Air Quality Report

Rhode Island Transportation Conformity Air QualityAnalysis

2013-2016 Transportation Improvement Program

Prepared for **Rhode Island Department of Administration**
Statewide Planning Program
Providence, Rhode Island

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Acknowledgements

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- Rhode Island Statewide Planning Program
- Rhode Island Department of Transportation
- Rhode Island Public Transit Authority
- Rhode Island Department of Environmental Management
- Federal Highway Administration
- Federal Transit Administration
- United States Environmental Protection Agency
- Vanasse Hangen Brustlin, Inc.

Many individuals from these agencies and firms also contributed with "behind the scenes" technical and administrative efforts, as well.

Executive Summary

As part of its transportation planning process, The State of Rhode Island has conducted an air quality analysis for the 2013-2016 TIP as part of its transportation planning process. The air quality analysis included a statewide analysis for ozone. The results of the air quality analyses demonstrate that Rhode Island's 2013-2016 TIP meets the federal transportation conformity requirements.

In response to the Federal Highway Administration (FHWA) and Environmental Protection Agency (EPA) guidance, Rhode Island has made substantial improvements in the calculation of on-road air quality emissions for this Transportation Improvement Program.

The general modeling process involved two major inputs, traffic and emission factor data. The traffic data were obtained from the Rhode Island Statewide Model (RISM). The RISM was updated to include additional roadways, modeling zones, and current planning assumptions. Consistent with federal guidance, the model's traffic data were adjusted to account for the following factors, Highway Performance Monitoring System, seasonal adjustment for pollutants, and peak and off-peak period speed characteristics.

The vehicle emission factors were derived using the EPA's latest mobile source emission factor model, MOBILE 6.2, and reflect Rhode Island-specific conditions, such as the vehicle registration distribution and the statewide Inspection and Maintenance (I/M) Program. The traffic and emission factor data were calculated on a link-by-link basis in the EPA's Air Information Retrieval System (AIRS) format, which is consistent with air quality analyses for previous Transportation Improvement Programs (TIPs).

The results of the air quality analyses demonstrate that, statewide, the 2013-2016 TIP emissions are below the 2009 Rhode Island State Implementation Plan's mobile source emission budgets of 22.75 tons per day (tpd) of volatile organic compounds and 25.29 tpd of oxides of nitrogen for all future years.

1.0 Background

1.1 Transportation Conformity Process

The federal Clean Air Act Amendments (CAAA) requires that states develop State Implementation Plans (SIPs) for improving and maintaining air quality. These plans state that evaluations must be made for the potential reduction of Volatile Organic Compounds (VOCs), Oxides of Nitrogen (NO_X), and Carbon Monoxide (CO). States must also submit several revisions of the SIP towards the finalization of the reduction evaluation. The requirements of the CAAA established significant new challenges to transportation and air quality modelers to improve traffic and emission estimates from on-road mobile sources. These challenges include projecting emission inventories for the SIP process and calculating the changes in emissions from Transportation Improvement Programs (TIPs) and Transportation Plans.

The transportation conformity of TIPs and Plans is required by the CAAA section 176(c) (42 U.S.C. 7506(c)) to ensure that federal funding and approval are given to highway and transit projects that are consistent with the air quality goals established by the Rhode Island SIP. Transportation Conformity means that highway and transit activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the National Ambient Air Quality Standards (NAAQS).

The 1990 CAAA established new requirements for transportation plans, programs, and projects. The EPA published a final rule in the November 24, 1993 Federal Register (58 FR 62188) that finalized the procedures to be followed by the United States Department of Transportation (USDOT) in determining conformity of transportation plans, programs, and projects. The CAAA emphasizes that estimates of emissions from transportation plans and programs must be consistent with the SIP. This integration of transportation and air quality planning is intended to ensure that the mobile source emission budgets established in the SIP are enforced. The conformity regulations require that nonattainment and maintenance areas prepare air quality analyses for TIPs and Transportation Plans for key CAAA years. The CAAA define a "nonattainment area" as a locality where air pollution levels for one or more pollutants persistently exceed NAAQS. Maintenance areas were previously nonattainment areas, but now meet NAAQS.

Ozone is not emitted directly by mobile sources. It is formed in a complex chemical process that occurs when precursor emissions of VOCs and NO_X react in the presence of sunlight and heat. Because heat and sunlight are important factors in ozone formation, violations of the ozone standard occur almost exclusively during summer periods. While both pollutants (VOC and NO_X) play significant roles in ozone formation, previous EPA requirements have focused on reducing VOC as the most effective strategy to achieve the ozone standard. However, the CAAA of 1990

requires that states develop SIPs that evaluate reductions in both VOC and NO_X emissions. The mobile source emission factors and traffic data used to calculate on-road mobile source emissions must be adjusted to represent specific conditions during the pollutant season, for ozone (typically summer). The State of Rhode Island is in attainment for CO and therefore CO was not evaluated as part of the conformity assessment.

The 1990 Clean Air Act Amendments establish a new perspective in addressing ground-level ozone, one of the most significant air quality problems. One of the key features of the law is that it "classifies" nonattainment areas with similar pollution levels. The purpose of this classification system is to match pollution control requirements and attainment deadlines with the severity of an area's air quality problem. These classifications include moderate, serious, severe, and extreme. This system was designed to solve the nonattainment problems in the country by imposing a combination of prescribed measures dependent on the severity of the air quality problems, while giving the states ultimate responsibility and flexibility to solve the problem.

The entire state of Rhode Island has been classified as “Moderate” nonattainment area for ozone. This designation requires that the air quality analysis use the best available land use, traffic model, and emissions model to calculate yearly emission that can be compared to the SIP mobile source budgets.

The CAAA require states to submit numerous SIP revisions, which must include measures to reduce air pollutants. Several of these SIP revisions specifically address the mobile source contribution to the ozone problem. The first of these SIP revisions required the submission of a 1990 State Emissions Inventory composed of four segments; stationary point sources, stationary area sources, mobile sources, and biogenic sources. This inventory establishes the baseline for the CAAA-required reductions. A second required SIP revision called for the submission of the 1996 Rate of Progress report. This report demonstrated how Rhode Island would achieve a reduction of fifteen percent of its adjusted 1990 VOC emission levels (adjusted to reflect CAAA-required programs) by 1996.

On April 30, 2008, the Rhode Island Department of Environmental Management has submitted the Rhode Island 8-Hour Ozone Reasonable Further Progress SIP to EPA which contains projected 2008 and 2009 inventory and requested 2008 and 2009 mobile source emissions budgets. Currently, the mobile source emission budgets are for 2009.

It is clear that a substantial reduction in the mobile source component of the emissions inventory is necessary in order to meet the minimum reduction requirements of the CAAA. Congress recognized this and in the CAAA it expanded the U.S. DOT's and the EPA's responsibilities in assuring that transportation plans, programs, and projects respond to the goals of SIPs. This responsibility is reflected in the requirements for "Conformity."

In November 1993, EPA published a series of three amendments to it to clarify ambiguities, correct errors, or make the conformity process more logical. The first set of amendments aligned the dates of conformity lapses due to SIP failures with the application of Clean Air Act highway sanctions for certain ozone areas and all areas with disapproved SIPs with a protective finding. The second set of amendments allowed transportation control measures from an approved SIP to proceed during a conformity lapse; aligned the date of conformity lapses with the date of application of Clean Air Act highway sanctions for any failure to submit or submission of an incomplete control strategy SIP; extended the grace period before which areas must determine conformity to a submitted control strategy SIP; established a grace period before which transportation plan and program conformity must be determined in newly designated nonattainment areas; and corrected the NO_X provisions of the transportation conformity rule consistent with the Clean Air Act and previous commitments made by EPA. The third set of amendments gives state and local governments more authority in setting the performance measures used as tests of conformity and more discretion when a transportation plan does not conform to a SIP and it allows mobile source emission budgets in a submitted SIP to be used to determine conformity instead of the "build/no-build" test.

Rhode Island has submitted the 1990 Emissions Inventory, the Rate of Progress Plan for 1996, and the 2008 Rhode Island Attainment Plan for the 8-Hour Ozone NAAQS. The 2008 Attainment Plan demonstrates that Rhode Island will attain the 8-hour NAAQS by the end of the 2009 ozone season, as required by the CAAA. The demonstration of this effort is the redesignation to attainment. The criteria for evaluating redesignation requests are described in EPA's September 4, 1992 memorandum on "Procedures for Processing Request to Redesignate Areas to Attainment". The EPA requires that a nonattainment area meet the following criteria:

- The area must demonstrate that it has attained the NAAQS;
- The area must have implemented an approved SIP under Section 110(k) of the CAAA and must have met all relevant requirements under Section 110 and Part D of the CAAA;
- The air quality improvements that have resulted in attainment must be permanent and enforceable; and,
- The area must have a fully approved maintenance plan pursuant to Section 175A of the CAAA.

The most recent Rhode Island 2009 mobile source emission budgets are defined in the Rhode Island State Attainment Plan for the One-Hour Ozone National Ambient Air Quality Standard. The mobile source emission budgets for VOC and NO_X are shown in Table 1.

Table 1
Rhode Island Mobile Source Emission Budgets (Tons per Day)

Pollutant	2009 Budget
Volatile Organic Compounds	22.75
Nitrogen Oxides	25.29

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2.0 2013-2016 Transportation Improvement Program (TIP)

The 2013-2016 TIP is one part of Rhode Island's transportation planning process. The planning process includes the development of a long range transportation plan. The State Planning Council adopts the long range transportation plan, along with a state airport system plan, and a freight rail plan as elements of the State Guide Plan. As projects in these long range plans advance to implementation, they are programmed in the TIP for study, design, and construction, provided they attain environmental permits and other necessary clearances.

The purpose of the TIP is to set forth the state's short-term program for transportation projects. The TIP is prepared according to State Planning Council Rule IX, "Transportation Planning and Public Involvement Procedures." A Transportation Advisory Committee (TAC) works with the Statewide Planning Program in soliciting project proposals from the public and cities and towns, and in developing a draft TIP. Following public and agency review, the draft TIP is approved by the State Planning Council, and forwarded to federal funding agencies—the Federal Highway Administration, and the Federal Transit Administration.

Prior to final approval, projects in the draft TIP are subjected to the transportation air quality conformity analysis. Details on all projects included within the current or draft TIP are reviewed with state implementing agencies (RIDOT), and "regionally significant" projects included in the air quality analysis. The regionally significant projects that were included in the "Build" condition of the conformity modeling process for the 2013-2016 TIP are presented in Table 2.

Table 2
Federal Fiscal Year 2013-2016
Transportation Improvement Program Roadway Projects

Project	2015 Build	2025 Build	2035 Build
Apponaug Bypass - Transportation Improvements, Warwick		X	X
Reconstruction of Two Mile Corner (134/114), Middletown	X	X	X
Pell Bridge Ramps, Newport, Middletown		X	X
Main Street Conversion, Pawtucket	X	X	X

X-Indicates that the project was included in that year of analysis.

