Air Quality Conformity Report
Visualize 2050 and the FY 2026-2029 Transportation Improvement Program

VISUALIZE 2050

National Capital Region
Transportation Planning Board

Approved December 17, 2025

ABOUT THE TPB

The National Capital Region Transportation Planning Board (TPB) is the federally designated metropolitan planning organization (MPO) for the metropolitan Washington region. It is responsible for developing and carrying out a continuing, cooperative, and comprehensive transportation planning process in the metropolitan area. Members of the TPB include representatives of the transportation agencies of the states of Maryland and Virginia and the District of Columbia, 22 local governments, the Washington Metropolitan Area Transit Authority, the Maryland and Virginia General Assemblies, and nonvoting members from the Metropolitan Washington Airports Authority and federal agencies. The TPB is staffed by the Department of Transportation Planning at the Metropolitan Washington Council of Governments (COG).

CREDITS

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CONTRIBUTING EDITORS

William Bacon
Anant Choudhary
Nazneen Ferdous
Sunil Kumar
Mark Moran
Wanda Owens
Jinchul (JC) Park
Jane Posey
Eric Randall
Ho Jun (Daniel) Son
Kanathur Srikanth
Dusan Vuksan
Feng Xie
Jian (Jim) Yin

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EXECUTIVE SUMMARY

This report documents the air quality conformity analysis of Visualize 2050, the region's metropolitan transportation plan, and the FY 2026-2029 Transportation Improvement Program (TIP). The analysis is carried out under the regulations contained in the U.S. Environmental Protection Agency's (EPA's) final rule, published in the November 24, 1993, *Federal Register,* with subsequent amendments and additional federal guidance published by the EPA, the Federal Highway Administration (FHWA), and the Federal Transit Administration (FTA). The process involved consultation with affected agencies such as the EPA, FHWA, FTA, and the Metropolitan Washington Air Quality Committee (MWAQC), as well as with the public. The analysis is the responsibility of the National Capital Region Transportation Planning Board (TPB).

"Conformity" is a requirement of the federal Clean Air Act (CAA) to ensure that transportation plans and transportation improvement programs are consistent with air quality goals and that progress toward achieving and maintaining federal air quality standards is being made. A conformity determination is undertaken to forecast air pollution from motor vehicles ("mobile source emissions") that use or are predicted to use an area's surface transportation system. The analysis must demonstrate that those emissions are within limits outlined in state air quality implementation plans, known as SIPs.

The EPA has designated the Metropolitan Washington, DC (DC-MD-VA) region as being in nonattainment of the 2015 Ozone National Ambient Air Quality Standards (NAAQS). Volatile Organic Compounds (VOCs) and Nitrogen Oxides (NO_x) mix with sunlight to form ground-level ozone. For the Visualize 2050 plan, emissions for ozone season VOC and NO_X were estimated for 2025, 2026, 2030, 2040, 2045, and 2050 forecast years. MWAQC developed mobile emissions budgets for VOC and NO_X in the 2023 revision of the 2008 Ozone Maintenance Plan. In October 2024, the EPA found these budgets adequate for use in conformity determinations.

This analysis shows that the Visualize 2050 plan and FY 2026-2029 TIP mobile emissions are within the mobile emissions budgets for ozone season VOC and NO_X for all forecast years. Thus, this analysis provides a basis for a determination of conformity for the Visualize 2050 plan and the FY 2026-2029 TIP.

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LIST OF ACRONYMS

AWDT	Average Weekday Traffic
BMC	Baltimore Metropolitan Council
CAAA	Clean Air Act Amendments of 1990
CAC	Citizens Advisory Committee
CLRP	Constrained Long-Range (Transportation) Plan
CMAQ	Congestion Mitigation & Air Quality
CO	Carbon Monoxide
C-SMMPO	Calvert-St. Mary's Metropolitan Planning Organization
DDOT	District of Columbia Department of Transportation
DTP	(COG's) Department of Transportation Planning
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
I/M	Inspection and Maintenance
LOV	Low Occupancy Vehicle
LRTP	Long-Range Transportation Plan
MDOT	Maryland Department of Transportation
MPO	Metropolitan Planning Organization
MOVES	Motor Vehicle Emissions Simulator
MTP	Metropolitan Transportation Plan
MVEB	Motor Vehicle Emissions Budget
MWAQC	Metropolitan Washington Air Quality Committee
MWCOG	Metropolitan Washington Council of Governments
NAAQS	National Ambient Air Quality Standards
NOx	Nitrogen Oxides
$PM_{2.5}$	Particulate Matter, 2.5 micrometers in diameter and smaller
PNR	Park and Ride Lot
SIP	State Implementation Plan
TAZ	Transportation Analysis Zone
TCM	Transportation Control Measure
TERM	Transportation Emission Reduction Measure
TIP	Transportation Improvement Program
TPB	National Capital Region Transportation Planning Board
US DOT	United States Department of Transportation
US EPA	United States Environmental Protection Agency
VDOT	Virginia Department of Transportation
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds
WMATA	Washington Metropolitan Area Transit Authority

TPB R3 -2026
December 17, 2025

NATIONAL CAPITAL REGION TRANSPORTATION PLANNING BOARD
777 North Capitol Street, N.E.
Washington, D.C. 20002

RESOLUTION FINDING THAT THE VISUALIZE 2050 NATIONAL CAPITAL REGION TRANSPORTATION PLAN AND THE FY 2026-2029 TRANSPORTATION IMPROVEMENT PROGRAM CONFORM WITH THE REQUIREMENTS OF THE CLEAN AIR ACT AMENDMENTS OF 1990

WHEREAS, the National Capital Region Transportation Planning Board (TPB) has been designated by the Governors of Maryland and Virginia and the Mayor of the District of Columbia as the Metropolitan Planning Organization (MPO) for the Washington Metropolitan Area; and

WHEREAS, the U.S. Environmental Protection Agency (EPA), in conjunction with the U.S. Department of Transportation (DOT), under the Clean Air Act Amendments of 1990 (CAAA), issued on November 24, 1993 "Criteria and Procedures for Determining Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Funded or Approved Under Title 23 U.S.C. or the Federal Transit Act," and, over the years, subsequently amended these regulations and provided additional guidance, which taken together provide the specific criteria for the TPB to make a determination of conformity of its metropolitan transportation plan and transportation improvement program (TIP) with the State Implementation Plan (SIP) for air quality maintenance within the Metropolitan Washington non-attainment area; and

WHEREAS, on February 15, 2023, the TPB staff released the Technical Inputs Solicitation Submission Guide and asked for inputs to Visualize 2050 and the FY 2026-2029 TIP; and

WHEREAS, following the direction from TPB's resolution R19-2021, as part of the Visualize 2050 Technical Inputs Solicitation, TPB and agency staff conducted a process to re-examine the capacity-related projects in Visualize 2045, where such improvements are significant for consideration in the air quality conformity analysis, and resubmit an updated mix of projects supported by updated revenue and expenditure estimates for new capital projects through 2050 demonstrating that funding is reasonably expected to be available; and

WHEREAS, a scope of work was developed to address all procedures and requirements, including public and interagency consultation, and the scope was released for public comment on March 1, 2024, and approved by the TPB at its May 15, 2024, meeting; and

WHEREAS, highway and transit project inputs submitted for inclusion in the air quality conformity analysis of Visualize 2050 and the FY 2026-2029 TIP were released for public comment on March 1, 2024, and approved by the TPB at its May 2024 meeting; and

WHEREAS, on October 23, 2025, the draft results of the air quality conformity analysis of Visualize 2050 metropolitan transportation plan and FY 2026-2029 TIP were released for a 30-day public comment period with inter-agency consultation; and

WHEREAS, the Air Quality Conformity Analysis Report of Visualize 2050 and the FY 2026-2029 Transportation Improvement Program demonstrates adherence to all mobile source emissions budgets for ground level ozone precursors Volatile Organic Compounds (VOC) and Nitrogen Oxides (NOx), and meets all regulatory, planning and interagency consultation requirements, and therefore provides the basis for a finding of conformity of Visualize 2050 and the FY 2026-2029 TIP with the requirements of the CAAA; and

WHEREAS, as part of the TPB's interagency consultation process, the Metropolitan Washington Air Quality Committee (MWAQC) concurs with the regional air quality conformity determination of Visualize 2050 and the FY 20263-2029 TIP and provided other comments relating to the region's air quality.

NOW, THEREFORE, BE IT RESOLVED THAT the National Capital Region Transportation Planning Board determines that Visualize 2050 and the FY 2026-2029 Transportation Improvement Program conform to all requirements of the Clean Air Act Amendments of 1990.

Adopted by the Transportation Planning Board at its regular meeting on December 17, 2025

Metropolitan Washington
Council of Governments

November 12, 2025

The Honorable Walter Alcorn, Chair
National Capital Region Transportation Planning Board
777 North Capitol Street, NE, Suite 300
Washington, D.C. 20002

Dear Chair Alcorn:

Thank you for providing an opportunity to comment on the draft air quality conformity analysis for the Visualize 2050 plan. MWAQC has reviewed the above analysis and concurs that the transportation sector emissions associated with the proposed transportation plans meet the motor vehicle emissions budgets (MVEBs) in the 2008 Ozone National Ambient Air Quality Standard (NAAQS) Maintenance Plan Update.

However, the Visualize 2050 plan continues to require the use of safety margins to meet the MVEBs and demonstrate conformity for volatile organic compounds (VOC) in 2025 and 2030. MWAQC urges TPB and its members to give particular focus to projects that would reduce air pollution emissions from the transportation sector so that future emissions from that sector remain below the MVEBs without safety margins to fully protect the health of our residents.

The draft Design Value data for ozone for the Washington region for the period 2023 through 2025 is 69 ppb parts per billion (ppb). This shows that the region is in compliance with the 2015 ozone NAAQS, however the region needs to continue reducing its emissions to maintain this compliance in the future. The projected year 2025 emissions inventory for the region in the above maintenance plan update submitted to EPA in 2023 shows onroad sources to be a significant contributor (26%) of NOx emission in the region. Therefore, it is essential that the region reduces its emissions further in order to keep complying with the 2015 ozone NAAQS from all sources, including onroad mobile sources.

MWAQC notes that the region also is experiencing an increase in total VMT along with an increase in population and job growth. Therefore, we urge TPB's continued investment in VMT and emission reduction strategies such as public transit, ride-sharing, pedestrian and bike infrastructure, other travel demand management strategies, and Transportation Emission Reduction Measures (TERMS) to reduce future growth in vehicle emissions.

Thank you again for the opportunity to comment on the draft conformity analysis for the Visualize 2050 plan.

Sincerely,

Hon. Thomas Dernoga
Chair, Metropolitan Washington Air Quality Committee

Alan Hew, Vice Chair

David Snyder, Vice Chair

777 NORTH CAPITOL STREET NE, SUITE 300, WASHINGTON, DC 20002
MWCOG.ORG (202) 962-3200

1. INTRODUCTION

The metropolitan Washington region is currently designated as being in nonattainment for the federal health standards for ground-level ozone, a harmful air pollutant. Clean air legislation in 1977 mandated that a Metropolitan Planning Organization (MPO) may not approve any transportation project that did not conform to the approved state implementation plan (SIP) for the attainment of clean air standards. This established the responsibility on the part of COG/TPB to review transportation plans and programs and affirm that they conform to air quality SIPs for the region.

This requirement means that TPB's plans, programs, and projects must be consistent with clean air objectives. In the 1990 Clean Air Act Amendments, conformity to an implementation plan is defined as conformity to an implementation plan's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of such standards. In addition, federal activities may not cause or contribute to new violations of air quality standards, exacerbate existing violations, or interfere with timely attainment or required interim emissions reductions towards attainment.

