APPENDIX A

Ambient Air Quality

Table of Contents

List of Tables

List of Figures

1.0 AVAILABLE AMBIENT MONITORING DATA

Ambient air quality monitoring was initiated Jacques Whitford Limited and GENIVAR Ontario Inc. in the vicinity of the proposed Project site in September 2007. The ambient monitoring program at this location continued until the end of December 2008.

The monitoring station was located on the west side of Courtice Road, approximately 1.5 km south of Highway 401, and within the fenced area of the project office for the Courtice water pollution control plant. The monitoring station was located approximately 2 km southwest from the proposed Project site. Figures A1-1 and A1-2 show the location and a photo of the monitoring station. The selection of the site for the monitoring station was done in consultation with Region of Durham/York representatives. The distance from source to the location of the Courtice Road monitoring station is representative of neighbourhood scales (0.5 – 4 km) that are used for monitoring of background concentration levels. The siting criteria used for the monitoring station is based on the Ontario Ministry of the Environment's (MOE) Operations Manual for Air Quality Monitoring in Ontario (MOE, 2008c) which is based on the US Code of Federal Regulations as well as the Environment Canada document entitled National Air Pollution Surveillance Network Quality Assurance and Control Guidelines. Details of monitoring station siting requirements are presented in the "Final Report on Ambient Air Monitoring at the Courtice Road Site" dated June, 2009 (Jacques Whitford Limited and GENIVAR Ontario Inc., 2009).

The purpose of the monitoring program was to develop a long-term ambient data set to develop suitable background ambient concentrations for use in the Environmental Assessment, Air Quality permitting, and Human Health and Ecological Risk Assessment. Details of the methodologies, analyses and results of the monitoring program are presented in the "Final Report on Ambient Air Monitoring at the Courtice Road Site" (Jacques Whitford Limited and GENIVAR Ontario Inc., 2009).

The ambient concentration of the following Criteria Air Contaminants (CACs) (which are common air pollutants with known human health and environmental effects) were measured at the Courtice Road monitoring station:

- Sulphur Dioxide (SO_2);
- Nitrogen Dioxide (NO_2);
- Carbon Monoxide (CO);
- Ozone (O_3); and,
- Particulate Matter smaller than 2.5 microns ($PM_{2.5}$).

Wind speed, wind direction, and temperature were also measured at a 10 m height.

On December 26, 2007, hi-volume air samplers were installed at the Courtice Road monitoring station to measure:

- Total Suspended Particulate (TSP) and metals;
- Polycyclic Aromatic Hydrocarbons (PAHs); and,
- Dioxins and Furans.

Air quality measurements of the air contaminants monitored at the Courtice Station are summarized in Section 2 of this appendix. In addition to the ambient monitoring data collected at the Courtice Road station, monitoring stations operated under the National Air Pollution Surveillance (NAPS) network were used to characterize regional air quality and to develop background concentration levels for volatile organic compounds (VOCs), chlorinated monocyclic aromatics (CMAs), and Polychlorinated Biphenyls (PCB). Regional air quality of these contaminants is discussed in Section 3. Background concentrations developed from the monitoring program are presented in Section 4.

Ambient air quality in Clarington is influenced by emissions from local industrial sources, vehicular traffic as well as longer range transport of secondary contaminants such as O_3 and fine particulates. Meteorology and climatology also play an important role in air contaminant formation, dispersion and transport.

Figure A1-1 Courtice Road Monitoring Site Location

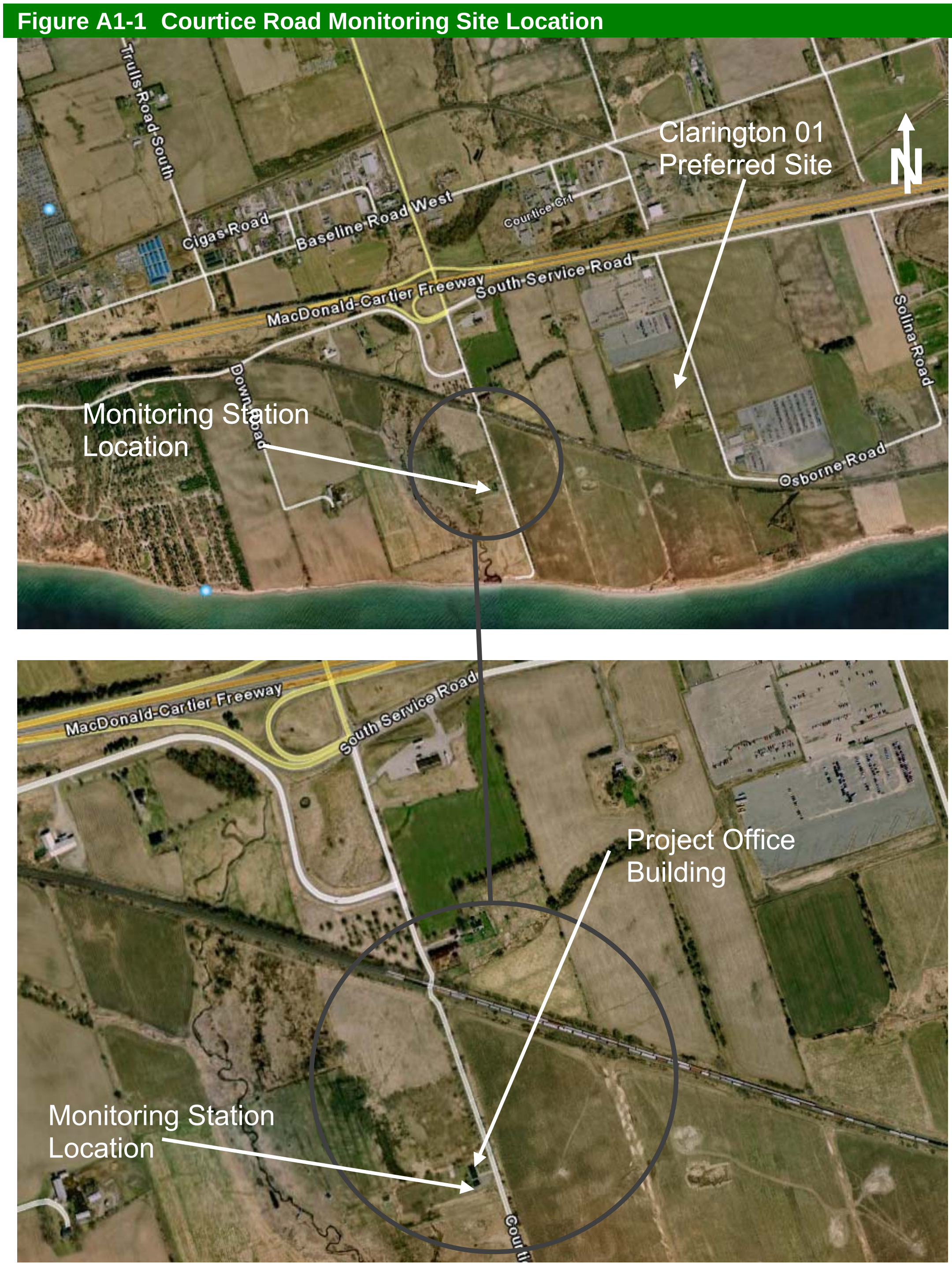


Figure A1-2 View of the Courtice Road Ambient Monitoring Station (Looking South-West)

2.0 SUMMARY OF SITE SPECIFIC AMBIENT MONITORING DATA

The following section provides a review of the ambient monitoring data collected at the Courtice Road station. The ambient monitoring results were compared with data collected at monitoring stations operated by the MOE at selected cities in Ontario in order to compare the air quality in the vicinity of the proposed Project with other regions. The following air quality discussion is grouped by compound. Detailed descriptions of the methodologies, analyses and results of the Courtice Road station monitoring program for each substance is presented in the report “Final Report on Ambient Air Monitoring at the Courtice Road Site” (Jacques Whitford Limited and GENIVAR Ontario Inc., 2009).

During May/June and July 2008, measured NO_2 concentrations exceeding the hourly and daily AAQCs on several occasions were noted in an interim report on the ambient monitoring dated October 1, 2008 (Jacques Whitford Limited and GENIVAR Ontario Inc., 2008a). The reason for these high levels was initially unclear and further investigation was undertaken to validate these measurements, as was committed to be undertaken in the interim report. A review of the monitoring station operational logs and internal shelter temperature measurements revealed that during these time periods the climate control system in the equipment shelter failed and temperatures in the shelter increased outside the normal operating range of the instrumentation. As the ambient monitoring equipment is sensitive to fluctuations in temperature, the data for all monitors during the times the climate control malfunction were invalidated, and excluded from the analysis on the following sub-sections.

2.1 Sulphur Dioxide

Sulphur dioxide is a colourless gas with a distinctive pungent sulphur odour at high concentrations. It is produced in combustion processes by the oxidation of sulphur in fuel. At high concentrations, SO_2 can have negative effects on human and animal health, specifically on the respiratory systems. With respect to plants, brief, high exposures to SO_2 can cause foliar injury. Prolonged moderate exposures can have negative effects on ecosystems. Sulphur dioxide can also be further oxidized and may combine with water to form the sulphuric acid component of “acid rain.”

Anthropogenic emissions comprise approximately 95 percent of global atmospheric SO_2. The largest anthropogenic contributor to atmospheric SO_2 is the industrial and utility use of heavy oils and coal. Oxidation of reduced sulphur compounds emitted by ocean surfaces accounts for nearly all biogenic emissions. Volcanic activity accounts for much of the remainder. Motor vehicles are minor contributors to the SO_2 content of the atmosphere (Wayne, 1991), particularly with recent reductions in the allowable sulphur content of gasoline and diesel fuel.

2.1.1 Summary of Courtice Road Monitoring Station Measurements

A summary of the maximum, minimum, median and standard deviation SO_2 concentration measured at the station is presented in Table A2-1. Also presented in this table is the applicable air quality criteria, maximum percentage and of number of exceedances of the air quality criteria.

The maximum hourly, 24-hour and annual average concentrations measured at the station were 115, 63 and 6 µg/m^3 respectively which are 17%, 23% and 11% of the applicable ambient air quality criteria.

Table A2-1 Summary of Ambient SO_2 Measurements (µg/m^3)

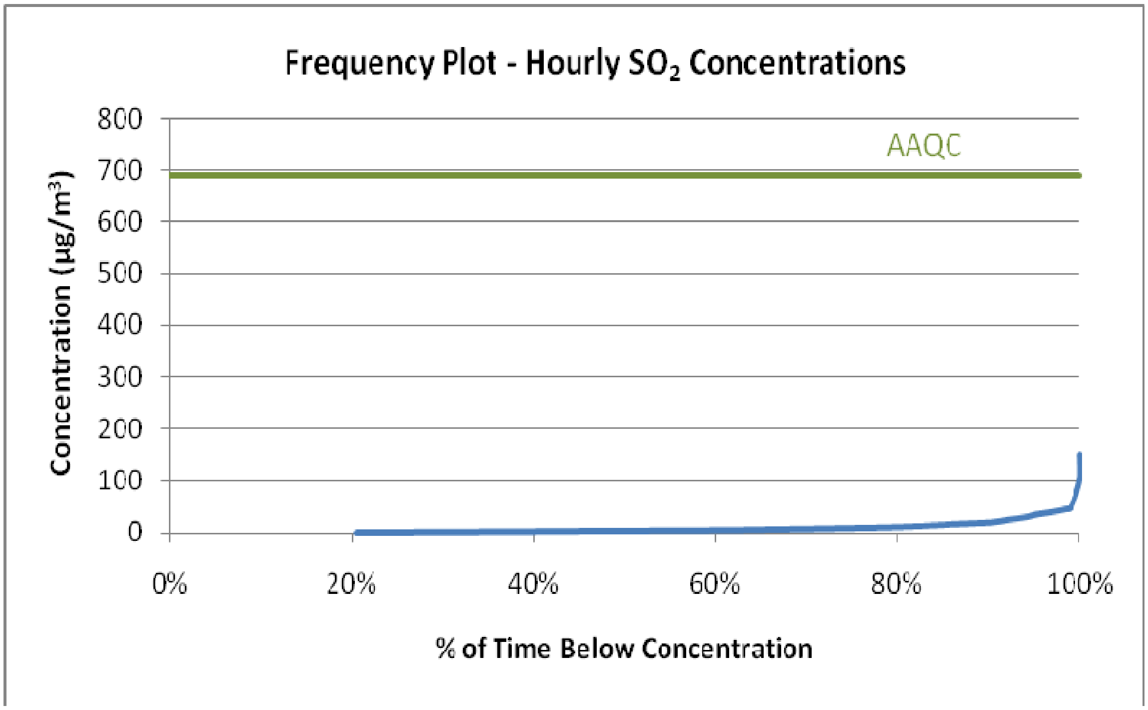
Averaging Period	AAQC (1)		Value
1	690	Maximum	114.8
		Minimum	0.0
		Median	3.5
		Standard Deviation	10.9
		# of Exceedances	0
24	275	Maximum	62.6
		Minimum	0.0
		Median	3.7
		Standard Deviation	10.7
		# of Exceedances	0
Annual	55	Average	6
		# of Exceedances	0

Notes:
1 – MOE ambient air quality criteria unless otherwise noted.

