4.1 Air Quality

An air quality assessment was performed to evaluate potential impacts to local and regional air quality. Based on the Transrapid International maglev technology, the project system infrastructure would have no direct air pollutant emissions. Point source air emission rates from the electric generation plants supplying power to the system would not be expected to increase as a result of the project. In addition, a comparison of increased power plant tonnage emissions against emission reductions achieved by reductions in passenger vehicle miles traveled (VMT) shows that a net reduction in the tonnage of criteria pollutants would result from the project. Therefore, the air quality analysis focused on potential impacts and/or benefits to local and regional air quality associated with potential increases and/or reductions to vehicular traffic around the stations and throughout the project area and the region.

4.1.1 Methodology

FRA and FHWA require transportation improvement projects to be evaluated for air quality impacts on both a local and a regional level. The possible macro benefits of electric powered transportation were evaluated by comparing projected increases in annual electric generation related criteria pollutant air emissions (nitrogen oxides [NOx] and volatile organic compounds [VOC]) against projected annual reductions in passenger VMT and related air emissions. As noted later in this section, a net annual tonnage reduction of criteria pollutants would result. Accordingly, further evaluation of regional air quality impacts will focus on the *Regional Air Quality Conformity Assessment* completed by the SPC.

Generally, local air quality is assessed on a micro-scale, by evaluating CO concentrations at the project level. High concentrations of CO tend to occur in areas of high traffic volumes or areas adjacent to a stationary source of the pollutant. CO emissions are associated with the incomplete combustion of fossil fuels in motor vehicles and are considered a good indicator of vehicle-induced air pollution.

Air quality modeling was performed at worst-case roadway intersections adjacent to each of the potential stations, in accordance with USEPA's *Guideline for Modeling Carbon Monoxide from Roadway Intersections*. Comparisons were made between CO levels associated with existing, design year no-build, and design year build (mitigated) conditions at each of the evaluated intersections. In addition, all projected CO levels were compared to the NAAQS for CO to determine if air quality impacts are anticipated as a result of the project. These standards are 35 parts per million (ppm) and 9 ppm for the second highest one-hour and eight-hour periods, respectively. These CO standards have been designed and adopted in an effort to protect public health and welfare. An explanation of the complete methodology applied to the air quality analysis is contained in the PTSF.

Regional air quality is assessed by evaluating potential O_3 concentrations and reductions in relation to emission budgets identified by the State Implementation Plan (SIP). This assessment is performed by SPC for the Transportation Improvement Program (TIP) and the regional Long-Range Transportation Plan. It is documented by SPC in a separate report (*Air Quality Conformity Assessment*).

4.1.2 Impact Analysis

4.1.2.1 Local Level Impact Analysis

No-Build Alternative

As noted in Table 4.1.2-1, only localized air quality (CO) emissions would be anticipated to improve with the No-Build Alternative due to the implementation of site-specific traffic flow improvements, upgraded fleet vehicles, and improved fuel efficiency for the year 2026. Overall there would be no net reduction in the tonnage of criteria pollutants with the No-Build Alternative.

Table 4.1.2-1 Air Quality Impacts: Sections A, B, and C

Intersection Evaluated	2002 - Existing CO level in PPM		2026 - No-Build CO level in PPM		2026 - Build CO level in PPM	
	1-hr level	*8-hr level*	*1-hr level*	*8-hr level*	*1-hr level*	*8-hr level*
Section A						
PIA Station						
N/A						
Steel Plaza Station						
Washington Ave. & Centre Ave.	4.2	2.9	4.1	2.9	4.1	2.9
Sixth Ave. & Centre Ave.	4.0	2.8	3.8	2.7	3.8	2.7
Washington Place & Webster Ave.	5.7	4.0	5.4	3.8	5.9	4.1
Section B						
Thompson Run Station						
US Business 22 & PA 791	8.5	6.0	7.7	5.4	7.9	5.5
Section C						
Greengate Mall Station						
US 30 & Lowes Rd.	11.5	8.1	10.9	7.6	11.3	7.9
US 30 & W. Hills Dr.	7.6	5.3	7.0	4.9	10.6	7.4
US 30 & Old Toll Rd.	8.5	6.0	7.7	5.4	8.8	6.2
Toll Route 66/PA Route 136 Station						
Millersdale Rd. & US 30	3.2	2.2	3.2	2.2	4.1	2.9

