16
Air Quality

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Acronyms/Abbreviations

CAA ..... Clean Air Act
CAAA ..... Clean Air Act Amendments
CFR ..... Code of Federal Regulations
EPA ..... U.S. Environmental Protection Agency
FHWA ..... Federal Highway Administration
GBNRTC ..... Greater Buffalo Niagara Regional Transportation Council
GWP ..... Global Warming Potential
LRT ..... light-rail transit
MOVES ..... Motor Vehicle Emission Simulator
MSAT ..... Mobile Source Air Toxics
NAAQS ..... National Ambient Air Quality Standards
NEPA ..... National Environmental Policy Act
SIP ..... State Implementation Plan
VMT ..... vehicle-miles traveled
GHG ..... greenhouse gas

16 Air Quality

This chapter describes the existing air quality within the study area for the Proposed Action and discusses the National Ambient Air Quality Standards (NAAQS) and federal regulations protecting air quality. In addition, projected year (2040) air quality conditions are presented. Mitigation measures are identified. Effects to air quality related to construction are described in Chapter 19, "Construction Effects."

16.1 REGULATORY CONTEXT

Air pollution is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual air pollutants can degrade the atmosphere by reducing visibility; they are also responsible for damaging property, reducing productivity or vigor of crops or natural vegetation, and harming human or animal health.

16.1.1 Sources of Emissions

Pollutants that can be traced principally to motor vehicles are relevant to the evaluation of the Proposed Action's impacts. These pollutants include carbon monoxide (CO), volatile organic carbon (VOC), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$) and mobile source air toxics (MSAT). Details about the sources and effects of these pollutants are described below. Transportation sources account for a small percentage of regional emissions of sulfur oxides (SOx) and lead (Pb); thus, a detailed analysis of these pollutants is not required.

CO impacts are generally localized. Even under the worst meteorological conditions and most congested traffic conditions, high concentrations are limited to a relatively short distance (300 to 600 feet) of heavily traveled roadways. Vehicle emissions are the major sources of CO. The Proposed Action could change traffic patterns within the corridor. Consequently, it is appropriate to predict concentrations of CO on both a regional and a microscale basis.

VOC and NOx emissions from automotive sources are a concern primarily because they are precursors in the formation of ozone and particulate matter. Ozone is formed through a series of reactions that occur in the atmosphere in the presence of sunlight. Since the reactions are slow and occur as the pollutants are diffusing downwind, elevated ozone levels often are found many miles from the sources of the precursor pollutants. Therefore, the effects of HC and NOx emissions generally are examined on a regional or "mesoscale" basis.

PM_{10} and $PM_{2.5}$ impacts are both regional and local. A large portion of particulate matter, especially PM_{10}, comes from disturbed vacant land, construction activity, and paved road dust. $PM_{2.5}$ also comes from these sources. Motor vehicle exhaust, particularly from diesel vehicles, is also a source of PM_{10} and $PM_{2.5}$. PM_{10}, and especially $PM_{2.5}$, can also be created by secondary formation from precursor elements such as SO_2, nitrogen oxides (NO_X), VOC and ammonia (NH_3). Secondary

formation occurs because of chemical reaction in the atmosphere generally downwind some distance from the original emission source. Thus it is appropriate to predict concentrations of PM_{10} and $PM_{2.5}$ on both a regional and a localized or "microscale" basis.

MSAT impacts are both regional and local. Through the issuance of the EPA's Final Rule (FR) regarding emission control of Hazardous Air Pollutants from Mobile Sources [66 FR 17229], it was determined that many existing and newly promulgated mobile source emission control programs would result in a reduction of MSATs. The EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline program, its national low emission vehicle standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel requirements. Future emissions likely would be lower than present levels as a result of the EPA's national control programs. These programs are projected to reduce MSAT emission by 91 percent from 2010 to 2050, even if VMT increases by 45 percent (FHWA 2016).

