Ozarks Transportation Organization

TRAVEL DEMAND MODEL
BASE YEAR 2012

December 2014

Contents

Introduction

In 2012, the Ozarks Transportation Organization staff began reviewing requirements for a travel demand model. Staff had attended several conferences and webinars and knew that data for travel demand models was changing.

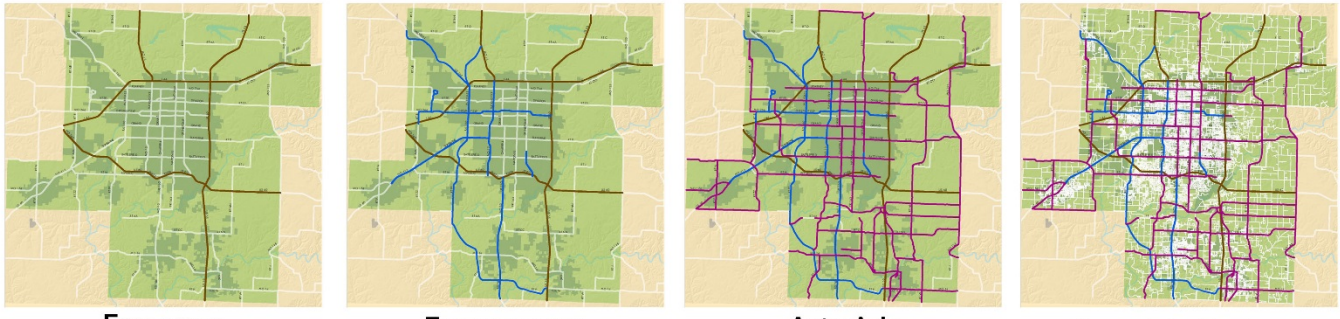
After an extensive RFP process, with in-person presentations from each consultant, OTO contracted with Olsson Associates in June of 2013. Olsson proposed using VISUM for the modeling software and was supportive of efforts to use already available data for the model. As an input into the model, OTO also needed revised socioeconomic and demographic projections by transportation analysis zone. Missouri State University's Bureau of Economic Analysis was able to provide this service and is the source of the first document reviewed in this report.

Over the next year, Olsson collected and entered data into the model, working through the OTO Travel Demand Model subcommittee, and then used that data to calibrate the model against current real-world conditions. Upon completion of the calibrated model, OTO worked with the Technical Planning Committee to develop scenarios for model forecasting, the results of which are reviewed later in this report.

Background

The Ozarks Transportation Organization has maintained a traditional four-step travel demand model for the region since the 1990s. When the travel demand model was initially developed, the metropolitan planning area consisted of the City of Springfield and a portion of Greene County. Since then, the area has grown to include seven cities within the majority of Greene County and northern Christian County.

The Springfield metropolitan region has a mostly arterial roadway network. As seen in the graphic below, the region has a limited set of freeways, which encircle Springfield, but do not reach the entire region. The current and proposed network of expressways work to complete that gap, but not all are in place, nor do all function as expressways. The arterial network is vital to travel throughout the region. OTO made this clear in the RFP, requesting a model sensitive to this attribute.



OTO Current and Future Roadway Network

OTO did not specify a modeling software preference in the request for proposals. The prior model had been developed in TransCAD, but there were some issues regarding the network and traffic assignment (relating to the model and not to TransCAD). OTO invited all respondents to propose a modeling software and methodology for developing the new model. Ultimately, the OTO Model Subcommittee preferred VISUM due to its ability to model node delay in addition to link delay, and

the model would interface with VISSIM that is already used locally. Since OTO's network is mostly arterial, rather than freeway-based, being able to model node delay offers a more complete view of the network.

Reports

Work on the model has, so far, produced three reports: 1) Employment, Income, and Population Forecast for Greene and Christian Counties at the Traffic Analysis Zone (2010-2040), 2) OTO Calibration Final Report, and 3) Future Scenarios Report. This document will serve to summarize the results of these reports and the model results.

Employment, Income, and Population Forecast for Greene and Christian Counties at the Traffic Analysis Zone (2010-2040)

OTO contracted with David Mitchell at Missouri State University and the Bureau of Economic Analysis to develop employment, income, and population forecasts for use in the model. These projections were done at the TAZ level for the entirety of Christian and Greene Counties, with 2010 as a base year, and projections developed for 2020, 2030, and 2040, using Slow, Expected, and High Growth scenarios.

Methods

Each projection type relied upon individual models of growth at the TAZ level, with county-level and MSA-level numbers used as controls.

Population was projected based on a model of other MSAs that were the same size as Springfield's in 1980, as well as characteristics of the principal city, such as employment industry shares and age distributions.

Employment growth was calculated within 20 different industries, using historical growth, as well as future trends in each industry. Each industry was provided a separate growth rate for the next thirty years, on a decade-by-decade basis, accounting for the industry's share of total employment at the county level.

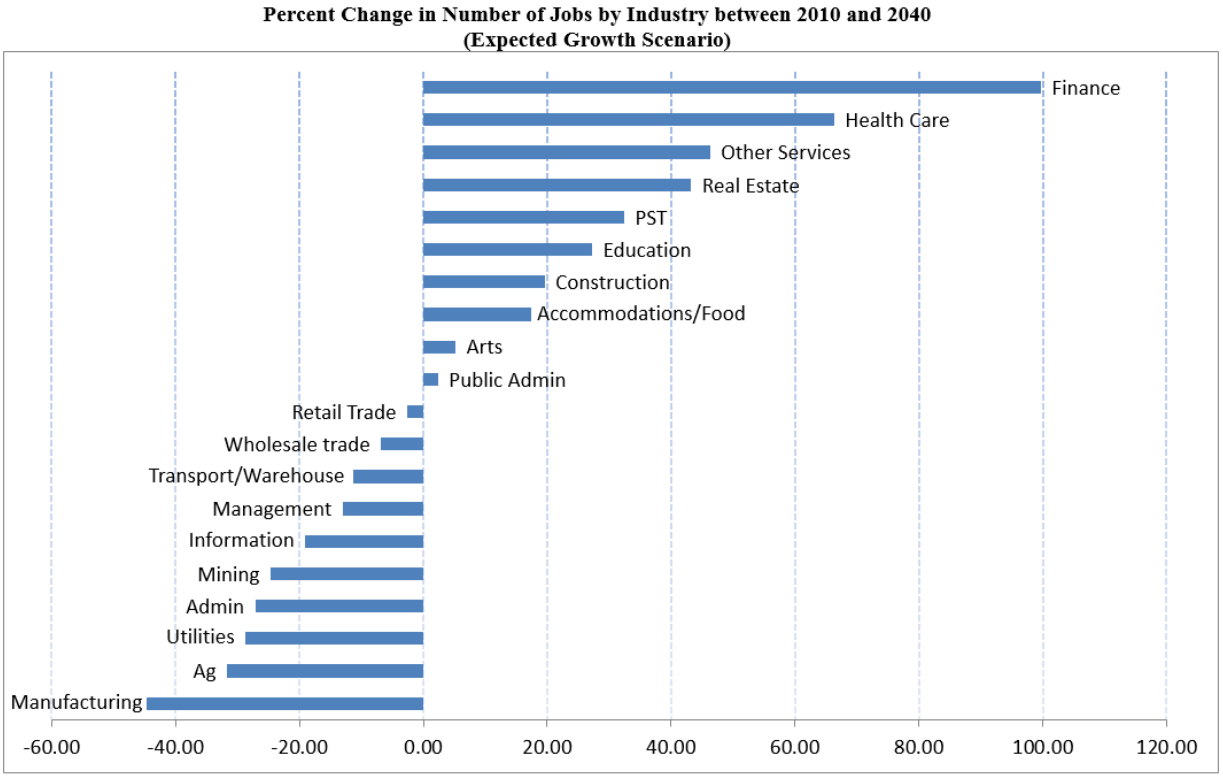
Median household income was modeled at the quintile level and on the basis of growth in real income over the past thirty years. Each quintile was modeled dynamically. The report demonstrates how the compound annual growth rate differs, especially for the top quintile, and further explains how incomes move between quintiles as time moves forward.

This information was then brought together to project the location of growth within the two-county area over the next thirty years. Employment share by industry was determined at the Census block level, and then aggregated to the TAZ level, with comparisons made to the surrounding TAZs. The current population, employment, and land use characteristics were used iteratively to predict each of the future 10-year increments. This dynamic projection method can have an impact on the model results, depending on the timing of certain improvements.

Results

Employment Growth

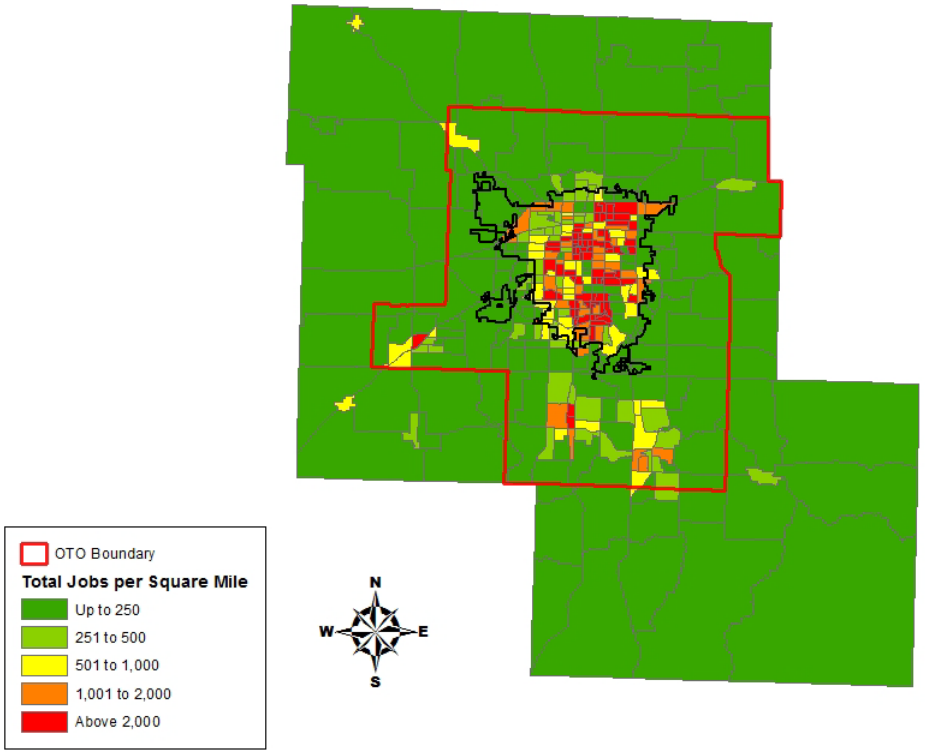
For the expected-growth scenario, Finance and Healthcare are predicted to be the fastest growing industry in the two-county region. Manufacturing and Agriculture are expected to see the largest declines.



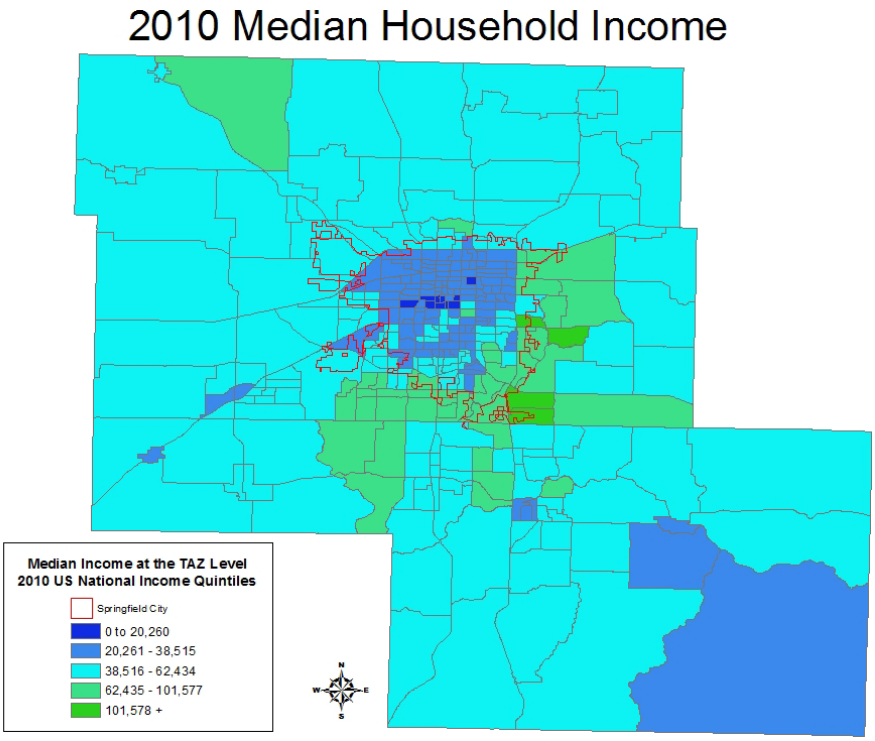
Projected employment density, however, remains strong in Springfield, with some growth seen in northern Christian County and the Republic area. The decrease in the manufacturing sector does have an impact on the future employment distribution of the OTO region, as can be seen in the northeast and northwest corners of Springfield. Employment is shown to decrease in the TAZs where the industrial parks are located. Of note, is that the employment projections for each TAZ over the next 30 years are based on the existing industries in those TAZs.

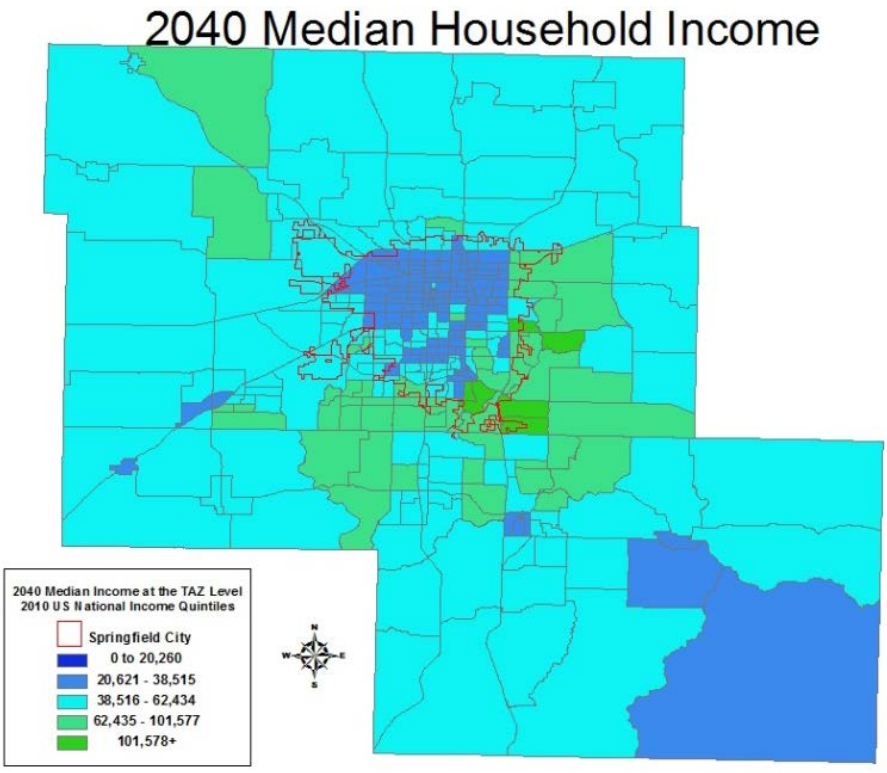
2010 Jobs Per Square Mile

2040 Jobs Per Square Mile



Income distribution across the region does not dramatically change.

