Application of New Data and Techniques for:

Performance Measurement

HDR

MAPA

Omaha - Council Bluffs Metropolitan Area Planning Agency

Metro Area Travel Improvement Study

Agenda

1. PROJECT **OVERVIEW**
2. REGIONAL PLANNING **PERSPECTIVE**
3. PROJECT **APPLICATION**
4. FINAL **THOUGHTS**

1 PROJECT OVERVIEW

Metro Area Travel Improvement Study (MTIS)

Metro Area Travel Improvement Study (MTIS)

- Study Evolution
- Collaboration among regional agencies
- Leveraging other studies
  - Heartland 2050
  - Regional Transit Vision
  - Regional Bicycle and Pedestrian Plan

Metro Area Travel Improvement Study

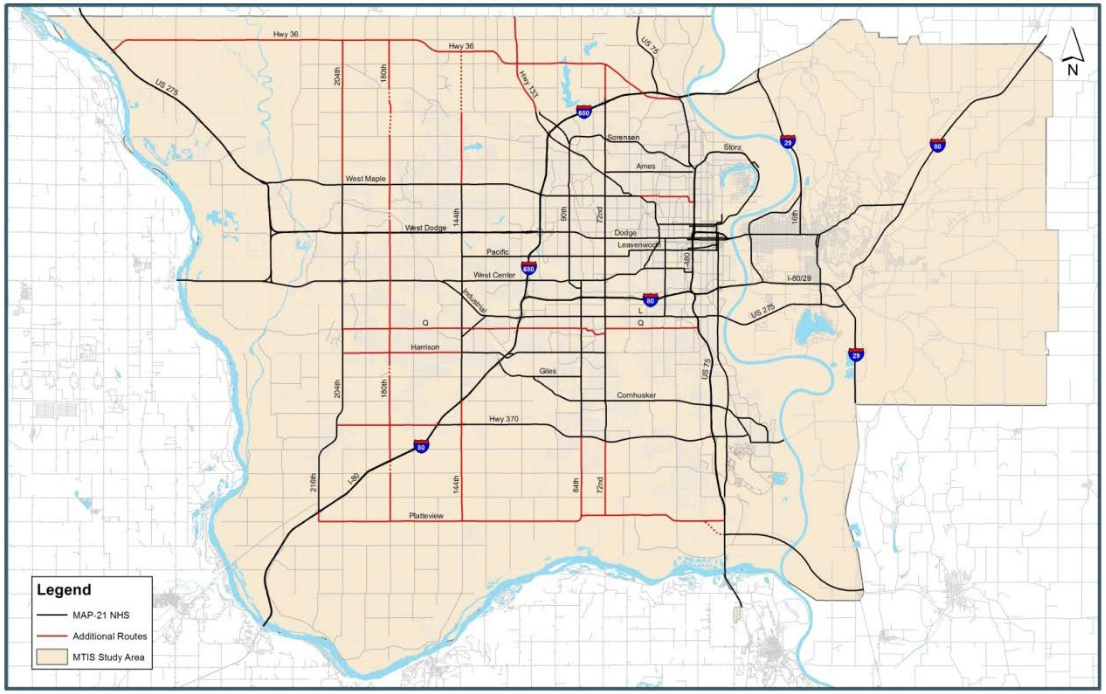
U.S. Department of Transportation
Federal Highway Administration

MAPA
Omaha - Council Bluffs
Metropolitan Area
Planning Agency

NDOR
Nebraska
Department of Roads

MTIS Overview

- Comprehensive, Multimodal Regional Transportation Study
- Provide an implementation plan that evaluates the interaction of potential investments in:
  - Interstate / Freeway System
  - Arterial / Local Road System
  - Transit System / Multi Model
  - New Strategies



MTIS Overview

PHASE 1 PHASE 2 PHASE 3

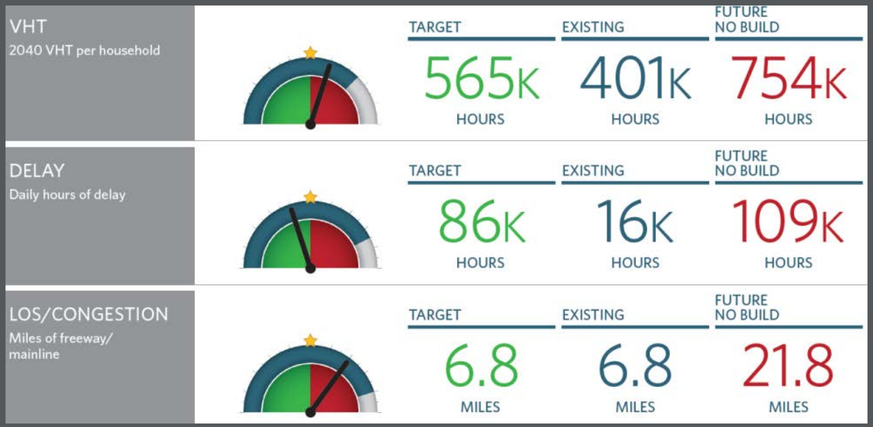
2 REGIONAL PLANNING PERSPECTIVE

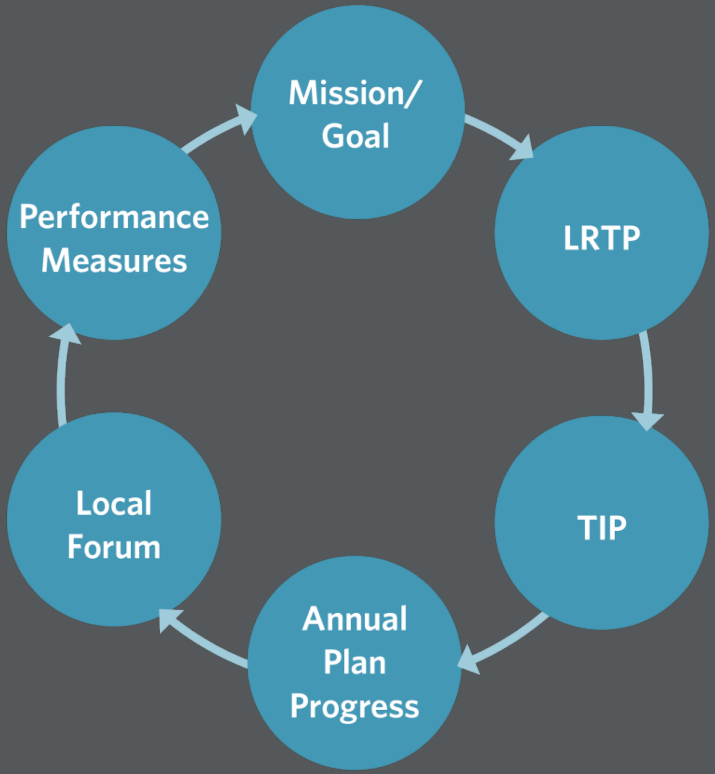
Where Performance Measurement Fits In

Performance Measures at MAPA

Triggered by MAP-21

- All Aspects of How MAPA Does Business
  - Vision: How do we define success as a region?
  - LRTP: Alternatives Analysis and Fiscally-Constrained Plan
  - TIP: Project Selection
  - Ongoing Monitoring





3

PROJECT

APPLICATION

Implementation of Performance Measures

MTIS Performance Goals

System Preservation

Congestion Reduction

Mobility and Accessibility

Stewardship and Environment

Safety

Performance Measures Used

System Preservation	Pavement Condition
	Bridge Condition
	Transit State-of-Good-Repair

Performance Measures Used

Congestion Reduction	System Reliability
	VMT
	VHT
	Delay
	Congested Miles of Freeway
	Miles of Congested Non-Freeway Segments

Performance Measures Used

Mobility and Accessibility	Regional Mode Share
	Access to Jobs
	Access (Proximity) to Transit
	EJ Access to Jobs
	EJ Access (Proximity) to Transit
	Bike/Ped Accessibility / Proximity
	Transit Passenger Trips

Performance Measures Used

Stewardship and Environment	Criteria Pollutant Emissions
	Economic Development
	Sustainability Score
	Existence of Ped/Bike Elements
	Transit Accommodation

