National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Transportation Planning Board
FROM: Cristina Finch, TPB Transportation Planner
SUBJECT: Finalization of Project Inputs for Visualize 2050 Air Quality Conformity Analysis
DATE: July 2, 2025

This memorandum provides an update on the progress of the Visualize 2050 regional transportation plan and the required air quality conformity analysis ahead of scheduled approval of the plan in December 2025.

In May 2024, the TPB approved the draft scope of work for the air quality conformity analysis of Visualize 2050 and the FY 2026-29 Transportation Improvement Program (TIP).[1] This scope of work included assumptions about the analysis years, the land use forecasts (Round 10 Cooperative Forecasts), and assumptions about other inputs, such as the transportation networks, which represent future-year highway and transit network projects that are considered regionally significant for air quality (RSAQ) planning purposes. In June 2024, the TPB approved amending the May transportation project list to add the I-495 Southside Express Lanes (SEL) for the air quality conformity analysis. Following this addition, it was understood that the conformity analysis would be run both with and without the I-495 SEL project to provide additional time for analysis on the project and for members to consider its value to the region's future transportation system.

At the September 17, 2025 meeting, as per a June 2024 resolution,[2] the TPB will be asked to decide if the I-495 SEL project should be included in the continued development of the next National Capital Region Transportation Plan, Visualize 2050. One final comment period, tentatively scheduled for Thursday, October 9 to Friday, November 7, 2025, will be held on the entire plan, in advance of the TPB's action on plan adoption in December.

BACKGROUND OF VISUALIZE 2050

In June 2021, the Board adopted R19-2021 to update Visualize 2045 by December 2024 with a zero-based budgeting (ZBB) perspective. In June 2022, Visualize 2045 was approved. Following its approval, the Technical Inputs Solicitation was issued in February 2023, including the TPB Synthesized Policy Framework, findings of TPB scenario analyses, and instructions for the ZBB exercise. To provide additional time for MDOT and WMATA to resolve project and funding plans, a six-

[1] "Air Quality Conformity Analysis: Visualize 2050 and FY 2026-29 TIP, Draft Scope of Work" (Washington, D.C.: National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, April 3, 2024).
[2] "Resolution on Inclusion of the I-95/I-495 Southside Express Lanes Project in the May 15, 2024 Approved Project Submissions for the Air Quality Conformity Analysis of the Visualize 2050 National Capital Region Transportation Plan and the FY 2026-2029 Transportation Improvement Program (TIP) (TPB R13-2024)," Resolution (Washington, D.C.: National Capital Region Transportation Planning Board, June 20, 2024), https://www.mwcog.org/events/2024/6/20/transportation-planning-board/.

month schedule extension was provided in April 2023, moving the plan deadline to June 2025. The scope of work for the air quality conformity (AQC) analysis including the Cooperative Forecasts for Land Use (Round 10.0), the technical tools and assumptions, and the regionally significant for air quality (RSAQ) project inputs were approved in May 2024. In June 2024, the Board directed TPB staff to conduct two sets of AQC analyses: one with the I-495 Southside Express Lanes (SEL) project and one without. This led to a further extension of the plan's schedule to be due in December 2025.

CURRENTLY APPROVED INPUTS TO VISUALIZE 2050

As noted, in May 2024, the TPB approved several inputs for Visualize 2050 to be used in the AQC analysis and are described below.

Land Use and Demographic Forecasts

Metropolitan Washington Council of Governments (COG) staff worked with local planning directors for all of COG's member agencies to determine where growth will occur by 2050. Following a process to determine the population, employment, and household forecasts by locality, the data was compiled to create the Cooperative Forecast for Land Use Round 10.0 which was approved by the COG Board and subsequently by the TPB. The Cooperate Forecast data, a key input to developing Visualize 2050, is applied to the TPB's Traffic Analysis Zones (TAZs), which are structured to reflect currently approved local and comprehensive plans and zoning. The Cooperative Forecast data, a key input to developing Visualize 2050, is applied to the TPB's Traffic Analysis Zones (TAZs), which are structured to reflect currently approved local and comprehensive plans and zoning. The data provides a basis from which future air quality conformity and system performance can be assessed.

