

2035 Model Review

Tri-County Regional Planning
Commission

Model Development Phase I (1991-2)

- Initial model converted from MDOT Mainframe to TRANPLAN with TRANSCAD network editor and data interface which converted and exported network from TRANSCAD format to TRANPLAN, then converted output back to TRANSCAD
- SE data & demographic forecasts
- “Quick calibration” to 1990 base year for 2015 Plan—went from about 260 zones point loaded to 460 zones;
- Updated capacities based on 1985 HCM plus FDOT work
- Done by Barton Aschman Associates, later the Parsons Transportation Group

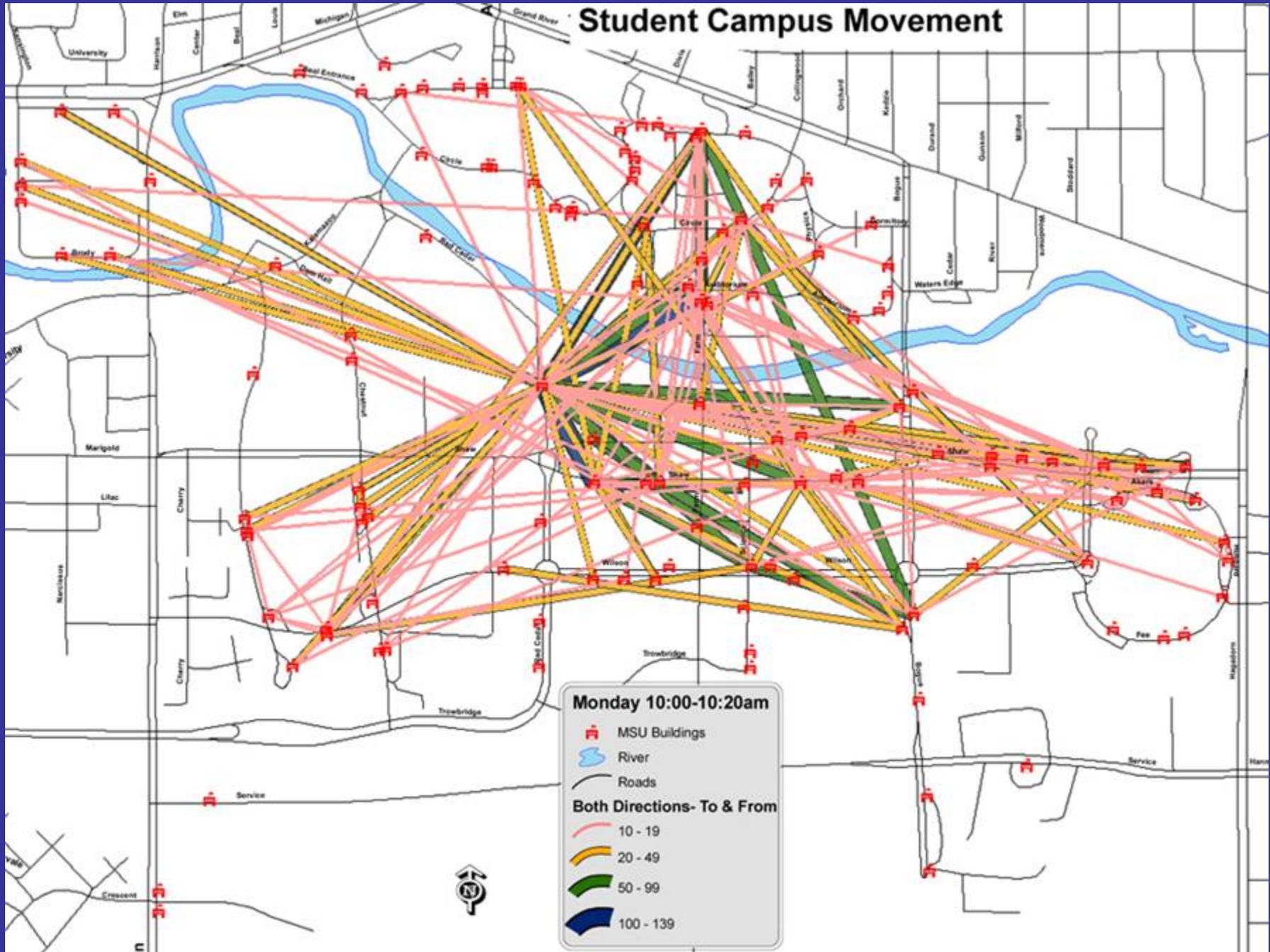
SE Data Model Development

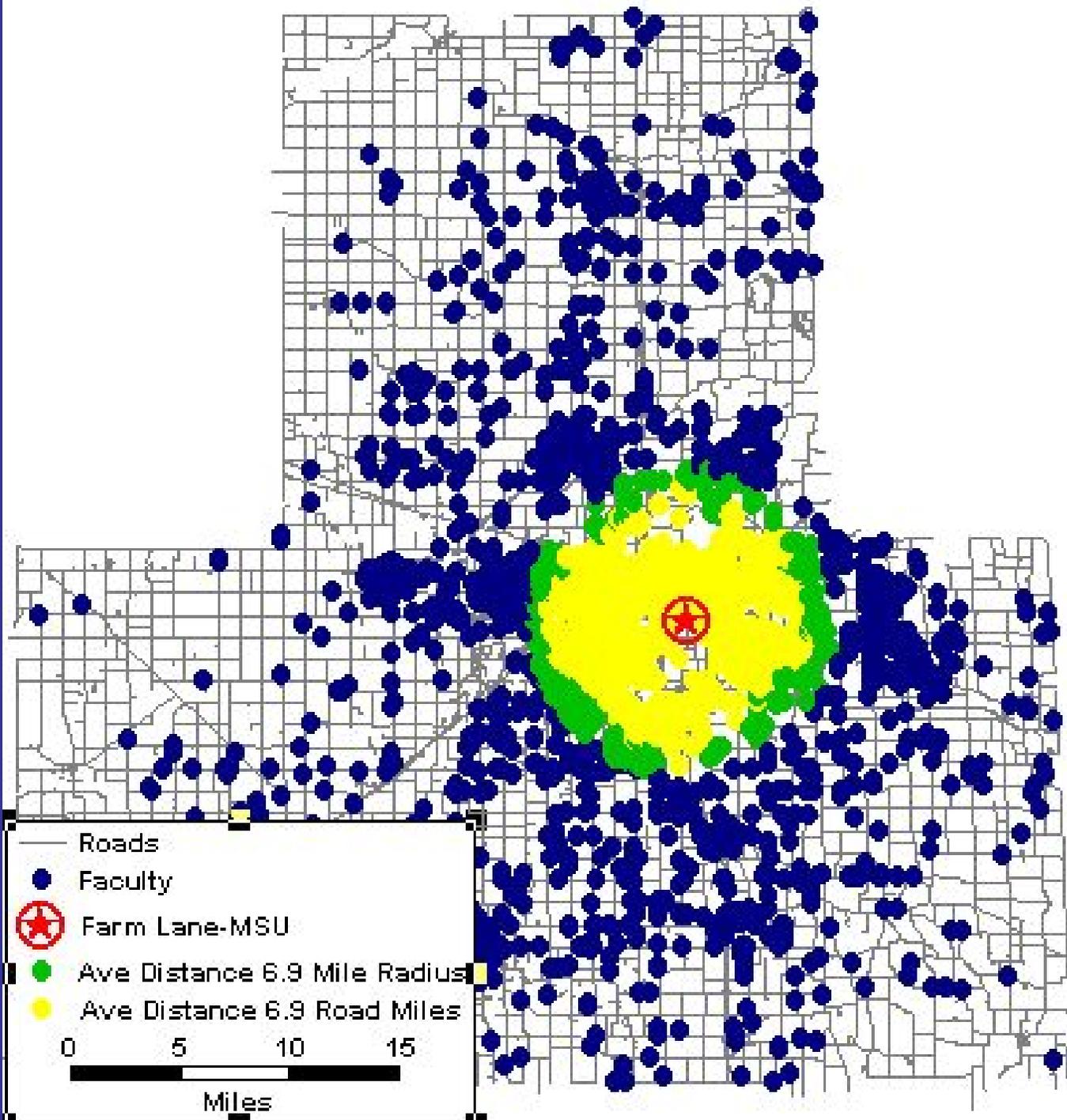
- Full SE Data Model –GIS Based:
- Control totals, two staged local review process
(modified Delphi)
- Zoning, Future Land Use Plans, vacant lands, environmental constraints (soils, slopes, wetlands, parks, cemeteries etc.), accessibility from travel model
(feedback loop but not closed)
- Multiple sources of employment data and control totals

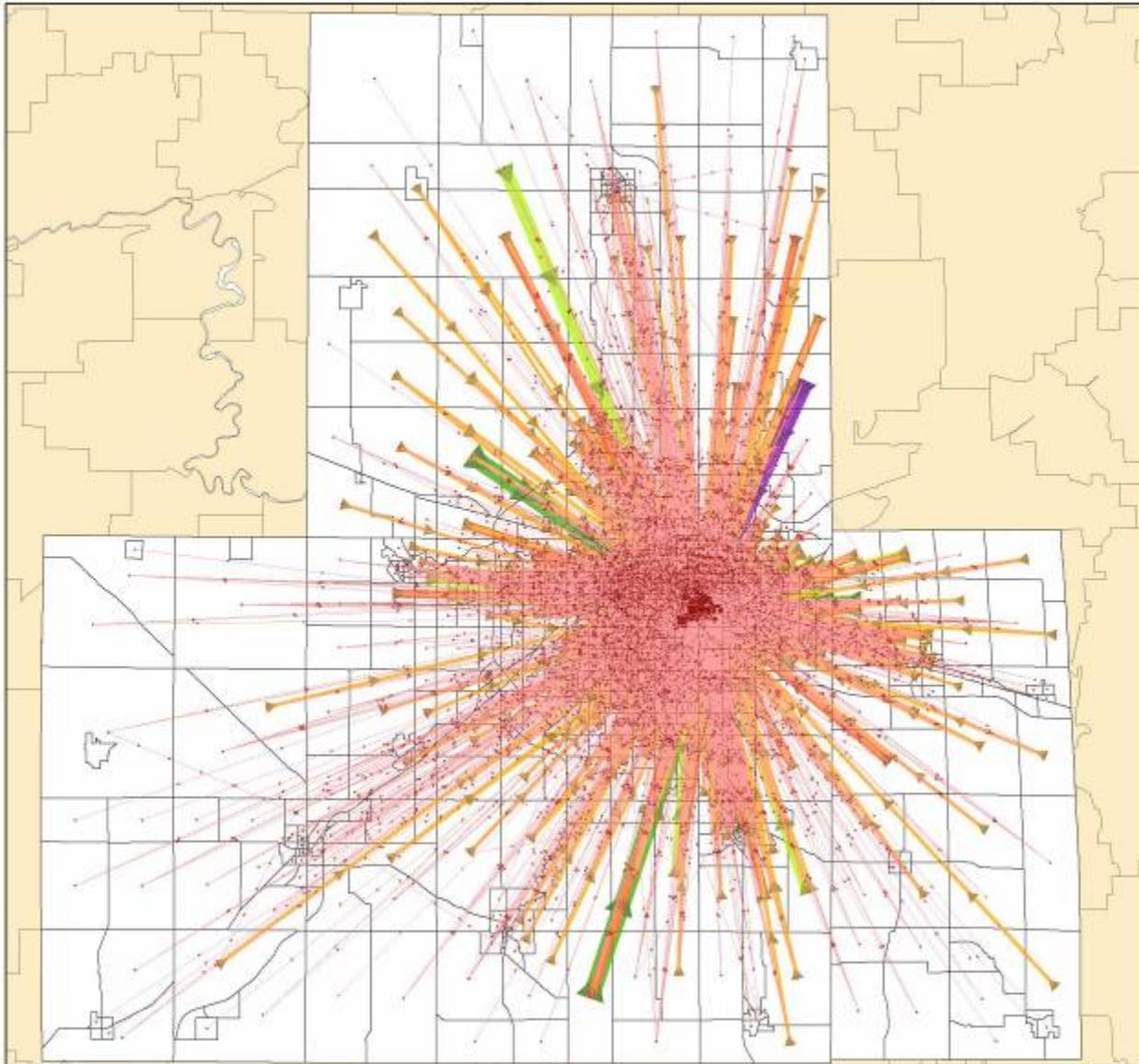
Model Development Phase II (1995-6)

