Air Quality Conformity Determination

For the **New Castle County, Delaware** Portion of the
PA-NJ-MD-DE 8-hour Ozone Nonattainment Area
& PA-NJ-DE Fine Particulate Matter ($PM_{2.5}$)
Maintenance Area

2050 Regional Transportation Plan &
FY 2020–2023 Transportation Improvement Program

January 2019

TEAM DelDOT
Transparent Efficient Accountable Measured

WILMAPCO

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

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Introduction

This report demonstrates transportation conformity of the Wilmington Area Planning Council's (WILMAPCO) Amended Fiscal Year (FY) 2020-2023 Transportation Improvement Program (TIP) and Amended 2050 Regional Transportation Plan (RTP) for the New Castle County, Delaware portion of the PA-NJ-MD-DE 8-hour ozone and PA-NJ-DE fine particulate matter (PM2.5) nonattainment areas.

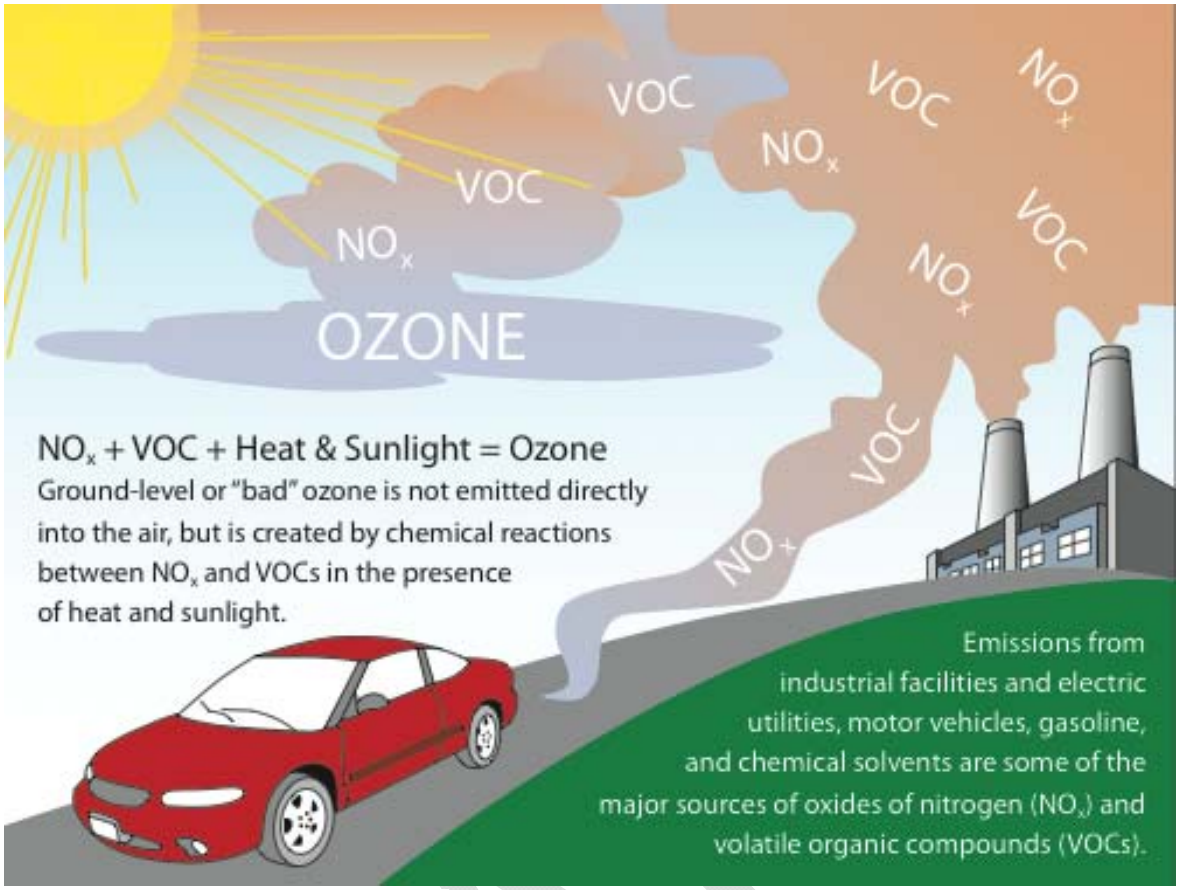
WILMAPCO is the Metropolitan Planning Organization (MPO) for New Castle County, Delaware and Cecil County, Maryland. It is designated by the governors of both states to plan for, coordinate, and program the many transportation investments in the region. Under federal law and regulation, all plans and programs that involve federal funds or are of regional significance must be reviewed and approved through WILMAPCO.

WILMAPCO is responsible for developing a Transportation Improvement Program (TIP) and a regional long-range transportation plan (RTP) in cooperation with the Maryland Department of Transportation (MDOT), the Delaware Department of Transportation (DelDOT) and affected transit operators. In accordance with federal planning requirements, a collaborative process has been developed wherein state, county and local governments and transportation providers are partners in the planning and programming process.

As the Federally-designated MPO for New Castle County, Delaware and Cecil County, Maryland, WILMAPCO is required by law to demonstrate that the RTP and TIP conform to the transportation emission budgets set forth in the Statewide Implementation Plan (SIP) for each state. If emissions generated from the projects programmed in the TIP and RTP are equal to or less than the emission budgets in the SIPs, then conformity has been demonstrated.

8-hour Ozone Background

Ozone is an odorless, colorless, gas and is created by a reaction between nitrogen oxides (NOx) and volatile organic compounds (VOC) in the presence of sunlight. While ozone in the stratosphere forms a protective layer, shielding the earth from the sun's harmful rays, ground level ozone is a key contributor to smog. Motor vehicle exhaust, industrial emissions, gasoline vapors, chemical solvents, and natural sources all contribute to NOx and VOC emissions. Since ozone is formed in the presence of heat and sunlight, it is considered a summertime pollutant.



Source: CleanEnergy.org; adapted from EPA

Ozone exposure is detrimental to public health. Ozone can irritate lung airways and cause inflammation similar to sunburn. Other symptoms include wheezing, coughing, and pain when taking a deep breath and breathing difficulties during exercise or outdoor activities. People with respiratory problems, children and seniors are most vulnerable, but even healthy people that are active outdoors can be affected when ozone levels are high. Even at very low levels, ground-level ozone triggers a variety of health problems including aggravated asthma, reduced lung capacity, and increased susceptibility to respiratory illnesses such as pneumonia and bronchitis.

In addition to adverse health effects, ground-level ozone also interferes with the ability of plants to produce and store food, which makes them more susceptible to disease, insects, other pollutants, and harsh weather. As a result, ground-level ozone negatively impacts both agricultural productivity and ecosystem stability. Furthermore, ozone damages the leaves of trees and other plants, ruining the appearance of cities, national parks, and recreation areas.

8-Hour Ozone National Ambient Air Quality Standards

The EPA published the 1997 8-hour ozone National Ambient Air Quality Standards (NAAQS) on July 18, 1997 (62 FR 38856), with an effective date of September 16, 1997. An area was in nonattainment of the 1997 8-hour ozone NAAQS if the 3-year average of the individual fourth highest air quality monitor readings, averaged over 8 hours throughout the day, exceeded the NAAQS of 0.08 parts per million (ppm). On May 21, 2013, the EPA

published a rule revoking the 1997 8-hour ozone NAAQS, for the purposes of transportation conformity, effective one year after the effective date of the 2008 8-hour ozone NAAQS area designations (77 FR 30160). As of July 20, 2013, New Castle County no longer needed to demonstrate conformity to the 1997 8-hour ozone NAAQS.