CO: Carbon Monoxide
PPM: Parts per Million

All CO levels include an assumed background concentration of 2.0 ppm, as per USEPA Guidelines. A persistence factor of 0.7 was applied to calculate 8 hr. CO concentrations, as per USEPA Guidelines.

Build Alternatives

Section A

There would be three stations within the limits of Section A of the project. Because there would be a relatively free flow of traffic at the proposed PIA station, no intersections were evaluated, and only free-flow ramps and weave areas were analyzed as part of the traffic impact study. There would be no impacts at the Enlow Station. The air quality analysis focused on the worst-case intersections adjacent to the Steel Plaza station only. The air quality analysis evaluated the effects of idling traffic emissions associated with existing and future CO concentrations. Adjacent to the Steel Plaza station, three intersections were evaluated based on future projected levels of service. These three intersections included the intersection of Washington Avenue/Centre Avenue, the intersection of Sixth Avenue/Centre Avenue, and the intersection of

Washington Place/Webster Avenue. As shown in Table 4.1.2-1, existing, worst-case, one-hour CO levels at these locations ranged from 4.0 ppm to 5.7 ppm. Future (2026) worst-case, one-hour, no-build levels at these intersections are expected to range from 3.8 ppm to 5.4 ppm. Future (2026) worst-case, one-hour, build levels at these intersections are projected to range from 3.8 ppm to 5.9 ppm. Future worst-case, eight-hour concentrations would range from 2.7 ppm to 4.1 ppm.

Section B

One station is proposed within Section B of the project, the Thompson Run station. Based on an analysis of projected traffic adjacent to this station, the intersection of U.S. Business Route 22 and PA Route 791 (Rodi Road) represents worst-case conditions. For this reason, the air quality analysis in Section B focused on existing, no-build (2026), and future (2026) CO levels adjacent to this intersection. As shown in Table 4.1.2-1, existing, worst-case, one-hour CO levels at this location were estimated at 8.5 ppm and worst-case, eight-hour concentrations were estimated at 6.0 ppm. Future (2026) worst-case, one-hour, no-build levels were projected at 7.7 ppm, and worst-case, eight-hour concentrations were estimated at 5.4 ppm. Future (2026) worst-case, one-hour, build levels were projected at 7.9 ppm and worst-case, eight-hour concentrations were estimated at 5.5 ppm.

Section C

Two different station locations have been proposed within Section C of the project. If Alternative Alignment C2-Mod or Alternative Alignment C5 were selected, the Greengate Mall station would be the termination point. If Alternative Alignment C6 were selected, the Toll Route 66/PA Route 136 station would be the termination point. For the purposes of the local air quality analysis, worst-case intersections adjacent to these stations were evaluated for existing and future CO concentrations.

Three intersections adjacent to the Greengate Mall station were evaluated based on future levels of service: the intersection of U.S. Route 30/Lowes Road, the intersection of U.S. Route 30/West Hills Drive, and the intersection of U.S. Route 30/Old Toll Road. As shown in Table 4.1.2-1, existing, worst-case, one-hour CO levels at these locations would range from 7.6 ppm to 11.5 ppm and worst-case, eight-hour concentrations would range from 5.3 ppm to 8.1 ppm. Future (2026) worst-case, one-hour, no-build levels at these intersections are projected to range from 7.0 ppm to 10.9 ppm and worst-case, eight-hour concentrations are expected to range from 4.9 ppm to 7.6 ppm. Future (2026) worst-case, one-hour, build levels at these intersections are projected to range from 8.8 ppm to 11.3 ppm and future worst-case, eight-hour concentrations are expected to range from 6.2 ppm to 7.9 ppm.

