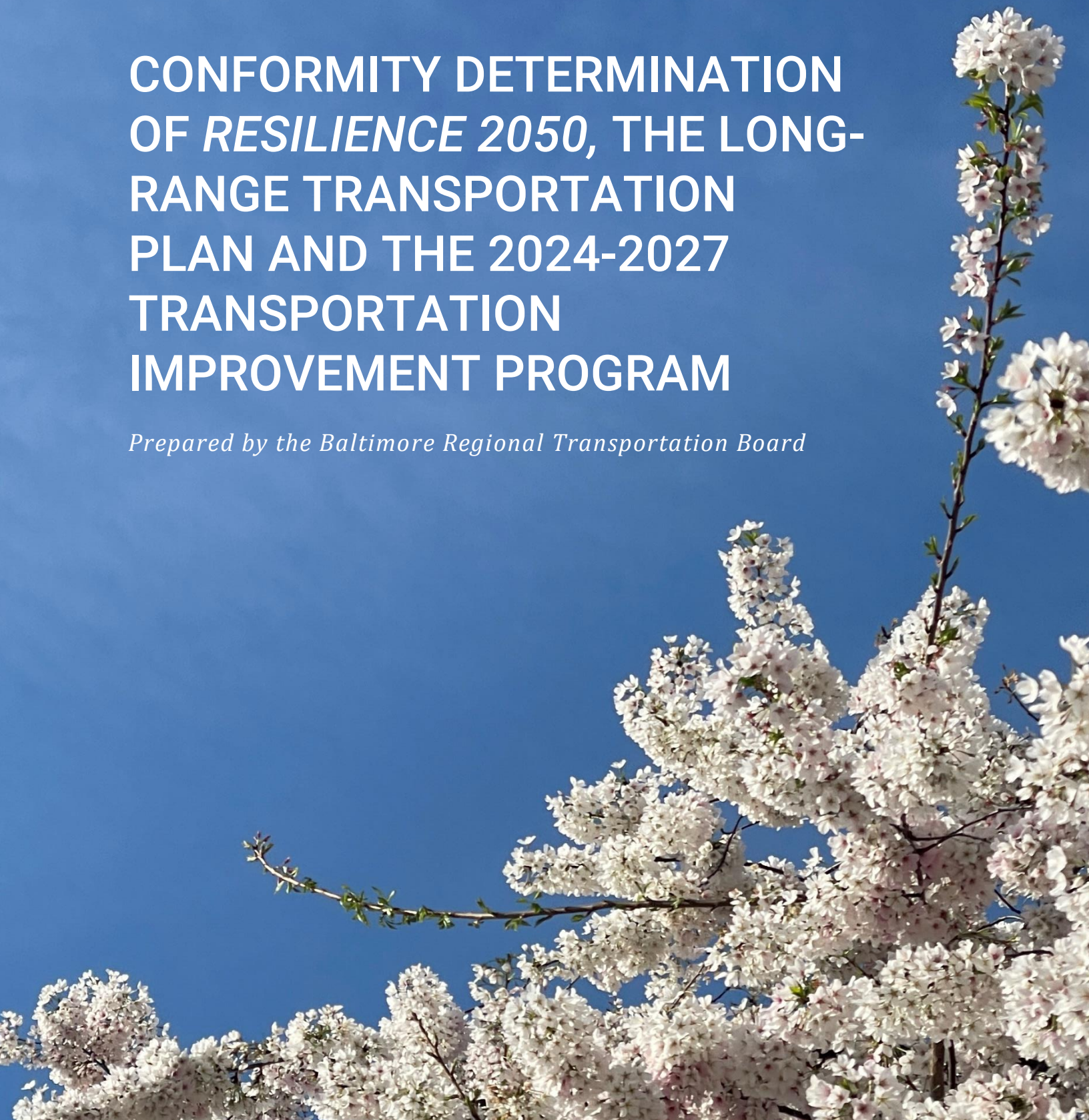
BRTB
Baltimore Regional Transportation Board

CONFORMITY DETERMINATION OF *RESILIENCE 2050,* THE LONG-RANGE TRANSPORTATION PLAN AND THE 2024-2027 TRANSPORTATION IMPROVEMENT PROGRAM

Prepared by the Baltimore Regional Transportation Board



Conformity Determination of Resilience 2050, the Long-Range Transportation Plan and the 2024-2027 Transportation Improvement Program

July 25, 2023

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Produced under the auspices of the Baltimore Regional Transportation Board, the Metropolitan Planning Organization for the Baltimore Region

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List of Acronyms

ABM	Activity Based Model
BMC	Baltimore Metropolitan Council
BRTB	Baltimore Regional Transportation Board
BWI	Baltimore Washington International Thurgood Marshall Airport
CAAA	Clean Air Act Amendments
CFG	Cooperative Forecasting Group
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
ICG	Interagency Consultation Group
InSITE	Initiative to Simulate Individual Travel Events, BMC's activity based model
LRTP	Long Range Transportation Plan
MDE	Maryland Department of the Environment
MDOT	Maryland Department of Transportation
MOVES	Motor Vehicle Emission Simulator
MPO	Metropolitan Planning Organization
NAAQS	National Ambient Air Quality Standards
NOx	Nitrogen Oxides
Ppb	Parts Per Billion
RFP	Reasonable Further Progress
SIP	State Implementation Plan
TAZ	Transportation Analysis Zone
TIP	Transportation Improvement Program
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds

INTRODUCTION

The transportation conformity process is required under the Clean Air Act Amendments (CAAA) to ensure that transportation planning and air quality planning processes within a state are coordinated. Emissions from mobile sources are amongst the most significant contributors to ozone pollution. Because of this, the transportation conformity process is a critical element of the region's and the State's efforts to address environmental issues.