Frequency distribution plots of hourly and daily SO_2 concentrations measured at the Courtice Road monitoring site are presented in Figure A2-1. In these plots the percentage of time that the measured SO_2 concentration was below a given level is presented. For hourly and daily averages, the Ontario Ministry of the Environment (MOE) ambient air quality criteria (AAQC) of 690 µg/m^3 and 275 µg/m^3 are shown as green lines on each of the frequency plots. As shown in these figures, measured ambient SO_2 concentrations at the Courtice station were well below these criteria. Hourly SO_2 concentrations above 100 µg/m^3 occurred less than 0.05% of the time during the monitoring period, and daily SO_2 concentrations above 50 µg/m^3 occurred less than 1% of the time.

A summary of hourly and daily SO_2 concentration percentiles (from 10% to 99.5%) are presented in Table A2-2. The 99th percentiles for hourly and daily SO_2 concentrations are 50 and 47 µg/m^3 respectively, which are less than 18% and 76% of the maximum values, demonstrating that the maximum values occur infrequently.

Figure A2-1 Frequency Plots for Hourly and Daily SO_2 Concentrations



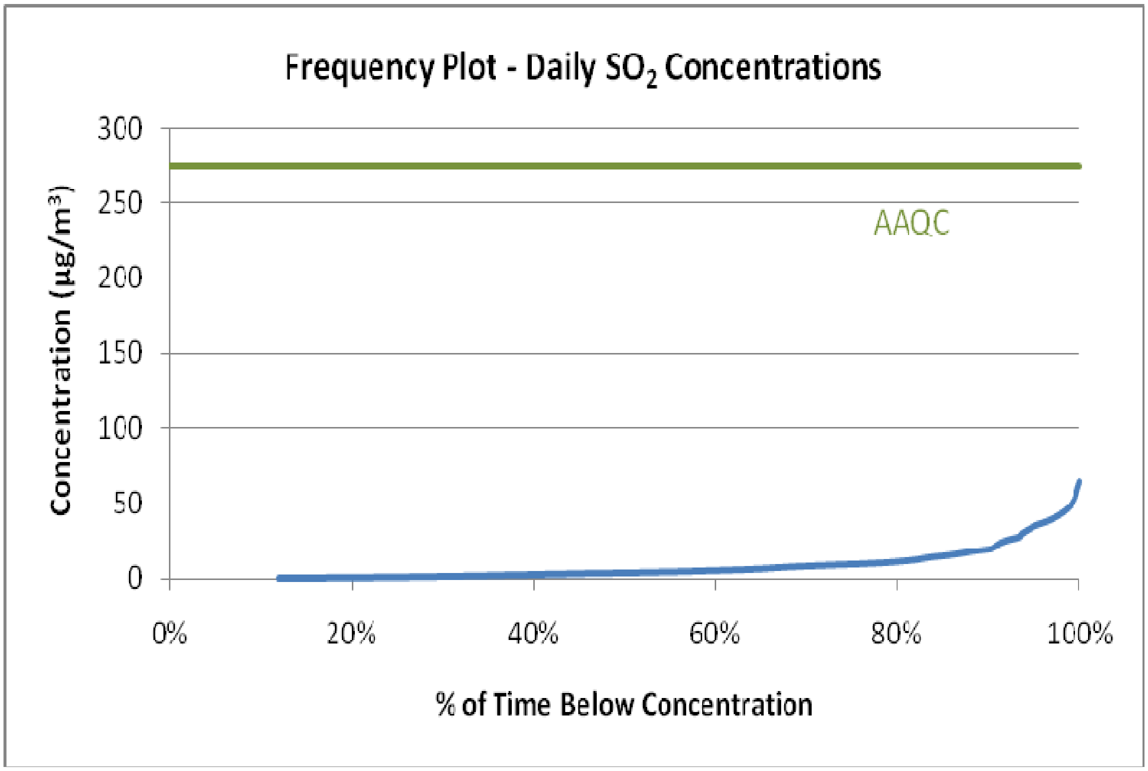


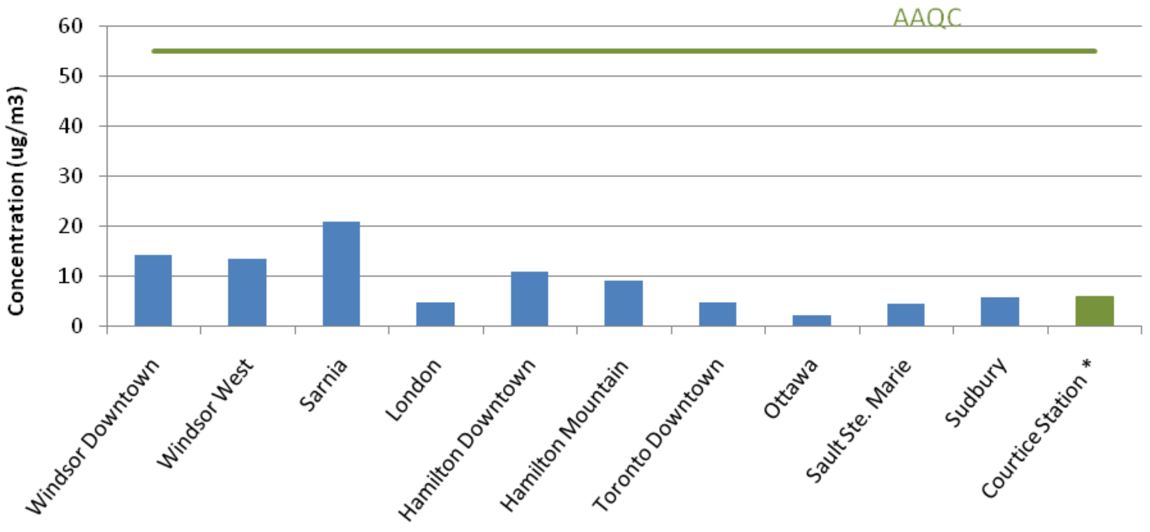
Table A2-2 Summary of Various Ambient SO_2 Concentration Percentile Values (µg/m^3)

Percentile	Hourly Average	24-Hour Average
10%	0.0	0.0
20%	0.0	0.4
30%	1.1	1.3
40%	2.4	2.4
50%	3.5	3.7
60%	4.7	5.1
70%	7.4	8.1
80%	11.0	11.1
90%	19.5	19.3
95%	33.6	33.5
99%	49.6	47.0
99.5%	56.0	52.6

2.1.2 Regional Comparisons

The ambient SO_2 monitoring data from the Courtice station were compared with measurements from selected ambient monitoring sites in operated by the MOE to evaluate the levels in vicinity of the Project site with other areas in Ontario. Figure A2-2 presents a comparison of the measured annual average SO_2 concentration at the Courtice station with those from MOE monitoring stations in selected Ontario cities. Sulphur dioxide was not monitored at the MOE Oshawa station. The SO_2 levels at Courtice Road station are much less than those in heavily industrialized areas of Ontario such as Hamilton, Windsor and Sarnia, and are comparable to those of other areas in Ontario. In the Clarington area, St. Mary's Cement (located approximately 4.7-km to the east of the monitoring station) is a significant contributor of SO_2 emissions in the air quality study area (about 3,647 tonnes per year in 2007).

Figure A2-2 SO_2 Annual Means at the Courtice Station and Selected Ontario Cities



Notes:
* Courtice Station - 2008 annual mean concentration measured at Courtice Road monitoring station
Annual means for other Ontario cities - 2007 annual means taken from Air Quality in Ontario 2007 Report, Ontario Ministry of the Environment

2.2 Nitrogen Dioxide

Nitrogen oxides are produced in most combustion processes, and are almost entirely made up of nitric oxide (NO) and nitrogen dioxide (NO_2). Together, they are often referred to as NO_X. NO_2 is an orange to reddish gas that is corrosive and irritating at high concentrations. Most NO_2 in the atmosphere is formed by the oxidation of NO, which is emitted directly by combustion processes, particularly those at high temperature and pressure, such as gas turbines. Nitric oxide (NO) is a colourless gas with no direct effects on health or vegetation at ambient levels. The levels of NO and NO_2, and the ratio of the two gases, together with the presence of hydrocarbons and sunlight are the most important factors in the formation of ground-level O_3 and other oxidants. Further oxidation and combination with water in the atmosphere forms nitric acid, another part of “acid rain”.

Anthropogenic emissions comprise approximately 93 percent of global atmospheric emissions of NO_X (i.e., NO + NO_2). The largest anthropogenic contributor to atmospheric NO_X is combustion of fuels such as natural gas, oil and coal. Forest fires, lightning and anaerobic processes in soil account for nearly all biogenic emissions (Wayne, 1991).

Generally for combustion, 5 to 10% of the initial total emissions of NO_X are NO_2 with the remaining 90 to 95% being NO. The conversion of the majority of NO occurs after emission to the atmosphere. The rate of conversion depends on the oxidizing potential of the atmosphere at the time of release. For example, if the ambient concentration of O_3 is high at the time of release, the conversion might be expected to be higher than if the ambient concentration of O_3 was low. The regulated form of NO_X is NO_2, which is discussed in this section.

2.2.1 Summary of Courtice Road Monitoring Station Measurements

A summary of the maximum, minimum, median and standard deviation NO_2 concentration measured at the station is presented in Table A2-3. Also presented in this table is the applicable air quality criteria, maximum percentage and of number of exceedances of the air quality criteria.

The maximum hourly, 24-hour and annual average concentrations measured at the station were 202.3, 105.0 and 37.0 $\mu g/m^3$ respectively which are 51%, 53% and 37% of the applicable ambient air quality criteria.

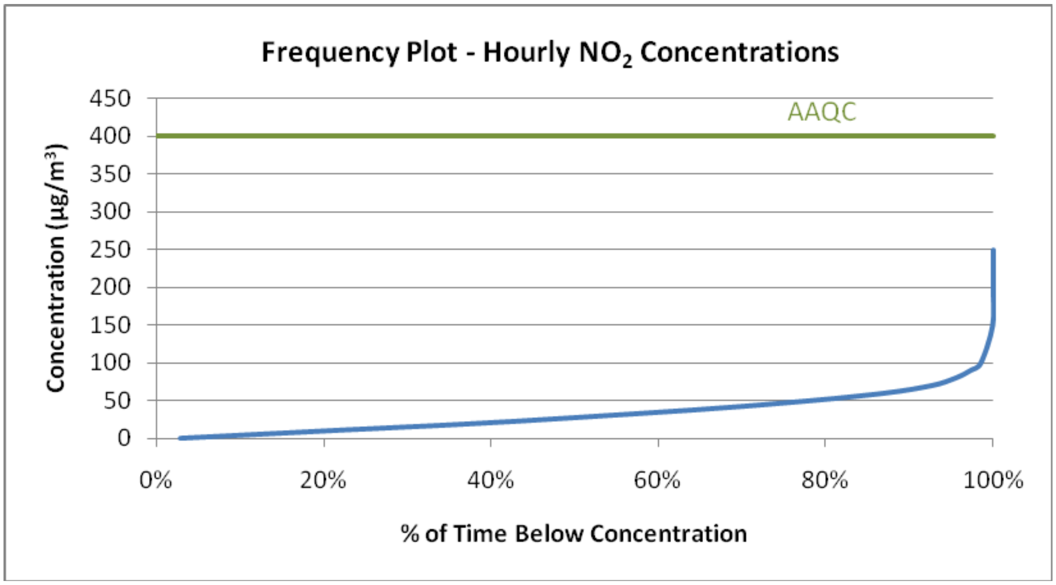
Table A2-3 Summary of Ambient NO_2 Measurements ($\mu g/m^3$)

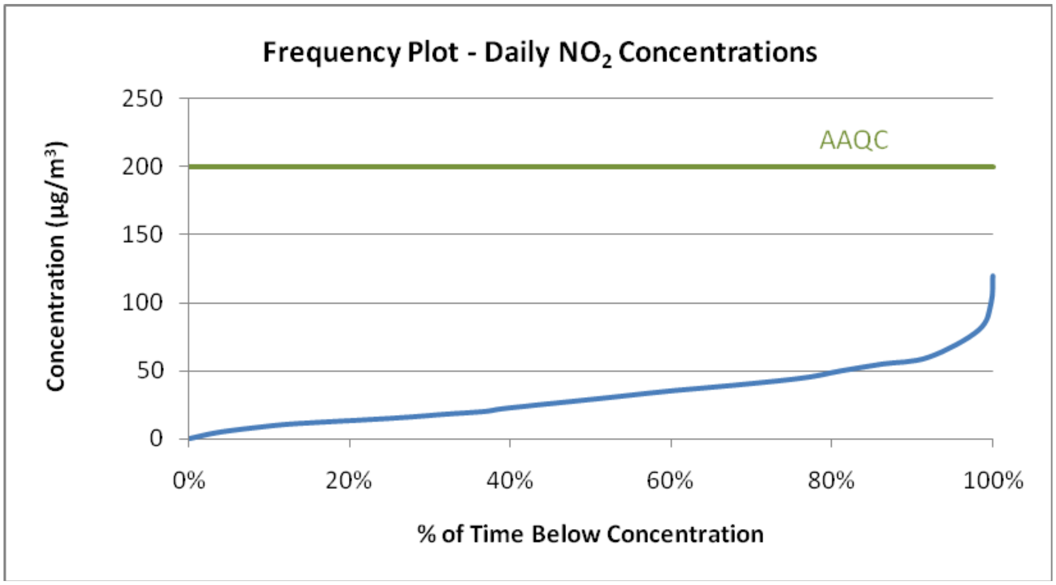
Averaging Period	AAQC (1)		Value
1	400	Maximum	202.3
		Minimum	0.0
		Median	27.6
		Standard Deviation	24.7
		# of Exceedances	0
24	200	Maximum	105.0
		Minimum	2.1
		Median	29.2
		Standard Deviation	19.7
		# of Exceedances	0
Annual	100 (2)	Average	37.03
		# of Exceedances	0

Notes:
1 – MOE ambient air quality criteria unless otherwise noted.
2 – Federal NAAQO Maximum Acceptable

Frequency distribution plots of hourly and daily NO_2 concentrations measured at the Courtice Road monitoring site are presented in Figure A2-3. In these plots, the percentage of time that the measured NO_2 concentration was below a given level is presented. The hourly and daily Ontario AAQC levels of 400 $\mu g/m^3$ and 200 $\mu g/m^3$ are shown as green lines on the frequency plots. As shown on these figures, all measured ambient NO_2 concentrations were below the criteria. Hourly NO_2 concentrations above 150 $\mu g/m^3$ occurred less than 0.1% of the time during the monitoring period, and daily NO_2 concentrations above 100 $\mu g/m^3$ occurred approximately 0.2% of the time.