At the Toll Route 66/PA Route 136 station, the intersection at Millersdale Road and U.S. Route 30 represents worst-case traffic conditions. For this reason, the air quality analysis focused on existing and future CO levels adjacent to this intersection. As shown in Table 4.1.2-1, existing worst-case, one-hour CO levels at this location were estimated at 3.2 ppm and worst-case, eight-hour CO concentrations were estimated at 2.2 ppm. Future (2026) worst-case, one-hour, no-build concentrations were projected at 3.2 ppm and future no-build, worst-case, eight-hour concentrations were estimated at 2.2 ppm. Future (2026) worst-case, one-hour, build levels were projected at 4.1 ppm and future worst-case, eight-hour build levels were estimated at 2.9 ppm.

4.1.2.2 Regional Level Impact Analysis

Alternative Transportation Electrification Evaluation

Possible macro air emission benefits that may be generated by the project as an electrified transportation alternative to individual fossil fuel vehicles were evaluated. Direct comparisons were made to projected increased emissions generated by the production of electricity needed to operate the maglev system versus projected reductions in passenger VMT and related air emissions. The analysis addressed the two largest criteria pollutants associated with both modes of transportation, namely NOx and VOCs. These pollutants are the primary precursors to the formation of ground level ozone and contribute to fine particulate levels. The evaluation of alternative electrified transportation systems is appropriate since large power plant point sources are generally more energy efficient and lower emitting when compared collectively to individual vehicle energy usage and emissions.

Electric power plant emissions were estimated using the *EPA Compilation of Air Emission Factors, AP–42, Fifth Edition, Volume I Reference* (2000). The analysis assumes the mix of regional electric generation supplied to the maglev project would consist of approximately 90 percent coal-fired and 10 percent natural gas-fired generation. Vehicle emissions were estimated using 2025 vehicle emission factors and a regional average passenger vehicle speed value of 36.9 mph (59.4 kph) developed by the SPC. The project VMT reduction is estimated by the ridership model developed and described in Section 4.12, Transportation, and depicted in Table 4.1.2-2.

Table 4.1.2-2 Project Vehicle Miles Traveled (VMT)

Year		Weekday VMT	Weekday VMT Reduction	Projected Annual VMT Reduction in million miles
2008	No-Build	58,356,300	N/A	N/A
	Build	57,722,700	633,600	190
2026	No-Build	66,517,300	N/A	N/A
	Build	65,675,800	841,500	252.5

Supporting documentation for the *Final Programmatic Environmental Impact Statement (DOT-VNTSC-FRA-00-04)* was used for the basis for annual electric energy needed to operate the maglev system (186,130 Megawatt - hours).

The net projected annual reduction in tons of NOx and VOC emissions that would result from the project is significant. The 2008 and 2026 build condition compared to the no-build condition is depicted in Table 4.1.2-3. The NOx emissions from power plants and vehicles are individually expected to vary. Power plant NOx emissions are expected to decrease moving forward to 2026 with the anticipated USEPA imposition of year round NOx controls for fine particulates. Vehicle emissions are conversely expected to increase with the national trend of increased vehicle usage.

In the 2008 comparison year, it is estimated that there will be a net annual decrease of approximately 160.3 metric tons (176.1 tons) of NOx attributable to the project through reduction of VMT. In the 2026 comparison year, it is estimated that a net annual decrease of 212.9 metric tons (234.0 tons) of NOx will be attributable to the project.

