



Southeast Saskatchewan
Airshed Association

2013 Annual Report



Southeast Saskatchewan
Airshed Association

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List of Terms and Definitions

24-hour	A calendar day, average is calculated midnight-to-midnight.
30-day	Passive monitoring data is based on a 30-day average concentration
8-Hour	Using for the 8-hour running average for O ₃ Canada-Wide Standard.
SAAQS	Saskatchewan Ambient Air Quality Standards
AIC	Automatic Instrument Check (instrument self-verification process)
AMG	Air Monitoring Guidelines for Saskatchewan, March 2012
BTEX	Benzene, toluene, ethylbenzene, and xylene
Calm	1-hour average wind speed lower than 1 km/hour
CWS	Canada-Wide-Standards
ET	Ambient temperature
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
QA/QC	Quality Assurance / Quality Control
RH	Relative humidity
SO ₂	Sulphur dioxide
WD	Wind direction
WS	Wind speed

Units of Measurement

average	arithmetic average = $n \sum X_i / n$ geometric average = $\text{antilog of } (n \log X_i) / n$
m/s	meter per second, or mps
µg/m ³	microgram per cubic meter
ppb	part per billion by volume
mm	millimeter of precipitation
°C	degree centigrade
%	percent of relative humidity, instrument uptime, etc.
Degree	angle of wind direction from the north

MESSAGE FROM THE EXECUTIVE DIRECTOR

2013 was an excellent year for SESAA and for air quality monitoring in southeastern Saskatchewan. SESAA is very pleased to inform our members that six (6) continuous air monitoring sites are now operating in the region and providing real time data. Four of these stations were made possible through a matching grant provided to SESAA by the Western Economic Diversification Canada Office in Saskatoon. We are exploring every opportunity to collaborate with other agencies in bringing additional monitoring into the region.

Our goal is to collect credible and defensible air quality data and provide excellent service to our members. The installation of continuous monitors throughout the region is helping the SESAA meet its goal. The monitors also allow the association to show companies already operating or considering operating in the area that this is a good place to invest because we know the air quality is being monitored and it is of good quality. SESAA is very excited about what the WEDC initiative has brought to the airshed's monitoring capabilities. The credibility and strength of the continuous monitoring network is scientific 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 first airshed site monitoring data was originally made available in early 2011 on the SESAA website: <http://www.sesaa.ca/AirQuality/index.php>.

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. This communication work is very important to SESAA and to its members.

Some of our recent communication initiatives:

- The Regina Leader Post; the Saskatoon Star Phoenix; the Weyburn Review; the Estevan Mercury; CTV Regina News Interviews; Saskatchewan Oil and Gas Show, Weyburn
- Saskatchewan Association of Rural Municipalities (SARM) the Councillor Newsletter Article
- SESAA circulates an E-bulletin to all members to keep them informed of any new developments, meeting dates and any other pertinent air quality information.

Future plans include expanding the network of continuous air monitoring stations, development of more communication materials, presentations to municipalities, Chambers of Commerce, high school classes, home and school meetings, etc.

The events of 2013, (four new airpointers and the positive publicity/communications regarding them) have positioned SESAA at a level that we all thought would take about 4 to 5 years to achieve. This development is excellent news for the people of southeast Saskatchewan and for all of our valued members. SESAA thanks all of our members for their participation.

EXECUTIVE SUMMARY

The Southeast Saskatchewan Airshed Association (SESAA), established in October 2005, is Saskatchewan's first airshed association with a mandate to monitor ambient air quality in the southeast region of the Province. SESAA is a collaborative group of industry, government, non-government organizations, and private citizens. The airshed covers an area of 36,800 square kilometres and includes 45 municipalities. Major economic activities in the region include agriculture, oil & gas, mining, power generation, and transportation.

SESAA manages a continuous air monitoring network and a passive sampling network. Figure 1 of the main report illustrates spatial distribution of the air monitoring stations. The continuous air monitoring network consists of six airpointers® at the Weyburn, Glen Ewen, Stoughton, Esterhazy, Wawota, and Wauchope stations. Four of the stations began operations in 2013: the Stoughton airpointer® was operational from July to December; Esterhazy was operational August to December; and Wawota and Wauchope began operations in December. The four new airpointers® were calibrated prior to operations; the Esterhazy airpointer was factory calibrated prior to installation, and routine quarterly calibration was completed in September. The SESAA continuous air monitoring network measures real-time data for sulphur dioxide (SO₂), hydrogen sulphide (H₂S), nitrogen oxides (NO, NO₂, NO_x), ozone (O₃), fine particulate matter (PM_{2.5}), ambient temperature (ET), relative humidity (RH), precipitation, wind speed (WS) and wind direction (WD).

Table ES-1 summarizes the average continuous measurement data; the measured air quality was within the Saskatchewan Ambient Air Quality Standards (SAAQS), with the exception of H₂S at the Weyburn, Glen Ewen, Stoughton, and Wauchope stations. A total of 85 exceedance events for 1-hour average H₂S and 15 exceedance events for 24-hour average H₂S were recorded. In addition, 44 8-hour running averages for O₃ were greater than the CWS of 65 ppb. These events do not constitute an exceedance of the CWS because the standard is based on the 4th highest concentration annually, averaged over three consecutive years. The air quality within the SESAA network was rated Low Risk or Good for more than 90% of the time according to the Air Quality Health Index and Air Quality Index.

The airpointers® were greater than 90% operational for the year of 2013, with the exception of the Weyburn airpointer® (<80% annual uptime for all parameters), Glen Ewen O₃ analyzer (88.8% annual uptime), and the Stoughton and Esterhazy PM_{2.5} analyzers (48.8% and 81.0% annual uptime, respectively). Operational uptimes can be found in the station summary tables in Appendix B-F.

The SESAA passive sampling network includes thirty stations. The network measured 30-day average SO₂, NO₂, O₃, H₂S, NH₃ and BTEX (benzene, toluene, ethylbenzene, and xylene). Table ES-2 summarizes the average concentration for 30-day passive samples. Eighteen passive stations were operational this year for the months of January, February, and May to

September. The sample capture rate was greater than 90% for all parameters. The measured concentrations were low in comparison with the SAAQS.

Table ES-1. Annual average concentrations for continuous parameters for 2013

Pollutant	Conc. Unit	Annual Average Concentration for Continuous Measurement Data					
		Weyburn	Glen Ewen	Stoughton ^a	Esterhazy ^b	Wawota ^c	Wauchope ^d
SO ₂	ppb	2	1	1	^e	^e	1
H ₂ S	ppb	0.8	0.7	1.0	^e	^e	0.8
NO	ppb	0.5	0.4	0.6	0.2	0.5	^e
NO ₂	ppb	2.0	2.2	2.1	1.4	1.7	^e
NO _x	ppb	2.4	2.5	2.7	1.5	2.2	^e
O ₃	ppb	32	31	^e	25	28	^e
PM _{2.5}	µg/m ³	4	^e	5	6	4	4

a. Stoughton average concentration for July to December

b. Esterhazy average concentration for August to December

c. Wawota average concentration for December

d. Wauchope average concentration for December

e. Parameter was not monitored.

Table ES-2. Average concentration for 30-day passive samples for 2013

Station No.	Station Name	Average Passive Concentrations (ppb)								
		SO ₂	NO ₂	O ₃	H ₂ S	NH ₃	Benzene	Toluene	Ethylbenzene	Xylene
1	Carnduff	-	-	-	-	-	-	-	-	-
2	Glen Ewen	0.4	0.7	32	-	-	-	-	-	-
3	North Portal	-	-	-	-	-	-	-	-	-
4	Roche Percee	0.9	1.5	30	-	-	-	-	-	-
5	Estevan	0.3	-	-	0.6	-	-	-	-	-
6	Torquay	-	-	-	-	-	-	-	-	-
7	Tribune	0.6	1.4	37	-	-	-	-	-	-
8	Macoun	-	-	-	-	-	0.3	0.4	<0.2	<0.2
9	Kingsford	-	-	-	-	-	-	-	-	-
10	Alameda	0.7	-	-	1.2	-	-	-	-	-
11	Oxbow	-	-	-	-	-	0.3	0.3	<0.2	<0.2
12	Storthoaks	0.4	0.9	32	-	-	-	-	-	-
13	Redvers	0.3	-	-	1.0	-	-	-	-	-
14	Steppes	-	-	-	-	-	-	-	-	-
15	Wordsworth	-	-	-	-	-	-	-	-	-
16	Kisbey	-	-	-	-	-	-	-	-	-
17	Huntoon	0.3	1.3	38	-	-	-	-	-	-
18	Ralph	-	-	-	-	-	-	-	-	-
19	Talmage	0.4	-	-	0.7	-	-	-	-	-
20	Creelman	-	-	-	-	2.5	-	-	-	-
21	Warmley	-	-	-	-	-	-	-	-	-
22	Kenosse Lake	0.4	0.9	33	-	-	-	-	-	-
23	Ryerson	-	-	-	-	-	-	-	-	-
24	Wapella	0.4	1.1	29	-	-	-	-	-	-
25	Baring	-	-	-	-	-	-	-	-	-
26	Odessa	0.3	0.9	31	-	-	-	-	-	-
27	Esterhazy	-	-	-	-	-	-	-	-	-
28	Bangor	0.3	1.3	35	-	-	-	-	-	-
29	ATCO	0.4	-	-	1.7	-	-	-	-	-
30	ATCO	0.5	-	-	2.1	-	-	-	-	-

- : Parameter was not monitored

1.0 Introduction

The Southeast Saskatchewan Airshed Association (SESAA) was established in October 2005 to manage ambient air quality in southeast Saskatchewan. The SESAA is a consortium of government, industry, non-government organizations, and private citizen stakeholders. The Southeast Saskatchewan airshed is Saskatchewan's first airshed. It covers an area of 36,800 square kilometres, including 45 municipalities. The airshed boundaries were established based on common history, meteorology, and funding considerations. Major economic activities in the region include agriculture, oil and gas, mining, power generation, and transportation.

Membership in the SESAA is currently voluntary. The current membership includes members of the agriculture, oil & gas, mining and power generation sectors, as well as the public. The Government of Saskatchewan Ministries of Environment, Energy & Resources, and Health, as well as representatives of the City of Estevan and Rural Municipality of Enniskillen Number 3 also participate as members of the Board of Directors. SESAA's operating budget consists of membership fees, environmental footprint, and emissions-based fees assessed to facilities operating within the airshed zone.

1.1 SESAA Mission

The SESAA mission is to collect credible, scientifically defensible air quality data for the southeast Saskatchewan region, and to make this data freely available to all stakeholders. Our objective is to bring together stakeholders from all backgrounds to identify local air quality issues and to develop innovative solutions for managing these issues

1.2 SESAA Air Monitoring Network

Figure 2 illustrates spatial distribution of the SESAA air monitoring stations. The SESAA air monitoring network includes six continuous air monitoring stations and thirty passive air sampling stations, among which eighteen passive stations were operational in 2013.

1.2.1 *airpointer®*

The Southeast Saskatchewan Airshed Association operates six *airpointers®* at the Weyburn, Glen Ewen, Stoughton, Esterhazy, Wawota, and Wauchope stations. The network measures sulphur dioxide (SO₂), hydrogen sulphide (H₂S), nitrogen oxides (NO, NO₂, NO_x), ozone (O₃), fine particulate matter (PM_{2.5}), ambient temperature (ET), relative humidity (RH), precipitation, wind speed (WS) and wind direction (WD). Table 1 presents a combination matrix of the monitoring stations and the measured parameters. The Weyburn station has been in place and operating since March 2010. The Glen Ewen station started operations in May 2012. Four new

stations began operations in 2013: the Stoughton station has been operating since July 2013, the Esterhazy station has been operating since August 2013, and the Wawota and Wauchope stations have been operating since December 2013. Real-time air monitoring data is available on the SESAA website at: www.sesaa.ca.

The airpointer® introduces a new concept in air quality monitoring. In the past, a multi-gas and particle pollution monitoring system would have been housed in a large walk-in shelter; sometimes in a trailer-type unit. The airpointer® makes it possible to acquire real-time data in a small vault type, self-contained unit. The airpointer® has very low operating costs compared to other analyzers in the industry. This is important to our members because we can provide quality data collection at a considerable saving. Furthermore, it is easy to access the monitoring data. A standard internet connection and web browser is all that is required.

1.2.2 Passive Network

The SESAA passive sampling network operated eighteen stations in 2013, collecting 30-day passive samples. SO₂ samples were collected at fifteen stations; NO₂ and O₃ at nine stations; and H₂S at six stations. BTEX (benzene, toluene, ethylbenzene, and xylene) samples were collected at the Macoun and Oxbow stations; and NH₃ samples were collected at the Creelman station. The passive air sampling network was operational for the months of January, February, and May through September.

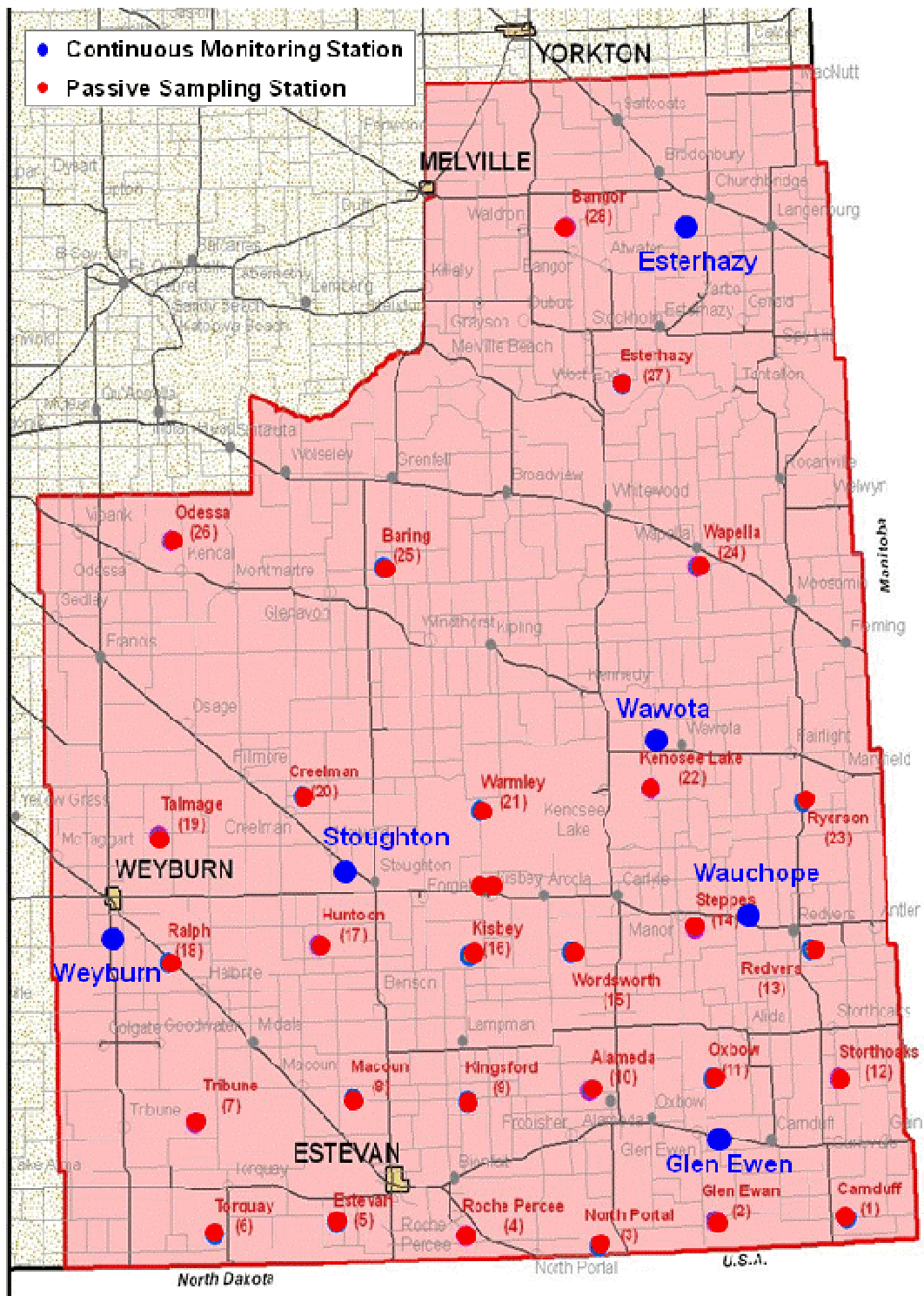


Figure 1. The ambient air monitoring network and airshed boundary for the Southeast Saskatchewan Airshed Association

Table 1. SESAA airpointer® continuous monitoring stations and the measurement parameters

Monitoring Parameters	Continuous air quality parameters measured in the SESAA network					
	Weyburn	Glen Ewen	Stoughton	Esterhazy	Wawota	Wauchope
SO ₂	✓	✓	✓	-	-	✓
H ₂ S	✓	✓	✓	-	-	✓
NO	✓	✓	✓	✓	✓	-
NO ₂	✓	✓	✓	✓	✓	-
NO _x	✓	✓	✓	✓	✓	-
O ₃	✓	✓	-	✓	✓	-
PM _{2.5}	✓	-	✓	✓	✓	✓
Ambient Temp.	✓	✓	✓	✓	✓	✓
Relative Humidity	✓	✓	✓	✓	✓	✓
Precipitation	✓	✓	✓	✓	✓	✓
Wind Speed	✓	✓	✓	✓	✓	✓
Wind Direction	✓	✓	✓	✓	✓	✓

2.0 Air Quality Monitoring

2.1 Summary of Exceedances above the SAAQS

The SESAA air monitoring network measures air pollutant concentrations to indicate the general quality of air in the airshed. Air quality data is used to investigate 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 2013. A total of 85 exceedance events for 1-hour average H₂S and 15 exceedance events for 24-hour average H₂S were recorded at the Weyburn, Glen Ewen, Stoughton, and Wauchope stations. There were 44 8-hour running averages greater than the O₃ CWS of 65 ppb, but they do not constitute an exceedance because the CWS standard is based on the 4th highest concentration, averaged over three consecutive years.

The detailed exceedance summaries are presented in Appendix H-K.

Table 2. Number of exceedance events for 2013

Parameter	No. of Stations	Average Type	SAAQS	No. of Exceedance
SO ₂	4	1-hour	172 ppb	0
		24-hour	57 ppb	0
		Annual	11 ppb	0
H ₂ S	4	1-hour	10.8 ppb	85
		24-hour	3.6 ppb	15
NO ₂	5	1-hour	212 ppb	0
		Annual	53 ppb	0
O ₃	4	1-hour	82 ppb	0
		8-Hour	65 ppb CWS	44 ^a
PM _{2.5}	5	24-hour	30 µg/m ³	0

- a. There were 44 8-hour running averages greater than 65 ppb for O₃, but they do not constitute an exceedance because the CWS standard is based on the 4th highest concentration, averaged over three consecutive years.

2.2 Wind

Wind speed and wind direction 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 2 presents the wind roses for the SESAA stations. According to the international wind classification system, the prevailing winds was typically classified as Light Air (<1.4 m/s), Light Breeze (<3.1 m/s), and Moderate Breeze (<7.8 m/s). Strong wind (>7.8 m/s) was more frequent at the Weyburn (8.9%) and Glen Ewen (3.1%) stations. The occurrence frequency of calm wind ranged between 0.5% (Weyburn) and 4.7% (Wawota).

Prevailing wind direction varied among the six air monitoring stations. The Wawota and Wauchope stations exhibited a high occurrence frequency from a single direction. 43.6% of the wind at the Wawota station was from the north-northwest direction, and 20.6% was from the west-southwest direction at the Wauchope station. The unidirectional trend could be due to existence of obstacles near the airpointers. At the Wawota station, there is a combine approximately 2 to 3 metres from the airpointer along the north orientation, while the Wauchope station has a building in the south, at a distance approximately 3 to 4 metres.

Excluding the above two stations, the southern SESAA airshed zone was characterized by prevailing winds from the southeast and northwest quadrants as recorded at the Weyburn, Stoughton, and Glen Ewen stations. At the Esterhazy station, in the northern region of the airshed zone, prevailing wind was more uniformly distributed between the south-southeast and north-northwest directions.

The detailed frequency distribution tables and wind roses are presented in the Appendices: Table B-12, Table C-11, Table D-11, Table E-10, Table F-3, and Table G-3.

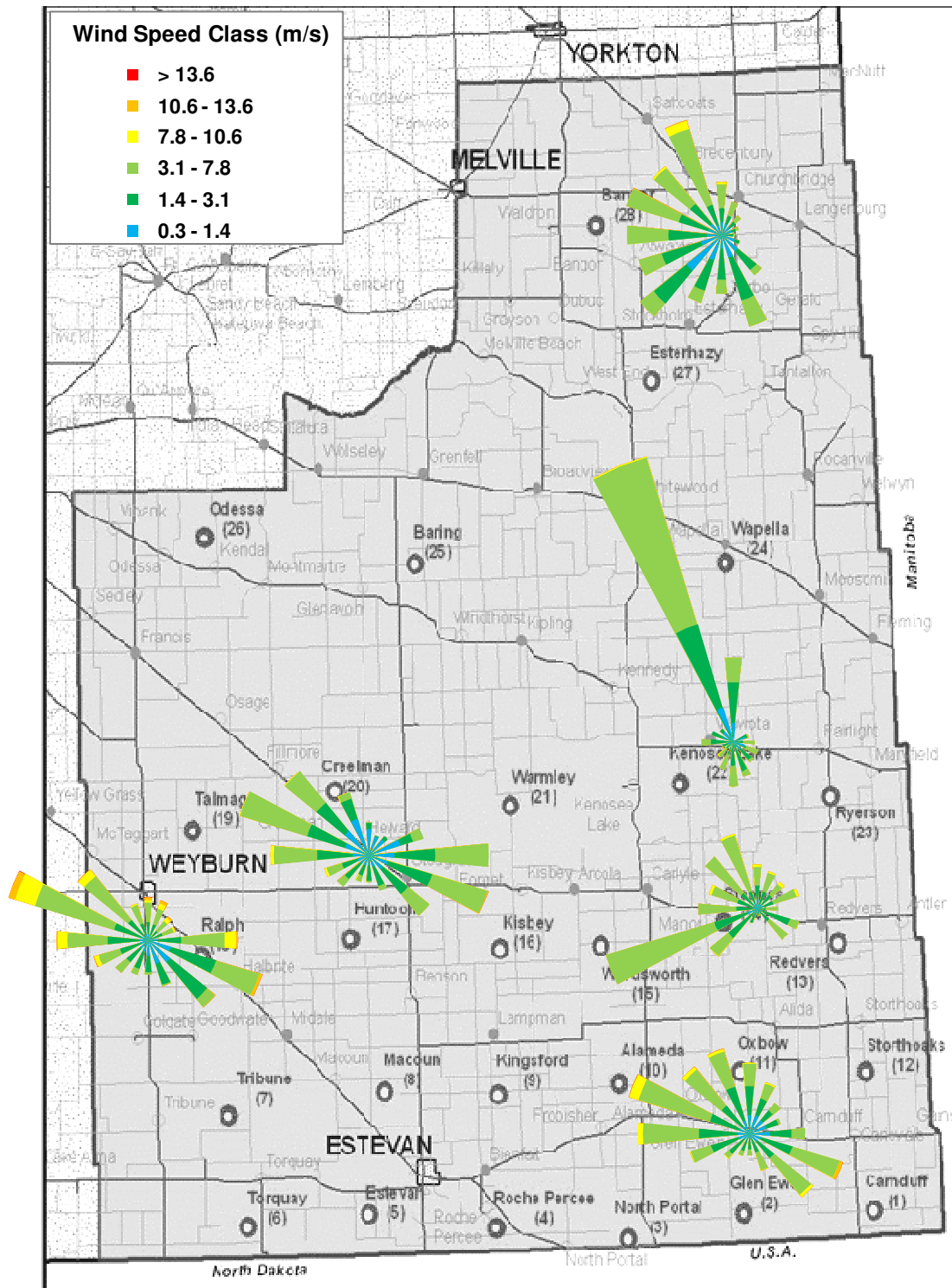


Figure 2. Wind roses for the SESAA continuous monitoring stations for 2013

2.3 Continuous Air Quality Data

2.3.1 Sulphur Dioxide (SO₂)

Sulphur dioxide (SO₂) is a colourless gas with a strong suffocating odour. It smells like burnt matches. At concentrations above 300 ppb, it can be detected by taste and odour. The health effects caused by exposure to high levels of SO₂ include breathing problems, respiratory illness, changes in lung function, and worsening respiratory and cardiovascular disease. People with asthma or chronic lung or heart disease are the most susceptible to SO₂. SO₂ also damages trees and crops.

SO₂, along with nitrogen oxides, are the main precursors of photochemical smog and acid rain, which contributes to the acidification of lakes and streams, accelerated corrosion of buildings, and reduced visibility. SO₂ in the air can form microscopic acid aerosols, which have serious health implications, as well as, contributing to climate change.

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 such as power plants, petroleum refineries, iron and steel mills, fertilizer plants, pulp and paper mills, and smelters, as well as small industries, such as small oil and gas plants, battery and well flares.

The Saskatchewan Ambient Air Quality Standards (SAAQS) for sulphur dioxide are:

- 1-hour average SAAQS = 172 ppb
- 24-hour average SAAQS = 57 ppb
- annual average SAAQS = 11 ppb

Table 3 presents the summary statistics for the 1-hour average concentrations for SO₂. The annual average concentration range was 1 ppb to 2 ppb. The maximum 1-hour concentration of 46 ppb was detected at the Glen Ewen station. The maximum 24-hour concentration of 12 ppb was detected at the Weyburn station. There were no exceedance events for the 1-hour, 24-hour, and annual average concentrations in 2013 (see Table 4).

Figures 3 to 6 present the pollutant roses for 1-hour average concentration for SO₂. The measured concentration at all stations was low; greater than 90% of the data was less than 5 ppb (the blue and dark green petals). The pollutant roses reveal that the Weyburn and Glen Ewen stations detected more high concentration events (>5 ppb). At the Weyburn station, the high concentration events are associated with the E-to-S (east to south) direction, where more industrial activities exist, such as coal-fired power plants and upstream oil and gas industry. At the Glen Ewen station, the high concentration events are associated with the WSW-to-NW (west-southwest to northwest) directions, where more industrial activities exist, such as upstream oil and gas industry.

The detailed frequency distribution tables for the pollutant roses are presented in the Appendices: Table B-2, Table C-2, Table D-2, and Table G2.

Table 3. Summary statistics for 1-hour average SO₂

Monitoring Station	Annual Average	Instrument Uptime	Maximum SO ₂ Conc. and Occurrence Time			
			1-hour Max.		24-hour Max.	
			ppb	Time	ppb	Date
Weyburn	2	77.4	36	Jan 27 15:00	12	Jan 27
Glen Ewen	1	92.5	46	Mar 25 15:00	10	Mar 25
Stoughton	1	100.0	27	Aug 22 11:00	3	Dec 23
Wauchope	1	100.0	13	Dec 08 06:00	4	Dec 8

Table 4. Number of exceedance events for SO₂

Monitoring Station	No. of Exceedance to Saskatchewan Ambient Air Quality Standards (SAAQS)		
	1-hr SAAQS	24-hr SAAQS	Annual SAAQS
	172 ppb	57 ppb	11 ppb
Weyburn	0	0	0
Glen Ewen	0	0	0
Stoughton	0	0	0
Wauchope	0	0	0