The following is a brief description of each of the regionally significant projects that were included in the conformity analysis:

- *Apponaug Bypass - Transportation Improvements, Warwick* : The Apponaug Bypass project includes the reconstruction o the Apponaug Circulator. The project includes changing one-way roadways to two-way, extending Veterans Memorial Drive around Apponaug Village and converting five signalized intersection to modern roundabouts, improving traffic operations and flow as well as pedestrian safety.
- *Reconstruction of Two Mile Corner (134/114), Middletown:* The Two Mile Corner project involves providing left-turns lanes on West Main Road, providing dual left turns on the Coddington Highway and East Main Road approaches to West Main Road, and converting Maple Avenue to right-out only, improving traffic operations and safety.
- *Pell Bridge Ramps, Newport, Middletown*: – The Pell Bridge Ramp project includes the reconfiguration of the ramps at the Pell Bridge Intersection on Aquidneck Island side to improve connections, traffic flow, traffic operations and improve safety.
- *Main Street Conversion, Pawtucket:* The Main Street Conversion project includes the conversion of Main Street from one-way to two-way between High Street and Broad Street to help reconnect the turnpikes so that downtown Pawtucket becomes an urban core once again.

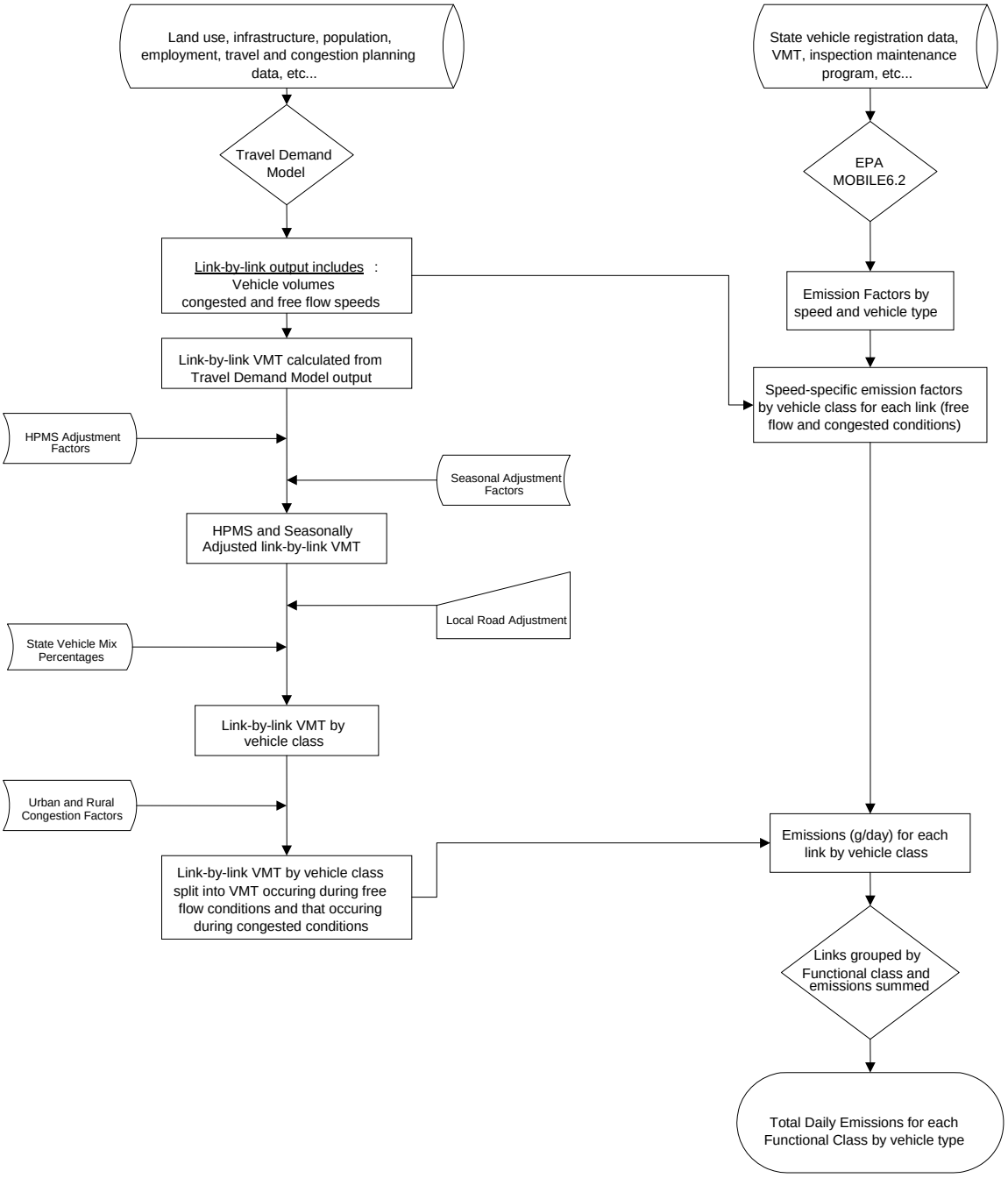
Regionally significant projects that have completed the NEPA process (i.e. already received a Record-of-Decision) are included in the No-Build Condition for all future years of analysis.

3.0 Methodology

3.1 General Modeling Process

The general modeling process utilized involved two major inputs: link-by-link traffic data from the Rhode Island Statewide Model (RISM) and emission factors derived using the EPA's MOBILE 6.2 emission factor model. The link-by-link traffic data includes daily vehicle volumes as well as free flow and congested speeds over each link. The vehicle volumes are combined with the link lengths in order to determine the daily vehicle miles traveled (VMT) over the link. The VMT is then multiplied by the appropriate speed-specific emission factors in order to arrive at the total daily emissions for each link. The final step is to group the links by functional class in order to arrive at the total daily emissions for each functional class. Figure 1 presents the general modeling process used.

Figure 1
General Modeling Process



4.0 Traffic Data

4.1 Travel Demand Model

Link-based travel demand models were used as the source of travel forecasts for determining on-road mobile emissions in the 2013-2016 TIP's air quality analyses. The models are capable of providing vehicle-miles-traveled (VMT) by functional classification, speed, direction, and time-of-day, resulting in more refined estimates than possible using the Highway Performance Monitoring System (HPMS). The application of a travel demand model to determine VMT also has the advantage of simulating 2013-2016 TIP projects that are not in the existing highway system.

The Rhode Island Department of Administration (DOA) updated the Rhode Island Statewide Model (RISM) in 2003. These updates include improving the roadway network, incorporating 2000 Census land use data (population, household, and employment) and updating the future land use data (population, household, and employment) based upon projections from DOA.

For the purpose of developing VMT estimates, the Rhode Island Statewide Model (RISM) was calibrated to current traffic conditions. A key calibration task was a comparison, by functional classification, to the HPMS data. Population and employment data were also updated based upon data supplied by the 2000 Census, the Massachusetts Statewide Model, the Connecticut Statewide Model, and forecasts from the Rhode Island Department of Administration. Employment forecasts were developed at the census tract level and population forecasts were developed at the town level. These data were allocated to reflect growth in land use activity and its location in the state.

The RISM model was built on a TransCAD software platform, version 2.0. There have been several new versions of the TransCAD software since then, which required conversion of data and a recording of all modeling procedures. The RISM model is now current in software version 4.8, and capable of generating VMT that are post-processed for input to the emissions model MOBILE 6.2.

The model features and characteristics follow:

- Network - the link-based network was built from the U.S. Census Topologically Integrated Geographic Encoding and Reference (TIGER) file. The network was recently updated to be geographically consistent with the official Rhode Island roadway layer. The 2013-2016 TIP projects were also coded into the network.

- Census Geography – As part of the latest model update, the traffic analysis zones (TAZs) are based on 2000 Census block group or smaller for Rhode Island, Connecticut, and Massachusetts. To improve model accuracy, particularly at external stations, communities surrounding Rhode Island were included in the TAZ structure. There are a total of 904 TAZs in Rhode Island, 286 TAZs in Massachusetts, and 67 TAZs in Connecticut.
- Socioeconomic Database - The land use was updated to match the 2000 Census data for population and households. In addition, existing 2000 Census tract employment numbers were incorporated into the current TAZ structure.
- Trip Generation - trip productions and attractions were estimated for TAZs by applying person trip rates from the 1999 National Cooperative Highway Research Program, Report 365: Travel Estimation Techniques for Urban Planning (NCHRP Report 365). This is an updated version of the 1989 National Cooperative Highway Research Program, Report 187: Quick Response Urban Travel Estimation Techniques and Transferable Parameters, (NCHRP Report 187). The NCHRP Report 365 differs considerably from NCHRP Report 187 and suggests the use of a cross-classification process rather than the regression techniques suggested in NCHRP Report 187. NCHRP Report 365 is generally regarded as the standard for a core model structure within the profession. The quick response system (QRS) techniques and default values were used as parameters in the trip generation phase. The Report 365 process uses a cross-classification method for predicting household productions. Prior to this update, the RISM used a regression form of trip generation for trip productions.
- Trip Purpose - the updated RISM, like its predecessor, has three trip purposes: home-based work (HBW) home-based non-work (HBNW), and non-home-based (NHB).
- Trip Distribution - the gravity model technique was used to distribute trips between pairs of TAZs. Adjustments were made to the travel time factors to reflect changes in travel characteristics that have occurred since 1990.
- Mode Split - the number of auto trips forecast considered the varying auto occupancy rates for each trip purpose.
- Trip Assignment - prior to assigning trips to the network, the non-transit person trips were converted to vehicle trips. An equilibrium assignment was used to load trip interchanges between TAZs.
- Calibration/Validation - assigned link volumes were compared to available count locations and appropriate adjustments made to model components. Because RISM model does not include local roads in the network, the percentage of local VMT from 2009 HPMS data was used to adjust future network model runs to account for travel on local roads.

In summary, the RISM was used to develop daily VMT estimates for each year of analysis for statewide ozone. Figures 2, presented in the following sections, illustrate VMT estimates output from the RISM that were used for the benchmark years of the TIP air quality analysis.

4.2 Latest Planning Assumptions

Section 93.110 of the conformity rule requires that the latest planning assumptions be used in conformity determinations. The conformity analysis performed for the 2013-2016 TIP used the most currently available estimates of population, employment, and travel. The latest version (version 5.0r3) of the popular modeling package TransCAD was used to run the RISM. The modeling process followed standard practice by using a four-step model process. Trip generation used the latest techniques as defined in NCHRP Report 365. This method uses a 20-cell cross-classification matrix of households by household size and auto availability as the basis for calculating trip productions. Area type was added to the trip generation process by considering the location of the household (urban, suburban, or rural) in the trip generation process.

Trip distribution used a gravity model equation, which is the most common for travel demand models. The gravity model was calibrated by adjusting the friction factors in the distribution equation to achieve the proper volume of traffic assigned to the network while maintaining consistency with trip length frequency distributions as reported by the Census and as reported in survey data from Report 365. Auto occupancy rates were derived from Report 365 and other occupancy studies conducted in New England. Traffic assignment was conducted using an equilibrium distribution model, which is the most common assignment model used. This assignment process recomputed travel paths based on congestion.

4.3 Years of Analysis

The years of analysis selected for the transportation conformity analysis included 2012, 2015, 2025, and 2035. These years were selected in consultation with DOT, DEM, FHWA, and EPA. The year 2012 was selected to represent existing conditions. The year 2035 was selected because it represents the last year of the traffic demand model. Finally, 2015 and 2025 were included as interim years because EPA and FHWA require that there not be more than 10 years between any two analysis years.