On May 21, 2012, the Environmental Protection Agency (EPA) issued a final rule via the Federal Register (77 FR 30088) establishing initial air quality designations for the 2008 primary and secondary NAAQS for ozone. The 2008 standard is set at an 8-hour average concentration of 0.075 ppm and retains the same general form and averaging time as the 0.080 ppm NAAQS set in 1997. The effective date of the 2008 ozone standard designations was July 20, 2012.

On October 26, 2015, EPA issued 2015 primary and secondary NAAQS for ozone (80 FR 65292). The 2015 standards revised the levels of primary and secondary standards to 0.070 ppm, and retained their indicator (O3), forms (fourth-highest daily maximum, average across three consecutive years), and averaging time (eight hours). New Castle County was classified as a marginal nonattainment area as of September 2018.

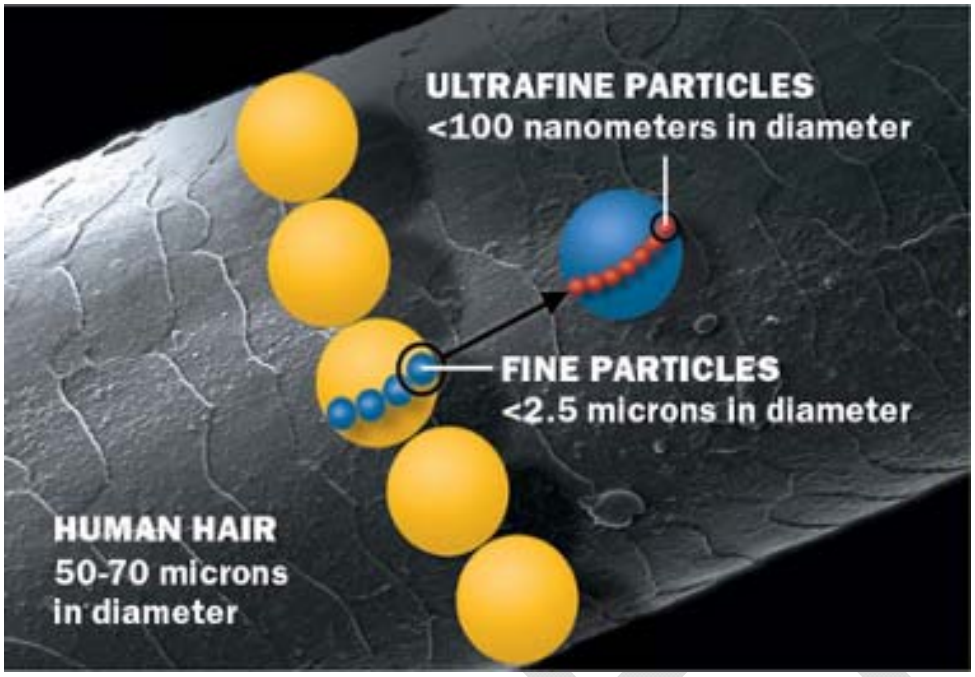
In February 2018, the District of Columbia Court of Appeals ruled that EPA's 2013 revocation of the 1997 Ozone Standard violated the Clean Air Act (*South Coast Air Quality Management District v. EPA*). For New Castle County and other areas, conformity must once again be demonstrated against the 1997 8-hour ozone NAAQS beginning on February 15, 2019.

Areas across the United States that have failed to meet the standards outlined above have been designated as nonattainment areas and, as a result, are subject to transportation conformity. Transportation conformity requires nonattainment and maintenance areas to demonstrate that all future transportation projects will not hinder the area from reaching and maintaining its attainment goals. In particular, the projects will not:

- *Cause or contribute to new air quality violations*
- *Worsen existing violations*
- *Delay timely attainment of the relevant NAAQS*

PM2.5 Background

Fine particulate matter (PM2.5 hereafter) is a mixture of microscopic solids and liquid droplets suspended in the air, where the size of the particles is less than 2.5 µm (or about one-thirtieth the diameter of a human hair). Fine particles can be emitted directly (such as smoke from a fire, or as a component of automobile exhaust) or be formed indirectly in the air from power plant, industrial and mobile source emissions of gases such as sulfur dioxide and nitrogen oxides.



Source: Tufts University

The health effects associated with exposure to fine particles are significant. Scientific studies have shown significant associations between elevated fine particle levels and premature death. Effects associated with fine particle exposure include aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions, emergency room visits, absences from school or work, and restricted activity days), lung disease, decreased lung function, asthma attacks, and certain cardiovascular problems such as heart attacks and cardiac arrhythmia. While fine particles are unhealthy for anyone to breathe, people with heart or lung disease, asthmatics, older adults, and children are especially at risk.

PM2.5 National Ambient Air Quality Standards

In July 1997, the EPA issued NAAQS for PM2.5, designed to protect the public from exposure to PM2.5 at levels that may cause health problems. That standard included two elements:

1) An annual standard set at 15 $\mu g/m^3$, based on a three-year average of the annual mean PM2.5 concentrations, and
2) A 24-hour standard of 65 $\mu g/m^3$, based on a three-year average of the 98^{th} percentile of 24-hour concentrations.

Areas need to meet both standards to be considered in attainment of PM2.5 NAAQS[1].

On April 5, 2005, EPA designations under the PM2.5 NAAQS became effective, under which the region consisting of New Castle County in Delaware, Bucks, Chester, Delaware, Montgomery, and Philadelphia counties in Pennsylvania, and Burlington, Camden and Gloucester counties in New Jersey were collectively designated as a nonattainment area. This region is known as the Philadelphia-Wilmington, PA-NJ-DE PM2.5 Nonattainment Area.

In December 2006, the EPA revised the 24-hour standard from 65 µg/m^3 to 35 µg/m^3. Three years later, in December 2009, the EPA designated the Philadelphia-Wilmington, PA-NJ-DE PM2.5 Nonattainment Area in nonattainment for the 24-hour standard. The October 2011 PM2.5 SIP's PM2.5 emission budget, calculated using the MOVES model, was found adequate for conformity purposes by EPA in December 2013.

On August 5, 2014, the EPA approved Delaware's request to re-designate to attainment the Delaware portion of the Philadelphia-Wilmington, PA-NJ-DE PM2.5 Nonattainment Area for both the 1997 annual and the 2006 24-hour PM2.5 standards. The EPA simultaneously approved the New Castle County PM2.5 Maintenance Plan, which requires conformity analyses using motor vehicle emission budgets associated with the 1997 annual in the 2006 24-hour PM2.5 standards. The effective date of this final rule was September 4, 2014.

Status of the Amended 2050 RTP and Amended FY 2020-2023 TIP

As the regional transportation-planning agency for Cecil County, Maryland and New Castle County, Delaware, WILMAPCO is charged with authoring a long-range transportation plan with at least a 20-year planning horizon. The RTP presents recommendations for enhanced transportation efficiency and functionality, including the construction of new facilities, improved connectivity to multiple travel modes, and the enhancement of existing highway, transit, and bicycle/pedestrian facilities. Transportation projects that address challenges faced by the region are identified in this plan and placed in the four-year TIP that corresponds to that project's development timetable.

The 2050 RTP and the FY 2020-2023 TIP were created by the WILMAPCO staff and member agencies. [DRAFT TEXT] The RTP and present conformity analysis were adopted by the WILMAPCO Council on March 14, 2018.

