



**Quarterly Ambient Air Quality  
Monitoring Report for the Durham  
York Energy Centre (Crago Road  
Station) – April to June 2018**

**FINAL REPORT**

August 22, 2018

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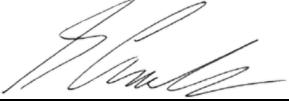


## Sign-off Sheet

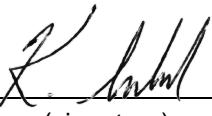
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**QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY  
CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018**

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## QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018

### Executive Summary

The Regional Municipalities of Durham and York operate the Durham York Energy Centre (DYEC) which is an Energy from Waste (EFW) facility intended to provide a long-term, sustainable solution to manage the remaining municipal solid waste after waste diversion from the Regions. The facility commenced commercial operation on February 1, 2016.

An Ambient Air Quality Monitoring Plan – Durham York Residual Waste Study (Ambient Monitoring Plan) was developed and included two monitoring stations referred to as the Courtice Water Pollution Control Plant (WPCP) Station and the Rundle Road Station (as well as a temporary Fence Line Station). The plan developed for these stations was based on the Regional Council's mandate to provide ambient air quality monitoring in the area of the DYEC for a three-year period.

Subsequently, the Region decided to add a third ambient air monitoring station located near the corner of Crago and Osborne Roads (referred to as the Crago Road Station), which was installed in October/November 2014. The Crago Road Station is not part of the Ambient Monitoring Plan, however, it is operated following the same protocols as the other two stations. Results from the Crago Road Station are reported separately from the Courtice WPCP and Rundle Road Stations.

The Crago Road Station is equipped to measure concentrations of several air contaminants either continuously or at scheduled intervals (non-continuously) as outlined below:

- Contaminants monitored continuously:
  - Sulphur Dioxide ( $\text{SO}_2$ );
  - Nitrogen Oxides ( $\text{NO}_x$ ); and,
  - Particulate Matter smaller than 2.5 microns ( $\text{PM}_{2.5}$ ).
- Contaminants monitored non-continuously:
  - Metals in Total Suspended Particulate (TSP) matter;
  - Polycyclic Aromatic Hydrocarbons (PAHs); and,
  - Dioxins and Furans.

Meteorological data is also measured at the station. The predominantly downwind Crago Road Station measures horizontal wind speed, wind direction, atmospheric temperature, relative humidity, and rainfall.

This quarterly report provides a summary of the ambient air quality data collected at the Crago Road Station for the period April to June 2018 (Calendar Quarter 2). All measured air quality parameters had acceptable data recovery rates during this quarter. Instrumentation recovery rates are presented in Section 3.2 of this report.

Site personnel noted ongoing Highway 418 construction on the north and south sides of Highway 401 between Courtice and Crago Roads during Quarter 2 2018.



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The following observations and conclusions were made from a review of the measured ambient air quality monitoring data:

1. Measured levels of NO<sub>2</sub>, SO<sub>2</sub> and PM<sub>2.5</sub> were below the applicable Ministry of Environment, Conservation and Parks (MECP) criteria and human health risk assessment (HHRA) health-based criteria presented in **Table 2-1** of this report.
2. Since the Canadian Ambient Air Quality Standard (CAAQS) for PM<sub>2.5</sub> is based on a 98<sup>th</sup> percentile level over 3 years, whereas the PM<sub>2.5</sub> measurement period at the Crago Road Station for this quarterly report was three months, there was insufficient data collected to determine with any certainty if exceedances of the CAAQS would occur. Therefore, no comparison of the measured PM<sub>2.5</sub> data during this quarter to the CAAQS was conducted for this report, as it would not be scientifically accurate or representative.
3. The maximum measured concentrations of TSP and all metals were below their applicable MECP criteria and HHRA health-based criteria (as presented in **Table 2-2** in this report).
4. The maximum measured concentrations of PAHs were below their applicable MECP criteria shown in **Table 2-3**, with the exception of the 24-hour benzo(a)pyrene (B(a)P) concentration in one (1) sample which exceeded the applicable Ontario Ambient Air Quality Criteria (AAQC) by 195%. The current Ontario 24-hour B(a)P AAQC was introduced in 2011 and levels above this AAQC are commonly measured throughout Ontario. The measurement was however, well below the MECP Schedule 6 Upper Risk Threshold, the MECP O. Reg. 419/05 24-hour average guideline, and the HHRA health-based criterion.
5. The maximum measured toxic equivalent dioxin and furan concentration was below the criteria presented in **Table 2-3**.

In summary, the measured concentrations of the air contaminants monitored were below their applicable MECP criteria during the monitoring period between April and June 2018, with the exception of one (1) benzo(a)pyrene sample. All measured levels of the monitored contaminants were below their applicable HHRA health-based criteria.



**QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018**

## **Abbreviations**

AAQC	Ambient Air Quality Criteria
ACB List	Air Contaminants Benchmarks List: Standards, Guidelines and Screening Levels for Assessing Point of Impingement Concentrations of Air Contaminants
CAAQS	Canadian Ambient Air Quality Standard
CAC	Criteria Air Contaminants
CDD	Chlorinated Dibenzo-p-dioxins
CDF	Chlorinated Dibenzo-p-furans
D/Fs	Dioxins and Furans
DYEC	Durham York Energy Centre
EFW	Energy from Waste
HHRA	Human Health Risk Assessment
MECP	Ontario Ministry of the Environment, Conservation and Parks
SO <sub>2</sub>	Sulphur Dioxide
NO <sub>x</sub>	Nitrogen Oxides
O <sub>3</sub>	Ozone
PAH	Polycyclic Aromatic Hydrocarbons
Particulate	A particle of a solid or liquid that is suspended in air.
PCB	Polychlorinated Biphenyl
PCDD/PCDF	Polychlorinated Dibenzo-p-dioxins and Dibenzofurans
PM	Particulate Matter
PM <sub>2.5</sub>	Particulate Matter smaller than 2.5 microns
Q1, Q2, Q3, Q4	Quarter 1 (January, February, and March); Quarter 2 (April, May, and June); Quarter 3 (July, August, and September); and Quarter 4 (October, November, and December)
TEQ	Toxic Equivalent Quotient
TEQs	Toxic Equivalents
TSP	Total Suspended Particulate
WPCP	Water Pollution Control Plant



**QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY  
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<b>Elements</b>	
Cd	Cadmium
Hg	Mercury
Pb	Lead
Al	Aluminum
As	Arsenic
Be	Beryllium
Cr	Chromium
Cu	Copper
Mn	Manganese
Ni	Nickel
Ag	Silver
Tl	Thallium
Sn	Tin
V	Vanadium
Zn	Zinc
<b>Miscellaneous</b>	
°C	Temperature in degrees Celsius
N/A	Not Available
%	Percent
ppm	Parts per million
ppb	Parts per billion
ppbv	Parts per billion by volume
ppt	Parts per trillion
min	Minimum
max	Maximum
mm	Millimetre
m	Metre
km/hr	Kilometre per hour
mg/m <sup>3</sup>	Milligrams per cubic metre
µg/m <sup>3</sup>	Micrograms per cubic metre
ng/m <sup>3</sup>	Nanograms per cubic metre
pg/m <sup>3</sup>	Picograms per cubic metre
pg TEQ/m <sup>3</sup>	Picograms toxic exposure equivalents per cubic metre



## QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018

Introduction  
August 22, 2018

## 1.0 INTRODUCTION

### 1.1 BACKGROUND AND OBJECTIVES

The Regional Municipalities of Durham and York operate the Durham York Energy Centre (DYEC) which is an Energy from Waste (EFW) facility intended to provide a long-term, sustainable solution to manage municipal solid waste remaining after diversion from the Regions. The location of the DYEC is shown in **Figure 1-1**. The facility commenced commercial operation on February 1, 2016.

An Ambient Air Quality Monitoring Plan – Durham York Residual Waste Study (Ambient Monitoring Plan) was developed and included two monitoring stations referred to as the Courtice Water Pollution Control Plant (WPCP) Station and the Rundle Road Station (as well as a temporary Fence Line Station). The plan developed for these stations was based on the Regional Council's mandate to provide ambient air quality monitoring in the area of the DYEC for a three-year period.

The purposes of the ambient air quality monitoring program are to:

1. Quantify any measurable ground level concentrations resulting from emissions from the DYEC cumulative to local air quality, including validating the predicted concentrations from the dispersion modelling conducted in the Environmental Assessment (Jacques Whitford, 2009);
2. Monitor concentration levels of EFW-related air contaminants in nearby residential areas; and,
3. Quantify background ambient levels of air contaminants in the area.

At the request of the Regional Municipality of Durham (the Region), a third ambient air monitoring station located near the corner of Crago and Osborne Roads was installed. This station, which is not part of the Ambient Monitoring Plan, is operated following the same protocols as the other two stations (Courtice WPCP and Rundle Road Stations) already in operation.

The Crago Road Station is equipped to measure concentrations of several air contaminants either continuously or at scheduled intervals (non-continuously) as outlined below:

- Contaminants monitored continuously:
  - Sulphur Dioxide ( $\text{SO}_2$ );
  - Nitrogen Oxides ( $\text{NO}_x$ ); and,
  - Particulate Matter smaller than 2.5 microns ( $\text{PM}_{2.5}$ ).
- Contaminants monitored non-continuously:
  - Metals in Total Suspended Particulate (TSP) matter;
  - Polycyclic Aromatic Hydrocarbons (PAHs); and,
  - Dioxins and Furans.

This quarterly report provides a summary of the ambient air quality data collected at this station for the period April to June 2018 (Q2).



## QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018

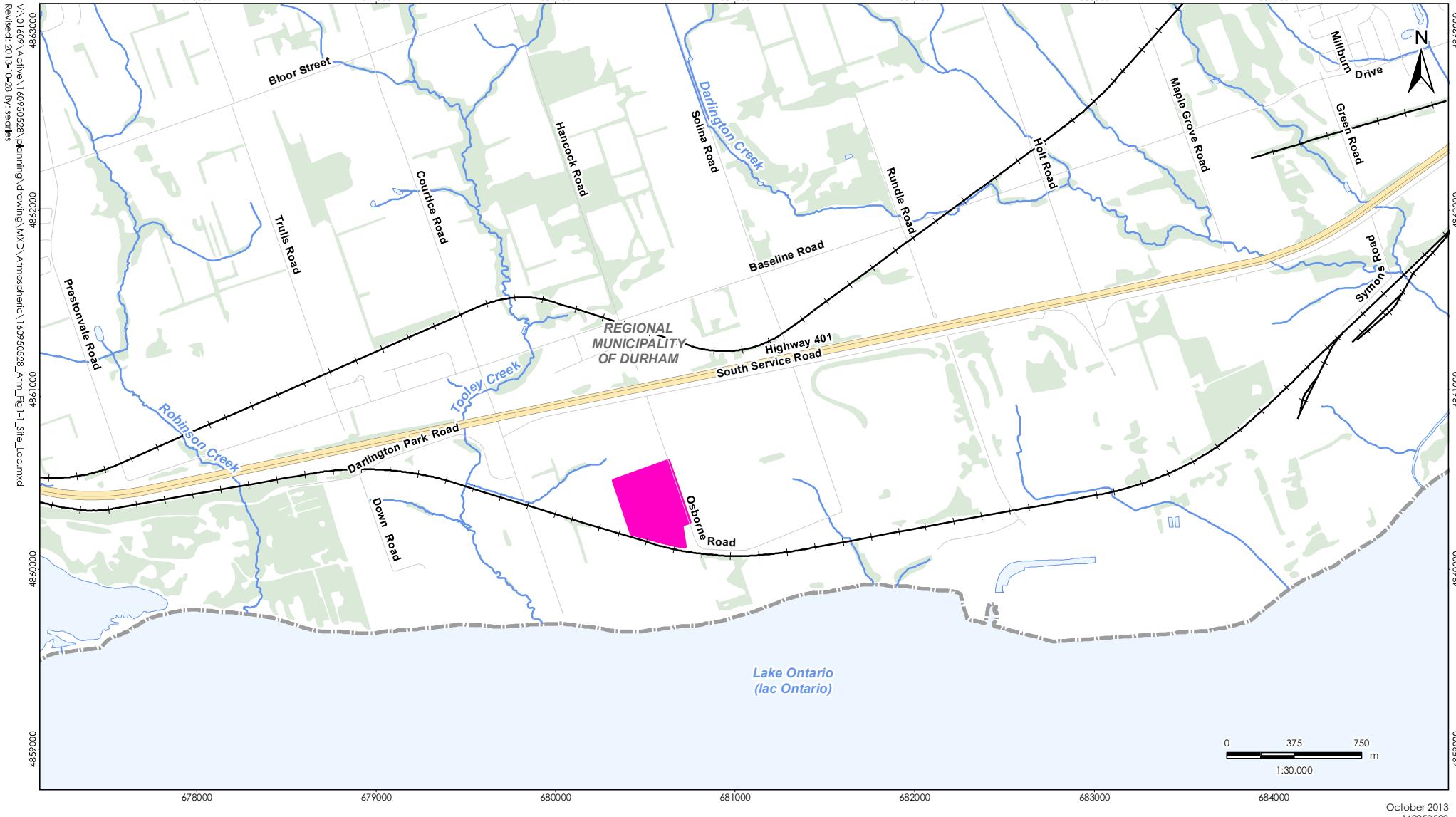
Introduction  
August 22, 2018

### 1.2 LOCATION OF AMBIENT AIR QUALITY MONITORING STATION

The selection of the site for the monitoring station was accomplished in consultation with Regional Municipality of Durham representatives, with consideration of the location of the existing monitoring stations and general MECP siting criteria. The final location of the monitoring station was influenced by the availability of electrical power, accessibility of each location, and security.

The Crago Road Station is sited east of the DYEC near the Darlington Hydro Upper and Lower Soccer Fields on the east side of Crago Road, north of Osborne Road. Its location is shown in **Figure 1-2** and **Figure 1-3**. The monitoring station measures all the air contaminants listed in Section 1.1 and meteorological data.





October 2013  
160950528



#### Notes

1. Coordinate System: NAD 1983 UTM Zone 17N

2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2013.

#### Legend

- Durham York Energy Centre Site
- Railway
- Road
- Highway
- Watercourse
- Waterbody
- Wooded Area



#### Client/Project

The Region of Durham  
Durham York Energy Centre

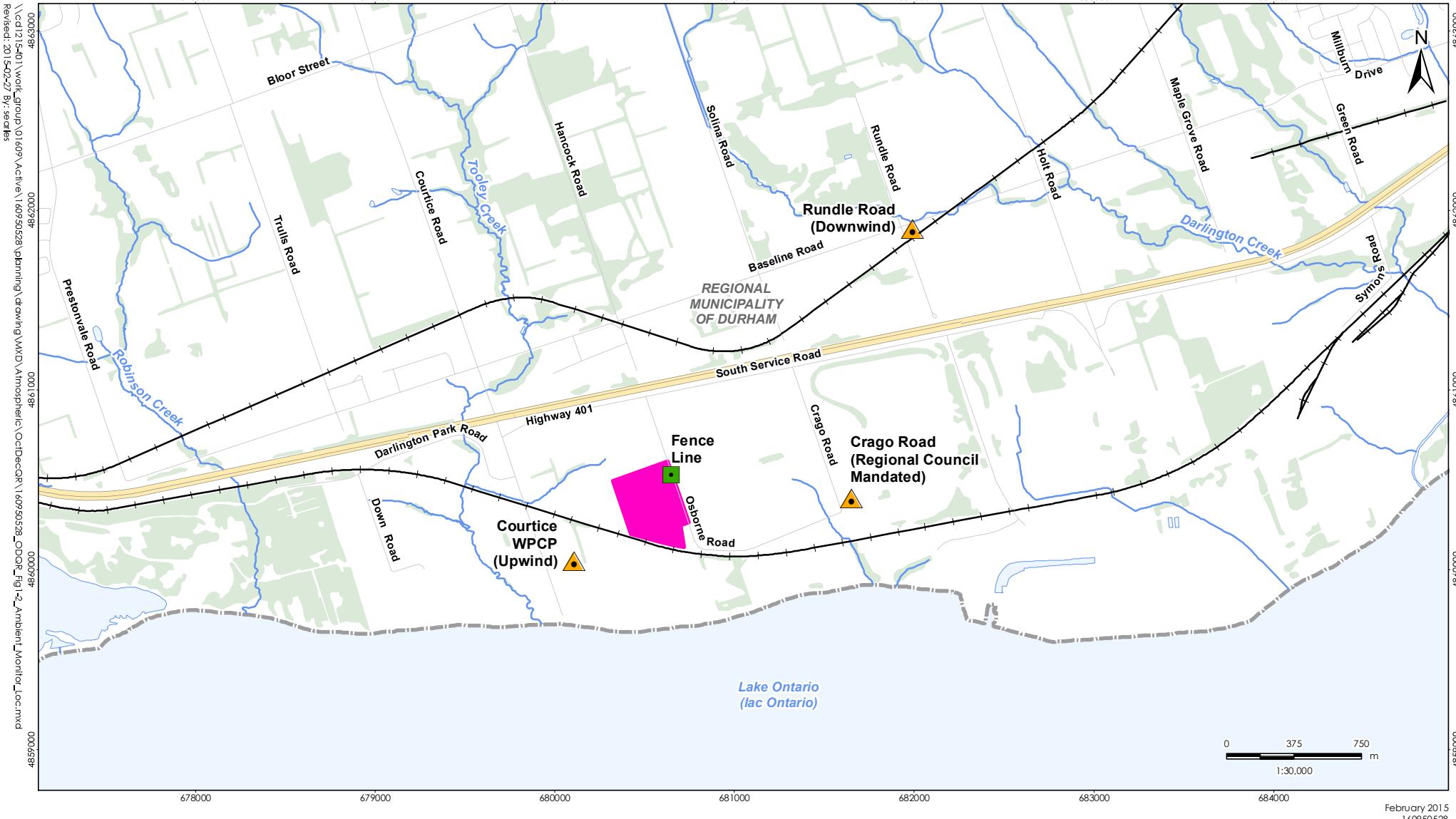
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1-1

#### Title

Site Location Plan





#### Legend

- ▲ Station Location
- Fence Line Station Location  
(Monitoring to begin after DYEC commissioning period)
- Durham York Energy Centre Site
- Railway
- Road
- Highway

- Watercourse
- Waterbody
- Wooded Area

#### Client/Project

The Region of Durham  
Durham York Energy Centre

#### Figure No.

1-2

#### Title

**Locations of Ambient Monitoring Stations**

#### Notes

1. Coordinate System: NAD 1983 UTM Zone 17N

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**QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018**

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**Figure 1-3: View of Crago Road Ambient Air Quality Monitoring Station**





# QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018

Key Components Assessed  
August 22, 2018

## 2.0 KEY COMPONENTS ASSESSED

### 2.1 METEOROLOGY

The following meteorological parameters are measured at the Crago Road monitoring station:

- Wind Speed and direction at a height of 7.5 m;
- Ambient temperature at a height of 2 m;
- Relative humidity; and,
- Rainfall.

### 2.2 AIR QUALITY CONTAMINANTS OF CONCERN

The ambient air quality monitoring program for the Crago Road Station includes the following contaminants specified in the Ambient Monitoring Plan (Stantec, 2012):

- Continuously monitored criteria air contaminants (CACs)
  - Sulphur Dioxide ( $\text{SO}_2$ );
  - Nitrogen Oxides ( $\text{NO}_x$ ); and,
  - Particulate Matter smaller than 2.5 microns ( $\text{PM}_{2.5}$ ).
- Non-continuously monitored
  - Metals in Total Suspended Particulate (TSP) matter;
  - Polycyclic Aromatic Hydrocarbons (PAHs); and,
  - Dioxins and Furans.

The following are lists of the specific metals, PAHs, and dioxins and furans being measured. Rationales for the choice of contaminants being monitored are provided in the Ambient Monitoring Plan (Stantec, 2012).

#### Metals:

- |                         |                   |                  |
|-------------------------|-------------------|------------------|
| • Aluminum (Al)         | • Iron (Fe)       | • Thallium (Tl)  |
| • Antimony (Sb)         | • Lead (Pb)       | • Tin (Sn)       |
| • Arsenic (As)          | • Magnesium (Mg)  | • Titanium (Ti)  |
| • Barium (Ba)           | • Manganese (Mn)  | • Uranium (U)    |
| • Beryllium (Be)        | • Mercury (Hg)    | • Vanadium (V)   |
| • Bismuth (Bi)          | • Molybdenum (Mo) | • Zinc (Zn)      |
| • Boron (B)             | • Nickel (Ni)     | • Zirconium (Zr) |
| • Cadmium (Cd)          | • Phosphorus (Ph) |                  |
| • Cobalt (Co)           | • Selenium (Se)   |                  |
| • Copper (Cu)           | • Silver (Ag)     |                  |
| • Chromium (Cr) (Total) | • Strontium (Sr)  |                  |



## QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018

Key Components Assessed  
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### Polycyclic Aromatic Hydrocarbons:

- 1-Methylnaphthalene
- 2-Methylnaphthalene
- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo(a)anthracene
- Benzo(a)fluorene
- Benzo(a)pyrene
- Benzo(b)fluorene
- Benzo(b)fluoranthene
- Benzo(e)pyrene
- Benzo(g,h,i)perylene
- Benzo(k)fluoranthene
- Biphenol
- Chrysene
- Dibenz(a,h)anthracene
- Dibenz(a,c)anthracene
- Fluoranthene
- Indeno(1,2,3-cd)pyrene
- Naphthalene
- Perylene
- Phenanthrene
- Pyrene
- Tetralin
- o-Terphenyl
- Total PAHs

### Dioxins and Furans:

- 2,3,7,8-Tetra CDD
- 1,2,3,7,8-Penta CDD
- 1,2,3,4,7,8-Hexa CDD
- 1,2,3,6,7,8-Hexa CDD
- 1,2,3,7,8,9-Hexa CDD
- 1,2,3,4,6,7,8-Hepta CDD
- Octa CDD
- Total Tetra CDD
- Total Penta CDD
- Total Hexa CDD
- Total Hepta CDD
- 2,3,7,8-Tetra CDF
- 1,2,3,7,8-Penta CDF
- 2,3,4,7,8-Penta CDF
- 1,2,3,4,7,8-Hexa CDF
- 1,2,3,6,7,8-Hexa CDF
- 2,3,4,6,7,8-Hexa CDF
- 1,2,3,7,8,9-Hexa CDF
- 1,2,3,4,6,7,8-Hepta CDF
- 1,2,3,4,7,8,9-Hepta CDF
- Octa CDF
- Total Tetra CDF
- Total Penta CDF
- Total Hexa CDF
- Total Hepta CDF
- Total toxic equivalency (I-TEQ)

## 2.3 AIR QUALITY CRITERIA

Several evaluation criteria were used for comparison to the air quality data as specified in the Ambient Monitoring Plan (Stantec, 2012). The first set was the Ontario Ambient Air Quality Criteria (AAQC) developed by the MECP (MECP, 2012). The second set of criteria was the Standards reported in O. Reg. 419/05 (Schedules 3 and 6). These are compliance-based Standards used throughout the province of Ontario. These criteria, along with O. Reg. 419/05 Guidelines and Jurisdictional Screening Levels were consolidated in December 2016 into a new format known as the “Air Contaminants Benchmarks List: Standards, Guidelines and Screening Levels for Assessing Point of Impingement Concentrations of Air Contaminants” (ACB List) (MECP, 2018).

Not all chemicals have O. Reg. 419/05 Standards, or in some instances updated health-based criteria were used in the human health risk assessment (HHRA) conducted in support of the Environmental Assessment (July 31, 2009 - December 10, 2009). These health-based values, which were reported in Table 7-2 (Summary of Inhalation TRVs and Inhalation Benchmarks Selected for CACs) and Table 7-3 (Inhalation TRVs and Inhalation Benchmarks for Selected COPCs) of the HHRA (Stantec, 2009) were used as another set of evaluation criteria.



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Key Components Assessed  
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The previously applicable 24-hour average Canada-Wide Standard (CWS) for PM<sub>2.5</sub> of 30 µg/m<sup>3</sup> (98<sup>th</sup> percentile averaged over 3 consecutive years), has been superseded by a new Canadian Ambient Air Quality Standard (CAAQS) of 28 µg/m<sup>3</sup> (98<sup>th</sup> percentile averaged over three consecutive years) and an annual objective of 10 µg/m<sup>3</sup> as noted in **Table 2-1**. The proposed CAAQS 24-hour objective for 2020 is 27 µg/m<sup>3</sup>.

Summaries of the relevant air quality criteria for the contaminants monitored are presented in **Table 2-1** to **Table 2-3**.

**Table 2-1: Summary of Air Quality Criteria for CACs**

Contaminant	CAS	MECP Criteria			HHRA Health-Based Criteria		
		1-Hour (ppb / µg/m <sup>3</sup> )	24-Hour (ppb / µg/m <sup>3</sup> )	Annual (ppb / µg/m <sup>3</sup> )	1-Hour (ppb / µg/m <sup>3</sup> )	24-Hour (ppb / µg/m <sup>3</sup> )	Annual (ppb / µg/m <sup>3</sup> )
Sulphur dioxide	7446095	250 / 690	100 / 275	20 / 55	250 / 690	100 / 275	11 / 29
Nitrogen dioxide	10102-44-0	200 / 400	100 / 200	-	200 / 400	100 / 200	30 / 60
Contaminant	CAS	Canadian Ambient Air Quality Standards (CAAQS)			HHRA Health-Based Criteria		
		1-Hour (µg/m <sup>3</sup> )	24-Hour (µg/m <sup>3</sup> )	Other Time Period (µg/m <sup>3</sup> )	1-Hour (µg/m <sup>3</sup> )	24-Hour (µg/m <sup>3</sup> )	Other Time Period (µg/m <sup>3</sup> )
PM <sub>2.5</sub>	N/A	-	28 <sup>A</sup>	10 <sup>B</sup>	-	30 <sup>C</sup>	-

**Notes:**

- A. Canadian Ambient Air Quality Standards (CAAQS) for Respirable Particulate Matter and Ozone, effective by 2015 (CCME, 2012). The Respirable Particulate Matter Objective is referenced to the 98<sup>th</sup> percentile daily average concentration averaged over 3 consecutive years.
- B. Annual Canadian Ambient Air Quality Standard for Respirable Particulate Matter, effective by 2015. The Respirable Particulate Matter Objective is referenced to the 3-year average of the annual average concentrations.
- C. HHRA Health-Based criterion for PM<sub>2.5</sub> was selected referencing CCME (2006).