This report documents the demonstration of transportation conformity of the 2024-2027 Transportation Improvement Program (TIP) and *Resilience 2050*, the long-range transportation plan for the Baltimore region (Plan), to address conformity to the 8-hour ozone National Ambient Air Quality Standard (NAAQS). Under the CAAA of 1990, areas designated as nonattainment for a NAAQS are required to review their current transportation plans and programs to ensure conformity with the applicable state air quality implementation plan. Since the passage of the CAAA, U. S. Environmental Protection Agency (EPA) released a final rule on November 24, 1993 outlining methods for nonattainment areas to conduct conformity analyses of plans and programs. EPA has amended the final rule (Conformity Rule) on a number of occasions, with the most recent occurring in April 2012.

The conformity analysis documented here was conducted through a quantitative and qualitative review of the projects in the Plan and TIP. The conformity determination process ensures that long-range transportation plans and short-term programs contribute to air quality improvement objectives delineated in the State Implementation Plan. In determining conformity, staff at the Maryland Department of the Environment (MDE) and the Baltimore Metropolitan Council (BMC) estimate the future emissions produced by the planned transportation system. These emission projections are then compared with the emission levels established in the State Implementation Plan.

This conformity determination is undertaken by the Baltimore Regional Transportation Board (BRTB), in its capacity as the Metropolitan Planning Organization (MPO) for the Baltimore metropolitan area. The BRTB, assisted by the Baltimore Metropolitan Council and in conjunction with the Maryland Departments of the Environment and Transportation, conducted a comprehensive analysis of conformity of the Plan and the TIP for the Baltimore region. The approach used for this conformity determination was developed in concert with the Conformity Rule.

CURRENT ATTAINMENT STATUS FOR NAAQS

Eight-hour Ozone Standard

The Baltimore region is designated as "moderate" nonattainment for the 2015 8-hour ozone standard. The standard is 0.070 parts per million (ppm). This designation became effective November 7, 2022. The region failed to attain the marginal nonattainment standard by the attainment date of August 3, 2021, so was reclassified as moderate nonattainment. The new attainment date is August 3, 2024, but attainment must be demonstrated by the last full ozone season prior to the attainment date, which is August 2023. The region has one year to perform a conformity determination for this NAAQS.

Earlier, in 2012, the region was designated as "moderate" nonattainment for the 2008 8-hour ozone National Ambient Air Quality Standard (NAAQS). At the time, under this rule the Baltimore region was designated the only "moderate" ozone nonattainment area for the 2008 8-hour ozone standard in the East. The Baltimore region's attainment date for the 2008 Ozone NAAQS was July 20, 2018. On August 23, 2019, the U. S. Environmental Protection Agency (EPA) determined that the Baltimore region had met the NAAQS by the attainment date.

The Baltimore region is a "serious" nonattainment area for the 1997 ozone standard.[1]

Mobile source emissions are amongst the most significant local contributors to the Baltimore area's ozone problem. The most current approved/adequate ozone motor vehicle emissions budgets are used in the transportation conformity process. This conformity determination demonstrates conformity to the 1997 ozone NAAQS, the 2008 ozone NAAQS, and the 2015 ozone NAAQS using the 2012 8-hour ozone Reasonable Further Progress (RFP) State Implementation Plan (SIP) budget. The 8-hour ozone RFP SIP budget was prepared by the Maryland Department of the Environment (MDE) and contains motor vehicle emissions budgets for volatile organic compounds (VOC) and nitrogen oxides (NO_X). The RFP budgets were determined by EPA as adequate for use in conformity determinations, as published in the Federal Register on February 22, 2016.

The 2019-2021 design value for the Baltimore region is 72 ppb, indicating that it is currently meeting the 2008 NAAQS.

[1] In 2015, the EPA issued a final rule revoking the 1997 ozone NAAQS. (80 FR 12264) However, a February 2018 court ruling reinstated the 1997 ozone NAAQS conformity requirement.

RESILIENCE 2050 – THE BALTIMORE REGION'S LONG-RANGE TRANSPORTATION PLAN

Resilience 2050 (Plan) is the new financially constrained long-range transportation plan for the Baltimore region.

The new short-range Transportation Improvement Program (TIP) for FY 2024-2027 and the new Plan are planned for approval concurrent with the conformity determination by the Baltimore Regional Transportation Board (BRTB), the region's federally-designated metropolitan planning organization (MPO), in July 2023. This conformity determination shows conformity of the 2024-2027 TIP and *Resilience 2050* long-range transportation plan.

CONFORMITY STATEMENT

The conformity rule, as it applies to the Baltimore nonattainment area, requires the Plan and TIP to conform to the motor vehicle emissions budgets established in the SIP. The applicable State Implementation Plan (SIP) for this Conformity Determination of *Resilience 2050* and the 2024-2027 TIP is the 2012 8-hour ozone Reasonable Further Progress (RFP) SIP budget for the Baltimore region (motor vehicle emission budgets determined adequate by EPA on February 22, 2016). Appendix A contains a matrix, which provides responses to all of EPA's criteria as applicable to this conformity determination.

The results of the conformity analysis for the Baltimore nonattainment area indicate that the projected mobile source emissions are below the most recent approved/ adequate motor vehicle emission budgets for the established analysis years of 2023, 2025, 2035, 2045 and 2050. Therefore, it is the conclusion of the BRTB, in its capacity as the MPO for the Baltimore region that *Resilience 2050* and the 2024-2027 Transportation Improvement Program are found to be in conformity with the requirements of the Clean Air Act Amendments of 1990 and the relevant sections of the Final Transportation Conformity Regulations 40 CFR Part 93.

