APPENDIX A

SCENARIO ANALYSIS

(first presented in the 2030 Long Range Transportation Plan)

2035 LONG RANGE TRANSPORTATION PLAN

SCENARIO ANALYSIS

INTRODUCTION

The purpose of this appendix is to describe the results of an analysis of future development scenarios conducted jointly by the ITCTC and the Tompkins County Planning Department (TCPD). The TCPD developed the Tompkins County Comprehensive Plan (Comprehensive Plan) in 2004 at the same time that the 2025 LRTP was being written. This provided the opportunity for both agencies to coordinate their efforts to ensure the creation of mutually supportive planning documents. Both agencies continued to work closely together developing the future scenarios included in the 2030 LRTP.

The principles and policies of the Comprehensive Plan recommend future development in Development Focus Areas, where increased densities and mixed uses are encouraged in existing urban areas, villages, other currently developed areas and areas where community water and sewer are available. This approach is supported by the goals and objectives found in this LRTP. A shift to mixed-use development patterns in Development Focus Areas is expected to result in, improved conditions for the provision of transit and for shifting a greater number of trips to walking, bicycling and ridesharing.

The TCPD developed a series of scenarios to help illustrate the potential impacts of future growth based on different land use development patterns. Using the TCPD's 2030 projected land use, the ITCTC used its travel demand model (TransCAD) to help determine the impacts of traffic on the county's road network. The scenarios and analysis results are described below.

For the first time in this LRTP, ITCTC was able to calculate the greenhouse gas emissions for current and future scenarios. ITCTC used an interface developed by the New York Department of Transportation called Roadway and Rail Energy and Greenhouse Gas Analysis Extension (RREGGAE) to run the Motor Vehicle Emission Simulator – Highway Vehicle Implementation (MOVES-HVI) software. ITCTC future scenarios will follow the recommendations and emission goals of the 2008 Energy and Greenhouse Gas Emissions Element of the Tompkins County Comprehensive Plan, which calls for a 40% reduction in carbon emissions over 20 years. Besides using the outputs from the TransCAD model (Vehicle Miles Traveled and Vehicle Hours Traveled) to make calculations, MOVES RREGGAE also takes into account 2030 projected Alternative Vehicle Fuels / Technologies for passenger cars, SUVs, vans, trucks and buses, vehicle speeds, and 2030 expected Fuel Efficiency.

The Comprehensive Plan and the LRTP recognize that responsibility for regulating land development in Tompkins County lies at the local municipal level, within the towns, villages and the City of Ithaca. Thus the land use scenarios were not meant to prescribe a specific future land use pattern. Rather, the scenarios were intended to show the relative impacts of future development on various systems in the county: transportation, natural areas, water resources, etc. The LRTP analysis explored the impacts on the transportation system. The Comprehensive Plan includes expanded analysis of other systems impacted by land use.

SCENARIOS

Two future land use scenarios, Trend-Based and Plan-Based, were developed for this analysis. A current conditions scenario was also developed to provide a point of comparison. The Trend-Based scenario was based on a development pattern that continues recent land development trends. The Plan-Based scenario included a more deliberate development pattern as supported by policies in the Comprehensive Plan. The scenarios were built by applying different geographic distributions of future housing units and future jobs. Each scenario assumed relatively little change in the existing land uses in Tompkins County and was based on future population projections reflecting an increase in population of 5,000 persons and 4,000 new jobs over a 25-30 year period, based on data from the New York Statistical Information System.

NOTE: ITCTC also used the projected land use patterns provided from the NYS Route 13/366 Corridor Management Plan (June 2008) and the Route 96 Corridor Management Plan (Draft – June 2009) in both the Trend-Based and Plan-Based scenarios. For these two corridors these results were deemed as more accurate than the projected land use from the Comprehensive Plan. For the rest of Tompkins County future land use projections were based on the Comprehensive Plan.

In addition to the housing and jobs distribution factors (land-use factors) the scenarios where defined by changes in the vehicle/fuel mix, reductions of number of in-commuter to the county, and adjustments to the overall number of drive-alone trips. How these factors were adjusted to help define the different models is explained in the following sections.

The list below shows the 2030 vehicle/fuel mixes used for modeling both the Trend –Based and Plan-Based scenarios section:

Moderate Alternative Vehicle Mix (AVM) –

Passenger Cars:

- 8% diesel by 2030
- 15% bio-fuels by 2030

- 30% hybrid by 2030
- 10% hydrogen hybrid-fuel cell by 2030
- 17% compressed natural gas by 2030
- 15% electric by 2030
- 5% gasoline by 2030

SUVs, Vans, Pickup Trucks:

- 13% diesel by 2030
- 28% bio-fuels by 2030
- 24% hybrid by 2030
- 5% hydrogen hybrid-fuel cell by 2030
- 10% electric by 2030

Transit Buses:

- 80% diesel full hybrid AIC by 2030
- 20% hydrogen hybrid-fuel cell by 2030

School Buses:

- 50% diesel full hybrid AIC by 2030
- 50% diesel by 2030

Light Commercial Trucks:

- 20% diesel by 2030
- 15% hybrid by 2030

Short-Haul Trucks:

- 52% diesel by 2030
- 34% bio-fuels by 2030

Long-Haul Trucks:

- 34% diesel by 2030
- 62% bio-fuels by 2030

Aggressive Alternative Vehicle Mix –

Passenger Cars, SUVs, Vans, Pickup Trucks:

- 0% gasoline or diesel by 2030
- 0% bio-fuels by 2030
- 0% hybrid by 2030
- 10% Hydrogen hybrid-fuel cell by 2030
- 40% Compressed Natural Gas by 2030
- 50% Electric by 2030

Transit Buses:

- 80% diesel full hybrid AIC by 2030
- 20% hydrogen hybrid-fuel cell by 2030

School Buses:

- 50% diesel full hybrid AIC by 2030
- 50% diesel by 2030

Light Commercial Trucks:

- 0% gasoline by 2030
- 40% diesel full hybrid AIC by 2030
- 20% Compressed Natural Gas by 2030
- 40% Hydrogen hybrid-fuel cell by 2030

Short-Haul Trucks:

- 0% gasoline by 2030
- 30% diesel full hybrid AIC by 2030
- 40% Compressed Natural Gas by 2030
- 30% Hydrogen hybrid-fuel cell by 2030

Long-Haul Trucks:

- 0% gasoline by 2030
- 20% diesel by 2030
- 40% diesel full hybrid AIC by 2030
- 20% Compressed Natural Gas by 2030
- 20% Liquid Propane Gas by 2030

Trend-Based Scenarios

Under the 2030 Trend-Based land use scenario future housing was distributed around the county based on patterns of development between 1990 and 2000. In that decade, housing growth occurred primarily in rural and suburban areas. A small portion of housing growth took place in existing urban areas and other historical center of development the county's villages, hamlets, and the City of Ithaca. Future housing in the Trend-Based scenario was projected to continue that pattern.

Job growth was designed to roughly follow housing growth pattern, with most of the growth happening in rural and suburban areas. It was also assumed that job growth would most likely locate along or near major transportation corridors.

Two (2) 2030 Trend-Based land use scenarios were analyzed for this long-range plan:

- **Trend-Based** – used the 2030 trend land use projections used in the Tompkins County Comprehensive Plan *only*.
- **Trend-Based (Aggressive AVM)** – used the 2030 trend land use projections provided in the Tompkins County Comprehensive Plan, a 40% reduction in drive-alone in-commute trips, *plus* aggressive predictions in alternative vehicle mix (AVM) and fuel use in 2030.

Plan-Based Scenarios

Five (5) 2030 Plan-Based land use scenarios were analyzed for this long -range plan:

- **Plan-Based** – used the 2030 planned land use projections used in the Tompkins County Comprehensive Plan *only*.

- **Plan-Based (Aggressive AVM)** – used the 2030 planned land use projections provided in the Tompkins County Comprehensive Plan, a 40% reduction in drive-alone in-commute trips, *plus* aggressive predictions in alternative vehicle mix (AVM) and fuel use in 2030.

- **Plan-Based (Aggressive AVM/Low Trip) –** used the 2030 planned land use projections provided in the Tompkins County Comprehensive Plan, a 40% reduction in drive-alone in-commute trips, aggressive predictions in alternative vehicle mix (AVM) and fuel use in 2030, *and* low reductions in drive-only trips in the Urbanized Area of the county [-15% drive-alone auto trips in City of Ithaca, -15% Hospital area, -30% Lansing Village, -15% Cayuga Heights, -10% Etna, -10% Varna, -10% Town of Ithaca].