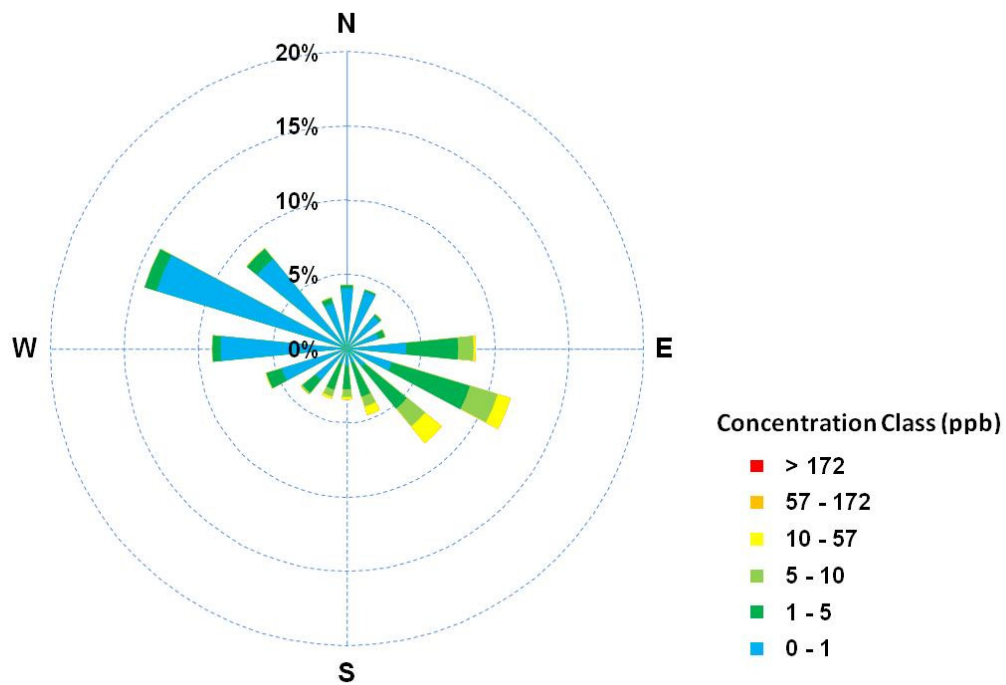


Figure 3. Pollutant rose for 1-hour average SO₂ data at the Weyburn Station

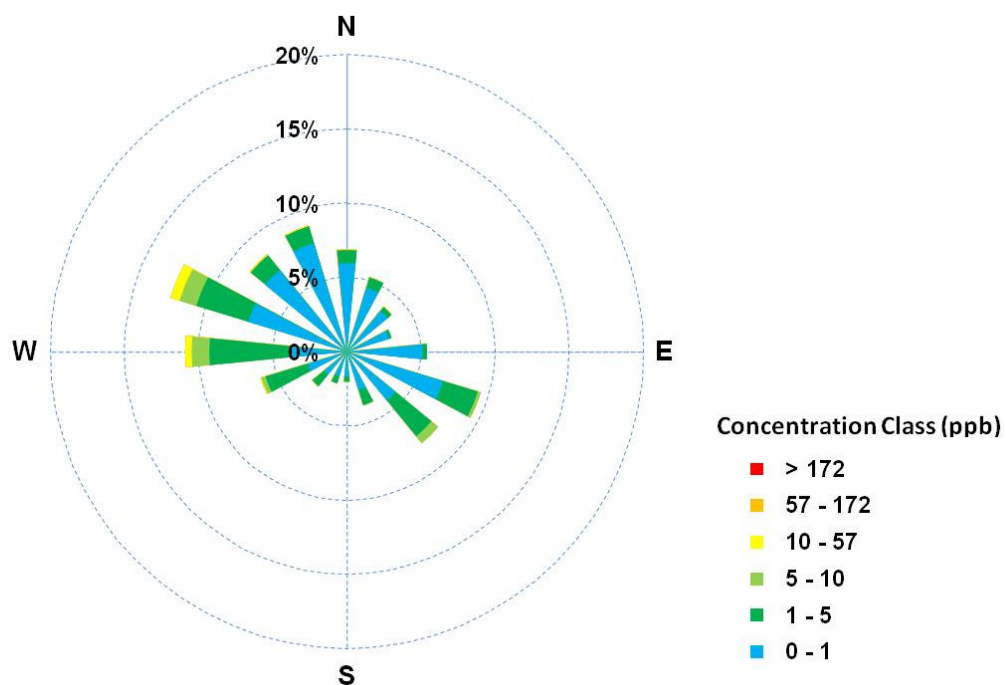


Figure 4. Pollutant rose for 1-hour average SO₂ data at the Glen Ewen Station

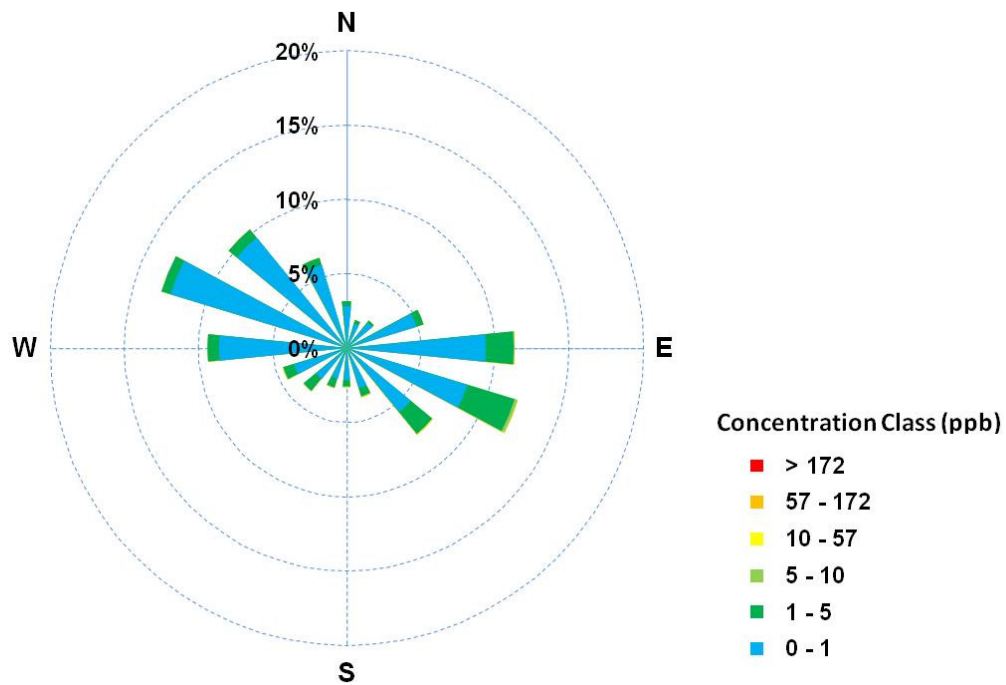


Figure 5. Pollutant rose for 1-hour average SO₂ data at the Stoughton Station

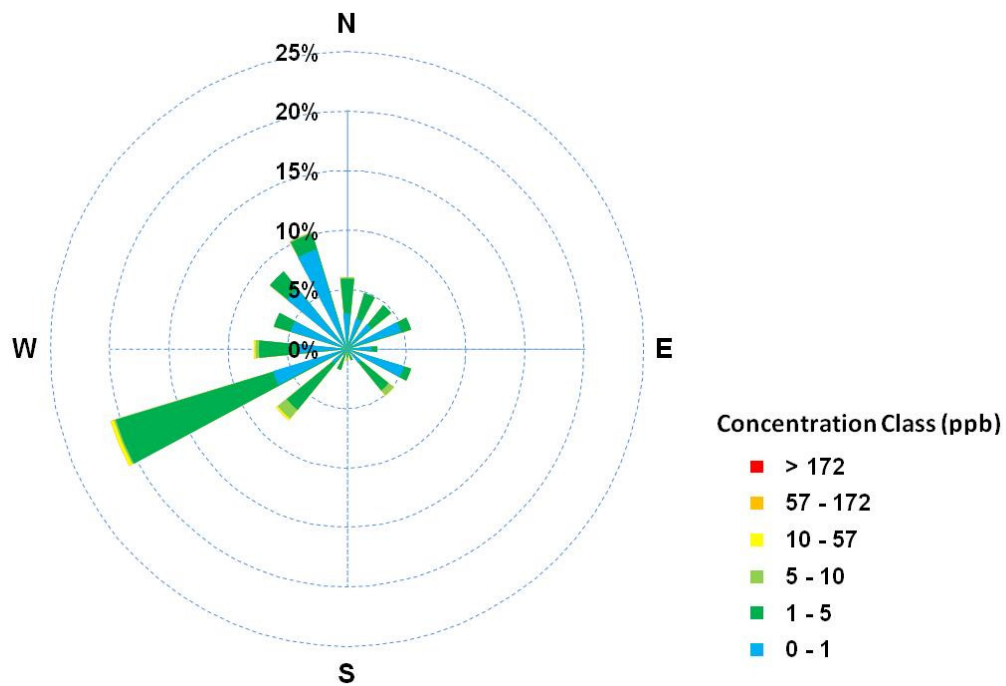


Figure 6. Pollutant rose for 1-hour average SO₂ data at the Wauchope Station

2.3.2 Hydrogen Sulphide (H_2S)

Hydrogen sulphide (H_2S) is a colourless gas with a characteristic “rotten egg” odour. It is produced both naturally and through anthropogenic emission sources. H_2S occurs naturally in coal, crude oil, natural gas, oil, 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 H_2S 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. Although very pungent at first, it quickly deadens the sense of smell. Potential victims may be unaware of its presence until it is too late. The Saskatchewan Ambient Air Quality Standards (SAAQS) for hydrogen sulphide are:

- 1-hour average SAAQS = 10.8 ppb
- 24-hour average SAAQS = 3.6 ppb

Table 5 presents summary statistics for 1-hour average concentrations for H_2S . The annual average concentration for H_2S ranged from 0.7 ppb to 1.0 ppb. The maximum 1-hour concentration of 40.7 ppb, and the maximum 24-hour concentration of 7.0 ppb were both detected at the Glen Ewen station.

Table 6 summarizes the number of exceedance events for H_2S . The measured H_2S concentration was low at all stations in comparison with the SAAQS for the majority of the time. However, there were occasional spikes causing exceedances of the 1-hour and 24-hour SAAQS:

- The Weyburn station detected 26 exceedance events for 1-hour average H_2S , and 6 exceedance events for 24-hour average H_2S . The maximum 1-hour and 24-hour average concentrations were 38.1 ppb and 4.6 ppb, respectively. A complete list of the exceedance events can be found in Appendix H: Table H-1 and H-2.
- The Glen Ewen station detected 34 exceedance events for 1-hour average H_2S , and 7 exceedance events for 24-hour average H_2S . The maximum 1-hour and 24-hour average concentrations were 40.7 ppb and 7.0 ppb, respectively. A complete list of the exceedance events can be found in Appendix I: Table I-1 and I-2.
- The Stoughton station detected 24 exceedance events for 1-hour average H_2S , and 2 exceedance events for 24-hour average H_2S . The maximum 1-hour and 24-hour average concentrations were 28.5 ppb and 4.9 ppb, respectively. A complete list of the exceedance events can be found in Appendix J: Table J-1 and J-2.

- The Wauchope station detected 1 exceedance events for 1-hour average H₂S. The maximum 1-hour average concentration was 13.6 ppb. Details on this exceedance event can be found in Appendix K: Table K-1.

Figures 7 through 10 present the pollutant roses for 1-hour average concentration of H₂S. The measured concentration was low at all stations for the majority of time; greater than 94% of the data was less than 3.6 ppb (the blue and dark green petals). The red petals represent exceedance of the 1-hour SAAQS. At the Weyburn station, the exceedances and high concentration events (>5 ppb) were primarily associated with the E-to-S (east to south) directions. The projected area is where more industrial activities exist, such as upstream oil and gas industry. Most of the exceedance events (17 out of 26) were detected during Light Air condition (≤ 1.4 m/s). It has yet to be determined if the cause of H₂S exceedances are related to localized industrial or biogenic sources. Further investigation is warranted by SESAA's Science Committee.

At the Glen Ewen station, the red petals are not readily visible, although this station detected the most number of exceedance events. Investigation found the exceedances were distributed in a number of directions such that the petals are too short to be visible. It was found the high concentration events (>5 ppb) did not have an apparent directional trend. Most of the 1-hour exceedance events (29 out of 34) were associated with Light Air wind conditions. These features were consistent with the findings of the 2012 monitoring program. A source-receptor relationship with localized industrial or biogenic sources has yet been determined.

At the Stoughton station, the exceedances and high concentration events (>5 ppb) were associated with the WNW-to-ESE (west-northwest to east-southeast) directions. Most of the 1-hour exceedance events (20 out of 24) were associated with Light Air wind conditions. This is the first year of the air monitoring program at the Stoughton station. More data is required to investigate the existence of any source-receptor relationship.

The pollutant rose of the Wauchope station is not suitable for directional trend analysis, as the wind data was not representative of the region due to an obstacle south of the station.

The detailed frequency distribution tables for the pollutant roses are presented in Appendices: Table B-7, Table C-7, Table D-6, and Table G-2.

Table 5. Summary statistics for 1-hour average H₂S

Monitoring Station	Annual Average	Instrument Uptime	Maximum H ₂ S Conc. and Occurrence Time			
			1-hour Max.		24-hour Max.	
			ppb	Time	ppb	Date
Weyburn	0.8	77.3	38.1	Mar 19 23:00	4.6	Dec 11
Glen Ewen	0.7	92.1	40.7	Aug 22 07:00	7.0	Aug 22
Stoughton	1.0	100.0	28.5	Aug 18 03:00	4.9	Aug 22
Wauchope	0.8	100.0	13.6	Dec 22 08:00	2.3	Dec 22

Table 6. Number of exceedance events for H₂S

Monitoring Station	No. of Exceedance to Saskatchewan Ambient Air Quality Standards (SAAQS)	
	1-hr SAAQS	24-hr SAAQS
	10.8 ppb	3.6 ppb
Weyburn	26	6
Glen Ewen	34	7
Stoughton	24	2
Wauchope	1	0

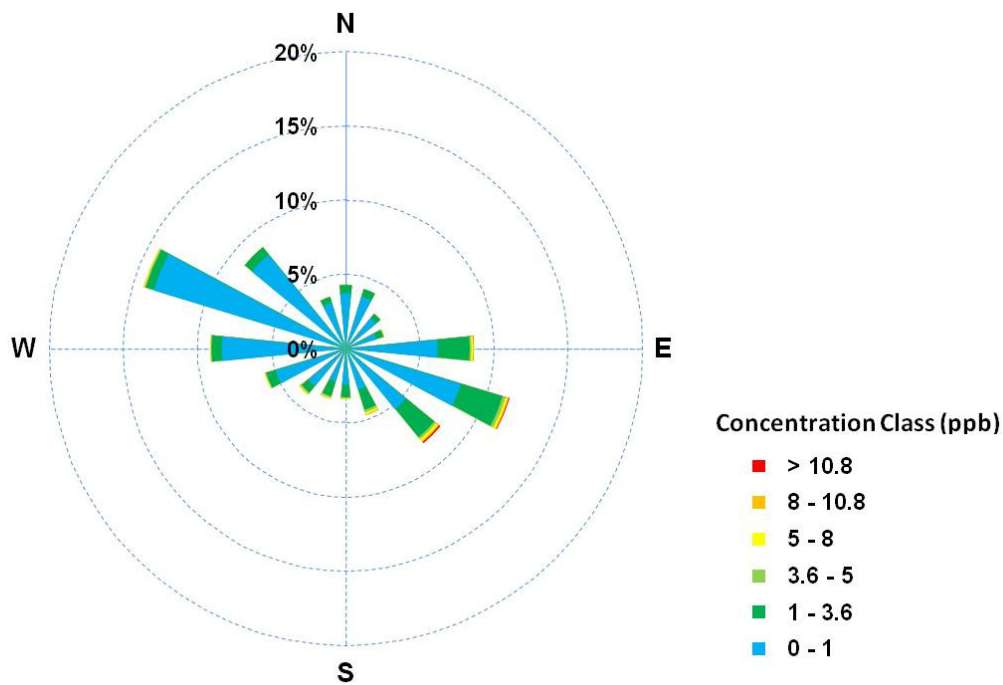


Figure 7. Pollutant rose for 1-hour average H₂S data at the Weyburn Station

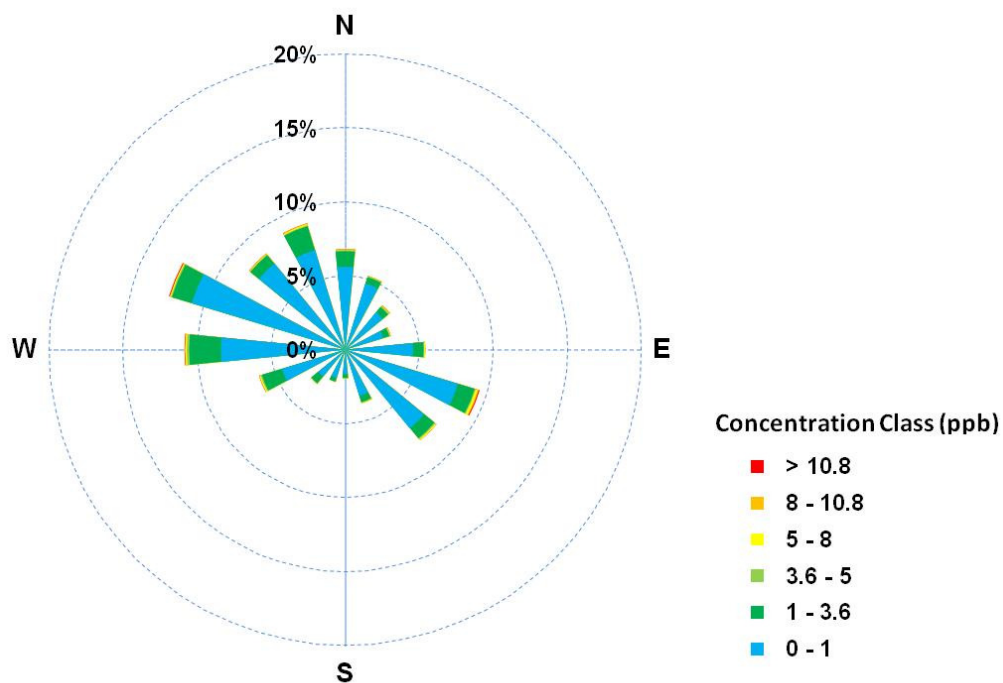


Figure 8. Pollutant rose for 1-hour average H₂S data at the Glen Ewen Station

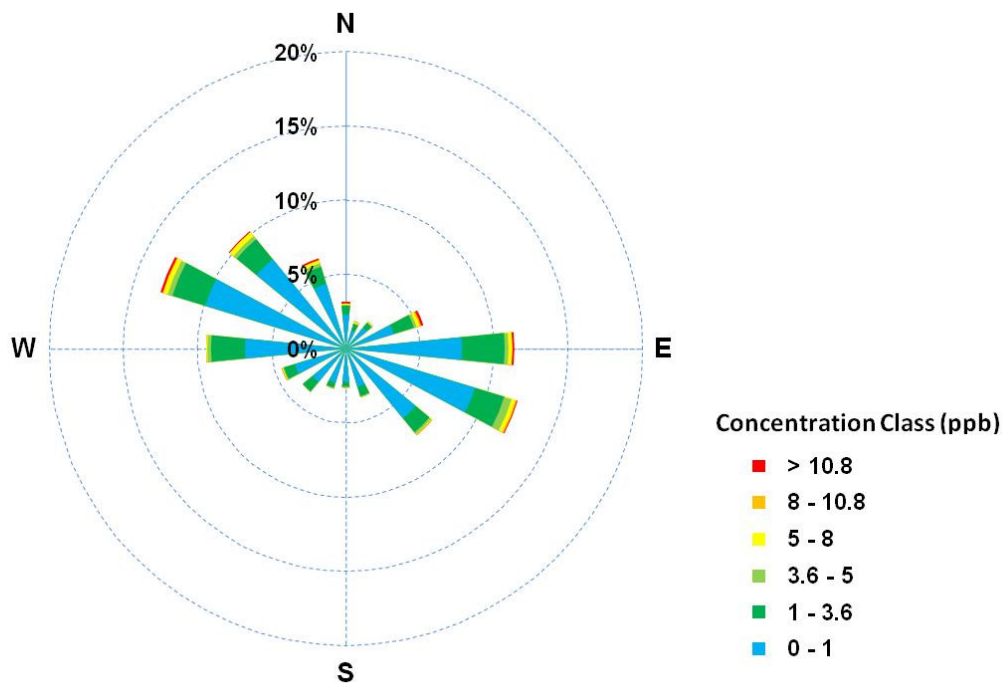


Figure 9. Pollutant rose for 1-hour average H₂S data at the Stoughton Station

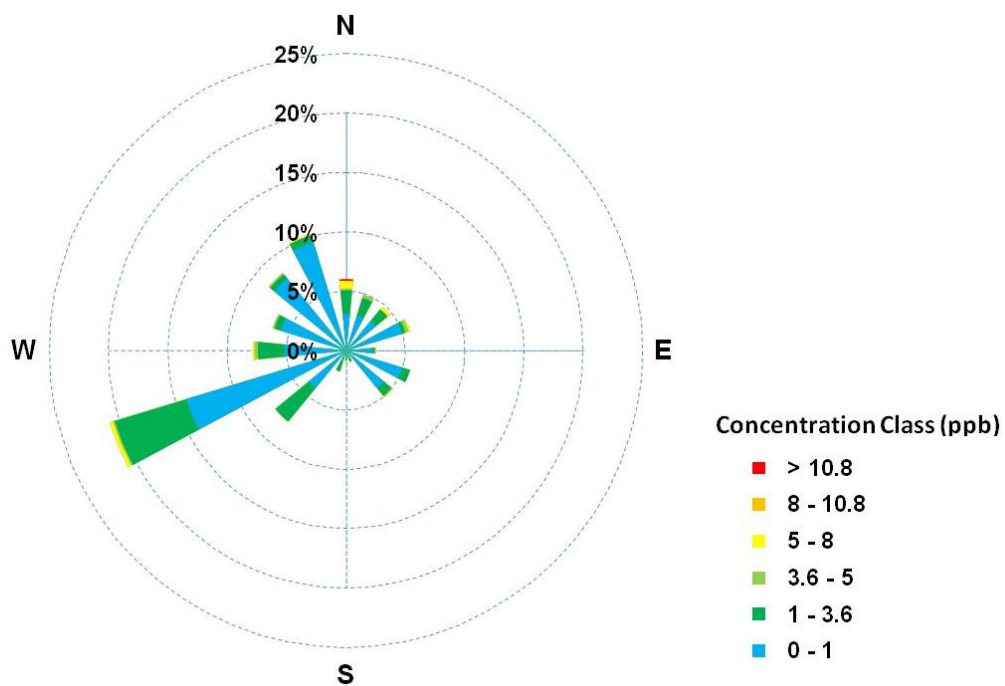


Figure 10. Pollutant rose for 1-hour average H₂S data at the Wauchope Station

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). Nitric oxide is a colorless, flammable gas with a slight odour. Nitrogen dioxide 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.

NO_x can cause respiratory disease, damage vegetation, and reduce visibility. The primary concern with NO_x emissions is their contribution to formation of ground-level ozone, smog and acid rain. To a lesser extent, some NO_x compounds (e.g. N₂O) contribute to stratospheric ozone layer depletion and global warming.

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. The major anthropogenic emission sources for NO_x are associated with fuel combustion, including both stationary sources, such as power plants, oil and gas industries, incinerators, as well as mobile sources such as automobiles. Non-combustion sources, for example nitric acid manufacture, welding processes and the use of explosives, comprise the smaller emission sources. In large cities, motor vehicle emission is the major source of NO_x.

The Saskatchewan Ministry of Environment regulates ambient air concentration for nitrogen dioxide. The Saskatchewan Ambient Air Quality Standards (SAAQS) for nitrogen dioxide are:

- 1-hour average SAAQS = 212 ppb
- annual average SAAQS = 53 ppb

Table 7 presents summary statistics for 1-hour average concentrations for NO₂ for 2013. The measured NO₂ concentration was low at all stations in comparison with the SAAQS. The annual average concentration ranged from 1.4 ppb to 2.2 ppb. The maximum 1-hour concentration of 31.5 ppb was detected at the Weyburn station. The maximum 24-hour concentration of 8.7 ppb was detected at the Stoughton station. There was no exceedance of the 1-hour or annual SAAQS in 2013 (see Table 8).

Figures 11 through 15 present the pollutant roses for 1-hour average NO₂. The concentration at all stations was low; greater than 90% of the data was less than 5 ppb (the blue color petals). The Weyburn, Glen Ewen, and Stoughton pollutant roses reveal a higher percent of concentration events greater than 5 ppb. While the pollutant roses indicate industrial activities, such as upstream oil and gas industry and/or coal-fired power plants, could be the potential sources, vehicular emissions may not be excluded. The average diurnal trend of NO₂ shows a double-crest pattern with the peaks during the morning and afternoon/evening commuting hours. A source-receptor relationship with industrial or vehicular sources has yet been determined.

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

Table 7. Summary statistics for 1-hour average NO₂

Monitoring Station	Annual Average	Instrument Uptime	Maximum NO ₂ Conc. and Occurrence Time			
			1-hour Max.		24-hour Max.	
			ppb	Time	ppb	Date
Weyburn	2.0	75.8	31.5	Dec 11 19:00	6.9	Feb 23
Glen Ewen	2.2	92.3	19.4	Feb 25 20:00	7.5	Dec 23
Stoughton	2.1	99.9	31.3	Dec 11 20:00	8.7	Dec 23
Esterhazy	1.4	99.9	10.2	Oct 26 19:00	4.1	Dec 23
Wawota	1.7	100.0	6.9	Dec 31 10:00	3.0	Dec 20

Table 8. Number of exceedance events for NO₂

Monitoring Station	No. of Exceedance to Saskatchewan Ambient Air Quality Standards (SAAQS)	
	1-hr SAAQS	Annual SAAQS
	212 ppb	53 ppb
Weyburn	0	0
Glen Ewen	0	0
Stoughton	0	0
Esterhazy	0	0
Wawota	0	0

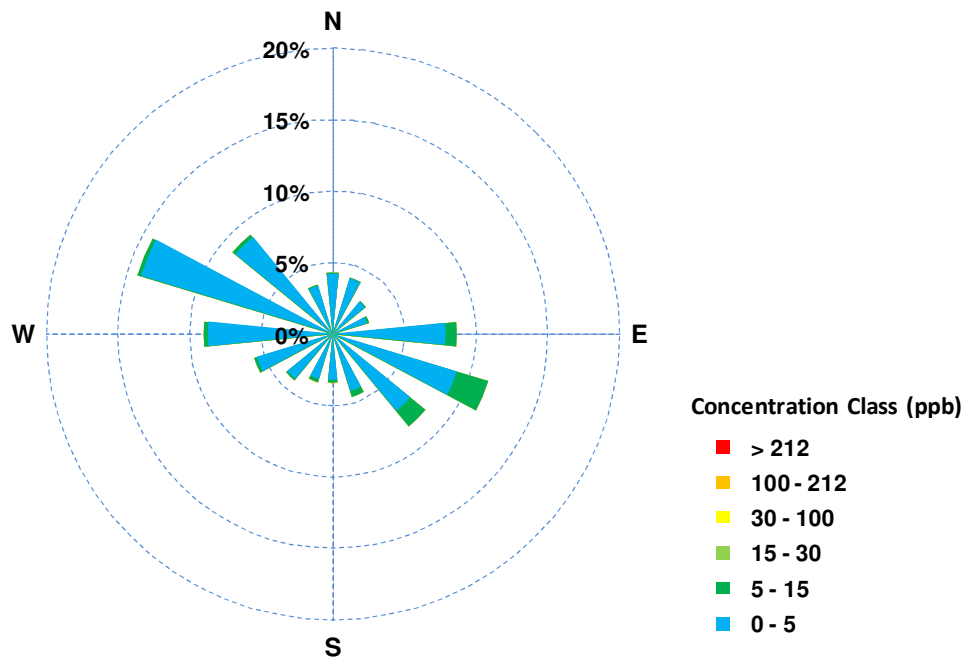


Figure 11. Pollutant rose for 1-hour average NO₂ data at the Weyburn Station

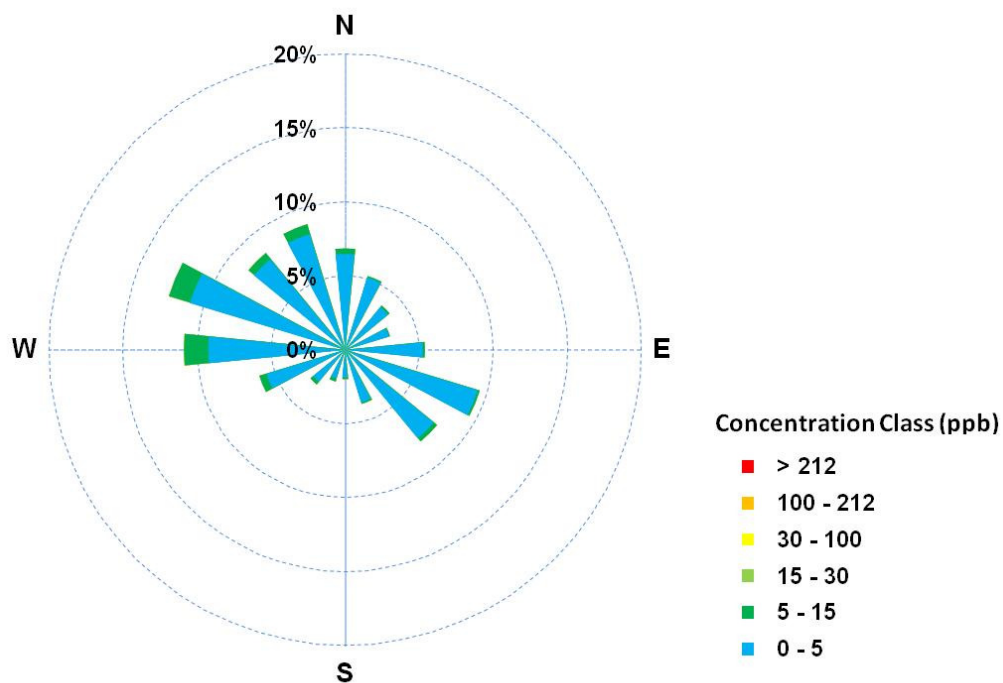


Figure 12. Pollutant rose for 1-hour average NO₂ data at the Glen Ewen Station

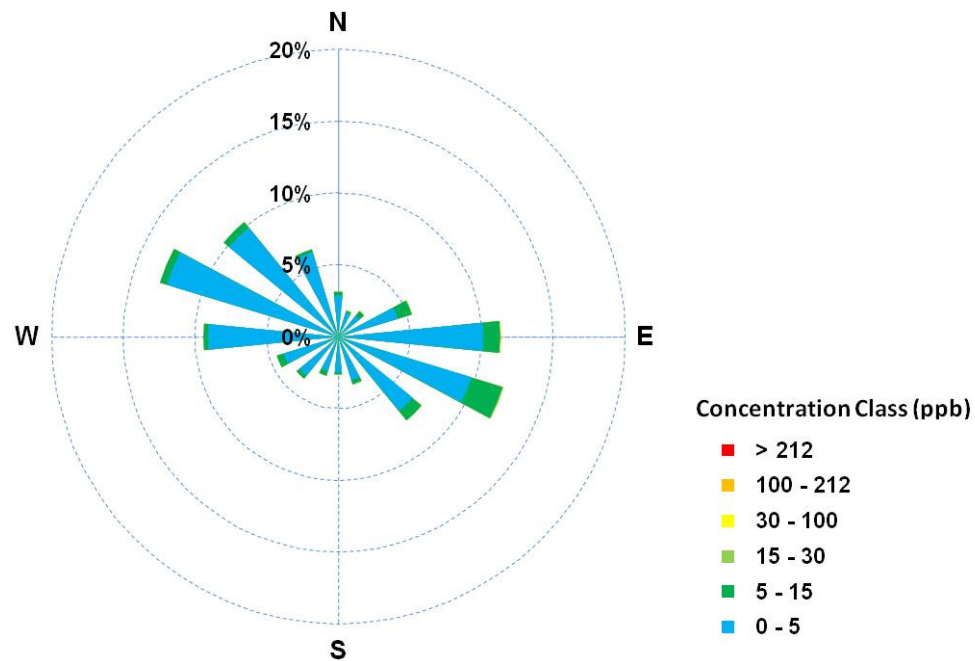


Figure 13. Pollutant rose for 1-hour average NO₂ data at the Stoughton Station

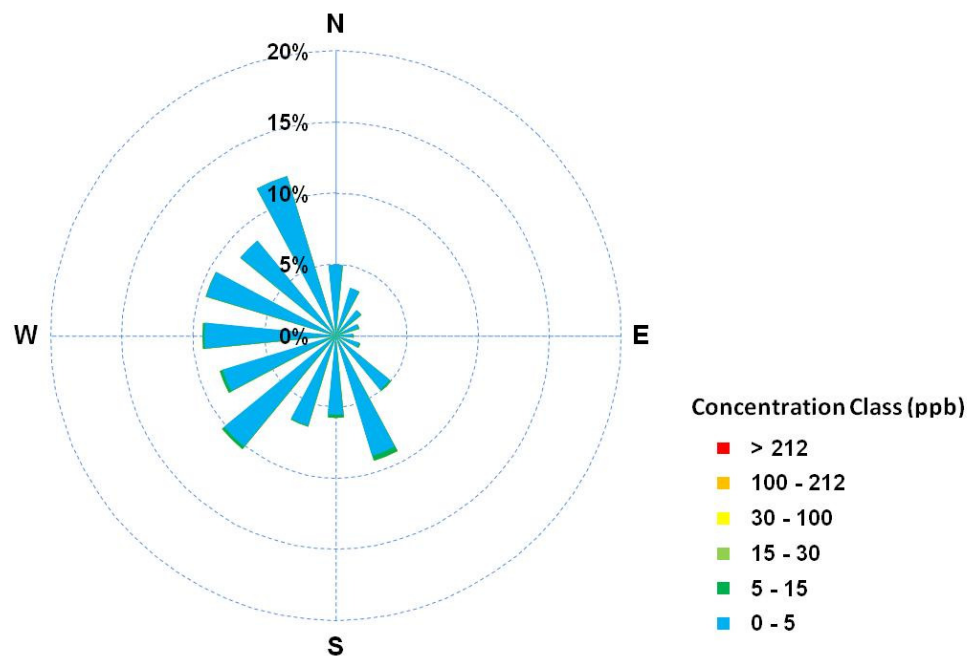


Figure 14. Pollutant rose for 1-hour average NO₂ data at the Esterhazy Station

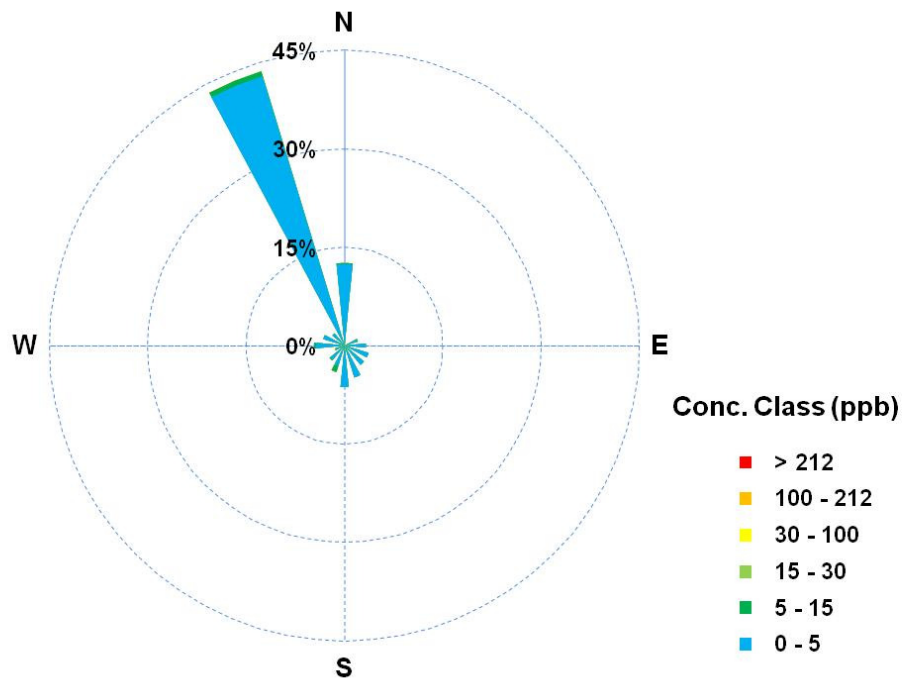


Figure 15. Pollutant rose for 1-hour average NO₂ data at the Wawota Station

2.3.4 Ozone (O₃)

Ozone (O₃) is a pale blue gas, slightly soluble in water. Most people can detect a sharp odour resembling chlorine bleach at about 10 ppb concentration. Ozone can be formed by electrical discharges and high energy electromagnetic radiation. In the indoor environments, ozone can be present as a result of electronic equipment such as ionic air purifiers, laser printers, photocopiers, and arc welders.

