REPORT

TECK COAL LTD. REGIONAL AIR MONITORING PROGRAM (RAMP)

SPARWOOD, BC

2017 ANNUAL REPORT

RWDI #1802626
March 30, 2018

SUBMITTED TO

Jessica Tremblay
Environmental EIT
Teck Coal Limited
T: 250.425.8805
jessica.tremblay@teck.com

SUBMITTED BY

Matthew Sawycky, B.Sc.
Senior Project Manager / Associate
matthew.sawycky@rwdi.com

Eric Christensen, M.Sc.
Air Quality Scientist
eric.christensen@rwdi.com

Jeff Lundgren, M.Sc.
Technical Director/Meteorologist
jeff.lundgren@rwdi.com

RWDI
Suite 280 - 1385 West 8th Avenue
Vancouver, BC, V6H 3V9
T: 604.730.5688

EXECUTIVE SUMMARY

Teck Coal Ltd. (Teck) operates five open pit coal mine operations in the Elk Valley: Coal Mountain (CMO), Elkview (EVO), Line Creek (LCO), Greenhills (GHO) and Fording River (FRO). Each mine is authorized by permits issued by the British Columbia Ministry of Environment & Climate Change Strategy (BC ENV) under the *Environmental Management Act* to discharge emissions to the air. There is also a requirement under these permits for a Regional Air Monitoring Program (RAMP) that allows for an ongoing assessment of the efficacy of monitoring and to provide annual reporting summarizing the state of air quality and meteorology in the region.

There are nine monitoring sites that are part of the RAMP where Particulate Matter 10 micrometer diameter and less (PM_{10}), Particulate Matter 2.5 micrometer diameter and less ($PM_{2.5}$) and Total Suspended Particulate (TSP) concentrations are measured. The meteorological conditions of 2017 largely impacted particulate concentrations and exceedances. Decreased precipitation volumes in the winter led to higher PM readings, and increased forest fires throughout Western North America led to increased regional PM over the summer months. During 2017, daily averaged TSP readings above British Columbia Ambient Air Quality Objectives (BCAAQO) occurred four times; two at LCO – L10A and two at GHO-Elkford.

Ninety (90) daily average results of PM_{10} were observed above BCAAQO at 6 stations: sixty-five (65) at South Station (FRO – SS /E297832), thirteen (13) at Michel Creek road Residences (EVO – MCRR), six (6) at Elkford (GHO – Elkford/E290310), four (4) at Hosmer (CMO – Hosmer), one (1) at Andy Good Weather Station (CMO – AGWS/E297251), and one (1) at Downtown Air Monitoring Station (EVO – DTAM/E262137). Over half of the exceedances occurred during the months of July through October 2017, an exceptionally bad forest fire season. The BCAAQO for $PM_{2.5}$ is evaluated against the 98th percentile of the daily average $PM_{2.5}$ over 365 days. In addition, daily average data is compared to the BCAAQO to inform performance. Fifty-five (55) results of $PM_{2.5}$ were observed above BCAAQO at 6 stations: fourteen (14) at CMO-Hosmer, twelve (12) at GHO-Elkford (E290310), eleven (11) at EVO – MCRR, ten (10) at Whispering Winds Trailer Park (EVO – WWTPE0250184), and four (4) each at CMO – AGWS (E297251) and EVO – DTAM (E262137).

There were no results above BCAAQO over any averaging period for NO_2, SO_2 or CO.

Long temporal records of air quality measurements were not available for all monitoring stations, therefore, figures presenting inter-annual variability are presented but the trends are not discernible in all cases. The trend at LCO – L10A (E206189) showed a continued decrease in annual TSP concentrations in 2017 to more typical long term values. CMO – AGWS (E297251) and GHO – Elkford (E290310) continuous air monitoring stations show a slight increase in annual TSP concentrations. All stations showed increases in annual PM_{10} and $PM_{2.5}$ concentrations in 2017, likely due to contributions from forest fires, with CMO – Hosmer exceeding the annual BCAAQO.

There were some months and quarters where data completeness did not achieve the 75% requirement of the BC MOE, outlined in site specific permits. Only PM_{10} and $PM_{2.5}$ at CMO – Hosmer and NO_2 at EVO - DTAM did not achieve 75% data completeness on an annual basis. This was a result of instrument malfunctions. Neither instrument is required by any of the operations' permits.

Meteorological monitoring at sites include: wind speed and direction, air temperature (measured at nine stations) and precipitation (measured at four stations). Meteorological data were compared against 30 – year climate normals

measured in Sparwood. Overall, 2017 was found to be colder and drier than normal. All variability in meteorological monitoring between stations can be mainly attributed to differences in elevation, local topography and the siting of each station.

During 2017, Teck received and followed up on twenty-seven (27) pieces of feedback related to air quality and dust management in the Elk Valley, the majority of which occurring at Elkview Operations (24). The Elk Valley mines recognize dust as a primary concern to nearby communities and takes all feedback seriously.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1 INTRODUCTION

Teck Coal Limited (Teck) operates five open pit coal mines (the Sites) within the Elk Valley located in the southeastern Kootenay region of British Columbia (Figure 1). The Elk Valley is characterized by rugged terrain and localized mountain weather patterns. As with similar valleys in British Columbia, the mixing of air and dispersion of any pollutants it may contain is limited by a combination of topographic constraints and meteorological conditions. The communities of Elkford (population 2,500) and Sparwood (population 4,200) are the largest communities located in the vicinity of the Sites. Each mine, as outlined below, is authorized by permits issued by the British Columbia Ministry of Environment & Climate Change Strategy (ENV) under the *Environmental Management Act* to discharge emissions to the air:

- Coal Mountain Operations (CMO) – PA-4751
- Elkview Operations (EVO) – PA-1807
- Fording River Operations (FRO) – PA-1501
- Greenhills Operations (GHO) – PA-6249
- Line Creek Operations (LCO) – PA-5352

In 2014, site specific permits were amended in to include a condition which states:

Valley Wide Monitoring Plan

The Permittee must participate in a comprehensive ambient monitoring program that considers emissions from all Teck Coal Limited mines in the Elk Valley. This program must be prepared and implemented by a qualified professional. This program must be conducted to the satisfaction of the Director.

The Regional Air Monitoring Program (RAMP) aims to satisfy this requirement of the Site's individual permits. The monitoring program uses an Adaptive Management Framework to allow for continual assessment and adjustment of the program to ensure it continues to efficiently meet objectives over time.

This report forms part of the requirements of the RAMP. This report will cover air quality and meteorological monitoring conducted by Teck in the Elk Valley under the RAMP, as well as draw in outside sources where necessary and if available. This report will supplement the Mines' reporting according to their individual permits by providing an overall summary and linking back to site specific monitoring and mining activities as required, providing context for the monitoring results for the Elk Valley.

This report includes information on:

- results above provincial or federal ambient air quality objectives or guidelines and,
- temporal trends in ambient air quality concentrations.

In addition, as required to provide context for the ambient results, this report includes:

- public input to visibility or nuisance dusting issues;
- changes in Teck mining operations that may impact air quality;
- changes in Teck's dust management plan, and
- changes in Teck's ambient monitoring program.

Using an adaptive management framework, this annual report will also make recommendations to adjust the RAMP where needed.

2 MONITORING LOCATIONS

Air quality and meteorological monitoring is conducted at the Sites and in three different communities in the Elk Valley. There are currently 34 active individual stations operated by Teck at which various parameters are measured and are subsequently used for different purposes, including research and development, site fugitive dust management plans and ambient air quality monitoring. This section describes the nine stations and all parameters that are included in the RAMP that focuses on monitoring and assessing ambient air quality. These nine stations were chosen to provide a representative assessment of air quality and meteorology throughout the Elk Valley region. See Table 1 and Figure 1 for the locations of the monitoring stations and Table 2 for a description of the parameters measured at each of those monitoring stations as required under the RAMP. The criteria air contaminants (CACs) measured at these stations include:

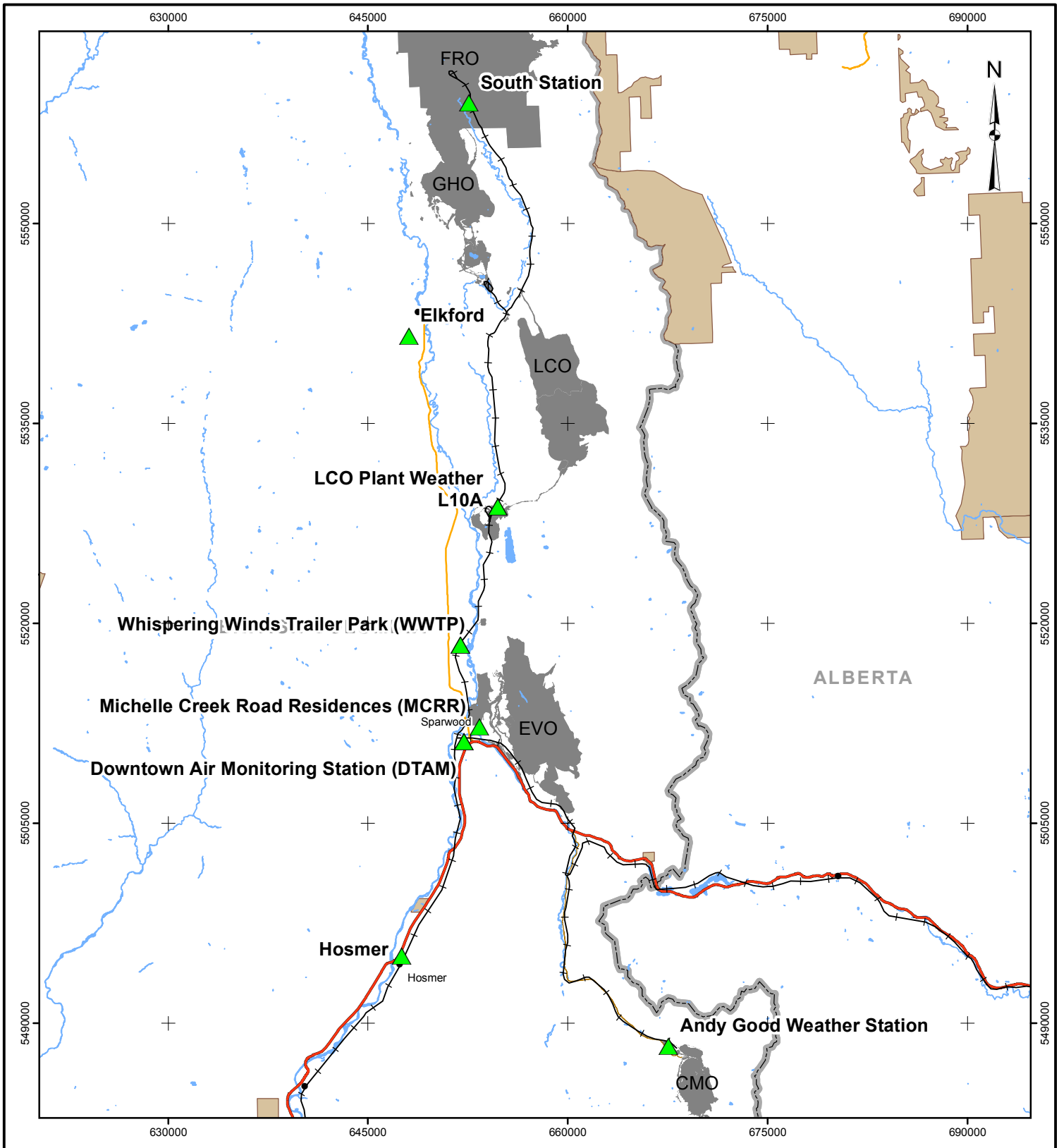
- TSP – Total Suspended Particulate
- PM_{10} – Particulate matter smaller than 10 µm in diameter
- $PM_{2.5}$ – Particulate matter smaller than 2.5 µm in diameter
- NO_2 – Nitrogen dioxide
- SO_2 – Sulphur dioxide
- CO – Carbon monoxide

Table 1: Location in decimal degrees and elevation in metres of the monitoring stations in the Regional Air Monitoring Program.

Station Name		Latitude (decimal degrees)	Longitude (decimal degrees)	Elevation (m)
CMO	Andy Good Weather Station (CMO - AGWS/E297251)[1]	49.523678	-114.684289	1493
	Hosmer	49.590260	-114.959234	1057
EVO	Downtown Air Monitoring Station (EVO - DTAM/E262137))	49.732811	-114.887683	1138
	Whispering Winds Trailer Park (EVO - WWTP/E0250184)	49.798506	-114.888639	1160
	Michel Creek Road Residences (EVO - MCRR)	49.743520	-114.872577	1150
LCO	L10A (LCO - L10A/E206189)	49.958750	-114.748035	1593
	LCO Plant Weather (E297050)	49.953143	-114.753542	1584
GHO	Elkford (GHO – Elkford/E290310)[2]	50.007808	-114.933668	1333
FRO	South Station (FRO - SS/E297832)[3]	50.148679	-114.856601	1582

Notes: Station name abbreviations along with station identifiers are included in parentheses beside the station name. Station names with regards to the valley wide monitoring program differ from those specified in the permits.

1- Named “Andy Good Spoils” in the Teck CMO permit PA 4751
2- Named “Rocky Mountain Elementary” in the Teck GHO permit PA 6249
3- Named “Sewage Treatment Facility Air Quality Station” in the Teck FRO permit PA 1501



LEGEND

- AIR MONITORING STATION
- CITY / TOWN / COMMUNITY
- CANADIAN PACIFIC RAILWAY
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- ROAD
- BRITISH COLUMBIA / ALBERTA PROVINCIAL BOUNDARY
- MINE OPERATIONS
- PROVINCIAL PARK
- WATERBODY

10 0 10

SCALE 1:400,000 KILOMETRES

PROJECT

TECK COAL REGIONAL
AIR MONITORING PROGRAM

TITLE

AIR MONITORING STATIONS

REFERENCE

Provincial Boundary and communities obtained from The Atlas of Canada, Natural Resources Canada. Alberta Hydrography obtained from CanVec, Government of Canada, Natural Resources Canada. BC Hydrography, Dominion Coal Blocks and project data obtained from Teck Coal Limited. Roads obtained from Geobase. Provincial parks and Railroad data obtained from Geogratis. Projection: UTM Zone 11 Datum: NAD 83

DRAFT

PROJECT No. 12-1349-0003			SCALE AS SHOWN	REV. 0
DESIGN	DR	03 Jan. 2014	FIGURE 1	
GIS	DJH	16 Mar. 2017		
CHECK	ABS	16 Mar. 2017		
REVIEW	TAD	16 Mar. 2017		

1500459_Teck_Monitoring_Figure 1_Monitoring Stations.mxd

Table 2: Parameters measured at each of the stations that are part of the Regional Air Monitoring Program.

Station Name		Air Quality Parameters							Meteorological Parameters						
		TSP	PM_{10}	$PM_{2.5}$	NO_2	CO	SO_2	Visual Viewshed	Wind Speed and Direction	Temperature	Relative Humidity	Barometric Pressure	Precipitation	Solar Radiation	Snow Depth
CMO	Andy Good Weather Station (CMO - AGWS/E297251)[3]	X	X	X				X	X	X			X		X
	Hosmer		X	X					X	X	X	X			
EVO	Downtown Air Monitoring Station (EVO - DTAM/E262137)		X[1]	X[1]	X	X	X	X	X	X	X				
	Whispering Winds Trailer Park (EVO - WWTP/E0250184)	X[2]	X[1]	X[1]					X	X	X				
	Michel Creek Road Residences		X	X					X	X	X				
LCO	L10A (LCO - L10A/E206189)	X[2]													
	LCO Plant Weather (E297050)								X	X			X		
GHO	Elkford (GHO – Elkford/E290310)[4]	X	X	X				X	X	X			X		
FRO	South Station (FRO - SS/E297832)[5]		X[1]						X	X	X		X	X	X

Notes: Station name abbreviations along with station identifiers are included in parentheses beside the station name. Station names with regards to the valley wide monitoring program differ from those specified in the permits

1- PM_{10} and $PM_{2.5}$ at these locations measured continuously using a Thermo 5030i SHARP
2- TSP at these locations are measured using a Hi-Volume sampler per the National Air Pollution Surveillance schedule
3- Named “Andy Good Spoils” in the Teck CMO permit PA 4751
4- Named “Rocky Mountain Elementary” in the Teck GHO permit PA 6249
5- Named “Sewage Treatment Facility Air Quality Station” in the Teck FRO permit PA 1501

3 AIR QUALITY RESULTS

As shown in Table 2, six air quality parameters were measured across Teck's regional monitoring network. The results of the monitoring in 2017 and the longer-term trends are discussed in this section. These results include a discussion of the number of excursions and/or results above applicable BC Provincial Ambient Air Quality Objectives (BCAAQO) for each air contaminant that is monitored (see Table 3 and Table 5), as well as the completeness of the datasets for PM and gases at the monitoring stations. Appendices A and B also provide more detailed information on air quality for 2017.

Figure 2 through Figure 7 and figures in Appendix B show time series of CAC concentrations measured at all stations within the regional monitoring network and Table 4 shows the annual means of particulate matter concentrations at all stations.

Table 3: BC Ambient Air Quality Objectives for each air contaminant that is monitored at any of the stations covered by this report.

Contaminant	BCAAQO / BC PCO	1-Hour	8-Hour	24-Hour	Annual
$PM_{2.5}$ (µg/m^3)	BCAAQO[2]			25[3]	8
PM_{10} (µg/m^3)	BCAAQO[2]			50	
TSP (µg/m^3)	BCAAQO[2]			120	60[6]
NO_2 (µg/m^3)	BCAAQO[2]	188[4]			60
SO_2 (µg/m^3)	BCAAQO[2]	196[5]			
CO (µg/m^3)	BC PCO[1]	14,300	5,500		

Notes:

1- BC PCO refers to the BC Ambient Air Quality Objectives, BC Pollution Control Objectives (BC MOE, 2016)
2- BCAAQO refers to the Provincial Ambient Air Quality Objective (BC MOE, 2016)
3- The $PM_{2.5}$ BC AAQO is based on 98th percentile values; therefore an exceedance is defined as occurring only after six excursions have occurred.
4- The NO_2 BC interim AAQO is based on the 98th percentile of the daily maximum 1-hour value. Therefore, an exceedance is defined as occurring only after six excursions have occurred.
5- The SO_2 BC interim AAQO is based on the 98th percentile of the daily maximum 1-hour value. Therefore, an exceedance is defined as occurring only after 3 excursions have occurred.
6- The annual TSP BCAAQO is based on the geometric mean.

3.1 Total Suspended Particulate (TSP)

Figure 2 shows the time series of 24-hour average TSP concentrations for the three stations at which TSP is measured as well as the BCAAQO for TSP of 120 µg/m^3. Figure 2 and Table 5 show that there were four values greater than the 24-hour objective: two at LCO – L10A and two at GHO-Elkford. At CMO- AGWS, TSP remained below the objective. Of the four TSP concentrations above the objective, three occurred in late August/early September during the period when many air quality advisories were issued; caused by forest fires in Western North America. The proximity of LCO – L10A to the train loadout at LCO may contribute to the higher TSP

concentrations seen at this location for time periods outside of the forest fire season. LCO – LC10A remained below the annual BCAAQO of 60 µg/m^3 for TSP (see Table 4, Table 6 and Figure 8) in 2017.

