

11. Air Quality

11.1. Chapter Overview

11.1.1. Introduction

This chapter discusses the changes to the potential for air quality impacts associated with the revisions to the Preferred Alternative in this SDEIS. Revisions affecting air quality are associated with changes to the ridership and parking destinations.

- Change in project terminus: the Preferred Alternative ends in Englewood; consequently, air quality impacts are not anticipated for any Tenafly roadway intersections.
- Change in project ridership and station use: changes to the ridership and the station destination affects the reduction in vehicle miles traveled (VMT), which are used to calculate changes to regional emissions.
- Relocation of Leonia Station parking deck: a parking deck is proposed to be developed within Overpeck County Park, causing changes to the roadway intersection analysis than what was completed for the DEIS.

Public comments on the DEIS noted that during construction diesel vehicles should comply with the air quality standards. This topic is discussed in Chapter 27: Construction. Another comment was concerned with air quality associated with the freight railroads. Since the Northern Branch project would not affect the frequency of freight service, there would be no changes to freight diesel emissions; therefore, freight traffic was not included in this analysis. National Ambient Air Quality Standards have been updated since the DEIS. Additionally, air quality monitoring data has been updated. This reassessment, therefore, addresses changes to the baseline data as well as changes associated with the SDEIS Preferred Alternative.

11.1.2. Summary of Findings of DEIS and SDEIS

The Northern Branch Corridor project is located in Hudson and Bergen Counties, which are in attainment for nitrogen dioxide (NO₂), lead (Pb), sulfur dioxide (SO₂), and inhalable particle matter smaller than 10 micrometers (PM₁₀). This means that the counties have met the national air pollution standards for these pollutants. The counties are in non-attainment for eight-hour ozone (O₃) and in maintenance for carbon monoxide (CO) and inhalable particle matter smaller than 2.5 micrometers (PM_{2.5}), which means that the ambient air in the counties has exceeded the maximum levels of these pollutants and no additional polluting activity is permitted. While the operation of the light rail vehicles would not introduce new pollutants to the region, the Preferred Alternative carries the potential to result in some air quality impacts associated with changes in local traffic patterns, as follows:

- The Preferred Alternative is anticipated to cause an increase in localized traffic near proposed stations; however, air quality modeling indicates that even with the increase in localized traffic, the CO levels would be below the one-hour (35 ppm) and eight-hour (9 ppm) National Ambient Air Quality Standards (NAAQS).
- The Preferred Alternative would reduce regional emissions of CO, PM_{2.5} and PM₁₀, hydrocarbons (HC), and nitrogen oxides (NO_x) due to a reduction in VMT.

The Northern Branch Rail Corridor project is listed within the FY2014-2023 Statewide Transportation Improvement Program (DB #T300) under Transit Rail Initiatives and in the North Jersey Transportation Planning Authority (NJTPA) Regional Transportation Plan titled “Plan 2040” (#TN08002). In addition, the regional analysis shows a reduction in PM_{2.5} and PM₁₀. Therefore, it is anticipated that this project

would comply with transportation conformity requirements established by the Clean Air Act Amendments of 1990.

11.2. Methodology

11.2.1. National Ambient Air Quality Standards

The Clean Air Act and its amendments (CAAA) are the primary basis for regulating national air pollutant emissions. As required by the CAAA, the US Environmental Protection Agency (USEPA) has established NAAQS for certain pollutants, called criteria pollutants. The national standards have been revised since the DEIS; however, no changes have been made to the state standards. Table 11-1 shows the current national standards.

