Memorandum

Economic and Development Services Department

Date: March 7, 2023

To: Oshawa Environmental Advisory Committee (O.E.A.C.)

From: Branden Morris, O.E.A.C. Policy Advisor,
Economic and Development Services Department

Item: **OEAC-23-14**
Staff Report INFO-23-29: Province of Ontario's 2020 Air Quality Report

City of Oshawa staff prepared staff report INFO-22-29 which provides an overview of the Province's Air Quality in Ontario and particularly data recorded at the Air Quality Index monitoring station at Ontario Tech University in Oshawa.

As per Section 2.0 of INFO-23-29 "A copy of INFO-23-29, dated February 15, 2023 and the 2020 Report will be provided to the Oshawa Environmental Advisory Committee for information."

Attachment 1 is Staff Report INFO-23-29.

Recommendation:

That this information memorandum dated March 7, 2023 concerning Staff Report INFO-23-29 about the Province of Ontario's 2020 Air Quality Report be received for information.

Information Memo

To:	City Council
From:	Warren Munro, HBA, MCIP, RPP, Commissioner, Economic and Development Services Department
Item Number:	INFO-23-29
Date:	February 15, 2023
Subject:	Province of Ontario's 2020 Air Quality Report
File:	12-02

1.0 Purpose

The purpose of this Report is to provide an overview of the Province's Air Quality in Ontario 2020 Report (the "2020 Report") and in particular, data recorded at the Air Quality Index (A.Q.I.) monitoring station located at the former E.P. Taylor Stables at Ontario Tech University (285 Britannia Avenue West) in Oshawa (the "Site"). The 2020 Report was released on December 21, 2022.

A copy of the 2020 Report is available at the following website: https://www.ontario.ca/document/air-quality-ontario-2020-report.

In 2014, staff were directed to provide Council with relevant information on the results and trends analysis by the Province from the A.Q.I. monitoring station located at the Site, as it becomes available.

2.0 Input From Other Sources

A copy of INFO-23-29, dated February 15, 2023 and the 2020 Report will be provided to the Oshawa Environmental Advisory Committee for information.

3.0 Analysis

3.1 Provincial Air Quality Monitoring

The Province, through the Ministry of the Environment, Conservation and Parks (M.E.C.P.), operates a network of A.Q.I. monitoring stations across Ontario. In 2020, the M.E.C.P. monitored ambient air quality in real time at 39 A.Q.I monitoring stations in Ontario, in collaboration with the federal National Air Pollutant Surveillance program. The M.E.C.P.'s A.Q.I. monitoring stations are sited to be representative of general population exposure and do not necessarily reflect the air quality in locations that are most influenced by local or industrial sources of air contaminants.

Staff note that there is only one A.Q.I. monitoring station in Durham Region, which is located on the Site. Prior to 2005, this station was located at Ritson Road Public School (300 Ritson Road South).

A.Q.I. monitoring stations generally measure common air pollutants associated with smog formation across the ambient air monitoring network. These key air pollutants can have adverse effects on human health and the environment, when detected at certain levels. These pollutants are:

- Ground level ozone;
- Fine particulate matter;
- Nitrogen dioxide;
- Carbon monoxide;
- Sulphur dioxide; and,
- Total Reduced Sulphur Compounds.

Information from the A.Q.I. monitoring stations is used by the M.E.C.P. to:

- Inform the public about Ontario's ambient air quality;
- Assess Ontario's air quality and evaluate long-term trends;
- Identify areas where criteria and standards are exceeded;
- Provide the basis for air quality policy/program development;
- Determine the impact from the United States and Canadian sources of Ontario's air quality;
- Provide scientists with air quality data to link environmental and human health effects to pollution levels; and,
- Provide smog advisories for public health protection.

The M.C.E.P.'s monitoring is continuous and can be viewed on a real time basis (hourly summaries) on the M.E.C.P.'s website. A link to the hourly air quality summaries in Ontario can be found at the following City website: https://www.oshawa.ca/en/home-property/air-quality.aspx.

Overall, air quality in Ontario has improved over time as both ambient concentrations of common air pollutants and emissions have decreased over the last ten (10) years. Generally, this improvement can be attributed to:

- Eliminating coal-fired power plants;
- Implementing Drive Clean vehicle emissions testing;
- Placing emissions caps on sulphur dioxide and nitrogen oxides;
- Developing new air standards and rules for industrial air emissions including:

    - New rules to regulate industrial sources of air pollution for petroleum and petrochemical industries;

    - New rules for regulating air contaminants for the metal finishers and foundries sectors;

- Creating provincial air zones that will help direct government actions to maintain and improve air quality based on the unique circumstances of each area of the province; and,

- More stringent sulphur dioxide air standards since it is a by-product of fossil fuel combustion and industrial smelting processes.

