Appendix 10A Air Quality

10A.1 INTRODUCTION

The Port Authority of New York & New Jersey proposes to replace the existing Port Authority Bus Terminal (PABT) in Manhattan, New York with a new Main Terminal, Storage and Staging Facility (SSF) (also referred to as the West Adjunct in the Final National Environmental Policy Act (NEPA) Scoping Information Packet), and associated ramp infrastructure (collectively, the 'Replacement Facility'). To accommodate the new Main Terminal, a portion of West 41st Street would be permanently closed between Eighth and Ninth Avenue. Two decks over below-grade portions of Dyer Avenue and the Lincoln Tunnel Expressway would be constructed to facilitate construction-period bus operations. These "Dyer Deck-Overs" would be converted to publicly accessible open space following completion of the Replacement Facility. The Replacement Facility would be accompanied by private development to assist in funding its construction. The Replacement Facility, conversion of the Dyer Deck-Overs to publicly accessible open space, and private development are collectively referred to as the Bus Terminal Replacement Project (the Proposed Project).

This appendix examines the potential for air quality impacts from the Proposed Project. For the purposes of analysis, the new Main Terminal, SSF, and the associated ramp infrastructure elements of the Replacement Facility are anticipated to be naturally ventilated with uniformly distributed openings on at least three side using either open facades or a permeable facade screen to allow airflow into and out of the facility for proper ventilation of bus operating areas of the facility. The permeable facade screens would be designed with a void-to-solid ratio of 50%. Air quality impacts can be either direct or indirect. Direct impacts result from emissions generated by stationary sources at a development site, such as emissions from on-site fuel combustion for heating and hot water systems or exhaust points of a manufacturing or industrial operation. Indirect impacts are caused by off-site emissions associated with a project, such as emissions from on-road vehicle trips affected by the Proposed Project.

The City Environmental Quality Review (CEQR) *Technical Manual* carbon monoxide (CO) screening threshold is 140 peak-hour automobile vehicle trips at nearby intersections in the study area. The maximum hourly incremental traffic volumes generated by the Proposed Project is projected to be above the CEQR CO screening threshold in 2040 at 25 intersections. A CO microscale analysis was performed consistent with procedures in the *CEQR Technical Manual*.

A particulate matter (PM) microscale/hot-spot analysis of $PM_{2.5}$ and PM_{10} was conducted consistent with U.S. Environmental Protection Agency (EPA) guidance for PM hot-spot analyses. In consultation with an Interagency Consultation Group (ICG), a microscale/hot-spot methodology was developed. The methodology included screening procedures based on a combination of EPA, New York State Department of Transportation *Transportation Environmental*

Manual (TEM), and CEQR guidance and modeling procedures to be followed for the analysis and in defining the analysis year to focus on the worst-case year for $PM_{2.5}$ 24-hour and annual averaging periods.

In general, when analyzing the potential effects of the Proposed Project, development that results in higher levels of emissions was assumed. Both the Replacement Facility and the private development associated with the Proposed Project are anticipated to be designed to operate with fully electric heating and hot water systems. Consequently, the Proposed Project would not include fossil fuel-burning heating and hot water systems for the Replacement Facility. Therefore, a stationary source analysis of these systems is not warranted.

The Proposed Project would include diversions of buses to city streets during the second phase of construction (Main Terminal Construction, Staging and Storage (Deck-Over) Retrofit). While the new Main Terminal is being constructed, buses would be temporarily operated and stored within the Dyer Deck-Overs and other temporary on-street locations. The traffic analysis (**Appendix 9B, "Traffic"**) determined the highest bus volume increases would occur along Tenth Avenue, between West 39th Street and West 41st Street. These intersections are located approximately 500 meters from the new Main Terminal.

For the purposes of analysis, the new Main Terminal, the SSF, and the roadways associated with the Replacement Facility are anticipated to be naturally ventilated. Therefore, an analysis was conducted to evaluate potential future pollutant concentrations in the vicinity of each of these components of the Replacement Facility. Total concentrations for the Proposed Project were estimated by conservatively summing the highest predicted pollutant increments from bus operations within the naturally ventilated areas to the highest predicted concentrations from the mobile source analysis, to assess the total combined impact of both sources.

10A.2 POLLUTANTS FOR ANALYSIS

Air quality is affected by air pollutants produced by both motor vehicles and stationary sources. Emissions from motor vehicles are referred to as mobile source emissions, while emissions from fixed facilities are referred to as stationary source emissions. Ambient concentrations of CO are predominantly influenced by mobile source emissions. PM, volatile organic compounds (VOCs), and nitrogen oxides (nitric oxide [NO] and NO_2, collectively referred to as NO_x) are emitted from both mobile and stationary sources. Fine PM is also formed when emissions of NO_x, sulfur oxides (SO_x), ammonia, organic compounds, and other gases react or condense in the atmosphere. Emissions of sulfur dioxide (SO_2) are associated mainly with stationary sources, and some sources utilizing non-road diesel such as large international marine engines. On-road diesel vehicles currently contribute very little to SO_2 emissions since the sulfur content of on-road diesel fuel, which is federally regulated, is extremely low. Ozone (O_3) is formed in the atmosphere by complex photochemical processes that involve NO_x and VOCs. Ambient concentrations of CO, PM, NO_2, SO_2, ozone, and lead are regulated by the EPA under the Clean Air Act (CAA) and are referred to as criteria pollutants; emissions of VOCs, NO_x, and other precursors to criteria pollutants from certain source categories are also regulated by EPA.

10A.2.1 Carbon Monoxide

CO, a colorless and odorless gas, is produced in the urban environment primarily by the incomplete combustion of gasoline and other fossil fuels. Breathing air with a high concentration of CO reduces the amount of oxygen that can be transported in the bloodstream to critical organs like the heart and brain. When CO levels are elevated outdoors, they can be of concern for people with sensitive health issues such as heart disease. In urban areas, approximately 80 to 90% of CO emissions are from motor vehicles. However, national 8-hour average CO levels have decreased by 85% between 1980 and 2019. This reduction is due in large part to the CAA, which required the EPA to issue a series of rules to reduce pollution from vehicle exhaust, refueling emissions, and evaporating gasoline. As a result, emissions from a new vehicle purchased today are over 90% cleaner than one purchased in 1970. CO concentrations can diminish rapidly over relatively short distances; elevated concentrations are usually limited to locations near crowded intersections, heavily traveled and congested roadways, parking lots, and garages. Consequently, CO concentrations must be analyzed on a local (microscale) basis.

Local CO effects are required per 40 CFR Section 93.123. As such, for the Proposed Project, CO was included in the on-street mobile source analysis in year 2040. Additionally, an analysis of CO was also included in the analysis of the Replacement Facility's natural ventilated terminal structure.

10A.2.2 Nitrogen Oxides, VOCs, and Ozone

NO_x are of principal concern because of their role, together with VOCs, as precursors in the formation of ozone. In addition to being a precursor to the formation of ozone, NO_2 (one component of NO_x) is also a regulated pollutant.

O_3 is a colorless, toxic gas found in both the Earth's upper and lower atmospheric levels. In the upper atmosphere, O_3 is a naturally occurring gas that helps to prevent the sun's harmful ultraviolet rays from reaching the Earth. In the lower layer of the atmosphere, the formation of O_3 is mostly the result of human activity, although O_3 also occurs because of hydrocarbons released by plants and soil. O_3 is not directly emitted into the atmosphere; in the lower atmosphere, it forms through a series of photochemical reactions in the presence of sunlight, hydrocarbons (HC) (primarily VOCs) and NO_x. VOCs and NO_x are emitted from industrial sources and from automobiles. Substantial O_3 formations generally require stagnant atmospheric conditions with strong sunlight; thus, high levels of O_3 are generally a concern in the summer. O_3 is the main ingredient of smog.

People most at risk from breathing air containing elevated ozone levels include those with asthma, children, older adults, and people who are active outdoors, especially outdoor workers.

Breathing air with a high concentration of NO_2 can irritate airways in the human respiratory system. Such exposures over short periods can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing or difficulty breathing), hospital admissions and visits to emergency rooms.