Performance Measures Used

Safety

Annual Number of Fatal and Injury Crashes

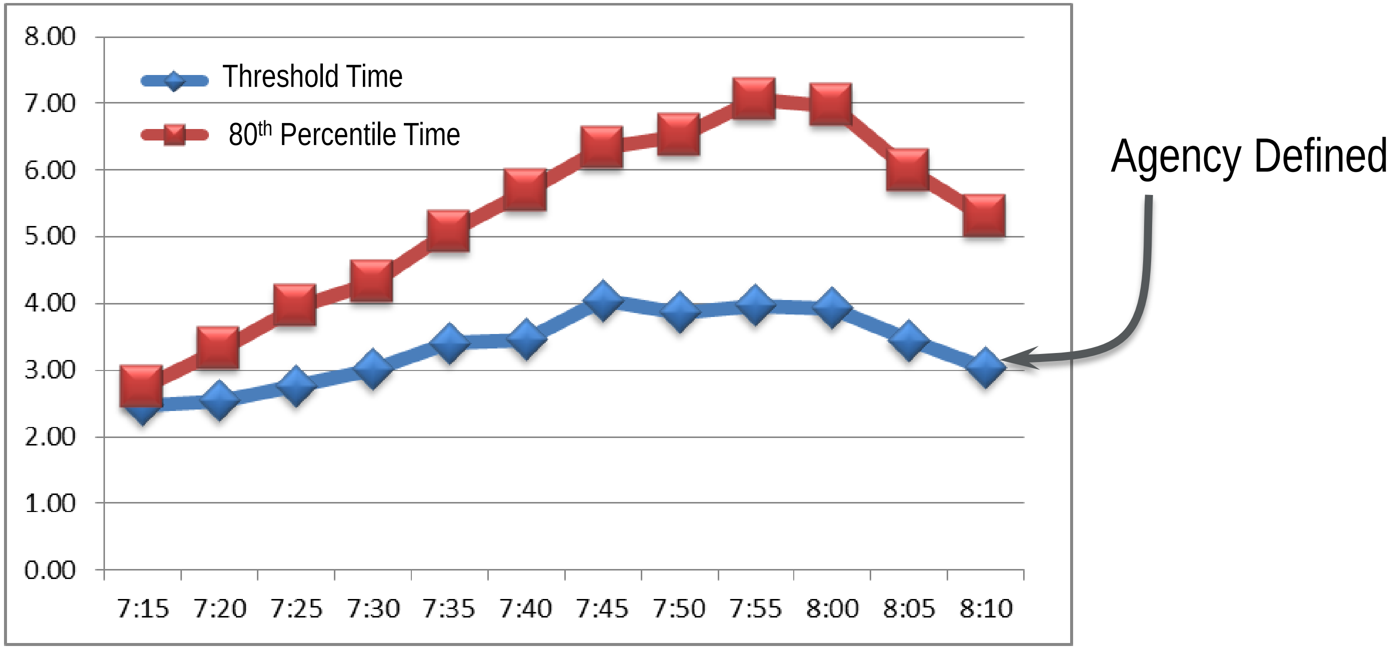
Example Performance Targets

Goal Area	Goal	Performance Measure	Performance Measure Target	Existing Conditions Baseline	Future No-Build Conditions Baseline
Mobility & Accessibility	Reduce the growth of peak-period travel times for all modes, and increase transit access and ridership	Regional Mode Share	DRAFT: Achieve 10% transit, bike, walk mode share for all trips by 2040	0.6% transit mode share 1.9% walk mode share 0.2% bike mode share 2.7% non-motorized	1.0% transit mode share 3.1% non-motorized
		Access to Jobs	DRAFT: Scenario increases average auto and transit access levels 10% above 2040 No-Build levels	Auto: 47.6% jobs within 15 minutes Transit: 7.0% jobs within 60 minutes	Auto: 36.9% jobs within 15 minutes Transit: 8.6% jobs within 60 minutes
		Access (Proximity) to Transit	DRAFT: Maintain housing and jobs proximity levels at ¼ mile walk distance at 2010 levels	Jobs: 45.0% within ¼ mile Houses: 32.3% within ¼ mile	Jobs: 39.7% within ¼ mile Houses: 27.9% within ¼ mile
		EJ Access to Jobs	DRAFT: Provide equal or higher levels of EJ access to jobs via auto and transit than 2010 levels	Auto: 47.5% jobs within 15 min for EJ HH Transit: 13.6% jobs within 60 minutes for EJ HH	Auto: 53.4% jobs within 15 min for EJ HH Transit: 19.6% jobs within 60 minutes for EJ HH
		EJ Access (Proximity) to Transit	DRAFT: Provide transit services within ½ mile to 90% of EJ households.	Within ¼ mile of local transit: 74.1% Within ½ mile of local transit: 89.3%	N/A
		Bike/Ped Accessibility / Proximity	DRAFT: Increase the percentage of jobs and households within ½ mile of bike facilities by 10% by 2040.	Jobs within ½ mile of bike facilities: 61.5% Households within ½ mile of bike facilities:56.2%	Jobs within ½ mile of bike facilities: 57.2% Households within ½ mile of bike facilities:50.2%
		Transit Passenger Trips	Use Mode Share Performance Measure	11,685	29,395

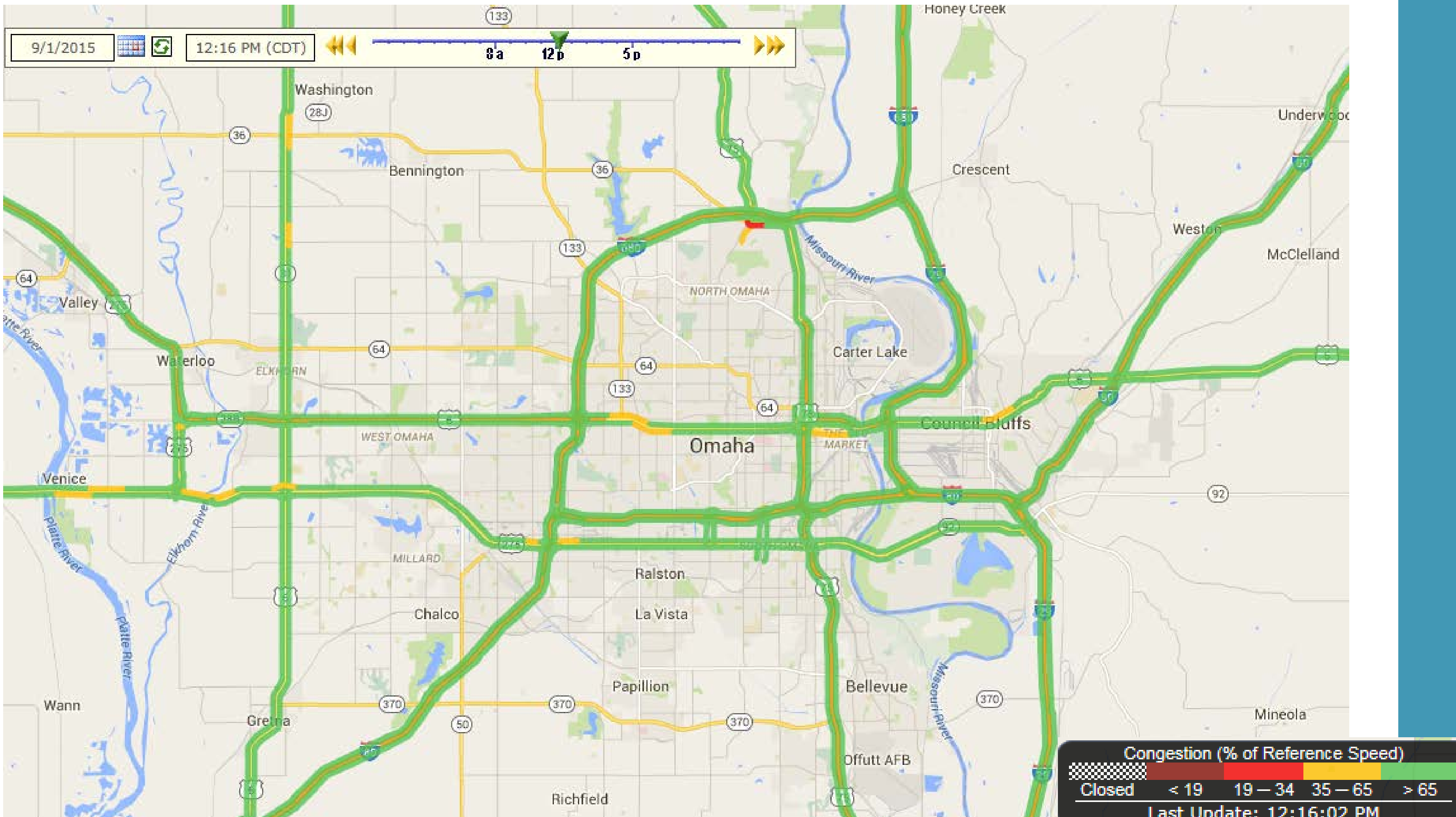
MTIS Innovative Applications

System Reliability

- How Reliable is Travel Time Through a Corridor?
- System Reliability based on RI_{80}
  - $$\left[\frac{80th\ Percentile\ Peak\ Period\ Travel\ Time}{\text{"}Threshold\text{"}\ Peak\ Period\ Travel\ Time}\right]$$



