REPORT

DURHAM YORK ENERGY CENTRE

DURHAM, ONTARIO

2020 ANNUAL AMBIENT AIR QUALITY MONITORING REPORT: CONTINUOUS & PERIODIC MONITORING PROGRAM

RWDI #1803743

May 14, 2021

SUBMITTED TO

The Director, Legislative Services-Regional Clerk or Designate,

The Regional Municipality of Durham
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1 INTRODUCTION

RWDI AIR Inc. (RWDI) was retained by Durham Region and York Region (the Regions) to conduct discrete and continuous ambient air quality monitoring at the Durham York Energy Centre (DYEC) monitoring stations. The facility address is 1835 Energy Drive, Clarington, Ontario. The DYEC is a facility that manages post diversion municipal solid waste from Durham Region and York Region to create energy from waste combustion. Commercial operation of the DYEC commenced on February 1st, 2016. The site location is shown in **Figure 1**.

In 2020, the facility had two monitoring stations which collected continuous and discrete ambient measurements, known as the Courtice Station and Rundle Road Station. The station locations are shown in **Figure 1**. The Courtice and Rundle Road Stations continuously monitor the following air quality parameters: Particulate Matter less than 2.5 microns ($PM_{2.5}$), Nitrogen Oxides (NO_X) and Sulfur Dioxide (SO_2). In addition, both discretely monitor the following air quality parameters: Total Suspended Particulate (TSP), Metals, Dioxins and Furans (D&F) and Polycyclic Aromatic Hydrocarbons (PAHs).

Continuous meteorological data is collected at the Courtice and Rundle Road Stations. The Rundle Road Station collects the following meteorological parameters: wind speed, wind direction, ambient temperature, precipitation and relative humidity. The meteorological tower at the Rundle Road Station, is approximately 10 meters tall. The Courtice Station collects the following meteorological parameters: ambient temperature, ambient pressure, precipitation and relative humidity. For purposes of this report, wind speed and wind direction data presented for the Courtice Station have been obtained from the adjacent Courtice Water Pollution Control Plant (WPCP) meteorological tower, which is approximately 20 meters tall.

All 2020 quarterly reports were issued to the MECP by RWDI on behalf of the Region of Durham. This report presents the annual results from January 1st to December 31st, 2020.

Throughout 2020, there were nine (9) exceedances of the AAQC for Benzo(a) Pyrene. At Courtice, four (4) exceedances occurred on April 9th, May 3rd, September 24th and December 17th. At Rundle, five (5) exceedances occurred on March 28th, April 9th, September 24th, November 11th and December 29th. Data recovery rates were acceptable and valid for all measured parameters at the Rundle Road and Courtice Monitoring Stations.

In previous years, the DYEC site had no recorded SO_2 exceedances. At the beginning of 2020, the 1-hour AAQC limit was reduced from 250 to 40 ppb. The ambient air monitoring program at the DYEC for 2020 had twenty-four (24) SO_2 1-hour average concentrations above the AAQC at the Courtice and Rundle Road Monitoring Stations. There were also thirty-three (33) exceedances of the rolling 10-minute average AAQC for SO_2 throughout 2020.

2 BACKGROUND

Condition 11 of the Environmental Assessment Notice of Approval and Condition 7(4) of the Environmental Compliance Approval (ECA) requires ambient air monitoring to be undertaken by the DYEC. An Ambient Air Monitoring and Reporting Plan was prepared and approved by the Ministry of Environment, Conservation and Parks (MECP) to satisfy these conditions. The monitoring plan established the Courtice and Rundle Road monitoring stations to monitor ambient air quality and quantify the background ambient air quality levels and DYEC contributed emissions to ambient air quality levels. The monitoring plan also initially included the Fence Line Station, which commenced on February 6, 2016 and ceased on December 4, 2018. Since no exceedances had been reported for TSP or Metals, a request to remove the station was approved by the Ministry of the Environment, Conservation and Parks (MECP).

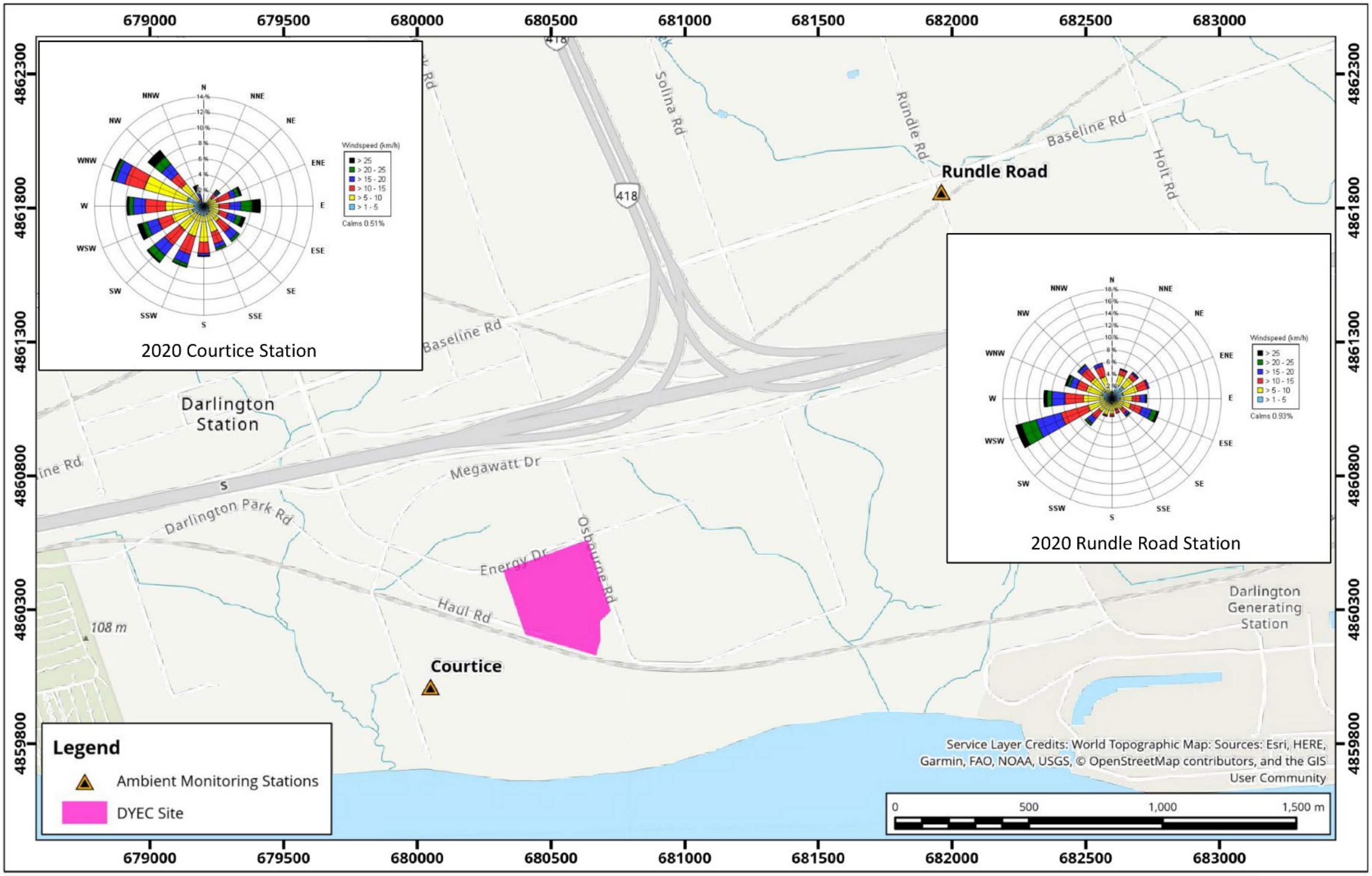
This monitoring plan was developed based on the Regional Council mandate to provide ambient monitoring in the area of the DYEC. The purpose of the ambient air monitoring program is to:

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, 2009a);
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.

3 MONITORING LOCATIONS

The station sites were selected in consultation with a working group that included representatives from the MECP, the Region of Durham, York Region, and the Energy from Waste Advisory Committee (EFWAC), as required by Condition 11.3 of the Environmental Assessment Notice of Approval. The DYEC Site and Ambient Monitoring Station Locations are presented in Figure 1, in addition to an annual windrose for each Station. A windrose is a visual representation of the wind speed and wind direction over a specified time period.

The Courtice Station is predominantly upwind of the DYEC and is located on the Courtice WPCP property just southwest of the DYEC. The Rundle Road Station is predominantly downwind of the DYEC and is located just southeast of the intersection of Baseline Road and Rundle Road, northeast of the DYEC. Pictures of the two (2) Stations are presented as **Figure 2** and **3**.



DYEC Site and Ambient Monitoring Station Locations

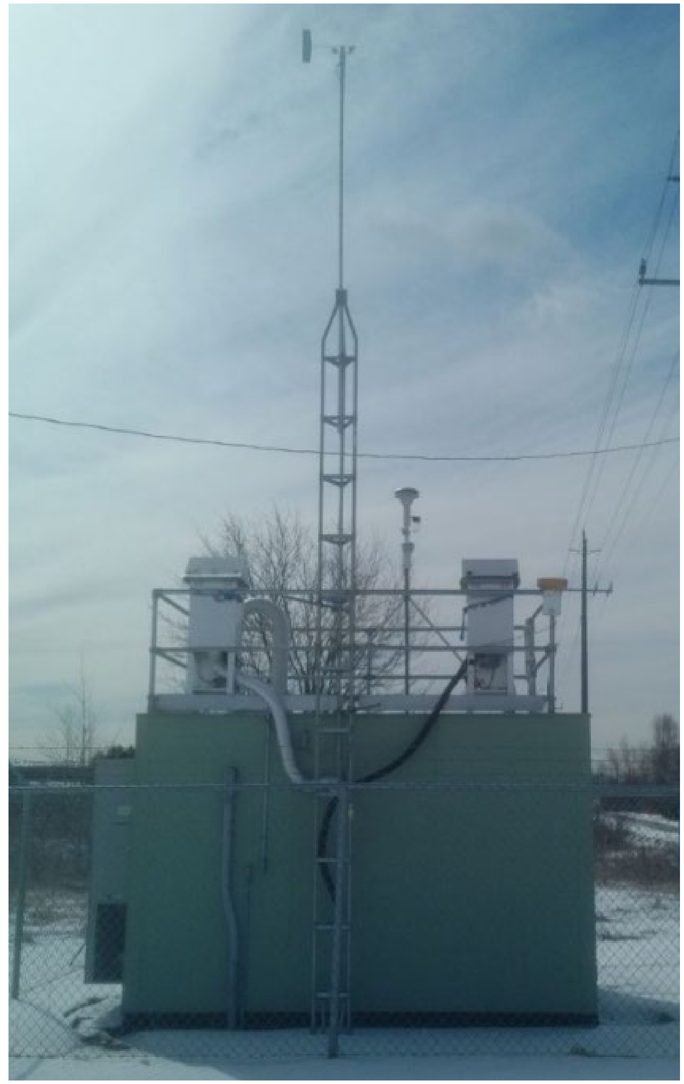
True North

Drawn by: DAJH	Figure: 1
Approx. Scale:	1:20,000
Date: March 23, 2021	

Map Projection: NAD 1983 UTM Zone 17N
DYEC - Region of Durham, Ontario
Project #: 1803743

Figure 2: Courtice Station

Figure 3: Rundle Road Station



4 SAMPLING PROGRAM

4.1 Field Operations

RWDI representatives were responsible for completing the following:

- Day-to-day changing of the filters where applicable;
- Field notes and recording observations;
- Monthly calibrations;
- Attending quarterly audits;
- General and preventative maintenance of the units (e.g., flow calibrations, motor replacements etc.);
- Troubleshooting, maintenance and repairs when problems were encountered;
- Routine cleaning (e.g. PUF housing, SHARP $PM_{2.5}$ heads, sample lines etc.);
- Preparation and recovery of PUF media;
- Completion of chain of custody forms for submission to ALS Laboratories in Burlington, ON; and,
- Preparation of the media for shipment to ALS Laboratories using MECP accepted methods.

The samplers were operated according to the Operations Manual for Air Quality Monitoring in Ontario published by the MECP (January 2018) and the Ambient Air Quality Monitoring Plan. RWDI adhered to the manual for any operational changes conducted during the contract period.

4.2 Sample Schedules

All discrete sampling at the Courtice and Rundle Road Stations adhered to the National Air Pollution Surveillance (NAPS) sampling schedule, sampling for 24 hours (midnight to midnight). Sampling was as follows:

- TSP/Metals hi-vol samplers operated on the six-day schedule; and,
- PUF samplers operated on the twelve-day schedule. The samples were analyzed for PAH's every twelve days, and D&F's every twenty-four days.

4.3 Instrumentation

Courtice and Rundle Road Monitoring Stations are both equipped with the following continuous monitors: Teledyne T200 Nitrogen Oxide Analyzer Model (NO_X analyzer), Teledyne T100 Sulfur Dioxide Analyzer and Thermo Scientific Model 5030 SHARP Monitor (SHARP) with a $PM_{2.5}$ inlet head. Courtice and Rundle Road Stations also have the following periodic monitors: High Volume (Hi-Vol) Air Sampler outfitted with a total suspended particulate (TSP) inlet capable of collecting particulate of all aerodynamic diameters and a Tisch TE-1000 sampler used to collect D&F's and PAH's using a polyurethane foam plug.

The Courtice and Rundle Road Stations also collect continuous meteorological parameters. The Courtice Station is equipped with the following continuous monitors: Campbell Scientific Model HMP60 (temperature/relative humidity), Campbell Scientific Model CS106 (atmospheric pressure), Texas Electronic TE525M (precipitation). The Courtice Monitoring Station uses the Courtice WPCP wind speed and direction data. The wind speed and direction data are provided to RWDI by Courtice WPCP staff upon request. The Rundle Road Station is equipped with the following continuous monitors: Campbell Scientific Model HMP60 (temperature/relative humidity), Texas Electronic TE525M (precipitation) and RM Young Model 05103-10 wind head (wind speed and direction).

4.4 Analytical Methods

4.4.1 Synchronized Hybrid Ambient Real-time Particulate (SHARP) Monitor

The SHARP 5030 is a hybrid nephelometric/radiometric particulate mass monitor capable of providing precise, real-time measurements with a superior detection limit. The SHARP incorporates a high sensitivity light scattering photometer whose output signal is continuously referenced to the time-averaged measurement of an integral beta attenuating mass sensor. The SHARP also incorporates a dynamic inlet heating system designed to maintain the relative humidity of the air passing through the filter tape constant.

The SHARP is calibrated once a month to ensure accuracy and validity of its data. The $PM_{2.5}$ inlet head and sharp cut cyclone is cleaned monthly as well to ensure proper performance. The monthly calibration process consists of the following: zeroing the nephelometer if necessary, calibration of ambient temperature, calibration of barometric pressure, and calibration of the flow.

The instrument collects data using its own data acquisition system (DAS) on a 5-minute interval. Data is collected from the instrument directly which is attached to an Envidas computer. The computer can be accessed remotely, and all instrument parameters can be examined as well as the measurement data. This allows the tracking of instrument performance. Data was also collected at 1-minute intervals by an external datalogger using analog output connections as a back-up. The measurement data was averaged using Envista processing software over a 1-hour and 24-hour period to compare to the applicable ambient air quality criteria.

4.4.2 Nitrogen Oxide Analyzer

The Teledyne T200 NO_X analyzers use chemiluminescence detection, coupled with microprocessor technology to provide sensitivity and stability for ambient air quality applications. The instrument determines real-time concentration of nitric oxide (NO), total nitrogen oxides (NO_X) (the sum of NO and NO_2), and nitrogen dioxide (NO_2). The amount of NO is measured by detecting the chemiluminescence reaction that occurs in the reaction cell when NO molecules are exposed to ozone (O_3). The NO and O_3 molecules collide in the reaction cell and enter a higher energy state. When these excited molecules return to a stable energy state, they emit a photon of light which is proportional to the amount of NO in the sample stream of gas entering the analyzer. To determine the total NO_X ($NO+NO_2$) measurement, sample gas is periodically bypassed through a heated molybdenum converter cartridge that converts any NO_2 molecules in the sample stream into NO (any existing

NO molecules in the stream remain as is). The instrument will switch the sample stream through the converter periodically and then through the reaction cell where the same chemiluminescence reaction occurs with ozone. The resultant response produced is now the sum of NO and converted NO_2 producing a NO_X measurement. The resultant NO_2 determination is the NO_X measurement subtracted from the NO measurement.

The NO_X analyzers were zero and span checked daily using the internal zero and span (IZS) system and calibrated once a month using EPA protocol span gases and a dilution system. Automatic IZS checks were performed on a daily basis commencing at approximately 1:45 and ending at 02:15 the same day. The checks consisted of a 10-minute zero check, a 10-minute span check and a 10-minute purge. These checks provide a way to monitor daily performance of the analyzer using an external charcoal and purafil zeroing cartridge for the zero, and an internal permeation oven with a permeation tube for the span. These IZS checks are not for calibration purposes but are merely a diagnostic tool to identify instrument drift.

The instrument collects data using its own data acquisition system (DAS) on a 5-minute interval. Data is collected from the instrument directly which is attached to an Envidas computer. The computer can be accessed remotely, and all instrument parameters can be examined as well as the measurement data. This allows the tracking of instrument performance. Data was also collected at 1-minute intervals by an external datalogger using analog output connections as a back-up. The measurement data was averaged using Envista processing software over a 1-hour and 24-hour period to compare to the applicable ambient air quality criteria.

4.4.3 Sulphur Dioxide Analyzer

The Teledyne T100 SO_2 Analyzer is a microprocessor-controlled analyzer that determines the concentration of SO_2 in a sample gas drawn through the instrument. In the sample chamber, sample gas is excited by ultraviolet light causing the SO_2 to absorb energy from the light and move to an active state (SO_2*). These active SO_2* molecules must decay into a stable state back to SO_2, and when this happens a photon of light is released which is recognized by the instrument as fluorescence. The instrument measures the amount of florescence to determine the amount of SO_2 present in the sample gas.

The SO_2 analyzers were zero and span checked daily using the IZS system and calibrated once a month using EPA protocol span gases and a dilution system. Automatic IZS checks were performed on a daily basis commencing at approximately 1:45 and ending at 02:15 the same day. The checks consisted of a 10-minute zero check, a 10-minute span check and a 10-minute purge. These checks provide a way to monitor daily performance of the analyzer using an external charcoal and purafil zeroing cartridge for the zero, and an internal permeation oven with a permeation tube for the span. These IZS checks are not for calibration purposes but are merely a diagnostic tool to identify instrument drift.

The instrument collects data using its own data acquisition system (DAS) on a 5-minute interval. Data is collected from the instrument directly which is attached to an Envidas computer. The computer can be accessed remotely, and all instrument parameters can be examined as well as the measurement data. This allows the tracking of instrument performance. Data was also collected at 1-minute intervals by an external datalogger using analog output connections as a back-up. The measurement data was averaged using Envista processing software over a 1-hour and 24-hour period to compare to the applicable ambient air quality criteria.

4.4.4 High Volume Air Sampler (Hi-Vol)

The Tisch TE-5170 Total Suspended Particulate (TSP) high volume (Hi-Vol) air samplers were outfitted with a TSP gabled inlet capable of collecting particulate of all aerodynamic diameters. Each Hi-Vol is equipped with a mass flow controller, which ensures a flow rate of 40 cubic feet per minute (CFM), a chart recorder for measuring cfm flow throughout the run time, an elapsed timer and a wheel timer for starting and stopping each sample. In the latter part of 2019, the pin-based wheel timer was modified with an automated relay system controlled by a datalogger to toggle the sampler on and off, and the chart recorder system was replaced by a digital pressure transducer to record the blower output pressure. Teflon coated glass fibre filters are outfitted at the top of the hi-vol samplers where air is drawn through the filter, thereby collecting TSP. Each Hi-Vol is calibrated quarterly (every three months) to ensure accuracy and validity of the volume of air drawn through the sampler.