- Updated Model—converted to Framework
- Went from 460 zones to 834 zones
- MSU a Separate Purpose, Balance A's to P's based on classroom seat data
- Cross Class Trip Gen
- Added Nested Logit Transit Model
- Updated Capacity Calculator to 1997 HCS
- Added Park/Walk
- Converted to Peak Period
- Recalibrated to 2000 base year
- Regional 2025 Plan—October 2003

Student Campus Movement

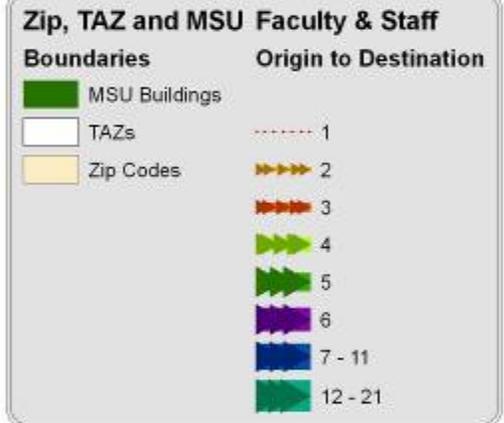






MSU Faculty and Staff Movement to Campus TAZ to MSU Building

*Within Tri-County Region
June 2008*

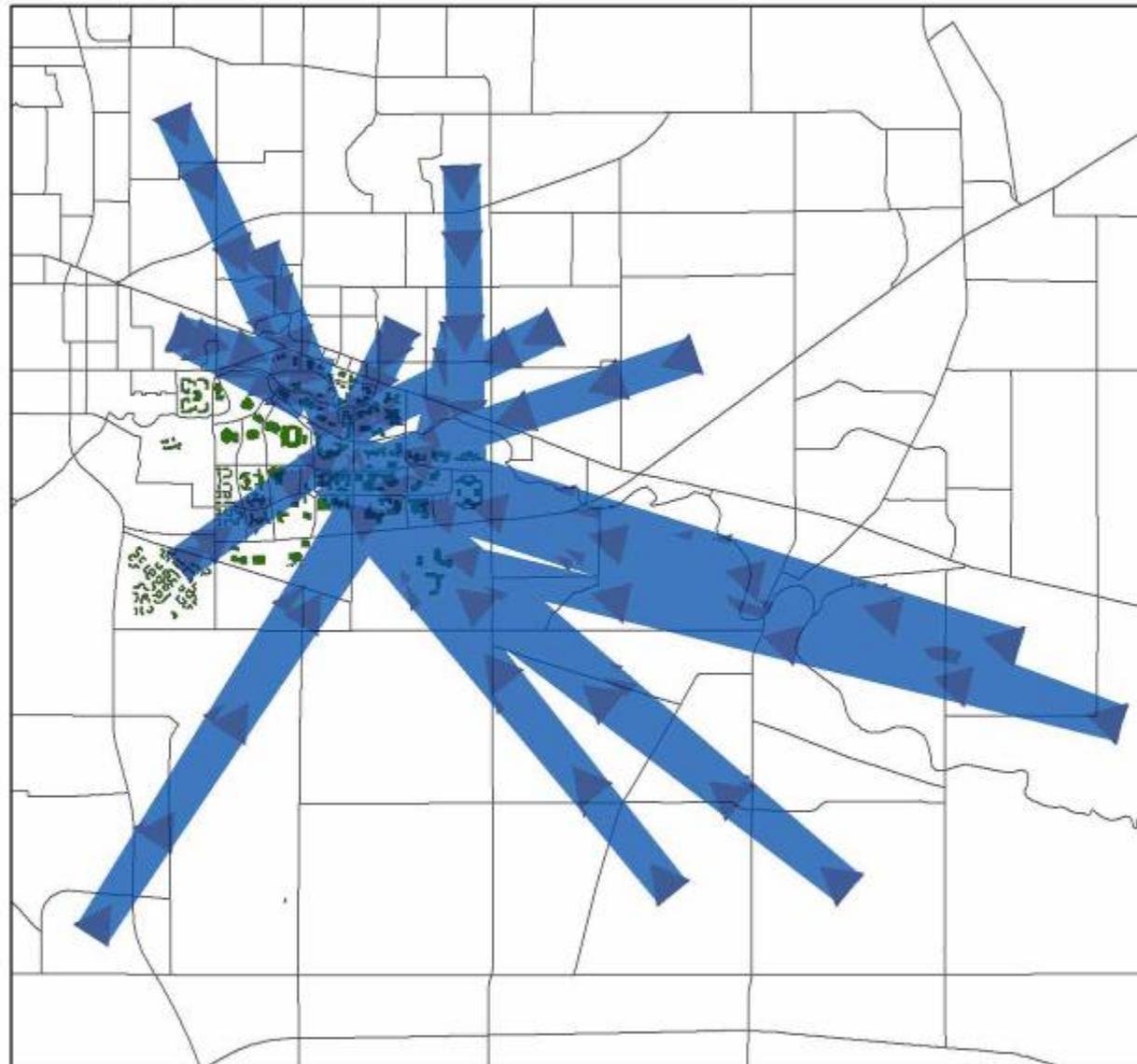


Sources: Office of Planning and Budgets, Michigan State University
Center for Geographic Information, State of Michigan
Tri-County Regional Planning Commission

Produced by: Tri-County Regional Planning Commission - 8/27/2008

MSU Faculty and Staff Movement to Campus TAZ to MSU Building

*Within Tri-County Region
June 2008*



**Zip, TAZ and MSU Faculty & Staff
Boundaries**

- MSU Buildings
- TAZs
- Zip Codes

Origin to Destination

- 7 - 11



Sources: Office of Planning and Budgets, Michigan State University
Center for Geographic Information, State of Michigan
Tri-County Regional Planning Commission

Produced by: Tri-County Regional Planning Commission - 8/27/2008

“Regional Growth: Choices for Our Future”— core of our planning process

**Land Use Alternatives Analysis=
Trends or “Business as Usual” Vs. “Wise Growth”
Build Out Vs. “Wise Growth” Build Out**

**Eight network alternatives—high transit, medium transit, demand
reduction/improve operations, combos, projects (Wise Growth),
projects (trends), highways only**

**Network alternatives analysis also core of Congestion
Management process)**

Consultants beg to be let go, but finished scope/lost money

New Contract: Corradino Group Phase III (2004)

Meet conformity deadline & requirements;

Regional 2030 Plan -- update adopted plan, extend it five years

(Phase IV) (2006)

Update model and calibrate to 2005, update capacities to new manual

Full update to SE data model to 2045

Fully convert both to TRANSCAD

Add other enhancements

Complete modeling for 2035 Plan

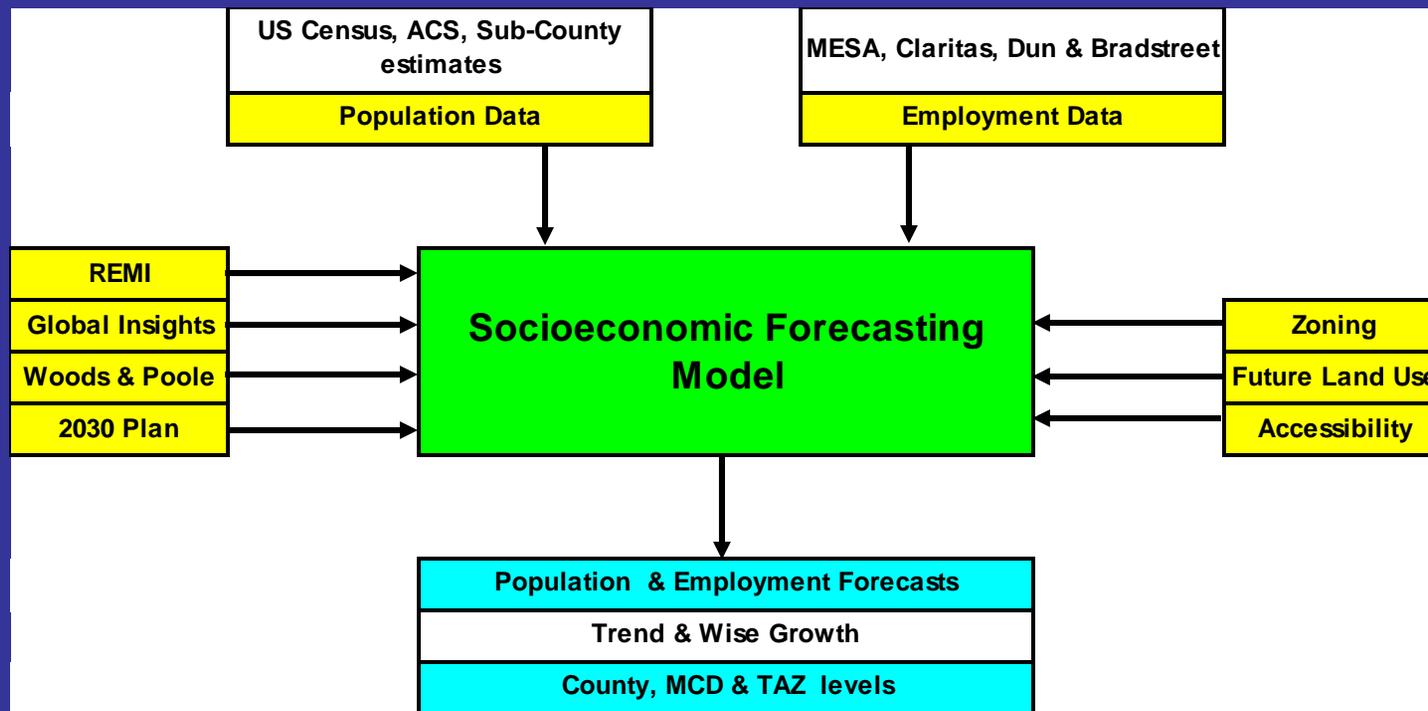
Staff Vs. Consultants

- FAMPO Survey/David Lee (2009, Fredericksburg MPO)
- 146/201 TMAs, with some smaller areas, but focus > 200K (76.4% response)
- 60 %- consultants
- 20 %- in house with supports
- 15-20% - depend on DOT

Consultant Vs. Staff, or Both?

