

**BROOKE-HANCOCK-JEFFERSON
TRANSPORTATION STUDY**

TECHNICAL MEMORANDUM 2008-9

**BHJ REGIONAL 2030 TRANSPORTATION PLAN
TRANSPORTATION AIR QUALITY CONFORMITY ANALYSIS**

JUNE 2008

BROOKE-HANCOCK-JEFFERSON TRANSPORTATION STUDY

BHJ REGIONAL 2030 TRANSPORTATION PLAN TRANSPORTATION AIR QUALITY CONFORMITY ANALYSIS TECHNICAL MEMORANDUM 2008-9

TABLE OF CONTENTS

Introduction	Page 1
Air Quality Designation & Emissions Tests	Page 2
Conformity Analysis Interagency Consultation Process	Page 2
Conformity Analysis Tests - §51.430	Page 4
Plan Conformity Analysis Project Networks §51.464, 51.439 & 51.448.....	Page 4
BR-1 Veterans Memorial Bridge Access Improvements	Page 4
BR-2 – New Ohio River Bridge Between Jefferson County, OH and Brooke County, WV	Page 5
Timely Implementation of TCMS - §51.481	Page 5
Latest Planning Assumptions - §51.412	Page 5
Establishing Conformity Analysis Pollutant Emission Burdens	Page 6
Public Involvement	Page 7
Conformity Determination.....	Page 7

LIST OF TABLES

Table 1	Steubenville 2030 Transportation Plan Update – Conformity Analysis Summary	Page 8
---------	---	--------

LIST OF FIGURES

Figure 1	BHJ Geographic Area – Non-Attainment Area Boundary	Page 3
Figure 2	BHJ Geographic Area – High-Crash Locations.....	Page 6

TRANSPORTATION AIR QUALITY CONFORMITY ANALYSIS

INTRODUCTION

The transportation conformity rule, found in the Code of Federal Regulations (CFR) Title 40 Parts 51.390 and Part 93, as established under section 176(c) of the Clean Air Act, ensures that the U.S. Department of Transportation, Metropolitan Planning Organizations (MPO), and other recipients of federal funds approve transportation activities that are consistent with air quality goals. Transportation conformity addresses air pollution from on-road mobile emissions created by cars, trucks, motorcycles, and transit vehicles. It ensures that these transportation activities do not worsen air quality or interfere with the "purpose" of the air quality State Implementation Plan (SIP), which is to meet the National Ambient Air Quality Standards (NAAQS). According to the Clean Air Act, transportation plans, programs, and projects cannot:

1. Create new NAAQS violations;
2. Increase the frequency or severity of existing NAAQS violations; or
3. Delay attainment of the NAAQS.

The federal requirements apply to areas designated as nonattainment for one or more NAAQS, or redesignated to attainment with federally approved air quality maintenance plans. Conformity applies to both pollutants and specific *precursors*, compounds that react in the atmosphere to form pollutants.

The conformity rule applies to the precursors Volatile Organic Compounds (VOC), sometimes referred to as Hydrocarbons (HC), and Nitrogen Oxides (NO_x) emissions in non-attainment or maintenance (non-attainment areas re-designated as attainment) Ozone (O₃) areas. Conformity also applies to areas designated as non-attainment or maintenance for U.S. Environmental Protection Agency (USEPA) air quality standards set for Nitrogen Dioxide (NO₂), Carbon Monoxide (CO), Particulate Matter with an aerodynamic diameter less than 10 microns (PM₁₀), and Particulate Matter with an aerodynamic diameter less than 2.5 microns (PM_{2.5}).

Particulate matter is a mixture of microscopic solids and liquid droplets suspended in air. It is comprised of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, soil or dust particles, and allergens (including fragments of pollen or mold spores). Sources of fine particle matter (PM_{2.5}) can be direct emissions into the air or formed as secondary particles in the atmosphere. Power plants and industrial facilities, for example, emit sulfur dioxides that in turn produce sulfates, a secondary PM_{2.5} particle. Automobiles, power plants, and other combustion sources emit another precursor of PM_{2.5} called Nitrogen Oxides (NO_x), directly into the atmosphere.