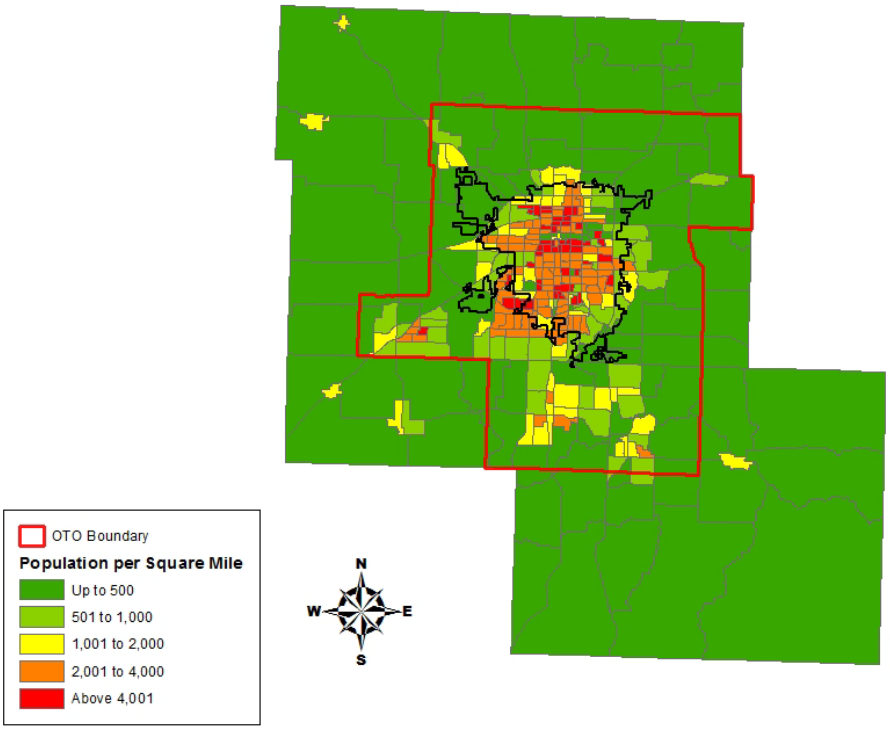




Population Growth

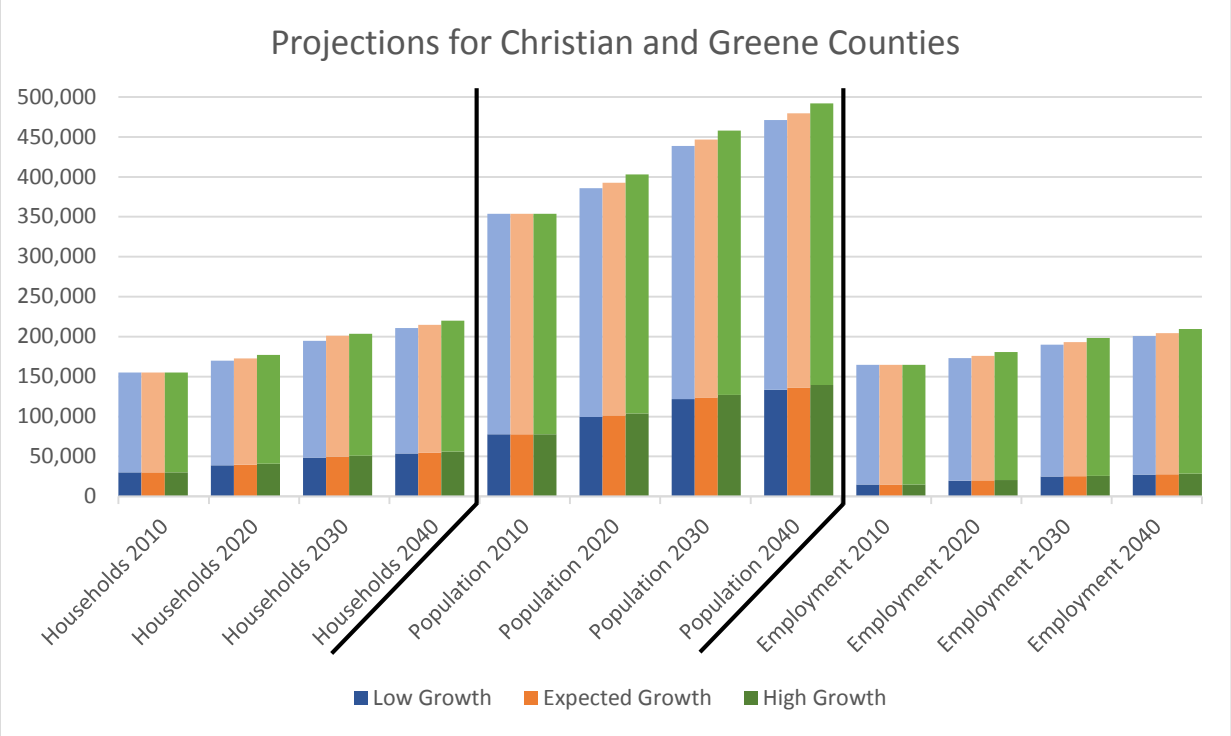
Population projections redistribute the population of the region, reducing density in the Springfield core and adding population and density to northern Christian County. The City of Springfield can expect an increase between 16 and 22 percent in population over the next thirty years, while Greene County could grow from 22.5 percent to almost 28 percent. This is relatively minor, however, compared to the growth in Christian County, which could range from 71 percent to 79 percent.

2010 Population Per Square Mile



2040 Population Per Square Mile

		High Growth			Expected Growth			Low Growth		
		All Greene	All Christian	**TOTAL**	All Greene	All Christian	**TOTAL**	All Greene	All Christian	**TOTAL**
2010	**Households**	124,873	30,114	**154,987**	124,873	30,114	**154,987**	124,873	30,114	**154,987**
	Population	275,638	77,999	**353,637**	275,638	77,999	**353,637**	275,638	77,999	**353,637**
	Jobs	149,614	14,946	**164,560**	149,614	14,946	**164,560**	149,614	14,946	**164,560**
2020	**Households**	136,375	40,886	**177,261**	132,971	39,864	**172,835**	130,655	39,166	**169,821**
	Population	299,032	103,865	**402,897**	291,563	101,271	**392,834**	286,477	99,508	**385,985**
	Jobs	160,139	20,525	**180,664**	156,134	20,015	**176,149**	153,422	19,663	**173,085**
2030	**Households**	152,628	50,892	**203,520**	151,685	49,620	**201,305**	146,219	48,751	**194,970**
	Population	330,734	127,249	**457,983**	322,464	124,069	**446,533**	316,847	121,901	**438,748**
	Jobs	172,330	25,856	**198,186**	168,029	25,213	**193,242**	165,097	24,770	**189,867**
2040	**Households**	164,037	56,161	**220,198**	159,924	54,755	**214,679**	157,134	53,800	**210,934**
	Population	352,511	139,412	**491,923**	343,694	135,929	**479,623**	337,710	133,555	**471,265**
	Jobs	181,078	28,547	**209,625**	176,560	27,835	**204,395**	173,476	27,348	**200,824**



Three growth scenarios were developed, low, expected, and high growth. There is not a large difference between the three growth scenarios. The report did not specify the assumptions used to develop the lower than expected or higher than expected growth rates. The 2040 model forecasts were developed based on the expected growth scenario.

OTO Calibration Final Report

Olsson Associates, in conjunction with Eco Resource Management Systems, Inc. (eRMSi), developed and calibrated the OTO travel demand model. The work completed by David Mitchell and the Bureau of Economic Analysis provided the background socioeconomic data needed for the model. A calibrated travel demand model is one that produces travel volumes for a base year within an acceptable range of current traffic counts. The base year for the OTO travel demand model is 2012. This report outlines the model process, as well as the data and assumptions used to produce a calibrated model.

Olsson developed a traditional four-step model that estimates person trips, which are then converted into vehicle and transit trips, utilizing morning, mid-day, and afternoon time periods to distribute those trips. As mentioned above, the OTO model was newly developed in VISUM rather than use any of the old model that had been developed in TransCAD.

Data Collection

Data collection was an intensive part of the modeling process. OTO did not have much of the background information normally included in a model. Data collection included several types of data: roadway link, intersection node, and land use data.

The underlying network was purchased through TeleAtlas. This data still required additional refinement. OTO and member jurisdictions provided Olsson with number of lanes, speed limit, volume, travel time, and intersection control details. For some specialty intersections, like the diverging diamond, Olsson was given engineering drawings. Recently completed construction projects were reviewed to ensure the network was up to date.

Additional land use data was provided, including the location of schools and universities. Olsson used LEHD (Longitudinal Employer-Household Dynamics) data from the U.S. Census Bureau. The LEHD data was able to provide information to develop trip generation characteristics. This was used in place of a traditional household travel survey.

Another key piece of data was the external trip survey. Rather than conduct an expensive and large-scale origin-destination survey, OTO worked with Olsson to purchase data from a company called AirSage. AirSage is a "developer of software that aggregates signaling data from cellular networks to provide real time travel speed and travel times for major roads." In other words, AirSage was able to provide OTO with information on the proportion of trips that are within, through, or arriving/leaving the OTO area.

Developing the Base Year Model

Links and Nodes

The base year model was developed first by building the roadway network. In VISUM, the roadway network contains links and nodes. The model report states that each street in the model is represented by a link or group of links, which is a direction description of connection between beginning and ending node points. The link attributes were derived from TeleAtlas and the OTO. The next table shows the attributes and their descriptions, as used in the model.

Attributes	Description
Number	Automatically generated unique identification
From node number	The node number from which the link starts
To node number	The node number to which the link ends
Type number	Link type corresponding to facility type
	10: Interstate/Freeway 20: Expressway/Higher Speed Arterial 30: Major Arterial 40: Minor Arterial 50: Collector 90: Ramp
Tsys set	Permitted transportation systems to use this link
Number of lanes	number of lanes on the link
Capacity PrT	link capacity
v0 PrT	free flow speed
Count_ADT	Daily traffic counts
Count_AM_Pk	AM peak hour traffic counts
Count_PM_Pk	PM peak hour traffic counts
Daily_Capacity	Daily capacity of the link
Hourly_Capacity	Hourly capacity of the link
Volume_ADT	Daily traffic volumes
Volume capacity ratio PrT (AP)	Volume-to-capacity ratio

Node attributes were also defined. A node is where two or more links come together to form the network. Per the model report, nodes were classified according to intersection control type and roadway functional classification.

Attributes	Description
Number	Node ID Number
Name	Node Name
Type number	Number of Node Type (0-99) allows for classification of the node as different type.
Control type	Node type Number
	0: Uncontrolled 10: Two-way stop 20: Two-way yield 30: Signalized 40: All-way stop 50: Roundabout
X-coordinate	X-coordinate
Y-coordinate	Y-coordinate
Volume PrT	Volume of the node
K1_Value	constant added to the capacity calculation
K4_Value	constant added to the capacity calculation
Number of links	number of links from/ to this node
Capacity PrT	Node Capacity
LOS	Level of Service

Links were classified according to the federal functional classification, with some modifications as necessary. Olsson employed the following classifications:

Freeway
Fully access-controlled facility with grade-separated interchanges.

Expressway
Defined as a high-level arterial; arterial with center median, with signal spacing of a minimum one-quarter mile, with posted speeds or a design to support posted speeds over 50 miles per hour (mph) or higher.

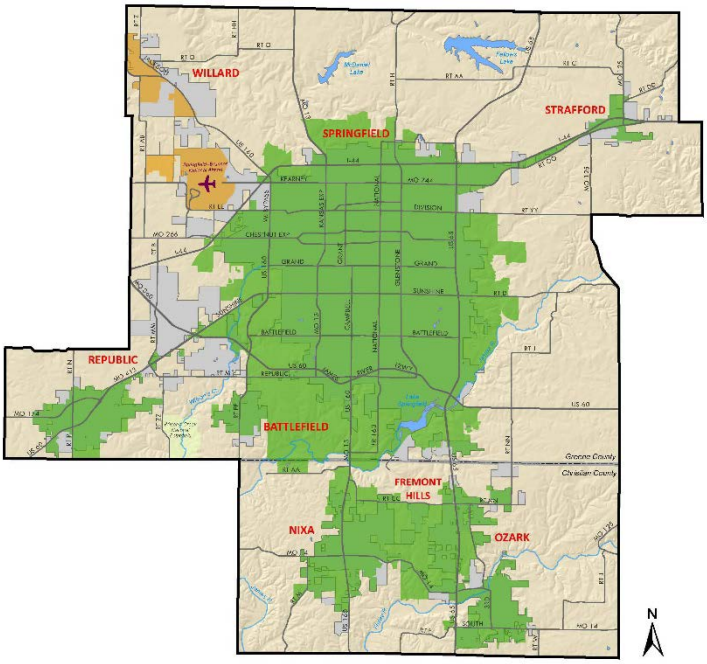
Major Arterial
Defined as a medium-level arterial; arterial with center median or center turn lane in some cases, with some control of side access, and signal spacing near one-quarter mile, with a design to support speeds at 40 or 45; in rural areas, a U.S. or numbered State Highway designed to support higher speeds.

Minor Arterial
Defined here as a basic-level arterial; an arterial with a center turn lane, or a four-lane section to support speeds of up to 35 mph; or a rural highway with shoulders and horizontal and vertical grades to provide for a drivable speed of 50 mph or higher.

Collector
Other significant roads with a shorter distance collector function, possibly with a lesser design characteristic than the minor arterials; a system of collectors provides land access service and traffic circulation within residential neighborhoods, commercial and industrial areas.

Ramps
A length of roadway providing an exclusive connection between two highway facilities; generally designed to permit high-speed merging and diverging maneuvers, thus minimizing disruptions to mainline traffic.

Links were also classified based on whether they were inside or outside the urban area boundary as defined by the U.S. Census Bureau. Then capacities were defined globally based on the functional classification, using those values developed by the Florida DOT, which are based on the 2010 Highway Capacity Manual.



OTO 2010 Urbanized Area

Type Number	Facility Type	Urban	Rural
		Capacity (vplpd)	Capacity (vplpd)
10	Interstate/Freeway	16,500	17,500
20	Expressway	8,875	9,950
30	Major (Multi-Lane) Arterial	7,900	8,450
40	Minor Arterial	7,100	7,800
50	Collector Street	6,500	6,500
90	Ramp	12,000	10,000

Source: Florida DOT/Systems Planning Office and previous models

Speed limits were entered for each link based on the posted values, representing free-flow conditions. These were reviewed against the model during the calibration process.