It is important to note that the 2020 Report includes references to the Canadian Ambient Air Quality Standards (C.A.A.Q.S.), which were published by the Canadian Council of Ministers of the Environment in May 2013 to replace the Canada-wide standards for ozone and fine particulate matter. The purpose of the new non-building standards is to promote continuous improvement in air quality monitoring.

With respect to Oshawa, the 2020 Report indicates that Oshawa's A.Q.I. monitoring station monitored three pollutants:

- Ozone;
- Fine particulate matter; and,
- Nitrogen dioxide.

The 2011 Air Quality Report noted that the other pollutants (i.e. sulphur dioxide, carbon monoxide and total reduced sulphur compounds) have reached background levels and are no longer required to be monitored at the Oshawa A.Q.I. monitoring station.

3.2 Ozone in Oshawa

3.2.1 Sources of Ozone

Ground-level ozone (denoted as O_3) is a colourless, odorless gas at typical ambient concentrations and is formed when nitrogen oxide and volatile organic compounds react in the presence of sunlight. The formation and transport of ozone is strongly dependent on weather conditions and emissions of chemicals that contribute to the formation of ozone (i.e. nitrogen oxide and volatile organic compounds). Ozone is a major component of smog and major sources of ozone include the transportation and industrial sectors and general solvent use.

3.2.2 Health and Environmental Effects

Ozone irritates the respiratory tract and eyes and exposure can result in chest tightness, coughing and wheezing. Children who are active outdoors during the summer, when ozone levels are highest, are particularly at risk of adverse effects. Individuals with pre-existing respiratory disorders, such as asthma and chronic obstructive pulmonary disease, are also at risk. Ozone is also associated with increased hospital emissions and premature deaths.

3.2.3 Oshawa Trends

In 2020, Oshawa experienced a mean ozone level of 26.4 parts per billion (p.p.b.), representing a slight increase from 2019 but still lower than the levels from 2016 and 2017.

In addition, 100% of all daily values were less than or equal to the C.A.A.Q.S. standard of 62 p.p.b. The maximum ozone level after 24 hours was 47 p.p.b., which is also below the criteria of 62 p.p.b. established by the C.A.A.Q.S.

Overall, the 10 year trend indicates that ozone levels have decreased 0.75% from 26.6 p.p.b. in 2011 to 26.4 p.p.b. in 2020. The overall annual mean ozone levels have been volatile since 2015 with some increases and decreases year-to-year as shown below:

- 27.2 p.p.b. in 2016;
- 27.9 p.p.b. in 2017;
- 25.8 p.p.b. in 2018;
- 24.4 p.p.b. in 2019; and,
- 26.4 p.p.b. in 2020.

3.3 Fine Particulate Matter in Oshawa

3.3.1 Sources of Fine Particulate Matter

Airborne particulate is the general term used to describe a mixture of microscopic solid particles and liquid droplets suspended in the air. Particulate matter (PM) includes aerosols, smoke, fumes, dust, fly ash and pollen. Fine particulate matter (denoted as $PM^{2.5}$) is less than 2.5 micrometers in diameter, which is approximately 30 times smaller than the average diameter of a human hair.

Fine particulate matter consists of primary and secondary $PM^{2.5}$ Primary $PM^{2.5}$ is emitted directly into the atmosphere and major sources include residential fireplaces, wood stoves, motor vehicles, smelters, power plants, industrial facilities, agricultural burning and forest fires. Secondary $PM^{2.5}$ is formed indirectly in the atmosphere through a series of complex chemical reactions involving gases such as nitrogen dioxide and sulphur dioxide.

3.3.2 Health and Environment Impacts

Fine particulate matter can have various negative health effects, especially on the respiratory and cardiovascular systems. Exposure to fine particulate matter is associated with increased hospital admissions and emergency room visits, as well as death from heart or lung diseases. Both long and short-term particle exposures have been linked to health issues. Individuals with heart or lung diseases, children and older adults are particularly sensitive to this pollutant.

3.3.3 Oshawa Trends

In 2020, Oshawa experienced a mean fine particulate matter level of 6.2 micrograms per cubic metre (µg/m3) representing a very small increase from 2019. In addition, 100% of all daily values were less than or equal to the C.A.A.Q.S. standard of 27 µg/m3. The maximum fine particulate matter level after 24 hours was 17 µg/m3, which is below the 2020 C.A.A.Q.S. maximum 24 hours reference level standard.

Overall, the 10-year trends indicates that fine particulate matter levels have decreased 10.1% from 6.9 µg/m3 in 2011 to 6.2 µg/m3 in 2020. Although fine particulate matter

levels are slightly higher than in 2017, the overall annual mean fine particulate matter levels have increased since 2016, as shown below:

- 5.9 µg/m3 in 2016;
- 5.9 µg/m3 in 2017;
- 6.4 µg/m3 in 2018;
- 6.1 µg/m3 in 2019; and,
- 6.2 µg/m3 in 2020.

