Appendices

1. CA0602 Traffic Forecast Plan
2. Traffic Technical Report
3. Vissim Model Methodology Report
4. Safety Technical Report
5. Level 2B Assessment
6. Transit Report
7. Traffic Forecast Tables
8. Mobility Exhibits
9. Measures of Effectiveness

Appendix 1: CA0602 Traffic Forecast Plan

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

Connecting Arkansas Program (CAP)

Traffic Count Plan, Traffic Projection Plan and Traffic Forecast

CA0602 – I-30 / I-40 Widening & Rehabilitation

Interstate 530 to Highway 67

January 27, 2015

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APPENDIX

Electronic Appendix of Data Submitted to AHTD

1. Base Traffic Counts
2. ESAL Calculations
3. Forecast Data Spreadsheets
4. Synchro Files

CHAPTER 1
INTRODUCTION AND OVERVIEW

With the passage of the temporary Arkansas one-half cent sales tax program in November 2012, the Arkansas State Highway and Transportation Department (AHTD) will finance an accelerated $1.8 billion four-lane State Highway Construction and Improvement Program (Program) that will be completed within approximately ten years called - Connecting Arkansas Program (CAP).

As part of the CAP, traffic forecasting was performed for each project. This report documents the traffic forecasting process, including a project description, traffic count and projection plan, and the traffic forecast. The report is being submitted to the AHTD in two Phases. Phase 1, which consisted of Chapters 1 through 4, was submitted and approved in May 2014. Phase 2, which consists of Chapters 5 and 6, is being submitted for approval.

Chapter 1 – Introduction and Overview
Chapter 2 – Project Description
Chapter 3 – Traffic Count Plan
Chapter 4 – Traffic Projection Plan
Chapter 5 – Traffic Forecast
Chapter 6 – Equivalent Single Axle Load Forecast

The primary resource that was used to define the Traffic Count and Projection Plans is the AHTD *Traffic Monitoring System Handbook* (November 2013). This handbook offers procedures on traffic monitoring practices and techniques used by AHTD staff and consultants providing traffic information for project design, planning studies, and environmental documentation. This handbook provides instructions for Traffic Forecasting, Turning Movement Count Forecasting, Equivalent Single Axle Loading (ESAL) Forecasting, Testing and Certification Procedures for Equipment, and development of Highway Performance Monitoring System data.

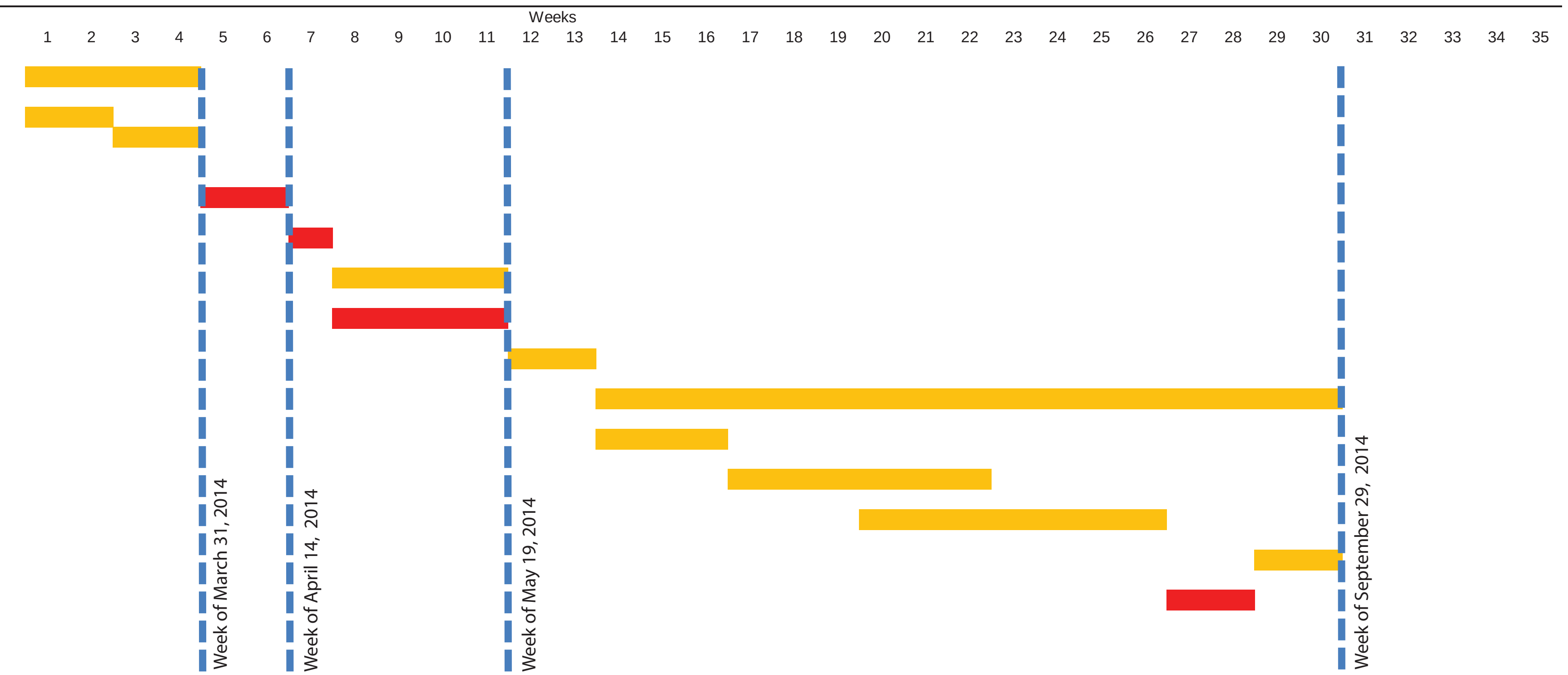
Exhibit 1 shows the traffic forecasting schedule for this project. This schedule indicates that data collection was completed the week of May 19, 2014.