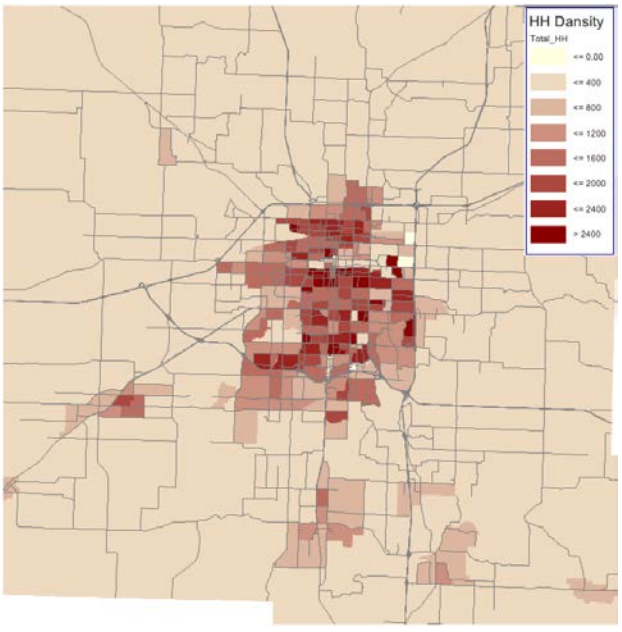
Nodes were also classified by type and capacity. Type is indicative of the controls present at an intersection, including merging and diverging areas at ramps, partial or two-way stops, all-way stops and roundabouts, as well as traffic signals. Node capacity was then calculated based on capacity, number of links, and the capacities of the links entering the node.

Land Use and Socioeconomic Data

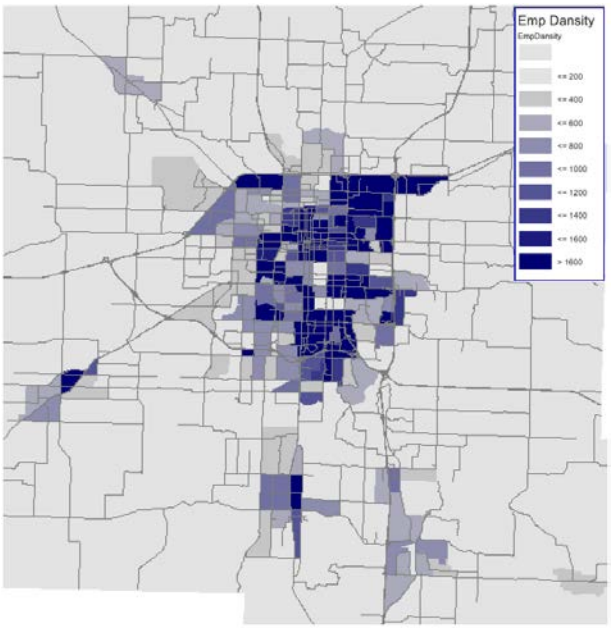
To develop a profile of land use for trip generation, Olsson used LEHD data and employment by NAICS code to create fourteen groupings for trip generation and distribution.

Land Use Type	Units	Quantity
SFDU_TOTAL	Dwelling Unit	124,313
MFDU	Dwelling Unit	32,628
Group_Qtrs	Person	7,500
HOTEL	Rooms	5,488
AG_MIN	Employment	464
RETAIL_BIG	Employment	6,727
RETAIL_OTHER	Employment	16,087
FOODENT	Employment	3,973
MAN	Employment	2,284
CONSTRUCT	Employment	8,451
WHLSTRANSUTIL	Employment	19,220
OFFICE	Employment	48,987
MEDICAL	Employment	35,371
EDUCATION	Employment	19,891

2012 Household Density



2012 Employment Density



Trip Generation

The model report defines trip generation as the first formal step of the four-step travel demand modeling process. Trip generation is developed for trip productions and attractions, in other words, where trips start (the origin) and where they end (the destination).

The OTO model generates trip productions for eight different purposes.

Home-Based Work (HBW) – Three Types
Trips that have one trip-end at home and one trip-end at work. HBW trips were stratified by the three income classes used by LEHD and productions were based upon the number of employees living in each zone, not simply based upon households. Using the three income-based stratifications ensured that the employees from households of a specific income group were distributed to the jobs that were of that income level.

Home-Based School (HBS)
Trips that have one end at home and the other at a school (elementary through high school).

Home-Based College (HBC)
Trips that have one end at home and one end at a college, university, or technology school.

Home-Based Other (HBO)
All other home-based trips.

Non-Home-Based (NHB)
Trips that do not begin or end at home.

Truck (Truck)
Trips that were made by trucks.

Note that for all home-based trips, the home end is considered the production end and the non-home end is considered the attraction end, regardless of the direction of the trip. (In/Out percentages are used to obtain the correct directionality in the peak-hour modeling.)

Trip production rates used in the model are based on the vehicle trip rate in the ITE Trip Generation Manual.

Trip attraction rates were also based on the ITE Trip Generation Manual, as well as NCHRP 716, and experience with other travel demand models for smaller urban areas. Trip attractions tend to be places of employment and rates are based on land use characteristics. Trip attraction rates were adjusted as needed during the calibration phase to better match with the calibrated productions. Within the model, productions and attractions must be balanced, as future forecasts may show varying growth across the area.

External Trips

There are two types of external trips within the model. One is for through trips, where they do not start or stop within the OTO region, also known as External to External trips. The other is for those that start or end outside of OTO, but then end or start within the OTO, also known as External to Internal trips.

The external to internal trips were approximated using directional traffic counts at twenty locations around the OTO boundary. External to external trips were determined with the purchased AirSage data. Twelve county level zones were created for the region and AirSage classified their provided data according to HBW, HBO, and NHB purposes. This information was analyzed and filtered by Olsson and eRMSI and adjusted along with the internal/external trips accordingly to develop an origin-destination matrix for the OTO region.

Trip Distribution

Trip distribution allocates the generated trips throughout the network. VISUM uses a "gravity" model to distribute trips, which essentially means that the number of trips in a zone reflect generated trips, coupled with travel time and distance, and classified by trip type. In the OTO model, trips are distributed for both peak hour and daily trips between transportation analysis zones.

Mode Choice

Distributing trips based on mode of travel was a feature OTO requested to include in this new model. The OTO model divides travel demand between automotive transport and bus transit service. This was developed based on observation of existing mode split in the base year model. The ability and ease of travel by these modes within/between each zone impacted the assignment of trips to each mode. Automobile travel was impacted by AM travel time and AM distance. This was further refined by identifying average vehicle occupancy of each trip type, with home-based-work trips having the highest occupancy and home-based-school trips having the least. Bus travel was adjusted according to journey time, in-vehicle time, transfer wait time, weighted origin weight time, weighted transfer wait time, walk time, access time, egress time, and number of transfers. As there was not information on which of these factors would be a priority, each were given the same weight.

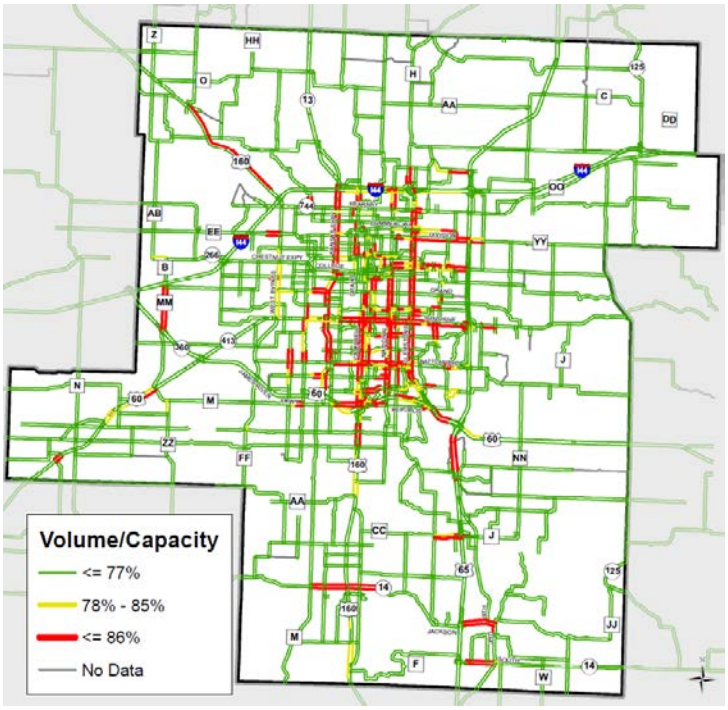
Traffic Assignment

This process determines which routes trips use to get from one zone to another. VISUM allows for several methods, and the OTO model uses the Equilibrium Lohse method of traffic assignment. This is an iterative process, in which drivers using a learning method to adjust their next trip based on factors found during the previous trip. Transit travel was assigned in such a way that it would closely match the base year model information.

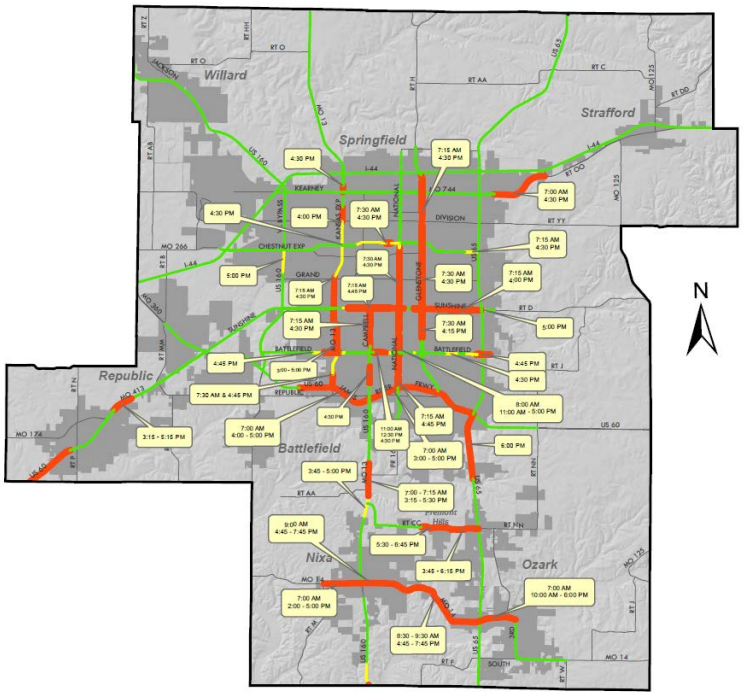
Base Model Calibration

Calibration refines the data and model rules until the model closely simulates existing travel patterns and volumes. Calibration requires a series of model runs coincident with analysis. Calibration is considered complete once the results of the simulation are statistically similar to existing data. Olsson/eRMSI used several publications to guide the calibration process and compared the results using multiple validation techniques.

As seen in the graphic below, the travel demand model is able to demonstrate congestion on more of the OTO network than was previously included in the OTO Congestion Management Process report. Both maps represent 2012. The CMP map is from observed travel time runs, whereas the map from the model is based on the simulated and calibrated results of a model run. The results are not too dissimilar and the model demonstrates the existing congestion within the OTO area.



2012 Base Model Volume/Capacity Results



2012 Congestion Management Process Volume/Capacity Ratio

OTO Travel Demand Model Future Scenario Report

Olsson Associates, in conjunction with Eco Resource Management Systems, Inc. (eRMSi), also developed scenarios which could affect changes in travel demand and behavior between now and 2040.

In addition to the 2012 base model, 6 scenarios were developed for the OTO region:

1) 2030 Existing plus Committed Network
2) 2014 Existing plus Committed Network
3) 2040 Regionally Significant Projects
4) 2040 Fuel Price Increase
5) 2040 Transit Share Increase
6) 2040 Southwest OTO Projects

Appendix A contains a full-page map of each scenario. Additional growth rates were applied to areas currently external to the OTO region to include any increased growth. Volume-to-capacity ratios accounted for commercial truck volumes, with one truck equivalent to two cars. The existing plus committed network contains those improvements which have been constructed since 2012 (the base model network) and those which are planned through 2018 (as programmed in the Transportation Improvement Program and cited by local jurisdictions). Appendix B contains this list as submitted by OTO to Olsson, as well as a full-page copy of each scenario map.

2030 Existing plus Committed Network

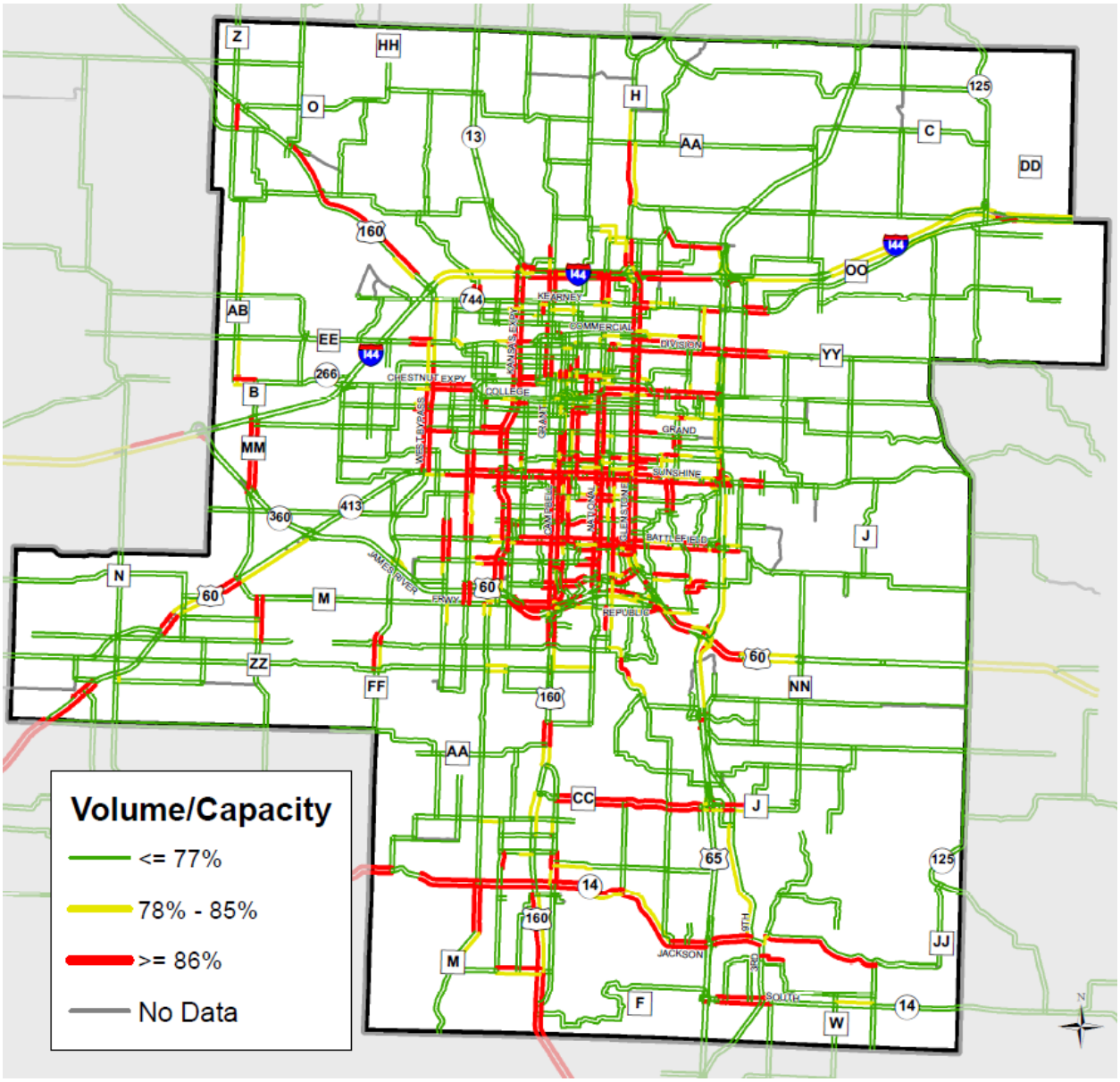
This is considered a no-build scenario for the year 2030. The results of this forecast represent changes to the network as planned through 2018, but then with no other improvements between 2018 and 2030. Changes made due to the network through 2018 include:

- Lane capacity changes
- Functional classification changes
- Major intersection changes
- New signals
- Adding medians along more than 1-mile in length

This scenario provides a baseline with which to evaluate project needs and provides a useful comparison to the next scenario, which looks to 2040.