16.1.2 Clean Air Act Amendments

The Clean Air Act (CAA) sets forth the framework and goals for improving air quality to protect public health and the environment. The CAA Amendments (CAAA) of 1990 and the Final Transportation Conformity Rule (40 Code of Federal Regulations [CFR] Parts 51 and 93)[1] direct the U.S. Environmental Protection Agency (EPA) to implement environmental policies and regulations that will ensure acceptable levels of air quality. The CAA and the Final Transportation Conformity Rule affect the funding and approval of proposed transportation projects. According to CAA Title I, Section 176 (c) 2:

> No federal agency may approve, accept or fund any transportation plan, program or project unless such plan, program or project has been found to conform to any applicable State Implementation Plan (SIP) in effect under this act.

According to Section 176(c)2(A) of the CAA, conformity to an implementation plan means eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of such standards; and that such activities will not:

- cause or contribute to any new violation of any NAAQS in any area;
- increase the frequency or severity of any existing violation of any NAAQS in any area; or
- delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in any area.

[1] Federal Highway Administration (FHWA), Code of Federal Regulations. 1997. http://www.fhwa.dot.gov/legsregs/directives/fapg/cfr0771.htm

16.1.3 National and State Ambient Air Quality Standards

As required by the CAA, NAAQS have been established for six major air pollutants. These pollutants, known as criteria pollutants, are carbon monoxide, nitrogen dioxide, ozone, particulate matter, sulfur dioxide, and lead. Table 16-1 summarizes the federal standards. The "primary" standards have been established to protect public health. The "secondary" standards are intended to protect the nation's welfare, and they account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of general welfare.

Table 16-1. National Ambient Air Quality Standards

Pollutant		Primary/Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead (Pb)		Primary and secondary	Rolling 3 month average	0.15 µg/m^3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)		Primary	1-hour	100 ppb	98th percentile, averaged over 3 years
		Primary and secondary	Annual	53 ppb(2)	Annual mean
Ozone (O_3)		Primary and secondary	8-hour	0.070 ppm(3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution	$PM_{2.5}$	Primary	Annual	12 µg/m^3	Annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m^3	Annual mean, averaged over 3 years
		Primary and secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	Primary and secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		Primary	1-hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Source: U.S. Environmental Protection Agency, *https://www.epa.gov/criteria-air-pollutants/naaqs-table*

ppm = parts per million; ppb = parts per billion; µg/m^3 = micrograms per cubic meter

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m^3 as a calendar quarter average) also remain in effect.

(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a state implementation plan (SIP) call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its SIP to demonstrate attainment of the required NAAQS.

16.1.4 Mobile Source Air Toxics

In addition to the criteria pollutants for which there are NAAQS, the EPA also regulates air toxics (also known as hazardous air pollutants). Toxic air pollutants are those pollutants known or suspected to cause cancer or other serious health effects. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

Controlling air toxic emissions became a national priority with the passage of the CAAA of 1990, whereby Congress mandated that the EPA regulate 188 air toxics. The EPA has assessed this expansive list in their latest rule—Control of Hazardous Air Pollutants from Mobile Sources (72 Federal Register 8427, February 26, 2007)—and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System[2]. In addition, the EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 2011 National Air Toxics Assessment:[3] 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While the Federal Highway Administration (FHWA) considers these the priority mobile source air toxics (MSAT), the list is subject to change and may be adjusted in consideration of future EPA rules.

The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. The FHWA, using EPA's Motor Vehicle Emission Simulator (MOVES) 2014a model[4], estimates a combined reduction of 91 percent in the total annual emissions for the priority MSATs even as forecasted vehicle-miles traveled (VMT) increases by 45 percent from 2010 to 2050.

16.1.5 Climate Change and Greenhouse Gases

Anthropogenic (human-caused) greenhouse gas (GHG) emissions contribute to climate change. Carbon dioxide (CO_2) makes up the largest component of these GHG emissions. Other prominent transportation-related GHGs include methane (CH_4) and nitrous oxide (N_2O). The Global Warming Potential (GWP) was developed to allow comparisons of the global warming impacts of different GHGs. Specifically, it is a measure of how much energy the emissions of one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of CO_2. The larger the GWP, the more that a given gas warms Earth compared to CO_2 over that period. The time period used for GWPs is typically 100 years. GWPs provide a common unit of measure, allowing analysts to sum emission estimates of different gases (e.g., to compile a national GHG inventory) for comparison and reduction opportunities in the future. The GWP values used by EPA were derived from data from the Intergovernmental Panel on Climate Change.