INTERAGENCY CONSULTATION

Under Section 93.105 of the Conformity Rule, each SIP revision must include procedures for interagency consultation before making conformity determinations, and also procedures to be undertaken by air quality agencies and transportation agencies before developing applicable implementation plans. On November 9, 2006, after public review and comment, Maryland state regulations codifying the interagency consultation process (26.11.26) were updated to reflect transportation conformity regulations for the 8-hour ozone and $PM_{2.5}$ NAAQS, the changes to the Conformity Rule, as well as incorporation of existing federal guidance that is consistent with a U.S. Court of Appeals decision.

For the Baltimore region, the BRTB established the Interagency Consultation Group (ICG) to carry out the consultation process and provide recommendations on air quality topics. Final procedures for consultation were prepared and formally endorsed by consultation members (TSC

Resolution #96-12). Final consultation procedures were developed through a cooperative effort involving staff to the BRTB, MDOT and MDE staffs, as well as EPA and Federal Highway Administration (FHWA) representatives. These procedures provide the framework that the BRTB follows in making conformity determinations.

The ICG meets formally to discuss and recommend appropriate procedures for determining conformity of the Plan and TIP. These meetings are critical to the findings reported in this document, as well as to the development of the consultation procedures that will govern future conformity determinations. ICG meetings provide an additional forum for public participation and input to the process, including comments on technical methodologies. Meetings are advertised on the BMC website. Agendas, meeting minutes, and necessary materials are emailed to interested parties and are also on the BMC website.

Table 1. ICG Meetings Specifically Addressing this Conformity Analysis

February 8, 2023	Review and approval of methodology/assumptions
April 5, 2023	Review and approval of conformity status of projects
May 3, 2023	ICG approves conformity determination regional emissions analysis results.
July 5, 2023	ICG and Technical Committee recommendation for BRTB approval of conformity determination.

Please see Appendix B for more information on the Interagency Consultation Process related to this conformity determination. Decisions relating to the exempt/non-exempt status of projects are available in Appendix C.

CONFORMITY PROCESS

Test Method

One of the first steps in the conformity determination process is to determine which test method to use – whether an interim emissions test or a budget test, and what the applicable budgets are. Through interagency consultation, it was determined that the budget test would be used to address the ozone NAAQS.

The conformity determination for the 2015 ozone NAAQS was performed using the 2012 RFP budgets for VOCs and NOx, because they are the most recent budgets deemed adequate by the EPA. According to the "Transportation Conformity Guidance for 2008 Ozone Nonattainment Areas," if 1997 8-hour ozone budgets are available for each analysis year in a conformity determination for the 2008 8-hour ozone NAAQS, an area would use 1997 ozone budgets that are established for that year or the most recent prior year. On February 22, 2016, EPA determined the motor vehicle emissions budgets in the Baltimore 1997 8-hour Ozone Standard RFP SIP for 2012

to be adequate for use in conformity determinations. The conformity testing for the 1997, and 2008 ozone NAAQS was performed using these budgets for VOCs and NO_X.

Selection of Horizon Years

In order to perform the technical analysis for the Plan and TIP, five horizon years were chosen through interagency consultation in order to analyze emission results. The date of full implementation of the long-range transportation plan, 2050, is a required model year. 2023 is being used as a horizon year because it is the year of the new attainment date, and is within 10 years of the base year for the SIP, which is 2017. The second horizon year, 2025, is the near term year, which may be no more than 10 years from the base year used to validate the transportation demand planning model. The current transportation demand planning model validation base year is 2019, and 2025 is within 10 years of 2019. The in-between horizon years, 2035 and 2045, are test scenarios set so that there are no more than 10 years between horizon years. The years of analysis shown in Table 2 have been determined in keeping with federal requirements.

Table 2. Horizon Years

Year	Analysis Required	Ozone Test
2023	Yes – attainment year, and no more than 10 years from base year of the SIP, 2017	Budget Test – 2012 RFP budget
2025	Yes – within 10 years of transportation demand model base year 2019	Budget Test – 2012 RFP budget
2035	Yes – intermediate year	Budget Test – 2012 RFP budget
2045	Yes – intermediate year	Budget Test – 2012 RFP budget
2050	Yes – last year of transportation plan	Budget Test – 2012 RFP budget

Emission Analysis Software

The EPA-developed MOVES3 motor vehicle emissions model, in combination with PPSuite, was used to assist the analysis of emissions of volatile organic compounds and oxides of nitrogen resulting from on-road mobile sources in the Baltimore region. PPSuite is a software package used to pre-format and post-format data to and from MOVES3.

Staff in the BMC Transportation Planning Division applied the travel forecasting model to horizon year scenarios to assess highway and transit system travel and speed impacts of implementing the region's proposed transportation plan (Plan) and program (TIP). Upon completion of travel forecasting, MDE used the MOVES3 computer model to estimate the emission effects of the projected transportation system usage and performance characteristics.

Identification of Exempt and Regionally Significant Projects

All projects from the 2024-2027 TIP and *Resilience 2050* were reviewed and categorized by the ICG as either “exempt” or “non-exempt.” Projects that are exempt from the conformity requirement may proceed forward even if there is no conforming plan and TIP. Exempt projects are identified in §93.126 and §93.127 of the Conformity Rule. Exempt projects in the TIP generally include projects with neutral or de minimis emissions impacts such as road rehabilitation and

resurfacing, streetscape improvements, bridge replacements and bicycle and pedestrian facilities.

Non-exempt projects are not exempt from the requirement to determine conformity. Non-exempt, regionally significant projects are included in the regional emissions analysis. According to §93.101 of the Conformity Rule, regionally significant projects are transportation projects, other than an exempt project, that are "on a facility which serves regional transportation needs (such as access to and from the area outside of the region, major activity centers in the region, major planned developments such as new retail malls, sports complexes, etc., or transportation terminals as well as most terminals themselves) and would normally be included in the modeling of a metropolitan area's transportation network, including, at a minimum, all principal arterial highways and all fixed guideway transit facilities that offer an alternative to regional highway travel." According to §93.122 of the Conformity Rule, projects which are non-exempt and not regionally significant are not required to be modeled explicitly, but vehicle miles traveled (VMT) must be estimated according to reasonable professional practice.