A Long Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP) adopted by an MPO in an area found to be in "non-attainment" or "maintenance" for applicable National Ambient Air Quality Standards (NAAQS), must conform to the applicable provisions of *Title 40: Protection of the Environment - CFR Part 93 - Determining Conformity of Federal Actions to State of Federal Implementation Plans*. Moreover, the MPO and various responsible federal and state entities involved in transportation conformity review/concurrence have established the required interagency consultation procedures through a Memorandum of Understanding. This report describes the criteria, procedures, and planning assumptions used to demonstrate transportation conformity for the MPO LRTP and the adopted FY 2008-2011 TIP for the Steubenville – Weirton, OH – WV Metropolitan Area.

AIR QUALITY DESIGNATION & EMISSION TESTS

The appropriate emissions analysis tests required by Conformity depend on whether federal authorities have established approved budgets for individual pollutants. If they have, then the Transportation Plan and TIP must meet the budgets. If they have not, then an interim test is applied. The interim tests compare the "action" scenario [i.e. the transportation system that would result from the implementation of the proposed action (transportation plan, TIP, etc. and all other expected regionally significant projects in the nonattainment area)] to some baseline. The emissions must be less than the baseline. This ensures that transportation plans will not worsen air quality while each state (in this instance Ohio and West Virginia) is developing a State Implementation Plan (SIP).

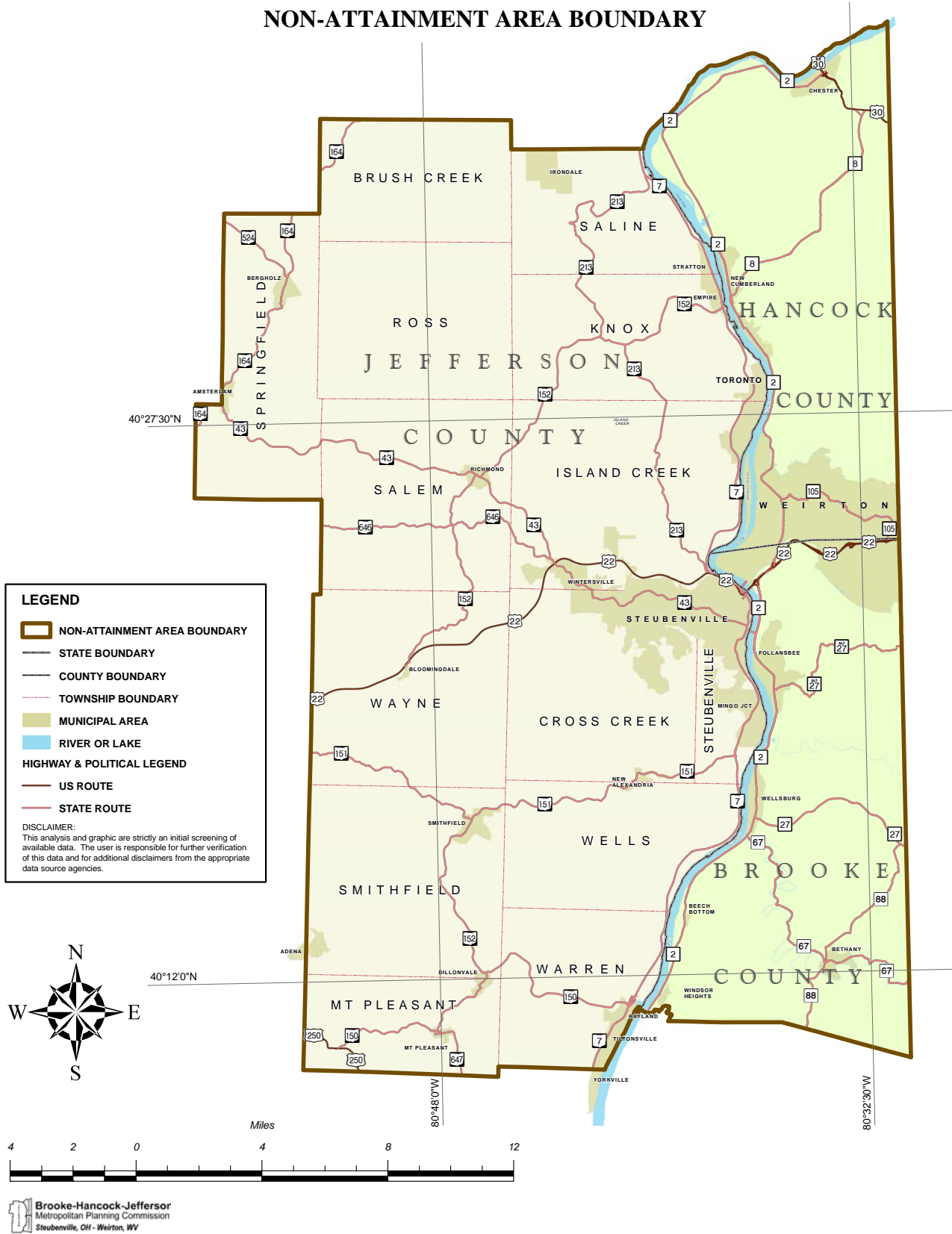
Both the State of Ohio and the State of West Virginia have submitted plans to USEPA that establish motor vehicle emission budgets (MVEB) for Nitrogen Oxides (NO_x) and Volatile Organic Compounds (VOC), under the 8-hour ozone standard. Each state has established separate budgets (i.e. NO_x and VOC budgets for Jefferson County, OH and separate NO_x and VOC budgets for the collective West Virginia Counties of Brooke & Hancock). On April 3, 2007, the USEPA circulated a Notice of Adequacy regarding the Jefferson County, Ohio budgets which became effective on April 18, 2007 (40 CFR Parts 52 and 81, Vol. 72 *Federal Register* 15879-80 April 18, 2007). In the following month on May 16, 2007, the USEPA issued a determination of attainment, (40 CFR 52 and 81, Vol. 72 *Federal Register* 27640-2 June 15, 2007) essentially re-designating Jefferson County as attaining the 8-hour ozone standard in force June 15, 2007. Then, on July 5, 2007, submitted a correcting amendment to the Jefferson County determination of attainment (40 CFR Part 52, Vol. 72 *Federal Register* 36599-60 Jul5, 2007). The revision modified language regarding the 2018 MVEB. On the other hand, USEPA issued an approval for a re-designation request from non-attainment to attainment for the 8-hour ozone for Brooke and Hancock counties, West Virginia May 14, 2007 (40 CFR Part 52, Vol. 72 *Federal Register* 27060-3 June 13, 2007). The re-designation request became effective June 13, 2007 and included maintenance emission budgets for NO_x and VOC.

