professional fees	6,041	5,783
Promotion	2,862	-
Repairs and maintenance	389	8,763
Telephone	1,743	1,873
Travel	466	202
	161,313	190,912
Excess of revenue over expenses	30,163	21,470
Net assets, beginning of year	314,620	293,150
Net assets, end of year	344,783	314,620

The accompanying notes are an integral part of these financial statements

Western Yellowhead Air Management Zone Inc.

Statement of Cash Flows

For the year ended December 31, 2016

	2016	2015
Cash provided by (used for) the following activities		
Operating		
Excess of revenue over expenses	30,163	21,470
Amortization	49,983	61,848
Amortization of deferred contributions	(40,000)	(40,000)
	40,146	43,318
Changes in working capital accounts		
Prepaid expenses	-	2,832
Accounts payable and accruals	(900)	6,956
Goods and Service Tax payable	188	(1,249)
	39,434	51,857
Investing		
Purchase of short term investment	(100,000)	-
Purchase of capital assets	-	(5,050)
	(100,000)	(5,050)
(Decrease) increase in cash resources	(60,566)	46,807
Cash resources, beginning of year	182,417	135,610
Cash resources, end of year	121,851	182,417

The accompanying notes are an integral part of these financial statements

Western Yellowhead Air Management Zone Inc.

Notes to the Financial Statements

For the year ended December 31, 2016

1. Incorporation and nature of the organization

Western Yellowhead Air Management Zone Inc. (the "Organization") was incorporated under The Non-Profit Corporations Act of Saskatchewan on February 14, 2012.

The Organization collects and monitors ambient air quality data in Northwest Saskatchewan and makes the data available to all members.

2. Significant accounting policies

The financial statements have been prepared in accordance with Canadian accounting standards for Not-for-profit organizations using the following significant accounting policies:

Revenue recognition

The Organization follows the deferral method of accounting for contributions. Restricted contributions are recognized as revenue in the year in which the related expenses are incurred. Unrestricted contributions are recognized as revenue when received. Membership fees are recognized when received. Grants are recognized as revenue when the amount to be received can be reasonably estimated and ultimate collection is reasonably assured.

Financial instruments

The Organization recognizes its financial instruments when the Organization becomes party to the contractual provisions of the financial instrument. All financial instruments are initially recorded at their fair value, including financial assets and liabilities originated and issued in related party transactions with management.

At initial recognition, the Organization may irrevocably elect to subsequently measure any financial instrument at fair value. The Organization has not made such an election during the year. All financial assets and liabilities are subsequently measured at amortized cost.

Transaction costs and financing fees are added to the carrying amount for those financial instruments subsequently measured at amortized cost or cost.

Financial asset impairment

The Organization assesses impairment of all of its financial assets measured at cost or amortized cost. The Organization groups assets for impairment testing when available information is not sufficient to permit identification of each individually impaired financial asset in the group. Management considers whether there has been a breach in contract, such as a default or delinquency in interest or principal payments in determining whether objective evidence of impairment exists. When there is an indication of impairment, the Organization determines whether it has resulted in a significant adverse change in the expected timing or amount of future cash flows during the year. If so, the Organization reduces the carrying amount of any impaired financial assets to the highest of: the present value of cash flows expected to be generated by holding the assets; the amount that could be realized by selling the assets; and the amount expected to be realized by exercising any rights to collateral held against those assets. Any impairment, which is not considered temporary, is included in current year excess of revenues over expenses.

The Organization reverses impairment losses on financial assets when there is a decrease in impairment and the decrease can be objectively related to an event occurring after the impairment loss was recognized. The amount of the reversal is recognized in the excess of revenues over expenses in the year the reversal occurs.

Short term investments

Short term investments with prices that are not quoted in an active market are measured at cost less impairment. They consist of Guaranteed Investment Certificates.

Western Yellowhead Air Management Zone Inc.
Notes to the Financial Statements
For the year ended December 31, 2016

2. Significant accounting policies *(Continued from previous page)*

Capital assets

Purchased capital assets are recorded at cost. Contributed capital assets are recorded at fair value at the date of contribution if fair value can be reasonably determined.