There is no local conformity requirement for NO_2. Furthermore, the Proposed Project would not involve the addition of any new stationary emission sources. Therefore, an analysis of potential local impacts on NO_2 concentrations was not warranted.

10A.2.3 Lead

Airborne lead emissions are currently associated principally with industrial sources. Lead is a stable element that persists and accumulates both in the environment and in animals. Its principal effects in humans are on the blood-forming, nervous and renal systems. Lead in gasoline has been banned under the CAA and would not be emitted from any component of the Proposed Project. Therefore, an analysis of this pollutant was not warranted.

10A.2.4 Respirable Particulate Matter—PM_{10} and $PM_{2.5}$

PM is a broad class of air pollutants that includes discrete particles of a wide range of sizes and chemical compositions, as either liquid droplets (aerosols) or solids suspended in the atmosphere. PM is regulated in two size categories: particles with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$) and particles with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}, which includes $PM_{2.5}$). The constituents of PM are both numerous and varied, and they are emitted from a wide variety of sources (both natural and anthropogenic). Natural sources are varied and include the condensed and reacted forms of naturally occurring VOCs; salt particles resulting from the evaporation of sea spray; wind-borne pollen, fungi, molds, algae, yeasts, rusts, bacteria, and material from live and decaying plant and animal life; particles eroded from beaches, soil, and rock; and particles emitted from volcanic and geothermal eruptions and from forest fires. Naturally occurring PM is generally greater than 2.5 micrometers in diameter. Major anthropogenic sources include the combustion of fossil fuels (e.g., vehicular exhaust, power generation, boilers, engines, and home heating), chemical and manufacturing processes, construction, agricultural activities, and wood-burning stoves and fireplaces. PM also acts as a substrate for the adsorption (accumulation of gases, liquids, or solutes on the surface of a solid or liquid) of other pollutants, often toxic, and some likely carcinogenic compounds.

Human exposure to PM can affect lung and heart function. Numerous scientific studies have linked particle pollution exposure to asthma and other respiratory system irritation, and to heart attacks and irregular heartbeat.

$PM_{2.5}$ is mainly derived from combustion material that has volatilized and then condensed to form primary PM (often soon after the release from a source) or from precursor gases reacting in the atmosphere to form secondary PM. $PM_{2.5}$ is also composed of particles from brake wear and tire wear. Solid material found in the exhaust of diesel-fuel powered vehicles, referred to as diesel PM, has been identified by the EPA as a toxic air pollutant due to the relationship between diesel exhaust exposure and lung cancer and other adverse health effects. Gasoline-powered and diesel-powered vehicles, especially heavy-duty trucks and buses operating on diesel fuel, are a significant source of respirable PM, most of which is $PM_{2.5}$; PM concentrations may, consequently, be locally elevated near roadways.

The Proposed Project would not involve the addition of any new stationary emission sources. Therefore, an analysis of potential local impacts on PM concentrations was not warranted for stationary sources. As required by 40 CFR Section 93.123, potential microscale impacts of PM concentrations from mobile sources was evaluated.

10A.2.5 Sulfur Dioxide

SO_2 emissions are primarily associated with the combustion of sulfur-containing fuels (oil and coal). SO_2 is also of concern as a precursor to $PM_{2.5}$ and is regulated as a $PM_{2.5}$ precursor under the New Source Review permitting program for large sources.[1] Due to the Federal restrictions on the sulfur content in diesel fuel for on-road and non-road vehicles, no significant quantities are emitted from vehicular sources. Due to use of ultra-low sulfur diesel fuel and essentially sulfur free gasoline, vehicular sources of SO_2 are not significant and therefore analysis of SO_2 from mobile sources was not warranted.

The Proposed Project would not involve the addition of any new fossil fuel-burning stationary emission sources. Therefore, an analysis of potential SO_2 emissions for stationary sources was not warranted.

10A.2.6 Air Toxics

In addition to the criteria pollutants for which there are National Ambient Air Quality Standards (NAAQS), the EPA also regulates air toxics. 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., construction equipment), area sources (e.g., industrial processes), and stationary sources (e.g., factories or refineries).

Controlling air toxic emissions became a national priority with the passage of the CAA Amendments of 1990, whereby Congress mandated that the EPA regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in its latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are listed in its Integrated Risk Information System.[2] In addition, EPA identified nine

1 New Source Review is a CAA program that requires industrial facilities to install modern pollution control equipment when they are built or when making a change that increases emissions significantly.

2 https://www.epa.gov/iris

compounds with substantial contributions from mobile sources that are among the national and regional-scale cancer risk drivers from its 2011 National Air Toxics Assessment.[3] These are: 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel PM, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter.

The 2007 EPA rule requires controls that dramatically decreased Mobile Source Air Toxic emissions through cleaner fuels and cleaner engines. According to a Federal Highway Administration analysis using the EPA's MOVES3.1 model, even if vehicle activity (vehicle-miles traveled) increases by 31% from 2020 to 2060 as forecast, a combined reduction of 76% in the total annual emissions for the priority Mobile Source Air Toxic emissions is projected for the same period.

The Proposed Project would not involve the addition of any new stationary emission sources and, as a replacement project, would not induce new mobile source traffic. Therefore, an analysis of potential local impacts on air toxics concentrations was not warranted.

10A.3 AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

10A.3.1 National and State Air Quality Standards

As required by the CAA, primary and secondary NAAQS have been established[4] for six major air pollutants: CO, NO_2, O_3, respirable PM (both $PM_{2.5}$ and PM_{10}), SO_2, and lead. The primary standards represent levels that are requisite to protect the public health, allowing an adequate margin of safety. The secondary standards are intended to protect the nation's welfare, and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the environment. The primary standards are generally either the same as the secondary standards or more restrictive. The NAAQS are presented in **Table 10A-1**. The NAAQS for 3-hour SO_2 (i.e., the concentration of SO_2 over a 3-hour period) has also been adopted as the ambient air quality standard for New York State, but is defined by an ongoing 12-month basis rather than for calendar years only. New York State has adopted the NAAQS as state standards.

Effective December 2015, EPA lowered the 2008 Ozone (O_3) NAAQS from 0.075 ppm to 0.070 ppm. EPA issued final area designations for the revised standard on April 30, 2018.

Federal ambient air quality standards do not exist for noncriteria pollutants;[5] however, the New York State Department of Environmental Conservation (NYSDEC) has issued standards for two noncriteria compounds. NYSDEC has also developed a guidance document DAR-1[6] (February

[3] https://www.epa.gov/national-air-toxics-assessment
[4] EPA. National Ambient Air Quality Standards. 40 CFR part 50.
[5] The term noncriteria pollutants refers to all air pollutants except for the criteria pollutants (SOx, PM, NOx, CO, O_3, and lead)
[6] NYSDEC. DAR-1: Guidelines for the Evaluation and Control of Ambient Air Contaminants Under Part 212. February 2021.

2021), which contains a compilation of annual and short term (1-hour) guideline concentrations for numerous other noncriteria compounds. The NYSDEC thresholds represent ambient levels that are considered safe for public exposure. The Proposed Project would not emit noncriteria pollutants subject to NYSDEC standards or guidance document DAR-1.

Table 10A-1. National Ambient Air Quality Standards (NAAQS)

Pollutant		Primary		Secondary	
		ppm	µg/m³	ppm	µg/m³
Carbon Monoxide (CO)	8-Hour Average	9[1]	10,000	None	
	1-Hour Average	35[1]	40,000		
Lead	Rolling 3-Month Average	NA	0.15	NA	0.15
Nitrogen Dioxide (NO_2)	1-Hour Average[2]	0.100	188	None	
	Annual Average	0.053	100	0.053	100
Ozone (O_3)	8-Hour Average[3]	0.070	140	0.070	140
Respirable Particulate Matter (PM_{10})	24-Hour Average[1]	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)	Annual Mean[4]	NA	12	NA	15
	24-Hour Average[5]	NA	35	NA	35
Sulfur Dioxide (SO_2)	1-Hour Average[6]	0.075	196	NA	NA
	Maximum 3-Hour Average[1]	NA	NA	0.50	1,300

Source: 40 CFR Part 50: National Primary and Secondary Ambient Air Quality Standards.
Notes: ppm – parts per million (unit of measure for gases only)
µg/m³ – micrograms per cubic meter (unit of measure for gases and particles, including lead)
NA – not applicable
All annual periods refer to calendar year.
Standards are defined in ppm. Approximately equivalent concentrations in µg/m³ are presented.
[1] Not to be exceeded more than once a year.
[2] 3-year average of the annual 98th percentile daily maximum 1-hr average concentration.
[3] 3-year average of the annual fourth highest daily maximum 8-hr average concentration.
[4] 3-year average of annual mean.
[5] Not to be exceeded by the annual 98th percentile when averaged over 3 years.
[6] 3-year average of the annual 99th percentile daily maximum 1-hr average concentration.