- **Plan-Based (Moderate AVM/High Trip)** – used the 2030 planned land use projections provided in the Tompkins County Comprehensive Plan, a 40% reduction in drive-alone in-commute trips, *moderate* predictions in alternative vehicle mix (AVM) and fuel use in 2030, *and* high (50%) reductions in drive-only trips for every household in the County.

- **Plan-Based (Aggressive AVM/Moderate Trip)** – used the 2030 planned land use projections provided in the Tompkins County Comprehensive Plan, a 40% reduction in drive-alone in-commute trips, *aggressive* predictions in alternative vehicle mix (AVM) and fuel use in 2030, *and* moderate (25%) reductions in drive-only trips for every household in the County.

The Plan-Based scenarios were all based on a change in the distribution of housing growth among rural, suburban and Development Focus Areas. These scenarios placed most housing growth in existing, expanded and new Development Focus Areas. The remaining residential growth was distributed in the rural and suburban areas. Job growth was distributed roughly proportional to the residential growth. These scenarios also assigned suburban and rural growth away from Natural Features Focus Areas and Agricultural Resource Areas as identified in the Comprehensive Plan.

The principal difference in the geographic distribution of housing and job growth assumed in these scenarios compared to the Trend-Based scenario is the expansion of the existing villages, City of Ithaca, and hamlet areas; and more focused development of South Lansing, Danby, Jacksonville and the area around the Cayuga Medical Center following the historical village pattern found in Tompkins County.

There would still be growth in the suburban and rural areas of the county, together accounting for roughly one-third of new residential development. However, there would be very little creation of new suburban areas. Rather, there would be infill development within existing suburban areas where water and sewer service is existing or planned.

After running the computer models for both Trend-Based scenarios and for all five Plan-Based scenarios, the **Plan-Based (Moderate AVM/High Trip)** and the **Plan-Based (Aggressive AVM/Moderate Trip)** were the only scenarios that met the greenhouse gas reductions recommended by the Energy and Greenhouse Gas Emissions Element of the Tompkins County Comprehensive Plan. The **Trend-Based (Aggressive AVM)**, **Plan-Based (Aggressive AVM/Low Trip)** and the **Plan-Based (Aggressive AVM)** scenarios reduce GHG by approximately half as much as recommended by the Comprehensive Plan. The Analysis section that follows shows comparisons between all the scenarios.

ANALYSIS

The maps in **FIGURES 40, 41** and **42** depict the distribution of land uses for the existing conditions, Trend-Based and Plan-Based scenarios (Source: Tompkins County Comprehensive Plan). As can be observed the proposed scenarios are only marginally different, a result of efforts to portray future conditions that are realistically achievable.

The TransCAD travel demand model used population and employment data to generate and distribute trips along the model's road network. The network included all state roads and county roads and other roadways of major regional significance. For this analysis the basic model network was modified to include recent roadways changes and others that were expected to occur with a high degree of certainty.

The TransCAD model used for this analysis was calibrated to model the PM peak hour of traffic from 5:00 to 6:00pm. As such it was designed to reflect the worst traffic conditions on the roadway network. "Calibration" means that the results of the 2009 Current Conditions model run were compared to the actual latest traffic counts at locations throughout the County to ensure the greatest accuracy for analysis.

The model is also a "drive-only" model, which means it predicts auto trips - not trips taken using walking, biking, or public transportation modes. The drive-only trips for journey-to-work origins and destinations per Traffic Analysis Zone (TAZ) are taken from the 2000 Census Transportation Planning Package, Parts 1 (Residence) and 2 (Workplace). Future increases in walking, biking, and bus modes-to-work are estimated in the future by reducing the percentage of drive-only origin / destination trips in a given TAZ.

All results from this analysis are based on computer models that include numerous assumptions and generalizations that result in inherent errors. In other words, no model can completely replicate reality; therefore their results are by no means exact. Nevertheless, computer models are valuable tools to help identify the relationships between different factors, and can help identify trends and their relative magnitude.

1. Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT)

The model served as a useful tool to generate a general view of the distribution of trips along the road network, highlighting major trends and patterns in traffic movements. To illustrate the impacts of the **Trend-Based** and **Plan-Based** scenarios we used the measures of vehicle-miles-traveled (VMT) and vehicle-hours-traveled (VHT). These factors provided system-wide measures of the efficiency of the road network for comparison between scenarios. VMT reflects the cumulative miles traveled for all trips, and VHT, the total hours of travel on the road for all trips. Both measures were derived from the model's road network for the PM peak hour and calculated to reflect annual values.

TABLE 32 below, shows significant differences when comparing the VMT and VHT in the two (2) Trend-based 2030 Scenarios to the five (5) Plan-based 2030 Scenarios:

- 3.4% more Vehicle Miles Traveled in the Trend –Based Scenario compared to the Plan-Based Scenario; 3.2% more Vehicle Hours Traveled in the Trend –Based Scenario compared to the Plan-Based Scenario.

- 3.8% more Vehicle Miles Traveled in the Trend –Based (Aggressive AVM) Scenario compared to the Plan-Based (Aggressive AVM) Scenario; 4.9% more Vehicle Hours Traveled in the Trend –Based (Aggressive AVM) Scenario compared to the Plan-Based (Aggressive AVM) Scenario.

- 42.0% more Vehicle Miles Traveled in the Trend –Based Scenario compared to the Plan-Based (Moderate AVM/High Trip) Scenario; 47.7% more Vehicle Hours Traveled in the Trend –Based Scenario compared to the Plan-Based (Moderate AVM/High Trip) Scenario.

The overall increase in population and employment is expected to generate traffic activity that would create pressure to increase VMT and VHT from current conditions. The data in Table 32 indicates that land use changes alone cannot help achieve reductions in VMT. The Trend Based scenario, reflecting higher low density rural/suburban development, resulted in the most severe VMT and VHT increases. The Plan Based scenario, with its more efficient land use pattern, also showed increases but not as pronounced. Even after reducing in-commuters by 40%, VMT and VHT remained above 2009 levels. To achieve reductions in VMT and VHT that will allow the county to reach its energy and emission reduction goals it is necessary to shift away from the use of single occupancy vehicles, i.e. driving alone.

When comparing the two extreme scenarios [the Plan-Based (Moderate AVM/High Trip) and the Trend-Based] we see that the allocation and distribution of future growth combined with programs, incentives and facilities to shift travelers away from single occupancy vehicles could have an major effect on 2030 traffic patterns. A 42% difference in VMT between these two models results in more than 300 million less vehicle miles traveled in the **Plan-Based (Moderate AVM / High Trip)** Scenario than in the **Trend-Based** scenario. Likewise a 47.7% reduction in VMT results in 4.5 million less vehicle hours travelled in the Plan-Based (Moderate AVM/High Trip) Scenario than in the Trend-Based scenario. The benefits of these differences translate directly into reduced congestion and all the resulting secondary positive effects (noise, safety, time savings, etc.), in addition to lower emissions of smog inducing gases and greenhouse gases and reduced energy consumption (see Section 2 below and **TABLE 33**).

FIGURES 43 thru **48** show a visual representation of congestion on county roads generated by the TransCAD model for the Current 2009 conditions, the Trend-Based and the Plan-Based(Moderate AVM/High Trip) future scenarios during the PM Peak Hour (5-6PM). Congestion is defined be the volume to capacity ratio (V/C). This ratio relates the traffic volume to the roadways capacity. A V/C ratio of 1 indicates that the road is working at capacity, therefore a value less than one indicates there is available capacity and values greater than 1 indicate the roadway is operating over-capacity. For this analysis a V/C ratio value of .8 - .9 is considered approaching congestion and values greater than .9 are considered congested. Here is a summary of the impacts of each Scenario:

<u>2030 TREND-BASED SCENARIO</u>:

- Rt 34 from Stewart Park to the Town of Lansing Line will be congested (not congested in 2009)
- Rt 34 from Town of Lansing Line to Waterwagon Rd will be approaching congestion (not congested in 2009)
- N Triphammer Rd in front of the Ithaca Mall will be approaching congestion (not congested in 2009)
- Warren Rd from Rt 13 to Hillcrest Rd will be congested (approaching congestion in 2009)
- Hanshaw Rd from Rt 13 to Etna Rd will be congested (approaching congestion in 2009)
- W Buffalo St from Meadow St to Taughannock Blvd will be congested (approaching congestion in 2009)
- N Cayuga St from W State St to W Court St will be congested (not congested in 2009)
- Albany St from Green St to Seneca St will be congested (not congested in 2009)

<u>2030 PLAN-BASED (Moderate AVM / High Trip) SCENARIO</u>:

- W Buffalo St from Meadow St to Taughannock Blvd will be congested (approaching congestion in 2009)
- Cayuga St from W Seneca St to W Court St will be congested (not congested in 2009)
- Rt 13 (N Fulton St) from Hancock St to W Court St will *not* be congested (congested in 2009)
- Rt 96B from Clinton St to Ithaca College will *not* be congested (congested in 2009)
- Rt 79 from Pine Tree Rd to Park La will *not* be congested (approaching congestion in 2009)
- Rt 13 from Mineah Rd to Village of Dryden Line will *not* be congested (approaching congestion in 2009)

In summary, the land use in the Trend-Based Scenario increased congestion at selected locations throughout the County. In contrast, the land use in the Plan-Based (Moderate AVM / High Trip) Scenario not only had less new congestion in the County, but actually decreased congestion at selected locations.