Amortization is provided using the declining balance method at rates intended to amortize the cost of assets over their estimated useful lives.

	Rate
Equipment	20 %

Long-lived assets

Long-lived assets consist of capital assets. Long-lived assets held for use are measured and amortized as described in the applicable accounting policies.

When the Organization determines that a long-lived asset no longer has any long-term service potential to the Organization, the excess of its net carrying amount over any residual value is recognized as an expense in the statement of operations. Write-downs are not reversed.

Deferred contributions related to capital assets

Deferred contributions related to capital assets represent the unamortized portion of contributed capital assets and restricted contributions that were used to purchase the Organization's equipment. Recognition of these amounts as revenue is deferred to periods when the related capital assets are amortized.

Measurement uncertainty

The preparation of financial statements in conformity with Canadian accounting standards for not-for-profit organizations requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses during the reporting period.

Amortization is based on the estimated useful lives of capital assets.

These estimates and assumptions are reviewed periodically and, as adjustments become necessary they are reported in excess of revenues and expenses in the periods in which they become known.

3. Capital assets

	Cost	Accumulated amortization	2016 Net book value	2015 Net book value
Equipment	428,590	228,658	199,932	249,915

4. Short term investment

Balance consists of a \$100,000 Guaranteed Investment Certificate with an interest rate of 1.15% maturing on December 20, 2017.

Western Yellowhead Air Management Zone Inc.
Notes to the Financial Statements
For the year ended December 31, 2016

5. Deferred contributions

Deferred contributions consist of externally restricted grants for the reimbursement of the purchase of four airpointers. Recognition of these amounts as revenue is amortized over the useful life of the related assets. Changes in the deferred contribution balance are as follows:

	2016	2015
Balance, beginning of year	100,000	140,000
Less: Amount recognized as revenue	(40,000)	(40,000)
	60,000	100,000
Less: current portion	40,000	40,000
Balance, end of year	20,000	60,000

6. Related party transactions

The Organization has entered into a contract agreement for management services, expiring May 2017. The contract is based on hours required, to a maximum of 1,000 hours, or \$50,000. Any overage is required to be approved by the Board of Directors. Included in expenses for the current year are \$39,800 (2015 - \$34,950) of management fees. The expenses were incurred in the normal course of operations and measured at the exchange amount, which is the amount of consideration established and agreed to by the related parties. At December 31, 2016, accounts payable and accruals includes \$nil (2015 - \$nil) due to this related party.

7. Financial instruments

The Organization, as part of its operations, carries a number of financial instruments. It is management's opinion that the Organization is not exposed to significant interest, currency, credit, liquidity or other price risks arising from these financial instruments except as otherwise disclosed.

Liquidity risk

Liquidity risk is the risk that the Organization will encounter difficulty in meeting obligations associated with financial liabilities. The Organization's exposure to liquidity risk is dependent on the collection of membership fee revenue and obligations to sustain operations.

8. Commitments

The Organization has entered into a contract agreement for the operation and maintenance of airpointer monitoring stations, expiring June 30, 2018. Payments remaining on the contract total \$65,980.

APPENDIX H. WYAMZ BOARD OF DIRECTORS

Dan Gauthier

Board Chair (Mosaic Potash Colonsay)



Mr. Gauthier joined Mosaic in 2008 and is a Professional Engineer registered in Saskatchewan. He has held various positions at the Mosaic Potash Colonsay mine including maintenance engineer, ISO 14001 and OHSAS 18001 Coordinator and most recently as the Senior Environmental Engineer. He is currently responsible for maintaining environmental compliance and improving environmental performance at the Mosaic Potash Colonsay mine.

He has experience leading large projects which include a tailings area expansion and the Mosaic Colonsay site ISO 14001 and OHSAS 18001 management system certification.

Gerry Mooney

Vice Chair (Akzo Nobel Chemicals Ltd.)



Gerry Mooney brings 35 years of chemical manufacturing experience, with a focus on Environmental Management and Community Engagement. He is a strong supporter of the collaborative approach to air quality management. He indicated that he is enthused to be part of a consensus based team which facilitates dialogue among regulators, public interest groups and industry while ensuring the availability of robust air quality data. As a member of the

Chemistry Industry Association of Canada (CIAC), AkzoNobel is committed to Responsible Care® – CIAC's internationally recognized sustainability initiative.