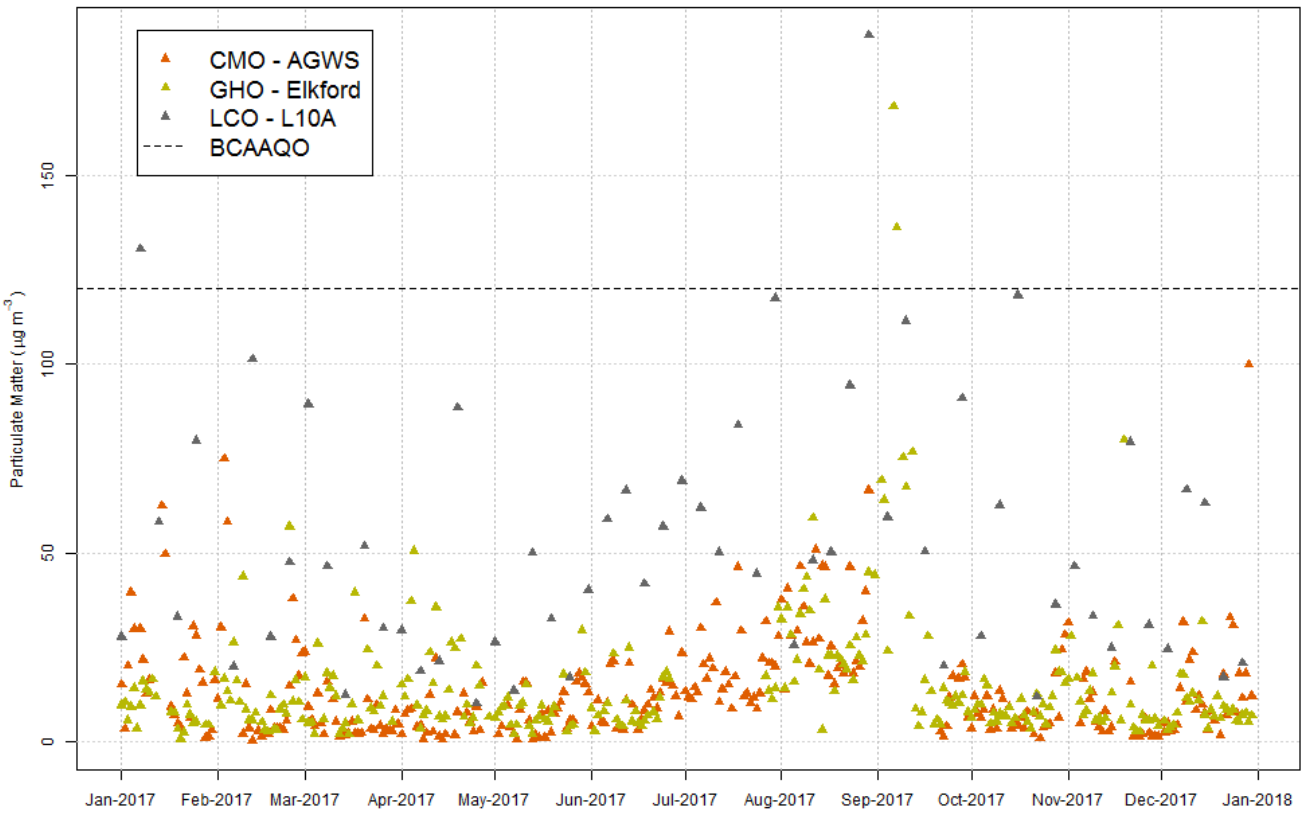


Figure 2: Daily Averaged TSP Concentrations. The BCAAQO of 120 µg/m^3 is indicated by a dashed line.

3.2 PM_{10}

Figure 3 shows the time series of the 24-hour average PM_{10} concentrations at seven stations as well as the BCAAQO of 50 µg/m^3. Figure 3 and Table 5 show that there were 90 daily average results above the BCAAQO, 65 at FRO- SS, thirteen (13) at EVO – MCRR, six (6) at GHO – Elkford, four (4) at CMO – Hosmer, one (1) at CMO – AGWS, and one (1) at EVO – DTAM. Over half of the daily averaged concentrations above the BCAAQO occurred during the months of July through October 2017. This period was an exceptionally bad forest fire season with numerous air quality advisories issued for the East Kootenays.

Results above the BCAAQO for FRO – SS during July through October the results are likely from elevated regional concentrations from forest fires, as concentrations above objectives are seen at almost all stations during this time period. PM_{10} results above objectives in January and December correspond to lower than average precipitation volumes.

Aside from FRO – SS, with the exception of CMO – Hosmer and EVO – MCRR, all of the exceedances occurred during the forest fire season. CMO – Hosmer shows one daily averaged concentration greater than the objective

in November, when other stations do not (EVO – DTAM, EVO – MCRR and CMO – AGWS). At the time, slash burning was being performed in the area (Fernie, 2017) and may have contributed to increase PM concentrations. The predominant wind direction at CMO – Hosmer (Figure 11) is from the Southwest, away from Teck sites.

Outside of the forest fire season, EVO – MCRR has results above the BCAAQO in February and December. The predominant wind direction at EVO - MCRR (Figure 11) is from the South. The higher concentrations observed in February and December could be linked to smoke from heating local homes with wood stoves.

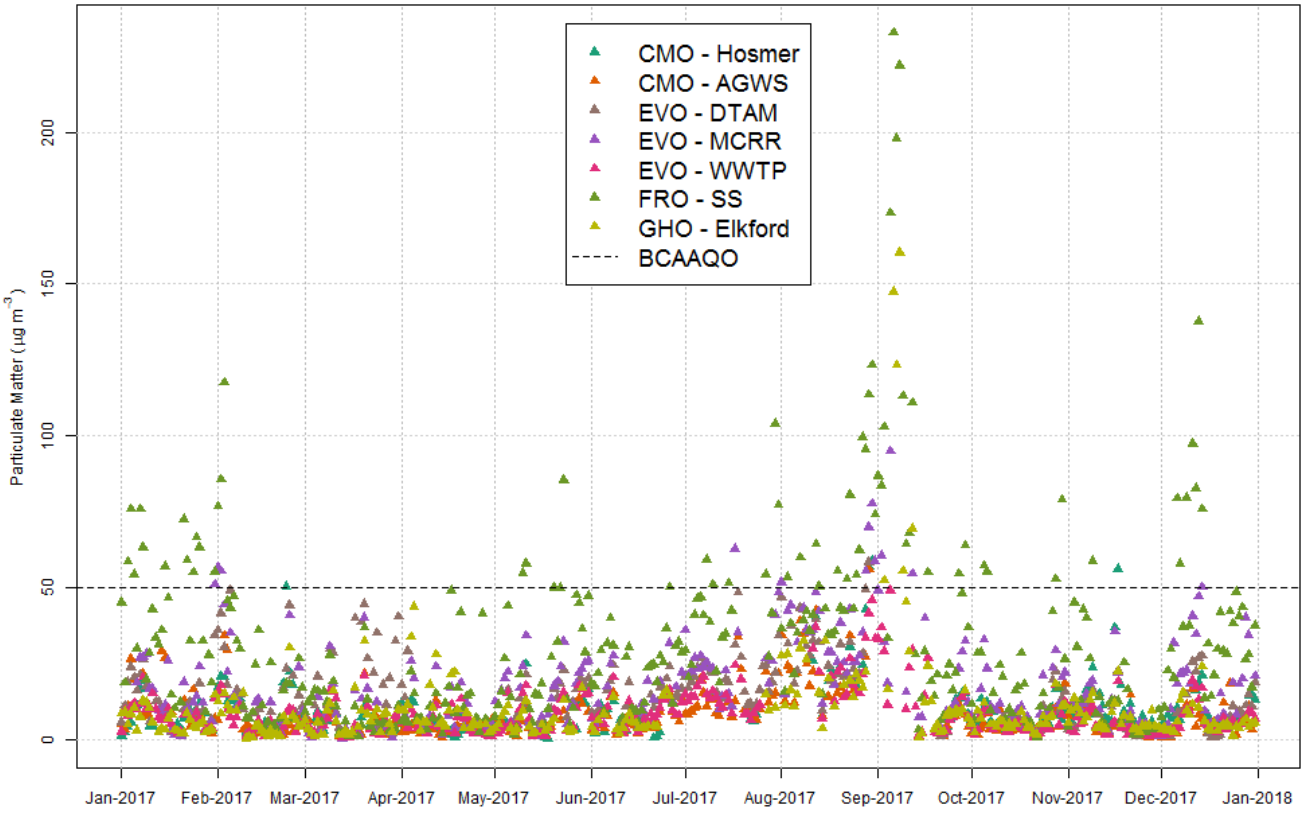


Figure 3: Daily Averaged PM10 Concentrations. The BCAAQO of 50 µg/m^3 is indicated by a dashed line.

3.3 $PM_{2.5}$

The term excursion is used here to describe a single 24-hour average that exceeds the numerical value of the BCAAQO. The 24-hour objective for $PM_{2.5}$ defines an exceedance based on the 98th percentile of the daily average over one year. Table A-13 in Appendix A provides the 98th percentile of $PM_{2.5}$ for each station. It is shown that the $PM_{2.5}$ 98th percentiles were above the BCAAQO at CMO – Hosmer, EVO – MCRR, EVO – WWTP and GHO – Elkford.

Figure 5 shows the time series of the 24-hour average $PM_{2.5}$ concentrations at six stations as well as the BCAAQO of 25 µg/m^3. Figure 5 and Table 5 show that there were 55 excursions above the 24-hour $PM_{2.5}$ BCAAQO. The annually averaged $PM_{2.5}$ concentration at CMO - Hosmer were greater than the BCAAQO of 8 µg/m^3, however this

station did not meet the minimum 75% completeness criterion for the year and comparison of the annual average to the objective is for indicative purposes only. Annually averaged $PM_{2.5}$ concentrations at the EVO – MCRR and GHO – Elkford stations were greater than the BC planning goal of 6 µg/m^3 (see Table 4). Fifty-two of the 55 excursions occurred during the months of July through October 2017. This period was an exceptionally bad forest fire season with numerous air quality advisories issued for the East Kootenays. The remaining three excursions all occurred on November 16 or 17, 2017 at either CMO – AGWS (1 excursion) or CMO – Hosmer (2 excursions). The $PM_{2.5}$ excursions observed at CMO – Hosmer coincide with PM_{10} concentrations that were higher than the BCAAQO on November 17, 2017. At the time, slash burning was being performed in the area (Fernie, 2017).

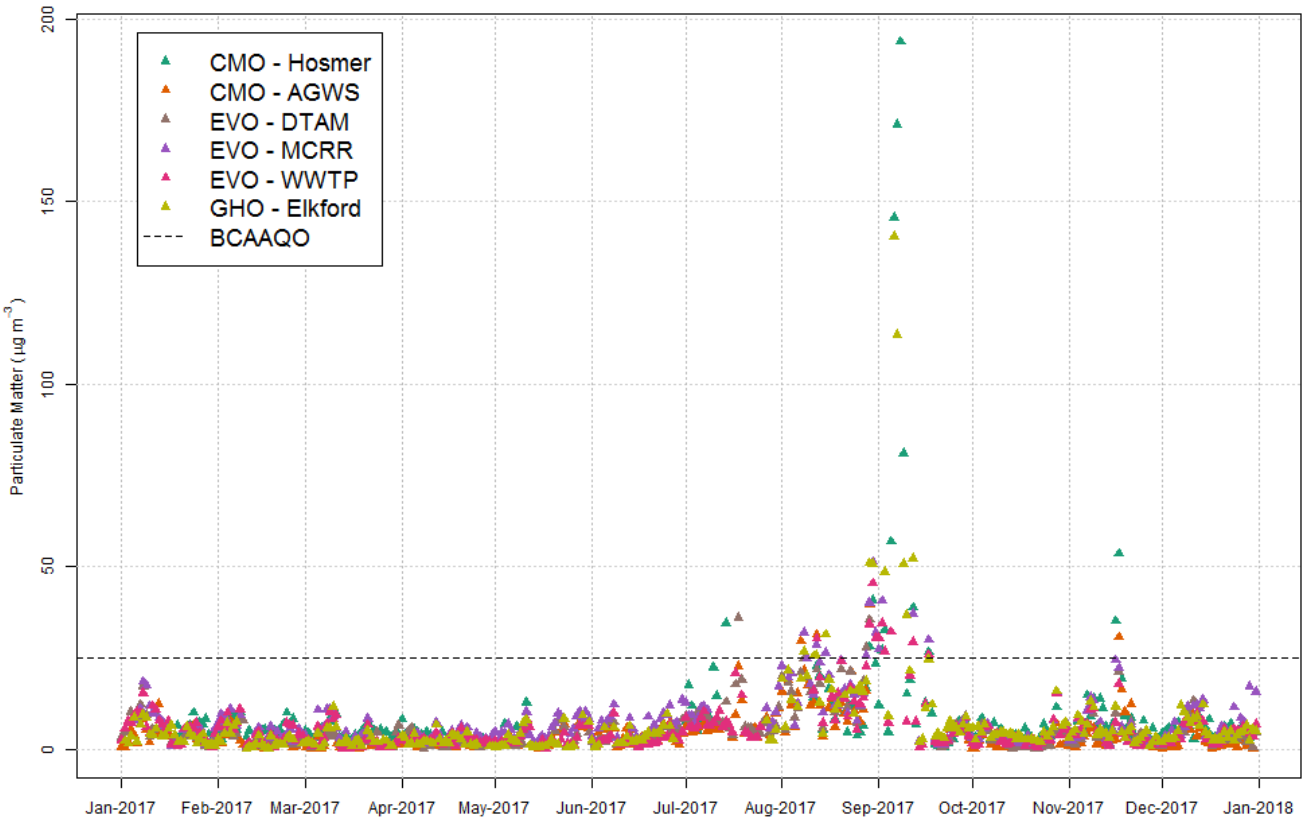


Figure 4: Daily Averaged $PM_{2.5}$ Concentrations. The BCAAQO of 25 µg/m^3 is indicated by a dashed line.

3.4 Gases

Figures 6 through 8 show the time series of concentrations of NO_2, CO and SO_2 respectively at the EVO – DTAM station as well as the relevant BCAAQO for each gas. These three figures as well as Table 5 show that there were no results above the applicable BCAAQO for any of these CACs over any averaging period during 2017. While there was no CO exceedance in 2017, the elevated concentrations observed in September 2017 are also attributable to forest fires during this time period.

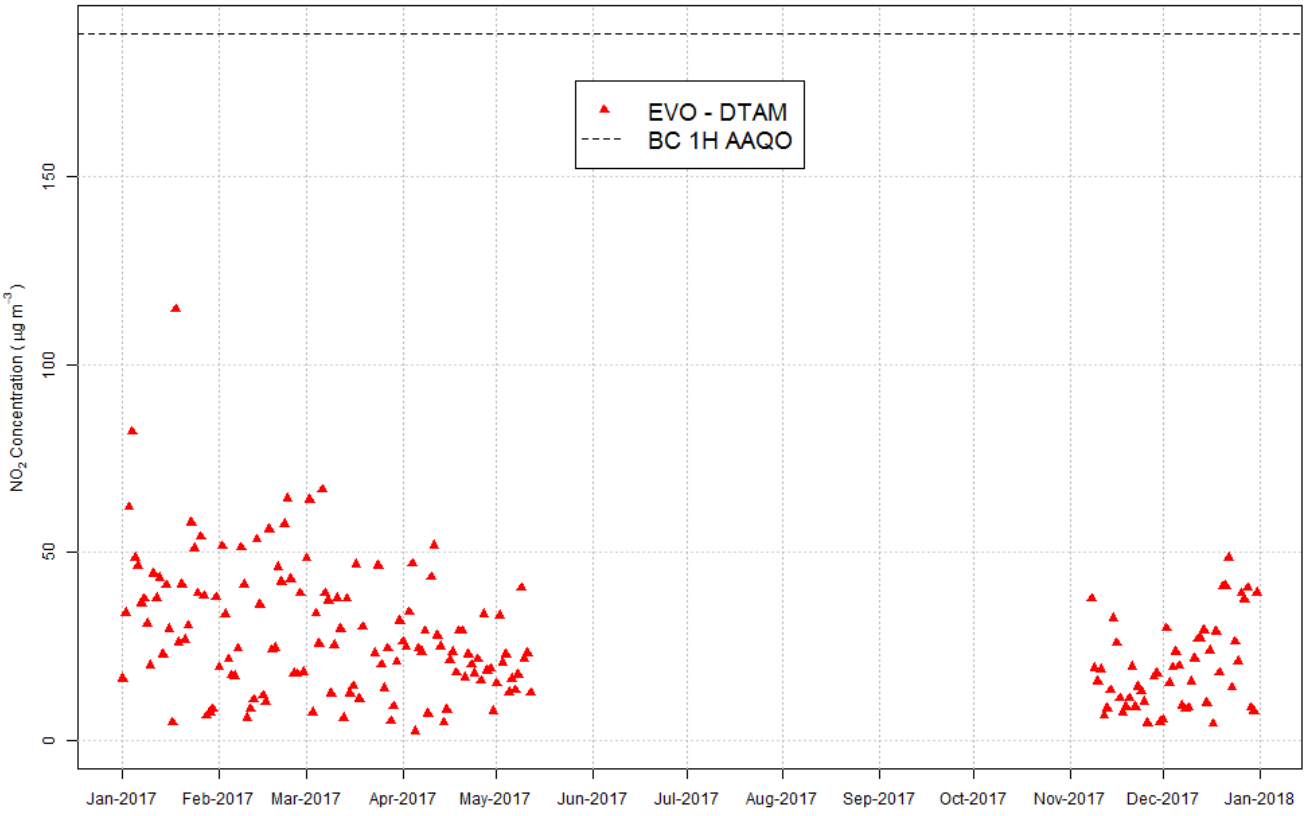


Figure 5: Daily 1-hour Maximum NO_2 Concentrations from EVO – DTAM. The BCAAQO of 188 µg/m^3 is indicated by a dashed line.