This report documents the air quality conformity analysis of the Visualize 2050 National Capital Region Transportation Plan and the FY 2026-2029 Transportation Improvement Program (TIP) with respect to ozone season pollutants, specifically, Volatile Organic Compounds (VOC) and Nitrogen Oxides (NO_X), which are precursors to ozone pollution when they combine with sunlight in the atmosphere. The results of the analysis provide a basis for a determination of conformity of Visualize 2050 and the FY 2026-2029 TIP. All references in this report are listed on pages 28-30. Linked references are also available on the Metropolitan Washington Council of Governments (MWCOG) and federal websites

2. BACKGROUND

Conformity Regulations

The concept of transportation conformity was introduced in the Clean Air Act (CAA) of 1977, which included a provision to ensure that federal funding supports transportation improvements that are consistent with air quality goals. These goals are set in each state's air quality implementation plan (SIP).

On November 15, 1990, President Bush signed into law the Clean Air Act Amendments (CAAA) of 1990. The CAAA establishes standards and procedures for reducing human and environmental exposure to a range of pollutants generated by industry and transportation. The law allows the EPA to define the boundaries of “nonattainment” areas for various common pollutants known as “criteria pollutants.” These boundaries outline geographic areas where air quality does not meet federal air quality standards. The law also established nonattainment area classifications ranked according to the severity of the area’s air pollution problem. These classifications are marginal, moderate, serious, severe, and extreme. EPA assigns each nonattainment area one of these categories, thus triggering various requirements that the area must comply with to meet a particular standard. The metropolitan Washington region is currently designated as being in “moderate” nonattainment for the federal health standards for ozone. Once a nonattainment area attains a standard for a pollutant, the area must progress through a series of steps to be reclassified from “nonattainment” to “maintenance.” The “maintenance” designation includes its own set of requirements that assure that the standard for that pollutant be maintained.

Conformity requirements were made substantially more rigorous in the CAA Amendments of 1990. The transportation conformity regulations (Reference 1) that detail implementation of the CAA requirements were first issued in the November 24, 1993, *Federal Register*, and have been amended several times, most recently in April 2012 (Federal Register notice: March 14, 2012). The

regulations establish the criteria and procedures for transportation agencies to demonstrate that air pollutant emissions from Metropolitan Transportation Plans (MTPs), Transportation Improvement Programs (TIPs), and projects funded or approved by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA) are consistent with ("conform to") the State's air quality goals in the SIP.

Pollutants

The Clean Air Act requires EPA to set NAAQS for six common air pollutants. These air pollutants, also known as "criteria pollutants," are found throughout the United States. The six pollutants are particle matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. EPA calls these pollutants "criteria" air pollutants because it sets standards for them based on human health and/or environmental criteria. The Clean Air Act identifies two types of national ambient air quality standards. **Primary standards** provide public health protection, including protecting the health of "sensitive" populations such as people with asthma, children, and older adults. **Secondary standards** provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

Ozone Season Pollutants

1979 Ozone Standard

The Washington, DC-MD-VA region was originally classified in 1990 as being in “serious” nonattainment of the 1979 (124 parts per billion – ppb) 1-hour ozone standard, with an attainment date of 1999. The region did not attain the standard by 1999 and was subsequently reclassified as “severe” nonattainment, with a new attainment date of 2005.

1997 Ozone Standard

In 2004 the Washington, DC-MD-VA region was designated as being in “moderate” nonattainment of the 1997 (84 ppb) 8-hour ozone standard, with an attainment date of 2010. In 2007, MWAQC developed an 8-hour ozone SIP (Reference 2) to reduce ozone-causing emissions of VOCs and NOx with the goal of attaining the 1997 standard. As part of this SIP, MWAQC developed Motor Vehicle Emissions Budgets (MVEBs or “mobile emissions budgets”) for VOC and NO_x. As required by federal guidance, MWAQC established 2008 budgets to show “reasonable further progress” in addition to the 2009 and 2010 attainment year budgets. On February 7, 2013, EPA found adequate the 2009 Attainment and 2010 Contingency budgets included in the 2007 SIP, and the TPB was subsequently required to use those budgets to meet conformity requirements. These budgets were used to assess conformity of the Washington region’s transportation plans from 2013 through 2017.

2008 Ozone Standard

In 2012, EPA designated the Metropolitan Washington, DC, (DC-MD-VA) region as being in “marginal” nonattainment of the 2008 Ozone Standard. With this designation, EPA regulations do not require the development of MVEBs. Instead, as per EPA regulations, conformity analyses for the region’s plan and TIP were being demonstrated to meet previously approved MVEBs from the older 1997 Ozone Standard. In 2015, the region attained the 2008 Ozone Standard, based on the readings from ambient air quality monitors. MWAQC developed a Redesignation Request and Maintenance Plan (Reference 3), which the state air agencies submitted to the EPA in early 2018. The 2008 Ozone Maintenance Plan included MVEBs for VOC and NO_x. In August 2018, EPA found these mobile emissions budgets adequate for use in the region’s air quality conformity analyses. As such, these 2008 Ozone Maintenance Plan mobile emissions budgets were first used in the conformity assessment of the Visualize 2045 plan and FY 2019-2024 TIP, adopted on October 17, 2018.

The MVEBs for the 2008 Ozone standard were updated in September 2023 (Reference 4), and after submission by the state departments of the environment, the EPA granted an adequacy finding on October 4, 2024. VOC and NO_X emissions budgets were established for three specific periods: the attainment year for the 2008 ozone NAAQS (2014), an intermediate year (2025), and the out year (2030) of the Maintenance Plan. The mobile emission ozone budgets include a 20 percent safety margin for both VOC and NO_X. Details about these budgets are discussed in the *Emissions Forecasts* section (Chapter 5) of this report.

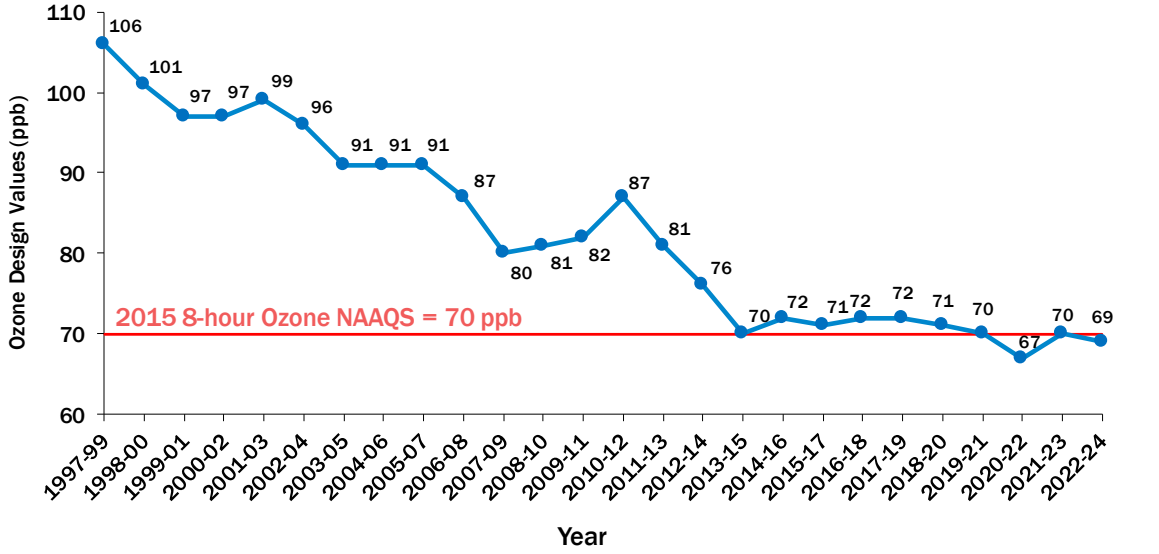
2015 Ozone Standard

Effective August 3, 2018, EPA designated the Metropolitan Washington, DC, (DC-MD-VA) region as being in "marginal" nonattainment for the 2015 Ozone Standard. Under a "marginal" designation, it is not necessary to develop MVEBs. Consequently, there are no MVEBs specific to the 2015 Ozone Standard. Provisions of the conformity regulations, however, require that emissions from the Plan and TIP conform to previously approved (or "found adequate for conformity purposes") MVEBs. The current MVEBs for the DC-MD-VA nonattainment area are those developed for the Maintenance Plan for the 2008 Ozone Standard. The emissions from the Visualize 2050 Plan and FY 2026-2029 TIP adhere to these MVEBs.

Marginal nonattainment areas had three years from the date of designation to achieve the 2015 Ozone Standard. Accordingly, the DC-MD-VA area had an attainment year of 2021 (i.e., three years following the August 3, 2018 designation). Because the August 2021 attainment date falls in the middle of the region's ozone season (March 1-October 31), the region had to achieve the standard by the end of the 2020 ozone season. The region did not achieve the 2015 Ozone Standard by the deadline, but it did achieve the 2015 Ozone Standard by the end of the 2021 ozone season. Because the region did not meet the deadline, the region was reclassified as "moderate" nonattainment for this NAAQS. Figure 1 shows the current (2015) ozone standard (red line) compared to the actual monitored ozone levels (blue dots), known as "design values," through time, from 1999 to 2024. The design value is an observed value, defined as the three-year average of the 4^{th} highest daily maximum 8-hour average ozone concentration.

On April 4, 2025, the EPA promulgated a final rule (effective May 5, 2025) granting a Determination of Attainment by Attainment Date (DAAD) and Clean Data Determination (CDD) for the Washington DC-MD-VA Nonattainment Area (The Washington Area) for the 2015 Ozone standard (90 FR 14730, April 4, 2025). At the same time, an exceptional events request was also granted for the McMillan monitor (near the intersection of Bryant Street NW and First Street NW, Washington, DC), as the June 29, 2023 readings were determined to be detrimentally impacted by smoke from Canadian wildfires. Based on approved air quality monitoring data and taking into account the exceptional events request, the Washington Area was found to have met the 2015 ozone standard by the attainment date of August 3, 2024. The region will remain classified as nonattainment until a redesignation request and 10-year maintenance plan (the first of two) are submitted by the state air quality agencies and approved by the EPA.

FIGURE 1: 8-HOUR OZONE DESIGN VALUES



**** Design value = 3-year average of 4th highest daily maximum 8-hour average ozone concentrations.***

Note: EPA granted waiver to the District of Columbia on May 5, 2025 for McMillan's June 29, 2023 ozone data (89 ppb) based on the District's Exceptional Events Waiver Demonstration and Request. This action brought the regional design value for 2021-23 down to 70 ppb from 71 ppb and for 2022-24 to 69 ppb from 70 ppb thus bringing the region back into compliance with the 2015 ozone standard. EPA indicated it could also grant waivers for the June 1, 2023 and June 2, 2023 data as reuqested by the District in the future in case the region's 2022-24 or 2023-25 desgin values go above 70 ppb.

Revocation of the 1997 Ozone Standard

Effective April 6, 2015, EPA revoked the 1997 Ozone Standard and eliminated conformity requirements associated with that standard. However, on February 16, 2018, the United States Court of Appeals for the District of Columbia ruled that the revocation of the 1997 Ozone Standard does not waive transportation conformity requirements for all areas. On May 9, 2018, an EPA response letter to an inquiry by the American Association of State Highway and Transportation Officials (AASHTO) clarifies that areas such as the Washington, DC-MD-VA air quality region, which are designated as nonattainment or maintenance for the 2008 ozone NAAQS, are not affected by the lawsuit.