[1] Meeting the PM2.5 standards nationwide is estimated to prevent at least 15,000 premature deaths; 75,000 cases of chronic bronchitis; 10,000 hospital admissions for respiratory and cardiovascular disease; hundreds of thousands of occurrences of aggravated asthma; and 3.1 million days when people miss work because they are suffering from symptoms related to particle pollution exposure.

Interagency Consultation

As required by the federal transportation conformity rule (40 CFR 93.105) the conformity process includes cooperative interaction among the federal, state and local agencies. Interagency consultation requirements include coordination with the local county representatives, the MPO and representatives from both state and federal agencies including:

- Wilmington Area Planning Council (WILMAPCO)
- Maryland Department of the Environment (MDE)
- Maryland Department of Transportation (MDOT)
- Delaware Transit Corporation (DTC)
- Delaware Department of Transportation (DelDOT)
- Delaware Department of Natural Resources and Environmental Control (DNREC)
- Cecil County
- New Castle County
- Federal Highway Administration (FHWA)
- Environmental Protection Agency (EPA)
- Federal Transit Administration (FTA)

As part of the interagency consultation, the Technical Advisory Committee (TAC) and Air Quality Subcommittee (AQS) groups met and collaborated in order to achieve the following goals related to the transportation conformity process:

- Determine planning assumptions
- Develop a definitive list of future year projects to be analyzed
- Develop a format for presenting determination
- Develop and standardize the public participation process

Meeting minutes and notes are available at the following webpage:

- http://www.wilmapco.org/aqs/

Determine Planning Assumptions

Ozone

The emissions resulting from the implementation of regionally significant transportation projects (those which do not qualify as exempt under 40 CFR 93.126 and 127) will be compared to the Delaware Department of Natural Resources and the Environmental Control's (DNREC) Motor Vehicle Emissions Budget (MVEB).

The ozone emissions budgets of record were developed by DNREC using the MOBILE6b model for 2009. The following budgets were used:

- VOC: 9.89 tons/summer day
- NOx: 19.23 tons/summer day

The EPA regulations, as outlined in the Final Transportation Conformity Rule, Section 93.118, require that emissions analyses for the following years:

- Attainment year
- A near-term year, one-to-five years in the future
- The last year of the RTP's forecast period
- An intermediate year or years such that analyses years are no more than ten years apart.

The following three analysis years were chosen for the ozone analysis:

- 2020 (near-term year and attainment year)
- 2030 (interim year to keep analysis years less than ten years apart)
- 2040 (interim year to keep analysis years less than ten years apart)
- 2050 (WILMAPCO Plan horizon year)

As discussed above, ozone formation is a direct result of VOC and NOx emissions reacting with each other in the presence of sunlight. The EPA has ruled that both precursor emissions, VOC and NOx, must be included in a regional analysis of 8-hour ozone for transportation conformity.

PM2.5

PM2.5 can result from both direct and indirect sources. Gasoline and diesel on-road vehicles emit both direct PM2.5 and other gases that react in the air to form PM2.5. Transportation-related direct PM2.5 emissions can result from particles in exhaust fumes, from brake and tire wear, from road dust kicked up by vehicles, and from highway and transit construction. Transportation-related indirect PM2.5 emissions can result from one or more of several exhaust components, including Nitrogen Oxides (NOx), Volatile Organic Compounds (VOCs), Sulfur Oxides (SOx), and ammonia (NH_3).

For the regional analysis of direct PM2.5 emissions, the EPA has ruled that both exhaust and brake/tire wear must be included. However, EPA has ruled that regional emissions analyses for direct PM2.5 should include road dust only if road dust is found to be a significant contributor to PM2.5 by either the EPA Regional Administrator or a state air agency. For this nonattainment area, neither of the EPA Regional Administrators nor any of the three state air agencies have found that road dust is a significant PM2.5 contributor. EPA has also ruled that regional direct PM2.5 analyses need only include fugitive dust from construction of transportation projects if the SIP identifies these emissions as significant contributors to the regional PM2.5 problem. The current submitted PM2.5 SIP has not deemed construction-related dust as a contributor to the regional PM2.5 problem.

Thus, the only components of direct PM2.5 emissions to be considered in the nonattainment area are tailpipe exhaust and brake/tire wear.

For the regional analysis of indirect PM2.5 emissions (also called PM2.5 precursors), the EPA has identified four potential transportation-related PM2.5 precursors: NOx, VOCs, SOx, and NH_3. The current PM2.5 SIP does not identify any precursors identified other than NOx as a significant contributor of PM2.5 emissions in New Castle County.

The following PM2.5 pollutants and precursors were tested:

- Direct PM2.5 source: tailpipe exhaust, brake and tire wear
- PM2.5 Precursor: NOx

The PM2.5 emissions budget of record were developed by DNREC using the MOVES model (described later) for 2012. The following budgets were used:

- Direct PM2.5 2012 budget: 199.0 tons/year (0.545 tons/day)
- Indirect (NOx) PM2.5 2012 budget: 6,273 tons/year (17.19 tons/day)

EPA regulations require that emissions analysis be conducted for specific analysis years. Section 93.119(g) of the *Final Rule* states that these analysis years must include a near-term year (one-to-five years in the future), the last year of the Plan, and an intermediate year or years such that analysis years are no more than 10 years apart.

The following analysis years were chosen for the PM2.5 analysis:

- 2020 (near-term year)
- 2030 (interim year to keep analysis years less than ten years apart)
- 2040 (interim year to keep analysis years less than ten years apart)
- 2050 (WILMAPCO Plan horizon year)

Travel Demand Modeling Methodology

The air quality analysis conducted for the FY 2020 - 2023 TIP and 2050 RTP used a series of computer-based modeling techniques. These techniques are consistent with methods WILMAPCO and DelDOT have used in conducting air quality analyses required by the CAA amendments, and are similar to those used by other state and regional transportation agencies in preparing air quality analyses. They are also consistent with the modeling procedures WILMAPCO and DelDOT have used assisting in the preparation of various SIP documents with the Delaware Department of Natural Resources and Environmental Control (DNREC).

Travel Demand Modeling

A travel demand model for Delaware, including New Castle County, is maintained by DelDOT. The model applies a variety of data regarding roadway network conditions, vehicular travel patterns, automobile ownership, and the location of population and employment sites. The model follows a five-step process of trip generation, distribution, mode split, assignment, and feedback that is commonly used throughout the transportation planning industry. The model components were processed through the CUBE Voyager software package. The primary products of the model used in the air quality analysis were estimated volumes and average speeds for each segment or "link" of the roadway system.

The modeling process developed for the FY 2020 - 2023 TIP and 2050 RTP used a 2015 base year network. Model networks were developed for the years 2020, 2030, 2040 and 2050 for New Castle County. Networks included major capacity improvement projects across the WILMAPCO region that are expected to be in place and open to service during these years. The types of projects tested included: roadway upgrades (such as new or improved shoulders), highway widening (one lane or more), and new construction.

Demographic projections, including employment, households, and population, were developed for each of the analysis years through the WILMAPCO Data & Demographic Subcommittee. WILMAPCO provided demographic projections for New Castle County, which were approved by the Delaware Population Consortium in 2017. WILMAPCO provided data for Cecil County was produced by the Maryland Department of Planning in 2015 (employment) and 2017 (population).

Travel estimates were developed for this conformity analysis using a so-called "five-step travel demand" modeling process. The approach includes trip generation, trip distribution, mode split, assignment, and feedback. This type of process is required by Federal air quality conformity regulations, and is a set of planning tools commonly used among MPOs and State DOTs.

