

**APPENDIX B**

**EMISSIONS ANALYSIS FOR THE  
CAPITAL DISTRICT AIR QUALITY  
CONFORMITY FINDING FOR**

**THE NEW VISIONS 2025  
REGIONAL TRANSPORTATION PLAN  
AND  
THE CDTC 2005-10 TRANSPORTATION IMPROVEMENT  
PROGRAM  
AND THE NEW YORK STATE DEPARTMENT OF  
TRANSPORTATION CAPITAL PROGRAM**

**Capital District Transportation Committee  
New York State DOT**

## **Methodology Used to Model the Emission Impacts of the Plan**

In accordance with New York State Department of Transportation guidelines, regional emissions estimates were generated by using EPA's Mobile Model 6 software for 1990, 2002, and "no-build" and plan "build" scenarios for years 2010, 2015 and 2025. These regional emissions rates were updated by the New York State Department of Environmental Conservation using EPA's Mobile Model 6 software in year 2004. The estimates of emissions were based upon the most recent population, employment, travel, and congestion information developed by the CDTC staff for the four counties.

The CDTC STEP Model was used to evaluate the benefits of the subject projects, including emissions benefits. CDTC's Systematic Traffic Evaluation and Planning (STEP) model is used to estimate travel volumes and resulting congestion (VMT and speed). Using TMODEL2 software, the regional STEP model directly generates PM peak hour VMT and speed data attendant to existing and future land use, traffic, and highway network conditions for the four counties in the Capital District. Twenty four-hour estimates were generated by factoring the PM peak hour trip set in accordance with NYSDOT's guidelines. For this exercise, the factor used to adjust the trip set was derived from hourly traffic distributions at more than 100 locations in the Capital District.

CDTC has developed a post processor program that calculates total emissions for any given traffic assignment. EPA's Mobile Model 6 emission rates for volatile organic compounds, NO<sub>x</sub> and CO were received from the New York State Department of Transportation and coded into look-up tables used by the STEP Model. For any given traffic assignment, emissions are calculated for each link on the network based on assigned traffic VMT, functional class, total link operating speed, year of analysis and the corresponding emission rate. The total emissions for all links are then aggregated for a regional total. This Mobile 6 post processor was used in analyzing the subject projects.

In order to evaluate the impact of the TIP on emissions, the impacts of a "no-build" scenario were evaluated. The no-build scenario is a hypothetical scenario that would result if the TIP were not implemented. The networks used for the 2010, 2015 and 2025 "no-build" scenarios assume projects in the TIP would not be implemented.

Travel demand for the year 2010, 2015 and 2025 "no-build" scenarios was simulated using Capital District Regional Planning Commission (CDRPC) official forecasts of households and employment, and CDTC forecasts of vehicle ownership.

The year 2010 TIP/Financially Constrained Plan network includes projects from the 2005-2010 TIP; the 2015 and 2025 TIP/Financially Constrained Plan networks include all TIP projects, including those scheduled in the post 5 year period of the TIP. For build conditions for 2010, 2015 and 2025, travel demand forecasts were prepared that were consistent with achievements expected from implementation of the *New Visions* plan. With full implementation of the *New Visions* plan, increases in daily vehicle travel will be dampened from the trend forecast of 30% (1996-2015) to approximately one-third to one-half that level. This will occur through a combination of substitution of communication for travel, increased carpooling, increased bus, bike, and/or walk travel, and shorter trip lengths (due to proximity of activities). This dampening of daily vehicle travel was represented in the CDTC STEP model as a 10% reduction in vehicle trips in 2010 with respect to trend growth forecasts, and as a 15% reduction in vehicle trips in 2015 and 2025. The full *New Visions* Plan network for 2015 and 2025 includes TIP

projects plus additional economic development and congestion management projects; hypothetical, representative projects were selected which do not have status in the New Visions Plan. The New Visions Plan intentionally does not designate the additional \$60 million for Congestion Management projects and the additional \$60 million economic development projects to any specific projects at this time.

The financially constrained plan is based on "steady-state funding". Steady state funding is the currently expected state, federal and local funds would continue at current levels (adjusted for inflation) through the 21-year period, and all federal demo project funds would be received. This scenario makes comparable progress across all plan improvement initiatives. The financially constrained plan is assumed to achieve comparable progress -- 71 percent -- in the reduction in travel that would be achieved by full plan implementation.

The TIP network used in the analysis assumes that all TIP projects are implemented. All non-exempt projects were modeled, as well as a number of exempt projects that will affect intersection capacities. Projects programmed in the post five year network were not included in the year 2010 TIP network, but were included in the 2015 and 2025 build networks. In addition, the for the years 2015 and 2025 the full plan scenario was modeled that includes TIP projects plus additional economic development and congestion management projects, as well as VMT reduction that would result from the full implementation of the *New Visions* Plan. Exempt and Non-Exempt projects related to the Luther Forest Technology Park campus plan were added to the build networks as described in Appendix A.