4.4 Traffic Adjustments

Three adjustments were made to the data before predicting vehicle emissions. First, the data were calibrated to the state HPMS system. Next, a seasonal adjustment factor was applied to determine appropriate daily VMT. Finally, a congestion factor was applied to divide the daily VMT into peak and off-peak periods.

a. Highway Performance Monitoring System

The travel demand model output data were first calibrated to the 2009 HPMS traffic data. The RIDOT collects sample data from roads throughout the state for FHWA reporting requirements. This calibration ensured the appropriateness of the assumptions used in the RISM.

b. Seasonal Adjustment Factors

The travel demand model provides average annual daily traffic (AADT) data for model output. The air quality analyses require the use of traffic data for the time of year consistent with the appropriate pollutant season. Seasonal Adjustment Factors (SAF) were applied to convert average annual daily traffic (AADT) model output to the appropriate typical months for the ozone season (summer). Since ozone formation peaks during warm summer months, AADT values were converted to July for statewide ozone analyses. The SAFs for each functional class, by season, and by county are presented in Table 3.

Table 3
Seasonal Adjustment Factors

	Seasonal Summer (Ozone) Adjustment Factor				
Functional Class	Providence County	Bristol County	Kent County	Newport County	Washington County
Rural					
Interstates	1.095	1.095	1.095	1.187	1.187
Principal Arterials	1.046	1.046	1.046	1.095	1.095
Minor Arterials	1.168	1.168	1.168	1.095	1.095
Major Collectors	1.067	1.067	1.067	1.592	1.592
Minor Collectors	1.095	1.095	1.095	1.095	1.095
Local	1.095	1.095	1.095	1.095	1.095
Urban					
Interstates	1.031	1.126	1.126	1.209	1.209
Other F&E	1.009	1.009	1.009	1.190	1.190
Principal Arterials	1.047	0.998	0.998	1.151	1.527
Minor Arterials	1.095	1.095	1.095	1.053	1.053
Collectors	1.095	1.095	1.095	1.095	1.095
Local	1.095	1.095	1.095	1.095	1.095

c. Congestion Factor (Peak /Off-Peak Speeds)

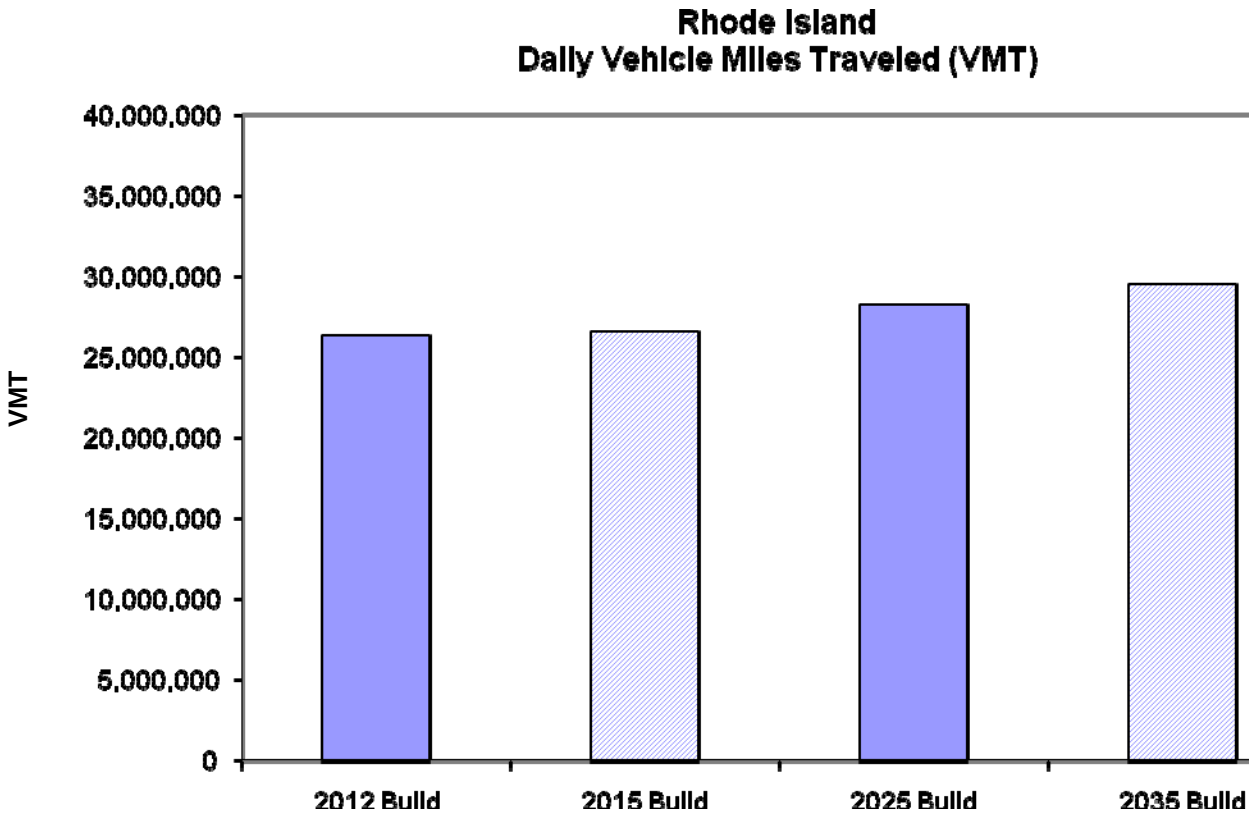
The Transportation Conformity Rule (40 CFR Parts 51 and 93) requires that emissions estimates be based on both peak and off-peak speeds in serious, severe, and extreme nonattainment area with populations over 200,000**.** A congestion factor derived from the 1990 National Personal Transportation Study, which documented the percent of vehicle trips made by hour by trip purpose, was applied to the model VMT data based on time-of-day, functional class, and county. Through the use of this congestion factor, a percentage of the VMT could be assigned a reduced congested travel speed for purposes of the emission calculations. These calculations were performed on a link-by-link basis.

Table 4
Congestion Factors

	Congestion Factor by Roadway Type	
County	Urban	Rural
Bristol County	0.55	0.45
Kent County	0.55	0.45
Newport County	0.55	0.45
Providence County	0.55	0.45
Washington County	0.55	0.45

Figures 2 presented below, illustrates VMT estimates output from the RISM that were used for the benchmark years of the TIP air quality analysis.

Figure 2
Rhode Island Statewide Vehicle Miles Traveled



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5.0 Emissions Data

5.1 Emission Factors

All vehicle emission factors used in the 2013-2016 TIP air quality analysis were obtained using the latest version of EPA's MOBILE 6.2 emissions model. MOBILE 6.2 calculates VOC, and NO_X, emission factors from motor vehicles in grams per vehicle-mile for existing and future years. Emission rates calculated in the analysis were adjusted to reflect Rhode Island-specific conditions such as age distribution from Rhode Island's vehicle registration data and the statewide Inspection and Maintenance (I/M) Program. The MOBILE 6.2 input parameters were developed through an iterative consultation process with RIDEM and EPA staff.

5.2 Emission Calculations

The emission calculations were based upon matching the roadway speeds with the MOBILE 6.2 emission factors for each vehicle type on a link-by-link basis. The RISM provides congested and uncongested speeds for each roadway link. The first step was to desegregate the total vehicle miles traveled (VMT) for each link by vehicle type by applying the RI statewide VMT mix percentages. The VMT were then further divided into VMT occurring during free flow conditions and during congested conditions. The roadway link emissions were calculated by multiplying the VMT by the corresponding speed-specific and vehicle-specific emission factor. These emissions calculations were then aggregated by functional class to produce statewide summertime ozone emissions estimates for each year of concern**.** The 2013-2016 TIP Conformity air quality analysis modeled four scenarios for two pollutants, the ozone precursor emissions of VOC and NO_X. These scenarios included:

- 2012 Existing,
- 2015 Build,
- 2025 Build, and
- 2035 Build.

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6.0 Results

The conformity air quality analysis produced emissions estimates for the four scenarios. These emission estimates cover the Rhode Island statewide ozone nonattainment area.

6.1 Ozone

The results of the VOC and NO_X emission estimates were compared to the 2009 mobile source emission budgets to determine whether the 2013-2016 TIP is in conformance. Figures 4 and 5, and Table 5 present the results of the 2012 existing, 2015, 2020, and 2035 build scenarios and the 2009 mobile source emission budget.

Figure 4
TIP Conformity Air Quality Analysis: Rhode Island Statewide VOC Emissions

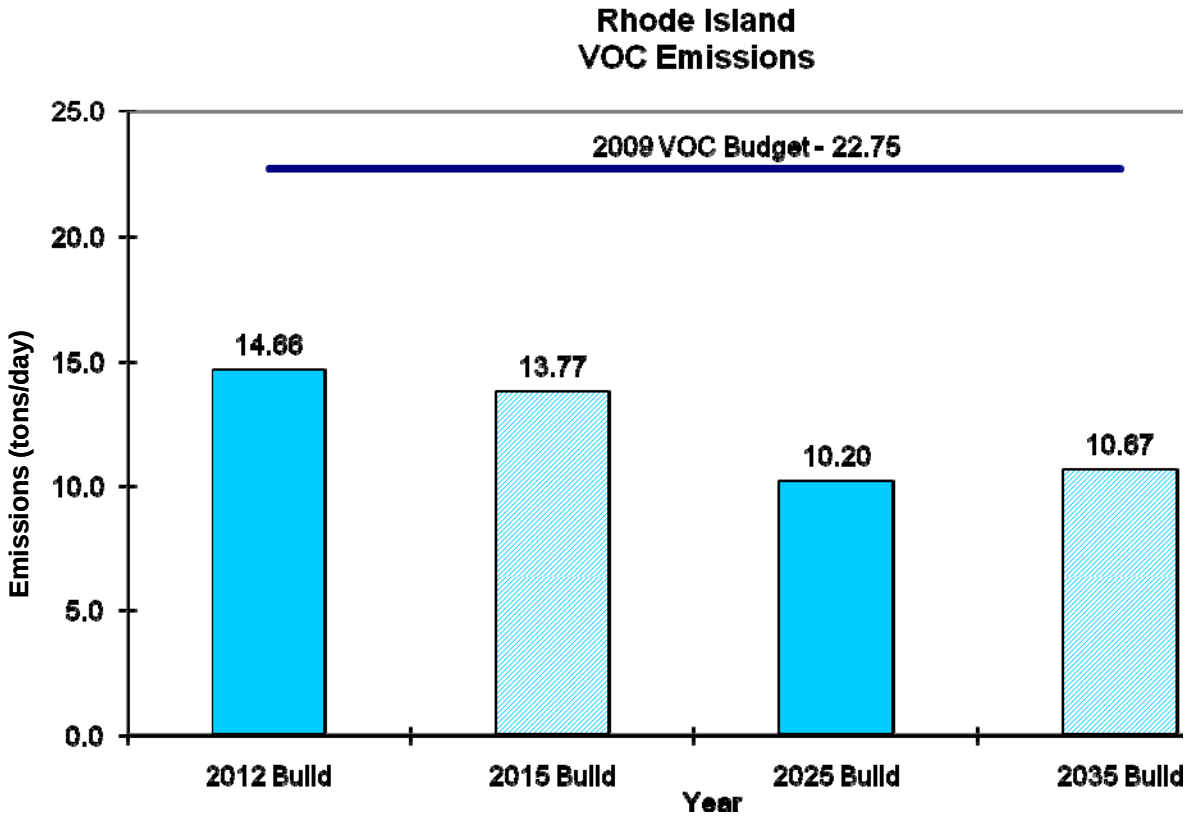

Figure 5
TIP Conformity Air Quality Analysis: Rhode Island Statewide NO_X Emissions