- Global marketplace for modelers
- Balancing cost and staffing availability
- Continuity, extension of staff, teaming
- Travel modelers are not demographers- demographers are not necessarily travel modelers, neither are necessarily traffic engineers or GIS experts
- Local knowledge and experience
- Higher level model enhancements may require consultants

Socioeconomic Forecasts

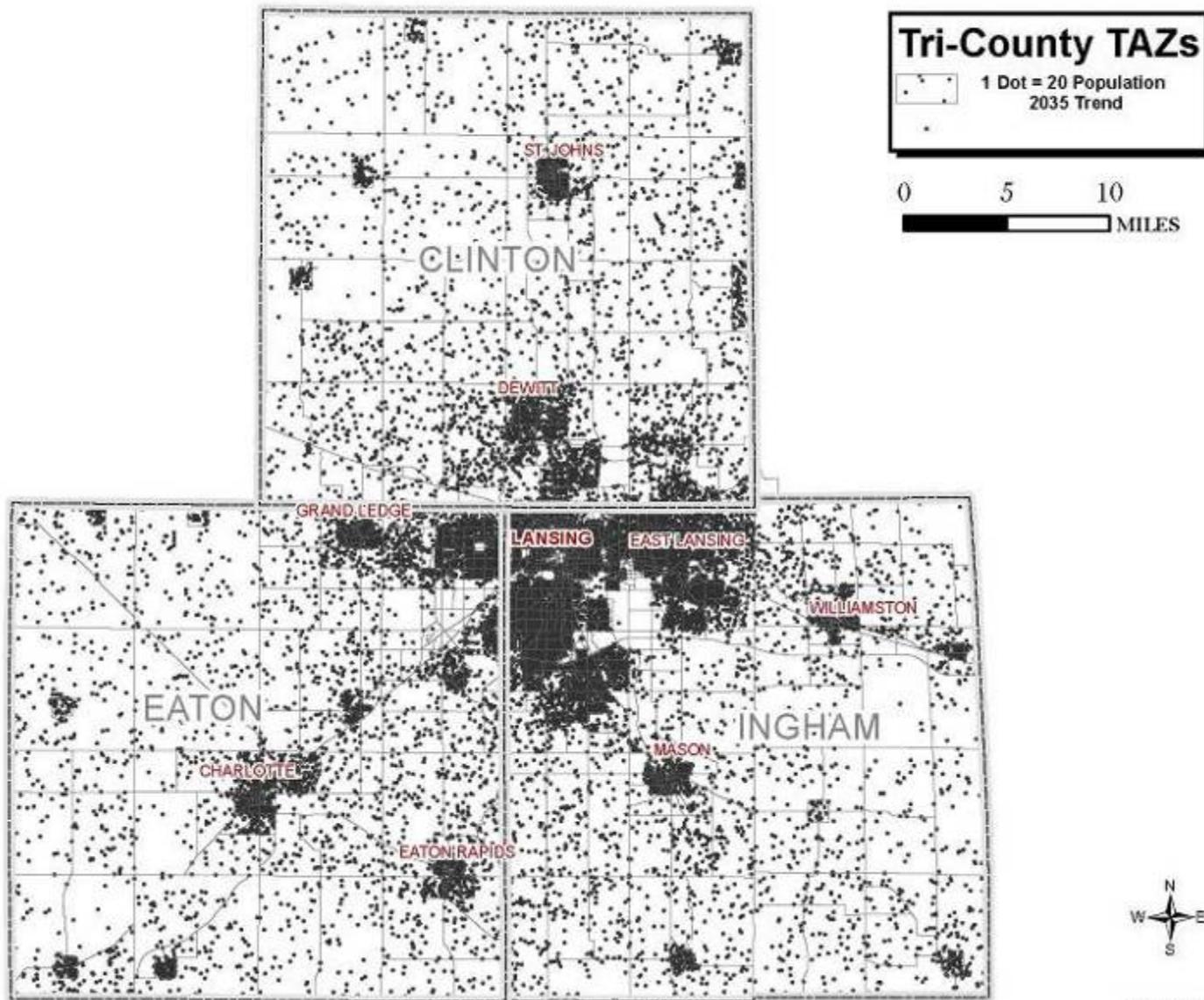


Socioeconomic Data Summary

Regional Data	2005	2010 Adopted Trend Forecast	2035 Adopted Trend Forecast	2035 Wise Growth	Build Out	Wise Growth Build Out
Population	454,667	451,260	491,808	491,808	1,163,800	1,076,300
Retail Employment	49,431	49,319	50,764	50,765	112,600	112,600
Non-Retail Employment	231,355	232,599	248,880	248,882	377,400	377,400
Households	181,836	181,082	212,914	212,914	446,200	446,200
Vehicles	331,219	315,111	352,938	352,938	925,500	812,100

2035 Trend Population

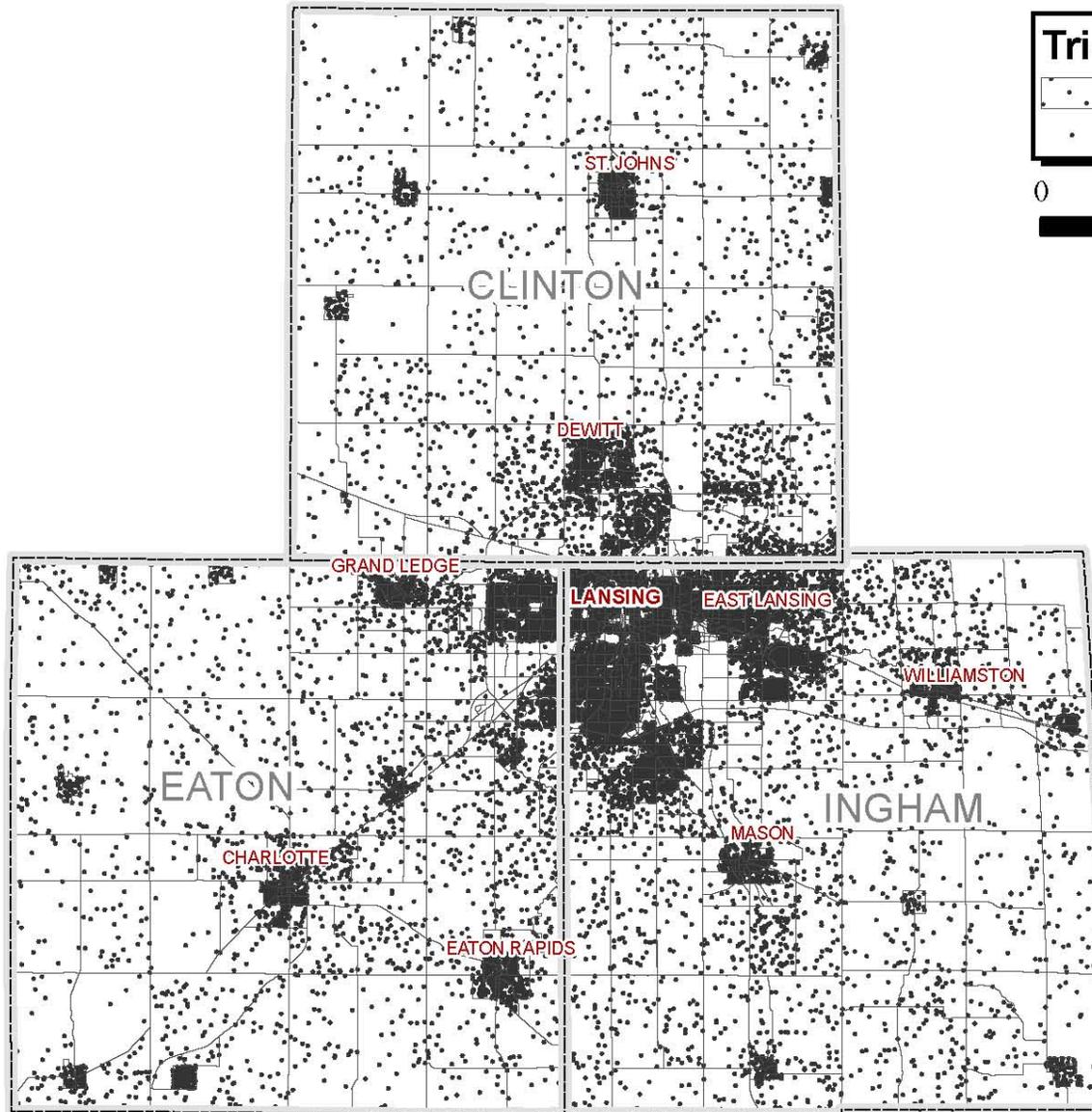
Tri-County Region



9/30/2009

2035 Wise Growth Population

Tri-County Region



Tri-County TAZs
1 Dot = 20 Population
2035 WG

0 5 10
MILES



REGIONAL VISION IMPLEMENTATION

- Reduce congested lane miles on regional roads by approximately 50 percent and save taxpayers between 1.6 and 4.8 billion dollars in road improvement costs which would otherwise be required if current trends are unchecked.
- Save the equivalent of three townships of agricultural land and open space.
- Reduce air pollutants by tens of thousands of kilograms per day, leading to public health benefits and lower long term public health costs.
- Improve the region's quality of life and economic competitiveness in an increasingly global economy greater than would occur under current public policies.



Model Improvements

- TAZ increased from 834 to 1,082
- Better feedback loop between network skimming and traffic assignment processes based on D. Boyce, 2007
- Freight component added (QRFM 1)
- All programs in TransCAD (batch files) using the latest version (5.0r3) – no more Fortran codes & Tranplan
- Improve MSU Commuter Lots & Transit
- GUI/File Management System
- Integrated calling Mobile 6.2 from TransCAD

Model Improvements

- Transit improvement on routes and stop locations
- Congested cost and fuel consumption calculation added
- Better network coding, fix errors in road coding from previous model
- Using latest version TransCAD-- managing parameter changes and sensitivity analysis are easier
- Updated capacity for LOS D using Highway Capacity Manual version 2000