The graphics provided here differ slightly from those contained in the original report, as the classification of the volume to capacity ratios better reflect how OTO has previously presented this information in the Congestion Management Process report. Green lines represent a ratio below 77 percent capacity, meaning a level of service of A, B, or C. Yellow lines represent a ratio between 78 and 85 percent capacity, or a level of service D. Anything over 86 percent capacity is red, which means the roadway has a level of service E or worse.

Scenario 1: 2030 Existing plus Committed (No-Build)

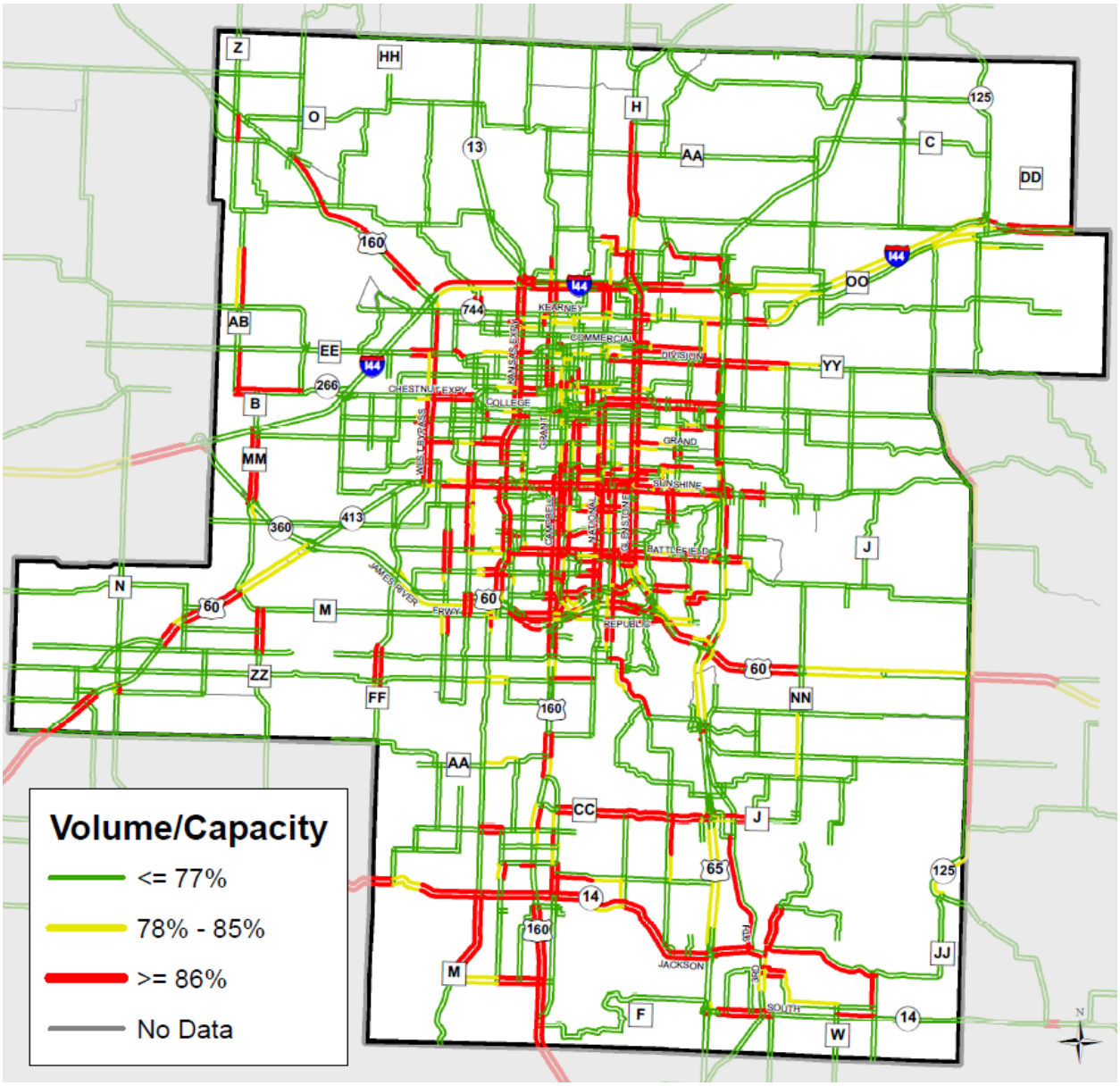


Compared to the base year, congestion on OTO's arterials is more widespread. The existing plus committed improvements appear to have eased congestion on US 65 south of James River Freeway, but time has added more congestion north of James River Freeway. Traffic is more proliferated along Highways 14 and CC in Christian County and increases are seen on US 160 through and south of Nixa. US 60 heading southwest from Republic also sees an increase in congestion.

2040 Existing plus Committed Network

This scenario is very similar to the 2030 Existing plus Committed Network, except it looks forward another decade to the year 2040.

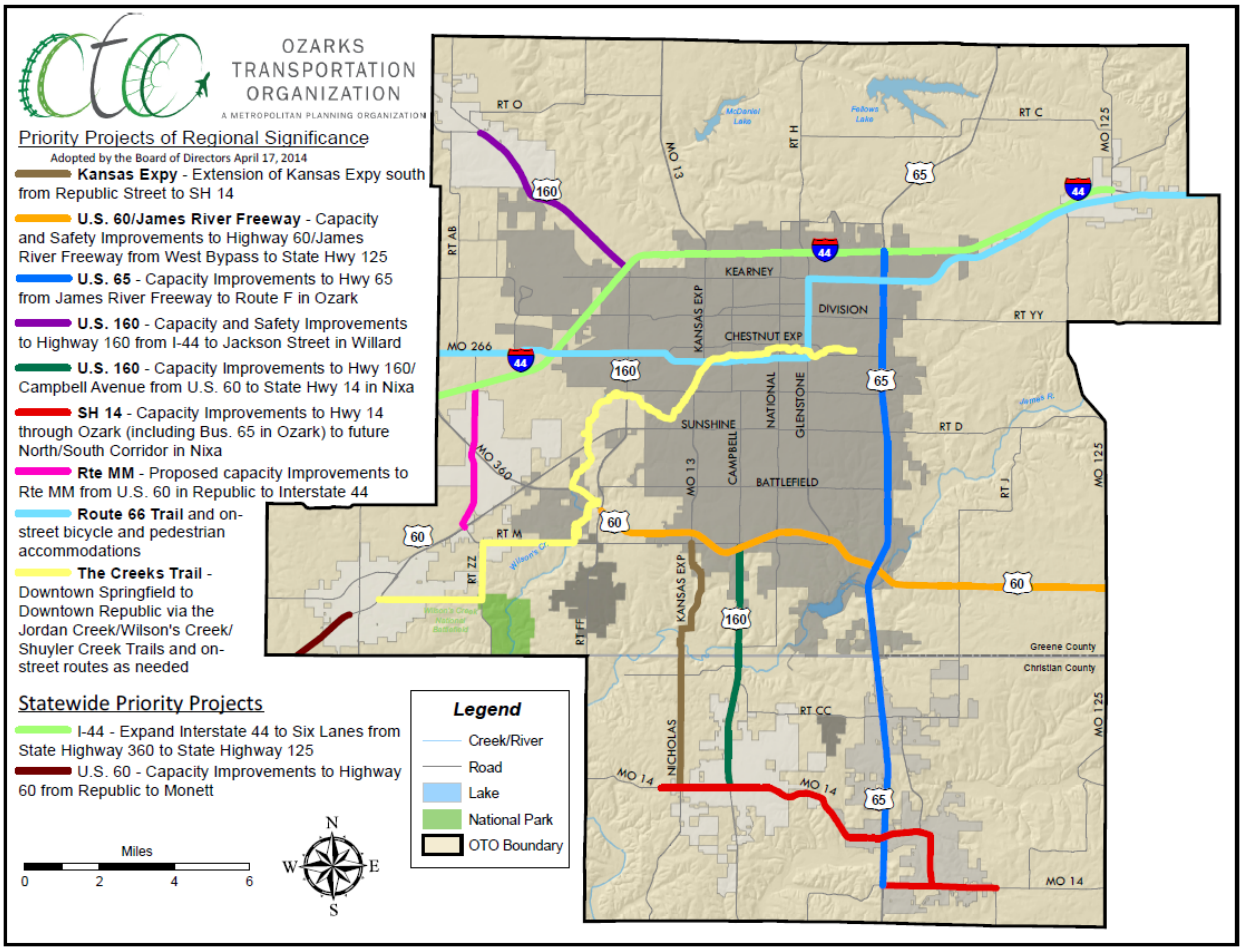
Scenario 2: 2040 Existing plus Committed



Compared to 2030, the 2040 Existing plus Committed scenario shows a further deepening of congestion throughout the OTO network. More periphery roadways are showing LOS E or worse, though the internal Springfield network does not show much change over 2030, where it was already impacted by the no-build scenario. The internal Springfield network is also where much of the congestion is shown in the 2012 base model.

2040 Priority Projects of Regional Significance

The OTO region has maintained a list of Regionally Significant Corridors since 2005. Priority projects are derived from this list and improvements along these corridors are thought to have the greatest impact on the region. A list of priorities was provided to Olsson, with the proposed improvements along the corridors. This scenario represents the roadway network should these priorities be completed.



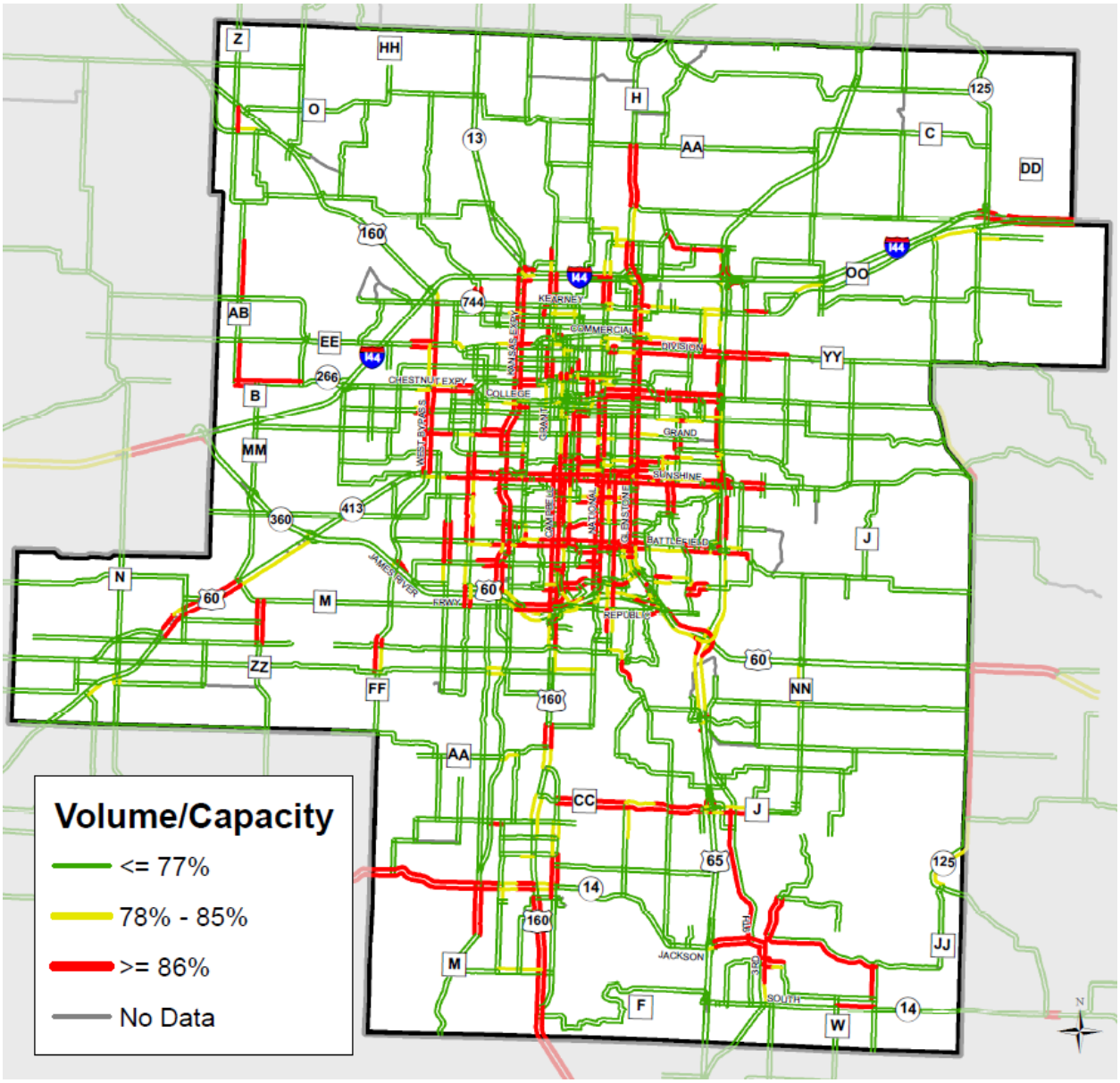
Regional Priority List

- Capacity Improvements to US 65:
  - Widening to 6-lanes from US 60 to State Route CC
  - Widening to 6-lanes from State Route CC to South Street (Route F) in Ozark
  - Interchange improvements at F to look like CC/65

- Capacity Improvements (5-laning) to State Route 14 from State Highway NN in Ozark to M/Nicholas in Nixa
- Capacity and safety improvements to US 60 (James River Freeway) from West Bypass to State Highway 125:
    - Upgrade to six-lane facility from West Bypass (Route FF/US 160) to US 65
    - Upgrade to 4-lane freeway from US 65 to State Highway 125, with interchanges at 60/J and 60/125
- Capacity and safety enhancing improvements to US 160 (West Bypass) from the I-44 interchange to Jackson Street in Willard:
    - 4-lanes from Springfield to AB
    - Jackson Street and 160 intersection
- Capacity enhancing improvements to US 160 (Campbell Avenue) from the US 60 interchange to State Highway 14 in Nixa:
    - 6-lanes to Hwy 14
    - Intersection Improvements – Dual Lefts all 4 directions
        - Aldersgate
        - Northview
        - Tracker
    - CC Relocation (see plan attachment)
- Upgrade I-44 to a six-lane facility from US 360 to Route 125
- Capacity improvements (4-lanes) to US 60 from Republic to Monett
- Ozark 14 – 5-lanes from US 65/14, through Ozark, to 14 and from US 65/F to W
- Widening to 5-lanes on MM from I-44 to US 60 in Republic
- Construction of Kansas Expressway with 4-lanes as a Primary Arterial from Republic Road to Hwy 14

Compared to the 2040 no-build scenario, improvements to the network can be seen in these priority locations, especially on Highway 14 between Nixa and Ozark, on MM near Republic, and on US 160 to Willard. US 160 south to Nixa and the roads within Nixa see some relief, as does James River Freeway and US 60 to the east. Few improvements are seen in the internal Springfield network.