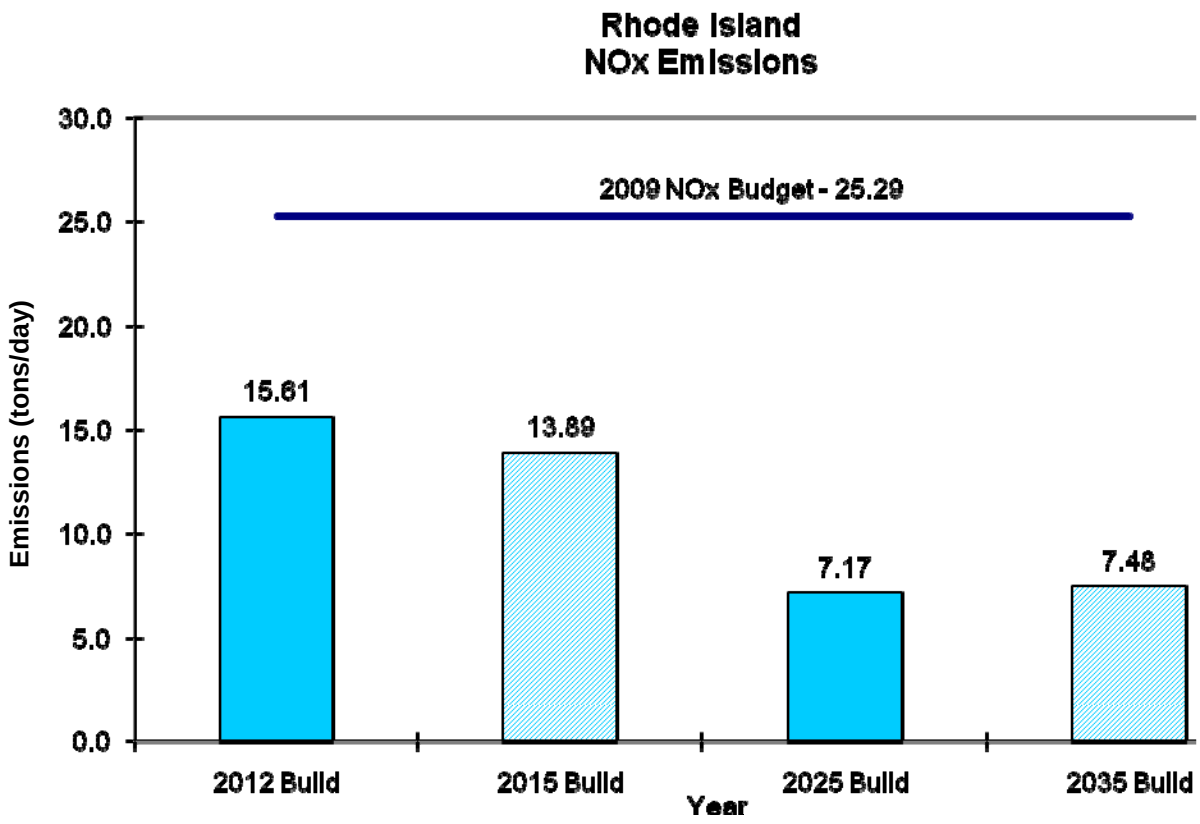

Table 5
TIP Conformity Air Quality Analysis:
Rhode Island Statewide Ozone Results

	Daily Vehicle Miles Traveled (VMT)	VOC (tons/day)	NO_X (tons/day)
2009 SIP Budget	---	22.75	25.29
2012 Build	26,276,327	14.66	15.61
2015 Build	26,575,628	13.77	13.89
2025 Build	28,222,988	10.20	7.17
2035 Build	29,484,420	10.67	7.48

6.3 Emission Trends

The results of the air quality analysis for the 2013-2016 Transportation Improvement Program demonstrate that in general, emissions of VOCs and NO_X emissions are reduced over time. This is primarily due to the reductions in EPA's emission factor model MOBILE6.2. MOBILE6.2 is based in part upon the Federal Motor Vehicle Emission Control Program (FMVECP, new car standards) and the Corporate Average Fuel Economy (CAFE, the sales weighted average fuel economy, expressed in miles per gallon, of a manufacturer's fleet sales in the United States). New car standards have resulted in today's cars being 97% cleaner than 1970 models. Similarly, the CAFE standards have doubled since the mid 1970s. Today's cars are running cleaner with better mileage. Future cars will continue to get cleaner, probably with the use of alternative fuels, and will be required to meet higher CAFE standards resulting in future emission trends that will continue to be reduced.

Conclusion

The air quality analysis performed for the 2013-2016 Transportation Improvement Program demonstrates that it conforms to the Rhode Island State Implementation Plan, the Clean Air Act Amendments, and the Transportation Conformity requirements.

The air quality analysis demonstrates that the mobile source emissions for 2012 Existing, 2015 Build, 2025 Build, and 2035 Build fall below the statewide 2009 SIP mobile source emission budgets for VOC and NO_X.

APPENDIX

MOBILE 6.2 Emissions Files

- Ozone Input Files
- Ozone Output Summary

VMT and Emissions Tables

Statewide – Ozone

- 2012 Existing
- 2015 Build
- 2025 Build
- 2035 Build

MOBILE 6.2 Emissions Files:

Ozone Input Files

2012 MOBILE 6.2 Input File – Ozone

```
MOBILE6 INPUT FILE :
> Run for Rhode Island 2012 Carbon Monoxide (Winter) Conditions
* This text is for annotating this file and is otherwise ignored.
POLLUTANTS         : HC NOX CO
DATABASE OUTPUT    :
WITH FIELDNAMES    :
AGGREGATED OUTPUT  :
EMISSIONS TABLE    : 12RICO.TB1
REPORT FILE        : 12RICO.out

RUN DATA
> Rhode Island run with Stage II refueling 2010;
> National LEV start 1999,  Tier 2 start 2004.
* Rhode Island runs for 2012.
EXPRESS HC AS VOC  :
EXPAND EVAPORATIVE :
REG DIST           : RI2010VR.prn
94+ LDG IMP        : NLEVNE.D
I/M DESC FILE      : REVRIIM.d
STAGE II REFUELING :
95 3 84. 84.
FUEL PROGRAM       : 2 N
FUEL RVP           : 12.5
MIN/MAX TEMP       : 39. 39.
* Adjusted VMT mix for 2010
VMT FRACTIONS      :
0.5509 0.0684 0.2277 0.0609 0.0280 0.0129 0.0013 0.0011
0.0008 0.0029 0.0034 0.0037 0.0132 0.0007 0.0003 0.0238

SCENARIO RECORD    : Scenario Title : RI speed 2.5
> 2012 Speed 2.5 mph (Arterial)
* This text is for annotating this file and is otherwise ignored.
CALENDAR YEAR      : 2012
EVALUATION MONTH   : 1
ALTITUDE           : 1
AVERAGE SPEED      : 2.5 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : Scenario Title : RI speed 3
> 2012 Speed 3 mph (Arterial)
* This text is for annotating this file and is otherwise ignored.
CALENDAR YEAR      : 2012
EVALUATION MONTH   : 1
ALTITUDE           : 1
AVERAGE SPEED      : 3 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : Scenario Title : RI speed 4
> 2012 Speed 4 mph (Arterial)
* This text is for annotating this file and is otherwise ignored.
CALENDAR YEAR      : 2012
EVALUATION MONTH   : 1
ALTITUDE           : 1
AVERAGE SPEED      : 4 Arterial 0.0 100.0 0.0 0.0


.....through.....


SCENARIO RECORD    : Scenario Title : RI speed 60.7 (= maximum allowed freeway speed)
> 2012 Speed 60.7 mph (Freeway)
* This text is for annotating this file and is otherwise ignored.
CALENDAR YEAR      : 2012
EVALUATION MONTH   : 1
ALTITUDE           : 1
AVERAGE SPEED      : 60.7 Freeway 92.0 0.0 0.0 8.0


END OF RUN         :
```

2015 MOBILE 6.2 Input File – Ozone

```
MOBILE6 INPUT FILE :
> Run for Rhode Island 2015 Ozone (Summer) Conditions
* This text is for annotating this file and is otherwise ignored.
POLLUTANTS          : HC NOX CO
DATABASE OUTPUT     :
WITH FIELDNAMES     :
AGGREGATED OUTPUT   :
EMISSIONS TABLE     : 15RIOZ.TB1
REPORT FILE         : 15RIOZ.out

RUN DATA
> Rhode Island run with Stage II refueling 2015;
> National LEV start 1999,  Tier 2 start 2004.
* Rhode Island runs for 2015.
EXPRESS HC AS VOC   :
EXPAND EVAPORATIVE  :
REG DIST            : RI2015VR.prn
94+ LDG IMP         : NLEVNE.D
I/M DESC FILE       : REVRIIM.d
STAGE II REFUELING  :
95 3 84. 84.
FUEL PROGRAM        : 2 N
FUEL RVP            : 6.8
MIN/MAX TEMP        : 67. 88.
* Adjusted VMT mix for 2015
VMT FRACTIONS       :
0.5062  0.0760  0.2530  0.0686  0.0316  0.0131  0.0013  0.0011
0.0008  0.0029  0.0035  0.0037  0.0133  0.0007  0.0003  0.0239

SCENARIO RECORD     : Scenario Title : RI speed 2.5
> 2015 Speed 2.5 mph (Arterial)
* This text is for annotating this file and is otherwise ignored.
CALENDAR YEAR       : 2015
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 2.5 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : Scenario Title : RI speed 3
> 2015 Speed 3 mph (Arterial)
* This text is for annotating this file and is otherwise ignored.
CALENDAR YEAR       : 2015
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 3 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : Scenario Title : RI speed 4
> 2015 Speed 4 mph (Arterial)
* This text is for annotating this file and is otherwise ignored.
CALENDAR YEAR       : 2015
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 4 Arterial 0.0 100.0 0.0 0.0


….through….


SCENARIO RECORD     : Scenario Title : RI speed 60.7 (= maximum allowed freeway speed)
> 2015 Speed 60.7 mph (Freeway)
* This text is for annotating this file and is otherwise ignored.
CALENDAR YEAR       : 2015
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 60.7 Freeway 92.0 0.0 0.0 8.0


END OF RUN          :
```