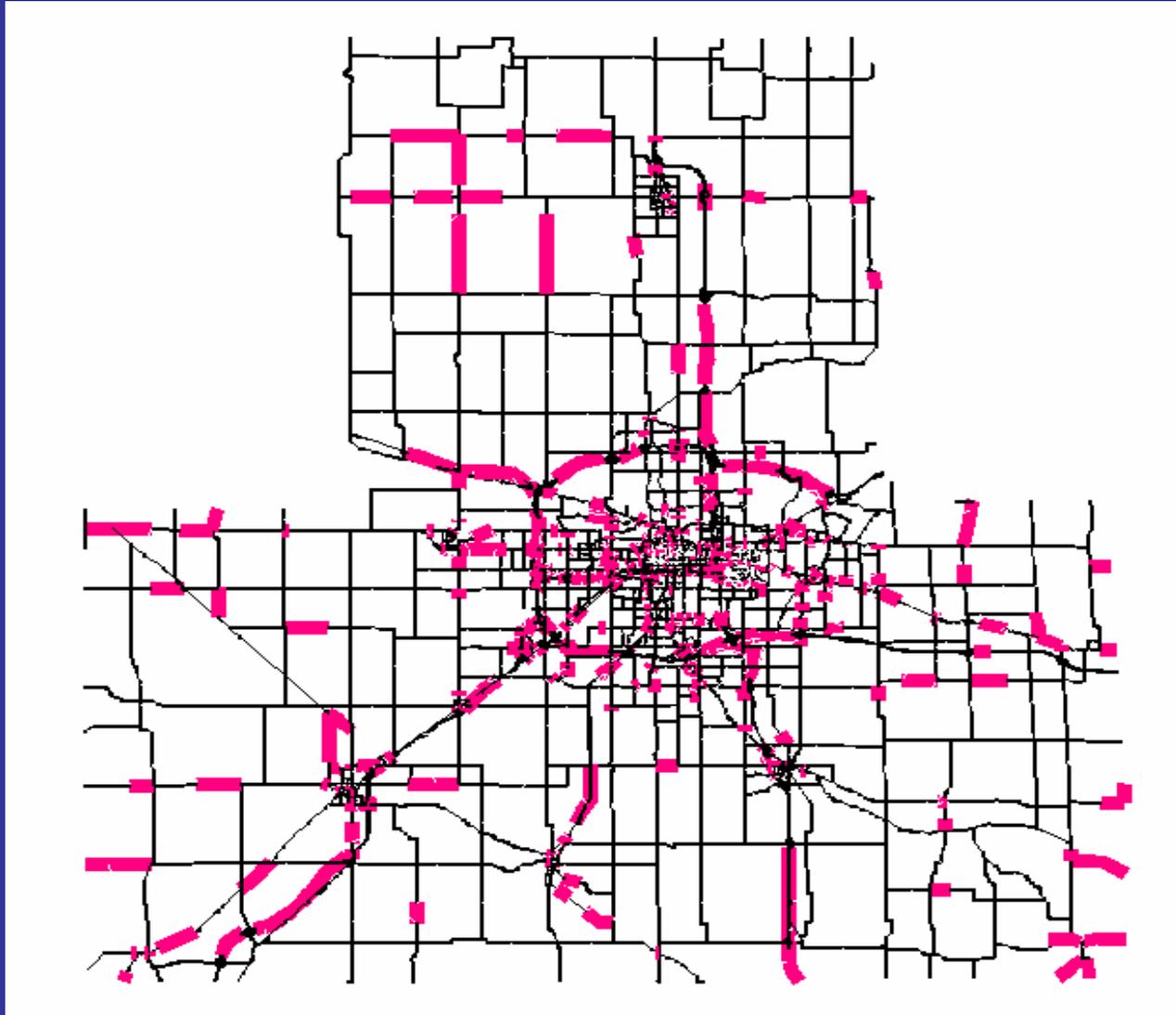
MI Travel Counts Data

- Consultants reviewed the data, applied based on their professional judgment
- Limited use
- Trip rates/externals
- Aggregation use issues Vs. cost of sampling?
- No local transit O-D's for FTA New Starts in spite of extensive surveying—question and study design issues

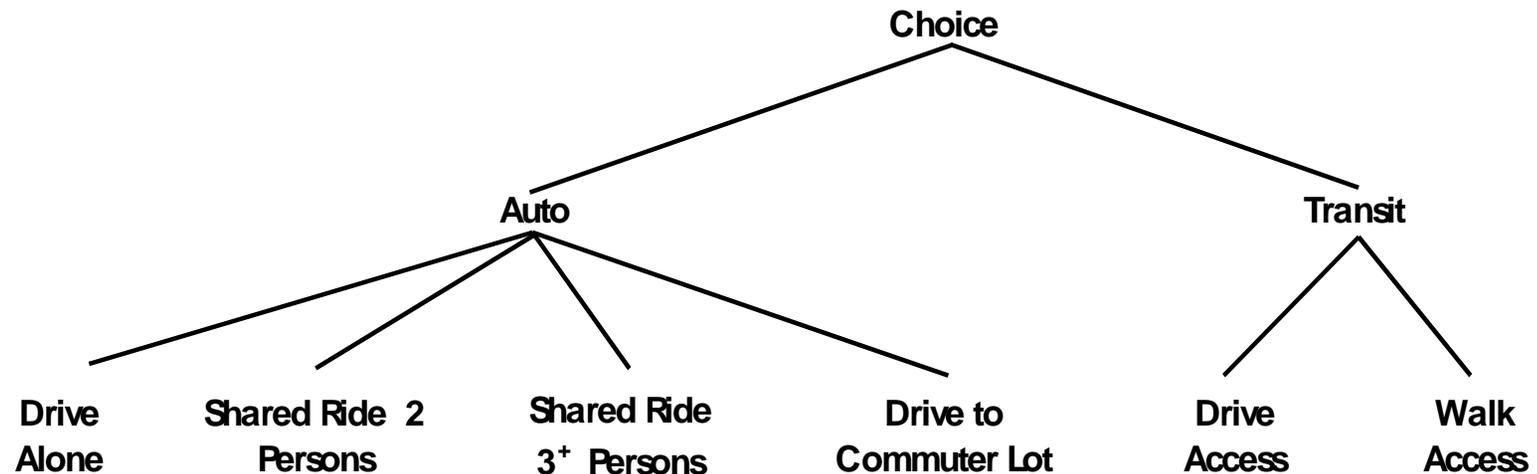
Traffic Counts

- Traffic counts used for 2005 calibration reduced from 1,720 (LRP 2030, 2000 base year) to 607 stations—sampling method applied
- Peak hour coefficients derived from previous LRP and adjusted 1% (up and down) for HBO and HBW
- Additional peak hour coefficient is introduced in current LRP 2035 for three types of freight: four-tire, single-unit and combined.

Traffic Count Locations



Mode Choice



The coefficient values are computed based on the following assumptions:

- Average value of time per minute = \$0.2
- Average auto operating cost per mile = \$0.12
- Average auto occupancy for Share Ride 2 Persons = 2
- Average auto occupancy for Shared Ride 3+ Persons = 3.2
- Weight of out of vehicle is assumed 2.5 times the weight of in-vehicle travel time.

Mode Choice Results

Survey

- CATA Survey
- Total Daily Average Ridership September 2005: 42,860
- MSU Survey
- Total Daily Commuter Riders: 2,160

Model

- Total Daily Transit Passengers: 42,922
- MSU Commuter lot riders : 2,147 vehicles

Freight Component

- Based on USDOT publication Quick Response Freight Manual (QRFM)
- Trip generation based on QRFM:

Vehicle Type	Non-Retail	Retail		Occupied Dwelling Unit
	Industrial	Commercial	Service	
4-tire	0.138	0.117	0.066	0.024
Single-unit	0.161	0.146	0.058	0.042
Combined	0.9	0.044	0.019	0.016

- Passenger Car Equivalents (PCEs) based on QRFM & HCM 2k: 1.5, 2, and 4 for 4-tire, Single, and Combined.

Time-of-Day Factors

Time-of-Day Factors (%) **2035 LRP Values**

Period	Direction	Trip Purpose							
		HBW	HBO	MSU	NHB	Four-tire	Single-unit	Combines	EXT
AM	P -> A	21.51	9.54	9.54	3.78	13	14.5	11.1	12.33
			10.54	10.54					
	A -> P	1.01	1.17	1.17	4.78				
		2.01	2.17	2.17					
PM	P -> A	3.05	9.13	9.13	29.81	23.5	19.4	14.4	27.12
			8.13	8.13					
	A -> P	25.55	13.8	13.8	28.81				
			12.8	12.8					
Off- Peak	P -> A	25.44	31.33	31.33	66.41	63.5	66.1	74.5	60.55
			23.44						
	A -> P		35.03	35.03					
		22.44							

Calibration & Validation

Assignment Results Summary

Model

Period: Daily

Total of link volumes: 6,351,101

Volume/Count Ratio = 1.01

VMT: 3,715,783

VHT: 64,671

Volume/Count VMT: 1.03

Traffic Counts

No of Counts: 489

Total of Traffic Count: 6,282,756

RMSE : 38.08%

VMT:3,595,924

VHT: 63,083

Calibration Target Summary

Facility Type	Count VMT ¹	Assigned VMT ²	A versus C ³	TARGET ⁴	TARGET MET?
Interstate	2,527,969	2,715,099	7%	±7%	Yes
Other Freeways	728,403	823,814	12%	±7%	No
Principal Arterials	549,461	611,356	10%	±10%	Yes
Minor Arterials	510,019	553,309	8%	±15%	Yes
Collector	279,599	256,382	-9%	±25%	Yes
Local	24,672	25,595	4%	±25%	Yes
Tri-County Total	4,620,122	4,985,554	7%	±5%	No

Facility Type	Count Volume	Assigned Volume	A versus C ¹	TARGET ²	TARGET MET?	Count Locations
Interstate	1,879,418	2,004,100	6%	±7%	Yes	111
Other Freeways	400,118	454,346	12%	±7%	No	27
Principal Arterials	2,992,479	3,378,945	11%	±10%	No	170
Minor Arterials	1,419,929	1,467,099	3%	±15%	Yes	150
Collector	473,099	465,519	-2%	±25%	Yes	127
Local	66,959	74,535	10%	±25%	Yes	22
Tri-County Total	7,232,002	7,844,543	8%	±5%	No	607

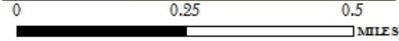
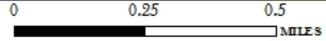
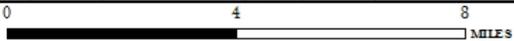
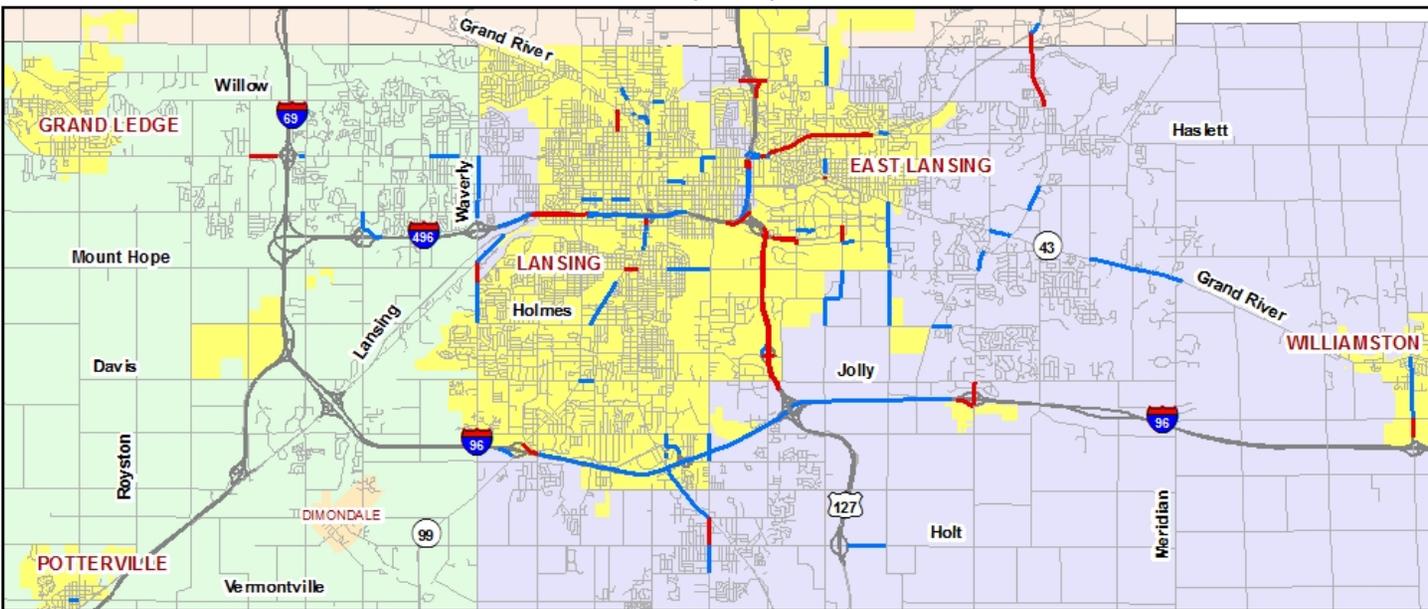
Calibration Target Summary

