Section 4.13
Air Quality

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Acronyms and Abbreviations

BRT .... Bus Rapid Transit
CFR .... Code of Federal Regulations
CO .... Carbon Monoxide
CO_2e .... CO_2 Equivalent
EPA .... Environmental Protection Agency
FHWA .... Federal Highway Administration
GBNRTC .... Greater Buffalo Niagara Regional Transportation Council
LOS .... Level of Service
LRT .... Light Rail Transit
Metro .... Niagara Frontier Transit Metro System, Inc
MOVES .... Motor Vehicle Emission Simulator
NEPA .... National Environmental Protection Act
NYSDOT .... New York State Department of Transportation
MSAT .... Mobile Source Air Toxics
NAAQS .... National Ambient Air Quality Standards
PM_{10} .... Particulate Matter
$PM_{2.5}$ .... Particulate Matter
TEM .... The Environmental Manual
VMT .... Vehicle Miles Traveled
VOC .... Volatile Organic Carbon

4. Environmental Consequences

4.13 AIR QUALITY

This section presents the projected year (2040) air quality conditions. Appendix D8, "Air Quality Supplemental Information" describes the existing air quality within the study area for the Project and discusses the National Ambient Air Quality Standards (NAAQS) and Federal regulations protecting air quality. Section 4.17, "Construction Effects," describes construction-related impacts to air quality.

Table 4.13-1. Summary of Project Air Quality Effects

Alternative	Permanent Impacts
No Build Alternative	No adverse impacts
LRT Build Alternative	No adverse impacts LRT Build Alternative operations and patronage benefits air quality.
BRT Build Alternative	No adverse impacts BRT Build Alternative operations and patronage benefits air quality.

4.13.1 Analysis Results

4.13.1.1 Regional Analysis

A regional, or mesoscale, analysis of a project determines a project's overall impact on regional air quality levels. A regional analysis was performed for the Project based on 2045 ridership forecasts and associated VMT reduction, as described in more detail in Appendix C2 "Travel Demand Forecasting" of this DEIS.

Table 4.13-2 presents the reduction in VMT and pollutant emissions for the LRT Build Alternative and the BRT Build Alternative in 2045, as compared to the No Build Alternative.

Table 4.13-2. Estimated 2045 Reduction in Pollutant Emissions (Grams per Day)

Alternative	Daily VMT	Carbon Monoxide (CO)	Nitrogen Oxides (NO_X)	Volatile Organic Compounds (VOC)	Particulate Matter ($PM_{2.5}$)	Carbon Dioxide Equivalent (CO_2e)
No Build Alternative	0	0	0	0	0	0
LRT Build Alternative	-44,792	-53,750	-448	-448	-269	-14,288,648
BRT Build Alternative	-2,938	-3,526	-29	-29	-18	-937,222

Both the LRT Build Alternative and BRT Build Alternative are expected to result in a decrease in VMT and pollutant emissions in the Project corridor for the analysis year 2045.

MOBILE SOURCE AIR TOXICS

Because the estimated VMT under the No Build Alternative and the LRT Build Alternative and the BRT Build Alternative are nearly the same, varying by less than 0.1 percent, it is expected there would be no appreciable difference in overall MSAT emissions among the No Build Alternative and the LRT Build Alternative and the BRT Build Alternative. For both future conditions, emissions are virtually certain to be lower than present levels in the analysis year (2040) as a result of the EPA's national control programs that are projected to reduce annual MSAT emissions by over 90 percent between 2010 and 2050. While local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures, the magnitude of EPA-projected reductions is so great that MSAT emissions in the study area are likely to be lower in the future than they are today.

4.13.1.2 MSAT Research

Air toxics analysis is a continuing area of research; while much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how potential public health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA.

Nonetheless, air toxics concerns continue to arise on highway projects during the NEPA process. Even as the science emerges, both the public and other agencies expect FHWA to address MSAT impacts in its environmental documents. The FHWA, the EPA, the Health Effects Institute, and others have funded and conducted research studies to more clearly define the potential risks from MSAT emissions associated with highway projects.

4.13.1.3 Microscale CO Analysis

Microscale modeling is used to predict CO concentrations resulting from emissions due to motor vehicles using roadways immediately adjacent to the locations at which predictions are being made. EPA's mobile source emission factor model (MOVES2014b) and the CAL3QHC (Version 2.0) air quality dispersion model (EPA 1995) were used to estimate existing and future CO levels at selected locations in the study area.