Neither Ohio nor West Virginia has finalized their respective PM_{2.5} Attainment SIPs. Accordingly, the build-no-greater than base year (\leq 2002) an interim Conformity test will demonstrate transportation conformity for this pollutant. The collective emissions of the entire nonattainment area must meet the PM_{2.5} test.

CONFORMITY ANALYSIS INTERAGENCY CONSULTATION PROCESS

To define the terms of the interagency process under §93.105, the BHJMPO has entered into a Memorandum of Understanding (MOU) with the Ohio Department of Transportation (ODOT), and the OEPA, as well as the West Virginia Department of Transportation (WVDOT), and the WVDEP. Under the terms of the MOU, the BHJMPO serves as the lead transportation-planning agency for the metropolitan area and is responsible for mobile source emission planning in the bi-state metropolitan area. The BHJMPO activities include coordination of individual plan elements, provide opportunities for public involvement, integrate air quality planning into the transportation planning process, and prepare mobile source inventories and plan elements related to the control of air pollution emissions from highway mobile sources.

**Figure 1
BHJ GEOGRAPHIC AREA
NON-ATTAINMENT AREA BOUNDARY**



CONFORMITY ANALYSIS TESTS - §51.430

Through the interagency consultation process, the BHJMPO, ODOT, WVDOT, and FHWA, OEPA, and USEPA have established the following conformity tests:

- Budget Emissions Tests for Ozone Precursors - Brooke and Hancock counties, WV; Jefferson County, OH
 - Analysis Year 2009 – 8-Hour Ozone Redesignation Budget Year
 - Analysis Year 2018 – 8-Hour Ozone Redesignation Budget Year
 - Analysis Year 2024 – Interim Year 8-Hour Emissions Budget Tests (vs. 2018 budgets)
 - Analysis Year 2030 – Plan Horizon Year (vs. 2018 budgets)