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 (VOC) in the presence of sunlight. Some research suggests that 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 are split opinions regarding relative importance of these mechanisms. A study in Regina suggested that high ozone events could be due to downward transport from the stratosphere for the reviewed data.

Exposure to ozone has been linked to premature mortality and a range of morbidity health endpoints, such as hospital admissions and asthma symptoms. Acute exposure to high concentrations of ozone can cause eye irritation and breathing difficulty. 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.

The Saskatchewan Ambient Air Quality Standard (SAAQS) for ozone is:

- 1-hour average SAAQS = 82 ppb

The Canada-Wide Standard (CWS) for ozone is:

- 8-hour average CWS = 65 ppb; achievement assessment is based on the 4th highest measurement annually, averaged over three consecutive years.

Table 9 presents summary statistics for 1-hour average concentrations for O₃. The annual average concentration ranged from 25 ppb to 32 ppb. The maximum 1-hour concentration of 79 ppb, as well as the maximum of the 4th highest 8-hour running average of 71 ppb were detected at the Glen Ewen station. There was no exceedance of the 1-hour SAAQS, but a number of 8-hour running averages were higher than the CWS standard (see Table 10). The 4th highest concentrations of 8-hour running average at the Weyburn and Glen Ewen stations were higher than the CWS standard, though they do not constitute an exceedance because the CWS standard is based on the average of three consecutive years. The Esterhazy and Wawota

stations are not included in the CWS achievement evaluation because they only monitored a partial year.

Figures 16 through 19 present the pollutant roses for 1-hour average concentration of O₃. The pollutant roses did not show a directional trend for high concentration events, indicating high O₃ events may be impacted by regional air quality trends and less likely a localized source.

The detailed frequency distribution table for the pollutant roses are presented in Appendices: Table B-6, Table C-6, Table E-6, and Table F-2.

Table 9. Summary statistics for 1-hour average O₃

Monitoring Station	Annual Average	Instrument Uptime	Maximum O ₃ Conc. and Occurrence Time			
			1-hour Max.		8-hour 4 th Highest	
	ppb	%	ppb	Time	ppb	Time
Weyburn	32	78.1	77	Mar 29 17:00	68	Mar 29 16:00
Glen Ewen	31	88.8	79	Mar 30 19:00	71	Mar 30 11:00
Esterhazy	25	99.6	57	Aug 28 16:00	51	Aug 28 11:00
Wawota	28	100.0	44	Dec 24 23:00	41	Dec 25

Table 10. Number of exceedance events for O₃

Monitoring Station	No. of Exceedance to Saskatchewan Ambient Air Quality Standards (SAAQS)	
	1-hr SAAQS	8-hr CWS
	82 ppb	65 ppb
Weyburn	0	14 ^a
Glen Ewen	0	30 ^a
Esterhazy	0	0
Wawota	0	0

- a. The data represents number of events higher than the CWS standard, but they do not constitute an exceedance because the CWS standard is based on the 4th highest concentration, averaged over three consecutive years.

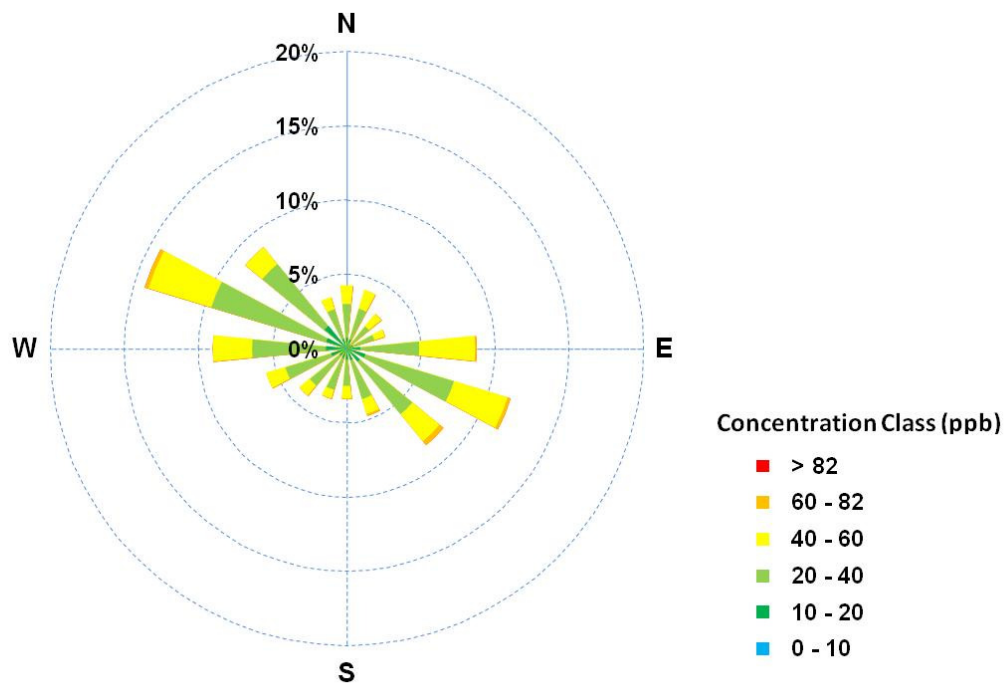


Figure 16. Pollutant rose for 1-hour average O₃ data at the Weyburn Station

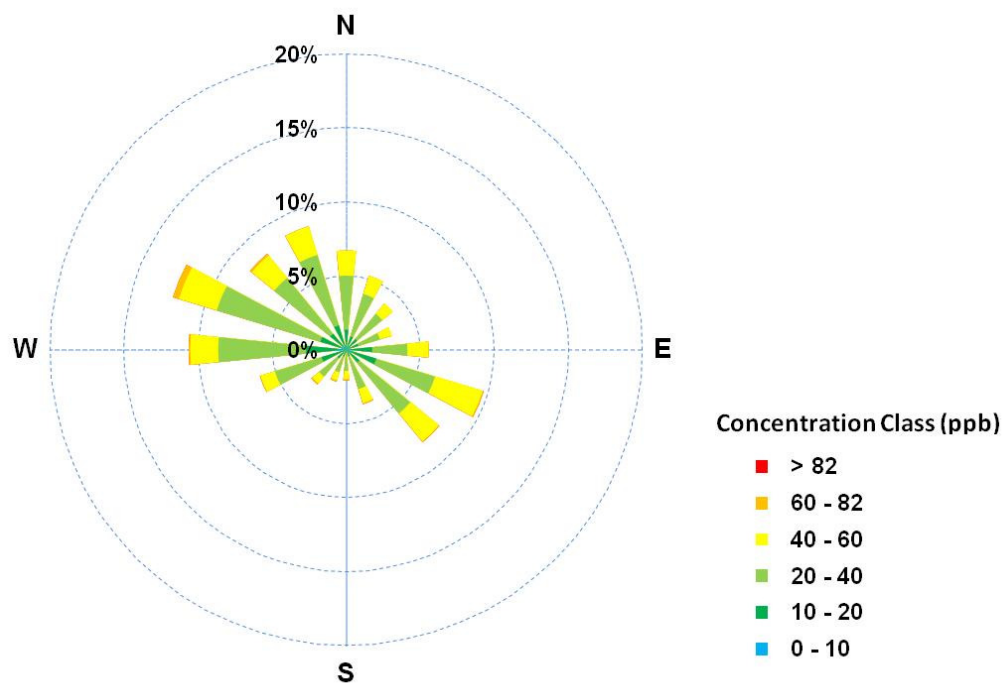


Figure 17. Pollutant rose for 1-hour average O₃ data at the Glen Ewen Station

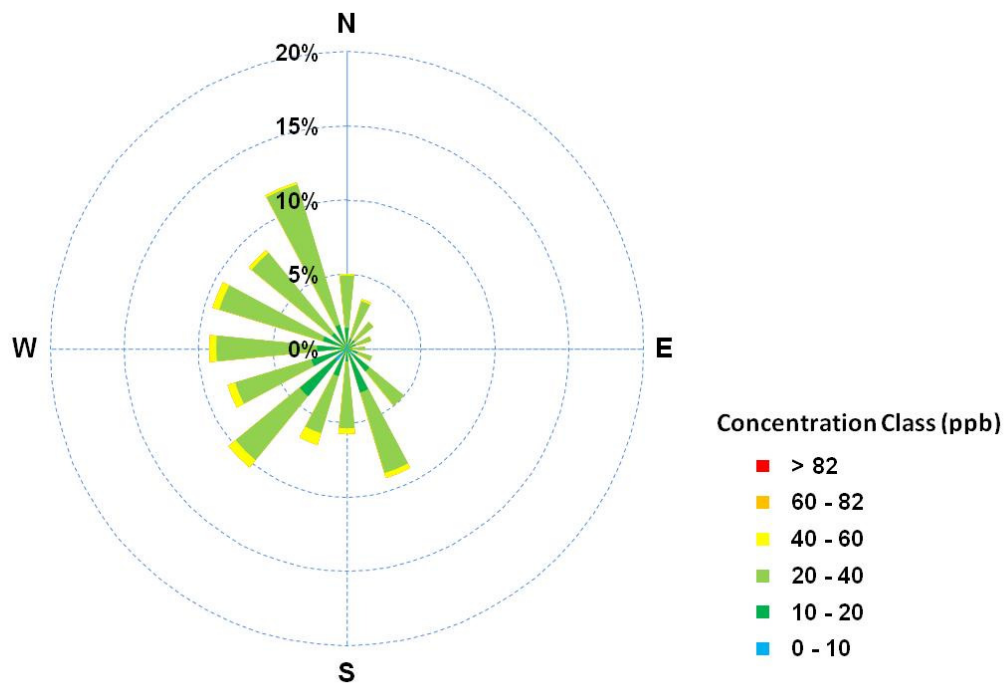


Figure 18. Pollutant rose for 1-hour average O₃ data at the Esterhazy Station

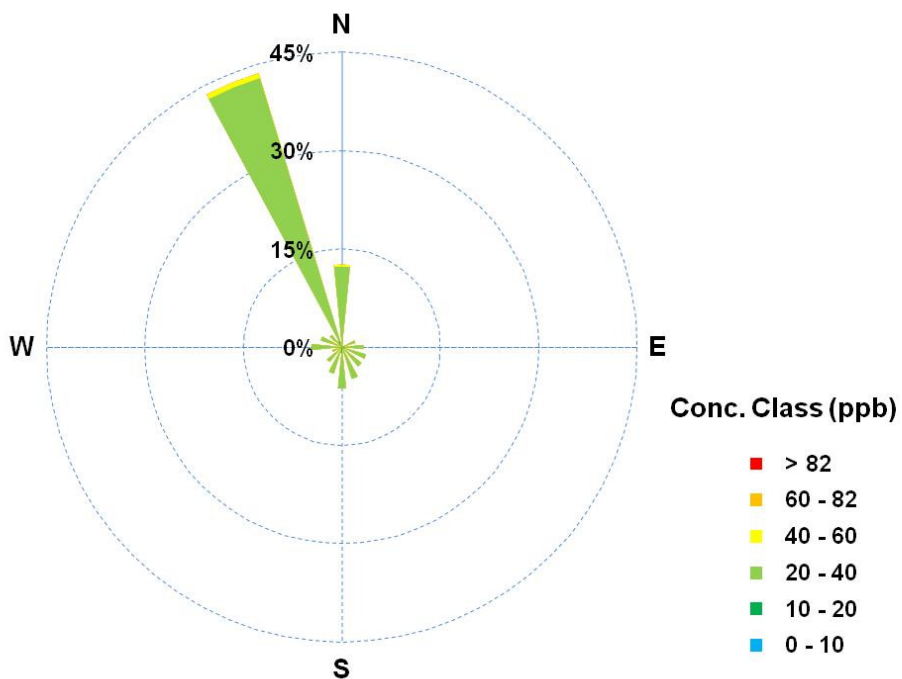


Figure 19. Pollutant rose for 1-hour average O₃ data at the Wawota Station

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 major concern for particulate matter deals with small particles referred to as inhalable particulate, or PM₁₀. PM₁₀ is defined as particles that have an aerodynamic diameter less than 10 microns (or 0.01 mm). PM₁₀ can be divided into two groups of particles based on size: fine particles and coarse particles. The fine particles are those particles with an aerodynamic diameter smaller than 2.5 microns (0.0025 mm) and are identified as PM_{2.5}. In contrast, coarse particles are those with aerodynamic diameter greater than 2.5 microns and less than 10 microns.

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, emitted by combustion activities, are transformed by chemical reactions in the air.

Adverse health effects from breathing air with a high PM_{2.5} concentration include: premature death, increased respiratory symptoms and disease, chronic bronchitis, and decreased lung function particularly for individuals with asthma. Particulate matter can clog stomatal openings of plants and interfere with photosynthesis functions, leading to growth stunting or mortality in some plant species.

Saskatchewan endorses the Canada-Wide Standards (CWS) for fine particulate matter (PM_{2.5}):

- 30 µg/m³ averaged over a 24-hour period from midnight to midnight; the standard is based on the 98th percentile annually, averaged over three consecutive years.

Table 11 presents the summary statistics for 1-hour average concentrations for PM_{2.5}. The annual average concentration ranged from 4 µg/m³ to 6 µg/m³. The maximum 1-hour concentration ranged of 72 µg/m³ was detected at the Esterhazy station. The maximum 24-hour concentration of 20 µg/m³ was detected at the Weyburn station. There was no exceedance of the 24-hour Canada-Wide Standards (see Table 12).

Figures 20 through 24 present the pollutant roses for 1-hour average concentration of PM_{2.5}. Generally, the high concentration events (e.g. >10 µg/m³ in the yellow, orange and red petals) were associated with all wind directions. There was no apparent directional trend. Similar to NO₂, the average diurnal trend of PM_{2.5} shows a double-crest pattern with the peaks during the morning and afternoon/evening commuting hours. In addition to industrial activities, vehicular emissions could be a potential contribution sources. Forest fires may cause high PM_{2.5} events during the wildfire season as well. A source-receptor relationship with the potential sources has yet been determined.

The detailed frequency distribution tables for the pollutant roses are presented in Appendices: Table B-8, Table D-7, Table E-6, Table F-2, and Table G-2.

Table 11. Summary statistics for 1-hour average PM_{2.5}

Monitoring Station	Annual Average µg/m ³	Instrument Uptime %	Maximum PM _{2.5} Conc. and Occurrence Time			
			1-hour Max.		24-hour Max.	
			µg/m ³	Time	µg/m ³	Date
Weyburn	4	78.9	34	Jul 11 21:00	20	Jul 9
Stoughton	5	48.8	35	Oct 9 00:00	13	Oct 7
Esterhazy	6	81.0	72	Sep 18 06:00	13	Oct 15
Wawota	4	100.0	17	Dec 03 04:00	7	Dec 23
Wauchope	4	100.0	23	Dec 22 18:00	10	Dec 23

Table 12. Number of exceedance events for PM_{2.5}

Monitoring Station	No. of Exceedance to Canada-Wide Standards (CWS)	
	24-hr CWS	
	30 µg/m ³	
Weyburn	0	
Stoughton	0	
Esterhazy	0	
Wawota	0	
Wauchope	0	

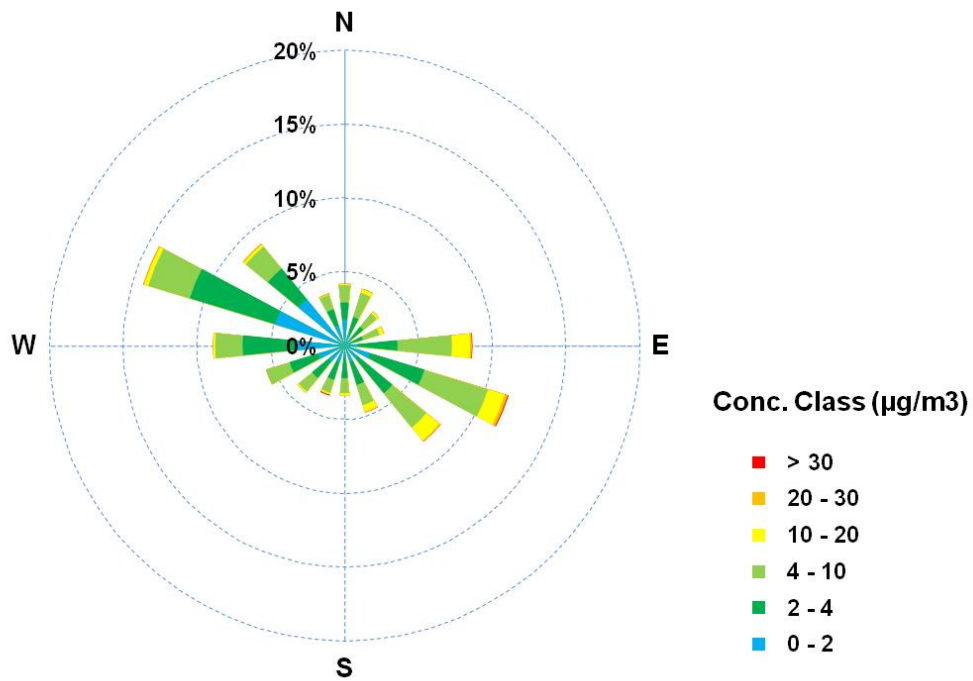


Figure 20. Pollutant rose for 1-hour average $PM_{2.5}$ data at the Weyburn Station

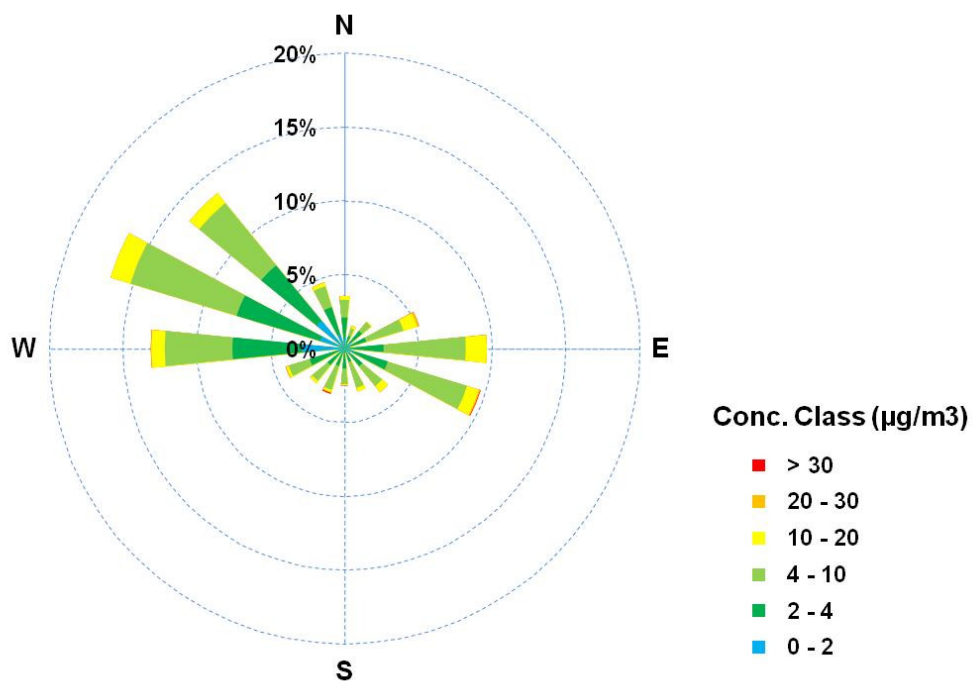


Figure 21. Pollutant rose for 1-hour average $PM_{2.5}$ data at the Stoughton Station

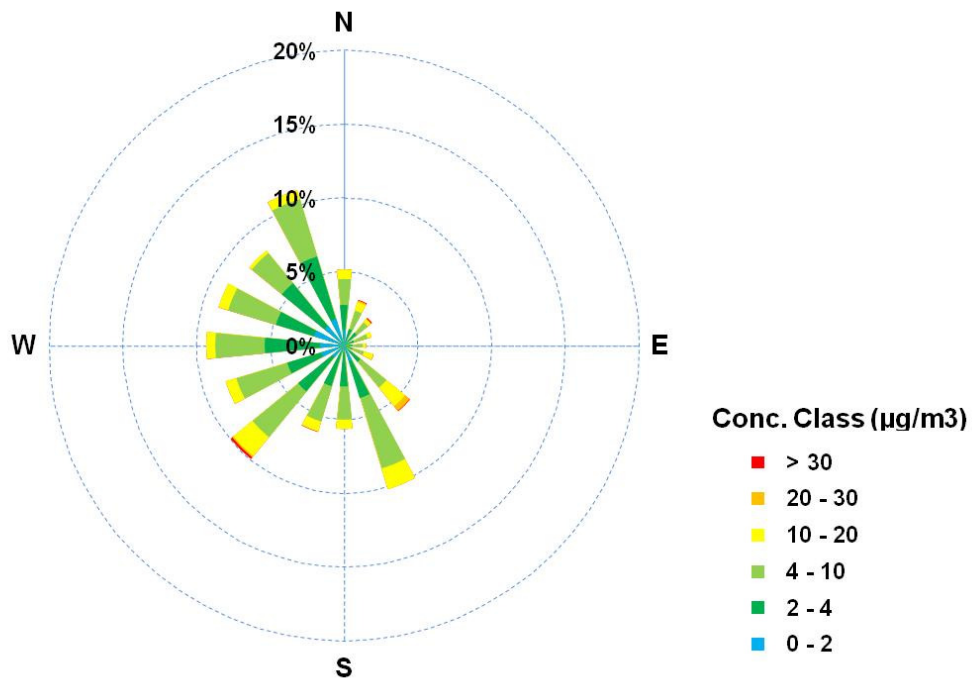


Figure 22. Pollutant rose for 1-hour average $\text{PM}_{2.5}$ data at the Esterhazy Station

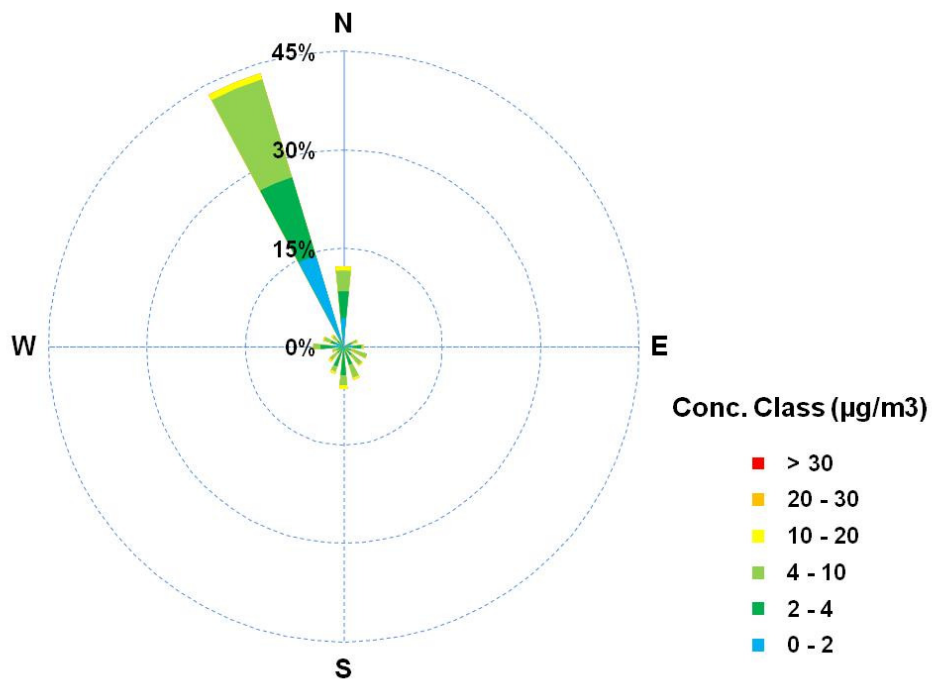


Figure 23. Pollutant rose for 1-hour average $\text{PM}_{2.5}$ data at the Wawota Station

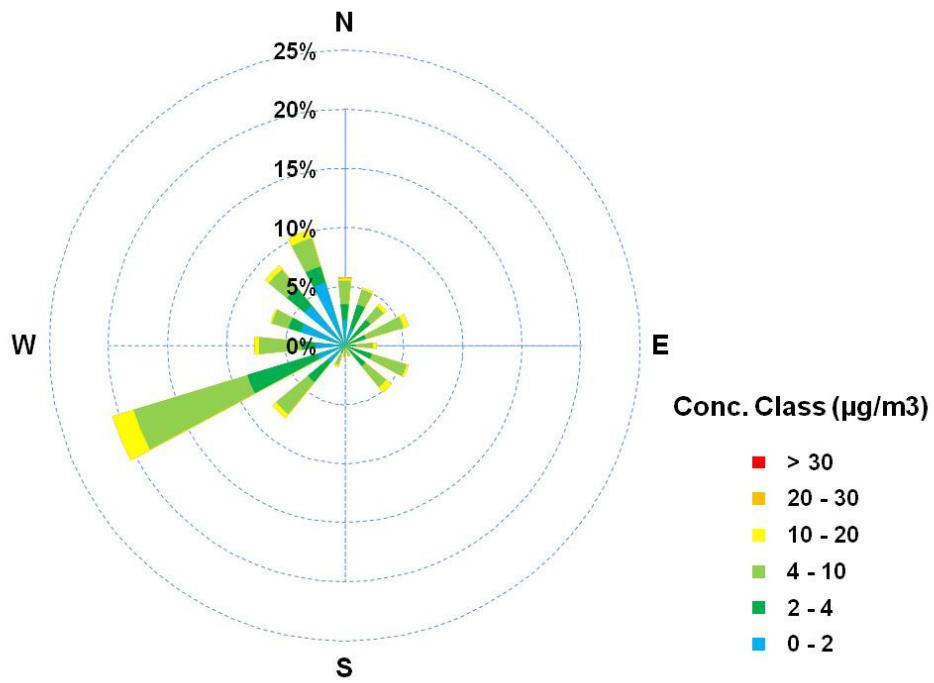



Figure 24. Pollutant rose for 1-hour average PM_{2.5} data at the Wauchope Station

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 as the indicator of health risk. 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 the AQHI.

Figure 8 summarizes the AQHI rating and the health messages for the at-risk population and the general population. The health risk is classified in categories by AQHI: Low Risk (1 to 3), Moderate Risk (4 to 6), High Risk (7 to 10), and Very High Risk (higher than 10).

Among the SESAA air monitoring station, Weyburn, Esterhazy, and Wawota are eligible for AQHI reporting. Table 13 summarizes the occurrence statistics for AQHI rating. At the Weyburn station, the air quality was rated Low Risk 98.3% of the time, and 1.7% was rated Moderate Risk. Moderate Risk rating was reported in March, April and June. At the Esterhazy station, the air quality was rated Low Risk 99.9% of the time. The remaining 0.1% was rated Moderate Risk, which was reported in September and October. The air quality at the Wawota station was rated Low Risk 100.0% of the time of December.



Health Risk	Air Quality Health Index	Health Messages	
		At Risk Population	General Population
Low Risk	1 – 3	Enjoy your usual outdoor activities.	Ideal air quality for outdoor activities.
Moderate Risk	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 Risk	7 – 10	Reduce or reschedule strenuous activities outdoors. Children and the elderly should also take it easy.	Consider reducing or rescheduling strenuous activities outdoors if you experience symptoms such as coughing and throat irritation.
Very High Risk	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 25. Risk classification and health messages for Air Quality Health Index (Environment Canada)

Table 13. Summary of occurrence statistics for AQHI rating

Monitoring Station	Occurrence Statistics	Number of Occurrence Hours and Frequency by AQHI Rating			
		Low Risk	Moderate Risk	High Risk	Very High Risk
Weyburn	Occurrence Hours	6629	112	0	0
	Occurrence Frequency	98.3%	1.7%	0.0%	0.0%
Esterhazy	Occurrence Hours	2729	4	0	0
	Occurrence Frequency	99.9%	0.1%	0.0%	0.0%
Wawota	Occurrence Hours	744	0	0	0
	Occurrence Frequency	100.0%	0.0%	0.0%	0.0%

2.5 Air Quality Index (AQI)

The Glen Ewen and Stoughton stations do not meet the reporting requirements for AQHI, the Air Quality Index (AQI) is used as an alternative index. The Wauchope station is excluded from index analysis because this station does not meet the reporting requirements of either index system.

The Air Quality Index (AQI) is a system developed to provide the public with a meaningful and comparable measure of outdoor air quality. The AQI uses readings from five major air pollutants: SO₂, NO₂, O₃, PM_{2.5}, and carbon monoxide (CO), to calculate the AQI. A minimum of three pollutants is required to calculate AQI. The AQI is rated in four categories: Good (0 to 25), Fair (26 to 50), Poor (51 to 100), and Very Poor (>100). Table 14 summarizes the effects associated with the AQI ratings.