SCREENING EVALUATION

A screening evaluation was performed on the 45 intersections analyzed in the traffic analysis (Chapter 3, "Transportation") based on volume and by LOS. The LOS describes the quality of traffic operating conditions, ranging from A to F, and it is measured as the duration of delay that a driver experiences at a given intersection. LOS A represents free-flow movement of traffic and minimal delays to motorists. LOS F generally indicates severely congested conditions with excessive delays to motorists. Intermediate grades of B, C, D, and E reflect incremental increases in congestion.

Following the NYSDOT's *The Environmental Manual* (TEM), Chapter 1.1, the intersections affected by the Project were screened to determine the need for a quantitative CO microscale/hot-spot analysis.[1] As per the referenced guidance, if an intersection is predicted under the transportation analysis to have a build LOS C or better, the intersection is deemed to pass the screening and no CO analysis is warranted.

If the intersection is predicted to have LOS D or worse in either Build Alternative, the intersection is further screened by the following criteria:

- A 10 percent or more reduction in the source-receptor distance
- A 10 percent or more increase in traffic volume on affected roadways
- A 10 percent or more increase in vehicle emissions
- Any increase in the number of queued lanes
- A 20 percent reduction in speed, when predicted average speed is at 30 mph or less

If the impacted intersection or roadway meets any one of the applicable criteria above, then a traffic volume threshold should be considered to further determine the need for a microscale air quality analysis. The NYSDOT TEM provides tables to determine the traffic volume threshold based on project-specific emission factors. If the project does not meet the applicable volume threshold, no microscale air quality analysis is necessary, even if any of the other criteria are met.

Chapter 3, "Transportation," presents 14 intersections that are estimated to experience LOS D or worse with the LRT Build Alternative and the BRT Build Alternative, one of which (Niagara Falls Blvd and Longmeadow Rd) has a projected volume increase greater than 10 percent. However, this intersection does not meet the volume threshold screening criteria. Table 4.13-3 and Table 4.13-4 presents the LOS and volume details for a forecast year of 2040. The queue emission factor of 3.49 grams/hour and free-flow emission factor of 1.06 gram/mile were used in the TEM charts to determine if a peak hour volume threshold of 4,000 at any approach to the Niagara Falls Blvd and Longmeadow Rd intersection would require further modeling. Table 4.13-4 shows that the total entering volume for this intersection is less than 4,000 for all alternatives. Therefore, this screening process did not require that any intersection required a microscale modeling analysis under the NYSDOT guidelines.

1 https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm/repository/epmair01.pdf

Table 4.13-3. Intersection Level of Service Screening for 2040 Forecast Year

Intersection	No Build Alternative			BRT Build Alternative			LRT Build Alternative		
	AM	MD	PM	AM	MD	PM	AM	MD	PM
Kenmore Ave and Main St	B	B	B	B	B	B	B	B	B
Niagara Falls Blvd and Kenmore Ave	C	C	C	C	C	C	C	C	C
Niagara Falls Blvd and Ford Ave/Cambridge Blvd	N/A	N/A	N/A	B	B	C	B	B	C
Niagara Falls Blvd and Decatur Rd*	A	A	A	B	C	D	B	C	D
Niagara Falls Blvd and Longmeadow Rd*	A	A	A	B	D	D	B	D	D
Niagara Falls Blvd and Eggert Rd*	C	C	C	C	C	D	C	D	D
Niagara Falls Blvd and Sheridan Dr*	C	D	D	D	E	D	D	E	E
Niagara Falls Blvd and Treadwell Rd	A	C	C	C	C	C	C	C	B
Niagara Falls Blvd and Mall Entrance*	A	B	B	B	C	D	B	C	C
Niagara Falls Blvd and Brighton Rd/Maple Rd*	C	E	D	C	D	D	C	D	D
Maple Rd and Alberta Dr*	A	C	B	C	E	C	C	D	C
Maple Rd and Bailey Ave*	B	D	D	C	E	E	C	E	E
Maple Rd and Bowmart Pkwy	A	B	B	A	B	B	A	B	B
Maple Rd and Hillcrest Dr	A	A	A	B	A	B	B	A	B
Maple Rd and Sweet Home Rd*	C	D	E	D	D	E	C	C	D
Sweet Home Rd and Rensch Rd	C	C	C	C	B	C	C	B	C
John James Audubon Pkwy and Rensch Rd*	B	B	D	D	C	D	B	B	C
John James Audubon Pkwy and Hamilton Rd	B	A	B	B	A	A	B	A	A
John James Audubon Pkwy and Core Rd/Lee Rd*	A	A	C	A	A	D	A	A	D
John James Audubon Pkwy and Frontier Rd	A	A	A	B	A	B	B	A	B
John James Audubon Pkwy and Forest Rd*	B	A	C	C	B	D	C	B	D
John James Audubon Pkwy and Sylvan Pkwy	A	A	A	B	A	C	B	A	B
John James Audubon Pkwy and Gordon R Yaeger Dr	A	A	A	A	A	A	A	A	A
John James Audubon Pkwy and Dodge Rd*	C	B	C	C	B	D	C	B	D
Eggert Rd and Sheridan Dr*	C	C	C	C	C	C	C	D	C