- Interim Emissions Tests for PM_{2.5} - Brooke and Hancock counties, WV; Jefferson County, OH
 - Analysis Year 2002 – Baseline for Interim PM_{2.5} ≤ 2002 Emissions Tests
 - Analysis Year 2009 – 1st Analysis Year for ≤ 2002 Tests
 - Analysis Year 2018 – Interim Year for ≤ 2002 Tests
 - Analysis Year 2024 – Interim Year for ≤ 2002 Tests
 - Analysis Year 2030 – Plan Horizon Year for ≤ 2002 Tests

The conformity tests demonstrate that the emission burdens from the Transportation Plan do not exceed the mobile source emission budgets for the 8-Hour Ozone standard as approved by the USEPA and established in the Ohio and West Virginia State Implementation Plans. The Brooke and Hancock County, West Virginia mobile source emission budgets, in tons per day, for VOC are 1.96 and NO_x is 2.82. The 2018 VOC and NO_x budgets for the West Virginia counties are 1.00 and 1.17 tons/day, respectively. The Jefferson County, OH 2009 mobile source emissions budgets are VOC = 2.63 tons/day and NO_x = 4.10 tons/day, while the 2018 budget for VOC is 1.40 and for NO_x is 1.67 both listed in tons per day.

PLAN CONFORMITY ANALYSIS PROJECT NETWORKS - §51.464, 51.439 & 51.448

Milestone Years 2002, 2009, and 2018

These networks represent the baseline scenario network 2002 for PM_{2.5} Interim Tests, as well SIP milestone years. These networks represent the implementation of the current 2008-2011 Transportation Improvement Program (TIP) and any regionally significant projects expected to be open for traffic by the end of each respective analysis year. The analysis is representative of the SIP milestone year's traffic assignment. The Travel Demand Model Validation Year is 2000 using comparable Average Daily Traffic count data, updated social-economic variables for 2009, and projected 2018 variables based on a straight-line extrapolation between 2009 set of variables and the Horizon Year 2030 variables.

This Plan identifies the following Major Capacity Addition project for the 2018 Plan Conformity analysis:

1. **BR-1 Veterans Memorial Bridge Access Improvements**

Milestone Year 2024

The BHJMPO selected the 2024 Analysis Year for consistency with the Transportation Plan financial forecasts, meaning an equal number of years, which is six (6), between the 2018 Budget Year and the 2030

Plan Horizon Year. The network represents the interim year test between the 2018 Budget Year and the 2030 Plan Horizon Year.

This Plan does not identify any projects for the 2024 Milestone Year.

Transportation Plan Horizon Year 2030

This represents the completed Long Range Plan (LRP) network using the 2030 Horizon Year traffic assignments. The LRP network is the future transportation system that will result from implementation of the proposed TIP, and any other regionally significant projects expected to be open for within the entire timeframe of the LRP.

In addition to the previous projects analyzed above, this Plan identifies the following Major Capacity Addition project for the 2030 Plan Conformity analysis:

1. **BR-2 New Ohio River Bridge between Jefferson County, OH and Brooke County, WV**

Non-Federal Projects

The air quality impacts of non-federally funded, regionally significant projects that contribute to increased vehicle miles traveled, change regional traffic patterns and contribute to higher vehicle emissions are also accounted for in the conformity analysis. The plan identifies one such project, **BR-4 New Ohio River Bridge Jefferson/Columbiana County, OH to Hancock County, WV South of Chester, WV**. However, the Plan does not identify a reasonable funding source to construct the project. Therefore, the plan lists the project as unfunded and not open within the entire timeframe of the LRP.

TIMELY IMPLEMENTATION OF TCMS - § 51.418

Conformity regulations also require provisions for timely implementation of transportation control measures (TCMs) in the SIP. The State's maintenance plans do not include any transportation control measures.

LATEST PLANNING ASSUMPTIONS - §51.412

Identifying projected growth centers and understanding urban and rural population changes are essential to determine future transportation needs in a given study area. Critical elements include an understanding the past and anticipated future shifts in the region's economy, population, land use patterns, and other environmental factors over time. In turn, these factors are useful for predicting future transportation patterns and justify transportation improvements over improvements over the next twenty years.