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**Table 2-2: Summary of Air Quality Criteria for Metals**

Contaminant	CAS	MECP Criteria			HHRA Health-Based Criteria		
		1-Hour ( $\mu\text{g}/\text{m}^3$ )	24-Hour ( $\mu\text{g}/\text{m}^3$ )	Other Time Period ( $\mu\text{g}/\text{m}^3$ )	1-Hour ( $\mu\text{g}/\text{m}^3$ )	24-Hour ( $\mu\text{g}/\text{m}^3$ )	Annual ( $\mu\text{g}/\text{m}^3$ )
Total Particulate	NA	-	120	-	-	120	60
Aluminum	7429-90-5	-	4.8	-	-	-	-
Antimony	7440-36-0	-	25	-	5	25	0.2
Arsenic	7440-38-2	-	0.3	-	0.2	0.3	0.015 <sup>A</sup> 0.0043 <sup>B</sup>
Barium	7440-39-3	-	10	-	5	10	1
Beryllium	7440-41-7	-	0.01	-	0.02	0.01	0.007 <sup>A</sup> 0.0024 <sup>B</sup>
Bismuth	7440-69-9				-		
Boron	7440-42-8	-	120	-	50	-	5
Cadmium	7440-43-9	-	0.025	0.005; annual	0.1	0.025	0.005 <sup>A</sup> 0.0098 <sup>B</sup>
Chromium (Total)	7440-47-3	-	0.5	-	1	-	60
Cobalt	7440-48-4	-	0.1	-	0.2	0.1	0.1
Copper	8440-50-8	-	50	-	-	-	-
Iron	15438-31-0	-	4	-	-	-	-
Lead	7439-92-1	-	0.5	0.2; 30-day	1.5	0.5	0.5
Magnesium	7439-95-4				-		
Manganese	7439-96-5	-	0.4	-	-	-	-
Mercury	7439-97-6	-	2	-	0.6	2	0.3
Molybdenum	7439-87-7	-	120	-	-	-	-
Nickel	7440-02-0	-	0.2	0.04; annual	6	-	0.05
Phosphorus	7723-14-0	-	-	-	-	-	$6.4 \times 10^7$
Selenium	7782-49-2	-	10	-	2	10	0.2
Silver	7440-22-4	-	1	-	0.1	1	0.01
Strontium	7440-24-6	-	120	-	-	-	-
Thallium	7440-28-0	-	-	-	1		0.1
Tin	7440-31-5	-	10	-	20	10	2
Titanium	7440-32-6	-	120	-	-	-	-



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**Table 2-2: Summary of Air Quality Criteria for Metals**

Contaminant	CAS	MECP Criteria			HHRA Health-Based Criteria		
		1-Hour ( $\mu\text{g}/\text{m}^3$ )	24-Hour ( $\mu\text{g}/\text{m}^3$ )	Other Time Period ( $\mu\text{g}/\text{m}^3$ )	1-Hour ( $\mu\text{g}/\text{m}^3$ )	24-Hour ( $\mu\text{g}/\text{m}^3$ )	Annual ( $\mu\text{g}/\text{m}^3$ )
Vanadium	7440-62-2	-	2	-	0.5	1	1
Uranium	7440-61-1	-	1.5	0.03; annual	-	-	-
Zinc	7440-66-6	-	120	-	50		5
Zirconium	7440-67-7	-	20	-	-	-	-

**Notes:**

- A. Annual Average
- B. Carcinogenic Annual Average

**Table 2-3: Summary of Air Quality Criteria for PAHs and D/Fs**

Contaminant	CAS	MECP Criteria			HHRA Health-Based Criteria			Toxic Equivalency Factor Annual A, F ( $\text{ng}/\text{m}^{3}\text{-}1$ )
		1-Hour ( $\text{ng}/\text{m}^3$ )	24-Hour ( $\text{ng}/\text{m}^3$ )	Other Time Period ( $\text{ng}/\text{m}^3$ )	1-Hour ( $\text{ng}/\text{m}^3$ )	24-Hour ( $\text{ng}/\text{m}^3$ )	Annual ( $\text{ng}/\text{m}^3$ )	
1-Methylnaphthalene	90-12-0	-	12,000	-	-	-	3,000	-
2-Methylnaphthalene	91-57-6	-	10,000	-	-	-	3,000	-
Acenaphthene	83-32-9	-	-	-	1,000	-	-	1
Acenaphthylene	208-96-8	-	3,500	-	1,000	-	-	10
Anthracene	120-12-7	-	200	-	500	-	50	-
Benzo(a)anthracene	56-55-3	-	-	-	500	-	-	100
Benzo(b)fluoranthene	205-99-2	-	-	-	500	-	-	100
Benzo(k)fluoranthene	207-08-9	-	-	-	500	-	-	100
Benzo(a)fluorene	238-84-6	-	-	-	500	-	50	-
Benzo(b)fluorene	243-17-4	-	-	-	500	-	50	-
Benzo (g,h,i) perylene	191-24-2	-	-	-	500	-	-	100
Benzo(a)pyrene	50-32-8	-	0.05 <sup>B</sup> 5 <sup>C</sup> 1.1 <sup>D</sup>	0.01; annual	-	1	87 <sup>A</sup>	-
Benzo(e)pyrene	192-97-2	-	-	-	500	-	-	10
Biphenyl	92-52-4	-	-	-	-	-	224,000	-
Chrysene	218-01-9							-
Dibenz(a,c)anthracene	215-58-7	-	-	-	-	-	-	100
Dibenz(a,h)anthracene	53-70-3	-	-	-	500	-	-	1,000



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**Table 2-3: Summary of Air Quality Criteria for PAHs and D/Fs**

Contaminant	CAS	MECP Criteria			HHRA Health-Based Criteria			Toxic Equivalency Factor Annual <sup>A, F</sup> (ng/m <sup>3</sup> ) <sup>-1</sup>
		1-Hour (ng/m <sup>3</sup> )	24-Hour (ng/m <sup>3</sup> )	Other Time Period (ng/m <sup>3</sup> )	1-Hour (ng/m <sup>3</sup> )	24-Hour (ng/m <sup>3</sup> )	Annual (ng/m <sup>3</sup> )	
Fluoranthene	206-44-0	-	-	-	500	-	-	1
Indeno(1,2,3-cd)pyrene	193-39-5	-	-	-	500	-	-	100
Naphthalene	91-20-3	-	22,500	-	-	22,500	3,000	-
o-Terphenyl	84-15-1	-	-	-	50,000	-	5,000	-
Perylene	198-55-0	-	-	-	500	-	-	1
Phenanthrene	85-01-8	-	-	-	500	-	-	1
Pyrene	129-00-0	-	-	-	500	-	-	1
Tetralin	119-64-2	-						-
Dioxins and Furans Total Toxic Equivalency <sup>E</sup>	NA	-	0.1 (pg TEQ/m <sup>3</sup> ) <sup>E</sup> 1 (pg TEQ/m <sup>3</sup> ) <sup>C</sup>	-	-	5 (pg TEQ/m <sup>3</sup> )	1.03 (pg TEQ/m <sup>3</sup> )	-

**Notes:**

- A. Carcinogenic Annual Average. Units in (ng/m<sup>3</sup>)<sup>-1</sup>.
- B. Ontario Ambient Air Quality Criteria - The standard for benzo(a)pyrene (B(a)P) is for B(a)P as a surrogate for PAHs.
- C. O. Reg. 419/05 Schedule 6 Upper Risk Thresholds
- D. O. Reg. 419/05 24 Hour Guideline
- E. Application of the air standard for dioxins, furans, and dioxin-like PCBs requires the calculation of the total toxicity equivalent (TEQ) concentration contributed by all dioxin-like compounds in the mixture. TEQ is calculated using the methodology as per the O. Reg. 419/05 Summary of Standards and Guidelines, and the corresponding WHO<sub>2005</sub> toxic equivalency factors (i-TEFs).
- F. Toxic Equivalency Factors (TEFs) are shown as benzo(a)pyrene equivalents.



# QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018

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## 3.0 INSTRUMENTATION SUMMARY AND FIELD CONDITIONS

### 3.1 INSTRUMENTATION

The measurement program at the monitoring site includes both continuous and non-continuous monitors to sample air contaminant concentrations.

Monitoring for respirable particulate matter (PM<sub>2.5</sub>), nitrogen oxides (NO<sub>x</sub>) and sulphur dioxide (SO<sub>2</sub>) are conducted on a continuous basis. A summary of the continuous monitors and a brief description of their principle of operation are provided in **Table 3-1** below.

**Table 3-1: Summary of Continuous Ambient Air Quality Monitors**

Contaminant	Monitor	Principle of Operation	Range	Time Interval
PM <sub>2.5</sub>	Thermo Sharp 5030 Synchronized Hybrid Ambient Real-time Particulate Monitor	Light Scattering Photometry / Beta Attenuation - Consists of a carbon14 source, detector, and light scattering Nephelometer in a rack-mountable enclosure. The Thermo Sharp utilizes a continuous (non-step wise) hybrid mass measurement and a combination of beta attenuation and light scattering technology. The unit's filter tape is automatically advanced based upon a user defined frequency or particulate loading.	0 - 10 mg/m <sup>3</sup>	1 minute
NO, NO <sub>2</sub> , NO <sub>x</sub>	Teledyne API Model 200E Chemiluminescence Analyzer	Chemiluminescence - Uses a chemiluminescence detection principle and microprocessor technology for ambient continuous emissions monitoring (CEM). Measurements are automatically compensated for temperature and pressure changes.	0 – 1000 ppb	1 second
SO <sub>2</sub>	Teledyne API Model T100	Pulsed Fluorescence - SO <sub>2</sub> levels are measured based on the principle that SO <sub>2</sub> has a strong ultraviolet (UV) absorption at a wavelength between 200 and 240 nanometres (nm). The absorption of photons at these wavelengths results in the emission of fluorescence photons at a higher wavelength. The amount of fluorescence measured is directly proportional to the concentration of SO <sub>2</sub> .	0 – 1000 ppb	1 second



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Two manually operated, high-volume air samplers are installed at the Crago Road Station to collect metals in total suspended particulate (TSP), polycyclic aromatic hydrocarbons (PAHs), and dioxins and furans. Sampling for these contaminants is conducted following the methodology and analyses described in the Ambient Monitoring Plan (Stantec, 2012), as presented in **Table 3-2**. The samples were submitted to Maxxam Analytics Inc., a Canadian Association for Laboratory Accreditation Inc. (CALA) / Standards Council of Canada (SCC) accredited laboratory, for analysis.

**Table 3-2: Summary of Non-Continuous Ambient Air Quality Monitors**

Contaminant	Sampler	Filter Media	Lab Analysis	Sampling Schedule
TSP and metals	Tisch Environmental TE-5170 mass-flow high volume sampler	Pre-weighed, conditioned Teflon coated glass fibre filters	Weighed for particulate loading and analysed using the Atomic Emission Spectroscopy / Inductively Coupled Plasma (AES/ICP) technique to determine metals content	24-hour sample taken every 6 days
PAHs	Tisch Environmental TE-1000 mass-flow high volume air sampler	Dual chambered sampling module with a Teflon-coated glass fibre filter and a Poly-Urethane Foam (PUF) cartridge	Gas Chromatography / Mass Spectrometry (GC/MS)	24-hour sample taken every 12 days
Dioxins and Furans				24-hour sample taken every 24 days

Horizontal wind speed, wind direction, atmospheric temperature, relative humidity, and rainfall are measured at the predominantly downwind Crago Road Station. The meteorological sensors at the Crago Road Station are mounted on an external 7.5 m aluminum tower and are logged using a digital data acquisition system (DAS). The meteorological equipment at the Crago Road Station is summarized in **Table 3-3**.

**Table 3-3: Summary of Meteorological Equipment**

Parameter	Equipment
Wind Speed/Wind Direction	Met One Instruments Inc. Model 034B
Temperature/Relative Humidity	Campbell Scientific Model HMP60
Rainfall	Texas Electronic TE525M

A Campbell Scientific CRX1000 station data acquisition system is used to collect continuous instrument monitoring data and status codes from the ambient air quality monitors. Continuous station data is maintained in the data loggers, and data is viewed locally using a laptop and the relevant DAS software applications. Remote data transmission is accomplished by the periodic transmission of collected station air quality data via cellular phone.



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### 3.2 INSTRUMENTATION ISSUES

A summary of the operational issues for each measurement parameter during the monitoring period is presented in **Table 3-4**.

**Table 3-4: Summary of Instrument Issues at the Crago Road Station**

Parameter	Issues	Timeframe	Remedial Action
SO <sub>2</sub>	Power outage at station during an ice storm.	April 15, 2018 at 16:00 to 18:00	No Action taken.
	Power outage at station during a wind storm.	May 4, 2018 at 17:00 to May 5, 2018 at 00:00	No Action taken.
NOx	Power outage at station during an ice storm.	April 15, 2018 at 16:00 to 18:00	No Action taken.
	Power outage at station during a wind storm.	May 4, 2018 at 17:00 to May 5, 2018 at 00:00	No Action taken.
PM <sub>2.5</sub>	Power outage at station during an ice storm.	April 15, 2018 at 16:00 to 18:00	No Action taken.
	Power outage at station during a wind storm.	May 4, 2018 at 17:00 to May 5, 2018 at 00:00	No Action taken.
TSP/Metals Hi-Vol	None	-	-
PAH/ D/F Hi-Vol	None	-	-
Other	Rain Gauge Frozen during an ice storm	April 14, 2018 at 11:00 to April 15, 2018 at 23:00	None required. After the ice storm, temperatures increased, the ice melted, and the rain gauge returned to normal functionality.
	Wind Speed/Direction sensor frozen during an ice storm.	April 14, 2018 at 9:00 to April 16, 2018 at 3:00	Data invalidated.

### 3.3 INSTRUMENTATION RECOVERY RATES

Data recovery rates for each monitor at the station during this quarter are presented in **Table 3-5**.

**Table 3-5: Summary of Data Recovery Rates for the Crago Road Station – April to June 2018**

Parameter	Valid Measurement Hours	Data Recovery Rate (%)
SO <sub>2</sub>	2168	99.3%
NOx	2168	99.3%
PM <sub>2.5</sub>	2166	99.2%
Temperature	2184	100%
Rainfall	2147	98.3%
Relative Humidity	2184	100%



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**Table 3-5: Summary of Data Recovery Rates for the Crago Road Station – April to June 2018**

Parameter	Valid Measurement Hours	Data Recovery Rate (%)
Wind Speed/Direction	2142	98.1%
TSP/Metals	15 <sup>A</sup>	100%
PAHs	7 <sup>A</sup>	100%
Dioxins and Furans	4 <sup>A</sup>	100%

**Notes:**

- A. Number of filters/24-hour average samples.
- B. Includes any instrumentation issues summarized in Table 3-4, maintenance, and monthly calibrations.

## 3.4 FIELD CONDITION OBSERVATIONS

During Q2 2018, activities in the vicinity of the Crago Road monitoring station were observed that had the potential to be affecting air quality levels. These observations were noted during field visits by Stantec personnel.

Construction of Highway 418, which will connect with Highway 401 between Courtice Road and Crago Road was ongoing during this quarter. Highway 418 will provide a north-south link between Highway 401 and the Phase 2 expansion of Highway 407. The Highway 401/418 interchange will be located almost directly north of the DYEC. Throughout the quarter, excavator/dump truck crews were observed working in a large area immediately north of the DYEC between Megawatt Drive and Highway 401. Major work observed included earthworks and Highway 401 overpass construction for on/off ramps connecting to Highway 418. A photograph of soil berms/ramps and overpass construction activities is provided in **Figure 3-1**.

During Q2, there were 7 noted feed stoppages at Boiler 1 and 10 stoppages at Boiler 2. The times when these feed stops occurred are summarized in **Table 3-6**.

**Table 3-6: Summary of Boiler Operational Status in Q2 2018**

Boiler	Date	Time	Status
Boiler 1	4-Apr-18	5:57-20:34	Boiler Down
	6-Apr-18	14:16-3:40 (7-Apr-18)	Feed Stop
	15-Apr-18	23:35-15:48 (16-Apr-18)	Boiler Down
	19-Apr-18	5:59-23:35	Feed Stop
	2-May-18	9:23-17:36	Boiler Down
	24-May-18	13:55-14:33	Boiler Down
	11-Jun-18	0:00-4:00 (14-Jun-18)	Boiler Down



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**Table 3-6: Summary of Boiler Operational Status in Q2 2018**

Boiler	Date	Time	Status
Boiler 2	4-Apr-18	5:57-16:33	Boiler Down
	6-Apr-18	15:09-3:35	Feed Stop
	10-Apr-18	23:02-1:32 (11-Apr-18)	Feed Stop
	15-Apr-18	21:03-21:32	Boiler Down
	15-Apr-18	23:35-15:39 (16-Apr-18)	Boiler Down
	19-Apr-18	6:00-23:32	Feed Stop
	23-Apr-18	13:52-14:55	Feed Stop
	2-May-18	9:23-16:40	Boiler Down
	24-May-18	13:55-14:33	Boiler Down
	25-Jun-18	0:00-11:00 (29-Jun-18)	Boiler Down



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**Figure 3-1: Looking North from Megawatt Drive at the Highway 401 and Highway 418 Construction (May 1, 2018)**



# QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018

Summary of Ambient Measurements  
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## 4.0 SUMMARY OF AMBIENT MEASUREMENTS

The following sections provide summaries of the validated data and the validation completed on each parameter.

### 4.1 METEOROLOGICAL DATA

A summary of the maximum, minimum, arithmetic mean, and standard deviation of the hourly average meteorological parameters measured at the monitoring station for the April to June 2018 period are presented in **Table 4-1**.

**Table 4-1: Summary of Hourly Meteorological Measurements – April to June 2018**

Parameter	Crago Road Station (Predominately Downwind)	Units
Temperature	Maximum	27.2
	Minimum	-7.7
	Mean (April)	2.2
	Mean (May)	13.0
	Mean (June)	16.7
	Mean (Period)	10.6
	Standard Deviation	7.4
Rainfall	Maximum	19.4
	Minimum	0.0
	Mean (April)	0.18
	Mean (May)	0.08
	Mean (June)	0.05
	Mean (Period)	0.10
	Standard Deviation	0.65
Relative Humidity	Maximum	98.1
	Minimum	12.5
	Mean (April)	67.4
	Mean (May)	67.3
	Mean (June)	69.7
	Mean (Period)	68.1
	Standard Deviation	18.2



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**Table 4-1: Summary of Hourly Meteorological Measurements – April to June 2018**

Parameter	Crago Road Station (Predominately Downwind)	Units
Wind Speed <sup>A</sup>	Maximum	54.5
	Minimum	0.0
	Mean (April)	14.9
	Mean (May)	10.4
	Mean (June)	9.7
	Mean (Period)	11.6
	Standard Deviation	7.7

**Note:**

A. Wind speed is measured at 7.5 m.

A wind rose showing directionality and speed is presented in **Figure 4-1**. The length of the radial barbs gives the total percent frequency of winds from the indicated direction, while portions of the barbs of different widths indicate the frequency associated with each wind speed category.

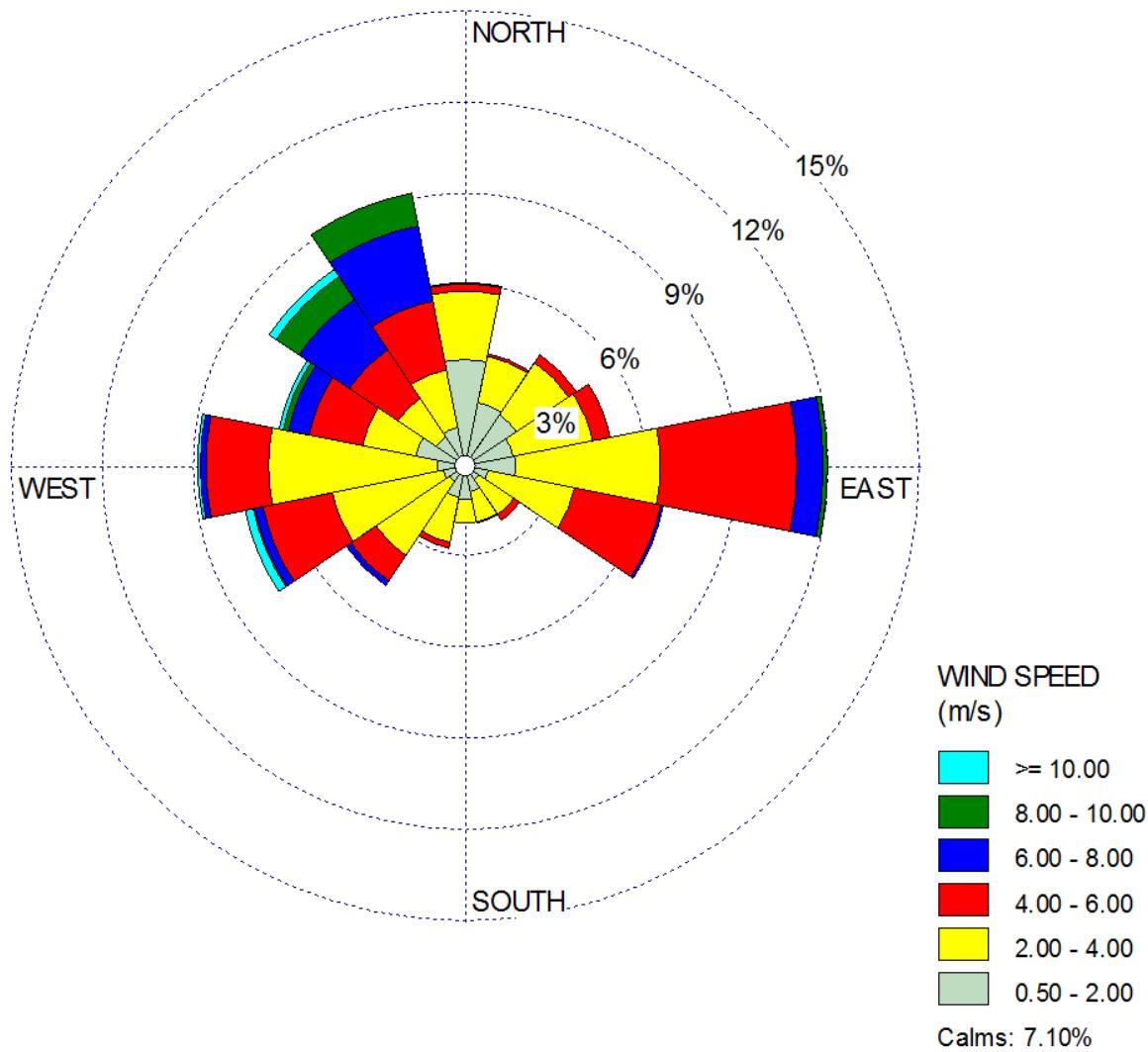
Winds over the three-month period occurred predominantly from easterly and north-northwesterly to west-southwesterly directions. Wind contribution from the southeast to southwest was low. Higher wind speeds occurred from west-southwesterly to northwesterly directions.



## QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018

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**Figure 4-1: Wind Rose for April to June 2018**



## 4.2 CAC AMBIENT AIR QUALITY MEASUREMENTS

A summary of the maximum, minimum, arithmetic mean, and standard deviation of the measured CAC pollutant concentrations are presented in **Table 4-2**. Also, presented in this table are the number of exceedances (if any occurred) of the relevant O. Reg. 419/05 Schedule 3 Standards, Ontario Ambient Air Quality Criteria (AAQC) or health-based criteria for each contaminant. All monitored contaminants were below their applicable criteria during the period April to June 2018.



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Nitric oxide (NO) has no regulatory criteria as discussed in Section 4.2.2 below. There are both hourly and daily AAQCs for NO<sub>2</sub> which are based on health effects of NO<sub>2</sub>; therefore, the AAQC were compared to measured NO<sub>2</sub> concentrations in this report.

The maximum concentration levels measured at the Crago Road Station in this quarter are compared in **Figure 4-2** to their respective air quality criteria along with the levels measured at the Courtice WPCP and Rundle Road Stations (Stantec, 2018).



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**Table 4-2: Summary of Ambient CAC Monitoring Data – April to June 2018**

Pollutant	Averaging Period	MECP and HHRA Health-Based Criteria		Description	Crago Road Station (Predominately Downwind)	
		ppb	µg/m³		Concentration (ppbv)	Concentration (µg/m³) <sup>c</sup>
$\text{SO}_2$	1	250	690	Maximum	80.9	223.2
				Minimum	0.0	0.0
				Mean (April)	2.0	5.7
				Mean (May)	1.1	2.9
				Mean (June)	1.3	3.4
				Mean (Period)	1.5	4.0
				Standard Deviation	5.9	16.1
				# of Exceedances	0	0
	24	100	275	Maximum	25.5	71.9
				Minimum	0.0	0.0
				Mean (April)	2.1	5.9
				Mean (May)	1.1	2.9
				Mean (June)	1.3	3.4
				Mean (Period)	1.5	4.0
				Standard Deviation	3.1	8.5
				# of Exceedances	0	0



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**Table 4-2: Summary of Ambient CAC Monitoring Data – April to June 2018**

Pollutant	Averaging Period	MECP and HHRA Health-Based Criteria		Description	Crago Road Station (Predominately Downwind)	
		ppb	µg/m³		Concentration (ppbv)	Concentration (µg/m³) <sup>c</sup>
PM <sub>2.5</sub>	24	N/A	28 <sup>a</sup>	Maximum	-	15.7
				Minimum	-	1.3
				Mean (April)	-	4.9
				Mean (May)	-	6.8
				Mean (June)	-	5.1
				Mean (Period)	-	5.6
				Standard Deviation	-	3.2
				# of Exceedances	-	N/A
NO <sub>2</sub>	1	200	400	Maximum	39.0	74.0
				Minimum	0.0	0.0
				Mean (April)	6.4	12.9
				Mean (May)	4.2	8.2
				Mean (June)	4.3	8.3
				Mean (Period)	4.9	9.8
				Standard Deviation	5.9	11.7
				# of Exceedances	0	0
NO <sub>2</sub>	24	100	200	Maximum	19.2	38.9
				Minimum	0.0	0.0
				Mean (April)	6.2	12.6
				Mean (May)	4.3	8.5
				Mean (June)	4.3	8.3
				Mean (Period)	5.0	9.8



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**Table 4-2: Summary of Ambient CAC Monitoring Data – April to June 2018**

Pollutant	Averaging Period	MECP and HHRA Health-Based Criteria		Description	Crago Road Station (Predominately Downwind)	
		ppb	µg/m <sup>3</sup>		Concentration (ppbv)	Concentration (µg/m <sup>3</sup> ) <sup>c</sup>
					Standard Deviation	3.1
NO <sup>b</sup>	1	N/A	N/A	Standard Deviation	0	0
				Maximum	36.8	46.3
				Minimum	0.0	0.0
				Mean (April)	2.1	2.8
				Mean (May)	1.1	1.4
				Mean (June)	1.2	1.5
				Mean (Period)	1.5	1.9
				Standard Deviation	3.0	3.9
	24	N/A	N/A	# of Exceedances	N/A	N/A
				Maximum	9.9	13.1
				Minimum	0.1	0.1
				Mean (April)	2.1	2.8
				Mean (May)	1.1	1.4
				Mean (June)	1.2	1.5
				Mean (Period)	1.5	1.9
				Standard Deviation	1.3	1.7
				# of Exceedances	N/A	N/A



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**Table 4-2: Summary of Ambient CAC Monitoring Data – April to June 2018**

Pollutant	Averaging Period	MECP and HHRA Health-Based Criteria		Description	Crago Road Station (Predominately Downwind)	
		ppb	µg/m³		Concentration (ppbv)	Concentration (µg/m³) <sup>c</sup>
NOx <sup>b</sup>	1	N/A	N/A	Maximum	64.3	130.0
				Minimum	0.0	0.0
				Mean (April)	8.2	16.5
				Mean (May)	5.1	9.9
				Mean (June)	5.2	10.1
				Mean (Period)	6.1	12.2
				Standard Deviation	8.0	16.0
				# of Exceedances	N/A	N/A
	24	N/A	N/A	Maximum	26.1	52.9
				Minimum	0.0	0.0
				Mean (April)	8.0	16.3
				Mean (May)	5.2	10.2
				Mean (June)	5.3	10.1
				Mean (Period)	6.2	12.2
				Standard Deviation	4.2	8.4
				# of Exceedances	N/A	N/A

**Notes:**

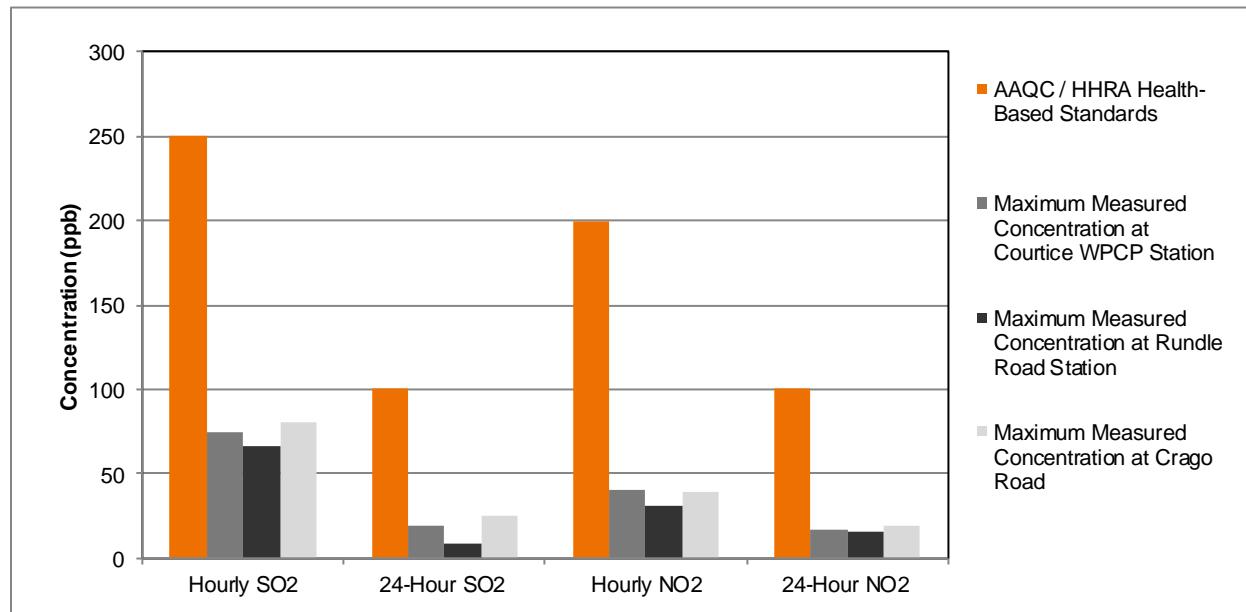
- A. Canadian Ambient Air Quality Standards (CAAQS) for Respirable Particulate Matter (CCME, 2012). The Respirable Particulate Matter Objective is referenced to the 98<sup>th</sup> percentile over 3 consecutive years.
- B. NO and NOx have no Ambient Air Quality Criteria.
- C. The conversions from ppb to µg/m³ are based on actual temperature and pressure. Therefore, the maximum concentration in ppb may not correspond to the same hour as the maximum concentration in µg/m³.