* Denotes intersection with LOS D, E, or F under any alternative
N/A = intersection not signalized under No Build Alternative

Table 4.13-4. Intersection Volume Screening for 2040 Forecast Year

Intersection	No Build Alternative			BRT Build Alternative			LRT Build Alternative		
	AM	MD	PM	AM	MD	PM	AM	MD	PM
Niagara Falls Blvd and Decatur Rd	1,670	2,115	1,767	1,684	2,136	1,800	1,797	2,303	1,981
Niagara Falls Blvd and Longmeadow Rd*	1,792	2,331	1,876	1,805	2,356	1,917	2,014	2,538	2,206
Niagara Falls Blvd and Eggert Rd	2,127	3,038	2,583	2,173	3,147	2,735	2,279	3,259	2,873
Niagara Falls Blvd and Sheridan Dr	3,182	4,792	4,351	3,201	4,874	4,475	3,280	4,983	4,724
Niagara Falls Blvd and Mall Entrance	1,769	2,785	3,017	1,794	2,842	3,105	1,805	2,845	3,161
Niagara Falls Blvd and Brighton Rd/Maple Rd	2,614	4,429	4,770	2,724	4,660	5,174	2,700	4,619	5,137
Maple Rd and Alberta Dr	1,227	2,419	2,404	1,316	2,668	2,805	1,314	2,631	2,799
Maple Rd and Bailey Ave	1,898	3,574	3,305	2,068	3,955	3,859	2,055	3,885	3,843
Maple Rd and Sweet Home Rd	2,862	4,073	3,089	3,061	4,377	3,510	3,029	4,433	3,498
John James Audubon Pkwy and Rensch Rd	1,272	1,851	827	1,332	2,065	1,046	1,362	2,079	1,083
John James Audubon Pkwy and Core Rd/Lee Rd	617	1,006	485	790	1,292	750	794	1,288	806
John James Audubon Pkwy and Forest Rd	1,164	1,530	609	1,365	1,888	935	1,362	1,881	951
John James Audubon Pkwy and Dodge Rd	1,518	1,496	547	1,754	1,969	985	1,755	1,908	992
Eggert Rd and Sheridan Dr	2,350	3,588	2,984	2,392	3,726	3,163	2,402	3,720	3,165

* Denotes intersection with >10% increase in volume during peak period

In the interest of providing a quantitative evaluation, the intersections were ranked by volume and LOS, as recommended in the EPA's *Guideline for Modeling Carbon Dioxide from Roadway Intersections*, to determine the intersections most likely to contribute to an increase in ambient CO concentrations. Based on the screening evaluation, two intersections were chosen for detailed analysis:

- **Niagara Falls Boulevard and Brighton Road/Maple Road** – This intersection has the highest entering volume of all the intersections in the study area. The highest volumes occur midday Saturday.
- **Maple Road and Bailey Avenue** – This intersection experiences the worst decline in LOS in the study area due to the Project. This intersection experiences the worst delay of all the intersections during the midday p.m. periods. This intersection experiences the worst delay of all the intersections during the a.m. period, with the exception of Maple Road and Sweet Home Road, which does not experience a decline in LOS as a result of the Project.

DISPERSION MODELING ANALYSIS

The CAL3QHC dispersion model was used to estimate CO concentrations in the vicinity of the two intersections. The model was run according to EPA guidance with parameters representing conservative worst-case conditions and receptors that represent locations where the public would be exposed to vehicle exhaust. Traffic data for the air quality analysis was derived from information developed as part of the traffic analysis, described in Chapter 3, "Transportation." Model inputs indicate data by turning movement from intersection simulation modeling, detailing information about vehicle volumes, speeds, and idle time.

Emission factors were developed from EPA's MOVES model, consistent with regional air quality modeling inputs provided by GBNRTC that specify local conditions, including climate, vehicle mix, and fuel parameters. Appendix D8, "Air Quality Supplemental Information" of this DEIS includes additional details to describe the microscale CO analysis, including figures that show emission sources and receptor locations.