Phil Burry

Secretary Treasurer (Husky Energy Upstream)



Mr. Burry is the Team Lead, Upstream Environmental Operations for Husky Energy, based in Lloydminster, Saskatchewan. Phil is a Professional Agrologist with approximately 15 years environmental management experience. He provides technical/regulatory support regarding air, water, waste, biophysical, spill and site remediation projects. Actively engaging key stakeholders is another key responsibility of his current position with Husky. He is very interested in furthering

his understanding of regional air quality issues.

Brad Sigurdson

Past Board Chair (Saskatchewan Mining Association)



Mr. Sigurdson is the Manager, Environment and Safety for the Saskatchewan Mining Association (SMA) and he brings nearly 25 years of mining, industrial and government experience to this role; including working in both Canadian and U.S. mining operations as well as previously with the Ministry of Environment as Manager of the Potash and Central Operations Section. During his time with the Ministry of Environment he acted as the advisor to the Industrial Content

Committee during the development of the Saskatchewan Environmental Code. Mr. Sigurdson has indicated that "It is a privilege to be a member of the WYAMZ Board and I really enjoy working with a group of individuals that are committed to working in a collaborative and cooperative manner with a common goal of ensuring excellent air quality in our Air Management Zone".

Murray Hilderman Member (Ministry of Environment)



Mr. Hilderman is a Senior Project Manager with the Ministry of Environment, Technical Resources Branch. He has 25 years of experience in environmental work related to air and water, working with industry, municipalities and other stakeholders on projects ranging from local to international. He is involved in the air management zone because he believes this is an excellent approach to engage all parties to better understand air issues in a region.

Brenda Wallace Member (City of Saskatoon)



Brenda is the Director of Environmental & Corporate Initiatives with the City of Saskatoon where she leads a team of environmental professionals, engineers, and project managers to improve environmental performance and plan major city-building projects that enhance quality of life. Ms. Wallace has a background in urban planning and has worked in the economic development sector on affordable housing projects, and has spent 3 years as Resource Planning Manager with the Meewasin Valley Authority.

David Henry Member (Saskatchewan Environmental Society)



David Henry has been an active member of the Saskatchewan Environmental Society since 2008. In 2007, he retired from his position as conservation ecologist for Parks Canada in the Yukon Territory. In that work, he developed an ecological monitoring program for each national park in the Yukon. He is presently an Adjunct Professor, Faculty of Environmental Design, University of Calgary. In the past working with others, he coordinated the public campaigns that were instrumental in the establishment Grasslands National Park and the revision of Canada's National Parks Act.

Gary Ericson Member (Saskatchewan Ministry of the Economy)



Mr. Ericson is the Regional Manager of the Lloydminster Office of The Ministry of the Economy and holds an ASCT. Designation with the Saskatchewan Applied Science Technologists and Technicians. He graduated from Kelsey Institute of Applied Arts and Sciences in Saskatoon with a Diploma in Mechanical Engineering Technology in 1979. He has over 34 years of oil and gas development experience and considered to be one of our Ministry's foremost heavy oil well development and production expert. Mr. Ericson has extensive experience in the upstream Petroleum and Natural Gas Industry relating to drilling, servicing, and production issues gained through his years as a field technician and a manager

Shelley Kirychuk Member (University of Saskatchewan)



Dr. Shelley Kirychuk is a nurse and holds Masters and PhD Degrees in Preventative Medicine and occupational hygiene. She is an Associate Professor at the University of Saskatchewan's Department of Medicine in the division of the Canadian Centre for Health and Safety in Agriculture. Her research and extension activities focus on environmental epidemiology and more specifically respiratory exposures and respiratory health of occupational, rural and agricultural populations.

Darren Letkeman Member (Environmental Protection Branch – Ministry of Environment)



Mr. Letkeman is an Environmental Protection Officer with the Industrial Branch of the Ministry of Environment and has been with the ministry since 1998. He has extensive regulatory experience in Northwestern Saskatchewan, and has worked with municipal, commercial, and industrial operations. Prior to working for the ministry, Darren worked 6 years as an Environmental Co-ordinator for an industrial wood processing facility.