TABLE 34 summarizes the miles of congested roads in the Current Conditions, Trend-Based and Plan-Based (Moderate AVM / High Trip) land use Scenarios. Congestion analysis for the other scenarios was not done because there were minor or no reductions in VMT. The congestion analysis data shows the following:

<u>2030 TREND-BASED SCENARIO</u>:

- a slight 7.5% increase in miles of congested roads when compared to Current Conditions
- a significant 93.6% increase in miles of “roads approaching congestion” when compared to Current Conditions

<u>2030 PLAN-BASED (Moderate AVM / High Trip) SCENARIO</u>:

- a significant 50.3% *decrease* in miles of congested roads when compared to Current Conditions
- a slight 10.0% *decrease* in miles of congested roads when compared to Current Conditions

<u>2. Air Quality and Energy</u>

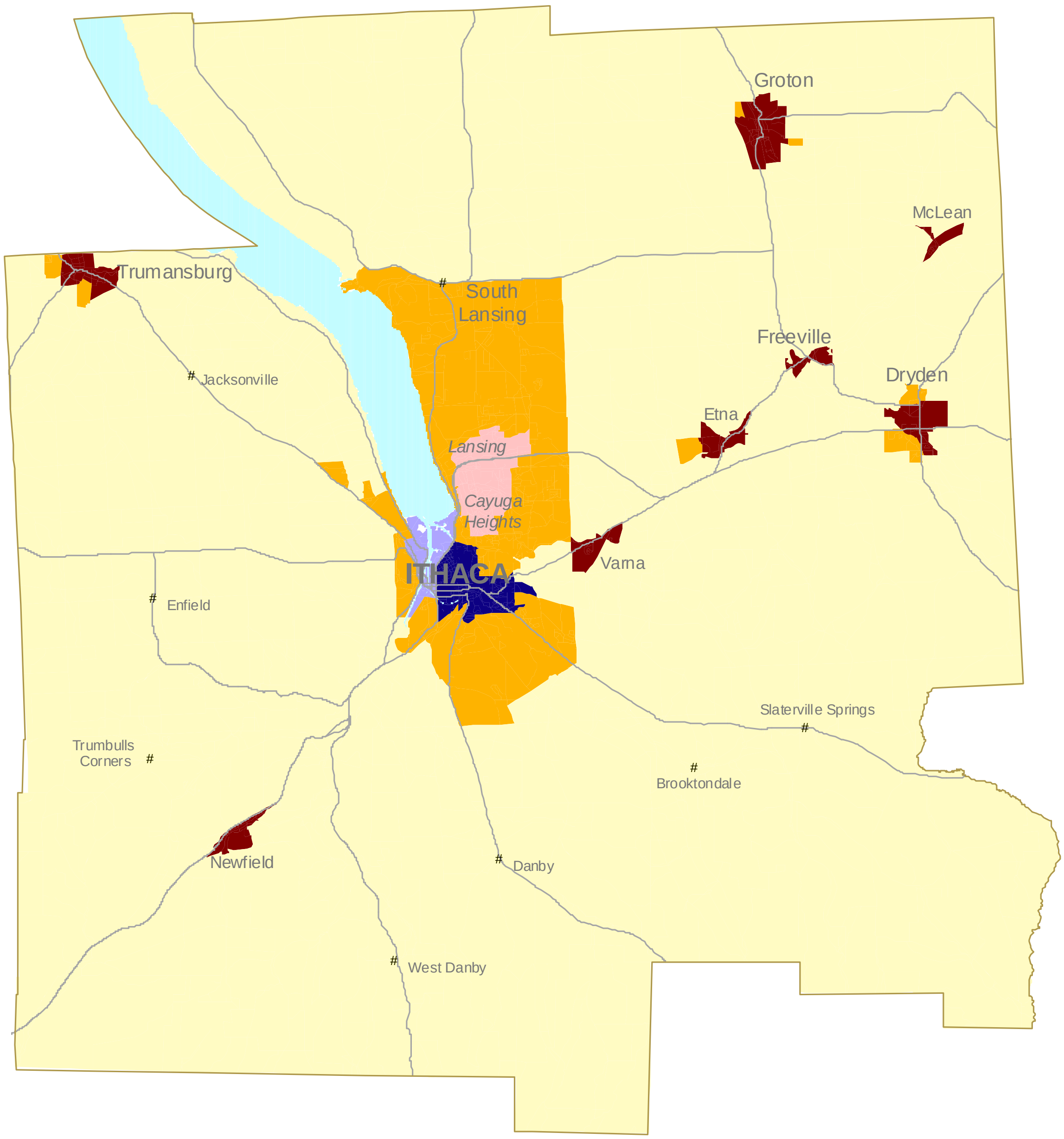
The State of New York Energy Plan requires that long range transportation plans quantify their energy and air quality impacts. For purposes of the 2030 LRTP the Trend-Based and the Plan-Based scenarios were analyzed to determine how they would affect these environmental parameters. The ITCTC used an interface developed by US EPA called Roadway and Rail Energy and Greenhouse Gas Analysis Extension (RREGGAE) to run the Motor Vehicle Emission Simulator (MOVES) software. These two pieces of software allow changing different parameters, vehicle fuels/technologies, to model the emissions impacts of different future scenarios. Off model conversion factors were used to generate estimates of energy consumption for the different scenarios.

The Tompkins County Comprehensive Plan established a goal of reducing greenhouse gas emissions in the county by at least 2 percent of the 2008 level for each of the next 40 years, achieving at least an 80 percent reduction in greenhouse gas emissions for each sector (including transportation) by the year 2050. This translates to a reduction of 40% from 2009 levels by the year 2030, the planning horizon of this LRTP.

TABLE 35 shows the result of a running the greenhouse gas analysis between the Current Conditions, the two (2)

Trend-Based and the five (5) Plan-Based scenarios. Using the current conditions scenario as a point of comparison the table shows significant increases in emissions under the Trend Based scenario (10.9%) and more moderate increases under the Planned Based scenario (5.9%). As with VMT and VHT the land use pattern included in the Planned Based scenario shows better results and continuing current trends in land development patterns. Reductions in emissions are achieved under when scenarios include Aggressive Alternative Vehicle Mix (AVM) and/or Drive Alone Trip Reductions. However, including Aggressive AVM in the Trend and Planned Based scenarios result in approximately half of the desired 40% reduction in greenhouse gas emissions by 2030 (-18.7% and –21.9% respectively). To reach an order of magnitude close to 40% reduction it is also necessary to implement a substantial mode shift from drive alone trips to alternative modes of transportation. The two models with greatest greenhouse gas reductions, -38.6% and –45.6%, integrate different combinations of AVM and drive alone trip reductions.

Similar to the above, the goal is for future scenarios to be less energy intensive. **TABLE 35** shows the results of energy calculations as applied to the different scenarios. Since both the emission and energy calculations are strongly influenced by the vehicle miles traveled for each scenario, the data patterns from the energy calculations are similar to that of emissions. That is, significant energy increases under the Trend-Based scenario and more moderate increases under the Plan Based scenario. Moderate reductions result from scenarios that add Aggressive AVM as a factor. The largest reductions are observed in the models that combine AVM and drive alone trip reductions.