2025 MOBILE 6.2 Input File – Ozone

```
MOBILE6 INPUT FILE :
> Run for Rhode Island 2025 Ozone (Summer) Conditions
* This text is for annotating this file and is otherwise ignored.
POLLUTANTS          : HC NOX CO
DATABASE OUTPUT     :
WITH FIELDNAMES     :
AGGREGATED OUTPUT   :
EMISSIONS TABLE     : 25RIOZ.TB1
REPORT FILE         : 25RIOZ.out

RUN DATA
> Rhode Island run with Stage II refueling 2025;
> National LEV start 1999,  Tier 2 start 2004.
* Rhode Island runs for 2025.
EXPRESS HC AS VOC   :
EXPAND EVAPORATIVE  :
REG DIST            : RI2025VR.prn
94+ LDG IMP         : NLEVNE.D
I/M DESC FILE       : REVRIIM.d
STAGE II REFUELING  :
95 3 84. 84.
FUEL PROGRAM        : 2 N
FUEL RVP            : 6.8
MIN/MAX TEMP        : 67. 88.
* Adjusted VMT mix for 2025
VMT FRACTIONS       :
0.4819  0.0800  0.2662  0.0726  0.0334  0.0136  0.0013  0.0011
0.0008  0.0030  0.0036  0.0039  0.0138  0.0007  0.0003  0.0238

SCENARIO RECORD     : Scenario Title : RI speed 2.5
> 2025 Speed 2.5 mph (Arterial)
* This text is for annotating this file and is otherwise ignored.
CALENDAR YEAR       : 2025
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 2.5 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : Scenario Title : RI speed 3
> 2025 Speed 3 mph (Arterial)
* This text is for annotating this file and is otherwise ignored.
CALENDAR YEAR       : 2025
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 3 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : Scenario Title : RI speed 4
> 2025 Speed 4 mph (Arterial)
* This text is for annotating this file and is otherwise ignored.
CALENDAR YEAR       : 2025
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 4 Arterial 0.0 100.0 0.0 0.0

….through….


SCENARIO RECORD     : Scenario Title : RI speed 60.7 (= maximum allowed freeway speed)
> 2025 Speed 60.7 mph (Freeway)
* This text is for annotating this file and is otherwise ignored.
CALENDAR YEAR       : 2025
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 60.7 Freeway 92.0 0.0 0.0 8.0


END OF RUN          :
```

MOBILE 6.2 Emissions Files:

Ozone Output Summary

2012 MOBILE 6.2 Output File – Ozone

	Arterial			Freeway	
Vehicle Speed (mph)	**VOCs** Emission Factor (g/veh-mile)	**NOx** Emission Factor (g/veh-mile)	Vehicle Speed (mph)	**VOCs** Emission Factor (g/veh-mile)	**NOx** Emission Factor (g/veh-mile)
2.5	3.63	1.21	2.7	3.37	1.19
3	2.92	1.17	3	2.99	1.16
4	2.03	1.11	4	2.10	1.11
5	1.49	1.08	5	1.56	1.07
6	1.28	1.02	6	1.29	1.01
7	1.13	0.98	7	1.13	0.94
8	1.02	0.94	8	1.01	0.89
9	0.93	0.92	9	0.92	0.85
10	0.86	0.90	10	0.84	0.82
11	0.82	0.87	11	0.79	0.79
12	0.78	0.84	12	0.74	0.76
13	0.74	0.82	13	0.71	0.73
14	0.72	0.80	14	0.68	0.71
15	0.69	0.79	15	0.65	0.69
16	0.67	0.77	16	0.63	0.67
17	0.65	0.76	17	0.62	0.67
18	0.63	0.75	18	0.61	0.68
19	0.62	0.74	19	0.60	0.68
20	0.61	0.73	20	0.59	0.68
21	0.59	0.72	21	0.58	0.68
22	0.58	0.71	22	0.57	0.68
23	0.57	0.71	23	0.56	0.68
24	0.56	0.70	24	0.56	0.68
25	0.55	0.70	25	0.55	0.68
26	0.55	0.69	26	0.54	0.68
27	0.54	0.69	27	0.54	0.68
28	0.53	0.68	28	0.53	0.68
29	0.53	0.68	29	0.53	0.68
30	0.52	0.67	30	0.52	0.68
31	0.52	0.67	31	0.52	0.68
32	0.51	0.67	32	0.51	0.68
33	0.51	0.67	33	0.51	0.68
34	0.50	0.67	34	0.51	0.68
35	0.50	0.67	35	0.50	0.68
36	0.50	0.67	36	0.50	0.69
37	0.49	0.67	37	0.50	0.69
38	0.49	0.68	38	0.49	0.69
39	0.49	0.68	39	0.49	0.69
40	0.49	0.68	40	0.49	0.70
41	0.48	0.68	41	0.49	0.70
42	0.48	0.69	42	0.49	0.71
43	0.48	0.69	43	0.49	0.71
44	0.48	0.70	44	0.48	0.71
45	0.48	0.70	45	0.48	0.72
46	0.48	0.70	46	0.48	0.72
47	0.47	0.71	47	0.48	0.73
48	0.47	0.71	48	0.48	0.73
49	0.47	0.72	49	0.47	0.74
50	0.47	0.72	50	0.47	0.74
51	0.47	0.73	51	0.47	0.75
52	0.47	0.73	52	0.47	0.76
53	0.47	0.74	53	0.47	0.76
54	0.46	0.75	54	0.47	0.77
55	0.46	0.75	55	0.47	0.78
56	0.46	0.76	56	0.47	0.79
57	0.46	0.77	57	0.47	0.80
58	0.46	0.77	58	0.47	0.81
59	0.47	0.78	59	0.48	0.82
60	0.47	0.79	60	0.48	0.83
61	0.47	0.80	60.7	0.48	0.83
62	0.47	0.81			
63	0.47	0.81			
64	0.47	0.82			
65	0.47	0.83			

NOTE: Emission factors were calculated by MOBILE6.2 and represent a composite vehicle type during summer conditions

2015 MOBILE 6.2 Output File – Ozone

	Arterial			Freeway	
Vehicle Speed (mph)	**VOCs** Emission Factor (g/veh-mile)	**NOx** Emission Factor (g/veh-mile)	Vehicle Speed (mph)	**VOCs** Emission Factor (g/veh-mile)	**NOx** Emission Factor (g/veh-mile)
2.5	2.87	0.87	2.7	2.66	0.85
3	2.32	0.84	3	2.37	0.83
4	1.64	0.79	4	1.69	0.78
5	1.24	0.76	5	1.29	0.75
6	1.07	0.72	6	1.07	0.70
7	0.96	0.68	7	0.95	0.65
8	0.87	0.66	8	0.86	0.61
9	0.80	0.64	9	0.79	0.59
10	0.75	0.62	10	0.73	0.56
11	0.71	0.60	11	0.69	0.54
12	0.68	0.58	12	0.66	0.52
13	0.65	0.56	13	0.63	0.50
14	0.63	0.55	14	0.60	0.48
15	0.61	0.54	15	0.58	0.46
16	0.59	0.53	16	0.57	0.45
17	0.57	0.52	17	0.55	0.45
18	0.56	0.51	18	0.54	0.45
19	0.55	0.50	19	0.53	0.45
20	0.53	0.49	20	0.52	0.45
21	0.52	0.49	21	0.51	0.45
22	0.52	0.48	22	0.51	0.45
23	0.51	0.48	23	0.50	0.45
24	0.50	0.47	24	0.50	0.45
25	0.49	0.47	25	0.49	0.45
26	0.49	0.46	26	0.49	0.45
27	0.48	0.46	27	0.48	0.45
28	0.48	0.46	28	0.48	0.45
29	0.47	0.45	29	0.47	0.45
30	0.47	0.45	30	0.47	0.45
31	0.46	0.45	31	0.46	0.45
32	0.46	0.45	32	0.46	0.45
33	0.46	0.45	33	0.46	0.45
34	0.45	0.44	34	0.45	0.45
35	0.45	0.44	35	0.45	0.45
36	0.45	0.44	36	0.45	0.45
37	0.44	0.45	37	0.45	0.45
38	0.44	0.45	38	0.44	0.46
39	0.44	0.45	39	0.44	0.46
40	0.44	0.45	40	0.44	0.46
41	0.44	0.45	41	0.44	0.46
42	0.43	0.45	42	0.44	0.46
43	0.43	0.46	43	0.43	0.47
44	0.43	0.46	44	0.43	0.47
45	0.43	0.46	45	0.43	0.47
46	0.43	0.46	46	0.43	0.47
47	0.43	0.47	47	0.43	0.48
48	0.43	0.47	48	0.43	0.48
49	0.42	0.47	49	0.43	0.48
50	0.42	0.47	50	0.43	0.49
51	0.42	0.48	51	0.42	0.49
52	0.42	0.48	52	0.42	0.50
53	0.42	0.49	53	0.42	0.50
54	0.42	0.49	54	0.43	0.51
55	0.42	0.49	55	0.43	0.51
56	0.42	0.50	56	0.43	0.52
57	0.42	0.50	57	0.43	0.52
58	0.42	0.51	58	0.43	0.53
59	0.42	0.51	59	0.43	0.53
60	0.43	0.52	60	0.44	0.54
61	0.43	0.52	60.7	0.44	0.54
62	0.43	0.53			
63	0.43	0.53			
64	0.43	0.54			
65	0.43	0.54			

NOTE: Emission factors were calculated by MOBILE6.2 and represent a composite vehicle type during summer conditions.

2025 MOBILE 6.2 Output File – Ozone

	Arterial			Freeway	
Vehicle Speed (mph)	**VOCs** Emission Factor (g/veh-mile)	**NOx** Emission Factor (g/veh-mile)	Vehicle Speed (mph)	**VOCs** Emission Factor (g/veh-mile)	**NOx** Emission Factor (g/veh-mile)
2.5	2.29	0.43	2.7	2.12	0.41
3	1.85	0.41	3	1.89	0.40
4	1.29	0.39	4	1.33	0.38
5	0.96	0.37	5	1.00	0.37
6	0.82	0.35	6	0.82	0.34
7	0.73	0.33	7	0.72	0.32
8	0.65	0.32	8	0.65	0.30
9	0.60	0.31	9	0.59	0.28
10	0.55	0.30	10	0.54	0.27
11	0.52	0.29	11	0.51	0.26
12	0.50	0.28	12	0.48	0.24
13	0.48	0.27	13	0.46	0.23
14	0.46	0.26	14	0.44	0.23
15	0.44	0.26	15	0.42	0.22
16	0.43	0.25	16	0.41	0.21
17	0.41	0.25	17	0.40	0.21
18	0.40	0.24	18	0.39	0.21
19	0.39	0.24	19	0.38	0.21
20	0.38	0.24	20	0.37	0.22
21	0.37	0.23	21	0.36	0.22
22	0.36	0.23	22	0.36	0.22
23	0.36	0.23	23	0.35	0.22
24	0.35	0.23	24	0.35	0.22
25	0.35	0.22	25	0.34	0.22
26	0.34	0.22	26	0.34	0.22
27	0.34	0.22	27	0.34	0.22
28	0.33	0.22	28	0.33	0.22
29	0.33	0.22	29	0.33	0.22
30	0.32	0.22	30	0.32	0.22
31	0.32	0.22	31	0.32	0.22
32	0.32	0.22	32	0.32	0.22
33	0.31	0.21	33	0.32	0.22
34	0.31	0.21	34	0.31	0.22
35	0.31	0.21	35	0.31	0.22
36	0.31	0.21	36	0.31	0.22
37	0.30	0.22	37	0.31	0.22
38	0.30	0.22	38	0.30	0.22
39	0.30	0.22	39	0.30	0.22
40	0.30	0.22	40	0.30	0.22
41	0.30	0.22	41	0.30	0.22
42	0.30	0.22	42	0.30	0.22
43	0.29	0.22	43	0.30	0.22
44	0.29	0.22	44	0.29	0.22
45	0.29	0.22	45	0.29	0.23
46	0.29	0.22	46	0.29	0.23
47	0.29	0.23	47	0.29	0.23
48	0.29	0.23	48	0.29	0.23
49	0.29	0.23	49	0.29	0.23
50	0.29	0.23	50	0.29	0.23
51	0.29	0.23	51	0.29	0.24
52	0.29	0.23	52	0.29	0.24
53	0.28	0.23	53	0.29	0.24
54	0.28	0.24	54	0.29	0.24
55	0.28	0.24	55	0.29	0.25
56	0.28	0.24	56	0.29	0.25
57	0.29	0.24	57	0.29	0.25
58	0.29	0.25	58	0.30	0.25
59	0.29	0.25	59	0.30	0.26
60	0.29	0.25	60	0.30	0.26
61	0.29	0.25	60.7	0.30	0.26
62	0.29	0.25			
63	0.30	0.26			
64	0.30	0.26			
65	0.30	0.26			

NOTE: Emission factors were calculated by MOBILE6.2 and represent a composite vehicle type during summer conditions.