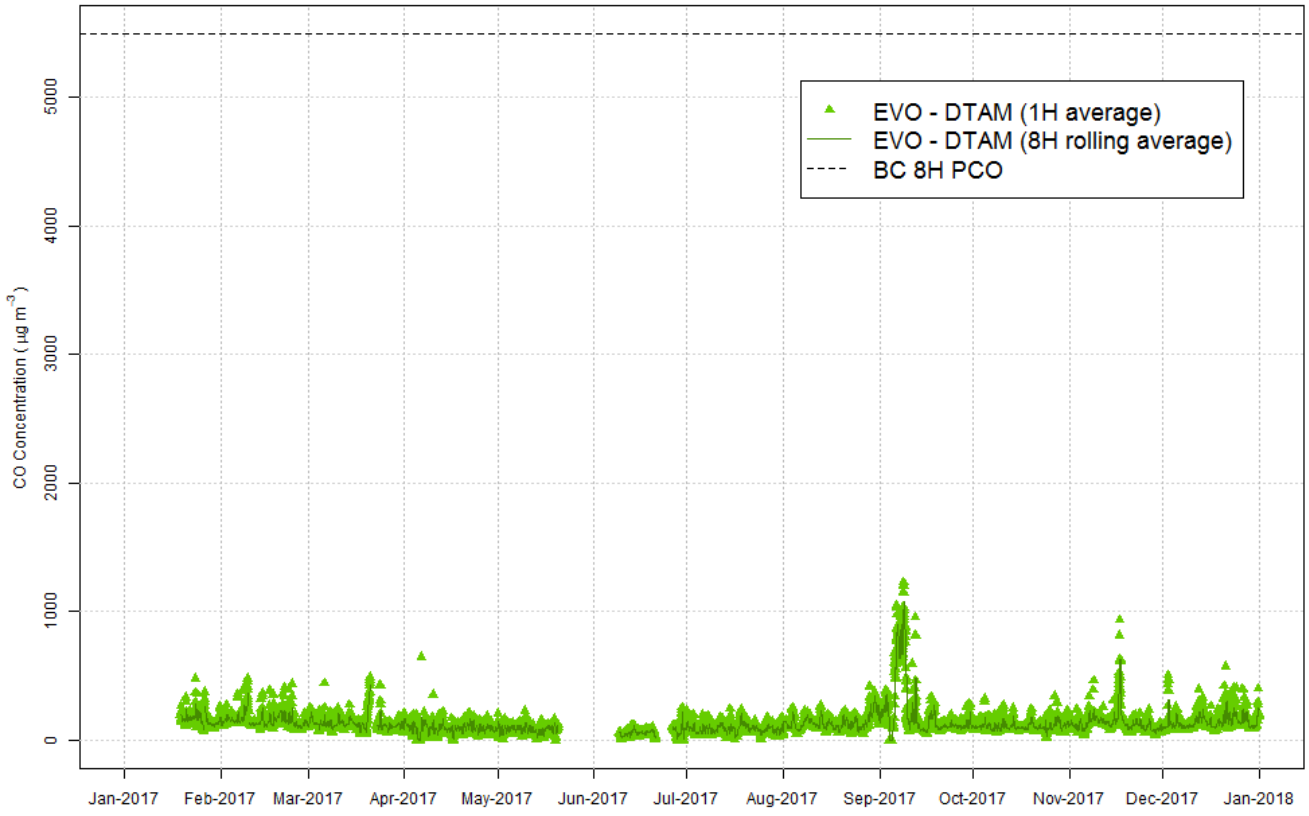


Figure 6: 1-hour and 8-hour Rolling Averaged CO Concentrations from EVO – DTAM. The BC 8H PCO of 5500 µg/m^3 is indicated by a dashed line. The BC 1H PCO of 14300 µg/m^3 was omitted for better presentation of the data.

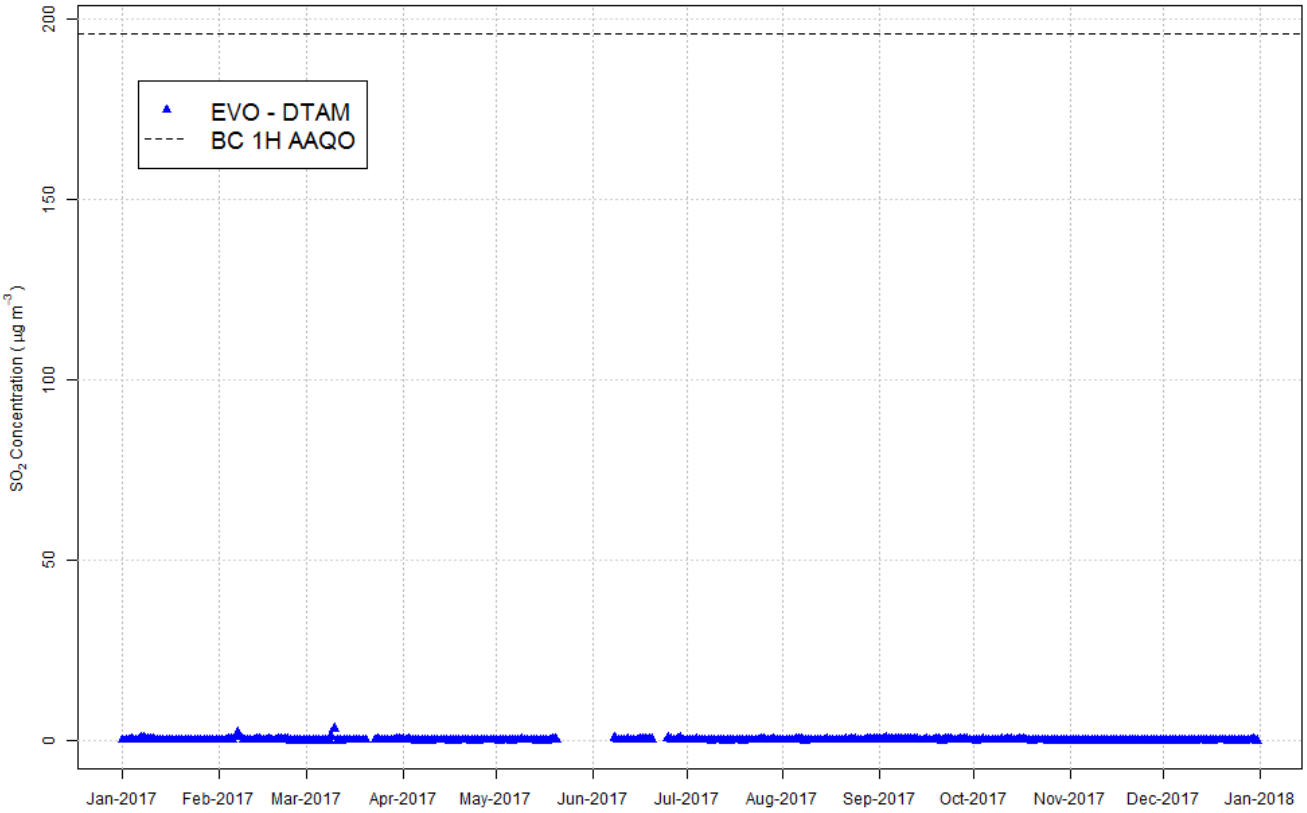


Figure 7: Daily 1-hour Maximum SO_2 Concentrations from EVO – DTAM. The BCAAQO of 196 µg/m3 is indicated by a dashed line.

Table 4: Annual Means of Particulate Matter Concentrations from Each Station for 2017

Station Name		TSP [(1)](µg/m³) Annual BCAAQO of 60 µg/m³	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³) Annual BCAAQO of 8 µg/m³
CMO	AGWS	5.8	8.6	4.2
	Hosmer		9.3	9.4
EVO	DTAM		14.3	5.3
	MCRR		16.7	7.6
	WWTP		8.9	5.8
LCO[(2)]	L10A	42.8		
GHO	Elkford	7.9	10.6	7.4
FRO	SS		31.1	

Notes: Annual means for all parameters and stations except LCO – L10A are calculated from hourly values.
(1): Annual average of TSP is calculated as the geometric mean to allow comparison with the BCAAQO.
(2): Annual average of daily means was used for LCO due to it being a non-continuous particulate monitor.

Table 5: Total Number Results above BCAAQO and Excursions for 2017

Station Name		Contaminant	Threshold		Excursions or exceedances	
					Total Number	Percentage
CMO	AGWS	TSP	NAAQO [1]	(120 µg/m^3)	0	0.00
		PM_{10}	BCAAQO[2]	(50 µg/m^3)	1	0.33
		$PM_{2.5}$	BCAAQO[3]	(25 µg/m^3)	4	1.21
	Hosmer	PM_{10}	BCAAQO[2]	(50 µg/m^3)	4	1.53
		$PM_{2.5}$	BCAAQO[3]	(25 µg/m^3)	14	5.36
EVO	DTAM	PM_{10}	BCAAQO[2]	(50 µg/m^3)	1	0.34
		$PM_{2.5}$	BCAAQO[3]	(25 µg/m^3)	4	1.19
		NO_2	BCAAQO[4]	(188 µg/m^3)	0	0.00
		CO (1-hour avg)	BC PCO	(14,300 µg/m^3)	0	0.00
		CO (8-hour avg)	BC PCO	(5,500 µg/m^3)	0	0.00
		SO_2	BCAAQO[5]	(200 µg/m^3)	0	0.00
	MCRR	PM_{10}	BCAAQO[2]	(50 µg/m^3)	13	3.95
		$PM_{2.5}$	BCAAQO[3]	(25 µg/m^3)	11	3.57
	WWTP	PM_{10}	BCAAQO[3]	(50 µg/m^3)	0	0.00
		$PM_{2.5}$	BCAAQO[3]	(25 µg/m^3)	10	2.95
LCO	L10A	TSP	NAAQO[1]	(120 µg/m^3)	2	3.33
GHO	Elkford	TSP	NAAQO[1]	(120 µg/m^3)	2	0.68
		PM_{10}	BCAAQO[2]	(50 µg/m^3)	6	2.03
		$PM_{2.5}$	BCAAQO[3]	(25 µg/m^3)	12	3.99
FRO	SS	PM_{10}	BCAAQO[2]	(50 µg/m^3)	65	18.36

Notes:

1- BC PCO refers to the BC Ambient Air Quality Objectives, BC Pollution Control Objectives (BC MOE, 2016)
2- BCAAQO refers to the Provincial Ambient Air Quality Objective (BC MOE, 2016)
3- The $PM_{2.5}$ BC AAQO is based on 98th percentile values; therefore an exceedance is defined as occurring only after six excursions have occurred.
4- The NO_2 BC interim AAQO is based on the 98th percentile of the daily maximum 1-hour value. Therefore, an exceedance is defined as occurring only after six excursions have occurred.
5- The SO_2 BC interim AAQO is based on the 98th percentile of the daily maximum 1-hour value. Therefore, an exceedance is defined as occurring only after 3 excursions have occurred.

3.5 Inter-annual Variability of Air Quality Measurements

As part of the analysis of air quality within the Elk Valley region, an examination of inter-annual variability in annual average CAC concentrations at all stations is presented below. A long-term record, dating from the year 2000, using a Hi-Vol intermittent sampler is available from LCO - L10A only. Hi-Vol sampling at other locations has

been discontinued. All other locations use continuous Thermo Scientific SHARP PM monitors. The longest records for these types of samplers are from GHO – Elkford, which began operation in late 2010, and CMO - AGWS which began operation in 2011. All other monitors have records that are four years or less in length. Due to the lack of long term records at most sites, it is difficult to determine temporal trends in CAC concentrations.

Table 6 and Figure 8 show the inter-annual trends of TSP concentrations. LCO – L10A shows relatively small variation from year to year with no overall trend, except for the years 2011-2014 when the annual TSP concentration was above the objective. CMO – AGWS has shown similar concentrations with no trend until 2016, with slightly lower concentrations observed in 2016 and 2017. GHO – Elkford has shown a slight upward trend in TSP.

Table 6: Annual Means of TSP Concentrations (geometric means)

Year	CMO AGWS TSP (µg/m^3)	GHO ElkFord TSP (µg/m^3)	LCO L10A (µg/m^3)
2000			42.5
2001			45.4
2002			49.2
2003			39.1
2004			40.8
2005			43.5
2006			41.1
2007			41.0
2008			44.9
2009			47.4
2010		1.7	48.0
2011	7.0	2.6	61.9
2012	7.9	6.2	76.3
2013	7.8	5.9	63.4
2014	7.0	5.9	61.8
2015	8.5	6.9	47.3
2016	5.7	7.1	43.5
2017	5.8	7.9	42.8

Notes:

- Cells highlighted in pink and red denote values for which the data was less than 75% complete
- CMO – AGWS TSP measurements began on 2011-10-03
- GHO – Elkford TSP measurements began on 2010-11-03

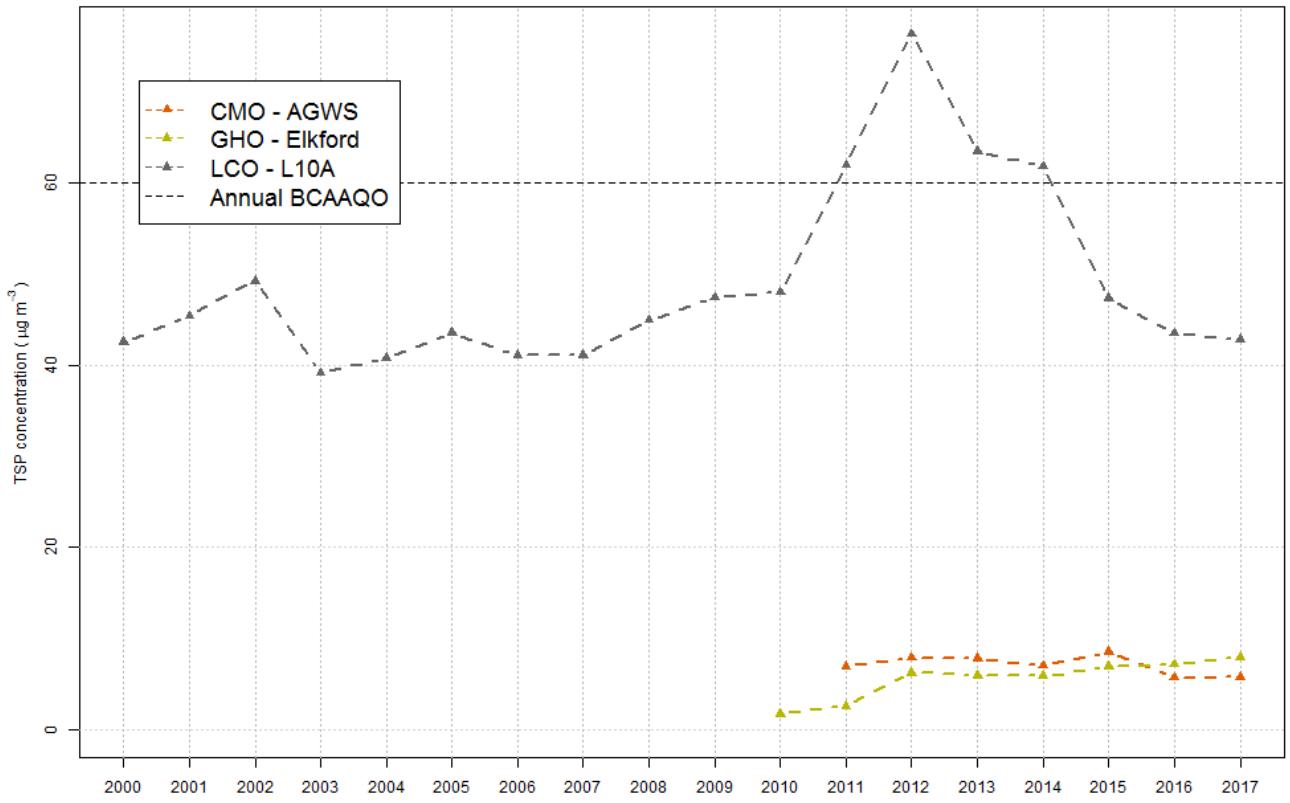


Figure 8: Time Series of Annual Averages of TSP Concentration since Station Inception (geometric mean). The annual BCAAQO of 60 µg/m3 is indicated by a dashed line.

Table 7 and Figure 9 show the inter-annual trends of PM_{10} concentrations. GHO- Elkford and CMO – AGWS show slight increases over the period of record while the record is too short at all other stations to establish any temporal trends. Annual average PM_{10} concentrations in 2017 increased at all stations, reflecting, in part, the higher regional PM_{10} concentrations observed through the forest fire season.

Table 7: Annual Means of PM_{10} Concentrations

Year	CMO		EVO			FRO	GHO
	Hosmer PM_{10} ($\mu g/m^3$)	AGWS PM_{10} ($\mu g/m^3$)	DTAM PM_{10} ($\mu g/m^3$)	MCRR PM_{10} ($\mu g/m^3$)	WWTP PM_{10} ($\mu g/m^3$)	SS PM_{10} ($\mu g/m^3$)	Elkford PM_{10} ($\mu g/m^3$)
2010							5.8
2011		8.9					7.3
2012		10.4					8.4
2013	6.7	8.9				12.7	8.3
2014	10.0	9.3	14.3	15.1	9.9	25.5	9.8
2015	10.2	12.1	10.1	15.4	7.8	25.1	9.6
2016	8.2	8.4	10.8	12.4	6.4	17.0	7.0
2017	9.3	8.6	14.3	16.7	8.9	31.1	10.6

Notes:

- Cells highlighted in pink and red denote values for which the data was less than 75% complete
- CMO – Hosmer PM_{10} measurements began on 2013-11-07
- CMO – AGWS PM_{10} measurements began on 2011-10-03
- EVO – DTAM PM_{10} measurements began on 2014-01-18
- EVO – MCRR PM_{10} measurements began on 2014-01-23
- EVO – WWTP PM_{10} measurements began on 2014-01-23
- FRO – SS PM_{10} measurements began on 2013-12-21
- GHO – Elkford PM_{10} measurements began on 2010-11-03

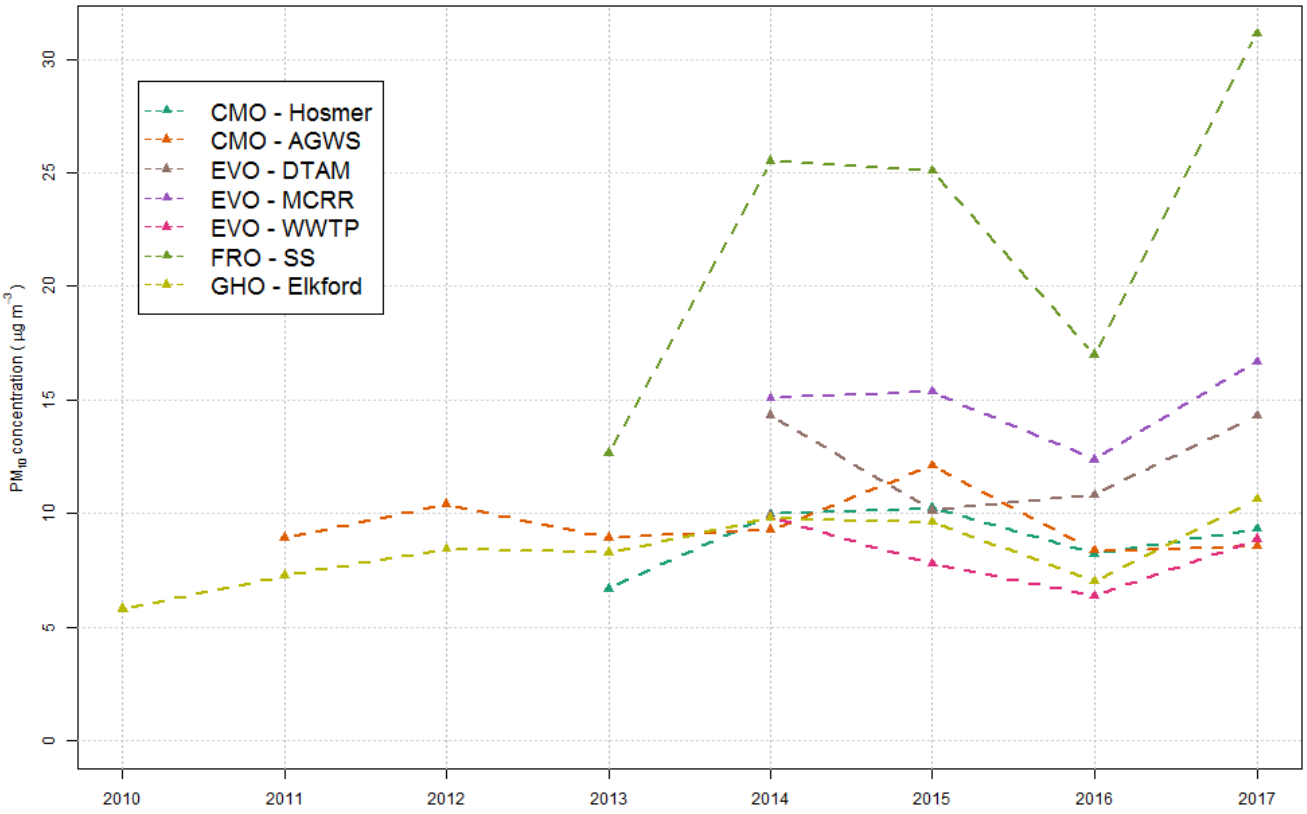


Figure 9: Time Series of Annual Averages of PM_{10} Concentration since Station Inception

Table 8 and Figure 10 show the inter-annual trends of $PM_{2.5}$ concentrations. Annual average $PM_{2.5}$ concentrations in 2017 increased at all stations reflecting the higher regional $PM_{2.5}$ concentrations observed through the forest fire season. The annual $PM_{2.5}$ concentration at CMO – Hosmer is above the annual BCAAQO.