Figure A2-3 Frequency Plots for Hourly and Daily NO_2 Concentrations





A summary of hourly and daily NO_2 concentration percentiles (from 10% to 99.5%) are presented in Table A2-4. The 99th percentiles for hourly and daily NO_2 concentrations are 107 and 85 µg/m^3, respectively, which are less than 53% and 81% of the maximum values, demonstrating that the maximum values had occurred infrequently.

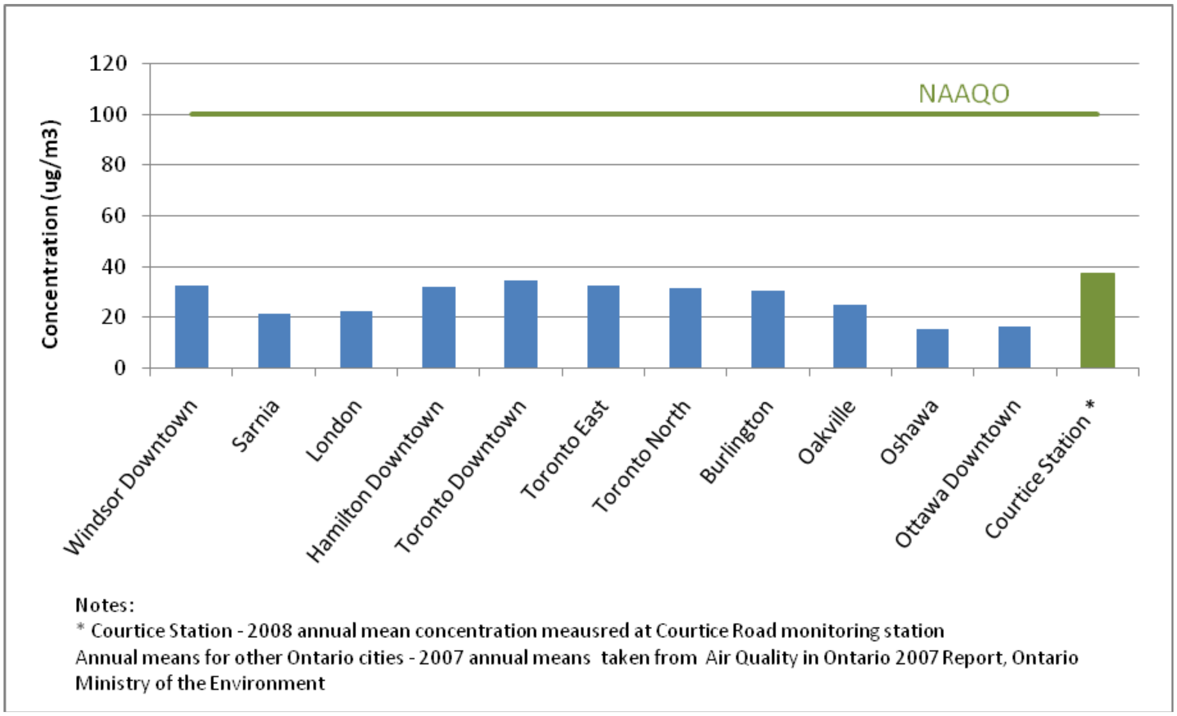
Table A2-4 Summary of Various Ambient NO_2 Concentration Percentile Values (µg/m^3)

Percentile	Hourly Average	24-Hour Average
10%	4.8	9.3
20%	9.7	12.9
30%	14.7	16.9
40%	20.8	23.1
50%	27.6	29.2
60%	34.6	35.1
70%	42.4	41.0
80%	51.7	48.9
90%	64.6	58.2
95%	78.1	67.2
99%	107.2	85.0
99.5%	117.6	91.9

2.2.2 Regional Comparisons

A comparison of the ambient NO_2 monitoring data from the Courtice station with measurements from selected ambient monitoring sites operated by the MOE is presented in Figure A2-4. The measured annual NO_2 level at the Courtice Road station was similar to that in other urbanized areas of Ontario such as Toronto, Hamilton and Windsor, and was well below the annual NAAQO maximum acceptable level of 100 µg/m^3. The Courtice monitoring station was situated about 1.5-km south of Highway 401, whose vehicle traffic is a significant source of nitrogen oxides. Stationary sources in the vicinity of the monitoring station that may contribute to the measured NO_2 levels include St. Mary's Cement and the new water pollution control plant to the east of the monitoring station (which contains a ground-based flare). It is likely that the NO_2 levels measured at the station reflect its proximity to the highway and these stationary sources.

Figure A2-4 NO_2 Annual Means at the Courtice Station and Selected Ontario Cities



Notes:
* Courtice Station - 2008 annual mean concentration meausred at Courtice Road monitoring station
Annual means for other Ontario cities - 2007 annual means taken from Air Quality in Ontario 2007 Report, Ontario Ministry of the Environment

2.3 Particulate Matter

Particulate matter as an air contaminant is classified by the size of the individual particles. Particle size determines the velocity with which gravitational settling occurs, and the ease with which the particles penetrate the human respiratory tract. Generally, large particles settle out very close to the source, and very fine particles may penetrate deep into the respiratory tract. Total suspended particulate matter encompasses all size ranges from approximately 100 micrometres (µm) to the sub-micrometre range. Inhalable (PM_{10}) and respirable ($PM_{2.5}$) particulate matter are comprised of very small particles that are less than 10 and 2.5 µm respectively. Ambient particulate matter occurs from a number of sources and mechanisms (e.g., wind erosion of exposed areas, combustion processes, material handling activities, and vehicle traffic).

Particles smaller than 10 µm make their way to the respiratory tract, and may become lodged there. Over the past few years, greater concern regarding these fine particles has led to research resulting in new sampling methods and criteria. In June 2000, the Canadian Council of Ministers of the Environment (CCME) adopted, in principle, a Canada-Wide Standard (CWS) for particulate matter (CCME, 2000). Although the CWS for $PM_{2.5}$ has not yet been adopted, it will be relevant in the near future. The CWS provides a proposed $PM_{2.5}$ standard of 30 µg/m^3, for a 24-hour averaging period, with the current objective of meeting the standard by 2010. Achievement is to be based on the 98th percentile of the ambient measurement annually, averaged over three consecutive years.

2.3.1 Summary of Courtice Road Monitoring Station Measurements

The $PM_{2.5}$ monitoring data collected at the Courtice Station in 2007 to 2008 was analysed. A summary of the maximum, minimum, median and standard deviation $PM_{2.5}$ concentrations measured at the station is presented in Table A2-5. Also presented in this table are the applicable air quality criteria, maximum percentage and number of exceedances of the air quality criteria.

The 98th percentile daily average and annual average concentrations measured at the station were 28.6 and 10.2 $\mu g/m^3$ respectively. The 98th percentile daily average is 95% of Canada Wide Standard (CWS) of 30 $\mu g/m^3$. It should be noted that the CWS for $PM_{2.5}$ is based on a 98th percentile level exceeded each year over a 3 year period, whereas the ambient monitoring program at Courtice Road was over a 15 month period (end of September 2007 to December 2008).

Table A2-5 Summary of Ambient $PM_{2.5}$ Measurements ($\mu g/m^3$)

Averaging Period	AAQC		Value
1 hour	-	Maximum measured	65
24 hour	30 (1)	Maximum measured	40.4
		98th percentile measurement (2)	28.6 (2)
		Minimum	1.7
		Median	10.2
		Standard Deviation	6.5
		# of Exceedances (2)	0
Annual	N/A	Average	10.2 (3)
		# of Exceedances	N/A

Notes:

1 – Canada Wide Standard (based on the maximum 98th percentile of the daily average values over the most recent 3 consecutive years)

2 – Based on 98th percentile measurement for comparison to the CWS

3 – Value previously reported as 9.8 in the July version of the report and updated due to additional QA of the monitoring data. Due to the minor change in magnitude, the background annual concentration used in this report was not updated from the value previously used in the July version of the report.

A frequency distribution plot of daily average $PM_{2.5}$ concentrations measured at the Courtice Road monitoring site is presented in Figure A2-5. Daily average $PM_{2.5}$ concentrations above the CWS value of 30 $\mu g/m^3$ occur approximately 1.5% of the time. Since the CWS standard is based on the 98th percentile value (i.e. 2% of the time the concentration can be above 30 $\mu g/m^3$) the plot demonstrates that the CWS level was not exceeded during the monitoring period. The measurements during this period did not exceed the CWS which is therefore, indicative that the CWS would not likely be exceeded over three consecutive years.

Table A2-6 presents a summary of percentiles for hourly and daily $PM_{2.5}$ concentrations. The 99th percentiles for hourly and daily $PM_{2.5}$ concentrations are 38 and 33 µg/m^3, respectively. A summary of daily $PM_{2.5}$ concentration percentiles (from 10% to 99.5%) is presented in Table A2-6.

Figure A2-5 Frequency Plot for Daily $PM_{2.5}$ Concentrations

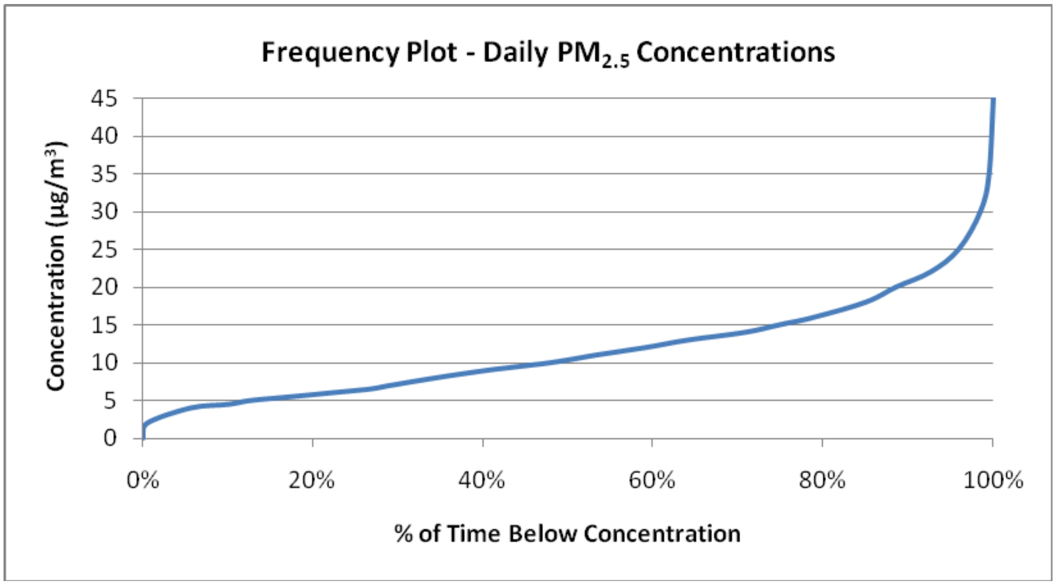


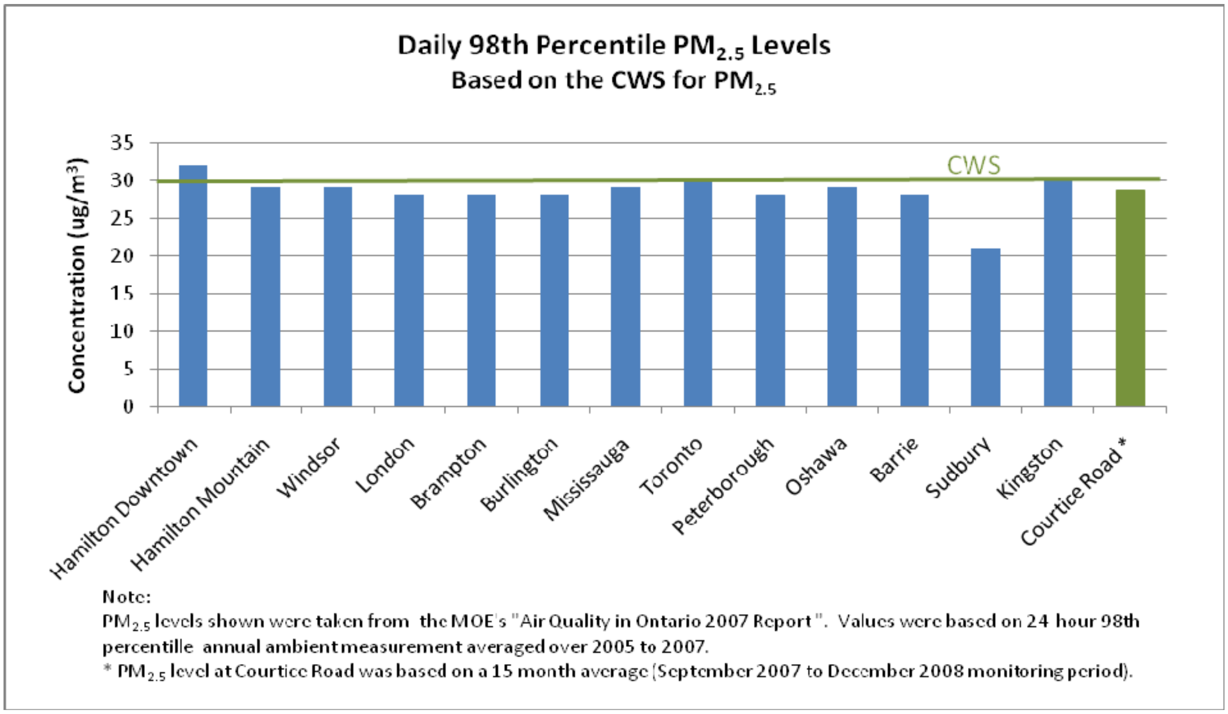
Table A2-6 Summary of Ambient $PM_{2.5}$ Concentration Percentiles (µg/m^3)