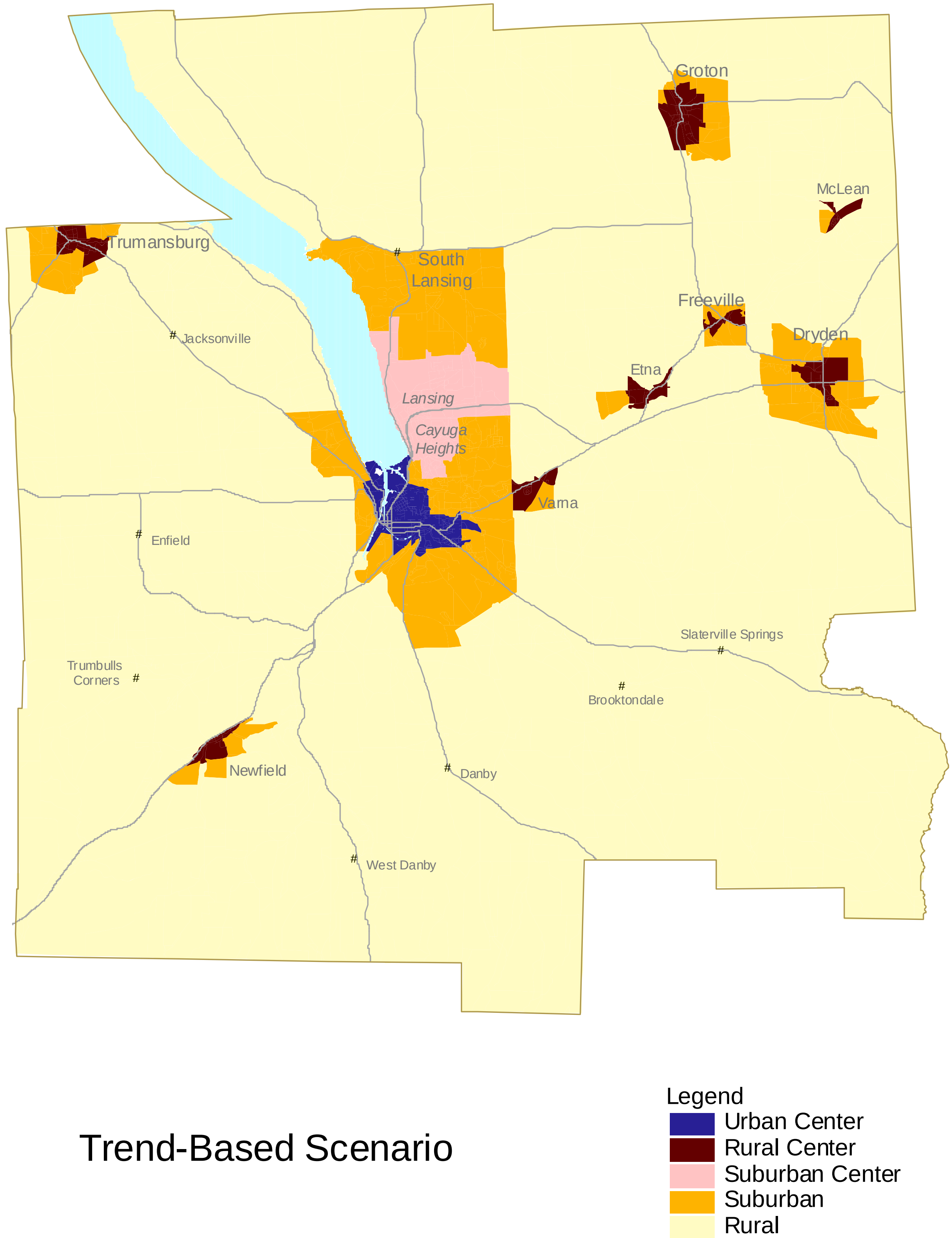


Existing Development

Legend
- Urban Center
- Expanding Urban Center
- Rural Center
- Suburban Center
- Suburban
- Rural

FIGURE 40

Source: Tompkins County Planning



Trend-Based Scenario

FIGURE 41

Source: Tompkins County Planning

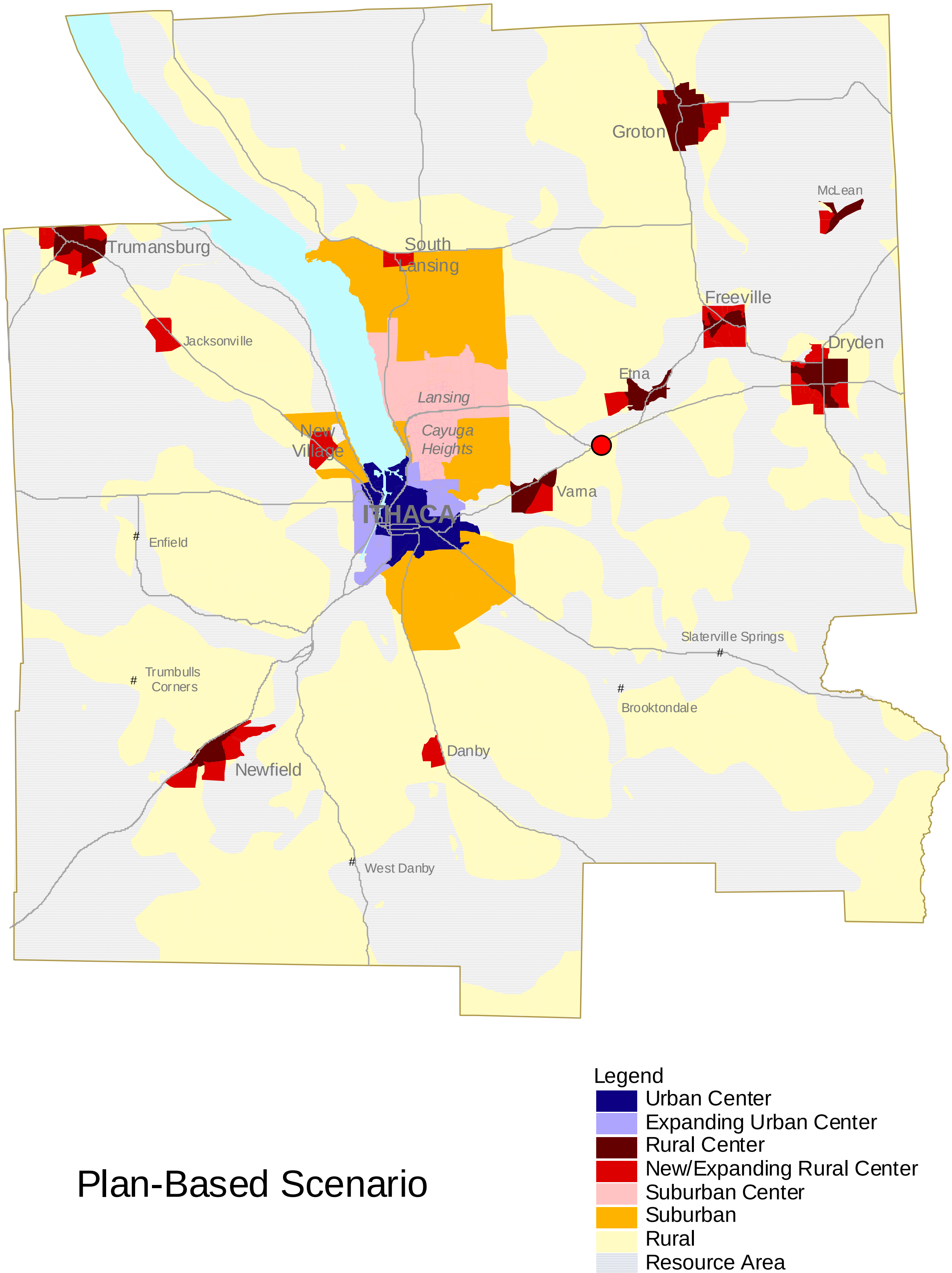


FIGURE 42

Source: Tompkins County Planning

TABLE 32 Vehicle Miles Traveled and Vehicle Hours Traveled				
Scenario	**Annual VMT (All Modes)*** (miles)	**Annual VHT (Auto Only)** (hours)	**% Change** Compared to 2009 (VMT)	**% Change** Compared to 2009 (VHT)
2009 - Current Conditions	672,319,554	8,287,865	x	x
2030 - Trend-based	743,913,724	9,438,446	10.6%	13.9%
w/ land use changes only				
2030 - Plan-based w/ land use changes only	718,341,676	9,140,334	6.8%	10.3%
2030 - Trend-Based (Aggressive AVM) w/ aggressive alternative vehicle mix / -40% in-commute	721,997,321	9,202,747	7.3%	11.0%
2030 - Plan-Based (Aggressive AVM) w/ aggressive alternative vehicle mix / -40% in-commute	694,501,459	8,746,694	3.3%	5.5%
2030-Plan-Based (Aggressive AVM / Low Trip) w/ aggressive alt vehicle mix / urban trip reduction / -40% in-commute	642,954,880	7,947,518	-4.4%	-4.1%
2030-Plan-Based (Moderate AVM / High Trip) w/ moderate alt vehicle mix / 50% trip reduction / -40% in-commute	431,735,362	4,938,045	-35.8%	-40.4%
2030-Plan-Based (Aggressive AVM / Moderate Trip) w/ aggressive alt vehicle mix / 25% trip reduction / -40% in-commute	563,159,695	6,830,662	-16.2%	-17.6%