Table 9 shows the annual average gas concentrations for the two years available at the EVO – DTAM location.

Table 8: Annual Means of $PM_{2.5}$ Concentrations

Year	CMO		EVO			GHO
	Hosmer $PM_{2.5}$ ($\mu g/m^3$)	AGWS $PM_{2.5}$ ($\mu g/m^3$)	DTAM $PM_{2.5}$ ($\mu g/m^3$)	MCRR $PM_{2.5}$ ($\mu g/m^3$)	WWTP $PM_{2.5}$ ($\mu g/m^3$)	Elkford $PM_{2.5}$ ($\mu g/m^3$)
2010						6.4
2011		3.2				3.7
2012		4.2				4.6
2013	6.6	3.9				4.2
2014	6.2	4.2	6.9	5.1	5.2	4.7
2015	6.8	6.1	5.5	5.8	5.4	4.9
2016	5.7	3.7	4.6	4.8	3.7	3.6
2017	9.4	4.2	5.3	7.6	5.8	7.4

Notes:

- Cells highlighted in pink and red denote values for which the data was less than 75% complete
- CMO – Hosmer $PM_{2.5}$ measurements began on 2013-11-07
- CMO – AGWS $PM_{2.5}$ measurements began on 2011-10-03
- EVO – DTAM $PM_{2.5}$ measurements began on 2014-01-18
- EVO – MCRR $PM_{2.5}$ measurements began on 2014-01-23
- EVO – WWTP $PM_{2.5}$ measurements began on 2014-01-23
- GHO – Elkford $PM_{2.5}$ measurements began on 2010-11-03

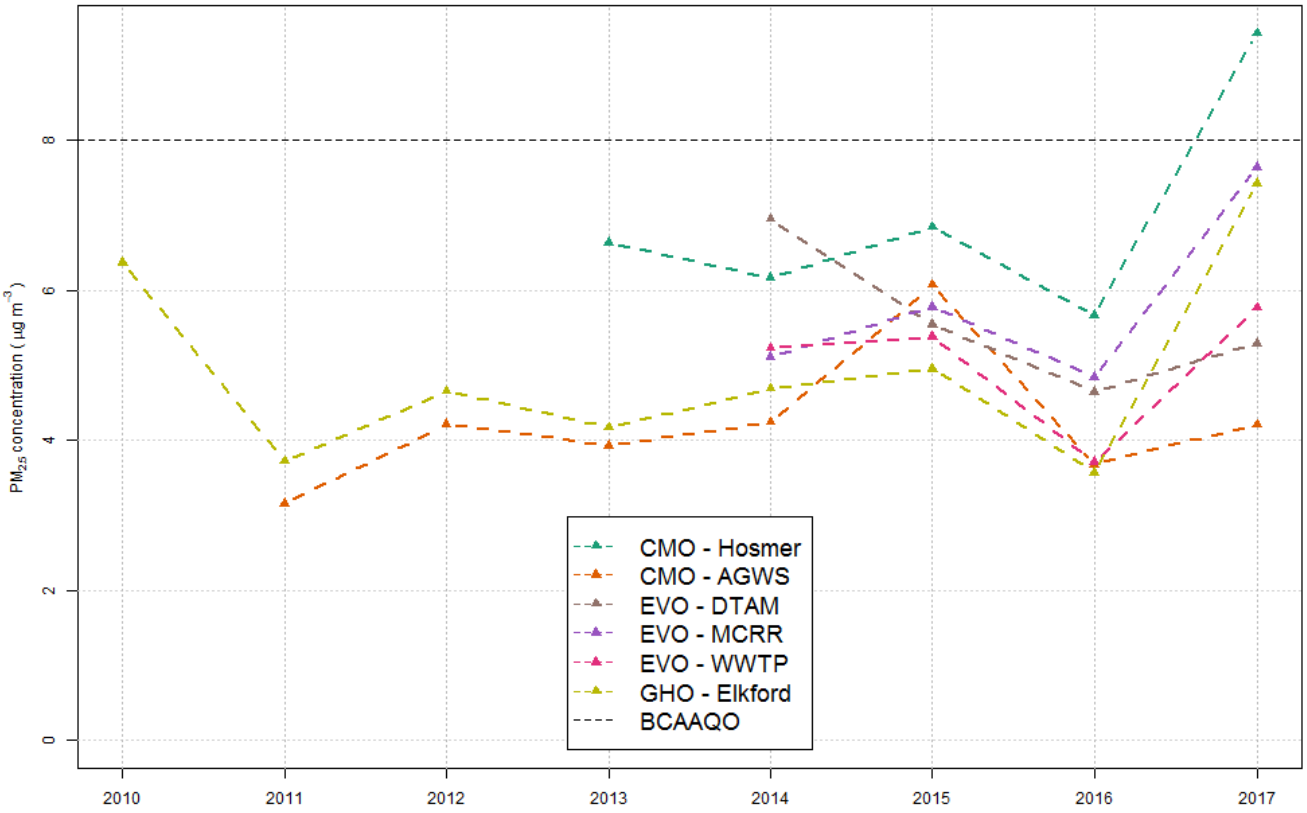


Figure 10: Time Series of Annual Averages of $PM_{2.5}$ Concentration since Station Inception

Table 9: Annual Means of Gas Concentrations

Year	EVO - DTAM		
	NO_2 ($\mu g/m^3$)	CO ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)
2014	8.5	189	0.1
2015	7.6	190	0.2
2016	6.2	287	0.2
2017	10.4	130	0.06

Notes:

- Cells highlighted in pink and red denote values for which the data was less than 75% complete

3.6 Data Completeness

The permit for each of the Teck mines states that continuous data for a given time period will be considered valid if 75% of the data for that time period has been captured. Non-continuous data for a given time period will be considered valid if 85% of the data for that time period has been captured. Tables A-1 through A-4 (Appendix A)

provide the number of valid hours and days of data per time period for TSP, PM_{10}, $PM_{2.5}$ and for the gases respectively. Cells highlighted in pink indicate periods that do not meet completeness objectives to be considered valid. Following an agreement between the Sites and ENV, the days during which annual maintenance were performed or extended maintenance involving notification to the ENV were removed from the possible number of days.

The following periods were removed from the data completeness calculations for a station due to all instruments at that station being removed for annual maintenance:

- CMO – AGWS: August 30 to September 20.
- CMO – Hosmer: July 26 to August 8.
- GHO – Elkford: June 28 to July 19.
- FRO – SS: July 19 to July 26.
- EVO – DTAM: August 30 to September 20.
- EVO – MCRR: July 19 to July 26.
- EVO – WWTP: July 26 to August 10.

Additionally, BC ENV was notified about an extended outage of PM_{10} at EVO-DTAM due a sample leak which led to only 5 days in April and 27 days of data in May remaining.

3.6.1 TSP

TSP measurements at CMO – AGWS met the objective for data completeness during all of the periods that were examined.

TSP measurements at GHO – Elkford did not meet the 75% completeness objective during the month of July however, this did not cause the completeness for the third quarter to be below the threshold. Completeness was greater than 75% for all other periods considered.

The LCO - L10A Hi-Vol station met the 85% completeness criterion for validity based on collection scheduled every six days for all months except January when it only sampled 5 out of 6 days.

3.6.2 PM_{10}

PM_{10} measurements at CMO – AGWS met the objective for data completeness during each month of the year.

PM_{10} measurements at CMO – Hosmer Station did not meet the 75% completeness objective for the months of May, June, July, and September. These invalid periods are also reflected in the second and third quarters of 2017 as well as for the year as a whole. The prolonged outage was due to limited site access that prevented technical staff from conducting repairs. The data completeness criterion of 75% was used for this station for illustrative purposes only as it is a non-permitted location and is not bound by this requirement for compliance.

PM_{10} measurements at EVO - DTAM did not meet the 75% completeness objective for the months of April, September and October. The outage in April was due to a leak in the sample line that required that the

instrument be removed from site for repairs. The outage in September and October was due to a failure of the sample pump. The outage in April is also reflected in the second quarter of 2017. Data completeness for the third or fourth quarters met the 75% threshold.

PM_{10} measurements at EVO – MCRR did not meet the 75% completeness objective for the month of September. This did not affect the third quarter: completeness was greater than 75% for all other periods considered.

PM_{10} measurements at EVO – WWTP and FRO – SS met the objective for data completeness during all of the periods that were examined

PM_{10} measurements at GHO – Elkford did not meet the 75% completeness objective for the months of July and August due to unstable readings caused by an issue with the unit's thermal correction coefficients. This invalid period is also reflected in the third quarter of 2017.

3.6.3 $PM_{2.5}$

$PM_{2.5}$ measurements at CMO – AGWS met the objective for data completeness during every month of the year.

$PM_{2.5}$ measurements at CMO – Hosmer did not meet the 75% completeness objective for the months of January, May, June and July. These invalid periods are also reflected in the second quarter of 2017 as well as for the year as a whole. The prolonged outage was due to limited site access that prevented technical staff from conducting repairs. The data completeness criterion of 75% was used for this station for illustrative purposes only as it is a non-permitted location and is not bound by this requirement for compliance.

$PM_{2.5}$ measurements at EVO – DTAM, and EVO – WWTP met the objective for data completeness during all of the periods that were examined.

$PM_{2.5}$ measurements at EVO – MCRR did not meet the 75% completeness objective for the months of March, July, and September, and consequently, the third quarter. The downtime in March was due to a malfunction of the tape advancement system; the outage in July was caused by a failure of the sample pump prior to removal of the unit for annual maintenance and the downtime in September was caused by an extended period during which $PM_{2.5}$ exceeded PM_{10} by more than twice the instrumental precision. When this occurs and neither instrument can be identified as having a specific problem, data from both are invalidated.

$PM_{2.5}$ measurements at GHO – Elkford did not meet the 75% completeness objective for the month of July due to unstable readings caused by an issue with the unit's thermal correction coefficients. The station met the requirement for data completeness during the remaining months and every quarter of the year.

3.6.4 Gases

A malfunction of the climate control unit in the environmental enclosure housing the gas monitors at EVO – DTAM in May caused all three gas monitors to overheat and suffer catastrophic damages. All three units needed to be taken offline for significant repairs and were re-installed in June. The Thermo 42i that measures NO2 had

additional leftover damage that required further repairs until November when the unit was returned to proper working order.

As a consequence, data from the NO_2 monitor did not meet the 75% completeness objective during the months of May through November, leading to insufficient completeness for the second, third and fourth quarter of 2017 as well as the year as a whole. Data from the CO monitor did not meet the 75% completeness objective during the months of January, May, and June 2017, and consequently the second quarter. Data from the SO_2 monitor did not meet the 75% completeness objective during the months of May and June 2017, and consequently the second quarter.

4 METEOROLOGY RESULTS

4.1 Wind Speed and Direction

Figure 11 shows wind roses for the eight stations included in the RAMP. The differences between stations in wind speed and direction that are apparent in the wind roses are mainly attributed to differences between local topography and, to a lesser extent, small scale surface features such as proximity to trees.

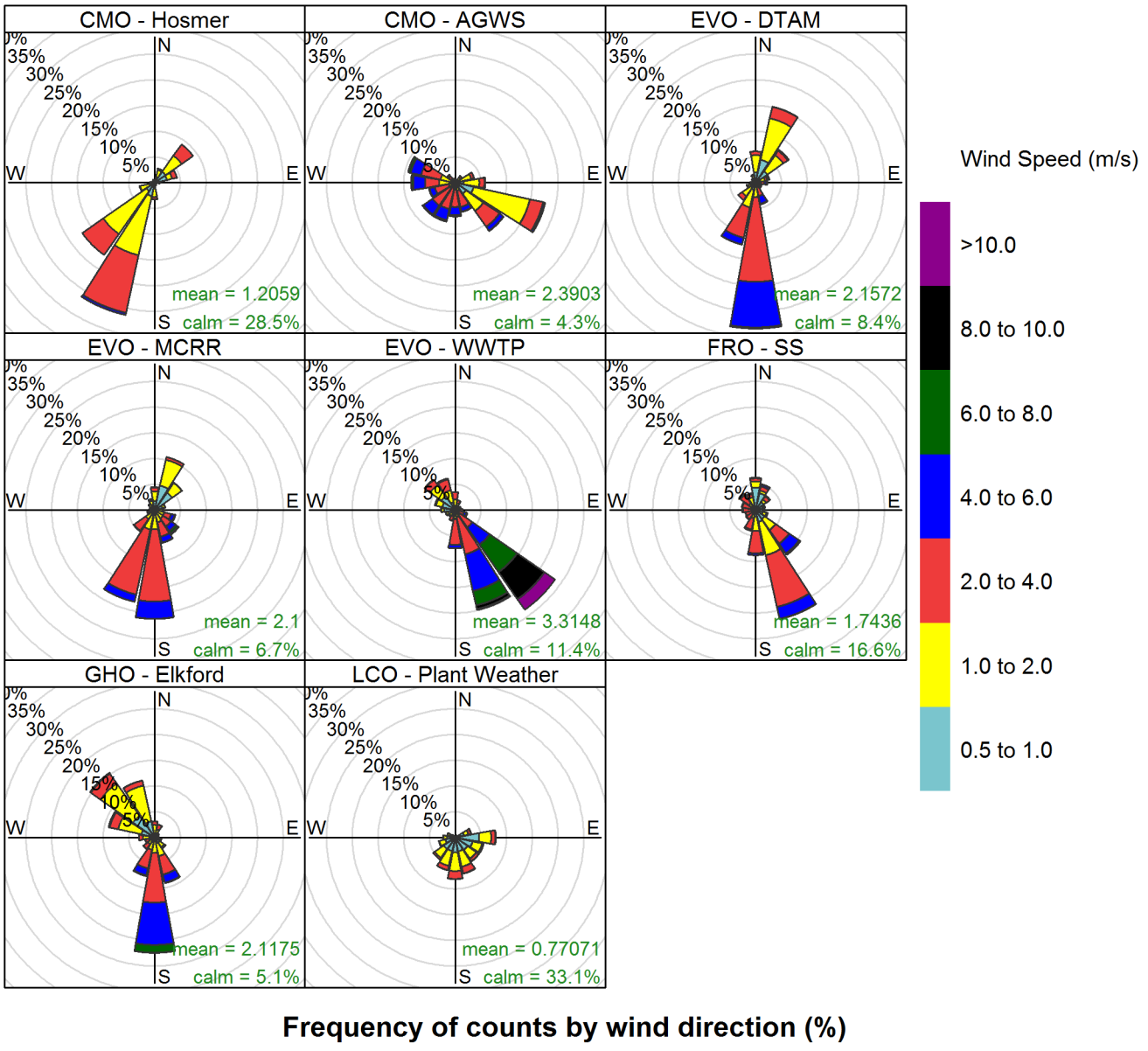


Figure 11: Wind Roses for All Stations in the Regional Air Monitoring Program

4.2 Precipitation

Monthly precipitation totals are shown in Figure 12 where they are compared to the 30 year mean and standard deviation of monthly precipitation totals observed at the Environment Canada meteorological station in Sparwood (1981 – 2010).

CMO - AGWS monitored precipitation from May to December in 2017. The precipitation gauge failed on October 28, 2016 due to an internal electrical problem and it was fully repaired and re-installed on May 4, 2017. The station recorded a total of 400 mm over the eight months the precipitation gauge was operating. The station recorded the highest monthly precipitation totals in June, October and November.

The months of January, May, June, July, August, September and December recorded below average precipitation at all stations. Precipitation fell short of the 30 year mean minus one standard deviation in January for all stations and in July and September for all but one station. The low summer precipitation throughout the province was likely linked to the extreme forest fire season and the lingering poor air quality events.

All stations recorded above average monthly precipitation totals in the months of February, March, April, and October.

FRO – SS received the least precipitation in 2017; recording a total of 498 mm (excluding CMO – AGWS for which the record was incomplete). GHO – Elkford received the most precipitation in 2017; recording a total of 563 mm.

The annual precipitation at the Environment and climate change Canada station in Sparwood was 583.2 mm versus the normal value of 613.3 mm.

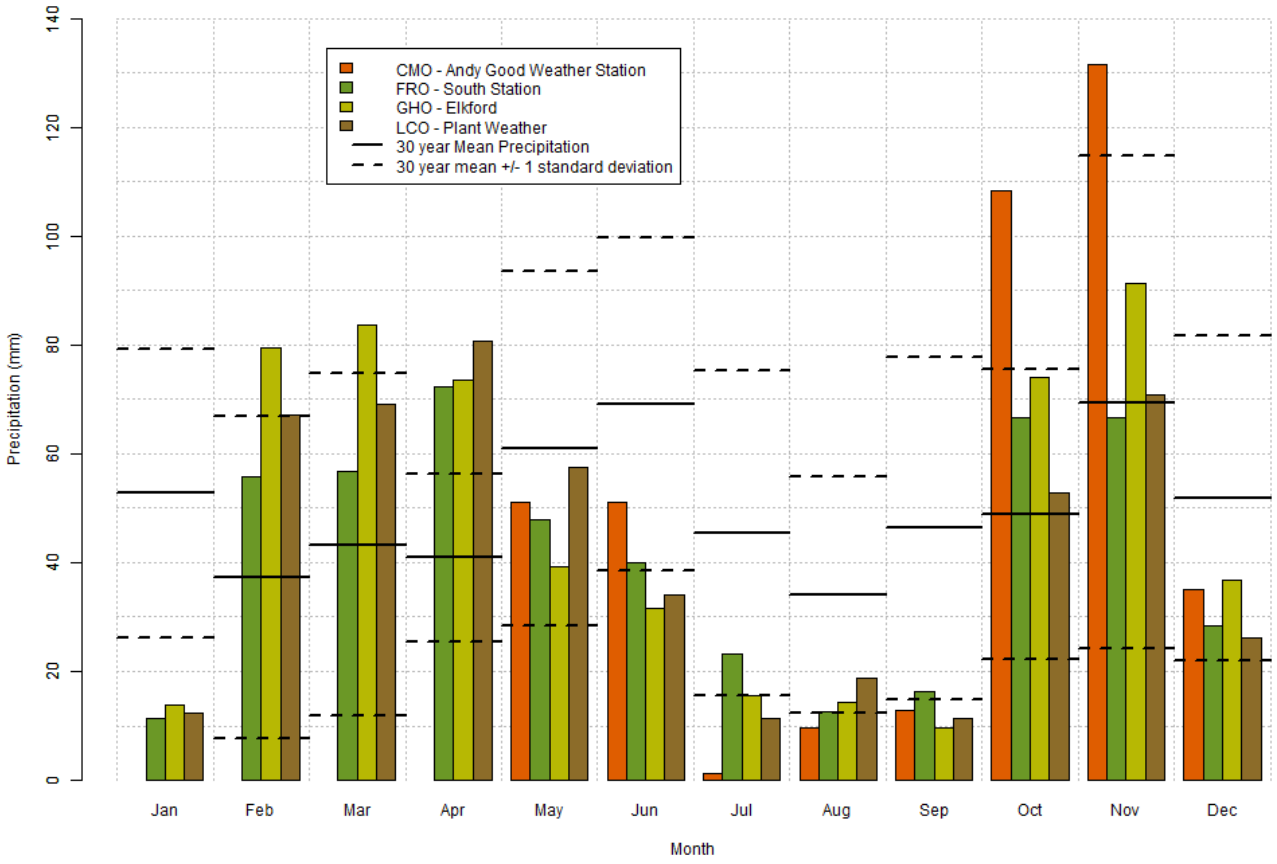


Figure 12: Monthly Precipitation Totals for Regional Air Monitoring Program as Compared to the 30-year Mean +/- 1 standard Deviation Calculated from the Environment Canada Weather Station in Sparwood.