The Teflon coated glass fibre filter media are pre and post weighed by ALS Laboratories in Burlington, Ontario. The filters are then analyzed for total particulate weight, metals analysis and mercury. The specific list of metals analyzed can be found in **Table 3** and the list and rationale is also provided in the Ambient Air Quality Monitoring Plan (Stantec, 2012).

4.4.5 Polyurethane Foam Samplers

The D&F, and PAH samples were collected using Tisch TE-1000 samplers, which are listed as reference devices for U.S. EPA Methods TO-9 and TO-13. The samplers use a collection filter that is 'backed-up' by a polyurethane foam (PUF) plug. The airborne compounds present in the particulate phase are collected on the Teflon coated glass fibre filter and any compounds present in the vapour phase are absorbed in the PUF plug. Each PUF sampler is equipped with a mass flow controller, which can sustain 8 CFM of flow over the sampling period, an elapsed timer and a wheel timer for starting and stopping each sample. In the latter part of 2019, the pin-based wheel timer was modified with an automated relay system controlled by a data logger to toggle the sampler on and off, and the chart recorder system was replaced by a digital pressure transducer to record the blower output pressure. Each PUF sampler is calibrated quarterly (every three months) to ensure accuracy and validity of the volume of air drawn through the sampler.

The filter and PUF media/glassware is proofed and analyzed by ALS Laboratories in Burlington, Ontario. The filters and PUF/XAD plugs are then analyzed for PAH's and D&F's. The specific list of PAHs and D&F analyzed can be found in Tables 4 & 5 and the list and rationale is also provided in the Ambient Air Quality Monitoring Plan (Stantec, 2012).

4.5 Equipment Replacement / Failures

4.5.1 Courtice Monitoring Station

4.5.1.1 Continuous Samplers

On February 4th, 2020 RWDI personnel responded to falling overnight IZS results from the NOx unit. A single point calibration check was performed, confirming proper operation of the analyzer, and confirming that the cause of the dropping span checks was a result of perm tube depletion. This check also confirmed that there was no need for any data invalidation related to this issue. Following the calibration check, a new permeation tube was installed.

On March 20th, 2020 a power failure occurred that affected all of the continuous criteria air contaminant parameters recorded at the station between 07:00 and 08:00.

During the calibration checks at the Courtice station on June 4th, 2020 it was found that the SO2 sample flow had reduced by 25%. The instrument response was within 10% of the reference therefore no span adjustment was required, but the zero had drifted. Zero drift corrections have been applied to this period of time. On June 5th, 2020, the RWDI technician returned to troubleshoot the sample flow reduction. After troubleshooting, the source of the flow reduction was not clear, so a spare SO2 unit was installed, allowed to stabilize, and calibrated for the interim. Upon troubleshooting back at RWDI, the source of the flow restriction was found and fixed. On June 10th, 2020 the repaired instrument was reinstalled and calibrated.

On August 20th, 2020 calibrations were performed on the meteorological instrumentation at the Courtice Station, as well as the Courtice WWTP wind head. All of the meteorological instrumentation at the Courtice Station met the respective validation criteria; however, the WWTP wind head was found to report slightly lower wind speed than expected during the calibration. It was recommended that WWTP instrumentation personnel further look into the issue.

On August 27th, 2020, RWDI personnel responded to an observed reduction in ozone flow rate and drifting overnight span on the NOx analyzer at the Courtice station. While calibration checks confirmed that the unit was still running well within specifications, it was decided to remove the analyzer for further troubleshooting, and a replacement unit was installed.

On November 11th, 2020 during the November calibration visit, a slight flow problem was identified in the SO2 monitor. The issue was traced back to a clog in a solenoid valve. The clog was cleared out and the instrument recalibrated. The instrument response was within the 10% span tolerance during the takeout calibration and no data was lost due to this malfunction. The sample intake manifold was cleaned as thoroughly as possible in an attempt to prevent the issue from recurring, and the instrument was left in good working order.

4.5.1.2 Discrete Samplers

On January 15th, 2020 the hardwiring of the Hi-Vol and PUF units and installation of pressure transducers at the Courtice Station was started and was completed on January 17th, 2020.

In early January, it was noted by the RWDI field technician that the PUF motor couldn't get up to the correct setpoint. After discussion with the laboratory, ALS, it was revealed that they had changed suppliers of the quartz filters. On January 20th, 2020 the RWDI field technician experimented with both filters and found that it was indeed the change in supplier filter that caused the issue. This error resulted in the January 4th and 16th samples being invalid, as they were not able to reach the correct sample volumes based on the existing calibration at the time. The filter supplier was changed back to what had been used previously.

The PUF samples taken at Courtice and Rundle Road Stations on July 26th, 2020 and Courtice Station on August 19th were invalidated due to volume sampled <300m^3 based on MECP criteria. New motors were installed on August 9th to try to overcome this issue. A very slight improvement in the PS-1 flow rates resulted from installation of the new blower motors, however it was confirmed that the flow restriction was being caused by the sampling media itself. After discussion with the ALS Laboratory Special Chemistries and Air Toxics Director it was confirmed that due to the combined polyurethane foam and the resin media creating increased resistance that it would be hard to consistently achieve a sampled volume of 300 m^3. It was his belief that the combined media had advantages over the PUF only cartridge and switching to achieve the MECP minimum sample volume would compromise the capture efficiency of the low molecular weight PAH's including naphthalene and biphenyl. He confirmed that the lab can get a sufficient sample for BaP from the combined cartridge with a sample size as low as 200 m^3. Given this information, and since the detection limits were being met for all of the PAH's for samples submitted that were less than 300 m^3, the samples <300 m^3 on the September 12th, 2020 sample date were submitted and reported as valid samples.

In early November, permanent ladders were installed at both stations as well as new bird deterrents over the Hi-Vol openings.

4.5.2 Rundle Road Monitoring Station

4.5.2.1 Continuous Samplers

On January 7th, 2020 RWDI personnel responded to falling overnight IZS results from the NOx unit. A single point calibration check was performed, confirming proper operation of the analyzer, and confirming that the cause of the dropping span checks was a result of perm tube depletion. This check also confirmed that there is no need for any data invalidation related to this issue. The permeation tube was replaced on January 16th, 2020.

It was noted in early April, that the frequency of '<sample' events for the Rundle Road MET wind direction had increased. It is believed that the nose cone bearings had degraded and caused many low or no wind events to be recorded during periods of relatively low wind. During these times the wind head cannot associate an appropriate direction therefore produces a '<sample' event. It is believed by RWDI personnel that during Q2 the windspeed values at the Rundle Road station are likely underestimated and the wind direction component should remain accurate despite the '<sample' events being logged.

On the afternoon of May 26th, 2020, the Rundle Road Station air conditioner (AC) malfunctioned, and the station temperature was uncontrolled until an RWDI technician was able to go to site on May 28th at which time the AC was reset. On June 3rd, 2020 the AC malfunctioned again and another visit was scheduled for the next day. On June 4th, 2020 the RWDI technician tried resetting the unit and troubleshooting with the manufacturer, however the unit would not initiate a cooling sequence. A call was made to a local HVAC technician and a callout was scheduled for June 9th, 2020. The HVAC technician visited the site on June 9th and was able to repair the AC and get it cooling. During the period of time that the station temperature was uncontrolled, the overnight zero and span values remained within acceptable bounds, therefore it is believed that data during this time is valid.

On June 10th, 2020, it was noted during the daily data checks that the NOx unit at the Rundle Road station had no flow as of June 9th at 21:00. An RWDI technician was dispatched on June 10th, and upon arrival it was found that the pump piston had broken. The pump was replaced, and the unit was calibrated. Data from June 9th at 21:00 until June 10th at 18:20 was invalidated.

The concrete base for the new Rundle Road Meteorological tower was poured on August 9th, 2020. Installation of the new tower and the migration of the existing meteorological equipment occurred on August 20th, 2020. All of the instrumentation was calibrated and passed the respective validation criteria.

On August 27th, 2020, the NO_X pump at the Rundle Road Station was replaced with a rebuilt spare pump.

4.5.2.2 Discrete Samplers

On January 7th, 2020 the hardwiring of the Hi-Vol and PUF units and installation of pressure transducers at the Rundle Road Station was started and was completed on January 8th, 2020.

As noted above, flow issues related to the PUF sampling media were also encountered at the Rundle Road station. See Section 4.5.1.2 for details.

The Rundle Road TSP samples taken on July 20th, 2020 and August 1st, 2020 were invalid as birds had damaged the filters. Chicken wire was installed between the gabled roof and Hi-Vol body to prevent birds from getting in and onto the filter.

4.6 Final Data Editing

There were edits made to the 2020 continuous monitoring dataset after a final review. The changes have been reflected in the 2020 final statistics. The edits were as follows:

- Data was invalidated in the Courtice Monitoring Station Rain dataset from August 20th at 8:00 to 9:00 due to calibrations taking place at this time which were not flagged.

4.7 MECP Audits

No MECP audits were completed during 2020.

5 AIR QUALITY CRITERIA AND STANDARDS

The monitored contaminant concentrations were compared to air quality criteria and standards set by the MECP and by Environment Canada. The MECP developed Ambient Air Quality Criteria (AAQCs) which are the maximum desirable concentrations in the outdoor air, based on effects to the environment and health (MECP, 2012). Not all contaminants have an applicable regulatory limit; therefore, other criteria were used for comparison. These included human health risk assessment (HHRA) criteria. New AAQC's for SO_2 were implemented in 2020, including a 10-minute rolling average AAQC of 67 ppb, a 1-hour rolling average AAQC of 40ppb and an annual AAQC of 4 ppb. There is no longer a 24-hour rolling average AAQC for SO_2.

Environment Canada has established a Canadian Ambient Air Quality Standard (CAAQS) which are health-based air quality objectives for the outdoor air (Environment Canada, 2013). The current CAAQS' for $PM_{2.5}$ are 27 µg/m^3 for the 3-year average of annual 98th percentile 24-hour concentration, and 8.8 µg/m^3 for the 3-year average of annual average concentrations (in effect as of 2020). In 2020, there are new CAAQS' being implemented which are listed in **Table 1**.

Table 1: $PM_{2.5}$, SO_2 and NO_2 CAAQS' by Implementation Year

Parameter	Averaging Time	Year Applied			Statistical Form
		2015	2020	2025	
Fine Particulate Matter ($PM_{2.5}$)	24-hour	28 µg/m^3	27 µg/m^3	-	The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations
	Annual	10 µg/m^3	8.8 µg/m^3	-	The 3-year average of the annual average of all 1-hour concentrations
Sulphur Dioxide (SO_2)	1-hour	-	70 ppb	65 ppb	The 3-year average of the annual 99th percentile of the daily maximum 1-hour average concentrations
	Annual	-	5 ppb	4 ppb	The average over a single calendar year of all 1-hour average concentrations
Nitrogen Dioxide (NO_2)	1-hour	-	60 ppb	42 ppb	The 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations
	Annual	-	17 ppb	12 ppb	The average over a single calendar year of all 1-hour average concentrations

(https://www.ccme.ca/en/air-quality-report)

All applicable criteria and standards are presented in the following section of this report.

6 SUMMARY OF AMBIENT MEASUREMENTS

Ambient air quality monitoring results of all parameters sampled for the Courtice and Rundle Road Monitoring Stations are discussed herein. Detailed results of the all continuous and discrete sampling throughout the year are included in **Appendix B** and **C**, respectively.

Table 2 below presents the number and percentage of valid samples collected at each sampling site for each parameter sampled. Data recovery above 75% is considered acceptable. Data recovery was 86.7% or higher at each station for all continuous and discrete parameters.

Table 2: 2020 Summary of Data Recovery by Sampling Site and Sampled Parameter

Station	Parameter	Total Possible # of Hours or Samples	# of Valid Hours or Samples Collected	Percentage of Valid Samples (%)	Overall Percentage of Valid Samples for the Station (%)
Courtice Monitoring Station	$PM_{2.5}$	8784	8671	99.7	**96.6**
	NO_X	8784	8740	99.5	
	NO	8784	8740	99.5	
	NO_2	8784	8740	99.5	
	SO_2	8784	8744	99.5	
	TSP & Metals	61	60	98.4	
	PAHs	30	27	90.0	
	D&F	15	13	86.7	
Rundle Road Monitoring Station	$PM_{2.5}$	8784	8757	99.7	**95.0**
	NO_X	8784	8703	99.1	
	NO	8784	8703	99.1	
	NO_2	8784	8703	99.1	
	SO_2	8784	8744	99.5	
	TSP & Metals	61	55	90.2	
	PAHs	30	26	86.7	
	D&F	15	13	86.7	

Table 3 presents a summary of the continuous sampling statistics at each station for 2020 compared to Ontario AAQC, Ontario Regulation 419/05 and HHRA values. **Table 4** presents a summary of the continuous sampling statistics at each station for 2020 compared to applicable CAAQS'. **Table 5** presents a summary of the 2020 TSP/metals discrete sampling statistics at Courtice and Rundle Road Stations. All results were compared to the applicable twenty-four (24) hour criteria/standards/HHRA. **Table 6** presents a summary of the 2020 PAH discrete sampling statistics at Courtice and Rundle Road Stations. All results were compared to the applicable twenty-four (24) hour criteria/standards/HHRA. **Table 7** presents a summary of the 2020 D&F discrete sampling statistics at Courtice and Rundle Road Stations. All results were compared to the applicable twenty-four (24) hour criteria/standards.

Table 3: 2020 Summary of Statistics for Continuous Sampling Parameter Levels at Courtice and Rundle Road Stations Compared to AAQC/HHRA's

Station	Parameter	Max 1-hr Mean	1-hr AAQC/ HHRA	Events > 1-hr AAQC / HHRA	Max 24-hr Running Mean	24-hr AAQC / HHRA	Events > 24-hr AAQC / HHRA	Annual Arithmetic Mean	Annual AAQC / HHRA	Events > Annual AAQC / HRRA
Courtice Monitoring Station	$PM_{2.5}$ (µg/m^3)	45.2			28.6			5.9		
	NO_X (ppb)	98.8			38.3			5.6		
	NO (ppb)	59.7			15.6			1.1		
	NO_2 (ppb)	40.1	200	0	25.6	100	0	4.6	17	0
	SO_2 (ppb)	72.2	40	19	21.4	100	0	1.4	4	0
Rundle Road Monitoring Station	$PM_{2.5}$ (µg/m^3)	59.3			23.1			5.2		
	NO_X (ppb)	66.9			22.1			4.6		
	NO (ppb)	33.9			5.0			0.8		
	NO_2 (ppb)	35.3	200	0	17.2	100	0	3.9	17	0
	SO_2 (ppb)	69.2	40	5	6.7	100	0	0.4	4	0

Table 4: 2018-2020 Summary of Statistics for Continuous Sampling Parameter Levels at Courtice and Rundle Road Stations Compared to CAAQS'

Station	Parameter	2018-2020[1] 1-Hour Mean	1-Hour CAAQS	Events > 1-Hour CAAQS	2018-2020[1] 24-Hour Mean	24-Hour CAAQS	Events > 24-Hour CAAQS	2018-2020[1] Annual Mean	Annual CAAQS	Events > Annual CAAQS
Courtice Monitoring Station	$PM_{2.5}$ (µg/m^3)				18.1 [4]	27	0	6.2 [5]	8.8	0
	Sulphur Dioxide (SO_2)	58.5 [2]	70	0				1.4 [6]	5	0
	Nitrogen Dioxide (NO_2)	36.4 [3]	60	0				4.6 [6]	17	0
Rundle Road Monitoring Station	$PM_{2.5}$ (µg/m^3)				17.4 [4]	27	0	5.7 [5]	8.8	0
	Sulphur Dioxide (SO_2)	31.6 [2]	70	0				0.4 [6]	5	0
	Nitrogen Dioxide (NO_2)	26.9 [3]	60	0				3.9 [6]	17	0

Notes: [1] 2017-2018 Q2 data taken from Stantec's 2017 Annual Report (Stantec, 2018) and Stantec's 2018 Q1 (Stantec, 2018a) and Q2 Reports (Stantec, 2018b)
[2] The 3-year average of the annual 99th percentile of the daily maximum 1-hour average concentrations
[3] The 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations
[4] The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations
[5] The 3-year average of the annual average of all 1-hour concentrations
[6] The average over a single calendar year of all 1-hour average concentrations

Table 5: 2020 Summary of Statistics for Discrete Sampling of TSP and Metal Parameter Levels at Courtice and Rundle Road Stations

Parameter	Units	AAQC	HHRA	Courtice Monitoring Station				Rundle Road Monitoring Station			
				Geometric Mean	Arithmetic Mean	Maximum 24-hour	No. of Elevated Readings	Geometric Mean	Arithmetic Mean	Maximum 24-hour	No. of Elevated Readings
Particulate (TSP)	µg/m³	120	120	18.8	22.4	69.7	0	21.1	24.4	102.3	0
Total Mercury (Hg)	µg/m³	2	2	8.16E-06	1.05E-05	4.00E-05	0	6.97E-06	9.82E-06	4.40E-05	0
Aluminum (Al)	µg/m³	4.8	-	1.01E-01	1.36E-01	5.00E-01	0	1.12E-01	1.52E-01	1.19E+00	0
Antimony (Sb)	µg/m³	25	25	6.40E-04	7.83E-04	4.06E-03	0	5.00E-04	6.05E-04	1.53E-03	0
Arsenic (As)	µg/m³	0.3	0.3	9.69E-04	1.02E-03	3.28E-03	0	1.09E-03	1.35E-03	1.11E-02	0
Barium (Ba)	µg/m³	10	10	4.94E-03	5.79E-03	1.55E-02	0	5.10E-03	6.17E-03	1.97E-02	0
Beryllium (Be)	µg/m³	0.01	0.001	3.02E-05	3.02E-05	3.26E-05	0	3.01E-05	3.02E-05	3.37E-05	0
Bismuth (Bi)	µg/m³	-	-	5.43E-04	5.43E-04	5.86E-04	0	5.43E-04	5.43E-04	6.07E-04	0
Boron (B)	µg/m³	120	-	1.21E-02	1.21E-02	1.30E-02	0	1.21E-02	1.21E-02	1.35E-02	0
Cadmium (Cd)	µg/m³	0.025	0.025	6.35E-04	6.98E-04	5.45E-03	0	6.23E-04	6.57E-04	3.55E-03	0
Chromium (Cr)	µg/m³	0.5	-	1.91E-03	2.10E-03	4.64E-03	0	1.95E-03	2.17E-03	5.08E-03	0
Cobalt (Co)	µg/m³	0.1	0.1	6.03E-04	6.04E-04	6.51E-04	0	6.11E-04	6.15E-04	1.27E-03	0
Copper (Cu)	µg/m³	50	-	1.26E-02	1.53E-02	4.70E-02	0	2.17E-02	2.72E-02	7.30E-02	0
Iron (Fe)	µg/m³	4	-	3.01E-01	3.66E-01	1.26E+00	0	2.99E-01	3.76E-01	2.00E+00	0
Lead (Pb)	µg/m³	0.5	0.5	1.91E-03	2.24E-03	7.81E-03	0	1.62E-03	1.99E-03	5.93E-03	0
Magnesium (Mg)	µg/m³	-	-	1.69E-01	2.11E-01	8.98E-01	0	1.72E-01	2.12E-01	9.86E-01	0
Manganese (Mn)	µg/m³	0.4	-	8.13E-03	9.96E-03	3.69E-02	0	8.39E-03	1.04E-02	3.68E-02	0
Molybdenum (Mo)	µg/m³	120	-	5.82E-04	7.28E-04	3.01E-03	0	9.47E-04	1.14E-03	2.90E-03	0
Nickel (Ni)	µg/m³	0.2	-	1.07E-03	1.14E-03	2.95E-03	0	1.08E-03	1.17E-03	3.02E-03	0
Phosphorus (P)	µg/m³	-	-	2.52E-01	2.74E-01	1.36E+00	0	2.49E-01	2.63E-01	6.77E-01	0