Transportation Control Measure Statement

The current SIP does not include any Transportation Control Measures. Therefore, neither the budgets nor the conformity analysis reflect Transportation Control Measures. The region continues to program and implement emission reduction measures in many areas, including commuter assistance activities, bicycle and pedestrian activities, park-and-ride lots, public transit, management and operations projects, preferential parking management, as well as clean vehicles, fuels and technologies. Appendix I provides descriptions of some of the emission reducing activities in the region.

PUBLIC INVOLVEMENT

The BRTB adopted an updated Public Participation Plan in December 2022. The plan updates information detailed in a previous version based on new guidance on meaningful public engagement, a new Executive Order 13985: Advancing Racial Equity and Support for Underserved Communities. In addition, the PPP aligns with the Fixing America's Surface Transportation (FAST) Act, a federal law that authorizes transportation funding to address such topics as new technologies and a review of the most effective public involvement practices. The plan was created in coordination with the Transportation CORE and other stakeholders. The public involvement procedures provide a framework and methodology for involving the public in all metropolitan planning activities. The Public Participation Plan is available online.

There is a 30(+) day public comment period on the Draft Conformity Determination, beginning in May 2023. This public comment period meets the transportation conformity public participation requirements in 93.105 (e) of the Conformity Rule, which states that reasonable public access be provided to technical and policy information at the beginning of the public comment period and prior to taking formal action on a conformity determination for all transportation plans and TIPs.

There are opportunities for the public to comment on the Draft Conformity Determination during several meetings listed below.

- May 3, 2023 Interagency Consultation Group – ICG addresses emission results
- May 17 - June 20, 2023 – Public comment period including multiple meetings in various jurisdictions as well as a virtual meeting for the 2024-2027 TIP, Resilience 2050 and Air Quality Conformity
- June 27, 2023 BRTB Meeting – public participation opportunity
- July 5, 2023 Joint Interagency Consultation Group/Technical Committee Meeting – the ICG and TC address the Conformity Determination of the TIP and Plan
- July 25, 2023 BRTB Meeting – BRTB addresses the Conformity Determination of the TIP and Plan

The Conformity Determination and its appendices are available at www.baltometro.org and PublicInput.com/Resilience2050 throughout the public comment period. The document is available online and upon request could be available in printed or an alternative format.

FISCAL CONSTRAINT

The most recent federal transportation legislative program was signed on November 15, 2021. The Bipartisan Infrastructure Law, as enacted in the Infrastructure Investment and Jobs Act, authorizes the largest federal investment in public transportation in the nation's history. The IIJA and its predecessor, the FAST Act, require regional transportation plans to be fiscally constrained. That is, the total estimated costs of projects and programs cannot exceed forecasted revenue levels.

For *Resilience 2050*, the BRTB, in consultation with the Maryland Department of Transportation, has forecasted the amount of revenues from federal, state, local, and private sources the region reasonably expects will be available for the 23-year period from 2028-2050.

Forecasted Revenues

Consistent with MDOT assumptions, the BRTB has assumed that 36.1% of statewide revenues (federal + state + private funds) will be available for the Baltimore region for the 2028-2050 period. Shown below are revenues (from federal, state, and private sources) expected to be available for the 2028-2050 period, broken down by type of investment:

Type of Investment	2028-2050 Financial Forecast
System Operations	$37.007 billion
System Preservation	$20.883 billion
Expansion	$12.062 billion
Total Revenues	**$69.952 billion**

Fiscal Constraint: Forecasted Revenues vs. Expansion Project Costs

Most projects in *Resilience 2050* are expansion projects that compete for the $12.062 billion in state and federal expansion funds anticipated to be available from 2028-2050. The table below shows a breakdown of forecasted revenues versus total estimated YOE costs for expansion projects in *Resilience 2050*. Included in this breakdown are set-aside funds for small programs intended to improve air quality and for Locally Operated Transit Systems (LOTS). This breakdown demonstrates that the region expects to have sufficient funds to pay for expansion projects in *Resilience 2050* from 2028-2039 and 2040-2050.

	Category	2028-2039	2040-2050	2028-2050
Estimated Expansion YOE Costs	Projects	$3,607,000,000	$8,084,000,000	$11,691,000,000
	Small Program Set-Asides	$45,000,000	$205,000,000	$250,000,000
	LOTS	$30,000,000		$30,000,000
	Total	**$3,682,000,000**	**$8,289,000,000**	**$11,971,000,000**
Forecasted Expansion Revenues		**$3,706,000,000**	**$8,356,000,000**	**$12,062,000,000**

Fiscal Constraint: Forecasted Revenues vs. System Preservation Costs

Resilience 2050 also includes several large-scale system preservation projects along with an estimated breakdown of future system preservation expenditures by category provided by MDOT MTA and MDOT SHA. Including further details on anticipated system preservation needs

in *Resilience 2050* reflects the increasing importance of system preservation at the national, state and regional level. As our transportation infrastructure ages, system preservation expenditures comprise an increasing share of transportation budgets.

The financial forecast for *Resilience 2050* includes estimated revenues of $20.883 billion in state and federal system preservation funds available from 2028-2050. Below is a breakdown of estimated YOE system preservation expenditures versus forecast revenues by project type. This breakdown includes YOE costs for 13 system preservation projects included in *Resilience 2050*.