Table 15 summarizes the occurrence hours and frequency by the AQI rating for the Glen Ewen and Stoughton stations. The Glen Ewen AQI is calculated from SO₂, NO₂, and O₃, as the airpointer® does not measure CO or PM_{2.5}. The Stoughton AQI is calculated from SO₂, NO₂, and PM_{2.5}, as the airpointer® does not measure CO or O₃.

The Air Quality Index at the Glen Ewen station was rated Good for 92.4% of the time and Fair 7.6% of the time. In 2013, the AQI rating never fell in the Poor or Very Poor categories. The AQI rating was always Good during the winter months; Fair air quality was recorded between March and September.

The Air Quality Index at the Stoughton station was rated Good for 99.8% of the time and Fair 0.2% of the time. The AQI rating never fell in the Poor or Very Poor categories. The Stoughton station started operations in July, but valid AQI was reported starting from October 1. Fair air quality was recorded in October; the winter months were rated Good.

Table 14. 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.

Source: Clean Air Strategic Alliance (CASA) - www.casadata.org/airqualityindex/aqi/whatis.asp

Table 15. Summary of occurrence statistics for AQI rating

Monitoring Station	Occurrence Statistics	Number of Occurrence Hours and Frequency by AQI Rating			
		Good	Fair	Poor	Very Poor
Glen Ewen	Occurrence Hours	6872	562	0	0
	Occurrence Frequency	92.4%	7.6%	0.0%	0.0%
Stoughton	Occurrence Hours	2044	4	0	0
	Occurrence Frequency	99.8%	0.2%	0.0%	0.0%

2.6 Passive Monitoring Network

The SESAA passive monitoring program was initiated in June 2006. Until August 2012, the passive monitoring network consisted of 30 sampling stations, as shown in Figure 1. Among the 30 sampling stations, the two ATCO stations (No. 29 and No. 30) are in close proximity to the Kisbey facility of the ATCO Midstream Limited for near-source monitoring, while the remaining 28 passive stations were selected for receptor and/or environmental monitoring.

The passive network was revised in August 2012. As shown in Table 16, SO₂, NO₂, and O₃ were monitored at 15, 9 and 9 stations, respectively. H₂S was monitored at 6 stations; NH₃ was monitored at the Creelman station (No. 20); and BTEX were monitored at the Macoun (No. 8) and Oxbow (No. 11) stations. Sampling was carried out for the months of January, February, and May through September. New passive sampler devices were introduced in May; passive ozone was sampled using an Ogawa passive sampler, and the remaining species used Radiello passive samplers.

Table 16 summarizes the sample capture rate for the year of 2013. The sample capture rate was greater than 90% for all parameters. The detailed passive monitoring results are presented in Appendix L.

Table 16. Sample capture rates for the SESAA passive monitoring network

Species	Number of Station	Number of Valid Passive Samples (no.)												Capture Rate (%)
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
SO ₂	15	15	15	-	-	14	15	13	15	14	-	-	-	96.2%
NO ₂	9	9	9	-	-	8	9	8	9	8	-	-	-	95.2%
O ₃	9	9	9	-	-	6	9	9	9	9	-	-	-	95.2%
H ₂ S	6	6	6	-	-	6	6	5	5	6	-	-	-	95.2%
NH ₃	1	1	1	-	-	1	1	1	1	1	-	-	-	100.0%
Benzene	2	2	2	-	-	1	2	2	2	2	-	-	-	92.9%
Toluene	2	2	2	-	-	2	2	2	2	2	-	-	-	100.0%
Ethylbenzene	2	2	2	-	-	2	2	2	2	2	-	-	-	100.0%
Xylene	2	2	2	-	-	2	2	2	2	2	-	-	-	100.0%

- : Passive program paused

2.6.1 Sulphur Dioxide (SO₂)

Figure 26 presents 30-day average concentration for the passive SO₂ network for the years from 2009 to 2013. The concentrations within the airshed zone were low in comparison to the SAAQS. The annual average concentrations of all stations were within the annual SAAQS (11 ppb). The chart seems to show a seasonal trend, where SO₂ concentration is higher in winter and early spring. In addition, a decreasing trend seems to be existent over the five years for most months. More data is needed to validate the trends.

Figure 27 presents a bubble chart showing spatial distribution of the annual average concentration for passive SO₂. The annual average concentration ranged from 0.3 ppb to 0.9 ppb. The spatial trend is somewhat different from the previous year. In 2012, the two sampling stations near the Kisbey facility of the ATCO Midstream Limited detected the highest 30-day concentrations most months. Since the introduction of the new passive sampler devices in May 2013, the concentrations at the sites near the Kisbey facility were not significantly different from the remaining stations. The maximum 30-day concentration was detected at varying stations during the five months, with the maximum annual average 0.9 ppb at the Roche Percee station. The different spatial pattern has not been explored in detail. On-going observation and analysis is required to investigate the cause.

The measured 30-day average concentrations ranged from <0.1 ppb to 2.9 ppb. Please refer to Appendix L: Table L-1 for the concentrations of individual samples.

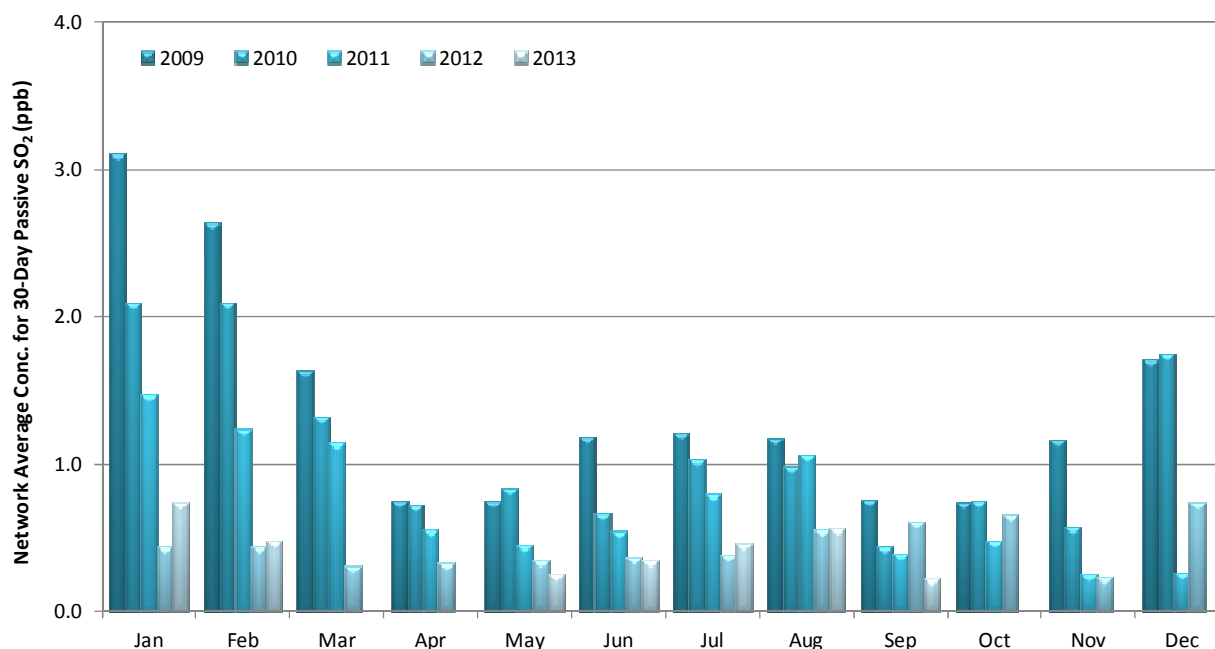


Figure 26. Monthly average concentration for the passive SO₂ network from 2009 to 2013

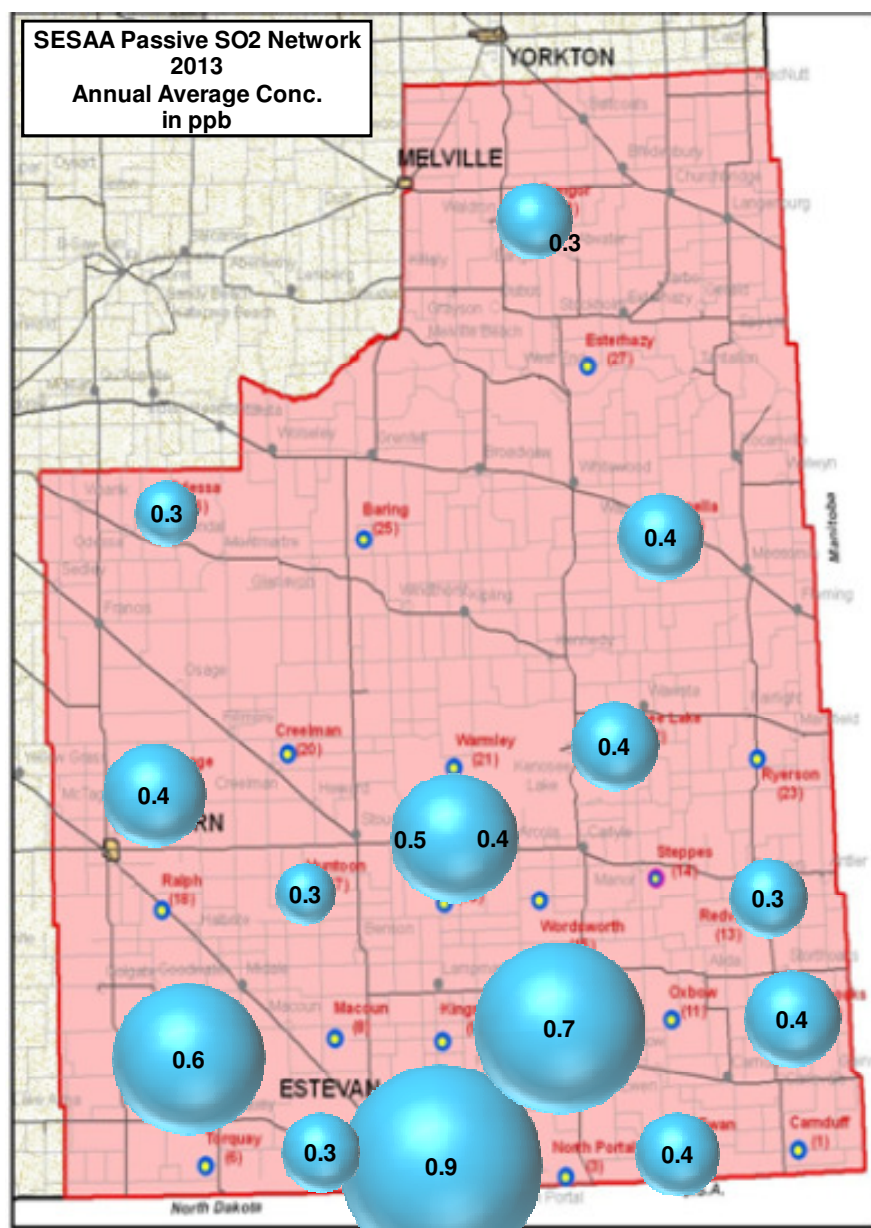


Figure 27. Spatial distribution of passive SO₂ concentration within the SESAA airshed zone

2.6.2 Nitrogen Dioxide (NO₂)

Figure 28 presents 30-day average concentrations for the passive NO₂ network for the years from 2009 to 2013. NO₂ concentration within the airshed zone was quite low in comparison to the SAAQS. There was no exceedance of the annual SAAQS (53 ppb) during the past five years. The chart does not show an apparent monthly or seasonal trend.

Figure 29 presents a bubble chart showing spatial distribution of annual average concentration for passive NO₂. The annual average concentrations ranged from 0.7 ppb to 1.5 ppb. There was no apparent spatial trend. Generally, the new passive samplers detected a lower concentration compared to 2012. On-going observation and analysis is required to investigate the cause.

The 30-day average concentrations ranged from <0.1 ppb to 3.7 ppb. Please refer to Appendix L: Table L-2 for the concentrations of individual samples.

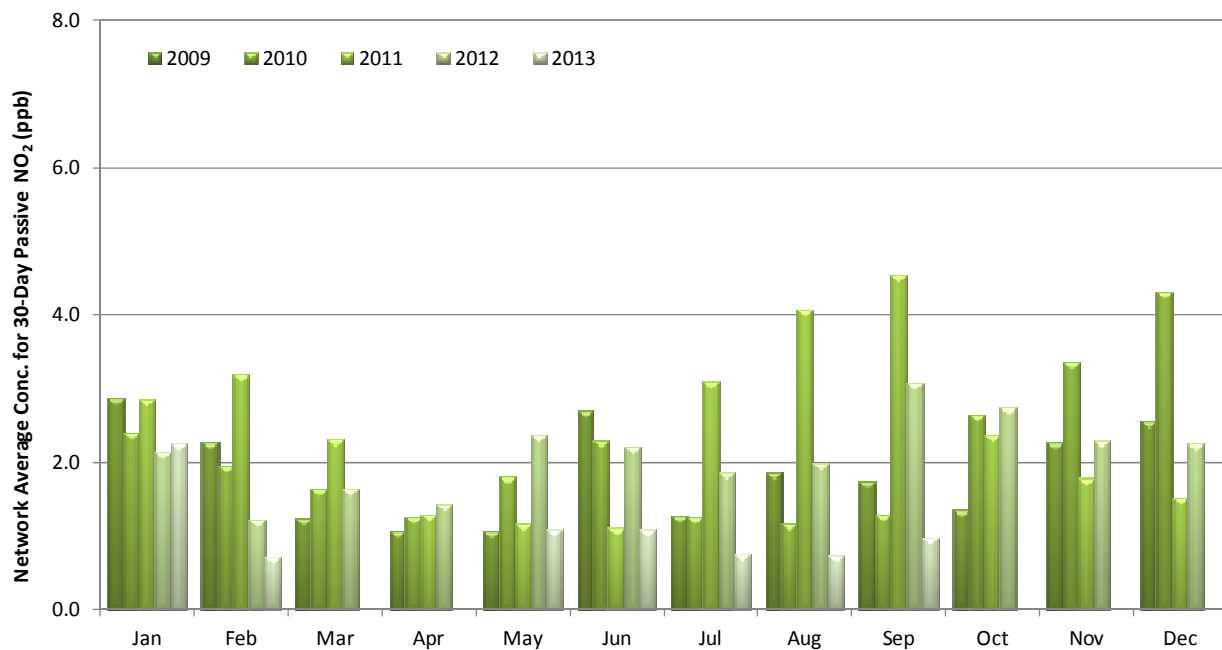


Figure 28. Monthly average concentration for the passive NO₂ network from 2009 to 2013

2.6.3 Ozone (O₃)

Figure 30 presents 30-day average concentration for passive O₃ for the years from 2008 to 2013. The data set seems to exhibit a seasonal trend, where O₃ concentration tends to be higher in the spring and early-summer months. The concentration of ground-level ozone is the net result of atmospheric formation, transport, and destruction processes. During spring and summer, vertical mixing is stronger and could promote downward movement of upper air ozone to the ground. However, some research suggests that there are split viewpoints as to the relative importance of contributions of ozone from the stratosphere, mixing from the upper troposphere, local photochemistry, and the medium and long-range transport. Further investigation is required.

Figure 31 presents a bubble chart showing spatial distribution of annual average concentration for passive O₃. The annual average concentrations ranged from 29 ppb to 38 ppb. There was no clear spatial trend within the airshed zone. Generally, the new passive sampler device detected similar concentrations compared to 2012, with the exception of the samples taken in May which recorded a higher trend.

The 30-day average concentrations ranged from 13 ppb to 64 ppb. Please refer to Appendix L: Table L-3 for the concentrations of individual samples.

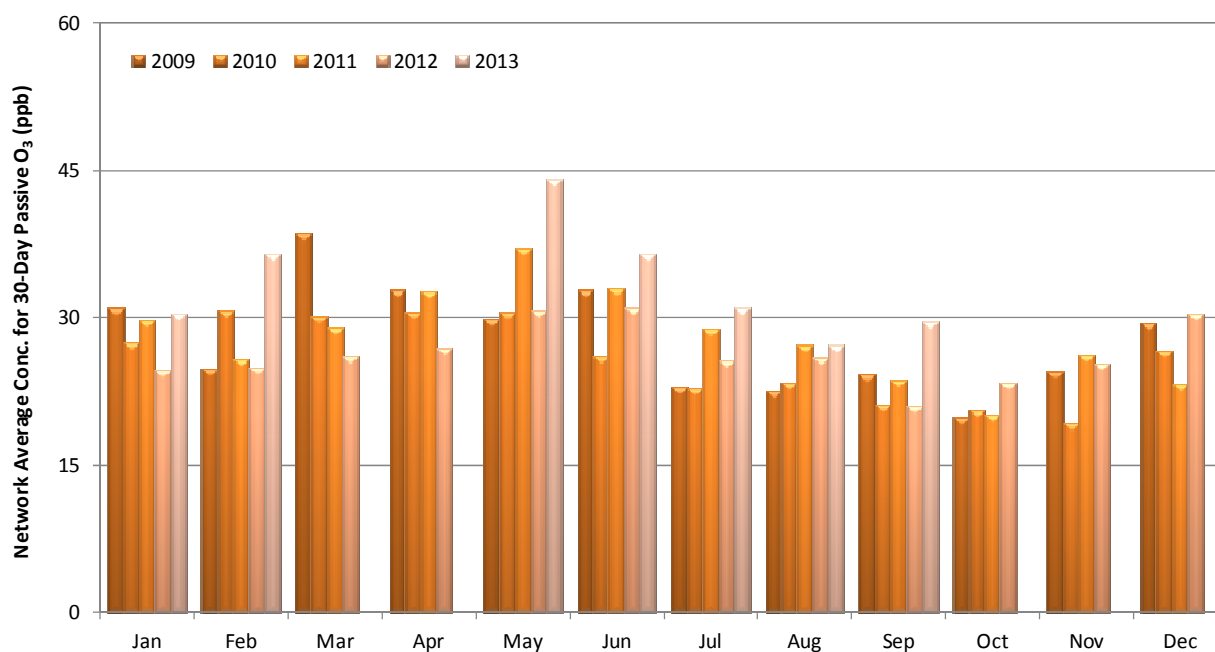


Figure 30. Monthly average concentration for the passive O₃ network from 2009 to 2013

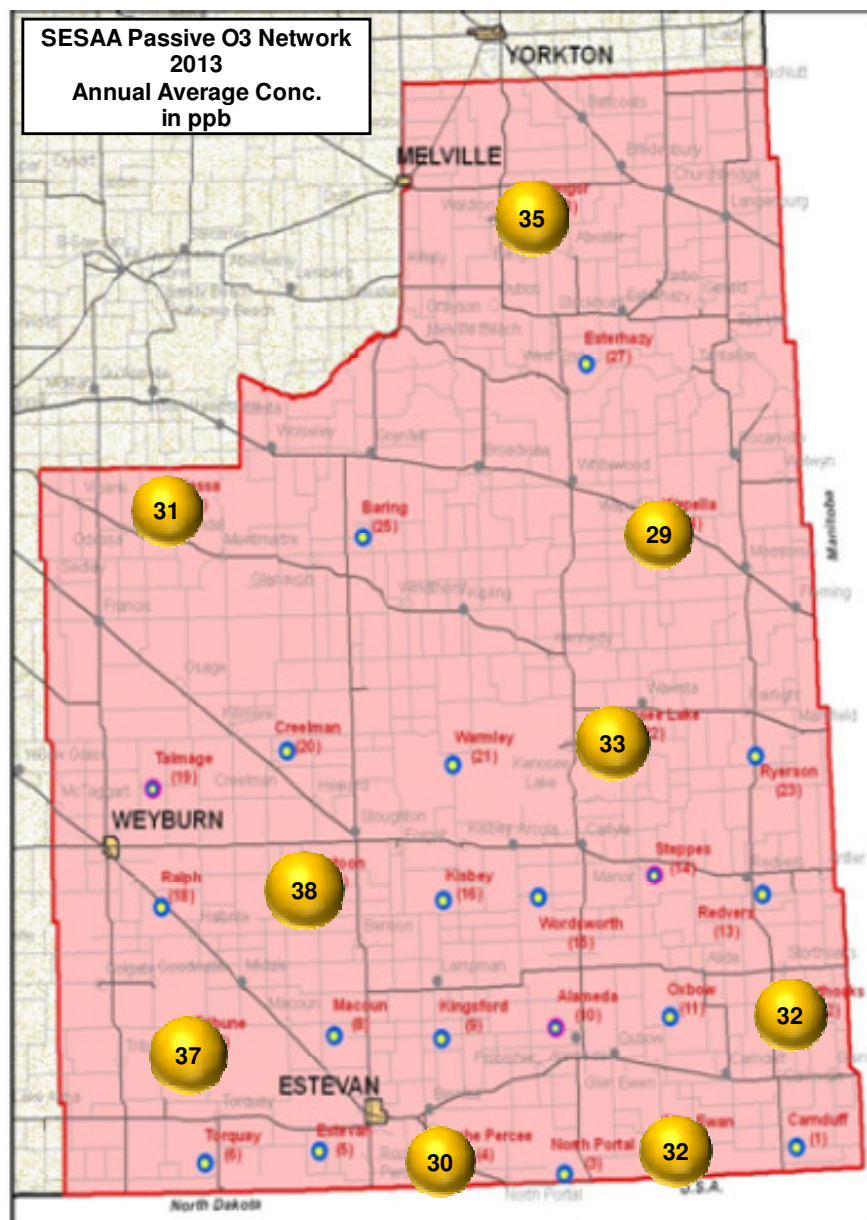


Figure 31. Spatial distribution of passive O₃ concentration within the SESAA airshed zone

2.6.4 Hydrogen Sulphide (H₂S)

Figure 32 presents 30-day average concentration for passive H₂S for the years from 2010 to 2013. The data set does not show an apparent monthly or seasonal trend.

Figure 33 presents a bubble chart showing spatial distribution of annual average concentration for passive H₂S. The annual average concentrations ranged from 0.6 ppb to 2.1 ppb. The new passive samplers detected similar concentration ranges as 2012 for June, July and September. The concentration for May tended to be low, while August concentrations were higher than historical ranges. On-going observation and analysis is required to investigate the cause.

The 30-day average concentrations ranged from 0.1 ppb to 8.2 ppb. Please refer to Appendix L: Table L-4 for the concentrations of individual samples.

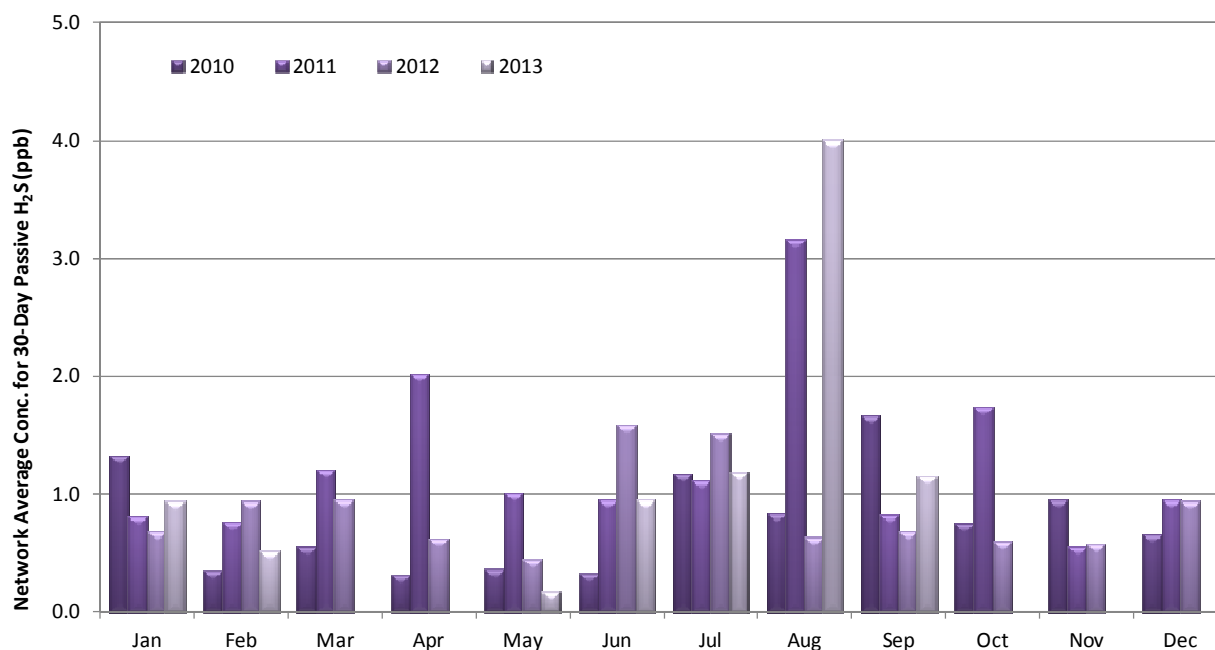


Figure 32. Monthly average concentration for the passive H₂S network from 2010 to 2013

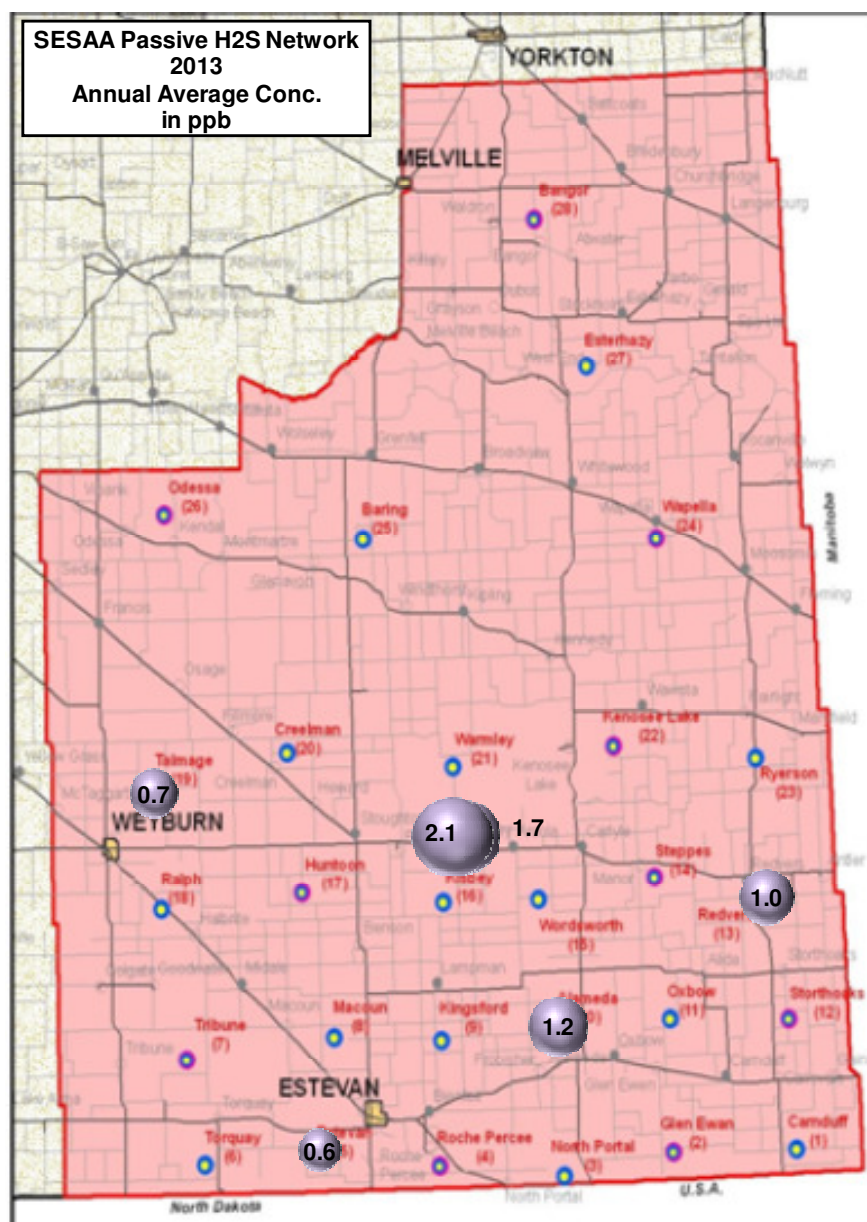


Figure 33. Spatial distribution of passive H₂S concentration within the SESAA airshed zone

2.6.5 Ammonia (NH₃)

Ammonia is a colourless gas with a characteristic pungent acrid-smelling odour. Ammonia is used in industry and commerce, and also exists naturally in humans and in the environment. Ammonia is essential for many biological processes and serves as a precursor for amino acid and nucleotide synthesis. In the environment, ammonia is part of the nitrogen cycle and is produced in soil from bacterial processes. Ammonia is also produced naturally from decomposition of organic matter, including plants, animals and animal wastes.

In addition to odour nuisance, two types of potential health effects are considered important for ammonia. Acute exposure of high concentration ammonia can cause coughing and irritation to eyes, nasal and throat. Chronic exposure to a low concentration can reduce pulmonary function, coughing, phlegm, wheezing or dyspnea.

The SESAA passive network started monitoring passive NH₃ in August 2012 at the Creelman station. Table 11 summarizes 30-day average concentrations for passive NH₃ samples. The measured concentrations ranged from 1.1 ppb to 3.9 ppb. Additional data is needed to investigate if a temporal trend exists.

Table 17. 30-Day average concentration for passive NH₃ samples for 2013

Passive Station		30-Day Passive Concentration (ppb)							AVG	MAX	MIN
No.	Name	Jan	Feb	May	Jun	Jul	Aug	Sep			
20	Creelman	1.1	1.6	3.9	3.6	2.2	2.9	1.9	2.5	3.9	1.1

2.6.6 Benzene, Toluene, Ethylbenzene, and Xylene (BTEX)

Benzene, toluene, ethylbenzene, and xylene are volatile aromatic compounds. These compounds are among the most abundantly produced chemicals in the world. These compounds occur naturally in crude oil. Other natural sources include gas emissions from volcanoes and forest fires. The primary anthropogenic sources are through emissions from motor vehicles, aircrafts, and cigarette smoke. BTEX compounds are created and used during the processing of petroleum products and during the production of consumer goods such as paints and lacquers, thinners, rubber products, adhesives, inks, cosmetics and pharmaceutical products.

BTEX exposures have been associated with skin and sensory irritation, central nervous system depression, and effects on the respiratory system. Prolonged exposure to these compounds can affect kidney, liver and blood systems. Benzene is a known carcinogen. Workers exposed to high levels of benzene were found to have an increased incidence of leukemia.

THE SESAA passive network started monitoring passive BTEX in August 2012 at the Macoun and Oxbow stations. Table 18 summarizes 30-day average concentrations of passive BTEX samples. The measured concentrations were less than 1 ppb for benzene and toluene. All ethylbenzene and xylene samples were less than method detection limits.