Percentile	Daily Average
10%	4.5
20%	5.9
30%	7.1
40%	8.9
50%	10.3
60%	12.2
70%	13.8
80%	16.3
90%	20.6
95%	24.4
99%	32.7
99.5%	33.7

2.3.2 Regional Comparisons

A comparison of the ambient $PM_{2.5}$ monitoring data from the Courtice station with measurements from selected ambient monitoring sites in operated by the MOE is presented in Figure A2-6. In this plot 98th percentile daily average $PM_{2.5}$ concentrations are presented as it is indicative of compliance with the CWS for $PM_{2.5}$ (which is based on meeting a daily average concentration of 30 $\mu g/m^3$ 98% of the time averaged over a three year period). The measured $PM_{2.5}$ level at the Courtice Road station was similar to that with other areas throughout Ontario.

Figure A2-6 Daily 98th Percentile $PM_{2.5}$ Concentrations at Courtice Station and Selected Ontario Cities



Daily 98th Percentile $PM_{2.5}$ Levels
Based on the CWS for $PM_{2.5}$

Note:
$PM_{2.5}$ levels shown were taken from the MOE's "Air Quality in Ontario 2007 Report". Values were based on 24 hour 98th percentile annual ambient measurement averaged over 2005 to 2007.
* $PM_{2.5}$ level at Courtice Road was based on a 15 month average (September 2007 to December 2008 monitoring period).

2.4 Ground Level Ozone

Ground level O_3 has both natural and anthropogenic origins. The source is natural photochemistry and, occasionally, injections of O_3 from the lower stratosphere. Ground level O_3 is not emitted directly but is rather formed by reaction of other air contaminants such as NO_X and VOCs in the presence of strong sunlight on hot days. The chemical transformation in the atmosphere follows a complex process in which NO_2 is transformed into NO plus O_3 in the presence of oxygen. In the vicinity of combustion sources, which emit a significant portion of their NO_X emissions as NO, an opposite chemical reaction (i.e., which occurs faster than the O_3 formation reaction during periods of enhanced ozone) can occur in which O_3 is used up in the chemical transformation of NO to NO_2. Due to this atmospheric reaction, decreased ground level O_3 concentrations are often seen within the vicinity of power generation facilities.

Locally, motor vehicle exhaust and industrial emissions can contribute to O_3 formation, although it is only a substantive issue in or near major urban centres. The combination of particulate matter, O_3 and ozone-forming substances is referred to as smog.

Signs and symptoms of acute exposure to O_3 may be severe and include irritation and burns of the skin, eyes, and mucous membranes. Concentrations in excess of 19,500 μg/m^3 (10 ppm) can lead to severe pulmonary edema, and decreased blood pressure.

2.4.1 Summary of Courtice Road Monitoring Station Measurements

A summary of the maximum, minimum, median and standard deviation O_3 concentrations measured at the station is presented in Table A2-7. Also presented in this table are the applicable air quality criteria, maximum percentage and of number of exceedances of the air quality criteria.

The maximum hourly, 8-hour, 24-hour and annual average concentrations measured at the station were 115.7, 86, 78.0 and 36.2 μg/m^3 respectively which are 70%, 67, 156% and 121 % of the air quality criteria. The daily average O_3 concentrations were above the NAAQO approximately 7% of the time.

Table A2-7 Summary of Ambient O_3 Measurements (μg/m^3)

Averaging Period	AAQC		Value
1	165	Maximum	115.7
		Minimum	0.0
		Median	32.6
		Standard Deviation	18.9
		# of Exceedances	0.0
8	128$^{(3)}$	Maximum	86.1
		Minimum	0.8
		Median	33.0
		Standard Deviation	16.0
		# of Exceedances	0.0
24	50$^{(2)}$	Maximum	78.0
		Minimum	1.5
		Median	32.8
		Standard Deviation	13.7
		# of Exceedances	24
Annual	30$^{(2)}$	Average	36.2
		# of Exceedances	N/A

Notes:

1 – MOE ambient air quality criteria unless otherwise noted.

2 – Federal NAAQO Maximum Acceptable
3 – Canada Wide Standard (65 ppb)

Frequency distribution plots of hourly and daily O_3 concentrations measured at the Courtice Road monitoring site are presented in Figure A2-7. The hourly AAQC of 165 $\mu g/m^3$ and daily NAAQO maximum acceptable level of 50 $\mu g/m^3$ are shown as green lines on the frequency plots. As shown in these figures, the measured hourly average concentrations were below the AAQC, while the daily average concentrations were above the NAAQO maximum acceptable level approximately 7% of the time.

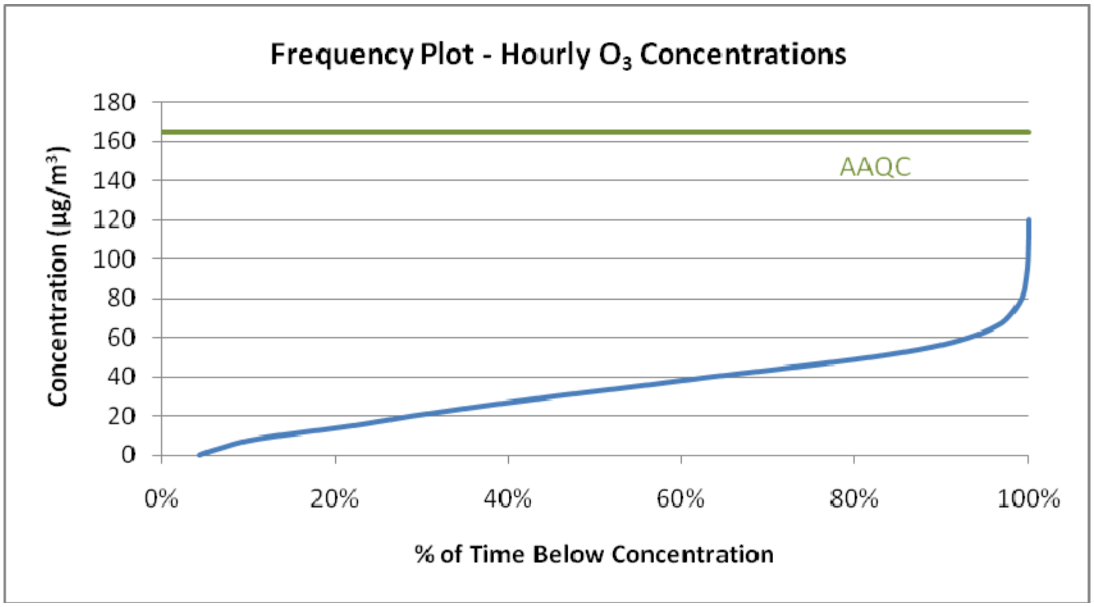
A summary of hourly and daily average O_3 concentration percentiles (from 10% to 99.5%) are presented in Table A2-8. The 99th percentile concentrations for hourly, 8-hour, and daily O_3 concentrations are 78, 72, and 64 $\mu g/m^3$ respectively, which are less than 67%, 84%, and 82% of the maximum values, demonstrating that the maximum values occurred infrequently.

2.4.2 Regional Comparisons

Ground level O_3 concentrations in Oshawa (about 15-km from the Clarington area) are generally high. The maximum measured O_3 concentration measured at the MOE Oshawa station was above the eight hour average CWS during 2007. Annual mean levels have an increasing trend from 1998 to 2007 and have exceeded the NAAQO of 30 $\mu g/m^3$, varying from 42 to 56 $\mu g/m^3$.

Data collected at Courtice Road was compared to selected MOE monitoring stations in Ontario. A plot of the annual ozone concentrations measured in a number of cities across Ontario is presented in Figure A2-8. The green line in the figure shows the NAAQO maximum acceptable annual level of 30 $\mu g/m^3$. The annual mean at Courtice Road is slightly above the NAAQO as are all of the other sites presented in the plot. The MOE also reports that in 2007 the maximum measured hourly average O_3 concentrations were above the provincial criteria at least once at 38 of 40 stations where ozone measurements were taken. As ozone is generated by complex chemical reactions in the atmosphere which occur over distances of 10's to 100's of kilometres for pre-cursor emissions sources, this points to ozone as being a regional rather than local air quality issue.

Figure A2-7 Frequency Plot for Hourly and Daily Ozone Concentrations



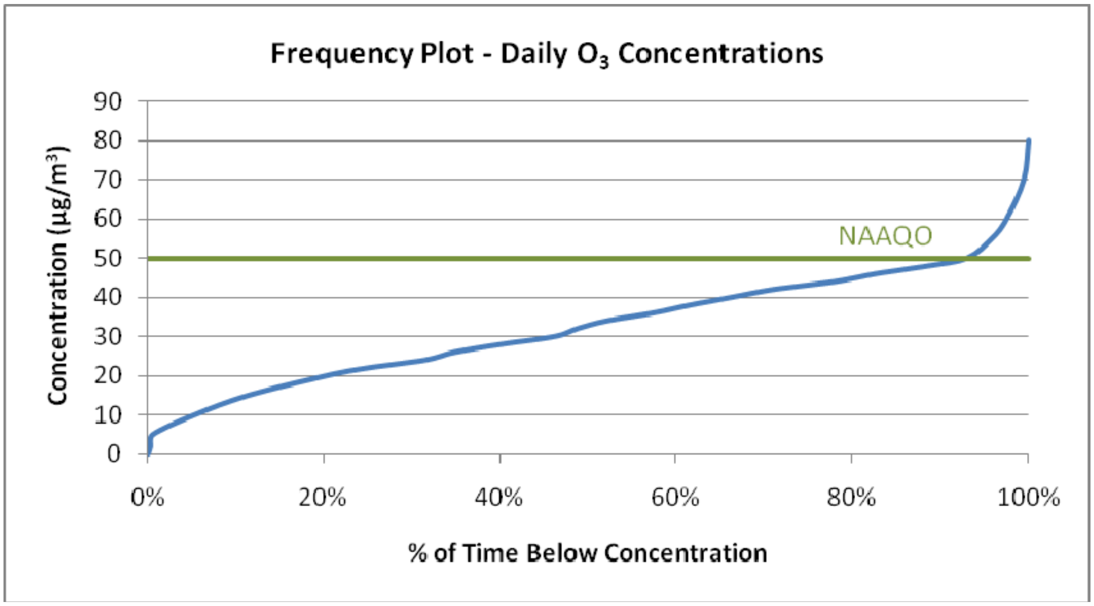
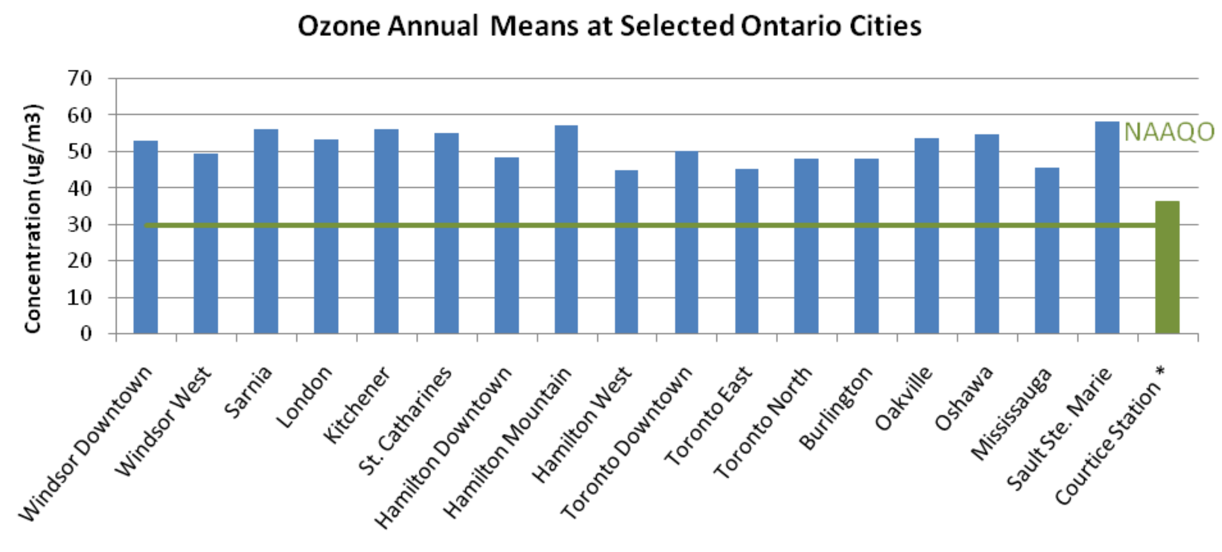


Table A2-8 Summary of Ambient Ozone Concentration Percentiles (μg/m^3)

Percentile	Hourly Average	8-Hour Average	24-Hour Average
10%	7.5	12.3	13.9
20%	13.8	17.9	19.9
30%	20.6	23.7	23.4
40%	27.0	28.7	27.9
50%	32.6	33.0	32.8
60%	38.0	38.1	37.2
70%	43.5	42.6	41.4
80%	48.8	47.1	44.9
90%	56.2	52.7	48.9
95%	63.0	59.4	52.5
99%	77.9	71.8	64.2
99.5%	85.9	74.4	65.6

Figure A2-8 Ozone Annual Mean Concentrations at the Courtice Station and Selected Ontario Cities



Notes:
* Courtice Station - 2008 annual mean concentration meausred at Courtice Road monitoring station
Annual means for other Ontario cities - 2007 annual means taken from Air Quality in Ontario 2007 Report, Ontario Ministry of the Environment

2.5 Carbon Monoxide

Carbon monoxide (CO) is a colorless, odourless and tasteless, but highly toxic gas. Exposures can lead to significant toxicity of the central nervous system and heart. Carbon monoxide is produced from the partial oxidation of carbon-containing compounds, such as from combustion processes. Carbon monoxide forms in preference to the more usual carbon dioxide when there is a reduced availability of oxygen present during the combustion process.