Table 4.1.2-3 Projected Maglev Related Annual Emission Outputs

Source	No-Build NO_X	Build NO_X	No-Build VOC	Build VOC
2008 Annual Emission Outputs in metric tons (short tons)				
Passenger Vehicles	14,763.0 (16,223)	14,763.0 (16,223)	15,289.8 (16,802)	15,289.8 (16,802)
Passenger Vehicle Reduction	N/A	-160.3 (-176.1)	N/A	-164.2 (-182.4)
Power Plants	276.8 (304.2)	276.8 (304.2)	1.7 (1.9)	1.7 (1.9)
Total Output	**15,039.8 (16,527.2)**	**14,879.5 (16,351.1)**	**15,291.5 (16,803.9)**	**15,127.3 (16,621.5)**
2026 Annual Emission Outputs in metric tons (short tons)				
Passenger Vehicles	16,871.4 (18,540)	16,871.4 (18,540)	17,473.8 (19,202)	17,473.8 (19,202)
Passenger Vehicle Reduction	N/A	-212.9 (-234.0)	N/A	-220.6 (-242.4)
Power Plants	157.2 (172.7)	157.2 (172.7)	1.7 (1.9)	1.7 (1.9)
Total Output	**17,028.6 (18,712.7)**	**16,815.7 (18,478.7)**	**17,475.5 (19,203.9)**	**17,254.9 (18,961.5)**

In the 2008 comparison year, it is estimated that there will be a net annual decrease of approximately 164.2 metric tons (182.4 tons) of VOCs attributable to the project through reduction of VMT. In the 2026 comparison year, it is estimated that a net annual decrease of 220.6 metric tons (242.4 tons) of VOCs will be attributable to the project. The net reduction in VOCs is considered significant since VOCs are the primary reactive pollutant in the ozone formation process

To put these reductions in perspective, annual Pennsylvania power plant NOx emissions in 1999 (the latest information available from the US Energy Information Agency) was 280,325 metric tons (309,000 tons). As noted above, future power plant NOx emissions can be expected to decrease by 2026. Similar VOC data are not available. However, for regulatory agency air quality planning purposes, power plants are not considered a significant source of VOCs in comparison to vehicle sources.

Using SPC VMT projections, the estimated 2008 annual no-build passenger vehicle emissions in the corridor are expected to be 14,763.0 metric tons (16,223 tons) of NOx and 15,289.8 metric tons (16,802 tons) of VOCs. Estimates of annual no-build passenger vehicle emissions indicate that there would be 16,871.4 metric tons (18,540 tons) of NOx and 17,473.8 metric tons (19,202 tons) of VOCs in 2026. In light of the relatively high annual tonnage emissions of NOx and VOCs that will continue to be produced from power plant and passenger vehicle sources in 2026, the overall benefit of reduced air emissions from the maglev project as an electrified alternative to the individual vehicle mode of transportation may not be readily discernible to the general public. However, it is appropriate to conclude that significant positive annual tonnage emission reductions of NOx and VOC would be generated by the maglev system in both comparison years. The expected net reduction takes on added significance when considering that Federal and State Implementation Plans place emission caps on major air emission source emitters such as power plants. Accordingly, maglev-related reductions in passenger car VMT would achieve significant automobile-related emission reductions in the Pittsburgh area.

Conformity Evaluation

The *Clean Air Act Amendments of 1990* (CAAA) mandate improvements to the nation's air quality. The conformity regulations promulgated by the USEPA in 1997 (*40 CFR Part 93*)

require transportation plans and programs to conform with the SIP. The final conformity rule requires that transportation plans in ozone non-attainment and maintenance areas be consistent with the most recent estimates of mobile source emissions; provide for the expeditious implementation of transportation control measures in the applicable implementation plan; and contribute to annual emission reductions in ozone and carbon monoxide non-attainment areas.

Based on the *CAAA* and most recent USEPA classifications, Allegheny and Westmoreland counties are within a designated seven-county maintenance area with respect to ozone attainment. Therefore, projects in these counties must be evaluated for regional air quality conformity.

Construction of the Pennsylvania High-Speed Maglev Project and related highway improvements providing access to the stations are included in SPC's latest Long-Range Transportation Plan (the 2030 Plan). Current, ongoing planning activities, environmental studies, and pre-construction phases were funded from previous Transportation Improvement Programs.