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**Figure 4-2: Comparison of NO<sub>2</sub> and SO<sub>2</sub> Ambient Air Quality Monitoring Data to Applicable Criteria at the Stations**



Detailed discussion for each measured contaminant is presented in the following sections.

### 4.2.1 Sulphur Dioxide (SO<sub>2</sub>)

Data summaries are presented in **Appendix A** for sulphur dioxide for each month as well as time history plots of hourly and 24-hour average SO<sub>2</sub> concentrations. For hourly and 24-hour averages, the Ontario AAQCs of 250 ppb and 100 ppb (690 µg/m<sup>3</sup> and 275 µg/m<sup>3</sup>) are shown with blue lines on the respective plot. As shown in these figures, measured ambient SO<sub>2</sub> concentrations at the station were well below the Ontario AAQCs.

The maximum hourly and 24-hour average SO<sub>2</sub> concentrations measured at the Crago Road Station during April to June 2018 were 80.9 and 25.5 ppb (223.2 and 71.9 µg/m<sup>3</sup>) respectively, which are 32% and 26% of the applicable 1-hour and 24-hour Ontario AAQCs.

A pollution rose of hourly average SO<sub>2</sub> concentrations measured at the Crago Road Station is presented in



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**Figure 4-3.** The pollution rose plot presents measured hourly average contaminant concentrations versus measured wind direction (over 10° wind sectors). Concentrations less than 2 ppb, which account for 89% of the measurements, have been removed from the plot to allow the distribution of maximum levels to be more clearly shown in the figure. In this period, the Crago Road Station generally measured higher hourly concentrations for winds blowing from easterly directions.

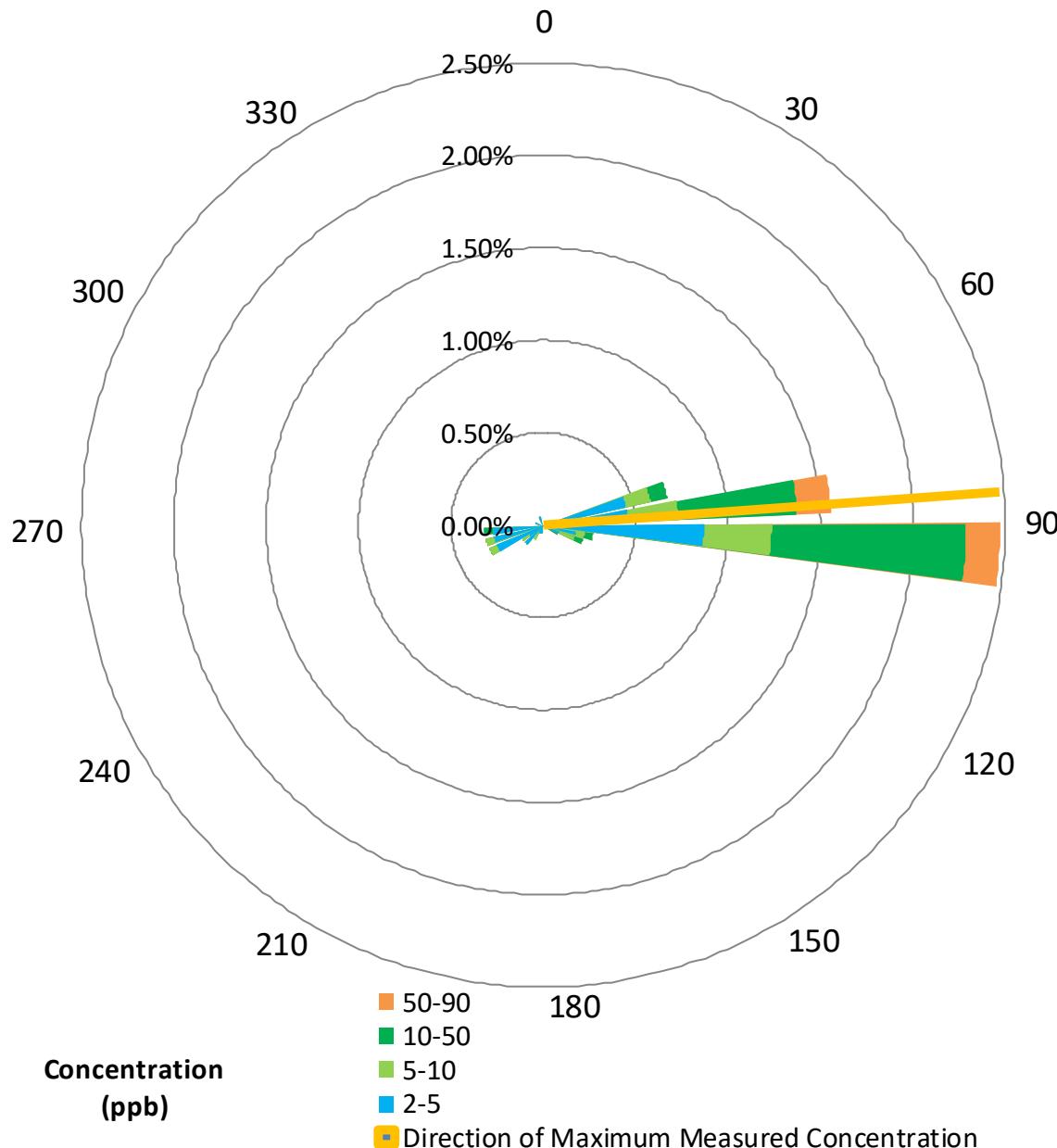
The maximum hourly average concentration of SO<sub>2</sub> occurred on June 3, 2018 at 11:00, with winds blowing from the east for which St. Mary's Cement and a CN railway were upwind. The maximum 24-hour average SO<sub>2</sub> concentration occurred on April 16, 2018 with winds also blowing from the east (based on the Courtice WPCP meteorological station, as the Crago wind direction sensor was frozen during this period).



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**Figure 4-3: Pollution Rose of Measured Hourly Average SO<sub>2</sub> Concentrations – April to June 2018**



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### 4.2.2 Nitrogen Dioxide (NO<sub>2</sub>)

Nitrogen oxides (NO<sub>x</sub>) are almost entirely made up of nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>). Together, they are often referred to as NO<sub>x</sub>. Most NO<sub>2</sub> in the atmosphere is formed by the oxidation of NO, which is emitted directly by combustion processes, particularly those at high temperature and pressure. Exposure to both NO and NO<sub>2</sub> can result in adverse health effects to an exposed population. NO<sub>2</sub> is the regulated form of NO<sub>x</sub>. Similar to other jurisdictions (e.g., Alberta Environment, World Health Organization), the O. Reg. 419/05 Schedule 3 Standards for NO<sub>x</sub> are based on health effects of NO<sub>2</sub>, as health effects are seen at much lower concentrations of NO<sub>2</sub> than NO. In this report, because NO<sub>2</sub> is the regulated form of NO<sub>x</sub>, the AAQC were compared to measured NO<sub>2</sub> concentrations.

Data summaries for nitrogen dioxide are presented in **Appendix B** for each month as well as time history plots of the hourly and 24-hour average NO<sub>2</sub> concentrations. For the hourly and 24-hour averages, the Ontario AAQCs of 200 ppb and 100 ppb (400 µg/m<sup>3</sup> and 200 µg/m<sup>3</sup>) are shown with blue lines on the respective plot. As shown in these figures, measured ambient NO<sub>2</sub> concentrations were well below the Ontario AAQCs.

The maximum measured hourly and 24-hour average concentrations were 39.0 and 19.2 ppb (74.0 and 38.9 µg/m<sup>3</sup>), which are 20% and 19% respectively, of the applicable 1-hour and 24-hour Ontario AAQCs.

A pollution rose of measured hourly average NO<sub>2</sub> concentrations is presented in **Figure 4-4**. Concentrations less than 20 ppb, which account for 93% of the measurements, have been removed from the plot to allow the distribution of maximum levels to be more clearly shown in the figure. Higher measured hourly average concentrations generally occurred for winds blowing from northerly directions.

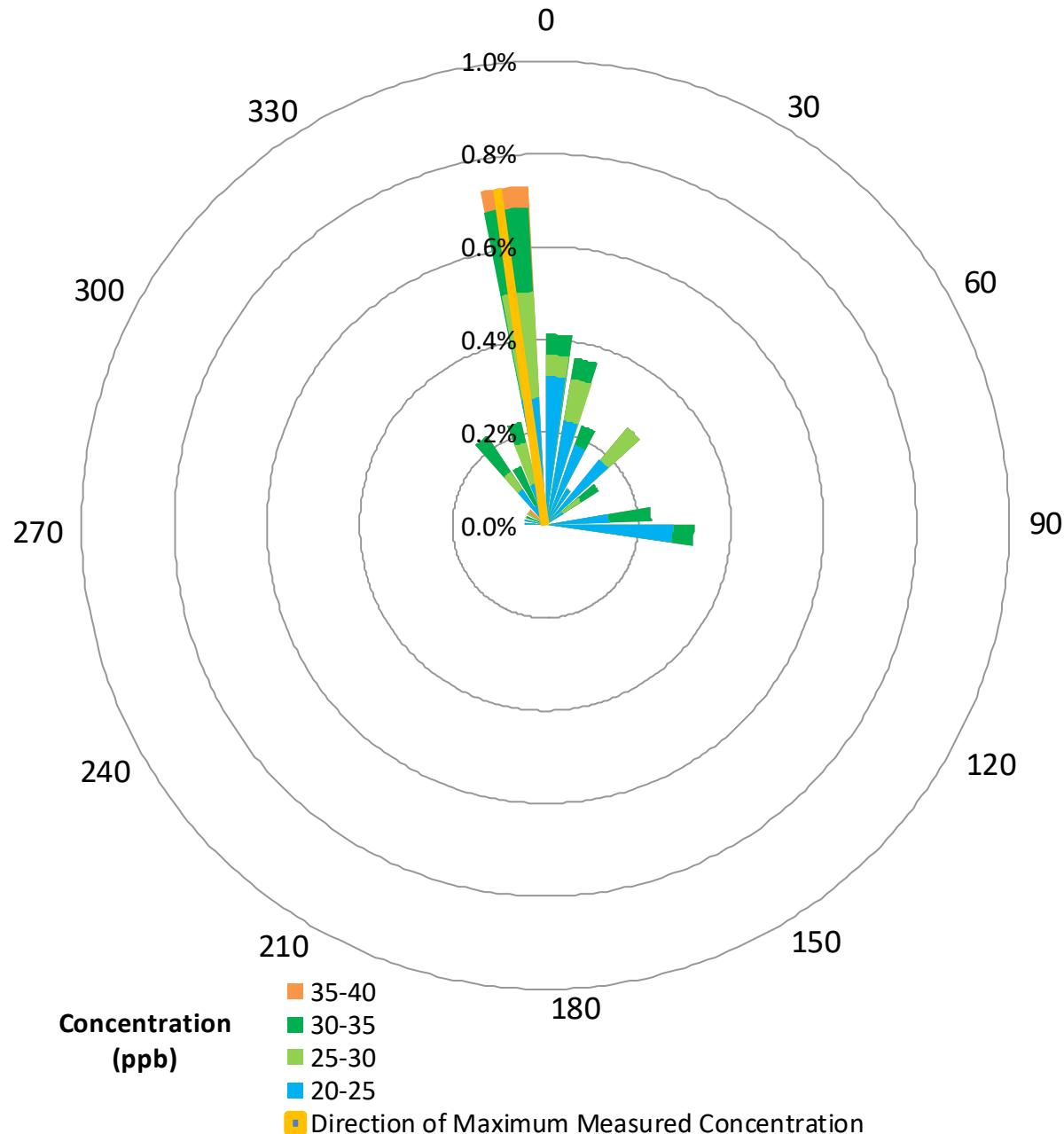
The highest measured hourly average NO<sub>2</sub> concentration occurred on June 28, 2018 at 21:00. During this hour, winds were blowing from a northerly direction for which Highway 401 and Highway 418 construction activities were upwind. The highest 24-hour average NO<sub>2</sub> concentration occurred when winds were blowing from the northeast on April 12, 2018 for which Highway 401 and Highway 418 construction activities were upwind.



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**Figure 4-4: Pollution Rose of Measured Hourly Average NO<sub>2</sub> – April to June 2018**



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### 4.2.3 Nitrogen Oxides (NO<sub>x</sub>)

Data summaries for each month are presented in **Appendix C** for nitrogen oxides as well as time history plots of the hourly and 24-hour average NO<sub>x</sub> concentrations. The maximum hourly NO<sub>x</sub> concentration measured at the Crago Road Station was 64.3 ppb (130.0 µg/m<sup>3</sup>), and the maximum measured 24-hour average NO<sub>x</sub> concentration was 26.1 ppb (52.9 µg/m<sup>3</sup>). See **Table 4-2** for detailed results.

A pollution rose of measured hourly average NO<sub>x</sub> concentrations is presented in **Figure 4-5**. Concentrations less than 20 ppb, which account for 91% of the measurements, have been removed from the plot to allow the distribution of maximum levels to be more clearly shown. Higher measured hourly average NO<sub>x</sub> concentrations typically occurred for winds blowing from northerly and easterly directions.

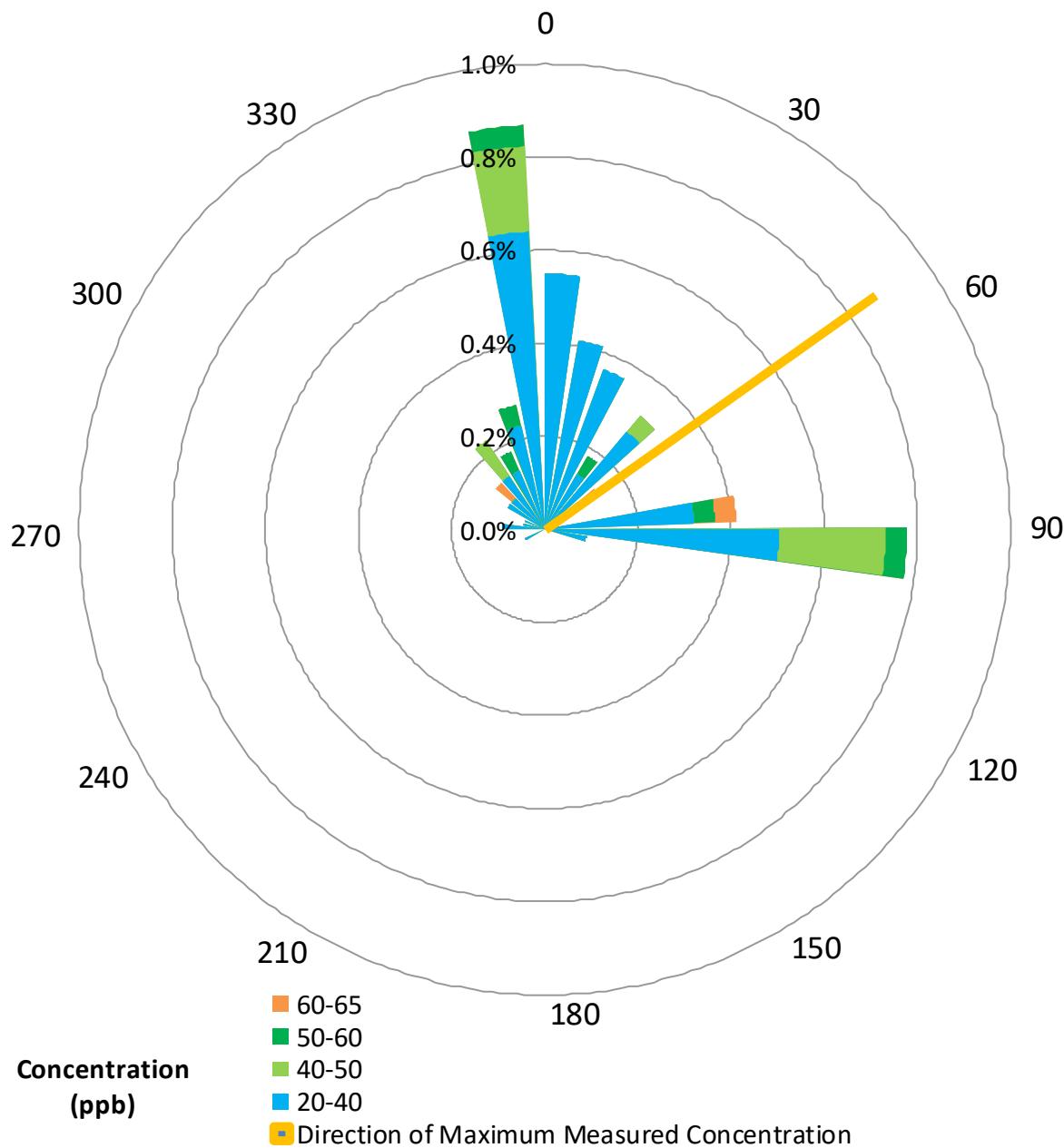
The highest measured hourly average NO<sub>x</sub> concentration occurred for a wind blowing from the northeast (from the direction of Highway 401 and Highway 418 construction activities) on April 16, 2018 at 3:00. The maximum 24-hour average NO<sub>x</sub> concentration was measured on April 12, 2018 when winds were also blowing from the northeast.



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**Figure 4-5: Pollution Rose of Measured Hourly Average NO<sub>x</sub> Concentrations – April to June 2018**



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### 4.2.4 Particulate Matter Smaller than 2.5 Microns (PM<sub>2.5</sub>)

Data summaries and time history plots of measured 24-hour average concentrations are presented in **Appendix D** for PM<sub>2.5</sub>.

The maximum measured 24-hour average PM<sub>2.5</sub> concentration was 15.7 µg/m<sup>3</sup> during this quarter. It should be noted that an exceedance of the 24-hour CAAQS for PM<sub>2.5</sub> requires the average of the 98<sup>th</sup> percentile levels in each of three consecutive calendar years to be greater than 28 µg/m<sup>3</sup>. The PM<sub>2.5</sub> measurements in this report consist of three months of data; therefore, there is insufficient data to determine with any certainty if exceedances of the CAAQS would occur.

A pollution rose showing the measured 24-hour average ambient PM<sub>2.5</sub> concentrations versus direction is shown in **Figure 4-6**. Concentrations less than 10 µg/m<sup>3</sup>, which account for 85% of the measurements, have been removed from the plot to allow the distribution of maximum levels to be more clearly shown in the figure. Higher measured concentrations typically occurred from southwesterly to northwesterly directions.

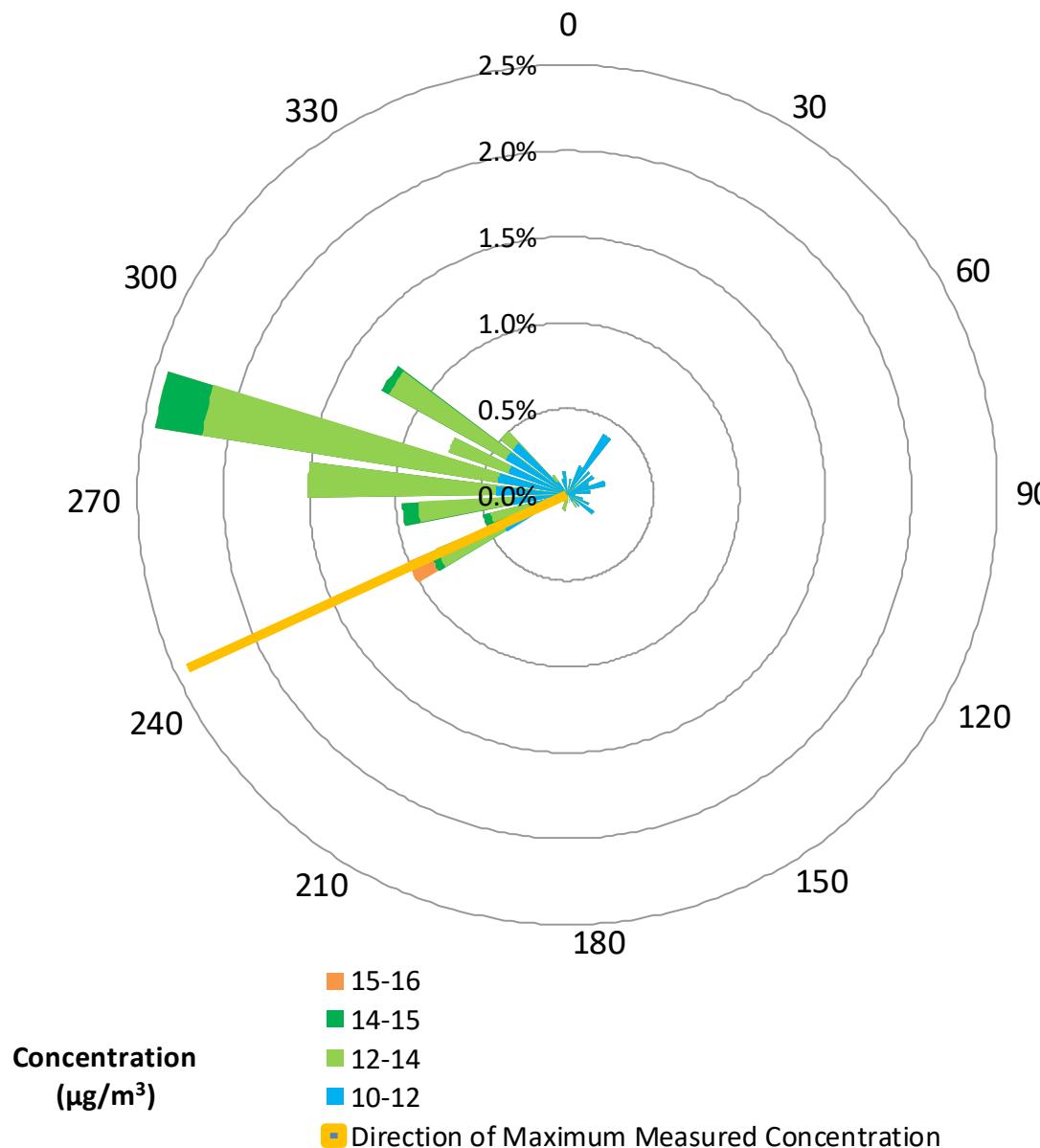
The highest measured 24-hour average PM<sub>2.5</sub> concentration occurred on June 18, 2018 with winds originating from the west-southwest. For this wind direction, agricultural fields, local roads, and a CN railway were upwind of the Crago Road Station.



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**Figure 4-6: Pollution Rose of Measured 24-Hour Average PM<sub>2.5</sub> Concentrations – April to June 2018**



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### 4.3 AMBIENT TSP / METALS CONCENTRATIONS

A summary of the maximum and minimum ambient TSP and metals concentrations (for a daily averaging period) are presented in **Table 4-3**. A detailed summary of the concentrations measured for each sample is presented in **Appendix F**.

The maximum measured concentrations of TSP and all metals with MECP AAQCs were below their applicable 24-hour criteria (shown in **Table 4-3** below).

**Table 4-3: Summary of Measured Ambient TSP/Metals Concentrations**

Contaminant	Units	MECP Criteria	HHRA Health Based Criteria	Results		
				Maximum	Minimum	No. of Exceedances
Particulate	µg/m³	120	120	106	13	0
Total Mercury (Hg)	µg/m³	2	2	2.65E-05	6.47E-06 A	0
Aluminum (Al)	µg/m³	4.8	-	9.34E-01	3.71E-02	0
Antimony (Sb)	µg/m³	25	25	3.59E-03 A	3.14E-03 A	0
Arsenic (As)	µg/m³	0.3	0.3	2.15E-03 A	1.88E-03 A	0
Barium (Ba)	µg/m³	10	10	1.56E-02	2.73E-03	0
Beryllium (Be)	µg/m³	0.01	0.01	3.59E-04 A	3.14E-04 A	0
Bismuth (Bi)	µg/m³	-	-	2.15E-03 A	1.88E-03 A	-
Boron (B)	µg/m³	120	-	2.15E-03 A	1.88E-03 A	0
Cadmium (Cd)	µg/m³	0.025	0.025	7.18E-04 A	6.28E-04 A	0
Chromium (Cr)	µg/m³	0.5	-	7.08E-03	1.57E-03 A	0
Cobalt (Co)	µg/m³	0.1	0.1	7.18E-04 A	6.28E-04 A	0
Copper (Cu)	µg/m³	50	-	3.41E-02	1.63E-03 A	0
Iron (Fe)	µg/m³	4	-	1.83E+00	1.19E-01	0
Lead (Pb)	µg/m³	0.5	0.5	1.45E-02	9.42E-04 A	0
Magnesium (Mg)	µg/m³	-	-	1.30E+00	6.96E-02	-
Manganese (Mn)	µg/m³	0.4	-	8.41E-02	3.64E-03	0
Molybdenum (Mo)	µg/m³	120	-	1.08E-03 A	9.42E-04 A	0
Nickel (Ni)	µg/m³	0.2	-	3.67E-03	9.42E-04 A	0
Phosphorus (P)	µg/m³	-	-	1.48E-01	8.13E-03 A	-
Selenium (Se)	µg/m³	10	10	3.59E-03 A	3.14E-03 A	0
Silver (Ag)	µg/m³	1	1	1.79E-03 A	1.57E-03 A	0
Strontium (Sr)	µg/m³	120	-	2.13E-02	1.69E-03	0
Thallium (Tl)	µg/m³	-	-	3.59E-03 A	3.14E-03 A	-
Tin (Sn)	µg/m³	10	10	3.59E-03 A	3.14E-03 A	0



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**Table 4-3: Summary of Measured Ambient TSP/Metals Concentrations**

Contaminant	Units	MECP Criteria	HHRA Health Based Criteria	Results		
				Maximum	Minimum	No. of Exceedances
Titanium (Ti)	µg/m <sup>3</sup>	120	-	3.38E-02	3.14E-03 A	0
Vanadium (V)	µg/m <sup>3</sup>	2	1	1.79E-03 A	1.57E-03 A	0
Zinc (Zn)	µg/m <sup>3</sup>	120	-	1.19E-01	6.70E-03	0
Zirconium (Zr)	µg/m <sup>3</sup>	20	-	1.79E-03 A	1.57E-03 A	0
Total Uranium (U)	µg/m <sup>3</sup>	1.5	-	1.61E-04 A	1.41E-04 A	0

**Note:**

A. Measured concentration was less than the laboratory method detection limit.

## **4.4 AMBIENT PAH CONCENTRATIONS**

A summary of the maximum and minimum ambient PAH concentrations (for a daily averaging period) are presented in **Table 4-4**. In this summary, both individual PAHs as well as a total PAH concentration are reported. A detailed summary of the concentrations measured for each sample is presented in **Appendix G**.