4.3 Air Temperature

Daily averaged air temperatures are presented in Figure 13 where they are compared to the 30 year mean and standard deviation of air temperature measured at the Environment Canada station in Sparwood. Inter-station variation is generally small compared to daily fluctuations but some change is discernible. Greater day to day variability is observed in the winter months (January to March, and November and December) than in the summer months (April to October). This is also observed in the 30-year averaged data from Sparwood and can be attributed to the passage of warm and cold weather fronts in the winter, bringing with them large variations in temperature. In the summer, the cold arctic air masses which dominate in winter are much farther north and there is less frontal activity in the region, resulting in less extreme temperature fluctuations.

Differences in elevation between stations drives the inter-station differences in temperature that can be observed: CMO – Hosmer EVO – DTAM and EVO – MCRR are among the lowest-lying stations in the monitoring program and they consistently record higher temperatures than the rest. FRO – SS is one of the highest elevation stations and consistently records lower temperatures. CMO – AGWS also frequently observes low temperatures

even though it is not at as high of an elevation. This may be explained by the local topography which considerably reduces sun exposure on site.

All stations observed temperatures lower than one standard deviation of the 30-year climate normal during periods in January, February, November and December.

The annual average temperature in Sparwood in 2017 was 4.1 °C versus the normal value of 4.4 °C.

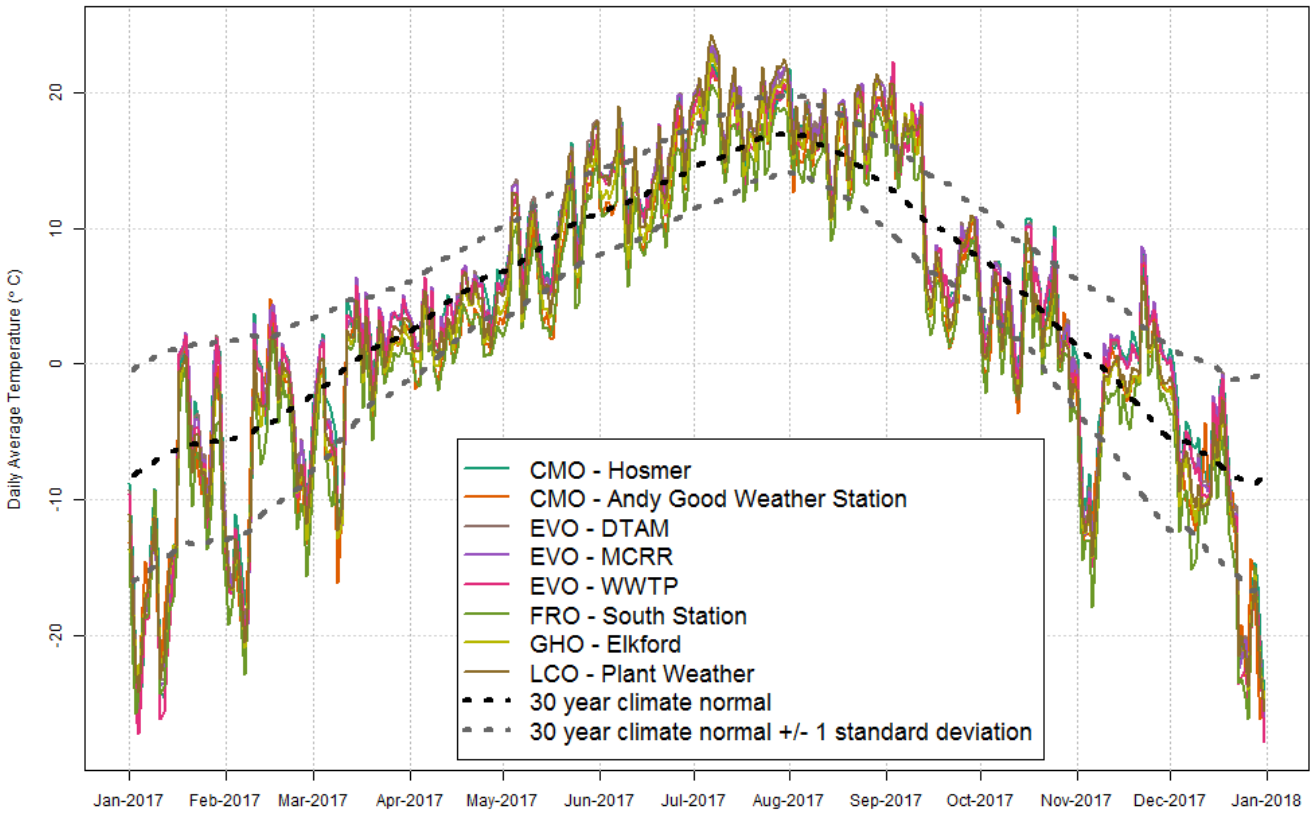


Figure 13: Daily Averaged Temperature for Regional Air Monitoring Program Stations as Compared to the 30-year Mean +/- 1 Standard Deviation Calculated from the Environment Canada Weather Station in Sparwood.

5 MANAGEMENT OF AIR QUALITY

5.1 Public Air Quality Feedback

The Teck Elk Valley Feedback Mechanism helps Teck consistently respond to feedback and maintain strong relationships with community members. Dust related feedback are either forwarded (by mine sites) or received directly by the Teck Social Responsibility group, which has an office in Sparwood. When feedback is received about Teck's activity, Teck's Social Responsibility group works with the relevant operation(s) to investigate the cause and the effect. If contact details have been provided, the Feedback Coordinator or designated respondent will respond to the community member.

Engagement is tracked in Tecks Trackline database, used for documenting engagement with Communities of Interest (residents of local communities, First Nations, etc.) and Regulators. Emails, letters, phone calls, and other communications are tracked here, as are follow-up actions. Teck looks for trends in feedback and uses this information to monitor the effectiveness of mitigations and to gauge the need for further public updates on our work.

In 2017, EVO received 27 pieces of feedback related to air quality and dust management. The majority of feedback was related to visual air quality (18), above EVO operations (17) or from train cars (1), with the remaining related to nuisance dusting in the community and/or on private property (9).

Due to an increasing amount of feedback and concern from the community on dust management, the following additional measures were taken in 2017 to provide information on current dust management practices and continual improvement opportunities:

- Information newsletter mailed out to Sparwood residents;
- A community information booth at Sparwood Mall and Sparwood Farmers Market, where we spoke to over 100 people;
- Ongoing work with the District of Sparwood to respond to community concerns and jointly develop a Socio-Community and Economic Effects Management Plan, and
- Article in new Elk Valley-wide newsletter Community Connections in December 2018.

Teck appreciates the opportunity to hear the community's feedback and to talk about the work being undertaken to resolve this issue and will continue to update the community on dust management initiatives in future.

5.2 Fugitive Dust Management Plans

Four of the five mine sites (EVO, LCO, GHO and FRO) are required to maintain Fugitive Dust Management Plans per their site specific permits. Each mine in the Elk Valley participates in a Regional Air Working Group to identify continual improvement opportunities for fugitive dust management. The mine sites continue to investigate methods to suppress and manage fugitive dust sources from site.

5.3 Summary

There were no significant changes in mining operations in 2017 which would be expected to impact air quality and there were no changes to ambient air monitoring programs in 2017.

6 REFERENCES

BC Ministry of Environment. 2016. British Columbia Ambient Air Quality Objectives.

http://www.fernie.ca/EN/meta/whats-new/news-archives/2017-archive/controlled-burn-program.html

APPENDIX A

Air Quality Data Summary Tables

RWDI#1802626
March 30, 2018

Table A-1: Number of valid TSP data. Red highlighted cells indicate less than 75% data completeness (or 85% for non-continuous monitors).

	Period (Month / Quarter / Year)	CMO AGWS (days / hours)		GHO Elkford (days / hours)		LCO L10A (days)	
		Collected	Maximum Possible	Collected	Maximum Possible	Collected	Maximum Possible
# Valid Monitoring Days per Month	January	26	31	24	31	5	6
	February	23	28	26	28	4	4
	March	30	31	24	31	5	5
	April	23	30	26	30	5	5
	May	29	31	26	31	6	6
	June	30	30	23	27	5	5
	July	31	31	5	12	5	5
	August	29	29	29	31	5	5
	September	10	10	27	30	5	5
	October	30	31	30	31	5	5
	November	23	30	27	30	5	5
	December	29	31	28	31	5	5
# Valid Monitoring Days per Quarter	2017 Q1	79	90	74	90	14	15
	2017 Q2	82	91	75	88	16	16
	2017 Q3	70	70	61	73	15	15
	2017 Q4	82	92	85	92	15	15
# Valid Monitoring Days for Entire Year	2017	313	343	295	343	60	61
# Valid Monitoring Hours per Quarter	2017 Q1	1993	2160	1872	2160		
	2017 Q2	2021	2184	1861	2112		
	2017 Q3	1679	1680	1397	1752		
	2017 Q4	2035	2208	2055	2208		
# Valid Monitoring Hours for entire year	2017	7728	8232	7185	8232		

Table A-2: Number of valid PM_{10} data. Red highlighted cells indicate less than 75% data completeness.

Period	Period (Month / Quarter / Year)	CMO				EVO						FRO		GHO	
		AGWS (days / hours)		Hosmer (days / hours)		DTAM (days / hours)		MCRR (days / hours)		WWTP (days / hours)		SS (days / hours)		Elkford (days / hours)	
		Collected	Maximum Possible	Collected	Maximum Possible	Collected	Maximum Possible	Collected	Maximum Possible	Collected	Maximum Possible	Collected	Maximum Possible	Collected	Maximum Possible
# Valid Monitoring Days per Month	January	25	31	24	31	31	31	25	31	31	31	31	31	30	31
	February	23	28	25	28	28	28	26	28	27	28	28	28	27	28
	March	29	31	31	31	31	31	31	31	31	31	31	31	30	31
	April	26	30	29	30	3	5	29	30	30	30	30	30	28	30
	May	24	31	14	31	27	27	31	31	31	31	31	31	24	31
	June	29	30	19	30	29	30	23	30	30	30	30	30	21	27
	July	29	31	3	25	30	31	23	23	24	25	21	23	3	12
	August	28	29	18	23	28	29	30	31	19	21	31	31	21	31
	September	10	10	10	30	3	10	21	30	25	30	30	30	26	30
	October	29	31	30	31	21	31	31	31	30	31	30	31	28	31
	November	23	30	30	30	30	30	30	30	30	30	30	30	28	30
	December	29	31	29	31	30	31	29	31	31	31	31	31	30	31
# Valid Monitoring Days per Quarter	2017 Q1	77	90	80	90	90	90	82	90	89	90	90	90	87	90
	2017 Q2	79	91	62	91	59	62	83	91	91	91	91	91	73	88
	2017 Q3	67	70	31	78	61	70	74	84	68	76	82	84	50	73
	2017 Q4	81	92	89	92	81	92	90	92	91	92	91	92	86	92
# Valid Monitoring Days for Entire Year	2017	304	343	262	351	291	314	329	357	339	349	354	357	296	343
# Valid Monitoring Hours per Quarter	2017 Q1	1977	2160	1914	2160	2147	2160	1995	2160	2099	2160	2156	2160	1984	2160
	2017 Q2	1984	2184	1662	2184	1439	1488	2078	2184	2158	2184	2175	2184	1811	2112
	2017 Q3	1618	1680	782	1872	1485	1680	1799	2016	1715	1824	1990	2016	1304	1752
	2017 Q4	2024	2208	2039	2208	1942	2208	2172	2208	2158	2208	2181	2208	2006	2208
# Valid Monitoring Hours for Entire Year	2017	7603	8232	6397	8424	7013	7536	8044	8568	8130	8376	8502	8568	7105	8232

Table A-3: **Number of valid $PM_{2.5}$ data. Red highlighted cells indicate less than 75% data completeness.**

Period	Period (Month / Quarter / Year)	CMO				EVO						GHO	
		AGWS (days / hours)		Hosmer (days / hours)		DTAM (days / hours)		MCRR (days / hours)		WWTP (days / hours)		Elkford (days / hours)	
		Collected	Maximum Possible	Collected	Maximum Possible	Collected	Maximum Possible	Collected	Maximum Possible	Collected	Maximum Possible	Collected	Maximum Possible
# Valid Monitoring Days per Month	January	31	31	13	31	31	31	25	31	31	31	29	31
	February	27	28	25	28	28	28	25	28	27	28	24	28
	March	31	31	31	31	31	31	23	31	31	31	27	31
	April	30	30	29	30	28	30	25	30	30	30	27	30
	May	25	31	9	31	31	31	31	31	31	31	27	31
	June	29	30	2	30	29	30	29	30	30	30	23	27
	July	29	31	14	25	30	31	13	23	24	25	4	12
	August	28	29	19	23	28	29	30	31	19	21	26	31
	September	10	10	30	30	10	10	17	30	25	30	25	30
	October	30	31	30	31	31	31	31	31	30	31	29	31
	November	30	30	30	30	29	30	30	30	30	30	29	30
	December	31	31	29	31	30	31	29	31	31	31	31	31
# Valid Monitoring Days per Quarter	2017 Q1	89	90	69	90	90	90	73	90	89	90	80	90
	2017 Q2	84	91	40	91	88	91	85	91	91	91	77	88
	2017 Q3	67	70	63	78	68	70	60	84	68	76	55	73
	2017 Q4	91	92	89	92	90	92	90	92	91	92	89	92
# Valid Monitoring Days for Entire Year	2017	331	343	261	351	336	343	308	357	339	349	301	343
# Valid Monitoring Hours per Quarter	2017 Q1	2115	2160	1660	2160	2146	2160	1803	2160	2099	2160	1960	2160
	2017 Q2	2064	2184	1124	2184	2116	2184	2060	2184	2158	2184	1862	2112
	2017 Q3	1648	1680	1534	1872	1658	1680	1563	2016	1716	1824	1389	1752
	2017 Q4	2192	2208	2126	2208	2161	2208	2172	2208	2157	2208	2022	2208
# Valid Monitoring Hours for Entire Year	2017	8019	8232	6444	8424	8081	8232	7598	8568	8130	8376	7233	8232

Table A-4: Number of valid gas data.

Period	Period (Month / Quarter / Year)	EVO - DTAM			Total Possible Number of days/hours
		NO_2	CO	SO_2	
# Valid Monitoring Days per Month	January	31 days	13 days	31 days	31 days
	February	28 days	28 days	28 days	28 days
	March	28 days	29 days	29 days	31 days
	April	28 days	30 days	30 days	30 days
	May	12 days	19 days	19 days	31 days
	June	0 days	16 days	17 days	30 days
	July	0 days	31 days	31 days	31 days
	August	0 days	31 days	31 days	31 days
	September	0 days	30 days	30 days	30 days
	October	0 days	31 days	31 days	31 days
	November	16 days	30 days	30 days	30 days
	December	29 days	31 days	31 days	31 days
# Valid Monitoring Days per Quarter	2017 Q1	87 days	70 days	88 days	90 days
	2017 Q2	40 days	65 days	66 days	91 days
	2017 Q3	0 days	92 days	92 days	92 days
	2017 Q4	45 days	92 days	92 days	92 days
# Valid Monitoring Days for Entire Year	2017	172 days	319 days	338 days	365 days
# Valid Monitoring Hours per Quarter	2017 Q1	1992 hours	1670 hours	2012 hours	2160 hours
	2017 Q2	970 hours	1577 hours	1601 hours	2184 hours
	2017 Q3	0 hours	2208 hours	2203 hours	2208 hours
	2017 Q4	1153 hours	2204 hours	2204 hours	2208 hours
# Valid Monitoring Hours for Entire Year	2017	4115 hours	7659 hours	8020 hours	8760 hours

Table A-5: TSP averaged annually, seasonally and by day of the week.

	Period (Month / Quarter / Year / Day of the Week / Season)	CMO AGWS (µg/m^3)	GHO Elkford (µg/m^3)	LCO L10A (µg/m^3)
Annual Hourly Mean	2017	5.8	7.9	
Annual Hourly Standard Deviation	2017	25.6	29.2	
Annual Daily Mean	2017	8.3	10.3	42.8
Annual Daily Standard Deviation	2017	13.1	17.3	34.6
Daily Average by Day of Week	Monday	13.0	13.3	52.1
	Tuesday	15.3	16.8	70.6
	Wednesday	12.5	15.9	52.5
	Thursday	12.8	16.8	45.9
	Friday	14.1	13.4	44.8
	Saturday	13.0	12.1	52.6
	Sunday	11.7	15.2	53.2
Daily Average by Season	Spring (MAM)	6.9	12.0	36.0
	Summer (JJA)	19.8	19.4	70.3
	Autumn (SON)	8.4	18.6	53.5
	Winter (DJF)	16.2	10.1	51.2

Note: Annual Hourly and Daily means are calculated as geometric means so they are comparable to the provincial pollution control objectives for TSP.

Table A-6: PM_{10} averaged annually, seasonally and by day of the week.

	Period (Month / Quarter / Year / Day of the Week / Season)	CMO		EVO			FRO	GHO
		AGWS ($\mu g/m^3$)	Hosmer ($\mu g/m^3$)	DTAM ($\mu g/m^3$)	MCRR ($\mu g/m^3$)	WWTP ($\mu g/m^3$)	SS ($\mu g/m^3$)	Elkford ($\mu g/m^3$)
Annual Hourly Mean	2017	8.6	9.3	14.3	16.7	8.9	31.1	10.6
Annual Hourly Standard Deviation	2017	10.5	12.3	14.9	19.9	11.4	38.4	19.8
Annual Daily Mean	2017	8.2	9.1	14.1	16.5	8.5	31.2	10.3
Annual Daily Standard Deviation	2017	7.9	8.8	11.1	14.8	7.6	31.4	16.2
Daily Average by Day of Week	Monday	8.0	7.8	14.6	16.5	8.2	29.8	9.8
	Tuesday	9.8	9.2	16.7	20.4	9.6	33.6	11.4
	Wednesday	8.2	10.0	13.0	16.3	8.7	35.5	12.3
	Thursday	8.4	10.8	14.8	19.0	8.4	31.8	11.1
	Friday	7.6	8.9	15.0	15.7	8.2	29.0	11.4
	Saturday	8.0	9.6	11.9	14.4	8.5	29.5	7.3
	Sunday	7.6	7.6	13.2	13.4	7.9	29.0	8.9
Daily Average by Season	Spring (MAM)	4.5	5.6	14.3	10.5	6.2	16.1	8.1
	Summer (JJA)	14.1	15.1	20.7	26.2	14.2	39.0	13.1
	Autumn (SON)	5.4	9.0	7.0	14.1	7.7	33.9	15.0
	Winter (DJF)	7.8	9.6	12.0	16.4	7.0	36.7	6.5

Table A-7: $PM_{2.5}$ averaged annually, seasonally and by day of the week.