Table 11-1: National Ambient Air Quality Standards

Pollutant	Averaging Period	Primary Standard ⁽¹⁾	Secondary Standard ⁽²⁾
Carbon Monoxide (CO)	One-hour	35 ppm	None
	Eight-hour	9 ppm	None
Ozone (O ₃)	Eight-hour	0.075 ppm	Same as primary
Nitrogen Dioxide (NO ₂)	One-hour	100 ppb	None
	Annually	53 ppb	Same as primary
Lead (Pb)	Rolling three-month average	0.15 µg/m ³	Same as primary
Sulfur Dioxide (SO ₂)	One-hour	0.075 ppm	None
	Three-hour	None	0.5 ppm
Inhalable Particulates (PM ₁₀)	24-hour	150 µg/m ³	Same as primary
Fine Particulates (PM _{2.5})	24-hour	35 µg/m ³	Same as primary
	Annually	12 µg/m ³	15 µg/m ³
⁽¹⁾ Primary standards define air quality levels intended to protect the public health. ⁽²⁾ Secondary standards define levels of air quality intended to protect the public welfare from any known or anticipated adverse effect of a pollutant (e.g., visibility, vegetation damage, material corrosion). Note: ppm = parts per million; ppb = parts per billion, µg/m ³ = micrograms per cubic meter.			

Source: USEPA: www.epa.gov/air/criteria.html, accessed February 19, 2015.

The CAAA requires the USEPA and states throughout the country to identify those areas not meeting the NAAQS. An area that does not meet a standard is referred to as being in non-attainment. If an area fails to attain the NAAQS for any criteria pollutants, the CAAA requires each state to develop and maintain a state implementation plan (SIP) that demonstrates the state's air pollution control strategy for meeting the NAAQS. Any federal action that occurs within an area that has not attained the NAAQS must show conformance with the SIP. Areas that previously were in violation of the NAAQS, but now achieve the standards are classified as maintenance areas. Maintenance areas must implement a plan to maintain ambient concentrations below the standards.

11.2.2. Pollutants of Concern

The Northern Branch Corridor project is located in Hudson County and Bergen County, which are both in attainment for NO₂, Pb, SO₂ and PM₁₀. Hudson and Bergen Counties are in non-attainment for eight-hour O₃ and in maintenance for CO and PM_{2.5}. While the operation of the light rail vehicles would not introduce new pollutants to the region and the project would result in an overall reduction in regional traffic, the Preferred Alternative would cause an increase in localized traffic near proposed stations. Air quality modeling focused on understanding both localized and regional level impacts for the three criteria pollutants that were classified as either non-attainment or maintenance for Hudson and Bergen Counties.

Particulate Matter

Hudson and Bergen Counties are in attainment for PM₁₀, and have been redesignated to maintenance for PM_{2.5}. Fine particulate matter (PM_{2.5}) smaller than 2.5 micrometers in diameter is created from chemical reactions in the atmosphere and through fuel combustion by sources such as motor vehicles and power generation. The PM_{2.5} annual standard has been reduced to 12 ug/m³. Regional PM_{2.5} levels were estimated for the Preferred Alternative to quantify net changes due to the reduction in motor vehicle VMT.

Ozone

The entire state of New Jersey is in non-attainment for O₃. Ground-level ozone is created when nitrogen oxides (NO_x) and volatile organic compounds (VOC) react in the presence of sunlight and heat. The incomplete combustion of fossil fuel, power plants, and other sources of combustion emit the primary source of NO_x. In recent years documented O₃ levels had been decreasing. In 2004, the USEPA created a new, more stringent O₃ standard and therefore precursors (NO_x and VOCs) are tracked very carefully. In the absence of USEPA project-level O₃ modeling guidance, O₃ precursors such as NO_x and VOCs were predicted on a regional basis for each alternative.

Carbon Monoxide

Hudson County and Bergen County are classified as maintenance areas for CO. New Jersey and its controlling Metropolitan Planning Organizations (MPO) must continue with a maintenance plan that includes control measures, a transportation conformity budget, and contingency plan to support the re-designation. CO is generated primarily by the incomplete combustion of fossil fuel. Substandard operating intersections produce significant delays and congestion, and result in excessive idle emissions. In addition, parking areas introduce additional idle emissions. CO levels were predicted both locally, as a result of increased traffic near proposed stations, and regionally, to quantify net changes in CO due to the reduction in motor vehicle VMT.