EPA's Mobile Model 6 emission rates for volatile organic compounds and NO<sub>x</sub> were applied on a link by link basis using speed and VMT estimates developed in the STEP model for each scenario. VMT was increased by ten percent in all scenarios to reflect summer traffic volumes, since the highest levels of ozone are usually detected in the summer months. The Mobile Model 6 emission rates reflect the most current New York State SIP proposals for upstate non-attainment.

Table B1 indicates the results of the STEP Model traffic assignments for the Capital District. Appendix C provides all of the outputs from these traffic assignments which summarize the VOC and NO<sub>x</sub> emissions for each assignment by functional class.

**Table B1: Air Quality Impact of the CDTC 2005-10 TIP and the *New Visions* Plan, and Luther Forest Technology Park Related Projects**

Model Results for the Capital District, without Montgomery County Projects or ITS Projects

<b>Scenario</b>	<b>Volatile Organic Compounds (VOCs) Emissions in Kilograms Per Day</b>	<b>Nitrogen Oxides (NO<sub>x</sub>) Emissions in Kilograms Per Day</b>	<b>Daily Vehicle Miles Traveled (Thousands)</b>
<b>1990</b>	60,849	58,524	17,740
<b>2002</b>	39,719	47,470	23,070
<b>Year 2010 No-build</b>	19,245	23,084	25,182
<b>Year 2010 with 2005-10 TIP and Financially Constrained New Visions Plan</b>	17,311	21,682	23,465
<b>Year 2015 No-build</b>	13,209	13,725	26,581
<b>Year 2015 with 2005-10 TIP and Financially Constrained New Visions Plan</b>	11,311	12,528	23,916
<b>Year 2015 with full <i>New Visions</i> Plan<sup>2</sup></b>	10,666	12,050	22,825
<b>Year 2025 No-build</b>	9,258	6,561	28,654
<b>Year 2025 with 2005-10 TIP and Financially Constrained New Visions Plan</b>	7,725	5,967	25,736
<b>Year 2025 with full <i>New Visions</i> Plan<sup>2</sup></b>	7,203	5,718	24,542

## Emissions Analysis for Counties outside of CDTC

Refer to Pages 4-5 of the main conformity determination narrative and *Appendix E*.

The build and no-build emissions estimate for PIN 2044.61 in Montgomery County separately from the CDTC STEP Model. Montgomery County is included in the Capital District non-attainment area. The results of the emissions analysis for Montgomery County are summarized in Table B2.

**Table B2 – Capital Program of Transportation Projects in Montgomery County, NY**

<b>Scenario</b>	<b>Volatile Organic Compounds (VOCs) Emissions in Kilograms Per Day</b>	<b>Nitrogen Oxides (NO<sub>x</sub>) Emissions in Kilograms Per Day</b>
<b>1990 (For informational purposes only)</b>	108	110
<b>2002</b>	68	78
<b>Year 2010 No-Build</b>	36	41
<b>Year 2010 Build</b>	33	39
<b>Year 2015 No-Build</b>	26	26
<b>Year 2015 Build</b>	23	24
<b>Year 2025 No-Build</b>	26	15
<b>Year 2025 Build</b>	17	13

## **Analysis of ITS Emissions Impacts for the TMC, HELP Program, and TRANSMIT Program**

The average daily emission reductions that will result from the Capital Region Traffic Management Center Operations (PIN 1806.60, CDTC TIP Project RG37A), HELP (PIN 1806.61, CDTC TIP Project RG37), and the ITS Elements & Transmit Systems for Capital District Interstates (PIN 1807.03, CDTC TIP Project RG99; includes new CCTV, VMS, the TRANSMIT Program) were calculated separately using the CDTC STEP Model for 2010, 2015 and 2025. The resulting benefits were then subtracted from the build alternatives' emissions in Table B5.

For the subject projects, separate traffic assignments were run representing typical major, medium, and minor incidents on the Capital District expressway system in the analysis years. In addition, a traffic assignment was run for a typical day in the analysis years without incidents. The representative incidents are described in Table B3. The emissions impacts resulting from each of these typical incidents were calculated by subtracting the total regional emissions for a typical PM peak assignment in each analysis year from the total regional emission with a given incident. The impact reductions resulting from the TMC and HELP programs corresponding to each incident type were estimated. An inventory developed by NYSDOT of actual incidents in years 2000 through 2003 was used to estimate typical incident frequencies by type. This information was used to estimate average daily emissions benefits of the subject projects. The analysis and results are summarized in Table B4.