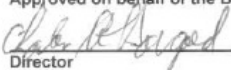
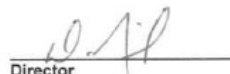
Table 18. 30-Day average concentration for passive benzene, toluene, ethylbenzene, and xylene samples for 2013

Pollutants	Passive Station		30-Day Passive Concentration (ppb)							AVG	MAX	MIN
	No.	Name	Jan	Feb	May	Jun	Jul	Aug	Sep			
Benzene	8	Macoun	0.5	0.5	0.1	<0.1	0.2	0.3	0.2	0.3	0.5	<0.1
	11	Oxbow	0.4	0.5	<0.1	<0.1	<0.1	0.1	<0.1	0.3	0.5	<0.1
Toluene	8	Macoun	0.5	0.7	<0.1	<0.1	<0.1	0.1	<0.1	0.4	0.7	<0.1
	11	Oxbow	0.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.4	<0.1
Ethylbenzene	8	Macoun	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.1
	11	Oxbow	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.1
Xylene	8	Macoun	<0.2	<0.2	<0.3	<0.3	<0.2	<0.2	<0.2	<0.2	<0.3	<0.2
	11	Oxbow	<0.2	<0.2	<0.3	<0.3	<0.2	<0.2	<0.2	<0.2	<0.3	<0.2

3.0 Audited Financial Statement

The 2013 audited financial summary for the SESAA is presented in the following table. The complete audited report is presented in Appendix M.

Table 19. SESAA financial summary for the year of 2013

Southeast Saskatchewan Airshed Association Statement of Financial Position <i>As at December 31, 2013</i>		
	2013	2012
Assets		
Current		
Cash	47,473	144,159
Accounts receivable	-	45,000
Prepaid expenses and deposits	8,287	-
Goods and Services Tax receivable	22,803	377
	78,563	189,536
Equipment (Note 3)	548,733	171,455
	627,296	360,991
Liabilities		
Current		
Accounts payable and accruals	105,164	16,001
Deferred contributions (Note 4)	180,000	-
	285,164	16,001
Net Assets		
Unrestricted net assets	342,132	344,990
	627,296	360,991
Approved on behalf of the Board  Director		
 Director		

The accompanying notes are an integral part of these financial statements

APPENDIX A. SASKATCHEWAN AMBIENT AIR QUALITY STANDARDS

Table A-1. Saskatchewan Ambient Air Quality Standards

Pollutant ⁽¹⁾	Average Concentration For Applicable Time Period				
	1 Hour	8 Hours	24 Hours	30 Days	Annual
Suspended Particulates			120 $\mu\text{g}/\text{m}^3$		*70 $\mu\text{g}/\text{m}^3$
Settleable Particulates				2.0 mg/cm^2	
Soil Index			1.5 COH units		
Sulphur Dioxide	450 (0.17) $\mu\text{g}/\text{m}^3$		150 (0.06) $\mu\text{g}/\text{m}^3$		**30 (0.01) $\mu\text{g}/\text{m}^3$
Sulphation				30 mg of SO_3 per 100 cm^2	
Carbon Monoxide	15 (13) mg/m^3	6 (5) mg/m^3			
Oxidants (Ozone)	160 (0.08) $\mu\text{g}/\text{m}^3$				
Nitrogen Dioxide	400 (.2) $\mu\text{g}/\text{m}^3$				**100 (0.05) $\mu\text{g}/\text{m}^3$
Hydrogen Sulphide	15 (10.8) $\mu\text{g}/\text{m}^3$		5 (3.6) $\mu\text{g}/\text{m}^3$		

NOTE: Volume units, in parts per million or parts per billion for H_2S , are in brackets

* Geometric Means, **Arithmetic Means

⁽¹⁾ Sampling will be in a manner and location specified by the Minister.

The Canada-wide Standards (CWSs) listed below are in addition to the above air quality standards.

- Particulate Matter
 - A CWS for $\text{PM}_{2.5}$ of 30 $\mu\text{g}/\text{m}^3$, 24-hour averaging time
 - Achievement to be based on the 98th percentile ambient measurement annually, averaged over three consecutive years
- Ozone
 - A CWS for ozone of 65 ppb, eight-hour averaging time
 - Achievement to be based on the 4th highest measurement annually, averaged over three consecutive years
- Benzene, Mercury, Dioxins & Furans
 - Information on numerical targets or emission limits for specific facilities or sectors is available from the Canadian Council of Ministers of the Environment website at <http://www.ccme.ca/>

APPENDIX B. WEYBURN STATION: CONTINUOUS MONITORING DATA

Table B-1. Weyburn Station: Summary of airpointer® monitoring results for the year 2013

Parameter	Unit	Hours of Calibration & AIC ^a	Hours of Valid Data	Annual Percent Uptime ^b	Summary Statistics for 1-Hour Average Data		
					Average	Minimum	Maximum
SO ₂	ppb	605	6336	77.4%	2	< 1	36
NO	ppb	360	6367	75.8%	0.5	< 0.1	13.8
NO ₂	ppb	360	6367	75.8%	2.0	< 0.1	31.5
NO _x	ppb	360	6367	75.8%	2.4	< 0.1	45.2
O ₃	ppb	325	6583	78.1%	32	3	77
H ₂ S	ppb	605	6301	77.3%	0.8	< 0.1	38.1
PM _{2.5}	µg/m ³	0	6904	78.9%	4	< 1	34
Ambient Temperature	°C	0	6909	78.9%	0.6	-32	31.0
Relative Humidity	%	0	6910	78.9%	73	13	94
Wind Speed	m/s	0	6338	72.4%	3.7	Calm	15.8
Precipitation	mm	0	6909	78.9%	336.2 ^c	< 0.1	15.4

a. Automatic Instrument Check

b. The Weyburn airpointer® was not operational August 6-October 2, November 15-18, November 22-25, and December 19-31.

c. Annual total precipitation

Table B-2. Weyburn Station: Summary of airpointer® SO₂ monitoring results for the year 2013

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=1	>1-5	>5-10	>10-57	>57-172	>172
January	712	100.0%	3	36	0	12	0	62.8	19.8	9.1	8.3	0.0	0.0
February	626	100.0%	2	33	0	6	0	50.3	31.9	13.7	4.0	0.0	0.0
March	670	100.0%	3	29	0	8	0	55.2	26.0	12.4	6.4	0.0	0.0
April	658	100.0%	2	18	0	8	0	64.0	25.7	6.4	4.0	0.0	0.0
May	675	99.9%	1	22	0	3	0	77.2	19.3	2.8	0.7	0.0	0.0
June	648	100.0%	1	26	0	6	0	77.5	20.1	1.5	0.9	0.0	0.0
July	678	99.6%	1	12	0	3	0	74.8	23.2	1.8	0.3	0.0	0.0
August	117	16.0%	1	9	0	2	0	69.2	28.2	2.6	0.0	0.0	0.0
September	-	0.0%	-	-	-	-	-	-	-	-	-	-	-
October	636	93.0%	1	19	0	3	0	79.2	18.4	2.2	0.2	0.0	0.0
November	503	75.6%	2	20	0	5	0	66.0	24.5	6.6	3.0	0.0	0.0
December	413	58.0%	3	23	0	11	0	48.7	36.6	8.2	6.5	0.0	0.0
Annual	6336	77.4%	2 ^c	36	0	12	0	66.3	24.1	6.3	3.3	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 172 ppb

b. 24-hour Saskatchewan Ambient Air Quality Standard = 57 ppb

c. Annual Saskatchewan Ambient Air Quality Standard = 11 ppb

Table B-3. Weyburn Station: Summary of airpointer® NO monitoring results for the year 2013

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=5	>5-15	>15-30	>30-100	>100-212	>212
January	712	100.0%	0.6	7.7	-	1.3	-	99.3	0.7	0.0	0.0	0.0	0.0
February	643	100.0%	0.6	4.2	-	1.4	-	100.0	0.0	0.0	0.0	0.0	0.0
March	703	100.0%	0.6	6.5	-	1.6	-	99.6	0.4	0.0	0.0	0.0	0.0
April	689	100.0%	0.4	7.5	-	1.0	-	99.9	0.1	0.0	0.0	0.0	0.0
May	544	76.4%	0.4	3.1	-	1.1	-	100.0	0.0	0.0	0.0	0.0	0.0
June	672	100.0%	0.4	3.3	-	1.0	-	100.0	0.0	0.0	0.0	0.0	0.0
July	679	98.5%	0.4	1.8	-	0.5	-	100.0	0.0	0.0	0.0	0.0	0.0
August	117	16.0%	0.2	1.0	-	0.3	-	100.0	0.0	0.0	0.0	0.0	0.0
September	-	0.0%	-	-	-	-	-	-	-	-	-	-	-
October	658	92.5%	0.4	3.9	-	0.9	-	100.0	0.0	0.0	0.0	0.0	0.0
November	525	76.2%	0.6	5.4	-	1.4	-	99.8	0.2	0.0	0.0	0.0	0.0
December	425	58.7%	0.9	13.8	-	2.4	-	99.3	0.7	0.0	0.0	0.0	0.0
Annual	6367	75.8%	0.5 ^c	13.8	-	2.4	-	99.8	0.2	0.0	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

Table B-4. Weyburn Station: Summary of airpointer® NO₂ monitoring results for the year 2013

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=5	>5-15	>15-30	>30-100	>100-212	>212
January	712	100.0%	2.3	13.4	0	5.5	-	88.1	11.9	0.0	0.0	0.0	0.0
February	643	100.0%	2.6	10.5	0	6.9	-	86.3	13.7	0.0	0.0	0.0	0.0
March	703	100.0%	2.5	10.2	0	6.2	-	88.3	11.7	0.0	0.0	0.0	0.0
April	689	100.0%	1.9	8.8	0	3.8	-	97.2	2.8	0.0	0.0	0.0	0.0
May	544	76.4%	1.9	6.2	0	4.2	-	98.0	2.0	0.0	0.0	0.0	0.0
June	672	100.0%	1.7	6.6	0	3.0	-	97.3	2.7	0.0	0.0	0.0	0.0
July	679	98.5%	1.0	6.0	0	2.0	-	99.9	0.1	0.0	0.0	0.0	0.0
August	117	16.0%	0.7	2.9	0	1.1	-	100.0	0.0	0.0	0.0	0.0	0.0
September	-	0.0%	-	-	-	-	-	-	-	-	-	-	-
October	658	92.5%	1.3	7.6	0	2.2	-	98.9	1.1	0.0	0.0	0.0	0.0
November	525	76.2%	2.0	13.2	0	6.4	-	93.7	6.3	0.0	0.0	0.0	0.0
December	425	58.7%	2.9	31.5	0	6.5	-	85.4	13.9	0.2	0.5	0.0	0.0
Annual	6367	75.8%	2.0 ^c	31.5	0	6.9	-	93.6	6.3	0.0	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 212 ppb

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. Annual Saskatchewan Ambient Air Quality Standard = 53 ppb

Table B-5. Weyburn Station: Summary of airpointer® NOx monitoring results for the year 2013

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=5	>5-15	>15-30	>30-100	>100-212	>212
January	712	100.0%	2.8	16.8	-	6.3	-	82.7	16.9	0.4	0.0	0.0	0.0
February	643	100.0%	3.2	12.4	-	8.3	-	79.5	20.5	0.0	0.0	0.0	0.0
March	703	100.0%	3.1	12.2	-	7.0	-	81.9	18.1	0.0	0.0	0.0	0.0
April	689	100.0%	2.2	16.3	-	4.5	-	92.7	7.1	0.1	0.0	0.0	0.0
May	544	76.4%	2.3	6.8	-	5.0	-	94.3	5.7	0.0	0.0	0.0	0.0
June	672	100.0%	2.1	9.1	-	3.6	-	95.7	4.3	0.0	0.0	0.0	0.0
July	679	98.5%	1.4	6.3	-	2.2	-	99.9	0.1	0.0	0.0	0.0	0.0
August	117	16.0%	0.9	3.1	-	1.4	-	100.0	0.0	0.0	0.0	0.0	0.0
September	-	0.0%	-	-	-	-	-	-	-	-	-	-	-
October	658	92.5%	1.7	11.5	-	2.8	-	97.3	2.7	0.0	0.0	0.0	0.0
November	525	76.2%	2.6	13.5	-	7.8	-	89.0	11.0	0.0	0.0	0.0	0.0
December	425	58.7%	3.7	45.2	-	8.0	-	77.2	22.1	0.2	0.5	0.0	0.0
Annual	6367	75.8%	2.4 ^c	45.2	-	8.3	-	89.5	10.4	0.1	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

Table B-6. Weyburn Station: Summary of airpointer® O₃ monitoring results for the year 2013

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 8-Hr Conc. (ppb)	8-Hour Conc. Above CWS ^b (no.)	Percent of Data in each Concentration Range					
								<=10	>10-20	>20-40	>40-60	>60-82	>82
January	712	100.0%	33	42	0	40	0	0.0	1.0	97.2	1.8	0.0	0.0
February	643	100.0%	36	51	0	47	0	0.0	0.5	77.1	22.4	0.0	0.0
March	703	100.0%	47	77	0	69	10	0.0	0.0	14.7	79.8	5.5	0.0
April	689	100.0%	46	76	0	67	4	0.0	0.0	23.2	74.2	2.6	0.0
May	706	99.9%	34	61	0	56	0	0.6	11.2	53.4	34.7	0.1	0.0
June	680	100.0%	32	60	0	53	0	1.3	17.2	54.1	27.2	0.1	0.0
July	709	99.6%	24	51	0	47	0	7.8	30.3	52.9	9.0	0.0	0.0
August	123	16.7%	20	42	0	37	0	16.3	38.2	43.1	2.4	0.0	0.0
September	-	0.0%	-	-	-	-	-	-	-	-	-	-	-
October	666	93.3%	20	40	0	37	0	11.6	43.8	44.4	0.2	0.0	0.0
November	527	76.5%	21	37	0	33	0	4.9	37.8	57.3	0.0	0.0	0.0
December	425	58.7%	26	42	0	39	0	1.2	8.7	89.6	0.5	0.0	0.0
Annual	6583	78.1%	32 ^c	77	0	68 ^d	14	3.0	15.1	54.7	26.3	0.9	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 82 ppb

b. 8-hour Canada-Wide Standard = 65 ppb (4th highest concentration annually, averaged over three consecutive years).

c. No annual Saskatchewan Ambient Air Quality Standard

d. The 4th highest concentration for 8-hour running average.

Table B-7. Weyburn Station: Summary of airpointer® H₂S monitoring results for the year 2013

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=1	>1-3.6	>3.6-5	>5-8	>8-10.8	>10.8
January	688	100.0%	0.9	22.7	8	3.9	1	81.5	14.1	1.5	1.7	0.0	1.2
February	620	100.0%	0.9	23.1	3	3.9	1	74.8	22.4	1.3	0.8	0.2	0.5
March	670	100.0%	0.8	38.1	1	2.4	0	84.0	14.2	0.4	0.6	0.6	0.1
April	658	100.0%	0.7	36.5	1	2.7	0	88.3	10.3	0.2	0.5	0.6	0.2
May	675	99.9%	0.5	3.9	0	1.0	0	90.1	9.6	0.3	0.0	0.0	0.0
June	644	99.8%	0.8	9.2	0	2.0	0	78.3	20.3	1.1	0.2	0.2	0.0
July	678	99.6%	1.4	32.2	7	4.6	3	58.4	36.0	2.4	1.6	0.6	1.0
August	117	16.0%	1.2	6.7	0	2.0	0	63.2	31.6	1.7	3.4	0.0	0.0
September	-	0.0%	-	-	-	-	-	-	-	-	-	-	-
October	636	93.0%	0.5	16.5	1	1.9	0	92.5	6.4	0.8	0.2	0.0	0.2
November	502	75.5%	0.8	7.7	0	1.6	0	83.9	14.5	1.2	0.4	0.0	0.0
December	413	58.0%	1.1	20.4	5	4.6	1	67.6	27.1	1.7	2.2	0.2	1.2
Annual	6301	77.3%	0.8 ^c	38.1	26	4.6	6	80.0	17.5	1.1	0.8	0.2	0.4

a. 1-hour Saskatchewan Ambient Air Quality Standard = 10.8 ppb

b. 24-hour Saskatchewan Ambient Air Quality Standard = 3.6 ppb

c. No annual Saskatchewan Ambient Air Quality Standard

Table B-8. Weyburn Station: Summary of airpointer® PM_{2.5} monitoring results for the year 2013

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (µg/m ³)	Maximum 1-Hr Conc. (µg/m ³)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (µg/m ³)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=2	>2-5	>5-10	>10-20	>20-30	>30
January	744	100.0%	2	23	-	8	0	52.0	37.9	9.0	0.9	0.1	0.0
February	672	100.0%	4	14	-	9	0	18.5	46.7	32.1	2.7	0.0	0.0
March	742	100.0%	5	22	-	14	0	10.4	51.5	29.8	8.2	0.1	0.0
April	720	100.0%	4	19	-	8	0	14.3	57.2	25.8	2.6	0.0	0.0
May	739	99.9%	6	32	-	19	0	1.5	29.0	55.5	11.9	1.6	0.5
June	716	100.0%	5	23	-	9	0	4.6	27.1	65.2	2.8	0.3	0.0
July	742	99.7%	8	34	-	20	0	12.5	15.2	43.7	22.1	5.7	0.8
August	129	17.3%	4	10	-	4	0	10.9	46.5	42.6	0.0	0.0	0.0
September	-	0.0%	-	-	-	-	-	-	-	-	-	-	-
October	696	93.5%	3	25	-	5	0	51.7	29.2	16.8	2.0	0.3	0.0
November	559	77.6%	2	20	-	6	0	53.1	30.4	15.0	1.4	0.0	0.0
December	445	59.8%	2	18	-	8	0	78.9	13.0	6.1	2.0	0.0	0.0
Annual	6904	78.9%	4 ^c	34	-	20	0	26.8	34.8	31.5	5.9	0.9	0.1

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24-hour Canada-Wide Standard = 30 µg/m³ (98th percentile annually, averaged over three consecutive years).

c. No annual Saskatchewan Ambient Air Quality Standard

Table B-9. Weyburn Station: Summary of airpointer® precipitation monitoring results for the year 2013

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					
						<=0	>0-5	>5-10	>10-30	>30-60	>60
January	744	100.0%	11.7	6.5	10.6	97.6	2.3	0.1	0.0	0.0	0.0
February	672	100.0%	0.7	0.3	0.4	98.8	1.2	0.0	0.0	0.0	0.0
March	744	100.0%	1.0	0.3	0.3	98.3	1.7	0.0	0.0	0.0	0.0
April	720	100.0%	11.5	3.9	7.2	97.2	2.8	0.0	0.0	0.0	0.0
May	739	99.9%	110.3	12.1	51.5	89.0	10.0	0.7	0.3	0.0	0.0
June	720	100.0%	117.2	12.2	21.8	83.8	15.3	0.8	0.1	0.0	0.0
July	741	99.6%	63.8	15.4	24.0	83.8	15.8	0.1	0.3	0.0	0.0
August	129	17.3%	7.4	3.9	4.3	63.6	36.4	0.0	0.0	0.0	0.0
September	-	0.0%	-	-	-	-	-	-	-	-	-
October	696	93.5%	5.1	0.9	2.2	95.5	4.5	0.0	0.0	0.0	0.0
November	559	77.6%	7.0	2.1	4.7	95.7	4.3	0.0	0.0	0.0	0.0
December	445	59.8%	0.7	0.2	0.4	98.0	2.0	0.0	0.0	0.0	0.0
Annual	6909	78.9%	336.2	15.4	51.5	92.9	6.8	0.2	0.1	0.0	0.0

Table B-10. Weyburn Station: Summary of airpointer® ambient temperature monitoring results for the year 2013

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	744	100.0%	-13.1	-31.3	4.7	0.8	42.7	50.0	6.5	0.0	0.0
February	672	100.0%	-8.6	-30.6	1.3	0.1	14.6	82.6	2.7	0.0	0.0
March	744	100.0%	-11.2	-24.4	2.3	0.0	23.1	74.7	2.2	0.0	0.0
April	720	100.0%	-2.3	-18.1	19.7	0.0	2.8	72.9	22.8	1.5	0.0
May	739	99.9%	12.7	-4.5	28.4	0.0	0.0	4.1	60.9	35.0	0.0
June	720	100.0%	16.9	4.7	27.4	0.0	0.0	0.0	35.7	64.3	0.0
July	741	99.6%	18.2	6.4	31.0	0.0	0.0	0.0	26.7	72.5	0.8
August	129	17.3%	16.6	9.4	25.7	0.0	0.0	0.0	39.5	60.5	0.0
September	-	0.0%	-	-	-	-	-	-	-	-	-
October	696	93.5%	3.6	-10.1	22.7	0.0	0.0	28.7	67.1	4.2	0.0
November	559	77.6%	-4.5	-24.9	12.4	0.0	8.2	64.2	27.5	0.0	0.0
December	445	59.8%	-17.4	-32.3	2.1	5.4	60.0	33.5	1.1	0.0	0.0
Annual	6909	78.9%	0.6	-32.3	31.0	0.4	13.3	39.7	26.5	19.9	0.1

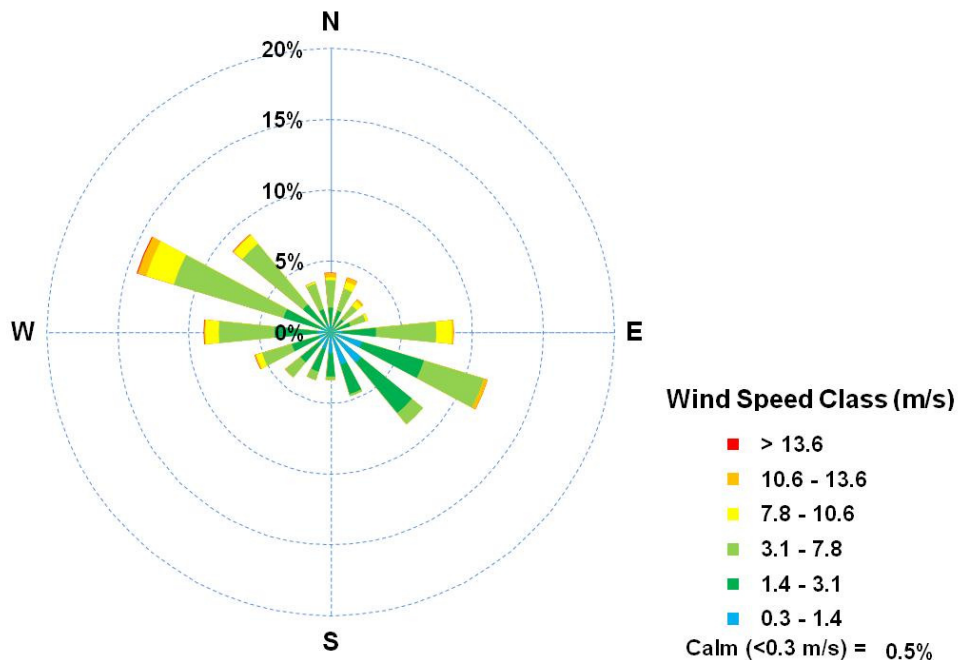
Table B-11. Weyburn Station: Summary of airpointer® relative humidity monitoring results for the year 2013

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	744	100.0%	79	55	90	0.0	0.0	0.5	57.1	42.2	0.1
February	672	100.0%	82	61	91	0.0	0.0	0.0	31.4	67.4	1.2
March	744	100.0%	81	57	91	0.0	0.0	0.7	31.7	66.5	1.1
April	720	100.0%	77	33	93	0.0	0.0	7.4	46.0	42.2	4.4
May	739	99.9%	58	13	94	0.5	18.0	32.3	27.1	14.9	7.2
June	720	100.0%	67	27	93	0.0	0.6	35.7	34.6	24.7	4.4
July	742	99.7%	72	35	93	0.0	0.0	25.9	31.3	34.9	8.0
August	129	17.3%	73	41	93	0.0	0.0	28.7	24.0	27.1	20.2
September	-	0.0%-	-	-	-	-	-	-	-	-	-
October	696	93.5%	66	27	91	0.0	1.1	32.9	42.0	23.3	0.7
November	559	77.6%	72	32	90	0.0	0.0	13.4	60.5	26.1	0.0
December	445	59.8%	74	59	90	0.0	0.0	0.7	87.9	11.5	0.0
Annual	6910	78.9%	73	13	94	0.1	2.1	15.8	42.5	36.3	3.2

Table B-12. Weyburn Station: airpointer® wind frequency table for the year 2013

Wind Direction Sector	Percent of Data in each Wind Speed Range, wind speed unit m/s						Totals
	>0.3-1.4	>1.4-3.1	>3.1-7.8	>7.8-10.6	>10.6-13.6	>13.6	
North NorthEast	0.4%	1.2%	1.6%	0.5%	0.3%	0.0%	4.0%
NorthEast	0.3%	0.8%	1.2%	0.4%	0.2%	0.0%	3.0%
East NorthEast	0.5%	1.0%	1.1%	0.2%	0.0%	0.0%	2.8%
East	0.8%	2.4%	4.3%	1.1%	0.1%	0.0%	8.7%
East SouthEast	2.3%	4.6%	4.4%	0.3%	0.0%	0.0%	11.6%
SouthEast	2.7%	4.6%	1.0%	0.0%	0.0%	0.0%	8.4%
South SouthEast	2.4%	2.2%	0.2%	0.0%	0.0%	0.0%	4.7%
South	1.5%	1.6%	0.2%	0.0%	0.0%	0.0%	3.3%
South SouthWest	1.1%	1.7%	0.6%	0.0%	0.0%	0.0%	3.5%
SouthWest	1.0%	1.7%	1.4%	0.0%	0.0%	0.0%	4.1%
West SouthWest	0.8%	2.0%	2.2%	0.4%	0.1%	0.0%	5.6%
West	0.9%	3.1%	3.9%	0.9%	0.1%	0.0%	8.9%
West NorthWest	0.8%	2.7%	8.1%	2.0%	0.6%	0.0%	14.2%
NorthWest	0.5%	2.0%	5.6%	0.8%	0.1%	0.0%	8.9%
North NorthWest	0.6%	1.1%	1.9%	0.1%	0.0%	0.0%	3.7%
North	0.5%	1.2%	1.9%	0.2%	0.3%	0.0%	4.2%
Total	17.2%	33.7%	39.8%	7.0%	1.8%	0.1%	99.5%

Percent Calm (<0.3 m/s)	0.5%
Number of Valid Hourly-Average Data	6338
Total Workable Hours in Time Period	8756



APPENDIX C. GLEN EWEN STATION: CONTINUOUS MONITORING DATA

Table C-1. Glen Ewen Station: Summary of airpointer® monitoring results for the year 2013

Parameter	Unit	Hours of Calibration & AIC ^a	Hours of Valid Data	Annual Percent Uptime ^b	Summary Statistics for 1-Hour Average Data		
					Average	Minimum	Maximum
SO ₂	ppb	724	7746	92.5%	1	< 1	46
NO	ppb	445	7671	92.3%	0.4	< 0.1	24.3
NO ₂	ppb	445	7671	92.3%	2.2	< 0.1	19.4
NO _x	ppb	445	7671	92.3%	2.5	< 0.1	35.5
O ₃	ppb	367	7447	88.8%	31	1	79
H ₂ S	ppb	724	7392	92.1%	0.7	< 0.1	40.7
Ambient Temperature	°C	0	8133	92.9%	1.7	-35	31.8
Relative Humidity	%	0	8132	92.9%	73	15	95
Wind Speed	m/s	0	8132	92.9%	3.3	Calm	14.0
Precipitation	mm	0	8132	92.9%	457.4 ^c	< 0.1	29.3

a. Automatic Instrument Check

b. The Glen Ewen airpointer® was not operational October 11- November 4.

c. Annual total precipitation

Table C-2. Glen Ewen Station: Summary of airpointer® SO₂ monitoring results for the year 2013

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=1	>1-5	>5-10	>10-57	>57-172	>172
January	712	100.0%	2	16	0	4	0	54.6	36.9	7.3	1.1	0.0	0.0
February	643	100.0%	2	22	0	5	0	48.7	40.4	9.5	1.4	0.0	0.0
March	702	99.9%	2	46	0	10	0	65.0	28.1	5.0	2.0	0.0	0.0
April	672	97.4%	1	30	0	4	0	78.4	17.4	3.1	1.0	0.0	0.0
May	708	99.4%	1	12	0	2	0	83.3	15.7	0.7	0.3	0.0	0.0
June	664	97.4%	1	17	0	2	0	79.7	17.9	2.1	0.3	0.0	0.0
July	711	99.9%	1	7	0	1	0	85.2	14.5	0.3	0.0	0.0	0.0
August	711	99.9%	1	11	0	3	0	74.3	24.2	1.3	0.3	0.0	0.0
September	680	100.0%	1	15	0	3	0	78.8	20.4	0.6	0.1	0.0	0.0
October	235	32.0%	1	19	0	2	0	71.9	24.7	2.1	1.3	0.0	0.0
November	600	87.6%	1	20	0	4	0	66.7	25.3	6.7	1.3	0.0	0.0
December	708	100.0%	2	32	0	6	0	48.4	40.5	6.4	4.7	0.0	0.0
Annual	7746	92.5%	1 ^c	46	0	10	0	69.5	25.5	3.8	1.1	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 172 ppb

b. 24-hour Saskatchewan Ambient Air Quality Standard = 57 ppb

c. Annual Saskatchewan Ambient Air Quality Standard = 11 ppb

Table C-3. Glen Ewen Station: Summary of airpointer® NO monitoring results for the year 2013

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=5	>5-15	>15-30	>30-100	>100-212	>212
January	712	100.0%	0.4	13.9	-	2.0	-	99.3	0.7	0.0	0.0	0.0	0.0
February	643	100.0%	0.6	14.9	-	1.7	-	98.3	1.7	0.0	0.0	0.0	0.0
March	700	99.7%	0.6	14.0	-	2.5	-	98.9	1.1	0.0	0.0	0.0	0.0
April	671	97.2%	0.3	6.8	-	1.3	-	99.6	0.4	0.0	0.0	0.0	0.0
May	704	98.9%	0.3	3.6	-	0.6	-	100.0	0.0	0.0	0.0	0.0	0.0
June	659	97.8%	0.3	2.3	-	0.8	-	100.0	0.0	0.0	0.0	0.0	0.0
July	675	99.1%	0.3	5.0	-	0.5	-	100.0	0.0	0.0	0.0	0.0	0.0
August	697	99.7%	0.3	7.0	-	0.7	-	99.7	0.3	0.0	0.0	0.0	0.0
September	667	99.7%	0.3	7.2	-	0.7	-	99.7	0.3	0.0	0.0	0.0	0.0
October	235	32.0%	0.3	3.4	-	0.5	-	100.0	0.0	0.0	0.0	0.0	0.0
November	600	87.6%	0.4	24.3	-	2.0	-	99.7	0.2	0.2	0.0	0.0	0.0
December	708	100.0%	0.6	5.7	-	1.8	-	99.3	0.7	0.0	0.0	0.0	0.0
Annual	7671	92.3%	0.4 ^c	24.3	-	2.5	-	99.5	0.5	0.0	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

Table C-4. Glen Ewen Station: Summary of airpointer® NO₂ monitoring results for the year