	Period (Month / Quarter / Year / Day of the Week / Season)	CMO		EVO			GHO
		AGWS (µg/m^3)	Hosmer (µg/m^3)	DTAM (µg/m^3)	MCRR (µg/m^3)	WWTP (µg/m^3)	Elkford (µg/m^3)
Annual Hourly Mean	2017	4.2	9.4	5.3	7.6	5.8	7.4
Annual Hourly Standard Deviation	2017	7.1	21.5	6.7	10.2	9.5	16.6
Annual Daily Mean	2017	4.1	9.4	5.2	7.3	5.5	6.8
Annual Daily Standard Deviation	2017	5.1	19.6	5.4	7.1	6.1	12.6
Daily Average by Day of Week	Monday	4.0	5.9	5.3	6.3	5.0	5.4
	Tuesday	5.1	8.7	6.3	8.6	5.8	7.6
	Wednesday	3.9	10.5	5.3	7.5	5.6	9.2
	Thursday	3.8	11.0	5.4	7.6	5.3	7.8
	Friday	3.8	11.9	4.7	6.7	5.1	4.6
	Saturday	4.2	9.6	4.7	7.1	5.8	6.3
	Sunday	4.2	7.5	4.8	7.2	5.5	6.6
Daily Average by Season	Spring (MAM)	1.8	4.1	2.6	4.7	2.8	2.7
	Summer (JJA)	8.2	13.0	9.7	12.6	8.4	11.6
	Autumn (SON)	3.4	14.8	4.0	6.2	6.3	10.5
	Winter (DJF)	3.0	5.7	4.4	6.2	4.9	4.0

Table A-8: Gas concentrations averaged annually, seasonally and by day of the week.

	Period (Month / Quarter / Year / Day of the Week / Season)	EVO - DTAM		
		NO_2 ($\mu g/m^3$)	CO ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)
Annual Hourly Mean	2017	10.4	130.1	0.1
Annual Hourly Standard Deviation	2017	10.0	94.9	0.1
Annual Daily Mean	2017	10.6	130.4	0.1
Annual Daily Standard Deviation	2017	6.4	81.8	0.1
Daily average by Day of Week	Monday	10.5	119.5	0.1
	Tuesday	11.3	132.6	0.1
	Wednesday	12.9	138.9	0.1
	Thursday	12.8	143.5	0.1
	Friday	10.3	138.2	0.1
	Saturday	8.3	124.5	0.1
	Sunday	7.9	115.8	0.0
Daily Average by Season	Spring (MAM)	8.0	106.3	0.0
	Summer (JJA)	0.0	104.8	0.1
	Autumn (SON)	6.5	154.6	0.1
	Winter (DJF)	13.3	153.7	0.1

Table A-9: Percentiles of TSP

Averaging Period of Data	Percentile	CMO AGWS ($\mu g/m^3$)	GHO Elkford ($\mu g/m^3$)	LCO L10A ($\mu g/m^3$)
Hourly	0	0.0	0.0	
	10	0.7	2.1	
	25	2.4	4.0	
	50	7.7	7.8	
	75	16.2	16.2	
	90	31.4	30.9	
	95	48.3	47.8	
	98	73.1	87.9	
	100	709.9	1227.0	
Daily (24H)	0	0.2	0.6	10.0
	10	2.0	4.1	18.5
	25	3.8	5.8	27.3
	50	9.6	9.6	46.9
	75	18.0	17.0	66.6
	90	29.3	28.2	94.9
	95	37.6	41.3	117.5
	98	48.8	67.5	128.1
	100	99.8	168.1	187.0

Table A-10: Percentiles of PM_{10}

Averaging Period of Data	Percentile	CMO		EVO			FRO	GHO
		AGWS ($\mu g/m^3$)	Hosmer ($\mu g/m^3$)	DTAM ($\mu g/m^3$)	MCRR ($\mu g/m^3$)	WWTP ($\mu g/m^3$)	SS ($\mu g/m^3$)	Elkford ($\mu g/m^3$)
Hourly	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	10	1.2	1.2	1.6	1.4	1.2	2.5	1.5
	25	2.1	2.7	4.0	3.7	2.3	6.7	2.7
	50	4.9	5.7	9.9	10.2	5.5	17.6	5.3
	75	10.9	11.5	19.3	22.4	11.6	41.2	11.1
	90	19.6	20.6	32.3	39.5	19.2	74.7	21.2
	95	29.0	29.0	42.9	54.2	27.1	104.6	31.1
	98	40.5	43.3	58.2	75.3	40.8	155.1	64.9
	100	124.5	241.3	169.1	421.9	225.2	380.9	371.6
Daily (24H)	0	0.7	0.5	0.8	0.5	0.7	0.7	0.4
	10	1.8	2.6	2.2	2.5	1.9	4.8	2.4
	25	2.9	4.1	4.9	5.4	3.1	10.0	3.8
	50	5.3	6.5	11.2	11.9	6.4	22.6	6.0
	75	11.1	11.5	20.1	23.4	11.0	42.4	11.0
	90	17.5	18.2	29.2	35.7	17.4	63.7	18.2
	95	23.1	22.5	36.6	46.0	22.2	84.3	28.3
	98	34.2	39.9	44.4	56.1	33.2	113.6	46.0
	100	56.1	58.8	58.5	95.0	49.1	232.8	160.4

Table A-11: Percentiles of $PM_{2.5}$

Averaging Period of Data	Percentile	CMO		EVO			FRO
		AGWS ($\mu g/m^3$)	Hosmer ($\mu g/m^3$)	DTAM ($\mu g/m^3$)	MCRR ($\mu g/m^3$)	WWTP ($\mu g/m^3$)	SS ($\mu g/m^3$)
Hourly	0	0.0	0.0	0.0	0.0	0.0	0.0
	10	0.3	1.2	0.5	1.2	0.7	0.7
	25	0.9	2.2	1.3	2.0	1.4	1.5
	50	1.8	4.5	3.2	4.6	3.0	3.1
	75	4.8	8.9	6.7	9.3	6.7	6.9
	90	10.0	16.7	12.1	16.9	12.3	15.1
	95	15.1	26.4	17.9	25.4	19.5	24.0
	98	25.5	53.0	26.8	35.4	32.2	50.8
	100	109.9	279.1	62.3	203.8	223.4	252.0
Daily (24H)	0	0.1	0.4	0.2	0.5	0.2	0.1
	10	0.6	2.4	0.8	1.6	1.2	1.1
	25	1.1	3.5	1.8	2.9	1.9	2.0
	50	2.3	5.0	3.5	5.3	3.5	3.8
	75	5.4	7.8	6.6	9.0	6.6	6.5
	90	9.2	14.2	11.7	14.9	10.5	12.4
	95	12.8	26.7	17.4	22.5	16.1	20.3
	98	20.0	51.1	21.3	29.8	29.7	48.6
	100	39.5	193.8	36.0	51.3	45.5	140.4

Table A-12: Percentiles of gas concentrations.

Averaging Period of Data	Percentile	EVO - DTAM		
		NO_2 ($\mu g/m^3$)	CO ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)
Hourly	0	-0.1	0.0	0.0
	10	2.3	65.4	0.0
	25	3.6	89.0	0.0
	50	6.8	112.9	0.0
	75	13.9	144.2	0.1
	90	23.6	192.2	0.2
	95	31.6	246.2	0.2
	98	40.2	366.9	0.3
	100	114.6	1227.4	3.3
Daily (24H)	0	2.5	0.0	0.0
	10	3.7	79.4	0.0
	25	5.7	95.5	0.0
	50	8.6	113.7	0.0
	75	14.9	146.0	0.1
	90	18.9	184.2	0.2
	95	23.7	211.6	0.2
	98	26.2	279.8	0.2
	100	32.1	861.7	0.9

Table A-13: 98th percentile values of daily averaged $PM_{2.5}$. values above BCAAQO are highlighted in red.

	Station Name	98th percentile of $PM_{2.5}$
CMO	AGWS	20.0
	Hosmer	51.1
EVO	DTAM	21.3
	MCRR	29.8
	WWTP	29.7
GHO	Elkford	48.6

APPENDIX B

Plots of Particulate Matter Concentrations

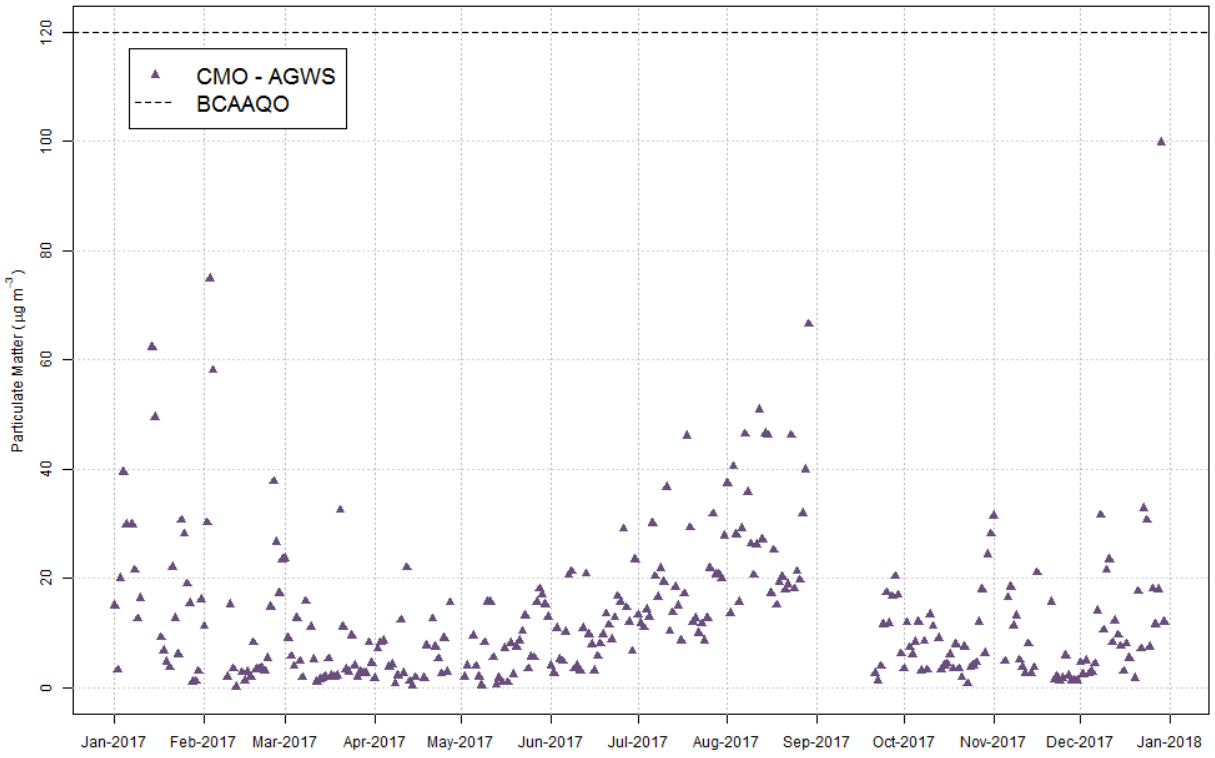


Figure B-1: **Daily Averaged TSP Concentrations from CMO – AGWS. The BCAAQO of 120 µg/m^3 is indicated by a dashed line.**

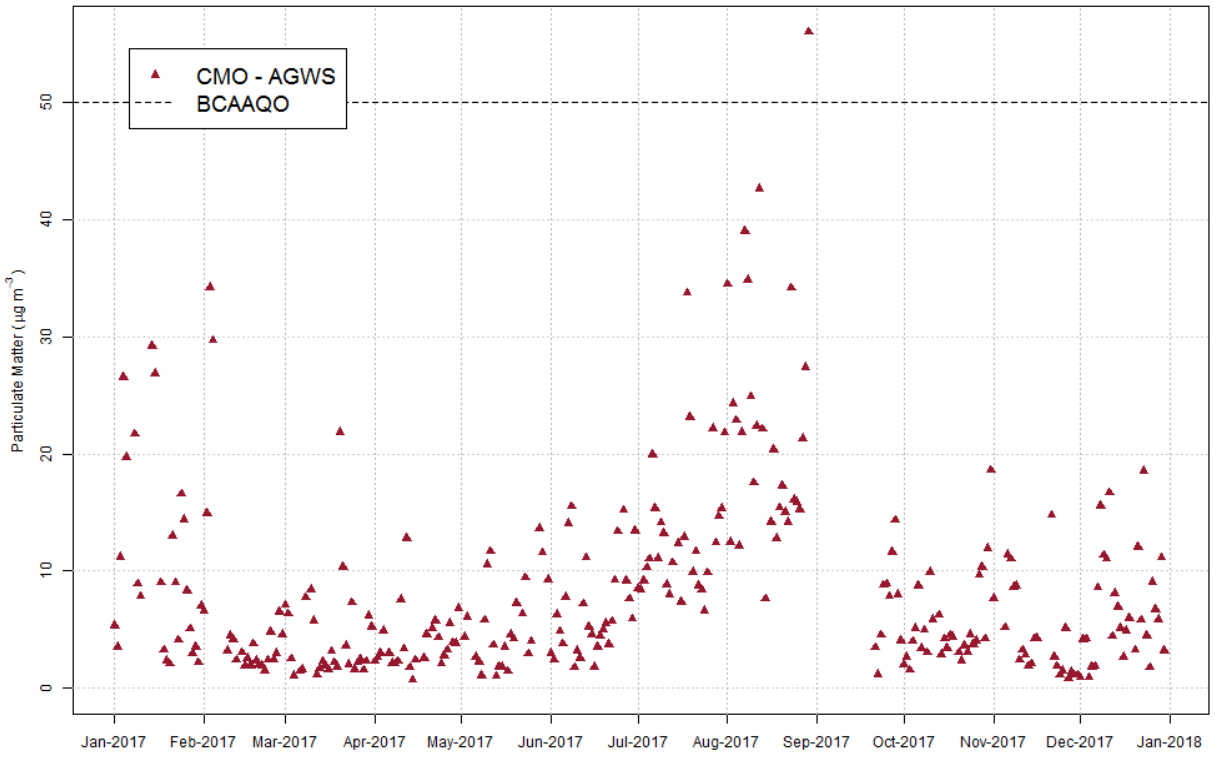


Figure B-2: **Daily Averaged PM_{10} Concentrations from CMO – AGWS. The BCAAQO of 50 µg/m^3 is indicated by a dashed line.**

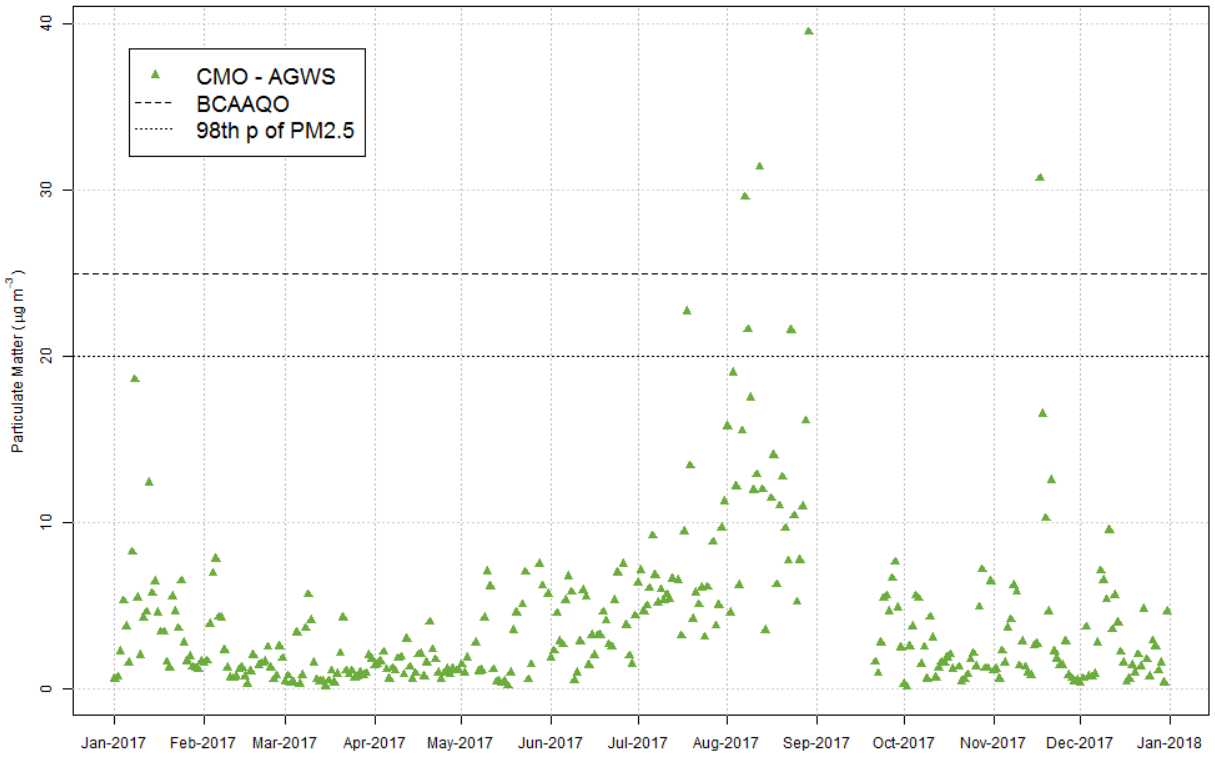


Figure B-3: **Daily Averaged $PM_{2.5}$ Concentrations from CMO – AGWS. The BCAAQO of 25 µg/m^3 is indicated by a dashed line. The dotted line indicates the 98th percentile of $PM_{2.5}$.**

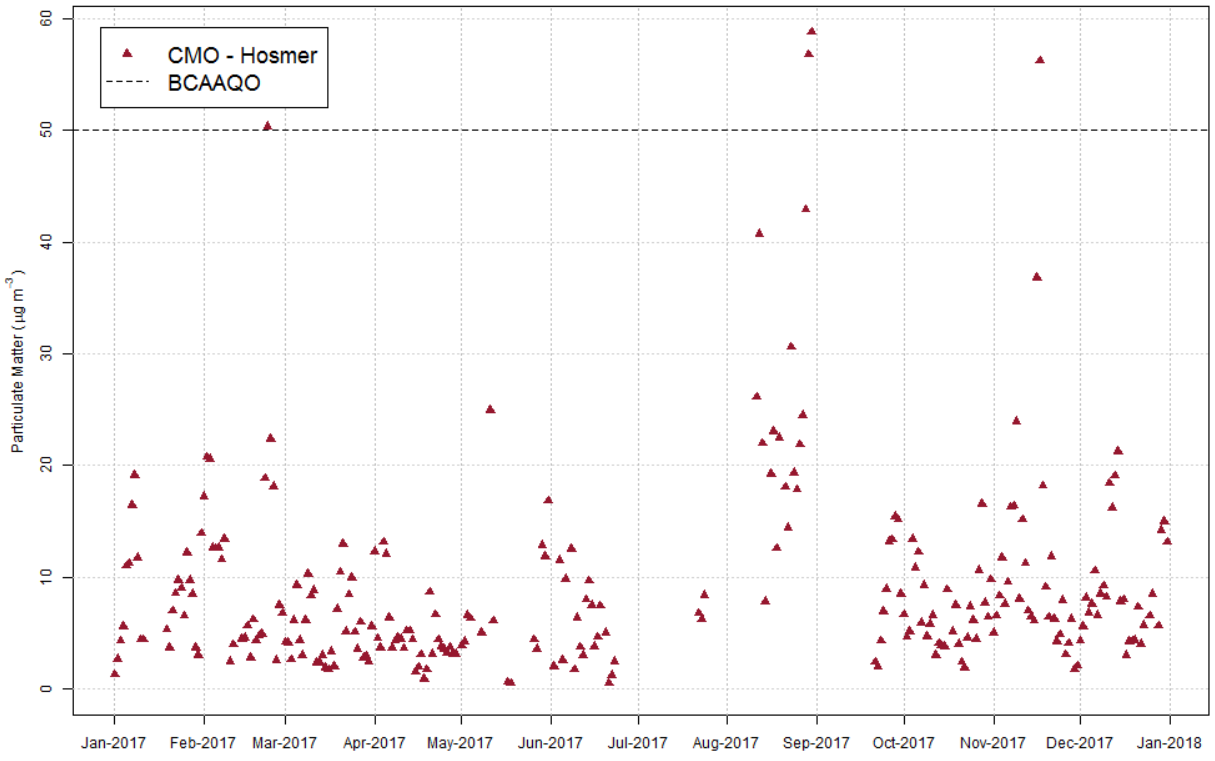


Figure B-4: **Daily Averaged PM_{10} Concentrations from CMO – Hosmer. The BCAAQO of 50 µg/m^3 is indicated by a dashed line.**