Fine Particle ($PM_{2.5}$) Pollutants

1997 $PM_{2.5}$ Standard

In 2004 the EPA designated the Washington, DC-MD-VA region as being in nonattainment of the 1997 (15 µg/m^3) fine particles ($PM_{2.5}$) standard. $PM_{2.5}$ standards refer to particulate matter less than or equal to 2.5 micrometers in diameter. In 2009, the EPA, using local monitored data, determined that the region had attained the 1997 $PM_{2.5}$ standard and issued a clean data determination for the area. The region subsequently withdrew the $PM_{2.5}$ Attainment SIP and decided to seek redesignation as a maintenance area for the 1997 $PM_{2.5}$ NAAQS.

In 2013 MWAQC approved a $PM_{2.5}$ redesignation request and a maintenance plan (Reference 5) for the Washington region. This maintenance plan includes forecast-year mobile emissions budgets for $PM_{2.5}$ direct and $PM_{2.5}$ Precursor NO_X for 2017 and 2025. On April 28, 2014, EPA found these mobile emissions budgets adequate for use in conformity analyses, with an effective date of May 13, 2014. These budgets were subsequently used for the first time officially in the conformity analysis of the 2014 Constrained Long-Range Plan (CLRP). On October 6, 2014, EPA approved the requests from the District of Columbia, Maryland, and Virginia to redesignate the Washington DC-MD-VA area as being in attainment of the 1997 NAAQS with an effective date of November 5, 2014.

2012 $PM_{2.5}$ Standard

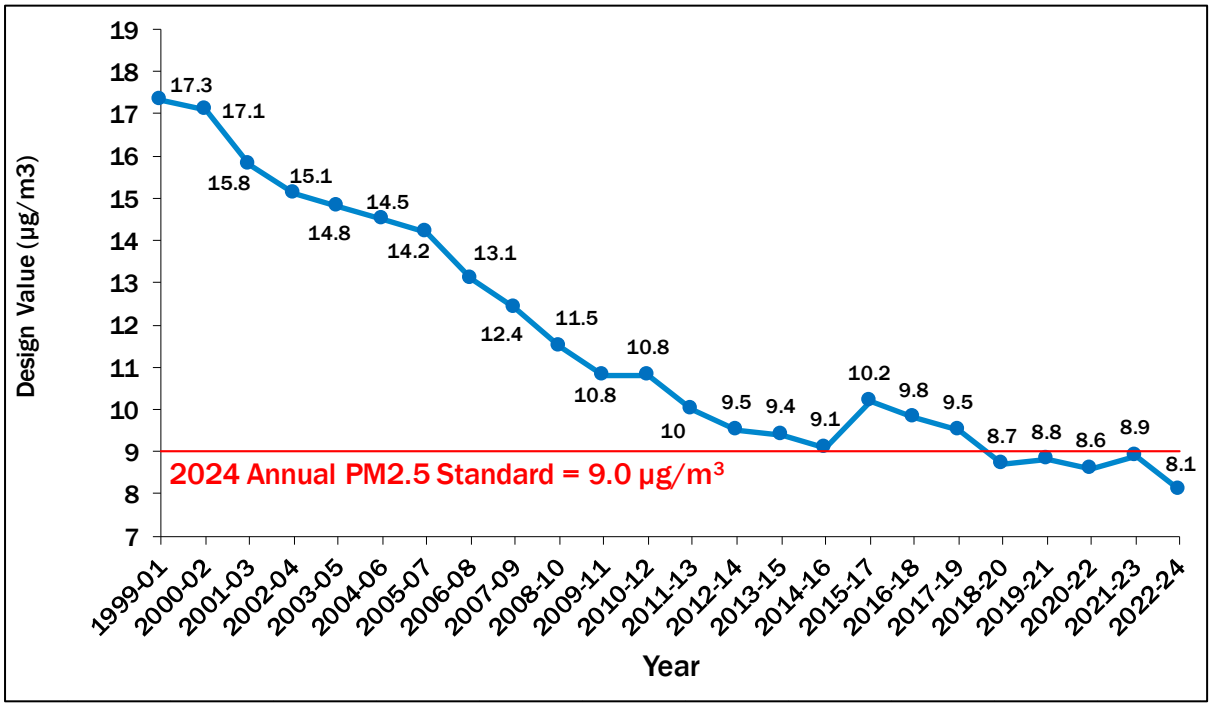
In 2012, the EPA set a new, tougher, annual $PM_{2.5}$ Standard of 12 µg/m³. The Washington region, with its steadily downward trend in the level of fine particle pollutants, based on the readings from ambient air quality monitors, was already in attainment of that standard at the time it was set. Therefore, there were no new requirements for the Washington region related to the 2012 Standard.

On August 24, 2016, EPA published a final rule (Reference 6) that resulted in the region no longer being required to demonstrate transportation conformity for any fine particles standard. As part of the rule, EPA revoked the 1997 fine particles standard, since the more stringent 2012 standard had been put in place. The revocation, combined with the decreasing levels of fine particles in our region, which was always remaining below the 2012 standard, resulted in our region no longer being required to analyze fine particles in the air quality conformity determinations of our transportation plans and TIPs. Since the region is no longer required to demonstrate transportation conformity for the $PM_{2.5}$ standard, there will no longer be any analysis associated with $PM_{2.5}$–related pollutants in this, or any future, air quality conformity reports, as long as the region remains in attainment of EPA's standard.

2024 $PM_{2.5}$ Standard

In 2024, the EPA set a new, tougher annual $PM_{2.5}$ Standard of 9 µg/m³. As was the case with the 2012 $PM_{2.5}$ NAAQS when they were first promulgated, the Washington region, based on the readings from ambient air quality monitors, was already in attainment of that standard at the time it was set. Therefore, there were no new requirements for the Washington region related to the 2024 Standard. Figure 2 shows the 2024 fine particles standard (red line) compared to the actual monitored $PM_{2.5}$ levels (blue dots), known as design values, from 1999 to 2024.

FIGURE 2: ANNUAL $PM_{2.5}$ DESIGN VALUES



Design Value = annual mean for $PM_{2.5}$, averaged over 3 years.

Wintertime CO

The Metropolitan Washington DC-MD-VA region attained the federal carbon monoxide (CO) standard in the 1990s and submitted a CO maintenance plan covering the 1996-2007 period. The maintenance plan included a mobile emissions budget of 1,671.5 tons/day. EPA approved this maintenance plan effective March 16, 1996. The region was required to submit a second maintenance plan within eight years of its redesignation as an attainment area. This revised plan (Reference 7) was completed on February 19, 2004, and provided for attainment of the CO standard in the Washington DC-MD-VA attainment area through March 16, 2016. After March 2016, the region no longer has to include Wintertime CO in any conformity analysis as long as it remains in attainment of EPA's standard.

3. WORK ACTIVITIES AND TECHNICAL INPUTS

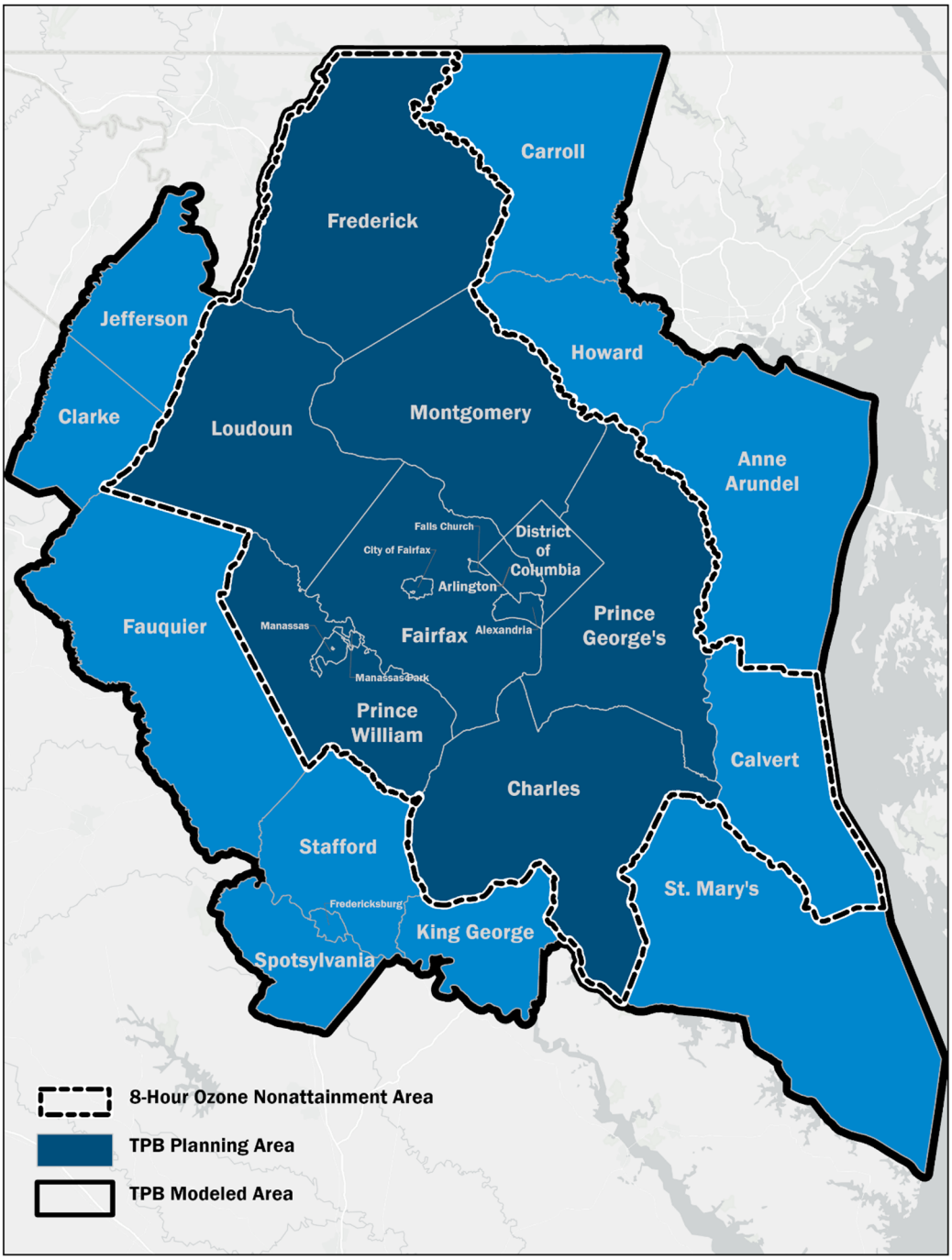
In developing the scope of work for the conformity analysis of Visualize 2050, as shown in Appendix A, staff identified the latest planning assumptions/modeling techniques and considered the requirements of the conformity regulations. The requirements associated with, and comments received about, past conformity analyses were also considered. Staff presented the work program to regional technical and policy committees. Staff also coordinated the draft work program with EPA, FHWA, FTA, and the state and local air management agencies through the TPB consultation procedures (Reference 8). The TPB adopted this scope on May 15, 2024.

Key technical planning assumptions and methods include:

- New Cooperative Forecasts for land activity: Round 10.0
- New vehicle registration data: December 2023 (DC/MD/VA)
- New transportation projects and updates to existing projects
- EPA's MOVES 4.0.1 Mobile Emissions Model
- TPB Gen2/Version 2.4.6 Travel Demand Model

Mobile emissions inventories were developed for ozone season VOC and NO_x for six forecast years (2025, 2026, 2030, 2040, 2045 and 2050). These inventories address a primary conformity requirement to demonstrate that emissions associated with the metropolitan transportation plan do not exceed the EPA-approved mobile emissions budgets. Figure 3 depicts the geographic areas for travel modeling and for emissions reporting.