- CO_2, by definition, has a GWP of 1 regardless of the period used. CO_2 remains in the atmosphere for a long time; CO_2 emissions increase atmospheric CO_2 concentrations that will last thousands of years.

[2] http://www.epa.gov/iris/
[3] https://www.epa.gov/national-air-toxics-assessment
[4] U.S. Environmental Protection Agency (EPA), MOVES2014 Motor Vehicle Emission Simulator. 2014. http://www.epa.gov/otaq/models/moves/index.htm

- Methane (CH_4) is estimated to have a GWP of 25 for a 100-year timescale. CH_4 emitted today lasts about a decade, which is a shorter period than CO_2. However, CH_4 absorbs much more energy than CO_2. The net effect of the shorter lifetime and higher energy absorption is reflected in the GWP. The CH_4 GWP also accounts for indirect effects, such as the fact that CH_4 is a precursor to ozone, and ozone is itself a GHG.
- Nitrous Oxide (N_2O) has a GWP 298 times that of CO_2 for a 100-year period. N_2O emitted today remains in the atmosphere for more than 100 years.

GHGs are reported in CO_2 Equivalents (CO_2e), which is a combined measure of GHG emissions weighted according to the GWP of each gas, relative to CO_2. CO_2 equivalent is calculated within the MOVES2014b model from CO_2, N_2O and CH_4 mass emissions according to the following equation:

$$\boldsymbol{CO_2e} = CO_2 \times GWP_{CO2} + CH_4 \times GWP_{CH4} + N_2O \times GWP_{N2O}$$

To date, the EPA has not developed concentration standards or thresholds for ambient GHG emissions. However, the EPA has established GHG emission standards to limit emissions from motor vehicles.

16.2 METHODOLOGY

16.2.1 Regional Criteria Pollutant and Greenhouse Gas 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 Proposed Action using the latest version of the EPA's MOVES emissions program, MOVES2014b.

MOVES2014b is the U.S. Environmental Protection Agency's (EPA) state-of-the-art tool for estimating emissions from highway vehicles. The model is based on analyses of millions of emission test results and considerable advances in the EPA's understanding of vehicle emissions. MOVES2014b incorporates project-generated VMT as well as specific MOVES input factors, such as inspection and maintenance programs, fleet mix, and speed profiles, for the traffic network being analyzed. MOVES input factors were obtained from New York State Department of Transportation.

The emission burden analysis of a project determines the annual "pollutant burden" levels of criteria pollutants and GHGs for each of the project alternatives, as well as the No Action condition, in order to provide a basis of comparison for regional emissions of each of the criteria pollutants under the Proposed Action.

16.2.2 Carbon Monoxide Microscale Analysis

To determine the Proposed Action's impact on local Carbon Monoxide (CO) levels, a detailed hotspot analysis was conducted at two locations within the study area: Niagara Falls Boulevard and Brighton Road/Maple Road, and Maple Road and Bailey Avenue. These two locations were chosen using an intersection screening analysis based on changes in level of service and overall intersection

volumes between the No Action condition and Proposed Action scenarios, as described in the EPA's *Guideline for Modeling Carbon Monoxide from Roadway Intersections*[5].

The chosen locations underwent detailed microscale modeling using emission factors developed through the use of EPA's MOVES2014b emission factor program and dispersion modeling using EPA's CAL3QHC program. CAL3QHC is a Gaussian model recommended in the EPA's *Guidelines for Modeling Carbon Monoxide from Roadway Intersections*. Gaussian models assume that the dispersion of pollutants downwind of a pollution source follow a normal distribution from the center of the pollution source.