Data Source: INRIX



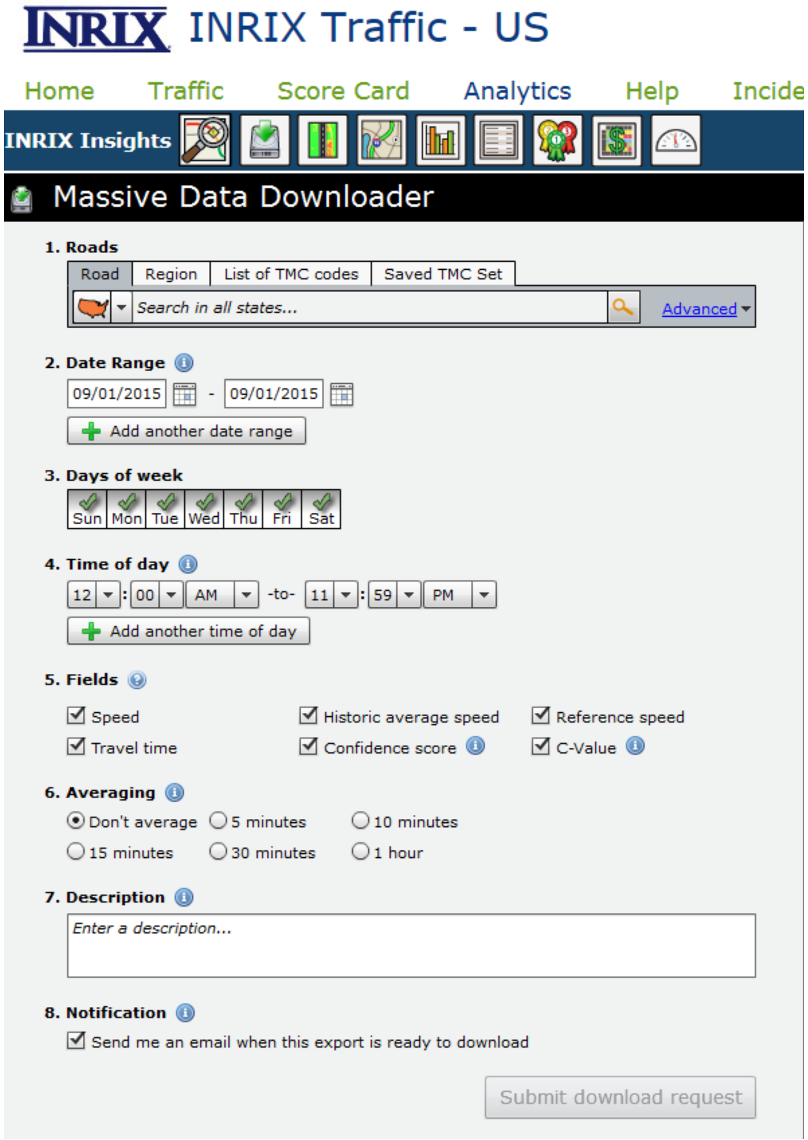
INRIX Massive Data Downloader

Approach Based on SCOPM Recommendations

- Entire year of data
- 5-minute bins
- RI_{80}

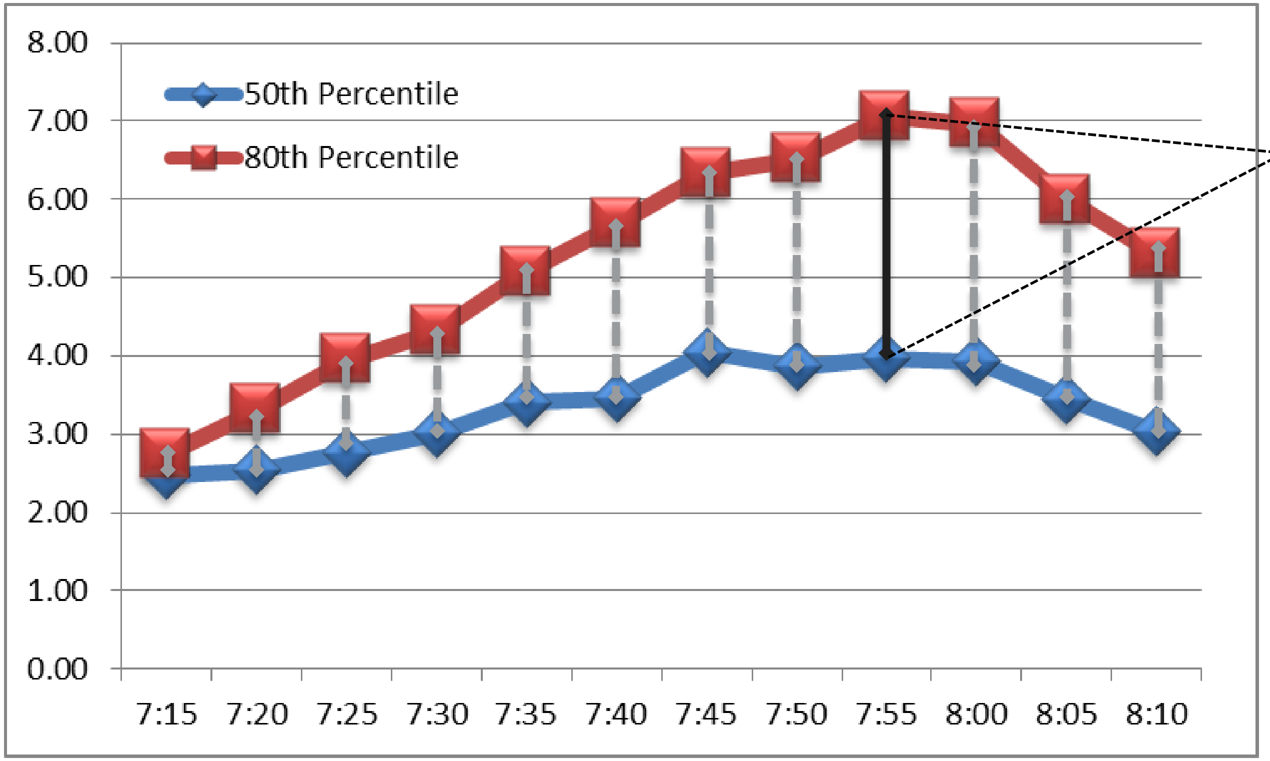
As Applied for MTIS

- 4 Months of Spring / Fall Weekdays in 2014-2015
- Data analyzed in 5-minute bins
- Used Median Travel Time as "Threshold" Travel Time
- Substantial Freeway Construction Period Avoided
- Custom aggregations of TMCs to fit our study corridors



MTIS RI $_{80}$

- $$\left[\frac{80th\ Percentile\ Peak\ Period\ Travel\ Time}{Median\ Peak\ Period\ Travel\ Time}\right]$$