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=5	>5-15	>15-30	>30-100	>100-212	>212
January	712	100.0%	3.0	19.2	0	6.4	-	87.8	12.1	0.1	0.0	0.0	0.0
February	643	100.0%	3.4	19.4	0	6.9	-	83.2	16.5	0.3	0.0	0.0	0.0
March	700	99.7%	3.1	17.4	0	7.0	-	82.7	17.0	0.3	0.0	0.0	0.0
April	671	97.2%	1.9	7.5	0	4.4	-	97.2	2.8	0.0	0.0	0.0	0.0
May	704	98.9%	2.1	17.1	0	5.1	-	95.7	4.1	0.1	0.0	0.0	0.0
June	659	97.8%	1.7	14.8	0	3.4	-	97.7	2.3	0.0	0.0	0.0	0.0
July	675	99.1%	0.9	4.5	0	1.6	-	100.0	0.0	0.0	0.0	0.0	0.0
August	697	99.7%	1.2	9.7	0	2.4	-	99.3	0.7	0.0	0.0	0.0	0.0
September	667	99.7%	1.3	16.7	0	2.8	-	99.4	0.4	0.1	0.0	0.0	0.0
October	235	32.0%	2.1	10.6	0	3.4	-	95.3	4.7	0.0	0.0	0.0	0.0
November	600	87.6%	2.4	16.5	0	4.5	-	95.7	4.2	0.2	0.0	0.0	0.0
December	708	100.0%	2.9	13.2	0	7.5	-	86.0	14.0	0.0	0.0	0.0	0.0
Annual	7671	92.3%	2.2 ^c	19.4	0	7.5	-	93.2	6.7	0.1	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 212 ppb

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. Annual Saskatchewan Ambient Air Quality Standard = 53 ppb

Table C-5. Glen Ewen Station: Summary of airpointer® NOx monitoring results for the year 2013

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=5	>5-15	>15-30	>30-100	>100-212	>212
January	712	100.0%	3.4	32.6	-	8.4	-	83.1	16.3	0.4	0.1	0.0	0.0
February	643	100.0%	3.9	21.9	-	8.5	-	72.8	25.5	1.7	0.0	0.0	0.0
March	700	99.7%	3.6	31.4	-	8.0	-	77.9	21.3	0.7	0.1	0.0	0.0
April	671	97.2%	2.3	12.8	-	5.4	-	93.9	6.1	0.0	0.0	0.0	0.0
May	704	98.9%	2.4	20.7	-	5.6	-	94.3	5.5	0.1	0.0	0.0	0.0
June	659	97.8%	2.0	15.6	-	3.7	-	97.4	2.4	0.2	0.0	0.0	0.0
July	675	99.1%	1.2	7.4	-	1.9	-	99.7	0.3	0.0	0.0	0.0	0.0
August	697	99.7%	1.4	15.7	-	2.7	-	98.1	1.7	0.1	0.0	0.0	0.0
September	667	99.7%	1.5	23.9	-	3.6	-	98.5	1.3	0.1	0.0	0.0	0.0
October	235	32.0%	2.3	10.8	-	3.7	-	94.0	6.0	0.0	0.0	0.0	0.0
November	600	87.6%	2.8	35.5	-	6.5	-	91.7	7.8	0.3	0.2	0.0	0.0
December	708	100.0%	3.4	14.9	-	9.2	-	82.3	17.7	0.0	0.0	0.0	0.0
Annual	7671	92.3%	2.5 ^c	35.5	-	9.2	-	90.1	9.6	0.3	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

Table C-6. Glen Ewen Station: Summary of airpointer® O₃ monitoring results for the year 2013

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 8-Hr Conc. (ppb)	8-Hr Conc. Above CWS ^b (no.)	Percent of Data in each Concentration Range					
								<=10	>10-20	>20-40	>40-60	>60-82	>82
January	712	100.0%	32	40	0	39	0	0.1	2.7	96.9	0.3	0.0	0.0
February	643	100.0%	36	53	0	51	0	0.0	0.2	73.1	26.7	0.0	0.0
March	702	99.9%	45	79	0	74	20	0.0	0.0	22.2	73.8	4.0	0.0
April	671	97.2%	48	74	0	67	5	0.0	0.0	15.9	78.7	5.4	0.0
May	708	99.4%	36	72	0	70	5	0.8	6.8	58.1	31.1	3.2	0.0
June	663	97.2%	32	61	0	58	0	2.1	14.8	56.4	26.5	0.2	0.0
July	711	99.9%	26	56	0	52	0	4.8	28.7	55.3	11.3	0.0	0.0
August	711	99.9%	23	61	0	56	0	14.5	30.5	44.2	10.7	0.1	0.0
September	680	100.0%	20	56	0	49	0	20.1	37.4	37.6	4.9	0.0	0.0
October	235	32.0%	22	39	0	37	0	8.5	41.3	50.2	0.0	0.0	0.0
November	600	87.6%	22	35	0	33	0	2.7	35.5	61.8	0.0	0.0	0.0
December ^e	411	56.9%	25	37	0	35	0	0.2	12.7	87.1	0.0	0.0	0.0
Annual	7447	88.8%	31 ^c	79	0	71 ^d	30	4.5	16.2	54.0	24.2	1.2	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 82 ppb

b. 8-hour Canada-Wide Standard = 65 ppb (4th highest concentration annually, averaged over three consecutive years).

c. No annual Saskatchewan Ambient Air Quality Standard

d. The 4th highest concentration for 8-hour running average.

e. The Glen Ewen ozone analyzer was not operational December 19-31.

Table C-7. Glen Ewen Station: Summary of airpointer® H₂S monitoring results for the year 2013

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=10	>10-20	>20-40	>40-60	>60-82	>82
January	687	100.0%	0.4	2.1	0	1.1	0	91.3	8.7	0.0	0.0	0.0	0.0
February	618	100.0%	0.8	19.8	4	2.7	0	85.1	12.6	0.3	1.0	0.3	0.6
March	669	99.9%	0.6	12.9	1	1.4	0	87.6	11.7	0.4	0.0	0.1	0.1
April	640	97.0%	0.2	6.5	0	1.2	0	94.8	4.7	0.3	0.2	0.0	0.0
May	676	99.4%	0.4	10.9	1	1.0	0	94.5	5.3	0.0	0.0	0.0	0.1
June	629	96.9%	0.8	16.9	2	1.2	0	77.4	20.3	1.7	0.2	0.0	0.3
July	676	99.4%	1.2	31.8	6	4.9	2	68.3	24.6	1.8	2.7	1.8	0.9
August	679	99.9%	1.8	40.7	20	7.0	5	57.6	31.5	3.1	3.7	1.2	2.9
September	644	99.5%	0.8	5.7	0	1.7	0	73.4	25.5	0.8	0.3	0.0	0.0
October	225	31.1%	0.9	8.9	0	2.3	0	76.9	18.7	1.8	1.8	0.9	0.0
November	574	87.1%	0.4	4.4	0	1.1	0	92.7	6.6	0.7	0.0	0.0	0.0
December	675	99.9%	0.4	8.0	0	1.0	0	95.3	4.4	0.1	0.1	0.0	0.0
Annual	7392	92.1%	0.7 ^c	40.7	34	7.0	7	83.1	14.4	0.9	0.8	0.3	0.5

a. 1-hour Saskatchewan Ambient Air Quality Standard = 10.8 ppb

b. 24-hour Saskatchewan Ambient Air Quality Standard = 3.6 ppb

c. No annual Saskatchewan Ambient Air Quality Standard

Table C-8. Glen Ewen Station: Summary of airpointer® precipitation results for the year 2013

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					
						<=0	>0-5	>5-10	>10-30	>30-60	>60
January	744	100.0%	3.2	1.2	1.7	99.2	0.8	0.0	0.0	0.0	0.0
February	672	100.0%	0.2	0.2	0.2	99.7	0.3	0.0	0.0	0.0	0.0
March	742	99.7%	0.3	0.1	0.2	99.1	0.9	0.0	0.0	0.0	0.0
April	702	97.5%	3.0	1.0	2.1	97.9	2.1	0.0	0.0	0.0	0.0
May	739	99.3%	85.3	7.6	39.6	87.1	12.2	0.7	0.0	0.0	0.0
June	709	98.5%	131.9	18.6	36.2	76.0	23.0	0.3	0.7	0.0	0.0
July	743	99.9%	135.4	29.3	67.5	84.8	14.0	0.7	0.5	0.0	0.0
August	743	99.9%	33.1	5.4	11.1	94.6	5.2	0.1	0.0	0.0	0.0
September	720	100.0%	59.4	14.2	33.9	92.4	7.2	0.3	0.1	0.0	0.0
October	245	32.9%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
November	633	88.2%	5.2	2.6	5.2	99.1	0.9	0.0	0.0	0.0	0.0
December	740	100.0%	0.5	0.3	0.3	99.3	0.7	0.0	0.0	0.0	0.0
Annual	8132	92.9%	457.4	29.3	67.5	93.7	6.0	0.2	0.1	0.0	0.0

Table C-9. Glen Ewen Station: Summary of airpointer® ambient temperature results for the year 2013

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	744	100.0%	-14.0	-32.3	2.6	1.9	42.9	52.7	2.6	0.0	0.0
February	672	100.0%	-10.8	-34.7	1.2	1.0	17.9	79.3	1.8	0.0	0.0
March	743	99.9%	-12.1	-26.6	1.6	0.0	31.2	68.1	0.7	0.0	0.0
April	702	97.5%	-3.1	-20.1	15.2	0.0	2.6	76.8	20.5	0.1	0.0
May	739	99.3%	11.5	-6.2	29.1	0.0	0.0	6.4	69.0	24.6	0.0
June	709	98.5%	16.2	3.0	26.6	0.0	0.0	0.0	39.5	60.5	0.0
July	743	99.9%	18.1	6.0	30.5	0.0	0.0	0.0	27.9	71.7	0.4
August	743	99.9%	18.3	5.6	31.8	0.0	0.0	0.0	30.6	66.5	3.0
September	720	100.0%	14.6	2.4	31.0	0.0	0.0	0.0	55.3	44.0	0.7
October	245	32.9%	7.9	-4.1	20.8	0.0	0.0	8.2	77.1	14.7	0.0
November	633	88.2%	-6.1	-28.0	11.5	0.0	9.6	70.5	19.9	0.0	0.0
December	740	100.0%	-17.5	-34.9	2.5	3.2	64.1	30.8	1.9	0.0	0.0
Annual	8133	92.9%	1.7	-34.9	31.8	0.6	15.0	33.3	26.2	24.5	0.4

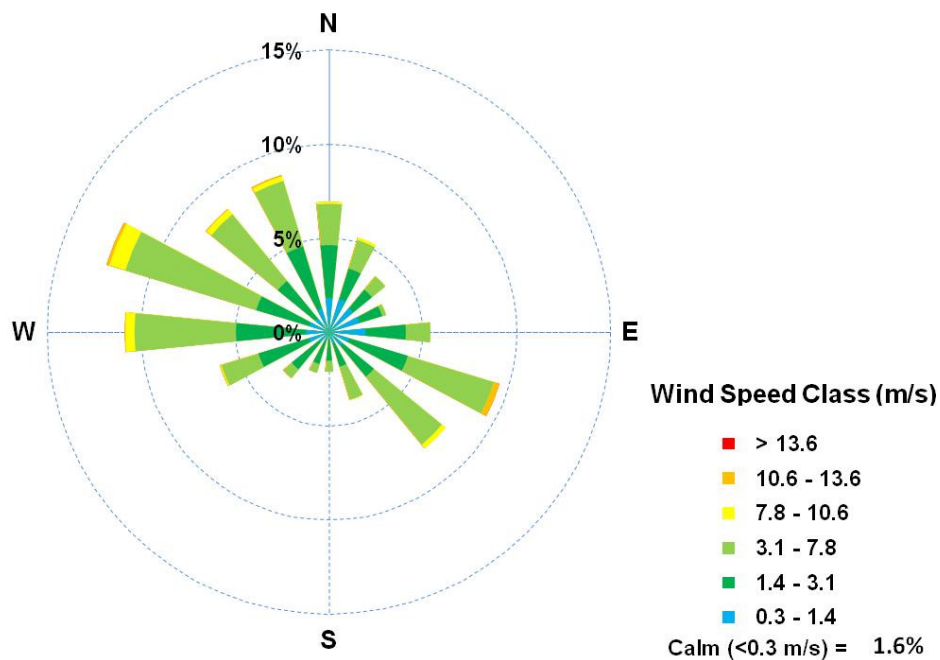
Table C-10. Glen Ewen Station: Summary of airpointer® relative humidity results for the year 2013

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	744	100.0%	77	58	89	0.0	0.0	0.3	66.5	33.2	0.0
February	672	100.0%	80	49	90	0.0	0.0	0.9	41.1	57.4	0.6
March	742	99.7%	79	53	89	0.0	0.0	0.5	50.4	49.1	0.0
April	702	97.5%	75	35	92	0.0	0.0	9.0	57.3	30.9	2.8
May	739	99.3%	61	15	95	0.0	16.0	30.4	22.5	16.0	15.2
June	709	98.5%	70	30	95	0.0	0.1	30.3	30.0	28.6	10.9
July	743	99.9%	73	36	94	0.0	0.0	24.6	33.0	32.7	9.7
August	743	99.9%	74	31	94	0.0	0.0	24.9	29.9	25.0	20.2
September	720	100.0%	73	33	94	0.0	0.0	26.9	28.8	27.2	17.1
October	245	32.9%	63	29	87	0.0	1.6	38.4	41.6	18.4	0.0
November	633	88.2%	73	34	92	0.0	0.0	10.6	60.3	27.6	1.4
December	740	100.0%	74	60	91	0.0	0.0	0.1	85.5	13.9	0.4
Annual	8132	92.9%	73	15	95	0.0	1.5	15.2	45.7	30.5	7.0

Table C-11. Glen Ewen Station: airpointer® wind frequency table for the year 2013

Wind Direction Sector	Percent of Data in each Wind Speed Range, wind speed unit m/s						Totals
	>0.3-1.4	>1.4-3.1	>3.1-7.8	>7.8-10.6	>10.6-13.6	>13.6	
North NorthEast	0.3%	0.8%	0.9%	0.1%	0.0%	0.0%	2.1%
NorthEast	1.9%	3.8%	5.9%	0.2%	0.0%	0.0%	11.8%
East NorthEast	5.0%	15.2%	21.7%	1.8%	0.1%	0.0%	43.9%
East	10.2%	15.8%	13.8%	0.7%	0.0%	0.0%	40.6%
East SouthEast	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SouthEast	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
South SouthEast	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
South	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
South SouthWest	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SouthWest	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
West SouthWest	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
West	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
West NorthWest	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NorthWest	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
North NorthWest	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
North	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	17.4%	35.6%	42.3%	2.9%	0.2%	0.0%	98.4%

Percent Calm (<0.3 m/s)	1.6%
Number of Valid Hourly-Average Data	8132
Total Workable Hours in Time Period	8754



APPENDIX D. STOUGHTON STATION: CONTINUOUS MONITORING DATA

Table D-1. Stoughton Station: Summary of airpointer® monitoring results for the year 2013 (July to December)

Parameter	Unit	Hours of Calibration & AIC ^a	Hours of Valid Data	Annual Percent Uptime	Summary Statistics for 1-Hour Average Data		
					Average	Minimum	Maximum
SO ₂	ppb	223	4202	100.0%	1	< 1	27
NO	ppb	230	4177	99.9%	0.6	< 0.1	25.1
NO ₂	ppb	230	4177	99.9%	2.1	< 0.1	31.3
NO _x	ppb	230	4177	99.9%	2.7	< 0.1	56.2
H ₂ S	ppb	223	4186	100.0%	1.0	< 0.1	28.5
PM _{2.5}	µg/m ³	0	2152	48.8%	5	1	35
Ambient Temperature	°C	0	4410	100.0%	5.1	-35	32.2
Relative Humidity	%	0	4410	100.0%	73	24	96
Wind Speed	m/s	0	4410	100.0%	2.6	Calm	9.7
Precipitation	mm	0	4409	100.0%	240.9 ^b	< 0.1	18.0

a. Automatic Instrument Check

b. Annual total precipitation

Table D-2. Stoughton Station: Summary of airpointer® SO₂ monitoring results for the year 2013 (July to December)

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=1	>1-5	>5-10	>10-57	>57-172	>172
July	710	100.0%	< 1	6	0	1	0	87.9	11.8	0.3	0.0	0.0	0.0
August	712	100.0%	1	27	0	2	0	87.6	11.5	0.7	0.1	0.0	0.0
September	679	100.0%	< 1	6	0	1	0	91.2	8.5	0.3	0.0	0.0	0.0
October	708	99.7%	< 1	4	0	1	0	90.7	9.3	0.0	0.0	0.0	0.0
November	682	100.0%	1	8	0	3	0	82.0	17.6	0.4	0.0	0.0	0.0
December	711	100.0%	1	7	0	3	0	71.2	27.6	1.3	0.0	0.0	0.0
Annual	4202	100.0%	1 ^c	27	0	3	0	85.1	14.4	0.5	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 172 ppb

b. 24-hour Saskatchewan Ambient Air Quality Standard = 57 ppb

c. Annual Saskatchewan Ambient Air Quality Standard = 11 ppb

Table D-3. Stoughton Station: Summary of airpointer® NO monitoring results for the year 2013 (July to December)

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=5	>5-15	>15-30	>30-100	>100-212	>212
July	710	100.0%	0.3	7.0	-	0.7	-	99.9	0.1	0.0	0.0	0.0	0.0
August	711	99.9%	0.4	6.2	-	1.3	-	99.6	0.4	0.0	0.0	0.0	0.0
September	655	99.8%	0.5	11.4	-	1.8	-	99.5	0.5	0.0	0.0	0.0	0.0
October	708	99.7%	0.6	10.0	-	1.7	-	99.3	0.7	0.0	0.0	0.0	0.0
November	682	100.0%	0.9	10.1	-	3.3	-	97.5	2.5	0.0	0.0	0.0	0.0
December	711	100.0%	0.8	25.1	-	2.8	-	98.3	1.4	0.3	0.0	0.0	0.0
Annual	4177	99.9%	0.6 ^c	25.1	-	3.3	-	99.0	0.9	0.0	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

Table D-4. Stoughton Station: Summary of airpointer® NO₂ monitoring results for the year 2013 (July to December)

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=5	>5-15	>15-30	>30-100	>100-212	>212
July	710	100.0%	1.5	13.9	0	4.1	-	96.6	3.4	0.0	0.0	0.0	0.0
August	711	99.9%	1.6	13.8	0	4.0	-	94.4	5.6	0.0	0.0	0.0	0.0
September	655	99.8%	1.4	13.0	0	3.0	-	97.1	2.9	0.0	0.0	0.0	0.0
October	708	99.7%	2.0	12.6	0	5.3	-	90.3	9.7	0.0	0.0	0.0	0.0
November	682	100.0%	3.0	19.9	0	8.5	-	82.3	17.4	0.3	0.0	0.0	0.0
December	711	100.0%	3.3	31.3	0	8.7	-	82.6	16.3	1.0	0.1	0.0	0.0
Annual	4177	99.9%	2.1 ^c	31.3	0	8.7	-	90.5	9.3	0.2	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 212 ppb

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. Annual Saskatchewan Ambient Air Quality Standard = 53 ppb

Table D-5. Stoughton Station: Summary of airpointer® NOx monitoring results for the year 2013 (July to December)

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=5	>5-15	>15-30	>30-100	>100-212	>212
July	710	100.0%	1.8	15.3	-	4.8	-	94.1	5.8	0.1	0.0	0.0	0.0
August	711	99.9%	2.0	19.0	-	4.9	-	92.5	7.3	0.1	0.0	0.0	0.0
September	655	99.8%	1.9	17.8	-	4.3	-	94.8	4.9	0.3	0.0	0.0	0.0
October	708	99.7%	2.5	18.3	-	7.0	-	85.3	14.1	0.6	0.0	0.0	0.0
November	682	100.0%	3.8	27.0	-	11.6	-	74.5	23.8	1.8	0.0	0.0	0.0
December	711	100.0%	4.0	56.2	-	11.4	-	77.4	20.0	2.4	0.3	0.0	0.0
Annual	4177	99.9%	2.7 ^c	56.2	-	11.6	-	86.4	12.7	0.9	0.0	0.0	0.0

- a. No 1-hour Saskatchewan Ambient Air Quality Standard*
b. No 24-hour Saskatchewan Ambient Air Quality Standard
c. No annual Saskatchewan Ambient Air Quality Standard

Table D-6. Stoughton Station: Summary of airpointer® H₂S monitoring results for the year 2013 (July to December)

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=1	>1-3.6	>3.6-5	>5-8	>8-10.8	>10.8
July	710	100.0%	1.4	12.6	3	3.5	0	61.8	28.7	4.2	3.2	1.5	0.4
August	712	100.0%	1.7	28.5	12	4.9	2	59.6	27.2	6.2	3.5	1.7	1.8
September	678	100.0%	1.0	11.9	2	3.5	0	69.0	26.5	1.2	2.4	0.6	0.3
October	708	99.7%	0.7	16.6	5	3.3	0	84.0	12.7	0.8	1.3	0.4	0.7
November	680	100.0%	0.5	11.8	1	1.6	0	88.2	10.3	1.0	0.3	0.0	0.1
December	698	100.0%	0.6	11.1	1	2.5	0	85.7	12.6	1.3	0.3	0.0	0.1
Annual	4186	100.0%	1.0 ^c	28.5	24	4.9	2	74.6	19.7	2.5	1.8	0.7	0.6

a. 1-hour Saskatchewan Ambient Air Quality Standard = 10.8 ppb

b. 24-hour Saskatchewan Ambient Air Quality Standard = 3.6 ppb

c. No annual Saskatchewan Ambient Air Quality Standard

Table D-7. Stoughton Station: Summary of airpointer® PM_{2.5} monitoring results for the year 2013 (July to December)

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (µg/m ³)	Maximum 1-Hr Conc. (µg/m ³)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (µg/m ³)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=2	>2-5	>5-10	>10-20	>20-30	>30
July ^d	6	0.8%	10	11	-	< 1	0	0.0	0.0	33.3	66.7	0.0	0.0
August ^d	0	0.0%	-	-	-	-	-	-	-	-	-	-	-
September ^d	0	0.0%	-	-	-	-	-	-	-	-	-	-	-
October	682	91.9%	6	35	-	13	0	18.5	26.0	41.2	12.2	1.6	0.6
November	720	100.0%	5	27	-	10	0	9.6	31.9	48.9	9.4	0.1	0.0
December	744	100.0%	4	14	-	9	0	12.5	40.6	43.4	3.5	0.0	0.0
Annual	2152	48.8%	5 ^c	35	-	13	0	13.4	32.9	44.5	8.4	0.6	0.2

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24-hour Canada-Wide Standard = 30 µg/m³ (98th percentile annually, averaged over three consecutive years).

c. No annual Saskatchewan Ambient Air Quality Standard

d. The Stoughton PM_{2.5} analyzer was not operational for July, August, and September. It was returned for factory repairs.

Table D-8. Stoughton Station: Summary of airpointer® precipitation monitoring results for the year 2013 (July to December)

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					
						<=0	>0-5	>5-10	>10-30	>30-60	>60
July	741	100.0%	66.9	18.0	22.3	94.1	5.4	0.4	0.1	0.0	0.0
August	744	100.0%	85.5	14.0	47.5	94.8	4.6	0.3	0.4	0.0	0.0
September	719	99.9%	40.8	14.1	14.8	94.3	5.4	0.1	0.1	0.0	0.0
October	741	99.9%	43.0	5.7	41.8	96.1	3.6	0.3	0.0	0.0	0.0
November	720	100.0%	4.7	2.3	2.8	96.7	3.3	0.0	0.0	0.0	0.0
December	744	100.0%	0.1	< 0.1	0.1	99.2	0.8	0.0	0.0	0.0	0.0
Annual	4409	100.0%	240.9	18.0	47.5	95.8	3.9	0.2	0.1	0.0	0.0

Table D-9. Stoughton Station: Summary of airpointer® ambient temperature monitoring results for the year 2013 (July to December)

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
July	741	100.0%	18.1	6.7	31.2	0.0	0.0	0.0	28.1	71.0	0.9
August	744	100.0%	18.7	8.2	32.2	0.0	0.0	0.0	28.0	68.3	3.8
September	720	100.0%	14.6	1.2	32.2	0.0	0.0	0.0	53.9	45.4	0.7
October	741	99.9%	3.3	-9.0	21.8	0.0	0.0	31.3	64.8	3.9	0.0
November	720	100.0%	-5.8	-26.9	11.2	0.0	11.3	65.7	23.1	0.0	0.0
December	744	100.0%	-18.1	-34.9	2.4	5.0	63.8	30.4	0.8	0.0	0.0
Annual	4410	100.0%	5.1	-34.9	32.2	0.8	12.6	21.1	33.0	31.5	0.9

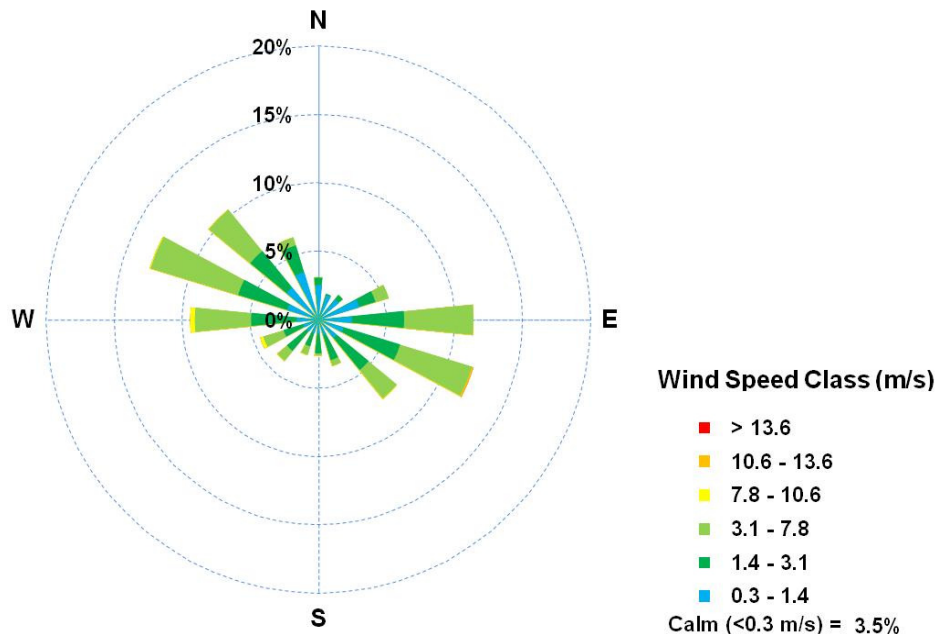
Table D-10. Stoughton Station: Summary of airpointer® relative humidity monitoring results for the year 2013 (July to December)

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
July	741	100.0%	72.0	38	95	0.0	0.0	26.7	33.5	27.0	12.8
August	744	100.0%	71	24	96	0.0	1.6	27.2	29.2	23.9	18.1
September	720	100.0%	71	31	95	0.0	0.0	28.3	31.3	28.3	12.1
October	741	99.9%	70	32	92	0.0	0.0	23.5	45.5	29.7	1.3
November	720	100.0%	76	37	92	0.0	0.0	7.4	51.8	38.5	2.4
December	744	100.0%	76	61	92	0.0	0.0	0.0	79.7	19.5	0.8
Annual	4410	100.0%	73	24	96	0.0	0.3	18.8	45.2	27.8	7.9

Table D-11. Stoughton Station: airpointer® wind frequency table for the year 2013 (July to December)

Wind Direction Sector	Percent of Data in each Wind Speed Range, wind speed unit m/s						Totals
	>0.3-1.4	>1.4-3.1	>3.1-7.8	>7.8-10.6	>10.6-13.6	>13.6	
North NorthEast	1.5%	0.1%	0.0%	0.0%	0.0%	0.0%	1.6%
NorthEast	1.6%	0.4%	0.0%	0.0%	0.0%	0.0%	2.0%
East NorthEast	2.8%	1.3%	1.0%	0.0%	0.0%	0.0%	5.1%
East	2.3%	3.9%	5.1%	0.0%	0.0%	0.0%	11.3%
East SouthEast	1.7%	4.4%	5.5%	0.1%	0.0%	0.0%	11.7%
SouthEast	1.7%	3.1%	2.7%	0.0%	0.0%	0.0%	7.5%
South SouthEast	1.1%	2.0%	0.4%	0.0%	0.0%	0.0%	3.4%
South	0.9%	1.5%	0.1%	0.0%	0.0%	0.0%	2.5%
South SouthWest	1.0%	1.0%	0.6%	0.0%	0.0%	0.0%	2.7%
SouthWest	1.1%	1.9%	0.9%	0.0%	0.0%	0.0%	3.9%
West SouthWest	1.1%	1.5%	1.6%	0.2%	0.0%	0.0%	4.4%
West	1.4%	3.3%	4.1%	0.3%	0.0%	0.0%	9.2%
West NorthWest	2.1%	3.7%	6.7%	0.0%	0.0%	0.0%	12.6%
NorthWest	2.8%	3.4%	3.9%	0.0%	0.0%	0.0%	10.1%
North NorthWest	3.2%	2.0%	0.6%	0.0%	0.0%	0.0%	5.8%
North	2.2%	0.5%	0.1%	0.0%	0.0%	0.0%	2.8%
Total	28.2%	34.1%	33.4%	0.7%	0.0%	0.0%	96.5%

Percent Calm (<0.3 m/s)	3.5%
Number of Valid Hourly-Average Data	4410
Total Workable Hours in Time Period	4411



APPENDIX E. ESTERHAZY STATION: CONTINUOUS MONITORING DATA

Table E-1. Esterhazy Station: Summary of airpointer® monitoring results for the year 2013 (August to December)

Parameter	Unit	Hours of Calibration & AIC ^a	Hours of Valid Data	Percent Uptime	Summary Statistics for 1-Hour Average Data		
					Average	Minimum	Maximum
NO	ppb	183	3200	99.9%	0.2	< 0.1	3.3
NO ₂	ppb	183	3200	99.9%	1.4	< 0.1	10.2
NO _x	ppb	183	3200	99.9%	1.5	< 0.1	10.9
O ₃	ppb	155	3218	99.6%	25	< 1	57
PM _{2.5}	µg/m ³	0	2742	81.0%	6	1	72
Ambient Temperature	°C	0	3385	99.9%	0.7	-37	32.7
Relative Humidity	%	0	3385	99.9%	71	27	95
Wind Speed	m/s	0	3385	99.9%	2.8	Calm	11.5
Precipitation	mm	0	3385	99.9%	93.1 ^b	< 0.1	8.0

a. Automatic Instrument Check

b. Annual total precipitation

Table E-2. Esterhazy Station: Summary of airpointer® NO monitoring results for the year 2013 (August to December)

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=5	>5-15	>15-30	>30-100	>100-212	>212
August	425	99.8%	0.2	1.7	-	0.4	-	100.0	0.0	0.0	0.0	0.0	0.0
September	676	100.0%	0.2	3.3	-	0.4	-	100.0	0.0	0.0	0.0	0.0	0.0
October	712	100.0%	0.1	2.0	-	0.4	-	100.0	0.0	0.0	0.0	0.0	0.0
November	676	99.6%	0.2	2.8	-	0.5	-	100.0	0.0	0.0	0.0	0.0	0.0
December	711	100.0%	0.2	2.7	-	0.7	-	100.0	0.0	0.0	0.0	0.0	0.0
Annual	3200	99.9%	0.2 ^c	3.3	-	0.7	-	100.0	0.0	0.0	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

Table E-3. Esterhazy Station: Summary of airpointer® NO₂ monitoring results for the year 2013 (August to December)

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=5	>5-15	>15-30	>30-100	>100-212	>212
August	425	99.8%	0.8	6.9	0	1.5	-	99.8	0.2	0.0	0.0	0.0	0.0
September	676	100.0%	1.0	4.6	0	1.7	-	100.0	0.0	0.0	0.0	0.0	0.0
October	712	100.0%	1.4	10.2	0	2.7	-	99.2	0.8	0.0	0.0	0.0	0.0
November	676	99.6%	1.7	6.3	0	3.7	-	98.2	1.8	0.0	0.0	0.0	0.0
December	711	100.0%	1.8	10.0	0	4.1	-	97.0	3.0	0.0	0.0	0.0	0.0
Annual	3200	99.9%	1.4 ^c	10.2	0	4.1	-	98.8	1.3	0.0	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 212 ppb

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. Annual Saskatchewan Ambient Air Quality Standard = 53 ppb

Table E-4. Esterhazy Station: Summary of airpointer® NOx monitoring results for the year 2013 (August to December)

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (ppb)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=5	>5-15	>15-30	>30-100	>100-212	>212
August	425	99.8%	0.9	7.1	-	1.6	-	99.8	0.2	0.0	0.0	0.0	0.0
September	676	100.0%	1.2	5.7	-	1.9	-	99.9	0.1	0.0	0.0	0.0	0.0
October	712	100.0%	1.5	10.9	-	3.0	-	99.2	0.8	0.0	0.0	0.0	0.0
November	676	99.6%	1.9	7.2	-	4.0	-	97.2	2.8	0.0	0.0	0.0	0.0
December	711	100.0%	1.8	10.0	-	4.6	-	96.5	3.5	0.0	0.0	0.0	0.0
Annual	3200	99.9%	1.5 ^c	10.9	-	4.6	-	98.4	1.6	0.0	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

Table E-5. Esterhazy Station: Summary of airpointer® O₃ monitoring results for the year 2013 (August to December)

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (ppb)	Maximum 1-Hr Conc. (ppb)	1-Hour Exceedance ^a (no.)	Maximum 8-Hr Conc. (ppb)	8-Hr Conc. Above CWS ^b (no.)	Percent of Data in each Concentration Range					
								<=10	>10-20	>20-40	>40-60	>60-82	>82
August	441	100.0%	26	57	0	53	0	12.2	23.8	48.8	15.2	0.0	0.0
September	680	98.8%	23	57	0	51	0	9.6	30.3	53.4	6.8	0.0	0.0
October	712	100.0%	25	45	0	43	0	2.1	26.7	67.4	3.8	0.0	0.0
November	674	99.1%	25	40	0	38	0	0.0	21.5	78.5	0.0	0.0	0.0
December	711	100.0%	27	40	0	39	0	0.1	6.6	93.2	0.0	0.0	0.0
Annual	3218	99.6%	25 ^c	57	0	51 ^d	0	4.2	21.5	69.9	4.4	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 82 ppb

b. 8-hour Canada-Wide Standard = 65 ppb (4th highest concentration annually, averaged over three consecutive years).

c. No annual Saskatchewan Ambient Air Quality Standard

d. The 4th highest concentration for 8-hour running average.