16.2.3 Mobile Source Air Toxics

On February 9, 2007, and under authority of CAA Section 202(l), the EPA signed a final rule—Control of Hazardous Air Pollutants from Mobile Sources (72 Federal Register 8427, February 26, 2007)—which sets standards to control MSATs from motor vehicles. Under this rule, the EPA set standards on fuel composition, vehicle exhaust emissions, and evaporative losses from portable containers. The new standards are estimated to reduce total emissions of MSATs by 330,000 tons in 2030, including 61,000 tons of Benzene. Concurrently, total emissions of Volatile Organic Compounds will be reduced by over 1.1 million tons in 2030 as a result of adopting these standards.

On February 3, 2006, the FHWA released *Interim Guidance on Air Toxic Analysis in NEPA Documents*. This guidance was superseded on October 18, 2016, by *FHWA's Updated Interim Guidance Update on Air Toxic Analysis in NEPA Documents*.[6] FHWA guidance is being referenced as Federal Transit Administration does not have their own specific guidance regarding MSAT in National Environmental Policy Act (NEPA) documentation. The purpose of FHWA's guidance is to advise on when and how to analyze MSATs in the NEPA environmental review process for highways. This guidance is considered interim because MSAT science is still evolving. As the science progresses, the FHWA will update the guidance.

A quantitative analysis provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The quantitative assessment presented is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*. The FHWA's Interim Guidance groups projects into the following tiered categories:

- Tier 1 – No analysis for projects without potential for meaningful MSAT effects
- Tier 2 – Qualitative analysis for projects with low potential MSAT effects
- Tier 3 – Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects

[5] U.S. Environmental Protection Agency (EPA), Guideline for Modeling Carbon Monoxide from Roadway Intersections. EPA-454/R-92-005. 1992. http://www.epa.gov/scram001/guidance/guide/coguide.pdf

[6] Federal Highway Administration (FHWA), Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents. 2016. https://www.fhwa.dot.gov/ENVIRonment/air_quality/air_toxics/policy_and_guidance/msat/

Based on the FHWA's recommended tiering approach, the Proposed Action falls within the Tier 2 approach (i.e., for projects with a low potential for MSAT effects). The amount of MSATs emitted would be proportional to the VMT, assuming the vehicle mix does not change.

As such, potential impacts of this project on MSATs have been analyzed based upon the regional changes in VMT. Regional VMT was provided by the Greater Buffalo Niagara Transportation Council (GBNRTC), as an output from the regional travel demand model. As described in Chapter 3, "Socioeconomic Conditions", the GBNRTC's regional model includes the Proposed Action. Therefore, an adjustment to future projections was applied to account for growth in the No Action condition. This adjustment was also used in the Comprehensive Transit-Oriented Development Plan (2018), and the methodology was agreed upon by GBNRTC and NFTA.

Since the LRT trains would be electrically powered, the Proposed Action itself would not produce any localized emissions.

16.3 EXISTING CONDITIONS

16.3.1 Attainment Status/Regional Air Quality Conformity

Section 107 of the 1977 CAAA requires that the EPA publish a list of all geographic areas in compliance with the NAAQS, plus those not attaining the NAAQS. Areas not in NAAQS compliance are deemed nonattainment areas. Areas that have insufficient data to make a determination are deemed unclassified, and are treated as being attainment areas until proven otherwise. Maintenance areas are areas that were previously designated as nonattainment for a particular pollutant, but have since demonstrated compliance with the NAAQS for that pollutant. An area's designation is based on the data collected by the state monitoring network on a pollutant-by-pollutant basis.

The Proposed Action corridor is in Erie County, New York. Table 16-2 shows the attainment status for Erie County. As shown in the table, Erie County is classified as attainment for all pollutants and averaging periods.