The travel demand modeling process uses two sets of primary input data. The first is socio-economic data for Traffic Analysis Zones (TAZ) for the New Castle County MPO region. Since the modeling process maintained for WILMAPCO by the Delaware DOT (Division of Planning) uses a single, integrated model of the Delaware/Maryland portion of the Delmarva Peninsula, WILMAPCO staff have developed a subcommittee process to estimate and manage demographic data for the TAZ in New Castle County. This demographic data generally consists of:

1) Population
2) Dwelling Units
3) Total Employment by Place of Work
4) Employment by Job Sector, by Place of Work
5) Total Employed Persons (Employment by Place of Residence)
6) Average Income
7) Income Quartiles

8) Average Vehicle Ownership
9) Vehicle Ownership Quartiles

For each TAZ, data for each of these items was obtained from the most recent census and updated as needed to the base year of the long range plan. For this conformity analysis, that means data from the 2010 Census was used with other locally obtained information to develop a set of TAZ estimates for 2015. Employment by place of work is not a product of the US Census, but the WILMAPCO Demographics and Data Subcommittee used a series of local, county, and state-agency data sources to develop and achieve consensus on TAZ-based employment locations. The MPO subcommittee also developed demographic forecasts for each TAZ, for the horizon years of 2020, 2030, 2040, and 2050.

The second primary travel model input is the so-called "travel network" representation of New Castle County roadways and streets. The network file stores the following data for each street segment:

1) Functional Class (or road type)
2) Number of Lanes
3) Lane Capacity
4) Posted Speed
5) Operating Speed
6) Average Peak Period Capacity (Lanes X Lane Capacity)

The current set of DelDOT/MPO travel demand models is typical of advanced TAZ-based travel models in use in the United States. DelDOT staff (with assistance from Whitman, Requardt and Associates, an engineering consulting firm) estimated these models using data from the 1997 – 2011 Delaware Travel Monitoring Survey (DTMS). The current TAZ-based models are referred to as "aggregate demand models" because they are applied at an aggregate, zonal level with extensive market segmentation.

DTMS data for 2012 - 2015 has not been analyzed at this time and is therefore not yet a part of the DelDOT/MPO travel model process.

The trip generation models include a precursor step, which disaggregates TAZ-based household data using workers per household, persons per household, and vehicles per household data from US Census PUMS, then applies cross classification-based trip generation rates to estimate productions and attractions for each TAZ, for several trip purposes including:

1) Home-Based Work (HBW)
2) Home-Based Local Shopping (HBLS)
3) Home-Based Regional Shopping (HBRS)
4) Home-Based Other (HBO)
5) Non-Home Based (NHB)
6) Journey-to-Work (JTW)
7) Journey-at-Work (JAW)

8) Trucks

The trip distribution models are standard gravity model formulations using trip length frequencies for each trip purpose based on analysis of the entire 1997 – 2011 DTMS dataset.

The mode choice model used by DelDOT and the MPOs is a nested logic choice format. Non-motorized trips (separate modes for bicycle and walk) are included as an option in certain sets of model runs that are based on tax-parcel TAZ geography. Non-motorized trips are not currently modeled in the TAZ-based regional modeling process used for county-based conformity analyses.

The trip assignment procedures use network capacity-constrained equilibrium methods, which emphasize average weekday peak period congestion levels to allocate roadway volumes and speeds by time period of day. Four peak period times are used: AM, Midday, PM, and Offpeak. The process uses customized speed-flow delay curves representing freeway, arterial, collector, and local speeds separately.

The model process methods, as required by conformity regulations, incorporate full feedback from trip assignment back through trip distribution. The travel model was run in the CUBE Voyager software package (Version 6.4.3 of the software dated Oct 6, 2017) under license from the vendor, Citilabs (http://www.citilabs.com/).

Summary

The modeling process for this conformity analysis used a 2015 base year network. Model networks were developed for 2020, 2030, 2040, and 2050 for New Castle County and for the Delaware/Maryland peninsula counties within the DelDOT/MPO "Peninsula Travel Model." Modeled transportation projects are listed in Table 1. The types of projects tested were corridor improvements, highway widening, and new roadway construction. Each project was added to the network in the year when the improvement was completed. Socioeconomic projects such as population, employment, and household size were developed for the same planning horizon years.

Table 1: Cecil and New Castle Counties' Regionally Significant Projects

Project	County	List	Model Year
I-95/Belvidere Road Interchange (new expressway interchange)	Cecil	Aspiration	2030
I-95: Susquehanna River to DE Line (add a lane in each direction, plus bridge expansion	Cecil	Constrained	2040
I-95/SR 222 Interchange (two to four lanes on the SR 222 bridge)	Cecil	Constrained	2040
MD 222: US 40 to MD 276 (multilane reconstruction)	Cecil	Aspiration	2040
MD 213: Frenchtown Road to US 40 (two to four lane divided highway)	Cecil	Aspiration	2050
MD 272: US 40 to Lums Rd. (two to four lane divided highway)	Cecil	Constrained	2050
US 301: MD State Line to SR 1 (new four lane expressway)	NCC	Constrained	2020
Christina River Bridge (new bridge)	NCC	Constrained	2030
SR 72, McCoy Road to SR 71 (two to four lanes)	NCC	Constrained	2030
Road A / SR 7 Improvements (new lane in each direction)	NCC	Constrained	2030
SR 299, SR 1 to Catherine Street (widening)	NCC	Constrained	2030
Elkton Road, Maryland State Line to Casho Mill Road (widening)	NCC	Constrained	2030
SR 141/I-95 Interchange (expansion)	NCC	Constrained	2030
US 301: Spur (new two lane road)	NCC	Constrained	2030
US 40/SR 896 (grade separated intersection)	NCC	Constrained	2030
SR 896/I-95 Interchange (expansion)	NCC	Constrained	2030
SR 896/Bethel Church Road Interchange (expansion)	NCC	Constrained	2030
US 40 Widening: Salem Church Road to Walther Road	NCC	Constrained	2030
SR 1: Tybouts Corner to SR 273 (four to six lanes)	NCC	Constrained	2030
SR 4 (Christina Parkway): SR 2 to SR 896 (widening entire lengh 2 to 4 lanes)	NCC	Constrained	2030
Boyds Corner Road: Cedar Lane Road to US 13 (two to four lanes)	NCC	Constrained	2030
Center Boulevard extended to Churchmans Road	NCC	Constrained	2030
Eagle Run Road: SR 273 to SR 7 (complete road for thru traffic)	NCC	Constrained	2030
Tyler McConnell Bridge, SR141: Montchanin Road to Alapocas Road (bridge expansion	NCC	Constrained	2040
I-295 Northbound: SR 141 to US 13 (add third lane)	NCC	Constrained	2040
Eagle Run Road to Continental Drive Connector	NCC	Constrained	2040
US 40/SR 7 Grade Separated Intersection	NCC	Constrained	2040
SR 1: Tybouts Corner to Roth Bridge (widening)	NCC	Constrained	2050
SR 896: US 40 to I-95 (widening to six lanes)	NCC	Constrained	2050

Emission Factor Estimate

EPA's Office of Transportation and Air Quality (OTAQ) developed the **MO**tor **V**ehicle **E**mission **S**imulator (MOVES) modeling software. Initial draft versions of the software were released in 2009. This is the required modeling software used in regional or countywide air quality analyses including transportation conformity analyses. MOVES 2014b has been used for this conformity analysis and it is the latest approved model version for transportation conformity purposes.

MOVES estimates emissions for mobile sources covering a broad range of mobile source pollutants and allows multiple scale analysis. The MOVES software produces estimates of emissions from cars, trucks and motorcycles.