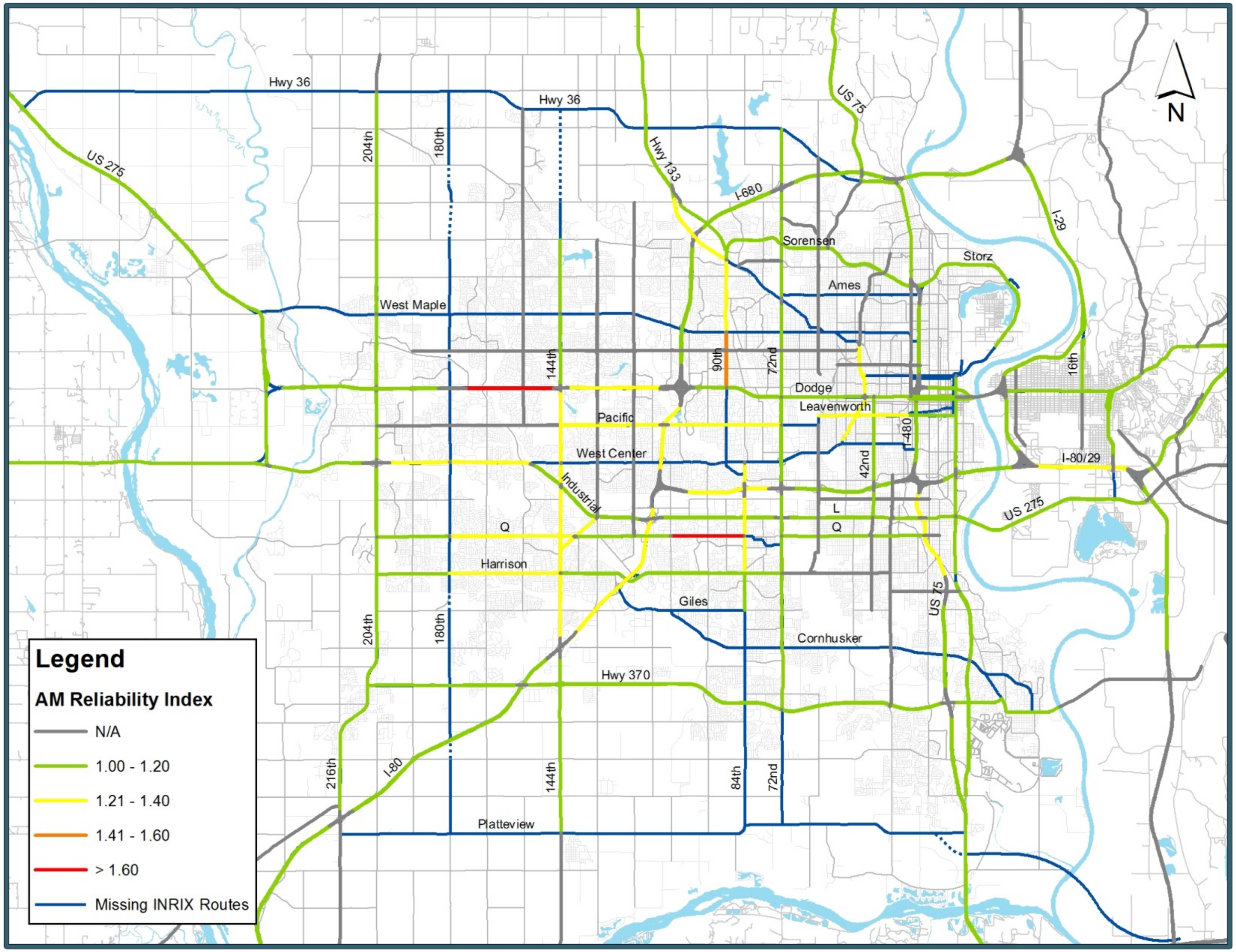


Segment Max @ 7:55 AM:
80^{th} = 7.0 Min
50^{th} = 4.0 Min
RI_{80} = 1.75

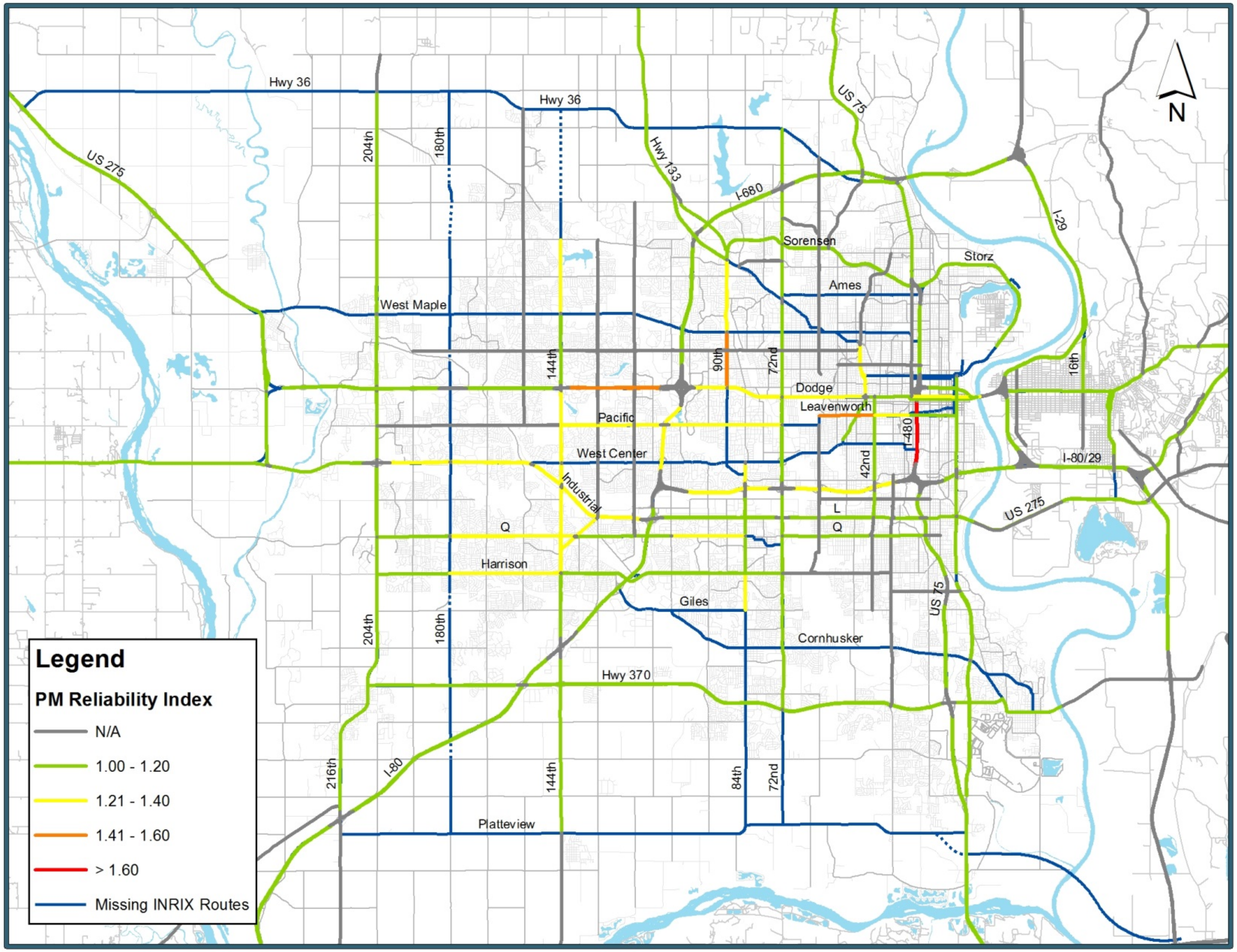
Systemwide Assessment

- Systemwide RI_{80}
  - Arterials
    - Urban: 1.17
    - Rural: 1.05
  - Freeways
    - Urban: 1.18
    - Rural: 1.03

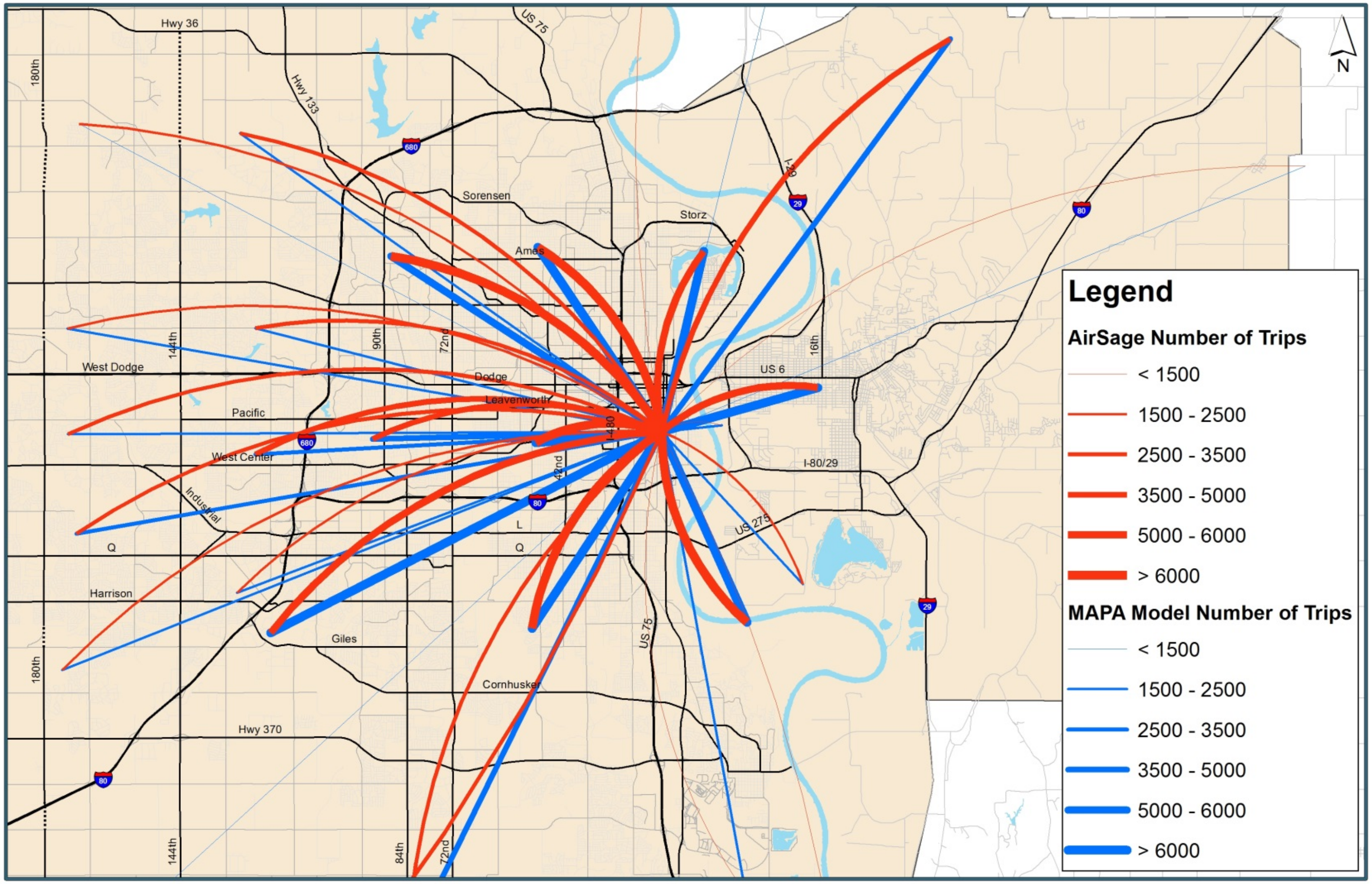
AM Corridor-Level Reliability



PM Corridor-Level Reliability



Access to Jobs



Access to Jobs

Regional Basis

+

Individual TAZ Basis

→

How Accessible are Jobs?