10A.3.2 NAAQS Attainment Status and State Implementation Plans

The CAA, as amended in 1990, defines non-attainment areas (NAAs) as geographic regions that have been designated as not meeting one or more of the NAAQS. When an area is designated as non-attainment by EPA, the state is required to develop and implement a State Implementation Plan (SIP), which delineates how a state plans to achieve air quality that meets the NAAQS under the deadlines established by the CAA, followed by a plan for maintaining attainment status once the area is in attainment.

In 2002, EPA redesignated New York City as in attainment for CO. Under the resulting maintenance plans, New York is committed to implementing site-specific control measures throughout New York City to reduce CO levels, should unanticipated localized growth result in elevated CO levels during the maintenance period. The second CO maintenance plan for the region was approved by EPA on May 30, 2014.

Manhattan had been designated as a moderate NAA for PM_{10}. EPA clarified on July 29, 2015 that the designation only applied to the revoked annual standard.

The five New York City counties and Nassau, Suffolk, Rockland, Westchester, and Orange Counties had been designated as a $PM_{2.5}$ NAA (New York Portion of the New York–Northern New Jersey–Long Island, NY-NJ-CT NAA) since 2004 under the CAA due to exceedance of the 1997 annual average standard, and were also non-attainment with the 2006 24-hour $PM_{2.5}$ NAAQS since November 2009. The area was redesignated as in attainment for that standard effective April 18, 2014 and is now under a maintenance plan. EPA lowered the annual average primary standard to 12 micrograms per cubic meter ($\mu g/m^3$) effective March 2013. EPA designated the area as in attainment for the 12 $\mu g/m^3$ NAAQS effective April 15, 2015.

Effective June 15, 2004, EPA designated Nassau, Rockland, Suffolk, Westchester, and the five New York City counties (the New York portion of the New York–Northern New Jersey–Long Island, NY-NJ-CT, NAA) as a moderate NAA for the 1997 8-hour average ozone standard. In March 2008 EPA strengthened the 8-hour ozone standards, but certain requirements remain in areas that were either non-attainment or maintenance areas for the 1997 ozone standard ('anti-backsliding'). EPA designated the same NAA as a marginal NAA for the 2008 ozone NAAQS, effective July 20, 2012. On April 11, 2016, as requested by New York State, EPA reclassified the area as a "moderate" NAA. On July 19, 2017, NYSDEC announced that the New York Metro Area (NYMA) was not projected to meet the July 20, 2018, attainment deadline and NYSDEC therefore requested that EPA reclassify the NYMA to "serious" non-attainment. EPA reclassified the NYMA from "moderate" to "serious" NAA, effective September 23, 2019, which imposed a new attainment deadline of July 20, 2021 (based on 2018-2020 monitored data). NYSDEC's proposed draft revisions to the SIP (June 2021) state that based on monitoring data, New York State has not demonstrated compliance with the 2008 ozone NAAQS. On November 29, 2021, NYSDEC submitted for EPA approval a SIP attainment demonstration for the 2008 ozone NAAQS. The SIP is currently in pending status before EPA. The submittal demonstrates the NYMA did *not* attain the 2008 ozone NAAQS by July 20, 2021, due to several monitors in Connecticut with design values exceeding the standard.[7] NYSDEC requested EPA redesignate the area to "severe" and allow adequate time to develop an attainment demonstration, including emission projections, for the "severe" designation. An attainment date has not been set.

On April 30, 2018, EPA designated the same area as a moderate NAA for the revised 2015 ozone standard. EPA is currently reviewing revisions to New York's SIP plan.

New York City is currently in attainment of the annual average NO_2 standard. EPA has designated the entire state of New York as "unclassifiable/attainment" of the 1-hour NO_2

7 A design value is a statistic that describes the air quality status of a given location relative to the level of the NAAQS.

standard effective February 29, 2012.[8] Since additional monitoring is required for the 1-hour standard, areas will be reclassified once three years of monitoring data are available.

EPA has established a 1-hour SO_2 standard, replacing the former 24-hour and annual standards, effective August 23, 2010. EPA has designated the entire state of New York as in attainment for this standard, with the exception of Monroe County, which was designated as "unclassifiable" and a portion of St. Lawrence County, which was designated as "non-attainment."

10A.3.3 Determining the Significance of Air Quality Impacts

Federal, New York State, and New York City regulations prescribe criteria for assessing air quality impacts. Review of the analysis by Federal, State, and New York City agencies prescribes the impact criteria to be used. At the Federal and State level, the primary criteria used to quantitatively assess impacts are the NAAQS. The NEPA process requires a project to take a "hard look" at potential impacts. New York City has established additional thresholds to use in evaluating a project due to dense development and complex traffic conditions in the City. The State Environmental Quality Review Act regulations and *CEQR Technical Manual* state that the significance of a predicted consequence of a project (i.e., whether it is material, substantial, large or important) should be assessed in connection with its setting (e.g., urban or rural), its probability of occurrence, its duration, its irreversibility, its geographic scope, its magnitude, and the number of people affected.[9] In terms of the magnitude of air quality impacts, any action predicted to increase the concentration of a criteria air pollutant to a level that would exceed the concentrations defined by the NAAQS (see **Section 10A.3.1**).

In addition, to maintain concentrations lower than the NAAQS in attainment areas, or to ensure that concentrations would not be significantly increased in non-attainment areas, threshold levels have been defined for certain pollutants at the local jurisdictional level; any action predicted to increase the concentrations of these pollutants above the thresholds would be deemed to have a potential significant adverse impact, even in cases where violations of the NAAQS are not predicted.

10A.3.3.1 CO De Minimis Criteria

Federal and State impact assessments for CO use a comparison to the CO NAAQS. New York City has developed *de minimis* criteria to assess the significance of the increase in CO concentrations that would result from a proposed project or action on mobile sources, as set forth in the *CEQR Technical Manual*. These are established due to the complex and dense traffic found in various areas throughout the city. These criteria set the minimum change in CO concentration that defines a significant adverse impact. Significant increases of CO

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8 An "unclassifiable" designation refers to any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

9 New York City. *CEQR Technical Manual*. Chapter 1, Section 222. November 2020; and SE*QR Regulations. 6 NYCRR § 617.7

concentrations in New York City are defined as: (1) an increase of 0.5 ppm or more in the maximum 8-hour average CO concentration at a location where the predicted No Action 8-hour concentration is equal to or between 8 and 9 ppm; or (2) an increase of more than half the difference between baseline (i.e., No Action) concentrations and the 8-hour standard, when No Action concentrations are below 8 ppm.

The above *de minimis* criteria are more stringent than an overall comparison to the NAAQS when assessing significance of a project's air quality impacts. In addition to a comparison to the NAAQS for Federal, State, and City purposes, the CEQR criteria have been used to evaluate the significance of predicted impacts of the Proposed Project on CO concentrations.

10A.3.3.2 $PM_{2.5}$ De Minimis Criteria

Federal and State impact assessments for $PM_{2.5}$ use a comparison to the $PM_{2.5}$ NAAQS. In addition, New York City uses *de minimis* criteria to determine the potential for significant adverse $PM_{2.5}$ impacts under CEQR are as follows:

- Predicted increase of more than half the difference between the background concentration and the 24-hour standard;
- Annual average $PM_{2.5}$ concentration increments that are predicted to be greater than 0.1 µg/m^3 at ground level on a neighborhood scale (i.e., the annual increase in concentration representing the average over an area of approximately 1 square kilometer, centered on the location where the maximum ground-level impact is predicted for stationary sources; or at a distance from a roadway corridor similar to the minimum distance defined for locating neighborhood scale monitoring stations); or
- Annual average $PM_{2.5}$ concentration increments which are predicted to be greater than 0.3 µg/m^3 at a discrete receptor location (elevated or ground level).