Figure 3 presents an overview of the process used to generate travel model and emissions model data for this conformity analysis. The travel model software, CUBE Voyager, was arranged by DelDOT staff with consultant assistance to include the DNREC "MOVES inventory method" for estimating mobile source emissions in New Castle County. That process was incorporated, step-by-step, into the CUBE Voyager software so that conformity analysis process is based directly on the DNREC application of the MOVES inventory method. A series of quality-control checks were performed by DelDOT and the consulting firm staff ensuring the CUBE-model generated emissions data accurately replicated the DNREC spreadsheet method.

Travel model link volumes are summed to countywide totals. Adjustment factors are then used to account for seasonal traffic variations and alignment of Delaware-based Vehicle Miles Traveled (VMT) estimates with the federally-required Highway Performance Management System (HPMS). HPMS data are used to standardize the Delaware specific VMT data as required by the EPA so that direct comparisons can be made among different years and modeling scenarios.

Figure 1: Overview of the Travel and Emissions Models for Conformity

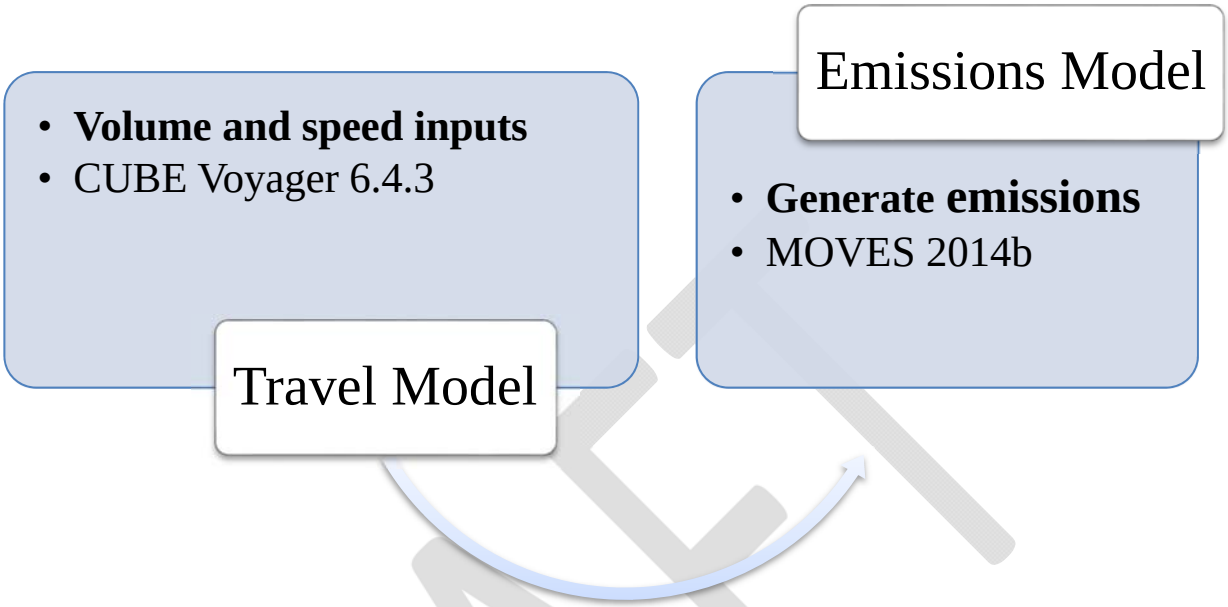
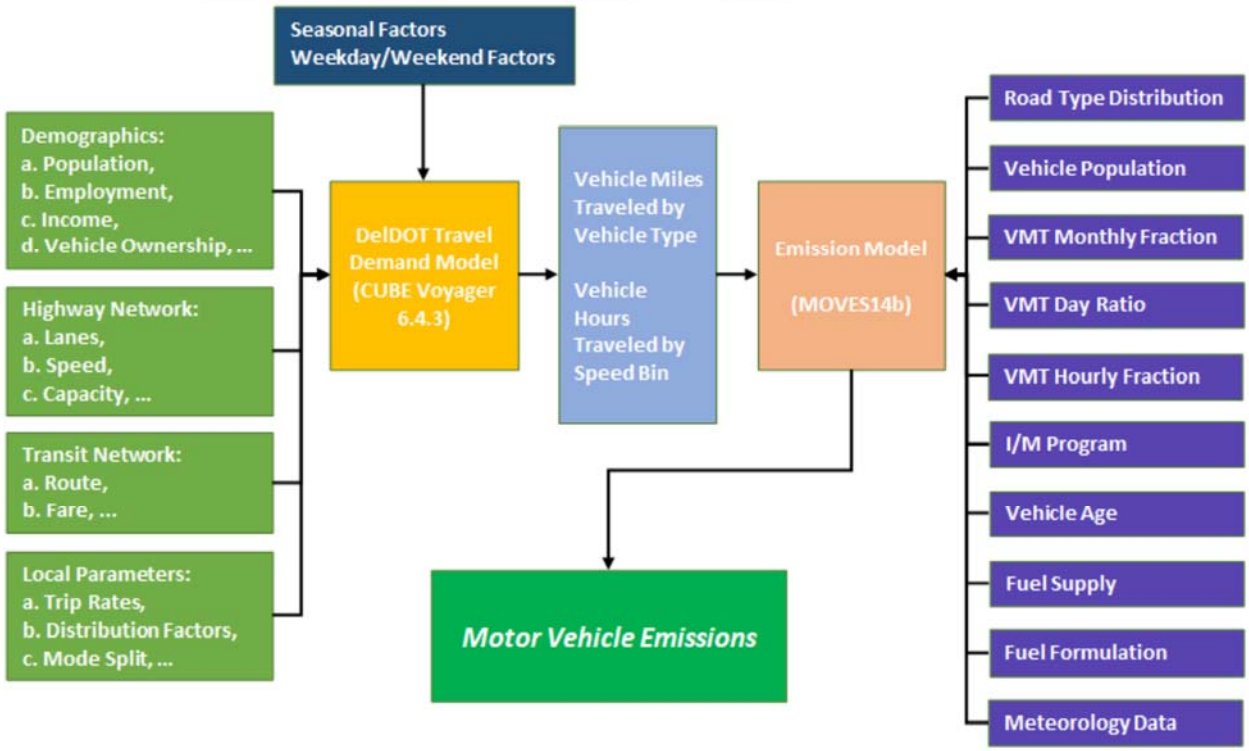


Figure 2: Detail: Travel and Emissions Models for Conformity



Mobile Source Emissions Estimates

The estimates of emissions for New Castle County are generated jointly by DelDOT and DNREC. The model post-processor takes data produced by CUBE Voyager model output for New Castle County and adjusts it for input into the MOVES mobile emissions process noted above. This process links the estimated roadway speeds and volumes generated by the travel demand model with emission trends derived from MOVES. The product of this process is countywide emission estimates presented in this document.

VMT data are adjusted to align with data in the SIPs. The adjustments account for seasonal traffic variations and to align the travel demand estimates with DelDOT's and the HPMS traffic level reporting system. These data were used to standardize the Delaware specific VMT data as required by the EPA so that direct comparisons can be made among different years and modeling scenarios.

Similarly, the vehicle population data is adjusted based on the DMV vehicle registration data.

Analysis Results

The results of the motor vehicle emissions budget tests are presented below in Tables 2 and 3 and 4. Table 2 presents the results of the budget tests for ozone emissions. Tables 3 and 4 present the results of the baseline and budget tests for PM2.5 emissions. All baselines and budget tests pass, which demonstrates conformity.