Technical Tools and Assumptions

In addition to the Cooperative Forecasts Round 10.0, the table below summarizes many other TPB-approved technical inputs. These were necessary to conduct the AQC analysis for Visualize 2050 and the FY 2026-2029 TIP in compliance with the Air Quality Conformity regulations. The information in Table 1 is being used in the travel demand forecasting model and motor vehicle emissions model to determine if the total on-road mobile source ozone emissions will be within the EPA-approved levels as well as measuring the future system performance.

Table 1: TPB approved Technical Tools and Assumptions for Visualize 2050 Air Quality Conformity Analysis

Pollutants	Ozone Season VOC and NOx
Emissions Model	MOVES4
Conformity Test	Budget Test: Using EPA approved mobile emissions budgets from the 2008 Ozone NAAQS Maintenance Plan
Vehicle Fleet Data	December 2023 vehicle registration data
Geography	8-hour ozone non-attainment area
Network Inputs	Regionally significant projects
Land Activity	Cooperative Forecasts Round 10

HOV/HOT	VA: I-66, I-95, I-395, and I-495 are all HOT3+; all HOV facilities will be HOV2+ through 2050 MD: HOV facility on US 50 will remain HOV2+ through 2050; HOV facility on I-270 will convert from HOV2+ to HOT3+ when additional lanes are added;
Roadway Restrictions	Roadway restrictions, such as truck prohibitions, are reflected in the travel model network using information supplied by the Departments of Transportation
Analysis Years	2025, 2026, 2030, 2040, 2045, and 2050
Modeled Area	6,800 square mile area with 3,722 Transportation Analysis Zones (TAZs)
Travel Demand Model	Gen2/Version 2.4.6

Projects Regionally Significant for Air Quality (RSAQ)

As noted in the technical inputs table above, the approved regionally significant highway capacity projects are expected to cumulatively add approximately 530 lane miles to the region's transportation network---an overall increase of about three percent. This total includes 239 arterial lane miles, representing a two percent increase. These arterial improvements encompass major arterials, minor arterials, and collector roadways.

The network will also gain 291 freeway and expressway lane miles---an eight percent increase---including 86 lane miles of tolled facilities (81 new HOT express lane miles and five electronic toll road lane miles). If approved, the I-495 Southside Express Lanes (SEL) project would contribute an additional 41 express lane miles to the freeway and expressway network, raising the total number of freeway and expressway lane miles to 332, representing a further 1 percent increase.

A total of 25 RSAQ projects will expand the region's transit capacity, comprising 14 bus rapid transit (BRT)/bus projects, nine commuter rail projects, one light rail project, and one streetcar project.

BACKGROUND ON AIR QUALITY CONFORMITY

Visualize 2050 must comply with specific federal requirements, one such requirement being that the transportation plan must align with or "conform" to the region's State Implementation Plan (SIP). The SIP outlines how the region will meet and maintain the federal National Ambient Air Quality Standard (NAAQS) as defined in the Clean Air Act and its Amendments (CAAA). The SIP includes specific goals the region needs to achieve, and one such goal is that the transportation plan must yield mobile (on-road) regional emissions below specific limits for certain pollutants. These limits are known as the Motor Vehicle Emission Budgets (MVEBs). The metropolitan Washington region is currently classified as non-attainment for the ground-level ozone NAAQS; therefore, the SIP contains MVEBs related to this pollutant. Ground-level ozone is the result of two precursor pollutants, Volatile Organic Compounds (VOCs) and Nitrogen Oxides (NO_X), combining in the presence of sunlight. The MVEBs set a ceiling on how much of these two precursor pollutants can be produced at the regional level. The transportation plan must demonstrate that its associated emissions of these precursor pollutants will be below the MVEBs to receive federal approval.

AIR QUALITY CONFORMITY ANALYSIS RESULTS

As previously mentioned, a final decision has not been made on whether the I-495 SEL will be included in Visualize 2050, so the air quality conformity analysis was performed twice, with and without the I-495 SEL. Upon completing the analysis, it was noted that the total regional emissions, calculated with and without the I-495 SEL, were identical. Table 2 summarizes the results, and Figures 1 and 2 show that total mobile emissions generated in the transportation plan fall below the MVEB, demonstrating that the transportation plan conforms to the SIP.