Table E-6. Esterhazy Station: Summary of airpointer® PM_{2.5} monitoring results for the year 2013 (August to December)

Month	Valid 1-Hr data (no.)	Operational Time (%)	Average Conc. (µg/m ³)	Maximum 1-Hr Conc. (µg/m ³)	1-Hour Exceedance ^a (no.)	Maximum 24-Hr Conc. (µg/m ³)	24-Hour Exceedance ^b (no.)	Percent of Data in each Concentration Range					
								<=2	>2-5	>5-10	>10-20	>20-30	>30
August	259	56.3%	11	44	-	13	0	2.3	6.6	40.9	46.3	1.9	1.9
September	689	96.0%	5	72	-	12	0	16.7	37.7	36.0	8.9	0.4	0.3
October ^d	368	49.5%	7	71	-	13	0	16.6	24.7	39.9	15.8	1.4	1.6
November ^d	682	94.7%	5	29	-	10	0	15.5	33.0	41.9	8.7	0.9	0.0
December	744	100.0%	4	18	-	8	0	14.0	43.4	40.5	2.2	0.0	0.0
Annual	2742	81.0%	6 ^c	72	-	13	0	14.3	33.4	39.7	11.5	0.7	0.5

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24-hour Canada-Wide Standard = 30 µg/m³ (98th percentile annually, averaged over three consecutive years).

c. No annual Saskatchewan Ambient Air Quality Standard

d. The Esterhazy PM_{2.5} analyzer was not operational October 16-November 2.

Table E-7. Esterhazy Station: Summary of airpointer® precipitation monitoring results for the year 2013 (August to December)

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					
						<=0	>0-5	>5-10	>10-30	>30-60	>60
August	461	100.0%	6.2	1.9	4.5	97.8	2.2	0.0	0.0	0.0	0.0
September	719	100.0%	47.1	5.5	13.9	93.9	6.0	0.1	0.0	0.0	0.0
October	744	100.0%	36.8	8.0	36.3	96.2	3.5	0.3	0.0	0.0	0.0
November	717	99.6%	2.8	1.9	2.3	98.2	1.8	0.0	0.0	0.0	0.0
December	744	100.0%	0.3	0.1	0.2	99.2	0.8	0.0	0.0	0.0	0.0
Annual	3385	99.9%	93.1	8.0	36.3	97.0	2.9	0.1	0.0	0.0	0.0

Table E-8. Esterhazy Station: Summary of airpointer® ambient temperature monitoring results for the year 2013 (August to December)

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
August	461	100.0%	20.2	6.4	32.7	0.0	0.0	0.0	21.0	72.2	6.7
September	719	100.0%	14.0	-0.8	31.6	0.0	0.0	0.4	59.9	38.9	0.7
October	744	100.0%	2.9	-12.3	18.3	0.0	0.0	32.1	64.8	3.1	0.0
November	717	99.6%	-6.6	-29.6	9.8	0.0	12.8	63.7	23.4	0.0	0.0
December	744	100.0%	-19.5	-36.5	1.8	7.1	65.7	26.5	0.7	0.0	0.0
Annual	3385	99.9%	0.7	-36.5	32.7	1.6	17.2	26.5	34.9	18.8	1.1

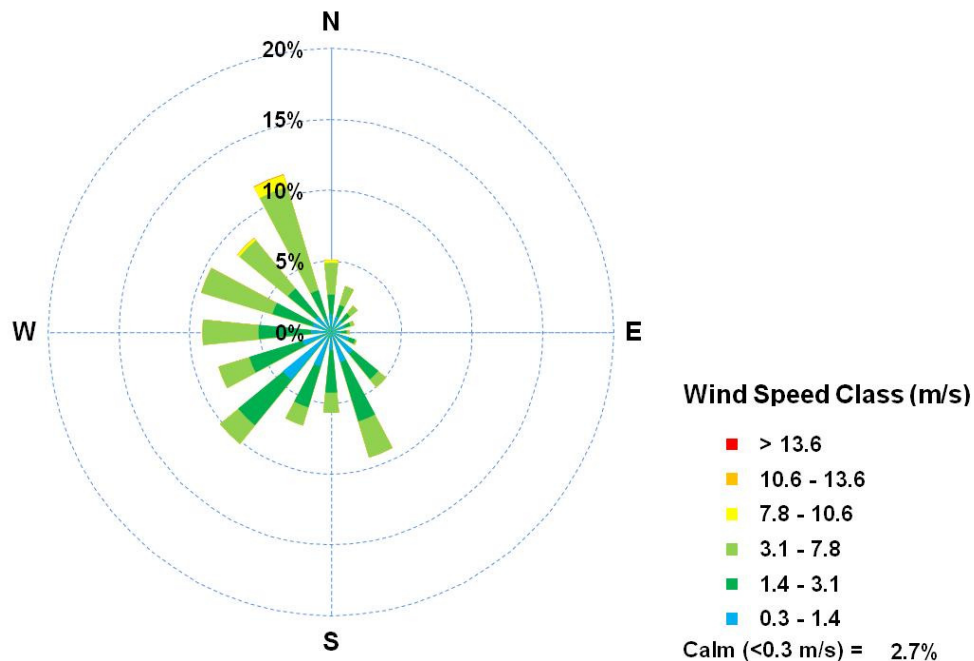
Table E-9. Esterhazy Station: Summary of airpointer® relative humidity monitoring results for the year 2013 (August to December)

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
August	461	100.0%	68	27	95	0.0	3.3	31.5	29.5	20.8	15.0
September	719	100.0%	70	28	95	0.0	0.6	29.9	31.0	23.4	15.2
October	744	100.0%	68	32	93	0.0	0.0	27.8	48.4	21.1	2.7
November	717	99.6%	76	40	91	0.0	0.0	4.2	64.2	30.4	1.3
December	744	100.0%	73	58	86	0.0	0.0	0.3	89.2	10.5	0.0
Annual	3385	99.9%	71	27	95	0.0	0.6	17.7	54.4	21.2	6.1

**Table E-10. Esterhazy Station: airpointer® wind frequency table for the year 2013
(August to December)**

Wind Direction Sector	Percent of Data in each Wind Speed Range, wind speed unit m/s						Totals
	>0.3-1.4	>1.4-3.1	>3.1-7.8	>7.8-10.6	>10.6-13.6	>13.6	
North NorthEast	1.0%	0.8%	1.4%	0.0%	0.0%	0.0%	3.2%
NorthEast	0.9%	0.7%	0.7%	0.0%	0.0%	0.0%	2.3%
East NorthEast	0.9%	0.4%	0.3%	0.0%	0.0%	0.0%	1.6%
East	0.6%	0.4%	0.2%	0.0%	0.0%	0.0%	1.2%
East SouthEast	1.2%	0.4%	0.1%	0.0%	0.0%	0.0%	1.7%
SouthEast	1.9%	2.3%	0.7%	0.0%	0.0%	0.0%	4.9%
South SouthEast	2.1%	4.3%	2.6%	0.0%	0.0%	0.0%	9.0%
South	1.2%	3.0%	1.4%	0.0%	0.0%	0.0%	5.6%
South SouthWest	2.4%	3.0%	1.3%	0.0%	0.0%	0.0%	6.7%
SouthWest	4.1%	4.1%	1.7%	0.0%	0.0%	0.0%	9.9%
West SouthWest	1.8%	4.0%	2.3%	0.0%	0.0%	0.0%	8.0%
West	1.4%	3.8%	4.0%	0.0%	0.0%	0.0%	9.1%
West NorthWest	1.3%	3.0%	5.3%	0.0%	0.0%	0.0%	9.5%
NorthWest	1.2%	2.5%	4.4%	0.2%	0.0%	0.0%	8.4%
North NorthWest	0.9%	2.1%	7.7%	0.9%	0.0%	0.0%	11.5%
North	0.9%	1.4%	2.3%	0.2%	0.0%	0.0%	4.8%
Total	23.5%	36.2%	36.3%	1.3%	0.0%	0.0%	97.3%

Percent Calm (<0.3 m/s)	2.7%
Number of Valid Hourly-Average Data	3385
Total Workable Hours in Time Period	3388



APPENDIX F. WAWOTA STATION: CONTINUOUS MONITORING DATA

Table F-1. Wawota Station: Summary of airpointer® monitoring results for December 2013

Parameter	Unit	Hours of Calibration & AIC ^a	Hours of Valid Data	Percent Uptime	Summary Statistics for 1-Hour Average Data		
					Average	Minimum	Maximum
NO	ppb	33	711	100.0%	0.5	< 0.1	15.3
NO ₂	ppb	33	711	100.0%	1.7	0.1	6.9
NO _x	ppb	33	711	100.0%	2.2	0.2	21.6
O ₃	ppb	33	711	100.0%	28	7	44
PM _{2.5}	µg/m ³	0	744	100.0%	4	< 1	17
Ambient Temperature	°C	0	744	100.0%	-17.8	-35	1.5
Relative Humidity	%	0	744	100.0%	73	58	91
Wind Speed	m/s	0	741	99.6%	2.9	Calm	7.9
Precipitation	mm	0	744	100.0%	0.2 ^b	< 0.1	0.1

a. Automatic Instrument Check

b. Annual total precipitation

Table F-2. Wawota Station: Summary statistics and data class distribution for December 2013

Parameter	Unit	Number of 1-hr Data	Operational Time (%)	Mean of 1-Hr Avg	Maximum 1-Hour Value	Number 1-Hour Violations	Maximum 24-Hour Value	Number 24-Hour Violations	Percent of Data in each Data Range					
									<=5	>5-15	>15-30	>30-100	>100-212	>212
NO	ppb	711	100.0%	0.5	15.3	-	1.7	-	98.9	1.0	0.1	0.0	0.0	0.0
NO ₂	ppb	711	100.0%	1.7	6.9	0 ^a	3.0	-	97.6	2.4	0.0	0.0	0.0	0.0
NOx	ppb	711	100.0%	2.2	21.6	-	3.9	-	94.9	4.6	0.4	0.0	0.0	0.0
									<=10	>10-20	>20-40	>40-60	>60-82	>82
O ₃	ppb	711	100.0%	28	44	0 ^b	41 ^c	0 ^c	0.1	4.8	94.1	1.0	0.0	0.0
									<=2	>2-4	>4-10	>10-20	>20-30	>30
PM _{2.5}	µg/m3	744	100.0%	4	17	-	7	0 ^d	28.5	33.1	34.7	3.8	0.0	0.0
									<=0	>0-5	>5-10	>10-30	>30-60	>60
Precipitation	mm	744	100.0%	0.2 ^e	0.1	-	0.1	-	99.1	0.9	0.0	0.0	0.0	0.0

Parameter	Unit	Number of 1-hr Data	Operational Time (%)	Mean of 1-Hr Avg	Minimum 1-Hour Value	Maximum 1-Hour Value	Percent of Data in each Data Range					
							<=-30	>-30~-15	>-15~0	>0~15	>15~30	>30
Temperature	°C	744	100.0%	-17.8	-34.8	1.5	2.6	67.1	27.8	2.6	0.0	0.0
							<=15	>15-30	>30-60	>60-80	>80-90	>90
Relative Humidity	%	744	100.0%	73	58	91	0.0	0.0	1.9	84.7	13.3	0.1

a. NO₂ 1-hour Saskatchewan Ambient Air Quality Standard = 212 ppb

b. O₃ 1-hour Saskatchewan Ambient Air Quality Standard = 82 ppb

c. Concentration is the maximum of 8-hour running average; number of violations is compared against 8-hour Canada-Wide Standard = 65 ppb

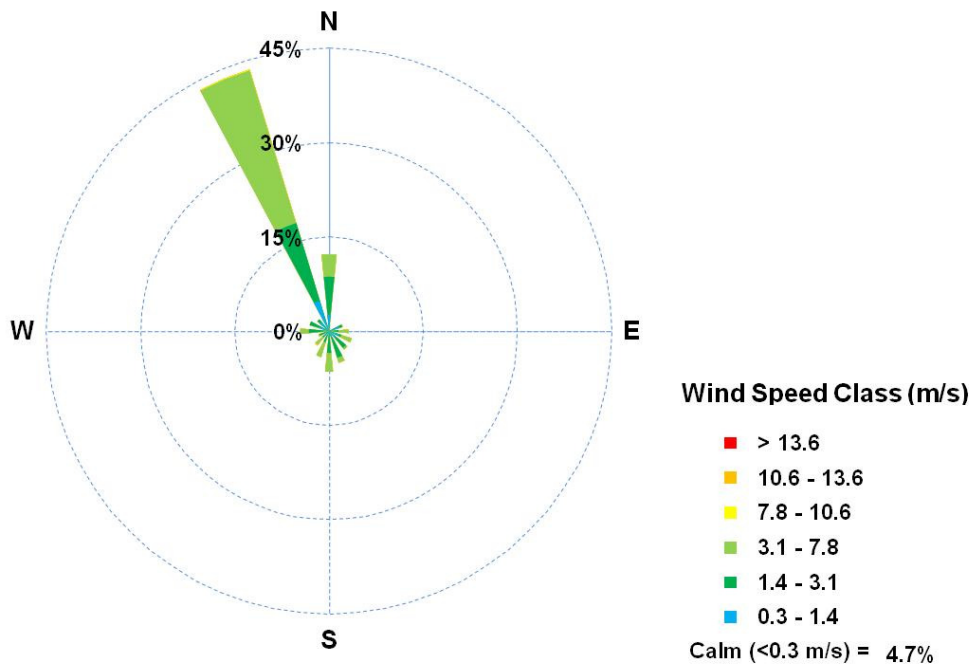
d. PM_{2.5} 24-hour Canada-Wide Standard = 30 µg/m³ (98th percentile annually, averaged over three consecutive years)

e. Total Precipitation for December 2013

Table F-3. Wawota Station: airpointer® wind frequency table for December 2013

Wind Direction Sector	Percent of Data in each Wind Speed Range, wind speed unit m/s						Totals
	>0.3-1.4	>1.4-3.1	>3.1-7.8	>7.8-10.6	>10.6-13.6	>13.6	
North NorthEast	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NorthEast	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
East NorthEast	1.5%	0.4%	0.1%	0.0%	0.0%	0.0%	2.0%
East	0.3%	1.1%	1.6%	0.0%	0.0%	0.0%	3.0%
East SouthEast	1.2%	0.4%	1.8%	0.0%	0.0%	0.0%	3.4%
SouthEast	1.2%	2.2%	0.3%	0.0%	0.0%	0.0%	3.6%
South SouthEast	0.9%	3.5%	0.8%	0.0%	0.0%	0.0%	5.3%
South	0.7%	2.6%	3.0%	0.0%	0.0%	0.0%	6.2%
South SouthWest	0.5%	1.2%	2.4%	0.0%	0.0%	0.0%	4.2%
SouthWest	0.5%	0.4%	1.5%	0.1%	0.0%	0.0%	2.6%
West SouthWest	0.7%	0.8%	0.1%	0.0%	0.0%	0.0%	1.6%
West	0.0%	3.0%	1.3%	0.0%	0.0%	0.0%	4.3%
West NorthWest	0.8%	1.6%	0.0%	0.0%	0.0%	0.0%	2.4%
NorthWest	1.5%	0.5%	0.0%	0.0%	0.0%	0.0%	2.0%
North NorthWest	4.9%	12.8%	25.5%	0.1%	0.0%	0.0%	43.3%
North	1.8%	5.9%	3.6%	0.0%	0.0%	0.0%	11.3%
Total	16.5%	36.4%	42.1%	0.3%	0.0%	0.0%	95.3%

Percent Calm (<0.3 m/s)	4.7%
Number of Valid Hourly-Average Data	741
Total Workable Hours in Time Period	744



APPENDIX G. WAUCHOPE STATION: CONTINUOUS MONITORING DATA

Table G-1. Wauchope Station: Summary of airpointer® monitoring results for December 2013

Parameter	Unit	Hours of Calibration & AIC ^a	Hours of Valid Data	Percent Uptime	Summary Statistics for 1-Hour Average Data		
					Average	Minimum	Maximum
SO ₂	ppb	33	711	100.0%	1	< 1	13
H ₂ S	ppb	33	711	100.0%	0.8	< 0.1	13.6
PM _{2.5}	µg/m ³	0	744	100.0%	4	< 1	23
Ambient Temperature	°C	0	744	100.0%	-18.8	-35.0	2.1
Relative Humidity	%	0	744	100.0%	75	52	90
Wind Speed	m/s	0	744	100.0%	3.9	Calm	10.2
Precipitation	mm	0	744	100.0%	1.1 ^b	< 0.1	0.4

a. Automatic Instrument Check

b. Annual total precipitation

Table G-2. Wauchope Station: Summary statistics and data class distribution for December 2013

Parameter	Unit	Number of 1-hr Data	Operational Time (%)	Mean of 1-Hr Avg	Maximum 1-Hour Value	Number 1-Hour Violations	Maximum 24-Hour Value	Number 24-Hour Violations	Percent of Data in each Data Range					
									<=1	>1-5	>5-10	>10-57	>57-172	>172
SO ₂	ppb	711	100.0%	1	13	0 ^a	4	0 ^b	55.4	41.5	2.5	0.6	0.0	0.0
									<=1	>1-3.6	>3.6-5	>5-8	>8-10.8	>10.8
H ₂ S	ppb	711	100.0%	0.8	13.6	1 ^c	2.3	0 ^d	74.3	22.1	1.5	1.8	0.1	0.1
									<=2	>2-4	>4-10	>10-20	>20-30	>30
PM _{2.5}	µg/m3	744	100.0%	4	23	-	10	0 ^e	26.6	26.6	40.7	5.9	0.1	0.0
									<=0	>0-5	>5-10	>10-30	>30-60	>60
Precipitation	mm	744	100.0%	0.2 ^f	0.1	-	0.1	-	99.1	0.9	0.0	0.0	0.0	0.0

Parameter	Unit	Number of 1-hr Data	Operational Time (%)	Mean of 1-Hr Avg	Minimum 1-Hour Value	Maximum 1-Hour Value	Percent of Data in each Data Range					
							<=-30	>-30~-15	>-15~0	>0~15	>15~30	>30
Temperature	°C	744	100.0%	-18.8	-35.4	2.1	7.1	63.4	27.8	1.6	0.0	0.0
							<=15	>15-30	>30-60	>60-80	>80-90	>90
Relative Humidity	%	744	100.0%	75	52	90	0.0	0.0	0.4	80.5	19.0	0.1

a. SO₂ 1-hour Saskatchewan Ambient Air Quality Standard = 172 ppb

b. SO₂ 24-hour Saskatchewan Ambient Air Quality Standard = 57 ppb

c. H₂S 1-hour Saskatchewan Ambient Air Quality Standard = 10.8 ppb

d. H₂S 24-hour Saskatchewan Ambient Air Quality Standard = 3.6 ppb

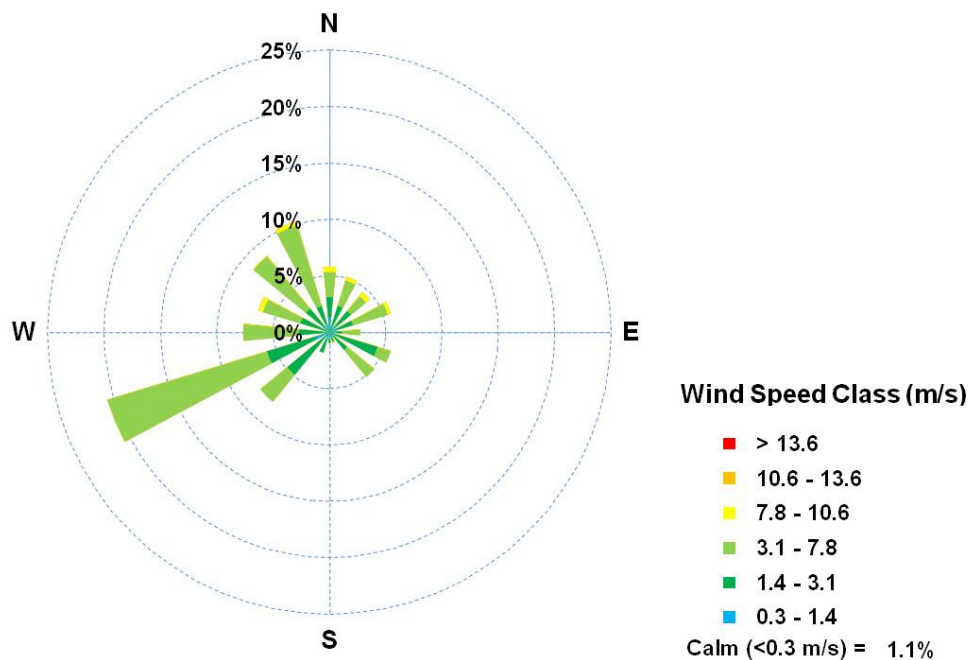
e. PM_{2.5} 24-hour Canada-Wide Standard = 30 µg/m³ (98th percentile annually, averaged over three consecutive years)

f. Total Precipitation for December 2013

Table G-3. Wauchope Station: airpointer® wind frequency table for December 2013

Wind Direction Sector	Percent of Data in each Wind Speed Range, wind speed unit m/s						Totals
	>0.3-1.4	>1.4-3.1	>3.1-7.8	>7.8-10.6	>10.6-13.6	>13.6	
North NorthEast	0.7%	1.7%	2.4%	0.3%	0.0%	0.0%	5.1%
NorthEast	0.7%	1.7%	1.7%	0.4%	0.0%	0.0%	4.6%
East NorthEast	0.5%	1.3%	3.2%	0.3%	0.0%	0.0%	5.4%
East	0.5%	0.5%	1.6%	0.0%	0.0%	0.0%	2.7%
East SouthEast	0.5%	3.8%	1.2%	0.0%	0.0%	0.0%	5.5%
SouthEast	0.4%	1.6%	3.1%	0.0%	0.0%	0.0%	5.1%
South SouthEast	0.5%	0.3%	0.1%	0.0%	0.0%	0.0%	0.9%
South	0.5%	0.4%	0.0%	0.0%	0.0%	0.0%	0.9%
South SouthWest	0.9%	0.9%	0.0%	0.0%	0.0%	0.0%	1.9%
SouthWest	0.7%	4.2%	3.1%	0.0%	0.0%	0.0%	7.9%
West SouthWest	1.2%	4.4%	14.8%	0.0%	0.0%	0.0%	20.4%
West	0.4%	2.3%	5.0%	0.0%	0.0%	0.0%	7.7%
West NorthWest	0.3%	2.3%	3.5%	0.4%	0.0%	0.0%	6.5%
NorthWest	0.8%	1.9%	6.0%	0.0%	0.0%	0.0%	8.7%
North NorthWest	0.8%	1.6%	7.5%	0.3%	0.0%	0.0%	10.2%
North	0.9%	1.7%	2.3%	0.4%	0.0%	0.0%	5.4%
Total	10.5%	30.8%	55.6%	2.0%	0.0%	0.0%	98.9%

Percent Calm (<0.3 m/s)	1.1%
Number of Valid Hourly-Average Data	744
Total Workable Hours in Time Period	744



APPENDIX H. WEYBURN STATION: EXCEEDANCE SUMMARY

Table H-1. Weyburn Station: Summary of exceedances for 1-hour SAAQS for the year 2013

1-Hour Exceedance Pollutant			Other Parameters During the Exceedance Event								
Pollutant	Conc. ppb	Exceedance Time mmm-dd hh:mm	WS m/s	WD deg	AQHI -	Rain mm	SO ₂ ppb	NO ₂ ppb	O ₃ ppb	H ₂ S ppb	PM _{2.5} µg/m ³
H ₂ S	12.1	Jan-01 03:00	1.6	142	2	0.0	33	7	21	12.1	1.9
H ₂ S	18.0	Jan-01 04:00	0.7	145	2	0.0	22	8	18	18.0	3.8
H ₂ S	13.9	Jan-01 05:00	1.5	167	2	0.0	10	4	24	13.9	1.9
H ₂ S	12.8	Jan-01 07:00	1.6	152	2	0.0	5	2	27	12.8	1.0
H ₂ S	14.7	Jan-04 12:00	1.6	85	2	0.0	6	6	29	14.7	2.5
H ₂ S	15.9	Jan-15 07:00	1.6	136	2	0.0	27	4	31	15.9	2.6
H ₂ S	14.9	Jan-15 08:00	1.5	132	2	0.0	25	3	33	14.9	2.2
H ₂ S	22.7	Jan-15 09:00	1.3	153	2	0.0	22	3	33	22.7	2.2
H ₂ S	14.5	Feb-25 23:00	0.5	141	2	0.0	5	3	31	14.5	2.5
H ₂ S	11.0	Feb-26 00:00	1.5	108	2	0.0	4	2	30	11.0	2.5
H ₂ S	23.1	Feb-26 01:00	1.4	111	2	0.0	2	4	27	23.1	3.1
H ₂ S	38.1	Mar-19 23:00	1.3	132	3	0.0	10	7	43	38.1	2.2
H ₂ S	36.5	Apr-01 09:00	1.6	118	2	0.0	17	2	41	36.5	4.1
H ₂ S	17.8	Jul-02 03:00	0.3	113	2	0.0	1	1	19	17.8	18.3
H ₂ S	15.5	Jul-02 05:00	0.9	95	2	0.0	2	2	15	15.5	17.5
H ₂ S	11.3	Jul-02 23:00	1.0	127	3	0.0	2	1	26	11.3	20.7
H ₂ S	13.6	Jul-03 01:00	0.6	123	2	0.0	1	2	24	13.6	18.2
H ₂ S	23.1	Jul-03 02:00	0.9	124	2	0.0	1	1	25	23.1	18.3
H ₂ S	32.2	Jul-05 04:00	0.8	97	1	0.0	3	1	14	32.2	10.9
H ₂ S	24.3	Jul-09 22:00	0.4	132	3	0.0	1	2	21	24.3	27.6
H ₂ S	16.5	Oct-21 02:00	0.6	187	1	0.0	0	1	8	16.5	0.2
H ₂ S	11.3	Dec-11 09:00	1.4	193	2	0.0	3	4	25	11.3	0.0
H ₂ S	20.4	Dec-11 18:00	0.9	173	2	0.0	3	30	6	20.4	0.9
H ₂ S	14.1	Dec-11 19:00	0.9	203	3	0.0	2	31	6	14.1	1.2
H ₂ S	12.8	Dec-11 20:00	1.6	242	3	0.0	2	8	21	12.8	2.2
H ₂ S	11.1	Dec-12 05:00	0.5	121	2	0.0	3	6	24	11.1	1.9

Table H-2. Weyburn Station: Summary of exceedances for 24-hour SAAQS for the year 2013

24-Hour Exceedance Pollutant			Other Parameters During the Exceedance Event								
Pollutant	Conc. ppb	Exceedance Date mmm-dd	WS m/s	WD deg	AQHI -	Rain mm	SO ₂ ppb	NO ₂ ppb	O ₃ ppb	H ₂ S ppb	PM _{2.5} µg/m ³
H ₂ S	3.8	Jan-1	5.4	221	2	0.0	6	3	31	3.8	1.7
H ₂ S	3.9	Feb-26	2.3	131	2	0.0	2	6	34	3.9	4.7
H ₂ S	4.6	Jul-2	1.0	133	3	0.0	2	1	31	4.6	19.7
H ₂ S	4.2	Jul-3	1.9	167	3	0.0	1	2	31	4.2	19.2
H ₂ S	4.3	Jul-5	1.5	114	2	0.1	1	2	22	4.3	15.0
H ₂ S	4.6	Dec-11	1.8	210	2	0.0	4	6	24	4.6	0.4

APPENDIX I. GLEN EWEN STATION: EXCEEDANCE SUMMARY

Table I-1. Glen Ewen Station: Summary of exceedances for 1-hour SAAQS for the year 2013