FIGURE 3: TPB TRANSPORTATION PLANNING AREAS MAP



Cooperative Forecasts

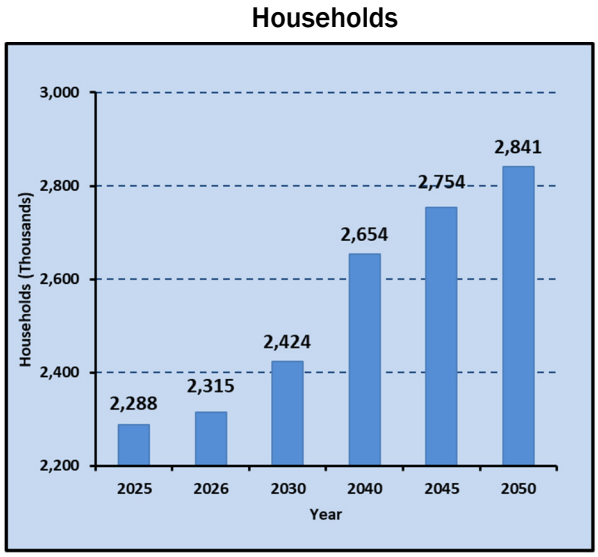
The COG Board of Directors approved, on June 14, 2023, the draft Round 10.0 Cooperative Forecasts of households, population, and employment for use in the air quality conformity analysis of the Visualize 2050 Plan and FY 2026-2029 TIP. In addition to forecasts from the TPB Planning Area, the Round 10.0 Cooperative Forecasts include the Baltimore Metropolitan Council's (BMC) Round 10 (endorsed July 15, 2022), the George Washington Regional Commission (GWRC)/Fredericksburg Area Metropolitan Planning Organization's (FAMPO) 2050 Socioeconomic Data Projections (revised May 2023), and the Maryland Department of Planning's Historical and Projected Total Population for Calvert and St. Mary's counties (December 2023). TPB staff revised employment definition

adjustment factors to ensure a consistent definition of employment is used for all jurisdictions in the modeled area. The Round 10.0 data were used for the conformity analysis of the Visualize 2050 plan and are summarized in Figure 4.

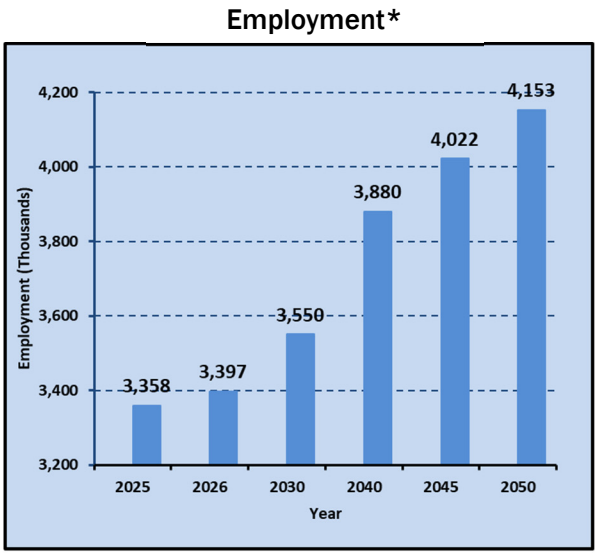
Round 10.0 shows a steady predicted growth in households and jobs through the 2050 out-year of the plan. Table 1 presents Round 10.0 forecasted households for each year in the nonattainment area's conformity analysis (BMC, GWRC/FAMPO, and St. Mary's Counties totals are not included).

Table 2 presents the forecasted employment, and Table 3 shows the forecasted population. The employment forecasts reflect adjustments made by applying employment definition adjustment factors to ensure that a consistent definition is used for employment throughout the modeled area. These adjustment factors were recently updated for this analysis (References 9 & 10).

FIGURE 4: ROUND 10.0 COOPERATIVE FORECASTS, HOUSEHOLDS AND EMPLOYMENT, IN THE NONATTAINMENT AREA



NOTE: Values are for the Nonattainment Area



NOTE: Values are for the Nonattainment Area
*Includes Employment Definition Adjustment

TABLE 1: FORECASTED HOUSEHOLDS

NON-ATTAINMENT AREA:	2025	2026	2030	2040	2045	2050
DISTRICT OF COLUMBIA	344,205	348,720	366,783	407,616	426,040	441,413
MONTGOMERY COUNTY	398,439	402,029	416,517	450,020	463,176	474,320
PRINCE GEORGE'S COUNTY	353,735	356,464	367,432	400,542	413,702	425,909
ARLINGTON COUNTY	118,188	119,793	126,223	140,067	146,906	153,656
CITY OF ALEXANDRIA	85,715	87,852	96,396	115,419	122,035	126,026
FAIRFAX COUNTY[1]	449,404	454,091	472,946	507,394	524,054	539,165
LOUDOUN COUNTY	148,943	151,486	161,652	174,668	178,245	181,738
PRINCE WILLIAM COUNTY[2]	185,441	187,417	195,346	208,306	212,759	216,238
FREDERICK COUNTY	106,157	107,831	114,535	133,226	144,269	155,652
CHARLES COUNTY	64,318	65,678	71,196	79,954	85,157	89,719
CALVERT COUNTY	33,715	34,018	35,223	36,722	37,175	37,327
TOTAL	2,288,260	2,315,379	2,424,249	2,653,934	2,753,518	2,841,163

SOURCE:

-MWCOG Round 10.0 Cooperative Forecasts

[1]Includes the cities of Fairfax and Falls Church

[2]Includes the cities of Manassas and Manassas Park

-Maryland Department of Planning, Historical and Projected Total Households, prepared by COG Staff based on input from the Maryland Department of Planning and local government staff, April 2023 for Calvert County

TABLE 2: FORECASTED EMPLOYMENT

NON-ATTAINMENT AREA:	2025	2026	2030	2040	2045	2050
DISTRICT OF COLUMBIA	846,101	854,133	886,264	954,371	989,020	1,021,569
MONTGOMERY COUNTY	522,906	527,422	545,620	591,048	613,758	636,471
PRINCE GEORGE'S COUNTY	356,661	358,690	366,816	396,614	415,921	434,742
ARLINGTON COUNTY	212,030	214,603	224,894	253,053	261,576	269,512
CITY OF ALEXANDRIA	96,935	96,606	95,287	108,276	112,144	118,313
FAIRFAX COUNTY[1]	725,647	738,172	788,434	852,817	873,412	884,976
LOUDOUN COUNTY	210,253	213,583	226,966	251,540	258,704	265,849
PRINCE WILLIAM COUNTY[2]	201,095	204,320	217,255	246,639	258,933	269,896
FREDERICK COUNTY	115,616	117,243	123,767	141,834	151,833	162,537
CHARLES COUNTY	46,107	46,838	49,759	57,388	59,962	62,194
CALVERT COUNTY	24,941	24,986	25,178	26,096	26,687	27,259
TOTAL	3,358,292	3,396,596	3,550,240	3,879,676	4,021,950	4,153,318

SOURCE:

-MWCOG Round 10.0 Cooperative Forecasts

[1]Includes the cities of Fairfax and Falls Church

[2]Includes the cities of Manassas and Manassas Park

-Maryland Department of Planning, Historical and Projected Total Households, prepared by COG Staff based on input from the Maryland Department of Planning and local government staff, April 2023 for Calvert County

Note: Employment in non-COG member counties is affected by Employment Definition Adjustment Factors

TABLE 3: FORECASTED POPULATION

NON-ATTAINMENT AREA:	2025	2026	2030	2040	2045	2050
DISTRICT OF COLUMBIA	697,644	703,832	728,600	787,138	816,422	844,405
MONTGOMERY COUNTY	1,082,979	1,089,953	1,118,033	1,189,610	1,222,193	1,250,646
PRINCE GEORGE'S COUNTY	997,753	1,004,785	1,032,926	1,122,675	1,159,554	1,193,713
ARLINGTON COUNTY	245,871	248,754	260,277	285,292	298,075	311,296
CITY OF ALEXANDRIA	180,524	184,819	201,989	239,827	252,914	261,847
FAIRFAX COUNTY[1]	1,245,725	1,256,205	1,298,135	1,375,769	1,413,184	1,446,801
LOUDOUN COUNTY	456,234	463,776	493,926	529,632	539,237	548,507
PRINCE WILLIAM COUNTY[2]	577,951	583,028	603,366	634,987	645,095	652,438
FREDERICK COUNTY	293,183	297,813	316,345	368,302	397,399	428,794
CHARLES COUNTY	176,348	179,808	193,640	216,539	230,440	242,668
CALVERT COUNTY	95,507	95,874	97,344	100,089	100,984	101,436
TOTAL	6,049,719	6,108,647	6,344,581	6,849,860	7,075,497	7,282,551

SOURCE:

-MWCOG Round 10.0 Cooperative Forecasts

[1]Includes the cities of Fairfax and Falls Church

[2]Includes the cities of Manassas and Manassas Park

-Maryland Department of Planning, Historical and Projected Total Households, prepared by COG Staff based on input from the Maryland Department of Planning and local government staff, April 2023 for Calvert County

Note: Includes Household and Group Quarters Population

Vehicle Registration Data

TPB staff have analyzed the region's motor vehicle fleet regularly since 2005. Motor vehicle registration data, also known as Vehicle Identification Number (VIN) data, are used to understand the vehicle type composition and vehicle age distributions, which are important determinants of mobile emissions. Periodic inventory reviews enable staff to refresh mobile emissions modeling inputs with recent information. The current data are from December 2023 for all states, where the District of Columbia is treated as a state. TPB staff analyzed the 2023 VIN data (Reference 11), and the analysis was reviewed by the COG/TPB technical oversight committees prior to being used in transportation planning applications.

Figure 5 and Table 4 show characteristics of the region's vehicle fleet through time. The graphs indicate that the fleet is continuing to grow, and that light-duty trucks (sport utility vehicles, or SUVs) are growing faster than other vehicle types. In general, light-duty trucks have a higher emissions rate than light-duty cars. The vehicle fleet has also continued to age, with more people holding on to vehicles for a longer period. These two trends are predicted to have a negative impact on vehicle emissions.

FIGURE 5: HISTORICAL GROWTH IN VEHICLES BY TYPE

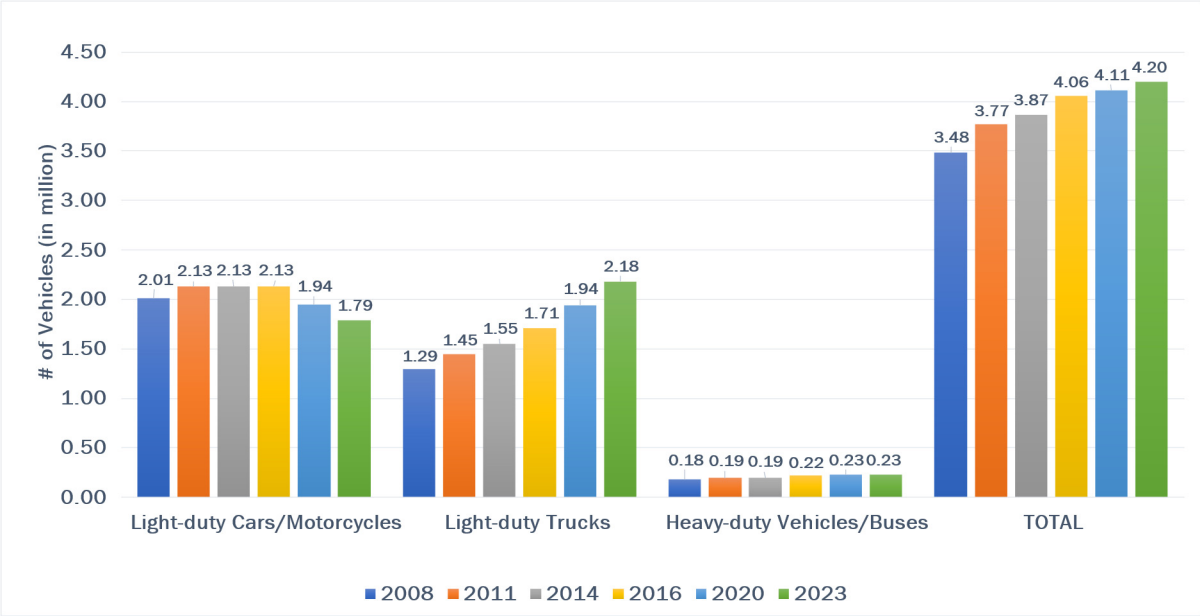


TABLE 4: AVERAGE AGE OF REGIONAL VEHICLE FLEET BY YEAR

Year	Light-duty Cars/Motorcycles	Light-duty Trucks	Heavy-duty Vehicles/Buses	All Vehicle Types
2008	8.51	7.53	9.21	8.18
2011	9.25	8.55	10.56	9.05
2014	9.62	9.09	11.30	9.49
2016	9.32	8.68	11.29	9.16
2020	10.05	8.74	11.51	9.51
2023	11.04	8.87	12.07	9.97

Project Inputs

Appendix B contains a complete list of highway and transit projects analyzed in the Visualize 2050 Plan and the FY 2026-2029 TIP conformity analysis. It highlights changes to the project list that have occurred since the 2022 Amendment to Visualize 2045. The list contains transit, highway, and High Occupancy Vehicle/Express Toll (HOV/HOT) projects, all summarized by state, agency, project characteristics and completion date. The projects are also displayed on an online interactive map on the COG website here: http://www.mwcog.org/V50FutureTransportationMap.