Table 2: 2025 and 2050 estimates of NOx and VOC emissions, with and without the I-495 SEL project

Model Output Measure	Today	2050 without the I-495 SEL	2050 with the I-495 SEL
Nitrogen Oxides (NOx) (Short Tons*/Day)	45.9	12.1	12.1
Volatile Organic Compounds (Short Tons*/Day)	28.5	14.9	14.9

* Emissions are displayed using one decimal point to be consistent with the MVEBs.

Figure 1: Visualize 2050 Air Quality Conformity Mobile Source Emissions and Mobile Emissions Budgets Ozone Season: Nitrogen Oxides (NOX)

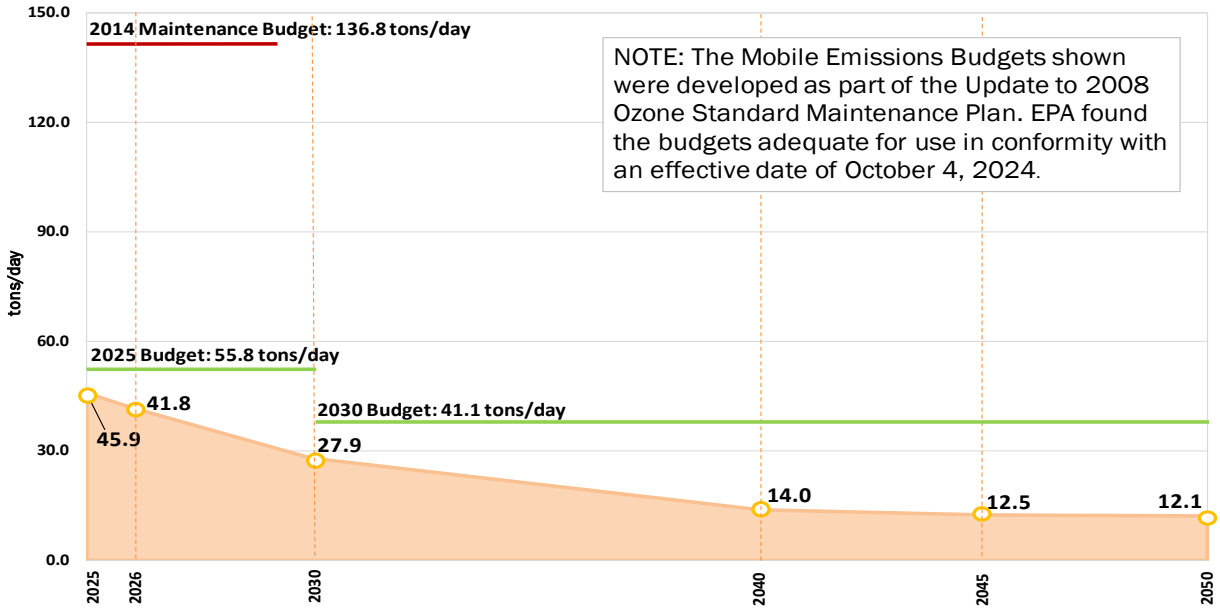
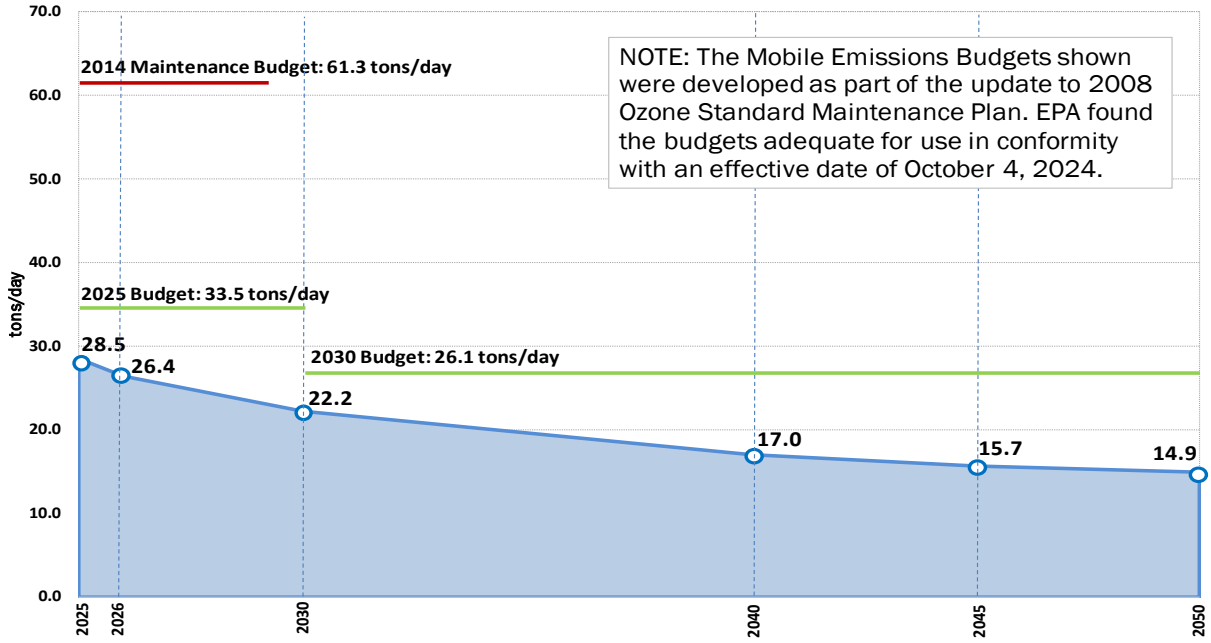