**Table B3**  
**Modeling a Typical Incident Using the CDTC STEP Model**  
**and Description Impacts Reduction Benefits per Incident**

	Typical incident modeled as	Impact Reduction of TMC	Benefits of HELP Vehicle	Benefits of I-90 Part 2 (includes new CCTV, VMS, the TRANSMIT Program)
<b>Major Incident</b>	Close the Northway PM peak hour northbound between Exit 7 and 8	40% reduction in delay and air quality impacts		25% increase of TMC benefits
<b>Medium Incident</b>	Northway at two thirds capacity PM peak hour, representing closing one lane for one mile	30% reduction in delay and air quality impacts		25% increase of TMC benefits
<b>Minor Incident</b>	Decrease capacity by 15% on Northway, for one tenth mile, representing vehicle in the shoulder	20% reduction in delay and air quality impacts	20% reduction in delay, and air quality impacts	25% increase of TMC benefits

Impact reduction results from faster response to the incident, shorter incident duration, prevention of secondary incidents and alternate routes posted resulting in traffic avoiding the incident. Limited quantitative information is available for estimating the benefits of incident management and traveler information systems. However, there is qualitative information that indicates the benefits are substantial. *Intelligent Transportation Systems Benefits and Costs*, FHWA, 2003 provides qualitative documentation of the benefits of ITS, along with anecdotal quantitative information.

For example, the report cited a study of the Coordinated Highways Action Response Team (CHART) in Maryland which found that mobilization and response portions of incident management systems reduced average incident duration by between 55% and 57%. However, this number does not represent the reduction in total delay from an incident, because the impacts of an incident to a traffic system linger beyond the duration of the incident.

It was assumed that the TMC would have a greater reduction of impacts for a major incident because of the pervasive secondary traffic system impacts that result from a major incident. Reduction in incident duration because of more rapid response would therefore have greater potential to reduce system impacts. Also, the value of traveler information to permit alternate travel plans would have much more significant benefits for major incidents than for minor incidents.

The Expressway TRANSMIT improvements (RG99) are assumed to have a significant incremental benefit per incident because they represent a significant expansion of the incident detection system and the traveler information system for the TMC.

**Table B4**

**Traffic Management Center Operations, the HELP Program, and Transmit  
Based on CDTC STEP Model and Mobile 6 Emission Rates**

	Annual Incidents	Average Daily Number of Incidents	Year 2010 Impacts								
			Emissions Impacts Per Incident (kg)			Emissions Benefits Per Incident (kg)			Emissions Benefits Per Average Day (kg)		
			VOC	NOX	CO	VOC	NOX	CO	VOC	NOX	CO
Major Incident	55	0.2	112	40		45	16		10	4	
Medium Incident	490	2.0	6	3		2	1		4	2	
Minor Incident	12,000	48.0	0.31	0.08		0.1	0.02		3	0.7	
Minor Incident with HELP response	5,750	23.0	0.28	0.09		0.1	0.02		1	0.4	
Total Benefits of Capital Region Traffic Mgt Center Operations (PIN 1806.60, CDTC TIP Project RG37A)									16	6	
Total Benefits of HELP (PIN 1806.61, CDTC TIP Project RG37)									1	0.4	
Incremental Benefits of the ITS Elements & Transmit Systems for Capital District Interstates (PIN 1807.03, CDTC TIP Project RG99)									4	2	
Total Benefits of TMC Operations, HELP, and Transmit									22	8.0	

**Traffic Management Center Operations, the HELP Program, and Transmit  
Based on CDTC STEP Model and Mobile 6 Emission Rates**

	Annual Incidents	Average Daily Number of Incidents	Year 2015 Impacts								
			Emissions Impacts Per Incident (kg)			Emissions Benefits Per Incident (kg)			Emissions Benefits Per Average Day (kg)		
			VOC	NOX	CO	VOC	NOX	CO	VOC	NOX	CO
Major Incident	55	0.2	63	21		25	8		6	2	
Medium Incident	490	2.0	3	1		1	0.3		2	0.6	
Minor Incident	12,000	48.0	0.20	0.05		0.0	0.01		2	0.5	
Minor Incident with HELP response	5,750	23.0	0.17	0.04		0.0	0.01		1	0.2	
Total Benefits of Capital Region Traffic Mgt Center Operations (PIN 1806.60, CDTC TIP Project RG37A)									9	2.9	
Total Benefits of HELP (PIN 1806.61, CDTC TIP Project RG37)									1	0.2	
Incremental Benefits of the ITS Elements & Transmit Systems for Capital District Interstates (PIN 1807.03, CDTC TIP Project RG99)									2	0.7	
Total Benefits of TMC Operations, HELP, and Transmit									12	3.8	

**Traffic Management Center Operations, the HELP Program, and Transmit  
Based on CDTC STEP Model and Mobile 6 Emission Rates**