These local thresholds are established due to the complex and dense traffic found in various areas throughout the city. Projects under CEQR predicted to increase $PM_{2.5}$ concentrations by more than the above *de minimis* criteria would be considered to have a potential significant adverse impact.

The above *de minimis* criteria are more stringent than an overall comparison to the NAAQS when assessing significance. In addition to a comparison to the NAAQS for Federal, State, and City purposes, the CEQR criteria have been used to evaluate the significance of predicted impacts of the Proposed Project on $PM_{2.5}$ concentrations.

10A.4 METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS

In order to assess the potential effects of the Proposed Project, the air quality analysis considered the future conditions for multiple analysis years depending on pollutant under study: 1) $PM_{2.5}$ and PM_{10} was evaluated for 2028 due to worst-case diesel vehicle traffic resulting from concurrent construction and continued bus operations; 2) CO was evaluated for 2040, when full demand is projected to occur and the private development associated with the Proposed Project would be complete and operational (see **Appendix 2C**, **"Analysis Framework"**).

In general, when analyzing the potential effects of the Proposed Project, development that results in higher levels of emissions was assumed. Both the Replacement Facility and the private development associated with the Proposed Project are anticipated to be designed to operate with fully electric heating and hot water systems. Consequently, there is no potential for project generated stationary source air quality impacts and further analysis of the heating and hot water systems was not warranted. Therefore, analyses were only performed to assess the potential for air quality impacts for the mobile source emissions and the natural ventilation of bus operating emissions.

10A.4.1 Mobile Sources

10A.4.1.1 Intersection Analysis

<u>Analysis Years</u>

Analysis of traffic study volume flow map data for 2028, 2032 and 2040 was used to select a worst-case year for the mobile source PM hot-spot analysis. During 2028, construction diesel truck traffic and operational diesel bus traffic would occur simultaneously. In 2032 and 2040, with completion of the Replacement Facility, bus operations would resume in the Replacement Facility. Therefore, 2028 was selected as the year of analysis for the PM hot-spot due the temporary incremental increase of heavy-duty diesel vehicles.

In 2028, due to the construction activities associated with the new Main Terminal and the existing PABT being taken out of service, bus operations would operate in the SSF (serving as an interim terminal), the Dyer Deck-Overs, or be temporarily diverted to city streets and the Dyer Deck-Overs, until 2032. These bus operations would be rerouted to travel along Tenth Avenue, between West 39th Street and West 41st Street.

<u>Analysis Sites</u>

Intersections in the traffic study area were screened for CO based on methodology developed in consultation with the ICG. Screening for CO was based on EPA guidance (40 CFR 93.123), the New York State TEM, and on the potential to exceed the CEQR criterion of 140 or more automobiles added to traffic in an intersection during a peak hour. Level of Service (LOS) and traffic volume were screened for the three years evaluated in the traffic study (2028, 2032, 2040). In 2040, due to numerous intersections with LOS D, E, or F, the CEQR criterion were used to select

LOS D, E, or F intersections with the highest-volume increase above the CEQR criterion. For intersections exceeding this criterion, three worst-case intersections were evaluated using dispersion modeling. For those intersections that exceeded the CEQR thresholds in 2028 and 2032, further screening was performed following the procedures outlined in the TEM. No intersections failed the TEM CO screening procedure for 2028 and 2032. In 2040, multiple intersections with LOS D, E, or F exceeded the threshold in the morning and evening peak hour. The three worst-case intersections in 2040 are shown below.

- Ninth Avenue and West 42nd Street
- Ninth Avenue and West 43rd Street
- Eighth Avenue and West 43rd Street

The ICG consultation process required for $PM_{2.5}$ hot-spot analyses was conducted. Per methodology approved by the ICG and EPA guidance, a PM_{10} and $PM_{2.5}$ hot-spot analysis was performed. The methodology resulting from the ICG consultation process is provided in **Appendix 10B, "Air Quality Assessment – Backup Data**." The analysis area for detailed PM microscale analysis consists of three intersections and street links connected to the intersections leading to the Dyer Deck-Overs for 2028**.** Intersection selection was guided by the methodology developed during consultation with the ICG. The analysis area is based on an evaluation of traffic patterns and diesel vehicle volumes in the entire traffic study area. Traffic patterns and diesel vehicle volumes were obtained from analysis of flow maps produced by the traffic study. The hot-spot analysis area extends along Tenth Avenue from West 42nd Street to West 37th Street and includes Tenth Avenue intersections with West 41st Street, West 40th Street, and West 39th Street. Traffic on West 39th Street, West 40th Street and West 41st Street feeding into the intersections is also included in the analysis. The link geometry for these streets was obtained from, and consistent with, the New York Metropolitan Transportation Council Best Practices Model (NYBPM). The NYBPM is a traffic model used to perform federally required transportation conformity determinations, regional emission analyses, and to assess projects in the Regional Transportation Plan and Transportation Improvement Program.

Vehicle Emissions

ENGINE EMISSIONS

On-road vehicle emissions were estimated using EPA's MOVES3.1 emissions model. MOVES input parameters specific for the New York metropolitan area were provided by the New York Metropolitan Transportation Council for fuel, vehicle population characteristics, meteorology and applicable regulatory programs. MOVES input relies on link-specific data. Project-specific data from the traffic study were used to select road links and traffic volumes on the links for the streets and intersections in this analysis.

In accordance with EPA guidance, PM emission factors were determined for four daily time periods. The Proposed Project does not involve gasoline vehicle start activity; it is a terminal project that primarily involves diesel rather than gasoline vehicles. As stated in EPA guidance, the seasonal temperature adjustment for PM has been changed in MOVES3. Guidance states there is no temperature effect on any PM emissions from diesel vehicles.[10]

The PM_{10} analyses included re-entrained road dust, exhaust emissions, and brake and tire wear.[11] $PM_{2.5}$ analyses for the 24-hour time period included re-entrained road dust, exhaust, brake wear, and tire wear emissions. Re-entrained road dust was included in the 24-hour $PM_{2.5}$ analyses because the New York SIP includes such emissions as a significant contributor to 24-hour $PM_{2.5}$ in the NAA. $PM_{2.5}$ analyses for the annual period included exhaust, brake wear and tire wear emissions.$PM_{2.5}$ precursors were not considered in the PM hot-spot analyses, since precursors take time at the regional level to form into secondary PM. For these analyses, both running and crankcase running exhaust was considered, because start exhaust is unlikely to occur on the roadways included in the model domain.

<u>Traffic Data</u>

TRAFFIC VOLUMES

Traffic data for the intersection and street link analysis were derived from existing traffic counts, projected changes in traffic patterns and future growth in traffic, and other information developed as part of the traffic analysis for the Proposed Project (as described in **Chapter 9, "Transportation"**). Traffic data for the Future Without the Proposed Project (the No Action Alternative) and the Future With the Proposed Project were employed in the respective air quality modeling condition. The weekday morning (8 to 9 a.m.) and evening (5 to 6 p.m.) peak periods were analyzed.

The peak morning and evening period traffic volumes were used as a baseline for determining study area intersections, street links, and off-peak volumes for the PM hot-spot analysis. The traffic study provided 24-hour traffic volume distribution profiles for use in the 24-hour PM2.5 hot-spot analysis.

For the natural ventilation analysis, peak-hour traffic was conservatively assumed to apply to all hours in the analysis.

VEHICLE SPEEDS

Project-specific vehicle speeds developed by the traffic study include the effects of all factors influencing vehicle speed in the traffic study area, including delay as described in **Chapter 9, "Transportation"**).

10 EPA. Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas. EPA-420-B-21-037. October 2021.

11 Re-entrainment is a process by which a material that has been deposited in one place is then displaced into the ambient air by vehicular travel, wind, or other causes.