SPC adopted the 2030 Plan on July 31, 2003. Major amendments to the plan were approved by SPC on October 27, 2003 to integrate projects into the plan from Lawrence County, SPC's newest member.

Conformity findings for the plan, as adopted in July 2003 and as amended in October 2003, were made by SPC concurrent with the plan adoption and amendment actions. USDOT concurrence with SPC's conformity findings for the 2030 Plan occurred on August 4, 2004.

On June 30, 2004 SPC adopted the region's current Transportation Improvement Program (the 2005-2008 TIP). During development of the 2005-2008 TIP, SPC conducted a conformity assessment for the TIP and reaffirmed conformity for the 2030 Plan. That plan and TIP conformity finding was adopted by SPC on June 30, 2004, concurrent with adoption of the 2005-2008 TIP.

USDOT concurrence with SPC's conformity finding for the 2005-2008 TIP and 2030 Plan occurred on September 30, 2004.

Since the project continues to be included in a conforming plan and TIP, it continues to satisfy all conformity requirements of the federal *Clean Air Act*.

4.1.3 Summary

Future (2026) worst-case, one-hour no-build CO levels are projected to range from 3.2 ppm to 10.9 ppm in the design year of the project, and future no-build worst-case, eight-hour CO levels are projected to range from 2.2 ppm to 7.6 ppm in the design year of the project. Similarly, future (2026) worst-case, one-hour build CO levels are projected to range from 3.8 to 11.3 ppm, and future worst-case, eight–hour build CO levels are projected to range from 2.7 to 7.9 ppm. Comparison between existing, future no-build, and future build levels indicates that local CO concentrations are anticipated to either not increase or only increase moderately as a result of increased traffic volumes and the introduction of signalized intersections adjacent to the stations. The increases in CO concentrations are not anticipated to exceed either the one-hour or eight-hour NAAQS for CO.

At the regional level, there would be positive annual tonnage emission reductions of NOx and VOC as a result of the project. Additionally, the project satisfies all conformity requirements, as outlined by the *CAAA of 1990*.

4.1.4 Mitigation

No local or regional air quality impacts are anticipated as a result of the project. Consequently, no mitigation measures are required.

4.2 Water Resources

The impacts to water resources from the proposed alternative alignments and stations were evaluated by documenting the existing conditions and construction suitability of the local soils, geology, groundwater resources, and streams.

4.2.1 Soils, Geology, and Groundwater Resources

4.2.1.1 Methodology

A literature and database review of soils, geology, and groundwater resources was conducted to evaluate the impact of the project on those features and resources. To confirm the actual presence and condition of the features and resources, a field reconnaissance was conducted.

To describe the variety of soil types impacted by the project, data from the USDA were reviewed. Information regarding the engineering characteristics and properties affected by the project, specifically for drilling, excavating, and constructing piers, are also provided. These include the potential for the alternative alignments to encounter slag, landslide prone soils, urban land, and corrosive, highly erodible, or compressible soils.

The impacts to the geology from the project alternative alignments and stations were defined using a literature review of information sources from the USGS, PADEP, Pennsylvania Geologic Survey, and the Pittsburgh Geologic Society. Specific sources of information included *Greater Pittsburgh Region Geologic Map and Cross Sections Map 42* (PADCNR, 1985) and E*ngineering Characteristics of the Rocks of Pennsylvania, PADEP Environmental Report 1* (Geyer and Wilshusen, 1982). Information regarding the characteristics of rocks and rock structures for drilling, excavating, and pier construction is also defined by this methodology. Local geologic formations were determined through the evaluation of the locations of floodplains, areas of soft erodible or landslide prone rock, and strength of rock type.

Information regarding the groundwater resources in the project area was obtained from PADEP groundwater well databases. These databases provide information regarding the groundwater resources within the project area rock units. Impacts from the alternative alignments and the stations on groundwater yield and chemical quality were determined from this information. Mine drainage and industrial pollution impacts were also considered.