The listed projects are coded in digital highway and transit networks, which are used as inputs to the travel model in the analysis. The Visualize 2050 Plan and FY 2026-2029 TIP include other projects not included in the list. These other projects are not included in the regional networks since they do not involve changes in capacity (e.g., transit operating assistance, highway rehabilitation, bridge reconstruction) or were too small to influence the modeling results at the regional level (e.g., intersection improvements, improvements to a facility that is not contained in the regional networks).

A notable project was the I-495 Southside Express Lanes Study (I-495 SEL), a proposed 11-mile extension of Virginia's express lanes along the southern Capital Beltway from the Springfield

Interchange (I-95/I-395/I-495) in Fairfax County to the MD 210 Interchange in Prince George's County, Maryland. The project would add two High Occupancy Toll (HOT) lanes in each direction, with vehicles carrying three or more occupants traveling toll-free. It also includes a new express transit route between the Branch Avenue Metro Station and Tysons Corner. In June 2024, the TPB deferred a decision on whether to include the project in Visualize 2050 to allow for additional consideration and public input and requested that the conformity analyses be completed both with and without the I-495 SEL to minimize any delay to the final approval of Visualize 2050. In October 2025, the TPB voted not to include the project in Visualize 2050, which is reflected in this report's analysis and documentation.

Table 5 presents mileage summaries for the fixed-guideway transit (rail and BRT) and the highway system for the nonattainment area.

TABLE 5: ROAD LANE MILES AND FIXED GUIDEWAY TRANSIT CENTERLINE FOR THE NONATTAINMENT AREA

Year	LOV (Lane Miles)	HOV/HOT (Lane Miles)	Metrorail (Miles)	Commuter Rail* (Miles)	BRT** (Miles)	Streetcar, Light Rail *** (Miles)
2025	17,197	294	129	173	14	2
2026	17,197	302	129	173	16	2
2030	17,337	327	129	173	54	20
2040	17,549	344	129	173	69	20
2045	17,642	365	129	173	93	20
2050	17,663	365	129	173	93	20

* Includes MARC & VRE
** Includes Metroway, US29, US1 (VA), Veirs Mill Rd, Randolph Rd, Bethesda, New Hampshire Ave., MD 355 BRT, Van Dorn St
*** Includes Purple Line, & DC Streetcar
NOTE: If a lane operates as HOV/HOT during any part of the day, it is counted in the HOV/HOT column

4. TRAVEL FORECASTS

Travel Demand Forecasting Model

The preparation of travel forecasts for each of the conformity alternatives was carried out using the Gen2/Version 2.4.6 Travel Model (Reference 12). The Gen2/Ver. 2.4.6 Travel Model is an aggregate, trip-based model (a.k.a. a "4-step model"). The modeled area, covering the District of Columbia, Northern Virginia, suburban Maryland, and one county in West Virginia, is divided into 3,722 transportation analysis zones (TAZs). The Gen2 Model was initially calibrated and validated to year-2007 conditions using the 2007/08 Household Travel Survey and many other data sources, including numerous transit on-board surveys, the 2007 American Community Survey data, and the 2007 COG/TPB Air Passenger Survey (Reference 13). The Gen2 Model was subsequently validated to year-2010 conditions using 2010 data including traffic counts, Metrorail electronic counts, the American Community Survey, and the Geographically Focused Household Travel Survey (Reference 14). More recently, the model was re-validated to year-2014 and year-2018 conditions using data that included traffic counts and Metrorail boardings (References 15 & 16).

In addition to existing toll facilities, the Visualize 2050 plan includes portions of I-95, I-66, and the Capital Beltway in Virginia, and parts of the Beltway in Maryland and parts I-270 as managed

facilities. These facilities have time-of-day tolls used to ensure that an acceptable level of service is maintained throughout the day. The Gen2/Ver. 2.3 Travel Model Calibration Report and two HOT Lanes modeling memos (References 17 & 18) document these procedures which did not change with the Gen2/Ver. 2.4.6 Travel Model.

Travel Networks

Digital representations of the highway and transit networks, incorporating all regionally significant project inputs, were coded for each analysis year. Transit fares include the latest assumptions for all coded transit services and reflect policies such as price differentials for those riders who use SmarTrip cards versus those who use cash. Highway tolls reflect current costs for tolled facilities. All prices in the model are brought to a common base year (currently 2007) using deflation factors.

Travel Model Forecasts

Travel demand forecasts were developed for each of the analysis years. A summary of the mode choice results for the nonattainment area is shown in Table 6 and Table 7. VMT summaries for the nonattainment area are shown in Table 8.

TABLE 6: MODE CHOICE SUMMARY: HOME-BASED WORK TRIP PURPOSE*

Year	Total Motorized Person Trips	Total Auto Person Trips	Single Occupant Person Trips	Multiple Occupant Auto Person Trips	Total Auto Driver Trips	Auto Occupancy	Total Transit Trips	Transit Mode Share (%)
2025	3,491,073	2,627,884	2,208,438	242,182	2,385,703	1.10	863,189	23.60
2026	3,528,996	2,654,286	2,229,399	245,649	2,408,637	1.10	874,709	23.60
2030	3,678,282	2,743,472	2,304,171	253,574	2,489,898	1.10	934,810	24.10
2040	3,987,260	2,936,710	2,461,062	276,258	2,660,452	1.10	1,050,551	24.90
2045	4,125,205	3,027,213	2,532,829	288,389	2,738,824	1.11	1,097,992	25.10
2050	4,247,305	3,107,753	2,594,689	300,393	2,807,361	1.11	1,139,552	25.20

*All values are for the nonattainment area

TABLE 7: MODE CHOICE SUMMARY: ALL TRIP PURPOSES*

Year	Total Motorized Person Trips	Total Auto Person Trips	Single Occupant Person Trips	Multiple Occupant Auto Person Trips	Total Auto Driver Trips	Auto Occupancy	Total Transit Trips	Transit Mode Share (%)
2025	16,464,440	15,179,734	7,668,253	4,518,570	10,661,164	1.42	1,284,706	6.90
2026	16,611,152	15,310,513	7,723,740	4,565,199	10,745,314	1.42	1,300,639	6.90
2030	17,186,008	15,792,500	7,923,625	4,738,573	11,053,927	1.43	1,393,508	7.10
2040	18,370,079	16,810,080	8,336,238	5,113,232	11,696,848	1.44	1,559,999	7.30
2045	18,899,009	17,273,100	8,534,485	5,276,775	11,996,325	1.44	1,625,908	7.40
2050	19,363,449	17,683,269	8,707,103	5,423,803	12,259,467	1.44	1,680,179	7.40

*All values are for the nonattainment area

TABLE 8: VEHICLE MILES TRAVELED (VMT) SUMMARY*

Year	Total Auto Trips	Medium and Heavy-Duty Truck Trips	Commercial Vehicle Trips	Total Vehicle Trips	Total Vehicle Miles of Travel
2025	12,116,753	579,326	1,208,899	13,904,978	124,555,429
2026	12,216,152	583,948	1,219,653	14,019,753	125,564,246
2030	12,582,386	603,919	1,262,617	14,448,922	129,528,225
2040	13,357,520	645,587	1,355,916	15,359,023	137,959,030
2045	13,717,404	665,657	1,396,941	15,780,002	141,566,051
2050	14,031,120	683,413	1,432,958	16,147,491	144,661,326

*All values are for the nonattainment area

5. EMISSIONS FORECASTS

Mobile Emissions Budgets

When the region achieved the 2008 Ozone Standard, MWAQC developed a Redesignation Request and Maintenance Plan, which the State Air Agencies submitted to the EPA in early 2018. The 2008 Ozone Maintenance Plan included MVEBs for VOC and NO_X. In August 2018, EPA found these mobile emissions budgets adequate for use in the region's conformity analyses.

On January 7, 2021, the EPA officially released a new version of their Motor Vehicle Emissions Simulator model, MOVES3, and required its use in transportation conformity analyses by January 2023. TPB staff completed sensitivity test runs which showed that, using the same inputs, MOVES3 resulted in significantly different emissions estimates than the previous version of MOVES which had been used, solely due to the changes in modeling methodology. The analysis showed that NO_X emissions estimates generated using MOVES3.0.4 were higher than those generated by MOVES2014b for the years 2021, 2023, 2025, 2030, 2040, and 2045 by 1%, 4%, 9%, 26%, 52%, and 54% respectively (Reference 19). The same analysis showed VOC emissions generated using MOVES3.0.4 were lower than those generated by MOVES2014b for the years 2021, 2023, 2025, 2030, 2040, and 2045 by 17%, 17%, 18%, 14%, 8%, and 7% respectively.

TPB staff shared these results with the Metropolitan Washington Air Quality Committee Technical Advisory Committee (MWAQC TAC) in September 2022, and informed the committee that, with the change in MOVES models, the region would find it challenging to remain below the current MVEBs, which were established in the 2008 ozone maintenance SIP with a different MOVES model (MOVES2014a). The MWAQC TAC, including representatives of the state air agencies, agreed to update the MVEBs in the 2008 ozone maintenance plan and completed the update in September 2023. On October 4, 2024, EPA found these mobile emissions budgets adequate for the region's conformity analyses (89 FR 80745, Oct 10, 2024). The revised 2008 Ozone Maintenance Plan established VOC and NO_x emissions budgets for three specific periods: the attainment year (2014), an intermediate year (2025), and for the out year (2030) of the Maintenance Plan. The MVEBs development included a 20% "conformity buffer" (discussed in the next section) and are summarized in Table 9 below.

TABLE 9: MOBILE EMISSIONS BUDGETS

Year	VOC On-Road Emissions (tpd*)	NO_x On-Road Emissions (tpd*)
Attainment Year 2014 Emission & Budget	61.25	136.84
2025 Predicted Emissions without Conformity Buffer	27.92	46.52
2025 Conformity Buffer	5.58	9.30
Intermediate Year 2025 Emissions Budgets	**33.50**	**55.82**
2030 Predicted Emissions without Conformity Buffer	21.75	34.26
2030 Conformity Buffer	4.35	6.85
Final Year 2030 Emissions Budgets	**26.10**	**41.11**

*tpd = tons per day.