		2028-2039 (Millions)	2040-2050 (Millions)	2028-2050 (Millions)
Roadway Estimated System Preservation YOE Costs	Transportation Alternatives	$127	$155	$282
	Environmental	$453	$552	$1,005
	Congestion Management	$457	$557	$1,014
	Bridge Replacement and Rehabilitation	$1,525	$1,444	$2,969
	Resurfacing and Rehabilitation	$1,758	$2,139	$3,897
	Safety and Spot	$1,043	$1,270	$2,313
	Urban Reconstruction	$429	$72	$501
	Roadway Subtotal	**$5,792**	**$6,189**	**$11,981**
Transit Estimated System Preservation YOE Costs	Guideway	$296	$541	$837
	Facilities	$464	$102	$566
	Systems	$291	$501	$792
	Stations	$515	$833	$1,348
	Vehicles	$1,804	$3,555	$5,359
	Transit Subtotal	**$3,370**	**$5,532**	**$8,902**
Total Estimated System Preservation YOE Costs		**$9,162**	**$11,721**	**$20,883**
Forecasted System Preservation Revenues		**$9,162**	**$11,721**	**$20,883**

The main resource used to determine the funding anticipated to be available for implementing the projects in *Resilience 2050* is the document titled *Financially Constrained Long Range Plan, Year 2022 to 2050 Update for the Baltimore Metropolitan Area*, prepared by MDOT. This document is included in Appendix J.

LATEST PLANNING ASSUMPTIONS

Socioeconomic Data

Estimates of travel on horizon year networks are based on the completed Round 10 cooperative forecasts. These forecasts were endorsed by the BRTB at their June 28, 2022 meeting. The Cooperative Forecasting Group (CFG), a subcommittee of the BRTB, is responsible for the development of the socioeconomic forecasts that serve as inputs to the region's activity-based

travel demand model (InSITE). Membership of the CFG is comprised of local government staff, and the group meets bimonthly to discuss demographic trends and future growth expectations.

The CFG utilizes a "bottom-up" forecasting approach, where group members develop the forecasts for their own jurisdictions, with the individual forecasts summing to a regional total. These agreed-upon regional forecasts represent a planning scenario created to extend through 2050. The CFG members provide Transportation Analysis Zone (TAZ) level forecasts for the number of households, total population, group quarters population, and total employment. Utilizing federal, state, and private sources, BMC staff supplements the CFG's TAZ estimates and forecasts with additional data points to support the travel demand model including: median household income; household labor force; enrollment; and employment by industry. The TAZ level estimates are inputs into demographic sub-models and a population component of change (births, deaths and migration) model used in estimating jurisdiction and TAZ household and population marginal distributions. The software package PopGen 2.0, with marginal distributions inputs, is used to synthesize a household and household person roster database. This rich set of household and person characteristics is used to estimate daily activity patterns, and serve as inputs into InSITE. Appendix D displays jurisdictional totals for the major socioeconomic data.

Transit Systems and Operating Assumptions

The Baltimore Metropolitan Council maintains an Activity Based Model (ABM), known locally as Initiative to Simulate Individual Travel Events (InSITE), for the Baltimore ozone non-attainment area which includes Anne Arundel County, Baltimore City, Baltimore County, Carroll County, Harford County, Howard County and Queen Anne's County. The InSITE ABM is composed of three major inputs: 1) synthetic household and population database, 2) transportation networks and 3) person daily activity pattern tour and trip roster estimated from an analysis of the 2008 Household Travel Survey. The InSITE model was recently calibrated using the 2019 Maryland Household Travel Survey and validated to 2019 observed data – daily and AM/PM peak period traffic counts, MTA transit route ons/offs, and 2019 Location Based Service (LBS) devise data. The transit network includes all bus and rail transit service for the Baltimore region. This includes the following service providers and a description of their operations:

- **Baltimore Link / MDOT Maryland Transit Administration (MDOT MTA)**
  - Modes: Metro-SubwayLink, Light RailLink, Commuter Rail (MARC), CityLink (bus), LocalLink (bus), Express BusLink (bus), and Commuter Bus, MobilityLink (paratransit)
  - Serves: Anne Arundel County, Baltimore City, Baltimore County, Harford County, Howard County and Queen Anne's County
  - Number of Bus Routes: 84
  - Map: MDOT MTA System Map
- **Regional Transportation Agency (RTA)**
  - Modes: Local Bus
  - Serves: Anne Arundel County & Howard County

    - Number of Bus Routes: 15
    - Map: RTA System Map
- **Trailblazer / Carroll Transit**
    - Modes: Local Bus
    - Serves: Carroll County
    - Number of Bus Routes: 4
    - Route Information: Trailblazer Routes
- **Harford Transit**
    - Modes: Local Bus
    - Serves: Harford County
    - Number of Bus Routes: 7
    - Map: LINK System Map
- **Annapolis Transit**
    - Modes: Local Bus
    - Serves: Anne Arundel County
    - Number of Bus Routes: 7
    - Map: Annapolis Transit System Map
- **Baltimore County Circulator (service initiated 2022)**
    - Modes: Local Bus
    - Serves: Baltimore County
    - Number of Bus Routes: 2
    - Map: The Loop

Transit Projects

BMC staff reviews each providers' periodic changes to their service and incorporates those changes into InSITE's transit network. BMC models transit networks for a validation year (2019) and air quality conformity horizon years of 2023, 2025, 2035, 2045 and 2050. These networks include transit projects found in the Transportation Improvement Program (TIP) and the long-range transportation plan (*Resilience 2050*). The following projects change the transit service for the region in the future:

- **Anne Arundel Countywide Microtransit -** The County would expand microtransit service in the County from one zone in the south to 7 zones, providing on-demand transit services to connect to existing fixed route services across the entire county. A *Resilience 2050* project, with a horizon year of 2035.
- **Annapolis to New Carrollton Transit -** New Express Bus service between Parole and New Carrollton with stops at major communities along the way. A *Resilience 2050* project, with a horizon year of 2035.