The maximum measured concentrations of PAHs with MECP AAQCs were below their applicable 24-hour criteria, with the exception of one (1) benzo(a)pyrene (B(a)P) measurement which was collected on May 26, 2018. The Ontario B(a)P AAQC level was exceeded in this sample by 195%. However, the sample was well below the MECP Schedule 6 Upper Risk Threshold, the MECP O. Reg. 419/05 24-hour average guideline, and the HHRA health-based criteria. On May 26, 2018 winds were blowing from the west-northwest, for which agricultural fields, local roads, the DYEC and Highway 401 are upwind.

Based on the air quality assessments completed during the Environmental Assessment Study and the Environmental Compliance Approval application for the DYEC, the facility will not be a significant contributor of B(a)P. Therefore, ambient B(a)P levels are not expected to be substantially impacted by the operation of the DYEC.

B(a)P is a byproduct of a wide variety of natural and man-made combustion processes (including motor vehicles, natural gas, wood, refuse, oil, forest fires, etc.) and is widely present in the environment (including being present in soil and water).

The current Ontario 24-hour B(a)P AAQC was introduced in 2011 and levels above this AAQC are commonly measured throughout Ontario. B(a)P measurement data available from the National Air Pollutant Surveillance (NAPS) network for Ontario in 2013 (for Simcoe, Toronto, and Hamilton), all had maximum levels above the AAQC (varying between 136% - 6,220% of the criteria). Available NAPS data for Ontario in 2012 (for Windsor, Toronto, and Hamilton) showed maximum B(a)P levels at these stations that varied between 716% - 2,920% of the criteria. In 2011, NAPS data available for seven Ontario stations (Windsor, Toronto, Etobicoke, Hamilton, Simcoe, Pt. Petrie, and Burnt Island) showed



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exceedances at six of the seven stations, with only the remote Burnt Island Ontario station reporting a maximum level below the MECP AAQC. In 2010, all of these stations, including the Burnt Island station, measured B(a)P levels above the AAQC.

**Table 4-4: Summary of Measured Ambient PAH Concentrations**

Contaminant	Units	MECP Criteria	HHRA Health Based Criteria	Results		
				Maximum	Minimum	No. of Exceedances
Benzo(a)pyrene	ng/m <sup>3</sup>	0.05 <sup>A</sup>	1	1.47E-01	6.90E-03	1
		5 <sup>B</sup>				0
		1.1 <sup>C</sup>				0
1-Methylnaphthalene	ng/m <sup>3</sup>	12,000	-	9.44E+00	1.06E+00	0
2-Methylnaphthalene	ng/m <sup>3</sup>	10,000	-	1.52E+01	1.74E+00	0
Acenaphthene	ng/m <sup>3</sup>	-	-	6.03E+00	1.07E-01 <sup>A</sup>	-
Acenaphthylene	ng/m <sup>3</sup>	3500	-	1.12E-01 <sup>A</sup>	7.06E-02 <sup>A</sup>	0
Anthracene	ng/m <sup>3</sup>	200	-	1.12E-01 <sup>A</sup>	7.06E-02 <sup>A</sup>	0
Benzo(a)anthracene	ng/m <sup>3</sup>	-	-	1.12E-01 <sup>A</sup>	7.06E-02 <sup>A</sup>	-
Benzo(a)fluorene	ng/m <sup>3</sup>	-	-	2.25E-01 <sup>A</sup>	1.41E-01 <sup>A</sup>	-
Benzo(b)fluoranthene	ng/m <sup>3</sup>	-	-	1.12E-01 <sup>A</sup>	7.06E-02 <sup>A</sup>	-
Benzo(b)fluorene	ng/m <sup>3</sup>	-	-	2.25E-01 <sup>A</sup>	1.41E-01 <sup>A</sup>	-
Benzo(e)pyrene	ng/m <sup>3</sup>	-	-	2.25E-01 <sup>A</sup>	1.41E-01 <sup>A</sup>	-
Benzo(g,h,i)perylene	ng/m <sup>3</sup>	-	-	1.12E-01 <sup>A</sup>	7.06E-02 <sup>A</sup>	-
Benzo(k)fluoranthene	ng/m <sup>3</sup>	-	-	1.12E-01 <sup>A</sup>	7.06E-02 <sup>A</sup>	-
Biphenyl	ng/m <sup>3</sup>	-	-	5.13E+00	4.35E-01	-
Chrysene	ng/m <sup>3</sup>	-	-	1.12E-01 <sup>A</sup>	7.06E-02 <sup>A</sup>	-
Dibenz(a,h)anthracene <sup>D</sup>	ng/m <sup>3</sup>	-	-	1.12E-01 <sup>A</sup>	7.06E-02 <sup>A</sup>	-
Dibenzo(a,c)anthracene + Picene	ng/m <sup>3</sup>	-	-	2.25E-01 <sup>A</sup>	1.41E-01 <sup>A</sup>	-
Fluoranthene	ng/m <sup>3</sup>	-	-	2.16E+00	7.77E-02 <sup>A</sup>	-
Indeno (1,2,3-cd)pyrene	ng/m <sup>3</sup>	-	-	1.12E-01 <sup>A</sup>	7.06E-02 <sup>A</sup>	-
Naphthalene	ng/m <sup>3</sup>	22,500	22,500	5.31E+01	4.60E+00	0
o-Terphenyl	ng/m <sup>3</sup>	-	-	2.25E-01 <sup>A</sup>	1.41E-01 <sup>A</sup>	-
Perylene	ng/m <sup>3</sup>	-	-	2.25E-01 <sup>A</sup>	1.41E-01 <sup>A</sup>	-
Phenanthrene	ng/m <sup>3</sup>	-	-	8.90E+00	6.21E-01	-



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**Table 4-4: Summary of Measured Ambient PAH Concentrations**

Contaminant	Units	MECP Criteria	HHRA Health Based Criteria	Results		
				Maximum	Minimum	No. of Exceedances
Pyrene	ng/m <sup>3</sup>	-	-	7.19E-01	7.77E-02 A	-
Tetralin	ng/m <sup>3</sup>	-	-	2.53E+00	6.83E-01	-
Total PAH E	ng/m <sup>3</sup>	-	-	1.05E+02	1.12E+01	-

**Notes:**

- A. Ontario Ambient Air Quality Criteria (AAQC). The AAQC for benzo(a)pyrene (B(a)P) is a surrogate for PAHs.
- B. O. Reg. 419/05 Schedule 6 Upper Risk Thresholds.
- C. O. Reg. 419/05 24 Hour Guideline
- D. Based on laboratory analyses, dibenzo(a,c)anthracene co-elutes with dibenz(a,h)anthracene. Picene elutes after dibenz(a,h)anthracene
- E. The reported total PAH is the sum of all analyzed PAH species.
- F. Measured concentration was less than the laboratory method detection limit.

## 4.5 AMBIENT DIOXINS AND FURANS CONCENTRATIONS

A summary of the maximum and minimum ambient dioxins and furans concentrations (for a daily averaging period) are presented in **Table 4-5**. In this summary, both individual dioxin and furan concentrations (pg/m<sup>3</sup>) as well as the total toxic equivalency concentration (TEQ) are reported. A detailed summary of the concentrations measured for each sample is presented in **Appendix H**.

The maximum measured toxic equivalent dioxin and furan concentration was below the applicable 24-hour Ontario AAQC of 0.1 pg TEQ/m<sup>3</sup> (as shown in **Table 4-5**).

**Table 4-5: Summary of Measured Ambient Dioxins and Furans Concentrations**

Contaminant	Units	MECP Criteria	HHRA Health Based Criteria	Results		
				Maximum	Minimum	No. of Exceedances
2,3,7,8-Tetra CDD *	pg/m <sup>3</sup>	-	-	5.10E-03 A	4.27E-03 A	
1,2,3,7,8-Penta CDD	pg/m <sup>3</sup>			5.40E-03 A	4.84E-03 A	
1,2,3,4,7,8-Hexa CDD	pg/m <sup>3</sup>			5.24E-03 A	4.41E-03 A	
1,2,3,6,7,8-Hexa CDD	pg/m <sup>3</sup>			1.29E-02	4.34E-03 A	
1,2,3,7,8,9-Hexa CDD	pg/m <sup>3</sup>			2.04E-02	4.49E-03 A	
1,2,3,4,6,7,8-Hepta CDD	pg/m <sup>3</sup>			1.25E-01	4.64E-03 A	
Octa CDD	pg/m <sup>3</sup>			3.48E-01	2.37E-02	
Total Tetra CDD	pg/m <sup>3</sup>			8.72E-02	4.27E-03 A	
Total Penta CDD	pg/m <sup>3</sup>			9.08E-02	6.83E-03 A	
Total Hexa CDD	pg/m <sup>3</sup>			1.73E-01	2.68E-02	
Total Hepta CDD	pg/m <sup>3</sup>			2.63E-01	4.94E-03 A	



**QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018**

Summary of Ambient Measurements  
August 22, 2018

**Table 4-5: Summary of Measured Ambient Dioxins and Furans Concentrations**

Contaminant	Units	MECP Criteria	HHRA Health Based Criteria	Results		
				Maximum	Minimum	No. of Exceedances
2,3,7,8-Tetra CDF **	pg/m <sup>3</sup>	MECP Criteria	HHRA Health Based Criteria	9.14E-02 A	4.69E-03 A	
1,2,3,7,8-Penta CDF	pg/m <sup>3</sup>			4.50E-02	4.64E-03 A	
2,3,4,7,8-Penta CDF	pg/m <sup>3</sup>			1.04E-01	4.84E-03 A	
1,2,3,4,7,8-Hexa CDF	pg/m <sup>3</sup>			1.62E-01	3.84E-03 A	
1,2,3,6,7,8-Hexa CDF	pg/m <sup>3</sup>			8.18E-02	3.84E-03 A	
2,3,4,6,7,8-Hexa CDF	pg/m <sup>3</sup>			8.84E-02	4.12E-03 A	
1,2,3,7,8,9-Hexa CDF	pg/m <sup>3</sup>			1.89E-02	4.41E-03 A	
1,2,3,4,6,7,8-Hepta CDF	pg/m <sup>3</sup>			4.23E-01	4.04E-03 A	
1,2,3,4,7,8,9-Hepta CDF	pg/m <sup>3</sup>			9.29E-02	5.41E-03 A	
Octa CDF	pg/m <sup>3</sup>			3.18E-01	4.69E-03 A	
Total Tetra CDF	pg/m <sup>3</sup>			1.15E+00	4.69E-03 A	
Total Penta CDF	pg/m <sup>3</sup>			1.20E+00	4.79E-03 A	
Total Hexa CDF	pg/m <sup>3</sup>			9.50E-01	3.98E-03 A	
Total Hepta CDF	pg/m <sup>3</sup>			7.88E-01	4.79E-03 A	
TOTAL TOXIC EQUIVALENCY <sup>B</sup>	pg TEQ/m <sup>3</sup>	0.1	-	9.76E-02	1.57E-02	0
		1 c				0

**Notes:**

- A. Measured concentration was less than the laboratory method detection limit.
  - B. Total Toxicity Equivalent (TEQ) concentration contributed by all dioxins, furans and dioxin-like PCBs calculated as per O. Reg. 419/05 methodology using corresponding WHO<sub>2005</sub> toxic equivalency factors (TEFs) and a value of half the minimum detection limit (MDL) substituted for concentrations less than the MDL.
  - C. O. Reg. 419/05 Schedule 6 Upper Risk Thresholds
- \* CDD - Chloro Dibenz-p-Dioxin, \*\* CDF - Chloro Dibenz-p-Furan



# QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018

Conclusions  
August 22, 2018

## 5.0 CONCLUSIONS

This quarterly report provides a summary of the ambient air quality data collected at the Crago Road monitoring station for the period April to June 2018.

The following observations and conclusions were made from a review of the measured ambient air quality monitoring data:

1. Measured levels of NO<sub>2</sub>, SO<sub>2</sub> and PM<sub>2.5</sub> were below the applicable MECP criteria and human health risk assessment (HHRA) health-based criteria presented in **Table 2-1** of this report.
2. Since the Canadian Ambient Air Quality Standard (CAAQS) for PM<sub>2.5</sub> is based on a 98<sup>th</sup> percentile level over 3 years, whereas the PM<sub>2.5</sub> measurement period at the Crago Road Station for this quarterly report was three months, there was insufficient data collected to determine with any certainty if exceedances of the CAAQS would occur. Therefore, no comparison of the measured PM<sub>2.5</sub> data during this quarter to the CAAQS was conducted for this report, as it would not be scientifically accurate or representative.
3. The maximum measured concentrations of TSP and all metals were below their applicable MECP criteria and HHRA health-based criteria (as presented in **Table 2-2** in this report).
4. The maximum measured concentrations of PAHs were below their applicable MECP criteria shown in **Table 2-3**, with the exception of the 24-hour benzo(a)pyrene (B(a)P) concentration in one (1) sample which exceeded the applicable Ontario Ambient Air Quality Criteria (AAQC) by 195%. The current Ontario 24-hour B(a)P AAQC was introduced in 2011 and levels above this AAQC are commonly measured throughout Ontario. The measurement was however, well below the MECP Schedule 6 Upper Risk Threshold, the MECP O. Reg. 419/05 24-hour average guideline, and the HHRA health-based criterion.
5. The maximum measured toxic equivalent dioxin and furan concentration was below the criteria presented in **Table 2-3**.

In summary, the measured concentrations of the air contaminants monitored were below their applicable MECP criteria during the monitoring period between April and June 2018, with the exception of one (1) benzo(a)pyrene sample. All measured levels of the monitored contaminants were below their applicable HHRA health-based criteria.





## **QUARTERLY AMBIENT AIR QUALITY MONITORING REPORT FOR THE DURHAM YORK ENERGY CENTRE (CRAGO ROAD STATION) – APRIL TO JUNE 2018**

References  
August 22, 2018

### **6.0 REFERENCES**

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**APPENDIX A:  
SO<sub>2</sub> DATA SUMMARIES AND TIME  
HISTORY PLOTS**



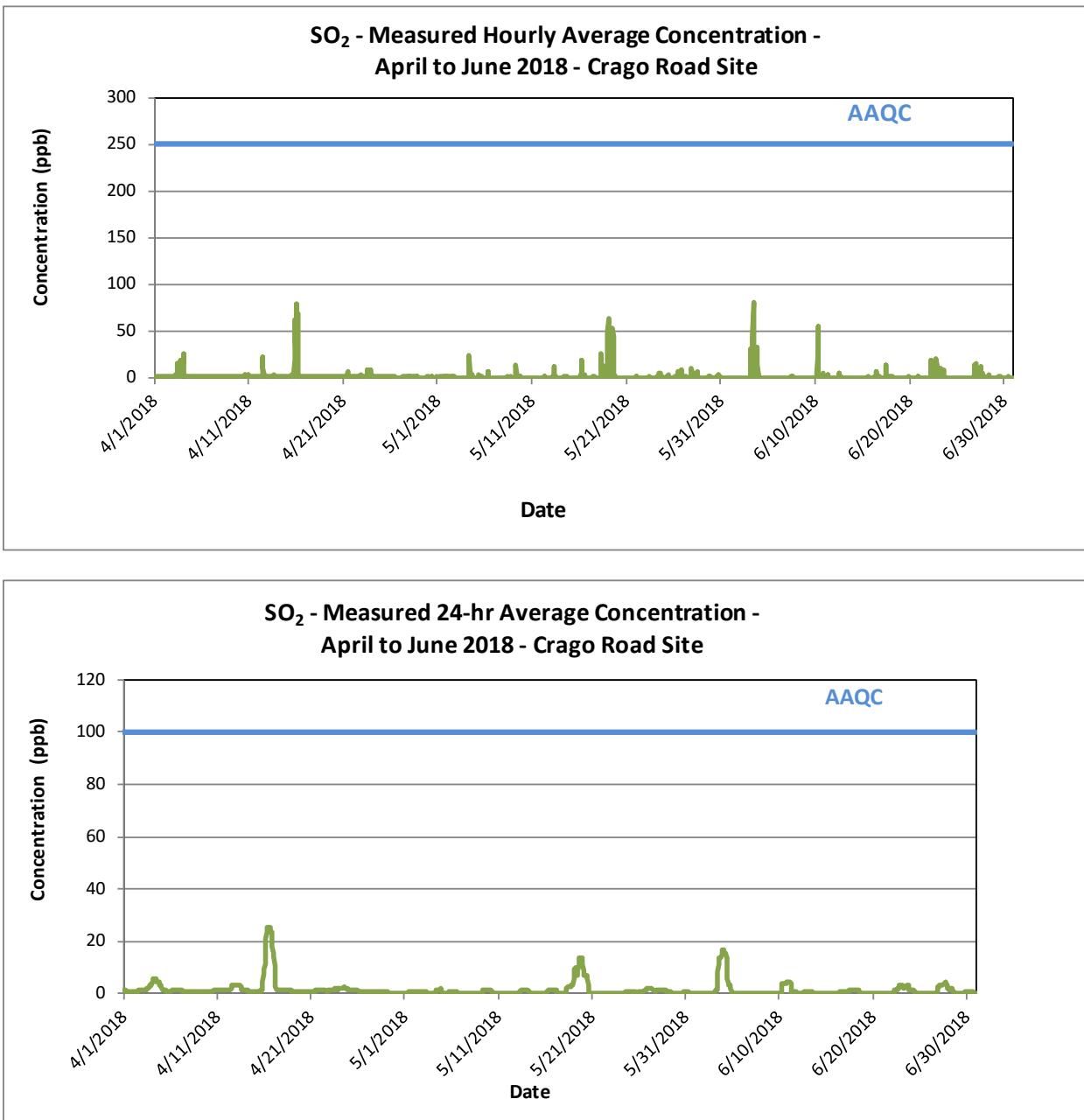
		SO <sub>2</sub> - Crago Road April 2018 (ppb)																													
		Hour																													
Day	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Count	Maximum	Minimum	Average	Hrs>250	Days>100	
1	0.9	0.9	0.9	0.9	0.8	0.9	0.8	0.8	0.9	0.9	0.8	0.8	0.9	0.9	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	24	0.9	0.8	0.9	0.9	0	0
2	0.9	0.9	0.8	0.9	1.3	1.3	1.5	1.5	1.6	2.1	2.2	1.2	1.1	1.1	1.2	2.2	1.7	1.2	1.2	1.0	0.9	0.9	0.9	0.9	24	2.2	0.8	1.3	0	0	0
3	0.9	0.9	1.1	1.0	0.9	0.9	1.0	2.3	2.8	1.3	4.4	14.7	3.7	2.1	1.6	5.9	2.3	1.1	4.8	18.7	4.1	1.6	1.2	1.1	24	18.7	0.9	3.4	0	0	0
4	1.8	5.4	19.7	26.1	5.0	2.4	1.7	1.6	1.5	1.7	1.6	1.4	1.2	1.2	1.1	1.1	1.1	1.1	0.9	1.1	1.0	1.0	0.9	0.9	24	26.1	0.9	3.4	0	0	0
5	0.9	0.9	0.9	0.9	1.0	1.1	1.3	1.4	1.7	1.8	1.5	1.2	1.1	1.1	0.9	1.0	1.0	0.8	0.9	0.9	0.8	0.9	1.0	24	1.8	0.8	1.1	0	0	0	
6	1.4	1.1	1.1	1.1	1.1	1.1	2.1	1.7	1.4	1.3	1.3	1.2	1.1	1.1	1.2	1.1	1.3	1.2	1.1	1.1	1.1	1.1	1.0	24	2.1	1.0	1.2	0	0	0	
7	1.0	0.9	0.8	0.9	1.0	1.0	0.9	1.0	1.0	1.0	0.9	1.0	1.0	0.9	1.0	1.1	1.0	0.9	0.9	0.9	0.9	0.9	0.9	24	1.1	0.8	0.9	0	0	0	
8	0.6	0.9	1.0	0.9	0.9	1.0	0.8	0.9	0.9	1.1	0.9	0.8	0.8	0.9	0.9	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	24	1.1	0.6	0.9	0	0	0	
9	0.9	0.9	0.9	0.8	0.8	0.9	1.2	1.1	1.2	1.3	1.2	1.1	1.0	1.1	1.1	1.1	1.3	1.2	1.1	1.1	1.1	1.1	1.2	24	1.3	0.8	1.1	0	0	0	
10	1.1	1.0	0.9	0.9	1.0	1.0	0.9	0.9	1.0	1.3	1.0	1.1	1.4	1.2	1.7	2.9	1.7	1.1	1.1	1.1	1.1	1.2	1.4	24	2.9	0.9	1.2	0	0	0	
11	3.2	1.6	1.6	1.5	1.4	1.3	1.2	1.3	1.4	1.5	1.3	1.3	1.4	1.6	1.3	1.2	1.4	1.3	1.1	1.1	1.4	1.3	1.1	24	3.2	1.1	1.4	0	0	0	
12	1.1	0.9	1.0	1.0	1.0	1.0	1.0	1.2	1.0	1.1	1.2	1.1	1.5	21.6	10.0	2.5	2.9	1.9	1.6	1.6	1.5	1.3	1.1	24	21.6	0.9	3.1	0	0	0	
13	1.1	1.1	1.1	1.1	1.0	1.0	1.1	1.1	1.2	1.4	1.1	1.2	1.1	1.1	1.0	3.9	1.1	0.9	1.1	1.0	1.0	0.9	0.9	24	3.9	0.9	1.2	0	0	0	
14	1.0	0.9	0.9	0.9	0.8	0.8	0.9	0.8	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.9	24	1.0	0.8	0.9	0	0	0	
15	0.9	0.8	0.9	0.9	0.9	0.8	0.9	0.9	0.8	0.9	1.2	0.8	1.9	1.2	3.2	3.0	M	M	1.8	1.6	18.0	62.2	58.4	50.0	22	62.2	0.8	9.6	0	0	0
16	0.0	0.0	43.1	79.3	65.7	69.4	58.6	35.6	3.2	2.0	1.7	1.5	1.3	1.3	1.4	1.7	1.5	1.8	1.4	1.2	1.1	1.1	1.1	24	79.3	0.0	15.7	0	0	0	
17	1.0	1.2	1.5	1.2	1.5	1.3	1.2	1.3	1.4	1.3	1.2	1.3	1.2	1.2	1.3	1.3	1.2	1.2	1.3	1.3	1.1	1.2	1.3	24	1.5	1.0	1.3	0	0	0	
18	1.1	1.1	1.1	1.1	1.2	1.1	1.1	1.2	1.2	1.3	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.1	1.1	24	1.3	1.0	1.1	0	0	0	
19	1.1	1.1	1.0	1.0	1.0	0.9	1.0	1.0	1.0	1.1	1.1	0.9	1.1	0.9	0.9	0.9	0.9	1.1	0.9	0.9	0.8	0.8	0.9	24	1.1	0.8	1.0	0	0	0	
20	0.9	0.9	0.9	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	1.2	1.1	24	1.2	0.7	0.9	0	0	0	
21	1.1	1.1	0.9	0.9	0.9	0.9	1.0	0.9	1.0	1.1	2.3	6.4	4.1	2.3	2.0	1.8	2.3	1.4	0.9	0.8	0.9	0.9	0.8	24	6.4	0.8	1.6	0	0	0	
22	1.0	0.9	1.0	1.1	1.1	1.1	1.1	1.2	1.3	1.3	1.2	1.1	1.1	1.1	1.0	1.0	0.9	0.9	0.8	1.1	3.1	1.5	1.4	1.0	24	3.1	0.8	1.2	0	0	0
23	1.0	1.0	1.1	1.1	1.1	1.1	1.1	2.0	1.3	1.2	1.0	1.0	1.0	0.9	9.1	6.0	1.1	1.8	1.8	1.1	1.1	1.1	4.7	8.7	24	9.1	0.9	2.2	0	0	0
24	4.1	1.2	1.1	1.1	1.1	1.1	1.1	1.3	1.3	1.3	1.5	1.6	1.4	1.5	1.3	1.3	1.2	1.1	1.3	1.1	1.1	1.2	1.3	24	4.1	1.1	1.4	0	0	0	
25	1.2	1.6	1.5	1.4	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	24	1.6	1.0	1.1	0	0	0	
26	1.1	1.1	1.0	1.1	1.0	1.0	1.1	1.1	1.0	1.0	C	C	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0								