Budget Setting versus Conformity

An air quality conformity analysis is conducted to formally demonstrate that projected motor vehicle emissions associated with the regional transportation plan and TIP are less than or equal to the mobile emissions budgets for each analysis year. The conformity regulations require the use of the "latest planning assumptions," meaning that each conformity analysis must incorporate the most up-to-date planning inputs and technical methods available at the beginning of the process. Therefore, the inputs used in regional air quality conformity analyses change with time. Mobile emissions budgets in air quality plans are established based on analyses that incorporate the "latest planning assumptions" when the air quality plan is developed and generally do not change with time.

Changes to inputs used in the air quality conformity analysis are not limited to transportation projects. They include other assumptions, such as vehicle fleet mix and demographics. Such changes to inputs in the conformity analysis relative to inputs used to establish mobile emissions will inevitably yield differences that are not strictly attributable to the transportation plan itself. Input assumptions are summarized in Table 10.

Anticipating such situations, federal air quality conformity regulations (Reference 1) allow air quality (Attainment and Maintenance) plans to provide a "conformity buffer" while establishing MVEBs. Accordingly, the DC-MD-VA 2008 Ozone Maintenance Plan established mobile emissions budgets with a 20% buffer to address uncertainty introduced when inconsistent assumptions are used between budget-setting and the conformity analysis.

TABLE 10: INPUT ASSUMPTIONS

Input	Maintenance SIP Mobile Budgets	Visualize 2050
Cooperative Forecasts	Round 9.2	Round 10.0
Vehicle Fleet	2020 VIN	2023 VIN
Travel Demand Model	Gen2/Ver 2.4	Gen2/Ver 2.4.6
Project Inputs	2022 Update to Visualize 2045	Visualize 2050
Mobile Emissions Model	MOVES3.0.4	MOVES4.0.1

MOVES Inputs

Emissions estimates were developed using the MOVES 4.0.1 model which was released by EPA in 2023. Input data from ten broad categories were used in the MOVES County Manager to generate the mobile emissions inventories for each analysis year. Five of these categories are travel-related (i.e., derived from the regional travel demand model or its associated speed post processor model), and the remaining five are obtained either directly from state agencies (i.e., air agencies and Departments of Motor Vehicles), or developed based on actual meteorological data.

Average Speed Distribution refers to average vehicle speeds stratified by vehicle type, road type, time of day, and type of day (i.e., weekday vs. weekend). Average vehicle speed data are used to derive Vehicle Hours of Travel (VHT). Speed data from the travel demand model are stratified, using a post processor (Reference 20), into hourly VHT for each jurisdiction by 3 vehicle types, 4 road types, and 16 speed bins. The VHT distribution for trash trucks, school buses, and transit buses is derived using locally observed data.

Road Type Distribution is the percentage of VMT allocated to each road type by vehicle type. The VMT by road type is stratified into 13 vehicle types and 4 road types.

The average annual weekday VMT by five HPMS vehicle types from the travel demand model is input into the EPA-provided annual VMT converter with local monthly adjustment factors and weekend-day adjustment factors. The converter develops annual VMT for five HPMS vehicle types as required for MOVES and provides two additional outputs, “monthVMTfraction” and “dayVMTfraction”. The local “hourlyVMTfraction” is also provided as part of the annual VMT input. Table 11 summarizes these categories and indicates the methodology used to develop these data.

Age Distribution and Source Type Population refer to vehicle fleet characteristics and are developed using regional vehicle registration/identification number (VIN) data. Age Distribution refers to the age of the vehicle fleet by vehicle type. For Age Distribution, registered vehicles are divided into 13 vehicle classes and 31 age categories in a series of steps, using a commercial decoding software program and an EPA-developed converter. Source Type Population refers to the specific types of vehicles in the fleet. Trendlines (Reference 21) derived from actual vehicle population data from the 1975-2023 analysis timeframe serve as the basis for developing total vehicle population projections by jurisdiction for each analysis year. For each forecast year, the population is then converted into 13 vehicle types using a population mapping table included in EPA’s technical guidance.

TABLE 11: MOVES LOCAL INPUT DATA CATEGORIES

Data Category	Data Table Name	Locality	Data Source
Age Distribution	sourceTypeAgeDistribution	County	based on VIN
Average Speed Distribution	avgSpeedDistribution	County	based on TDM's post-processor outputs + school bus/refuse truck data from Fairfax Co. + Transit bus from WMATA
Road Type Distribution	roadTypeDistribution	County	based on TDM's post-processor outputs
Source Type Population	sourceTypeYear	County	based on CLRP Vehicle Projection & VIN
Vehicle Type VMT	HPMSVTypeYear	County	based on TDM's post-processor outputs
	monthVMTFraction	Region	based on Regional Data
	dayVMTFraction	Region	based on Regional Data
	hourVMTFraction	Region	based on Regional Data
Fuel	FuelSupply	State	from state air agency (state-wide data)
	FuelFormulation	State	from state air agency (state-wide data)
I/M Programs	IMCoverage	State	from state air agency (state-wide data)
Meteorology Data	zoneMonthHour	Region	from DEP (region-wide data)
AVFT	AVFT	State	from state air agency (state-wide data)
State II Program	Countyyear	State	from state air agency (state-wide data)

With the MOVES model, local data are used to provide bus VMT estimates. Local bus VMT is substituted for heavy-duty vehicle VMT from the travel model. With the MOVES model, auto access to transit VMT is added to the travel model VMT. To develop auto access VMT, TPB staff gathered capacity information for current and future parking lots. Parking lot capacities were kept constant throughout all forecast years because high-quality historical data is unavailable to develop future growth trends. However, this assumption may change in subsequent conformity analyses if reliable data becomes available. A regional average home-to-transit travel distance of 4.5 miles was assumed for most parking lots. This assumption was based on findings from Commuter Connections surveys and the 2012 Geographically Focused Household Travel Survey (Reference 22). An average home-to-transit travel distance of 7.5 miles was used for certain parking lots where longer commuting distances were assumed to apply. The parking capacity was multiplied by twice the average travel distance to provide auto-access-to-transit VMT.

Ramp Fraction is the percentage of driving time on ramps by road type. Local data indicate that ramp time represents 8 percent of VHT, which coincidentally is the national default value.

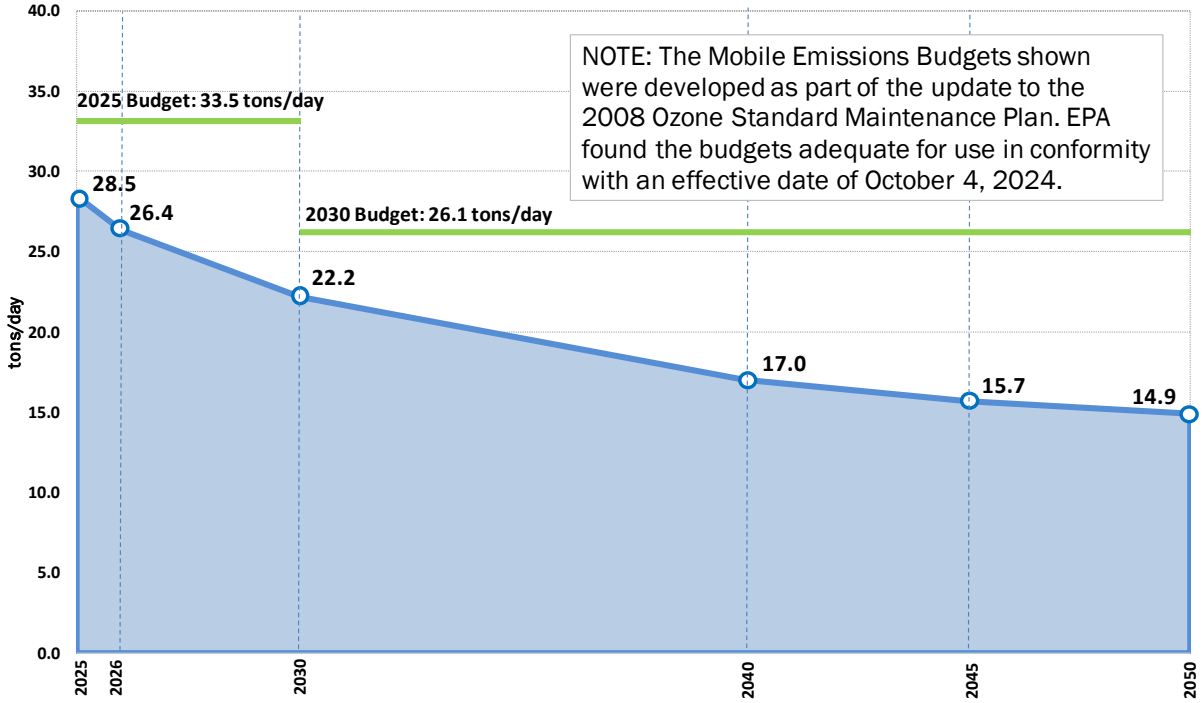
Appendix C includes a detailed description of how the MOVES inputs were developed. TPB staff developed the travel-related MOVES inputs based on the regional travel demand model (Gen2/Version 2.4.6). COG's Department of Environmental Programs (DEP) staff provided inputs related to Fuel Supply and Formulation and Inspection and Maintenance (I/M) programs and Meteorology Data. Fuel and I/M program data were supplied directly from DC, Maryland, and Virginia air agencies in MOVES-ready formats. Meteorological data were developed by DEP staff and supplied

as hourly records of temperature and relative humidity in MOVES format. The federal conformity regulations require that the meteorological data used for each conformity analysis is the same as that used in the development of the motor vehicle emissions budgets.

Mobile Emissions Inventories

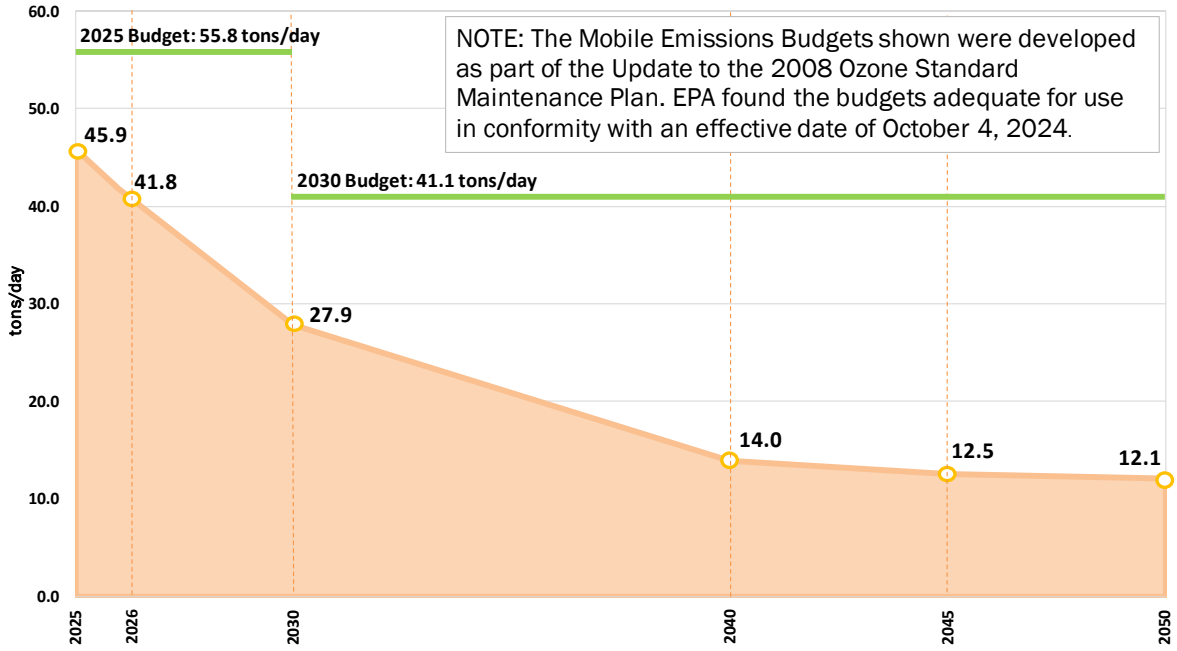
Estimated ozone season emissions totals are illustrated in Figure 6 and Figure 7. The estimated emissions are shown in relation to the mobile emissions budgets for each pollutant. The MVEBs are used to demonstrate conformity for the Visualize 2050 transportation plan and FY 2026-2029 TIP with respect to VOC and NO_X. Emission levels for VOC and NO_X are well below the mobile budgets for all analysis years.