Parameter	Units	AAQC	HHRA	Courtice Monitoring Station				Rundle Road Monitoring Station			
				Geometric Mean	Arithmetic Mean	Maximum 24-hour	No. of Elevated Readings	Geometric Mean	Arithmetic Mean	Maximum 24-hour	No. of Elevated Readings
Selenium (Se)	µg/m³	10	10	3.02E-03	3.02E-03	3.26E-03	0	3.01E-03	3.02E-03	3.37E-03	0
Silver (Ag)	µg/m³	1	1	3.02E-04	3.02E-04	3.26E-04	0	3.01E-04	3.02E-04	3.37E-04	0
Strontium (Sr)	µg/m³	120	-	3.71E-03	4.90E-03	2.08E-02	0	4.26E-03	5.46E-03	4.07E-02	0
Thallium (Tl)	µg/m³	-	-	2.72E-05	2.72E-05	2.93E-05	-	2.71E-05	2.72E-05	3.03E-05	-
Tin (Sn)	µg/m³	10	10	6.82E-04	7.85E-04	2.47E-03	0	6.39E-04	8.23E-04	2.97E-03	0
Titanium (Ti)	µg/m³	120	-	5.61E-03	7.17E-03	3.10E-02	0	6.10E-03	8.18E-03	7.13E-02	0
Uranium (Ur)	µg/m³	0.3	-	3.06E-05	3.08E-05	6.97E-05	0	3.10E-05	3.22E-05	1.43E-04	0
Vanadium (V)	µg/m³	2	1	1.51E-03	1.51E-03	1.63E-03	0	1.51E-03	1.51E-03	1.69E-03	0
Zinc (Zn)	µg/m³	120	-	2.81E-02	3.30E-02	9.38E-02	0	1.97E-02	2.55E-02	1.05E-01	0
Zirconium (Zr)	µg/m³	20	-	6.21E-04	6.50E-04	3.33E-03	0	6.12E-04	6.18E-04	1.43E-03	0

Table 6: 2020 Summary of Statistics for Discrete Sampling of PAH Parameter Levels at Courtice and Rundle Road Stations

Parameter	Units	AAQC	HHRA	Courtice Monitoring Station			Rundle Road Monitoring Station		
				Arithmetic Mean	Maximum 24-hour	No. of Elevated Readings	Arithmetic Mean	Maximum 24-hour	No. of Elevated Readings
1-Methylnaphthalene	ng/m³	12000	-	4.72E+00	1.69E+01	0	6.58E+00	2.70E+01	0
2-Methylnaphthalene	ng/m³	10000	-	7.37E+00	2.88E+01	0	1.09E+01	4.85E+01	0
Acenaphthene	ng/m³	-	-	2.98E+00	1.43E+01	-	5.34E+00	2.69E+01	-
Acenaphthylene	ng/m³	3500	-	2.04E-01	1.62E+00	-	1.83E-01	5.54E-01	0
Anthracene	ng/m³	200	-	1.40E-01	5.13E-01	0	4.34E-01	2.12E+00	0
Benzo(a)Anthracene	ng/m³	-	-	2.20E-02	9.46E-02	-	2.49E-02	1.13E-01	-
Benzo(a)fluorene	ng/m³	-	-	4.13E-02	1.26E-01	-	5.72E-02	2.32E-01	-
Benzo(a)Pyrene	ng/m³	0.05 [1] 5 [2] 1.1 [3]	1	2.92E-02	9.24E-02	4	3.26E-02	1.29E-01	5
Benzo(b)Fluoranthene	ng/m³	-	-	6.26E-02	2.82E-01	-	6.97E-02	1.78E-01	-
Benzo(b)fluorene	ng/m³	-	-	2.87E-02	9.94E-02	-	3.73E-02	1.25E-01	-
Benzo(e)Pyrene	ng/m³	-	-	4.05E-02	1.97E-01	-	4.02E-02	1.38E-01	-
Benzo(g,h,i)Perylene	ng/m³	-	-	4.18E-02	2.00E-01	-	4.45E-02	1.07E-01	-
Benzo(k)Fluoranthene	ng/m³	-	-	5.09E-02	2.15E-01	-	5.87E-02	1.89E-01	-
Biphenyl	ng/m³	-	-	2.37E+00	8.65E+00	-	3.78E+00	1.93E+01	-
Chrysene	ng/m³	-	-	9.61E-02	4.10E-01	-	1.16E-01	3.04E-01	-
Dibenzo(a,h)Anthracene	ng/m³	-	-	7.19E-03	4.61E-02	-	9.23E-03	1.16E-01	-
Fluoranthene	ng/m³	-	-	6.72E-01	2.07E+00	-	1.54E+00	6.18E+00	-
Fluorene	ng/m³	-	-	2.22E+00	9.85E+00	-	3.93E+00	1.65E+01	-

Parameter	Units	AAQC	HHRA	Courtice Monitoring Station			Rundle Road Monitoring Station		
				Arithmetic Mean	Maximum 24-hour	No. of Elevated Readings	Arithmetic Mean	Maximum 24-hour	No. of Elevated Readings
Indeno(1,2,3-cd)Pyrene	ng/m^3	-	-	4.54E-02	1.94E-01	-	4.88E-02	1.37E-01	-
Naphthalene	ng/m^3	22500	22500	2.62E+01	6.71E+01	0	3.04E+01	1.05E+02	0
o-Terphenyl	ng/m^3	-	-	1.26E-02	3.44E-02	-	1.38E-02	3.98E-02	-
Perylene	ng/m^3	-	-	3.50E-03	1.84E-02	-	3.71E-03	1.47E-02	-
Phenanthrene	ng/m^3	-	-	3.50E+00	1.58E+01	-	7.35E+00	3.06E+01	-
Pyrene	ng/m^3	-	-	3.58E-01	1.05E+00	-	7.66E-01	3.60E+00	-
Tetralin	ng/m^3	-	-	3.28E+00	1.27E+01	-	4.30E+00	1.68E+01	-
Total PAH [4]	ng/m^3	-	-	5.44E+01	1.70E+02	-	7.60E+01	2.74E+02	-

Notes: [1] Ontario Ambient Air Quality Criteria. The Standard for benzo(a)Pyrene (B(a)P) is for B(a)P as a surrogate for PAHs,
[2] O.Reg. 419/05 Schedule 6 Upper Risk Thresholds,
[3] O.Reg. 419/05 24 Hour Guideline,
[4] The reported total PAH is the sum of all analysed PAH species

Table 7: 2020 Summary of Statistics for Discrete Sampling of D&F Parameter Levels at Courtice and Rundle Road Stations

Parameter	Units	AAQC	HHRA	Courtice Monitoring Station			Rundle Road Monitoring Station		
				Arithmetic Mean	Maximum 24-hour	Number of Elevated Readings	Arithmetic Mean	Maximum 24-hour	Number of Elevated Readings
2,3,7,8-TCDD	pg/m³	-	-	1.21E-03	2.79E-03	-	1.48E-03	6.04E-03	-
1,2,3,7,8-PeCDD	pg/m³	-	-	2.07E-03	1.20E-02	-	1.86E-03	6.49E-03	-
1,2,3,4,7,8-HxCDD	pg/m³	-	-	1.50E-04	5.36E-04	-	4.46E-04	3.16E-03	-
1,2,3,6,7,8-HxCDD	pg/m³	-	-	4.22E-04	2.32E-03	-	4.45E-04	2.85E-03	-
1,2,3,7,8,9-HxCDD	pg/m³	-	-	3.23E-04	1.28E-03	-	5.28E-04	3.01E-03	-
1,2,3,4,6,7,8-HpCDD	pg/m³	-	-	6.86E-04	3.82E-03	-	5.53E-04	2.06E-03	-
OCDD	pg/m³	-	-	8.86E-05	3.12E-04	-	9.69E-05	4.89E-04	-
2,3,7,8-TCDF	pg/m³	-	-	1.24E-04	2.51E-04	-	1.31E-04	4.59E-04	-
1,2,3,7,8-PeCDF	pg/m³	-	-	3.42E-05	6.62E-05	-	5.01E-05	1.52E-04	-
2,3,4,7,8-PeCDF	pg/m³	-	-	4.69E-04	1.26E-03	-	5.86E-04	2.18E-03	-
1,2,3,4,7,8-HxCDF	pg/m³	-	-	1.36E-04	4.29E-04	-	2.00E-04	8.54E-04	-
1,2,3,6,7,8-HxCDF	pg/m³	-	-	1.53E-04	4.47E-04	-	1.97E-04	8.07E-04	-
2,3,4,6,7,8-HxCDF	pg/m³	-	-	2.57E-04	8.17E-04	-	2.99E-04	2.17E-03	-
1,2,3,7,8,9-HxCDF	pg/m³	-	-	1.98E-04	5.23E-04	-	2.60E-04	1.03E-03	-
1,2,3,4,6,7,8-HpCDF	pg/m³	-	-	7.25E-05	1.70E-04	-	7.61E-05	2.06E-04	-
1,2,3,4,7,8,9-HpCDF	pg/m³	-	-	2.05E-05	5.39E-05	-	2.61E-05	1.58E-04	-
OCDF	pg/m³	-	-	5.17E-06	1.28E-05	-	4.57E-06	1.66E-05	-
Total Toxic Equivalency	pg/m³	0.1 [1] 1 [2]	-	6.42E-03	2.54E-02	0	7.24E-03	3.04E-02	0

Notes: [1] O.Reg. 419/05 Schedule 3 Standard phased in after July 1st, 2016
[2] O.Reg. 419/05 Schedule 6 Upper Risk Thresholds

6.1 Exceedances

6.1.1 Courtice Monitoring Station

The Courtice Monitoring Station observed no exceedances of TSP, metals, D&F's, $PM_{2.5}$ or NO_2 over their applicable AAQC, HHRA or CAAQS during 2020.

The Courtice Monitoring Station observed four (4) exceedances over the daily AAQC for Benzo(a)pyrene (0.05 ng/m^3) during 2020. The exceedances occurred on April 9th, May 3rd, September 24th and December 17th, 2020 with 24-hour average concentrations of 0.075, 0.08, 0.055 and 0.092 ng/m^3 respectively. The exceedance details are provided in **Table 8**. The Courtice Monitoring Station had no other PAH exceedances (with the exception of Benzo(a)pyrene) during 2020.

Table 8: 2020 Courtice Monitoring Station BaP Exceedance Details

Date	Percentage of BaP Criteria	Wind Direction	Potential Source Contributions
April 9, 2020	150%	WSW	According to the Courtice WPCP meteorological data, the Courtice Station was upwind of the DYEC during the sampling period. Since the winds were coming from the West-southwest, it is more likely that the exceedance was due to regional air quality issues, as the Rundle Road Station experienced a BaP exceedance on April 9th as well.
May 3, 2020	160%	SSW, WNW	According to the Courtice WPCP meteorological data, the Courtice Station was upwind of the DYEC for part of the sampling period. Since the winds were coming from the South-southwest and West-northwest, it is likely that the measured BaP exceedances may be attributed to sources other than the Energy Centre operations.
September 24, 2020	110%	NE-SSW	According to the Courtice meteorological data, the Station was downwind of the DYEC part of the time during the sampling period. The winds were coming from the NE-SSW and it is likely that the measured BaP exceedances may be attributed to industrial sources along the lakeshore with a possible contribution from DYEC in the NE-ENE quadrants.
December 17, 2020	184%	SSE	According to the Courtice meteorological data, the Courtice Station was not upwind or downwind of the DYEC during the sampling period. Since the winds were predominantly coming from the SSE, it is likely that the measured BaP exceedances may be attributed to sources other than the Energy Centre operations.

The Courtice Monitoring Station observed nineteen (19) exceedances over the maximum hourly mean AAQC for SO_2 (40 ppb) during 2020. The exceedance details are provided in **Table 9**. There were also twenty-four (24) exceedances of the rolling 10-minute average AAQC (67 ppb) at the Courtice Station in 2020. The exceedance details are provided in **Table 10**.

Table 9: 2020 Courtice Monitoring Station SO_2 1-Hour Exceedance Details

Date	Number of Exceedances	Maximum Percentage of Criteria
January 24, 2020	4	141%
April 28, 2020	5	131%
April 29, 2020	4	170%
May 18, 2020	1	102%
June 10, 2020	3	181%
August 15, 2020	1	136%
August 30, 2020	1	104%

Table 10: 2020 Courtice Monitoring Station SO_2 10-Minute Exceedance Details

Date	Number of Exceedances	Maximum Percentage of Criteria
January 24, 2020	1	118%
April 28, 2020	5	133%
April 29, 2020	8	117%
June 10, 2020	7	120%
August 15, 2020	1	101%
August 25, 2020	1	164%
December 18, 2020	1	105%

The elevated SO_2 events at the Courtice Ambient Monitoring Station occurred from the E to S directions. The events were possibly a result of emissions from industrial sources along the lakeshore. It is unlikely that any significant contribution of measured SO_2 came from the DYEC.

Durham Region staff have provided Technical Memorandums summarizing the DYEC SO_2 continuous emissions monitoring system (CEMS) data during the exceedance events recorded at the Courtice and Rundle Road Ambient Monitoring Stations for each quarter. The Memorandums indicates that based on the in-stack concentration levels measured by the CEMS, that there were no unusual levels in SO_2 emissions during the ambient Station exceedance events and that the facility's contribution to ambient air quality would be expected to be quite low.

6.1.2 Rundle Road Monitoring Station

The Rundle Road Monitoring Station observed no exceedances of TSP, metals, D&F's, $PM_{2.5}$ or NO_2 over their applicable AAQC, HHRA or CAAQS during 2020.

The Rundle Road Monitoring Station observed five (5) exceedances over the daily AAQC for Benzo(a)pyrene (0.05 ng/m^3) during 2020. The exceedances occurred on March 28th, April 9th, September 24th, November 11th and December 29th, 2020 with 24-hour average concentrations of 0.058, 0.129, 0.061, 0.053 and 0.182 ng/m^3 respectively. The exceedance details are provided in **Table 11**. The Rundle Road Monitoring Station had no other PAH exceedances (with the exception of Benzo(a)pyrene) during 2020.

Table 11: 2020 Rundle Road Monitoring Station BaP Exceedance Details

Date	Percentage of BaP Criteria	Wind Direction	Potential Source Contributions
March 28, 2020	116%	ENE-ESE	According to the Rundle Road meteorological data, the Rundle Road Station was neither upwind nor downwind of the DYEC during the sampling period. Since the winds were coming from the East, it is likely that the measured BaP exceedances may be attributed to sources other than the Energy Centre operations.
April 9, 2020	258%	WNW-NW	According to the Rundle Road meteorological data, the Rundle Road Station was neither upwind nor downwind of the Energy Centre during the sampling period, therefore it is unlikely that the DYEC contributed to the exceedance. It is likely that the exceedance was due to regional air quality issues, as the Courtice Station experienced a BaP exceedance on April 9th as well.
September 24, 2020	122%	NE, S	According to the Rundle meteorological data, the Rundle Road Station was upwind of the DYEC during the sampling period. Since the winds were predominantly coming from the Northeast and South, it is likely that the measured BaP exceedances may be attributed to sources other than the Energy Centre operations.
November 11, 2020	106%	SW-WSW	According to the Rundle meteorological data, the Rundle Road Station was downwind of the DYEC during part of the sampling period. Since the winds were predominantly coming from the Southwest and West-southwest, it is likely that the measured BaP exceedances may be partially attributed to the DYEC and sources other than the Energy Centre operations.
December 29, 2020	364%	W-NNW	According to the Rundle Road meteorological data, the Rundle Station was not upwind or downwind of the DYEC during the sampling period. Since the winds were predominantly coming from the West through North-northwest, it is likely that the measured BaP exceedances may be attributed to sources other than the Energy Centre operations.

The Rundle Monitoring Station observed five (5) exceedances over the maximum hourly mean AAQC for SO_2 (40 ppb) during 2020. The exceedance details are provided in **Table 12**. There were also nine (9) exceedances of the rolling 10-minute average AAQC (67 ppb) at the Rundle Station in 2020. The exceedance details are provided in **Table 13**.

Table 12: 2020 Rundle Road Monitoring Station SO_2 1-Hour Exceedance Details

Date	Number of Exceedances	Maximum Percentage of Criteria
June 16, 2020	2	173%
June 18, 2020	2	169%
September 25, 2020	1	104%

Table 13: 2020 Rundle Road Monitoring Station SO_2 10-Minute Exceedance Details

Date	Number of Exceedances	Maximum Percentage of Criteria
April 25, 2020	1	144%
June 16, 2020	3	254%
June 17, 2020	1	123%
June 18, 2020	3	160%
September 25, 2020	1	101%

The elevated SO_2 events at the Rundle Road Ambient Monitoring Station occurred from the E to S directions. The events were possibly a result of emissions from industrial sources along the lake shore. It is unlikely that any significant contribution of measured SO_2 came from the DYEC.

Durham Region staff have provided Technical Memorandums summarizing the DYEC SO_2 continuous emissions monitoring system (CEMS) data during the exceedance events recorded at the Courtice and Rundle Road Ambient Monitoring Stations for each quarter. The Memorandums indicates that based on the in-stack concentration levels measured by the CEMS, that there were no unusual levels in SO_2 emissions during the ambient Station exceedance events and that the facility's contribution to ambient air quality would be expected to be quite low.

7 AMBIENT AIR QUALITY TRENDS

Ambient air quality measurements from the Courtice and Rundle Road Monitoring Stations from 2013 to 2020 are compared in this section of the report. Stantec collected and reported the data from 2013 until the end of Quarter 2 of 2018. RWDI has been responsible for collecting and reporting data from Quarter 3 of 2018 to present. The data from 2013 to 2017 was obtained from Stantec's 2017 Annual Ambient Air Quality Monitoring Report for the Durham York Energy Centre (Stantec, 2018).

It should be noted that due to the global Covid-19 pandemic there was far less vehicular traffic in the Courtice area during the year of 2020. Since vehicular traffic is a key component of air quality in the area, this had a noticeable impact on the concentration statistics for the year and led to a general reduction in the measured parameters. This change is noticeable when viewing the annual averages comparison and helps to support the theory that vehicular traffic from nearby highways directly impacts the monitoring station results at DYEC.

Another observable change which occurred in 2020 was the reduction of the SO_2 1-hour AAQC limit from 250 to 40 ppb. Prior to 2020, the DYEC had never recorded an SO_2 exceedance over any of the applicable AAQC's. Subsequently, there have been nineteen (19) exceedances and five (5) exceedances of the new 1-hour AAQC at the Courtice and Rundle Stations, respectively.