VMT and Emissions Tables:

Statewide-Ozone
2012 Existing

Table: 1

VEHICLE MILES OF TRAVEL

Functional Class	1998 HPMS	1998 Network Model Output	Network Model Output	HPMS Adjusted	HPMS & Seasonal Factor Adjusted
Interstate-Rural	1,108	1,145	1,168,212	1,130,462	1,352,032
Other PA-Rural	350	305	314,156	360,507	416,385
Minor Art. -Rural	366	416	429,004	377,441	435,945
Major Coll.-Rural	407	444	456,337	418,309	483,146
Minor Coll.-Rural	99	70	71,532	101,166	116,847
Local-Rural	62	63	318,459	326,723	359,552
Interstate-Urban	4,773	4,503	4,590,450	4,865,694	5,289,009
Other F/E-Urban	3,389	3,469	3,347,604	3,270,403	3,489,520
Other PA-Urban	5,902	5,553	5,828,459	6,194,771	6,609,820
Minor Art.-Urban	3,224	3,125	3,117,510	3,216,273	3,431,763
Collector-Urban	2,128	1,843	1,867,155	2,155,891	2,300,335
Local-Urban	794	756	1,764,372	1,931,451	1,991,971
Total	22,602	21,692	23,273,249	24,349,090	26,276,327

Input Tranplan File: C:\RIDOA\Traffic\2012OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\12RIOZ.TXT

Table: 2

VMT MIX BY VEHICLE TYPE AS FRACTION OF FLEET

Vehicle Type	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC
Fraction of Fleet	0.550	0.296	0.088	0.012	0.001	0.001	0.012	0.024

Input Tranplan File: C:\RIDOA\Traffic\2012OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\12RIOZ.TXT

Table: 3

VMT By Vehicle Type and Functional Class(veh-miles/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	744,159	400,337	118,438	15,819	676	1,758	15,819	32,178	1,352,032
Other PA-Rural	229,178	123,292	36,475	4,872	208	541	4,872	9,910	416,385
Minor Art. -Rural	239,944	129,083	38,189	5,101	218	567	5,101	10,375	435,945
Major Coll.-Rural	265,924	143,060	42,324	5,653	242	628	5,653	11,499	483,146
Minor Coll.-Rural	64,313	34,598	10,236	1,367	58	152	1,367	2,781	116,847
Local-Rural	197,897	106,463	31,497	4,207	180	467	4,207	8,557	359,552
Interstate-Urban	2,911,071	1,566,076	463,317	61,881	2,645	6,876	61,881	125,878	5,289,009
Other F/E-Urban	1,920,632	1,033,247	305,682	40,827	1,745	4,536	40,827	83,051	3,489,520
Other PA-Urban	3,638,045	1,957,168	579,020	77,335	3,305	8,593	77,335	157,314	6,609,820
Minor Art.-Urban	1,888,842	1,016,145	300,622	40,152	1,716	4,461	40,152	81,676	3,431,763
Collector-Urban	1,266,105	681,129	201,509	26,914	1,150	2,990	26,914	54,748	2,300,335
Local-Urban	1,096,381	589,823	174,497	23,306	996	2,590	23,306	47,409	1,991,971
Total	14,462,490	7,780,420	2,301,806	307,433	13,138	34,159	751,503	625,377	26,276,327
Total (in Tons)	15.94	8.58	2.54	0.34	0.01	0.04	0.83	0.69	28.96

Input Tranplan File: C:\RIDOA\Traffic\2012OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\12RIOZ.TXT

Table: 4

Total Carbon Monoxide Emissions(grams/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	0	0	0	0	0	0	0	0	0
Other PA-Rural	1,596,806	1,162,578	294,058	22,054	172	286	22,054	120,068	3,202,670
Minor Art. -Rural	1,645,494	1,200,100	303,504	23,066	181	301	23,066	127,275	3,306,945
Major Coll.-Rural	1,822,468	1,329,267	336,165	25,597	201	334	25,597	141,250	3,663,080
Minor Coll.-Rural	411,600	302,044	76,359	7,615	55	93	7,615	41,575	841,741
Local-Rural	0	0	0	0	0	0	0	0	0
Interstate-Urban	22,734,443	16,251,061	4,115,996	325,458	2,275	3,797	325,458	1,786,764	45,311,006
Other F/E-Urban	15,475,505	11,035,458	2,795,637	211,049	1,461	2,434	211,049	1,166,352	30,745,125
Other PA-Urban	23,663,668	17,339,438	4,379,748	405,153	3,013	5,043	405,153	2,215,951	48,138,399
Minor Art.-Urban	12,270,491	8,995,024	2,271,463	205,219	1,542	2,579	205,219	1,130,010	24,940,308
Collector-Urban	8,122,713	5,956,063	1,506,024	153,765	1,108	1,862	153,765	832,838	16,622,810
Local-Urban	0	0	0	0	0	0	0	0	0
Total	87,743,189	63,571,035	16,078,954	1,378,973	10,008	16,730	411,114	7,562,083	176,772,085
Total (in Tons)	96.72	70.08	17.72	1.52	0.01	0.02	0.45	8.34	194.86

Input Tranplan File: C:\RIDOA\Traffic\2012OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\12RIOZ.TXT

Table: 5

Total Volatile Organic Compound Emissions(grams/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	0	0	0	0	0	0	0	0	0
Other PA-Rural	98,663	85,905	19,850	1,831	23	140	1,831	29,997	239,136
Minor Art. -Rural	103,913	90,368	20,892	1,944	24	149	1,944	31,549	251,759
Major Coll.-Rural	115,209	100,181	23,162	2,157	27	165	2,157	34,987	279,130
Minor Coll.-Rural	29,648	25,499	5,937	611	8	47	611	9,288	72,034
Local-Rural	0	0	0	0	0	0	0	0	0
Interstate-Urban	1,242,388	1,080,528	249,796	22,692	284	1,736	22,692	398,076	3,028,765
Other F/E-Urban	801,073	699,306	161,406	14,125	178	1,086	14,125	259,401	1,956,662
Other PA-Urban	1,645,223	1,417,288	328,955	32,958	409	2,515	32,958	509,519	3,989,250
Minor Art.-Urban	848,882	731,986	169,768	16,863	210	1,288	16,863	262,313	2,057,963
Collector-Urban	587,814	504,822	117,618	12,213	151	933	12,213	184,331	1,427,858
Local-Urban	0	0	0	0	0	0	0	0	0
Total	5,472,814	4,735,883	1,097,384	105,396	1,313	8,059	162,248	1,719,462	13,302,556
Total (in Tons)	6.03	5.22	1.21	0.12	0.00	0.01	0.18	1.90	14.66

Input Tranplan File: C:\RIDOA\Traffic\2012OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\12RIOZ.TXT

Table: 6

Total Nitrogen Oxide Emissions(grams/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	0	0	0	0	0	0	0	0	0
Other PA-Rural	87,790	87,585	26,162	6,004	48	231	6,004	14,302	253,921
Minor Art. -Rural	91,410	91,253	27,265	6,216	49	236	6,216	14,833	263,761
Major Coll.-Rural	101,299	101,123	30,216	6,885	54	262	6,885	16,434	292,281
Minor Coll.-Rural	24,953	24,565	7,360	1,542	13	62	1,542	3,754	70,821
Local-Rural	0	0	0	0	0	0	0	0	0
Interstate-Urban	1,167,712	1,159,538	345,873	80,418	743	3,624	80,418	199,690	3,491,609
Other F/E-Urban	777,686	772,619	230,278	54,671	517	2,524	54,671	137,196	2,345,874
Other PA-Urban	1,391,743	1,382,376	413,795	89,449	726	3,537	89,449	217,184	3,985,052
Minor Art.-Urban	717,840	714,804	213,940	46,650	375	1,827	46,650	113,273	2,059,840
Collector-Urban	494,373	485,774	145,539	30,227	253	1,233	30,227	73,589	1,400,700
Local-Urban	0	0	0	0	0	0	0	0	0
Total	4,854,807	4,819,637	1,440,427	322,064	2,777	13,537	1,920,354	790,257	14,163,859
Total (in Tons)	5.35	5.31	1.59	0.36	0.00	0.01	2.12	0.87	15.61

Input Tranplan File: C:\RIDOA\Traffic\2012OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\12RIOZ.TXT

VMT and Emissions Tables:

Statewide-Ozone
2015 Build

Table: 1

VEHICLE MILES OF TRAVEL

Functional Class	1998 HPMS	1998 Network Model Output	Network Model Output	HPMS Adjusted	HPMS & Seasonal Factor Adjusted
Interstate-Rural	1,108	1,145	1,190,242	1,151,780	1,377,529
Other PA-Rural	350	305	326,418	374,578	432,637
Minor Art. -Rural	366	416	446,728	393,035	453,955
Major Coll.-Rural	407	444	469,937	430,776	497,546
Minor Coll.-Rural	99	70	73,594	104,083	120,216
Local-Rural	62	63	321,851	330,380	363,647
Interstate-Urban	4,773	4,503	4,685,173	4,966,097	5,398,147
Other F/E-Urban	3,389	3,469	3,191,511	3,117,911	3,326,811
Other PA-Urban	5,902	5,553	5,927,839	6,300,397	6,722,524
Minor Art.-Urban	3,224	3,125	3,208,315	3,309,954	3,531,721
Collector-Urban	2,128	1,843	1,895,999	2,189,195	2,335,871
Local-Urban	794	756	1,783,492	1,953,409	2,015,024
Total	22,602	21,692	23,521,099	24,621,594	26,575,628

Input Tranplan File: C:\RIDOA\Traffic\2015OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\15RIOZ.TXT

Table: 2

VMT MIX BY VEHICLE TYPE AS FRACTION OF FLEET

Vehicle Type	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC
Fraction of Fleet	0.506	0.329	0.099	0.012	0.001	0.002	0.012	0.024

Input Tranplan File: C:\RIDOA\Traffic\2015OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\15RIOZ.TXT