- MAPA TransCAD Model
- GIS Analysis

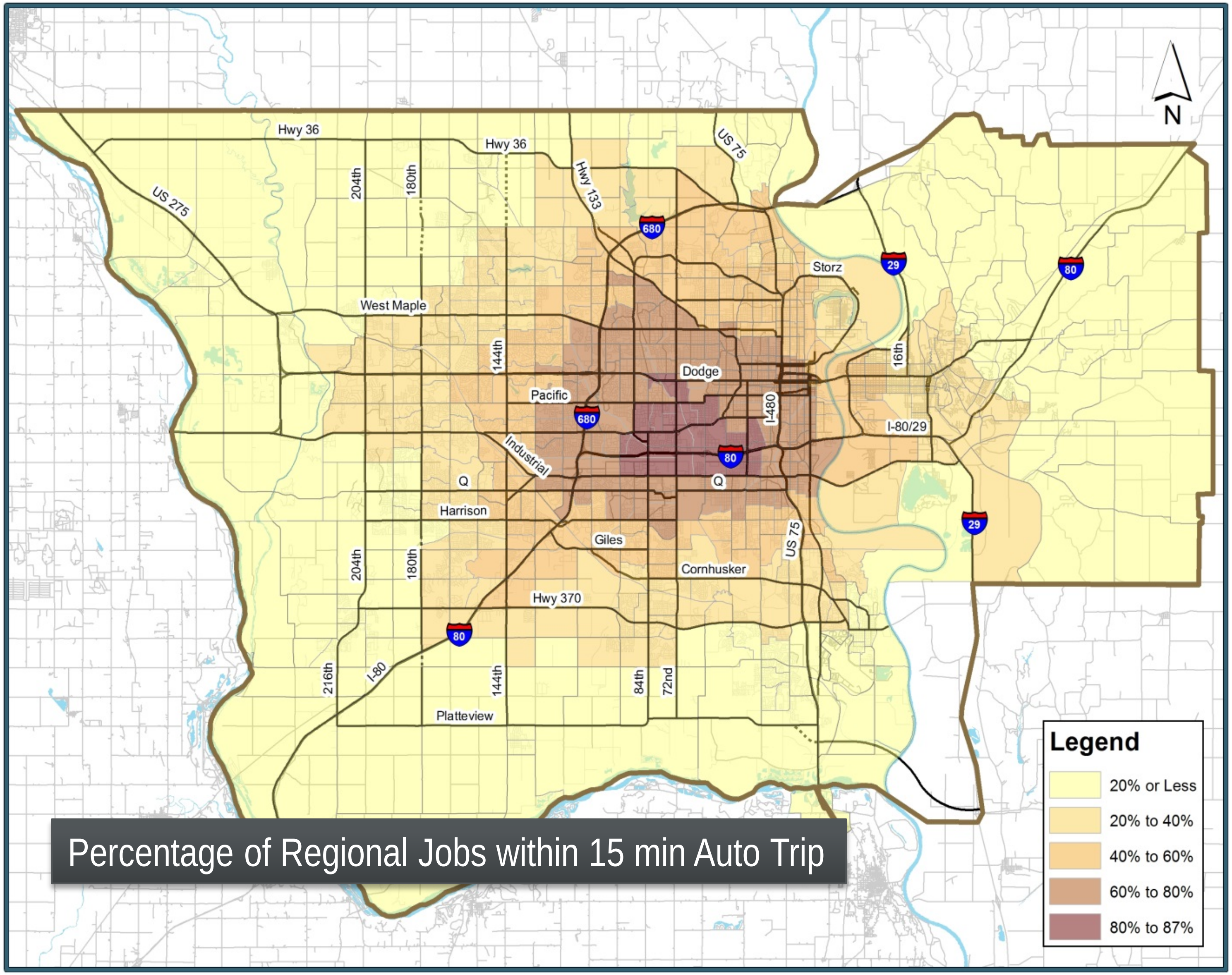
Access to Jobs

- Two Modal Benchmarks

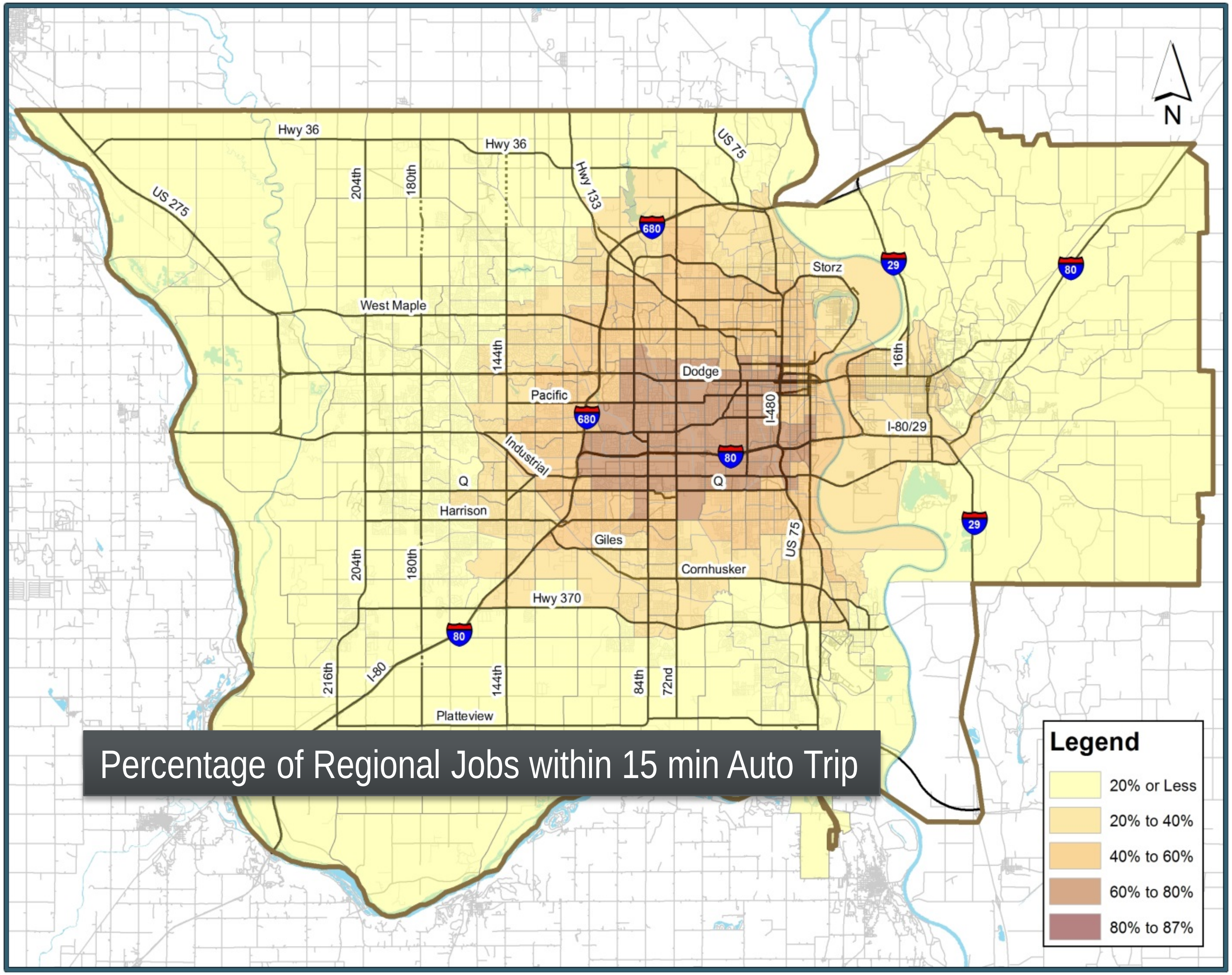
Within 15 Minutes Via Auto	Within 60 Minutes Via Transit
• Skim # jobs within 15 minutes • (Zonal total access) / (regional total) = zonal accessibility • AM Period (6:30 to 8:30)	• Similar to Auto • Total Transit Time Skim = o Walk time to bus (“Access” to stop) o Wait Time o In Vehicle Time o Transfer Time (if applicable) o Walk time off bus (“Egress” from stop)

- Compare Accessibility for:
  - Environmental Justice (EJ)
  - Non-EJ Populations