Figure 2: Visualize 2050 Air Quality Conformity Mobile Source Emissions and Mobile Emissions Budgets Ozone Season: Volatile Organic Compounds (VOC)



The overall impact of the I-495 SEL on total emissions is minor in comparison to the entirety of emissions generated across the region. In general, past TPB staff analyses have shown that "it is challenging to make substantial progress on the TPB's goals by adding any individual project or project mix to the existing system."[3] While each individual project, including the I-495 SEL, impacts traffic patterns to some extent, individual projects tend to have minimal impact on various metrics, such as emissions, at the regional level, as they affect a limited number of over 20 million daily trips in the region. TPB staff have found that policies that impact everyone (e.g., vehicle electrification, telework, and pricing) tend to have the largest impact on emissions and other metrics.

RESULTS OF MOBILE SOURCE EMISSIONS ANALYSIS FOR OTHER POLLUTANTS

Due to the transportation sector's significant contribution to emissions, the TPB tracks various types of emissions that the region is not legally required to assess. The EPA's 2016 revocation of the 1997 fine particle ($PM_{2.5}$) NAAQS means the region no longer needs to demonstrate conformity for this pollutant. Nonetheless, staff have estimated $PM_{2.5}$ emissions for Visualize 2050 to continue to track emissions trends for the pollutant. As shown in Figure 3 and Table 3, $PM_{2.5}$ emissions are forecasted to decrease between 2025 and 2050 by 28%, and emissions with the I-495 SEL are 0.1% lower than without it.

[3] Srikanth, Kanti, and Stacy Cook. "A Summary of the TPB and COG Scenario Study Findings: Informing Planning for the Metropolitan Washington Region." Page 19. Draft Report. National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, November 3, 2022. https://www.mwcog.org/events/2022/11/4/tpb-technical-committee.