Dispersion Model for Microscale Analysis

Particulate matter concentrations due to vehicular emissions adjacent to the analysis sites were predicted using the American Meteorological Society/Environmental Protection Agency Regulated Model (AERMOD) Version (currently version 22112). The model uses emission source geometry, link-specific emission factors from the MOVES3.1 model output, and meteorological data to estimate concentrations of PM at a series of receptors. The model setup included a series of links, or roadway segments, extended 1,000 feet in the north-south direction and encompassed cross streets. Link-specific inputs include length, mixing zone width, hourly volume, emission factor, initial vertical dimension and vertical dispersion coefficient, as well as release height above ground.

The CAL3QHC model was used to predict CO concentrations adjacent to the three worst-case intersections from the CO screening analysis. This model uses source geometry, link-specific emission factors from the MOVES3.1 model output, free-flow traffic volumes, saturated traffic volumes, and signal timing data for each study intersection. The intersections were modeled as actuated signaled intersections with red signal time determined by subtracting green and yellow signal time from total signal cycle time. It was assumed that traffic continues to move through the intersection during the yellow phase, which is characteristic of traffic behavior in the area. Queue links were assigned a direction of flow based on traffic direction; free-flow links are not dependent on direction.

Meteorology

Meteorological input files for AERMOD were obtained from NYSDEC. As recommended in EPA's "Guideline on Air Quality Models" (Appendix W to 40 CFR Part 51), five consecutive years of the most recent and readily available meteorological data (calendar years 2017 to 2021) were used for the dispersion modeling analysis. Hourly surface meteorological data and twice daily upper air data from LaGuardia Airport were used, which are representative of the terrain, climate, and topography of the study area. Upper air data was taken from the Brookhaven upper air station.

Analysis Years

As per EPA guidance, the Proposed Project's analysis years reflect those within the transportation plan or regional emissions analysis, as appropriate, during which peak emissions from the Proposed Project are expected. The Proposed Project would consist of several construction phases as described in **Appendix 2C, "Analysis Framework**." Construction years range from 2024 through the end of 2040 (see **Appendix 14A, "Construction,"** for assumptions regarding the anticipated construction schedule). Bus operations in varying capacity would be maintained throughout the construction activities. The $PM_{2.5}$ and PM_{10} hot-spot analysis was performed for an interim analysis year (the beginning year of the second phase of construction) of 2028. A CO microscale analysis was performed for a final analysis year of 2040. Year 2040 includes growth in bus ridership to the full forecast and the completion of the private development associated with the Proposed Project. Throughout the Proposed Project development period, the vehicle fleet is expected to transition to cleaner fleets and lower emissions due to an increasing population of electrified vehicles. However, traffic fleet populations currently in MOVES3.1 for future years do not account for New York's and New Jersey's programs and goals for vehicle fleet electrification. Therefore, this analysis represents a conservative forecast of projected exhaust emissions by not including zero or low-emission buses in the modeling.

In accordance with the *CEQR Technical* Manual, the analysis was performed for both the No Action Alternative and the Proposed Project for PM and CO.

10A.4.1.2 Receptor Placement

Receptors were placed to estimate the highest concentrations of CO, PM_{10} and $PM_{2.5}$ to determine potential violations of the NAAQS. The highest concentrations from on-road vehicles are expected to occur near the areas with the highest-volume roadways and near areas where vehicles are idling, or at natural ventilation sources. Receptors were placed to evaluate compliance with the applicable NAAQS for mobile sources and the *CEQR de minimis* criteria for $PM_{2.5}$ and CO, including on sidewalks adjacent to traveled roadways where there is continuous public access to ambient air, and in a grid, as applicable. Furthermore, receptors included adjacent elevated structures at locations of operable windows and air intakes, as well as the 'Dyer Deck-Overs' that would be converted to open space following construction of the Replacement Facility.

10A.4.1.3 Naturally Ventilated Vehicle Exhaust Analysis

For the purposes of this analysis, the new Main Terminal, SSF, and the associated ramp structures of the Replacement Facility are anticipated to include at least three facades that would allow for airflow between the Replacement Facility and ambient air. Therefore, an analysis was performed of the naturally ventilated interior roadways and passenger gates where buses would be circulating, restarting, and idling.

Emissions from vehicles using the Replacement Facility could potentially affect pollutant concentrations in the immediate surrounding vicinity. While the areas where bus operations would occur would be naturally ventilated, the Replacement Facility would condition air within passenger waiting areas separate from the interior roadway spaces. Therefore, passengers exposure to vehicle exhaust from bus operations would be transient in nature and would not experience the air quality conditions within these areas. Therefore, an air quality analysis was performed to determine bus operation air emissions originating from within the naturally ventilated structures on the surrounding area. Since bus operations would differ throughout the Replacement Facility, the analysis assessed the potential air quality effects from the new Main Terminal, SSF, and the associated ramp structures of the Replacement Facility individually and conservatively summed the effects across each of the three elements.

The dispersion analysis of these emissions in the environment was performed by calculating pollutant levels in the surrounding area, using emissions factors for CO and PM projected by the EPA MOVES program, as described above. Emission estimates were then calculated using the dimensions of the new Main Terminal, SSF, and the associated ramp structures; travel routes within the Replacement Facility; peak-hour bus entrances to and exits from the Replacement Facility. Average bus entrances were conservatively estimated using the peak-hour values. Based on methodology set for in the *CEQR Technical* Manual and consistent with EPA guidance for evaluating indirect emission sources, emissions were projected to disperse to receptor locations using the Gaussian plume equation for an area source[12] and adjusted for consideration of the above-grade levels of the Replacement Facility.

Maximum CO concentrations were determined based on the peak-hour bus volumes entering/exiting the Replacement Facility by level for the time periods when overall terminal usage would be the greatest, considering the hours when the greatest number of vehicles would exit the facility. PM increments were determined on a 24-hour and annual average basis. The number of vehicles entering and exiting the naturally ventilated structures was derived from the trip generation analysis described in **Chapter 9**, "**Transportation**," and **Appendix 9B**, "**Traffic,"** of this EIS. Daily and annual average number of vehicles was conservatively assumed as the average number of vehicles in either the AM or PM peak periods. Consequently, the analysis conservatively assumed average peak-hour conditions for each hour of the day, and for each day of the year.

Emissions from vehicles operating within the naturally ventilated structures were determined using the EPA MOVES3.1 mobile source emissions model, as described in detail above for use in the intersection analysis. For all arriving and departing vehicles, an average speed of five miles per hour was conservatively assumed for travel within the naturally ventilated structures. In addition, all buses were assumed to idle for three minutes for passenger drop-off and boarding.[13] Buses exiting the Replacement Facility would represent either buses that leave the Replacement Facility immediately, or buses that remained at a gate for additional passenger boarding. If the number of buses exiting the Replacement Facility exceeds the number of buses entering in that hour, start emissions are added to each additional bus.

A "near" receptor was placed at sidewalk locations at a distance of 7 feet from the facade (as referenced in the *CEQR Technical Manual*) and a "far" receptor was placed on the opposite side of the street. The receptors were placed at a pedestrian height of 6 feet. A receptor was also located at a height of 10 feet above the source to conservatively assess the air quality impacts on nearby buildings' windows or air intake locations. The analysis conservatively did not consider potential reductions in concentrations due to meteorological variability over longer averaging periods and assumed that maximum 1-hour concentrations would persist for the 8-hour, 24-hour, and annual averaging periods. Consequently, concentrations were

12 EPA. *Guidelines for Air Quality Maintenance Planning and Analysis Volume 9 (Revised): Evaluating Indirect Sources*, September 1978.

13 As prescribed in the PABT Rules and Regulations, consistent with Section 4-08(p) of Title 34 of the Rules of the City of New York.

conservatively assumed to remain at the 1-hour average concentrations for the entire duration of the longer averaging periods.

10A.4.1.4 Total Concentration Assessment

Background and maximum on-street modeled concentrations were conservatively added to the maximum modeled results from the natural ventilation analysis to obtain the total ambient levels, regardless of location, to estimate the worst-case total concentration design values. The worst-case design values were then compared with the NAAQS, and incremental CO and $PM_{2.5}$ concentrations were compared to the *CEQR de minimis* criteria. The 24-hour average $PM_{2.5}$ background concentration was used to determine the *de minimis* criterion-derived threshold.