Table 16-2. Study Area Attainment Status

Pollutant	Erie County
Ozone (O_3)	Attainment
Nitrogen Dioxide (NO_2)	Attainment
Carbon Monoxide (CO)	Attainment
Particulate Matter (PM_{10})	Attainment
Particulate Matter (PM2.5)	Attainment
Lead (Pb)	Attainment

Source: EPA Green Book: *https://www.epa.gov/green-book*

The CAA requires that a State Implementation Plan (SIP) be prepared for each nonattainment area and a maintenance plan be prepared for each former nonattainment area that subsequently demonstrated compliance with the standards. A SIP is a compilation of a state's air quality control plans and rules that are approved by the EPA. Section 176(c) of the CAA provides that federal agencies cannot engage, support, or provide financial assistance for licensing, permitting, or

approving any project unless the project conforms to the applicable SIP. The state and EPAs' goals are to eliminate or reduce the severity and number of violations of the NAAQS and to achieve expeditious attainment of these standards.

Erie County is part of the Greater Buffalo Niagara Regional Transportation Council (GBNRTC). The GBNRTC focuses on establishing a comprehensive, coordinated, and continuing transportation planning process for Erie and Niagara Counties' metropolitan area. To do this, the GBNRTC develops a long-range regional transportation plan, known as the *Metropolitan Transportation Plan* (MTP). The GBNRTC also maintains a short-range program of projects, known as the *Transportation Improvement Program* (TIP), to fund with federal transportation money. Since Erie and Niagara Counties are currently in attainment for all NAAQS, no SIP is required, and no regional conformity determination is required.

16.3.2 Local Meteorology

The nature of the surrounding atmosphere is an important element in assessing the ambient air quality of an area. According to the National Oceanic and Atmospheric Administration (NOAA), the Niagara Frontier experiences a humid, continental type climate, with a definitive maritime influence caused by Lake Erie.[7] The winters in general are cloudy, cold, and snowy. Over half of the annual snowfall comes from "lake-effect" process, which is very localized. The lake-effect snow develops when cold air crosses the warmer lake waters and becomes saturated, creating downwind clouds and precipitation. This brings snowfall from November to the time at which the lake freezes.

Spring comes slowly to the Buffalo area, with ice packs in Lake Erie often not disappearing until mid to late-April and the lake remaining chilly through May. As the prevailing flow is southwesterly, areas near the lake are often cooler than inland locations. Conversely, the cool lake acts as a strong stabilizing influence so that areas near the city and lakeshore experience fewer thunderstorms and more sunshine than inland areas in the spring.

Summers tend to be beautiful, with plentiful sunshine and moderate humidity. Rainfall is adequate but not overwhelming, and the stabilizing influence of Lake Erie continues to inhibit thunderstorms and enhance sunshine. The lake also tends to moderate most extreme heat approaching from the Ohio Valley, and 90-degree readings are relatively rare in the area. Buffalo has sunnier and drier summers, compared to many major cities in the Northeast.

Autumn is pleasant, but rather brief. September and October tend to be tame, with the warm lake extending the mild weather. The first frosts typically appear mid-October in the metro area, when cold air surges from Canada become more common. These cold air surges passing over the Great Lakes result in a drastic increase in cloud cover in late October and early November. This "lake-effect" season includes heavy localized snowfall (NOAA 2019).

[7] National Oceanic and Atmospheric Administration (NOAA), Buffalo Climate Narrative. Accessed July 23, 2019. https://www.weather.gov/buf/BUFclifo

16.3.3 Monitored Criteria Pollutant Levels

The New York State Department of Environmental Conservation maintains a series of monitors throughout the state to measure ambient air quality levels.[8] Table 16-3 presents the air quality data monitored near the study area for the years 2015–2017. As shown in the table, there were several exceedances of the ozone standard, but no exceedances of any of the other criteria pollutants.