Figure 3: Fine Particles (PM2.5) Mobile Source Emissions

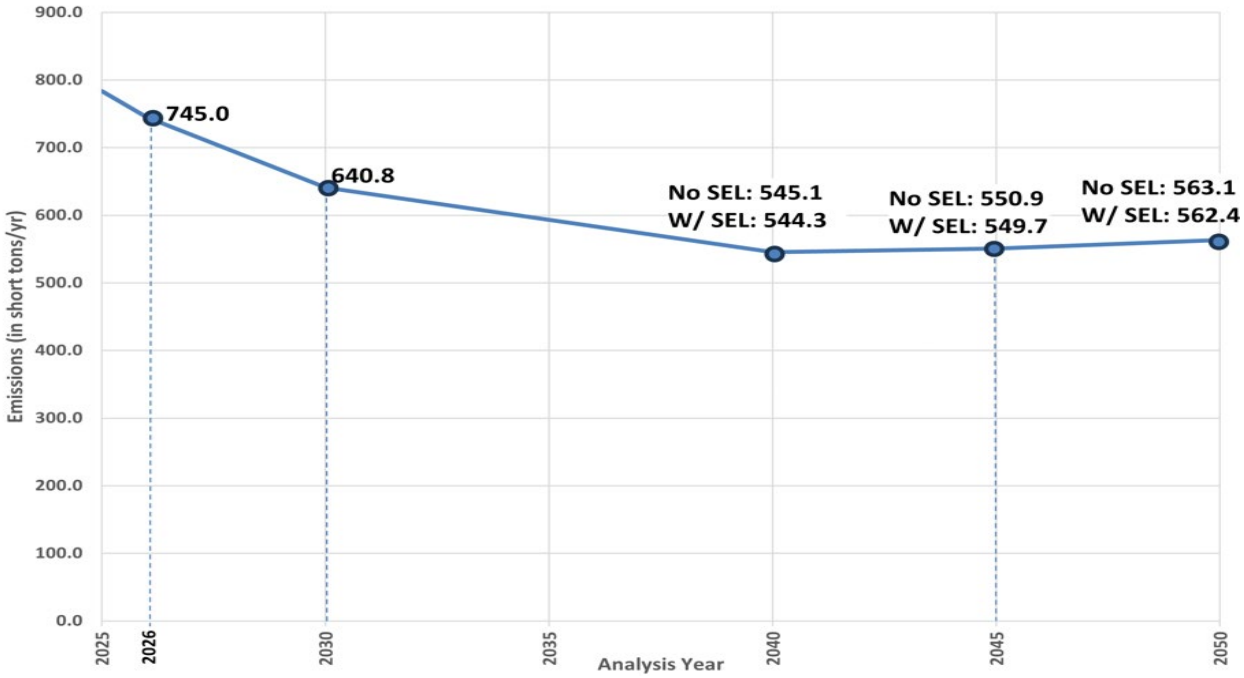


Table 3: Fine Particles $PM_{2.5}$ Model Output Measures

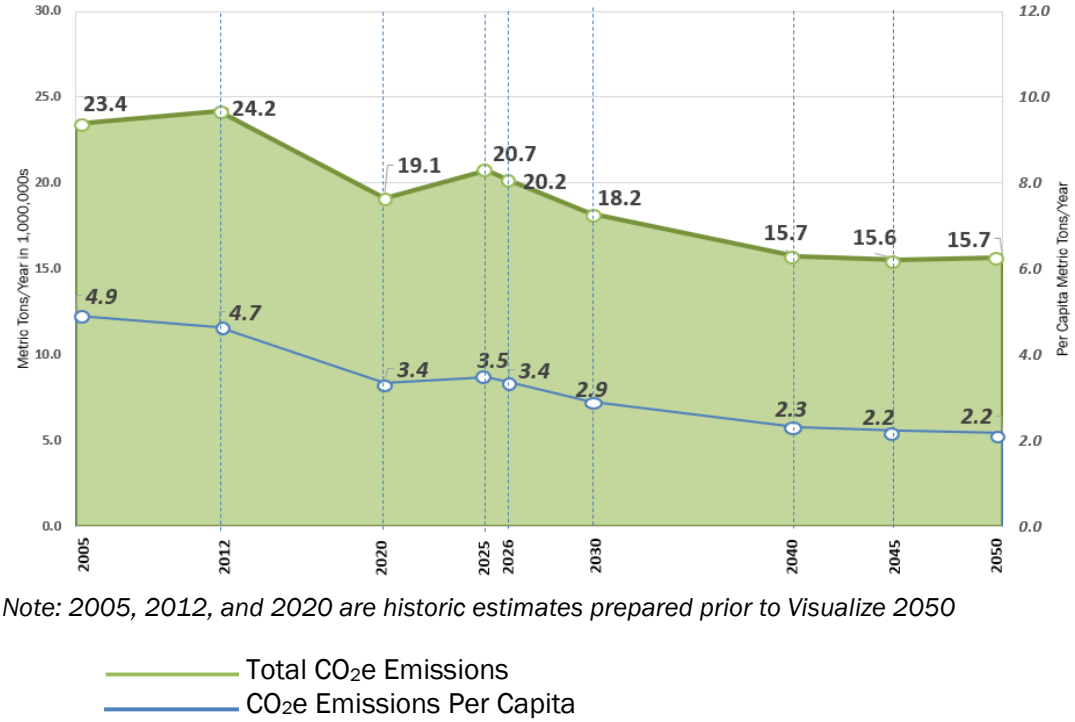
Model Output Measure	Today	2050 without the I-495 SEL	2050 with the I-495 SEL
PM2.5 (tons)	783.2	563.1	562.4

In 2010, the TPB started proactively estimating and reporting future greenhouse gas (GHG) mobile source emissions (expressed in carbon dioxide equivalents or CO_2e) in the regional transportation plan. The analysis has shown that total on-road GHG emissions decrease by 24% between 2025 and 2050, while emissions per capita decrease by 37% during the same period (see Figure 4 and Table 4). GHG emissions are identical for both options, with and without the SEL project.