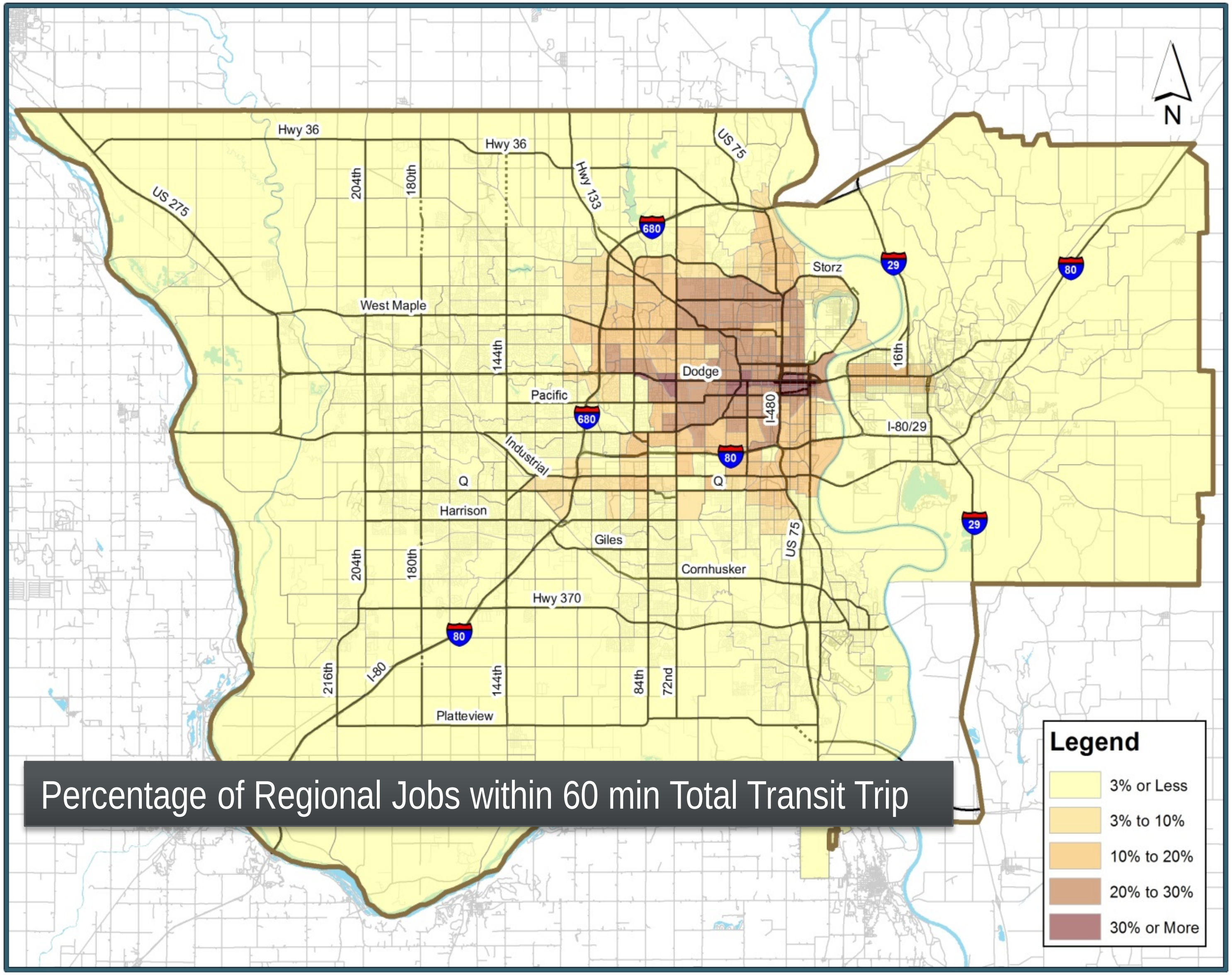
Auto Accessibility, 2010



Auto Accessibility, 2040

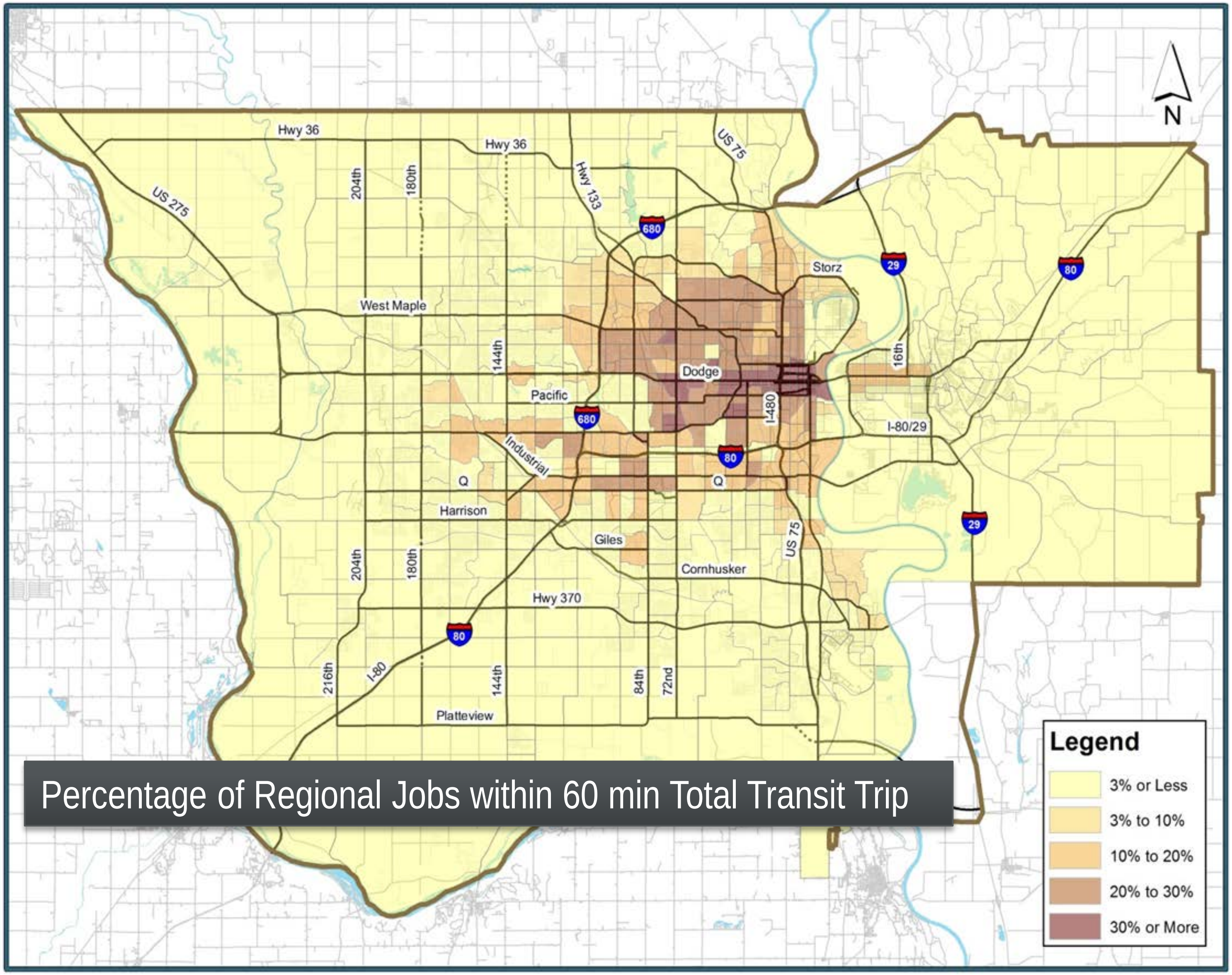


Transit Accessibility, 2010

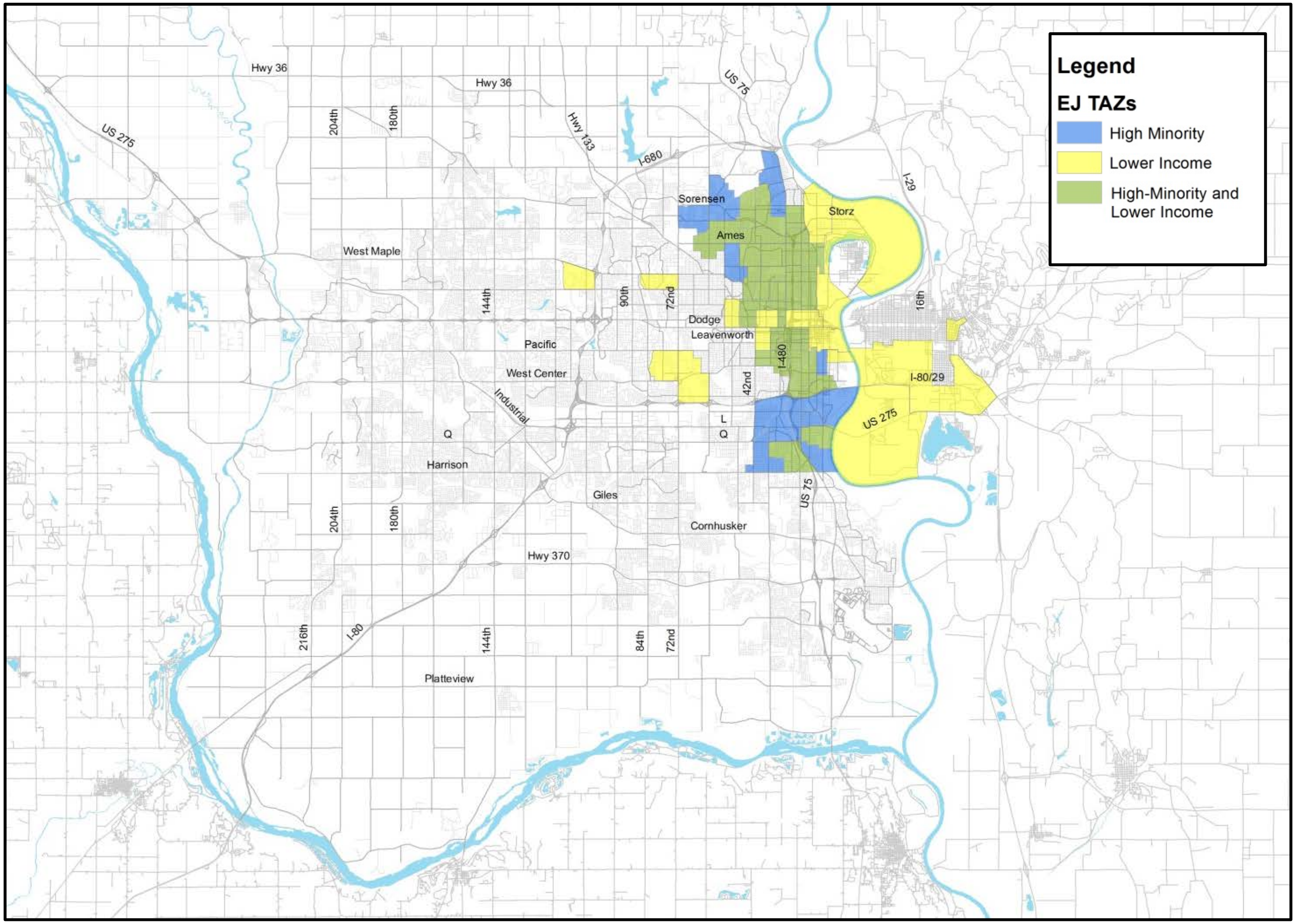


Percentage of Regional Jobs within 60 min Total Transit Trip

Transit Accessibility, 2040



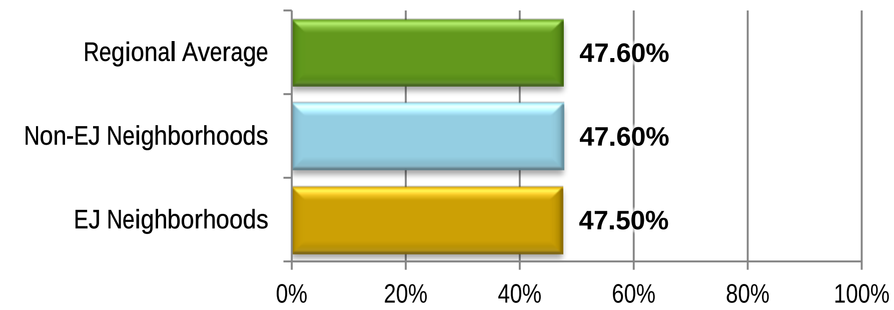
Environmental Justice Areas



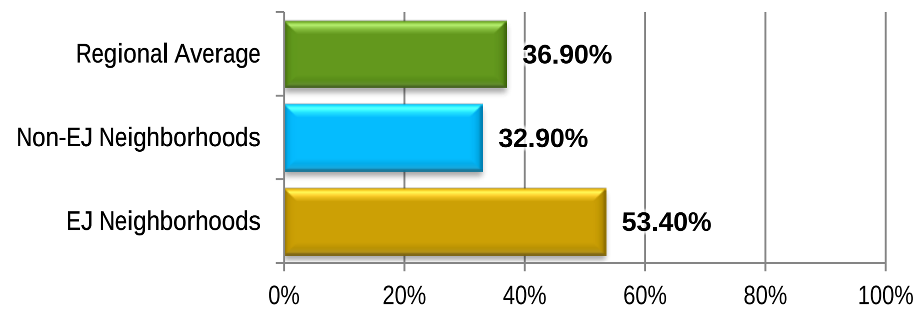
Jobs Access Regional Results

Jobs within 15 minutes via Auto

- 2010

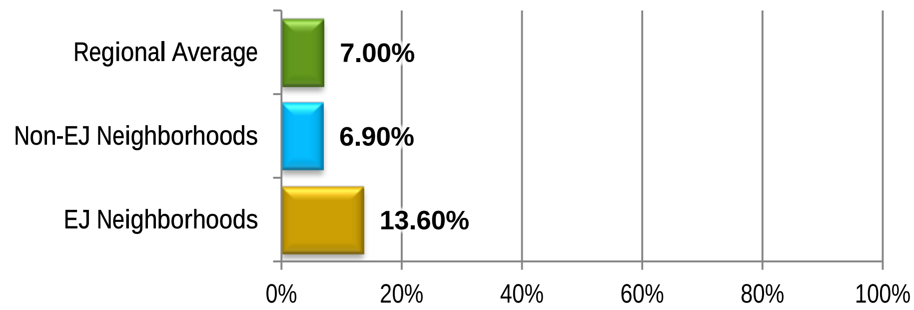


- 2040

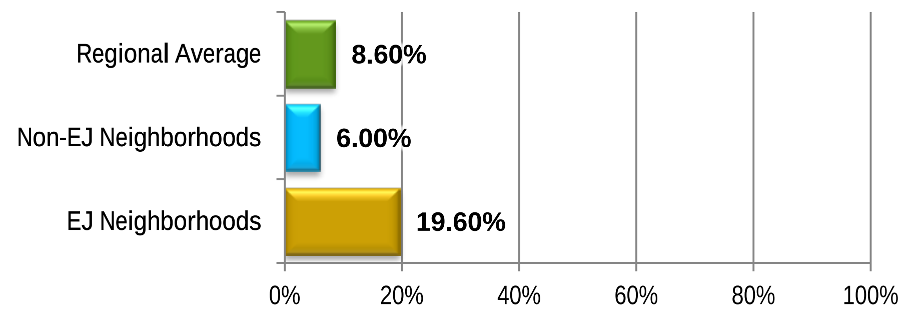


Jobs within 60 minutes via Transit

- 2010

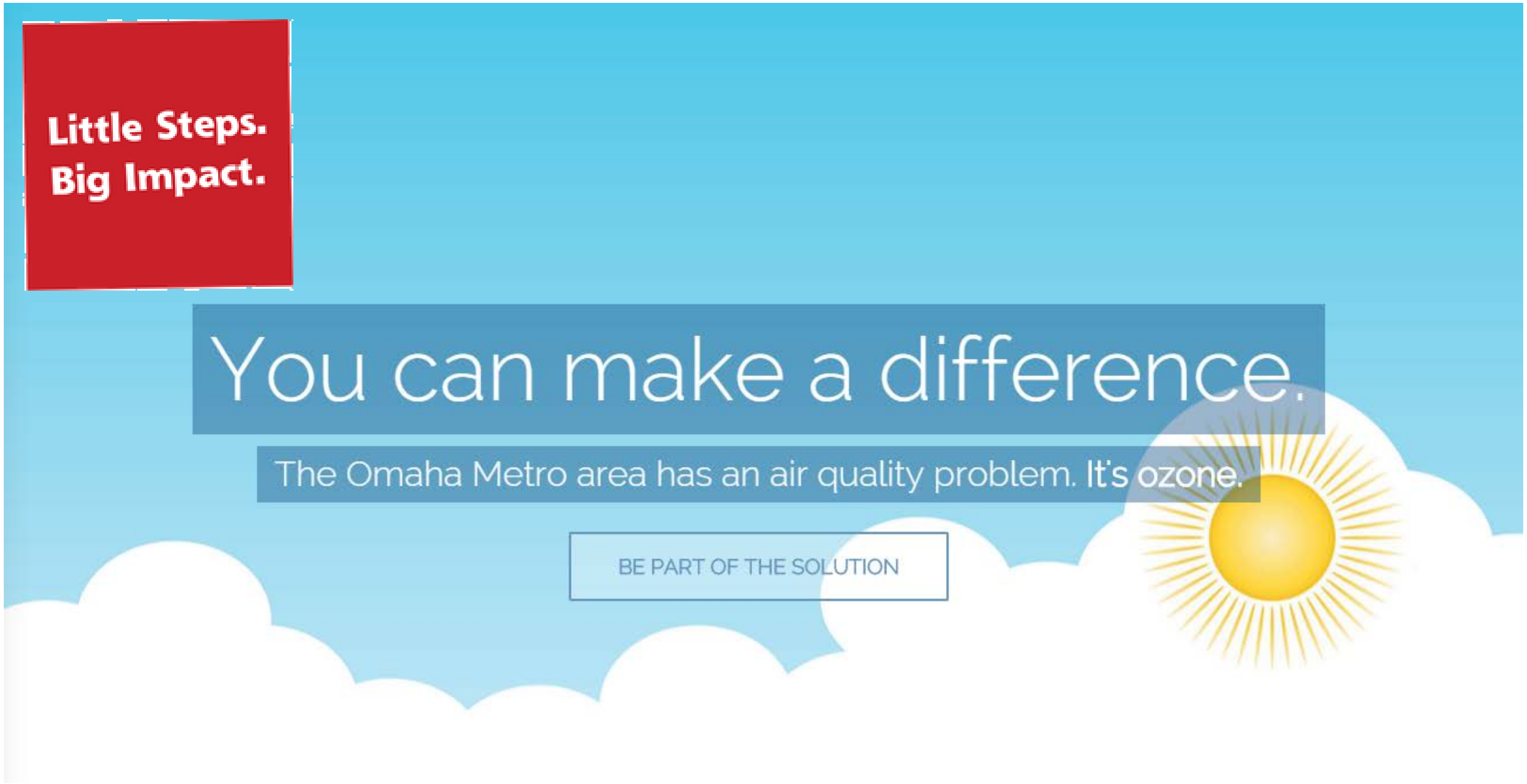


- 2040



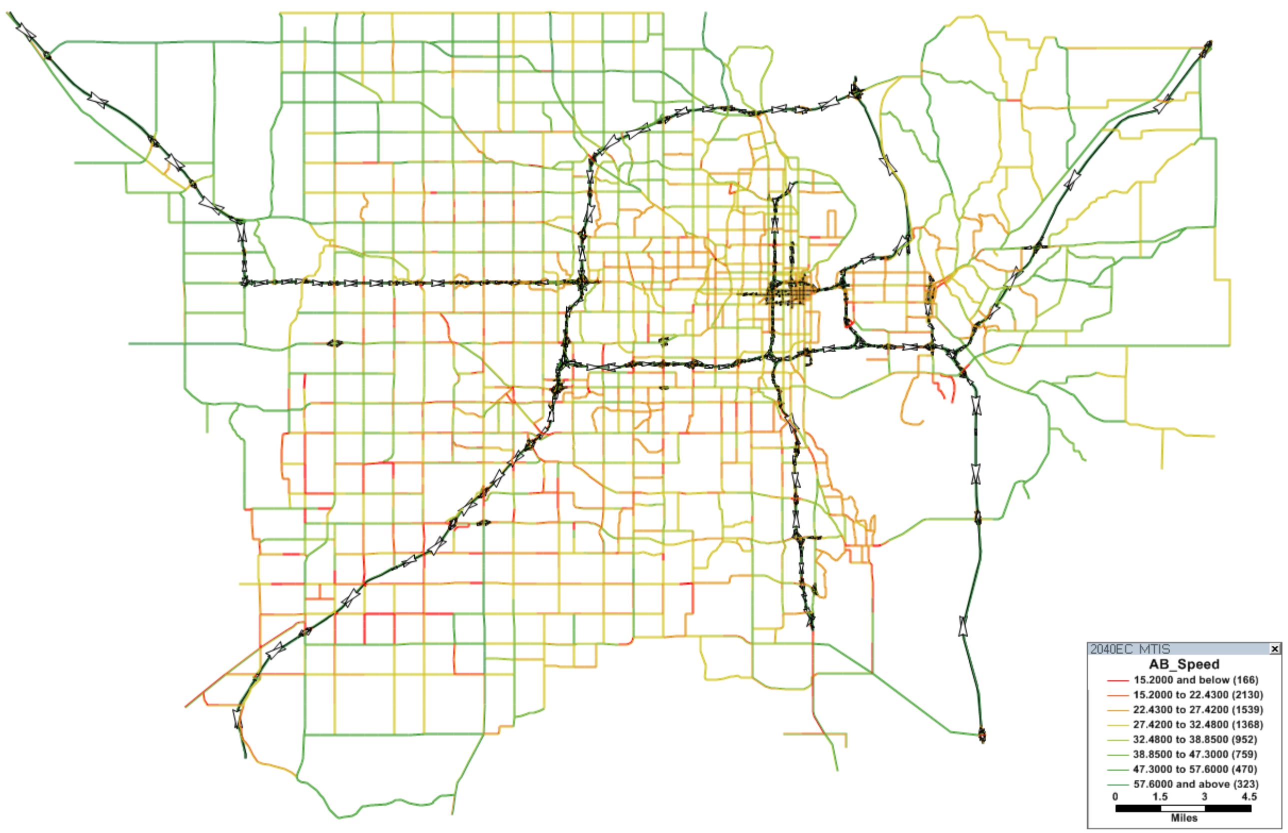
Criteria Pollutant Emissions

- MAPA: In Attainment
- Active Program to Limit Regional Emissions
  - Concerns with Ozone



MOVES Approach

- Travel Model Scenarios
- MOVES2014 Application
  - o All 3 Counties Modeled
  - o EPA Local Defaults Used
  - o All Road Types Modeled
  - o 4 Months Modeled:
    - January
    - April
    - July
    - October



Emissions Rates

Pollutant	Speed Bin (average speed – mph)	Road Type 2 (Rural Restricted Access		Road Type 3 (Rural Unrestricted Access)		Road Type 4 (Urban Restricted Access)		Road Type 5 (Urban Unrestricted Access)	