* includes VMT from auto, TCAT bus, school bus, and trucks

TABLE 33 **Road Congestion**		
Scenario	**Miles of Congested Roads** (> or = .9 VOC)	**Miles of Roads Approaching Congestion** (.8-.9 VOC)
2009 - Current Conditions	10.21	8.46
2030 - Trend-based	10.98	16.38
2030 - Plan-Based (Moderate AVM / High Trip) w/ moderate alt vehicle mix and 50% trip reduction	5.07	7.61

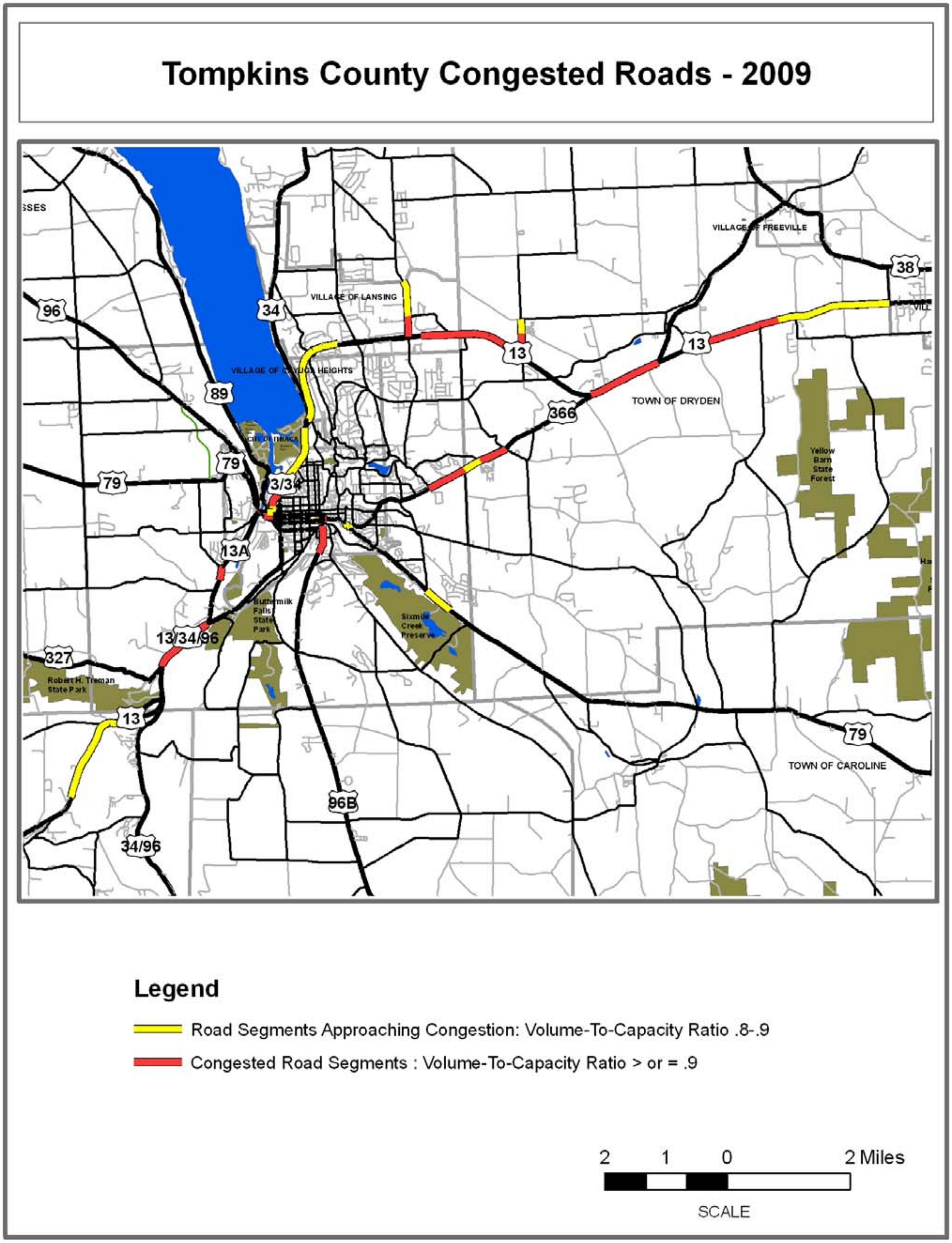

Tompkins County Congested Roads - 2009
VILLAGE OF FREEVILLE
VILLAGE OF LANSING
VILLAGE OF CAYUGA HEIGHTS
CITY OF ITHACA
TOWN OF DRYDEN
TOWN OF CAROLINE
Yellow Barn State Forest
Buttermilk Falls State Park
Sixmile Creek Preserve
Robert H. Treman State Park
96
34
89
79
13
38
366
13A
13/34/96
327
96B
34/96
Legend
Road Segments Approaching Congestion: Volume-To-Capacity Ratio .8-.9
Congested Road Segments : Volume-To-Capacity Ratio > or = .9
2 1 0 2 Miles
SCALE