	Annual Incidents	Average Daily Number of Incidents	Year 2025 Impacts								
			Emissions Impacts Per Incident (kg)			Emissions Benefits Per Incident (kg)			Emissions Benefits Per Average Day (kg)		
			VOC	NOX	CO	VOC	NOX	CO	VOC	NOX	CO
Major Incident	55	0.2	41	12		16	5		4	1	
Medium Incident	490	2.0	3	1		1	0.3		2	0.6	
Minor Incident	12,000	48.0	0.13	0.03		0.0	0.01		1	0.3	
Minor Incident with HELP response	5,750	23.0	0.17	0.04		0.0	0.01		1	0.2	
Total Benefits of Capital Region Traffic Mgt Center Operations (PIN 1806.60, CDTC TIP Project RG37A)									7	1.9	
Total Benefits of HELP (PIN 1806.61, CDTC TIP Project RG37)									1	0.2	
Incremental Benefits of the ITS Elements & Transmit Systems for Capital District Interstates (PIN 1807.03, CDTC TIP Project RG99)									2	0.5	
Total Benefits of TMC Operations, HELP, and Transmit									9	2.5	

Note: "Incremental Benefits of ITS Elements & Transmit Systems for Capital District Interstates" (seventh line) are calculated as 25% of the "Total Benefits of Capital Region Traffic Management Center Operations" (fifth line).

<b>Table B5</b>						
<b>Air Quality Impact of the CDTC 2005-10 TIP, Fiscally Constrained <i>New Visions</i> Plan, and the Capital Program of Transportation Projects in Montgomery, Greene, and Schoharie Counties*</b>						
<b>Scenario</b>	<b>Volatile Organic Compounds (VOCs) Emissions</b>		<b>Nitrogen Oxides (NO<sub>x</sub>) Emissions</b>		<b>Daily Vehicle Miles Traveled (Thousands)</b>	
	<b>kg/day</b>	<b>tons/day</b>	<b>kg/day</b>	<b>tons/day</b>		
<b>1990<sup>◇</sup></b>	60,957	67.19	58,634	64.63	17,776	
<b>2002<sup>◇</sup></b>	39,787	43.86	47,548	52.41	23,114	
<b>Year 2010 No-build</b>	19,281	21.25	23,125	25.49	25,231	
<b>Year 2010 with 2005-10 TIP and Financially Constrained New Visions Plan</b>	17,322	19.09	21,713	23.93	23,514	
<b>Year 2015 No-build</b>	13,235	14.59	13,751	15.16	26,633	
<b>Year 2015 with 2005-10 TIP and Financially Constrained New Visions Plan</b>	11,322	12.48	12,548	13.83	23,968	
<b>Year 2025 No-build</b>	10,677	11.77	12,070	13.30	22,877	
<b>Year 2025 with 2005-10 TIP and Financially Constrained New Visions Plan</b>	9,284	10.23	6,576	7.25	28,713	

1. The “Financially Constrained New Visions Plan” for 2010, 2015 and 2025 includes the TIP network as well as the VMT reduction that would result from the implementation of the financially constrained *New Visions* Plan. The year 2010 network includes projects scheduled in the five year TIP period; the 2015 and 2025 networks include all TIP projects, including those scheduled in the post 5 year period of the TIP. It is assumed that 71% of the VMT reduction of the full implementation of the plan would be achieved by the financially constrained plan.
2. Years 2015 and 2025 “with full *New Visions* Plan” includes TIP projects plus additional economic development and congestion management projects, as well as VMT reduction that would result from the full implementation of the *New Visions* Plan.
3. The build and no-build emissions and VMT for a non-exempt project corridor in Montgomery County have been added to the total emissions for the four county CDTC area. These emissions were calculated separately from the CDTC STEP Model. Montgomery County is included in the Capital District non-attainment area.
4. The average daily emission reductions that will result from the Capital Region Traffic Management Center Operations (PIN 1806.60, CDTC TIP Project RG37A), HELP (PIN 1806.61, CDTC TIP Project RG28), and the ITS Elements and TRANSMIT Systems for the Capital District Interstates Project (PIN 1807.03, CDTC TIP Project RG99; includes new CCTV, VMS, the TRANSMIT Program) were calculated separately using the CDTC STEP Model for 2010, 2015 and 2025. The resulting benefits were then subtracted from the build alternatives’ emissions in Table B1. CDTC Project RG99 is being designated as a “non-exempt” project.

\* The “build” scenario includes the CDTC STEP Model network and the effects of one non-exempt project in the Montgomery County Capital Program. There are no non-exempt projects in the Greene and Schoharie County Capital programs. Therefore, no non-exempt projects are included in the “build” action scenarios for Greene and Schoharie Counties.

◇ The emissions test used to demonstrate conformity is the “build-no-greater-than-no-build” test. Therefore, 1990 and 2002 emissions estimates are included in this table for informational purposes only.