Table: 3

VMT By Vehicle Type and Functional Class(veh-miles/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	696,616	453,207	135,962	16,393	689	2,066	16,393	32,923	1,377,529
Other PA-Rural	218,785	142,338	42,701	5,148	216	649	5,148	10,340	432,637
Minor Art. -Rural	229,565	149,351	44,805	5,402	227	681	5,402	10,850	453,955
Major Coll.-Rural	251,609	163,693	49,108	5,921	249	746	5,921	11,891	497,546
Minor Coll.-Rural	60,793	39,551	11,865	1,431	60	180	1,431	2,873	120,216
Local-Rural	183,896	119,640	35,892	4,327	182	545	4,327	8,691	363,647
Interstate-Urban	2,729,843	1,775,990	532,797	64,238	2,699	8,097	64,238	129,016	5,398,147
Other F/E-Urban	1,682,368	1,094,521	328,356	39,589	1,663	4,990	39,589	79,511	3,326,811
Other PA-Urban	3,399,580	2,211,710	663,513	79,998	3,361	10,084	79,998	160,668	6,722,524
Minor Art.-Urban	1,785,991	1,161,936	348,581	42,027	1,766	5,298	42,027	84,408	3,531,721
Collector-Urban	1,181,250	768,501	230,550	27,797	1,168	3,504	27,797	55,827	2,335,871
Local-Urban	1,018,998	662,943	198,883	23,979	1,008	3,023	23,979	48,159	2,015,024
Total	13,439,295	8,743,382	2,623,014	316,250	13,288	39,863	765,378	635,158	26,575,628
Total (in Tons)	14.81	9.64	2.89	0.35	0.01	0.04	0.84	0.70	29.29

Input Tranplan File: C:\RIDOA\Traffic\2015OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\15RIOZ.TXT

Table: 4

Total Carbon Monoxide Emissions(grams/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	5,245,521	4,681,628	1,233,176	108,519	583	1,110	108,519	802,332	12,090,284
Other PA-Rural	1,321,248	1,207,588	316,516	22,594	165	312	22,594	125,292	2,998,238
Minor Art. -Rural	1,365,098	1,249,451	327,368	23,683	174	329	23,683	133,137	3,104,031
Major Coll.-Rural	1,495,513	1,368,845	358,640	25,988	191	361	25,988	146,096	3,400,892
Minor Coll.-Rural	339,226	311,663	81,515	7,739	53	100	7,739	42,954	784,867
Local-Rural	989,362	936,781	247,296	55,780	279	548	55,780	245,178	2,486,524
Interstate-Urban	18,361,586	16,525,773	4,342,849	327,527	2,146	4,069	327,527	1,833,105	41,458,024
Other F/E-Urban	11,672,464	10,483,657	2,756,597	197,905	1,286	2,433	197,905	1,113,706	26,263,672
Other PA-Urban	19,232,809	17,678,291	4,626,767	409,617	2,838	5,402	409,617	2,274,366	44,314,859
Minor Art.-Urban	10,080,820	9,271,290	2,426,218	210,415	1,472	2,800	210,415	1,175,159	23,211,710
Collector-Urban	6,607,973	6,067,873	1,587,568	154,364	1,039	1,983	154,364	849,730	15,302,776
Local-Urban	5,482,208	5,190,844	1,370,303	309,087	1,546	3,038	309,087	1,358,568	13,778,210
Total	82,193,829	74,973,682	19,674,814	1,853,220	11,771	22,485	364,665	10,099,622	189,194,088
Total (in Tons)	90.60	82.64	21.69	2.04	0.01	0.02	0.40	11.13	208.55

Input Tranplan File: C:\RIDOA\Traffic\2015OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\15RIOZ.TXT

Table: 5

Total Volatile Organic Compound Emissions(grams/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	206,198	211,194	55,744	4,164	55	401	4,164	123,132	607,990
Other PA-Rural	67,877	68,642	18,402	1,467	19	139	1,467	31,300	190,483
Minor Art. -Rural	71,638	72,295	19,403	1,562	20	148	1,562	32,995	200,890
Major Coll.-Rural	78,546	79,257	21,273	1,714	22	162	1,714	36,184	220,262
Minor Coll.-Rural	20,183	20,052	5,434	489	6	46	489	9,596	56,763
Local-Rural	84,041	80,039	22,253	2,718	29	217	2,718	40,675	235,323
Interstate-Urban	841,622	852,899	227,630	17,876	232	1,694	17,876	408,159	2,381,856
Other F/E-Urban	507,026	516,834	137,476	10,340	136	989	10,340	248,090	1,438,746
Other PA-Urban	1,108,779	1,106,718	298,430	26,160	333	2,440	26,160	521,528	3,114,353
Minor Art.-Urban	578,741	578,462	155,868	13,552	173	1,268	13,552	271,875	1,625,741
Collector-Urban	395,247	392,059	106,261	9,664	122	898	9,664	188,014	1,111,202
Local-Urban	465,682	443,509	123,307	15,059	162	1,200	15,059	225,384	1,303,958
Total	4,425,580	4,421,960	1,191,482	104,765	1,309	9,601	195,936	2,136,933	12,487,567
Total (in Tons)	4.88	4.87	1.31	0.12	0.00	0.01	0.22	2.36	13.77

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Table: 6

Total Nitrogen Oxide Emissions(grams/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	204,109	256,062	84,432	16,130	161	1,188	16,130	62,224	755,029
Other PA-Rural	58,330	73,822	24,532	4,382	29	209	4,382	14,922	198,229
Minor Art. -Rural	60,821	77,056	25,626	4,547	29	214	4,547	15,508	206,336
Major Coll.-Rural	66,661	84,449	28,086	4,981	32	235	4,981	16,994	226,131
Minor Coll.-Rural	16,414	20,487	6,823	1,114	8	56	1,114	3,879	54,656
Local-Rural	51,491	61,734	20,387	2,904	31	226	2,904	10,169	169,447
Interstate-Urban	763,003	960,872	318,511	57,601	438	3,212	57,601	204,470	2,668,374
Other F/E-Urban	475,480	598,812	198,141	36,608	285	2,090	36,608	131,183	1,676,219
Other PA-Urban	905,327	1,139,611	380,050	63,900	429	3,144	63,900	221,636	3,043,909
Minor Art.-Urban	472,528	596,249	198,868	33,692	224	1,643	33,692	116,859	1,592,444
Collector-Urban	321,068	399,957	133,217	21,559	149	1,093	21,559	75,026	1,066,902
Local-Urban	285,319	342,079	112,965	16,090	170	1,251	16,090	56,346	938,933
Total	3,680,550	4,611,192	1,531,638	263,508	1,985	14,562	1,563,959	929,216	12,596,611
Total (in Tons)	4.06	5.08	1.69	0.29	0.00	0.02	1.72	1.02	13.89

Input Tranplan File: C:\RIDOA\Traffic\2015OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\15RIOZ.TXT

VMT and Emissions Tables:

Statewide-Ozone
2025 Build

Table: 1

VEHICLE MILES OF TRAVEL

Functional Class	1998 HPMS	1998 Network Model Output	Network Model Output	HPMS Adjusted	HPMS & Seasonal Factor Adjusted
Interstate-Rural	1,108	1,145	1,289,764	1,248,086	1,492,711
Other PA-Rural	350	305	365,148	419,022	483,970
Minor Art. -Rural	366	416	499,352	439,334	507,430
Major Coll.-Rural	407	444	518,539	475,328	549,004
Minor Coll.-Rural	99	70	82,067	116,066	134,057
Local-Rural	62	63	341,742	350,753	386,189
Interstate-Urban	4,773	4,503	4,911,172	5,205,646	5,658,537
Other F/E-Urban	3,389	3,469	3,373,428	3,295,632	3,516,439
Other PA-Urban	5,902	5,553	6,269,805	6,663,856	7,110,334
Minor Art.-Urban	3,224	3,125	3,395,746	3,503,324	3,738,046
Collector-Urban	2,128	1,843	2,035,004	2,349,695	2,507,125
Local-Urban	794	756	1,893,019	2,073,133	2,139,146
Total	22,602	21,692	24,974,786	26,139,873	28,222,988

Input Tranplan File: C:\RIDOA\Traffic\2025OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\25RIOZ.TXT

Table: 2

VMT MIX BY VEHICLE TYPE AS FRACTION OF FLEET

Vehicle Type	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC
Fraction of Fleet	0.481	0.346	0.104	0.012	0.000	0.002	0.012	0.024

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Table: 3

VMT By Vehicle Type and Functional Class(veh-miles/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	718,740	516,777	155,988	18,360	597	2,239	18,360	35,527	1,492,711
Other PA-Rural	233,032	167,550	50,575	5,953	194	726	5,953	11,518	483,970
Minor Art. -Rural	244,328	175,672	53,026	6,241	203	761	6,241	12,077	507,430
Major Coll.-Rural	264,345	190,065	57,371	6,753	220	824	6,753	13,066	549,004
Minor Coll.-Rural	64,548	46,410	14,009	1,649	54	201	1,649	3,191	134,057
Local-Rural	185,950	133,699	40,357	4,750	154	579	4,750	9,191	386,189
Interstate-Urban	2,724,586	1,958,986	591,317	69,600	2,263	8,488	69,600	134,673	5,658,537
Other F/E-Urban	1,693,165	1,217,391	367,468	43,252	1,407	5,275	43,252	83,691	3,516,439
Other PA-Urban	3,423,626	2,461,598	743,030	87,457	2,844	10,666	87,457	169,226	7,110,334
Minor Art.-Urban	1,799,869	1,294,112	390,626	45,978	1,495	5,607	45,978	88,966	3,738,046
Collector-Urban	1,207,181	867,967	261,995	30,838	1,003	3,761	30,838	59,670	2,507,125
Local-Urban	1,029,999	740,572	223,541	26,311	856	3,209	26,311	50,912	2,139,146
Total	13,589,369	9,770,798	2,949,302	347,143	11,289	42,334	841,045	671,707	28,222,988
Total (in Tons)	14.98	10.77	3.25	0.38	0.01	0.05	0.93	0.74	31.11

Input Tranplan File: C:\RIDOA\Traffic\2025OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\25RIOZ.TXT

Table: 4

Total Carbon Monoxide Emissions(grams/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	3,931,510	4,165,219	1,215,149	118,424	374	931	118,424	865,781	10,306,507
Other PA-Rural	1,027,900	1,116,519	323,364	25,460	109	269	25,460	139,621	2,635,689
Minor Art. -Rural	1,061,311	1,154,550	334,182	26,709	115	284	26,709	148,419	2,728,164
Major Coll.-Rural	1,147,797	1,248,619	361,403	28,940	125	308	28,940	160,802	2,950,804
Minor Coll.-Rural	265,294	289,137	83,493	8,690	35	87	8,690	47,699	695,305
Local-Rural	771,692	855,671	247,387	59,662	177	462	59,662	259,286	2,200,136
Interstate-Urban	13,308,023	14,222,415	4,132,906	346,862	1,336	3,311	346,862	1,923,282	33,969,233
Other F/E-Urban	8,520,142	9,089,052	2,644,455	210,170	805	1,987	210,170	1,168,910	21,653,730
Other PA-Urban	14,241,935	15,539,879	4,487,864	440,034	1,787	4,453	440,034	2,409,904	37,169,564
Minor Art.-Urban	7,469,582	8,154,278	2,355,003	226,141	927	2,307	226,141	1,245,308	19,476,008
Collector-Urban	4,978,822	5,425,281	1,566,180	167,595	663	1,661	167,595	911,163	13,068,156
Local-Urban	4,274,495	4,739,663	1,370,305	330,472	981	2,557	330,472	1,436,218	12,186,821
Total	60,998,502	66,000,283	19,121,691	1,989,158	7,433	18,618	188,037	10,716,394	159,040,117
Total (in Tons)	67.24	72.75	21.08	2.19	0.01	0.02	0.21	11.81	175.31