Volume Group	Count Volume	Assigned Volume	A versus C ¹	TARGET ²	TARGET MET
1 - 1,000	25,530	19,648	-30%	±200%	Yes
1,001 - 2,500	146,649	113,868	-29%	±100%	Yes
2,501 - 5,000	338,926	284,736	-19%	±50%	Yes
5,001- 10,000	956,542	943,411	-1%	±25%	Yes
10,001- 25,000	3,373,201	3,660,121	8%	±20%	Yes
25,001- 50,000	2,290,978	2,659,724	14%	±15%	Yes
All Count Groups	7,131,826	7,681,508	7%	-	-

Model Use

2005 PM Modeled Deficiencies

(MAP 1/1)



2005 PM

- Link Deficient
- Link Near Deficient



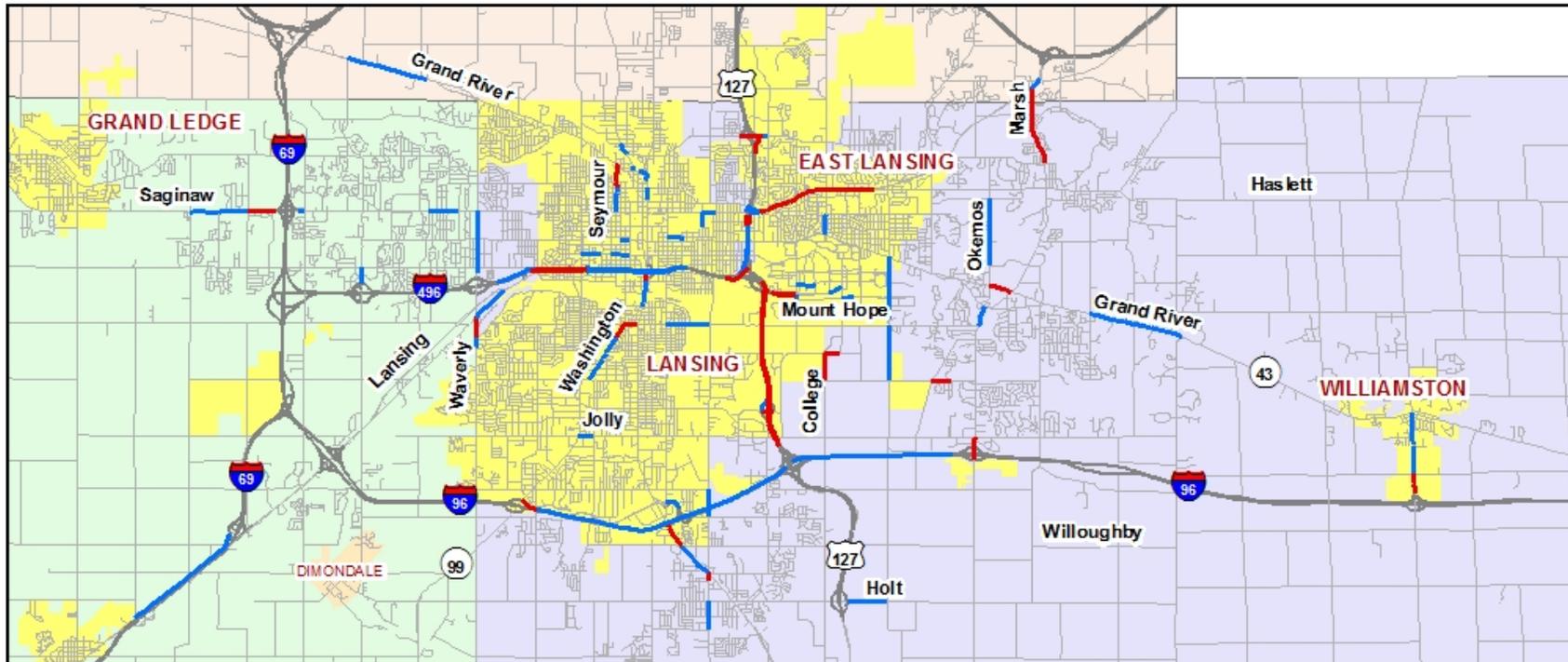
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December 2, 2008

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2010 PM Modeled Deficiencies

(MAP 1/1)



0 0.25 0.5 MILES



0 1,000 2,000 FEET

0 4 8 MILES

2010 PM

- Link Deficient
- Link Near Deficient



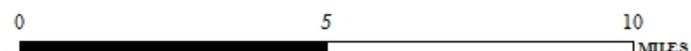
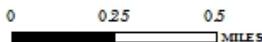
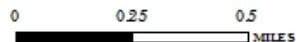
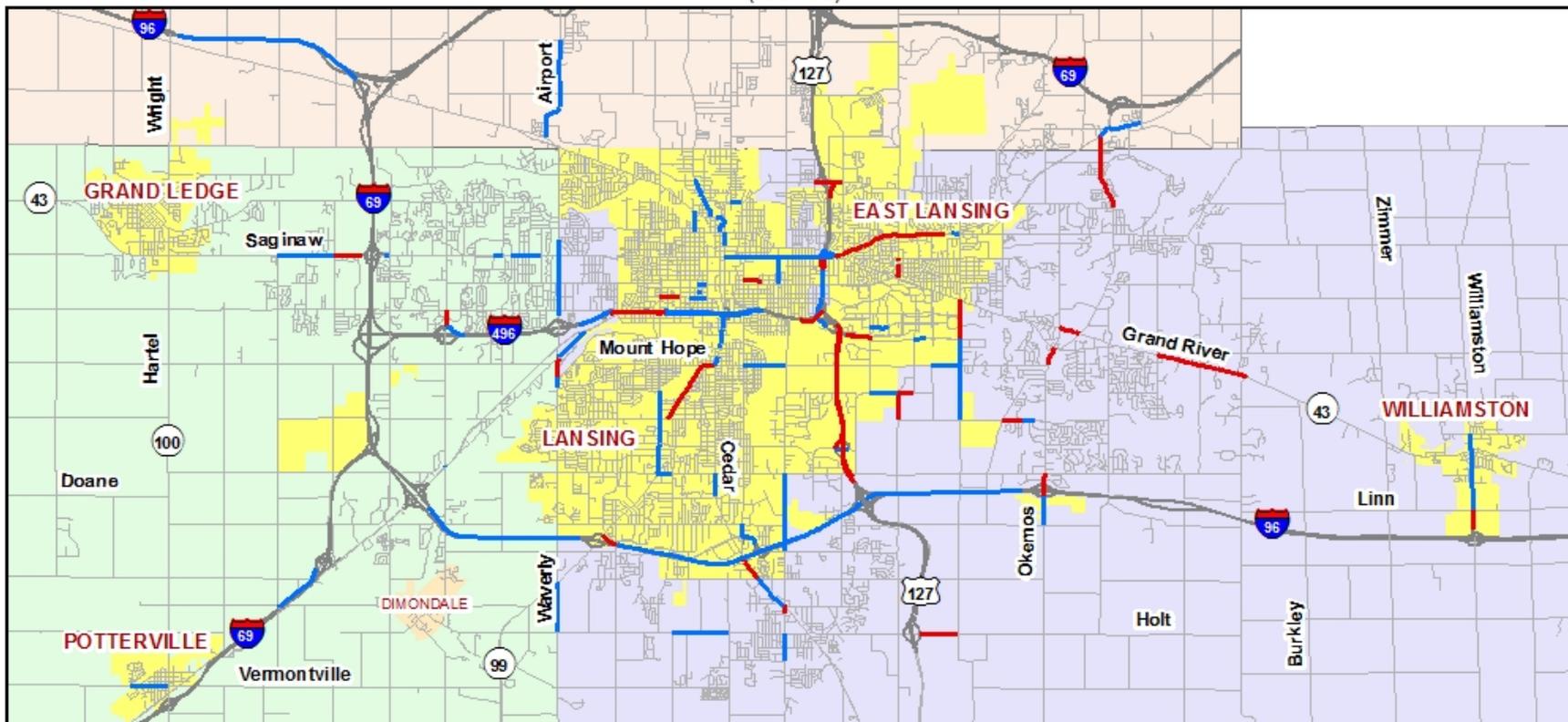
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2035 PM Wise Growth Modeled Deficiencies

(MAP 1/1)



2035 PM Wise Growth

- Link Deficient
- Link Near Deficient

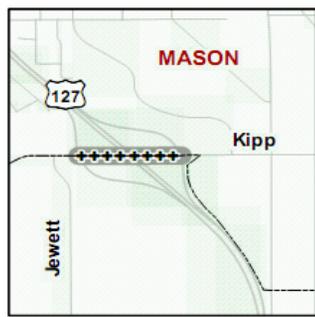


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Freight Volume & 2035 Daily Wise Growth Deficiencies

Metropolitan Area



2035 Daily Wise Growth
 +++++ Link Deficient

of Freight Vehicles

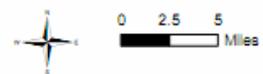
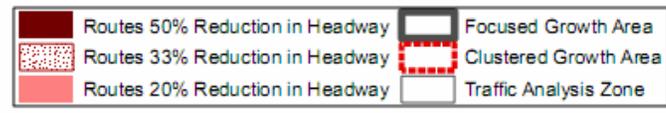
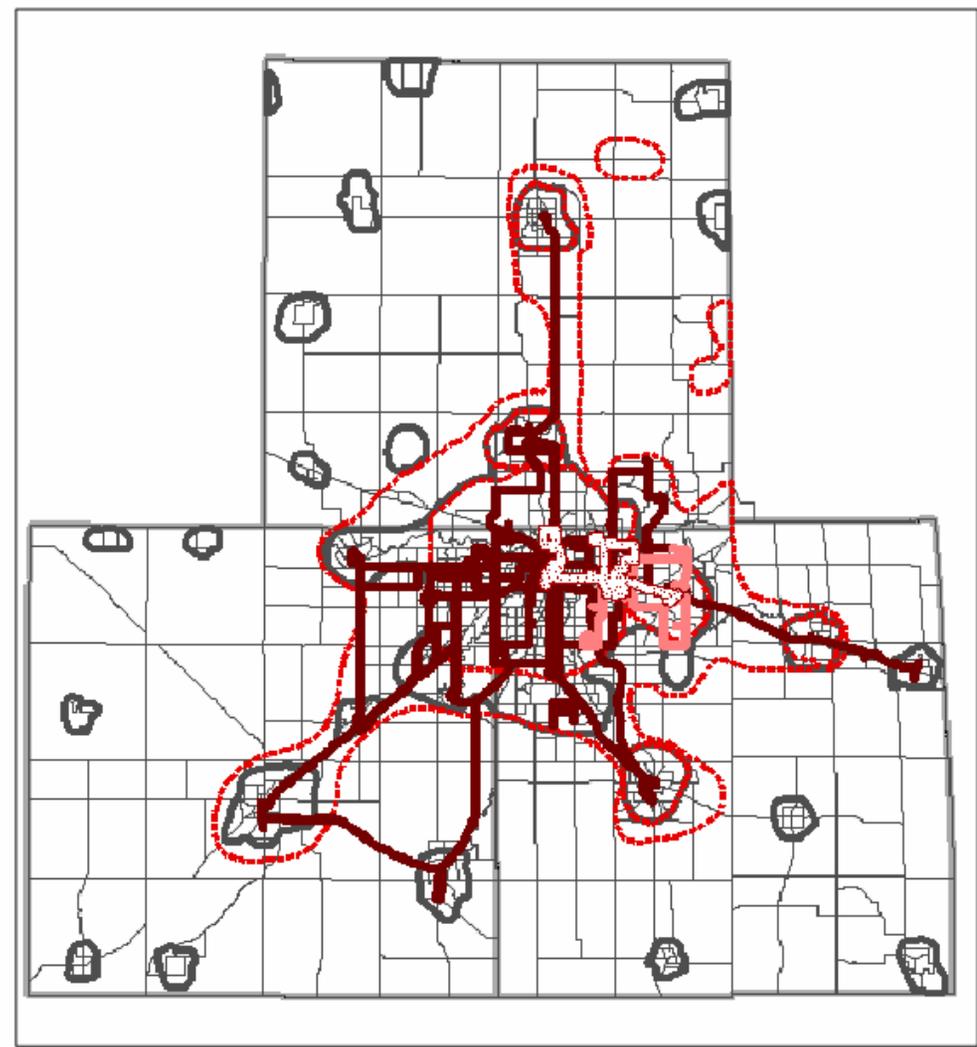
- 332 - 2000
- 2001 - 3500
- 3501 - 7809
- City