A CO background level must be added to model results to account for CO entering the area from other sources upwind of the receptors. Background values used for the 1-hour and 8-hour CO levels, 1.7 ppm and 1.4 ppm, respectively, are the maximum monitored CO levels from the past three years of data (2021-2023). These values were conservatively used as the background for all CO modeling analyses. Future CO background levels are anticipated to be lower than existing levels due to mandated emission source reductions.

ANALYSIS RESULTS

Maximum one-hour and eight-hour CO levels were predicted for the existing year (2018) and analysis year (2040) at the two intersections selected for analysis. Table 4.13-5 shows maximum one-hour CO concentrations, and Table 4.13-6 shows maximum eight-hour CO concentrations. The CO levels estimated by the model are the maximum concentrations that could be expected to occur at each air quality receptor site analyzed. This assumes simultaneous occurrence of a number of worst-case conditions: peak-hour traffic conditions, conservative vehicular operating conditions, low wind speed, low atmospheric temperature, neutral atmospheric conditions, and maximizing wind direction.

Table 4.13-5. Predicted Worst-Case One-Hour CO Concentrations (ppm)

Intersection	2018			2040								
	Existing			No Build Alternative			LRT Build Alternative			BRT Build Alternative		
	AM	MD	PM	AM	MD	PM	AM	MD	PM	AM	MD	PM
Niagara Falls Blvd and Brighton Rd/ Maple Rd	2.2	2.5	2.5	1.8	1.9	1.9	1.8	1.9	1.9	1.8	1.9	1.9
Maple Rd and Bailey Ave	2.2	2.4	2.5	1.8	1.9	1.9	1.8	1.9	1.9	1.8	1.9	1.9

Notes: Concentrations = modeled results + 1-hour CO background. 1-hour CO background = 1.7 ppm; 1-hour CO standard = 35 ppm.
Abbreviations: AM = morning; MD = midday; PM = evening; ppm = parts per million.

Table 4.13-6. Predicted Worst-Case Eight-Hour CO Concentrations (ppm)

Intersection	2018			2040								
	Existing			No Build Alternative			LRT Build Alternative			BRT Build Alternative		
	AM	MD	PM	AM	MD	PM	AM	MD	PM	AM	MD	PM
Niagara Falls Blvd and Brighton Rd/ Maple Rd	1.8	2.0	2.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Maple Rd and Bailey Ave	1.8	1.9	2.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5

Notes: Concentrations = (modeled results x persistence factor [0.7]) + 8-hour CO background. 8-hour CO background = 1.4 ppm; 8-hour CO standard = 9 ppm.
Abbreviations: AM = morning; MD = midday; PM = evening; ppm = parts per million.

Based on the eight-hour values presented in the tables above, the LRT Build Alternative and the BRT Build Alternative are predicted to have minimal effect on CO levels in 2040, when compared to the No Build Alternative. All predicted 1-hour CO concentrations are below 35 ppm, and all predicted 8-hour CO concentrations are below 9 ppm. No violations of the NAAQS are predicted for any of the future analysis years.

In summary, a microscale CO analysis was conducted to determine if the Project has the potential to cause or exacerbate a violation of the applicable CO standards. The result of this analysis is that the LRT Build Alternative and the BRT Build Alternative are not predicted to cause or exacerbate a violation of the NAAQS for CO.

4.13.1.4 Microscale PM Analysis

The NYSDOT TEM describes the process for determining if a microscale PM_{10} analysis is required. While particulate matter emissions are not typically modeled as part of a transportation project air quality analysis in New York, it may be appropriate in some situations, if a conformity demonstration is required. The Project is not located in an area where transportation conformity is required. Furthermore, the project does not meet any of the criteria outlined in 40 CFR 93.123(b) requiring a quantitative analysis of local particulate emissions (hot spots) in non-attainment or maintenance areas. Therefore, no microscale particulate matter modeling was performed as part of this air quality analysis.

4.13.2 Potential Mitigation Strategies

Based on the analysis conducted and described in the previous sections, the Project is not expected to cause or exacerbate a violation of the National Ambient Air Quality Standards. As the Project is not expected to increase regional emission burdens, or Mobile Source Air Toxics levels, no mitigation is warranted. In addition, transit vehicles offer avoidance mitigation. Electric power for the LRT vehicles would be provided by a catenary system. For the BRT Build Alternative, Metro would acquire new 60-foot articulated battery-electric buses to maximize operational efficiencies and environmental benefits of the Project.