7.1 Criteria Air Contaminant Comparisons

A summary of the criteria air contaminant (CAC) concentration statistics for Courtice and Rundle Road Stations from 2013-2020 are presented in following sections, as well as plotted graphs and observations made from comparing the annual Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2) and Particulate Matter less than 2.5 microns ($PM_{2.5}$) data statistics. Annual data statistics including a comparison to statistics from previous years can be found in **Tables 14 – 21**.

7.1.1 NO_2 Comparison

All continuously monitored NO_2 levels were below the applicable hourly, 24-hour and annual average criteria from 2013 to 2020 for both the Courtice and Rundle Road Monitoring Stations. A summary of annual NOx, NO and NO_2 data for both stations is presented in **Table 14** for 2013-2020. It should be noted that NOx and NO do not have any applicable AAQC's/CAAQS'. As of 2020 there are two new CAAQS' for NO_2 which define limits on the annual average concentration and on the 3-year average of the annual 98th percentile of the daily maximum 1-hour mean concentrations.

Table 14: 2013-2020 Comparison of Measured NO_X, NO and NO_2 Statistics for Courtice and Rundle Road Monitoring Stations

Contaminant	Statistic	Courtice Station								Rundle Road Station							
		2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020	2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020
NO_X (ppb)	Annual Arithmetic Mean	9.6	10.8	9.1	8.8	9.0	8.0	7.1	5.6	8	7.8	8.2	7.1	7.2	6.7	5.1	4.6
	Maximum 1-hour Mean	151.3	122.2	148.5	97.1	146.9	86.8	98.7	95.1	68.5	70	102	71.3	89.3	73.6	275.7	66.3
	Maximum 24-hour Mean	49.6	52.1	42.6	44.7	45.0	35.6	38.6	38.3	34.9	38.6	31.9	28.3	35.5	32.3	27.9	22.1
NO (ppb)	Annual Arithmetic Mean						2.1	1.5	1.1						1.9	1	0.8
	Maximum 1-hour Mean	111.1	79.1	88.5	69.5	128.9	68.5	62.6	57.3	40.7	38.2	90.9	42.8	88.5	54.3	218.6	31.7
	Maximum 24-hour Mean	22.9	21.7	22.3	21.9	25.1	17.2	19.5	15.6	10.6	11.2	15.9	9.2	7.9	11.9	14.7	5
NO_2 (ppb)	Annual Arithmetic Mean	6.4	8	6.8	6.4	6.4	6.1	5.8	4.6	6.5	6.1	6.6	5.4	5.5	4.9	4.3	3.9
	Annual CAAQS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	17.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	17.0
	Events > Annual CAAQS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
	Maximum 1-hour Mean	48	52.7	62.3	62.4	42.8	70.6	41.3	39	39.3	62.2	42.6	36.2	42.9	38.3	57.2	35.2
	1-hour AAQC	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Events > 1-hour AAQC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	98^{th} Percentile (Daily Maximum 1-hr Mean) [2]						37.4	36.6	35.1						30.2	26.9	23.5
	3-Year Average of the Annual 98th Percentile of the Daily Maximum 1-hour Mean Concentrations	N/A	N/A	N/A	N/A	N/A	N/A	N/A	36.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	26.9
	1-Hour CAAQS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	60.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	60.0
	Events > 1-Hour CAAQS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
	Maximum Running 24-hour Mean	26.8	31.7	25.9	23.1	26.4	21.0	23.2	25.6	24.7	28	22.6	21.5	30.5	20.5	19.8	17.2
	24-hour AAQC	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Events > 24-hour AAQC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes: [1] 2013-2018 Q2 data taken from Stantec's 2017 Annual Report (Stantec, 2018) and Stantec's 2018 Q1 (Stantec, 2018a) and Q2 Reports (Stantec, 2018b).

Annual variations in measured NO_2 data for maximum 1-hour, 24-hour and annual means and their applicable AAQC limits are presented in **Figures 4**, **5** and **6** respectively. The following observations were made from the data plots:

- The maximum measured hourly average NO_2 concentrations at the two stations have generally shown the Courtice Station having higher maximums than Rundle Road apart from 2014 and 2019; 2017 showed similar levels (as seen in **Figure 4**).
- Two new CAAQS standards for NO_2 were also introduced for 2020 which defined the 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentration limit as 60 ppb and the average over a single calendar year of all 1-hour average concentration limit as 17 ppb.
- The maximum measured 24-hour average NO_2 concentrations at the two stations have remained relatively constant and have generally shown similar levels between both stations year to year (as seen in **Figure 5**).
- Measured annual average NO_2 concentrations at the Courtice Station have been slightly higher than the Rundle Road Station apart from 2013 and 2015 where they showed similar levels (as seen in **Figure 6**). Measured annual average NO_2 concentrations at both stations were relatively constant for all of the years presented.
- Measured maximum 1-hour and 24-hour average NO_2 concentrations have not come close to exceeding the applicable AAQC's over the timeseries.

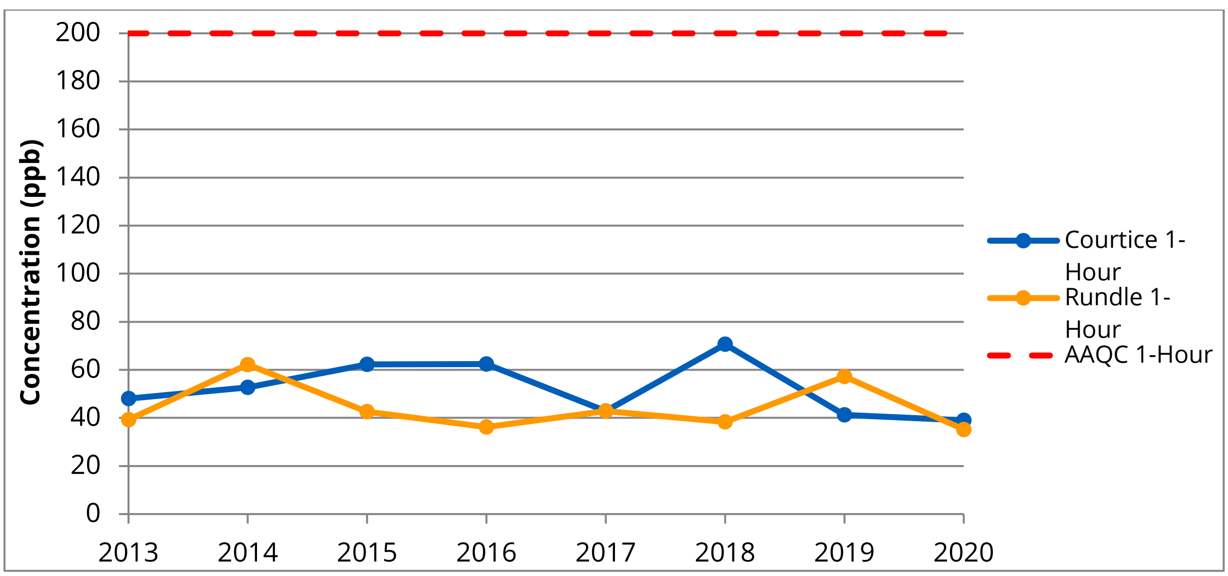


Figure 4: Maximum Measured 1-hour Mean NO_2 Concentrations by Year

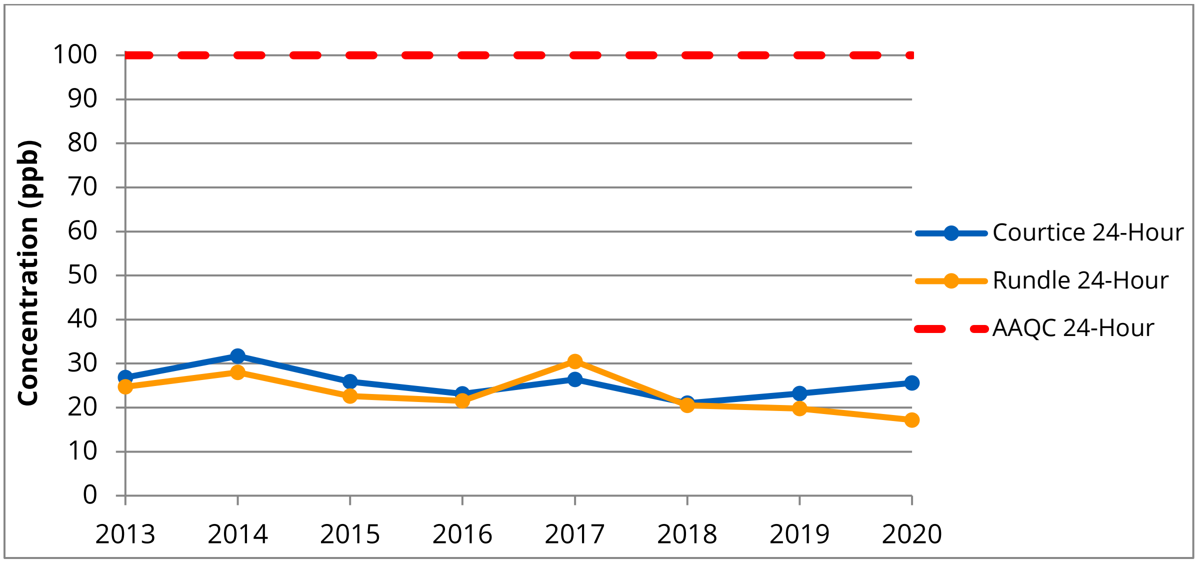
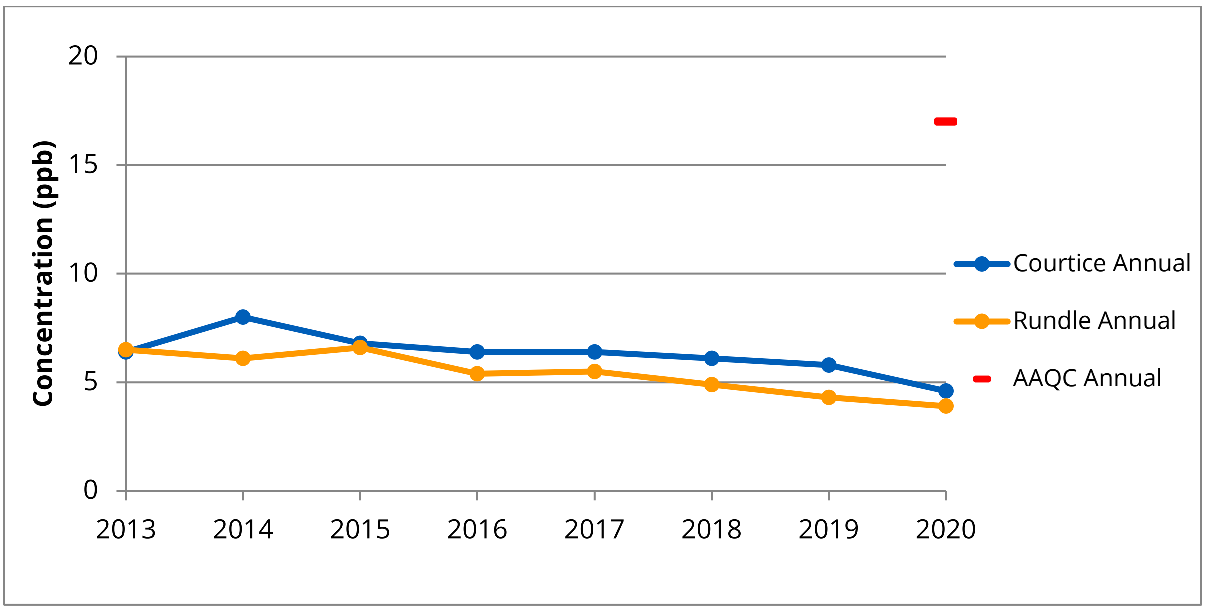


Figure 5: Maximum Measured 24-hour Mean NO_2 Concentrations by Year



Notes: Annual NO_2 AAQC in effect as of 2020

Figure 6: Maximum Measured Annual Mean NO_2 Concentrations by Year

7.1.2 SO_2 Comparison

In 2020, there have been more frequent SO_2 concentrations elevated above the AAQC's than in previous years due to the new limits imposed at the start of 2020. A summary of annual SO_2 data for both stations is presented in **Table 15** for 2013-2020.

Table 15: 2013-2020 Comparison of Measured SO_2 Statistics for Courtice and Rundle Road Monitoring Stations

Contaminant	Statistic	Courtice Station								Rundle Road Station							
		2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020	2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020
SO_2 (ppb)	Annual Arithmetic Mean	1.6	1.5	1	1.7	1.8	2.7	1.9	1.4	0	0.7	0.7	0.8	0.6	0.7	0.5	0.4
	Annual AAQC	20	20	20	20	20	20	4[3]	4	20	20	20	20	20	20	4[3]	4
	Events > Annual AAQC	N/A [2]	0	0	0	0	0	0	0	N/A	0	0	0	0	0	0	0
	Maximum 1-hour Mean	56.3	43.3	39	57.1	95.6	96.2	58.2	67.2	24.8	34.1	28.3	30.7	61.0	66.0	34.8	59.7
	1-hour AAQC	250	250	250	250	250	250	250	40	250	250	250	250	250	250	250	40
	Events > 1-hour AAQC	0	0	0	0	0	0	0	19	0	0	0	0	0	0	0	5
	99^{th} Percentile (Daily Maximum 1-hr Mean)						73.0	50.8	51.6						33.4	25.7	35.8
	3-Year Average of the Annual 99th Percentile of the Daily Maximum 1-hour Mean Concentrations	N/A	N/A	N/A	N/A	N/A	N/A	N/A	58.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	31.6
	1-Hour CAAQS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	70	N/A	N/A	N/A	N/A	N/A	N/A	N/A	70
	Events > 1-Hour CAAQS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
	Maximum Running 24-hour Mean	13.8	15.6	8.8	13	18.7	17.0	18.6	21.4	3.9	4.2	8.3	6.2	5.2	8.1	5.6	6.7
	24-hour AAQC	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Events > 24-hour AAQC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes: [1] 2013-2018 Q2 data taken from Stantec's 2017 Annual Report (Stantec, 2018) and Stantec's 2018 Q1 (Stantec, 2018a) and Q2 Reports (Stantec, 2018b).
[2] As per Stantec's 2017 Annual Report (Stantec, 2018), the measurement period in 2013 was less than 9 months therefore annual averages are not comparable to the AAQC
[3] MECP comments on the 2019 Q4 report called for comparison to the 2020 annual SO_2 AAQC of 4 ppb in the 2019 Annual Report

Annual variations in measured SO_2 data for maximum 1-hour, 24-hour and annual means and their applicable AAQC limits are presented in **Figures 7**, **8** and **9** respectively. The following observations were made from the data plots:

- In previous years the measured maximum 1-hour, 24-hour average and annual average SO_2 concentrations did not come close to exceeding their applicable AAQC's.
- In 2020, the maximum 1-hour mean AAQC was changed from 250 to 40 ppb (an 84% reduction). There were nineteen (19) exceedances of the new criteria at the Courtice station and five (5) exceedances at the Rundle station.
- There were also twenty-four (24) and nine (9) exceedances of the rolling 10-minute average AAQC (67 ppb) at the Courtice and Rundle stations respectively.
- Two new CAAQS standards were also introduced for SO_2 in 2020 which defined the 3-year average of the annual 99th percentile of the daily maximum 1-hour average concentration limit as 70 ppb and the average over a single calendar year of all 1-hour average concentration limit as 5 ppb.
- The maximum measured hourly average SO_2 concentrations at the two stations have generally shown the Courtice Station consistently having higher maximums than Rundle Road and both stations trending the same over the entire timeseries (as seen in **Figure 7**).
- The maximum measured 24-hour average SO_2 concentrations at the two stations have generally shown the Courtice Station consistently having higher maximums than Rundle Road with the exception of 2015 where maximums were generally the same (as seen in **Figure 8**). Measured 24-hour average SO_2 concentrations at both stations were relatively constant for all of the years presented.
- Measured annual average SO_2 concentrations at the Courtice Station have been slightly higher than the Rundle Road Station apart from 2015 where they showed similar levels (as seen in **Figure 9**). Measured annual average SO_2 concentrations at both stations were relatively constant for all of the years presented.