In addition to the maximum design values, contour maps were created using the dispersion model results to demonstrate the relative concentrations at all receptors included in the analysis.

10A.5 EXISTING CONDITIONS

10A.5.1 Ambient Air Quality

The representative criteria pollutant concentrations measured in recent years at NYSDEC air quality monitoring stations nearest to the Project Area are presented in **Table 10A-2**.

Values reported were obtained from NYSDEC annual monitoring reports and the EPA Air Data monitor values database. Monitor locations were selected based on location (distance, location downwind or west side of Manhattan) and similar surroundings. The values presented are consistent with the form of the NAAQS. As shown in **Table 10A-2**, the recently monitored levels did not exceed the NAAQS.

The CO, PM2.5, and ozone monitor location (City College of New York [CCNY]) is the closest active monitor on the west side of Manhattan to the Project site with data available for 2019 through 2022.

The SO2, PM10, and lead monitor location (IS52) is the closest active monitor to the Project site with data available for 2019 through 2022.

Table 10A-2. Representative Monitored Ambient Air Quality Data

Pollutant	Location	Averaging Period	Concentration			
			2019	2020[8]	2021[8]	2022
CO (ppm)	CCNY (160 Convent Avenue, Manhattan)	1-hour	1.8	1.9	1.6	1.7
		8-hour	1.3	1.5	0.9	1.2
SO_2 (ppb)	IS 52 (681 Kelly Street, Bronx) [1]	1-hour	4.5	4.3	4.0	3.7
PM_{10} (µg/m³)	IS 52[7]	24-hour	33	31	44	26
$PM_{2.5}$ (µg/m³)	CCNY[2, 3]	Annual	6.6	6.3	7.0	6.1
		24-hour	16.1	15.6	18.3	13.9
NO_2 (ppb)	IS 52[2, 4]	Annual	16.87	15.22	15.21	15.84
		1-hour	57.7	52.7	50.8	56.6
Lead (µg/m³)	IS 52[5]	3-month	0.0027	0.0033	0.0035	0.0036
Ozone (ppm)	CCNY[6]	8-hour	0.066	0.069	0.076	0.065

Source: New York State Air Quality Report Ambient Air Monitoring System, NYSDEC, 2019–2022 and EPA Air Data website (https://www.epa.gov/outdoor-air-quality-data/monitor-values-report).

[1] The 1-hour value is based on the 99th percentile of daily maximum 1-hour average concentrations. IS52 is closest SO_2 monitor to project site.

[2] Annual value is based on annual mean concentration for each year.

[3] The 24-hour value is based on the 98th percentile of 24-hour average concentration for each year.

[4] The 1-hour value is based on a three-year average (2020–2022) of the 98th percentile of daily maximum 1-hour average concentrations.

[5] Based on the highest quarterly average concentration measured during 2020 to 2022.

[6] Based on the 4th highest daily maximum 8-hour average concentrations.

[7] Values shown are maximum 24 hour in the year.

[8] Concentrations may have been affected by lower vehicle related emissions due to COVID-19. NYSDEC has not formally requested exceptional event designation for the data.

10A.5.2 Air Quality Index

The Air Quality Index (AQI) is a method for communicating daily air quality and its relationship to health effects. The AQI is calculated for major criteria air pollutants, including: ozone, particulate matter (PM_{10} and $PM_{2.5}$), and carbon monoxide. The AQI is divided into six categories: good, moderate, unhealthy for sensitive groups, unhealthy, very unhealthy, and hazardous. Each category corresponds to a different level of health concern.

The AQI illustrates how clean or unhealthy the air is and what health effects one may experience if exposed to specific pollutant levels. The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value over 300 represents hazardous air quality.

An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally determined satisfactory. When AQI values are above 100, air quality is considered to be unhealthy-at first for certain sensitive groups of people, then for everyone as AQI values get higher.

For the past few years (2017 through 2022), the AQI has held fairly steady on an annual average basis at a value below 50 (good). The AQI varies on a daily basis due to weather conditions conducive to ozone and secondary particle formation or trapping of air pollutants and natural events such as wildfire smoke transported into the area.

10A.5.3 New York City Community Air Survey

In addition to the official NYSDEC monitoring used to assess compliance with the NAAQS, the New York City Department of Health and Mental Hygiene and Queens College of the City University of New York are conducting the New York City Community Air Survey (NYCCAS), a program to monitor air quality across New York City. The purpose of NYCCAS is to better understand air pollution levels and patterns by revealing how pollution from traffic, buildings and other sources varies among the city's neighborhoods. This helps identify which neighborhoods have the highest pollutant levels and where changes can be made to improve air quality. The difference in monitored values between the NYSDEC information and the NYCCAS information is due to different collection methods and averaging periods reported. NYCCAS data does not meet the regulatory requirements of a NYSDEC monitor and cannot be used to determine compliance with the NAAQS or as background values for regulatory modeling. It does, however, indicate the general air quality trend.

There are about 100 NYCCAS air pollution monitors installed throughout the five boroughs, with at least one in each Community District. Many are in neighborhoods with high traffic volumes and high building density. Others are in quieter locations with fewer buildings. Some monitors are placed near unique facilities, like bus depots and ferry terminals.

The following key findings are the result of the NYCCAS monitoring over the past decade:

Citywide, annual average levels of four key pollutants have gone down between the first year of monitoring, 2009, and the most recent year of data, 2018. This includes:

- $PM_{2.5}$: Reduction of approximately 32%
- NO_2: Reduction of approximately 29%
- NO: Reduction of approximately 47%
- Black Carbon: Reduction of approximately 33%

Air quality improved significantly after the city required building owners to convert to cleaner heating oils by 2015; since the first winter of monitoring, average levels of SO_2 have declined by 95%.

Air quality changes with location:

- $PM_{2.5}$, NO_2, NO, and black carbon are highest in areas of higher traffic density, areas with higher density of buildings with heat and hot water boilers, and industrial areas.
- Ozone levels are highest in the outer boroughs, areas that are downwind of high NO_x emissions, and areas with fewer combustion emissions.

Based on this data, concentrations of $PM_{2.5}$ in both the Midtown and Chelsea-Clinton neighborhoods are generally decreasing.

10A.5.4 Improved Diesel Emission Standards

Diesel engines are one of the primary sources of PM. As such, EPA regulations requiring stringent emission standards for criteria pollutants, based on the year of vehicle manufacture, are a are a major contributing factor in the improvement of New York City's air quality. The EPA has established these emission standards for diesel vehicles with the goal of reducing the emission rates of PM and other criteria pollutants. From the present time through 2040, the character of diesel bus fleets is anticipated to be in transition. Hybrid and zero to low-emission buses are anticipated to be replacing diesel buses during this time period. Major bus operators utilizing the PABT have plans in place to procure electric buses as diesel buses reach the end of their service life.

10A.6 INTERIM CONCURRENT CONSTRUCTION AND OPERATION (2028)

10A.6.1 Mobile Source Analysis

PM_{10} concentrations in the Interim Concurrent Construction and Operation phase were determined by using the methodology previously described. In 2028, operation of the temporary terminal, ramps and storage occurs while construction begins on the replacement terminal. Predicted future PM_{10} 24-hour concentrations, including background concentrations, at the analyzed intersections in the Interim Concurrent Construction and Operation phase are presented in **Table 10A-3**. The values shown are the highest predicted concentrations for the receptor locations. Because the modeled values are the first maximum, the background value added to the modeled result is the highest first maximum from the last three full years of NYSDEC monitoring data (highest value occurred during 2021 in the 2020-2022 range). Selecting the highest maximum concentration from the last three years of data is a more conservative approach than selecting the most recent highest maximum concentration. As shown in **Table 10A-3**, concentrations in the Interim Concurrent Construction and Operation phase are predicted to be well below the PM_{10} NAAQS.

Table 10A-3. Maximum Predicted 24-Hour Average PM_{10} Concentrations: Interim Concurrent Construction and Operation—2028

Location	Future Without the Proposed Project[1]	Future With the Proposed Project[1]	NAAQS
Tenth Avenue between West 39th and West 41st Streets	63.5 (μg/m³)	65.5 (μg/m³)	150 (μg/m³)

[1] Concentration includes a background concentration of 44 μg/m³. This value is the first maximum concentration measured at IS52 in the highest full year data set from the last three years (selected year 2021 from 2020-2022 range).