FIGURE 6: ESTIMATED MOBILE SOURCE EMISSIONS, OZONE SEASON VOC



Transportation Emission Reduction Measures and Transportation Control Measures are not included in totals.

FIGURE 7: ESTIMATED MOBILE SOURCE EMISSIONS, OZONE SEASON NO_X



Transportation Emission Reduction Measures and Transportation Control Measures are not included in totals.

Transportation Emission Reduction Measures

Transportation Emission Reduction Measures (TERMs) are strategies or actions that the TPB can employ to further reduce emissions from mobile sources. TERMs are generally intended to reduce either the number of motor vehicle trips (VT), vehicle miles traveled (VMT), or both. These strategies may include ridesharing and telecommuting programs, improved transit and bicycling facilities, clean fuel vehicle programs or other possible actions. These types of considerations, while not explicitly accounted for in the travel demand model, will continue to reduce the emissions levels in the region.

The emission benefits associated with the TERMs have not been needed to pass conformity for over ten years. During this time TERMs emissions benefits were calculated for reference purposes only. While TERMs are beneficial, their associated emission reductions are minimal compared to the overall emissions inventories. Calculating the transportation and emissions benefits of the TERMs is a time and resource intensive task. Given these factors, a quantitative analysis of TERMs was not undertaken for this report. The need for quantification and potential inclusion of the TERMs in emission inventories will be re-evaluated in future conformity determinations/plan updates.

Transportation Control Measures (TCMs)

A Transportation Control Measure, or TCM, is any measure that is specifically identified in a SIP for the purpose of reducing emissions or concentrations of air pollutants from transportation sources. These on-road mobile source measures typically reduce vehicle use or change traffic flow or congestion conditions. A few examples of TCMs are programs for improved public transit, employer-based transportation management plans, trip-reduction ordinances, programs to control extended idling of vehicles, reducing emissions from extreme cold-start conditions, employer-sponsored programs to permit flexible work schedules, and programs to encourage removal of pre-1980 vehicles.

Section 93.113 of the conformity regulations requires the timely implementation of TCMs. All adopted TCMs for this region were included in the 1-Hour Ozone SIP (Reference 23) and the 8-Hour Ozone Attainment SIP. MWAQC adopted the 1-Hour Ozone SIP on February 19, 2004. The 8-Hour

Ozone Attainment SIP was adopted by MWAQC on May 23, 2007, and replaced the 1-Hour Ozone SIP when EPA found the Reasonable Further Progress (RFP) mobile emissions budgets adequate for use in conformity in September 2009. All TCMs included in these SIPs were implemented in a timely manner, as documented in Appendix D of this report.

6. CONFORMITY CRITERIA AND PROCEDURES

EPA's conformity regulations identify criteria and procedures for the determination of conformity. The April 2012 amendments to EPA's regulations represent the current transportation conformity requirements. The following sections indicate (1) the appropriate sections of the regulations that must be adhered to in this conformity analysis and (2) how the regulations have been met.

Conformity Criteria

This section identifies the criteria (sections of the regulations) the MTP must meet to conform to current state implementation plans in the District of Columbia, Maryland, and Virginia. Figure 8 lists the sections of the regulations relevant for analyzing the Visualize 2050 Plan and the FY 2026-2029 TIP. The following discussion indicates the way each criterion was met.

Sec. 93.110 Criteria and procedures: Latest planning assumptions

The conformity analysis is based upon the current planning assumptions available for the Washington region. Round 10.0 Cooperative Forecasts were approved for use in the conformity analysis of the Visualize 2050 plan and FY 2026-2029 TIP. These forecasts were developed and reviewed, taking into consideration transportation and land use interaction.

Travel demand modeling methods incorporating the latest available data were used in this study. The refinements include the development and use of a comprehensive set of transit and HOV networks. As with previous conformity analyses, transit fares are modeled explicitly in the mode choice process. The analysis includes current fares, with increases through time as a function of historical increases in the consumer price index. Base-year fares are modeled to reflect the WMATA tariff #45, effective June 30, 2024, and other actual charges levied by each transit provider. Transit operating policies, such as hours and frequency of service, are modeled explicitly to reflect actual conditions in the peak and off-peak periods. The overall travel demand modeling process is continually monitored and refined, incorporating the newest data available at the time of each update.

Sec. 93.111 Criteria and procedures: Latest emissions model

The current analysis used EPA's MOVES4.0.1 emissions estimation model, taking advantage of the two-year grace period that was granted with the publication of *Official Release of the MOVES5 Motor Vehicle Emissions Model for SIPs and Transportation Conformity* (89 FR 99862).

FIGURE 8: CONFORMITY CRITERIA

Conformity Criteria

All Actions at all times:	
§93.110	Latest planning assumptions.
§93.111	Latest emissions model.
§93.112	Consultation.
Transportation Plan:	
§93.113(b)	TCMs.
§93.118 and/or §93.119	Emissions budget and/or Interim emissions.
TIP:	
§93.113(c)	TCMs.
§93.118 and/or §93.119	Emissions budget and/or Interim emissions.
Project (From a Conforming Plan and TIP):	
§93.114	Currently conforming transportation plan and TIP.
§93.115	Projects from a transportation plan and TIP.
§93.116	Localized CO, PM_{10}, and $PM_{2.5}$ violations (hotspots).
§93.117	Compliance with PM_{10} and $PM_{2.5}$ control measures.
Project (Not From a Conforming Plan and TIP):	
§93.113(d)	Timely implementation of TCMs.
§93.114	Currently conforming transportation plan and TIP.
§93.116	Localized CO, PM10, and PM2.5 violations (hotspots).
§93.117	Compliance with PM10 and PM2.5 control measures.
§93.118 and/or §93.119	Emissions budget and/or Interim emissions.

Source: EPA Transportation Conformity Regulations, April 2012, EPA-420-B-12-013

Sec. 93.112 Criteria and procedures: Consultation

The TPB offers many opportunities for public comment. Since the initial consultation procedures were developed, TPB has expanded the opportunities for public involvement through a series of initiatives. Examples include: the public comment period at the start of each TPB meeting; regular public forums and workshops on major topics; COG's Community Advisory Committee and its Access For All Committee; website posts, and postings on social media (e.g., X/Twitter and Facebook). TPB staff updated the region's participation plan. The document, TPB Participation Plan (Reference 24), was completed in Spring 2020.

Sec. 93.113 Criteria and procedures: Timely implementation of TCMs

Transportation Control Measures were included in the 1-Hour Ozone SIP, the 8-Hour Ozone Attainment SIP, and the $PM_{2.5}$ SIP. Documentation regarding the timely implementation of each project is included as Appendix D of this document.

Sec. 93.114 Criteria and procedures: Currently conforming transportation plan and TIP

There is a currently conforming plan and program in the Washington region. This current conformity analysis is designed to update and supersede the (conforming) 2022 Amendment to Visualize 2045 plan, adopted by the TPB in June 2022 and approved by the FHWA/FTA on August 25, 2022.

Sec. 93.115 Criteria and procedures: Projects from a plan and TIP

All projects advanced for implementation come from a conforming plan and TIP.

Sec. 93.116 Criteria and procedures: Localized CO and PM_{10} violations (hot spots)

Projects advancing to the current TIP have met this criterion as an element of their environmental study prior to being included in the TIP. (The Washington area is in attainment for both carbon monoxide and PM_{10}.)

Sec. 93.117 Criteria and procedures: Compliance with PM_{10} and $PM_{2.5}$ control measures

The Washington area is in attainment for PM_{10}. Prior to the region attaining the 1997 $PM_{2.5}$ NAAQS, a SIP for the Washington nonattainment area was developed and submitted to EPA in April 2008. That SIP was never approved. After attaining the 1997 $PM_{2.5}$ NAAQS, MWAQC submitted, and EPA approved, a $PM_{2.5}$ Redesignation Request and Maintenance Plan for the Washington region. The On-Road control measures in that Maintenance Plan include only measures directly impacting vehicles and fuels which would not be pertinent for project-level conformity determinations. These are the 2007 heavy-duty engine rule, Tier 1 federal motor vehicle emissions standards, Tier 2 vehicle and gasoline sulfur program, and enhanced motor vehicle emissions and maintenance programs.

Sec. 93.118 Criteria and procedures: Motor vehicle emissions budget

As discussed earlier in this report, this analysis includes use of the existing budgets developed as part of the 2023 revision of the 2008 Ozone Maintenance Plan and found adequate for use in conformity analyses by EPA in October 2024. Approved budgets exist for ozone season VOC and NO_X. The mobile emissions inventories for all analysis years were compared to these budgets. Total on-road mobile VOC and NO_X emissions for all plan milestone analysis years are within their respective emissions budgets.

Sec. 93.119 Criteria and procedures: Interim emissions in areas without motor vehicle budgets

All assessed pollutants have motor vehicle emissions budgets.

NOTE: See EPA's conformity regulations for the full text associated with each section's requirements.

7. CONSULTATION AND PUBLIC PARTICIPATION

Consultation

The conformity regulations require that MPOs make Transportation Plans, TIPs, and conformity determinations available to the public, and accept and respond to public comment. The Transportation Planning Board (TPB) staff went through a lengthy process involving EPA and state and local air quality agencies to develop the region's transportation and air quality conformity consultation procedures. These procedures have been organized into a report, *Transportation Planning Board Consultation Procedures with Respect to Transportation Conformity Regulations Governing TPB Plans and Programs* (Reference 8). They were adopted by the Board initially on September 21, 1994, and subsequently updated in response to EPA's August 15, 1997 amendments, and formally adopted by the TPB on May 20, 1998. The procedures seek early involvement of the air agencies in the transportation planning process through concurrent mailings to the TPB and consultation agencies of all material relevant to transportation conformity, including announcements of work sessions and public forums in which the materials will be discussed.

Public Participation

Federal law and regulations require all MPOs in the U.S. (such as the TPB) to conduct public participation activities as part of the development of their metropolitan transportation plans (referred to below as Long-Range Transportation Plan, LRTP). Public participation is recognized as an integral part of the planning process.