FIGURE 43

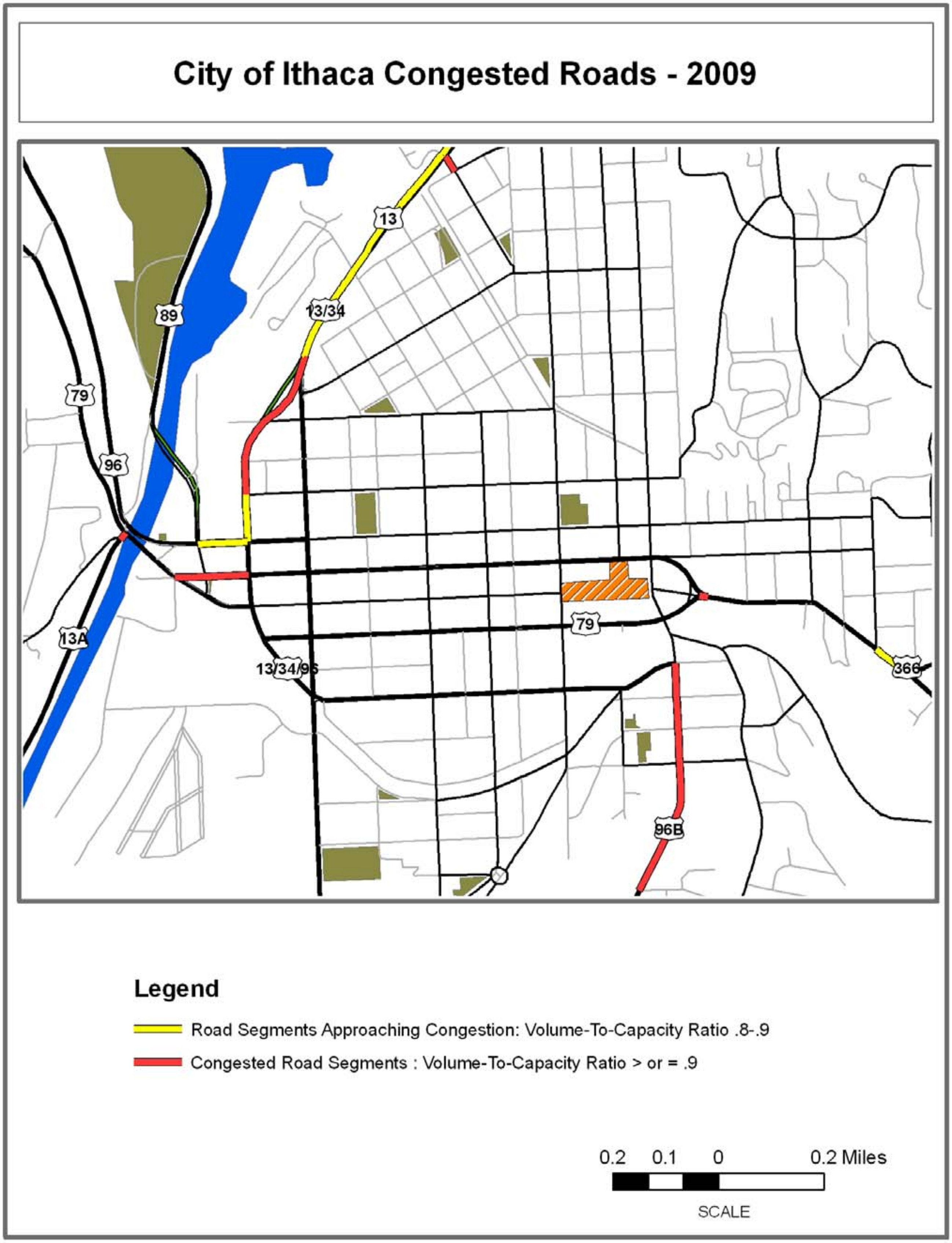
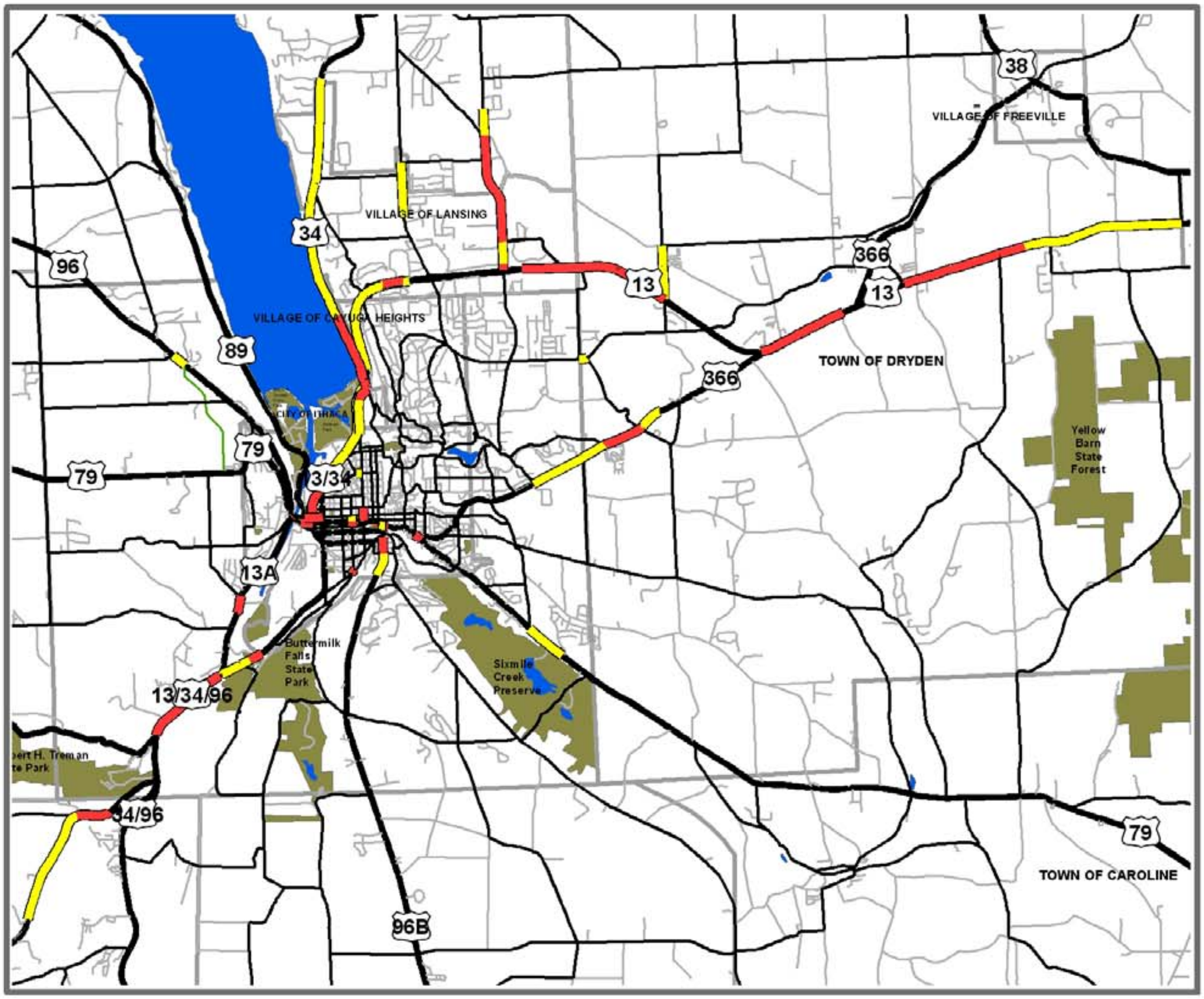

City of Ithaca Congested Roads - 2009
13
13/34
89
79
96
13A
13/34/96
79
366
96B
Legend
Road Segments Approaching Congestion: Volume-To-Capacity Ratio .8-.9
Congested Road Segments : Volume-To-Capacity Ratio > or = .9
0.2 0.1 0 0.2 Miles
SCALE

FIGURE 44

Tompkins County Congested Roads - 2030 Trend Scenario



Legend

Congested Road Segments : Volume-To-Capacity Ratio > or = .9

Road Segments Approaching Congestion: Volume-To-Capacity Ratio .8-.9

1 0.5 0 1 Miles

SCALE

FIGURE 45

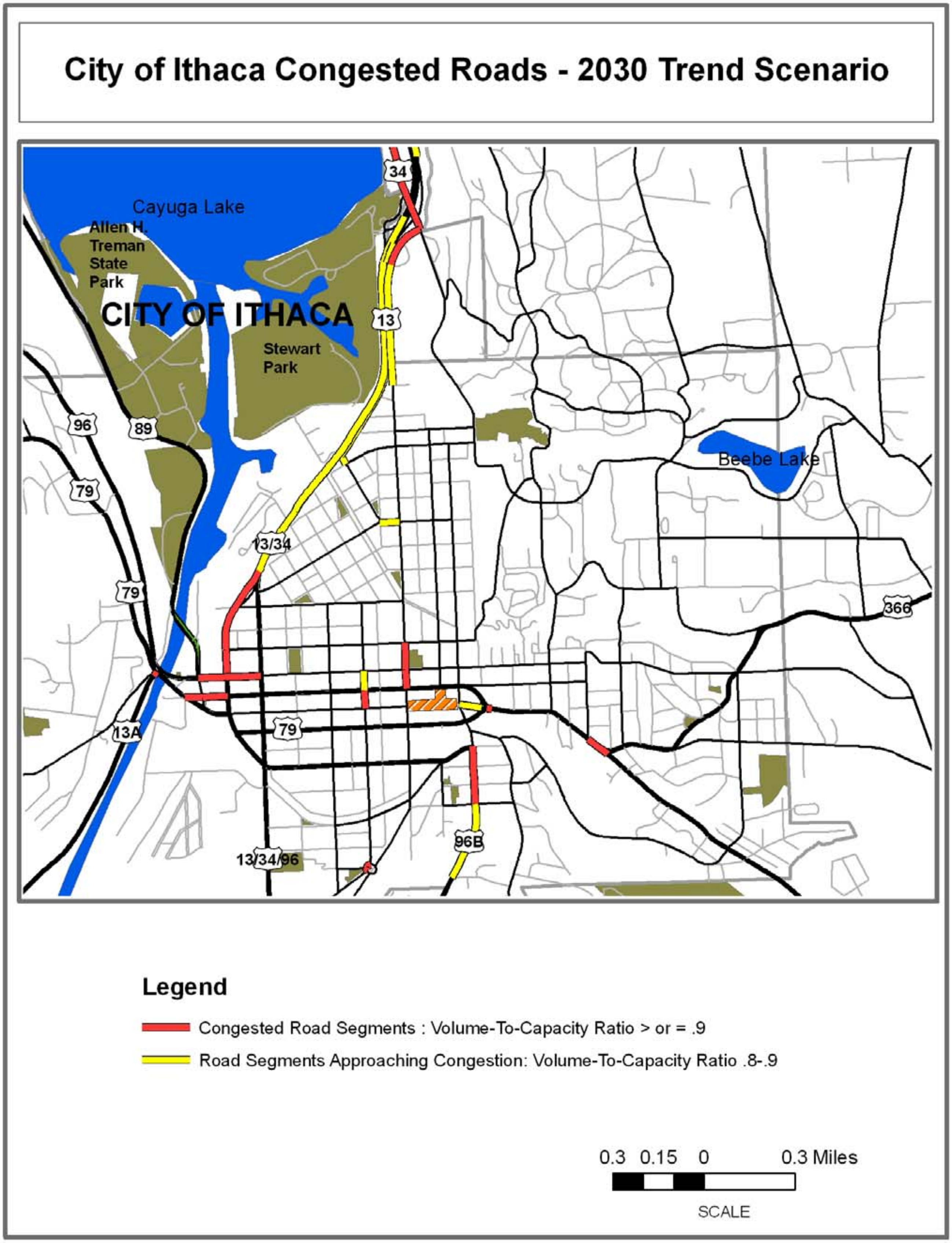

City of Ithaca Congested Roads - 2030 Trend Scenario
Cayuga Lake
Allen H. Treman State Park
CITY OF ITHACA
Stewart Park
Beebe Lake
34
13
96
89
79
13/34
366
13A
96B
13/34/96
Legend
Congested Road Segments : Volume-To-Capacity Ratio > or = .9
Road Segments Approaching Congestion: Volume-To-Capacity Ratio .8-.9
0.3 0.15 0 0.3 Miles
SCALE