- **Glen Burnie to Annapolis Transit -** New Express Bus service between Annapolis/Parole and Glen Burnie. A *Resilience 2050* project, with a horizon year of 2035.
- **Annapolis to Fort Meade / Columbia Transit** - New Express Bus service between Parole and Columbia with primary service to Fort Meade and stops at major communities along the way. A *Resilience 2050* project, with a horizon year of 2035.
- **MDOT MTA Commuter Bus Service (Harford County)** – Additional MDOT MTA Commuter Bus Service from Harford County to downtown Baltimore and Harbor East. Includes connections with Harford Transit. A *Resilience 2050* project, with a horizon year of 2035.
- **U.S. 29 Bus Rapid Transit (BRT)** – new BRT service connecting Ellicott City to Columbia, Maple Lawn and Burtonsville at MD 198 in Montgomery County, integrating with Montgomery County improvements and including development of a transit center in Downtown Columbia. A *Resilience 2050* project, with a horizon year of 2035.
- **MDOT MTA East-West Corridor -** New east-west transit service to connect major Baltimore region destinations like West Baltimore, Downtown, East Baltimore, and the western suburbs as identified in the RTP. A *Resilience 2050* project, with a horizon year of 2035.
- **Aberdeen MARC Station** – Transit Oriented Development (TOD) and new train station including additional parking, U.S. 40 "Green Boulevard," and removal of the pedestrian overpass and replacement with Station Square Plaza – a new pedestrian underpass and green, terraced plaza. A *Resilience 2050* project, with a horizon year of 2045.
- **U.S. 1 Bus Rapid Transit (BRT)** – new BRT service between the Dorsey MARC station and the Laurel MARC Station, the City of Laurel, College Park, and the Purple Line Light Rail station. A *Resilience 2050* project, with a horizon year of 2045.
- **BWI Bus Rapid Transit (BRT)** – new BRT service between the Dorsey MARC station and the BWI Light Rail station (with stops at the Arundel Mills Mall and the BWI consolidated rental car facility). A *Resilience 2050* project, with a horizon year of 2045.
- **MDOT MTA North-South Corridor** – New north-south transit service to connect Towson to Downtown Baltimore, with associated investments to significantly improve the speed and reliability of transit service in this busy corridor, as identified in the RTP. A *Resilience 2050* project, with a horizon year of 2045.
- **MDOT MTA Transit Hubs** – MDOT MTA has identified transit hub locations as part of the RTP. Typically, a transit hub includes enhanced amenities (shelters, benches, information). These projects are still in planning, but service changes in the form of reduced headways are assumed. Resilience 2050 includes the following 17 MDOT MTA transit hubs (horizon year in parenthesis):
    - Charles Center (2035)
    - Mondawmin (2035)
    - Penn Station (2035)
    - Penn-North (2045)
    - Rogers Avenue (2045)
    - Owings Mills (2045)
    - Patapsco (2045)

- BWI Airport (2050)
- Glen Burnie (2050)
- Bayview Medical Center (2050)
- Camden Station (2050)
- Johns Hopkins Hospital (2050)
- Lexington Market (2050)
- State / Cultural Center (2050)
- UM Medical Center (2050)
- Essex (2050)
- White Marsh (2050)

Transit Modeling Results

BMC used InSITE to estimate horizon years 2019, 2023, 2025, 2035, 2045 and 2050 mobile source emissions. The following are horizon year linked person transit trips by purpose (see Table 3) using model region transit (MDOT MTA, WMATA, and LOTS).

Table 3. Average Weekday Person Transit Trips Projections ***(data to be provided in the final draft)***

	2019	2023	2025	2035	2045	2050
Mandatory						
Work	87,700	85,600	85,300	88,200	95,500	94,400
School/University	17,000	18,100	18,700	18,400	19,000	17,400
Non-Mandatory						
Meal	12,200	12,200	12,400	12,400	13,600	13,400
Shop	24,900	25,200	25,600	26,500	28,800	29,000
Personal Business	25,200	26,000	26,300	26,900	29,400	29,500
Social Recreation	13,300	13,800	13,500	14,500	15,700	16,100
Escort	13,300	13,000	13,200	13,800	14,500	14,400
Return Home	104,600	105,200	105,300	108,400	117,400	116,000
Total	**298,200**	**299,100**	**300,300**	**309,100**	**333,900**	**330,200**

For an overview of transit services in the region, reference Appendix I for more information.

Toll Facilities

The Baltimore region currently has seven toll facilities, including three harbor crossings, one managed lane facility, the Chesapeake Bay crossing and two Susquehanna River crossings. The Maryland Transportation Authority (MDTA) has implemented video and electronic toll transponder transactions toll collection on all toll facilities. All transactions are now at highway speeds at these facilities. The passenger car toll for the harbor crossings is $6.00 for video transactions, $3.00 for Maryland EZ Pass users or $1.40 for commuter plan users. For additional tolling information on the harbor crossings, including truck tolls, see:

https://driveezmd.com/toll-rate-calculator/ or **https://mdta.maryland.gov/TollRatesTables**

The harbor crossings include:

- I-95, Fort McHenry Tunnel
- I-895, Baltimore Harbor Tunnel
- I-695, Frances Scott Key Bridge

The managed lane facility, known as Express Toll Lanes (ETL), is on I-95 north of Baltimore. It connects I-95 and I-895 on the eastern edge of Baltimore City to MD 43, White Marsh Boulevard and I-95 north, a distance of eight miles. The ETL's are tolled at a per-mile rate, which amounts to $2.54 peak / $2.19 off-peak for video toll users and $1.54 peak / $1.19 off-peak for electronic toll users. For more information on the ETL toll rates see:

https://mdta.maryland.gov/TollRatesTables

The Bay Bridge (U.S. 50/301) toll for passenger cars is $6.00 for video transactions, $2.50 for Maryland EZ Pass users, $2.00 for shoppers, and $1.40 for commuter plan users.