SO <sub>2</sub> - Crago Road May 2018 (ppb)																																	
Day	Hour																											Count	Maximum	Minimum	Average	Hrs>250	Days>100
	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300									
1	0.4	0.2	0.2	0.2	0.1	0.2	0.6	1.0	1.2	2.0	2.0	1.5	1.4	1.4	1.2	1.0	0.7	1.0	0.8	0.3	0.6	1.1	1.5	0.4	24	2.0	0.1	0.9	0	0			
2	0.6	0.7	0.7	0.6	0.5	0.4	0.4	0.5	1.0	1.5	1.2	1.4	1.1	1.2	1.1	0.4	0.4	0.7	0.8	0.6	0.3	0.2	0.1	0.1	24	1.5	0.1	0.7	0	0			
3	0.0	0.3	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24	0.3	0.0	0.1	0	0			
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	23.0	3.1	0.6	0.6	0.6	0.4	0.3	2.3	M	M	M	M	M	M	M	17	23.0	0.0	0	0	0			
5	0.3	0.0	0.2	0.2	0.1	0.0	0.1	0.1	0.3	1.4	2.6	1.5	0.8	0.6	1.0	0.8	1.0	0.8	0.4	0.2	0.2	0.2	0.1	0.1	24	2.6	0.0	0.5	0	0			
6	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	6.5	0.1	0.1	0.1	0.2	0.0	0.2	0.2	0.2	0.5	0.3	0.2	0.1	0.1	0.0	24	6.5	0.0	0.4	0	0			
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.2	0.2	0.3	0.1	0.1	24	0.3	0.0	0.1	0	0			
8	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.3	1.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.9	0.2	0.1	0.2	0.2	0.1	0.1	24	1.3	0.1	0.2	0	0			
9	0.1	0.1	0.1	0.1	0.1	0.1	0.6	8.8	13.7	0.8	0.6	0.5	0.3	0.3	0.3	0.3	0.6	0.4	0.6	0.6	0.4	0.5	0.4	0.3	24	13.7	0.1	1.3	0	0			
10	0.1	0.3	0.5	0.5	0.4	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24	0.5	0.0	0.1	0	0			
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.4	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.2	0.4	0.1	0.1	0.1	24	0.4	0.0	0.1	0	0			
12	0.1	0.1	0.2	0.2	0.1	0.2	0.4	0.6	0.3	0.8	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	24	0.8	0.1	0.2	0	0			
13	0.1	0.1	0.1	0.3	0.3	1.2	1.2	12.2	9.4	0.4	1.0	0.3	0.2	0.1	0.2	0.2	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.1	24	12.2	0.0	1.2	0	0			
14	0.2	0.2	0.1	0.0	0.0	0.1	0.1	0.0	0.3	0.3	1.1	1.3	1.0	1.0	0.8	1.2	0.6	0.3	0.2	0.2	0.1	0.1	0.0	0.0	24	1.3	0.0	0.4	0	0			
15	0.3	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24	0.5	0.0	0.1	0	0			
16	0.0	0.0	0.0	0.0	1.7	5.0	18.8	5.1	0.5	0.4	0.3	0.4	0.4	2.6	0.4	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	24	18.8	0.0	1.5	0	0			
17	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.5	0.9	1.2	1.1	0.8	0.6	0.6	0.4	0.3	0.1	0.1	0.0	0.0	0.0	24	1.2	0.0	0.3	0	0			
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7	26.0	10.4	14.3	0.4	0.2	0.2	0.1	0.2	0.2	0.5	0.2	5.8	5.2	1.0	0.4	1.7	24	26.0	0.0	3.4	0	0	
19	2.1	49.6	63.5	26.5	10.0	2.3	0.7	0.5	0.2	0.1	0.3	1.1	10.5	24.6	53.3	45.1	13.7	13.9	3.6	1.4	0.8	0.3	0.2	0.2	24	63.5	0.1	13.5	0	0			
20	0.1	0.2	0.2	0.1	0.1	0.4	0.1	0.1	0.1	0.1	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24	0.4	0.0	0.1	0	0			
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.3	0.1	0.3	0.1	0.3	24	0.3	0.0	0.1	0	0			
22	0.3	0.9	0.2	0.6	0.4	0.2	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24	0.9	0.0	0.1	0	0			
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.7	0.7	0.5	0.2	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.2	0.2	24	0.7	0.0	0.1	0	0			
24	0.1	0.1	0.0	0.1	0.1	0.2	0.4	0.6	0.6	1.1	1.8	4.1	4.7	1.6	0.7	0.8	0.7	0.2	0.1	0.1	0.1	0.1	0.1	0.1	24	4.7	0.0	0.8	0	0			
25	0.2	0.1	0.0	0.0	0.2	0.4	1.0	1.1	1.1	1.2	2.9	1.2	0.5	0.3	0.2	0.3	0.1	0.1	0.1	0.4	0.2	0.1	0.2	0.4	24	2.9	0.0	0.5	0	0			
26	0.4	0.3	0.4	0.7	1.3	0.9	0.8	0.7	0.6	1.2	1.7	2.0	2.8	6.2	3.6	2.7	2.3																





**Figure A-1 Time History Plots of Measured Hourly Average and 24-Hour Average SO<sub>2</sub> Concentrations – Crago Road Station**





**APPENDIX B:  
NO<sub>2</sub> DATA SUMMARIES AND TIME  
HISTORY PLOTS**



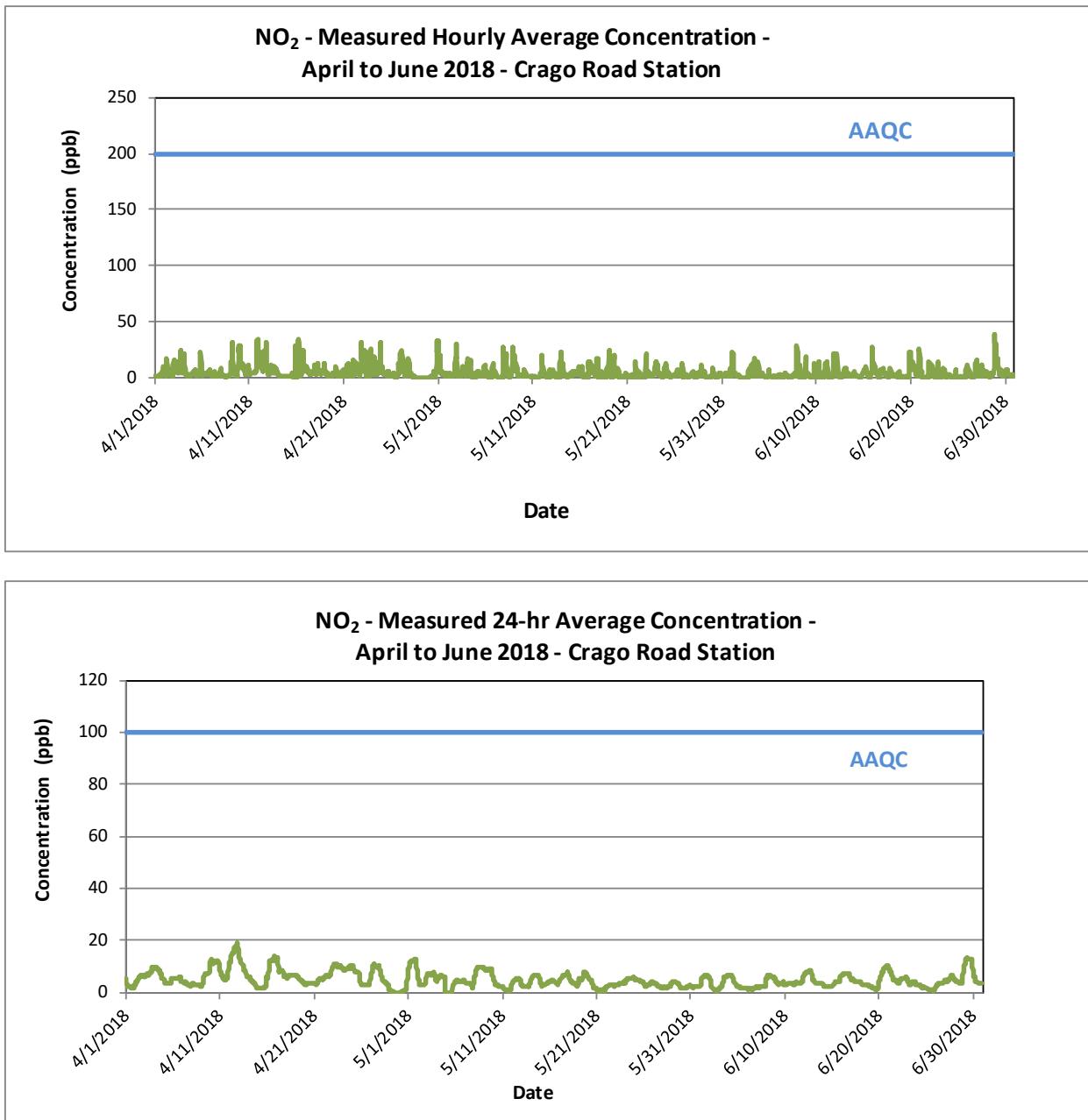
		NO <sub>2</sub> - Crago Road April 2018 (ppb)																														
Hour		Day	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Count	Maximum	Minimum	Average	Hrs>200	Days>100
		1	1.9	1.6	1.1	1.0	1.2	1.5	1.4	1.5	1.1	1.7	1.3	1.3	2.6	2.1	2.1	1.9	2.0	2.4	4.5	7.9	7.5	8.2	9.9	24	9.9	1.0	2.9	0	0	
		2	8.7	7.0	7.5	5.7	5.3	2.3	5.2	18.0	9.0	7.8	5.4	3.9	6.4	7.0	4.4	5.2	4.9	3.3	3.6	2.3	3.1	3.9	1.7	12.2	24	18.0	1.7	6.0	0	0
		3	16.1	10.7	7.1	16.4	10.3	9.3	8.0	8.1	8.3	4.6	7.5	14.4	6.2	5.1	5.1	14.8	9.1	6.6	11.2	24.6	8.7	5.8	4.8	4.9	24	24.6	4.6	9.5	0	0
		4	5.6	10.8	22.1	20.6	12.7	7.6	3.1	4.4	4.4	3.0	2.2	1.8	2.2	2.6	2.6	2.2	1.8	1.8	2.4	2.4	3.1	3.6	2.9	24	22.1	1.8	5.3	0	0	
		5	4.0	4.8	6.5	5.0	2.8	6.1	6.8	3.9	2.9	2.0	1.8	1.7	1.8	2.7	2.6	4.0	3.8	3.5	3.5	8.7	18.6	22.5	13.1	2.2	24	22.5	1.7	5.6	0	0
		6	1.9	2.1	2.5	3.4	4.5	3.6	5.1	5.1	4.8	3.3	3.0	5.1	3.6	4.6	4.2	3.9	6.2	6.0	5.4	8.1	5.2	3.1	2.4	1.8	24	8.1	1.8	4.1	0	0
		7	1.6	1.9	1.4	1.6	1.8	3.0	4.4	6.4	2.1	1.4	1.4	1.3	1.2	1.0	2.3	2.2	3.2	3.3	2.2	2.6	1.9	2.9	4.7	24	9.3	1.0	2.7	0	0	
		8	6.9	6.5	4.9	2.9	2.2	3.7	3.7	2.0	1.0	1.1	1.1	1.2	0.9	1.0	1.2	1.1	1.2	2.0	2.4	2.7	3.3	3.7	3.4	24	6.9	0.9	2.5	0	0	
		9	4.8	4.8	10.8	15.2	13.5	26.1	31.2	16.8	7.4	6.7	5.8	4.3	1.6	1.1	1.3	1.6	2.7	2.3	3.5	5.2	14.7	27.6	22.6	29.4	24	31.2	1.1	10.9	0	0
		10	28.6	24.5	18.0	12.2	8.6	9.2	13.2	11.9	11.4	9.5	9.2	7.7	4.2	3.2	4.4	5.1	3.4	4.7	4.2	5.2	11.1	3.3	4.6	5.6	24	28.6	3.2	9.3	0	0
		11	8.8	4.4	5.1	3.7	3.9	4.2	4.3	4.4	4.9	4.8	4.9	5.2	4.2	5.1	6.1	4.9	5.2	5.6	7.6	10.6	32.8	35.2	34.6	31.1	24	35.2	3.7	10.1	0	0
		12	23.5	21.1	16.6	23.3	23.0	19.5	15.2	16.6	8.5	6.3	7.3	6.0	23.0	24.9	17.3	7.2	10.3	8.3	17.5	32.4	25.1	9.0	6.2	7.7	24	32.4	6.0	15.7	0	0
		13	4.6	3.7	3.3	3.6	4.7	9.0	11.6	6.4	4.7	4.9	4.2	4.2	5.2	5.0	4.1	6.7	9.6	4.7	6.4	8.3	8.2	7.8	6.2	4.2	24	11.6	3.3	5.9	0	0
		14	3.6	2.9	2.4	1.8	1.9	2.1	1.6	1.7	1.8	1.8	2.0	1.8	1.5	1.4	1.4	1.6	1.4	1.5	1.5	1.2	1.3	1.2	24	3.6	1.2	1.8	0	0		
		15	1.3	1.3	1.4	1.5	1.6	1.3	1.6	1.7	1.5	2.0	2.1	2.0	3.1	2.3	4.2	4.3	M	2.3	3.1	14.9	28.5	29.2	14.4	22	29.2	1.3	5.7	0	0	
		16	0.0	0.0	1.1	34.7	34.7	30.4	33.0	23.1	1.9	2.1	2.2	2.1	2.7	3.6	3.2	8.5	9.9	24.3	23.3	14.3	9.5	8.7	8.1	6.4	24	34.7	0.0	12.0	0	0
		17	9.0	9.9	10.0	8.9	7.5	7.9	6.0	5.1	5.3	4.3	3.5	4.1	3.8	4.4	5.0	4.3	5.3	4.5	6.7	5.0	5.5	8.4	11.8	8.0	24	11.8	3.5	6.4	0	0
		18	5.0	3.7	4.4	4.3	6.2	12.4	13.8	11.2	8.5	5.0	5.4	6.5	4.3	3.4	2.8	4.2	6.2	4.9	4.9	5.5	7.2	6.9	7.0	13.1	24	13.8	2.8	6.5	0	0
		19	7.0	4.9	6.6	3.1	2.9	3.1	5.1	3.7	2.1	2.2	1.8	2.3	2.0	2.0	1.8	1.7	1.8	2.3	2.8	4.1	4.9	3.9	2.9	24	7.0	1.7	3.2	0	0	
		20	3.7	3.9	4.5	5.8	7.1	10.1	5.9	2.2	2.1	1.9	2.0	1.7	1.3	1.2	1.4	1.6	1.8	2.1	4.2	5.6	5.2	7.4	24	10.1	1.2	3.7	0	0		
		21	2.3	2.0	2.0	2.1	2.3	2.5	6.5	9.6	8.3	11.7	12.8	10.1	8.8	4.9	3.0	3.7	1.9	1.6	1.8	3.5	3.8	2.5	2.1	3.3	24	12.8	1.6	4.7	0	0
		22	16.6	8.9	5.2	4.9	2.5	11.2	14.7	10.2	13.2	7.1	8.4	9.7	6.6	4.3	5.1	4.1	2.7	2.4	1.9	11.5	31.6	25.6	18.3	12.3	24	31.6	1.9	10.0	0	0
		23	10.5	19.4	6.2	9.8	9.9	24.1	11.8	13.0	3.5	2.9	2.2	2.7	1.8	1.7	5.6	3.0	2.0	2.6	3.5	22.5	25.4	23.3	11.2	12.7	24	25.4	1.7	9.6	0	0
		24	6.4	3.2	5.0	14.9	11.1	18.4	16.3	10.3	4.6	5.0	4.4	3.4	3.1	3.1	4.9	6.2	7.2	5.0	14.4	13.1	10.5	32.3	27.2	13.8	24	32.3	3.1	10.2	0	0
		25	4.5	9.9	7.7	5.7	2.7	3.4	3.1	4.0	2.9	2.7	2.6	2.4	2.8	1.7	2.5	6.1	3.2	5.7	3.7	3.4	2.9	2.7	2.2	24	9.9	1.7	3.8	0	0	
		26	2.3	2.3	1.7	2.5	2.2	2.8	4.1	3.3	2.9	2.3	2.2	C	C	2.4	2.1	1.7	3.3	3.4	9.5	13.3	3.9	20.8	21.8	21	21.8	1.7	5.3	0	0</td	

		NO <sub>2</sub> - Crago Road May 2018 (ppb)																													
Hour		0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Count	Maximum	Minimum	Average	Hrs>200	Days>100
Day																															
1	30.7	26.1	15.8	13.7	9.2	19.9	6.2	4.1	4.7	5.8	4.1	3.8	3.8	3.0	3.0	3.6	2.5	2.4	2.2	4.1	1.6	2.2	2.2	4.2	24	30.7	1.6	7.5	0	0	
2	2.7	1.8	2.8	3.3	4.3	1.9	3.1	2.4	2.9	3.5	2.3	2.2	2.2	2.8	2.4	2.7	2.6	2.8	6.3	12.6	19.1	19.0	16.7	30.2	24	30.2	1.8	6.4	0	0	
3	17.2	6.2	2.3	3.7	1.7	1.3	1.8	2.5	2.5	2.0	2.1	3.4	3.2	2.5	9.7	10.2	2.9	2.6	4.8	6.2	8.4	3.6	2.3	4.4	24	17.2	1.3	4.5	0	0	
4	4.6	5.5	14.9	11.1	17.7	10.8	4.9	2.6	5.8	16.7	2.5	1.3	2.7	1.1	0.9	1.2	4.9	M	M	M	M	M	M	M	17	17.7	0.9	0.9	0	0	
5	3.9	3.2	1.7	1.5	4.9	5.5	5.3	1.5	1.8	2.4	2.0	1.3	1.4	1.1	3.0	3.6	3.3	2.8	1.8	4.1	8.3	10.6	11.5	12.3	24	12.3	1.1	4.1	0	0	
6	8.8	6.2	6.3	4.7	3.6	3.6	1.7	0.6	0.3	2.6	0.0	0.0	0.2	0.6	0.3	2.4	5.3	6.8	9.4	13.1	5.5	7.5	7.9	2.7	24	13.1	0.0	4.2	0	0	
7	2.4	5.9	1.4	3.0	2.9	2.8	2.2	0.8	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.3	1.2	0.0	14.4	26.8	23.0	22.0	24	26.8	0.0	4.6	0	0	
8	20.2	16.8	17.3	17.8	21.7	18.2	12.0	6.0	7.0	2.8	1.3	0.0	0.3	0.0	0.1	0.2	1.1	1.2	1.6	2.1	14.2	27.9	28.1	15.7	24	28.1	0.0	9.7	0	0	
9	14.0	19.8	12.6	11.0	13.7	12.9	6.5	11.7	8.5	2.8	3.0	1.7	2.3	1.3	2.6	2.5	2.1	1.0	1.7	2.8	2.0	1.5	1.3	3.7	24	19.8	1.0	5.9	0	0	
10	1.6	7.4	6.6	3.9	5.2	1.6	4.3	1.1	1.4	2.0	1.5	2.1	1.9	1.8	1.2	1.9	1.7	1.4	1.4	1.3	1.3	0.6	0.8	1.5	24	7.4	0.6	2.3	0	0	
11	0.5	1.0	0.0	0.1	0.5	1.4	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.3	1.0	3.3	3.3	4.7	4.3	20.3	20.4	24	20.4	0.0	2.6	0	0	
12	13.7	8.9	7.3	5.6	6.9	7.2	4.0	2.9	2.2	2.3	1.1	1.4	1.2	0.9	0.0	0.0	0.1	0.7	0.0	1.9	7.8	4.3	4.8	2.3	24	13.7	0.0	3.6	0	0	
13	1.4	3.9	6.8	2.5	2.2	1.9	2.5	1.1	4.8	3.0	0.9	0.9	0.6	0.5	0.6	2.0	3.5	0.4	1.6	4.1	0.9	13.0	17.8	22.6	24	22.6	0.4	4.1	0	0	
14	16.6	8.8	10.8	7.4	9.1	13.1	11.9	1.4	2.3	2.7	3.3	2.8	2.2	2.8	1.0	0.5	1.3	2.7	3.1	2.0	2.1	1.7	1.8	2.2	24	16.6	0.5	4.7	0	0	
15	4.3	3.3	3.1	1.6	1.0	3.2	5.3	6.4	3.4	5.1	3.5	5.3	5.7	4.0	3.1	3.2	4.9	6.0	4.4	3.5	4.9	3.5	6.9	9.6	24	9.6	1.0	4.4	0	0	
16	3.5	2.8	2.7	4.6	5.9	8.4	10.1	2.2	1.0	0.8	0.6	0.0	0.6	2.7	1.4	1.5	3.3	1.4	2.7	0.4	0.7	7.5	15.0	8.3	24	15.0	0.0	3.7	0	0	
17	14.7	12.7	7.3	10.9	12.3	11.0	5.1	9.8	8.3	7.0	6.5	5.1	5.6	3.3	2.2	1.5	1.8	1.9	3.1	1.4	17.7	18.1	11.2	1.8	24	18.1	1.4	7.5	0	0	
18	0.8	0.4	0.4	1.3	1.6	1.0	1.3	4.7	6.1	2.6	3.7	0.4	0.1	0.0	0.5	0.1	0.0	0.0	0.7	2.6	6.8	9.9	5.3	3.9	24	9.9	0.0	2.3	0	0	
19	3.5	23.4	24.9	14.5	7.3	2.6	2.0	1.9	0.8	0.6	1.1	2.4	12.8	16.9	20.6	14.8	4.6	7.3	2.4	2.2	4.2	2.3	2.7	5.1	24	24.9	0.6	7.5	0	0	
20	2.7	8.6	6.6	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	2.1	0.3	0.0	0.0	0.1	0.1	0.1	0.2	0.9	2.6	3.8	1.7	3.4	24	8.6	0.0	1.4	0	0	
21	1.2	0.4	0.0	0.1	0.0	0.1	0.5	0.9	0.0	0.1	0.8	0.2	2.7	0.0	0.3	0.1	0.3	1.1	0.0	0.0	0.0	14.8	10.4	7.9	24	14.8	0.0	1.7	0	0	
22	3.2	3.8	1.5	1.2	0.9	2.0	6.2	5.1	4.4	1.6	1.3	0.9	0.6	1.0	0.7	0.5	0.9	1.1	2.6	0.8	0.6	2.3	0.7	22.1	24	22.1	0.5	2.7	0	0	
23	7.8	1.3	1.5	3.4	5.6	3.4	2.3	2.8	4.5	4.6	5.1	4.0	3.4	2.4	1.1	1.1	1.2	1.0	2.0	2.8	4.1	4.8	4.9	8.3	24	8.3	1.0	3.5	0	0	
24	14.8	12.6	13.9	6.3	3.8	10.0	11.7	2.4	4.4	3.7	4.6	5.2	3.7	2.7	2.0	3.2	2.4	2.2	0.8	1.6	5.3	6.6	8.4	6.6	24	14.8	0.8	5.8	0	0	
25	7.4	11.1	2.0	3.8	13.6	3.7	5.9	4.1	4.7	4.4	4.2	2.0	1.4	0.8	1.2	1.2	1.8	1.4	1.4	1.1	1.4	1.9	1.5	2.4	24	13.6	0.8	3.5	0	0	
26	2.2	2.7	1.9	2.0	1.7	5.6	5.2	6.1	7.9	6.7	5.4	3.0	4.7	3.6	3.1	2.5	2.2	2.5													





**Figure B-1 Time History Plots of Measured Hourly Average and 24-Hour Average NO<sub>2</sub> Concentrations – Crago Road Station**