Chapter 11—Alternatives Analysis

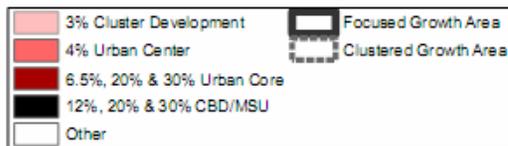
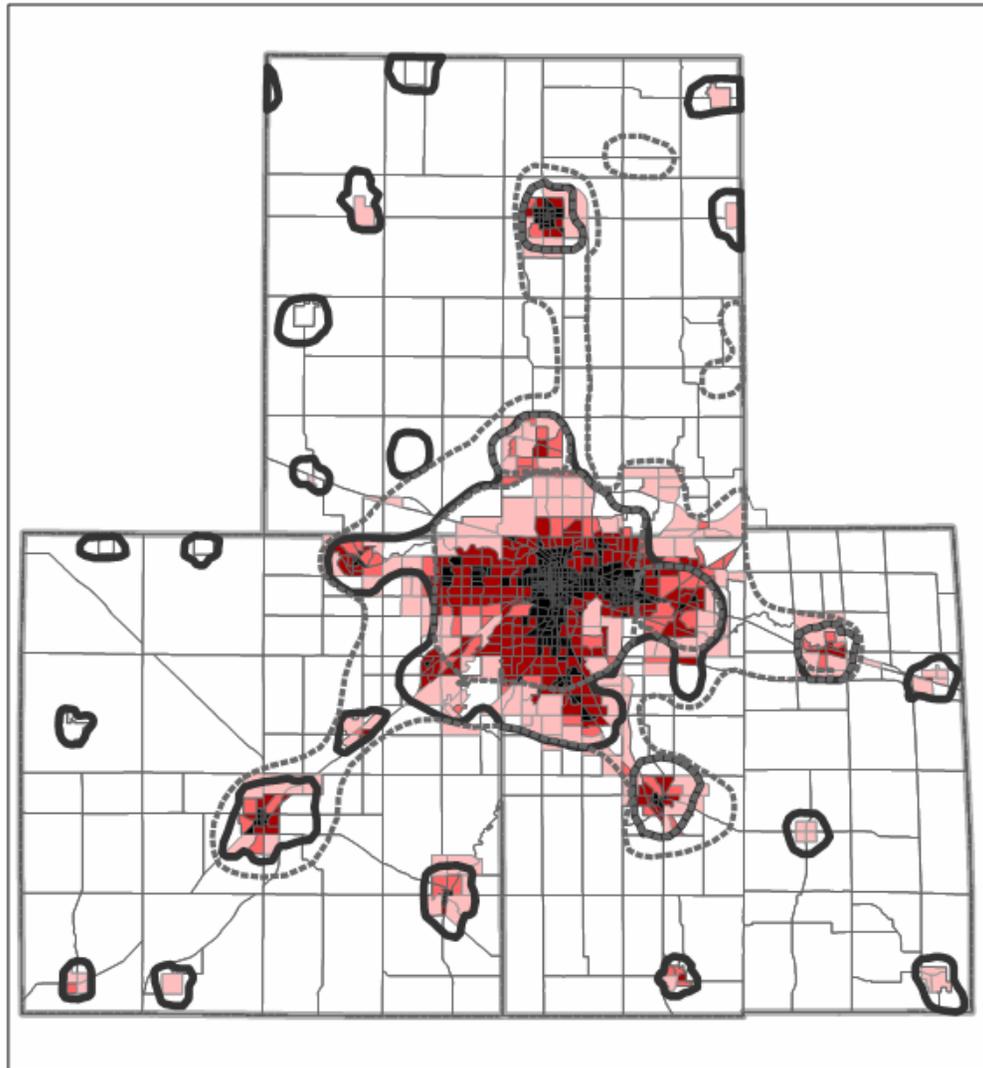
- **Eight options considered:**
- **1) High transit**
- **2) Medium transit**
- **3) Demand reductions/improve operations**
- **4) Combine of 2 & 3**
- **5) Combine 2, 3 & projects (recommended)**
- **6) Projects (wise growth)**
- **7) Projects (trends)**
- **8) Highways only**
- **Adopted plan**