Input Tranplan File: C:\RIDOA\Traffic\2025OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\25RIOZ.TXT

Table: 5

Total Volatile Organic Compound Emissions(grams/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	131,529	142,630	39,309	2,809	24	204	2,809	132,869	456,403
Other PA-Rural	45,777	48,376	13,338	1,049	8	73	1,049	34,872	146,193
Minor Art. -Rural	48,415	50,972	14,060	1,120	9	78	1,120	36,752	154,304
Major Coll.-Rural	52,413	55,168	15,218	1,213	10	84	1,213	39,788	167,034
Minor Coll.-Rural	13,942	14,294	3,951	356	3	24	356	10,656	44,198
Local-Rural	58,946	58,426	16,183	1,948	13	111	1,948	43,015	183,833
Interstate-Urban	528,798	562,310	155,184	11,987	98	840	11,987	427,109	1,717,054
Other F/E-Urban	317,770	341,605	94,248	6,894	57	491	6,894	261,046	1,039,443
Other PA-Urban	723,116	746,574	205,812	18,081	142	1,231	18,081	550,830	2,294,288
Minor Art.-Urban	377,138	389,875	107,451	9,362	74	639	9,362	287,246	1,196,826
Collector-Urban	263,499	269,820	74,542	6,798	53	459	6,798	201,252	835,005
Local-Urban	326,510	323,630	89,640	10,788	71	616	10,788	238,267	1,018,271
Total	2,887,852	3,003,681	828,934	72,405	562	4,851	190,865	2,263,702	9,252,851
Total (in Tons)	3.18	3.31	0.91	0.08	0.00	0.01	0.21	2.50	10.20

Input Tranplan File: C:\RIDOA\Traffic\2025OUTPUTR.DBF; Input Mobile File: C:\RIDOA\Mobile\25RIOZ.TXT

Table: 6

Total Nitrogen Oxide Emissions(grams/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	94,155	133,328	49,136	5,416	30	493	5,416	67,145	396,055
Other PA-Rural	28,098	39,253	14,392	1,516	6	90	1,516	16,618	108,186
Minor Art. -Rural	29,317	40,904	14,998	1,572	6	92	1,572	17,252	112,542
Major Coll.-Rural	31,720	44,257	16,227	1,700	6	100	1,700	18,660	121,757
Minor Coll.-Rural	7,939	10,814	3,979	384	1	24	384	4,307	29,630
Local-Rural	24,731	31,687	11,098	955	6	92	955	10,754	87,700
Interstate-Urban	342,538	480,236	176,902	18,637	78	1,280	18,637	212,637	1,352,280
Other F/E-Urban	214,528	302,514	111,364	11,961	51	840	11,961	137,619	857,590
Other PA-Urban	415,161	572,203	210,428	20,899	78	1,274	20,899	233,127	1,569,533
Minor Art.-Urban	216,516	299,438	110,121	11,031	41	667	11,031	123,032	821,695
Collector-Urban	150,023	203,582	74,891	7,151	27	450	7,151	80,135	557,355
Local-Urban	136,990	175,516	61,474	5,289	31	507	5,289	59,567	485,780
Total	1,691,717	2,333,730	855,010	86,511	359	5,908	546,013	980,854	6,500,102
Total (in Tons)	1.86	2.57	0.94	0.10	0.00	0.01	0.60	1.08	7.17

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VMT and Emissions Tables:

Statewide-Ozone
2035 Build

Table: 1

VEHICLE MILES OF TRAVEL

Functional Class	1998 HPMS	1998 Network Model Output	Network Model Output	HPMS Adjusted	HPMS & Seasonal Factor Adjusted
Interstate-Rural	1,108	1,145	1,374,970	1,330,539	1,591,325
Other PA-Rural	350	305	396,748	455,284	525,853
Minor Art. -Rural	366	416	540,142	475,221	548,881
Major Coll.-Rural	407	444	557,379	510,931	590,125
Minor Coll.-Rural	99	70	87,937	124,368	143,645
Local-Rural	62	63	356,914	366,319	403,450
Interstate-Urban	4,773	4,503	5,130,745	5,438,385	5,911,524
Other F/E-Urban	3,389	3,469	3,476,116	3,395,952	3,623,481
Other PA-Urban	5,902	5,553	6,517,495	6,927,113	7,391,229
Minor Art.-Urban	3,224	3,125	3,528,448	3,640,229	3,884,124
Collector-Urban	2,128	1,843	2,139,737	2,470,624	2,636,156
Local-Urban	794	756	1,976,952	2,165,024	2,234,629
Total	22,602	21,692	26,083,583	27,299,988	29,484,420

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Table: 2

VMT MIX BY VEHICLE TYPE AS FRACTION OF FLEET

Vehicle Type	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC
Fraction of Fleet	0.481	0.346	0.104	0.012	0.000	0.002	0.012	0.024

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Table: 3

VMT By Vehicle Type and Functional Class(veh-miles/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	766,223	550,917	166,293	19,573	637	2,387	19,573	37,874	1,591,325
Other PA-Rural	253,198	182,050	54,952	6,468	210	789	6,468	12,515	525,853
Minor Art. -Rural	264,286	190,023	57,358	6,751	220	823	6,751	13,063	548,881
Major Coll.-Rural	284,145	204,301	61,668	7,259	236	885	7,259	14,045	590,125
Minor Coll.-Rural	69,165	49,730	15,011	1,767	57	215	1,767	3,419	143,645
Local-Rural	194,261	139,674	42,160	4,962	161	605	4,962	9,602	403,450
Interstate-Urban	2,846,399	2,046,570	617,754	72,712	2,365	8,867	72,712	140,694	5,911,524
Other F/E-Urban	1,744,706	1,254,449	378,654	44,569	1,449	5,435	44,569	86,239	3,623,481
Other PA-Urban	3,558,877	2,558,844	772,383	90,912	2,956	11,087	90,912	175,911	7,391,229
Minor Art.-Urban	1,870,206	1,344,684	405,891	47,775	1,554	5,826	47,775	92,442	3,884,124
Collector-Urban	1,269,309	912,637	275,478	32,425	1,054	3,954	32,425	62,741	2,636,156
Local-Urban	1,075,974	773,628	233,519	27,486	894	3,352	27,486	53,184	2,234,629
Total	14,196,748	10,207,506	3,081,122	362,658	11,794	44,227	878,636	701,729	29,484,420
Total (in Tons)	15.65	11.25	3.40	0.40	0.01	0.05	0.97	0.77	32.50

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Table: 4

Total Carbon Monoxide Emissions(grams/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	4,191,239	4,440,388	1,295,426	126,248	398	993	126,248	922,978	10,987,392
Other PA-Rural	1,116,302	1,212,584	351,180	27,668	119	293	27,668	151,788	2,862,593
Minor Art. -Rural	1,147,644	1,248,478	361,365	28,907	125	308	28,907	160,637	2,950,270
Major Coll.-Rural	1,233,268	1,341,612	388,310	31,138	134	331	31,138	173,012	3,170,829
Minor Coll.-Rural	284,267	309,816	89,465	9,311	37	93	9,311	51,110	745,033
Local-Rural	806,183	893,915	258,444	62,328	185	482	62,328	270,875	2,298,472
Interstate-Urban	13,854,238	14,809,374	4,302,804	363,450	1,401	3,473	363,450	2,013,541	35,380,976
Other F/E-Urban	8,763,748	9,350,322	2,720,325	216,414	829	2,048	216,414	1,204,733	22,277,199
Other PA-Urban	14,814,683	16,162,683	4,667,621	460,679	1,865	4,650	460,679	2,518,062	38,676,000
Minor Art.-Urban	7,762,478	8,473,638	2,447,242	235,624	965	2,402	235,624	1,296,752	20,242,505
Collector-Urban	5,235,628	5,705,210	1,646,958	176,506	697	1,748	176,506	959,005	13,743,438
Local-Urban	4,465,291	4,951,222	1,431,470	345,223	1,024	2,671	345,223	1,500,325	12,730,789
Total	63,674,970	68,899,242	19,960,607	2,083,497	7,780	19,492	197,091	11,222,818	166,065,496
Total (in Tons)	70.19	75.95	22.00	2.30	0.01	0.02	0.22	12.37	183.06

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Table: 5

Total Volatile Organic Compound Emissions(grams/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	140,219	152,053	41,906	2,995	25	217	2,995	141,647	486,555
Other PA-Rural	49,752	52,572	14,495	1,140	9	80	1,140	37,899	158,883
Minor Art. -Rural	52,380	55,142	15,211	1,212	10	84	1,212	39,766	166,942
Major Coll.-Rural	56,355	59,312	16,361	1,306	10	91	1,306	42,790	179,604
Minor Coll.-Rural	14,940	15,317	4,233	382	3	26	382	11,419	47,359
Local-Rural	61,581	61,038	16,906	2,035	13	116	2,035	44,938	192,049
Interstate-Urban	554,375	588,766	162,489	12,623	103	883	12,623	447,005	1,798,665
Other F/E-Urban	327,838	352,248	97,195	7,122	59	507	7,122	269,084	1,071,971
Other PA-Urban	753,582	777,755	214,421	18,887	149	1,285	18,887	573,946	2,390,714
Minor Art.-Urban	392,278	405,455	111,746	9,746	77	665	9,746	298,766	1,244,813
Collector-Urban	277,167	283,800	78,403	7,155	56	483	7,155	211,709	878,340
Local-Urban	341,084	338,076	93,641	11,269	74	644	11,269	248,902	1,063,722
Total	3,021,550	3,141,533	867,008	75,870	588	5,080	200,117	2,367,870	9,679,617
Total (in Tons)	3.33	3.46	0.96	0.08	0.00	0.01	0.22	2.61	10.67

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Table: 6

Total Nitrogen Oxide Emissions(grams/day)

Functional Class	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	Total
Interstate-Rural	100,375	142,136	52,382	5,774	32	525	5,774	71,581	422,219
Other PA-Rural	30,522	42,641	15,634	1,647	6	98	1,647	18,052	117,518
Minor Art. -Rural	31,705	44,240	16,221	1,700	6	99	1,700	18,660	121,718
Major Coll.-Rural	34,090	47,563	17,441	1,826	7	107	1,826	20,055	130,854
Minor Coll.-Rural	8,507	11,587	4,263	412	2	26	412	4,615	31,749
Local-Rural	25,837	33,103	11,594	997	6	96	997	11,234	91,620
Interstate-Urban	357,539	500,947	184,548	19,400	81	1,331	19,400	221,262	1,409,747
Other F/E-Urban	220,921	311,494	114,666	12,308	52	862	12,308	141,555	882,712
Other PA-Urban	432,518	595,592	219,035	21,699	81	1,326	21,699	242,072	1,633,450
Minor Art.-Urban	225,162	311,291	114,478	11,455	42	693	11,455	127,777	854,152
Collector-Urban	157,831	214,132	78,772	7,517	29	473	7,517	84,228	586,210
Local-Urban	143,104	183,350	64,218	5,525	32	530	5,525	62,225	507,463
Total	1,768,112	2,438,077	893,252	90,260	375	6,166	569,855	1,023,317	6,789,413
Total (in Tons)	1.95	2.69	0.98	0.10	0.00	0.01	0.63	1.13	7.48

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