		Average Emission Rate (g/mile) [2010]	Average Emission Rate (g/mile) [2040]	Average Emission Rate (g/mile) [2010]	Average Emission Rate (g/mile) [2040]	Average Emission Rate (g/mile) [2010]	Average Emission Rate (g/mile) [2040]	Average Emission Rate (g/mile) [2010]	Average Emission Rate (g/mile) [2040]
Oxides of Nitrogen (NOx)	1 (2.5)	15.6675	1.7892	8.6093	0.8786	8.7033	0.8909	5.8275	0.5204
	2 (5)	8.4670	0.9606	4.7888	0.4669	4.8507	0.4792	3.3636	0.2784
	3 (10)	5.1871	0.5712	3.1568	0.2893	3.0745	0.2872	2.3032	0.1753
	4 (15)	4.3191	0.4652	2.7067	0.2375	2.5608	0.2323	1.9977	0.1444
	5 (20)	3.7793	0.3971	2.4342	0.2040	2.2435	0.1992	1.8185	0.1250
	6 (25)	3.4878	0.3577	2.2449	0.1829	2.0968	0.1807	1.6893	0.1125
	7 (30)	3.4194	0.3434	2.1188	0.1754	2.0696	0.1753	1.5784	0.1087
	8 (35)	3.1307	0.3055	1.9373	0.1558	1.9574	0.1610	1.4575	0.0982
	9 (40)	3.0961	0.2955	1.9010	0.1504	1.9584	0.1588	1.4253	0.0955
	10 (45)	3.0654	0.2876	1.8724	0.1462	1.9547	0.1569	1.4062	0.0937
	11 (50)	3.0030	0.2763	1.8438	0.1419	1.9257	0.1524	1.3975	0.0922
	12 (55)	2.9383	0.2659	1.8273	0.1394	1.8935	0.1479	1.3968	0.0917
	13 (60)	2.9207	0.2680	1.8235	0.1414	1.8867	0.1492	1.4098	0.0942
	14 (65)	3.0702	0.2797	1.9131	0.1493	1.9765	0.1575	1.4801	0.1010
	15 (70)	3.2303	0.2939	2.0369	0.1624	2.0882	0.1694	1.5814	0.1130
	16 (75)	3.4260	0.3139	2.1954	0.1805	2.2264	0.1857	1.7130	0.1294