2035 Plan Modeled Transit Service Improvements by Percentage of Headway Reduction

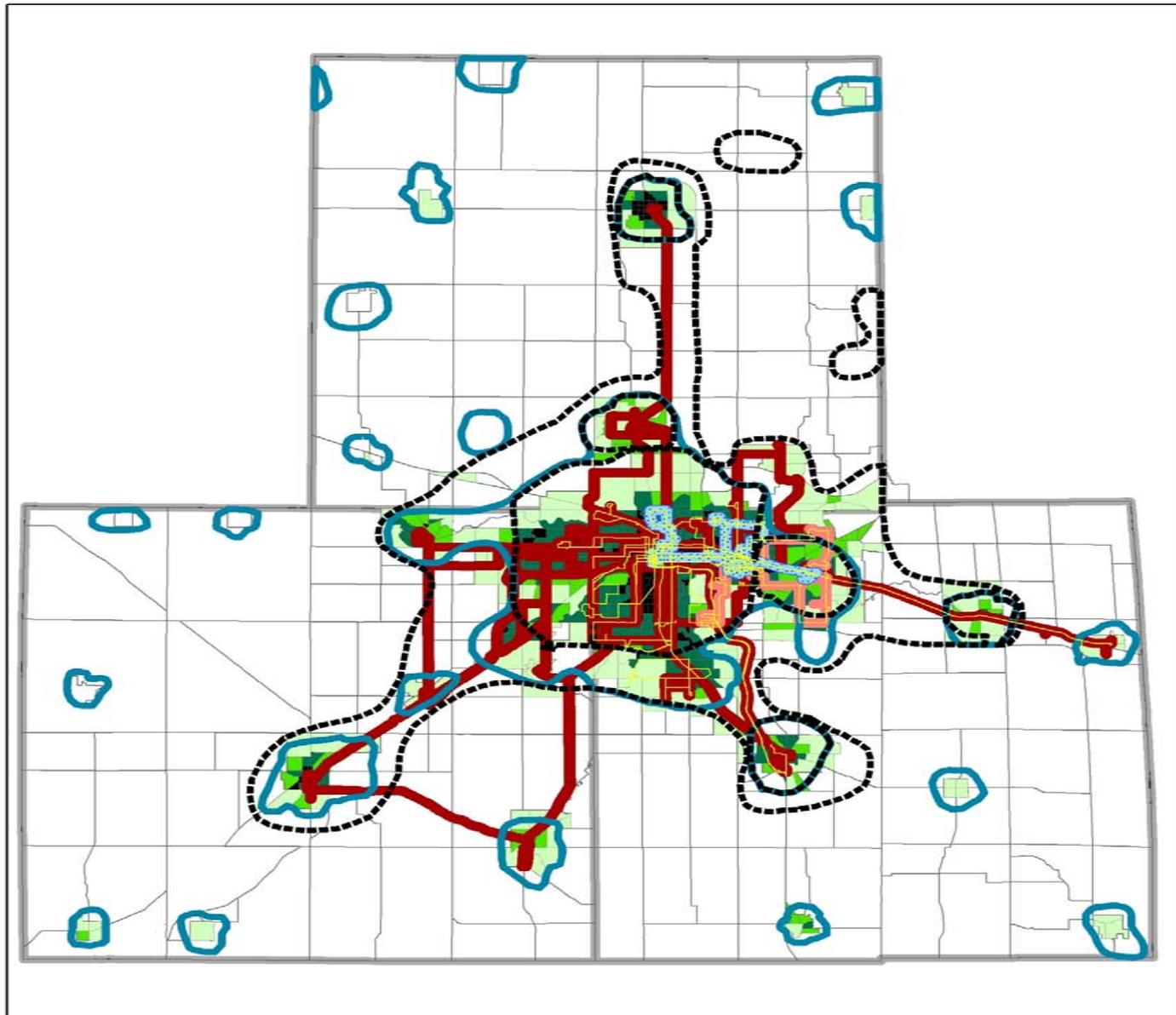
Tri-County Region



2035 Plan Generalized Demand Reduction and
Management/Operation Improvements by Percentage
Tri-County Region

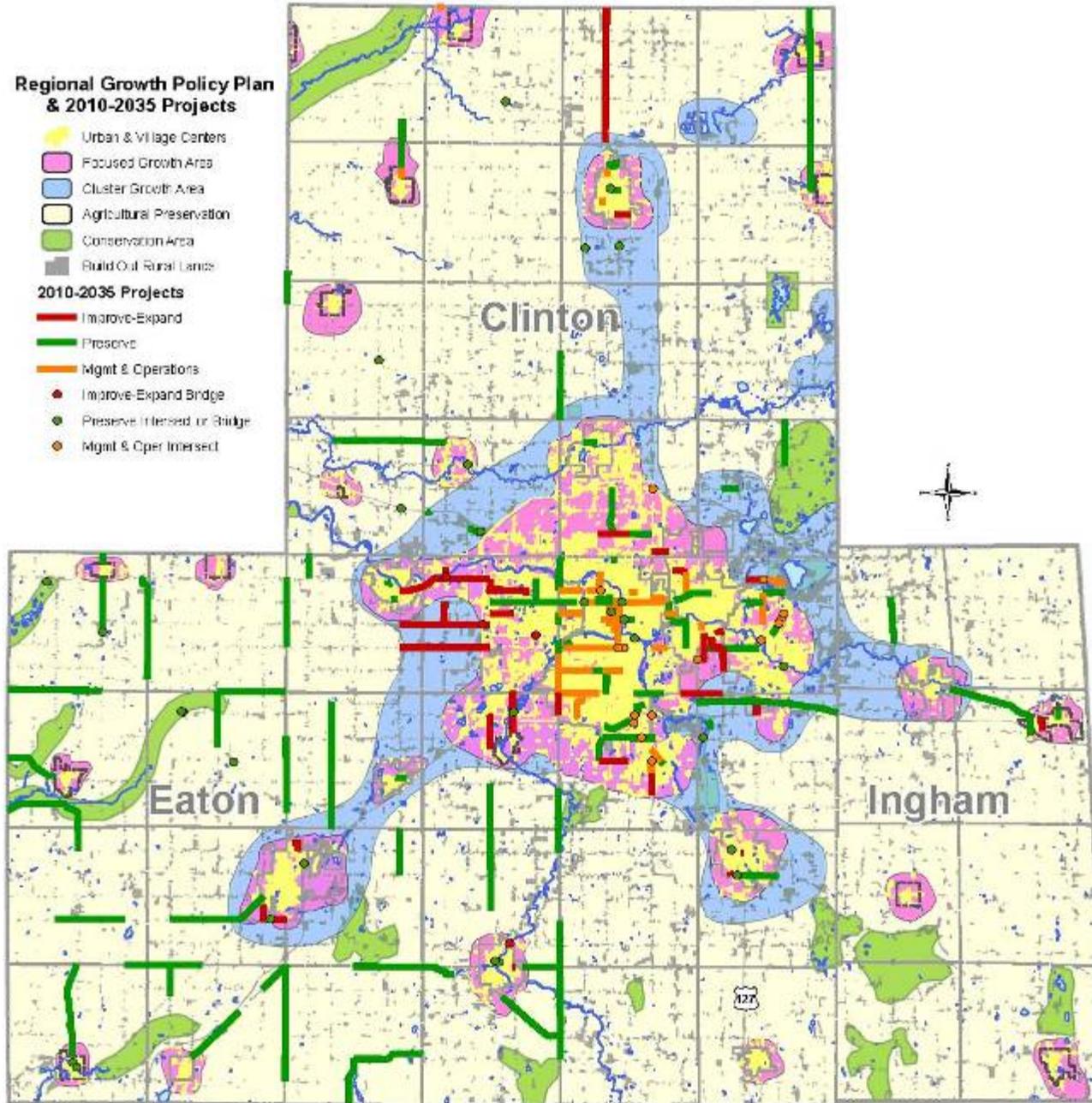


Existing & Proposed Transit Routes With Demand Reduction/ Management & Operations Improvements by Percentage *Tri-County Region*

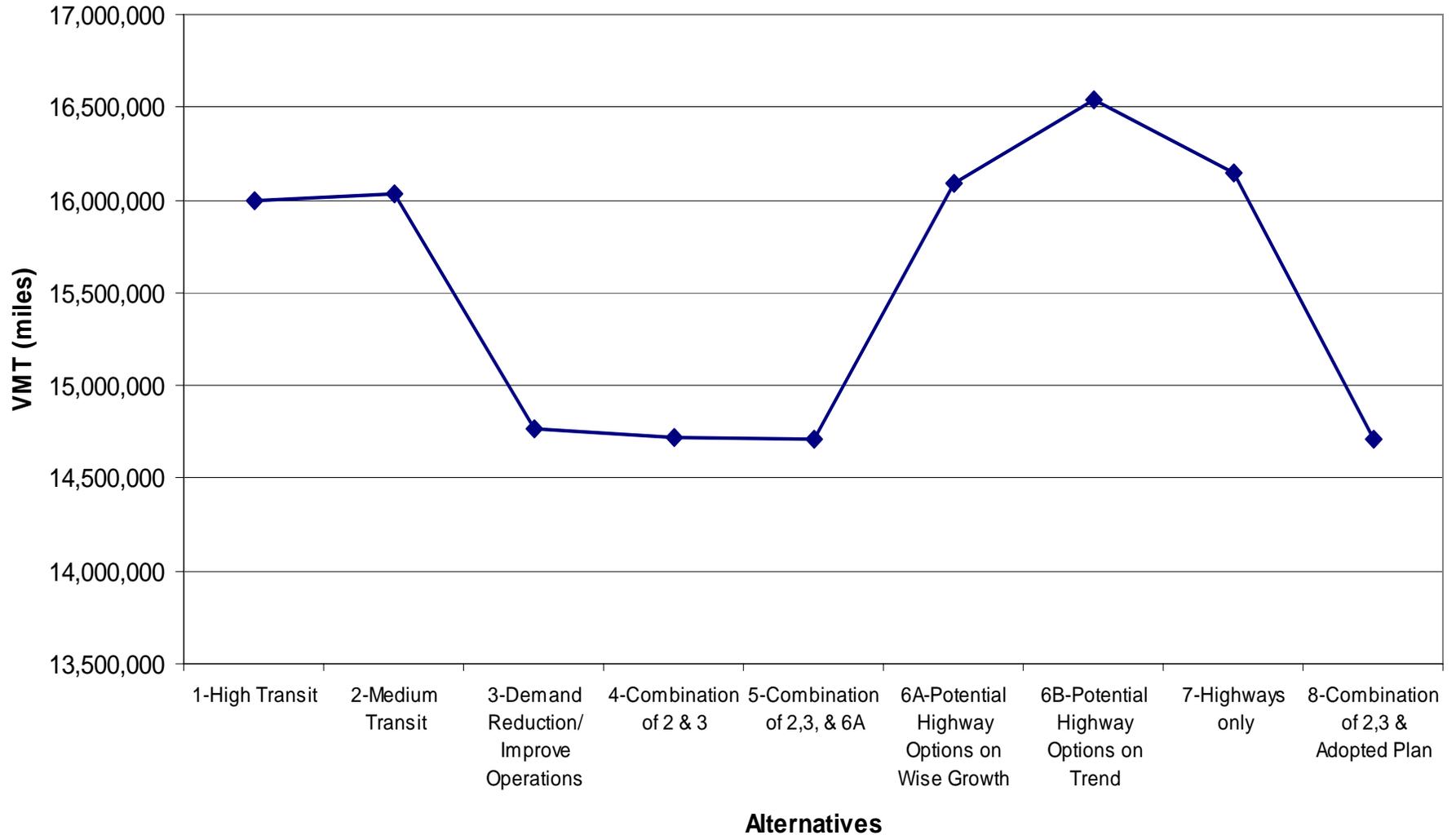


**Regional Growth Policy Plan
& 2010-2035 Projects**

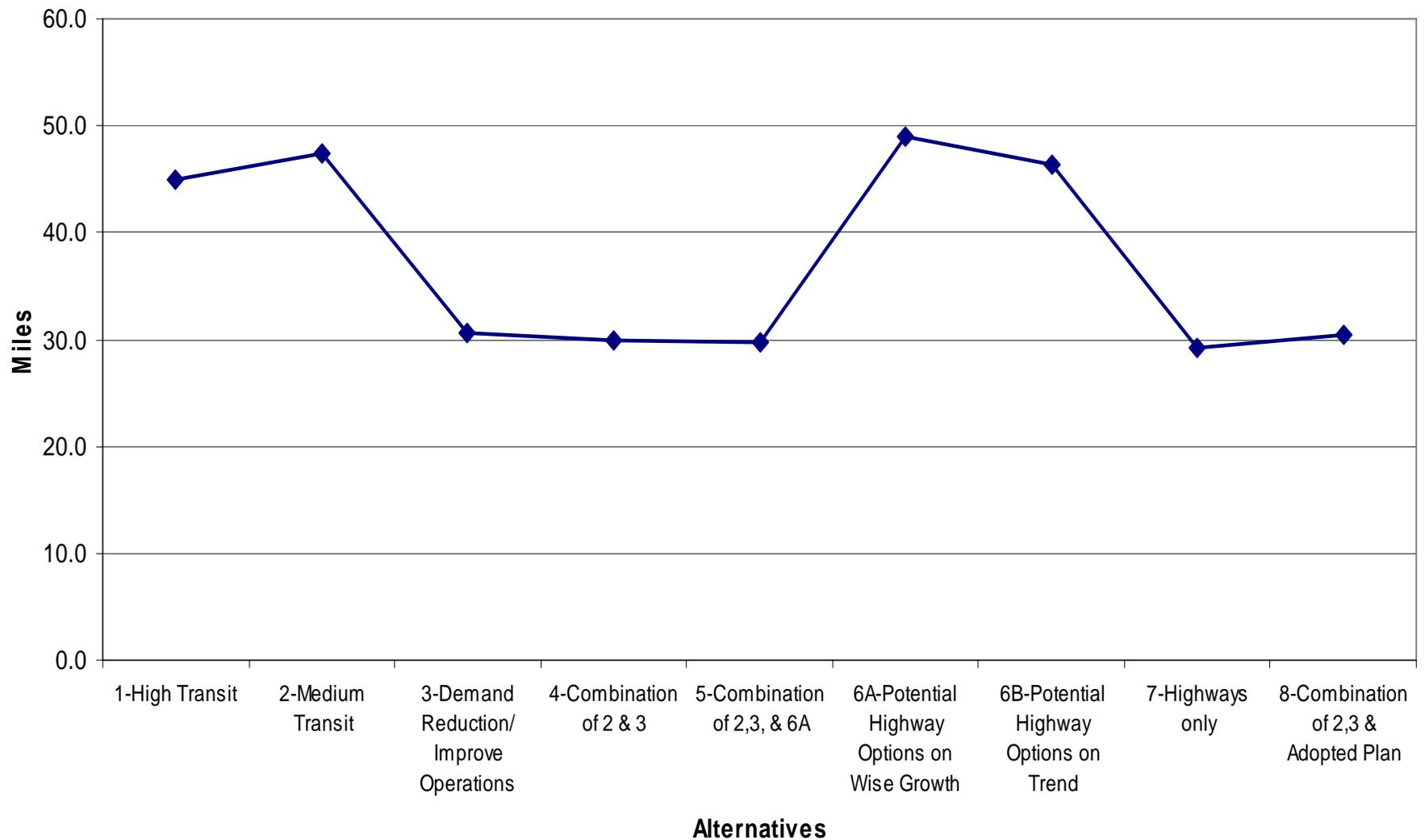
-  Urban & Village Centers
 -  Focused Growth Area
 -  Cluster Growth Area
 -  Agricultural Preservation
 -  Conservation Area
 -  Build Out Rural Lands
- 2010-2035 Projects**
-  Improve-Expand
 -  Preserve
 -  Mgmt & Operations
 -  Improve-Expand Bridge
 -  Preserve Intersect or Bridge
 -  Mgmt & Oper Intersect