FIGURE 46

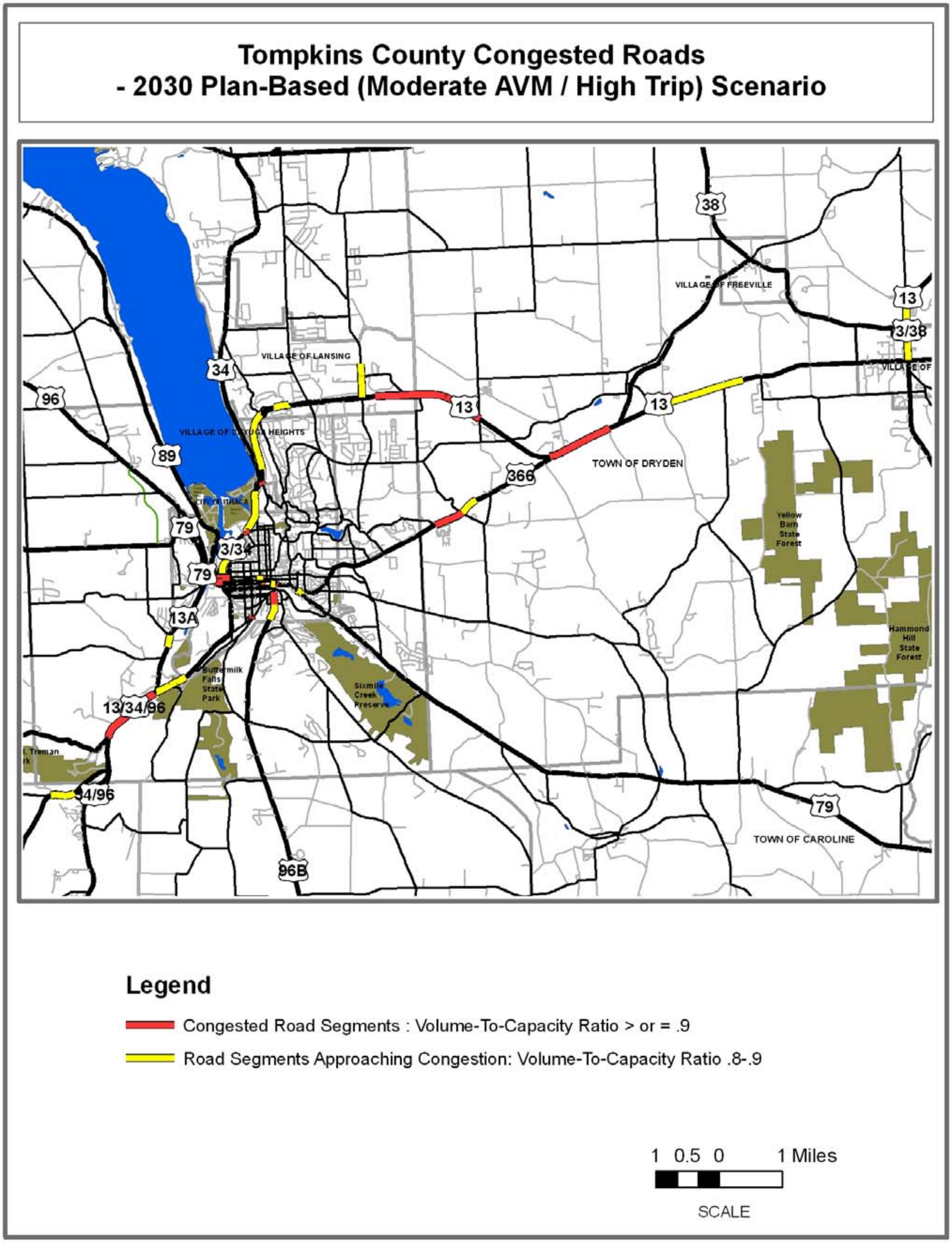

Tompkins County Congested Roads
- 2030 Plan-Based (Moderate AVM / High Trip) Scenario
38
VILLAGE OF FREEVILLE
13
13/38
VILLAGE OF LANSING
34
96
13
89
TOWN OF DRYDEN
366
79
13/34
79
13A
13/34/96
Yellow Barn State Forest
Hammond Hill State Forest
Sixmile Creek Preserve
79
TOWN OF CAROLINE
96B
Legend
Congested Road Segments : Volume-To-Capacity Ratio > or = .9
Road Segments Approaching Congestion: Volume-To-Capacity Ratio .8-.9
1 0.5 0 1 Miles
SCALE

FIGURE 47

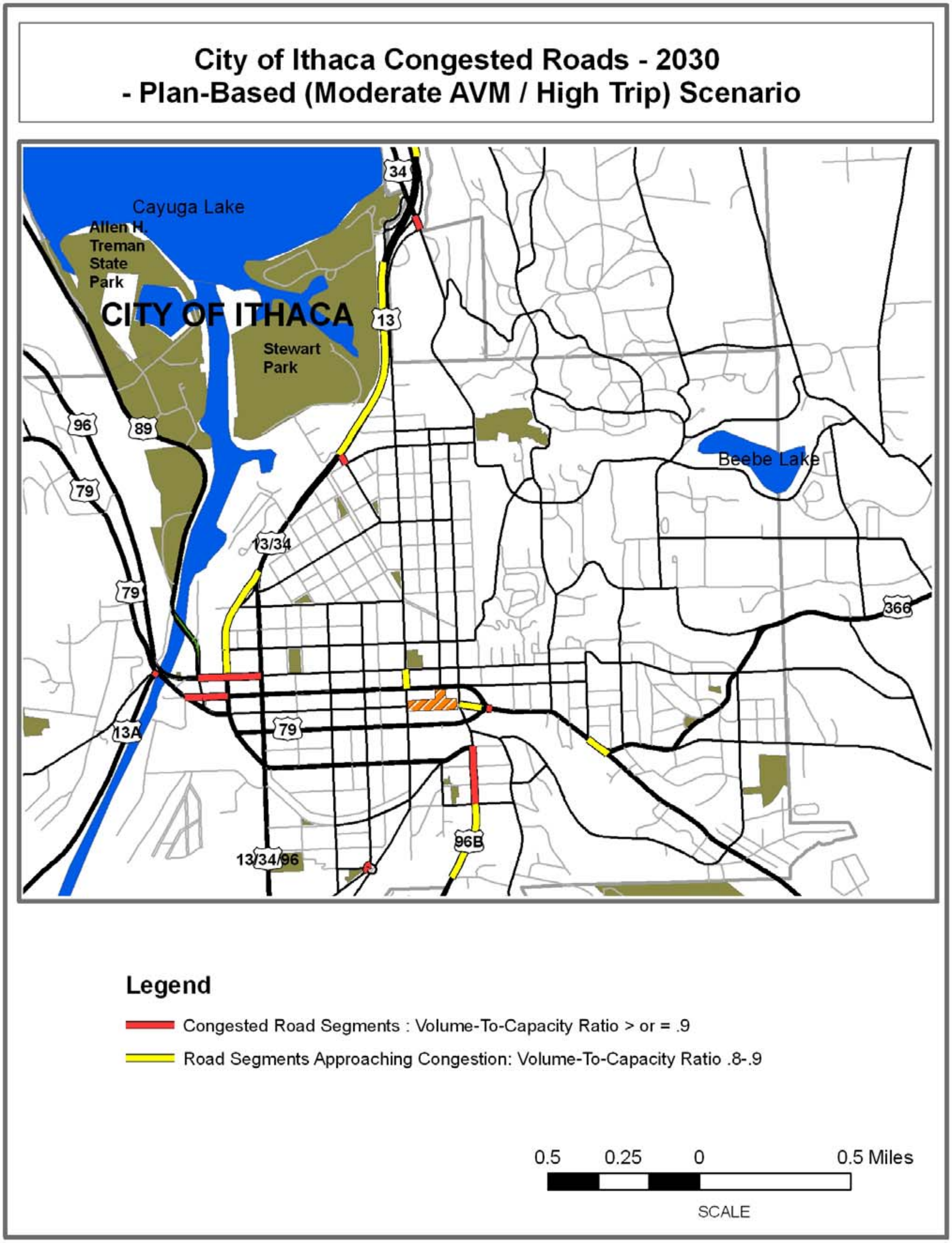

City of Ithaca Congested Roads - 2030
- Plan-Based (Moderate AVM / High Trip) Scenario
Cayuga Lake
Allen H. Treman State Park
CITY OF ITHACA
Stewart Park
Beebe Lake
34
13
96
89
79
13/34
79
366
13A
79
96B
13/34/96
Legend
Congested Road Segments : Volume-To-Capacity Ratio > or = .9
Road Segments Approaching Congestion: Volume-To-Capacity Ratio .8-.9
0.5 0.25 0 0.5 Miles
SCALE