A Travel Demand Model (TDM) is the traditional forecasting tool used to examine potential changes in future travel patterns for a specific study area, in this case the Brooke Hancock Jefferson Metropolitan Area (BHJMPO). The BHJMPO, with the assistance of ODOT Modeling & Forecasting, maintains a validated region-wide TDM that employs a four-step modeling process consisting of trip generation, trip distribution, mode choice, and route assignment performed with the Cube Voyager software package. The model Outputs generated from the TDM are link-by-link directional 24-hour traffic volumes for simulating Base Year and Horizon Year travel patterns generated by the LRTP transportation network.

ESTABLISHING CONFORMITY ANALYSIS POLLUTANT EMISSION BURDENS

Emission Factor Generation

MOBILE6 software generates emission factors by facility type (freeway, surface arterial), every hour of the day (0-23). For freeways, the speed ranges from 5 to 65 mph in 1 mph increments. For surface arterial, the speeds range from 5 to 55 mph in 1 mph increments. Each scenario record combines the appropriate hourly temperature and VMT vehicle mix estimated by hour of day. The VMT vehicle mix follows MOBILE6 Users guide procedures using 16 combined gasoline and diesel-fuel categories.

The first emission factors file used to establish the conformity analysis consists of hourly non-evaporative emission factors (HC and NOX) for freeway and arterial, exhaust CO for freeway and arterial, exhaust CO for freeway and arterial, 24 hour evaporative, and intra zonal HC, NOX, and CO. This process generates a separate set of emission factors for intrazonal trips. A second emissions factor file establishes emissions for direct particulate matter (PM2.5) and pre-cursor NOx. There is also a separate set of emission factors for intrazonal trips.

For freeways and arterials, ODOT wrote four (4) small routines to reformat MOBILE6 descriptive output to the format needed M6FOR8A, M6FOR8B, M6FOR8C, and M6FOR8D. Three (3) other written routines convert the 24-hour evaporative emissions, M6EF24A, M6EF24B, and M6EF24C.

MOBILE6 is run six (6) times, twice for freeways, twice for arterials, and twice for evaporative emissions. A batch file reformats the programs, which combine the results of the three MOBILE6 runs, computes composite emission factors, and creates a single emission factor file. M6FOR8A extracts PM2.5, VOC, CO, NOX, resting, and running loss factors from MOBILE6 output. M6FOR8B appends a speed index to output of M6FOR8A. M6FOR8C computes composite emission factors from the output of M6FOR8A. The source codes and process details documented in the ODOT Modeling & Forecasting Section files are available upon request.

The next phase in the process consisted of using the USEPA MOBILE6.2 program to generate 16,136 emission factors based on input from the conversion. ODOT has developed several DOS batch post-processing routines to write MOBILE6.2 output in the array or control parameter format. This format is required for use in ODOT's POSTCMS program to calculate Congestion Management statistics and Air Quality emission burdens.

In the third phase, ODOT used the POSTCMS program to relate the MOBILE6.2 emission factors with the Travel Demand Model 24-hour link data files to generate hourly pollutant burdens for hydrocarbons (HC), oxides of nitrogen (NOx), direct particulate matter (PM2.5), and carbon monoxide (CO). This process does not use the CO estimates in the analysis because the region CO attainment designation.

The POSTCMS program reads the transportation links containing the weighted 24 hour volumes, the node grid coordinates, and the emission factors generated by the MOBILE6.2 program, and then lists the number of centroids, the program control records, the table summaries used by the program, the option values used, the hours requested, and the seasonal factors for both HC and CO. The program multiplies hourly volumes by the corresponding seasonal factor (1.08 for HC and 1.0 for CO).

The program lists intrazonal vehicle miles of travel (VMT) after the seasonal factors. The intrazonal VMT calculation assumes that the zonal area in square miles represents a circle. After calculating the radius, the algorithm multiplies the intrazonal trips by the radius to compute the intrazonal VMT. Additional calculations then estimate the directional hourly speeds by applying the percent Average Daily Traffic (ADT), percent direction, and percent heavy-duty trucks (adjusted by 1.7 to represent auto equivalents). Further, by dividing the auto equivalent by the directional capacity, the program uses the resulting volume to capacity ratio (V/C) in a lookup table to determine the directional speed. Then, using the hour, functional classification, and directional speed to derive the directional emission factor found in the MOBILE6.2 array file. If required, this process may interpolate the emission factors. The software calculation explained in the process above hourly on each link in the network. After processing all hours, the POSTCMS program lists the hourly vehicle miles of travel and pollutant burdens for freeways and surface arterials, the total vehicle miles and pollutant burden for evaporative and refueling HC, and the total HC pollutant burden.