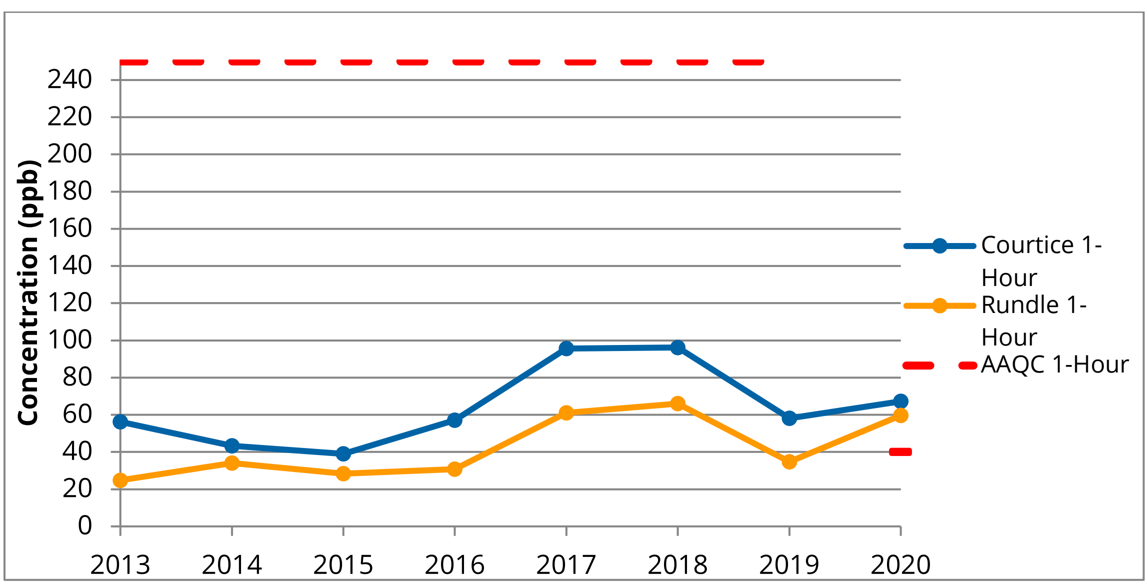


Figure 7: Maximum Measured 1-hour Mean SO_2 Concentrations by Year

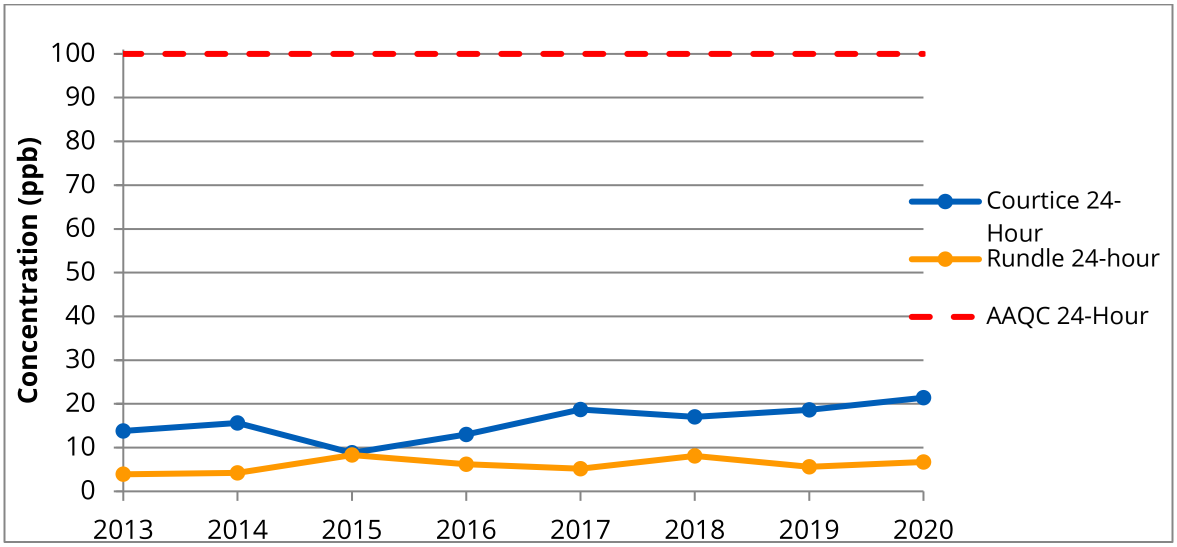


Figure 8: Maximum Measured 24-Hour Mean SO_2 Concentrations by Year

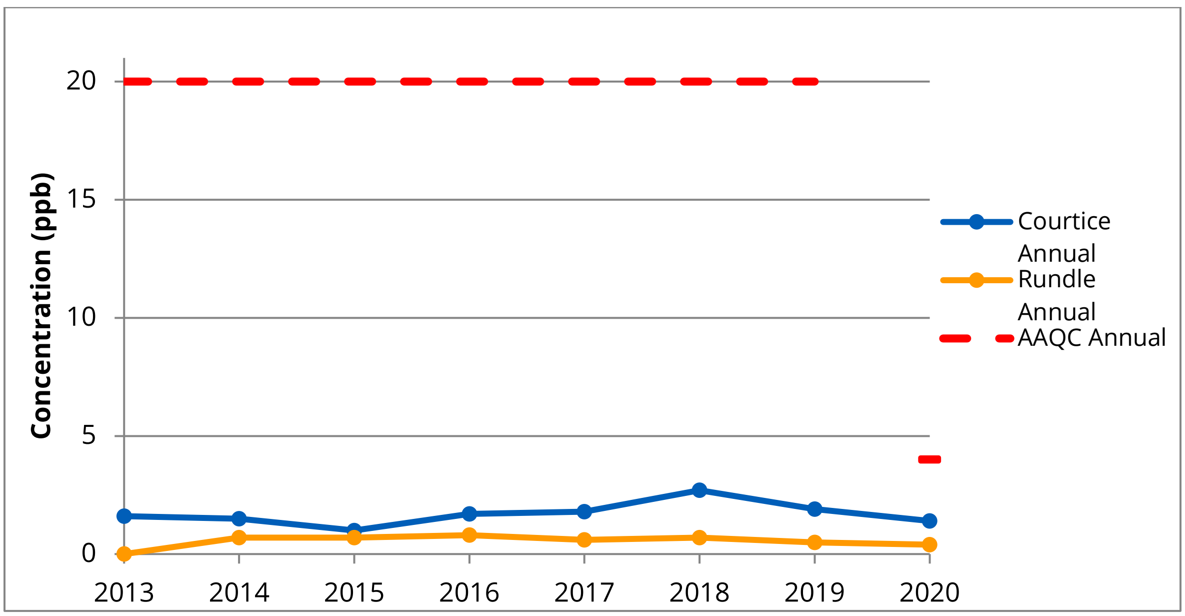


Figure 9: Maximum Measured Annual Mean SO_2 Concentrations by Year

7.1.3 $PM_{2.5}$ Comparison

All continuously monitored $PM_{2.5}$ levels were below the applicable CAAQS' from 2013 to 2020 for both the Courtice and Rundle Road Monitoring Stations. A summary of annual $PM_{2.5}$ data for both stations is presented in **Table 16** for 2013-2020. In 2020 CAAQS' were lowered for the 24-hour and annual limits as described in Section 5 Air Quality Criteria and Standards.

Table 16: 2013-2020 Comparison of Measured $PM_{2.5}$ Statistics for Courtice and Rundle Road Monitoring Stations

Contaminant	Statistic	Courtice Station								Rundle Road Station							
		2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020	2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020
$PM_{2.5}$ (µg/m³)	Annual Arithmetic Mean	8.4	8.6	7.7	6.8	6.4	6.3	6.4	5.9	8.4	8.5	9.5	9.6	6.3	6.1	5.7	5.2
	3-Year Average of the Annual Arithmetic Mean of all 1-hour Concentrations	N/A	N/A	N/A [2]	7.7	7.0	6.5	6.4	6.2	N/A	N/A	N/A [2]	9.2	8.5	7.3	6.0	5.7
	Annual CAAQS	10	10	10	10	10	10	10	8.8	10	10	10	10	10	10	10	8.8
	Events > Annual CAAQS	N/A [3]	N/A [3]	N/A [3]	0	0	0	0	0	N/A [3]	N/A [3]	N/A [3]	0	0	0	0	0
	Maximum 1-hour Mean						64.8	68.6	45.1						68.3	49.0	45.2
	Maximum Running 24-hour Mean	27	43.2	59.6	34.7	70.6	34.6	35.7	28.6	50.6	41.3	64.7	43.1	35.8	31.4	33.6	23.1
	98th Percentile (24-hour Mean)	21.5	22.3	27.3	21.6	19.8	18.7	18.5	17	21.7	21.1	28.4	32.9	20.3	18.6	17.4	16.1
	3-Year Average of the Annual 98th Percentile of the Daily 24-hour Mean Concentrations	N/A	N/A	N/A [2]	23.7	22.9	20.0	19.0	18.1	N/A	N/A	N/A [2]	27.5	27.2	23.9	18.8	17.4
	24-hour CAAQS	30	30	28	28	28	28	28	27	30	30	28	28	28	28	28	27
	Events > 24-hour CAAQS	N/A [3]	N/A [3]	N/A [3]	0	0	0	0	0	N/A [3]	N/A [3]	N/A [3]	0	0	0	0	0

Notes: [1] 2013-2018 Q2 data taken from Stantec's 2017 Annual Report (Stantec, 2018) and Stantec's 2018 Q1 (Stantec, 2018a) and Q2 Reports (Stantec, 2018b).
[2] As per Stantec's 2017 Annual Report (Stantec, 2018), the measurement period in 2013 was less than 9 months, therefore the 3-year average for 2013-2015 is not applicable.
[3] As per Stantec's 2017 Annual Report (Stantec, 2018), the measurement period in 2013 was less than 9 months, therefore the 3-year averages for comparison to CAAQS' are not comparable.

One-hour mean $PM_{2.5}$ concentrations were averaged over 3-year consecutive periods and compared to the annual CAAQS, which is presented visually in **Figure 10**. The annual 98th percentiles of the daily 24-Hour mean $PM_{2.5}$ concentrations were averaged over 3-year consecutive periods and compared to the 24-Hour CAAQS, which is presented visually in **Figure 11**. It should be noted that the averaged period from 2013-2015 is not plotted in **Figure 10** or **11** as the measurement period in 2013 was less than 9 months (Stantec, 2018) and does not meet the validity requirements for averaging over the 3-year period. The following observations were made from the data plots:

- Two CAAQS standards for $PM_{2.5}$ were reduced in 2020. The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations was changed from 28 to 27 ppb and the 3-year average of the annual averages of all 1-hour concentrations was changed from 10 to 8.8 ppb.
- The 3-year averaged annual $PM_{2.5}$ concentrations measured at the two stations have generally shown a declining trend in overall averages and the Rundle Road Station has had a slightly higher average as compared to the Courtice Station, with the exception of 2017-2019 where both stations were similar and 2018-2020 where Courtice is slightly higher (as seen in **Figure 10**).
- The 3-Year averages of annual 98th percentile 24-Hour $PM_{2.5}$ mean concentrations measured at the two stations have generally shown a declining trend in overall averages and the Rundle Road Station has had a slightly higher average as compared to the Courtice Station, with the exception of 2017-2019 where both stations were similar and 2018-2020 where Courtice is slightly higher (as seen in **Figure 11**).
- Measured 3-year averaged 98th percentile 24-hour average values and 3-year averaged annual $PM_{2.5}$ concentrations measured at both the Courtice and Rundle Road Stations were fairly close to the CAAQS limits in the 2014-2016 and 2015-2017 yearly averages with the highest being 92% of the CAAQS, but have since declined to as high as 67% of the CAAQS in the 2018-2020 groupings as seen in **Figure 10** and **Figure 11**, respectively.

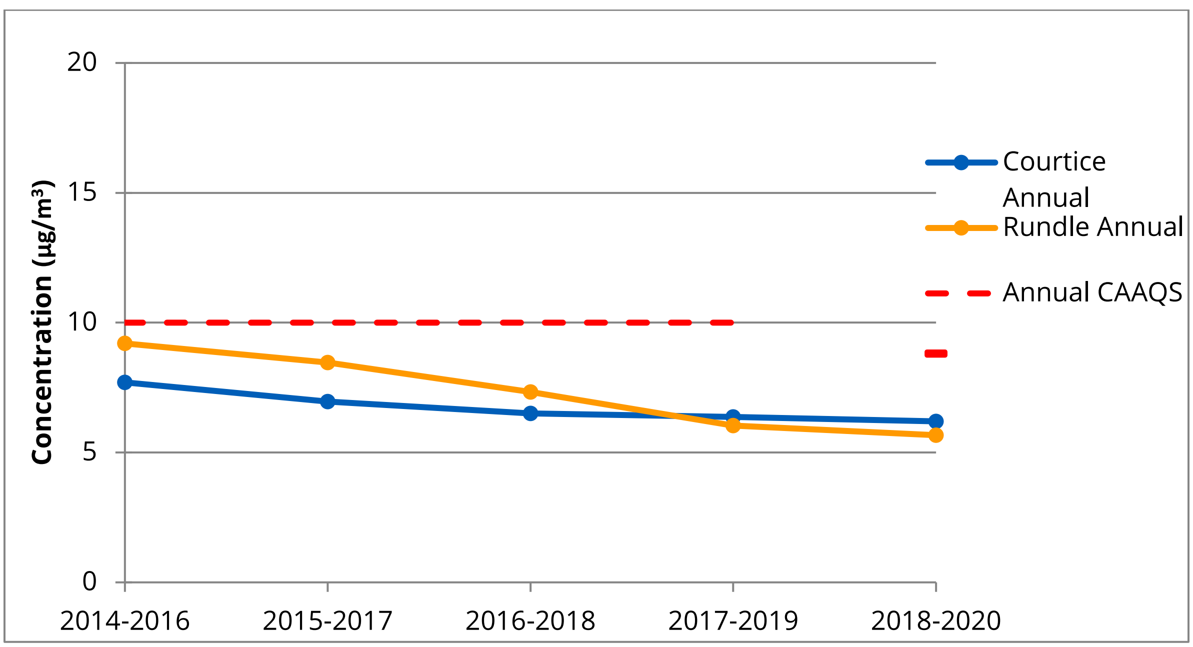


Figure 10: 3-Year Averages of Annual $PM_{2.5}$ Arithmetic Means (of 1-Hour Average Concentrations) by 3-Year Grouping

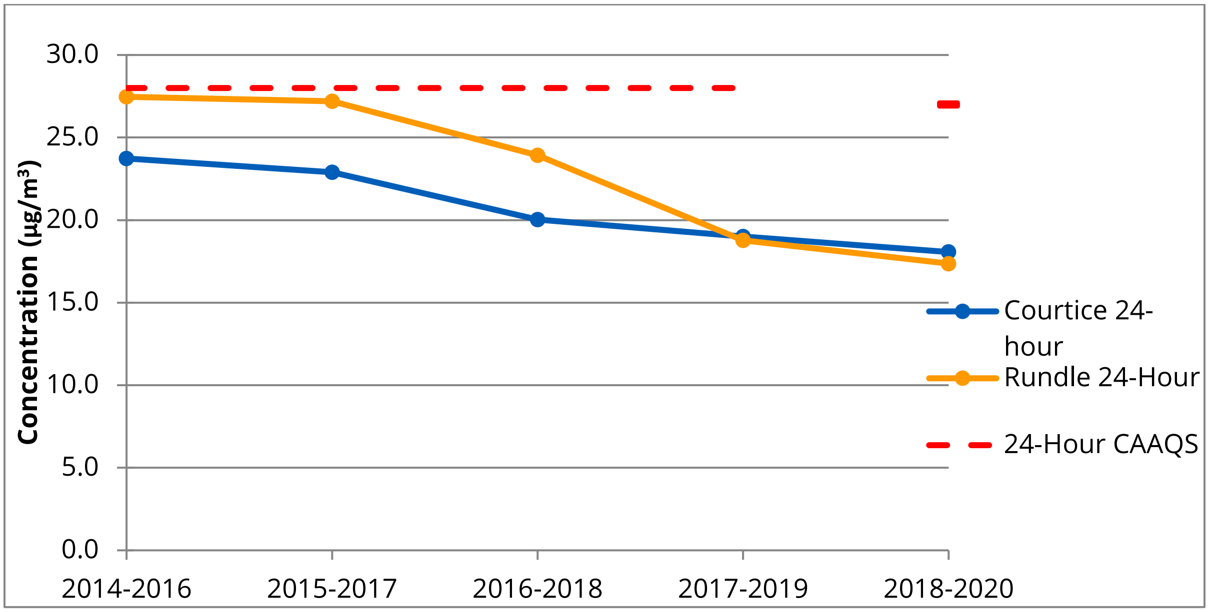


Figure 11: 3-Year Averages of Annual 98th Percentile 24-Hour $PM_{2.5}$ Mean Concentrations by 3-Year Grouping

7.2 TSP and Metals Comparisons

A summary of the maximum measured daily average Total Suspended Particulates (TSP) and Metal concentrations and percentage of the applicable AAQC's/HHRC's from 2013-2014, and 2016-2020 at the Courtice and Rundle Road Monitoring Stations is presented in **Table 17** and **18** respectively. As per Stantec's comment in the 2017 Annual Report, the 2013, 2014 and 2016 data should be reviewed with caution "since the measurement period in 2013 was eight months (April-December), six months (January-June) in 2014, and 11 months (February-December) in 2016, due to the non-continuous monitoring being temporarily discontinued as per the ambient monitoring plan. Caution should be exercised in comparing the data, as the measurement period lengths were different and cover different periods of each year (with different meteorological conditions)" (Stantec, 2018).

There were two (2) TSP exceedances in 2017, four (4) exceedances in 2018, and one (1) exceedance in 2019. No other exceedances of TSP or Metals have occurred at the Courtice or Rundle Road Monitoring Stations from 2013 to 2020.

Table 17: 2013-2020 Comparison of Measured TSP and Metals Concentrations at the Courtice Station

Contaminant	Units	AAQC	HHRA	Maximum Concentration								Percentage of Criteria							
				2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020	2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020
Particulate (TSP)	µg/m^3	*120*	*120*	62.0	57.0	N/A	94.7	59.6	84.7	146.4	69.7	51.7%	47.5%	N/A	78.9%	49.7%	70.6%	122.0%	58.1%
Total Mercury (Hg)	µg/m^3	*2*	*2*	3.12E-05	2.15E-05		3.62E-05	3.60E-05	4.19E-05	7.75E-05	4.00E-05	0.002%	0.001%		0.002%	0.002%	0.002%	0.004%	0.002%
Aluminum (Al)	µg/m^3	*4.8*	-	3.34E-01	3.57E-01		6.78E-01	4.49E-01	8.95E-01	1.00E+00	5.00E-01	7.0%	7.4%		14.1%	9.4%	18.6%	20.8%	10.4%
Antimony (Sb)	µg/m^3	*25*	*25*	2.69E-03	3.91E-03		3.67E-03	3.73E-03	7.14E-03	2.55E-03	4.06E-03	0.01%	0.02%		0.01%	0.01%	0.03%	0.01%	0.02%
Arsenic (As)	µg/m^3	*0.3*	*0.3*	3.79E-03	2.35E-03		2.20E-03	4.14E-03	4.29E-03	2.76E-03	3.28E-03	1.3%	0.8%		0.7%	1.4%	1.4%	0.9%	1.1%
Barium (Ba)	µg/m^3	*10*	*10*	1.58E-02	1.90E-02		3.39E-02	2.05E-02	1.89E-02	2.23E-02	1.55E-02	0.2%	0.2%		0.3%	0.2%	0.2%	0.2%	0.2%
Beryllium (Be)	µg/m^3	*0.01*	*0.01*	2.69E-04	3.91E-04		3.67E-04	3.73E-04	1.56E-03	7.19E-05	3.26E-05	2.7%	3.9%		3.7%	3.7%	15.6%	0.7%	0.3%
Bismuth (Bi)	µg/m^3	-	-	1.66E-03	2.35E-03		2.20E-03	2.24E-03	4.29E-03	1.42E-03	5.86E-04	-	-		-	-	-	-	-
Boron (B)	µg/m^3	*120*	-	1.13E-02	5.61E-03		8.50E-03	5.39E-03	1.31E-02	1.39E-02	1.30E-02	0.009%	0.005%		0.007%	0.004%	0.011%	0.012%	0.011%
Cadmium (Cd)	µg/m^3	*0.025*	*0.025*	5.59E-04	1.18E-03		7.34E-04	7.45E-04	1.90E-03	6.95E-04	5.45E-03	2.2%	4.7%		2.9%	3.0%	7.6%	2.8%	21.8%
Chromium (Cr)	µg/m^3	*0.5*	-	3.82E-03	6.29E-03		7.74E-03	1.03E-02	9.50E-03	2.25E-02	4.64E-03	0.8%	1.3%		1.5%	2.1%	1.9%	4.5%	0.9%
Cobalt (Co)	µg/m^3	*0.1*	*0.1*	5.59E-04	7.83E-04		7.34E-04	7.45E-04	1.43E-03	6.95E-04	6.51E-04	0.6%	0.8%		0.7%	0.7%	1.4%	0.7%	0.7%
Copper (Cu)	µg/m^3	*50*	-	7.68E-02	5.95E-02		1.27E-01	9.85E-02	4.55E-02	6.10E-02	4.70E-02	0.2%	0.1%		0.3%	0.2%	0.1%	0.1%	0.1%
Iron (Fe)	µg/m^3	*4*	-	9.90E-01	9.26E-01		1.58E+00	1.01E+00	2.53E+00	3.31E+00	1.26E+00	24.8%	23.2%		39.5%	25.3%	63.3%	82.8%	31.6%
Lead (Pb)	µg/m^3	*0.5*	*0.5*	6.47E-03	5.50E-03		7.52E-03	1.09E-02	1.43E-02	1.39E-02	7.81E-03	0.3%	0.3%		0.4%	0.5%	0.7%	0.7%	0.4%
Magnesium (Mg)	µg/m^3	-	-	5.71E-01	4.13E-01		1.14E+00	5.61E-01	1.21E+00	1.25E+00	8.98E-01	-	-		-	-	-	-	-
Manganese (Mn)	µg/m^3	*0.4*	-	3.31E-02	3.08E-02		4.86E-02	5.25E-02	7.25E-02	1.20E-01	3.69E-02	8.3%	7.7%		12.2%	13.1%	18.1%	30.1%	9.2%
Molybdenum (Mo)	µg/m^3	*120*	-	1.65E-03	2.36E-03		3.15E-03	4.44E-03	7.69E-03	2.20E-03	3.01E-03	0.001%	0.002%		0.003%	0.004%	0.006%	0.002%	0.003%
Nickel (Ni)	µg/m^3	*0.2*	-	4.35E-03	2.78E-03		2.40E-03	3.95E-03	3.85E-03	5.35E-03	2.95E-03	2.2%	1.4%		1.2%	2.0%	1.9%	2.7%	1.5%
Phosphorus (P)	µg/m^3	-	-	1.45E-01	1.05E-01		4.60E-01	9.76E-02	1.08E+00	2.02E+00	1.36E+00	-	-		-	-	-	-	-
Selenium (Se)	µg/m^3	*10*	*10*	2.69E-03	3.91E-03		3.67E-03	3.73E-03	7.14E-03	3.48E-03	3.26E-03	0.03%	0.04%		0.04%	0.04%	0.07%	0.03%	0.03%
Silver (Ag)	µg/m^3	*1*	*1*	1.89E-03	1.96E-03		1.83E-03	1.86E-03	3.57E-03	3.48E-04	3.26E-04	0.2%	0.2%		0.2%	0.2%	0.4%	0.0%	0.03%
Strontium (Sr)	µg/m^3	*120*	-	1.10E-02	1.34E-02		1.86E-02	1.38E-02	1.73E-02	4.35E-02	2.08E-02	0.01%	0.01%		0.02%	0.01%	0.01%	0.04%	0.02%
Thallium (Tl)	µg/m^3	-	-	2.69E-03	3.91E-03		3.67E-03	3.73E-03	7.14E-03	9.81E-05	2.93E-05	-	-		-	-	-	-	-
Tin (Sn)	µg/m^3	*10*	*10*	4.79E-03	3.91E-03		3.67E-03	3.73E-03	7.14E-03	2.52E-03	2.47E-03	0.05%	0.04%		0.04%	0.04%	0.07%	0.03%	0.02%
Titanium (Ti)	µg/m^3	*120*	-	1.73E-02	2.26E-02		2.82E-02	2.08E-02	3.19E-02	4.31E-02	3.10E-02	0.01%	0.02%		0.02%	0.02%	0.03%	0.04%	0.03%
Uranium (Ur)	µg/m^3	*0.3*	-	1.24E-04	1.76E-04		1.65E-04	1.68E-04	3.57E-03	1.11E-04	6.97E-05	0.04%	0.06%		0.06%	0.06%	1.19%	0.04%	0.02%
Vanadium (V)	µg/m^3	*2*	*1*	6.50E-02	1.14E-01		9.54E-02	2.46E-01	3.57E-03	2.02E-02	1.63E-03	3.3%	5.7%		4.8%	12.3%	0.2%	1.0%	0.1%
Zinc (Zn)	µg/m^3	*120*	-	1.39E-03	1.96E-03		1.83E-03	1.86E-03	1.86E-01	1.66E-01	9.38E-02	0.001%	0.002%		0.002%	0.002%	0.155%	0.138%	0.1%
Zirconium (Zr)	µg/m^3	*20*	-	1.92E-03	1.96E-03		1.83E-03	1.86E-03	1.64E-03	2.35E-03	3.33E-03	0.010%	0.010%		0.009%	0.009%	0.008%	0.012%	0.017%

Notes: [1] 2013-2018 Q2 data taken from Stantec's 2017 Annual Report (Stantec, 2018) and Stantec's 2018 Q1 (Stantec, 2018a) and Q2 Reports (Stantec, 2018b).