Organize Model Output

- Time Period
- Road Type
- Speed Bin
- County

```
=+IFERROR(IF(AND($C3="Douglas",$D3="Type_4"),VLOOKUP(U3,'County Lookup Tables'!$B$5:$AA$20,7,FALSE)*E3,IF(AND($C3="Douglas",$D3="Type_5"),VLOOKUP(U3,'County Lookup Tables'!$B$5:$AA$20,9,FALSE)*
E3,IF(AND($C3="Sarpy",$D3="Type_4"),VLOOKUP(U3,'County Lookup Tables'!$B$5:$AA$20,15,FALSE)*E3,IF(AND($C3="Sarpy",$D3="Type_5"),VLOOKUP(U3,'County Lookup Tables'!$B$5:$AA$20,17,FALSE)*E3,IF(AND(
$C3="CB",$D3="Type_4"),VLOOKUP(U3,'County Lookup Tables'!$B$5:$AA$20,23,FALSE)*E3,IF(AND($C3="CB",$D3="Type_5"),VLOOKUP(U3,'County Lookup Tables'!$B$5:$AA$20,25,FALSE)*E3,0)))))),0)
```

T U V W X Y Z AA AB AC AD AE AF AG AH AI AJ AK AL

ID	Dir	County	Type_Road	AB_V_Dist_T	BA_V_Dist_T	AB_V_Dist_T	BA_V_Dist_T	AB_V_Dist_T	BA_V_Dist_T	AB_V_Dist_T	BA_V_Dist_T	AB_Speed	BA_Speed	AB_Speed	BA_Speed	AB_Speed	BA_Speed	AB_Speed	BA_Speed
24	0	Douglas	Type_5	8.575837	12.611468	38.811022	38.185446	21.365535	17.88999	27.120367	26.710361	29.961305	29.654675	29.839244	29.851754	29.381056	29.760323	29.998822	29.998916
119	0	Douglas	Type_5	57.972666	84.951321	169.981103	182.059955	108.585845	127.443561	108.801745	109.733891	29.012401	27.76337	29.620965	29.835791	26.904782	27.758418	29.998302	29.999481
121	0	Douglas	Type_5	11.002207	8.761053	31.867828	12.322612	33.63194	15.806393	10.964038	4.392337	29.999985	29.999997	29.999994	30	29.999262	29.999994	30	30
330	0	Sarpy	Type_5	16.622398	13.351741	33.977015	17.882193	22.438266	23.430924	17.829081	13.354752	34.999959	34.999988	34.999998	35	34.999976	34.999968	35	35
1010	0	Douglas	Type_5	61.798855	83.048256	235.719729	279.828392	225.364686	171.251763	181.083631	105.978159	29.99878	29.994272	29.998199	29.995613	29.849668	29.965023	29.999976	30
1138	1	Douglas	Type_5	134.022944		385.177666		200.26269		139.884664		29.989816		29.996645		29.990121		30	
1749	0	Douglas	Type_5	28.810932	131.408018	120.47491	183.976759	216.727676	86.131496	102.745659	60.539345	34.999734	33.833798	34.999284	34.992426	33.165986	34.987386	34.999985	35.000001
2046	0	Douglas	Type_5	65.093899	252.4476	211.676548	375.575129	305.443697	194.559612	56.962049	45.44479	34.99797	31.621766	34.998833	34.96864	34.022147	34.914647	35	35
2084	0	Douglas	Type_5	5.39027	3.736227	8.907676	9.791113	4.53003	8.634458	3.559713	5.279569	34.99978	34.999967	34.999998	34.999996	34.99999	34.999656	35.000001	35.000001
2186	0	Douglas	Type_5	9.722413	13.610817	23.87471	31.463476	17.150268	24.860668	12.059994	21.726813	30	29.999998	30	30	29.999998	29.999993	30	30
2212	0	Douglas	Type_5	14.319318	24.621902	44.157371	20.426067	37.792647	27.211101	7.494424	14.269074	24.999986	24.999723	24.999993	25	24.999691	24.999946	25	25
2294	0	Douglas	Type_5	6.998964	7.116693	21.255762	26.229114	26.709611	34.356613	14.388964	1.073995	30	30	30	30	29.999931	29.999687	30	30
2505	1	Douglas	Type_4	982.882725		2335.589186		1542.549777		1069.103532		59.950537		59.994179		59.937986		59.999995	
2507	1	Douglas	Type_4	767.206872		2147.359892		1902.006239		1363.038854		59.99756		59.999275		59.96158		59.999996	
2738	1	Douglas	Type_5	104.23332		251.830376		108.032621		87.255868		29.999684		29.999959		29.999956		30	
2740	1	Douglas	Type_5	58.623039		433.609148		439.549076		204.158827		29.999965		29.997951		29.755086		29.999998	
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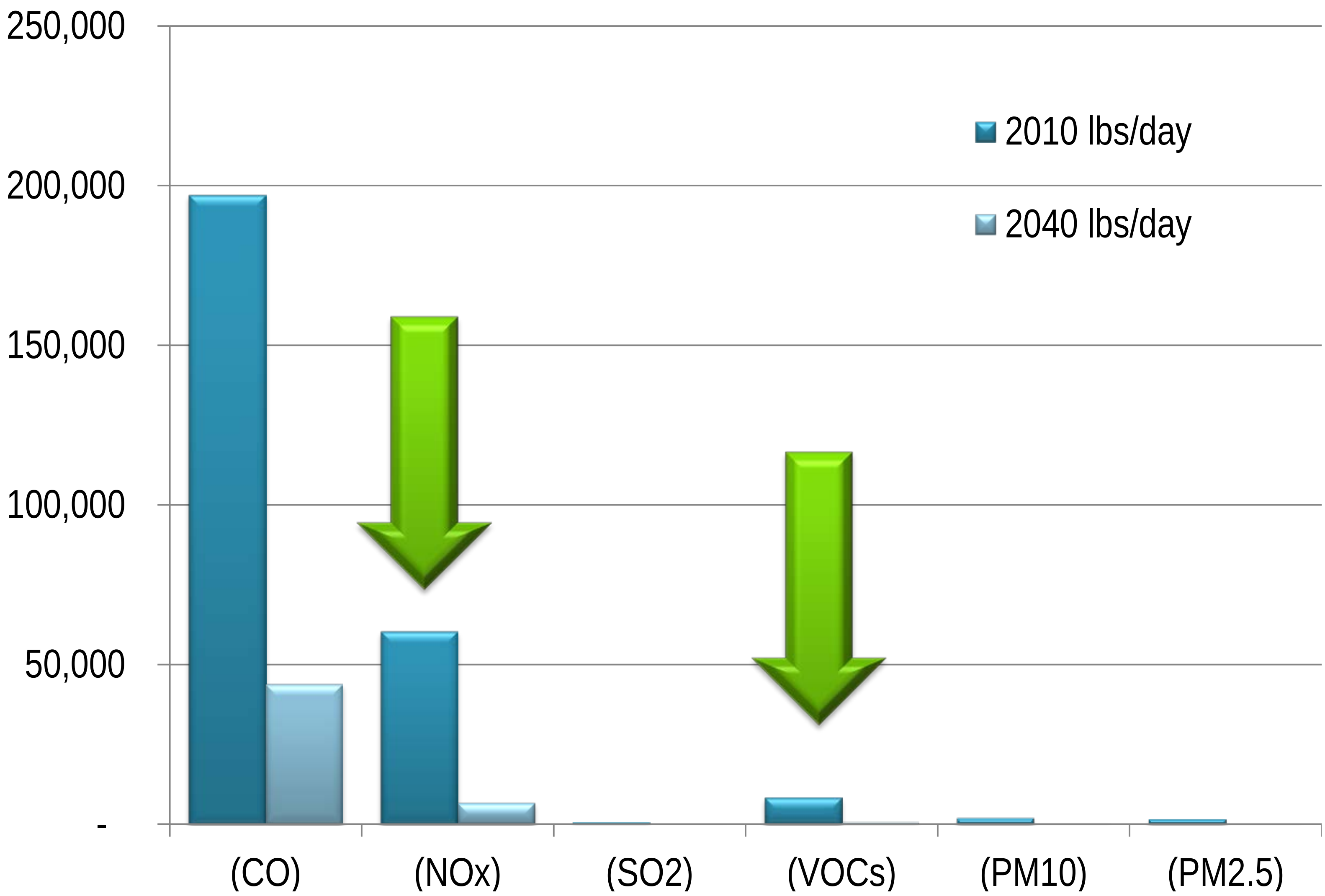
3203	0	Douglas	Type_5	95.57313	144.691465	184.456276	304.594851	247.968858	243.37852	111.480039	155.414238	29.9912	29.909572	29.999652	29.994461	29.800005	29.83075	30	29.999994
4095	0	Sarpy	Type_5	286.499315	163.165365	432.851016	390.952925	445.265522	274.008566	251.903259	331.768814	44.962846	44.997965	44.999625	44.999814	44.95508	44.996732	45	44.999997
4182	0	Sarpy	Type_5	67.139799	1.930494	11.891702	2.585053	7.782949	82.688968	0	0.994515	24.998595	24.999999	24.999999	24.999999	24.999999	24.999323	24.999999	24.999999
4187	0	Sarpy	Type_5	485.784392	199.918917	363.53924	258.273787	465.018029	543.765311	262.580897	285.158371	54.105341	54.992255	54.999805	54.999966	54.918927	54.812815	54.999999	54.999999

Air Quality Results



4

FINAL THOUGHTS

Direction for PMs at MAPA

Final Thoughts

MPO Process Consideration

- ONGOING MONITORING
- CONTINUING EVOLUTION

Project Application

- SCENARIO COMPARISON
- WEIGHTING MULTIPLE PMs

QUESTIONS?

THANK YOU