Table 2: Ozone (VOC & NOx) Emissions Test Results – MVEB Test (tons/summer weekday)

VOC (tpsd)	2020	2030	2040	2050
Emissions	3.97	2.19	1.64	1.61
2009 Budget	9.89	9.89	9.89	9.89
Result	Pass	Pass	Pass	Pass

NOx (tpsd)	2020	2030	2040	2050
Emissions	7.78	3.31	2.37	2.47
2009 Budget	19.23	19.23	19.23	19.23
Result	Pass	Pass	Pass	Pass

Table 3: Annual PM2.5 Emissions Test Results – MVEB Test (tons/year)

Direct PM2.5 (tpy)	2020	2030	2040	2050
Emissions	98.39	61.66	54.14	58.16
2012 Budget	199.0	199.0	199.0	199.0
Result	Pass	Pass	Pass	Pass

Indirect (NOx) PM2.5 (tpy)	2020	2030	2040	2050
Emissions	2,793	1,224	907	946
2012 Budget	6,273	6,273	6,273	6,273
Result	Pass	Pass	Pass	Pass

Table 4: Daily PM2.5 Emissions Test Results – MVEB Test (tons/day)

Direct PM2.5 (tpd)	2020	2030	2040	2050
Emissions	0.270	0.169	0.148	0.159
2012 Budget	0.545	0.545	0.545	0.545
Result	Pass	Pass	Pass	Pass

Indirect (NOx) PM2.5 (tpd)	2020	2030	2040	2050
Emissions	7.65	3.35	2.48	2.59
2012 Budget	17.19	17.19	17.19	17.19
Result	Pass	Pass	Pass	Pass

Description of Input Data

Many inputs to MOVES are needed to fully account for the numerous vehicle and environmental parameters that affect emissions. These include traffic flow characteristics, vehicle descriptions, fuel parameters, inspection/maintenance (I/M) program parameters, and environmental variables. MOVES includes a default national database of meteorology, vehicle fleet, vehicle activity, fuel, and emissions control program data for every county; but EPA cannot certify that the default data is the most current or best available information for any specific area. As a result, local data is recommended for use when completing a regional conformity analysis. Local data sources are used for all inputs that have a significant impact on calculated emission rates. These data items are discussed in the following sections.

Roadway Data

The emission calculation process uses key traffic data from the regional travel demand model to estimate regional Vehicle Miles Traveled (VMT) and speeds. This data includes individual roadway traffic volumes and physical roadway descriptive characteristics including area type, facility type, lanes, distances, capacity, and free-flow speeds. Travel demand model runs are produced for future analysis years and include the impact of regionally significant transportation projects. The model provides a key resource for estimating the impact of population and employment growth on roadway volumes and calculating the diversions due to transportation projects.

VMT was determined for each roadway class/setting by multiplying the length of road by the number of vehicles using the road per day. Additional adjustments to VMT included: seasonal adjustment factors reflecting traffic variation within the spring, summer, fall, and winter months (derived from permanent count station monitoring), and, Highway Performance Monitoring System (HPMS) adjustments used to align annual VMT estimates with HPMS reported totals for the base year.

Speed data was calculated for each highway segment and hour of the day, based on roadway capacity, traffic volume, and other physical roadway features (e.g. traffic signals). Thus, the travel demand model provided VMT according to the speed bins required by the MOVES software, thereby accounting for certain physical highway conditions and congestion caused by traffic volume. A speed bin is essentially an increment of speed range; for example: “VMT for the 30-35 mph range”. For future horizon years, congestion (and thereby speed) can be affected by traffic growth and changes in physical conditions due to planned transportation improvements and other projects assumed to be “in-service” in horizon years.

Vehicle Class Data

Emission rates within MOVES vary significantly by vehicle type. The MOVES model produces emissions and rates by thirteen MOVES vehicle source types. However, VMT is input into MOVES by five HPMS vehicle groups. MOVES14b requires that VMT for any 2-axle, 4-tire vehicle weighting less than 10,000 lbs – regardless of wheelbase length – is entered together. The new HPMSVtypeID 25 (short + long wheelbase light-duty vehicles)

in MOVES2014b replaces both HPMSVtypeID 20 (passenger car) and HPMSVtypeID 30 (other 4-tire trucks) in MOVES2010b.

For this emissions analysis, vehicle type pattern data was developed for New Castle County by functional class based on DelDOT (DMV) vehicle registration report, R45CAM07. The vehicle data included in report R45CAM07 are classified to 16 MOBILE6 categories. They were converted to the 13 MOVES soucetype (vehicle type) using the factors contained in the EPA's tool "VMT-Converter-road-veh16-20100209.xls".

The impact of trucks on traffic flow is accounted for within the travel demand modeling process. A heavy truck weight factor is used by functional class to adjust the rates at which increasing numbers of vehicles (congestion) cause average traveling speeds to drop. This effect generally is due to larger trucks taking up more roadway space than a given number of cars and also tend to have slower average traveling speeds than cars for most functional classes. The final loaded speeds from the travel model (used to define which speed bin a given road segment's VMT is placed in) reflect this truck adjustment.

Vehicle Age

Vehicle age distributions were input to MOVES for the county by the thirteen source types. The age distributions reflect the percentage of vehicles for each model year in the fleet up to 31 years old. The vehicle age distributions were prepared by DNREC DAQ based on information obtained from DMV registration data.

The base year vehicle age distributions for this conformity analysis were based on 2012 DMV registration data. In the late summer of 2012, DNREC DAQ staff transformed DMV raw data for a July 1, 2012 summary of vehicle age data into MOBILE6.2-16 composite vehicle type system using a spreadsheet method. The future year vehicle age distributions were estimated using the EPA's "Age Distribution Projection" tool for MOVES14 based on the base year data.

Vehicle Population Data

Vehicle fleet information such as the number and age of vehicles has an impact on the forecasted start and evaporative emissions within MOVES. The MOVES model requires the number of vehicles (called "vehicle population") to be defined for each of the thirteen source type categories, for each year emissions estimates are needed including future horizon years. This data was prepared and provided by DelDOT's travel demand and air quality modeling consulting firm using a spreadsheet.

For the analysis years 2020, 2030, 2040, and 2050, the vehicle populations were estimated for New Castle County by developing a growth factor based on the projected increase in total countywide vehicles from 2012 to each horizon year. WILMAPCO staff and the Data and Demographics Subcommittee (DDS) use 2010 Census-based data for vehicles per person and vehicles per household (for each traffic analysis zone) to develop TAZ-based estimates of future year vehicles. To generate future year vehicle populations needed for MOVES (for each horizon year), the TAZ based estimates (again, for each horizon year)

were summed and averaged to a countywide growth factor that was then applied to the 2012 age distribution data described above.

Environmental and Fuel Data

Information on environmental, fuel, vehicle technology, and other control strategy assumptions were determined based on a review of MOVES2014b default information by DNREC DAQ.

Fuel Data: DNREC DAQ used the fuel formulation and supply data that has been assigned to New Castle County, Delaware by the EPA in the MOVES model. The EPA obtains data on all fuel shipments from the refineries in the Delaware area and develops the formulations based on these data. Data inputs include fields such as: ethanol content, sulfur content, aromatic content, benzene content, olefin content, Methyl Ter-Butyl Ether (MTBE) volume, Ethyl-tertiary-butyl-ether (ETBE) volume, and Tertiary-amyl-methyl-ether (TAME) volume.