Within InSITE, the effects of tolls are reflected in usual place of work & school long term choice, tour/trip destination choice, mode choice and route assignment. The tolls are converted to travel time segmenting person into five Value of Time (VOT) groups with an average per hour value of $2.49, $5.33, $8.64, $13.85, and $31.38. The VOT is added to the toll and ETLs calculated travel time based on the travel speed. The travel cost (time) is fed into work and school long term and tour/trip destination choice. During mode choice, the dollar cost of traveling on the ETL is calculated and added to the auto operating cost for the utility of single occupant vehicle (SOV) and shared ride. Route choice travel time for all roads is based on the travel time to traverse the road section, including the toll time where applicable. The assignment algorithm chooses the path that minimizes travel time. During periods of high congestion, the ETLs become the preferred choice over the general purpose lanes due to their time (cost) savings.

Selection of Network Facilities

A series of computerized highway and transit networks was prepared and tested for each modeled horizon year (2023, 2025, 2035, 2045, and 2050) under the Plan and TIP implementation scenario. The implementation scenario is the future transportation system that will result from the goals and policies proposed in the Plan and TIP in given horizon years. Criteria for inclusion

of highway and transit improvements in the implementation scenario were reviewed by the ICG, including voting representatives from MDOT, MDE, and BRTB as well as advisory members from FHWA, FTA, and EPA. As described above, the ICG members discuss which projects in the Plan and TIP, as well as regionally significant projects, are exempt from the regional emission analysis.

Additionally, BRTB member jurisdictions provided highway and transit project specifications for all regionally significant non-federally funded highway and transit projects that have committed funding sources and could reasonably be expected to be completed by the appropriate analysis year.

The following were included:

- All in-place regionally significant highway and transit facilities, services, and activities;
- Completion of all regionally significant projects (including facilities, services, and activities) included in the proposed Plan and TIP;
- Completion of all expected regionally significant non-FHWA/FTA highway and transit projects that have clear funding sources and commitments leading toward their implementation and completion by the analysis year.

TECHNICAL METHODOLOGY

The mobile source emission estimation process relies on EPA's MOVES3 using simulated transportation demand, observed environmental conditions, and federal and state adopted motor vehicle emission control regulations. Transportation demand is simulated using the region's InSITE, Activity Based Model (ABM). The InSITE model uses 1) a household/population synthesizer in estimation household and person characteristics and household person roster, 2) a micro travel simulation estimating long-term choices and person trip roster, the average weekday travel sequence (location, time of day, and mode) for each person, and 3) a freight modeling system capturing long distance commodity flows, and local freight and commercial truck/vehicle goods, deliveries, and service tours. The InSITE model incorporates the latest planning assumptions. InSITE model documentation describing development, estimation, calibration and validation is publicly available. The summary of this report is included in Appendix E of this conformity report.

Representative highway and transit networks and trip tables were developed to correspond with conditions expected in the horizon years of 2023, 2025, 2035, 2045 and 2050 reflecting projects in the 2024-2027 TIP and *Resilience 2050*.

Procedures for Determining Regional Transportation-Related Emissions

The Baltimore region is using EPA's MOVES3 model for estimating mobile source emissions. A commercially-available software package, *Central*, was used to manage the process of connecting travel model output to the MOVES3 model that estimates mobile source emissions. The Central package processes travel demand model output and generates the needed MOVES transportation files then exports the information into the appropriate MOVES database. Other non-transportation databases (meteorological data, vehicle registration, motor fuel parameters

and Inspection and Maintenance (IM)) are imported into the appropriate MOVES database. After importing local planning assumptions, the MOVES emissions model is used to generate gram per mile emission factors which are applied to the local travel activity. The process is completed by generating user-friendly summaries of the MOVES output emission databases.

The following general steps summarize the mobile emission estimation process:

- Output travel demand model estimates of daily-, a.m.- and p.m. peak-period link passenger vehicle and truck volumes;
- Convert travel demand model estimates of daily link total and truck volume to seasonal Highway Performance Monitoring System (HPMS) adjusted hourly estimates;
- Estimate link volume by vehicle class (motorcycle, 2 axle, bus, and 2 axle 6 tire and 3+ axles)
- Calculate new travel speed;
- Prepare MOVES transportation related files;
- Prepare MOVES non-transportation assumptions, environmental assumptions, control program specification files, fuel parameter, source type, population, and fleet age distribution;
- Execute MOVES, estimating mobile gram per mile composite emissions for each pollutant and by vehicle type; and
- Develop summaries showing estimated mobile source emissions by vehicle type for each pollutant and converted to tons per day.

The Conformity Rule contains transportation-related emissions determination procedures that must be implemented in nonattainment areas. The Baltimore region has maintained a process for a number of years that meets the modeling requirements under §93.122(b)(1)(i) through (vi) for designated severe ozone nonattainment areas. Since the revocation of the 1-hour ozone standard on June 15, 2005, the Baltimore region is no longer a severe nonattainment area for 1-hour ozone. As mentioned previously, the region is a designated moderate nonattainment area for the 2008 and 2015 8-hour ozone standard. However, the region still follows the same procedures and meets the requirements of a severe nonattainment designation. BMC staff, on behalf of the BRTB, simulates travel demand associated with implementation of plans and programs. MDE is responsible for all non-transportation emissions model inputs.

Travel information within a database format (dBase) is used in exchanging link characteristics between the travel demand modeling software CUBE and PPSUITE. Estimated link volume is adjusted using jurisdiction HPMS factors and seasonal factors (1.04 percent for average summer weekday and 0.938 percent for average winter weekday) by facility type and area type. The HPMS factors are derived from the 2019 travel demand model. The 2019 HPMS adjustment factors used are provided in Appendix F. The 2019 HPMS factors are closer to one on the upper class facilities and are greater as the facility class decreases due to less representation of the highway network within the travel demand model. The travel model includes all interstates but only skeletal representation of the lower class facilities, especially in the more developed jurisdictions.