**APPENDIX C:**  
**NO<sub>x</sub> DATA SUMMARIES AND TIME  
HISTORY PLOTS**



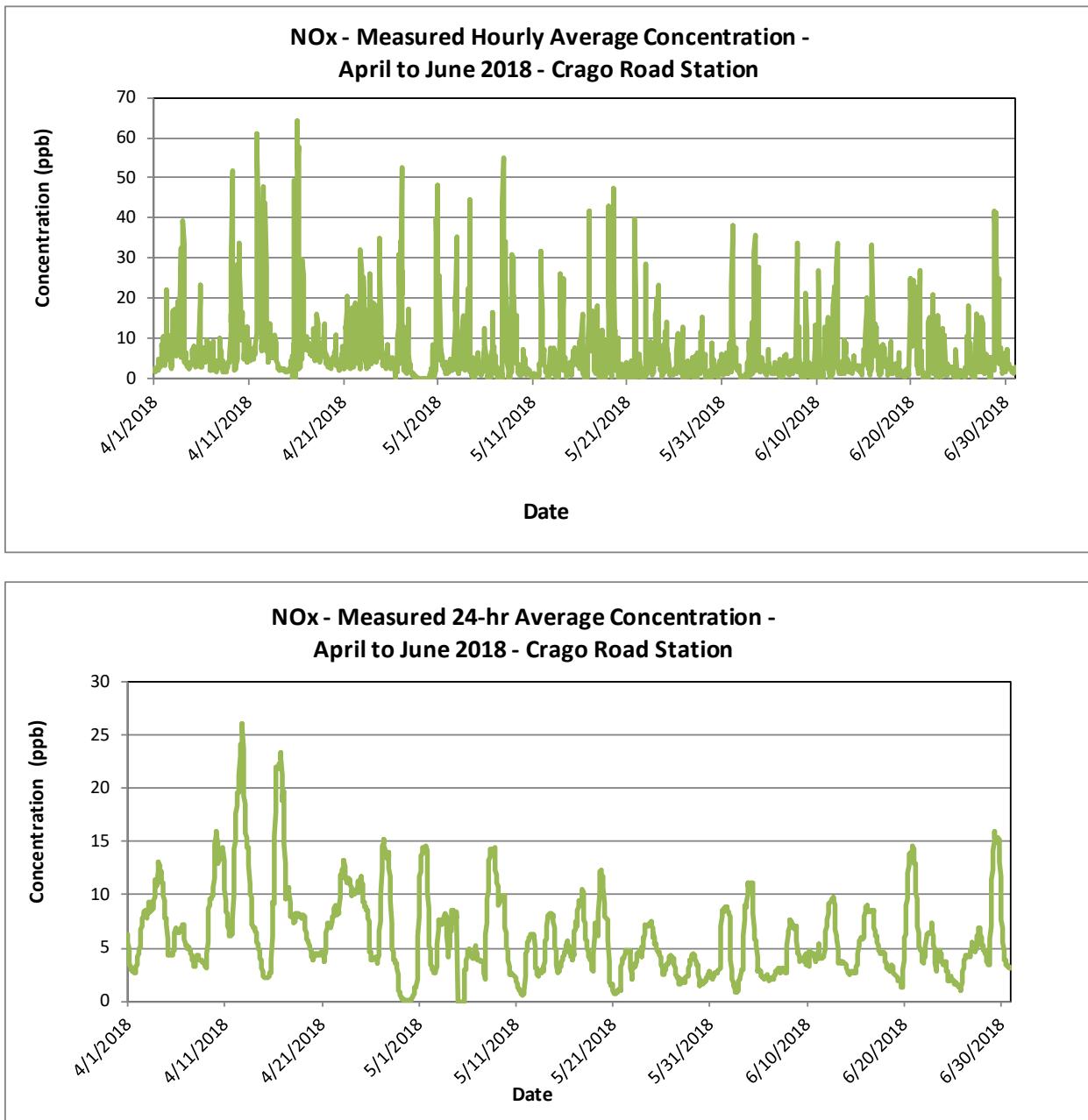




		NOx		Crago Road June 2018 (ppb)																														
		Hour		Day	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Count	Maximum	Minimum	Average	Hrs>200	Days>100
1	1.6	7.3	23.0	36.7	38.3	23.7	12.3	4.1	6.7	5.3	4.2	7.6	4.4	3.5	2.5	2.1	2.5	1.9	1.9	3.2	3.4	1.4	1.3	0.9	24	38.3	0.9	8.3	0	0				
2	0.7	0.1	0.5	0.0	0.2	0.4	0.5	0.4	0.1	0.2	0.0	1.4	0.0	0.1	0.4	0.0	0.6	3.9	3.7	0.2	6.0	9.1	9.3	7.1	24	9.3	0.0	1.9	0	0				
3	4.1	2.5	2.1	0.9	14.1	1.5	1.3	1.6	1.8	19.8	26.0	31.5	35.9	17.9	10.9	3.3	2.0	1.9	3.4	9.2	26.5	27.6	12.8	2.6	24	35.9	0.9	10.9	0	0				
4	4.6	1.8	3.4	4.2	3.8	5.3	5.2	5.2	2.2	1.9	2.2	2.6	1.9	3.4	2.7	2.0	1.3	0.7	1.2	1.3	1.7	2.4	3.6	7.1	24	7.1	0.7	3.0	0	0				
5	4.3	3.0	2.1	2.0	1.7	2.1	1.8	1.3	1.3	1.4	2.0	1.4	1.6	2.0	1.1	4.1	2.6	2.3	2.6	3.1	1.3	3.7	24	4.3	1.1	2.2	0	0						
6	2.1	0.9	0.7	2.8	4.7	4.3	2.8	0.8	1.2	1.4	0.6	0.9	0.9	1.9	5.1	5.5	5.8	4.7	5.9	3.8	4.7	3.1	3.8	3.7	24	5.9	0.6	3.0	0	0				
7	1.4	2.2	0.9	0.8	2.1	1.5	2.6	2.5	4.3	3.8	2.0	1.4	1.8	2.5	2.2	4.1	2.0	4.8	2.6	2.1	5.6	7.2	30.4	33.7	24	33.7	0.8	5.2	0	0				
8	28.2	6.7	1.6	2.5	11.8	12.9	5.8	1.2	1.5	1.5	0.7	0.5	0.0	0.5	1.0	2.1	0.0	3.6	0.8	0.3	5.6	14.5	21.2	11.1	24	28.2	0.0	5.6	0	0				
9	4.9	3.3	2.3	2.4	4.1	2.8	3.5	2.3	3.6	1.7	0.6	3.2	0.8	0.0	0.7	0.9	0.8	0.0	0.3	8.1	13.3	7.3	6.7	9.6	24	13.3	0.0	3.5	0	0				
10	5.2	2.6	3.1	1.4	0.6	3.3	12.8	26.9	2.4	0.4	0.7	0.0	0.0	0.1	0.5	1.3	0.0	0.1	1.7	5.8	6.0	5.4	13.0	24	26.9	0.0	3.9	0	0					
11	8.4	4.5	5.0	5.1	15.4	12.8	5.1	2.3	1.3	1.7	0.9	0.2	0.1	2.1	0.5	0.6	1.2	1.2	1.8	4.6	18.3	22.4	22.9	21.3	24	22.9	0.1	6.7	0	0				
12	18.5	12.4	6.1	11.5	27.2	33.9	6.8	3.5	2.4	1.7	1.3	1.8	2.8	3.6	1.3	3.7	1.1	2.4	2.0	1.8	4.4	2.3	1.4	9.6	24	33.9	1.1	6.8	0	0				
13	3.9	7.5	6.5	9.0	4.6	3.3	4.4	3.6	4.9	1.6	2.2	1.8	1.6	1.5	2.7	1.8	3.7	2.0	1.3	1.7	2.5	2.5	2.6	5.6	24	9.0	1.3	3.4	0	0				
14	3.4	2.7	2.3	3.1	3.4	2.7	2.4	3.0	2.8	3.3	3.4	3.0	2.2	2.5	2.1	1.7	2.0	1.9	1.0	1.9	3.4	3.3	3.1	4.8	24	4.8	1.0	2.7	0	0				
15	6.3	7.2	7.7	6.1	6.7	10.7	16.9	20.0	7.4	6.3	6.6	6.4	5.9	2.7	3.9	1.0	1.0	1.0	1.3	2.4	4.5	19.0	33.5	15.5	24	33.5	1.0	8.3	0	0				
16	11.7	13.0	8.8	5.7	7.2	13.5	11.3	13.0	7.7	6.2	6.8	8.0	6.9	2.3	2.2	0.8	2.7	0.7	1.1	1.2	6.8	7.4	6.2	5.5	24	13.5	0.7	6.5	0	0				
17	7.2	8.3	8.1	7.7	6.3	5.6	5.4	4.6	5.0	3.1	3.1	3.9	4.5	1.0	1.0	2.0	2.1	1.1	1.1	2.5	9.1	5.6	5.5	3.7	24	9.1	1.0	4.5	0	0				
18	3.3	1.6	1.3	1.5	1.5	3.0	3.0	3.5	3.2	3.5	3.4	2.3	2.2	1.8	0.9	3.0	3.6	5.1	6.3	1.7	2.1	1.6	0.9	1.4	24	6.3	0.9	2.6	0	0				
19	1.0	0.8	1.0	0.9	1.1	1.9	1.6	1.3	0.4	0.6	1.6	1.3	2.0	2.3	2.1	1.0	1.5	1.3	0.9	1.1	2.1	17.7	23.3	25.1	24	25.1	0.4	3.9	0	0				
20	19.8	19.8	12.9	8.1	23.4	24.6	22.2	14.9	18.9	19.9	23.0	17.7	17.5	9.7	5.2	3.4	4.0	1.9	1.4	1.7	3.3	25.0	27.1	17.5	24	27.1	1.4	14.3	0	0				
21	13.1	3.3	3.6	6.9	3.5	2.9	1.1	0.1	0.2	0.8	0.1	0.0	1.4	0.9	0.2	0.0	0.0	1.4	1.5	1.1	0.0	13.9	15.3	15.4	24	15.4	0.0	3.6	0	0				
22	13.9	9.9	6.1	11.4	10.5	5.5	15.7	20.8	1.6	1.4	2.0	1.2	1.4	2.0	1.7	0.7	0.4	0.0	3.5	5.5	15.6	9.6	1.0	5.2	24	20.8	0.0	6.1	0	0				
23	3.8	4.8	1.9	0.7	0.5	0.9	1.0	1.4	10.3	12.4	4.2	2.0	3.4	10.9	10.3	2.3	1.9	1.0	1.4	0.9	3.6	1.7	1.6	2.2	24	12.4	0.5	3.6	0	0				
24	2.0	2.2	2.7	2.8	2.6	2.4	1.9	1.4	1.2	2.8	1.5	1.3	0.7	1.1	0.6	2.7	2.3	4.3	2.5	7.3	1.3	0.3	1.4	24	7.3	0.1	2.1	0	0					
25	1.2	0.4	0.3	0.3	1.1	1.8	2.2	1.7	1.0	0.7	1.3	0.7	0.4	0.4	0.9	0.9	1.4	0.6	1.1	2.8	1.1	7.0	10.6	7.7	24	10.6	0.3	2.0	0	0				
26	4.6	18.0	6.0	5.4	7.5	8.8	5.4	4.3	3.0	2.5	0.9	1.0	1.4	0.2	0.1	0.0	0.0	0.1	3.1	3.6	6.2	12.8	14.6	16.2	24	18.0	0.0	5.2	0	0				
27	12.3	4.7	1.8	5.7	10.1	3.4	4.0	8.0	6.6	1.8	1.6	2.3	15.3	13.6	5.0	2.3	8.5																	



**Figure C-1 Time History Plots of Measured Hourly Average and 24-Hour Average NO<sub>x</sub> Concentrations – Crago Road Station**





**APPENDIX D:**  
**PM<sub>2.5</sub> DATA SUMMARIES AND TIME  
HISTORY PLOTS**



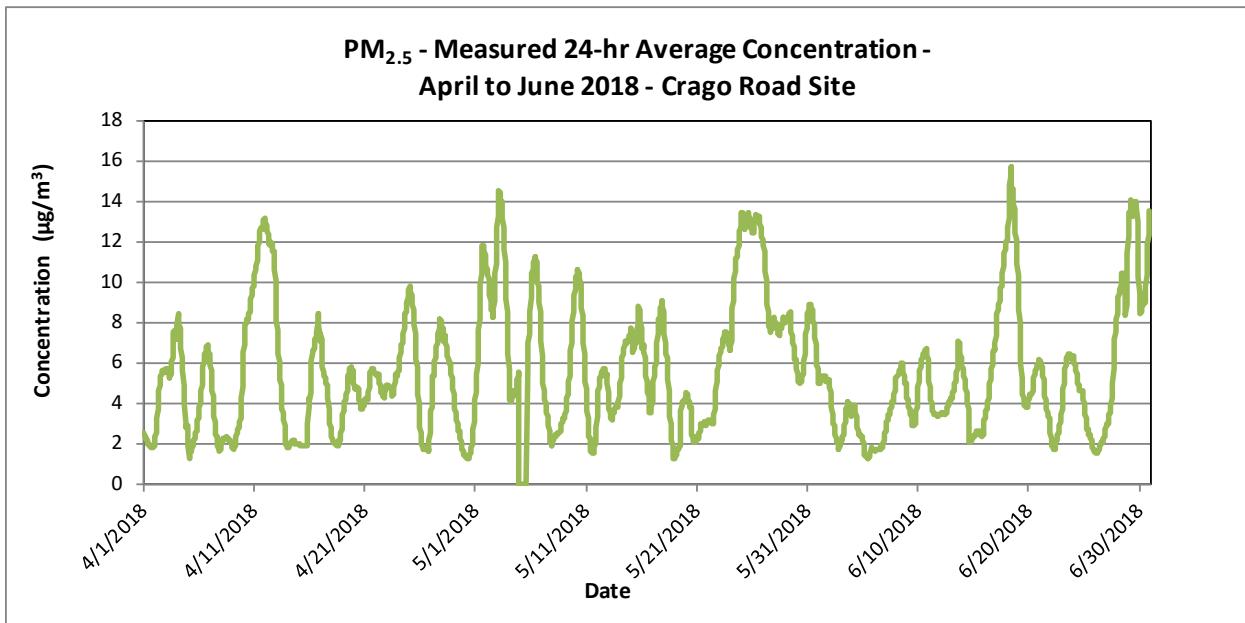
		PM <sub>2.5</sub> - Crago Road																											
		April 2018																											
		(µg/m <sup>3</sup> )																											
Hour																													
Day	Hour	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Count	Maximum	Minimum	Average
1	0	2.0	1.9	1.5	1.3	1.2	1.2	1.3	1.6	1.5	1.3	1.1	1.2	1.4	1.6	1.8	1.9	2.2	2.0	2.0	2.2	2.6	2.4	3.0	2.8	24	3.0	1.1	1.8
2	0	4.0	6.4	6.7	4.1	4.9	6.3	5.0	10.2	11.2	10.8	8.3	6.9	8.3	7.3	5.3	4.2	3.6	3.5	4.0	3.2	2.5	2.4	2.2	3.8	24	11.2	2.2	5.6
3	0	5.7	5.4	4.6	4.9	5.0	6.4	6.5	6.3	8.5	8.0	9.9	10.5	7.1	6.4	6.6	18.5	8.1	4.6	10.8	26.5	3.1	1.1	0.9	0.7	24	26.5	0.7	7.3
4	0	1.6	6.1	20.3	18.2	2.3	1.5	1.6	1.9	1.4	0.8	0.4	0.5	0.9	0.8	1.1	1.1	1.1	1.2	1.0	0.9	0.8	1.0	1.1	1.2	24	20.3	0.4	2.9
5	0	1.4	1.5	1.5	3.4	3.9	4.1	4.2	2.7	2.7	2.5	2.5	2.4	3.0	3.3	3.0	3.6	4.6	2.9	2.4	3.6	5.1	5.7	4.6	3.5	24	5.7	1.4	3.3
6	0	3.7	5.8	8.4	7.5	8.5	8.9	10.9	9.6	9.5	9.6	8.6	8.9	7.8	6.4	5.0	4.6	5.5	5.7	5.8	6.4	3.6	2.1	1.6	1.4	24	10.9	1.4	6.5
7	0	1.1	1.0	1.0	1.3	1.5	1.6	2.0	2.7	1.7	1.3	1.1	1.2	1.2	1.6	2.2	2.0	2.1	2.2	2.0	2.0	2.4	2.7	2.7	24	2.7	1.0	1.7	
8	0	3.1	3.7	3.8	3.8	3.0	2.9	3.4	2.1	1.6	1.3	1.4	1.7	1.4	1.4	1.5	1.6	1.1	0.9	1.0	1.4	1.3	1.4	1.6	1.6	24	3.8	0.9	2.0
9	0	1.7	1.7	2.1	2.8	3.0	3.7	4.7	3.4	1.9	6.2	7.4	6.3	3.3	2.8	2.6	2.7	3.5	3.1	3.4	5.1	7.5	11.4	11.5	13.5	24	13.5	1.7	4.8
10	0	14.6	17.3	15.3	11.4	11.5	12.0	11.3	6.6	5.4	7.3	6.9	6.1	5.9	3.9	5.3	5.7	8.1	7.5	9.4	9.5	10.1	13.2	15.3	16.5	24	17.3	3.9	9.8
11	0	20.2	20.1	19.0	18.1	15.8	11.8	12.4	12.6	11.6	12.4	12.2	10.8	9.5	9.7	9.7	8.7	7.6	7.3	8.4	10.6	14.7	16.4	18.4	18.2	24	20.2	7.3	13.2
12	0	18.9	19.3	16.1	13.9	11.3	10.7	11.3	9.3	8.6	7.6	8.7	8.4	11.7	11.0	9.6	6.6	5.0	5.4	5.9	8.8	12.2	9.1	7.7	4.6	24	19.3	4.6	10.1
13	0	2.8	2.0	2.0	2.1	1.7	1.7	1.8	1.6	1.1	1.2	1.2	0.9	1.5	1.7	2.1	2.1	4.2	1.7	2.0	2.2	2.4	2.1	2.1	1.8	24	4.2	0.9	1.9
14	0	1.7	1.5	1.8	2.2	2.3	2.6	2.6	2.4	2.5	2.3	2.1	1.9	1.7	1.6	1.7	1.8	1.8	1.8	1.8	1.7	1.8	1.8	1.8	24	2.6	1.5	2.0	
15	0	1.8	1.9	2.0	2.0	2.1	2.0	2.0	2.8	2.4	2.0	1.8	1.7	1.7	1.6	1.9	1.8	M	M	1.8	2.2	7.9	18.1	21.0	10.9	22	21.0	1.6	4.2
16	0	0.0	0.0	12.8	15.4	11.5	13.2	10.3	6.1	1.8	1.9	4.0	4.7	4.5	5.2	3.6	4.6	9.5	10.7	15.0	10.4	7.7	5.7	6.0	4.6	24	15.4	0.0	7.1
17	0	5.1	5.0	5.5	3.1	2.7	2.7	2.1	2.1	2.5	2.3	2.1	2.3	2.5	2.1	2.0	1.6	2.5	3.7	2.9	2.2	2.0	2.1	2.1	1.6	24	5.5	1.6	2.7
18	0	1.5	1.2	1.4	1.4	1.3	1.6	1.9	1.7	2.0	1.8	2.1	1.9	1.6	1.4	1.4	3.8	7.8	4.0	3.5	4.0	5.1	5.4	5.3	6.1	24	7.8	1.2	2.9
19	0	6.5	9.3	7.2	5.2	4.7	4.3	4.1	3.8	3.9	4.3	5.6	8.0	7.8	6.9	7.0	6.5	6.8	5.9	5.1	3.4	4.0	3.6	2.4	24	9.3	2.4	5.4	
20	0	3.1	2.5	2.8	3.5	4.4	5.2	5.1	3.9	3.3	3.4	4.7	3.4	2.5	3.3	3.4	3.9	4.9	3.9	3.7	4.2	4.6	4.7	7.0	5.3	24	7.0	2.5	4.0
21	0	4.2	4.4	4.5	4.1	3.9	4.4	4.1	3.6	7.2	9.6	9.8	11.0	7.0	4.3	4.4	6.5	4.0	3.5	3.8	4.4	4.4	3.4	4.2	24	11.0	3.4	5.4	
22	0	5.2	3.8	3.8	3.6	3.3	4.9	4.4	3.1	3.6	3.6	7.3	8.7	5.8	5.1	5.0	3.7	3.8	2.6	2.0	3.9	8.0	6.2	7.2	5.7	24	8.7	2.0	4.8
23	0	6.8	6.8	3.2	3.1	2.9	3.8	2.9	4.2	4.1	3.6	3.5	3.9	4.0	4.1	6.1	5.9	6.2	7.0	9.3	9.9	8.2	7.4	6.2	7.6	24	9.9	2.9	5.4
24	0	8.4	6.9	6.6	7.0	7.3	9.6	10.0	8.7	5.4	5.9	7.1	6.1	7.2	9.5	12.9	12.3	12.1	10.6	11.7	11.9	13.3	12.5	12.6	11.5	24	13.3	5.4	9.5
25	0	9.3	10.9	9.5	7.2	4.9	5.1	5.5	4.2	2.9	1.8	2.1	2.0	2.1	1.6	1.4	1.3	1.6	2.0	1.5	1.7	1.8	1.7	1.7	1.7	24	10.9	1.3	3.6
26	0	1.5	1.4	1.3</td																									

		PM <sub>2.5</sub> - Crago Road																													
		May 2018																													
		(µg/m <sup>3</sup> )																													
Hour																															
Day	Hour	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Count	Maximum	Minimum	Average		
1	9.5	9.5	7.0	9.8	9.3	14.0	16.2	13.5	14.6	14.4	13.2	16.5	17.5	17.7	18.5	17.5	8.0	4.9	4.9	4.9	5.4	5.5	5.7	5.3	24	18.5	4.9	11.0			
2	5.3	5.8	5.8	6.7	7.6	8.1	8.0	7.9	8.4	9.9	10.4	10.8	13.5	16.7	14.9	13.9	15.6	16.6	15.8	16.6	15.1	17.7	19.7	18.9	24	19.7	5.3	12.1			
3	19.7	19.9	19.4	20.2	11.0	5.6	3.0	5.2	7.5	7.3	8.5	4.1	3.8	5.1	7.9	6.3	4.4	1.3	1.6	1.3	1.4	1.1	2.2	3.1	24	20.2	1.1	7.1			
4	3.1	3.6	4.1	3.9	4.0	3.8	3.6	3.9	8.1	20.6	3.7	2.9	5.0	6.6	8.0	7.6	4.1	M	M	M	M	M	M	M	17	20.6	2.9				
5	0.6	1.8	2.1	3.3	3.7	5.6	4.2	1.8	1.9	2.0	2.6	5.3	8.0	9.7	13.4	14.6	11.2	11.8	13.1	12.8	16.6	16.8	16.1	12.2	24	16.8	0.6	8.0			
6	13.6	19.5	14.8	12.9	10.8	9.4	6.4	5.1	4.8	6.4	5.0	4.8	5.5	5.8	4.8	5.7	5.9	6.8	9.2	7.8	5.8	5.3	2.7	2.1	24	19.5	2.1	7.5			
7	2.1	2.1	1.9	2.0	1.8	1.6	3.0	1.4	1.4	1.6	1.7	1.4	1.6	1.5	1.4	1.4	1.3	1.4	1.2	1.6	4.1	4.1	4.3	4.1	24	4.3	1.2	2.1			
8	3.9	3.3	3.7	2.8	3.1	2.6	1.9	1.5	2.3	2.6	2.5	2.1	2.2	1.8	1.7	1.8	2.7	5.1	4.0	4.6	5.3	5.1	5.2	5.5	24	5.5	1.5	3.2			
9	4.8	5.0	4.7	5.3	6.6	6.4	6.1	8.1	7.2	6.7	7.7	9.1	8.9	8.7	10.0	15.8	12.8	12.1	12.0	15.4	15.3	13.4	12.1	11.1	24	15.8	4.7	9.4			
10	10.6	10.0	10.6	9.0	9.2	12.0	7.0	5.8	6.2	6.8	7.2	3.1	2.0	1.8	1.9	2.2	2.5	2.6	2.8	2.8	2.0	1.7	1.4	1.3	24	12.0	1.3	5.1			
11	1.3	1.3	1.1	1.1	1.0	1.0	1.1	2.4	0.9	1.1	1.2	1.3	1.3	1.2	2.0	2.7	4.4	6.0	5.7	5.0	4.3	8.4	10.9	24	10.9	0.9	2.8				
12	14.6	13.1	10.5	8.8	6.1	5.7	4.4	4.0	4.0	3.5	2.4	2.4	2.7	2.8	2.0	2.2	2.3	2.3	2.1	3.4	6.0	7.0	4.7	2.7	24	14.6	2.0	5.0			
13	3.2	3.7	4.9	4.0	2.8	2.2	2.2	1.8	3.0	4.0	8.2	3.9	2.7	4.0	3.8	4.4	3.8	3.2	3.5	4.1	4.5	5.6	6.1	9.1	24	9.1	1.8	4.1			
14	9.8	8.0	9.0	9.0	10.3	11.0	9.7	8.6	8.6	6.6	7.4	7.4	7.9	7.3	5.1	3.9	3.9	3.1	2.6	4.0	9.1	8.8	6.7	8.4	24	11.0	2.6	7.3			
15	12.5	13.8	9.2	8.1	2.3	1.2	1.5	9.9	9.9	9.0	8.9	9.5	9.4	10.2	9.2	10.1	12.1	11.7	10.0	9.1	5.4	4.4	4.1	3.4	24	13.8	1.2	8.1			
16	3.2	2.6	2.3	2.2	2.6	3.7	2.7	1.7	1.7	1.7	1.6	2.4	4.4	5.4	4.4	5.4	7.4	6.4	4.8	2.1	4.0	6.2	7.2	6.1	24	7.4	1.6	3.8			
17	9.4	11.8	9.3	8.7	10.1	9.4	4.5	4.8	5.8	9.8	9.7	10.9	14.4	13.4	11.0	9.2	9.4	8.6	7.5	7.2	9.0	9.6	7.6	1.4	24	14.4	1.4	8.8			
18	1.2	1.1	1.1	1.1	1.0	1.0	2.1	1.9	1.3	1.5	1.2	1.0	0.9	1.1	1.1	1.2	1.2	1.1	1.5	1.9	1.8	1.4	1.2	24	2.1	0.9	1.3				
19	1.3	2.4	2.9	2.1	2.2	2.9	3.6	3.7	2.1	1.8	2.3	3.5	11.4	16.7	16.6	6.7	2.5	2.9	2.9	2.2	2.7	2.6	2.2	3.0	24	16.7	1.3	4.3			
20	3.2	3.5	4.9	1.0	0.8	0.6	0.6	0.5	0.1	0.3	0.8	3.7	4.7	3.1	2.6	2.3	2.1	1.8	1.7	2.2	6.8	3.7	3.7	24	6.8	0.1	2.4				
21	2.5	3.1	2.1	2.6	3.2	3.3	2.5	2.7	2.9	3.1	3.4	3.8	3.3	2.7	3.0	2.7	3.1	3.4	0.3	0.0	2.4	5.9	5.8	24	5.9	0.0	3.1				
22	3.5	4.1	2.4	2.1	2.4	2.0	2.9	3.0	2.8	1.8	2.5	3.2	4.6	6.3	9.0	8.8	8.9	9.9	10.0	11.3	10.5	10.1	8.1	12.0	24	12.0	1.8	5.9			
23	9.6	5.8	5.6	5.3	4.9	4.1	3.5	4.0	4.9	5.5	6.5	7.3	8.7	7.3	7.6	9.4	9.2	7.9	8.3	7.7	7.4	7.7	6.9	6.7	24	9.6	3.5	6.7			
24	7.1	7.2	8.4	11.9	18.6	17.6	15.1	13.6	14.6	14.6	13.1	15.2	13.5	14.7	12.6	9.9	11.1	12.2	12.5	12.1	13.1	13.1	11.6	10.9	24	18.6	7.1	12.7			
25	12.0	14.0	13.8	12.9	12.8	12.2	10.8	11.5	12.6	14.0	15.3	18.4	18.8	16.5	13.3	14.9	13.1	10.0	9.6	9.8	10.3	9.3									

		PM <sub>2.5</sub> - Crago Road																											
		June 2018																											
		(µg/m <sup>3</sup> )																											
Day	Hour	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Count	Maximum	Minimum	Average
1	0	4.9	4.7	6.7	7.1	6.4	6.8	9.0	5.7	4.8	2.9	2.9	3.5	3.7	4.3	4.1	4.0	3.6	4.1	6.1	6.4	6.4	5.2	4.4	3.8	24	9.0	2.9	5.06
	100	2.0	1.0	0.8	0.8	0.7	0.6	0.6	0.7	0.7	0.6	0.5	0.6	0.5	0.5	0.5	0.7	2.2	4.0	3.5	2.6	3.4	7.6	7.5	3.9	24	7.6	0.5	1.9
	200	3.4	2.8	2.4	2.1	3.8	2.1	2.4	2.7	3.3	5.6	5.0	5.8	7.1	5.5	5.3	3.1	2.7	2.1	2.4	2.6	2.8	3.1	2.5	1.8	24	7.1	1.8	3.4
	300	2.3	2.9	5.7	5.6	5.2	5.2	3.0	1.5	1.0	0.9	1.0	1.1	0.9	1.7	1.3	1.4	1.9	1.9	1.7	1.9	2.2	2.0	1.6	1.3	24	5.7	0.9	2.3
	400	1.4	1.4	1.2	1.0	0.8	0.7	0.8	0.7	0.9	0.8	0.9	1.0	1.2	1.7	2.1	2.0	3.0	4.2	6.6	3.5	1.9	1.2	1.0	1.2	24	6.6	0.7	1.7
	500	1.2	0.8	0.8	0.9	1.0	1.1	1.1	0.9	1.3	1.1	1.1	1.2	1.0	1.5	2.0	3.0	4.6	5.0	4.7	4.7	4.1	3.4	4.4	6.3	24	6.3	0.8	2.4
	600	2.8	2.0	2.9	4.2	5.0	4.8	4.4	3.9	2.6	2.2	2.0	2.3	3.2	3.9	4.8	6.4	6.8	5.6	5.6	6.4	6.7	7.4	7.7	9.7	24	9.7	2.0	4.7
	700	10.7	6.8	4.6	4.6	5.4	5.7	4.9	3.9	4.5	5.0	5.3	4.9	4.6	5.0	4.6	3.0	2.6	2.8	2.5	2.5	3.3	5.3	7.0	5.4	24	10.7	2.5	4.8
	800	2.6	2.0	2.0	2.5	2.8	2.6	2.8	2.5	2.4	2.1	1.8	2.0	1.7	2.6	3.2	3.3	3.0	3.8	7.9	7.9	10.4	12.1	14.3	24	14.3	1.7	4.2	
10	0	10.8	8.6	8.4	8.3	6.8	6.5	6.1	6.3	4.9	4.5	4.8	4.2	4.0	4.1	3.8	3.5	4.2	3.9	4.1	4.6	4.1	4.6	4.4	4.3	24	10.8	3.5	5.4
	100	3.3	2.6	2.3	2.5	2.5	2.6	2.3	2.4	2.8	3.4	3.3	3.9	4.1	3.7	3.7	3.4	4.1	3.5	4.0	4.0	4.7	5.3	4.4	4.3	24	5.3	2.3	3.5
	200	3.6	3.0	2.4	2.7	3.2	3.4	2.7	2.5	2.3	2.3	2.8	3.2	4.4	5.2	5.1	5.8	5.9	5.7	6.3	6.4	5.3	5.5	6.1	24	6.4	2.3	4.2	
	300	4.6	3.8	4.1	4.5	4.8	5.8	4.9	5.2	5.6	5.3	5.1	5.0	12.1	9.2	19.4	22.5	7.7	2.2	1.8	1.7	2.0	1.8	2.0	24	22.5	1.7	5.9	
	400	2.1	1.5	1.4	1.5	1.3	1.1	1.1	1.4	2.0	2.3	2.8	2.3	2.7	3.0	3.9	3.0	2.9	2.4	2.2	2.1	2.2	5.6	2.7	2.8	24	5.6	1.1	2.3
	500	2.0	1.7	1.7	1.8	1.9	2.7	2.9	3.6	2.4	1.9	2.2	2.5	2.7	2.2	2.0	1.8	1.8	1.7	2.0	2.5	3.3	4.9	12.3	7.6	24	12.3	1.7	3.0
	600	5.4	5.0	4.6	4.5	4.4	5.4	5.7	5.9	5.2	6.4	7.5	9.8	8.3	6.7	6.5	6.5	5.8	5.3	6.5	8.4	8.0	9.2	10.9	10.7	24	10.9	4.4	6.8
	700	11.2	12.1	15.4	14.0	11.2	9.1	7.7	8.1	8.6	9.4	9.2	19.2	14.3	7.8	8.7	12.2	14.0	12.4	12.6	13.7	13.7	13.0	13.6	13.3	24	19.2	7.7	11.9
	800	13.7	15.0	17.0	18.8	20.1	20.6	19.9	20.4	21.7	22.3	18.0	4.5	5.2	6.0	5.0	7.6	6.3	4.7	4.4	3.3	3.4	5.4	5.6	3.5	24	22.3	3.3	11.3
20	900	2.9	2.8	3.5	4.6	5.1	5.3	5.5	5.5	4.4	3.7	3.2	2.2	3.4	2.5	2.4	4.9	3.5	2.8	2.9	3.2	5.5	5.9	6.6	24	6.6	2.2	3.9	
	1000	6.8	6.4	6.0	6.5	6.5	5.2	4.5	5.2	5.4	7.0	7.5	7.6	8.9	6.8	4.5	4.1	6.2	5.3	4.7	4.2	4.2	6.5	7.8	9.2	24	9.2	4.1	6.1
	1100	8.1	4.6	4.1	4.8	4.4	3.2	2.1	1.7	1.7	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.7	1.9	2.7	2.5	1.9	24	8.1	1.5	2.6
	1200	1.8	1.5	1.4	1.5	1.5	1.5	2.0	2.0	2.7	4.0	4.1	3.7	3.6	3.9	4.0	3.9	3.9	4.2	5.0	5.5	6.6	5.8	4.4	5.1	24	6.6	1.4	3.5
	1300	6.8	9.4	9.5	9.3	8.7	7.9	8.1	7.1	8.0	8.3	5.9	5.2	5.4	4.8	4.8	4.2	3.6	3.4	3.8	4.2	4.6	6.4	6.3	6.8	24	9.5	3.4	6.4
	1400	6.2	6.8	6.5	6.4	6.7	6.7	6.1	4.4	3.2	2.6	3.7	3.1	2.6	2.3	2.6	2.4	2.7	4.2	4.0	4.2	3.9	3.1	2.6	2.7	24	6.8	2.3	4.2
	1500	3.1	2.6	2.3	1.9	1.7	1.7	1.4	1.6	1.7	1.4	1.3	1.2	1.2	1.0	1.2	1.2	1.4	1.3	1.2	1.3	1.5	1.6	2.2	1.7	24	3.1	1.0	1.6
	1600	1.8	2.2	2.2	2.3	2.1	2.2	2.0	2.3	2.7	3.2	3.0	2.9	2.4	2.3	2.2	2.2	2.3	2.2	2.2	2.4	3.2	3.9	4.4	4.8	24	5.4	1.8	2.8
	1700	4.1																											