Carbon monoxide is a minor constituent of the atmosphere, mainly produced from volcanic activity as well as from natural and man-made fires, and the burning of fossil fuels. Through natural processes in the atmosphere, it is eventually oxidized to carbon dioxide. It is an atmospheric pollutant in urban areas, mainly from exhaust from vehicles and other engines used residentially, commercially and industrially, and also from improper burning of fuels. Along with aldehydes, it reacts photochemically to produce peroxy radicals. Peroxy radicals react with nitrogen oxide to increase the ratio of NO_2 to NO, which reduces the quantity of NO available to react with ozone.

2.5.1 Courtice Road Monitoring Data

A summary of the maximum, minimum, median and standard deviation CO concentrations measured at the station is presented in Table A2-9. Also presented in this table are the applicable air quality criteria as well as the maximum percentages and of number of exceedances of the air quality criteria.

The maximum hourly, 8-hour and annual average concentrations measured at the station were 1800, 1700, and 632 µg/m^3 respectively which are 5.0% and 10.8% of the applicable hourly and 8-hour ambient air quality criteria.

Table A2-9 Summary of Ambient CO Measurements (µg/m^3)

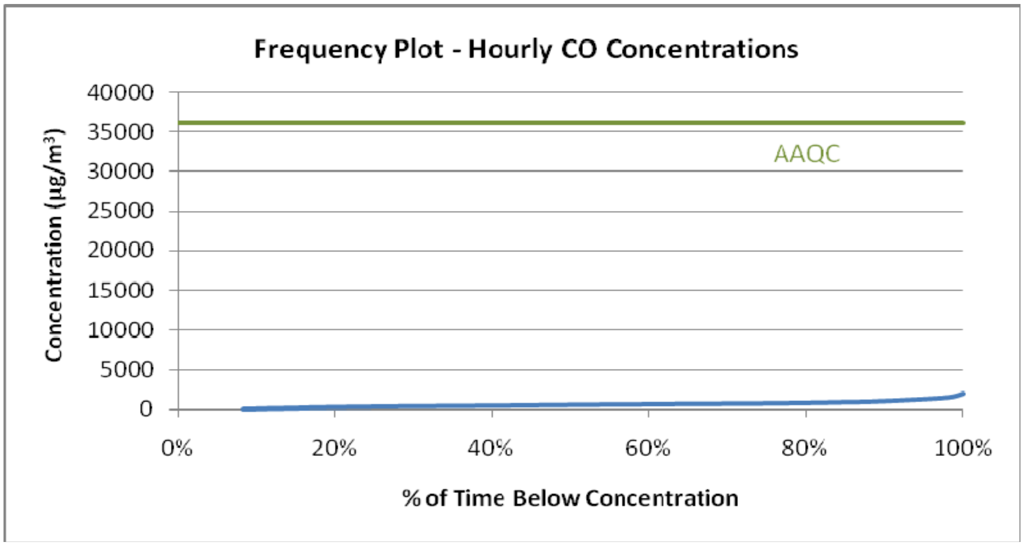
Averaging Period	AAQC (1)		Value
1	36200	Maximum	1800
		Minimum	0
		Median	500
		Standard Deviation	400
		# of Exceedances	0
8	15700	Maximum	1700
		Minimum	0
		Median	500
		Standard Deviation	40
		# of Exceedances	0
Annual	N/A	Average	632
		# of Exceedances	0

Notes:
1 – MOE ambient air quality criteria unless otherwise noted.

Frequency distribution plots of hourly and 8-hour average CO concentrations measured at the Courtice Road monitoring site are presented in Figure A2-9. The hourly and 8-hour AAQC of 36200 µg/m^3 and 15700 µg/m^3 are shown as green lines on the frequency plots. The maximum measured hourly and 8-hour concentrations were always well below the AAQC.

A summary of hourly and 8-hour CO concentration percentiles (from 10% to 99.5%) are presented in Table A2-10. The 99th percentile concentrations for hourly and 8-hour CO concentrations are 1561 and 1557 µg/m^3, respectively, which are less than 87% and 92% of the maximum values. This shows that the maximum values occur frequently.

Figure A2-9 Frequency Plots of Hourly and 8-Hour Carbon Monoxide Concentrations



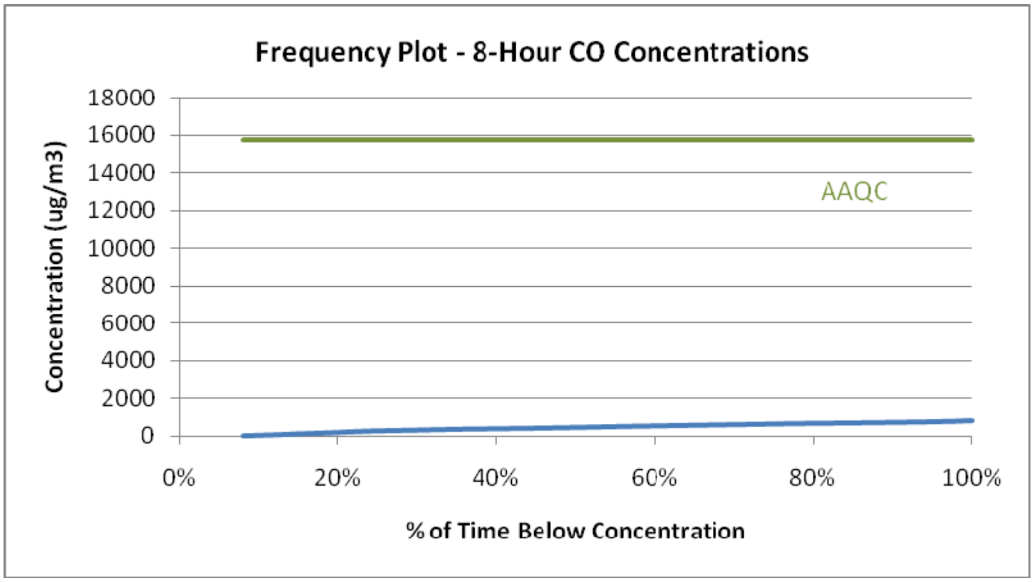


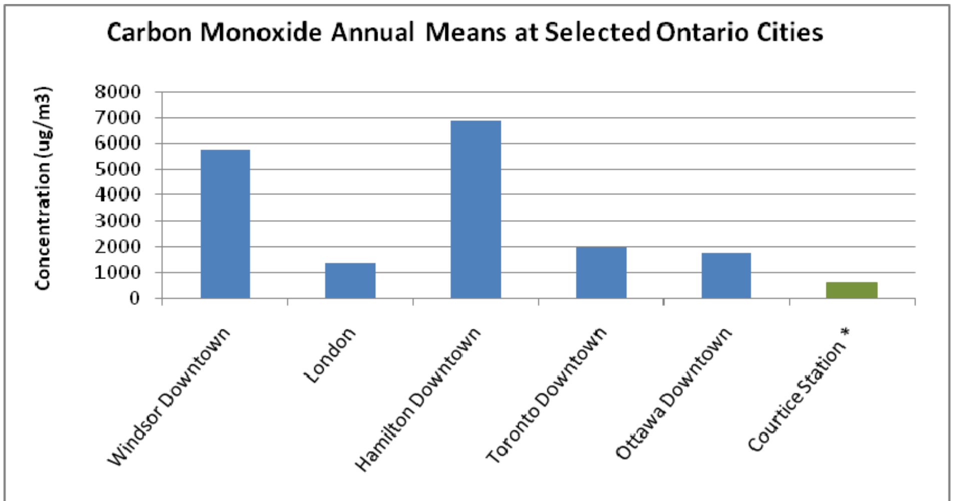
Table A2-10 Summary of Ambient Carbon Monoxide Percentile Concentrations (µg/m^3)

Percentile	Hourly Average	8-hour Average
10%	44	61
20%	253	260
30%	366	365
40%	445	445
50%	545	545
60%	631	628
70%	699	698
80%	804	792
90%	1035	1036
95%	1310	1297
99%	1561	1557
99.5%	1604	1588

2.5.2 Regional Comparisons

Carbon monoxide monitoring data collected at Courtice Road was compared to selected MOE monitoring stations in Ontario and is presented in Figure A2-10 for annual average concentrations. The annual average CO concentration measured at Courtice Road is well below the levels measured in other cities.

Figure A2-10 Carbon Monoxide Annual Means at the Courtice Station and Selected Ontario Cities



Notes:
* Courtice Station - 2008 annual mean concentration measured at Courtice Road monitoring station
Annual means for other Ontario cities - 2007 annual means taken from Air Quality in Ontario 2007 Report, Ontario Ministry of the Environment

2.6 Polycyclic Aromatic Hydrocarbons

Polycyclic aromatic hydrocarbons (PAHs) are a large group of organic compounds with two or more fused aromatic rings. PAHs are formed mainly as a result of pyrolytic processes, especially the incomplete combustion of organic materials during industrial and other human activities, such as processing of coal and crude oil, combustion of natural gas, vehicle traffic, cooking and tobacco smoking.

The following PAHs were monitored at the Courtice site using hi-vol samplers:

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

A summary of the maximum and percentile daily average PAH concentrations are presented in Table A2-11. Also presented in this table are the applicable MOE ambient air quality criteria and the percentage of the criteria. Both individual PAHs as well as a total PAH concentration are reported. All PAHs were below their respective MOE criteria.

Also presented in this table are the method detection limits for the laboratory analysis of each PAH and the percentage of measurements above the MDL. For several PAHs, the measured levels in all samples were below the method detection limit (MDL), therefore ½ the MDL was used to calculate ambient concentrations (which follows MOE protocols). Since most samples had slightly different sampler flow volumes (due to variations in atmospheric conditions during sampling) and in some cases the MDL for a contaminant changed from sample to sample, small variations in concentrations are seen for these contaminants at the various percentile levels presented in this table.