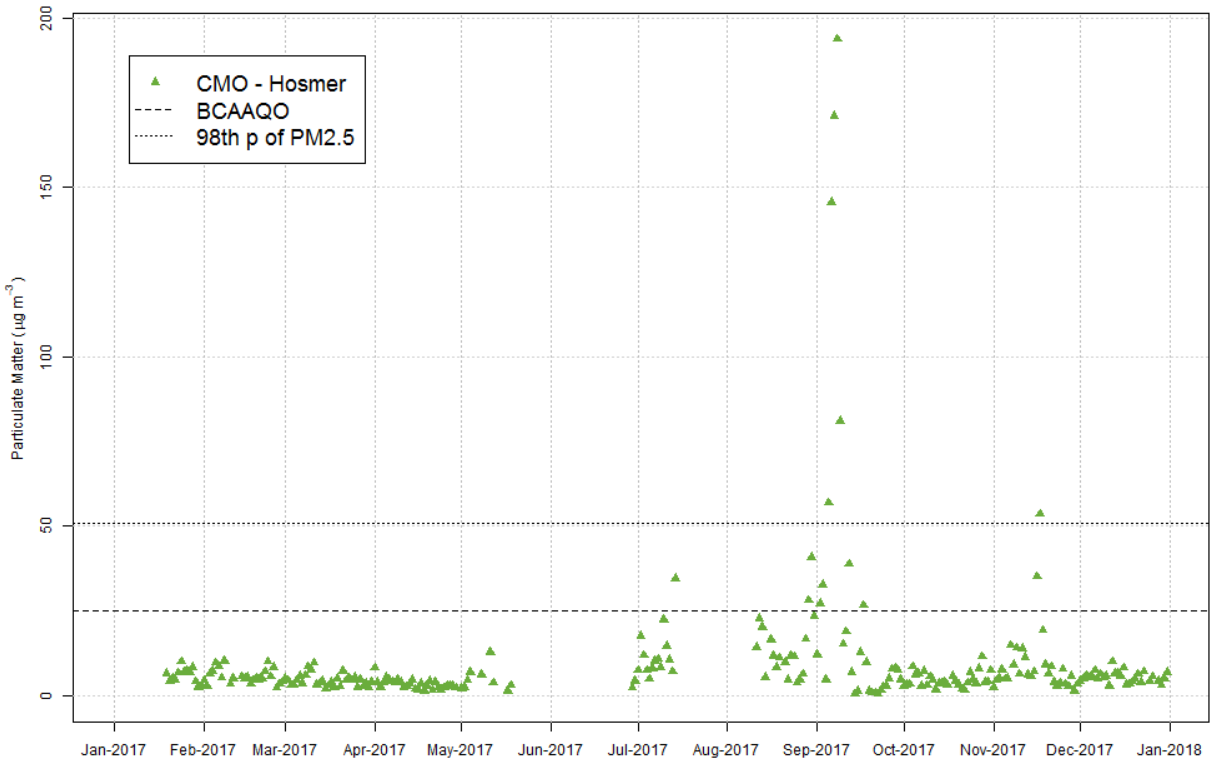


Figure B-5: **Daily Averaged $PM_{2.5}$ Concentrations from CMO – Hosmer. The BCAAQO of 25 µg/m^3 is indicated by a dashed line. The dotted line indicates the 98th percentile of $PM_{2.5}$.**

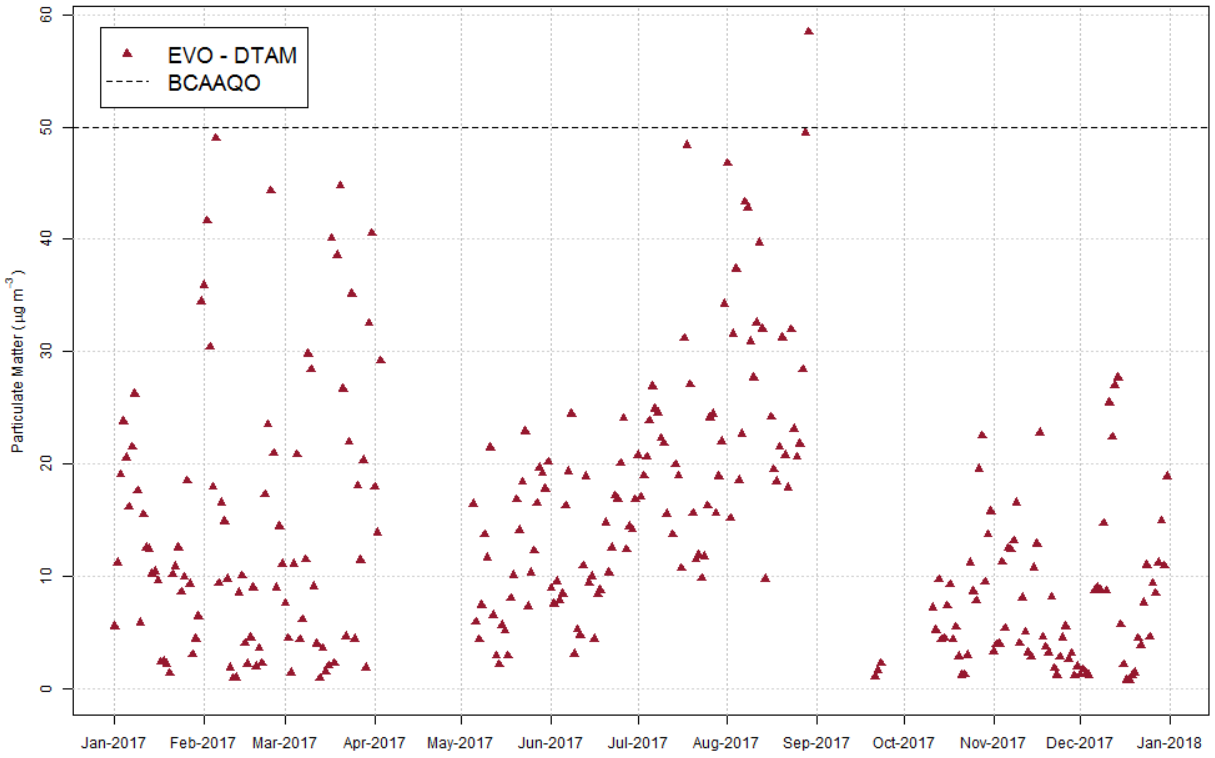


Figure B-6: **Daily Averaged PM_{10} Concentrations from EVO – DTAM. The BCAAQO of 50 µg/m^3 is indicated by a dashed line.**

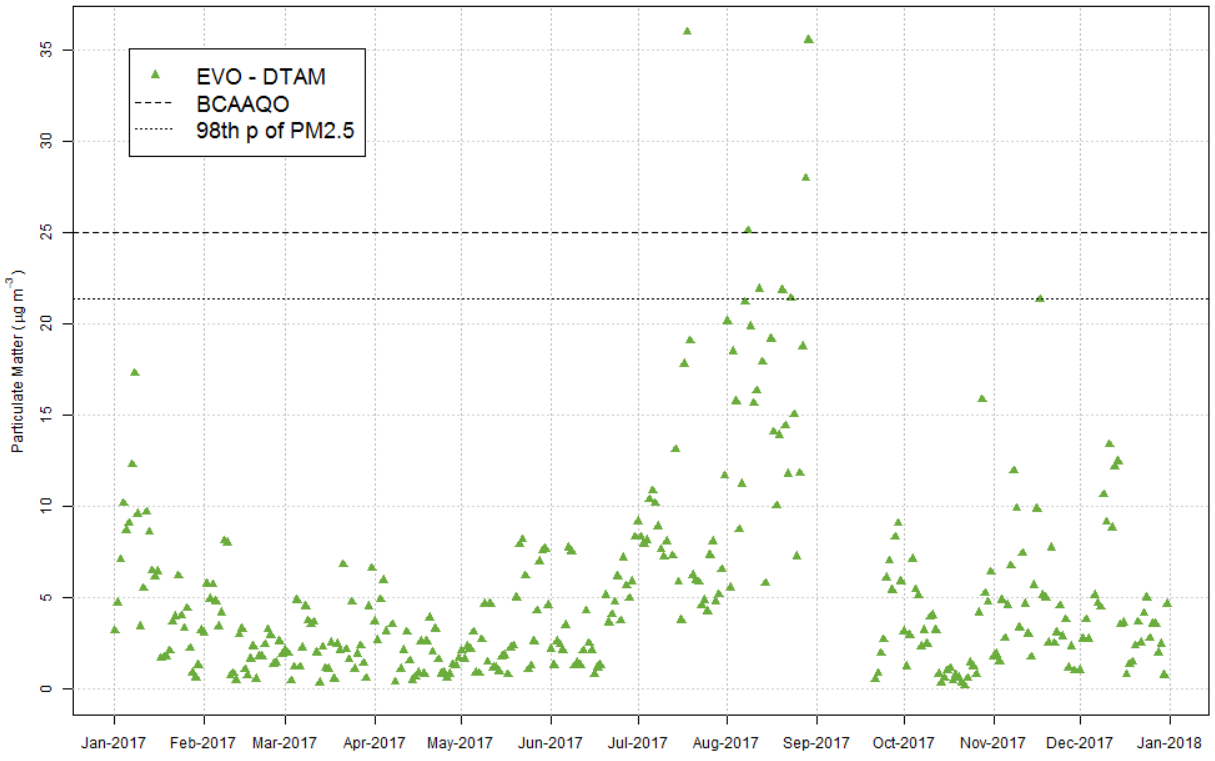


Figure B-7: **Daily Averaged $PM_{2.5}$ Concentrations from EVO – DTAM. The BCAAQO of 25 µg/m^3 is indicated by a dashed line. The dotted line indicates the 98th percentile of $PM_{2.5}$.**

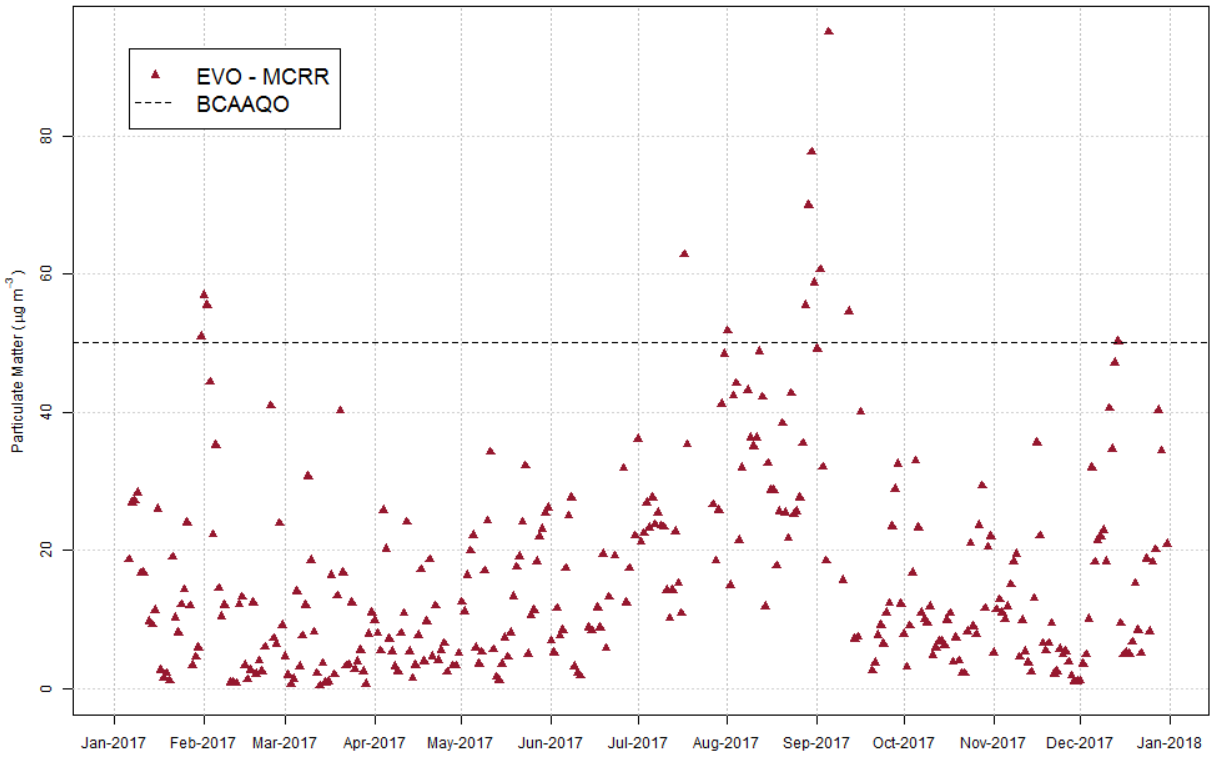


Figure B-8: **Daily Averaged PM_{10} Concentrations from EVO – MCRR. The BCAAQO of 50 µg/m^3 is indicated by a dashed line.**

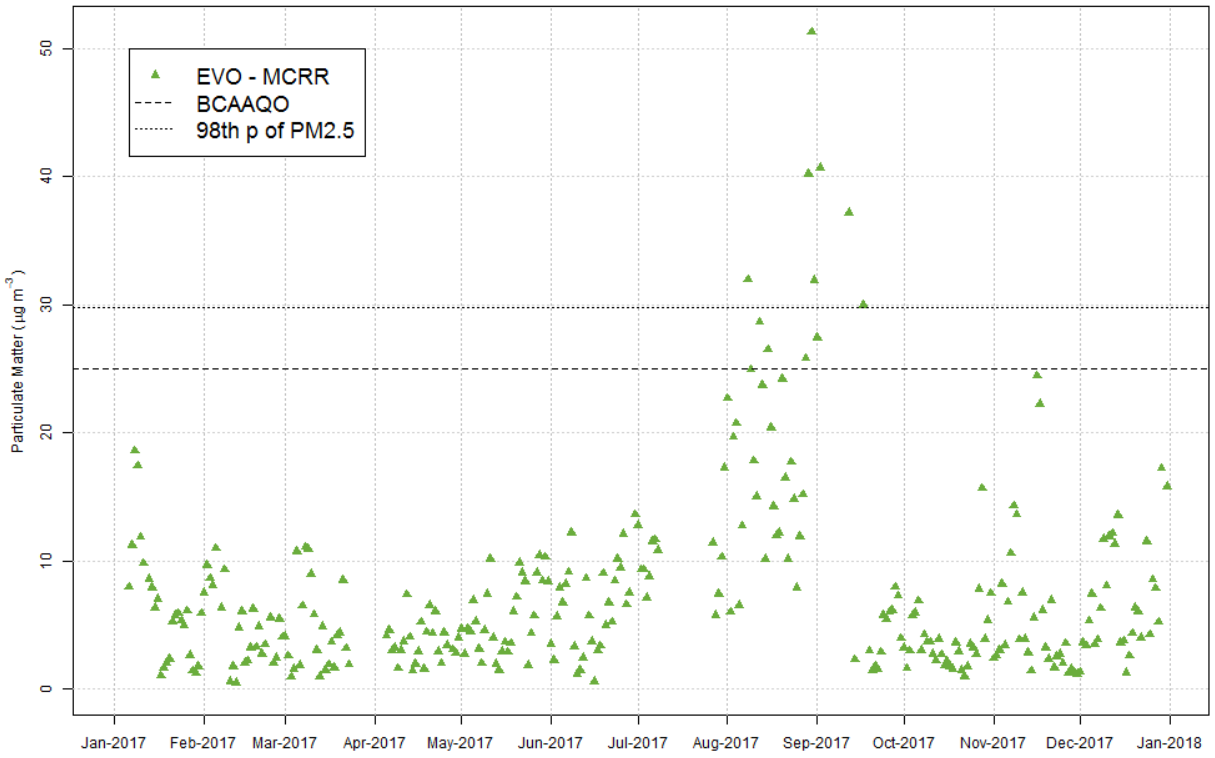


Figure B-9: **Daily Averaged $PM_{2.5}$ Concentrations from EVO-MCRR. The BCAAQO of 25 µg/m^3 is indicated by a dashed line. The dotted line indicates the 98th percentile of $PM_{2.5}$.**

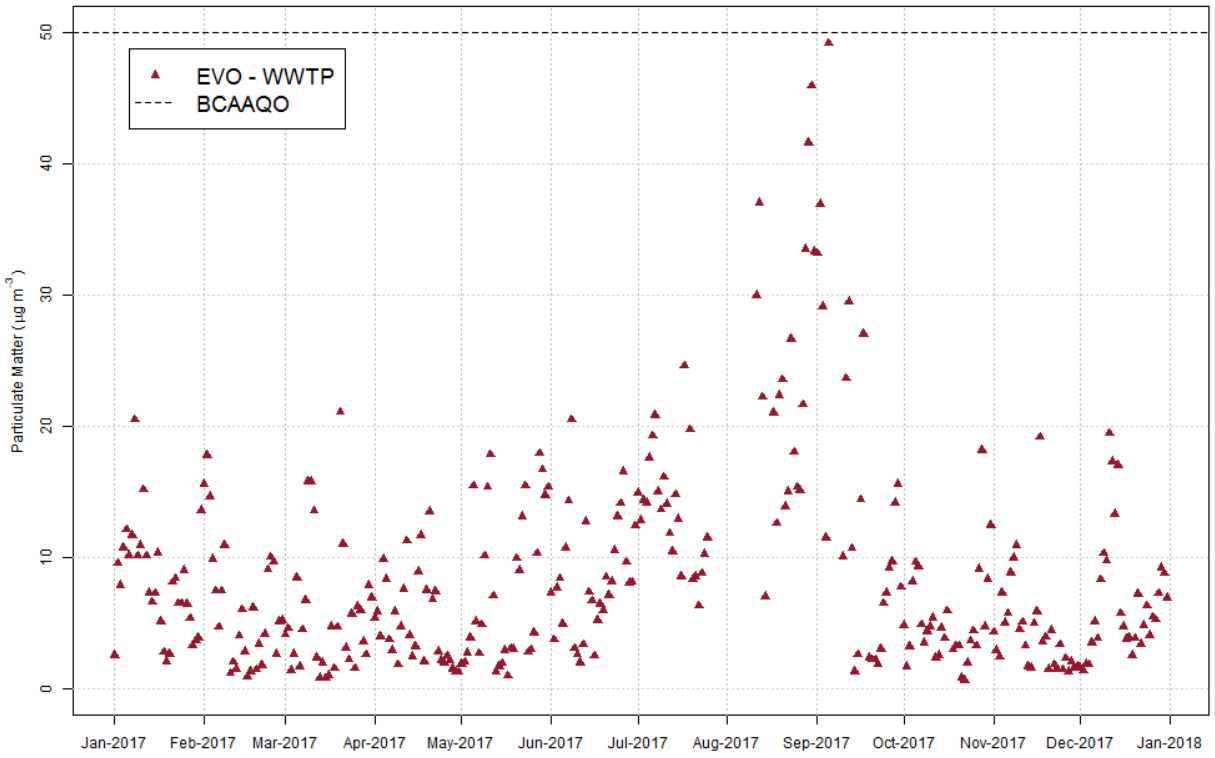


Figure B-10: **Daily Averaged PM_{10} Concentrations from EVO – WWTP. The BCAAQO of 50 µg/m^3 is indicated by a dashed line.**