Meteorological Data: Evaporative emissions are influenced significantly by the temperatures of the surrounding air. DNREC used the data from the New Castle County Airport to generate the temperature and humidity values. These values are presented as month-by-month, hourly data sets for New Castle County.

Other Vehicle Technology and Control Strategy Data

The MOVES2010b default I/M data was reviewed and updated by DNREC DAQ for New Castle County. The current I/M program known as the Vehicle Emission Inspection Program (VEIP) was utilized for these analysis runs and is described below.

DE Vehicle Emission Inspection Program: This program tests the following gasoline-powered and diesel-powered vehicles: model year 1968 and newer light duty passenger cars, as well as 1970 and newer light duty trucks up to 8,500 pounds. The test is done biennially and on change of ownership. There is a seven-year grace period for new vehicles. In New Castle County, 1996 and newer light duty vehicles subject to the regulation receive an On-board Diagnostics (OBD) II test. Model year 1968-1980 vehicles subject to the regulation receive an idle test; those of model year 1981-1995 receive a two-speed idle test. In addition, model year 1975-1995 vehicles receive a tank and cap pressure test. Finally, all 1975 and newer light duty vehicles in New Castle County subject to this regulation receive a visual inspection of the catalytic converter. The compliance factors reflect the fail and waiver rates observed in the program, combined with an assumed 96% compliance rate for vehicles showing up for testing.

Federal Programs: Current federal vehicle emissions control and fuel programs are incorporated into the MOVES2014b software. These include the National Program standards covering model year vehicles through 2016. Modifications of default emission rates are required to reflect the implementation of the National Low Emission

Vehicle Program (NLEV) program in Delaware. To reflect these impacts, EPA has released instructions and input files that can be used to model these impacts. This inventory utilized the August 2010 version of the files:

- http://www.epa.gov/oms/models/moves/tools.htm
- https://www.epa.gov/emission-standards-reference-guide/all-epa-emission-standards

State Vehicle Technology Program:
DE Clean Car Program: Under the Delaware Low Emission Vehicle Program, 7 DE Admin Code 1140, which was revised December 2013, Delaware required manufacturers of 2014 model year vehicles to comply with Non-Methane Organic Gas (NMOG) emission requirements and California Low Emission Vehicle (LEV II) phase-in requirements. The regulation also requires manufacturers of 2015 and subsequent model year vehicles to comply with NMOG plus NOx emission requirements, as well as California LEV III phase-in requirements. Zero emission vehicles are currently not required by this regulation. California adopted the Low-Emission Vehicle regulation entitled LEV III (third generation low emission vehicle standards) in March 2012. These amendments create more stringent emission standards for new motor vehicles. These new standards will be phased-in over the 2015-2025 model years.

The impacts of this program were modeled for all analysis years using EPA's guidance document, *Instructions for Using LEV and NLEV Inputs for MOVES14*. EPA provided input files to reflect the CAL LEV III program with the standard phase-in schedules for new emission standards. Modifications to those schedules were done per EPA's instructions, to reflect a later start for the State of Delaware beginning with vehicle model year 2014.

2050 RTP and FY 2020 – FY 2030 TIP Conformity Determination

Financial Constraint

The planning regulations, Sections 450.322(b) (11) and 450.324(e) require the transportation plan to be financially constrained while the existing transportation system is being adequately operated and maintained. Only projects for which construction and operating funds are reasonably expected to be available are included. WILMAPCO has developed an estimate of the cost to maintain and operate existing roads and bridges in the MPO area and has compared that with the estimated revenues and maintenance needs of the new roads. As shown in the RTP, WILMAPCO has found that the projected revenues are sufficient to cover the costs; therefore, satisfying the financial constraint requirement.

Public Participation

This conformity document has undergone the public participation requirements set forth in the Final Conformity Rule, and Final Statewide / Metropolitan Planning Rule. The draft analysis was made available for public review and comment beginning on January 14, 2019 and ending on March 6, 2019. The public review and comment period was announced using the following outlets:

- Notices in the Delaware News Journal and Cecil Whig
- WILMAPCO website (www.wilmapco.org)
- WILMAPCO E-NEWS (monthly electronic newsletter)
- WILMAPCO Transporter (quarterly newsletter)
- Public Workshop on February 7, 2019 at the Newark STAR Tower Atrium in Newark, Delaware

The documentation of the observed 30-day public comment period can be found in Appendix G of the TIP.

Appendices

Appendix A

Conformity Question Checklist

Table A-1: Conformity Questions Matrix

SECTION OF 40 CFR PART 93	CRITERIA	YES / NO	COMMENTS
GENERAL CRITERIA APPLICABLE TO BOTH PLAN AND TIP			
93.11	Are the conformity determinations based upon the latest planning assumptions ?	Yes	The conformity determination uses the most recent available information including recent demographics and vehicle registration.
	(a) Is the conformity determination, with respect to all other applicable criteria in §§93.111 - 93.119, based upon the most recent planning assumptions in force at the time of the conformity determination?	Yes	Population, housing and land use data inputs for the Travel Demand Model were updated in 2017. Extrapolated vehicle fleet data using a 2012 base year was utilized in the conformity determination.
	(b) Are the assumptions derived from the estimates of current and future population, employment, travel, and congestion most recently developed by the MPO or other designated agency? Is the conformity determination based upon the latest assumptions about current and future background concentrations?	Yes	Transportation demand end emissions modeling assumptions are developed by the DE Dept of Transportation in conjunction with WILMAPCO and other local, state and federal representatives as part of the consultation process. Standard procedures for projecting future demographics are outlined in the Plan.
	(c) Are any changes in the transit operating policies (including fares and service levels) and assumed transit ridership discussed in the determination? **(d)** The conformity determination must include reasonable assumptions about transit service and increases in transit fares and road and bridge tolls over time.	Yes	Reasonable assumptions have been made with regard to transit fares and operating policies (fare and service levels). Changes to transit policy and tolling may occur during the duration of the Plan. However, these cannot be predicted. Therefore, the model assumes they will remain constant during the life of the Plan.

SECTION OF 40 CFR PART 93	CRITERIA	YES / NO	COMMENTS
	(f) Key assumptions shall be specified and included in the draft documents and supporting materials used for the interagency and public consultation required by §93.105.	Yes	Key planning assumptions are included and explained in the conformity determination document and agreed upon by all participating parties through the interagency consultation process. The conformity document has been made available for public review for the required 30 day period.
93.111	Is the conformity determination based upon the latest emissions model?	Yes	EPA's latest emission model, MOVES, was used for this conformity analysis.
	Did the MPO make the conformity determination according to the consultation procedures of the conformity rule or the state's conformity SIP?		WILMAPCO conducted the conformity determination in accordance with the consultation procedures of the conformity rule.
TRANSPORTATION PLAN			
93.106(a) (1)	Are the Horizon Years correct?	Yes	Analysis horizon years included 2020, 2030, 2040 and 2050. These represent the appropriate horizon years for the 8-hour ozone and PM2.5 NAAQS conformity determination.
93.106(a) (2)(i)	Does the plan quantify and document the demographic and employment factors influencing transportation demand?	Yes	Socioeconomic data including population, retail and non retail employment and number of house-holds are included in the body of the conformity document
93.106(a) (2)(ii)	Is the highway and transit system adequately described in terms of the regionally significant additions or modifications to the existing transportation network which the transportation plan envisions to be operational in the horizon years?	Yes	The regional modifications to the highway and transit systems are documented within the conformity determination report and included in the emissions analysis.
93.108	Is the Transportation Plan Fiscally Constrained?	Yes	The transportation plan is in complete agreement with the State's FY 2019 to 2024 Capital Improvement Plan.
93.113(b)	Are TCMs being implemented in a timely manner?	N/A	There are no TCMs included in the Plan.
93.118	For Areas with SIP Budgets:Is the Transportation Plan, TIP or Project consistent with the motor vehicle emissions budget(s) in the applicable SIP?	Yes	Emission totals calculated for each analysis years were tested against the 2009 SIP budgets for ozone and the 2012 PM2.5 budget.