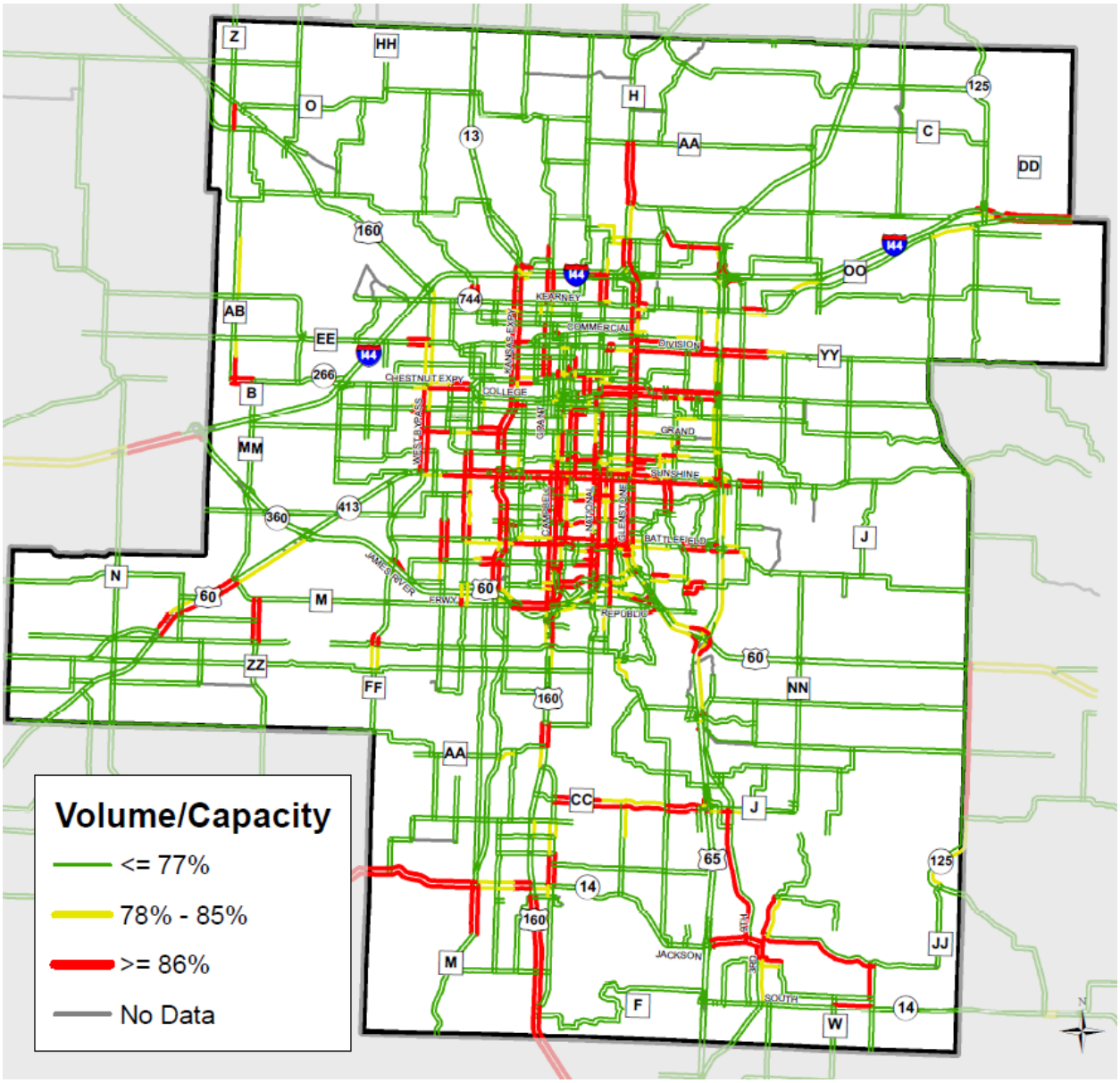
Scenario 3: 2040 Priority Projects of Regional Significance



2040 Fuel Price Increase

The 2040 Regional Priority scenario was then adjusted to model how higher fuel prices might impact this planned network. Travel times were adjusted to represent fuel cost increases of 25 to 30 percent, while the number of trips was reduced by 10 percent, reflecting less travel outside of the OTO area. The results were shifts to shorter trips and to transit.

Scenario 4: 2040 Priority Projects of Regional Significance + Fuel Price Increase

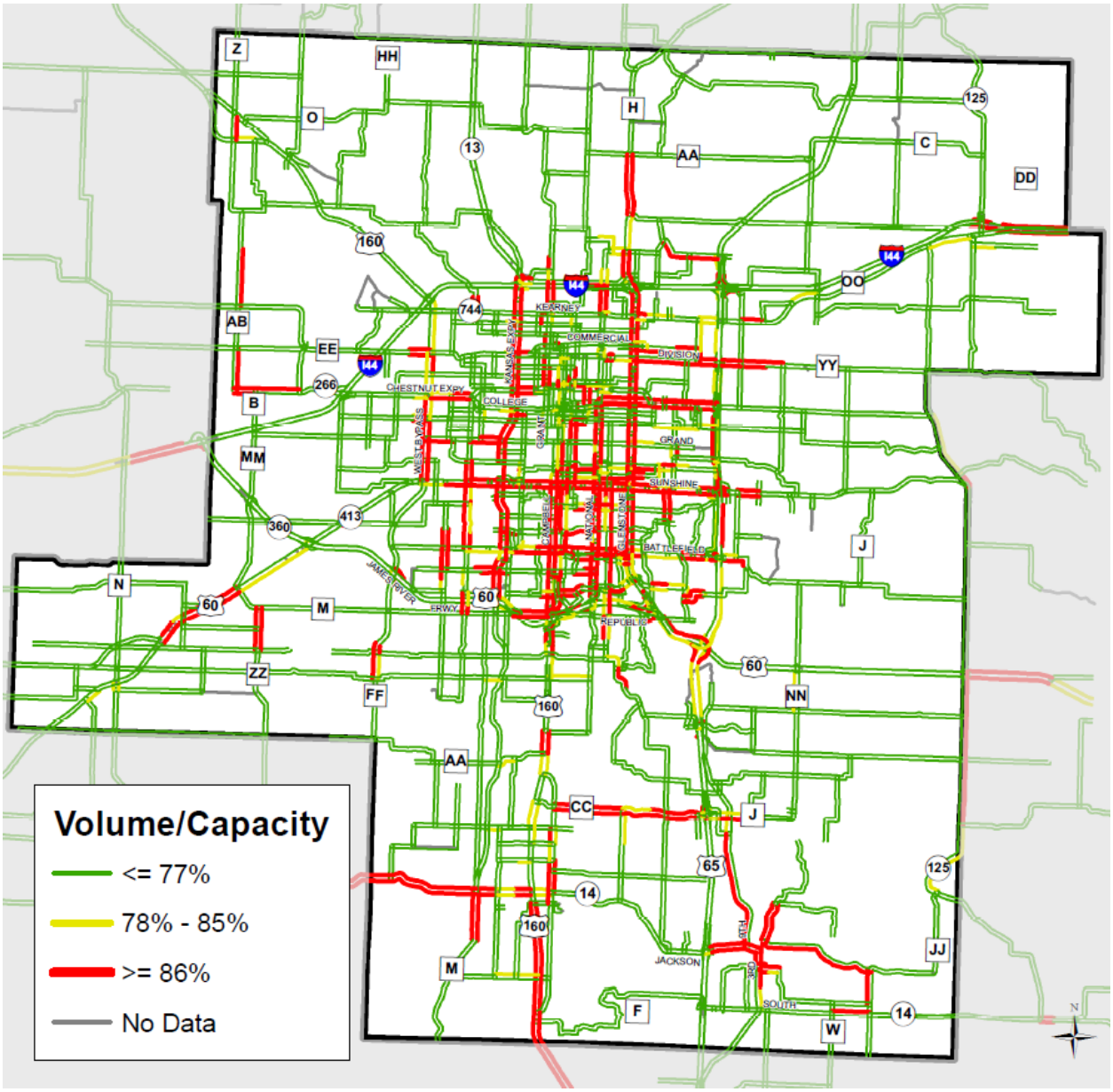


The most significant improvements to the network due to an increase in fuel prices, are on the west side of the OTO region, namely on AB, B, and West Bypass. US 65 also sees a noticeable amount of congestion decrease. Some minor additional improvements can be seen in the Ozark area and on CC in Christian County, as well as FF through the City of Battlefield.

2040 Transit Share Increase

This scenario models impacts to the network achieved by a five-fold increase in transit ridership, within the 2040 Regional Priority scenario. Transit frequency, wait time, and pedestrian environment are assumed to have improved, with the general representation of transit utility improving to achieve the increase. Transit trips and average vehicle occupancy were then adjusted accordingly.

Scenario 5: 2040 Priority Projects of Regional Significance + Transit Increase



In this scenario, the location of transit service is not assumed to have changed. When compared to the 2040 Regional Priority scenario, the changes are small and only within the Springfield internal network. This increased transit-associated trips to 33,114 compared to 6,626 as seen in the 2040 Regional Priority scenario, but car-associated trips are over 1.6 million, so the increase does not make a big impact The map shows an improvement on West Bypass and slight improvements on Fort at Sunshine, as well as in the very core of downtown Springfield. Congestion appears to be slightly worse on Golden south of Inman Road (Walnut Lawn to the east).

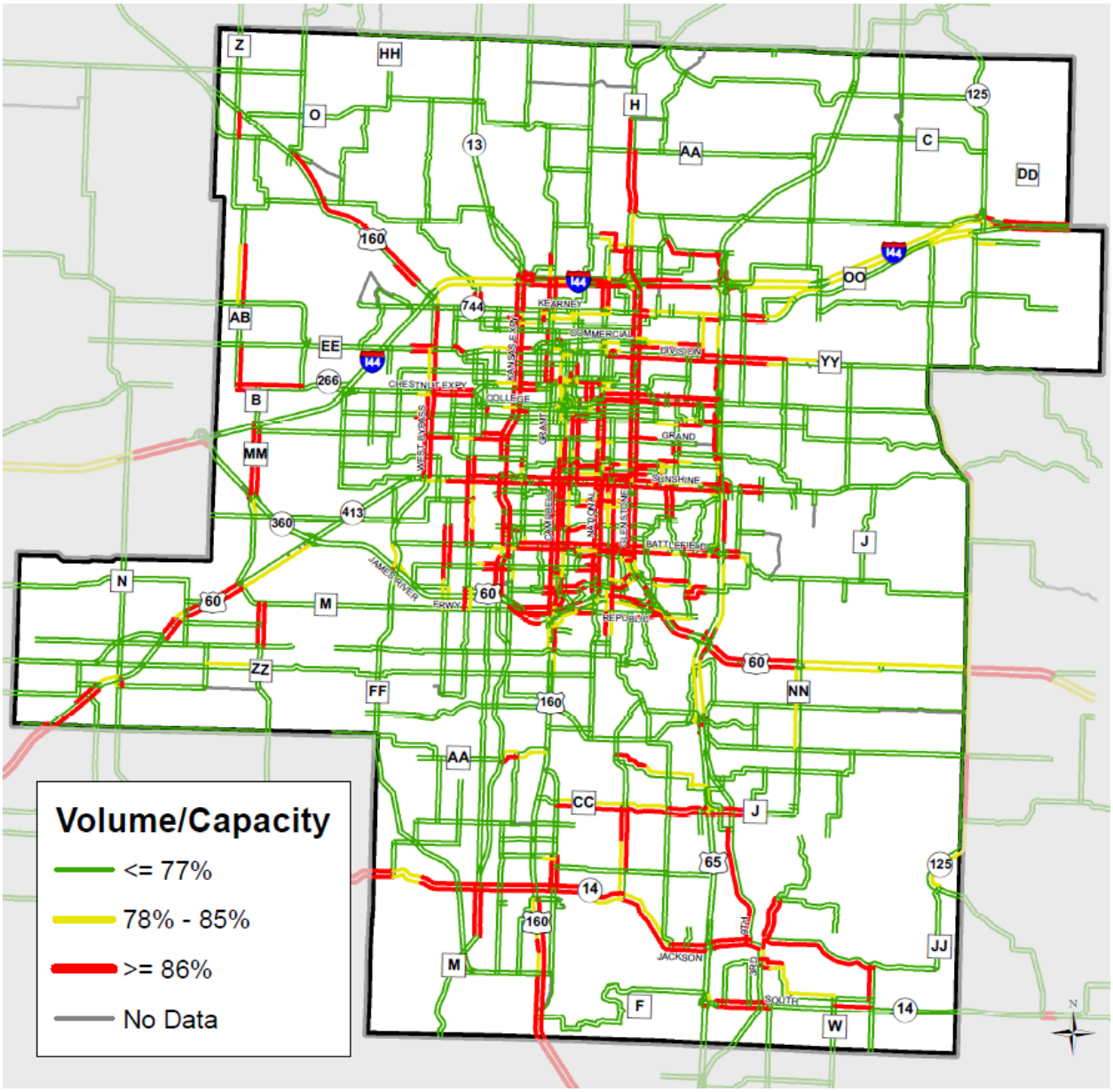
Southwest OTO Projects

This scenario started with a base of the OTO Existing plus Committed network. Then, projects on the southwest side of the OTO region were added:

- Construction of Kansas Expressway with 4-lanes as a Primary Arterial from Republic Road to Hwy 14
- Continuation of National as a 4-lane Primary Arterial per the Major Thoroughfare Plan
    - Continue south as FR 163 to E/W Arterial, then follow E/W Arterial to the east, then turn south on Westwind and follow to Cheyenne
- West Bypass Extension:
    - Widen to Primary Arterial through the City of Battlefield, then continue south as an Expressway to Rosedale per the alignment shown in the MTP.
- Construction of the E/W Arterial from US 65 to FF as a 4-lane Primary Arterial
- Widening to 6-lanes, all of US 160
    - 6-lanes to Hwy 14
    - Intersection Improvements – Dual Lefts all 4 directions
        - Aldersgate
        - Northview
        - Tracker

Compared to the 2040 Existing plus Committed (no-build) scenario, improvements can be seen on James River Freeway between Kansas Expressway and West Bypass, on FF through Battlefield, on US 160 south to Nixa, throughout most of Nixa, and on Rosedale. Highway CC between Nixa and Ozark also shows some relief. Kissick Road by Lake Springfield, sees improvements, though some other minor routes in the area, like Westwind and AA, see an increase in volumes compared to capacity.