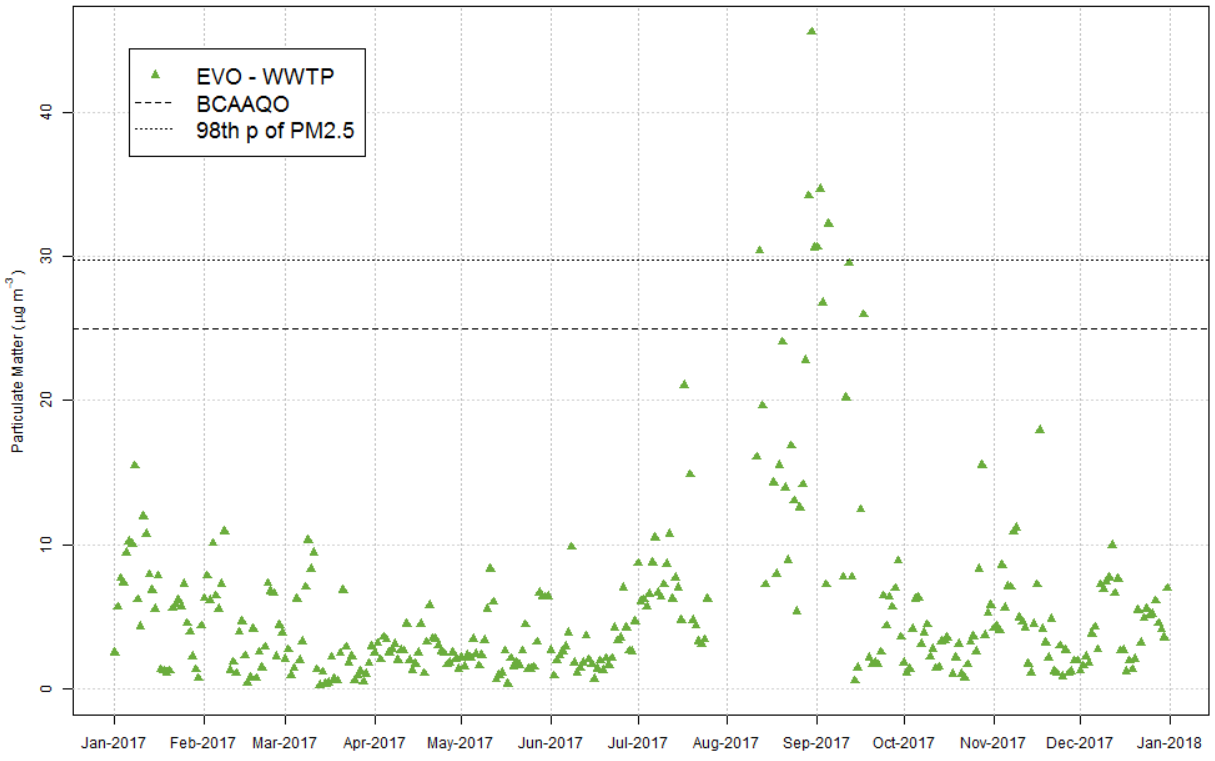


Figure B-11: Daily Averaged $PM_{2.5}$ Concentrations from EVO – WWTP. The BCAAQO of 25 µg/m^3 is indicated by a dashed line. The dotted line indicates the 98th percentile of $PM_{2.5}$.

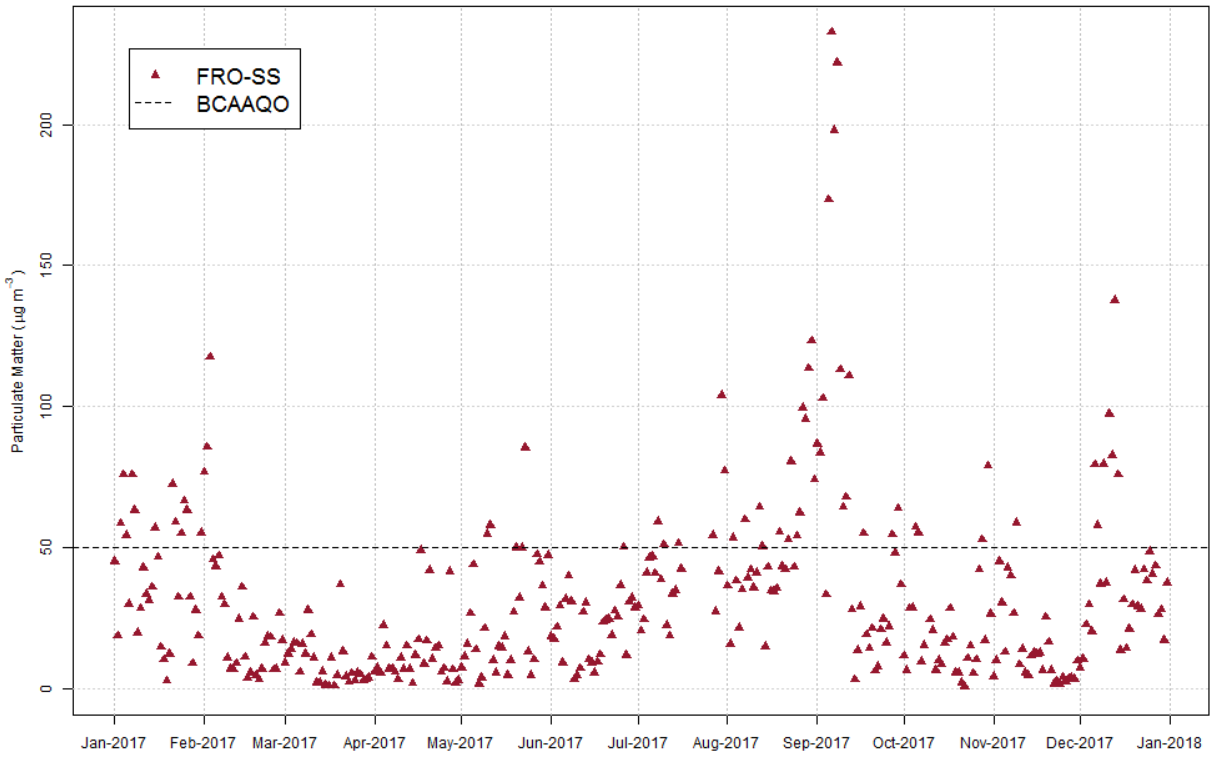


Figure B-12: Daily Averaged PM_{10} Concentrations from FRO – SS. The BCAAQO of 50 µg/m^3 is indicated by a dashed line.

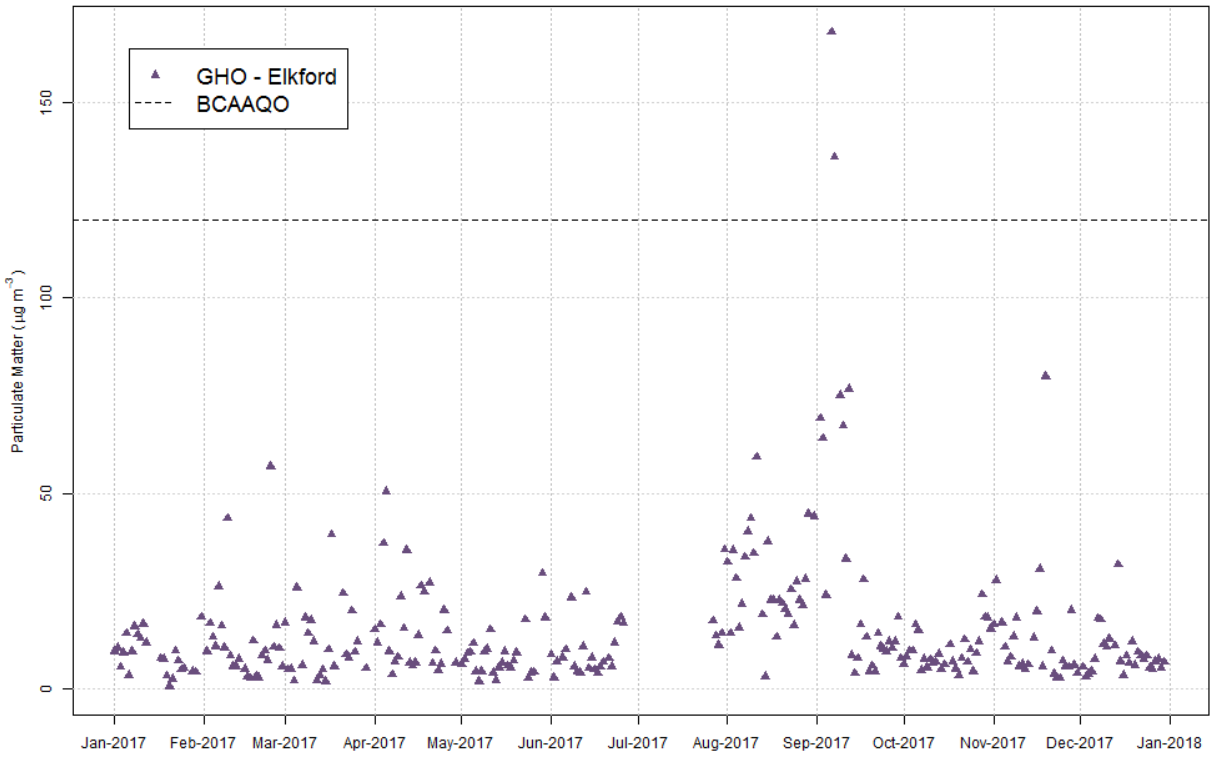


Figure B-13: Daily Averaged TSP Concentrations from GHO – Elkford. The BCAAQO of 120 µg/m^3 is indicated by a dashed line.

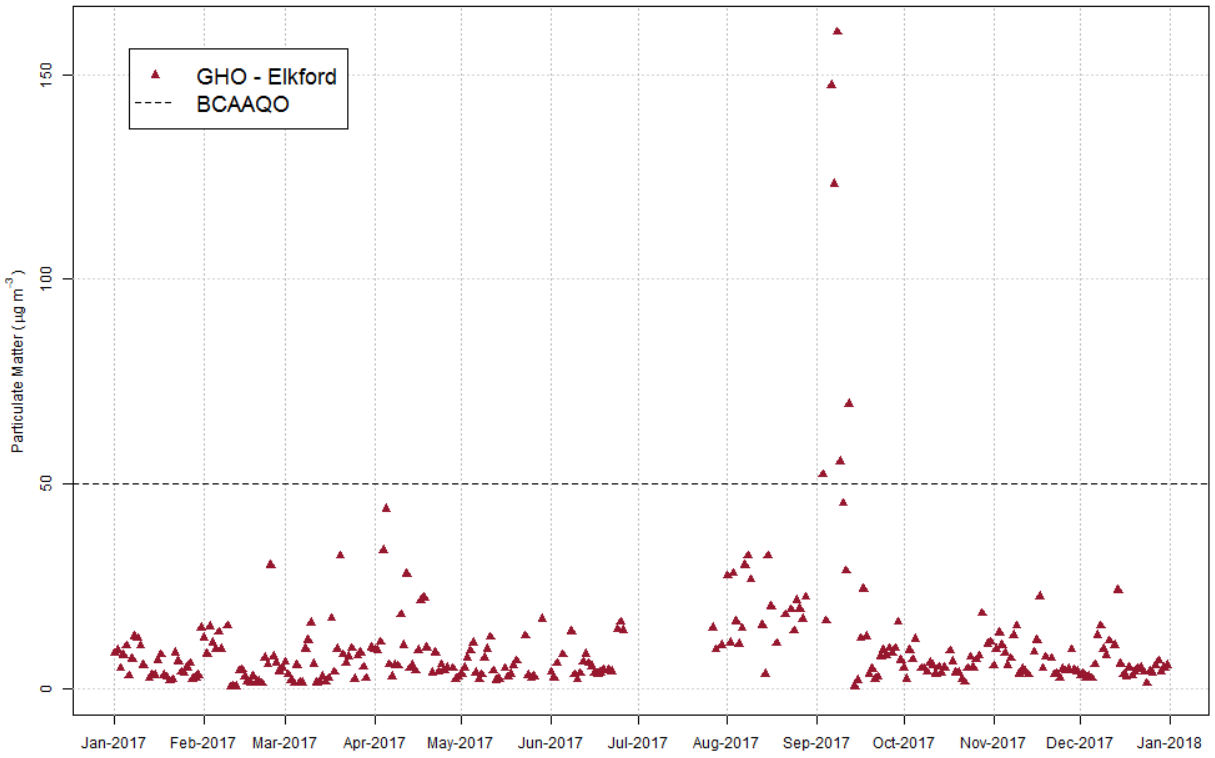


Figure B-14: Daily Averaged PM_{10} Concentrations from GHO – Elkford. The BCAAQO of 50 µg/m^3 is indicated by a dashed line.

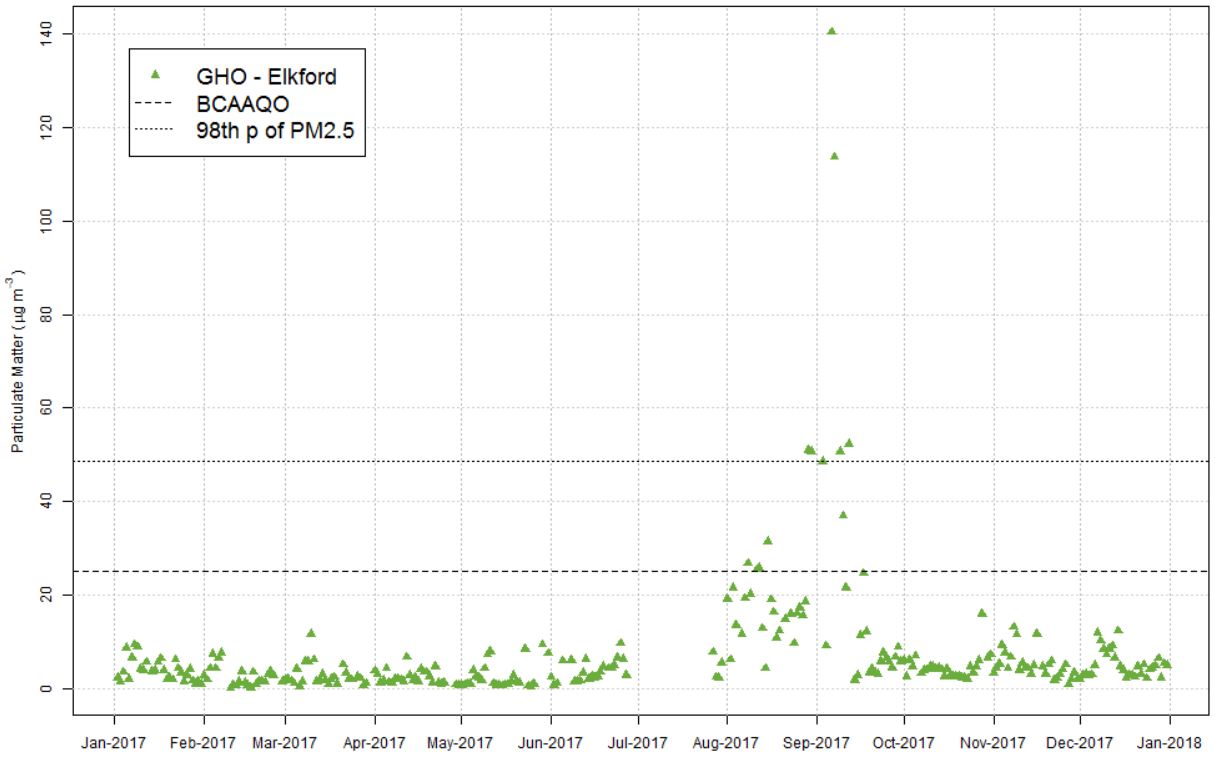


Figure B-15: Daily Averaged $PM_{2.5}$ Concentrations from GHO – Elkford. The BCAAQO of 25 µg/m^3 is indicated by a dashed line. The dotted line indicates the 98th percentile of $PM_{2.5}$.

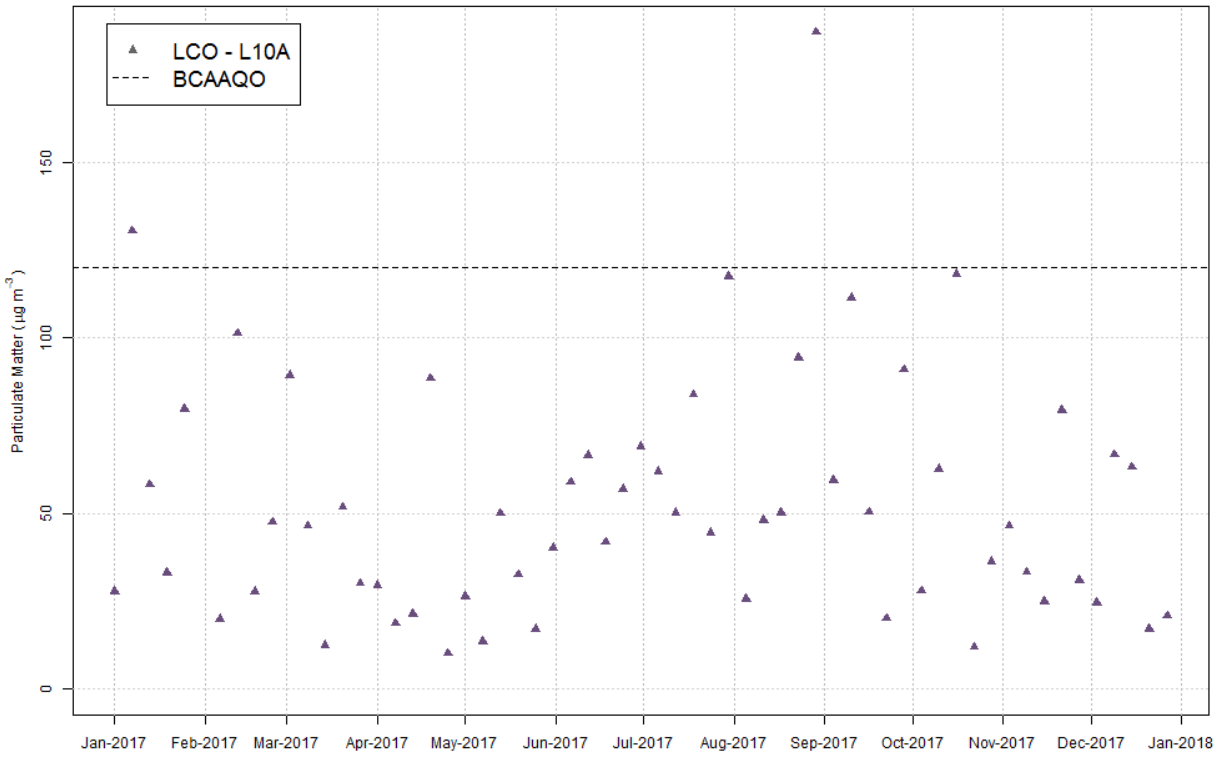


Figure B-16: TSP Concentrations from LCO - L10A. The BCAAQO of 120 µg/m^3 is indicated by a dashed line.