Aaron Studer Member (Husky Energy Downstream)

Aaron Studer joined Husky in 2004, and is currently leading a team of 5 environmental specialists tasked with maintaining environmental compliance at Husky's Downstream Assets in the Lloydminster area. He has worked extensively in the environmental field for 6 years, and was previously working for an international environmental consulting firm. His areas of experience include project and office management; all aspects of groundwater well installation, monitoring, sampling, and reporting; Phase I and II assessments; contaminated site remediation; and licensing, construction and commissioning of new facilities. He has technical experience in reclamation assessments, lease construction, drilling, service, and operations.

Don Corrigan Member (Prairie North Regional Health Authority)



Don Corrigan worked throughout the BC Public Health system from 1976 until retirement in 2011, as a field Public Health Inspector in northern BC (Vanderhoof) and the Okanagan Valley (Kelowna); as a Chief Public Health Inspector for the East Kootenay region in Cranbrook; as the Manager of Health Protection for the Kootenay/Boundary region of BC and as an Assistant Director of Health Protection with Interior Health, with a broad program portfolio including Water Quality, Healthy Built Environments, Emergency Response Planning & Operations, Community Care Facilities Licensing, Public Health Engineering, Tobacco Reduction, and Air Quality. In 2013, took the of Manager of Environmental Protection Services position with Prairie North Health Authority.

Terry Gibson

Executive Director



Mr. Gibson brings more than 30 years of Public Health/Environmental Health experience to the position. He has held the positions of President of the Saskatchewan Public Health Association and Vice-Chair of the Saskatchewan Epidemiology Association. He teaches Public Health Protection at the University of Saskatchewan Master of Public Health Program and has served on many provincial and national boards and committees. Terry is committed to working with industry and regulators in a consensus decision making process to ensure that the health of the environment of Saskatchewan is always protected.

APPENDIX I. WYAMZ MEMBER COMPANIES

The Western Yellowhead Air Management Zone would like to express our gratitude to our members in good standing for their support of WYAMZ, for their very strong support regarding quality air data collection, and for their commitment to the citizens and environment of Saskatchewan.

For information on how to become a member, please contact Terry Gibson, Executive Director at 306.491.9198.

- 101173425 Saskatchewan Ltd.
- 5 Star Resources
- Agrium Inc.
- Akzo Nobel
- Alta Gas
- Bayhurst Gas
- Baytex Energy Ltd.
- Beaumont Energy
- Black Pearl Resources
- Bruin Oil and Gas
- Buzzard Resources
- Caltex Resources
- Canadian Natural Resources Limited
- Can-Expo
- Carrier Forest
- Cenovus Energy
- Chinook Resources
- City of Saskatoon
- Compass Minerals
- Conoco Phillips
- Cory ATCO Operations
- Crescent Point
- Crocotta Energy
- Crocus Oil
- Devon Canada Corporation
- Enerplus Corporation
- ERCO Worldwide
- Gear Energy
- Halo Exploration
- Husky Oil Operations Limited
- Hyzer Energy
- Ish Energy
- Leeco Resources
- Longhorn Oil and Gas
- Longview Oil
- Modexco Petroleum
- Meridian Cogeneration Power
- Mosaic
- NAL Resources Limited
- North Battleford Power L.P.
- North West Bio Energy
- Northern Blizzard
- Novus Energy Inc.
- P&H Milling
- Palliser Oil and Gas
- Pengrowth Energy Corporation
- Plasti-Fab
- Potash Corp
- Prosper Petroleum
- Raven Resources
- Renegade Petroleum
- Rife Resources
- Rifle Shot Oil
- Saputo Products
- SaskEnergy Incorporated/ TransGas Limited
- Sask Power
- Secure Energy Services Inc
- Serafina Energy
- Smitty's Farms
- Sojourn Energy
- Spartan Energy
- Sphere Energy
- Spur Resources
- SSSS Oil Partnership
- Tamarack Valley
- Talisman Energy
- Tuscany Energy
- Viterra
- West Lake Twin Butte
- Zelmar Energy