1-Hour Exceedance Pollutant			Other Parameters During the Exceedance Event							
Pollutant	Conc. ppb	Exceedance Time mmm-dd hh:mm	WS m/s	WD deg	AQI -	Rain mm	SO ₂ ppb	NO ₂ ppb	O ₃ ppb	H ₂ S ppb
H ₂ S	19.8	Feb-23 01:00	2.9	124	22	0.0	4	4	44	19.8
H ₂ S	11.2	Feb-25 10:00	0.3	255	15	0.0	2	9	30	11.2
H ₂ S	12.0	Feb-25 11:00	1.1	236	16	0.0	2	9	31	12.0
H ₂ S	11.1	Feb-26 05:00	1.4	348	13	0.0	1	7	26	11.1
H ₂ S	12.9	Mar-17 12:00	0.0	0	21	0.0	1	0	41	12.9
H ₂ S	10.9	May-28 06:00	1.1	119	3	0.0	0	5	6	10.9
H ₂ S	14.2	Jun-18 04:00	0.4	297	1	0.0	1	5	2	14.2
H ₂ S	16.9	Jun-18 05:00	0.3	349	2	0.0	1	4	4	16.9
H ₂ S	17.0	Jul-01 04:00	0.4	38	3	0.0	0	3	7	17.0
H ₂ S	11.3	Jul-05 03:00	0.5	348	12	0.0	1	1	24	11.3
H ₂ S	26.7	Jul-05 04:00	0.5	304	7	0.0	0	2	13	26.7
H ₂ S	14.4	Jul-05 06:00	0.4	341	6	0.0	0	3	11	14.4
H ₂ S	13.5	Jul-10 05:00	1.2	262	6	0.0	0	2	11	13.5
H ₂ S	31.8	Jul-14 22:00	1.8	120	12	0.0	1	1	23	31.8
H ₂ S	17.0	Aug-14 21:00	3.5	121	15	0.0	1	1	29	17.0
H ₂ S	12.9	Aug-14 22:00	1.5	120	11	0.0	1	1	23	12.9
H ₂ S	23.1	Aug-14 23:00	2.2	123	11	0.0	1	1	23	23.1
H ₂ S	21.2	Aug-15 00:00	1.0	116	8	0.0	1	1	16	21.2
H ₂ S	11.2	Aug-20 02:00	0.5	290	5	0.0	0	2	10	11.2
H ₂ S	12.1	Aug-20 03:00	0.3	181	4	0.0	0	2	7	12.1
H ₂ S	12.4	Aug-20 05:00	0.3	5	2	0.0	0	2	4	12.4
H ₂ S	12.4	Aug-20 07:00	0.1	138	1	0.0	0	3	3	12.4
H ₂ S	11.1	Aug-21 01:00	0.2	247	5	0.0	1	1	10	11.1
H ₂ S	26.7	Aug-21 03:00	0.3	314	4	0.0	1	1	9	26.7
H ₂ S	15.2	Aug-22 03:00	0.4	285	3	0.0	1	2	5	15.2
H ₂ S	13.2	Aug-22 04:00	0.5	277	2	0.0	0	2	4	13.2
H ₂ S	17.9	Aug-22 05:00	0.5	264	1	0.0	1	2	1	17.9
H ₂ S	25.5	Aug-22 06:00	0.4	287	1	0.0	0	1	1	25.5
H ₂ S	40.7	Aug-22 07:00	0.1	319	1	0.0	1	2	1	40.7
H ₂ S	11.1	Aug-26 04:00	0.4	63	8	0.0	1	2	15	11.1
H ₂ S	17.2	Aug-27 03:00	0.2	289	4	0.0	0	2	7	17.2
H ₂ S	15.9	Aug-27 04:00	0.2	126	3	0.0	0	2	5	15.9
H ₂ S	18.3	Aug-27 07:00	0.2	206	2	0.0	0	3	4	18.3
H ₂ S	17.0	Aug-28 07:00	0.3	256	2	0.0	1	3	5	17.0

Table I-2. Glen Ewen Station: Summary of exceedances for 24-hour SAAQS for the year 2013

24-Hour Exceedance Pollutant			Other Parameters During the Exceedance Event							
Pollutant	Conc. ppb	Exceedance Date mmm-dd	WS m/s	WD deg	AQI -	Rain mm	SO ₂ ppb	NO ₂ ppb	O ₃ ppb	H ₂ S ppb
H ₂ S	3.7	Jul-1	1.1	153	13	0.0	0	1	26	3.7
H ₂ S	4.9	Jul-5	1.6	172	13	0.0	1	1	27	4.9
H ₂ S	4.0	Aug-14	2.6	124	11	0.2	1	1	22	4.0
H ₂ S	4.1	Aug-20	1.5	196	13	0.0	1	2	24	4.1
H ₂ S	4.2	Aug-21	1.4	311	11	0.0	1	1	22	4.2
H ₂ S	7.0	Aug-22	1.5	196	11	0.0	1	1	21	7.0
H ₂ S	3.7	Aug-27	0.9	204	13	0.0	2	2	26	3.7

APPENDIX J. STOUGHTON STATION: EXCEEDANCE SUMMARY

Table J-1. Stoughton Station: Summary of exceedances for 1-hour SAAQS for the year 2013

1-Hour Exceedance Pollutant			Other Parameters During the Exceedance Event								
Pollutant	Conc. ppb	Exceedance Time mmm-dd hh:mm	WS m/s	WD deg	AQHI -	Rain mm	ET C	SO ₂ ppb	NO ₂ ppb	H ₂ S ppb	PM _{2.5} µg/m ³
H ₂ S	11.7	Jul-03 05:00	2.1	124	-	0.0	15	1	3	11.7	-
H ₂ S	12.6	Jul-05 04:00	1.5	108	-	0.0	15	0	4	12.6	-
H ₂ S	11.9	Jul-05 05:00	1.2	96	-	0.0	14	0	9	11.9	-
H ₂ S	28.5	Aug-18 03:00	0.7	314	-	0.0	16	0	0	28.5	-
H ₂ S	12.6	Aug-18 07:00	0.2	335	-	0.0	15	0	0	12.6	-
H ₂ S	12.1	Aug-22 02:00	0.4	59	-	0.0	10	0	5	12.1	-
H ₂ S	11.2	Aug-22 04:00	0.5	67	-	0.0	10	0	8	11.2	-
H ₂ S	13.4	Aug-22 05:00	0.8	83	-	0.0	9	0	8	13.4	-
H ₂ S	15.5	Aug-22 06:00	0.8	86	-	0.0	9	0	5	15.5	-
H ₂ S	18.1	Aug-22 07:00	0.9	73	-	0.0	9	0	6	18.1	-
H ₂ S	12.7	Aug-22 08:00	1.5	90	-	0.0	13	0	5	12.7	-
H ₂ S	21.5	Aug-25 06:00	0.2	356	-	0.0	13	1	4	21.5	-
H ₂ S	14.2	Aug-25 08:00	0.3	66	-	0.0	17	1	6	14.2	-
H ₂ S	11.0	Aug-28 08:00	1.6	99	-	0.0	18	1	5	11.0	-
H ₂ S	12.7	Aug-31 02:00	0.7	295	-	0.0	17	0	2	12.7	-
H ₂ S	11.9	Sep-03 08:00	0.8	73	-	0.0	15	0	4	11.9	-
H ₂ S	11.4	Sep-12 01:00	0.3	294	-	0.0	9	0	1	11.4	-
H ₂ S	16.6	Oct-03 02:00	0.7	303	6	0.0	1	0	2	16.6	7.1
H ₂ S	12.2	Oct-03 03:00	0.9	299	6	0.0	0	0	3	12.2	6.8
H ₂ S	16.2	Oct-05 06:00	0.7	334	6	0.0	-5	0	2	16.2	6.9
H ₂ S	14.9	Oct-05 07:00	0.3	356	5	0.0	-4	0	3	14.9	6.4
H ₂ S	11.3	Oct-05 08:00	0.4	349	7	0.0	-4	1	4	11.3	8.7
H ₂ S	11.8	Nov-06 10:00	1.0	328	13	0.0	-8	1	2	11.8	15.5
H ₂ S	11.1	Dec-12 10:00	0.7	5	3	0.0	-14	3	5	11.1	3.9

Table J-2. Stoughton Station: Summary of exceedances for 24-hour SAAQS for the year 2013

24-Hour Exceedance Pollutant			Other Parameters During the Exceedance Event								
Pollutant	Conc. ppb	Exceedance Date mmm-dd	WS m/s	WD deg	AQHI -	Rain mm	ET C	SO ₂ ppb	NO ₂ ppb	H ₂ S ppb	PM _{2.5} µg/m ³
H ₂ S	4.6	Aug-18	1.6	178	-	0.0	20	1	2	4.6	-
H ₂ S	4.9	Aug-22	2.6	103	-	0.0	18	2	4	4.9	-

APPENDIX K. WAUCHOPE STATION: EXCEEDANCE SUMMARY

Table K-1. Wauchope Station: Summary of exceedances for 1-hour SAAQS for the year 2013

1-Hour Exceedance Pollutant			Other Parameters During the Exceedance Event						
Pollutant	Conc. ppb	Exceedance Time mmm-dd hh:mm	WS m/s	WD deg	Rain mm	ET C	SO ₂ ppb	H ₂ S ppb	PM _{2.5} µg/m ³
H ₂ S	13.6	Dec-22 08:00	0.7	354	0.0	-27	0.4	13.6	3.2

APPENDIX L. PASSIVE MONITORING DATA

Table L-1. 30-day average concentration for passive SO₂ samples for the year 2013

Passive Site		30-Day Passive SO ₂ Concentration (ppb)												AVG	MAX	MIN
No.	Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
2	Glen Ewen	0.7	0.6	-	-	0.1	0.3	NA	0.1	0.3	-	-	-	0.4	0.7	0.1
4	Roche Percee	1.0	0.3	-	-	NA	0.3	1.0	2.3	0.2	-	-	-	0.9	2.3	0.2
5	Estevan	0.6	0.1	-	-	0.6	0.3	0.4	0.1	0.2	-	-	-	0.3	0.6	0.1
7	Tribune	1.1	0.6	-	-	0.4	0.4	1.1	<0.1	0.2	-	-	-	0.6	1.1	<0.1
10	Alameda	0.6	0.2	-	-	0.2	0.4	0.6	2.9	0.1	-	-	-	0.7	2.9	0.1
12	Storthoaks	0.7	0.6	-	-	0.2	0.3	0.4	<0.1	0.2	-	-	-	0.4	0.7	<0.1
13	Redvers	0.6	0.3	-	-	<0.1	0.3	<0.1	<0.1	0.1	-	-	-	0.3	0.6	<0.1
17	Huntoon	0.6	0.4	-	-	0.1	0.2	0.1	0.1	-	-	-	-	0.3	0.6	0.1
19	Talmage	0.8	0.6	-	-	0.2	0.4	0.6	0.2	0.2	-	-	-	0.4	0.8	0.2
22	Kenosse Lake	0.7	0.7	-	-	0.2	0.3	<0.1	0.1	0.2	-	-	-	0.4	0.7	<0.1
24	Wapella	0.6	0.6	-	-	0.2	0.3	0.5	0.2	0.1	-	-	-	0.4	0.6	0.1
26	Odessa	0.6	0.4	-	-	0.1	0.3	0.1	0.1	<0.1	-	-	-	0.3	0.6	<0.1
28	Bangor	0.4	0.6	-	-	0.2	0.5	0.1	0.2	0.2	-	-	-	0.3	0.6	0.1
29	ATCO	1.1	0.5	-	-	0.2	0.4	0.1	0.2	0.4	-	-	-	0.4	1.1	0.1
30	ATCO	0.9	0.6	-	-	0.6	0.4	NA	0.2	0.5	-	-	-	0.5	0.9	0.1
Network Average		0.7	0.5	-	-	0.3	0.3	0.5	0.6	0.2	-	-	-	0.4	2.9	<0.1

F: Sample Failure

NA: Missing Sample or Missing Data

-: Passive Program Paused

Table L-2. 30-day average concentration for passive NO₂ samples for the year of 2013

Passive Site		30-Day Passive NO ₂ Concentration (ppb)												AVG	MAX	MIN
No.	Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
2	Glen Ewen	1.1	0.1	-	-	0.4	1.0	NA	0.7	1.0	-	-	-	0.7	1.1	0.1
4	Roche Percee	3.5	0.9	-	-	NA	1.0	1.3	1.1	1.4	-	-	-	1.5	3.5	0.9
7	Tribune	2.4	0.7	-	-	2.2	1.4	0.6	1.0	1.2	-	-	-	1.4	2.4	0.6
12	Storthoaks	1.4	0.6	-	-	1.1	1.1	1.0	0.2	0.9	-	-	-	0.9	1.4	0.2
17	Huntoon	3.7	1.0	-	-	0.6	0.7	0.5	1.0	-	-	-	-	1.3	3.7	0.5
22	Kenosse Lake	1.9	0.7	-	-	0.8	1.0	0.5	0.5	0.6	-	-	-	0.9	1.9	0.5
24	Wapella	2.5	0.7	-	-	0.9	1.0	<0.1	0.6	0.9	-	-	-	1.1	2.5	<0.1
26	Odessa	1.8	0.6	-	-	0.8	1.0	0.5	0.6	0.8	-	-	-	0.9	1.8	0.5
28	Bangor	2.0	1.0	-	-	1.8	1.6	0.8	0.9	1.0	-	-	-	1.3	2.0	0.8
Network Average		2.3	0.7	-	-	1.1	1.1	0.7	0.7	1.0	-	-	-	1.1	3.7	<0.1

F: Sample Failure

NA: Missing Sample or Missing Data

-: Passive Program Paused

Table L-3. 30-day average concentration for passive O₃ samples for the year of 2013

Passive Site		30-Day Passive O ₃ Concentration (ppb)												AVG	MAX	MIN
No.	Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
2	Glen Ewen	26	31	-	-	49	32	32	26	25	-	-	-	32	49	25
4	Roche Percee	30	33	-	-	22	28	36	28	33	-	-	-	30	36	22
7	Tribune	33	38	-	-	53	40	31	26	37	-	-	-	37	53	26
12	Storthoaks	31	39	-	-	F	37	30	31	27	-	-	-	32	39	27
17	Huntoon	31	42	-	-	64	42	35	24	31	-	-	-	38	64	24
22	Kenosse Lake	32	37	-	-	F	37	32	31	33	-	-	-	33	37	31
24	Wapella	30	36	-	-	13	39	30	25	28	-	-	-	29	39	13
26	Odessa	32	37	-	-	F	37	28	26	26	-	-	-	31	37	26
28	Bangor	29	36	-	-	62	36	26	27	26	-	-	-	35	62	26
Network Average		30	36	-	-	44	36	31	27	30	-	-	-	33	64	13

F: Sample Failure

NA: Missing Sample or Missing Data

-: Passive Program Paused

Table L-4. 30-day average concentration for passive H₂S samples for the year of 2013

Passive Site		30-Day Passive H ₂ S Concentration (ppb)												AVG	MAX	MIN
No.	Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
5	Estevan	1.1	0.2	-	-	0.2	0.5	0.7	0.8	0.5	-	-	-	0.6	1.1	0.2
10	Alameda	0.9	0.4	-	-	0.2	1.1	1.6	2.6	1.2	-	-	-	1.2	2.6	0.2
13	Redvers	0.8	0.6	-	-	0.1	0.8	1.3	1.5	1.7	-	-	-	1.0	1.7	0.1
19	Talmage	1.0	0.5	-	-	0.2	1.1	0.9	NA	0.7	-	-	-	0.7	1.1	0.2
29	ATCO	1.0	0.8	-	-	0.2	0.9	1.4	6.9	1.0	-	-	-	1.7	6.9	0.2
30	ATCO	0.9	0.5	-	-	0.2	1.2	NA	8.2	1.7	-	-	-	2.1	8.2	0.2
Network Average		0.9	0.5	-	-	0.2	0.9	1.2	4.0	1.1	-	-	-	1.2	8.2	0.1

F: Sample Failure

NA: Missing Sample or Missing Data

-: Passive Program Paused

Table L-5. 30-day average concentration for passive NH₃, benzene, toluene, ethylbenzene, and xylene samples for 2013

Pollutants	Passive Site		30-Day Passive Concentration (ppb)												AVG	MAX	MIN
	No.	Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
NH ₃	20	Creelman	1.1	1.6	-	-	3.9	3.6	2.2	2.9	1.9	-	-	-	2.5	3.9	1.1
Benzene	8	Macoun	0.5	0.5	-	-	0.1	<0.1	0.2	0.3	0.2	-	-	-	0.3	0.5	<0.1
	11	Oxbow	0.4	0.5	-	-	<0.1	<0.1	<0.1	0.1	<0.1	-	-	-	0.3	0.5	<0.1
Toluene	8	Macoun	0.5	0.7	-	-	<0.1	<0.1	<0.1	0.1	<0.1	-	-	-	0.4	0.7	<0.1
	11	Oxbow	0.1	0.4	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	0.3	0.4	<0.1
Ethylbenzene	8	Macoun	<0.2	<0.2	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	<0.2	<0.2	<0.1
	11	Oxbow	<0.2	<0.2	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	<0.2	<0.2	<0.1
Xylene	8	Macoun	<0.2	<0.2	-	-	<0.3	<0.3	<0.2	<0.2	<0.2	-	-	-	<0.2	<0.3	<0.2
	11	Oxbow	<0.2	<0.2	-	-	<0.3	<0.3	<0.2	<0.2	<0.2	-	-	-	<0.2	<0.3	<0.2

-: Passive Program Paused

APPENDIX M. 2013 FINANCIAL STATEMENTS



**Southeast Saskatchewan
Airshed Association
Financial Statements**
December 31, 2013



ACCOUNTING › CONSULTING › TAX
100, 1219 – 5TH STREET, ESTEVAN SK, S4A 0Z5
P: 306.634.2603 F: 306.634.8706 MNP.ca

Management's Responsibility

To the Members of Southeast Saskatchewan Airshed Association:

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. 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. 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 may meet periodically and separately with, both the Board and management to discuss their audit findings.

May 26, 2014



MNP

Independent Auditors' Report

To the Members of Southeast Saskatchewan Airshed Association:

We have audited the accompanying financial statements of Southeast Saskatchewan Airshed Association which comprise the statement of financial position as at December 31, 2013 and the statements of revenue and expenses 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 audit 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 Southeast Saskatchewan Airshed Association as at December 31, 2013 and the results of its operations and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

Estevan, Saskatchewan

May 26, 2014

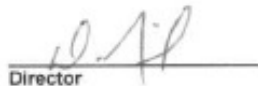
MNP LLP
Chartered Accountants

**Southeast Saskatchewan
Airshed Association**
Statement of Financial Position
As at December 31, 2013

	2013	2012
Assets		
Current		
Cash	47,473	144,159
Accounts receivable	-	45,000
Prepaid expenses and deposits	8,287	-
Goods and Services Tax receivable	22,803	377
	78,563	189,536
Equipment (Note 3)	548,733	171,455
	627,296	360,991
Liabilities		
Current		
Accounts payable and accruals	105,164	16,001
Deferred contributions (Note 4)	180,000	-
	285,164	16,001
Net Assets		
Unrestricted net assets	342,132	344,990
	627,296	360,991

Approved on behalf of the Board


Director


Director

The accompanying notes are an integral part of these financial statements

**Southeast Saskatchewan
Airshed Association**
Statement of Revenue and Expenses and Changes in Net Assets
For the year ended December 31, 2013

	2013	2012
Revenue		
Grants	49,000	45,000
Amortization of deferred contributions (Note 4)	20,000	-
Membership fees	230,639	247,261
	299,639	292,261
Expenses		
Advertising	1,353	4,098
Air monitoring	108,474	102,509
Amortization	80,021	27,878
Bank charges and interest	2,163	238
Insurance	8,287	6,550
Licences and fees	198	195
Management fees	68,750	48,000
Meetings	1,079	2,748
Office supplies	5,791	8,826
Professional fees	5,500	4,950
Repairs and maintenance	17,656	-
Supplies	-	2,075
Survey	-	10,675
Travel	3,225	5,926
	302,497	224,668
 (Deficiency) excess of revenue over expenses	 (2,858)	 67,593
Net assets beginning of year	344,990	277,397
 Net assets, end of year	 342,132	 344,990

The accompanying notes are an integral part of these financial statements

**Southeast Saskatchewan
Airshed Association
Statement of Cash Flows**
For the year ended December 31, 2013

	2013	2012
Cash provided by (used for) the following activities:		
Operating		
Cash receipts from grants	294,000	-
Cash receipts from membership fees	230,639	247,261
Cash paid to suppliers	(164,026)	(147,256)
	360,613	100,005
Investing		
Purchase of equipment	(457,299)	(119,885)
Decrease in cash resources	(96,686)	(19,880)
Cash resources, beginning of year	144,159	164,039
Cash resources, end of year	47,473	144,159

The accompanying notes are an integral part of these financial statements

**Southeast Saskatchewan
Airshed Association**
Notes to the Financial Statements
For the year ended December 31, 2013

1. **Incorporation and nature of the organization**

Southeast Saskatchewan Airshed Association (the "Organization") was incorporated under The Non-Profit Corporations Act, 1995 on October 7, 2005, and thus is exempt from income taxes. In order to maintain its status as a not-for-profit organization under the Act, the Organization must meet certain requirements within the Act. In the opinion of management these requirements have been met. The Organization collects and monitors ambient air quality data in Southeast Saskatchewan and makes this 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 as issued by the Accounting Standards Board in Canada and include the following significant accounting policies:

Cash and cash equivalents

Cash and cash equivalents include balances with banks and short-term investments with maturities of three months or less.

Equipment

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.

	Method	Rate
Equipment	declining balance	20 %

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.

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.

Transaction costs and financing fees directly attributable to the origination, acquisition, issuance or assumption of financial instruments subsequently measured at fair value are immediately recognized in the excess (deficiency) of revenues over expenses for the current period. Conversely, transaction costs and financing fees are added to the carrying amount for those financial instruments subsequently measured at amortized cost or cost.

The Organization has recorded cash, deposits, accounts receivable, goods and services taxes receivable, accounts payable and accruals at amortized 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.

**Southeast Saskatchewan
Airshed Association**
Notes to the Financial Statements
For the year ended December 31, 2013

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.

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 equipment.

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. Equipment

	Cost	Accumulated amortization	2013 Net book value	2012 Net book value
Equipment	665,460	116,727	548,733	171,455

4. Deferred contributions

Deferred capital contributions consist of the unamortized amount of contributions received for the purchase of equipment. Recognition of these amounts as revenue is deferred to periods when the related equipment are amortized. Changes in deferred capital contributions are as follows:

	2013	2012
Amount received during the year	200,000	-
Less: Amount recognized as revenue during the year	(20,000)	-
Balance, end of year	180,000	-

5. 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.

6. Related party transactions

Included in expenses for the current year are \$68,750 (2012 - \$48,000) paid to a Company operated by management of the Organization. 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. Of this balance \$68,750 (2012 - \$4,000) is remaining in accounts payable at December 31, 2013 and is bearing interest at 3% per annum.

APPENDIX N. SESAA BOARD OF DIRECTORS

Board of Directors and Alternates

Chuck Bosgoed

Saskatchewan Ministry of Environment



Mr. Bosgoed is an environmental engineer who has worked with the Saskatchewan Ministry of Environment for almost 30 years. He believes airshed management is an excellent approach to better understand air issues and is one more way to help resolve regional air quality problems. Mr. Bosgoed writes, "Being a member of the Board provides me, as an environmental regulator, with an effective way of managing air quality issues."

Alternate: Murray Hilderman

Debbie Nielsen

Director, Environment, SaskPower



Ms. Nielsen has worked with SaskPower in a variety of capacities dealing with environmental issues and programs for the past 22 years. In her current capacity she manages SaskPower's corporate environmental department which provides technical, analytical, environmental and regulatory decision-making support to the company's business units and support groups. Engaging with key environmental stakeholders to develop a better understanding of issues is also a key responsibility of her position.

She is a strong believer that by working in collaborative partnerships such as the airshed association, more sustainable outcomes can be achieved.

Alternate: David Smith

Dean Pylypuk

Regional Manager, Saskatchewan Ministry of the Economy



Mr. Pylypuk is the Regional Manager for Area 4 with Energy and Resources. Dean began his career in the oil and gas industry in 1972 working throughout Western Canada and the Arctic Islands. In 1980 the Pylypuk family moved overseas where Dean was employed as a Rig Manager with Kenting Drilling UK. Returning to Canada, Dean joined the Petroleum Development Branch of the then Department of Energy and Mines in July of 1984 and has been head quartered in Estevan from that time to

present. A graduate of the University of Regina Extension Program, Mr. Pylypuk has two certificates in Administration and has been a member of Saskatchewan Applied Science Technologists and Technicians since 1987.

Alternate: Todd Han

Holland Thompson Environmental Manager, Mosaic Potash Esterhazy



Mr. Thompson grew up in rural Minnesota and attended Florida Institute of Technology, graduating in 1996 with a BS in Chemical Engineering. He has 18 years of environmental experience in various industries, including waste management, printed circuit board manufacturing, phosphate fertilizer manufacturing and potash mining. Holland has held various roles with Mosaic for the past 7 years and relocated from Florida to Esterhazy, SK in 2012 to assume his current position of Environmental Manager for Mosaic's Esterhazy facilities.

Grant Paulson Senior Public Health Inspector



Mr. Paulson graduated from Ryerson Polytechnic Institute in 1972 and worked as a Public Health Inspector in Regina Rural and Swift Current Health Regions. He returned to his family farm for 10 years in southwest Saskatchewan before becoming Senior Public Health Inspector in Weyburn in 1992.

Darlene Sakires Director, Canadian Natural Resources Limited



Ms. Sakires is an Environmental Coordinator who is responsible for CNRL's Environmental Management Plan and Environmental Operating Guidelines. She manages site decommissioning and remediation projects across the prairies, ensuring compliance with environmental regulatory requirements in all aspects of the company's operations. She is active on a variety of committees, including the Saskatchewan Petroleum Industry Government Environmental Committee and the Saskatchewan Environmental Managers Association.

Alternate: John Hutt

Chris Seeley Public Health Engineer, Saskatchewan Health



Mr. Seeley is the Public Health Engineer with the Ministry of Health. He provides technical and policy advice to Regional Health Authorities in many environmental health areas including drinking water, wastewater, and swimming pools. He is involved with the airshed association to support its activities in providing information about air quality.

Shane Boyes

Councillor, Rural Municipality of Enniskillen Number 3



Mr. Boyes represents the R. M. of Enniskillen No.3. He has lived in this area for most of his life. He brings the concerns and experiences of living in an area with heavy oil and gas production from both the standpoint of a landowner and resident as well as that of someone who works in the oil and gas industry. He provides input to the Board regarding the people in rural southeast Saskatchewan.

Brian Johnson

Councillor, City of Estevan



Mr. Johnson has served as an Estevan City Councillor for the past 12 years and recently re-elected for another term. He presently works at SaskPower at BDPS as an Electrical Supervisor, he has been working with this Crown Corporation for 36 years now.

Rose McInnes

Ms. McInnes has experience in air quality monitoring and laboratory testing on water and soils. She has experience with all general laboratory duties. Rose brings her practical environmental skills to the Board. Rose is an A.Sc.T; as an Environmental Technologist, her business, Blue Earth Environmental, deals with water/wastewater issues and will soon expand to recycling/waste management.

Marge Young

Ms. Young is a retired teacher who lives in Estevan. She taught for 32.5 years, most of them in Estevan. She has lived in Estevan since she was 16 years old. She has been interested in the air quality in this area for many years.

Terry Gibson

Executive Director



Mr. Gibson brings nearly 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 south east Saskatchewan is always protected.

APPENDIX O. SESAA MEMBER COMPANIES

SESAA would like to express our gratitude to our members in good standing for their support of SESAA, for their very strong support regarding quality air data collection, and for their commitment to the citizens and environment of south east Saskatchewan.

- 101033165 Saskatchewan Ltd.
- 618555 Saskatchewan Ltd. TDL Petroleum
- Abenteuer Resources Corp.
- Admiralty Oils
- Advantage Oil and Gas
- Aldon Oils
- Antoinway Resources
- Apache Canada Ltd.
- ARC Resources
- ATCO Energy Solutions
- AvenEx Energy
- Barracuda Energy
- Base Resources Inc.
- Baytex
- Black Rider Resources Inc.
- Bluebird Resources
- Bonterra Energy
- Border Energy Ltd
- Brown Bros. Resources
- Bulldog Oil and Gas
- Caje Holdings Ltd.
- Canada Capital Energy
- Canadian Natural Resources Limited
- Caprice Resources
- Cenovus Energy Inc.
- Chinook Iteration
- Coast Resources
- Condor Canada
- Conoco Phillips
- Contact Exploration
- Crescent Point Resources Partnership
- Daylight Energy
- Devon Canada Corporation
- Diaz Resources Ltd.
- EERG Energy ULC
- Elkhorn Resources
- Elswick Energy Ltd.
- Enermark Inc.
- Enerplus Corporation
- Fairborne Energy Ltd.
- Firesky Energy
- Flagstone Energy
- Frank R. Lee Investments
- Freemantle Petroleum
- GKN Resources Ltd.
- Gold River Oil and Gas
- Grand Bow Petroleum Limited
- Halvar Resources
- Highrock Energy
- Hillsdale Drilling
- Hummingbird Energy Inc (Virtus group)
- Husky Oil Operations Limited
- JDM Petroleum
- Jedi Exploration & Development
- K and S Investments Ltd.
- Kenwood Resources Ltd.
- Keystone Royalty
- Kinwest 2008 Energy

- Kiwi Resources Ltd.
- Kootenay Energy
- Lakeco Holdings
- Legacy Oil and Gas
- Long Fortune
- Longview Oil
- Magellan Resources Ltd.
- Mancal Energy Inc.
- Marquee Energy LTD
- Midale Petroleums Ltd.
- Molopo Energy
- Mosaic
- NAL Resources Limited
- Nexxtep Resources
- Noramera Bioenergy
- Novus Energy Inc.
- Nuloch Resources Inc.
- Omatius Oil & Gas Ltd.
- Oneex Operations
- Openfield Ventures
- Painted Pony Petroleum
- Pemoco Ltd.
- Penn West Petroleum Ltd.
- Petrex Energy
- PetroBakken Energy Ltd.
- Petro One Energy
- Pinecrest Energy
- Pinto Resources
- Plains Midstream
- Primrose Drilling Ventures Ltd.
- Questerre Energy Corporation
- Regent Resources Ltd.
- Renegade Petroleum
- Rife Resources
- Runcible Oil Corp.
- Saskatchewan Environmental Industry and Managers Association SEIMA
- SaskEnergy Incorporated/ TransGas Limited
- Sask Power
- Prairie Mines and Royalty (Sherritt Coal)
- Silver Bay Resources Ltd.
- Skywest Energy
- Southern Exploration
- Spartan Exploration
- Spectrum Resource Group
- Sure Energy Inc.
- T-45 Oil Corporation
- TAQA North
- T. Bird Oil Ltd.
- Tetonka Resources
- Texalta Petroleum Ltd.
- TransGas/SaskEnergy
- Triwest Exploration
- Valleyview Petroleums Ltd.
- Villanova Resources Inc.
- Viterro Inc.
- Williston Hunter Canada Inc.
- Zargon Oil & Gas Ltd.

How to Become a Member

For information on how to become a member, please contact Terry Gibson, Executive Director at (306) 371-2478.