Table 18: 2013-2020 Comparison of Measured TSP and Metals Concentrations at the Rundle Road Station

Contaminant	Units	AAQC	HHRA	Maximum Concentration								Percentage of Criteria							
				2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020	2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020
Particulate (TSP)	µg/m³	*120*	*120*	78.0	59.0		97.1	232	203.6	81.7	102.3	65.0%	49.2%		80.9%	193.3%	169.7%	68.1%	85.2%
Total Mercury (Hg)	µg/m³	*2*	*2*	5.14E-05	2.94E-05		2.50E-05	4.80E-05	9.83E-05	6.10E-05	4.40E-05	0.003%	0.001%		0.001%	0.002%	0.005%	0.003%	0.002%
Aluminum (Al)	µg/m³	*4.8*	-	4.54E-01	2.90E-01		7.86E-01	1.08E+00	1.42E+00	6.64E-01	1.19E+00	9.5%	6.0%		16.4%	22.5%	29.6%	13.8%	24.8%
Antimony (Sb)	µg/m³	*25*	*25*	2.86E-03	3.41E-03		3.57E-03	3.69E-03	2.64E-02	4.81E-03	1.53E-03	0.01%	0.01%		0.01%	0.01%	0.11%	0.02%	0.006%
Arsenic (As)	µg/m³	*0.3*	*0.3*	1.76E-03	2.05E-03		4.72E-03	2.21E-03	2.06E-02	4.79E-03	1.11E-02	0.6%	0.7%		1.6%	0.7%	6.9%	1.6%	3.7%
Barium (Ba)	µg/m³	*10*	*10*	1.61E-02	1.18E-02		2.37E-02	3.20E-02	2.58E-02	2.67E-02	1.97E-02	0.2%	0.1%		0.2%	0.3%	0.3%	0.3%	0.2%
Beryllium (Be)	µg/m³	*0.01*	*0.01*	2.86E-04	3.41E-04		3.57E-04	3.69E-04	1.81E-03	3.27E-05	3.37E-05	2.9%	3.4%		3.6%	3.7%	18.1%	0.3%	0.3%
Bismuth (Bi)	µg/m³	-	-	1.76E-03	2.05E-03		2.14E-03	2.21E-03	2.63E-03	1.46E-03	6.07E-04	-	-		-	-	-	-	-
Boron (B)	µg/m³	*120*	-	1.45E-02	4.43E-03		7.45E-03	6.12E-03	1.33E-02	1.31E-02	1.35E-02	0.012%	0.004%		0.006%	0.005%	0.011%	0.011%	0.01%
Cadmium (Cd)	µg/m³	*0.025*	*0.025*	8.99E-04	6.83E-04		7.13E-04	7.38E-04	4.73E-03	6.54E-04	3.55E-03	3.6%	2.7%		2.9%	3.0%	18.9%	2.6%	14.2%
Chromium (Cr)	µg/m³	*0.5*	-	1.78E-02	4.75E-03		7.93E-03	1.75E-02	8.20E-03	8.54E-03	5.08E-03	3.6%	1.0%		1.6%	3.5%	1.6%	1.7%	1.0%
Cobalt (Co)	µg/m³	*0.1*	*0.1*	5.95E-04	6.83E-04		2.78E-03	7.38E-04	8.77E-04	6.54E-04	1.27E-03	0.6%	0.7%		2.8%	0.7%	0.9%	0.7%	1.3%
Copper (Cu)	µg/m³	*50*	-	2.36E-01	1.93E-01		1.16E-01	2.29E-01	6.15E-02	8.54E-02	7.30E-02	0.5%	0.4%		0.2%	0.5%	0.1%	0.2%	0.1%
Iron (Fe)	µg/m³	*4*	-	1.31E+00	9.30E-01		1.83E+00	2.26E+00	2.97E+00	1.25E+00	2.00E+00	32.8%	23.3%		45.8%	56.5%	74.1%	31.2%	50.1%
Lead (Pb)	µg/m³	*0.5*	*0.5*	6.80E-03	7.34E-03	N/A	7.25E-03	1.30E-02	3.96E-01	5.81E-03	5.93E-03	0.3%	0.4%	N/A	0.4%	0.7%	19.8%	0.3%	0.3%
Magnesium (Mg)	µg/m³	-	-	6.76E-01	2.97E-01		1.10E+00	1.76E+00	2.10E+00	9.90E-01	9.86E-01	-	-		-	-	-	-	-
Manganese (Mn)	µg/m³	*0.4*	-	1.02E-01	2.60E-02		6.56E-02	7.74E-02	1.13E-01	5.56E-02	3.68E-02	25.5%	6.5%		16.4%	19.4%	28.1%	13.9%	9.2%
Molybdenum (Mo)	µg/m³	*120*	-	3.79E-03	2.76E-03		6.24E-03	3.13E-02	6.26E-03	2.20E-03	2.90E-03	0.003%	0.002%		0.005%	0.026%	0.005%	0.002%	0.002%
Nickel (Ni)	µg/m³	*0.2*	-	4.67E-03	4.58E-03		1.94E-02	3.62E-03	3.26E-03	2.42E-03	3.02E-03	2.3%	2.3%		9.7%	1.8%	1.6%	1.2%	1.5%
Phosphorus (P)	µg/m³	-	-	1.59E-01	1.85E-01		1.03E-01	1.45E-01	1.75E+00	2.15E+00	6.77E-01	-	-		-	-	-	-	-
Selenium (Se)	µg/m³	*10*	*10*	2.86E-03	3.41E-03		3.57E-03	3.69E-03	4.39E-03	3.27E-03	3.37E-03	0.03%	0.03%		0.04%	0.04%	0.04%	0.03%	0.03%
Silver (Ag)	µg/m³	*1*	*1*	2.33E-03	1.71E-03		1.78E-03	1.85E-03	1.06E-02	3.27E-04	3.37E-04	0.2%	0.2%		0.2%	0.2%	1.1%	0.0%	0.03%
Strontium (Sr)	µg/m³	*120*	-	1.95E-02	1.09E-02		2.11E-02	7.54E-02	5.82E-02	3.13E-02	4.07E-02	0.02%	0.01%		0.02%	0.06%	0.05%	0.03%	0.03%
Thallium (Tl)	µg/m³	-	-	2.86E-03	3.41E-03		3.57E-03	3.69E-03	4.39E-03	6.36E-05	3.03E-05	-	-		-	-	-	-	-
Tin (Sn)	µg/m³	*10*	*10*	2.86E-03	3.41E-03		4.12E-02	3.69E-03	3.09E-02	4.30E-03	2.97E-03	0.03%	0.03%		0.41%	0.04%	0.31%	0.04%	0.03%
Titanium (Ti)	µg/m³	*120*	-	2.40E-02	1.71E-02		3.50E-02	6.46E-02	5.57E-02	2.52E-02	7.13E-02	0.02%	0.01%		0.03%	0.05%	0.05%	0.02%	0.06%
Uranium (Ur)	µg/m³	*0.3*	-	1.32E-04	1.54E-04		1.60E-04	1.66E-04	1.97E-04	3.27E-05	1.43E-04	0.04%	0.05%		0.05%	0.06%	0.07%	0.01%	0.05%
Vanadium (V)	µg/m³	*2*	*1*	7.43E-02	1.24E-01		6.66E-02	2.95E-01	1.88E-02	3.46E-02	1.69E-03	3.7%	6.2%		3.3%	14.8%	0.9%	1.7%	0.1%
Zinc (Zn)	µg/m³	*120*	-	1.48E-03	1.71E-03		1.78E-03	1.85E-03	1.12E-01	5.87E-02	1.05E-01	0.001%	0.001%		0.001%	0.002%	0.093%	0.049%	0.087%
Zirconium (Zr)	µg/m³	*20*	-	3.22E-03	1.71E-03		3.14E-03	3.43E-03	2.19E-03	6.54E-04	1.43E-03	0.016%	0.009%		0.016%	0.017%	0.011%	0.003%	0.01%

Notes: [1] 2013-2018 Q2 data taken from Stantec's 2017 Annual Report (Stantec, 2018) and Stantec's 2018 Q1 (Stantec, 2018a) and Q2 Reports (Stantec, 2018b)

7.3 PAH Comparisons

A summary of the maximum measured daily average Polycyclic Aromatic Hydrocarbons (PAH) concentrations and percentage of the applicable AAQC's from 2013-2014, and 2016-2020 for both Courtice and Rundle Road Monitoring Stations is presented in **Table 19** and **20** respectively. As per Stantec's comment in the 2017 Annual Report, the 2013, 2014 and 2016 data should be reviewed with caution "since the measurement periods are not the same in each year, the data are not directly comparable" (Stantec, 2018).

The maximum measured PAH concentrations, with the exception of Benzo(a)Pyrene, were all well below applicable AAQC's from 2013-2020. There have been twenty-four (24) exceedances of Benzo(a)Pyrene above the applicable AAQC from 2013-2020 at the Courtice Monitoring Station and thirty-six (36) exceedances of Benzo(a)Pyrene above the applicable AAQC from 2013-2020 at the Rundle Road Monitoring Station.

Table 19: 2013-2020 Comparison of Measured PAH Concentrations at the Courtice Station

Contaminant	Units	*MECP Criteria*	*HHRA*	Maximum Concentration								Percentage of Criteria							
				2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020	2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020
1-Methylnaphthalene	ng/m³	*12000*	-	27.2	8.2		24.0	19.7	21.8	14.6	16.9	0.2%	0.1%		0.2%	0.2%	0.2%	0.1%	0.1%
2-Methylnaphthalene	ng/m³	*10000*	-	54.3	13.9		50.4	33.5	39.9	23.5	28.8	0.5%	0.1%		0.5%	0.3%	0.4%	0.2%	0.3%
Acenaphthene	ng/m³	-	-	38.7	11.8		29.6	17.0	20.2	10.1	14.3	-	-		-	-	-	-	-
Acenaphthylene	ng/m³	*3500*	-	1.1	0.4		0.3	0.8	0.6	0.5	1.6	0.03%	0.01%		0.01%	0.02%	0.02%	0.01%	0.05%
Anthracene	ng/m³	*200*	-	13.1	1.1		0.5	0.6	0.8	0.4	0.5	6.6%	0.6%		0.3%	0.3%	0.4%	0.2%	0.3%
Benzo(a)Anthracene	ng/m³	-	-	0.2	0.2		0.1	0.1	0.1	0.1	0.1	-	-		-	-	-	-	-
Benzo(a)fluorene	ng/m³	-	-	0.3	0.3		0.2	0.2	0.2	0.1	0.1	-	-		-	-	-	-	-
Benzo(a)Pyrene	ng/m³	*0.05[2]* *5[3]* *1.1[4]*	*1*	0.1	0.1		0.1	0.1	0.2	0.1	0.1	129.6%	264%		207%	176%	361%	197%	185%
Benzo(b)Fluoranthene	ng/m³	-	-	0.4	0.6		2.5	0.1	0.3	0.1	0.3	-	-		-	-	-	-	-
Benzo(b)fluorene	ng/m³	-	-	0.3	0.3		0.2	0.2	0.2	0.1	0.1	-	-		-	-	-	-	-
Benzo(e)Pyrene	ng/m³	-	-	0.3	0.3		0.2	0.2	0.2	0.1	0.2	-	-		-	-	-	-	-
Benzo(g,h,i)Perylene	ng/m³	-	-	0.4	0.3		2.5	0.1	0.1	0.1	0.2	-	-		-	-	-	-	-
Benzo(k)Fluoranthene	ng/m³	-	-	0.4	0.3	N/A	2.5	0.1	0.1	0.1	0.2	-	-	N/A	-	-	-	-	-
Biphenyl	ng/m³	-	-	14.9	4.5		11.1	9.7	10.1	5.0	8.6	-	-		-	-	-	-	-
Chrysene	ng/m³	-	-	0.2	0.5		0.2	0.1	0.3	0.2	0.4	-	-		-	-	-	-	-
Dibenzo(a,h)Anthracene	ng/m³	-	-	0.3	0.5		2.8	0.1	0.1	0.03	0.0	-	-		-	-	-	-	-
Fluoranthene	ng/m³	-	-	4.5	4.0		3.2	2.6	3.3	1.2	2.1	-	-		-	-	-	-	-
Fluorene	ng/m³	-	-	-	-		-	-	-	2.9	9.8	-	-		-	-	-	-	-
Indeno(1,2,3-cd)Pyrene	ng/m³	-	-	0.4	0.5		2.8	0.1	0.1	0.1	0.2	-	-		-	-	-	-	-
Naphthalene	ng/m³	*22500*	*22500*	143.0	38.7		60.9	92.2	77.8	48.1	67.1	0.6%	0.2%		0.3%	0.4%	0.3%	0.2%	0.3%
o-Terphenyl	ng/m³	-	-	0.3	0.3		0.2	0.2	0.2	0.02	0.0	-	-		-	-	-	-	-
Perylene	ng/m³	-	-	0.3	0.3		0.2	0.2	0.2	0.02	0.0	-	-		-	-	-	-	-
Phenanthrene	ng/m³	-	-	33.9	14.2		23.1	16.4	21.6	8.7	15.8	-	-		-	-	-	-	-
Pyrene	ng/m³	-	-	1.7	2.5		1.3	1.2	1.4	0.6	1.0	-	-		-	-	-	-	-
Tetralin	ng/m³	-	-	5.8	25.3		3.8	4.9	4.6	7.8	12.7	-	-		-	-	-	-	-
Total PAH[5]	ng/m³	-	-	327.0	95.0		208.7	200.0	203.6	117.9	170.2	-	-		-	-	-	-	-

Notes:
[1] 2013-2018 Q2 data taken from Stantec's 2017 Annual Report (Stantec, 2018) and Stantec's 2018 Q1 (Stantec, 2018a) and Q2 Reports (Stantec, 2018b)
[2] Ontario AAQC. The Standard for benzo(a)Pyrene (B(a)P) is for B(a)P as a surrogate for PAHs
[3] O.Reg. 419/05 Schedule 6 Upper Risk Thresholds
[4] O.Reg. 419/05 24 Hour Guideline
[5] The reported total PAH is the sum of all analysed PAH species

Table 20: 2013-2020 Comparison of Measured PAH Concentrations at the Rundle Road Station

Contaminant	Units	*MECP Criteria*	*HHRA*	Maximum Concentration								Percentage of Criteria							
				2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020	2013 [1]	2014 [1]	2015 [1]	2016 [1]	2017 [1]	2018[1]	2019	2020
1-Methylnaphthalene	ng/m³	*12000*	-	26.6	10.8		238.2	29.4	26.6	16.1	27.0	0.2%	0.1%		2.0%	0.2%	0.2%	0.1%	0.2%
2-Methylnaphthalene	ng/m³	*10000*	-	45.4	18.7		502.5	69.2	54.1	29.4	48.5	0.5%	0.2%		5.0%	0.7%	0.5%	0.3%	0.5%
Acenaphthene	ng/m³	-	-	18.9	8.1		303.2	44.1	40.4	18.0	26.9	-	-		-	-	-	-	-
Acenaphthylene	ng/m³	*3500*	-	1.6	2.0		3.3	1.2	0.6	0.6	0.6	0.1%	0.1%		0.1%		0.02%	0.02%	0.02%
Anthracene	ng/m³	*200*	-	1.5	0.7		7.5	3.1	2.6	1.9	2.1	0.8%	0.4%		3.8%		1.3%	0.9%	1.1%
Benzo(a)Anthracene	ng/m³	-	-	0.5	0.2		0.2	0.1	0.1	0.1	0.1	-	-		-	-			-
Benzo(a)fluorene	ng/m³	-	-	0.6	0.3		0.4	0.4	0.3	0.1	0.2	-	-						-
Benzo(a)Pyrene	ng/m³	*0.05[2]* *5[3]* *1.1[4]*	*1*	0.4	0.3		0.2	0.2	0.1	0.1	0.1	826%	576%		415%	316%	278%	221%	258.7%
Benzo(b)Fluoranthene	ng/m³	-	-	1.0	0.7		0.5	0.4	0.1	0.2	0.2	-	-		-	-	-	-	-
Benzo(b)fluorene	ng/m³	-	-	0.5	0.3		0.2	0.3	0.3	0.1	0.1	-	-		-	-	-	-	-
Benzo(e)Pyrene	ng/m³	-	-	0.5	0.3		0.2	0.3	0.3	0.1	0.1	-	-		-	-	-	-	-
Benzo(g,h,i)Perylene	ng/m³	-	-	0.6	0.3		0.1	0.1	0.1	0.1	0.1	-	-		-	-	-	-	-
Benzo(k)Fluoranthene	ng/m³	-	-	0.3	0.2	N/A	0.1	0.1	0.1	0.1	0.2	-	-	N/A	-	-	-	-	-
Biphenyl	ng/m³	-	-	7.4	5.8		125.9	14.2	13.2	5.5	19.3	-	-		-	-	-	-	-
Chrysene	ng/m³	-	-	0.9	0.7		0.4	0.1	0.2	0.2	0.3	-	-		-	-	-	-	-
Dibenzo(a,h)Anthracene	ng/m³	-	-	0.2	0.2		0.1	0.1	0.1	0.03	0.1	-	-		-	-	-	-	-
Fluoranthene	ng/m³	-	-	7.7	3.5		14.7	13.9	13.5	4.7	6.2	-	-		-	-	-	-	-
Fluorene	ng/m³	-	-	-	-		-	-	-	6.9	16.5	-	-		-	-	-	-	-
Indeno(1,2,3-cd)Pyrene	ng/m³	-	-	0.5	0.3		0.2	0.1	0.1	0.1	0.1	-	-		-	-	-	-	-
Naphthalene	ng/m³	*22500*	*22500*	94.1	92.6		294.6	85.4	74.2	53.7	104.7	0.4%	0.4%		1.3%	0.4%	0.3%	0.2%	0.5%
o-Terphenyl	ng/m³	-	-	0.5	0.3		0.2	0.3	0.3	0.02	0.0	-	-		-	-	-	-	-
Perylene	ng/m³	-	-	0.5	0.3		0.2	0.3	0.3	0.02	0.0	-	-		-	-	-	-	-
Phenanthrene	ng/m³	-	-	29.4	13.0		209.7	69.8	58.1	24.0	30.6	-	-		-	-	-	-	-
Pyrene	ng/m³	-	-	3.2	1.9		6.6	5.6	5.4	2.0	3.6	-	-		-	-	-	-	-
Tetralin	ng/m³	-	-	5.1	4.0		4.4	3.8	7.7	36.0	16.8	-	-		-	-	-	-	-
Total PAH[5]	ng/m³	-	-	165.0	153.9		1710.2	309.0	292.1	160.3	274.2	-	-		-	-	-	-	-