The emission reductions in both $PM_{2.5}$ and GHGs between today and 2050 can be largely attributed to vehicle standards that reduce emissions and increase fuel efficiency. Upticks in both of these emissions are projected to occur between 2040 and 2050 as the vehicles meeting stricter standards saturate the overall fleet, and benefits from improved fuel efficiency standards and vehicle electrification no longer keep pace with projected VMT increases. TPB staff also continue to work with the MWCOG Department of Environmental Programs staff to monitor the region's compliance with the recently adopted and more stringent 2024 $PM_{2.5}$ NAAQS.[4]

[4] Reconsideration of the National Ambient Air Quality Standards for Particulate Matter, 89 Fed. Reg. 16202 (March 6, 2024)

Figure 4: Greenhouse Gas Mobile Source Emissions CO_2e and CO_2e Per Capita



Note: 2005, 2012, and 2020 are historic estimates prepared prior to Visualize 2050

Table 4: Greenhouse Gas Mobile Source Emissions CO_2e and CO_2e Per Capita Model Output Measures

Model Output Measure	Today	2050 without the I-495 SEL	2050 with the I-495 SEL
CO_2e (metric tons)	20.7	15.7	15.7
CO_2e per capita	3.5	2.2	2.2

SELECT PERFORMANCE ANALYSIS RESULTS

The performance analysis of Visualize 2050 considers how well the anticipated transportation system will accommodate current and forecast travel demand and address mobility and accessibility challenges. This analysis uses output from the TPB's travel demand model, which forecasts where, when, and how people will travel around the region in coming decades. To make its predictions, the model relies on the latest regional population and job growth forecasts from the Metropolitan Washington Council of Governments, information on existing travel patterns from the TPB's Household Travel Survey, and the future transportation system. While the full performance analysis is scheduled to be presented in Fall 2025 including more than twenty measures, this analysis provides a summary (see Table 5) of future performance while supporting TPB's current Visualize 2050 deliberations, that is, noting if and where I-495 SEL would have an appreciable impact on forecasted trends.

Overall, in conducting this analysis staff found many of the measures of accessibility, mobility, congestion, and delay are not appreciably different with or without I-495 SEL. The analysis shared here does note instances where the I-495 SEL project may have an impact in 2050; however, the region's long-term performance trends are forecasted to continue regardless of its inclusion or not. TPB staff is not concluding that the I-495 SEL project has no impact within parts of the region but rather that the geographic scope of the TPB planning area and methodology designed for examining the long-term impact of Visualize 2050 in its entirety is less suited for identifying the impact of a single project.

Table 5: Summary of Select Performance Measures

Model Output Measure		**Today**	**2050 without the I-495 SEL**	**2050 with the I-495 SEL**
Share of People Inside Regional Activity Centers		28%	33%	33%
Share of Jobs Inside Regional Activity Centers		63%	64%	64%
Share of People Close to High-Capacity Transit		16%	26%	26%
Share of Jobs Close to High-Capacity Transit		40%	46%	46%
Access to Jobs by Auto (AM Peak, 45-min)		1.06M	1.01M	1.02M
Change in Access to Jobs by Transit (AM Peak, 45-min)		399k	460k	460k
Total Daily Vehicle Hours of Delay		929k	1.575M	1.550M
Average Minutes of Delay Per Trip		4.1	5.9	5.8
Change in Resident Vehicle Miles Travelled		n/a	-5%	-5%
Share of All Trips:	*Drive Alone*	41%	38%	38%
	Drive Two or More	40%	40%	40%
	Transit	7%	8%	8%
	Walk and Bike	12%	14%	14%
Share of Work Trips:	Drive Alone	60%	57%	57%
	Drive Two or More	11%	11%	11%
	Transit	24%	25%	25%
	Walk and Bike	5%	6%	6%

Growth in People and Jobs and the Region's Future Transportation System

Between Today and 2050, Round 10.0 of COG's Cooperative Forecast finds that the region will be home to an additional 1.2 million people and 800 thousand new jobs, a 21 and 24 percent increase, respectively. In context of implementing the TPB's priority strategy of bringing jobs and housing closer together, analysis identifies an increasing share of the region's population and jobs within Regional Activity Centers (RAC) and in close proximity to High-Capacity Transit (HCT) stations. By 2050, the share of people within RAC increases five percent to more than 33 percent and 10 percent growth in those close to HCT, more than 26 percent of people by 2050. For jobs, 64 percent will be inside RAC and 46 percent close to HCT, a six percent growth, by 2050.