Scenario 6: 2040 E+C with Southwest OTO Projects



Summary Statistics

The Future Scenario Report provides several summary tables relating each scenario to aspects of the model, such as vehicle miles traveled and average speed.

	Vehicle Miles Traveled	Change from 2012	Vehicle Hours Traveled	Change from 2012	Average Speed
2012	9,317,822		292,148		32.04
2030 E+C	11,326,142	17.7%	405,238	38.7%	28.10
2040 E+C	12,163,218	23.4%	490,251	48.9%	24.95
2040 Regional Priorities	12,240,134	23.9%	458,572	33.9%	26.84
2040 Priorities + Gas Prices	11,764,078	20.8%	422,348	28.4%	28.01
2040 Priorities + Transit	12,188,358	23.6%	453,083	38.1%	27.05
2040 E+C + Southwest	12,215,103	23.7%	486,169	42.8%	25.27

Over the course of each scenario, excepting Increased Transit, transit-associated trips decline between 2012 and 2040. Car-associated trips increase from 1.4 million to 1.6 million, and truck-associated trips increase from over 57,000 to about 63,000, depending on the scenario.

	2012	2040 Regional Priority List	2040 Plan Gas Price	2040 Plan 5x Transit	2030 E+C	2040 E+C	2040 E+C SW OTO
Bus	7,298	6,626	7,053	33,114	6,794	6,642	6,626
Car	1,409,484	1,674,488	1,671,767	1,655,378	1,589,552	1,674,530	1,669,865
Truck	57,714	63,023	62,225	63,028	61,333	63,012	62,968
Transit Share	0.34%	0.25%	0.27%	1.26%	0.28%	0.26%	0.25%

Conclusion

There is currently a significant amount of roadways in the OTO region with a level of service E or worse. As population and employment continue to increase, more roads will experience congestion. The preliminary indication is that targeted corridor improvements can improve location-specific conditions. Additional work must be done to analyze which corridors should be prioritized for such improvements.

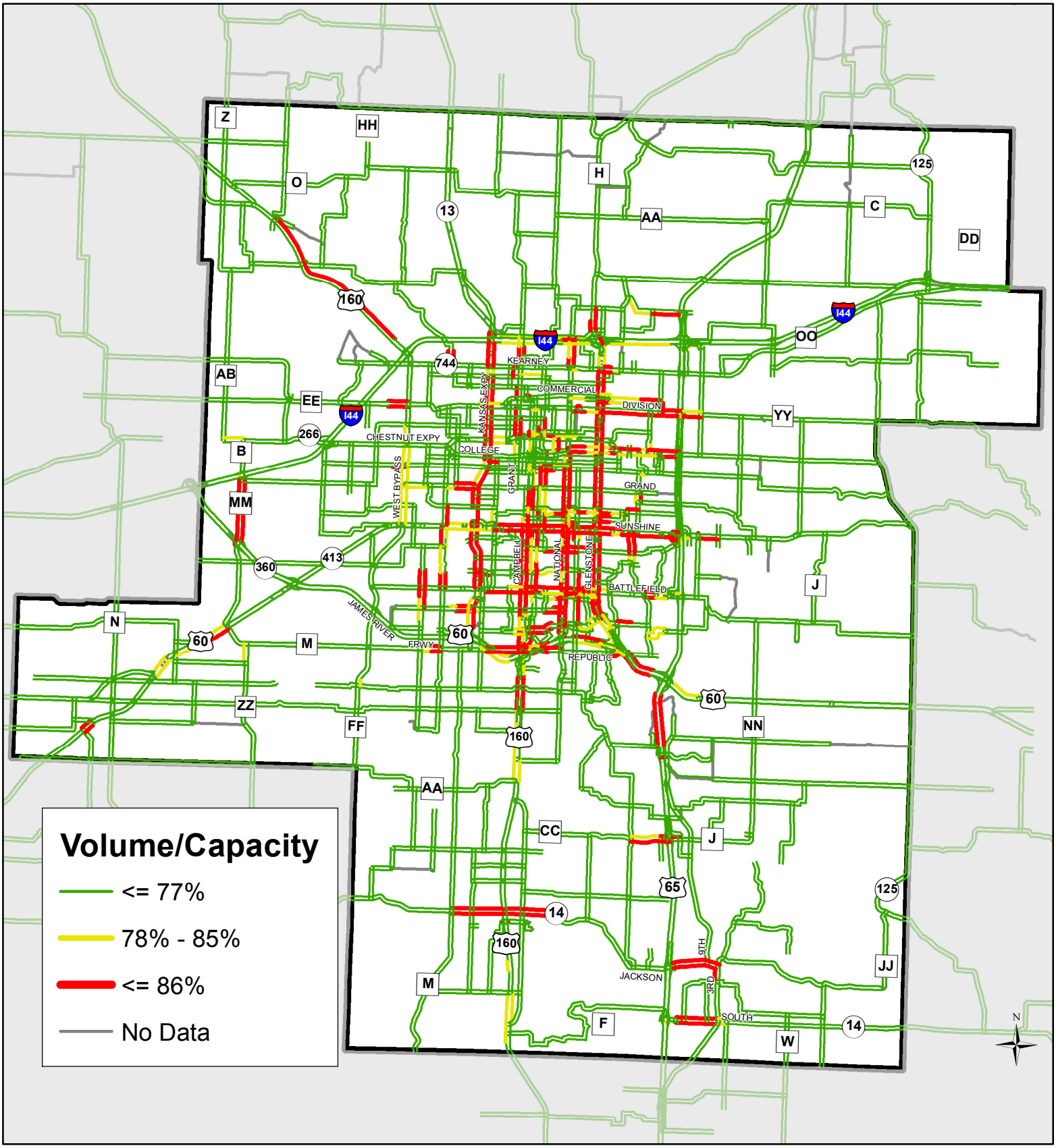
Appendix A: Base Year and Scenario Maps

Index:

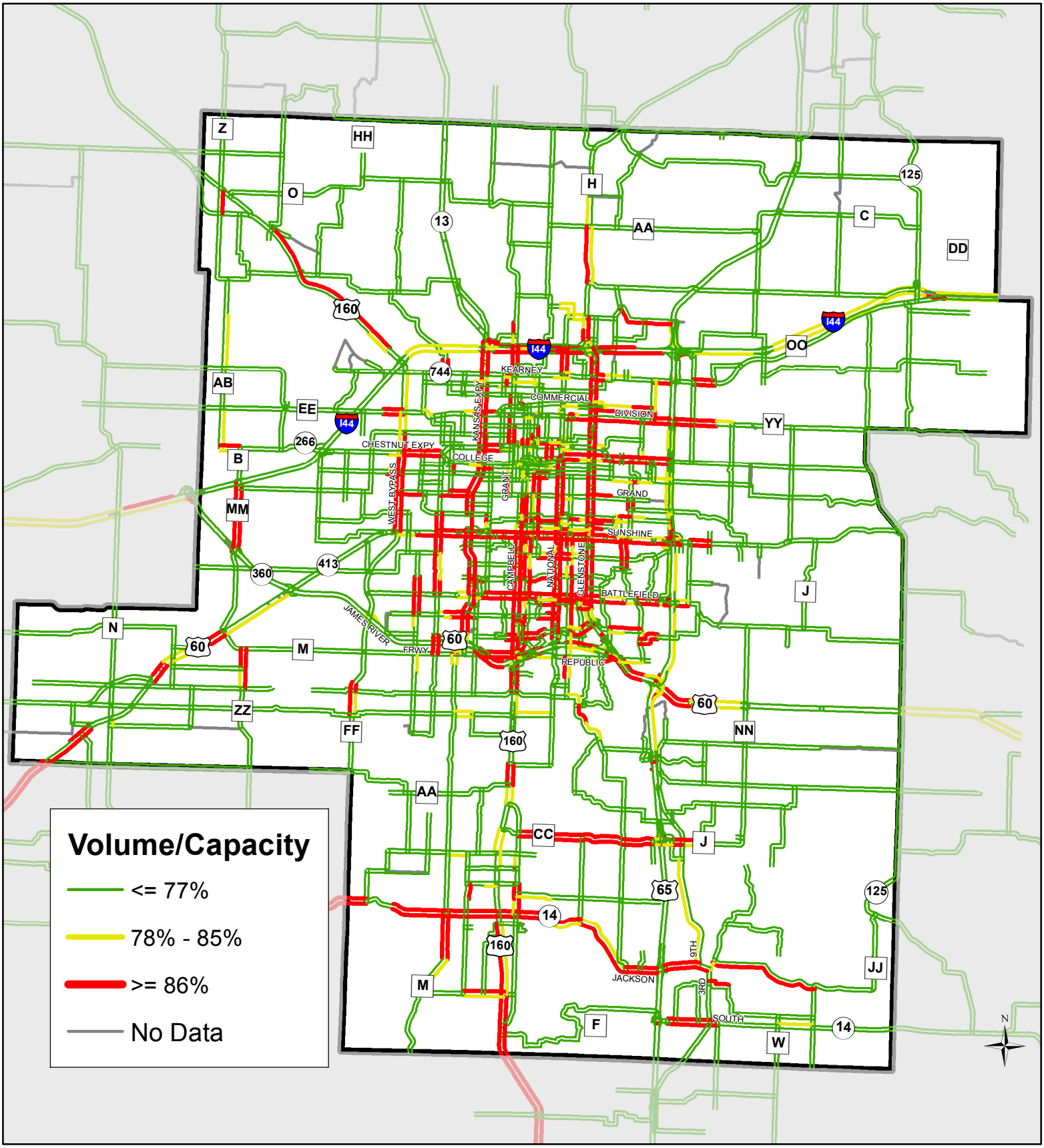
Note:

The shapefiles exported from VISUM require some adjustment to be used in ArcMap. The bi-directional network lines were geographically represented in the same location within ArcMap. The Cartographic Representation feature in ArcMap allowed each direction to be offset -1 points, pushing north/south and east/west bound lanes to the appropriate orientation, so that the directionality of the data could be visually represented.