The region's fifth *TPB Participation Plan* (Reference 24), adopted by the TPB on October 21, 2020, provides an overall framework for participation in the TPB process. The *Participation Plan* describes the policies of the TPB regarding public involvement activities relating to the development of TPB Plans and Programs, including the air quality conformity analysis. The *Participation Plan* ensures that the TPB follows federal requirements for public involvement by including the following comment periods and comment policies:

- The provision of a 30-day comment period prior to approval of federally required plans and programs, with the ability for the public to comment via mail, email, and on the TPB website.
- The posting of all publicly available TPB documents on the TPB website.
- The development and consideration of written responses to comments received.
- The provision of an additional opportunity for public comment if the final Long-Range Transportation Plan or TIP differs significantly from the version that was made available for public comment by the TPB and raises new material issues which interested parties could not reasonably have foreseen from the public involvement efforts.
- When significant written and oral comments are received on the draft Long-Range Transportation Plan and TIP (including the financial plans) as a result of the participation process in this section or the interagency consultation process required under the EPA transportation conformity regulations (40 CFR part 93), a summary, analysis, and report on the disposition of comments shall be made as part of the final Long-Range Transportation Plan and TIP.
- The provision of a period of time at the beginning of each TPB meeting for public comment on transportation issues under consideration by the TPB and provide follow-up acknowledgement and response as appropriate.
- The distribution of relevant reports and technical information free of charge at the TPB meetings and meeting of its committees and sub-committees.
- The scheduling of at least one formal public meeting during the TIP development process

The TPB maintains and supports two public advisory committees: The Community Advisory Committee (CAC) and the Access for All Advisory Committee (AFA). These committees are intended to promote public involvement and represent the opinions of a variety of communities and interests. The CAC includes members of the public and representatives of environmental, business, and civic interests concerned with regional transportation matters. The AFA advises the TPB on transportation issues, programs, policies, and services that are important to low-income communities, minority communities, and people with disabilities. Participants in the AFA include individuals and organizations considered underrepresented and underserved.

The TPB also maintains a comprehensive website; Bluesky, Facebook, Instagram, and X/Twitter accounts; and shares information through the COG LinkedIn account. Social media was used to announce meetings, events, public comment periods, and the release of key publications and reports.

Since 2015, TPB has live-streamed audio and video of TPB, TPB Technical Committee meetings, and the majority of the TPB subcommittees. The YouTube audio/video recordings are available on the meeting web pages.

The Visualize 2050 planning process kicked off in early 2023 when the TPB approved the plan's schedule, including creating a unique Visualize 2050 Public Engagement Plan (PEP) and Communications plan.

- The first public outreach phase occurred from February to November in 2023, when public opinion on Visualize 2045 projects proposed for resubmittal to the 2050 plan was collected.
- The second period was during March 2024 and focused on regionally significant for air quality project inputs, land use inputs, and the air quality analysis scope of work.
- The third period took place in fall 2025, when the TPB initiated a 30-day public comment period from October 23 - November 21, 2025, for the draft *Visualize 2050 National Capital Region Transportation Plan*, the draft *FY 2026-2029 Transportation Improvement Program* (TIP), and the draft *Air Quality Conformity Analysis Report*.
- The TPB held a virtual TIP Forum on November 13, 2025. At the TIP Forum planners presented highlights from the FY2026-2029 TIP and representatives from the state-level departments of transportation and WMATA were available to answer questions.

TPB staff developed a website specific to Visualize 2050, sharing information about the Plan update. The website is Visualize2050.org. The public was able to submit comments about Visualize 2050 at any time through email or through the TPB's website.

Details related to the extensive public outreach for Visualize 2050 can be found in the Public Engagement and Communications Process Document found on the Visualize 2050 website, while details regarding public involvement specific to the conformity analysis are included in Appendix E of this document.

Table 12 shows the schedule for the conformity analysis of the MTP and TIP.

Coordination with Calvert-St. Mary's Metropolitan Planning Organization (C-SMMPO)

Calvert County, Maryland is in the Washington DC region's ozone nonattainment area, and is also a member of the southern Maryland MPO, C-SMMPO. Projects in Calvert County have always been included in the TPB's conformity analysis, but, with the establishment of the C-SMMPO, it was necessary to formalize coordination between the TPB and the C-SMMPO. On January 20, 2016, the TPB approved a resolution with the C-SMMPO and Calvert County where all parties agreed upon procedures for ensuring that transportation plans, programs, and projects in Calvert County are

assessed for regional air quality conformity. The TPB/C-SMMPO agreement, and documentation about how each task in the agreement was completed, is included in Appendix F.

TABLE 12: AIR QUALITY CONFORMITY SCHEDULE

2023	
February 2023	• The TPB releases the Technical Inputs Solicitation document to initiate the Call for Projects for the region's MTP/LRTP update, Visualize 2050, and the FY2026-2029 Transportation Improvement Program (TIP)
2024	
Jan – Feb 2024	• TPB staff reviews and compile the conformity project input table showing changes and send draft table with changes to agencies for review by February 1
March 2024	• The Technical Committee and TPB receive a briefing on the draft inputs for the conformity analysis, the draft AQC scope of work, and the draft financial plan • Public comment period (March 1-30) on inputs to the plan, conformity analysis, and AQC scope of work
April 2024	• The TPB receives summary of public comments; agencies sponsoring the projects will have the opportunity to discuss and advise staff on responses • The TPB reviews responses to comments
May 2024	• The TPB asked to accept comments and approve inputs and AQC scope of work, authorizing staff to begin analysis • TPB staff commences Air Quality Conformity technical analysis
June 2024	• The TPB approves a second set of inputs, including the I-495 Southside Express Lanes (SEL), as an additional option for the AQC analysis and extends Visualize 2050 and FY2026-2029 TIP development approval to December 17, 2025
Aug - Dec 2024	• The EPA finds new Motor Vehicle Emissions Budgets (MVEBs) in the updated 2008 ozone maintenance plan adequate for use in AQC analyses (October 2024)
2025	
July 2025	• The TPB receives a briefing on draft results of the AQC and system performance analyses for both options, with and without the I-495 SEL project
September 2025	• The Metropolitan Washington Air Quality Committee Technical Advisory Committee (MWAQC TAC) and MWAQC review draft results of the AQC analysis for Visualize 2050 and the FY 2026–2029 TIP
October 2025	• The TPB votes to move forward with or without the I-495 SEL project in Visualize 2050 • TPB staff finalizes the draft Visualize 2050 plan, TIP, and AQC documents, website, reflecting TPB's action • TPB staff releases above draft documents for a 30-day public comment period
November 2025	• The TPB is briefed on all aspects of Visualize 2050, the FY 2026-2029 TIP, the conformity analysis, and comments received to date • Public comment period closes
December 2025	• The TPB receives a briefing on additional comments and responses and is asked to approve the results of the AQC analysis and adopt Visualize 2050 and the FY 2026-2029 TIP

8. FISCAL CONSTRAINT

EPA's conformity regulations require that MTPs and TIPs must be fiscally constrained in order to be found in conformity. The Visualize 2050 plan represents a "major" update to the plan, which occurs at a minimum of every four years. The Visualize 2050 includes a full financial analysis of the constrained regional transportation plan and program in Chapter 5 of the Visualize 2050 plan, which is available on the COG and Visualize 2050 websites. The financial plan demonstrates that the Visualize 2050 plan, covering the period from 2026 through 2050, is financially constrained.

The plan is financially realistic, balancing all proposed new project investments and system maintenance/operating costs with reasonable revenue expectations. The plan demonstrates that the forecast revenues reasonably expected to be available cover the estimated costs of expanding and adequately maintaining and operating the highway and public transportation system in the region.

A total of $297.3 billion in transportation expenditures is projected for the metropolitan Washington region for the 25-year period of 2026 to 2050. The majority, $251.8 billion (85 percent), of future transportation revenues will be devoted to the operations and maintenance, and state of good repair of the public transportation and highway systems. Funding for expansion of the transportation system makes up the remainder: $45.5 billion (15 percent). Evaluating expenditures by mode, WMATA expenditures constitute 50 percent and other public transportation 23 percent of the total through 2050. Expenditures on highways and pedestrian and bicycle systems constitute 27 percent of the total. Funding is identified for significant capital projects, including, the I-270 and I-495 Traffic Relief Plan (Ops Plan) in Maryland (G13825), the operation, maintenance, replacement, and upgrading of traffic signal systems throughout the District of Columbia (G13680), and construction of the Richmond Highway (U.S. 1) Bus Rapid Transit line from Huntington Metrorail Station to Fort Belvoir. The financial plan also demonstrates full funding for WMATA's forecast needs for both operations and state of good repair through 2050.

Graphics illustrating the revenues and expenditures for Visualize 2050 can be found in Figure 9 and Figure 10.

FIGURE 9: REVENUES BY FUNDING SOURCE IN YEAR OF EXPENDITURE DOLLARS (BILLIONS), 2026-2050

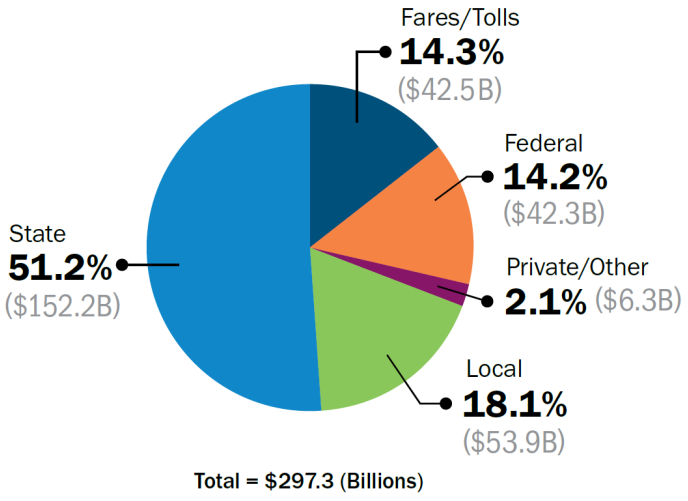
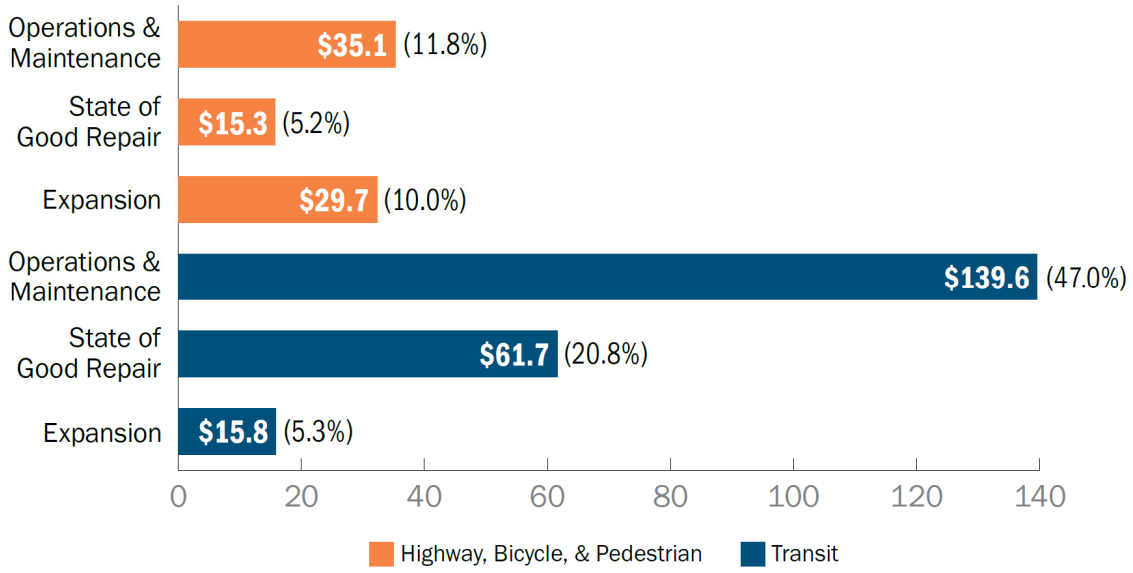


FIGURE 10: EXPENDITURES BY TYPE AND MODE IN YEAR OF EXPENDITURE DOLLARS (BILLIONS), 2026-2050



9. CONCLUSION

The analytical results described in this report provide a basis, in relation to U.S. EPA conformity regulations, for a determination by the TPB of conformity of Visualize 2050 National Capital Region Transportation Plan and the FY 2026-2029 Transportation Improvement Program for the National Capital Region, with requirements of the Clean Air Act Amendments of 1990.

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