The region's transportation system will grow by 2050 to help support the growth in people and jobs. By 2050, the region's roadway network will add an additional three percent of lane miles, increasing

from 17,124 to over 17,600. Of those lane miles, High-Occupancy Toll (HOT3+) express lanes increase between 81 to 122 lane miles, a 32 to 48 percent increase from the number of HOT3+ express lane miles Today.[5] High-Capacity Transit (HCT) lane miles will grow an additional 97 miles, a 31 percent increase from Today as additional Light Rail and Bus Rapid Transit services come online.

Access to Jobs

Analyzing roadway performance through the number of jobs accessible by auto during a 45-minute morning commute, the region will see a decline in access by 2050 with or without the I-495 SEL. This decline in access ranges from four to five percent below the 2025 level of nearly 1.06 million jobs accessible. Regionally, including the I-495 SEL identifies a decline in job access of four percent, or a total 1.02 million jobs accessible by 2050, and not including the project identifies a decline of five percent, or a total of 1.01 million jobs accessible by 2050. As the region forecasts growth in people and jobs, this contributes to increase demand on the region's roadway network and increases congestion and delay (see analysis below) along with the location of future jobs being outside of a 45-minute commute period for many residents.

Access to jobs by transit is expected to grow between Today and 2050. With additional HCT service planned for the region and forecasts expecting more people and jobs close to those transit services, the analysis finds a 16 percent increase in jobs accessible by transit during a 45-minute morning commute, increasing from more than 398 thousand to 460 thousand jobs accessible by 2050. The I-495 SEL project does not have an appreciable impact on the results of this measure.