EXHIBIT 1

CA0602 - I-30/I-40 Widening & Rehabilitation
Interstate 530 to Highway 67
Traffic Forecasting Schedule

AHTD
Connecting Arkansas Program (CAP)
Traffic Forecasting Schedule
CA0602 - I-30/I-40 Widening & Rehabilitation, Interstate 530 to Highway 67

Task Number	Task Name
1	**Prepare and Submit Traffic Count Plan and Traffic Projection Plan**
	1A Develop Traffic Count Plan
	1B Develop Traffic Projection Plan
2	**AHTD Review of Traffic Count Plan and Traffic Projection Plan**
3	**Assign and Schedule Traffic Counts**
4	**Initiate Traffic Projection Development (Collect Information)**
5	**Collect and Provide Raw Counts to Traffic Manager**
6	**Review Traffic Counts**
7	**Develop and Submit Traffic Projections and Tech Memo**
	7A Future No-Build Forecast
	7B Future Build Forecast
	7C Draft Documentation (AHTD and Metroplan)
	7D Final Documentation
8	**AHTD Review of Tech Memo**
9	**Validation of AHTD's and/or CARTS 2040 Models (When Complete)**



Note: Red tasks are AHTD tasks

September 2014

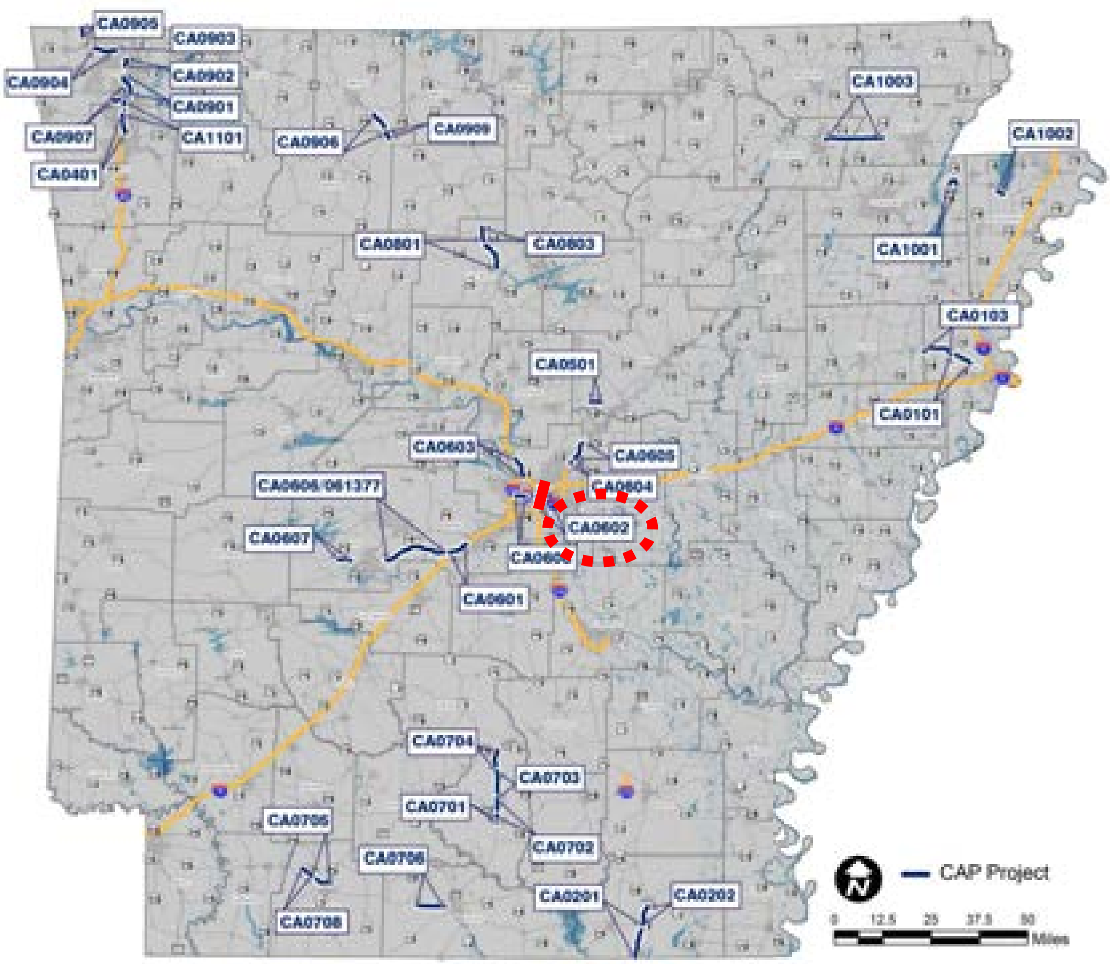
CHAPTER 2

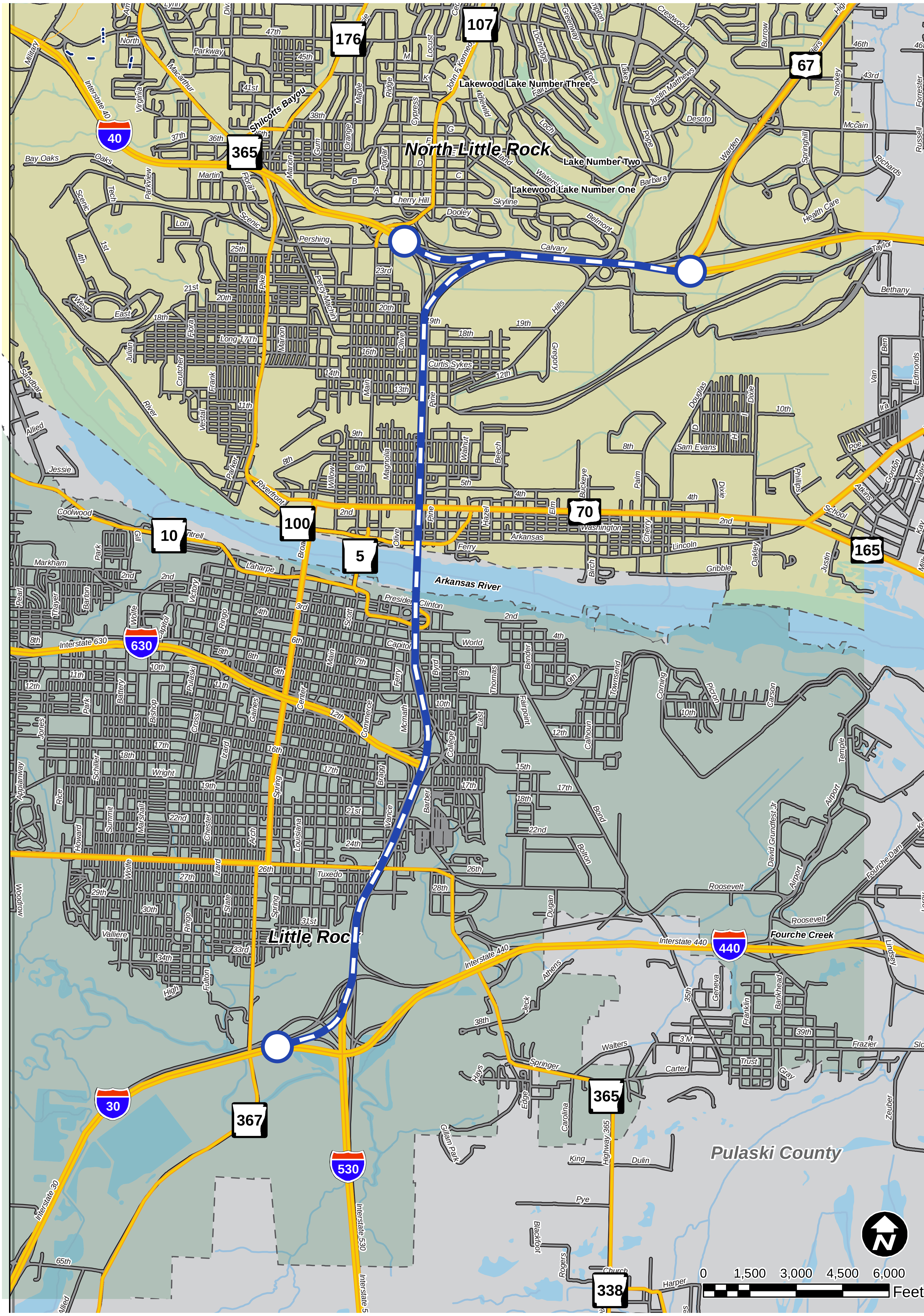
PROJECT DESCRIPTION