Maximum predicted 24-hour and annual average $PM_{2.5}$ concentration increments were also calculated so that they could be compared with the NAAQS. Based on this analysis, the maximum predicted localized 24-hour average and annual average $PM_{2.5}$ concentrations are presented in **Table 10A-4**. Concentrations shown for comparison to the NAAQS are the highest 98th percentile predicted concentrations for the modeled receptor locations. These results include background concentrations. Design values determined by USEPA are used as background values and are added to model results for $PM_{2.5}$ NAAQS comparison. A design value is a statistic that describes the air quality status of a given location relative to the level of the National Ambient Air Quality Standards (NAAQS). Design values are computed and published annually by EPA's Office of Air Quality Planning and Standards and reviewed in conjunction with the EPA Regional Offices.

Table 10A-4. Maximum Predicted Annual Average $PM_{2.5}$ Concentrations: Interim Concurrent Construction and Operation 2028 (μg/m³)

Location	Averaging Time	Future Without the Proposed Project [3]	Future With the Proposed Project[4]	Modeled Increment	NAAQS / *De Minimis*
Tenth Avenue between West 39th and West 41st Streets	24 hours[1]	20.0 (μg/m³)	20.1 (μg/m³)	0.1 (μg/m³)	35 / 9.6 (μg/m³)
	Annual[2]	7.07 (μg/m³)	7.10 (μg/m³)	0.03 (μg/m³)	12.0 / 0.3 (μg/m³)

[1] 98th percentile.
[2] 3-year average of annual mean.
[3] Concentrations presented include a 24-hour background design value concentration of 15.9 μg/m³.
[4] Concentrations presented include an annual background design value concentration of 6.5 μg/m³.

The results show that the 24-hour and annual $PM_{2.5}$ increments are predicted to be below the *de minimis* criterion and total concentrations are below the NAAQS at the maximum impacted receptor.

In 2028, during interim operation and construction, the Proposed Project would result in traffic volume increases and decrease LOS. Further screening was completed following the procedures outlined in the TEM. All intersections passed the screening. Therefore, detailed modeling for CO was not warranted.

10A.6.2 Naturally Ventilated Vehicle Exhaust Analysis

Based on the methodology previously described the maximum predicted CO and $PM_{2.5}$ concentrations at the proposed ramp structures and the SSF were analyzed assuming a near-side sidewalk receptor on the same side of the street (6 feet), and a far-side sidewalk receptor on the opposite side of the street.

Receptor locations would be representative of sidewalk locations adjacent to the ramp structure (along Eleventh Avenue between West 39th and West 40th Streets, West 39th Street at Eleventh Avenue, and West 40th Street at Eleventh Avenue) and the SSF (Tenth Avenue between West 39th and West 40th Streets, West 39th Street between Dyer Avenue and Tenth Avenue, and West 40th Street between Dyer Avenue and Tenth Avenue).

10A.6.3 Total PM2.5 Concentration Analysis

As discussed above, the total $PM_{2.5}$ concentration is determined from both the on-street vehicle emissions at analyzed intersections and natural ventilation of vehicle exhaust from the ramp structures and SSF, regardless of location where maximum concentrations would occur.

Maximum 24-hour and annual average total $PM_{2.5}$ concentrations are presented in **Table 10A-5**. Concentrations shown for comparison to the NAAQS are the highest 98th percentile predicted concentrations for the modeled receptor locations. These results include background concentrations.

Table 10A-5. Maximum Predicted Total Average $PM_{2.5}$ Concentrations: Interim Concurrent Construction and Operation 2028 (μg/m³)

Location	Averaging Time	Future Without the Proposed Project[3]	Future With the Proposed Project[4]	Modeled Increment	NAAQS / *De Minimis*
Tenth Avenue between West 39th and West 41st Streets	24 hours[1]	20.0 (μg/m³)	20.2 (μg/m³)	0.2 (μg/m³)	35 / 9.6 (μg/m³)
	Annual[2]	7.07 (μg/m³)	7.24 (μg/m³)	0.2 (μg/m³)	12.0 / 0.3 (μg/m³)

[1] 98th percentile.
[2] 3-year average of annual mean.
[3] Concentrations presented include a 24-hour background design value concentration of 15.9 μg/m³.
[4] Concentrations presented include an annual background design value concentration of 6.5 μg/m³.

Of the total predicted incremental concentrations, the maximum predicted 24-hour and annual average $PM_{2.5}$ increments are 0.14 μg/m³.

The results demonstrate that the cumulative 24-hour and annual $PM_{2.5}$ increments are predicted to be below the *de minimis* criterion and total concentrations are below the NAAQS at the maximum impacted receptor.

10A.7 FUTURE PROPOSED PROJECT— OPERATION OF THE REPLACEMENT FACILITY (2032)

10A.7.1 Mobile Source Analysis

In 2032, construction of the Main Terminal would be complete, the Proposed Project would result in traffic volume increases and decrease LOS. Further screening was completed following the procedures outlined in the TEM. All intersections passed the screening. Therefore, detailed modeling for CO was not warranted.

The ICG consultation process resulted in selection of 2028 as the expected year of highest diesel traffic due to a combination of construction and operation of the temporary terminal. EPA guidance suggests evaluating intersections at LOS D, E, or F. For this Proposed Project, CEQR thresholds were also considered in determining study intersections. PM screening for diesel volume changes in 2032 between the No Action Alternative and the Proposed Project did not result in any locations exceeding the *CEQR Technical Manual* threshold of 23 heavy-duty vehicles. In 2032, the reconstructed Main Terminal would be reopened, and construction-period bus operations would no longer occur on city streets or the Dyer Deck-Overs. The year 2032 did not result in changes to diesel vehicle volume worse than the year 2028; therefore, detailed modeling analysis for PM for 2032 was not warranted.

10A.7.2 Naturally Ventilated Vehicle Exhaust Analysis

Based on the methodology previously described the maximum predicted CO and PM concentrations at the new Main Terminal, SSF, and associated ramp structures were analyzed assuming a near-side sidewalk receptor on the same side of the street (6 feet), and a far-side sidewalk receptor on the opposite side of the street.

Receptor locations would be representative of sidewalk locations adjacent to the ramp structure (along Eleventh Avenue between West 39th and West 40th Streets, West 39th Street at Eleventh Avenue, and West 40th Street at Eleventh Avenue), the SSF (Tenth Avenue between West 39th and West 40th Streets, West 39th Street between Dyer Avenue and Tenth Avenue, and West 40th Street between Dyer Avenue and Tenth Avenue), and the Main Terminal (Along West 40th Street between Eighth and Ninth Avenue, Eighth Avenue between West 40th Street and West 42nd Street, and West 42nd Street at Eighth Avenue).

10A.7.2.1 Total Concentration Analysis

As discussed above, the Proposed Project in 2032 would not result in changes to diesel vehicle volume worse than the year 2028; therefore, detailed modeling analysis for PM for 2032 is not warranted. However, an analysis of the naturally ventilated vehicle exhaust was performed for the new Main Terminal, SSF, and the associated ramp structures. The total $PM_{2.5}$ and CO concentration are presented in **Table 10A-6** and **Table 10A-7**. These results include background concentrations.

Table 10A-6. Maximum Predicted Total CO Concentrations (2032) (ppm)

Location	Averaging Time	Future Without the Proposed Project	Future With the Proposed Project	NAAQS
Ninth Avenue and West 42nd Street	1 hour[1]	1.9	1.9	35
	8 hours[2]	1.5	1.5	9

[1] 1-hour concentration includes a background concentration of 1.9 ppm.
[2] 8-hour concentration includes a background concentration of 1.5 ppm.