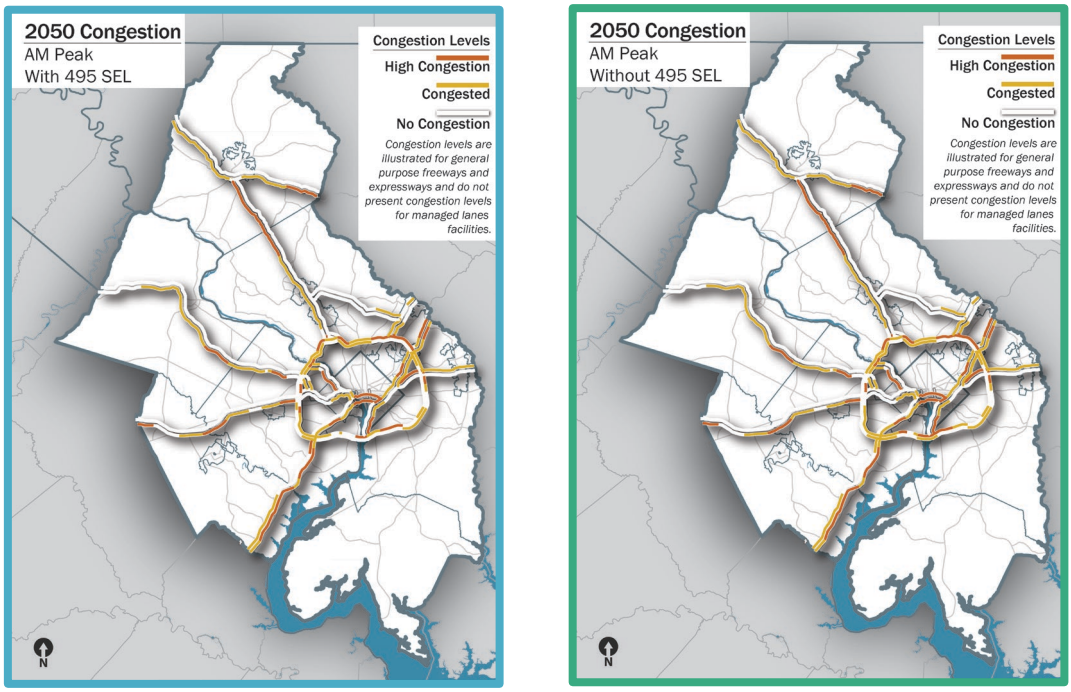
Delay and Congestion by Auto

Due to increasing demand on the region's roadways, delay and congestion are forecast to increase between Today and 2050. Total Daily Vehicle Hours of Delay, which represents time spent in traffic in congested conditions, will increase between 67 and 70 percent and Average Minutes of Delay per Trip increases between 44 and 46 percent, or from four minutes to nearly six minutes by 2050. Regionally, I-495 SEL modestly decreases growth in delay by three percent, from 70 to 67 percent, in Total Daily Vehicle Hours of Delay and two percentage points decline, from 46 to 44 percent, in Average Minutes of Delay Per Trip.

Regionally, congestion, defined as the forecasted ratio of vehicle to capacity during the morning commute on freeway and expressway general purpose lanes, increases for a large portion outside the I-495 SEL project area (see Figure 5). In the I-495 SEL project area, congestion levels decline considerably compared to not including the project but are not wholly eliminated. Areas outside but close to the I-495 SEL project area are impacted as well, with some lanes experiencing greater congestion likely due to the increased volume of auto travel.

[5] Final lane miles dependent on inclusion of I-495 SEL.

Figure 5: Visualize 2050 Congestion Levels with or without the I-495 SEL project



Resident Vehicle Miles Travelled Per Capita

Residents of the region are likely to be driving fewer miles per person in 2050 than they do today, meeting a noted target in COG's Region Forward. By 2050, the average resident is forecast to travel five percent less than they do today. This finding suggests that travel behavior in the region does respond to changes to the land use and transportation infrastructure environment, particularly that of the region's residents. These can include people making shorter trips due to jobs and housing being in closer proximity, using non-auto-based modes more often as more infrastructure is built, and changes to travel behavior due to the impact of congestion and delay.

Decline in Non-Single Occupancy Travel

The share of trips, both work and all purpose, in this region taken on non-single occupancy vehicle (SOV) modes like high occupancy auto, bicycle and pedestrian, and transit increases by 2050. For all trip purposes, rates of growth in non-SOV trips exceeds the growth in SOV trips, leading to more than 60 percent of trips taken on non-SOV modes by 2050 compared to 59 percent today. This is a similar trend for work trips, where 43 percent of commute trips will be taken on non-SOV modes by 2050 compared to 40 percent today. SOV travel will continue to be the predominate way regional commuters travel to work. The I-495 SEL project does not have an appreciable impact on the results of this measure.

NEXT STEPS

As shown in Table 6, in September, the TPB will vote on including the I-495 SEL in Visualize 2050 after which the draft Visualize 2050 plan, FY 2026-2029 Transportation Improvement Program, and Air Quality Conformity Analysis report will be completed and published for a 30-day public comment period. At the November TPB meeting, the TPB will receive a summary of public comments. In December, the TPB will vote on the approval of the three documents: Visualize 2050, the FY 2026-2029 Transportation Improvement Program, and the Air Quality Conformity Analysis report.

Table 6: Remaining Schedule for Developing Visualize 2050

September 2025	• **TPB votes to move forward with or without the I-495 Southside Express Lanes project for continuation in the plan development and air quality conformity processes.** • Metropolitan Washington Air Quality Committee (MWAQC) and MWAQC Technical Advisory Committee (MWAQC-TAC) reviews draft results of AQC analysis for the updated plan and FY 2026–2029 TIP. • Staff finalize the draft plan, TIP, and AQC documents, website, and advertise the comment period.
October 2025	• **Public comment period on the draft plan, TIP, and the results of AQC analysis for the updated plan and FY 2026-2029 TIP** (**tentative dates: Thursday, October 9 – Friday, November 7, 2025**). • TPB, TPB Technical Committee review the draft Visualize 2050 plan, FY 2026-2029 TIP, and Air Quality Conformity Analysis Report.
November 2025	• TPB receives a summary of the comments received on the analysis, plan and TIP; the agencies sponsoring the projects will have the opportunity to provide responses to comments.
December 2025	• **TPB will be asked to approve the results of the AQC analysis and adopt the Visualize 2050 plan and the FY 2026-2029 TIP.**