Table 16-3. Ambient Air Quality Monitoring Data 2015–2017

			Amherst Audubon Golf Course 450 Maple Road			Buffalo 185 Dingens Street			Cheektowaga		
			2015	2016	2017	2015	2016	2017	2015	2016	2017
Carbon Monoxide (CO) [ppm]	1-Hour	Maximum				2.1	1.5	1.3	1.3	1.7	0.4
		2nd Maximum				1.9	1.3	1.3	1.2	1.4	0.4
		# of Exceedances				0	0	0	0	0	0
	8-Hour	Maximum				1.7	0.9	1	0.9	0.9	0.3
		2nd Maximum				1.5	0.9	1	0.8	0.8	0.3
		# of Exceedances				0	0	0	0	0	0
Particulate Matter [ug/m^3]	PM_{10}	Maximum 24-Hour				78	93	53			
		Second Maximum				48	66	33			
		# of Exceedances				0	0	0			
	$PM_{2.5}$	24-Hour 98th Percentile	19	13	15	23	15	17	23	14	15
		Mean Annual	8.1	6.1	6.6	8.8	6.8	72	9.3	6.7	7.4
Ozone (O_3) [ppm]	8-Hour	First Highest	0.076	0.081	0.076						
		Second Highest	0.073	0.075	0.070						
		Third Highest	0.071	0.075	0.070						
		Fourth Highest	0.071	0.074	0.066						
		# of Days Standard Exceeded	4	6	1						
Nitrogen Dioxide (NO_2) [ppb]		1-Hour 98th Percentile				53	48	46	52	45	40
		Annual Mean				11.1	9.9	9.6	12.48	10.78	9.49
Sulfur Dioxide (SO_2) [ppb]		1-Hour 99th Percentile				11	7	8			

Source: *https://www.dec.ny.gov/docs/air_pdf/2017airqualreport.pdfNYSDEC* 2019

16.4 ANALYSIS RESULTS

16.4.1 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 using the latest version of the EPA's Motor Vehicle Emission Simulator (MOVES) emissions program, MOVES2014b. MOVES2014b incorporates project-generated VMT as well as specific MOVES input factors, such as inspection and

[8] New York Department of Environmental Conservation (NYSDEC), New York State Ambient Air Quality Report for 2017. https://www.dec.ny.gov/docs/air_pdf/2017airqualreport.pdf

maintenance programs, fleet mix, and speed profiles, for the traffic network being analyzed. MOVES input files were obtained from NYSDOT.

The emission burden analysis of a project determines the annual "pollutant burden" levels for each of the project alternatives, as well as the No Action condition, in order to provide a basis of comparison for regional emissions of each of the criteria pollutants under the Proposed Action. The VMT and emission burdens (in metric tons) for existing conditions, No Action condition, and the Proposed Action, are presented in Table 16-4.

Table 16-4. Annual Regional Emission Burden Assessment (Metric Tons per Year)

Alternative	Daily VMT	Hydrocarbons (HC)	Nitrogen Oxides (NO_X)	Carbon Monoxide (CO)	Particulate Matter (PM_{10})	Particulate Matter ($PM_{2.5}$)	Carbon Dioxide Equivalents (CO_2e)
Existing Condition 2015	22,967,300	2,941	7,210	41,119	682	395	4,156,707
No Action 2040	23,672,100	1,007	1,549	13,922	395	83	2,933,964
Proposed Action 2040	23,685,290	1,007	1,551	13,930	395	83	2,936,809
% Change from Existing Condition	3%	-66%	-78%	-66%	-42%	-76%	-29%
% Change from No Action	0.06%	0.01%	0.16%	0.06%	0.01%	0.05%	0.10%

In the analysis year (2040), regional emissions would be substantially lower under both the No Action condition and Proposed Action, when compared to existing condition emission burdens. Future emissions are lower due to the implementation of fuel economy and vehicle emissions standards.

The projected VMT from the Proposed Action is 0.06 percent higher than the No Action condition. The net increase in VMT includes the increased VMT due to future development and growth associated with anticipated transit-oriented development, as well as the decreased VMT from usage of the LRT system. Chapter 3, "Socioeconomics" describes the population and employment growth anticipated with the Proposed Action. Pollutant emissions burdens would be 0 percent to 0.16 percent higher than the No Action condition. As shown in the table, the Proposed Action would increase regional roadway emissions of CO_2e by approximately 0.1 percent, as compared to the No Action condition.

As discussed earlier, the affected environment for GHGs is the entire planet. On a global scale, the regional increase in roadway emissions of CO_2e associated with the Proposed Action is not considered significant.