11.2.3. Criteria For Determining Impacts

As stated within the CAAA, proposed projects must adhere to and ensure conformity of the governing SIP. The USEPA promulgated the Transportation Conformity Rule (TCR) under the CAAA. The TCR provides criteria and procedures for determining conformity to SIPs of transportation plans, programs, and projects funded or approved under Title 23 U.S.C. or the Federal Transit Act. The conformity requirements are as follows:

- The project must originate from a conforming transportation plan and program.
- In non-attainment areas or maintenance areas, the project must eliminate or reduce the severity and number of violations of the NAAQS.

Hudson and Bergen Counties are in maintenance for PM_{2.5}. The *Transportation Conformity Guidance for Qualitative Hot-spot Analysis in PM_{2.5} and PM₁₀ Non-Attainment and Maintenance Areas* (EPA 420-B-

13-053) has been released to assist with determining projects of air quality concern. Under 40 CFR 93.123(b)(iii), the Northern Branch Corridor project would not be considered a project of PM_{2.5} concern since the Preferred Alternative would not cause a significant number of diesel vehicles to congregate at a single location. Therefore, a hot-spot analysis for PM_{2.5} is not required.

Localized CO levels were estimated based on the proposed project improvements and compared to the federal/state CO primary standards of 35 ppm for a one-hour period, and 9 ppm for a continuous eight-hour period. If they met the standard and did not cause an exceedance, the project would conform to the SIP.

11.2.4. Analysis of Carbon Monoxide (CO) Emissions at Intersections

Intersections within the study area anticipated to experience the greatest project-related impact were selected for hot-spot CO modeling. The morning (a.m.) peak weekday period traffic conditions for the two intersections listed below were selected for analysis based on a combination of factors: highest traffic volumes, worst levels of service in the study area, and proximity to pedestrian activity (refer to Chapter 9: Traffic for details):

- Leonia Station Area:
 - Fort Lee Road and Overpeck County Park Entrance
 - Fort Lee Road and Willow Tree Drive/Station Parkway

To analyze CO concentrations as a result of roadways within the study area, the New Jersey Department of Environmental Protection (NJDEP) requires a specific methodology at intersections, which is outlined in the *Air Quality Analysis for Intersections* document released by the Bureau of Air Quality Evaluation, dated May 2004. Two USEPA-approved models were utilized: MOVES 2014 (EPA420-B-14-055) to calculate pollutant emission factors for input to the air dispersion model and CAL3QHC Version 2.0 (EPA-404/12-92-006).

The transport and concentration of pollutants from vehicular sources are influenced by three principal meteorological factors: wind speed, wind direction, and stability. Following NJDEP and USEPA guidelines, a wind speed of one meter per second and neutral atmospheric conditions were used.

The MOVES model simulates the different emission rates that occur when vehicles are in queue (idling), accelerating, decelerating, and cruising at different speeds. CAL3QHC simplifies these different emission rates into the following two components:

- Emissions when vehicles are in queue (idling) during the red phase of a signalized intersection
- Emissions when vehicles are in motion during the green phase of a signalized intersection

In addition, CAL3QHC estimates the average number of vehicles that would queue during the red phase of an intersection based on the characteristics of intersection and traffic conditions.

Since CO levels are highest adjacent to areas of localized congestion, NJDEP requires air quality receptors at “reasonable” locations at modeled intersections. Sidewalks are present at some of the modeled intersection approach legs. Therefore, receptors were placed along the right-of-way lines or sidewalks at each approach leg, whichever was closest to the roadway. CO concentrations are expected to decrease with distance at residential receptors, which are located back from the sidewalks and right-of-way lines.

CAL3QHC was used to estimate one-hour CO concentrations. Ambient background levels were then added to each one-hour concentration to yield the total CO concentration at each receptor site. A one-hour background CO level of 2.3 ppm (see Table 11-2) was utilized. Resultant one-hour CO concentrations were then compared to the standard of 35 ppm.