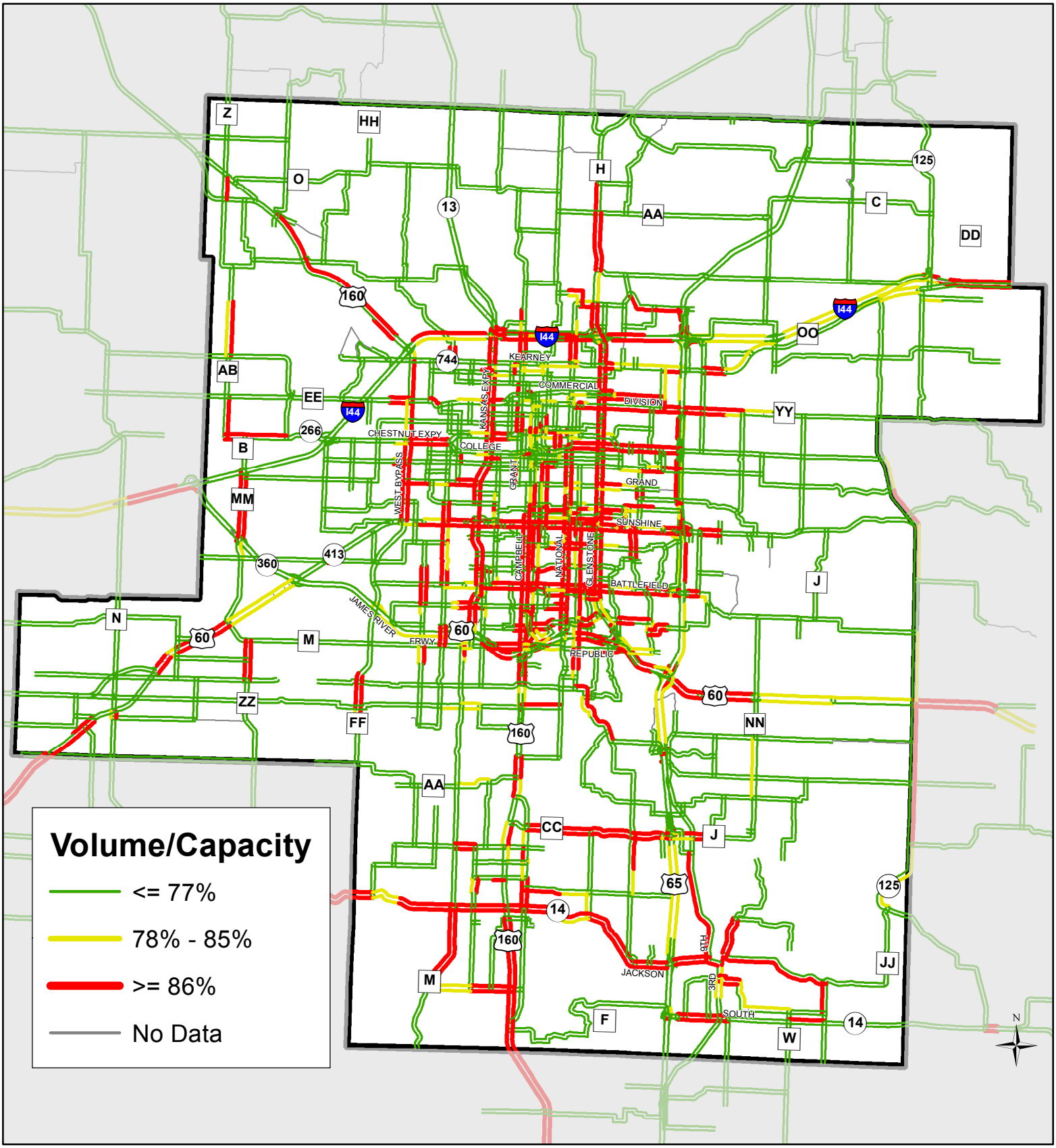
2012 Base Year



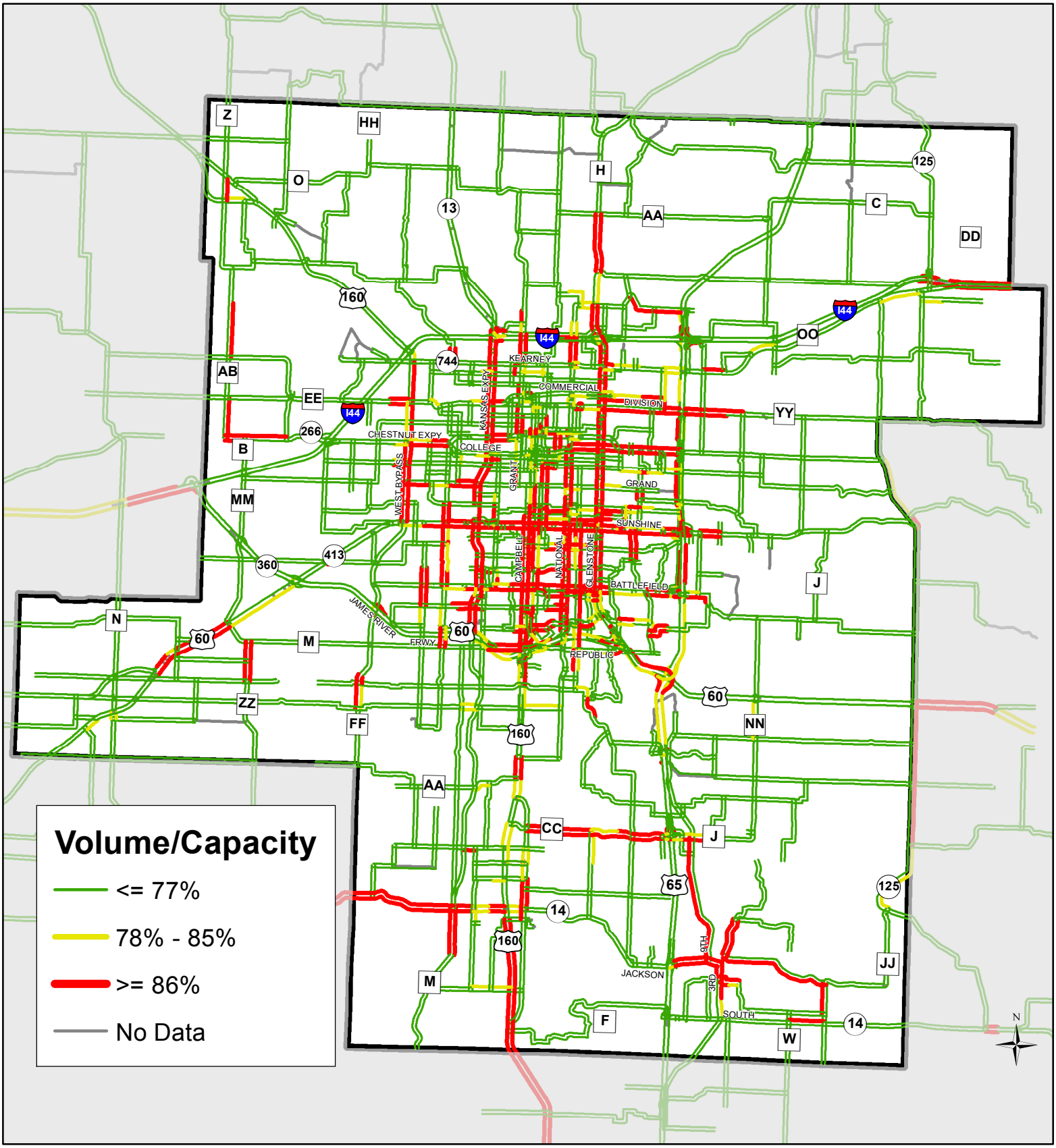
2030 Existing plus Committed Network



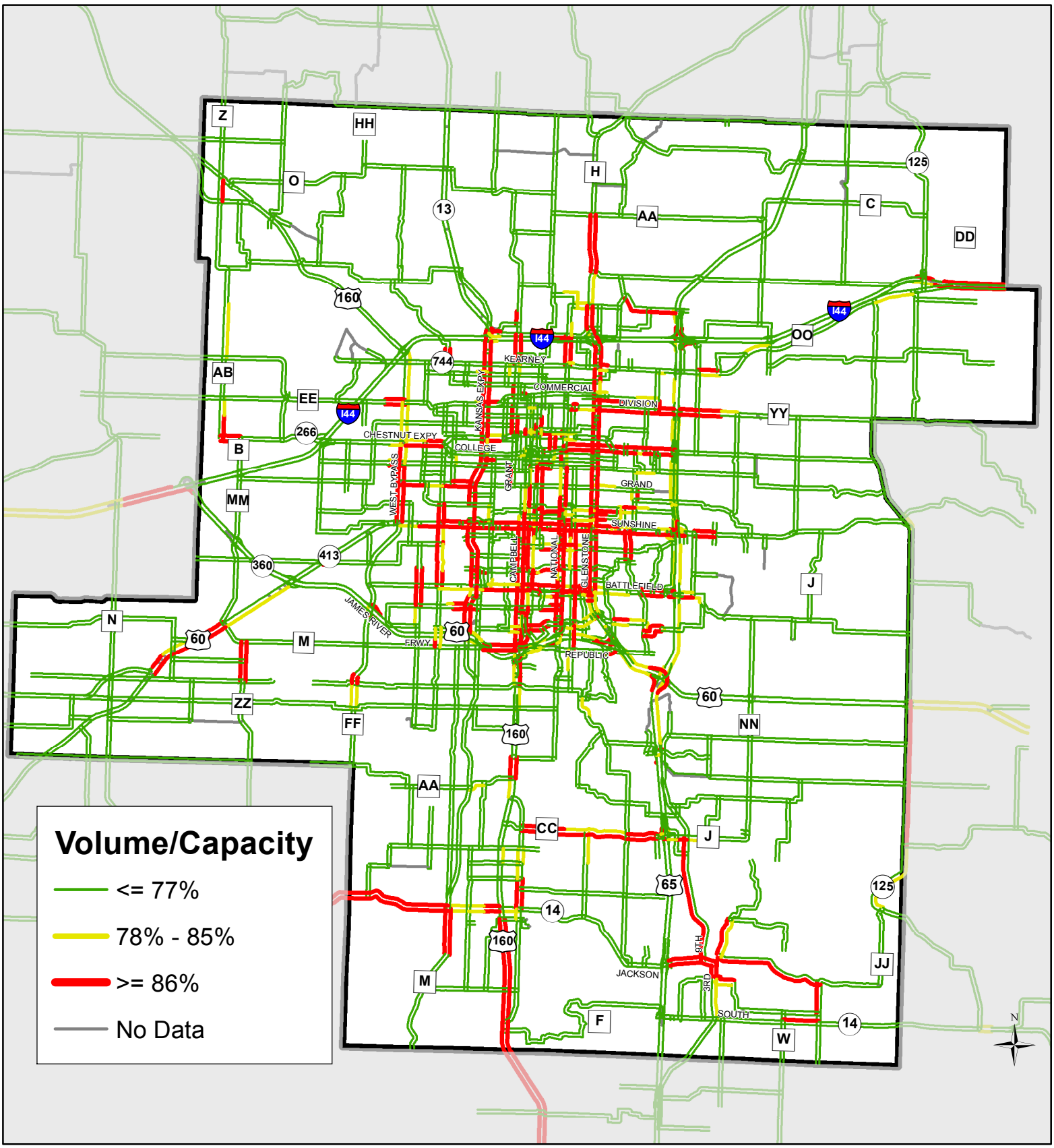
2040 Existing plus Committed Network



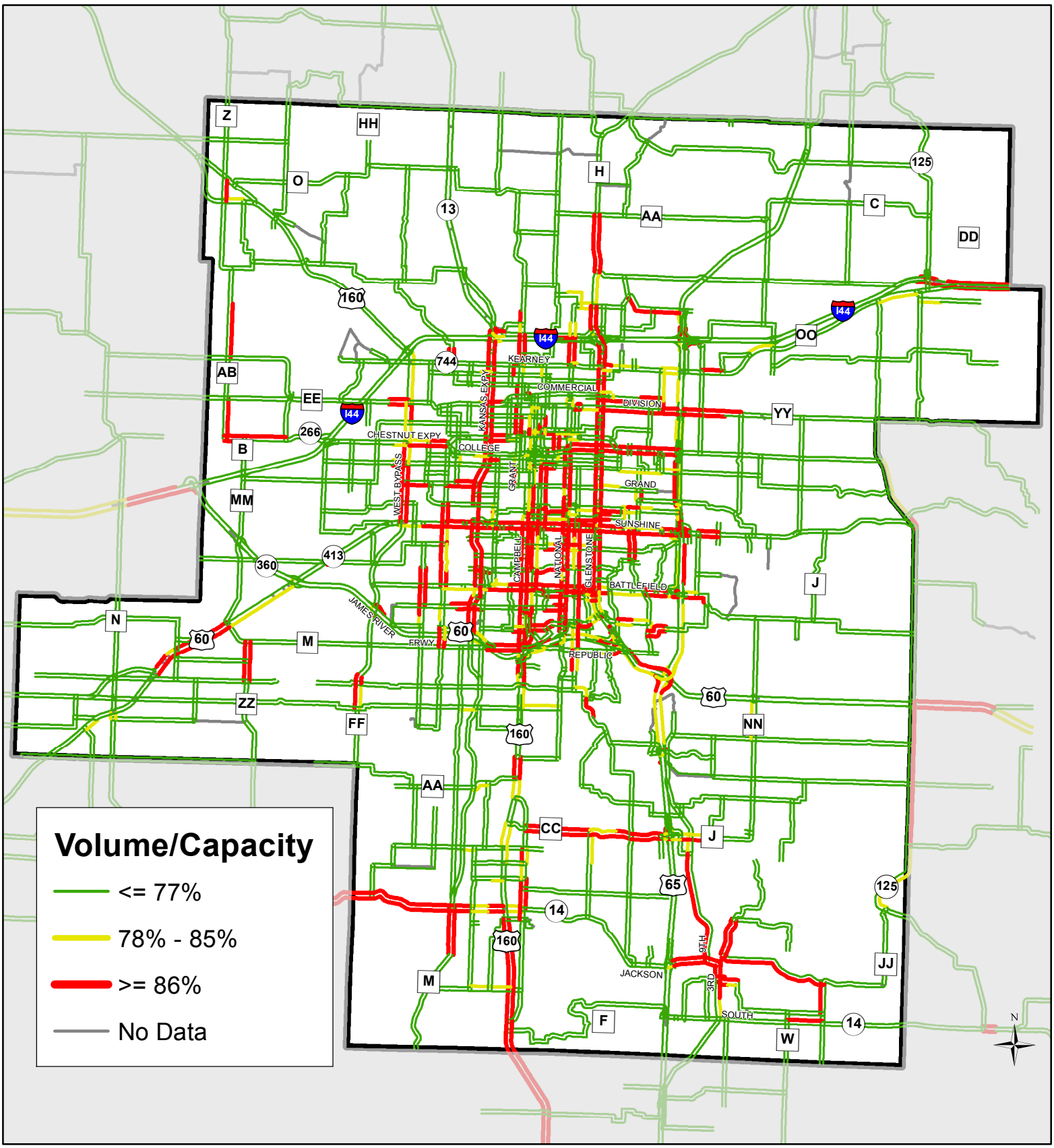
2040 Priority Projects of Regional Significance



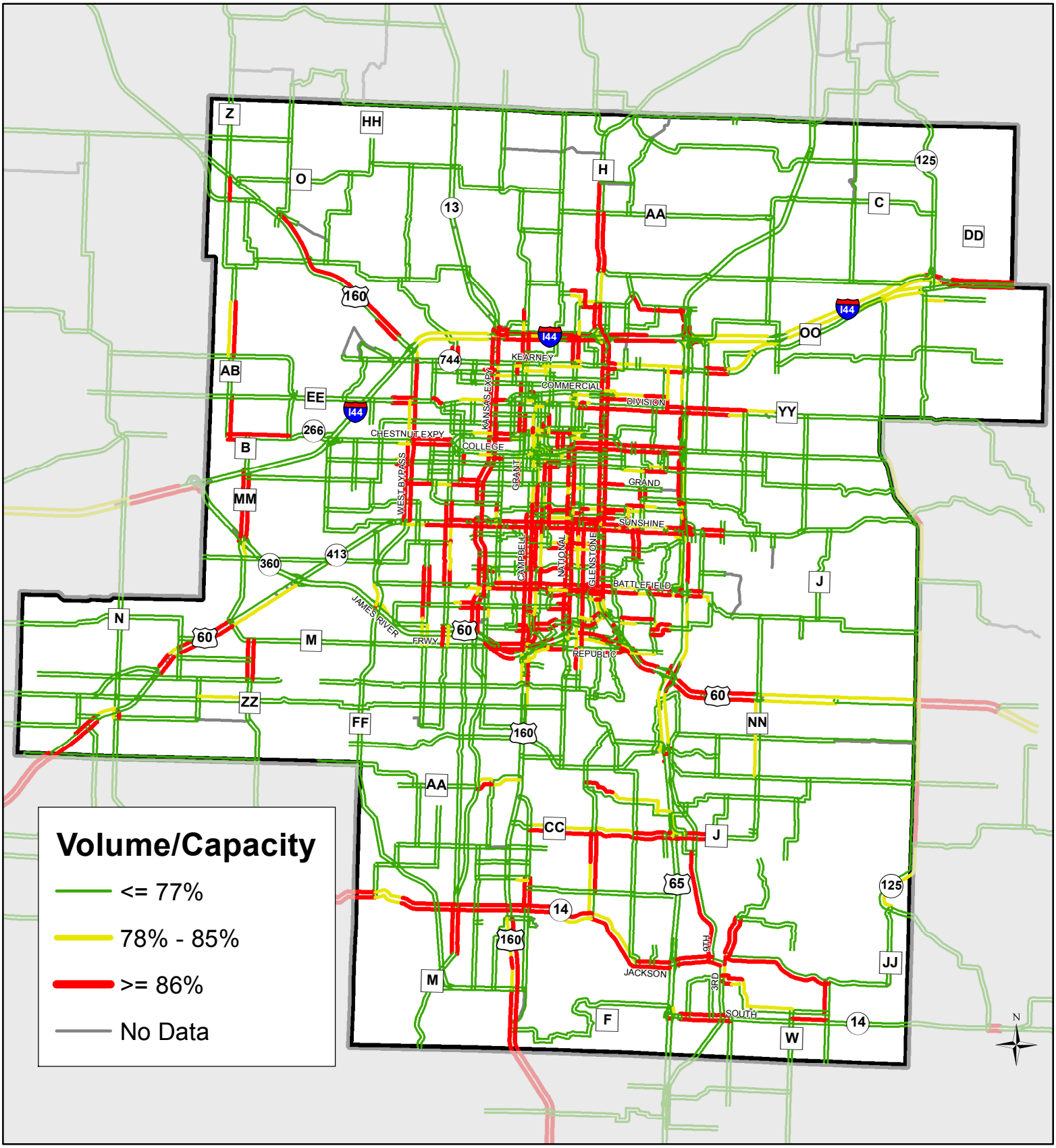
2040 Priority Projects of Regional Significance + Fuel Price Increase