Appendix B

Conformity Results
Detailed VMT and Emissions
By County
By Functional Class
By Analysis Year

New Castle County Annual PM2.5 and Nox Emission (Tons) - 2018 Run

Month	2015			2020			2030			2040			2050		
	VOC	NOx	PM25	VOC	NOx	PM25	VOC	NOx	PM25	VOC	NOx	PM25	VOC	NOx	PM25
1	198.62	387.33	12.25	132.43	226.12	8.09	82.50	100.92	4.72	67.44	77.82	4.04	66.91	80.85	4.29
2	179.80	385.20	11.97	119.36	224.29	7.96	74.09	99.10	4.69	60.19	76.15	4.06	59.80	79.32	4.34
3	181.63	391.90	11.52	122.48	228.91	7.87	73.18	102.49	4.80	60.30	76.90	4.17	59.66	80.06	4.46
4	166.88	407.81	11.42	110.99	237.48	8.06	64.47	104.35	5.11	51.37	77.07	4.51	50.76	80.46	4.85
5	173.46	413.81	11.66	117.16	242.06	8.38	67.59	105.85	5.39	52.53	77.51	4.77	51.71	80.95	5.14
6	173.40	384.81	11.09	115.26	223.37	8.09	64.04	95.32	5.29	48.14	68.42	4.72	47.21	71.45	5.10
7	180.91	380.23	11.15	120.07	220.50	8.14	66.39	93.77	5.33	49.72	67.09	4.75	48.68	69.98	5.14
8	176.81	403.93	11.44	117.77	234.63	8.34	65.69	100.36	5.45	49.52	72.19	4.86	48.58	75.41	5.25
9	166.53	385.31	10.93	111.24	224.13	7.95	62.38	96.22	5.18	47.20	69.49	4.62	46.31	72.60	4.99
10	175.86	409.15	11.68	119.49	240.19	8.30	70.01	106.23	5.28	55.33	78.43	4.64	54.53	81.80	4.98
11	178.89	412.53	12.17	119.38	241.68	8.38	70.70	108.34	5.16	58.12	81.07	4.47	57.62	84.44	4.79
12	196.62	426.74	13.18	129.61	249.38	8.84	79.86	110.71	5.25	64.62	84.84	4.53	64.19	88.27	4.82
Total	**2149.41**	**4788.73**	**140.47**	**1435.24**	**2792.75**	**98.39**	**840.92**	**1223.65**	**61.66**	**664.50**	**907.00**	**54.14**	**655.97**	**945.59**	**58.16**

New Castle County Summer Weekday Ozone & PM2.5 Emission (Tons) - 2018 Run

Month	2015			2020			2030			2040			2050		
	VOC	NOx	PM25	VOC	NOx	PM25	VOC	NOx	PM25	VOC	NOx	PM25	VOC	NOx	PM25
6	6.01	13.54	0.40	3.98	7.85	0.29	2.20	3.34	0.19	1.65	2.39	0.17	1.62	2.50	0.19
7	6.06	12.94	0.39	4.00	7.50	0.28	2.20	3.18	0.19	1.64	2.27	0.17	1.61	2.37	0.18
8	5.93	13.75	0.40	3.93	7.98	0.29	2.18	3.40	0.19	1.64	2.44	0.17	1.61	2.55	0.19
Average	**6.00**	**13.41**	**0.39**	**3.97**	**7.78**	**0.29**	**2.19**	**3.31**	**0.19**	**1.64**	**2.37**	**0.17**	**1.61**	**2.47**	**0.19**

Table B-2: VMT by Vehicle Type

New Castle County Annual VMT by Vehicle Type - 2018 Run

HPMSVTypeID	2015 HPMS Annual VMT	2020 HPMS Annual VMT	2030 HPMS Annual VMT	2040 HPMS Annual VMT	2050 HPMS Annual VMT
Motorcycles	41,499,492	44,190,356	48,526,932	52,882,178	58,039,934
Light Duty Vehicles	5,480,965,214	5,836,355,867	6,409,100,813	6,984,311,447	7,665,512,218
Buses	34,760,801	37,014,722	40,647,125	44,295,165	48,615,405
Single Unit Trucks	52,326,123	55,718,996	61,186,924	66,678,391	73,181,734
Combination Trucks	140,872,625	150,006,931	164,727,711	179,511,865	197,020,194
Total	**5,750,424,255**	**6,123,286,872**	**6,724,189,505**	**7,327,679,046**	**8,042,369,485**

New Castle County Vehicle Population - 2018 Run

sourceTypeName	2015 SourceType Population	2020 SourceType Population	2030 SourceType Population	2040 SourceType Population	2050 SourceType Population
Motorcycle	13,354	13792	14406	14661	14636
Passenger Car	236,569	244330	255204	259734	259286
Passenger Truck	153,604	158643	165704	168645	168354
Light Commercial Truck	50,545	52203	54526	55494	55398
Intercity Bus	191	197	206	210	209
Transit Bus	573	592	618	629	628
School Bus	946	977	1021	1039	1037
Refuse Truck	75	78	81	83	83
Single Unit Short-haul Truck	3,059	3159	3300	3358	3353
Single Unit Long-haul Truck	216	223	233	237	236
Motor Home	375	387	404	411	411
Combination Short-haul Truck	1,183	1222	1276	1299	1296
Combination Long-haul Truck	889	918	959	976	974
Total	461,578	476,720	497,938	506,776	505,901

Table B-3: Vehicle Population

New Castle County Average Daily VMT by Functional Classification - 2018 Run

Functional Class	2015 HPMS Adjusted VMT	2020 HPMS Adjusted VMT	2030 HPMS Adjusted VMT	2040 HPMS Adjusted VMT	2050 HPMS Adjusted VMT
freeway-rural	1235119	1287266	1517322	1557677	1802045
PA-rural	259930	261,825	251,532	291,395	323,208
Minor Arterial-rural	386984	418,146	418,455	494,424	524,566
Major collector-rural	264258	284,062	295,415	372,200	423,689
minor collector-rural	86150	96,889	118,367	142,073	155,958
local-rural	178693	186,174	211,439	270,062	298,328
interstate-urban	3700787	3,854,412	4,312,382	4,697,756	5,048,683
freeway-urban	1079488	1,226,033	1,824,772	1,953,709	2,174,781
PA-urban	3952908	4,104,116	3,873,743	4,180,213	4,385,677
Minor Arterial-urban	1634396	1,655,256	1,728,856	1,849,975	1,998,074
Major collector-urban	1154456	1,209,181	1,282,038	1,406,764	1,488,175
minor collector-urban	54942	57,543	44,697	51,298	54,881
local-urban	1766477	2,089,391	2,543,419	2,753,434	3,355,825
Total	15754588	16,730,294	18,422,437	20,020,980	22,033,890

Table B-4: VMT by Functional Classification

Appendix C

Interagency Consultation

For a collection of meeting notes, please visit:

wilmapco.org/aqs

Appendix D

Public Participation Materials

Please visit:

wilmapco.org/rtp

wilmapco.org/tip

wilmapco.org/aq