PUBLIC INVOLVEMENT

Steubenville's Public Involvement for Air Quality Conformity information is an integral part of the Transportation Plan development public involvement process. Air Quality Conformity information and data were available for Transportation Plan public involvement activities.

CONFORMITY DETERMINATION

This section demonstrates that the Long Range Transportation Plan (LRTP) conforms to the applicable provisions of the CFR as well as the July 1, 2004 final conformity rule (Federal Registry Publication 69 FR 40004) that addresses conformity for the new 8-hour standards and the March 1999 court decision. This section documents that the TIP also meets applicable PM_{2.5} National Ambient Air Quality Standards.

The conformity analysis demonstrates that the LRTP conforms to the transportation conformity rule because projects listed meet the applicable conformity tests and will not:

- Cause or contribute to any new violation of the 8-hour ozone or PM_{2.5} standard;
- Increase the frequency or severity of any existing violations of the 8-hour ozone or PM_{2.5} standard;
- Delay the timely attainment of the 8-hour ozone or PM_{2.5} standard.

As exhibited in Table 1, based upon Travel Demand Model output, the emissions generated by projects found in this LRTP are below the applicable 8-Hour Ozone and PM_{2.5} conformity tests for Jefferson County, Ohio and Brooke and Hancock counties, WV. The test results conclude that the projects listed in this LRTP do not cause or contribute to any new violation of the 8-hour ozone or the PM_{2.5} standard.

Table 1
Steubenville 2030 Transportation Plan Update
Conformity Analysis Summary

Ozone

Attainment status: 8-hour OH/WV Ozone Maintenance Area
 Geography: Jefferson Co., OH & Brooke and Hancock Cos., WV
 SIP Status: Jefferson Co., OH 8-Hour Redesignation Plan – Effective 6/15/07
 Brooke and Hancock Cos., WV 8-Hour Redesignation Plan – Effective 6/13/07
 Conformity Tests: 8-Hour budget tests of BHJ Plan/TIP analysis year networks
 Analysis Years: 2009 8-Hour Redesignation Plan budget year
 2018 8-Hour Redesignation Plan budget year
 2024 Interim year
 2030 Plan Horizon Year

Ozone (Tons/Day)						
Jefferson Co.	2009 Budget	2009 Emissions	2018 Budget	2018 Emissions	2024 Emissions	2030 Emissions
VOC	2.63	1.77	1.40	0.97	0.76	0.74
NO _x	4.10	3.04	1.67	1.26	0.86	0.75
BRO & HAN Cos.						
BRO & HAN Cos.	2009 Budget	2009 Emissions	2018 Budget	2018 Emissions	2024 Emissions	2030 Emissions
VOC	1.96	1.32	1.00	0.73	0.58	0.56
NO _x	2.82	2.00	1.17	0.86	0.61	0.52

PM_{2.5}

Attainment status: PM_{2.5} OH/WV Nonattainment area
 Geography: Jefferson Co., OH & Brooke and Hancock Cos., WV
 Conformity Tests: 2002 baseline interim budget tests of BHJ Plan/TIP analysis year networks
 Analysis Years: 2009 1st Analysis year (within 5 years of conformity determination year §93.119(g) (1))
 2018 Interim year
 2024 Interim year
 2030 Plan Horizon Year

PM_{2.5} (Tons/Day)					
Jefferson Co.	2002 Baseline	2009 Emissions	2018 Emissions	2024 Emissions	2030 Emissions
Direct PM	34.24	18.88	10.74	9.01	9.26
NO _x	2008.16	1151.97	469.16	308.84	263.31
BRO & HAN Cos.					
BRO & HAN Cos.	2002 Baseline	2009 Emissions	2018 Emissions	2024 Emissions	2030 Emissions
Direct PM	23.28	13.17	7.58	6.51	6.54
NO _x	1258.73	751.65	315.84	215.30	182.07
Area Totals					
Area Totals	2002 Baseline	2009 Emissions	2018 Emissions	2024 Emissions	2030 Emissions
Direct PM	57.52	32.05	18.32	15.51	15.80
NO _x	3266.90	1903.62	785.01	524.14	445.37