2040 Priority Projects of Regional Significance + Transit Share Increase



2040 Southwest OTO Projects



Appendix B: Existing plus Committed Project List as Submitted to Olsson

Existing

TIP #	Roadway	Description	Changes (Lanes, Functional Class, Intersection, Signals, Medians)
GR0512	Weaver Road/Campbell	Intersection Improvements	Realigned intersection, added two through lanes (4-lane at intersection), 1 dedicated right turn lane and 2 dedicated left turn lanes on both legs of Weaver, includes 4 direction signalization (no signal before).
OK0702	Route 14 Improvements	Improvements on Route 14 from Finley River Bridge to Oak Street	The turn lanes at the intersection were reconfigured. See project OK1006 below.
	14/BR65/3rd Street	Widen to 3 lanes and add turn lanes between Finley River Bridge and 3rd/Jackson (already 3 lanes on 3rd south of Jackson) in Ozark	See project OK1006 below. These two projects were engineering and scoping only; OK1006 implemented a segment as 5 lanes with a signal at Jackson and 3rd.
SP0626	60/65	Interchange and Ramp Improvements	Replace EB to NB with directional ramp. Replace NB to WB with direction ramp.
SP0701	Seminole Street and National	Intersection and Signalization Improvements	Added dedicated right for both legs of National; Added dedicated right for eastbound leg of Seminole.
SP0913	US 65	Capacity Improvements from Chestnut to Sunshine	Three lanes each direction from Chestnut to Sunshine
SP1015	60/160 (Campbell)	Construction of Improvements at 60/160 interchange, including expanding 160 to 6-lanes from 60 to N. of Plainview	See pictures at end. Also, 3-lanes from Republic northbound to 2nd driveway, then becomes right turn lane to South Street.
CC1205	160 South of Nixa	Turn lane improvements at various locations between S. Main and the Finley River south of Nixa	Turn lanes at Citydel Road and South Main Street were new ones.
GR1202	I-44/160	Ramp and signal improvements	Signals added

TIP #	Roadway	Description	Changes (Lanes, Functional Class, Intersection, Signals, Medians)
NX0901	Gregg/14	Intersection and signal improvements	Southbound Gregg – added dedicated right and left turns; Northbound Gregg, changed from one right and one combined thru/left to dedicated right, one thru, and dedicated left; Westbound added dedicated right; Eastbound no change
RP1104	60/Oakwood	Route 60 Intersection Improvements at FR 93 (Oakwood)	Added signals for all directions. US60 East added a dedicated right turn lane, but lost the dedicated left turn lane. US 60 west kept the dedicated left turn lane and added a dedicated right turn lane. Oakwood/FR93 south became right out only, and Oakwood north became right/left only. U-turns installed on EB and WB 60 for FR 93 traffic access (But can be used by any 60 traffic)
SP0719	E/W Arterial at Evans	Extend Southwood from Evans to new E/W Arterial and relocate Evans to Southwood Ave Extension	Signals added at exit and on Evans extension? See pictures at end. City's project (I'm not sure what all was included with this, I think the signal was put in on the ramp, not sure about one at the Mercy entrance. Then there is a roundabout at Southwood.).
SP1208	65/Evans	Add left turn lanes to ramps to west, widen bridge of 65 to 5 lanes, add signals	Also see SP0719. This work was not done – see the City's project SP0719 for what was actually built.
SP1016	Chestnut/65	Interchange improvements	New diverging diamond under bridge. Northbound Eastgate right only with U-turn about 100 feet to the east. See picture at end.
SP1214	Kansas Expressway/US60	Interchange Improvements (Diverging Diamond) – Convert interchange at JRF	Diverging Diamond

TIP #	Roadway	Description	Changes (Lanes, Functional Class, Intersection, Signals, Medians)
	Route 125/D	Rebuild intersection at Route D east of Springfield to make a 3-way intersection	When did this happen, because it doesn't appear too different in the aerials? It would have happened last summer to early fall.
	US 60	Add third lane in each direction between Campbell and Kansas Expy	Auxiliary lane connecting KS and Campbell on-ramps. Yes, and West Bypass improvements to add WB dual lefts to SB West Bypass and two SB through lanes on West Bypass at the EB on ramp (which kept dual lefts) When did National and Campbell get connected – with DDI at National? Yes, with that project.
ST1202	125/OO	Turn lane and rail crossing improvements – widen intersection and add traffic signal	EB right turn lane, EB through lane, EB left turn lane; WB through/right turn lane, WB left turn lane; NB right turn lane, NB left/through lane. Signalization of intersection. Also, right turn lane at John Deere Reman facility entrance to the south of this intersection on Route 125.

Committed

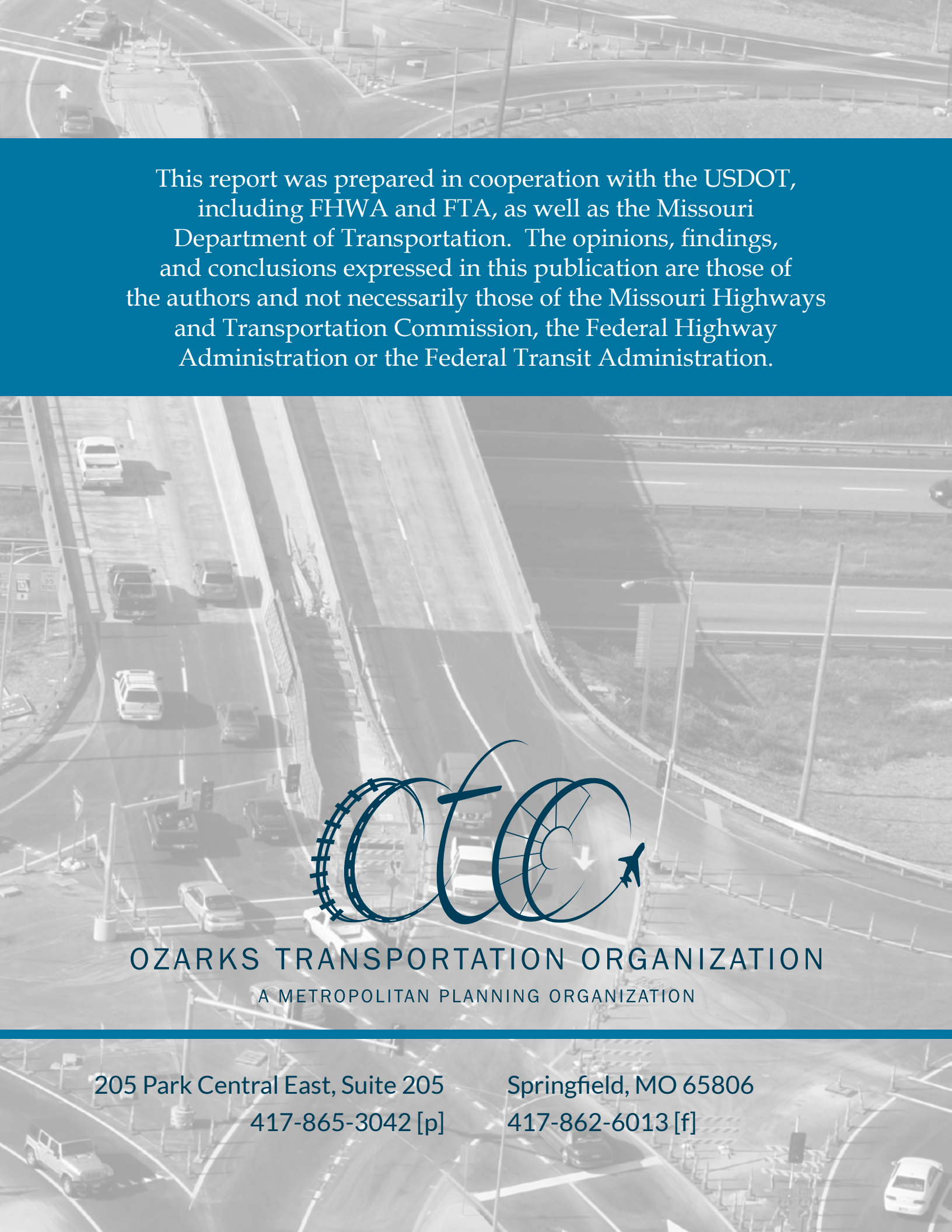
TIP #	Roadway	Description	Changes (Lanes, Functional Class, Intersection, Signals, Medians)
BA1401	Weaver Road in Battlefield	Widen from Wilson Creek Elementary to FF	City/County Project (I think it was three lanes??)
CC1110	65/CC/J Interchange	Improvements to 65/CC/J Interchange in Ozark	DDI. EB one left turn lane, two through lanes one right turn lane; WB one right turn lane, one through lane and one shared through/left turn lane. WB: Two through lanes, right turn lane and left turn lane at 17th Street signal; two through lanes and one right turn lane between Route 65 ramps and 17th Street; two through lanes from Route 65 ramps to 22nd street. EB: Right turn lane for 22nd street; one through lane that splits to two throughs and one right turn lane at the interchange; continue two through lanes to 17th street, but add a left turn lane and right turn lane at 17th. SB off ramp has dual lefts and dual rights; NB off ramp has single left and single right.
CC1201	CC from Cheyenne to Rolling Hills	Roadway improvements	This is just a realignment
CC1203	14/Cheyenne	New turn lanes and traffic signal	EB left turn lane, WB right turn lane, SB left and right turn lanes (no through), close field entrance at south leg of intersection and signalize.
CC1302	CC/Cheyenne	Intersection Improvements	Signal. Turning movements? WB left turn lane and through; EB through lane only, SB left turn lane and shared through/right turn lane; NB left turn lane and shared through/right turn lane.
GR1010	60/J/NN Interchange	Interchange Improvements, aka building an interchange	Interchange at 60 and NN/J with minimal outer road changes.

TIP #	Roadway	Description	Changes (Lanes, Functional Class, Intersection, Signals, Medians)
GR1309/ SP1407/ SP1408	Campbell/Plainview	Intersection Improvements – Widen to 6 lanes through Plainview, add turn lanes and improve traffic signal at Plainview Road	This project carries through Farm Road 157 just south of Plainview intersection.
NX0906	160/14	Intersection Improvements	Dual left? Per preliminary plans: Yes, except for northbound. Also, right turn lanes in all directions.
OK1006	Third Street in downtown Ozark	Roadway Capacity and Safety Improvements from Finley River to north of Church Street	3 lanes (encompassed with OK0702?) 5 lanes, not 3. Also, signalized Jackson and 3rd Street. (Yes, OK0702 was the early version that was pared down into this project).
SP1021	Chestnut and Sherman	Intersection Improvements	EB dual lefts to Sherman, with outer lane feeding OTC parking lot. EB two through lanes with separate right turn lane. SB Left turn lane, and separate through lane with SB bike lane; NB left turn lane with combined through/right-turn lane and WB Right turn lane, two through lanes and one left turn lane.
SP1106	Eastgate/65	Relocation of Eastgate, east of US 65	Committed? The project is committed, but the timeline is uncertain. Will relocate outer road intersection to the east.
SP1108	Battlefield/65	Bridge and Interchange Improvements (Diverging Diamond)	Diverging diamond EB one left turn, one shared left/through turn lane and one through-only lane. WB two through lanes and one left turn lane. SB and NB off ramps dual lefts and one right turn lane each; connect auxiliary lanes between Sunshine St. and Battlefield Road on Route 65. Add signal at Woodstock St.
SP1122	Kansas Expressway and Broadmoor	Construction of an acceleration lane on Kansas at Broadmoor	← yes.

TIP #	Roadway	Description	Changes (Lanes, Functional Class, Intersection, Signals, Medians)
SP1203	US 60	Ramp improvements at various locations along US 60 (connecting auxiliary lanes)	Kansas to Campbell and improvements @ West Bypass/FF (same as listed under existing?) Yes, this is the same as the existing project.
SP1204	Evans Road/65	Improvements to Evans Road Bridge over US 65	No geometric changes, but signalization? Included with SP1208? This is just a bridge repair; nothing being done to impact traffic movement.
SP1206	Kearney Street Safety Improvements	Add turn lanes at Mustard Way and at Mulroy Road east of Springfield	EB left turn lane and WB right turn lane at Mustard Way. EB left turn lane, SB left/through combo lane, WB left turn lane, right turn lane and separate through lane at Mulroy Road.
SP1313	S. Glenstone	Roadway improvements from Battlefield to US 60 – Widen to 6 lanes; improve intersection at Independence Street and remove traffic signal at Republic Court	Add an additional lane in each direction on Glenstone Avenue between Battlefield Road and James River Freeway (Route 60) and modify three intersections – 1) Independence Street will become a four-legged intersection. Republic Road on the east side of Glenstone Avenue will be rerouted along Luster Avenue to Independence Street; 2) The entrance to the east outer road at Peele Street will be closed and relocated north of the intersection. When the project is complete, the entrance to the east outer road will be right-in and right-out only on Glenstone Avenue; 3)The Republic Court/Glenstone Avenue intersection will become a right-in/right-out entrance and the traffic signal will be removed.

TIP #	Roadway	Description	Changes (Lanes, Functional Class, Intersection, Signals, Medians)
SP1410	US 65	Operational and Roadway improvements to US 65 from US 60 to .7 miles south of Evans	Extend 6 lanes to ramp and extend James River Freeway Southbound ramp. We don't really know what we will do yet, but this will suffice for now.
ST1201	SH 125	Turn lane at Washington	← Yes (WB left turn lane)
WI1201	160/Hunt	Intersection improvements on 160 at Hunt in Willard	Included a signal. (And this is complete, so would it be existing?)
Greene	E. Weaver Road (FR 178), Campbell Ave to National Place	Widening the existing 2 lane roadway to a 3-lane facility with curb/gutter (1 thru lane in each direction with a center turn lane)	(County project)
Greene	Republic Road (FR 170), Scenic to Golden	Widening the existing 3 lane roadway to a 5 lane facility with curb/gutter (2 thru lanes in each direction plus a center turn lane)	(City-County project)
Greene	Republic Road (FR 170), Golden to Route FF	Widening the existing 2-lane roadway to a 5 lane facility with curb/gutter (2 thru lanes in each direction plus a center turn lane)	(City-County project)
NX0601	Tracker/Main	Intersection Improvements	City project
Springfield	Packer and Kearney	Intersection Improvements	Adds NB combo left/through lane and separate right-turn lane. Adds a signal. Extends Packer to the north so that the offset driveway in the NE quadrant can be closed.

TIP #	Roadway	Description	Changes (Lanes, Functional Class, Intersection, Signals, Medians)
Springfield	Division/65	Interchange Improvements	Relocates SE outer road (Eastgate Ave) to the east 415 feet with separate left turn and right turn lanes onto Division St./Route YY. NB off ramp dual lefts and one right turn lane. SB off ramp separate left turn and right turn lanes. EB Division add Left turn lane, through lane and right turn lane. WB Division add two through lanes and one left turn lane.
Springfield	Republic Road		5 lanes Campbell to National
Springfield	Primrose/Campbell		3 different projects – National to Campbell
Springfield	Chestnut RR		Railroad grade separation on East Chestnut. Also adds a signal at Ingram Mill Road.



This report was prepared in cooperation with the USDOT, including FHWA and FTA, as well as the Missouri Department of Transportation. The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Missouri Highways and Transportation Commission, the Federal Highway Administration or the Federal Transit Administration.

OZARKS TRANSPORTATION ORGANIZATION

A METROPOLITAN PLANNING ORGANIZATION

205 Park Central East, Suite 205
Springfield, MO 65806
417-865-3042 [p]
417-862-6013 [f]