Notes: [1] 2013-2018 Q2 data taken from Stantec's 2017 Annual Report (Stantec, 2018) and Stantec's 2018 Q1 (Stantec, 2018a) and Q2 Reports (Stantec, 2018b)
[2] Ontario AAQC. The Standard for benzo(a)Pyrene (B(a)P) is for B(a)P as a surrogate for PAHs
[3] O.Reg. 419/05 Schedule 6 Upper Risk Thresholds
[4] O.Reg. 419/05 24 Hour Guideline
[5] The reported total PAH is the sum of all analysed PAH species

7.4 Dioxins and Furans Comparisons

The maximum measured ambient toxic equivalent Dioxins and Furans (D&F) concentrations from 2013 – 2020 and their specific measurement period for both Courtice and Rundle Road Monitoring Stations is presented in **Table 21**. As per Stantec's comment in the 2017 Annual Report, the 2013-2016 data should be reviewed with caution "as the measurement periods were different and cover different periods of each year (with different meteorological conditions). Only the 2017 measurements encompassed a full year as previous years sampling were dependent on the start-up date of the DYEC" (Stantec, 2018).

There was one (1) exceedance of the maximum measured toxic equivalent D&F concentration AAQC at the Courtice Monitoring Station in 2018, but none in 2013-2017 or 2019-2020. The maximum measured toxic equivalent D&F concentrations at the Rundle Road Station were all below the applicable AAQC from 2013-2020.

Table 21: 2013-2020 Comparison of Maximum Measured D&F Concentrations at the Courtice and Rundle Road Stations

Year	Sampling Period Throughout Year	Courtice Station		Rundle Road Station	
		Maximum Concentration (pg TEQ/m^3)	No. of Exceedances	Maximum Concentration (pg TEQ/m^3)	No. of Exceedances
2013 [1]	May - December	0.036	0	0.029	0
2014 [1]	January - June	0.038	0	0.065	0
2015 [1]	October - December	0.017	0	0.021	0
2016 [1]	February - December	0.044	0	0.026	0
2017 [1]	January – December	0.052	0	0.065	0
2018 [1]	January - December	0.109	1	0.091	0
2019	January - December	0.012	0	0.025	0
2020	January - December	0.025	0	0.030	0

Notes: [1] 2013-2018 Q2 data taken from Stantec's 2017 Annual Report (Stantec, 2018) and Stantec's 2018 Q1 (Stantec, 2018a) and Q2 Reports (Stantec, 2018b)

8 RECOMMENDATIONS

During Q1-2 of 2020, several PUF samples were invalidated due to insufficient sampling volumes for sampling D&F and PAH's. After attempting to replace the motors and troubleshooting different media to pinpoint the issue, it was discovered that this is a common issue for samplers utilizing the combined polyurethane foam and the resin media. After discussion with the ALS Laboratory Special Chemistries and Air Toxics Director, it was confirmed that due to the combined polyurethane foam and the resin media creating increased resistance, it would be difficult to consistently achieve a sample volume of greater than 300 m^3, which would mean that the EPA TO-9A expected sample volumes of 325-400 m^3 are unrealistic with the combined media. The ALS Laboratory Special Chemistries and Air Toxics Director has confirmed that they can get sufficient sample for the Ontario Ambient Air Quality Criteria for PCDD/F from PUF/Resin where there is approximately 250 m^3 of sample.

In discussions with the lab, the combined PUF/resin media is preferable for D&F and PAH capture and they can get sufficient sample from a sampled volume of greater than 250 m^3 for both D&F and PAHs. A reduction in sample volumes by 25% is more than offset by the greater capture efficiencies of the PUF/Resin cartridges. This is born out by the high surrogate recoveries in the samples. The slightly higher method detection limits caused by lower volumes are well below the AAQC values. The method is more conservative, particularly with the lighter PAH's, than using the higher volumes and lower capture efficiencies of straight PUF cartridges.

A memo issued January 5th 2020, was sent to the MECP with a response to their 2020 Q3 report comments on this topic.

A discussion should be initiated with the MECP regarding the sampling media. Upon agreement of any changes, the Ambient Air Monitoring Plan may be revised in accordance with Section 9.2.3 Revisions to the Ambient Monitoring Plan – Ambient Air Quality Monitoring Plan (Stantec, 2012).

9 CONCLUSIONS

The ambient air monitoring program at the DYEC for 2020 had nine (9) Benzo(a)pyrene daily average concentrations above the applicable AAQC at the Courtice and Rundle Road Monitoring Stations.

At the beginning of 2020, the SO_2 1-hour AAQC limit was reduced from 250 to 40 ppb. The ambient air monitoring program at the DYEC for 2020 had twenty-four (24) SO_2 1-hour average concentrations above the AAQC at the Courtice and Rundle Road Monitoring Stations. There were also thirty-three (33) exceedances of the rolling 10-minute average AAQC for SO_2 throughout 2020.

Throughout the 2020 year, there were a few minor issues with equipment failures and malfunctions. These were addressed as soon as they were identified, and preventive actions were put in place to prevent reoccurrences.

Data recovery was 86% or higher at each station for all contaminants, which exceeds the MECP's requirement of 75% of collected readings to be considered valid. The overall data recovery was 96.6% for the Courtice Monitoring Station and was 95.0% for the Rundle Road Monitoring Station.

10 REFERENCES

1. Jacques Whitford, (2009). Final Environmental Assessment, December 4, 2009.
2. Stantec Consulting Ltd., (2012). Ambient Air Quality Monitoring Plan, Durham York Residual Waste Study, May 8, 2012.
3. Stantec Consulting Ltd., (2018). 2017 Annual Ambient Air Quality Monitoring Report for the Durham York Energy Centre.
4. Stantec Consulting Ltd., (2018a). Quarterly Ambient Air Quality Monitoring Report for the Durham York Energy Centre – January to March 2018.
5. Stantec Consulting Ltd., (2018b). Quarterly Ambient Air Quality Monitoring Report for the Durham York Energy Centre – April to June 2018.

APPENDIX A

EPA Sampling Schedule 2020

Important Dates

Notes

3-Day schedule is shown in orange, green, and purple

6-Day schedule is shown in green and purple

12-Day schedule is shown in purple

January

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

February

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

March

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

April

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

May

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

June

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

July

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

August

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

September

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

October

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

November

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

December

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

APPENDIX B

Table B1: 2020 Monitoring Summary Results for $PM_{2.5}$ at Courtice Station

Data Statistics	Annual Arithmetic Mean	Maximum 1 hr Mean	Maximum Running 24 hr Mean	98th Percentile (24 hr Mean) [1]	Number of valid Hours	% valid data
Compound	$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$
	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)	No.	%
2020	5.9	45.1	28.6	17.0	8761	99.7

[1] - This value is the 98th percentile of daily average levels for the 2020 year.

Table B2: 2020 Monitoring Summary Results for $PM_{2.5}$ at Rundle Station

Data Statistics	Annual Arithmetic Mean	Maximum 1 hr Mean	Maximum Running 24 hr Mean	98^{th} Percentile (24 hr Mean) [1]	Number of valid Hours	% valid data
Compound	$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$
	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)	No.	%
2020	5.2	45.2	23.1	16.1	8757	99.7

[1] - This value is the 98th percentile of daily average levels for the 2020 year.

Table B3: 2020 Monitoring Summary Results for NOx at Courtice Station

Data Statistics	Events > 1 hr AAQC	Events > 24 hr AAQC	Annual Arithmetic Mean	Maximum 1 hr Mean	98th Percentile (Daily Max 1 hr Mean) [1]	Maximum Running 24 hr Mean	Number of valid Hours	% valid data
Compound	NO_x	NO_x	NO_x	NO_x	NO_x	NO_x	NO_x	NO_x
	No.	No.	(ppb)	(ppb)	(ppb)	(ppb)	No.	%
2020	75	N/A	5.6	95.1	56.9	38.3	8740	99.5

[1] - This value is the 98th percentile of daily maximum 1-hour average concentrations for the 2020 year.

Table B4: 2020 Monitoring Summary Results for NOx at Rundle Station

Data Statistics	Events > 1 hr AAQC	Events > 24 hr AAQC	Annual Arithmetic Mean	Maximum 1 hr Mean	98th Percentile (Daily Max 1 hr Mean) [1]	Maximum Running 24 hr Mean	Number of Valid Hours	% Valid Data
Compound	NO_x	NO_x	NO_x	NO_x	NO_x	NO_x	NO_x	NO_x
	No.	No.	(ppb)	(ppb)	(ppb)	(ppb)	No.	%
2020	8	N/A	4.6	66.3	36.5	22.1	8703	99.1

[1] - This value is the 98th percentile of daily maximum 1-hour average concentrations for the 2020 year.

Table B5: 2020 Monitoring Summary Results for NO at Courtice Station

Data Statistics	Events > 1 hr AAQC	Events > 24 hr AAQC	Annual Arithmetic Mean	Maximum 1 hr Mean	98th Percentile (Daily Max 1 hr Mean) [1]	Maximum Running 24 hr Mean	Number of valid Hours	% valid data
Compound	NO	NO	NO	NO	NO	NO	NO	NO
	No.	No.	(ppb)	(ppb)	(ppb)	(ppb)	No.	%
2020	6	N/A	1.1	57.3	29.7	15.6	8740	99.5

[1] - This value is the 98th percentile of daily maximum 1-hour average concentrations for the 2020 year.

Table B6: 2020 Monitoring Summary Results for NO at Rundle Station

Data Statistics	Events > 1 hr AAQC	Events > 24 hr AAQC	Annual Arithmetic Mean	Maximum 1 hr Mean	98th Percentile (Daily Max 1 hr Mean) [1]	Maximum Running 24 hr Mean	Number of valid Hours	% valid data
Compound	NO	NO	NO	NO	NO	NO	NO	NO
	No.	No.	(ppb)	(ppb)	(ppb)	(ppb)	No.	%
2020	0	N/A	0.8	31.7	18.1	5.0	8703	99.1

[1] - This value is the 98th percentile of daily maximum 1-hour average concentrations for the 2020 year.

Table B7: 2020 Monitoring Summary Results for NO_2 at Courtice Station

Data Statistics	Events > 1 hr AAQC	Events > 24 hr AAQC	Events > Annual CAAQS	Annual Arithmetic Mean	Maximum 1 hr Mean	98th Percentile (Daily Max 1 hr Mean) [2]	Maximum Running 24 hr Mean	Number of valid Hours	% valid data
Compound	NO_2	NO_2	NO_2	NO_2	NO_2	NO_2	NO_2	NO_2	NO_2
	No.	No.	No.	(ppb)	(ppb)	(ppb)	(ppb)	No.	%
2020	0	0	0	4.6	39.0	35.1	25.6	8740	99.5

[1] - This value is the 98th percentile of daily maximum 1-hour average concentrations for the 2020 year.

Table B8: 2020 Monitoring Summary Results for NO_2 at Rundle Station

Data Statistics	Events > 1 hr AAQC	Events > 24 hr AAQC	Events > Annual CAAQS	Annual Arithmetic Mean	Maximum 1 hr Mean	98th Percentile (Daily Max 1 hr Mean) [2]	Maximum Running 24 hr Mean	Number of valid Hours	% valid data
Compound	NO_2	NO_2	NO_2	NO_2	NO_2	NO_2	NO_2	NO_2	NO_2
	No.	No.	No.	(ppb)	(ppb)	(ppb)	(ppb)	No.	%
2020	0	0	0	3.9	35.2	23.5	17.2	8703	99.1

[1] - This value is the 98th percentile of daily maximum 1-hour average concentrations for the 2020 year.

Table B9: 2020 Monitoring Summary Results for SO_2 at Courtice Station

Data Statistics	Events > 1 hr AAQC	Events > 24 hr AAQC	Events > Annual AAQC	Events > Annual CAAQS	Annual Arithmetic Mean	Maximum 1 hr Mean	99th Percentile (Daily Max 1 hr Mean) [1]	Maximum Running 24 hr Mean	Number of valid Hours	% valid data
Compound	SO_2	SO_2	SO_2	SO_2	SO_2	SO_2	SO_2	SO_2	SO_2	SO_2
	No.	No.	No.	No.	(ppb)	(ppb)	(ppb)	(ppb)	No.	%
2020	16	0	0	0	1.4	67.2	51.6	21.4	8744	99.5

[1] - This value is the 99th percentile of daily maximum 1-hour average concentrations for the 2020 year.

Table B10: 2020 Monitoring Summary Results for SO_2 at Rundle Station

Data Statistics	Events > 1 hr AAQC	Events > 24 hr AAQC	Events > Annual AAQC	Events > Annual CAAQS	Annual Arithmetic Mean	Maximum 1 hr Mean	99th Percentile (Daily Max 1 hr Mean) [1]	Maximum Running 24 hr Mean	Number of valid Hours	% valid data
Compound	SO_2	SO_2	SO_2	SO_2	SO_2	SO_2	SO_2	SO_2	SO_2	SO_2
	No.	No.	No.	No.	(ppb)	(ppb)	(ppb)	(ppb)	No.	%
2020	3	0	0	0	0.4	59.7	35.8	6.7	8744	99.5

[1] - This value is the 99th percentile of daily maximum 1-hour average concentrations for the 2020 year.

APPENDIX C

Table C1: 2020 Courtice Station Monitoring Results for TSP and Metals

DYEC AAQM Courtice Station Monitoring Results for Total Suspended Particulate and Metals												
Contaminant	Units	AAQC	HHRA Health Based Criteria	AAQC ($\mu g/m^3$)	HHRA ($\mu g/m^3$)	No. > AAQC	Geometric Mean	Arithmetic Mean	Maximum Concentration	Minimum Concentration	Number of Valid Samples	% Valid data
Particulate (TSP)	$\mu g/m^3$	*120*	*120*	120	120	0	18.8	22.4	69.7	4.9	60	98.4
Total Mercury (Hg)	$\mu g/m^3$	*2*	*2*	2	2	0	8.16E-06	1.05E-05	4.00E-05	2.83E-06	60	98.4
Aluminum (Al)	$\mu g/m^3$	*4.8*	-	4.8	-	0	1.01E-01	1.36E-01	5.00E-01	1.17E-02	60	98.4
Antimony (Sb)	$\mu g/m^3$	*25*	*25*	25	25	0	6.40E-04	7.83E-04	4.06E-03	1.92E-04	60	98.4
Arsenic (As)	$\mu g/m^3$	*0.3*	*0.3*	0.3	0.3	0	9.69E-04	1.02E-03	3.28E-03	8.47E-04	60	98.4
Barium (Ba)	$\mu g/m^3$	*10*	*10*	10	10	0	4.94E-03	5.79E-03	1.55E-02	1.80E-03	60	98.4
Beryllium (Be)	$\mu g/m^3$	*0.01*	*0.01*	0.01	0.01	0	3.02E-05	3.02E-05	3.26E-05	2.82E-05	60	98.4
Bismuth (Bi)	$\mu g/m^3$	-	-	-	-	-	5.43E-04	5.43E-04	5.86E-04	5.08E-04	60	98.4
Boron (B)	$\mu g/m^3$	*120*	-	120	-	0	1.21E-02	1.21E-02	1.30E-02	1.13E-02	60	98.4
Cadmium (Cd)	$\mu g/m^3$	*0.025*	*0.025*	0.025	0.025	0	6.35E-04	6.98E-04	5.45E-03	5.65E-04	60	98.4
Chromium (Cr)	$\mu g/m^3$	*0.5*	-	0.5	-	0	1.91E-03	2.10E-03	4.64E-03	1.41E-03	60	98.4
Cobalt (Co)	$\mu g/m^3$	*0.1*	*0.1*	0.1	0.1	0	6.03E-04	6.04E-04	6.51E-04	5.65E-04	60	98.4
Copper (Cu)	$\mu g/m^3$	*50*	-	50	-	0	1.26E-02	1.53E-02	4.70E-02	3.54E-03	60	98.4
Iron (Fe)	$\mu g/m^3$	*4*	-	4	-	0	3.01E-01	3.66E-01	1.26E+00	8.35E-02	60	98.4
Lead (Pb)	$\mu g/m^3$	*0.5*	*0.5*	0.5	0.5	0	1.91E-03	2.24E-03	7.81E-03	8.48E-04	60	98.4
Magnesium (Mg)	$\mu g/m^3$	-	-	-	-	-	1.69E-01	2.11E-01	8.98E-01	2.93E-02	60	98.4
Manganese (Mn)	$\mu g/m^3$	*0.4*	-	0.4	-	0	8.13E-03	9.96E-03	3.69E-02	1.98E-03	60	98.4
Molybdenum (Mo)	$\mu g/m^3$	*120*	-	120	-	0	5.82E-04	7.28E-04	3.01E-03	2.82E-04	60	98.4
Nickel (Ni)	$\mu g/m^3$	*0.2*	-	0.2	-	0	1.07E-03	1.14E-03	2.95E-03	8.47E-04	60	98.4
Phosphorus (P)	$\mu g/m^3$	-	-	-	-	-	2.52E-01	2.74E-01	1.36E+00	2.12E-01	60	98.4
Selenium (Se)	$\mu g/m^3$	*10*	*10*	10	10	0	3.02E-03	3.02E-03	3.26E-03	2.82E-03	60	98.4
Silver (Ag)	$\mu g/m^3$	*1*	*1*	1	1	0	3.02E-04	3.02E-04	3.26E-04	2.82E-04	60	98.4
Strontium (Sr)	$\mu g/m^3$	*120*	-	120	-	0	3.71E-03	4.90E-03	2.08E-02	8.77E-04	60	98.4
Thallium (Tl)	$\mu g/m^3$	-	-	-	-	-	2.72E-05	2.72E-05	2.93E-05	2.54E-05	60	98.4
Tin (Sn)	$\mu g/m^3$	*10*	*10*	10	10	0	6.82E-04	7.85E-04	2.47E-03	2.88E-04	60	98.4
Titanium (Ti)	$\mu g/m^3$	*120*	-	120	-	0	5.61E-03	7.17E-03	3.10E-02	3.11E-03	60	98.4
Uranium (Ur)	$\mu g/m^3$	*0.3*	-	0.3	-	0	3.06E-05	3.08E-05	6.97E-05	2.82E-05	60	98.4
Vanadium (V)	$\mu g/m^3$	*2*	*1*	2	1	0	1.51E-03	1.51E-03	1.63E-03	1.41E-03	60	98.4
Zinc (Zn)	$\mu g/m^3$	*120*	-	120	-	0	2.81E-02	3.30E-02	9.38E-02	8.44E-03	60	98.4
Zirconium (Zr)	$\mu g/m^3$	*20*	-	20	-	0	6.21E-04	6.50E-04	3.33E-03	5.65E-04	60	98.4