16.4.2 Mobile Source Air Toxics

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

16.4.2.1 Information that is Unavailable or Incomplete

In the FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the CAA and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the IRIS, which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA, *http://www.epa.gov/iris/*). Each report contains assessments of non-cancerous and cancerous effects from compounds and estimates of risk levels from exposure.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents. Among the adverse health effects linked to MSAT compounds at high exposures are: cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations[9] or in the future as vehicle emissions substantially decrease[10].

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts—each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding

[9] Health Effects Institute (HEI), Mobile-Source Air Toxics: A Critical Review of the Literature on Exposure and Health Effects, Special Report 16. 2007. *http://pubs.healtheffects.org/view.php?id=282* and http://pubs.healtheffects.org/getfile.php?u=395.

[10] Health Effects Institute (HEI), Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects, HEI Panel on the Health Effects of Traffic-Related Air Pollution, Preprint Special Report 17. 2009. http://pubs.healtheffects.org/view.php?id=306.

changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (*http://pubs.healtheffects.org/view.php?id=282*). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA (*http://www.epa.gov/risk/basicinformation.htm#g*) and the HEI (*http://pubs.healtheffects.org/getfile.php?u=395*) have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the CAA to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld the EPA's approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable.

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

16.4.3 Microscale CO Analysis

The most recent version of the EPA mobile source emission factor model (MOVES2014b) and the CAL3QHC (Version 2.0) air quality dispersion model (EPA 1995) were used to estimate existing, future No Action condition and Proposed Action CO levels at selected locations in the project area.

Mobile source models are the basic analytical tools used to estimate CO concentrations expected under given traffic, roadway geometry, and meteorological conditions. The mathematical expressions and formulations that comprise the various models attempt to describe an extremely complex physical phenomenon as closely as possible. The dispersion modeling program used in this project for estimating pollutant concentrations near roadway intersections is the CAL3QHC (Version 2.0) dispersion model developed by EPA and first released in 1992.

CAL3QHC is a Gaussian model recommended in the EPA's Guidelines for Modeling Carbon Monoxide from Roadway Intersections (EPA 1992). Gaussian models assume that the dispersion of pollutants downwind of a pollution source follow a normal distribution from the center of the pollution source.

Different emission rates occur when vehicles are stopped (i.e., idling), accelerating, decelerating, and moving at different average speeds. CAL3QHC simplifies these different emission rates into two components:

- Emissions when vehicles are stopped (i.e., idling) during the red phase of a signalized intersection
- Emissions when vehicles are in motion during the green phase of a signalized intersection

The CAL3QHC (Version 2.0) air quality dispersion model has undergone extensive testing by EPA and has been found to provide reliable estimates of inert (i.e., nonreactive) pollutant concentrations resulting from motor vehicle emissions. A complete description of the model is provided in the *User's Guide to CAL3QHC (Version 2.0): A Modeling Methodology for Predicting Pollutant Concentrations near Roadway Intersections* (Revised) (EPA 1995b).

The transport and concentration of pollutants emitted from motor vehicles are influenced by three principal meteorological factors: wind direction, wind speed, and the atmosphere's profile. The values for these parameters were chosen, in accordance with EPA's guidance, to maximize pollutant concentrations at each prediction site. That is, to establish a conservative, reasonable worst-case scenario. The following values were used for these parameters:

- **Wind Direction**. Maximum CO concentrations normally are found when the wind is assumed to blow parallel to a roadway adjacent to the receptor location. At complex intersections, it is difficult to predict which wind angle will result in maximum concentrations. Therefore, the approximate wind angle that would result in maximum pollutant concentrations at each receptor location was used in the analysis. All wind angles from 0 to 360 degrees (in 5-degree increments) were considered.
- **Wind Speed**. The CO concentrations are greatest at low wind speeds. A conservative wind speed of one meter per second (2.2 miles per hour) was used to predict CO concentrations during peak traffic periods.
- **Profile of the Atmosphere**. A "mixing" height (the height in the atmosphere to which pollutants rise) of 1,000 meters, and neutral atmospheric stability (stability class D) conditions were used in estimating microscale CO concentrations.