Table 10A-7. Maximum Predicted Total Average $PM_{2.5}$ Concentrations: Interim Concurrent Construction and Operation 2032 (µg/m³)

Location	Averaging Time	Future Without the Proposed Project[3]	Future With the Proposed Project[4]	Modeled Increment	NAAQS / *De Minimis*
Tenth Avenue between West 39th and West 41st Streets	24 hours[1]	16.5 (µg/m³)	16.7 (µg/m³)	0.2 (µg/m³)	35 / 9.6 (µg/m³)
	Annual[2]	6.6 (µg/m³)	6.8 (µg/m³)	0.2 (µg/m³)	12.0 / 0.3 (µg/m³)

[1] 98th percentile.
[2] 3-year average of annual mean.
[3] Concentrations presented include a 24-hour background design value concentration of 15.9 µg/m³.
[4] Concentrations presented include an annual background design value concentration of 6.5 µg/m³.

The maximum predicted concentrations are substantially below the 1-hour and 8-hour standards of 35 ppm and 9 ppm, respectively, and the maximum predicted 8-hour concentration is below the *de minimis* CO criteria. Additionally, the maximum predicted $PM_{2.5}$ increments are well below the respective $PM_{2.5}$ *de minimis* criteria of 9.6 µg/m³ for the 24-hour average concentration and 0.3 µg/m³ for the annual average concentration. Therefore, the Proposed Project would not result in significant adverse air quality impacts from vehicle exhaust in the year 2032.

10A.8 FUTURE WITH THE PROPOSED PROJECT—FULL BUILD OUT (2040)

10A.8.1 Mobile Source Analysis

CO concentrations in the Future With the Proposed Project (2040) were determined using the methodology previously described. In 2040, traffic data comparisons of automobile volumes for the Proposed Project and the No Action Alternative show multiple intersections would have LOS of D, E, or F and with morning and evening peak conditions above the *CEQR* screening threshold. The Proposed Project and No Action Alternative conditions were evaluated with microscale modeling to evaluate potential impacts. **Table 10A-8** shows the future maximum predicted 1-hour and 8-hour CO concentration, including background concentration, at the analysis intersection for the Future With and Without the Proposed Project (2040). The values shown are the highest predicted concentration for the receptor locations near Ninth Avenue and West 42nd Street for the Peak PM peak-hour scenario.

Table 10A-8. Maximum Predicted CO Concentrations: Future Proposed Project Full Build Out — 2040 (ppm)

Location	Averaging Time	Future Without the Proposed Project	Future With the Proposed Project	NAAQS
Ninth Avenue and West 42nd Street	1 hour[1]	2.3	2.3	35
	8 hours[2]	1.8	1.8	9
Ninth Avenue and West 43rd Street	1 hour[1]	2.2	2.2	35
	8 hours[2]	1.7	1.7	9
Eighth Avenue and West 43rd Street	1 hour[1]	2.2	2.2	35
	8 hours[2]	1.7	1.7	9

[1] 1-hour concentration includes a background concentration of 1.9 ppm.

[2] 8-hour concentration includes a background concentration of 1.5 ppm.

The results demonstrate that the 1-hour and 8-hour CO total concentrations are substantially below the 1-hour and 8-hour standards of 35 ppm and 9 ppm, respectively, and the maximum predicted 8-hour concentration is below the CEQR *de minimis* CO criteria.

In 2040, the Replacement Facility would be in operation and the private development associated with the Proposed Project would be completed. The PM screening for diesel vehicle volume changes in 2040 between the No Action Alternative and the Proposed Project for intersections with LOS D, E, or F did not result in any locations exceeding the *CEQR Technical Manual* threshold of 23 heavy-duty vehicles. Therefore, detailed modeling analysis for PM was not warranted.

10A.8.2 Naturally Ventilated Vehicle Exhaust Analysis

Based on the methodology previously described the maximum predicted CO and PM concentrations at the new Main Terminal, SSF, and associated ramp structures of the Replacement Facility were analyzed assuming a near-side sidewalk receptor on the same side of the street (6 feet), and a far-side sidewalk receptor on the opposite side of the street.

Receptor locations would be representative of sidewalk locations adjacent to the ramp structure (along Eleventh Avenue between West 39th and West 40th Streets, West 39th Street at Eleventh Avenue, and West 40th Street at Eleventh Avenue), the SSF (Tenth Avenue between West 39th and West 40th Streets, West 39th Street between Dyer Avenue and Tenth Avenue, and West 40th Street between Dyer Avenue and Tenth Avenue), and the Main Terminal (Along West 40th Street between Eighth and Ninth Avenue, Eighth Avenue between West 40th Street and West 42nd Street, and West 42nd Street at Eighth Avenue).

10A.8.3 Total Concentration Analysis

Table 10A-9 shows the future total predicted 1-hour and 8-hour CO concentration, including on-street concentrations, concentrations from the natural ventilation of the Main Terminal, and background concentrations, at the analysis intersections for the Future With and Without the Proposed Project (2040). The values shown are the highest predicted concentration for the receptor locations near each location.

Table 10A-9. Maximum Predicted CO Concentrations: Future Proposed Project Full Build Out — 2040 (ppm)

Location	Averaging Time	Future Without the Proposed Project	Future With the Proposed Project	NAAQS
Ninth Avenue and West 42nd Street	1 hour[1]	2.3	2.3	35
	8 hours[2]	1.8	1.8	9
Ninth Avenue and West 43rd Street	1 hour[1]	2.2	2.2	35
	8 hours[2]	1.7	1.7	9
Eighth Avenue and West 43rd Street	1 hour[1]	2.2	2.2	35
	8 hours[2]	1.7	1.7	9

[1] 1-hour concentration includes a background concentration of 1.9 ppm.

[2] 8-hour concentration includes a background concentration of 1.5 ppm.

Of the total predicted incremental concentrations, the maximum predicted CO impacts from the naturally ventilated vehicle exhaust would result in a maximum predicted 1-hour and 8-hour average increment of 0.01 ppm, respectively.

The results show that the 1-hour and 8-hour CO total concentrations are substantially below the 1-hour and 8-hour standards of 35 ppm and 9 ppm, respectively, and the maximum predicted 8-hour concentration is below the *de minimis* CO criteria.

10A.9 CONCLUSIONS

For CO, a screening of incremental volume changes and other traffic parameters (LOS and delay) was conducted for 2028 and 2032. For those intersections that exceeded the CEQR thresholds in 2028 and 2032, further screening was performed following the procedures outlined in the TEM. No intersections failed the TEM screening procedure for 2028 and 2032. In 2040, the screening process resulted in 25 intersections with automobile volumes exceeding the threshold. The three worst-case intersections were analyzed with detailed dispersion modeling for the No Action Alternative and the Proposed Project for comparison to the NAAQS. The maximum modeled 8-hour CO concentration in both the No Action Alternative and the Proposed Project was determined to be 1.8 ppm, which is less than the NAAQS value of 9 ppm, and below the *de minimis* CO criteria.

The PM hot-spot analysis was conducted for year 2028. The Proposed Project construction period, in combination with continued bus operations, results in the highest diesel vehicle volume, as construction and bus operations occur simultaneously. During construction, bus traffic is rerouted to accommodate use of the SSF as a temporary bus terminal and demolition and construction of the new Main Terminal. In 2032, after construction completion of the Replacement Facility, and in 2040 after construction completion of the private development associated with the Proposed Project, bus routing utilizes direct access to the Replacement Facility and the temporary on-street bus operations as a result of construction cease.

Three intersections and associated streets leading to each intersection were selected as the worst-case analysis sites based on the diesel traffic volume comparison of the No Action Alternative and the Proposed Project. A detailed hot-spot analysis using dispersion modeling was performed to determine potential PM hot-spot impacts. The modeling demonstrates that 24-hour $PM_{2.5}$, 24-hour PM_{10} and annual $PM_{2.5}$ would be below the applicable NAAQS, and the maximum predicted $PM_{2.5}$ increments would be well below the respective $PM_{2.5}$ *de minimis* criteria.

Natural ventilation from the permeable facades of the new Main Terminal, the SSF, and the associated ramp structures of the Replacement Facility was also analyzed for potential air quality effects. Total concentrations were conservatively estimated by summing the highest impacts from the natural ventilation of bus operations and the highest impacts from on-street vehicle exhaust regardless of location. The analysis determined the Proposed Project would not result in cumulative significant adverse air quality impacts.

Based on this information, the Proposed Project would not be anticipated to result in significant adverse air quality impacts, and no further analysis is warranted.