Table A2-11 Summary 24-Hour Average Ambient PAHs Monitoring Data (µg/m^3)

Contaminant	MDL (µg)	% of Measurements above MDL	24-Hour Concentration (µg/m^3)						Applicable Criteria (µg/m^3)	Max % of Criteria
			50th Percentile	75th Percentile	90th Percentile	95th Percentile	99th Percentile	Max		
1-Methylnaphthalene	0.10	42%	1.40E-04	5.62E-04	1.30E-03	1.43E-03	1.65E-03	1.71E-03	12[2]	0.01%
2-Methylnaphthalene	0.10	67%	3.53E-04	9.97E-04	2.19E-03	2.57E-03	3.09E-03	3.23E-03	10[2]	0.03%
Acenaphthene	0.05	96%	3.01E-04	5.37E-04	1.25E-03	1.73E-03	2.95E-03	3.30E-03	N/A	N/A
Acenaphthylene	0.05	50%	8.14E-05	2.28E-04	3.09E-04	3.52E-04	5.66E-04	6.27E-04	3.5[2]	0.02%
Anthracene	0.05	21%	6.02E-05	7.27E-05	1.63E-04	1.86E-04	2.16E-04	2.24E-04	0.2[2]	0.11%
Benzo(a)anthracene	0.05	0%	5.61E-05	6.14E-05	6.77E-05	7.11E-05	7.50E-05	7.60E-05	N/A	N/A
Benzo(a)fluorene	0.10	0%	1.12E-04	1.23E-04	1.35E-04	1.42E-04	1.50E-04	1.52E-04	N/A	N/A
Benzo(a)pyrene	0.05	0%	5.61E-05	6.14E-05	6.77E-05	7.11E-05	7.50E-05	7.60E-05	0.0011[1]	6.91%
Benzo(b)fluoranthene	0.05	33%	5.76E-05	8.29E-05	1.42E-04	1.47E-04	1.82E-04	1.93E-04	N/A	N/A
Benzo(b)fluorene	0.10	0%	1.12E-04	1.23E-04	1.35E-04	1.42E-04	1.50E-04	1.52E-04	N/A	N/A
Benzo(e)pyrene	0.10	0%	1.12E-04	1.23E-04	1.35E-04	1.42E-04	1.50E-04	1.52E-04	N/A	N/A
Benzo(g,h,i)perylene	0.05	4%	5.61E-05	6.19E-05	7.07E-05	7.53E-05	9.43E-05	9.98E-05	1.2[2]	0.01%
Benzo(k)fluoranthene	0.05	0%	5.61E-05	6.14E-05	6.77E-05	7.11E-05	7.50E-05	7.60E-05	N/A	N/A
Biphenyl	0.10	58%	3.41E-04	7.70E-04	1.36E-03	1.45E-03	1.48E-03	1.49E-03	N/A	N/A
Chrysene	0.05	13%	5.69E-05	6.60E-05	9.64E-05	1.09E-04	1.39E-04	1.48E-04	N/A	N/A
Dibenz(a,h)anthracene	0.05	0%	5.61E-05	6.14E-05	6.77E-05	7.11E-05	7.50E-05	7.60E-05	N/A	N/A
Fluoranthene	0.05	100%	3.77E-04	4.38E-04	6.01E-04	6.06E-04	8.68E-04	9.46E-04	140[2]	<0.01%
Indeno(1,2,3-cd)pyrene	0.05	0%	5.61E-05	6.14E-05	6.77E-05	7.11E-05	7.50E-05	7.60E-05	N/A	N/A
Naphthalene	0.07	83%	4.83E-04	1.51E-03	2.43E-03	2.65E-03	2.78E-03	2.81E-03	22.5[1]	0.01%
o-Terphenyl	0.10	0%	1.12E-04	1.23E-04	1.35E-04	1.42E-04	1.50E-04	1.52E-04	N/A	N/A
Perylene	0.10	0%	1.12E-04	1.23E-04	1.35E-04	1.42E-04	1.50E-04	1.52E-04	N/A	N/A
Phenanthrene	0.05	100%	1.64E-03	1.94E-03	2.57E-03	2.83E-03	4.22E-03	4.62E-03	N/A	N/A
Pyrene	0.05	83%	1.77E-04	2.44E-04	2.83E-04	3.00E-04	3.48E-04	3.62E-04	0.2[2]	0.18%
Tetralin	0.10	0%	1.12E-04	1.23E-04	1.35E-04	1.42E-04	1.50E-04	1.52E-04	1200[2]	<0.1%
Total PAH	N/A	N/A	1.06E-02	1.40E-02	1.63E-02	1.81E-02	2.09E-02	2.16E-02	N/A	N/A

1 AAQC
2 – JSL List

2.7 Dioxins and Furans

Dioxins and furans refer to a family of toxic substances that all share a similar chemical structure. Dioxins and furans all contain chlorine and can occur in different configurations, called cogeners. Most dioxins and furans are not man-made or produced intentionally, but are created when other chemicals or products are manufactured. Of all of the dioxins and furans, one cogener 2,3,7,8-tetrachloro-p-dibenzo-dioxin (2,3,7,8 Tetra CDD) is considered the most toxic. International toxicity equivalency factors (I-TEFs) are applied to 17 dioxin and furan isomers to convert them into an equivalent 2,3,7,8 Tetra CDD concentration (I-TEQ) for comparison to ambient air quality criteria.

The following dioxins and furans were monitored at the Courtice site:

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

Dioxins and furans (D/Fs) were monitored at the Courtice Station using a hi-volume air sampler to collect 24-hour average samples. A summary of the maximum and percentile daily average D/F concentrations are presented in Table A2-12. Also presented in this table is the applicable MOE ambient air quality criterion for I-TEQ and the percentage of the criterion. The individual D/F concentrations (pg/m^3) as well as the total toxic equivalency concentration (I-TEQ) are reported. The total maximum measured toxic equivalent D/F concentration was well below the applicable criteria.

Also presented in this table are the method detection limits for the laboratory analysis of each cogner and the percentage of measurements above the MDL. For several cogeners, the measured levels in all samples were below the method detection limit (MDL), therefore ½ the MDL was used to calculate ambient concentrations (which follows MOE protocols). Since most samples had slightly different sampler flow volumes (due to variations in atmospheric conditions during sampling) and in some cases the MDL for a contaminant changed from sample to sample, small variations in concentrations are seen for these contaminants at the various percentile levels presented in this table.

Table A2-12 Summary of 24-Hour Average Ambient D/F Concentrations

Contaminant	MDL (µg)	% of Measurements above MDL	24-Hour Concentrations (pg TEQ/m^3)						MOE Criteria (pg TEQ/m^3)	Maximum % of Criteria
			50th percentile	75th percentile	90th percentile	95th percentile	99th percentile	Max		
2,3,7,8-Tetra CDD *	4.5	0%	1.68E-03	2.42E-03	4.79E-03	5.10E-03	5.19E-03	5.21E-03	N/A	N/A
1,2,3,7,8-Penta CDD	4.2	0%	1.61E-03	2.53E-03	4.47E-03	4.72E-03	4.75E-03	4.76E-03	N/A	N/A
1,2,3,4,7,8-Hexa CDD	2.4	27%	1.63E-03	2.96E-03	5.49E-03	1.10E-02	1.62E-02	1.76E-02	N/A	N/A
1,2,3,6,7,8-Hexa CDD	2.6	45%	2.98E-03	6.16E-03	7.20E-03	1.75E-02	2.75E-02	3.01E-02	N/A	N/A
1,2,3,7,8,9-Hexa CDD	4.7	45%	4.62E-03	7.93E-03	1.36E-02	3.14E-02	4.86E-02	5.30E-02	N/A	N/A
1,2,3,4,6,7,8-Hepta CDD	2.5	100%	4.11E-02	5.71E-02	7.68E-02	2.89E-01	4.96E-01	5.48E-01	N/A	N/A
Octa CDD	45.0	91%	1.35E-01	1.88E-01	3.08E-01	1.29E+00	2.24E+00	2.47E+00	N/A	N/A
Total Tetra CDD	2.6	45%	3.17E-03	4.85E-03	6.88E-03	7.58E-03	8.18E-03	8.33E-03	N/A	N/A
Total Penta CDD	6.2	0%	2.69E-03	4.48E-03	5.66E-03	7.33E-03	8.84E-03	9.22E-03	N/A	N/A
Total Hexa CDD	4.0	91%	2.50E-02	4.96E-02	5.41E-02	1.62E-01	2.67E-01	2.94E-01	N/A	N/A
Total Hepta CDD	2.5	100%	9.54E-02	1.22E-01	1.83E-01	6.26E-01	1.06E+00	1.16E+00	N/A	N/A
2,3,7,8-Tetra CDF **	6.6	73%	1.29E-02	1.99E-02	2.71E-02	2.99E-02	3.19E-02	3.24E-02	N/A	N/A
1,2,3,7,8-Penta CDF	2.8	27%	2.76E-03	3.89E-03	7.73E-03	8.63E-03	9.11E-03	9.22E-03	N/A	N/A
2,3,4,7,8-Penta CDF	12.0	73%	1.29E-02	1.70E-02	2.25E-02	2.35E-02	2.39E-02	2.41E-02	N/A	N/A
1,2,3,4,7,8-Hexa CDF	6.0	55%	5.32E-03	9.29E-03	1.37E-02	1.64E-02	1.86E-02	1.92E-02	N/A	N/A
1,2,3,6,7,8-Hexa CDF	5.2	55%	3.48E-03	6.70E-03	1.20E-02	1.41E-02	1.60E-02	1.65E-02	N/A	N/A
2,3,4,6,7,8-Hexa CDF	3.1	45%	4.30E-03	7.65E-03	9.85E-03	1.37E-02	1.72E-02	1.81E-02	N/A	N/A
1,2,3,7,8,9-Hexa CDF	3.8	0%	1.69E-03	2.56E-03	3.92E-03	4.07E-03	4.13E-03	4.14E-03	N/A	N/A
1,2,3,4,6,7,8-Hepta CDF	17	9%	1.23E-02	1.49E-02	1.82E-02	2.69E-02	3.51E-02	3.72E-02	N/A	N/A
1,2,3,4,7,8,9-Hepta CDF	5.0	9%	2.41E-03	4.85E-03	9.97E-03	1.53E-02	2.00E-02	2.11E-02	N/A	N/A
Octa CDF	5.8	91%	1.57E-02	3.11E-02	3.76E-02	4.05E-02	4.29E-02	4.34E-02	N/A	N/A
Total Tetra CDF	2.2	100%	5.22E-02	1.13E-01	1.99E-01	2.04E-01	2.08E-01	2.09E-01	N/A	N/A
Total Penta CDF	2.8	100%	3.01E-02	7.00E-02	1.01E-01	1.36E-01	1.69E-01	1.78E-01	N/A	N/A
Total Hexa CDF	2.9	82%	1.83E-02	5.49E-02	6.28E-02	1.08E-01	1.52E-01	1.63E-01	N/A	N/A
Total Hepta CDF	13	36%	1.23E-02	1.49E-02	3.23E-02	3.81E-02	4.18E-02	4.28E-02	N/A	N/A
TOTAL TOXIC EQUIVALENCY (I-TEQ)	NA	NA	1.31E-02	2.18E-02	2.37E-02	3.17E-02	3.95E-02	4.14E-02	5	0.8%

2.8 Metals

Metals may exist in elemental form or in a variety of inorganic or organic compounds. Most environmental regulators do not make distinctions between metal species, and refer to them as metals and their compounds. Both natural (biogenic) and man-made (anthropogenic) processes and sources may emit metals and their compounds into the air. The processing of minerals, fuel combustion, and the wearing out of motor vehicle tyres and brake pads result in the emission of metals associated with particulate matter. Metals occur naturally in soil and rock - weathering of the rocks, and mining/construction activities, can release metals into air as particulate matter.

The ambient particulate data collected at the Courtice site were analysed for the following metals:

- Antimony (Sb)
- Boron (B)
- Phosphorus (P)
- Thallium (Tl)
- Aluminum (Al)
- Arsenic (As)
- Barium (Ba)
- Beryllium (Be)
- Cadmium (Cd)
- Chromium (Cr)
- Cobalt (Co)
- Lead (Pb)
- Nickel (Ni)
- Selenium (Se)
- Silver (Ag)
- Tin (Sn)
- Vanadium (V)
- Zinc (Zn)

Metals were monitored at the Courtice Station using a hi-volume air sampler to collect 24-hour average total particulate samples which were then analysed for metals content. A summary of the maximum and percentile daily average metals concentrations are presented in Table A2-13 along with their applicable MOE ambient air quality criteria and the percentage of the criteria. All metals were below their respective MOE criteria.

Also presented in this table are the method detection limits for the laboratory analysis and the percentages of measurements above the MDL. For several metals, the majority of the measurements were below the MDL. When this occurred, ½ the MDL was used to calculate the ambient concentration, which follows MOE protocols. This resulted in several metals having identical concentrations and very similar concentrations at all percentile levels (such as selenium).

Table A2-13 Summary of Ambient Metals Monitoring Data

Contaminant	MDL (µg)	% of Measurements above MDL	Concentrations ($\mu g/m^3$)						MOE Criteria ($\mu g/m^3$)	Maximum % of Criteria
			50th percentile	75th percentile	90th percentile	95th percentile	99th percentile	Max		
Antimony	10	0%	2.93E-03	2.98E-03	3.02E-03	3.06E-03	3.09E-03	3.10E-03	25[1]	<0.1%
Boron	6	30%	1.79E-03	3.96E-03	7.60E-02	8.24E-02	9.14E-02	9.68E-02	120[1]	<0.1%
Phosphorus	25	87%	2.74E-02	5.10E-02	7.19E-02	9.16E-02	3.16E-01	5.10E-01	NA	NA
Thallium	10	0%	2.93E-03	2.98E-03	3.02E-03	3.06E-03	3.09E-03	3.10E-03	0.24[2]	1.3%
Aluminum	20	98%	8.88E-02	1.79E-01	2.13E-01	2.25E-01	3.69E-01	4.40E-01	4.8[2]	9.2%
Arsenic	6	2%	1.76E-03	1.79E-03	1.81E-03	1.84E-03	2.86E-03	4.28E-03	0.3[1]	1%
Barium	1	100%	4.15E-03	6.13E-03	8.18E-03	1.08E-02	1.39E-02	1.44E-02	10[1]	<0.1%
Beryllium	1	0%	2.94E-04	2.98E-04	3.02E-04	3.07E-04	4.22E-04	5.84E-04	0.01[1]	6%
Cadmium	2	0%	5.88E-04	5.97E-04	6.04E-04	6.13E-04	9.90E-04	1.52E-03	0.025[1]	6%
Chromium	2	72%	1.52E-03	2.16E-03	2.76E-03	3.80E-03	4.47E-03	4.90E-03	1.5[3]	<0.1%
Cobalt	2	2%	5.88E-04	5.97E-04	6.04E-04	6.13E-04	8.49E-04	1.18E-03	0.1[3]	1%
Lead	3	73%	3.04E-03	4.02E-03	4.98E-03	7.52E-03	1.12E-02	1.38E-02	0.5[1]	3%
Nickel	3	50%	2.00E-03	3.17E-03	4.49E-03	5.71E-03	6.11E-03	6.38E-03	2[1]	<0.1%
Selenium	10	0%	2.93E-03	2.98E-03	3.02E-03	3.06E-03	3.09E-03	3.10E-03	10[3]	<0.1%
Silver	1	10%	2.94E-04	2.99E-04	3.42E-04	7.77E-04	9.10E-04	1.04E-03	1[1]	<0.1%
Tin	10	0%	2.93E-03	2.98E-03	3.02E-03	3.06E-03	3.09E-03	3.10E-03	10[1]	<0.1%
Vanadium	2	12%	5.89E-04	6.03E-04	1.55E-03	1.89E-03	2.33E-03	2.59E-03	2[1]	<0.1%
Zinc	5	100%	2.12E-02	3.24E-02	4.24E-02	4.92E-02	8.19E-02	8.84E-02	120[1]	<0.1%

1 – Reg. 419 Schedule 3
2 – JSL List
3 - AAQC

2.9 Influence of Variability of Emissions Sources on the Air Quality Measurements

It was noted that during the monitoring period from 2007 to 2008, the St. Mary's Cement Plant was operating at 67% of full capacity and therefore emissions from this facility may have been lower than in previous years. The St. Mary's plant is located about 4.7 km to the east of the Courtice Road monitoring station. The potential effect of reduced emissions from this source on the air quality measurements was evaluated by determining when the monitoring station was located downwind from the plant and prorating the SO_2 concentration measurements by the ratio of the St. Mary's plant at full capacity to that at 2007 capacity. SO_2 was chosen as a surrogate contaminant for this analysis as the St. Mary's plant is the most significant source of SO_2 in the area. For other air contaminants, there are other emissions sources in the area and St. Mary's contribution to measured ambient air quality levels will not be as pronounced. Therefore examining SO_2 concentrations is expected to provide a conservative (i.e. high) estimate of St. Mary's contribution to ambient levels of other contaminants.