Factoring by the HPMS factors compensates for differences between simulated volume (from the travel model) and estimated observed volume. During the adjustment process, an estimate of local (off-network) VMT is made using the ratio of local to non-local 2019 HPMS estimates applied to the adjusted model estimates. These ratios are also shown in Appendix F. These three steps, as shown below, reconcile the travel demand model with 2019 estimated observed volume.

- Applying the HPMS factors;
- Applying the seasonal factors; and
- Estimating local VMT.

The HPMS and seasonal factors are also applied to horizon year estimates of VMT; thereby reconciling horizon year estimates with the ratio of unexplained volume in the base year 2019. This reconciliation ultimately allows the travel model to provide an estimate for all regional VMT.

Travel demand model outputs simulate volume in eight time periods, while the MOVES model utilizes hourly inputs. Therefore, vehicle type pattern files are used to convert simulated period volume into hourly volume. The vehicle type pattern files are broken into four vehicle classes (motorcycle, 2-axle 4-tire, bus, and 2-axle 6-tire/3+ axle). These files are developed using two types of counts: observed counts taken hourly for all vehicles; and hourly classified counts (FHWA F-13 scheme), summarized by facility and area type (urban/rural). The counts are used to develop estimates of the share of the volume per hour. These estimates are applied against the simulated link time period volume (a.m. and p.m. peak, mid-day and overnight) by facility and area type.

Each link's hourly vehicle type volume is compared against the modification to the Bureau of Public Roads curve used in highway trip table loading. As with the travel demand model, Passenger Car Equivalence is used for the estimated truck volume. Each hourly volume is also subject to peak spreading where individual hourly volumes that exceeds 30% of the maximum volume is spread to other hours within the peak period. The final estimate is a new travel time and speed estimated on each HPMS adjusted link volume considering peak spreading.

Standard MOVES input files of VMT by facility, VMT by hour, and VMT by speed bin are developed using information from the travel model and air quality post-processor. An exact description of the data estimated can be found in the MOVES User Guide developed by EPA. The fraction of VMT for each vehicle type is calculated from the HPMS adjusted link volume.

Central then assembles the MOVES information such as source type population for the Baltimore region, environmental conditions (such as temperature), control programs, and transportation information described in the above steps. National defaults are used for the more complex and data intensive inputs into MOVES. MOVES scripts are built for each area type (urban or rural) and facility type within each jurisdiction (only for the assembly of the transportation information, since neither environmental conditions nor control programs vary across the non-attainment area).

The assembled MOVES scripts are submitted to the MOVES software, which generates the database output (ASCII database) and the report. The output gives the gram per mile emission factors for each pollutant, for each of the vehicle types. The gram per mile factor is a composite

factor based on the age distribution, transportation characteristics, environmental conditions, and control program applicable for that vehicle type.

The MOVES model generates a VMT fraction share for all vehicle types based on supplied information (registration data, diesel sales fractions, and mileage accumulation rates). This fraction share can be used to generate a composite emission factor that can be applied to the estimated VMT or can be used to convert regional VMT into an estimate of VMT for each vehicle type and then factored by the gram per mile emission factor for that particular vehicle. Both methods would produce the same estimate of VMT. The latter method is used in order to generate more specific reports about emissions and VMT for the region.

The final step is to accumulate the estimate of VMT and emissions for the various vehicle types and facility types.

Meteorological and Control Strategy Assumptions

In cooperation between BMC and MDE staff, assumptions used within the MOVES3 emissions model are reviewed and validated with the latest information on environmental conditions and MOVES3 commands representing control strategies and other policies.

The monthly analysis of mobile source emissions required the development of average hourly and monthly temperatures and humidity along with daily estimate of barometric pressure. The BWI weather reporting station observations were analyzed to develop the required input. Other monthly assumptions in fuel composition and volatility were estimated or used the MOVES default for that month.

The MOVES script for the Inspection and Maintenance program reflects the current test procedures in use at the various state inspection stations.

ANALYSIS RESULTS

The results of the emissions analysis of the 2024-2027 TIP and *Resilience 2050*, as shown in Tables 4 and 5 below, demonstrate that emissions are below levels necessary to demonstrate conformity to the 1997 8-hour ozone standard, the 2008 8-hour ozone standard, and the 2015 8-hour ozone standard.

Average summer weekday emissions of VOCs and NOx resulting from the region's transportation network in 2023, 2025, 2035, 2045, and 2050 are below the most recent approved/ adequate SIP budgets.

Table 4. VOC Emissions Test Results (average summer weekday, tons/day)

	2023	2025	2035	2045	2050
Total Emissions	16.986	15.232	10.047	9.261	9.259
Conformity Budget[1]	40.2	40.2	40.2	40.2	40.2
Conformity Result	**PASS**	**PASS**	**PASS**	**PASS**	**PASS**

[1] 2012, 8-hour ozone Reasonable Further Progress (RFP) SIP budget for the Baltimore region (motor vehicle emission budgets determined adequate by EPA on February 22, 2016)

Table 5. Weekday NOx Emissions Test Results (average summer weekday, tons/day)

	2023	2025	2035	2045	2050
Total Emissions Modeled	30.551	25.433	17.586	17.514	18.132
Conformity Budget[1]	93.5	93.5	93.5	93.5	93.5
Conformity Result	**PASS**	**PASS**	**PASS**	**PASS**	**PASS**

[1] 2012, 8-hour ozone Reasonable Further Progress (RFP) SIP budget for the Baltimore region (motor vehicle emission budgets determined adequate by EPA on February 22, 2016)