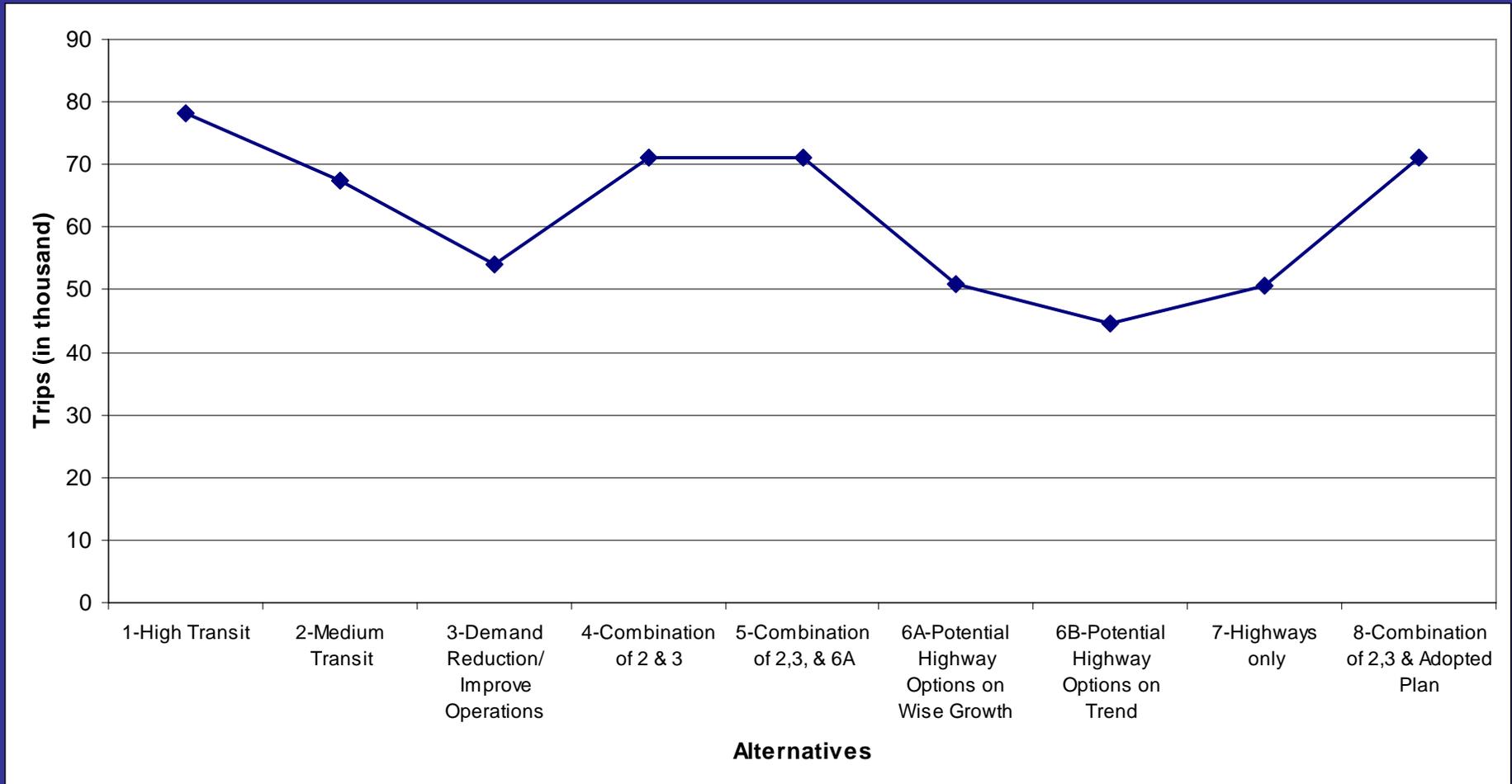
Daily VMT of Alternatives



Daily Congested Lane Miles



Daily Unlinked Transit Trips by Transportation Alternative (System Total)

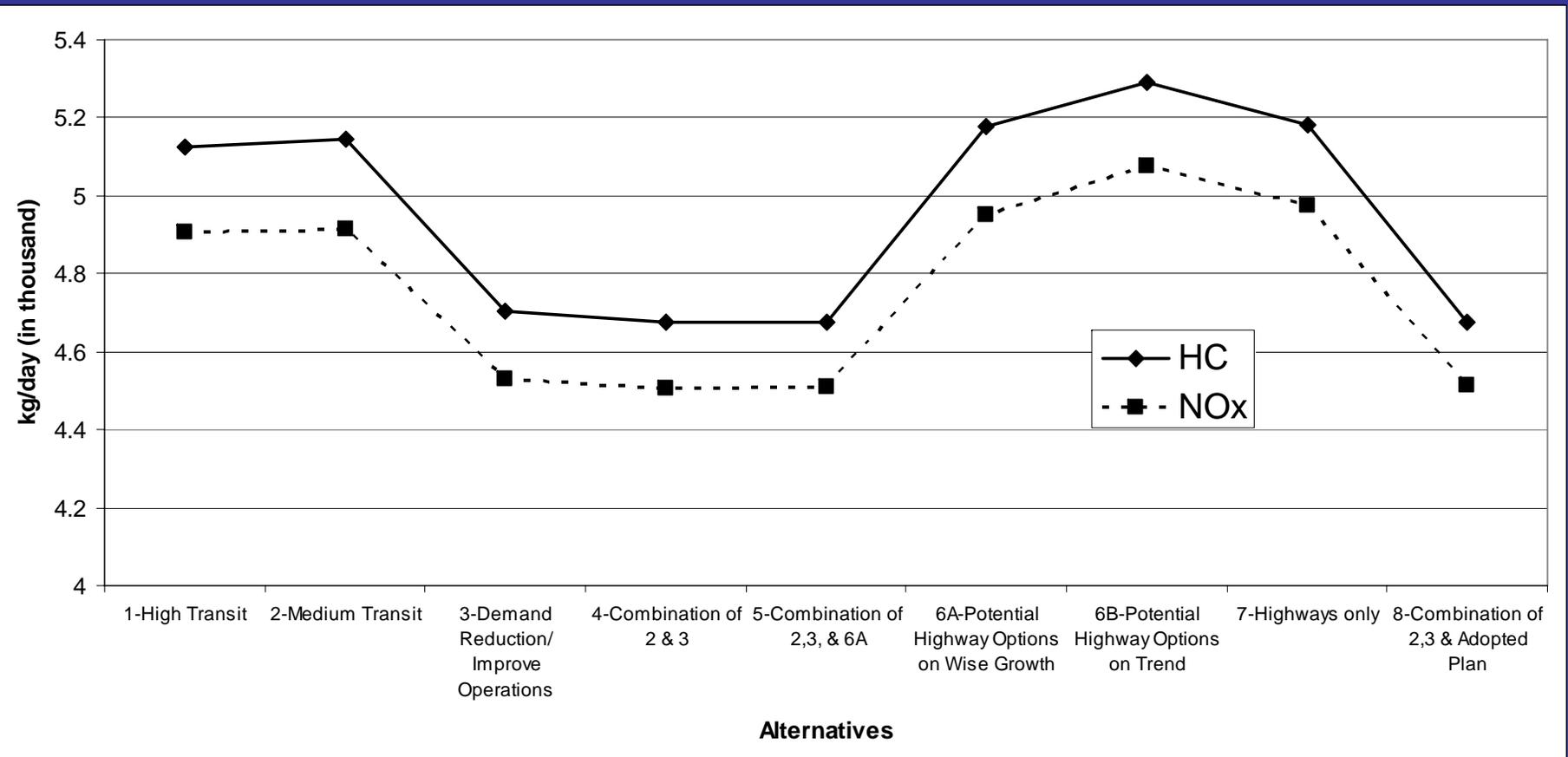


HC and NOx (Delay)

2005 Base Year

HC = 16,467 kg/day

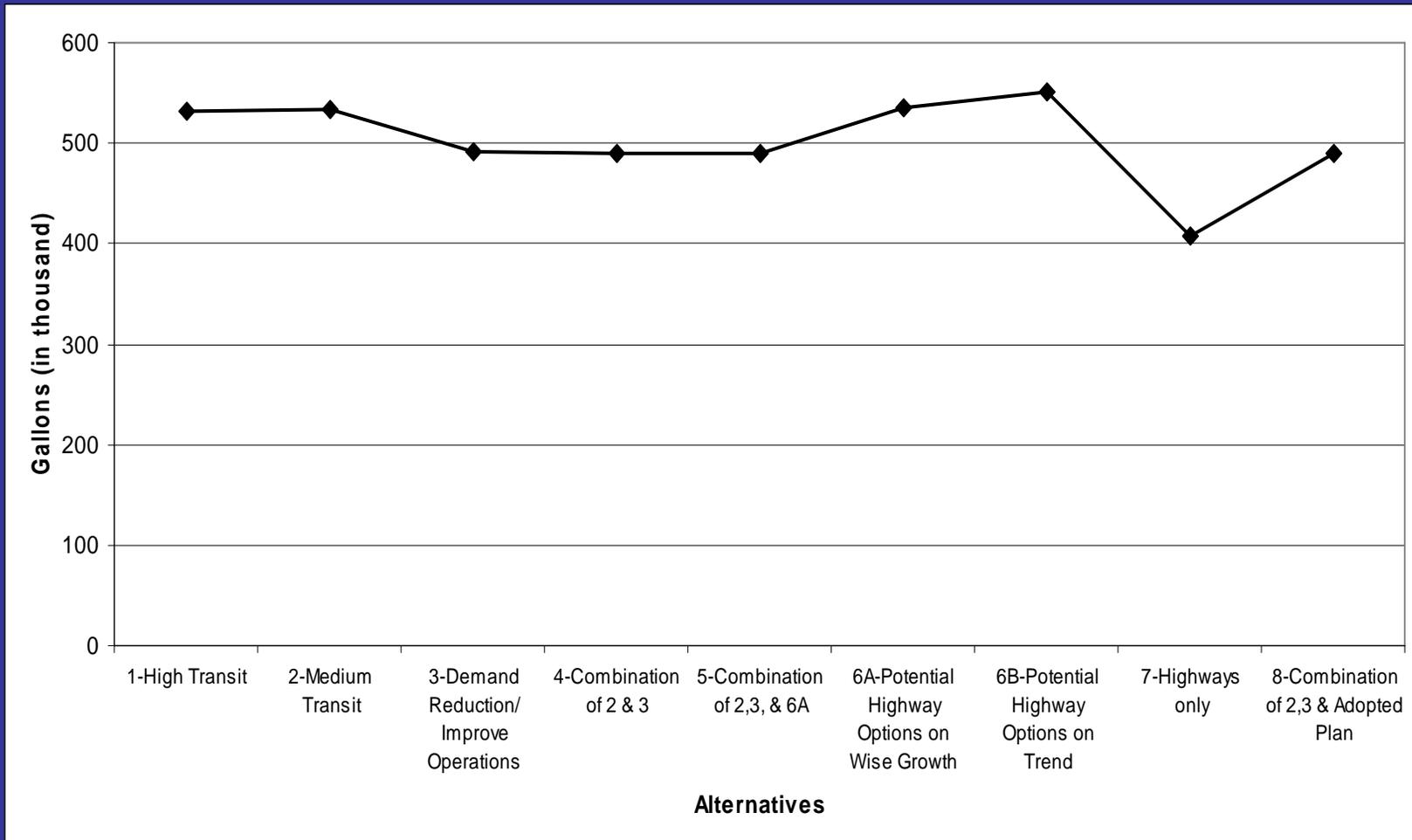
NOx = 30,759 kg/day



Fuel Consumption (Delay)

2005 Base Year

Fuel Consumption = 510,998 gallons



Regional Transportation Conformity Analysis , 8 Hour Ozone Standard, Regional 2035 Transportation Plan and 2008-2011 Transportation Improvement Program

<u>Scenario</u>	<u>Emissions*</u>		<u>DAILY VMT**</u>
	VOC	NO _x	
8 Hour Conformity Budget	25,691.90	48,145.10	-----
2010 Action	9,943.86	17,759.99	23,990.13
2018 Action	6,115.14	7,825.93	24,347.51
2025 Action	4,766.88	5,394.62	24,743.59
2030 Action	4,668.01	4,681.52	24,962.79
2035 Action	4,674.42	4,510.84	25,183.05

Model Use for Other Projects

- Road diet analysis
- Marketing analysis -- LSJ (traffic flow to retail areas/origins)
- Michigan Avenue Grand River Corridor alternatives analysis
- Lansing comp plan update
- Various other corridor studies in progress in town—IPACE/Lake Lansing, elsewhere

Future Directions

- New TIP has 400K STPU—2012-14, plus match
- Update the model for LRP 2040: network, SE data, transit, parking, count data
- Integration with MOVES2010
- Calibrate to 2010 base year
- Climate change/GHG/Other new requirements???
- Various enhancements TBD...Probably Minor....
- Strategic Plan.....wait—review again?
- Activity Based Trip Gen
- Dynamic Assignment?

Thank You

Paul T. Hamilton, Chief Planner

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