For hours when winds were blowing from St. Mary's Cement to the monitoring station, the measured SO_2 concentrations were multiplied by 1.49 (1.0/0.67) to account for the differences in operating levels. This is a conservative method as it assumes that all the measured SO_2 when winds were blowing from the St. Mary's plant to the monitor were due to St. Mary's and there was no contribution from other emissions sources. The 90th percentile (background) values were then calculated for the entire monitoring period data (concentration measurements from all wind directions) and compared to the previous results.

Using this approach, the background hourly and daily average SO_2 concentrations were estimated to increase by 12% and 2% respectively due to St. Mary's operating at full capacity. For other air contaminants, where there are many other significant emissions sources in the area, the change in ambient levels would be expected to be much less than those for SO_2. Since the measured concentrations in the area were generally low relative to their ambient air quality criteria, it is not expected that the changes in background concentrations with St. Mary's operating at full capacity would affect the conclusions of the study.

3.0 SUMMARY OF REGIONAL AMBIENT MONITORING DATA

The following section provides a review of ambient monitoring data including volatile organic compounds (VOCs), Chlorinated Monocyclic Aromatics (CMAs), and Polychlorinated Biphenyls (PCB) collected at NAPs stations operated by Environment Canada. Several NAPs stations with available monitoring data for the years 2006 to 2008 for these air contaminants were reviewed. The NAPs stations in closest proximity to the Clarington area were chosen as these would be expected to be the most representative of the air quality in the vicinity of the Project. Several years of data (2006-2008) were analysed at each station and the highest measured concentration over all years and stations was conservatively used to represent the air quality in the Project area. This is expected to be a conservative approach as the NAPS monitoring stations are generally located in more urbanized areas where air quality levels would be expected to be higher than in the Clarington area.

3.1 Volatile Organic Compounds

VOCs are carbon-containing (i.e., organic) compounds that readily evaporate into the air under ambient conditions. Many VOCs are of natural origin, including methane. Others may be potentially harmful to the environment, either directly or indirectly as a contributor to ground level O_3 and smog formation.

Some VOCs may have short-term and long-term adverse health effects. Key signs or symptoms associated with exposure to VOCs include eye irritation, nose and throat discomfort, headache, allergic skin reaction, declines in serum cholinesterase levels, nausea, fatigue, and dizziness. The VOCs may be emitted by a wide array of products and activities. Examples include: service stations, paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions.

Data on VOCs from the years 2006 to 2008 were extracted from the following monitoring stations which were closest to the Clarington area.

- NAPS Station # 60413 (MOE ID 35003) - Centennial Park, Etobicoke West, Toronto;
- NAPS Station # 60427 (MOE ID 31508) - College Street, Toronto;
- NAPS Station # 60429 (MOE ID 35033) - Judson St. & Etona Ct., Etobicoke, Toronto; and,
- NAPS Station # 65101 (MOE ID 48006) - Eagle St. & McCaffrey Rd., New Market.

For two VOCs (acetaldehyde and formaldehyde) for which data were unavailable from the four stations presented above, data from a Windsor station (NAPS #60211, MOE ID 12016) was used, as this station measures a more extensive list of speciated VOCs than most other stations in Ontario. The applicability of the Windsor station data was reviewed with the MOE prior to use, and it was agreed that it was the most representative data for the air quality study area from the available measurements.

The maximum 24-hour average concentration, the highest 90th percentile 24-hour average concentration and the highest annual average concentration over all the stations over all years (2006 to 2008) were extracted and are presented in Table A3-1. Also presented in this table are the applicable MOE ambient air quality criteria and the percentage of the criteria. All maximum measured VOC concentrations were below their applicable air quality criteria.

Table A3-1 Summary of VOC Concentrations over Selected NAPs Monitoring Stations from 2006 to 2008.

Contaminant	Concentrations ($\mu g/m^3$)			Applicable 24-Hour Criteria ($\mu g/m^3$) [1]	% of 24-Hour Criteria	Station [3,4]
VOCs	Maximum 24-Hour	90th Percentile 24-Hour	Annual			
Acetaldehyde	2.0E+00	1.8E+00	1.0E+00	500[1]	0.4%	E, E, E
Benzene	1.7E+01	1.2E+01	3.9E+00	N/A	N/A	D, D, D
Bromodichloromethane	7.8E-02	1.7E-02	1.1E-02	N/A	N/A	D, B, B

Table A3-1 Summary of VOC Concentrations over Selected NAPs Monitoring Stations from 2006 to 2008.

Contaminant	Concentrations (µg/m^3)			Applicable 24-Hour Criteria (µg/m^3) [1]	% of 24-Hour Criteria	Station [3,4]
VOCs	**Maximum 24-Hour**	**90th Percentile 24-Hour**	**Annual**			
Bromoform	1.4E-01	2.9E-02	2.3E-02	55	0.3%	D, D, D
Bromomethane	1.9E+00	8.8E-02	9.8E-02	1350[2]	0.1%	D, A, D
Carbon tetrachloride	8.0E-01	7.4E-01	6.1E-01	2.4	33.1%	C, D, D
Chloroform	5.6E-01	2.3E-01	1.6E-01	1	55.8%	D, B, B
Dichlorodifluoromethane	3.6E+00	3.2E+00	2.8E+00	500000	0.0%	B, B, B
Dichloroethene, 1,1 -	1.2E-02	2.5E-03	5.8E-04	10	0.1%	D, D, D
Ethylbenzene	3.1E+00	1.2E+00	6.9E-01	1000	0.3%	C, B, B
Ethylene Dibromide	1.3E-02	5.2E-03	1.8E-03	3	0.4%	D, D, D
Formaldehyde	4.0E+00	3.4E+00	1.7E+00	65	6.2%	E, E, E
Methylene chloride	3.3E+00	1.3E+00	7.6E-01	220	1.5%	C, C, B
Tetrachloroethene	1.3E+00	4.9E-01	2.6E-01	360	0.4%	A, A, B
Toluene	2.5E+01	9.5E+00	4.4E+00	2000	1.2%	B, C, C
Trichloroethane, 1,1,1 -	4.5E-01	1.1E-01	9.8E-02	115000	0.0%	B, B, B
Trichloroethene	1.9E+00	5.4E-01	2.7E-01	12	15.8%	A, A, A
Trichlorofluoromethane	1.1E+01	2.1E+00	1.9E+00	6000	0.2%	D, D, B
Vinyl chloride	6.8E-02	5.9E-03	3.6E-03	1	6.8%	C, C, C
Xylenes, m-, p- and o-	1.3E+01	4.8E+00	2.8E+00	730	1.8%	B, B, B

1 – Reg. 419 Schedule 3 unless otherwise noted
2- AAQC
3 –Stations:
A: NAPS 60413 - Centennial Park, Etobicoke West, Toronto
B: NAPS 60427 – College Street, Toronto,
C: NAPS 60429 – Judson St. & Etona Ct., Etobicoke, Toronto
D: NAPS 65101 – Eagle St. & McCaffrey Rd., New Market,
E: NAPS 60211- Windsor
4 –IDs shown in this column list the stations used for the maximum 24-hour, 90th percentile 24-hour, and annual average concentrations respectively

3.2 Chlorinated Monocyclic Aromatics

Monocyclic aromatics hydrocarbons consists of a basic benzene ring with six carbon atoms and up to six hydrogen atoms. Substitution of hydrogen atoms by chlorine atoms yield chlorinated monocyclic aromatics (CMAs). Anthropogenic sources for the release of CMS into the environment are during production and transport of various products such as biocides, pesiticides, dielectric fluids and styrene rubbers or from industrial wastes in industries manufacturing chlorobenzene-containing products.

CMA data from the years 2006 to 2008 were extracted from the following monitoring stations which measured CMA and were closest to the Clarington site:

- NAPS Station # 60413 (MOE ID 35003) - Centennial Park, Etobicoke West, Toronto;
- NAPS Station # 60427 (MOE ID 31508) - College Street, Toronto;
- NAPS Station # 60429 (MOE ID 35033) - Judson St. & Etona Ct., Etobicoke, Toronto; and,
- NAPS Station # 65101 (MOE ID 48006) - Eagle St. & McCaffrey Rd., New Market.

With the exception of hexachlorobenzene (HCB) and petachlorophenol (PCP), CMA concentrations were taken from the available CMA monitoring data from 2006 to 2008 at the three Toronto stations and the Newmarket station. HCB and PCP data was not available for the above stations. HCB and PCP background values were extracted from 2006 to 2008 monitoring data from the following station:

- NAPS Station # 60429 (MOE ID 35033) - Judson St. & Etona Ct., Etobicoke, Toronto

The maximum concentration and highest 90th percentile concentration over all the stations over all years (2006 to 2008) were extracted and are presented in Table A3-2. Applicable MOE ambient air quality criteria and the percentage of the criteria are also presented in the table. All maximum measured CMA concentrations were below their applicable air quality criteria.

Table A3-2 Summary of CMA Concentrations over Selected NAPs Monitoring Stations from 2006 to 2008.

Contaminant	Concentrations (µg/m^3)				Applicable 1-hour Criteria (µg/m^3)^1	Applicable 24-hour Criteria (µg/m^3)^1	% of 1-Hour Criteria	% of 24-Hour Criteria	Station^{2,3}
Chlorinated Monocyclic Aromatics	Maximum 1-hour	Maximum 24-Hour	90th Percentile 24-Hour	Annual					
1,2-Dichlorobenzene	5.77E-02	2.37E-02	1.08E-02	4.66E-03	30500	N/A	0%	N/A	D, D, D, B
1,2,4,5-Tetrachlorobenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
1,2,4-Trichlorobenzene	3.12E-01	1.28E-01	4.58E-02	1.69E-02	N/A	400	N/A	0.03%	D, D, D, D
2,3,4,6-Tetrachlorophenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
2,4,6-Trichlorophenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
2,4-Dichlorophenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Table A3-2 Summary of CMA Concentrations over Selected NAPs Monitoring Stations from 2006 to 2008.

Contaminant	Concentrations (µg/m^3)				Applicable 1-hour Criteria (µg/m^3)[1]	Applicable 24-hour Criteria (µg/m^3)[1]	% of 1-Hour Criteria	% of 24-Hour Criteria	Station[2,3]
Chlorinated Monocyclic Aromatics	Maximum 1-hour	Maximum 24-Hour	90th Percentile 24-Hour	Annual					
Pentachloro-phenol	2.65E-03	1.09E-03	8.76E-04	4.10E-04	60	20	0%	0.01%	C, C, C, C
Hexachloro-benzene	1.62E-04	6.65E-05	6.25E-05	5.27E-05	N/A	N/A	N/A	N/A	C, C, C, C
Pentachloro-benzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

1 – Reg. 419 Schedule 3 unless otherwise noted
2 –Stations:
A: NAPS 60413 - Centennial Park, Etobicoke West, Toronto
B: NAPS 60427 – College Street, Toronto,
C: NAPS 60429 – Judson St. & Etona Ct., Etobicoke, Toronto
D: NAPS 65101 – Eagle St. & McCaffrey Rd., New Market,
E: NAPS 60211- Windsor
3 –IDs shown in this column list the stations used for the maximum 1-hour, maximum 24-hour, 90th percentile 24-hour, and annual average concentrations respectively

3.3 Polychlorinated Biphenyls

Polychlorinated biphenyls (PCBs) are a class of organic compounds with 1 to 10 chlorine atoms attached to biphenyl which is a molecule composed of two benzene rings each containing six carbon atoms. PCBs were used as dielectric fluids in transformers and capacitors, coolants, lubricants, stabilizing additives in flexible PVC coatings of electrical wiring and electronic components, pesticide extenders, cutting oils, flame retardants, hydraulic fluids, sealants (used in caulking, etc), adhesives, wood floor finishes, paints, de-dusting agents, and in carbonless copy paper. PCB production was banned in the 1970s due to the high toxicity of most PCB congeners and mixtures. PCBs are classified as persistent organic pollutants which bioaccumulate in animals.