NOTE: All non-detectable results were reported as 1/2 of the detection limit

Table C2: 2020 Rundle Station Monitoring Results for TSP and Metals

DYEC AAQM Rundle Station Monitoring Results for Total Suspended Particulate and Metals												
Contaminant	Units	AAQC	HHRA Health Based Criteria	AAQC Criteria (µg/m^3)	HHRA (µg/m^3)	No. > AAQC	Geometric Mean	Arithmetic Mean	Maximum Concentration	Minimum Concentration	Number of Valid Samples	% Valid data
Particulate (TSP)	µg/m^3	*120*	*120*	120	120	0	21.1	24.4	102.3	6.5	55	90.2
Total Mercury (Hg)	µg/m^3	*2*	*2*	2	2	0	6.97E-06	9.82E-06	4.40E-05	2.85E-06	55	90.2
Aluminum (Al)	µg/m^3	*4.8*	-	4.8	-	0	1.12E-01	1.52E-01	1.19E+00	1.18E-02	55	90.2
Antimony (Sb)	µg/m^3	*25*	*25*	25	25	0	5.00E-04	6.05E-04	1.53E-03	7.65E-05	55	90.2
Arsenic (As)	µg/m^3	*0.3*	*0.3*	0.3	0.3	0	1.09E-03	1.35E-03	1.11E-02	8.46E-04	55	90.2
Barium (Ba)	µg/m^3	*10*	*10*	10	10	0	5.10E-03	6.17E-03	1.97E-02	1.55E-03	55	90.2
Beryllium (Be)	µg/m^3	*0.01*	*0.01*	0.01	0.01	0	3.01E-05	3.02E-05	3.37E-05	2.82E-05	55	90.2
Bismuth (Bi)	µg/m^3	-	-	-	-	-	5.43E-04	5.43E-04	6.07E-04	5.08E-04	55	90.2
Boron (B)	µg/m^3	*120*	-	120	-	0	1.21E-02	1.21E-02	1.35E-02	1.13E-02	55	90.2
Cadmium (Cd)	µg/m^3	*0.025*	*0.025*	0.025	0.025	0	6.23E-04	6.57E-04	3.55E-03	5.64E-04	55	90.2
Chromium (Cr)	µg/m^3	*0.5*	-	0.5	-	0	1.95E-03	2.17E-03	5.08E-03	1.41E-03	55	90.2
Cobalt (Co)	µg/m^3	*0.1*	*0.1*	0.1	0.1	0	6.11E-04	6.15E-04	1.27E-03	5.64E-04	55	90.2
Copper (Cu)	µg/m^3	*50*	-	50	-	0	2.17E-02	2.72E-02	7.30E-02	6.38E-03	55	90.2
Iron (Fe)	µg/m^3	*4*	-	4	-	0	2.99E-01	3.76E-01	2.00E+00	6.60E-02	55	90.2
Lead (Pb)	µg/m^3	*0.5*	*0.5*	0.5	0.5	0	1.62E-03	1.99E-03	5.93E-03	8.63E-04	55	90.2
Magnesium (Mg)	µg/m^3	-	-	-	-	-	1.72E-01	2.12E-01	9.86E-01	2.93E-02	55	90.2
Manganese (Mn)	µg/m^3	*0.4*	-	0.4	-	0	8.39E-03	1.04E-02	3.68E-02	1.53E-03	55	90.2
Molybdenum (Mo)	µg/m^3	*120*	-	120	-	0	9.47E-04	1.14E-03	2.90E-03	2.90E-04	55	90.2
Nickel (Ni)	µg/m^3	*0.2*	-	0.2	-	0	1.08E-03	1.17E-03	3.02E-03	8.46E-04	55	90.2
Phosphorus (P)	µg/m^3	-	-	-	-	-	2.49E-01	2.63E-01	6.77E-01	2.12E-01	55	90.2
Selenium (Se)	µg/m^3	*10*	*10*	10	10	0	3.01E-03	3.02E-03	3.37E-03	2.82E-03	55	90.2
Silver (Ag)	µg/m^3	*1*	*1*	1	1	0	3.01E-04	3.02E-04	3.37E-04	2.82E-04	55	90.2
Strontium (Sr)	µg/m^3	*120*	-	120	-	0	4.26E-03	5.46E-03	4.07E-02	8.79E-04	55	90.2
Thallium (Tl)	µg/m^3	-	-	-	-	-	2.71E-05	2.72E-05	3.03E-05	2.54E-05	55	90.2
Tin (Sn)	µg/m^3	*10*	*10*	10	10	0	6.39E-04	8.23E-04	2.97E-03	2.85E-04	55	90.2
Titanium (Ti)	µg/m^3	*120*	-	120	-	0	6.10E-03	8.18E-03	7.13E-02	3.10E-03	55	90.2
Uranium (Ur)	µg/m^3	*0.3*	-	0.3	-	0	3.10E-05	3.22E-05	1.43E-04	2.82E-05	55	90.2
Vanadium (V)	µg/m^3	*2*	*1*	2	1	0	1.51E-03	1.51E-03	1.69E-03	1.41E-03	55	90.2
Zinc (Zn)	µg/m^3	*120*	-	120	-	0	1.97E-02	2.55E-02	1.05E-01	5.34E-03	55	90.2
Zirconium (Zr)	µg/m^3	*20*	-	20	-	0	6.12E-04	6.18E-04	1.43E-03	5.64E-04	55	90.2

NOTE: All non-detectable results were reported as 1/2 of the detection limit

Table C3: 2020 Courtice Station Monitoring Results for PAHs

DYEC AAQM Courtice Station Monitoring Results for Polycyclic Aromatic Hydrocarbons										
Contaminant	Units	*AAQC*	*HHRA Health Based Criteria*	AAQC ($\mu g/m^3$)	HHRA ($\mu g/m^3$)	No. > AAQC	Arithmetic Mean	Maximum Concentration	Number of Valid Samples	% Valid data
1-Methylnaphthalene	ng/m^3	*12000*	-	12000	-	0	4.72E+00	1.69E+01	27	90.0
2-Methylnaphthalene	ng/m^3	*10000*	-	10000	-	0	7.37E+00	2.88E+01	27	90.0
Acenaphthene	ng/m^3	-	-	-	-	-	2.98E+00	1.43E+01	27	90.0
Acenaphthylene	ng/m^3	*3500*	-	3500	-	0	2.04E-01	1.62E+00	27	90.0
Anthracene	ng/m^3	*200*	-	200	-	0	1.40E-01	5.13E-01	27	90.0
Benzo(a)Anthracene	ng/m^3	-	-	-	-	-	2.20E-02	9.46E-02	27	90.0
Benzo(a)fluorene	ng/m^3	-	-	-	-	-	4.13E-02	1.26E-01	27	90.0
Benzo(a)Pyrene	ng/m^3	*0.05 [1]* *5 [2]* *1.1 [3]*	*1*	0.05	1	4	2.92E-02	9.24E-02	27	90.0
Benzo(b)Fluoranthene	ng/m^3	-	-	-	-	-	6.26E-02	2.82E-01	27	90.0
Benzo(b)fluorene	ng/m^3	-	-	-	-	-	2.87E-02	9.94E-02	27	90.0
Benzo(e)Pyrene	ng/m^3	-	-	-	-	-	4.05E-02	1.97E-01	27	90.0
Benzo(g,h,i)Perylene	ng/m^3	-	-	-	-	-	4.18E-02	2.00E-01	27	90.0
Benzo(k)Fluoranthene	ng/m^3	-	-	-	-	-	5.09E-02	2.15E-01	27	90.0
Biphenyl	ng/m^3	-	-	-	-	-	2.37E+00	8.65E+00	27	90.0
Chrysene	ng/m^3	-	-	-	-	-	9.61E-02	4.10E-01	27	90.0
Dibenzo(a,h)Anthracene	ng/m^3	-	-	-	-	-	7.19E-03	4.61E-02	27	90.0
Fluoranthene	ng/m^3	-	-	-	-	-	6.72E-01	2.07E+00	27	90.0
Fluorene	ng/m^3	-	-	-	-	-	2.22E+00	9.85E+00	26	86.7
Indeno(1,2,3-cd)Pyrene	ng/m^3	-	-	-	-	-	4.54E-02	1.94E-01	27	90.0
Naphthalene	ng/m^3	*22500*	*22500*	22500	22500	0	2.62E+01	6.71E+01	27	90.0
o-Terphenyl	ng/m^3	-	-	-	-	-	1.26E-02	3.44E-02	27	90.0
Perylene	ng/m^3	-	-	-	-	-	3.50E-03	1.84E-02	27	90.0
Phenanthrene	ng/m^3	-	-	-	-	-	3.50E+00	1.58E+01	27	90.0
Pyrene	ng/m^3	-	-	-	-	-	3.58E-01	1.05E+00	27	90.0
Tetralin	ng/m^3	-	-	-	-	-	3.28E+00	1.27E+01	27	90.0
Total PAH[4]	ng/m^3	-	-	-	-	-	5.44E+01	1.70E+02	27	90.0

NOTE: All non-detectable results were reported as 1/2 of the detection limit

[1] AAQC

[2] O. Reg. 419/05 Schedule Upper Risk Thesholds

[3] O. Reg. 419/05 24 Hour Guideline

[4] Total PAH sums all PAH contaminants

Table C4: 2020 Rundle Station Monitoring Results for PAHs

DYEC AAQM Rundle Station Monitoring Results for Polycyclic Aromatic Hydrocarbons										
Contaminant	Units	AAQC	HHRA Health Based Criteria	AAQC Criteria ($\mu g/m^3$)	HHRA (µg/m3)	No. > AAQC	Arithmetic Mean	Maximum Concentration	Number of Valid Samples	% Valid data
1-Methylnaphthalene	ng/m^3	*12000*	-	12000	-	0	6.58E+00	2.70E+01	26	86.7
2-Methylnaphthalene	ng/m^3	*10000*	-	10000	-	0	1.09E+01	4.85E+01	26	86.7
Acenaphthene	ng/m^3	-	-	-	-	-	5.34E+00	2.69E+01	26	86.7
Acenaphthylene	ng/m^3	*3500*	-	3500	-	0	1.83E-01	5.54E-01	26	86.7
Anthracene	ng/m^3	*200*	-	200	-	0	4.34E-01	2.12E+00	26	86.7
Benzo(a)Anthracene	ng/m^3	-	-	-	-	-	2.49E-02	1.13E-01	26	86.7
Benzo(a)fluorene	ng/m^3	-	-	-	-	-	5.72E-02	2.32E-01	26	86.7
Benzo(a)Pyrene	ng/m^3	*0.05 [1]* *5 [2]* *1.1 [3]*	*1*	0.05	1	5	3.26E-02	1.29E-01	26	86.7
Benzo(b)Fluoranthene	ng/m^3	-	-	-	-	-	6.97E-02	1.78E-01	26	86.7
Benzo(b)fluorene	ng/m^3	-	-	-	-	-	3.73E-02	1.25E-01	26	86.7
Benzo(e)Pyrene	ng/m^3	-	-	-	-	-	4.02E-02	1.38E-01	26	86.7
Benzo(g,h,i)Perylene	ng/m^3	-	-	-	-	-	4.45E-02	1.07E-01	26	86.7
Benzo(k)Fluoranthene	ng/m^3	-	-	-	-	-	5.87E-02	1.89E-01	26	86.7
Biphenyl	ng/m^3	-	-	-	-	-	3.78E+00	1.93E+01	26	86.7
Chrysene	ng/m^3	-	-	-	-	-	1.16E-01	3.04E-01	26	86.7
Dibenzo(a,h)Anthracene	ng/m^3	-	-	-	-	-	9.23E-03	1.16E-01	26	86.7
Fluoranthene	ng/m^3	-	-	-	-	-	1.54E+00	6.18E+00	26	86.7
Fluorene	ng/m^3	-	-	-	-	-	3.93E+00	1.65E+01	26	86.7
Indeno(1,2,3-cd)Pyrene	ng/m^3	-	-	-	-	-	4.88E-02	1.37E-01	26	86.7
Naphthalene	ng/m^3	*22500*	*22500*	22500	22500	0	3.04E+01	1.05E+02	26	86.7
o-Terphenyl	ng/m^3	-	-	-	-	-	1.38E-02	3.98E-02	26	86.7
Perylene	ng/m^3	-	-	-	-	-	3.71E-03	1.47E-02	26	86.7
Phenanthrene	ng/m^3	-	-	-	-	-	7.35E+00	3.06E+01	26	86.7
Pyrene	ng/m^3	-	-	-	-	-	7.66E-01	3.60E+00	26	86.7
Tetralin	ng/m3	-	-	-	-	-	4.30E+00	1.68E+01	26	86.7
Total PAH[4]	ng/m^3	-	-	-	-	-	7.60E+01	2.74E+02	26	86.7

NOTE: All non-detectable results were reported as 1/2 of the detection limit
[1] AAQC
[2] O. Reg. 419/05 Schedule Upper Risk Thesholds
[3] O. Reg. 419/05 24 Hour Guideline
[4] Total PAH sums all PAH contaminants

Table C5: 2020 Courtice Station Monitoring Results for Dioxins & Furans

DYEC AAQM									
Courtice Station Monitoring Results for Dioxins & Furans									
Contaminant	Units	AAQC	HHRA Health Based Criteria	AACQ Criteria ($\mu g/m^3$)	No. > AAQC	Arithmetic Mean	Maximum Concentration	Number of Valid Samples	% Valid data
2,3,7,8-TCDD	pg/m^3	-	-	-	-	1.21E-03	2.79E-03	13	86.7
1,2,3,7,8-PeCDD	pg/m^3	-	-	-	-	2.07E-03	1.20E-02	13	86.7
1,2,3,4,7,8-HxCDD	pg/m^3	-	-	-	-	1.50E-04	5.36E-04	13	86.7
1,2,3,6,7,8-HxCDD	pg/m^3	-	-	-	-	4.22E-04	2.32E-03	13	86.7
1,2,3,7,8,9-HxCDD	pg/m^3	-	-	-	-	3.23E-04	1.28E-03	13	86.7
1,2,3,4,6,7,8-HpCDD	pg/m^3	-	-	-	-	6.86E-04	3.82E-03	13	86.7
OCDD	pg/m^3	-	-	-	-	8.86E-05	3.12E-04	13	86.7
2,3,7,8-TCDF	pg/m^3	-	-	-	-	1.24E-04	2.51E-04	13	86.7
1,2,3,7,8-PeCDF	pg/m^3	-	-	-	-	3.42E-05	6.62E-05	13	86.7
2,3,4,7,8-PeCDF	pg/m^3	-	-	-	-	4.69E-04	1.26E-03	13	86.7
1,2,3,4,7,8-HxCDF	pg/m^3	-	-	-	-	1.36E-04	4.29E-04	13	86.7
1,2,3,6,7,8-HxCDF	pg/m^3	-	-	-	-	1.53E-04	4.47E-04	13	86.7
2,3,4,6,7,8-HxCDF	pg/m^3	-	-	-	-	2.57E-04	8.17E-04	13	86.7
1,2,3,7,8,9-HxCDF	pg/m^3	-	-	-	-	1.98E-04	5.23E-04	13	86.7
1,2,3,4,6,7,8-HpCDF	pg/m^3	-	-	-	-	7.25E-05	1.70E-04	13	86.7
1,2,3,4,7,8,9-HpCDF	pg/m^3	-	-	-	-	2.05E-05	5.39E-05	13	86.7
OCDF	pg/m^3	-	-	-	-	5.17E-06	1.28E-05	13	86.7
Total Toxic Equivalency	pg TEQ/m^3	0.1 1[1]	-	0.1	0	6.42E-03	2.54E-02	13	86.7

NOTE: All non-detectable results were reported as 1/2 of the detection limit

[1] O. Reg. 419/05 Schedule Upper Risk Thresholds

Table C6: 2020 Rundle Station Monitoring Results for Dioxins & Furans

DYEC AAQM									
Rundle Station Monitoring Results for Dioxins & Furans									
Contaminant	Units	*AAQC*	*HHRA Health Based Criteria*	AAQC (µg/m^3)	No. > AAQC	Arithmetic Mean	Maximum Concentration	Number of Valid Samples	% Valid data
2,3,7,8-TCDD	pg/m^3	-	-	-	-	1.48E-03	6.04E-03	13	86.7
1,2,3,7,8-PeCDD	pg/m^3	-	-	-	-	1.86E-03	6.49E-03	13	86.7
1,2,3,4,7,8-HxCDD	pg/m^3	-	-	-	-	4.46E-04	3.16E-03	13	86.7
1,2,3,6,7,8-HxCDD	pg/m^3	-	-	-	-	4.45E-04	2.85E-03	13	86.7
1,2,3,7,8,9-HxCDD	pg/m^3	-	-	-	-	5.28E-04	3.01E-03	13	86.7
1,2,3,4,6,7,8-HpCDD	pg/m^3	-	-	-	-	5.53E-04	2.06E-03	13	86.7
OCDD	pg/m^3	-	-	-	-	9.69E-05	4.89E-04	13	86.7
2,3,7,8-TCDF	pg/m^3	-	-	-	-	1.31E-04	4.59E-04	13	86.7
1,2,3,7,8-PeCDF	pg/m^3	-	-	-	-	5.01E-05	1.52E-04	13	86.7
2,3,4,7,8-PeCDF	pg/m^3	-	-	-	-	5.86E-04	2.18E-03	13	86.7
1,2,3,4,7,8-HxCDF	pg/m^3	-	-	-	-	2.00E-04	8.54E-04	13	86.7
1,2,3,6,7,8-HxCDF	pg/m^3	-	-	-	-	1.97E-04	8.07E-04	13	86.7
2,3,4,6,7,8-HxCDF	pg/m^3	-	-	-	-	2.99E-04	2.17E-03	13	86.7
1,2,3,7,8,9-HxCDF	pg/m^3	-	-	-	-	2.60E-04	1.03E-03	13	86.7
1,2,3,4,6,7,8-HpCDF	pg/m^3	-	-	-	-	7.61E-05	2.06E-04	13	86.7
1,2,3,4,7,8,9-HpCDF	pg/m^3	-	-	-	-	2.61E-05	1.58E-04	13	86.7
OCDF	pg/m^3	-	-	-	-	4.57E-06	1.66E-05	13	86.7
Total Toxic Equivalency	pg TEQ/m^3	*0.1* *1 [1]*	-	0.1	0	7.24E-03	3.04E-02	13	86.7

NOTE: All non-detectable results were reported as 1/2 of the detection limit

[1] O. Reg. 419/05 Schedule Upper Risk Thresholds