To evaluate an eight-hour air quality impact, each one-hour computer modeled concentration was multiplied by a 0.7 persistence factor. This value represents the role traffic and meteorological conditions may have on an overall eight-hour period. The eight-hour background CO level of 1.6 ppm (see Table 11-2) was utilized. Resultant eight-hour concentrations were then compared to the standard of 9 ppm. Hot spot microscale CO analyses were performed for future conditions with and without the proposed action (i.e., future No Build and future Build Alternative conditions) for 2030. It was assumed that if the Preferred Alternative did not cause an increase in air quality pollutants at these intersections, then the remaining intersections, with less congestion, would also not experience a similar increase.

11.2.5. Analysis of Carbon Monoxide (CO) Emissions at Parking Lots

Parking areas associated with the proposed stations contribute to new sources of CO emissions within the project study area. CO emissions were predicted at the Englewood Route 4 parking deck since it is the largest proposed parking facility. Utilizing AERSCREEN, a USEPA-recommended area source screening tool, CO concentrations adjacent to the parking deck were modeled.

Receptor locations were selected at sidewalks directly adjacent to the parking deck on all four sides. It was assumed that if this parking deck did not cause an increase in air quality pollutants, then the remaining parking areas, with less volume, would also not cause a similar increase.

11.2.6. Mesoscale Analysis of Regional Emissions

A mesoscale, or regional, analysis was conducted to assess the net effects of the proposed rail service on the emissions of pollutants. This analysis assessed the change in regional air quality based on the change in vehicle-related emissions. Relative differences in vehicle-related emissions were a function of the net change in VMT, average vehicle travel speed, and the corresponding pollutant emission rates. The emission rates for vehicles were determined for the project's build year of 2030 using USEPA's model MOVES 2014. These calculations included the effect of the inspection/maintenance and anti-tampering programs, as well as county-wide roadway and vehicle fleet characteristics consistent with regional air quality modeling in regulatory determinations. Five pollutants were assessed within the mesoscale analysis: CO, PM₁₀, PM_{2.5}, NO_x, and HCs. HC and NO_x were included because of their role as precursors for O₃. By calculating the change in the emissions for hydrocarbons and nitrogen oxides, the effect on ozone would be assessed indirectly.

11.3. Environmental Review

11.3.1. Existing Conditions

Each criteria pollutant is monitored on a continuous basis throughout the State of New Jersey by NJDEP. Major objectives of monitoring air quality are to provide an early warning system for pollutant concentrations, assess air quality in light of public health and welfare standards, and also track trends or changes in these pollutant levels. The most recent monitored data is shown in Table 11-2.

Table 11-2: Pollutant Monitoring Data

Pollutant	Averaging Period	Maximum Averaging Period Concentrations	
		2013 Maximum Values	National and New Jersey Ambient Air Quality Standards
Fine Particulates (PM _{2.5})	24 hrs. ⁽¹⁾	23 µg/m ³ ⁽⁵⁾	35 µg/m ³
	1 yr. ⁽²⁾	9.1 µg/m ³ ⁽⁵⁾	12 µg/m ³
Ozone (O ₃)	8 hr. ⁽³⁾	0.077 ppm ⁽⁶⁾	0.075 ppm
Carbon Monoxide (CO)	1 hr. ⁽⁴⁾	2.3 ppm ⁽⁷⁾	35 ppm
	8 hr. ⁽⁴⁾	1.6 ppm ⁽⁷⁾	9 ppm

Notes:
 ppm = parts per million; µg/m³ = micrograms per cubic meter
⁽¹⁾ 98th percentile concentration – 3-year average; ⁽²⁾ 3-year average; ⁽³⁾ 3-year average of 4th highest daily eight-hour maximum; ⁽⁴⁾ highest second highest maximum concentration over the past five years; ⁽⁵⁾ Fort Lee Library, Center Street, Fort Lee; ⁽⁶⁾ Overpeck Park, Leonia; ⁽⁷⁾ 133 River Street, Hackensack; ⁽⁸⁾ 2010 design value is the latest CO monitoring data available.

Source: USEPA AQS Data Mart, USEPA Design Values

Hudson and Bergen Counties have been designated as a part of a regional non-attainment area for eight-hour O₃, which is supported by the monitoring data in Table 11-2 as the average eight-hour O₃ concentration over the previous three years exceeded the eight-hour standard of 0.075 ppm. The one-hour and eight-hour CO concentrations, as well as the 24-hour and three-year average annual mean PM_{2.5} concentrations, were below the standards, supporting the CO and PM_{2.5} maintenance status of Hudson and Bergen Counties.