PCB monitoring data from the years 2006 to 2008 were extracted from the following monitoring stations which measured PCB and were closest to the Clarington site:

- NAPS Station # 60427 (MOE ID 35003) - College Street, Toronto; and,
- NAPS Station # 60429 (MOE ID 31508) - Judson St. & Etona Ct., Etobicoke, Toronto.

The maximum concentration and highest 90th percentile 24-hour average concentration (as well as the annual average) over all the stations over all years (2006 to 2008) were extracted and presented in Table A3-3. Also presented in this table are the applicable MOE ambient air quality criteria and the percentage of the criteria. The maximum measured PCB concentrations were below their applicable air quality criteria.

Table A3-3 Summary of the Maximum and Highest 90th Percentile 24-Hour Average and Annual Average PCB Concentrations over Selected NAPs Monitoring Stations from 2006 to 2008.

Contaminant	Concentrations (µg/m³)			Applicable 24-Hour Criteria (µg/m³)[1]	% of 24-Hour Criteria	Station [2,3]
	Maximum 24-Hour	90th Percentile 24-Hour	Annual			
Polychlorinated Biphenyls (PCB)	4.7E-05	4.2E-05	1.9E-05	0.15	0.03%	B, B, B

1 – Reg. 419 Schedule 3 unless otherwise noted
2 –Stations:
A: NAPS 60413 - Centennial Park, Etobicoke West, Toronto
B: NAPS 60427 – College Street, Toronto,
C: NAPS 60429 – Judson St. & Etona Ct., Etobicoke, Toronto
D: NAPS 65101 – Eagle St. & McCaffrey Rd., New Market,
E: NAPS 60211- Windsor
3 –IDs shown in this column list the stations used for the maximum 24-hour, 90th percentile 24-hour, and annual average concentrations respectively

4.0 BACKGROUND CONCENTRATIONS FOR DISPERSION MODELLING

Background concentrations were used in the dispersion modelling to represent the cumulative impact of other emissions sources (i.e., both anthropogenic and biogenic) by adding the background levels to the dispersion model predictions of the Project emissions. This section presents the background concentrations applied in the dispersion modelling where ambient monitoring data were available. In previous assessments, the MOE has required that 90th percentile ambient monitoring data be added to the dispersion model predictions to conservatively account for existing ambient concentrations (cumulative effects). The background levels used in this study were therefore the 90th percentile values for short-term averages. For annual averages, an annual average value was used as the background level. The use of 90th percentile measurement data to account for cumulative effects was specified in the CALPUFF pre-test plan submitted for review by the MOE by Jacques Whitford (JW 2009).

4.1 Criteria Air Contaminants

Background concentrations for criteria air contaminants were developed from the Courtice Road ambient monitoring program. The 90th percentile concentrations over the entire 15-month monitoring period were chosen for the short-term background concentrations. The 2008 annual average of the measurements was used as the annual average background concentration. These values are presented in Table A4-1 below.

Table A4-1 Background Concentrations - Criteria Air Contaminants

Contaminant Criteria Air Contaminants	1 Hour – Average (µg/m^3)	8 - Hour – Average (µg/m^3)	24 Hour Average (µg/m^3)	Annual Average (µg/m^3)
Sulphur Dioxide (SO_2)	19.5	N/A	19.3	5.9
Nitrogen Dioxide (NO_X)	64.6	N/A	58.2	37
Carbon Monoxide (CO)	1035	1036	1029	632
Particulate Matter PM_{10}	N/A	N/A	N/A	N/A
Particulate Matter $PM_{2.5}$	22.8	N/A	20.4	9.8
Total Particulate Matter	86.2	N/A	35.4	21.3

4.2 Polycyclic Aromatic Hydrocarbons and Dioxins and Furans

Background concentrations for Polycyclic Aromatic Hydrocarbons (PAHs) and total dioxins and furans (D/Fs) were data obtained at the Courtice Road ambient monitoring station. The 90th percentile 24-hour average concentrations over the entire monitoring period were chosen for the 24-hour average background concentrations. These concentrations were then converted to an equivalent hourly average using the methodology recommended by the MOE in the “Procedure for Preparing an Emission Summary and Dispersion Modelling Report” (MOE, 2009). These values are presented in Table A4-2 below.

Table A4-2 Background PAHs and Total D/Fs Concentrations

Contaminant Polycyclic Aromatic Hydrocarbons	1 Hour – Average (µg/m^3)	24 Hour Average (µg/m^3)	Annual Average (µg/m^3)
Acenaphthylene	7.53E-04	3.09E-04	1.58E-04
Acenaphthene	3.04E-03	1.25E-03	5.48E-04
Anthracene	3.97E-04	1.63E-04	8.00E-05
Benzo(a)anthracene	1.65E-04	6.77E-05	5.63E-05
Benzo(b)fluoranthene	3.45E-04	1.42E-04	7.56E-05
Benzo(k)fluoranthene	1.65E-04	6.77E-05	5.63E-05
Benzo(a)fluorene	3.30E-04	1.35E-04	1.13E-04
Benzo(b)fluorene	3.30E-04	1.35E-04	1.13E-04
Benzo(ghi)perylene	1.72E-04	7.07E-05	5.85E-05
Benzo(a)pyrene	1.65E-04	6.77E-05	5.63E-05
Benzo(e)pyrene	3.30E-04	1.35E-04	1.13E-04
Biphenyl	3.32E-03	1.36E-03	5.21E-04

Table A4-2 Background PAHs and Total D/Fs Concentrations

Contaminant	1 Hour – Average (µg/m³)	24 Hour Average (µg/m³)	Annual Average (µg/m³)
Polycyclic Aromatic Hydrocarbons			
Chrysene	2.35E-04	9.64E-05	6.47E-05
Dibenzo(a,c)anthracene	N/A	N/A	N/A
Dibenzo(a,h)anthracene	1.65E-04	6.77E-05	5.63E-05
Fluoranthene	1.46E-03	6.01E-04	3.93E-04
Indeno(1,2,3 – cd)pyrene	1.65E-04	6.77E-05	5.63E-05
1 – methylnaphthalene	3.17E-03	1.30E-03	4.43E-04
2 – methylnaphthalene	5.33E-03	2.19E-03	7.56E-04
Naphthalene	5.91E-03	2.43E-03	8.59E-04
Perylene	3.30E-04	1.35E-04	1.13E-04
Phenanthrene	6.26E-03	2.57E-03	1.71E-03
Pyrene	6.88E-04	2.83E-04	1.83E-04
Tetralin	3.30E-04	1.35E-04	1.13E-04
O-terphenyl	3.30E-04	1.35E-04	1.13E-04
Dioxins (as TEQ Toxic Equivalents)	5.778-08	2.37E-08	1.66E-08

4.3 Metals

The 90th percentile 24-hour average concentrations over the entire monitoring period were chosen for the 24-hour average background concentrations. These concentrations were then converted to an equivalent hourly average using the methodology recommended by the MOE in the “Procedure for Preparing an Emission Summary and Dispersion Modelling Report” (MOE, 2009). These values are presented in Table A4-3 below.

Table A4-3 Background Metals Concentrations

Contaminant	1 Hour – Average (µg/m³)	24 Hour Average (µg/m³)	Annual Average (µg/m³)
Metals			
Aluminum	5.17E-01	2.13E-01	1.14E-01
Antimony	7.35E-03	3.02E-03	2.93E-03
Arsenic	4.41E-03	1.81E-03	1.80E-03
Barium	1.99E-02	8.18E-03	4.95E-03
Beryllium	7.35E-04	3.02E-04	2.98E-04
Boron	1.85E-01	7.60E-02	1.54E-02

Table A4-3 Background Metals Concentrations

Contaminant Metals	1 Hour – Average (µg/m³)	24 Hour Average (µg/m³)	Annual Average (µg/m³)
Cadmium (Cd)	1.47E-03	6.04E-04	6.01E-04
Cadmium and Thallium (Cd + Th)	N/A	N/A	N/A
Chromium (hexavalent)	N/A	N/A	N/A
Total Chromium (and compounds)	6.72E-03	2.76E-03	1.71E-03
Cobalt	1.47E-03	6.04E-04	5.96E-04
Lead (Pb)	1.21E-02	4.98E-03	3.29E-03
Mercury (Hg) - Vapour/Particulate phase	N/A	N/A	N/A
Nickel	1.09E-02	4.49E-03	2.24E-03
Phosphorus	1.75E-01	7.19E-02	4.67E-02
Silver	8.33E-04	3.42E-04	3.43E-04
Selenium	7.35E-03	3.02E-03	2.93E-03
Thallium	7.35E-03	3.02E-03	7.35E-03
Tin	7.35E-03	3.02E-03	2.93E-03
Vanadium	3.77E-03	1.55E-03	7.70E-04
Zinc	1.03E-01	4.24E-02	2.54E-02
Sum of (As, Ni, Co, Pb, Cr, Cu, V, Mn, Sb)	5.15E-01	2.12E-01	1.05E-01

4.4 Volatile Organic Compounds

Background concentrations for VOCs were developed from the regional ambient monitoring data presented in Section A3.1. The 24-hour average concentrations measured at the stations were converted to an equivalent hourly average using the methodology recommended by the MOE in the "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" (MOE, 2009). These values are presented in Table A4-4 below.

Table A4-4 Summary of Background VOC Concentrations

Contaminant VOCs	1 Hour – Average (µg/m³)	24 Hour Average (µg/m³)	Annual Average (µg/m³)
Acetaldehyde	4.29E+00	1.76E+00	1.05E+00
Benzene	2.88E+01	1.18E+01	3.94E+00
Bromodichloromethane	4.24E-02	1.74E-02	1.07E-02
Bromoform	7.17E-02	2.95E-02	2.28E-02

Table A4-4 Summary of Background VOC Concentrations

Contaminant VOCs	1 Hour – Average (µg/m³)	24 Hour Average (µg/m³)	Annual Average (µg/m³)
Bromomethane	2.15E-01	8.83E-02	9.84E-02
Carbon tetrachloride	1.80E+00	7.40E-01	6.11E-01
Chloroform	5.51E-01	2.26E-01	1.62E-01
Dichlorodifluoromethane	7.87E+00	3.23E+00	2.81E+00
Dichloroethene, 1,1 -	6.09E-03	2.50E-03	5.76E-04
Ethylbenzene	3.03E+00	1.24E+00	6.92E-01
Ethylene Dibromide	1.27E-02	5.20E-03	1.84E-03
Formaldehyde	8.23E+00	3.38E+00	1.66E+00
Methylene chloride	3.08E+00	1.27E+00	7.60E-01
Tetrachloroethene	1.20E+00	4.93E-01	2.64E-01
Toluene	2.31E+01	9.47E+00	4.40E+00
Trichloroethane, 1,1,1 -	2.77E-01	1.14E-01	9.79E-02
Trichloroethene	1.31E+00	5.37E-01	2.70E-01
Trichlorofluoromethane	5.23E+00	2.15E+00	1.89E+00
Vinyl chloride	1.43E-02	5.88E-03	3.65E-03
Xylenes, m-, p- and o-	1.17E+01	4.83E+00	2.76E+00

4.5 Chlorinated Monocyclic Aromatics

Chlorinated monocyclic aromatics background concentrations were developed from the regional ambient monitoring data presented in Section A3.2. The highest 90th percentile concentration over all the stations and over all years (2006 to 2008) were chosen for the 24-hour average background concentrations. These concentrations were then converted to an equivalent hourly average using the methodology recommended by the MOE in the "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" (MOE, 2009). These values are presented in Table A4-5 below.

Table A4-5 Summary of CMA Background Concentrations

Contaminant Chlorinated Monocyclic Aromatics	1 Hour – Average (µg/m³)	24 Hour Average (µg/m³)	Annual Average (µg/m³)
1,2-Dichlorobenzene	2.63E-02	1.08E-02	4.66E-03
1,2,4,5-Tetrachlorobenzene	N/A	N/A	N/A
1,2,4-Trichlorobenzene	1.12E-01	4.58E-02	1.69E-02

Table A4-5 Summary of CMA Background Concentrations

Contaminant	1 Hour – Average (µg/m^3)	24 Hour Average (µg/m^3)	Annual Average (µg/m^3)
Chlorinated Monocyclic Aromatics			
2,3,4,6-Tetrachlorophenol	N/A	N/A	N/A
2,4,6-Trichlorophenol	N/A	N/A	N/A
2,4-Dichlorophenol	N/A	N/A	N/A
Pentachlorophenol	2.13E-03	8.76E-04	4.10E-04
Hexachlorobenzene	1.52E-04	6.25E-05	5.27E-05
Pentachlorobenzene	N/A	N/A	N/A

4.6 Polychlorinated Biphenyls

Background values for total PCB were developed from the regional ambient monitoring data from presented in Section A3.3. The highest 90th percentile concentration over all the stations and over all years (2006 to 2008) were chosen for background value, which is expected to be a conservative approach. The 90th percentile 24-hour average concentrations were converted to an equivalent hourly average using the methodology recommended by the MOE in the “Procedure for Preparing an Emission Summary and Dispersion Modelling Report” (MOE, 2009). These values are presented in Table A4-6 below.

Table A4-6 Summary of PCB Background Levels

Contaminant	1 Hour – Average (µg/m^3)	24 Hour Average (µg/m^3)	Annual Average (µg/m^3)
Polychlorinated Biphenyls (PCB)	1.0E-04	4.2E-05	1.9E-05