The CO levels estimated by the model are the maximum concentrations which could be expected to occur at each air quality receptor site analyzed, given the assumed 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.

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. A CO background level must be added to this value to account for CO entering the area from other sources upwind of the receptors. Background levels for this analysis were obtained from the Dingens Street monitoring site, which is located approximately 8 miles from the project area. The background values used for the 1-hour and 8-hour CO levels, 2.1 ppm and 1.7 ppm, respectively, are the maximum monitored CO levels from the past three years of data (2015–2017). 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.

Traffic data for the air quality analysis was derived from information developed as part of the traffic analysis, described in Chapter 13, "Transportation" and Appendix E, Traffic Analysis Report of this DEIS.

Emission factors were developed using the latest version of the EPA's MOVES program, MOVES2014b. MOVES2014b is the EPA's state-of-the-art tool for estimating emissions from highway vehicles. The model is based on analyses of millions of emission test results and considerable advances in the EPA's understanding of vehicle emissions. Compared to previous tools, MOVES2014b incorporates the latest emissions data, more sophisticated calculation algorithms, increased user flexibility, new software design, and substantial new capabilities.

16.4.3.1 Screening Evaluation

A screening evaluation was performed on the twenty intersections analyzed in the traffic analysis (Chapter 13, "Transportation".) As recommended in EPA's "*Guideline for Modeling Carbon Monoxide from Roadway Intersections*" the intersections were ranked by volume and by level of service (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.

Based on the screening evaluation, two intersections were chosen for detailed analysis:

- #9 – 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 during the Saturday midday time period.
- #11 - Maple Road and Bailey Avenue – This intersection experiences the worst overall delay in the study area, which occurs in the weekday PM peak time period. This intersection also experiences the worst delay of all the intersections during the Saturday midday period.

16.4.3.2 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. Maximum one-hour CO concentrations are shown in Table 16-6. Maximum eight-hour CO concentrations are shown in Table 16-7. 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 16-5. Predicted Worst-Case One-Hour CO Concentrations (ppm)

Intersection	2018			2040					
	Existing			No Action			Proposed Action		
	AM	MD	PM	AM	MD	PM	AM	MD	PM
Niagara Falls Blvd and Brighton Rd/Maple Rd	2.6	2.9	2.9	2.2	2.3	2.3	2.2	2.3	2.3
Maple Rd and Bailey Ave	2.6	2.9	2.9	2.2	2.3	2.3	2.2	2.3	2.3

Notes: Concentrations = modeled results + 1-hour CO background. 1-hour CO background = 2.1 ppm; 1-hour CO standard = 35 ppm.
Abbreviations: AM = morning; MD = midday; PM = evening; ppm = parts per million.

Table 16-6. Predicted Worst-Case Eight-Hour CO Concentrations (ppm)

Intersection	2018			2040					
	Existing			No Action			Proposed Action		
	AM	MD	PM	AM	MD	PM	AM	MD	PM
Niagara Falls Blvd and Brighton Rd/Maple Rd	2.1	2.3	2.3	1.8	1.8	1.8	1.8	1.8	1.8
Maple Rd and Bailey Ave	2.1	2.3	2.3	1.8	1.8	1.8	1.8	1.8	1.8

Notes: Concentrations = (modeled results x persistence factor [0.7]) + 8-hour CO background. 8-hour CO background = 1.7 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 Proposed Action is predicted to have no effect on CO levels in 2040, when compared to the No Action condition. 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 Proposed Action has the potential to cause or exacerbate a violation of the applicable CO standards. The result of this analysis is that the Proposed Action is not predicted to cause or exacerbate a violation of the NAAQS for CO.

16.5 MITIGATION

The Proposed Action is not expected to cause or exacerbate a violation of the NAAQS. The Proposed Action is not expected to increase regional emission burdens, MSAT levels, or greenhouse gases. Therefore, no mitigation is warranted.

16.6 REFERENCES

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