FIGURE 48

TABLE 34
Emissions Analysis

Scenarios	Annual VMT *All Modes* (miles)	Methane (Metric Tons)	Nitrous Oxide (Metric Tons)	Atmos CO2 (Metric Tons)	CO2 Equiv (Metric Tons)	% Change from 2009 (CO2 Equiv)
2009 - Current Conditions	672,319,554	12.99	18.28	385,300	391,200	x
2030 - Trend-based w/ land use changes only	743,913,724	14.69	20.54	427,300	434,000	10.9%
2030 - Plan-based w/ land use changes only	718,341,676	13.94	19.48	407,900	414,200	5.9%
2030 - Trend-Based (Aggressive AVM) w/ aggressive alternative vehicle mix / -40% in-commute	721,997,321	15.59	14.23	313,200	317,900	-18.7%
2030 - Plan-Based (Aggressive AVM) w/ aggressive alternative vehicle mix / -40% in-commute	694,501,459	14.91	13.54	301,100	305,700	-21.9%
2030-Plan-Based (Aggressive AVM / Low Trip) w/ aggressive alt vehicle mix/urban trip reduction / -40% in-commute	642,954,880	14.13	12.85	289,100	293,400	-25.0%
2030-Plan-Based (Moderate AVM / High Trip) w/ moderate alt vehicle mix / 50% trip reduction / -40% in-commute	431,735,362	7.43	10.05	236,900	240,100	-38.6%
2030-Plan-Based (Aggressive AVM / Moderate Trip) w/ aggressive alt vehicle mix / 25% trip reduction / -40% in-commute	563,159,695	10.42	10.84	209,300	212,900	-45.6%

TABLE 35

Energy Analysis

Scenario	Total Energy Consumption (metric tons)	Petroleum Energy Consumption (metric tons)	Fossil Fuel Energy Consumption (metric tons)
2009 - Current Conditions	5,104,000	4,886,000	4,998,000
2030 - Trend-based	5,662,000	5,419,000	5,542,000
% change - compared to 2009	*10.9%*	*10.9%*	*10.9%*
2030 - Plan-based	5,404,000	5,172,000	5,290,000
% change - compared to 2009	*5.9%*	*5.9%*	*5.8%*
2030 - Trend-based (Aggressive AVM)	4,754,000	3,499,000	4,641,000
% change - compared to 2009	*-6.9%*	*-28.4%*	*-7.1%*
2030 - Plan-based (Aggressive AVM)	4,565,000	3,370,000	4,458,000
% change - compared to 2009	*-10.6%*	*-31.0%*	*-10.8%*
2030-Plan-Based (Aggressive AVM / Low Trip)	4,380,000	3,240,000	4,277,000
% change - compared to 2009	*-14.2%*	*-33.7%*	*-14.4%*
2030-Plan-Based (Moderate AVM / High Trip)	3,227,000	2,951,000	3,164,000
% change - compared to 2009	*-36.8%*	*-39.6%*	*-36.7%*
2030-Plan-Based (Aggressive AVM / Moderate Trip)	3,242,000	2,297,000	3,154,000
% change - compared to 2009	*-36.5%*	*-53.0%*	*-36.9%*

CONCLUSIONS

In order to meet energy and air quality reporting requirements for the State of New York Energy Plan ITCTC staff used its travel demand model together with EPA's MOVES, the RREGGAE interface, and off-model calculations to make future projections of energy use and emissions. The projections were made based on potential future development scenarios found in the Tompkins County Comprehensive Plan and were crafted in cooperation with the Tompkins County Planning Department.

Much of the analysis in this chapter us based on the 5:00pm-6:00pm peak hour of vehicle travel, which is a current analysis limitation of the transportation model used. Peak hour results were used to generate annual figures. The scenario analysis is useful visualize the direction and magnitude of trends and offer interesting insights to inform future decisions.

The analysis in this chapter indicates that the Trend-Based, Plan-Based and Plan-Based scenarios will result in increased vehicle miles traveled, energy used for transportation and greenhouse gas emissions. In addition, the scenario analysis shows that the Plan-Based scenario will generate less vehicle miles traveled, energy use and emissions than the Trend-Based scenario. We can conclude that the land use pattern included in the Plan Based scenario and the Tompkins County Comprehensive Plan is an important component of a more sustainable future for the region. However, even if the "smart" land use development pattern were to be strengthened beyond the conservative application use in the Plan-Based scenario, it is difficult to envision land use changes alone allowing the transportation sector in Tompkins County to reach the 40% reduction target for greenhouse gas emissions included in the County's Comprehensive Plan.

Multiple models runs of the Trend and Plan-Based scenarios showed that it was not until in-commuter mode shifts were combined with aggressive alternative vehicle and fuel mix (AVM) assumptions that the results begin to produce significant reductions in energy use and greenhouse gas emissions. Even so, these scenarios with Aggressive AVM, which includes an almost complete shift away from petroleum-based fossil fuels for transportation, only resulted in 20% reductions from current levels. To reach the 40% target reductions the Plan-Based scenario was incremented to include significant reductions in drive-alone trips in combination with Aggressive and Moderate AVM assumptions.

There are several key conclusions that surface from this analysis as efforts are made to reduce energy use and emissions from transportation:

-First, there is no single fix to the challenge of reducing energy use and emissions from transportation. This is a system wide challenge that will require multifaceted, system wide solutions. The analysis showed that combining strategies (i.e. more efficient vehicles + trip reduction) is essential to achieve the goal reductions in energy and emissions.

-Reducing vehicle miles traveled in general, and particularly by drive-alone or single occupancy vehicles (SOV), will be a key component of any successful strategy. It is recognized that shifting the prominent transportation role currently played by private automobiles will be a significant challenge. The goal is to make the car one of many options for most people to get around, instead of the only option. Reaching established goals for energy and emissions reductions in transportation will not be likely without a reduction in countywide vehicle miles traveled

-In order to achieve a modal shift away from car dependency land use development patterns must take a more efficient form, as described in the Tompkins County Comprehensive Plan. This will facilitate the use of transit, walking, bicycling, car pools, vanpools, car sharing and ride sharing. All of these currently available alternatives work best when land uses are integrated and in close proximity.

-Vehicle fleet efficiency and fuel mix is another key component of any successful strategy to reduce energy consumption and emissions. Cars and trucks will continue to be important components of all future transportation scenarios. The analysis in this chapter showed that just having energy efficient, clean cars is not enough to meet established goals for energy use and vehicular emissions. However, without a clean, efficient vehicle fleet it is difficult to envision achieving them.

-Transit in all its forms will need to play a much-expanded role in transportation. Transit needs to evolve into a 'first option' for all different trips – recreational, work commute, social, services, shopping, etc.

-Non-motorized modes, bicycling and walking, already account for significant number of trips in Tompkins County (i.e. over 40% of work based trip in the City of Ithaca). These modes need to be accommodated and enhanced to encourage additional use. They offer a clear opportunity for urbanized areas in the County to capture the inherent efficiency of their urban forms. Together with transit improvements, they offer the most cost effective way to encourage a mode shift in the short term.

-Information and computer technologies can make telecommuting, travel demand management, ridesharing, vanpools, car sharing, public transportation, and mobility support programs more efficient to implement and accessible to the community. New efforts are needed to make integration of service delivery through technology benefit service providers and consumers alike. These programs encourage the use of multiple modes of transportation and are needed to increase the mode share of alternatives to driving-alone.

-The scenario analysis in this chapter highlighted how vehicle technology and type of fuel used will play a huge role in achieving energy and emission reduction goals. There is little opportunity to affect these factors at the local level. State, national and international policies, along with market forces, will be of greatest influence in advancing and promoting new technologies and alternative fuels. The market is unpredictable but public response during the 2008 gasoline price spike is indicative of the immense power of pricing to affect change at all levels of society and particularly in the transportation sector.

-Federal and State policies and programs that promote and fund transit and other alternative modes and encourage a mode shift away from SOVs will help drive local action. National and State leadership and support will be essential to allow those at the local level to accomplish the significant transformation of the transportation system that will be required to meet the challenges of global warming and energy descent.