

# GO Rail Network Electrification Transit Project Assessment Process

## *Study Summary: Air Quality Assessment (Appendix F)*

### Scope of the Study

The scope of the GO Rail Network Electrification Transit Project Assessment Process (TPAP) involves electrification of the following GO Transit rail corridors:

1. Union Station Rail Corridor – From UP Express Union Station to Don Yard Layover
2. Lakeshore West Corridor – From just west of Bathurst St (Mile 1.20) to Burlington
3. Kitchener Corridor – From UP Express Spur (at Highway 427) to Bramalea
4. Barrie Corridor – From Parkdale Junction (off Kitchener Corridor) to Allandale GO Station
5. Stouffville Corridor – From Scarborough Junction (off Lakeshore East Corridor) to Lincolnville GO Station
6. Lakeshore East Corridor – From Don Yard Layover to Oshawa GO Station

The Study Area for the air quality baseline conditions phase of the TPAP encompasses the GO Transit rail corridors outlined above, including proposed locations for the taps (points as which high voltage power will be ‘tapped’ from Hydro One’s existing grid)/traction power facilities (TPF). The approach to establishing baseline air quality conditions within the study area was based on a review and summarization of relevant monitoring data for present day (2015) conditions.

The Air Quality Assessment Report for the GO Rail Network Electrification is composed of two parts: i) Air Quality Baseline Conditions Report and ii) Air Quality Impact Assessment Report.

### Approach/Methodology

The intent of the Air Quality Impact Assessment was to demonstrate the overall net positive benefits on air quality as a result of replacing diesel powered GO Trains with electric GO trains. Electrification will result in elimination of diesel emissions, for those corridors/sections being electrified, which has a benefit for both local and regional air quality. It should be noted that even under the 2025 RER Electrified Scenario, there will still be some diesel GO trains in service. Electrification also requires increased electricity generation, some of which may come from power plants operating on fossil fuel.

Air pollutant emissions with and without electrification were assessed to predict net changes in the regional air pollution burden. This assessment focused on:

- Contaminants of concern are the common air contaminants or CAC’s (i.e., CO (carbon monoxide), NOX (nitric oxide), PM2.5 (particulate matter) and Total VOC (volatile organic compound);
- Specification of diesel train operating conditions and emission factors for the contaminants of concern under the base case scenario. Relevant specifications included average train speed and average operating horsepower on each corridor for both the propulsion and head-end-power (HEP) engine, if applicable;
- Specifications and emission factors for electricity generation under the electrification scenario. Using a number of electricity generation scenarios including one that all of the electricity required for the electric trains is generated by gas-fired generating stations, using technology that is representative of the gas-fired stations that currently operate in Southern Ontario; and
- The foregoing specifications and emission factors were used in combination with future service levels under a 2025 Regional Express Rail (RER) Scenario to assess the network-wide emissions loading for the base case and electrification scenarios, so as to provide an estimate of the net reduction in regional emissions resulting from electrification.

The contaminants reviewed as a component of this study are those associated with the currently operating diesel locomotives, and are listed below:

- carbon monoxide;
- nitrogen dioxide;
- particulate matter less than 2.5 µm in diameter (PM<sub>2.5</sub>);
- particulate matter less than 10 µm in diameter (PM<sub>10</sub>);
- formaldehyde;
- acetaldehyde;
- benzene;
- 1,3-butadiene; and
- benzo(a)pyrene.

Baseline air quality in the vicinity of the rail corridors was characterized using available summary statistics from up to five years of recent monitoring data from existing air quality monitoring stations located in the region of interest operated by the Ontario Ministry of the Environment and Climate Change (MOECC), the National Air Pollution Surveillance Program (NAPS), and Metrolinx. For purposes of differentiating the various types of potential environmental effects related to the GO Transit Rail Network Electrification Project, the potential effects were characterized and grouped as Operational Impacts, and Construction Impacts.

To characterize baseline conditions, monitoring stations were identified as belonging to one of three land use categories:

- “Urban”, where baseline air quality is characteristic of urban areas or dominated by emissions from major highways;
- “Suburban”, where baseline air quality is influenced by surrounding neighbourhoods but not from major emission sources and highways; and
- “Rural”, where baseline air quality is representative of background levels in less populated areas without influence from significant human activities.

This study used data from monitoring locations within the Study Area these included:

- nine urban monitoring locations;
- nine suburban monitoring locations; and
- two rural monitoring locations.

The concentrations from these locations were assumed to be representative of air quality in the vicinity of rail corridors that travel through urban, suburban, and rural areas.

In order to assess the impacts of the project on air quality, the study quantified the emissions from both the electricity generation required to power the electric trains based on the future 2025 RER service levels, and from the locomotives themselves if the trains were to remain diesel-powered. These calculations were used to establish what the net change in regional emissions will be due to electrification. The impact on climate change was also assessed by quantifying the emissions of greenhouse gases (as carbon dioxide equivalent, or CO<sub>2</sub>e) for diesel versus electric trains.

## Summary of Impact Assessment Results

Electrification will result in a significant reduction of diesel emissions which have both local and regional impacts, but also requires increased electricity generation, some of which may come from power plants operating on fossil fuel, thus adding back some regional impacts. Additionally the impact assessment found:

- Overall, electrification of the GO Rail Network shows a net reduction in total emissions when compared to present-day diesel-powered trains;
- The reduction in diesel exhaust emissions will translate into a reduction in the local levels of air pollutants at locations adjacent to the rail corridors;

- The contribution of the GO Rail Network to the total regional emissions is small, and as such, the electrification provides only a small benefit for regional air quality. It also provides a small direct benefit in terms of greenhouse gas emissions;
- No significant changes to emissions or new sources of air emissions are expected as a result of modifying the existing maintenance facilities to accommodate electric GO Trains; and
- Construction is expected to have minimal impact on air quality.

**For additional more detailed information, please refer to the Air Quality Impact Assessment Report contained in Appendix F.**

## **Mitigation Recommendations**

No operational phase mitigation is required. Mitigation is required for construction activities as they will involve heavy equipment that generates air pollutants and dust. Mitigation of construction emissions is normally achieved through diligent implementation of operating procedures such as watering or applying other dust suppressants, covering up stockpiles, reducing travel speeds for heavy vehicles, minimizing haul distances, and efficiently staging the activities.

## **Next Steps/Future Work**

As this project will have a net benefit to air quality, post-construction monitoring during operations is not necessary. Construction activities will emit by-products of combustion (NO<sub>x</sub>, CO, VOCs, and PM) from diesel construction equipment, and dust. Monitoring of these air pollutants is considered unnecessary, provided that all equipment complies with the latest emission standards.