**Figure D-1 Time History Plot of Measured 24-Hour Average PM<sub>2.5</sub> Concentrations – Crago Road Station**





## **APPENDIX E: CONTINUOUS PARAMETER EDIT LOG**



## EDIT LOG TABLE

Project Name	Durham York Energy Centre Ambient Air Monitoring Program										
Contact	Greg Crooks / Connie Lim / Toni Zbierowski	Phone:	905-944-7777	E-mail:	greg.crooks@stantec.com, connie.lim@stantec.com, toni.zbierowski@stantec.com						
Station number:	N/A	Station Name:	Crago Road								
Station address:	Crago Road	Emitter Address:	The Region of Durham, 605 Rossland Rd, Whitby, ON								
Pollutant or parameter:	SO2	Instrument make & model:	Teldyne Monitor Labs Sulphur Dioxide		Serial Number:	1228					
Data edit period	Start date:	1-Apr-18	End date:	30-Jun-18	Time Zone : EST						
Edit #	Edit date	Editor's Name	Edit Action	Starting		Ending		Reason			
				Date (dd/mm/yyyy)	Hour (xx:xx)	Date (dd/mm/yyyy)	Hour (xx:xx)				
26	11-Jun-18	TZ	Invalidate	30-May-18	14:00	30-May-18	16:00	Monthly calibration.			
27	11-Jun-18	TZ	Invalidate	4-May-18	17:00	5-May-18	00:00	Power outage at Station during wind storm.			
28	11-Jun-18	TZ	Invalidate	15-Apr-18	16:00	15-Apr-18	18:00	Power outage at Station during ice storm.			
29	11-Jun-18	TZ	Data Review	18-Apr-18	12:00	18-Apr-18	19:00	Instances of multiple repeating concentrations were investigated. The measurements fluctuated slightly, but appear to be repeating due to rounding off the values to 1 decimal place.			
30	11-Jun-18	TZ	Data Review	20-Apr-18	09:00	20-Apr-18	16:00	Instances of multiple repeating concentrations were investigated. The measurements fluctuated slightly, but appear to be repeating due to rounding off the values to 1 decimal place.			
31	11-Jun-18	TZ	Data Review	25-Apr-18	14:00	26-Apr-18	01:00	Instances of multiple repeating concentrations were investigated. The measurements fluctuated slightly, but appear to be repeating due to rounding off the values to 1 decimal place.			
32	11-Jun-18	TZ	Data Review	29-Apr-18	00:00	29-Apr-18	07:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
33	11-Jun-18	TZ	Data Review	29-Apr-18	14:00	29-Apr-18	22:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
34	11-Jun-18	TZ	Data Review	3-May-18	16:00	4-May-18	07:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
35	11-Jun-18	TZ	Data Review	7-May-18	00:00	7-May-18	07:00	Instances of multiple repeating concentrations were investigated. The measurements fluctuated slightly, but appear to be repeating due to rounding off the values to 1 decimal place.			
36	11-Jun-18	TZ	Data Review	10-May-18	13:00	11-May-18	06:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
37	11-Jun-18	TZ	Data Review	15-May-18	05:00	15-May-18	14:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
38	11-Jun-18	TZ	Data Review	15-May-18	19:00	16-May-18	03:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
39	11-Jun-18	TZ	Data Review	17-May-18	23:00	18-May-18	06:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
40	11-Jun-18	TZ	Data Review	20-May-18	16:00	21-May-18	08:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
41	11-Jun-18	TZ	Data Review	22-May-18	15:00	23-May-18	08:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
42	11-Jun-18	TZ	Data Review	28-May-18	22:00	29-May-18	13:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
43	11-Jun-18	TZ	Data Review	31-May-18	01:00	31-May-18	23:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
44	13-Jun-18	TZ	Invalidate	26-Apr-18	11:00	26-Apr-18	13:00	Monthly calibration.			
45	13-Jun-18	TZ	Data Review	15-Apr-18	21:00	16-Apr-18	07:00	Elevated SO <sub>2</sub> concentrations ranging from 50 to 79 ppb were noted. Elevated concentrations between 35 and 50 ppb were also measured at the Courteau WPCP during this time. Winds were blowing from the east. Possible emission sources include St. Mary's Cement. Data determined to be valid.			
46	13-Jun-18	TZ	Data Review	19-May-18	01:00	19-May-18	03:00	Elevated SO <sub>2</sub> concentrations ranging from 50 to 63 ppb were noted. Elevated concentrations around 35 ppb were also measured at the Courteau WPCP during this time. Winds were blowing from the east. Possible emission sources include St. Mary's Cement. Data determined to be valid.			
47	11-Jul-18	TZ	Invalidate	30-May-18	14:00	30-May-18	15:00	Monthly calibration.			
48	11-Jul-18	TZ	Invalidate	28-Jun-18	09:00	28-Jun-18	10:00	Monthly calibration.			
49	12-Jul-18	TZ	Data Review	3-Jun-18	09:00	3-Jun-18	13:00	Elevated SO <sub>2</sub> concentrations ranging from 40 to 81 ppb were noted. Elevated concentrations between 30 and 74 ppb were also measured at the Courteau WPCP during this time. Winds were blowing from the east. Possible emission sources include St. Mary's Cement. Data determined to be valid.			
50	12-Jul-18	TZ	Data Review	4-Jun-18	16:00	5-Jun-18	18:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
51	12-Jul-18	TZ	Data Review	5-Jun-18	22:00	6-Jun-18	14:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
52	12-Jul-18	TZ	Data Review	8-Jun-18	12:00	9-Jun-18	07:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
53	12-Jul-18	TZ	Data Review	9-Jun-18	10:00	9-Jun-18	17:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
54	12-Jul-18	TZ	Data Review	13-Jun-18	04:00	13-Jun-18	22:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
55	12-Jul-18	TZ	Data Review	14-Jun-18	02:00	14-Jun-18	14:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
56	12-Jul-18	TZ	Data Review	14-Jun-18	22:00	15-Jun-18	06:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
57	12-Jul-18	TZ	Data Review	18-Jun-18	13:00	19-Jun-18	04:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
58	12-Jul-18	TZ	Data Review	21-Jun-18	02:00	21-Jun-18	08:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
59	12-Jul-18	TZ	Data Review	11-Jun-18	20:00	12-Jun-18	04:00	Instances of multiple repeating concentrations were investigated. The measurements fluctuated slightly, but appear to be repeating due to rounding off the values to 1 decimal place.			
60	12-Jul-18	TZ	Data Review	19-Jun-18	11:00	19-Jun-18	17:00	Instances of multiple repeating concentrations were investigated. The measurements fluctuated slightly, but appear to be repeating due to rounding off the values to 1 decimal place.			
61	12-Jul-18	TZ	Data Review	24-Jun-18	01:00	24-Jun-18	11:00	Instances of multiple repeating concentrations were investigated. The measurements fluctuated slightly, but appear to be repeating due to rounding off the values to 1 decimal place.			
62	12-Jul-18	TZ	Data Review	25-Jun-18	14:00	25-Jun-18	21:00	Instances of multiple repeating concentrations were investigated. The measurements fluctuated slightly, but appear to be repeating due to rounding off the values to 1 decimal place.			
63	12-Jul-18	TZ	Data Review	29-Jun-18	00:00	29-Jun-18	06:00	Instances of multiple repeating concentrations were investigated. The measurements fluctuated slightly, but appear to be repeating due to rounding off the values to 1 decimal place.			

Examples of Acceptable Edit Actions:

Add offset of

Delete hours

Zero Correction

Slope Correction

Manual data entry for missing, but collected data

Invalidating span &amp; zero check data

Invalidating data due to equipment malfunctions and power failures.

Invalidating data when instrumentation off-line

Marking data as out-of-range

## EDIT LOG TABLE

Project Name	Durham York Energy Centre Ambient Air Monitoring Program										
Contact	Greg Crooks / Connie Lim / Toni Zbieranowski	Phone:	905-944-7777	E-mail:	greg.crooks@stantec.com, connie.lim@stantec.com, toni.zbieranowski@stantec.com						
Station number:	N/A	Station Name:	Crago Road								
Station address:	Crago Road	Emitter Address:	The Region of Durham, 605 Rossland Rd, Whitby, ON								
Pollutant or parameter:	NOx	Instrument make & model:	API Model 200E Chemiluminescence Analyzer								
Data edit period	Start date:	1-Apr-18	End date:	30-Jun-18	1424						
					Time Zone : EST						
Edit #	Edit date	Editor's Name	Edit Action	Starting		Ending		Reason			
				Date (dd/mm/yyyy)	Hour (xxxx)	Date (dd/mm/yyyy)	Hour (xxxx)				
8	11-Jun-18	TZ	Invalidate	30-May-18	14:00	30-May-18	16:00	Monthly calibration.			
9	11-Jun-18	TZ	Invalidate	4-May-18	17:00	5-May-18	00:00	Power outage at Station during a wind storm.			
10	11-Jun-18	TZ	Invalidate	15-Apr-18	16:00	15-Apr-18	18:00	Power outage at Station during an ice storm.			
11	11-Jun-18	TZ	Data Review	28-Apr-18	22:00	29-Apr-18	14:00	Instances of repeating zero values in this timeframe were due to negative instrument zero drift less than -5 ppb and rounded to 0 ppb. As per the MOECC Ambient Monitoring Guideline, no drift correction was applied.			
12	11-Jun-18	TZ	Data Review	29-Apr-18	17:00	30-Apr-18	03:00				
13	13-Jun-18	TZ	Invalidate	26-Apr-18	11:00	26-Apr-18	13:00	Monthly calibration.			
14	13-Jun-18	TZ	Data Review	16-Apr-18	03:00	16-Apr-18	07:00	Elevated NOx concentrations of 39 to 64 ppb was noted during this time period. Elevated NOx was also measured at the Courtice WPCP during this time. Winds were blowing from the east. During this time, NO2 concentrations were slightly higher than NO indicating a more distant emission source. Possible sources include St. Mary's Cement and the CN rail line. Data determined to be valid.			
15	13-Jun-18	TZ	Data Review	7-May-18	21:00	7-May-18	23:00	Elevated NOx concentrations of 28 to 55 ppb was noted during this time period. Elevated NOx was also measured at the Courtice WPCP during this time. Winds were blowing from northerly to northeasterly directions. During this time, NO2 concentrations were higher than NO indicating a more distant emission source. Possible sources include Highway 401 and Highway 418 construction. Data determined to be valid.			
16	11-Jul-18	TZ	Invalidate	30-May-18	14:00	30-May-18	15:00	Monthly calibration.			
17	11-Jul-18	TZ	Invalidate	28-Jun-18	09:00	28-Jun-18	10:00	Monthly calibration.			
18	12-Jul-18	TZ	Data Review	28-Jun-18	21:00	29-Jun-18	01:00	Elevated NOx concentrations of 34 to 41 ppb was noted during this time period. Elevated NOx was also measured at the Courtice WPCP during this time. Winds were blowing from northerly directions. During this time, NO2 concentrations were higher than NO indicating a more distant emission source. Possible sources include Highway 401. Data determined to be valid.			

Examples of Acceptable Edit Actions:

Add offset of

Invalidating span &amp; zero check data

Delete hours

Invalidating data due to equipment malfunctions and power failures.

Zero Correction

Invalidating data when instrumentation off-line

Slope Correction

Marking data as out-of-range

Manual data entry for missing, but collected data

## EDIT LOG TABLE

<b>Project Name</b>	Durham York Energy Centre Ambient Air Monitoring Program									
<b>Contact</b>	Greg Crooks / Connie Lim / Toni Zbierowski	Phone:	905-944-7777	E-mail:	greg.crooks@stantec.com, connie.lim@stantec.com, toni.zbierowski@stantec.com					
<b>Station number:</b>	N/A		<b>Station Name:</b>	Crago Road						
<b>Station address:</b>	Crago Road		<b>Emitter Address:</b>	The Region of Durham, 605 Rossland Rd, Whitby, ON						
<b>Pollutant or parameter:</b>	PM2.5	<b>Instrument make &amp; model:</b>	Thermo Sharp 5030 Synchronized Hybrid		<b>Serial Number:</b>	CM 0269				
<b>Ambient Real-time</b>										
<b>Data edit period</b>	<b>Start date:</b>	1-Apr-18	<b>End date:</b>	30-Jun-18	Time Zone : EST					
<b>Edit #</b>	<b>Edit date</b>	<b>Editor's Name</b>	<b>Edit Action</b>	<b>Starting</b>	<b>Ending</b>	<b>Reason</b>				
				Date (dd/mm/yyyy)	Hour (xx:xx)	Date (dd/mm/yyyy)	Hour (xx:xx)			
12	11-Jun-18	TZ	Invalidate	30-May-18	14:00	30-May-18	16:00	Monthly calibration.		
13	11-Jun-18	TZ	Invalidate	4-May-18	17:00	5-May-18	00:00	Power outage at Station during a wind storm.		
14	11-Jun-18	TZ	Invalidate	15-Apr-18	16:00	15-Apr-18	18:00	Power outage at Station during an ice storm.		
15	13-Jun-18	TZ	Invalidate	8-Apr-18	08:55	8-Apr-18	09:06			
16	13-Jun-18	TZ	Invalidate	18-Apr-18	15:22	18-Apr-18	15:33	Minute data invalidated during SHARP zero checks.		
17	13-Jun-18	TZ	Invalidate	23-Apr-18	07:48	23-Apr-18	07:54			
18	13-Jun-18	TZ	Invalidate	26-Apr-18	12:00	26-Apr-18	12:00	Monthly calibration.		
19	13-Jun-18	TZ	Invalidate	1-May-18	14:20	1-May-18	14:27			
20	13-Jun-18	TZ	Invalidate	4-May-18	07:20	4-May-18	07:26			
21	13-Jun-18	TZ	Invalidate	11-May-18	11:45	11-May-18	11:54	Minute data invalidated during SHARP zero checks.		
22	13-Jun-18	TZ	Invalidate	15-May-18	06:51	15-May-18	06:56			
23	13-Jun-18	TZ	Invalidate	25-May-18	10:49	25-May-18	10:59			
24	13-Jun-18	TZ	Data Review	3-Apr-18	19:00	3-Apr-18	19:00	An elevated PM2.5 concentration of 27 µg/m³ was observed during this time. A similar concentration was also observed at the Courtice WPCP. Elevated NOx and SO₂ was also observed during this time suggesting a combustion source. Winds were blowing from the east. Likely sources include a CN rail line or St. Mary's Cement.		
25	13-Jun-18	TZ	Data Review	4-May-18	09:00	4-May-18	09:00	An elevated PM2.5 concentration of 21 µg/m³ was observed during this time. A very similar concentration was also observed at the Courtice WPCP. Elevated NOx and SO₂ was also observed during this time suggesting a combustion source. Winds were blowing from the east. Likely sources include a CN rail line or St. Mary's Cement.		
26	11-Jul-18	TZ	Invalidate	29-May-18	10:00	29-May-18	12:00	Monthly calibration.		
27	11-Jul-18	TZ	Invalidate	28-Jun-18	08:00	28-Jun-18	12:00	Monthly calibration.		
28	12-Jul-18	TZ	Data Review	28-Jun-18	20:00	29-Jun-18	01:00	Elevated PM2.5 concentrations of 20 to 29 µg/m³ was noted during this time. Elevated PM2.5 was also measured at the Courtice WPCP during this time. Winds were blowing from the north. Likely sources include Highway 401 and Highway 418 construction.		

Examples of Acceptable Edit Actions:

Add offset of

Delete hours

Zero Correction

Slope Correction

Manual data entry for missing, but collected data

Invalidating span &amp; zero check data

Invalidating data due to equipment malfunctions and power failures.

Marking data as out-of-range

Test

## EDIT LOG TABLE

Project Name	Durham York Energy Centre Ambient Air Monitoring Program										
Contact	Greg Crooks / Connie Lim / Toni Zbierowski	Phone:	905-944-7777	E-mail:	greg.crooks@stantec.com, connie.lim@stantec.com, toni.zbierowski@stantec.com						
Station number:	N/A	Station Name:	Crago Road								
Station address:	Crago Road	Emitter Address:	The Region of Durham, 605 Rossland Rd, Whitby, ON								
Pollutant or parameter:	Temperature	Instrument make & model:	Campbell Scientific Model HMP60								
Data edit period	Start date:	1-Apr-18	End date:	30-Jun-18	Time Zone : EST						
Edit #	Edit date	Editor's Name	Edit Action	Starting Date (dd/mm/yyyy)	Hour (xxxx)	Ending Date (dd/mm/yyyy)	Hour (xxxx)	Reason			
None											

## EDIT LOG TABLE

Project Name	Durham York Energy Centre Ambient Air Monitoring Program										
Contact	Greg Crooks / Connie Lim / Toni Zbierowski	Phone:	905-944-7777	E-mail:	greg.crooks@stantec.com, connie.lim@stantec.com, toni.zbierowski@stantec.com						
Station number:	N/A	Station Name:	Crago Road								
Station address:	Crago Road	Emitter Address:	The Region of Durham, 605 Rossland Rd, Whitby, ON								
Pollutant or parameter:	Rainfall	Instrument make & model:	Texas Electronic TE525M								
Data edit period	Start date:	1-Apr-18	End date:	30-Jun-18	Time Zone : EST						
Edit #	Edit date	Editor's Name	Edit Action	Starting Date (dd/mm/yyyy)	Hour (xxxx)	Ending Date (dd/mm/yyyy)	Hour (xxxx)	Reason			
1	19-Jun-18	TZ	Invalidate	14-Apr-18	11:00	15-Apr-18	23:00	Rain gauge sensor frozen during an ice storm.			
2	16-Jul-18	TZ	Invalidate	16-Apr-18	05:00	16-Apr-18	05:00	High rainfall amount invalidated, likely ice from two day storm event melting during the hour and being recorded as a 1-hour measurement.			

Examples of Acceptable Edit Actions:

Add offset of

Delete hours

Zero Correction

Slope Correction

Manual data entry for missing, but collected data

Invalidating span &amp; zero check data

Invalidating data due to equipment malfunctions and power failures.

Invalidating data when instrumentation off-line

## EDIT LOG TABLE

<b>Project Name</b>	<b>Durham York Energy Centre Ambient Air Monitoring Program</b>						
Contact	Greg Crooks / Connie Lim / Toni Zbieranowski	Phone:	905-944-7777	E-mail:	greg.crooks@stantec.com, connie.lim@stantec.com, toni.zbieranowski@stantec.com		
Station number:	N/A	Station Name:	Crago Road				
Station address:	Crago Road	Emitter Address:	The Region of Durham, 605 Rossland Rd, Whitby, ON				
Pollutant or parameter:	Relative Humidity	Instrument make & model:	Campbell Scientific Model HMP60				
Data edit period	Start date:	1-Apr-18	End date:	30-Jun-18	Time Zone : EST		
Edit #	Edit date	Editor's Name	Edit Action	Starting	Ending	Reason	
				Date (dd/mm/yyyy)	Hour (xx:xx)	Date (dd/mm/yyyy)	Hour (xx:xx)
	None						

## EDIT LOG TABLE

<b>Project Name</b>	<b>Durham York Energy Centre Ambient Air Monitoring Program</b>							
Contact	Greg Crooks / Connie Lim / Toni Zbieranowski	Phone:	905-944-7777	E-mail:	greg.crooks@stantec.com, connie.lim@stantec.com, toni.zbieranowski@stantec.com			
Station number:	N/A	Station Name:	Crago Road					
Station address:	Crago Road	Emitter Address:	The Region of Durham, 605 Rossland Rd, Whitby, ON					
Pollutant or parameter:	Wind Speed/Wind Direction	Instrument make & model:	Met One Instruments Inc. Model 034B					
Data edit period	Start date:	1-Apr-18	End date:	30-Jun-18	Time Zone : EST			
Edit #	Edit date	Editor's Name	Edit Action	Starting	Ending	Reason		
				Date (dd/mm/yyyy)	Hour (xx:xx)	Date (dd/mm/yyyy)	Hour (xx:xx)	
7	11-Jun-18	TZ	Invalidate	14-Apr-18	09:00	16-Apr-18	03:00	WS and WD Sensor frozen during an ice storm.

Examples of Acceptable Edit Actions:

Add offset of

Delete hours

Zero Correction

Slope Correction

Manual data entry for missing, but collected data

Invalidating span &amp; zero check data

Invalidating data due to equipment malfunctions and power failures.