11.3.2. Potential Impacts and Mitigation

No Build and Preferred Alternative

The modeling procedures described within Section 11.2. Methodology, were utilized to estimate vehicular CO emissions at intersections near proposed stations under future year 2030 without the project and with the Preferred Alternative. The results are presented in Table 11-3. The modeled concentrations, which include CO background values, do not exceed the NAAQS. Therefore, no significant CO impact is anticipated at intersections adjacent to proposed station areas or at the parking areas.

Table 11-3: Predicted CO Concentrations at Intersections and Parking Deck

Area	Location	NAAQS	No Build	Preferred Alternative
Predicted one-hour CO Concentrations (ppm)				
Leonia	Fort Lee Road & Overpeck County Park	35	3.1	3.1
	Fort Lee Road & Willow Tree Road	35	2.7	2.6
Englewood Route 4	Parking Deck	35	2.3	2.6
Predicted eight-hour CO Concentrations (ppm)				
Leonia	Fort Lee Road & Overpeck County Park	9	2.2	2.2
	Fort Lee Road & Willow Tree Road	9	1.9	1.8
Englewood Route 4	Parking Deck	9	1.6	1.8

Note: Background concentrations were included: 2.3 ppm for one-hour and 1.6 ppm for eight-hour

Source: Jacobs, 2015

Since a significant number of commuters are projected to switch modes of travel from passenger vehicles to rail, the proposed project would reduce the regional VMT, and consequently, the quantities of vehicular-related pollutants. In 2030, the reduction would be 121,000 VMT per day. The effects of automobiles idling when waiting to enter or exit parking areas were also added to the analysis, assumed to

be 2,655 in 2030. As shown in Table 11-4, the Preferred Alternative would reduce emissions of CO, PM₁₀, PM_{2.5} HC, and NO_x, thereby improving the air quality within the region.

Table 11-4: Comparison of Net Effects on Regional Emissions (tons/year)

Pollutant	No Build Alternative	Preferred Alternative
Carbon Monoxide (CO)	0	-36.56
PM ₁₀	0	-2.74
PM _{2.5}	0	-0.44
Hydrocarbons (HC)	0	-0.98
Nitrogen Oxides (NO _x)	0	-1.54

Source: Jacobs, 2015

Mitigation

The Preferred Alternative would not cause a significant impact to local or regional air quality; therefore, mitigation is not required.

11.4. Summary of Potential Environmental Effects

The Preferred Alternative exhibits no increase in CO emissions over the No Build Alternative at the intersections, and a slight increase at the parking deck, as the No Build Alternative would have no new parking areas. All predicted concentrations are well below the one-hour and eight-hour NAAQS standards.

A comparison of regional emissions for the Preferred Alternative compared to the No Build Alternative is provided in Table 11-4. As shown, the Preferred Alternative would reduce emissions of all pollutants due to the reduction in VMT.

Compliance with Transportation Conformity Criteria

According to USEPA's TCR, transportation projects must originate from a conforming transportation plan and program, and in non-attainment areas, projects must eliminate or reduce the severity and number of violations of the NAAQS. The Northern Branch Rail Corridor project is listed within the FY2014-2023 Statewide Transportation Improvement Program (DB #T300) under Transit Rail Initiatives and in the NJTPA's Regional Transportation Plan for Northern New Jersey titled "Plan 2040" (#TN08002). The results of the CO analysis documents CO levels would fall below the one-hour (35 ppm) and eight-hour (9 ppm) NAAQS. In addition, the regional analysis shows a reduction in PM_{2.5} and PM₁₀. Therefore, it is anticipated that this project would comply with the conformity requirements established by the CAAA of 1990. Prior to project funding, the project would be included in the Statewide Transportation Improvement Program as a project and would be included in NJTPA's regional transportation conformity analysis.

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