3.4 Nitrogen Dioxide in Oshawa

3.4.1 Sources of Nitrogen Dioxide

Nitrogen dioxide is a reddish-brown gas with a pungent odour, which transforms in the atmosphere to form gaseous nitric acid and nitrates. Nitrogen dioxide plays a major role in atmospheric reactions that produce ground-level ozone, as well as reactions with other gaseous contaminants (i.e. sulphur dioxide, ammonia and volatile organic compounds) leading to the formation of fine particulate matter.

The transportation sector is the main source of nitrogen dioxide in Ontario. In addition, combustion or burning of carbon-based materials (e.g. wood, gasoline, etc.) in air produces nitrogen oxides, of which nitrogen dioxide is a component.

3.4.2 Health and Environmental Impacts

Nitrogen dioxide can irritate the lungs and lower resistance to respiratory infection, especially individuals with asthma and bronchitis. Nitrogen dioxide chemically transforms into nitric acid in the atmosphere and, when deposited, contributes to the acidification of lakes and soils in Ontario. Nitric acid can also corrode metals, fade fabrics, degrade rubber and damage trees and crops.

3.4.3 Oshawa Trends

In 2020, Oshawa experienced a mean nitrogen dioxide level of 3.6 p.p.b. representing a very small increase from 2019. In addition, 100% of the daily values were less than or equal to 17 p.p.b. The highest 24 hours nitrogen dioxide level was 15.7 p.p.b., which is below the C.A.A.Q.S. reference level of 17.0 p.p.b.

Overall, the 10 year trend indicates that nitrogen dioxide levels have decreased 48.5% from 7.0 p.p.b. in 2011 to 3.6 p.p.b. in 2020. Other than a marginal increase in 2017 and 2020, the overall annual mean of nitrogen dioxide levels have steadily decreased since 2016, as shown below:

- 6.3 p.p.b. in 2016;
- 6.4 p.p.b. in 2017;
- 3.8 p.p.b. in 2018;
- 3.5 p.p.b. in 2019; and,
- 3.6 p.p.b. in 2020.

3.5 Impact of the COVID-19 Pandemic on Ontario's Ambient Air Quality in 2020

In response to the global COVID-19 pandemic, the Government of Ontario put in place various measures including a temporary stay-at-home order which reduced transportation and industrial activities across the province. The stay-at-home-order in 2020 offered a unique opportunity to evaluate how reduced transportation and industrial emissions impacted ambient levels of common air pollutants in Ontario. Air quality measurements collected through the M.E.C.P.'s ambient and roadside air monitoring networks were assessed for the following three different time periods in 2020 to determine the impact of the stay-at-home-order on ambient air quality including:

- Pre-COVID period (January 1 to March 18);
- Stay-at-home period (March 19 to May 18); and,
- Re-opening period (May 19 to December 31).

During the stay-at-home period, concentrations of common air pollutants measured at the Highway 401 roadside monitoring station decreased by 27% for black carbon (B.C.), 21% for ultrafine particles (U.F.P.), 10% for nitrogen dioxide ($N.O._2$) and 35% for sulphur dioxide (SO_2). Reduced traffic-related emissions due to less vehicular traffic in the near road environment was responsible for the observed decrease in pollutant concentrations. As traffic volumes increased during the re-opening period, levels of these air pollutants remained lower than the baseline period but to a lesser degree than during the stay-at-home period.

In contrast, concentrations of fine particulate matter ($PM^{2.5}$) and ozone (O_3) changed little during the stay-at-home period and were higher during the re-opening period in comparison to the baseline years (2017-2019). Both fine particulate matter and ozone concentrations are impacted by local emissions and their regional background levels. The minimal change in levels of fine particulate matter and ozone during the stay-at-home period and the increased levels of fine particulate matter and ozone during the re-opening period reflect the influence of local/regional sources (e.g., forest fires) and its secondary formation in air, as well as reduced ozone titration effects due to the reduction in nitric oxide emissions (e.g., transportation emissions).

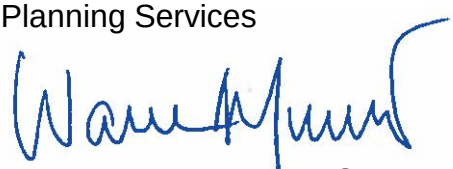
4.0 Financial Implications

There are no financial implications associated with this Report.

5.0 Relationship to the Oshawa Strategic Plan

This Report advances the Environmental Responsibility goal of the Oshawa Strategic Plan.

Tom Goodeve, M.Sc.Pl., MCIP, RPP, Director,
Planning Services



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