Invalidating data when instrumentation off-line

Marking data as out-of-range



## **APPENDIX F: METALS DATA SUMMARY**



Calculated Concentrations	Quarter 2			Crago 16	Crago 17	Crago 18	Crago 19	Crago 20	Crago 21	Crago 22	Crago 23	Crago 24	Crago 25	Crago 26	Crago 27	Crago 28	Crago 29	Crago 30
	Units	Maximum	Minimum	02/04/2018	08/04/2018	14/04/2018	20/04/2018	26/04/2018	02/05/2018	08/05/2018	14/05/2018	20/05/2018	26/05/2018	01/06/2018	07/06/2018	13/06/2018	19/06/2018	25/06/2018
Particulate	µg/m³	105.94	12.69	27.87	12.69	22.10	18.33	33.93	105.94	37.50	48.69	30.30	59.78	57.70	44.74	60.80	29.39	34.02
Total Mercury (Hg)	µg/m³	2.65E-05	6.47E-06	7.02E-06	6.51E-06	7.18E-06	6.67E-06	6.61E-06	2.65E-05	1.35E-05	6.73E-06	6.73E-06	1.98E-05	6.66E-06	1.36E-05	1.36E-05	1.26E-05	6.47E-06
Aluminum (Al)	µg/m³	9.34E-01	3.71E-02	9.13E-02	3.71E-02	6.39E-02	9.53E-02	1.73E-01	9.34E-01	2.71E-01	2.52E-01	1.08E-01	3.68E-01	2.94E-01	2.72E-01	2.93E-01	8.73E-02	1.25E-01
Antimony (Sb)	µg/m³	3.59E-03	3.14E-03	3.51E-03	3.25E-03	3.59E-03	3.33E-03	3.31E-03	3.38E-03	3.38E-03	3.37E-03	3.37E-03	3.30E-03	3.33E-03	3.39E-03	3.40E-03	3.14E-03	3.23E-03
Arsenic (As)	µg/m³	2.15E-03	1.88E-03	2.11E-03	1.95E-03	2.15E-03	2.00E-03	1.98E-03	1.99E-03	2.03E-03	2.03E-03	2.02E-03	1.98E-03	2.00E-03	2.04E-03	2.04E-03	1.88E-03	1.94E-03
Barium (Ba)	µg/m³	1.56E-02	2.73E-03	5.05E-03	2.73E-03	2.80E-03	4.80E-03	9.46E-03	1.56E-02	1.08E-02	1.01E-02	1.34E-02	1.17E-02	8.33E-03	7.26E-03	6.94E-03	5.02E-03	5.04E-03
Beryllium (Be)	µg/m³	3.59E-04	3.14E-04	3.51E-04	3.25E-04	3.59E-04	3.33E-04	3.31E-04	3.31E-04	3.38E-04	3.38E-04	3.37E-04	3.30E-04	3.33E-04	3.39E-04	3.40E-04	3.14E-04	3.23E-04
Bismuth (Bi)	µg/m³	2.15E-03	1.88E-03	2.11E-03	1.95E-03	2.15E-03	2.00E-03	1.98E-03	1.99E-03	2.03E-03	2.03E-03	2.02E-03	1.98E-03	2.00E-03	2.04E-03	2.04E-03	1.88E-03	1.94E-03
Boron (B)	µg/m³	2.15E-03	1.88E-03	2.11E-03	1.95E-03	2.15E-03	2.00E-03	1.98E-03	1.99E-03	2.03E-03	2.03E-03	2.02E-03	1.98E-03	2.00E-03	2.04E-03	2.04E-03	1.88E-03	1.94E-03
Cadmium (Cd)	µg/m³	7.18E-04	6.28E-04	7.02E-04	6.51E-04	7.18E-04	6.67E-04	6.61E-04	6.62E-04	6.77E-04	6.73E-04	6.60E-04	6.66E-04	6.79E-04	6.81E-04	6.28E-04	6.47E-04	6.47E-04
Chromium (Cr)	µg/m³	7.08E-03	1.57E-03	1.76E-03	1.63E-03	1.79E-03	1.67E-03	1.65E-03	7.08E-03	1.69E-03	5.14E-03	3.77E-03	1.65E-03	1.67E-03	1.70E-03	3.40E-03	1.57E-03	1.62E-03
Cobalt (Co)	µg/m³	7.18E-04	6.28E-04	7.02E-04	6.51E-04	7.18E-04	6.67E-04	6.61E-04	6.62E-04	6.77E-04	6.76E-04	6.73E-04	6.60E-04	6.66E-04	6.79E-04	6.81E-04	6.28E-04	6.47E-04
Copper (Cu)	µg/m³	3.41E-02	1.63E-03	3.41E-02	1.63E-03	3.66E-03	6.60E-03	6.68E-03	2.28E-02	1.19E-02	1.95E-02	9.69E-03	3.05E-02	1.36E-02	1.64E-02	1.06E-02	3.18E-02	1.12E-02
Iron (Fe)	µg/m³	1.83E+00	1.19E-01	2.87E-01	1.39E-01	1.19E-01	2.48E-01	5.12E-01	1.83E+00	6.10E-01	7.37E-01	3.02E-01	7.85E-01	5.86E-01	6.59E-01	5.84E-01	2.36E-01	2.73E-01
Lead (Pb)	µg/m³	1.45E-02	9.42E-04	1.05E-03	9.76E-04	1.08E-03	1.00E-03	9.92E-04	6.75E-03	2.64E-03	4.26E-03	1.01E-03	1.45E-02	9.99E-04	3.67E-03	1.02E-03	9.42E-04	9.70E-04
Magnesium (Mg)	µg/m³	1.30E+00	6.96E-02	1.82E-01	6.96E-02	8.04E-02	1.80E-01	4.14E-01	1.30E+00	2.73E-01	4.45E-01	1.58E-01	4.04E-01	2.74E-01	3.67E-01	2.93E-01	1.02E-01	1.33E-01
Manganese (Mn)	µg/m³	8.41E-02	3.64E-03	8.85E-03	3.64E-03	3.95E-03	8.26E-03	1.51E-02	8.41E-02	1.48E-02	2.88E-02	1.08E-02	2.22E-02	1.87E-02	1.82E-02	1.87E-02	6.84E-03	7.89E-03
Molybdenum (Mo)	µg/m³	1.08E-03	9.42E-04	1.05E-03	9.76E-04	1.08E-03	1.00E-03	9.92E-04	1.02E-03	1.01E-03	1.01E-03	9.90E-04	9.99E-04	1.02E-03	1.02E-03	9.42E-04	9.70E-04	9.70E-04
Nickel (Ni)	µg/m³	3.67E-03	9.42E-04	1.05E-03	9.76E-04	1.08E-03	1.00E-03	9.92E-04	2.78E-03	1.02E-03	1.01E-03	1.01E-03	9.90E-04	9.99E-04	3.67E-03	1.02E-03	9.42E-04	9.70E-04
Phosphorus (P)	µg/m³	1.48E-01	8.13E-03	8.78E-03	8.13E-03	8.97E-03	8.33E-03	3.11E-02	1.48E-01	5.48E-02	4.79E-02	5.12E-02	7.19E-02	9.39E-02	5.43E-02	7.49E-02	4.21E-02	5.89E-02
Selenium (Se)	µg/m³	3.59E-03	3.14E-03	3.51E-03	3.25E-03	3.59E-03	3.33E-03	3.31E-03	3.31E-03	3.38E-03	3.38E-03	3.37E-03	3.30E-03	3.33E-03	3.39E-03	3.40E-03	3.14E-03	3.23E-03
Silver (Ag)	µg/m³	1.79E-03	1.57E-03	1.76E-03	1.63E-03	1.79E-03	1.67E-03	1.65E-03	1.66E-03	1.69E-03	1.69E-03	1.68E-03	1.65E-03	1.67E-03	1.70E-03	1.70E-03	1.57E-03	1.62E-03
Strontium (Sr)	µg/m³	2.13E-02	1.69E-03	4.21E-03	1.69E-03	1.72E-03	5.20E-03	9.33E-03	2.13E-02	1.06E-02	8.93E-03	6.60E-03	6.40E-03	7.13E-03	6.65E-03	7.01E-03	2.51E-03	4.07E-03
Thallium (Tl)	µg/m³	3.59E-03	3.14E-03	3.51E-03	3.25E-03	3.59E-03	3.33E-03	3.31E-03	3.31E-03	3.38E-03	3.38E-03	3.37E-03	3.30E-03	3.33E-03	3.39E-03	3.40E-03	3.14E-03	3.23E-03
Tin (Sn)	µg/m³	3.59E-03	3.14E-03	3.51E-03	3.25E-03	3.59E-03	3.33E-03	3.31E-03	3.31E-03	3.38E-03	3.38E-03	3.37E-03	3.30E-03	3.33E-03	3.39E-03	3.40E-03	3.14E-03	3.23E-03
Titanium (Ti)	µg/m³	3.38E-02	3.14E-03	3.51E-03	3.25E-03	3.59E-03	7.33E-03	1.39E-02	3.38E-02	1.62E-02	1.56E-02	6.73E-03	1.91E-02	1.73E-02	1.43E-02	1.50E-02	3.14E-03	7.74E-03
Vanadium (V)	µg/m³	1.79E-03	1.57E-03	1.76E-03	1.63E-03	1.79E-03	1.67E-03	1.65E-03	1.66E-03	1.69E-03	1.69E-03	1.68E-03	1.65E-03	1.67E-03	1.70E-03	1.70E-03	1.57E-03	1.62E-03
Zinc (Zn)	µg/m³	1.19E-01	6.70E-03	1.74E-02	6.70E-03	2.18E-02	9.40E-03	2.16E-02	5.77E-02	2.19E-02	3.33E-02	1.60E-02	1.19E-01	1.80E-02	2.34E-02	2.17E-02	1.04E-02	9.83E-03
Zirconium (Zr)	µg/m³	1.79E-03	1.57E-03	1.76E-03	1.63E-03	1.79E-03	1.67E-03	1.65E-03	1.66E-03	1.69E-03	1.69E-03	1.68E-03	1.65E-03	1.67E-03	1.70E-03	1.70E-03	1.57E-03	1.62E-03
Total Uranium (U)	µg/m³	1.61E-04	1.41E-04	1.58E-04	1.46E-04	1.61E-04	1.50E-04	1.49E-04	1.52E-04	1.52E-04	1.51E-04	1.48E-04	1.50E-04	1.53E-04	1.41E-04	1.46E-04		



## **APPENDIX G: PAHS DATA SUMMARY**



Polycyclic Aromatic Hydrocarbons		Crago Station		Crago 8/04/2018	Crago 20/04/2018	Crago 2/05/2018	Crago 14/05/2018	Crago 26/05/2018	Crago 7/06/2018	Crago 19/06/2018	
Location Date		dd/mm/yyyy	hh:mm hours								
Start Time		0:00	0:00		0:00	0:00	0:00	0:00	0:00	0:00	
Sample Duration		24.15	24.09	GCG726-01	GGS611-01	GG5725-01	GNA469-01	GNA486-01	GNA514-01	GSJ370-01	
Technician		AW, TZ	AW	GKR764	GNJ895	GPSP991	GRV063	GUJ309	GXF299	GZ7X23	
Filter Number		B897967	B893120	B8A4034	B8B3865	B8C452	B8D8924	B8F1249	B8F1249		
Total Volumetric Flow	Am <sup>3</sup> /sample	351.52	321.90	343.67	354.19	333.59	289.57	333.95			
Analytical Results		Units	Value	RDL	Value	RDL	Value	RDL	Value	RDL	
Benzo(a)pyrene	µg	<0.0057	0.0057	0.00222	0.0024	0.0170	0.0086	0.0093	0.0492	0.0013	
1-Methylnaphthalene	µg	0.42	0.15	0.34	0.10	2.01	0.15	1.30	0.10	3.15	
2-Methylnaphthalene	µg	0.66	0.15	0.56	0.10	3.54	0.15	2.28	0.10	5.07	
Acenaphthene	µg	<0.075	0.075	0.100	0.050	1.89	0.075	1.30	0.050	2.01	
Acenaphthylene	µg	<0.075	0.075	<0.050	0.050	<0.075	0.075	<0.050	0.050	<0.075	
Anthracene	µg	<0.075	0.075	<0.050	0.050	<0.075	0.075	<0.050	0.050	<0.075	
Benzo(a)anthracene	µg	<0.075	0.075	<0.050	0.050	<0.075	0.075	<0.050	0.050	<0.075	
Benzo(a)fluorene	µg	<0.15	0.15	<0.10	0.10	<0.15	0.15	<0.10	0.10	<0.15	
Benzo(b)fluoranthene	µg	<0.075	0.075	<0.050	0.050	<0.075	0.075	<0.050	0.050	<0.075	
Benzo(b)fluorene	µg	<0.15	0.15	<0.10	0.10	<0.15	0.15	<0.10	0.10	<0.15	
Benzo(e)pyrene	µg	<0.15	0.15	<0.10	0.10	<0.15	0.15	<0.10	0.10	<0.15	
Benzo(g,h,i)perylene	µg	<0.075	0.075	<0.050	0.050	<0.075	0.075	<0.050	0.050	<0.075	
Benzo(k)fluoranthene	µg	<0.075	0.075	<0.050	0.050	<0.075	0.075	<0.050	0.050	<0.075	
Biphenyl	µg	0.21	0.15	0.14	0.10	1.08	0.15	0.70	0.10	0.72	
Chrysene	µg	<0.075	0.075	<0.050	0.050	<0.075	0.075	<0.050	0.050	<0.075	
Dibenz(a,h)anthracene	µg	<0.075	0.075	<0.050	0.050	<0.075	0.075	<0.050	0.050	<0.075	
Dibenz(a,c) anthracene + Picene <sup>1</sup>	µg	<0.15	0.15	<0.10	0.10	<0.15	0.15	<0.10	0.10	<0.15	
Fluoranthene	µg	<0.075	0.075	<0.050	0.050	0.300	0.075	0.280	0.050	0.720	
Indeno[1,2,3-cd]pyrene	µg	<0.075	0.075	<0.050	0.050	<0.075	0.075	<0.050	0.050	<0.075	
Naphthalene	µg	2.40	0.11	1.48	0.072	10.2	0.11	6.36	0.072	17.7	
o-Terphenyl	µg	<0.15	0.15	<0.10	0.10	<0.15	0.15	<0.10	0.10	<0.15	
Perylene	µg	<0.15	0.15	<0.10	0.10	<0.15	0.15	<0.10	0.10	<0.15	
Phenanthrene	µg	0.270	0.075	0.200	0.050	1.71	0.075	1.48	0.050	2.97	
Pyrene	µg	<0.075	0.075	<0.050	0.050	0.120	0.075	0.100	0.050	1.58	
Tetralin	µg	0.36	0.15	0.22	0.10	0.87	0.15	0.44	0.10	0.46	
Calculated Concentrations		Quarter 1		Crago	Crago	Crago	Crago	Crago	Crago	Crago	
		Units	Maximum	Minimum	9	10	11	12	13	14	15
		8/04/2018	20/04/2018	2/05/2018	14/05/2018	26/05/2018	7/06/2018		19/06/2018		
Benzo(a)pyrene	ng/m <sup>3</sup>	1.04E-01	1.44E-02	8.11E-03	6.90E-03	4.95E-02	2.52E-02	1.47E-01	4.11E-02	8.06E-03	
1-Methylnaphthalene	ng/m <sup>3</sup>	4.56	0.86	1.19E+00	1.06E+00	5.85E+00	3.67E+00	9.44E+00	4.97E+00	4.49E+00	
2-Methylnaphthalene	ng/m <sup>3</sup>	7.13	1.37	1.88E+00	1.74E+00	1.03E+01	6.44E+00	1.52E+01	8.50E+00	8.09E+00	
Acenaphthene	ng/m <sup>3</sup>	1.19E+00	9.00E-02	1.07E-01	3.11E-01	5.50E+00	3.67E+00	6.03E+00	4.97E+00	4.85E+00	
Acenaphthylene	ng/m <sup>3</sup>	0.50	0.08	1.07E-01	7.77E-02	1.09E-01	7.06E-02	1.12E-01	8.63E-02	1.12E-01	
Anthracene	ng/m <sup>3</sup>	0.13	0.07	1.07E-01	7.77E-02	1.09E-01	7.06E-02	1.12E-01	8.63E-02	1.12E-01	
Benzo(a)anthracene	ng/m <sup>3</sup>	1.32E-01	7.22E-02	1.07E-01	7.77E-02	1.09E-01	7.06E-02	1.12E-01	8.63E-02	1.12E-01	
Benzo(a)fluorene	ng/m <sup>3</sup>	2.64E-01	1.44E-01	2.13E-01	1.55E-01	2.18E-01	1.41E-01	2.25E-01	1.73E-01	2.25E-01	
Benzo(e)pyrene	ng/m <sup>3</sup>	2.64E-01	1.44E-01	2.13E-01	1.55E-01	2.18E-01	1.41E-01	2.25E-01	1.73E-01	2.25E-01	
Benzo(g,h,i)perylene	ng/m <sup>3</sup>	1.32E-01	7.22E-02	1.07E-01	7.77E-02	1.09E-01	7.06E-02	1.12E-01	8.63E-02	1.12E-01	
Benzo(k)fluoranthene	ng/m <sup>3</sup>	3.06E-01	7.61E-02	1.07E-01	7.77E-02	1.09E-01	7.06E-02	1.12E-01	8.63E-02	1.12E-01	
Biphenyl	ng/m <sup>3</sup>	2.72E+00	6.48E-01	5.97E-01	4.35E-01	3.14E+00	1.98E+00	5.13E+00	2.42E+00	2.16E+00	
Chrysene	ng/m <sup>3</sup>	3.12E-01	7.61E-02	1.07E-01	7.77E-02	1.09E-01	7.06E-02	1.12E-01	8.63E-02	1.12E-01	
Dibenz(a,h)anthracene	ng/m <sup>3</sup>	1.32E-01	7.22E-02	1.07E-01	7.77E-02	1.09E-01	7.06E-02	1.12E-01	8.63E-02	1.12E-01	
Dibenz(a,c) anthracene + Picene	ng/m <sup>3</sup>	2.64E-01	8.51E-02	2.13E-01	1.55E-01	2.18E-01	1.41E-01	2.25E-01	1.73E-01	2.25E-01	
Fluoranthene	ng/m <sup>3</sup>	9.01E-01	9.00E-02	1.07E-01	7.77E-02	8.73E-01	7.91E-01	2.16E+00	1.24E+00	1.80E+00	
Indeno[1,2,3-cd]pyrene	ng/m <sup>3</sup>	1.32E-01	7.22E-02	1.07E-01	7.77E-02	1.09E-01	7.06E-02	1.12E-01	8.63E-02	1.12E-01	
Naphthalene	ng/m <sup>3</sup>	31.7	5.26	6.83E+00	4.60E+00	2.97E+01	1.80E+01	5.31E+01	2.21E+01	1.83E+01	
o-Terphenyl	ng/m <sup>3</sup>	2.64E-01	1.44E-01	2.13E-01	1.55E-01	2.18E-01	1.41E-01	2.25E-01	1.73E-01	2.25E-01	
Perylene	ng/m <sup>3</sup>	2.64E-01	1.44E-01	2.13E-01	1.55E-01	2.18E-01	1.41E-01	2.25E-01	1.73E-01	2.25E-01	
Phenanthrene	ng/m <sup>3</sup>	2.59E+00	7.13E-01	7.68E-01	6.21E-01	4.98E+00	4.18E+00	8.90E+00	5.46E+00	7.46E+00	
Pyrene	ng/m <sup>3</sup>	6.18E-01	8.68E-02	1.07E-01	7.77E-02	3.49E-01	2.82E-01	7.19E-01	4.83E-01	7.19E-01	
Tetralin	ng/m <sup>3</sup>	2.04E+00	7.56E-01	1.02E+00	6.83E-01	2.53E+00	1.24E+00	2.07E+00	1.59E+00	1.71E+00	
Total PAH	ng/m <sup>3</sup>	5.34E+01	1.18E+01	1.49E+01	1.12E+01	6.55E+01	4.17E+01	1.05E+02	5.36E+01	5.20E+01	

Note:  
RDL = Reportable Detection Limit

1. These parameters have not been subjected to Maxxam's standard validation process nor has it been accredited for the submitted matrix.



## **APPENDIX H: DIOXINS AND FURANS DATA SUMMARY**



Dioxins and Furans		Crago Station												
Location	Date	dd/mm/yyyy	Crago			Crago			Crago			Crago		
Start Time	hh:mm		0:00			0:00			0:00			0:00		
Sample Duration	hours		24.15			24.08			24.08			23.98		
Technician			AW, T2			AW			AW			AW		
Filter Number			GCQ/26-01			GG5/25-01			GNA486-01			GS370-01		
Maxxam ID			GKR766			GP5991			GUN309			GXZ723		
Maxxam Job #			B879697			B8A4034			B8C6452			B8F1249		
Total Volumetric Flow	Am <sup>3</sup> /sample		351.52			343.67			333.59			333.95		
Analytical Results	Units	Value	EDL	WHO <sub>2005</sub>	TEF	Value	EDL	WHO <sub>2005</sub>	TEF	Value	EDL	WHO <sub>2005</sub>	TEF	Value
2,3,7,8-Tetra CDD *	pg	<3.0	3.0	1	<3.5	3.5	1	<3.4	3.4	1	<3.4	3.4	1.00	
1,2,3,7,8-Penta CDD *	pg	<3.4	3.4	1	<3.7	3.7	1	<3.6	3.6	1	<3.4	3.4	1.00	
1,2,3,4,7,8-Hexa CDD *	pg	<3.1	3.1	0.1	<3.6	3.6	0.1	<3.2	3.2	0.1	<3.4	3.4	0.100	
1,2,3,6,7,8-Hexa CDD *	pg	<3.2	3.2	0.1	<3.7	3.7	0.1	4.3	3.3	0.1	<2.9	2.9	0.100	
1,2,3,7,8,9-Hexa CDD *	pg	5.8 (1)	3.0	0.1	<3.4	3.4	0.1	6.8	3.1	0.1	<3.0	3.0	0.100	
1,2,3,4,6,7,8-Hepta CDD *	pg	34.8	2.7	0.0003	<29.1	3.0	0.001	41.6	3.3	0.001	<3.1	3.1	0.0100	
Octa CDD *	pg	84.1	3.0	0.0003	109	3.8	0.0003	116	3.1	0.0003	7.9	3.3	0.000300	
Total Tetra CDD *	pg	<3.0	3.0		17.7	3.5		29.1	3.4		<17 (1)	17		
Total Penta CDD *	pg	23.8	3.1		9.2	3.6		57.6	3.2		<19 (1)	19		
Total Hexa CDD *	pg	75.0	2.7		69.8	3.0		87.9	3.3		<37 (1)	37		
2,3,7,8-Tetra CDF **	pg	<3.3	3.3	0.1	<3.5	3.5	0.1	<61 (1)	61	0.1	<3.6	3.6	0.100	
1,2,3,7,8-Penta CDF **	pg	<3.4	3.4	0.03	<3.6	3.6	0.03	15.0	3.2	0.03	<3.1	3.1	0.0300	
2,3,4,7,8-Penta CDF **	pg	<3.4	3.4	0.3	<3.5	3.5	0.3	14.6	3.2	0.3	<3.3	3.3	0.300	
1,2,3,4,7,8-Hexa CDF **	pg	<2.7	2.7	0.1	<3.2	3.2	0.1	54.1 (2)	3.1	0.1	<3.0	3.0	0.100	
1,2,3,4,7,8-Hexa CDF **	pg	<2.7	2.7	0.1	<3.2	3.2	0.1	27.3	3.2	0.1	<2.6	2.6	0.100	
2,3,4,6,7,8-Hepta CDF **	pg	<3.0	2.9	0.1	<3.4	3.4	0.1	29.5	3.4	0.1	<2.8	2.8	0.100	
1,2,3,7,8,9-Hexa CDF **	pg	<3.1	3.1	0.1	<3.7	3.7	0.1	6.3	3.6	0.1	<3.9	3.9	0.100	
1,2,3,4,6,7,8-Hepta CDF **	pg	<3.0	3.0	0.01	<5.0 (2)	5.0	0.01	141	2.6	0.01	<2.7	2.7	0.0100	
1,2,3,4,7,8,9-Hepta CDF **	pg	<3.8	3.8	0.01	<3.8	3.8	0.01	31.0	3.1	0.01	<3.9	3.9	0.0100	
Octa CDF **	pg	<3.3	3.3	0.0003	6.5	3.6	0.0003	106	3.0	0.0003	<3.3	3.3	0.000300	
Total Tetra CDF **	pg	<3.3	3.3		<3.5	3.5		385	3.5		<3.6	3.6		
Total Penta CDF **	pg	<3.4	3.4		5.8	3.5		399	3.2		<3.2	3.2		
Total Hexa CDF **	pg	<2.8	2.8		<3.4	3.4		317	3.3		<3.0	3.0		
Total Hepta CDF **	pg	<3.4	3.4		4.1	3.4		263	2.9		<3.2	3.2		
Toxic Equivalency	pg													

Notes:  
\* CDD = Chloro Dibenzo-p-Dioxin    \*\* CDF = Chloro Dibenzo-p-Furan

Calculated Concentrations	Quarter 1			Crago	Crago	Crago	Crago
	Units	Maximum	Minimum	8/04/2018	2/05/2018	26/05/2018	19/04/2018
2,3,7,8-Tetra CDD *	pg/m <sup>3</sup>	6.24E-03	5.04E-03	0.004	0.005	0.005	0.005
1,2,3,7,8-Penta CDD *	pg/m <sup>3</sup>	1.36E-02	5.28E-03	0.005	0.005	0.005	0.005
1,2,3,4,7,8-Hexa CDD *	pg/m <sup>3</sup>	1.62E-02	5.46E-03	0.004	0.005	0.005	0.005
1,2,3,6,7,8-Hexa CDD *	pg/m <sup>3</sup>	2.89E-02	5.79E-03	0.005	0.005	0.013	0.004
1,2,3,7,8,9-Hexa CDD *	pg/m <sup>3</sup>	5.03E-02	7.94E-03	0.016	0.005	0.020	0.004
1,2,3,4,6,7,8-Hepta CDD *	pg/m <sup>3</sup>	3.50E-01	7.45E-02	0.099	0.085	0.125	0.005
Octa CDD *	pg/m <sup>3</sup>	6.39E-01	1.09E-01	0.239	0.317	0.348	0.024
Total Tetra CDD *	pg/m <sup>3</sup>	6.24E-03	5.28E-03	0.004	0.052	0.087	0.025
Total Penta CDD *	pg/m <sup>3</sup>	4.25E-02	5.28E-03	0.007	0.009	0.091	0.028
Total Hexa CDD *	pg/m <sup>3</sup>	2.25E-01	3.12E-02	0.068	0.027	0.173	0.055
Total Hepta CDD *	pg/m <sup>3</sup>	6.27E-01	1.75E-01	0.213	0.203	0.263	0.005
2,3,7,8-Tetra CDF **	pg/m <sup>3</sup>	2.05E-02	4.41E-03	0.005	0.005	0.091	0.005
1,2,3,7,8-Penta CDF **	pg/m <sup>3</sup>	6.80E-03	4.33E-03	0.005	0.005	0.045	0.005
2,3,4,7,8-Penta CDF **	pg/m <sup>3</sup>	6.80E-03	4.48E-03	0.005	0.005	0.104	0.005
1,2,3,4,7,8-Hexa CDF **	pg/m <sup>3</sup>	6.09E-03	5.28E-03	0.004	0.005	0.162	0.004
1,2,3,6,7,8-Hexa CDF **	pg/m <sup>3</sup>	5.95E-03	4.33E-03	0.004	0.005	0.082	0.004
2,3,4,6,7,8-Hexa CDF **	pg/m <sup>3</sup>	6.66E-03	5.06E-03	0.004	0.005	0.088	0.004
1,2,3,7,8,9-Hexa CDF **	pg/m <sup>3</sup>	7.37E-03	5.92E-03	0.004	0.005	0.019	0.006
1,2,3,4,6,7,8-Hepta CDF **	pg/m <sup>3</sup>	3.12E-02	4.76E-03	0.004	0.007	0.423	0.004
1,2,3,4,7,8,9-Hepta CDF **	pg/m <sup>3</sup>	9.07E-03	5.46E-03	0.005	0.006	0.093	0.006
Octa CDF **	pg/m <sup>3</sup>	1.60E-02	5.46E-03	0.005	0.019	0.318	0.005
Total Tetra CDF **	pg/m <sup>3</sup>	4.57E-02	4.41E-03	0.005	0.005	1.154	0.005
Total Penta CDF **	pg/m <sup>3</sup>	9.54E-03	5.28E-03	0.005	0.017	1.196	0.005
Total Hexa CDF **	pg/m <sup>3</sup>	1.82E-02	5.45E-03	0.004	0.005	0.950	0.004
Total Hepta CDF **	pg/m <sup>3</sup>	3.12E-02	5.11E-03	0.005	0.012	0.788	0.005
Toxic Equivalency	pg TEQ/m <sup>3</sup>	3.78E-02	2.04E-02	0.016	0.017	0.098	0.016
Calculated TEQ Concentrations	Units			Crago	Crago	Crago	Crago
				8/04/2018	02/05/2018	26/05/2018	19/04/2018
2,3,7,8-Tetra CDD *	pg TEQ/m <sup>3</sup>			0.004	0.005	0.005	0.005
1,2,3,7,8-Penta CDD	pg TEQ/m <sup>3</sup>			0.005	0.005	0.005	0.005
1,2,3,4,7,8-Hexa CDD	pg TEQ/m <sup>3</sup>			0.0004	0.0005	0.0005	0.0005
1,2,3,6,7,8-Hexa CDD	pg TEQ/m <sup>3</sup>			0.0005	0.0005	0.0013	0.0004
1,2,3,7,8,9-Hexa CDD	pg TEQ/m <sup>3</sup>			0.0016	0.0005	0.0020	0.0004
1,2,3,4,6,7,8-Hepta CDD	pg TEQ/m <sup>3</sup>			0.0010	0.0008	0.0012	0.0000
Octa CDD	pg TEQ/m <sup>3</sup>			0.00007	0.00010	0.00010	0.00001
Total Tetra CDD	pg TEQ/m <sup>3</sup>						
Total Penta CDD	pg TEQ/m <sup>3</sup>						
Total Hexa CDD	pg TEQ/m <sup>3</sup>						
Total Hepta CDD	pg TEQ/m <sup>3</sup>						
2,3,7,8-Tetra CDF **	pg TEQ/m <sup>3</sup>			0.0005	0.0005	0.0091	0.0005
1,2,3,7,8-Penta CDF	pg TEQ/m <sup>3</sup>			0.0001	0.0002	0.0013	0.0001
2,3,4,7,8-Penta CDF	pg TEQ/m <sup>3</sup>			0.001	0.002	0.031	0.001
1,2,3,4,7,8-Hexa CDF	pg TEQ/m <sup>3</sup>			0.0004	0.0005	0.0162	0.0004
1,2,3,6,7,8-Hexa CDF	pg TEQ/m <sup>3</sup>			0.0004	0.0005	0.0082	0.0004
2,3,4,6,7,8-Hexa CDF	pg TEQ/m <sup>3</sup>			0.0004	0.0005	0.0088	0.0004
1,2,3,7,8,9-Hexa CDF	pg TEQ/m <sup>3</sup>			0.0004	0.0005	0.0019	0.0006
1,2,3,4,6,7,8-Hepta CDF	pg TEQ/m <sup>3</sup>			0.0004	0.0007	0.00423	0.00004
1,2,3,4,7,8,9-Hepta CDF	pg TEQ/m <sup>3</sup>			0.0005	0.0006	0.0093	0.00006
Octa CDF	pg TEQ/m <sup>3</sup>			0.000001	0.000006	0.000095	0.000001
Total Tetra CDF	pg TEQ/m <sup>3</sup>						
Total Penta CDF	pg TEQ/m <sup>3</sup>						
Total Hexa CDF	pg TEQ/m <sup>3</sup>						
Total Hepta CDF	pg TEQ/m <sup>3</sup>						
TOTAL TOXIC EQUIVALENCY	pg TEQ/m <sup>3</sup>			0.016	0.017	0.098	0.016

Notes:  
EDL = Estimated Detection Limit  
\* CDD = Chloro Dibenzo-p-Dioxin    \*\* CDF = Chloro Dibenzo-p-Furan  
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient  
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