CA0602 – I-30 / I-40 Widening & Rehabilitation - Interstate 530 to Highway 67 will widen, reconstruct, and rehabilitate portions of Interstates 30 and 40 and will include widening the Interstate 30 Bridge over the Arkansas River. The corridor will extend generally from the Interstate 30 interchange with Interstates 440 and 530 north to Highway 67 in Pulaski County between Little Rock and North Little Rock.

Figure 1 shows the location of the project within the state. Exhibit 2 provides a more detailed description of the project and the surrounding roadway network.

Figure 1
CAP Statewide Projects including
CA0602 – I-30 / I-40 Widening - Interstate 530 to Highway 67





CA0602- I-30/I-40 Widening & Rehabilitation
Interstate 530 to Highway 67
Project Location

EXHIBIT 2

September 2014

CHAPTER 3
TRAFFIC COUNT PLAN

The following chapter outlines the traffic count plan for the CA0602 – I-30 / I-40 Widening & Rehabilitation, Interstate 530 to Highway 67.

Approach

The general traffic count plan approach collected historical and existing traffic volumes within the project study area. Traffic counts were collected along the highway mainline, slip ramps and the interchange ramp terminals. Both daily and peak hour traffic counts were collected.

- Historical traffic data was collected from the AHTD website
- Current traffic data was collected by the AHTD
  - Traffic data collection methodology followed the AHTD guidelines
  - 48-hour counts were collected on both ends and in the middle of the corridor
  - Turning Movement Counts (TMC) were collected at appropriate locations defined in the following section.

Data Needs from AHTD

The data needs for the traffic count plan are listed below and shown on Exhibit 3. Traffic counts were collected based on the methodology outlined in the AHTD *Traffic Monitoring System Handbook* (November 2013). Traffic Counts were collected one interchange beyond the proposed work interchange in most cases in preparation for an Interchange Justification Report.

A. 48-hour mainline counts at both ends and near the middle of the project were collected. Counts were performed in 15-minute increments and include vehicle classification and speed (Shown as “A” on Exhibit 3).
   - A1 – I-40 between N Hills Boulevard Interchange and Highway 67 Interchange
   - A2 – I-30 between Broadway Street Interchange and Cantrell Road/Clinton Avenue Interchange (note: this count was performed north of the Arkansas River Bridge)
   - A3 – I-30 between Roosevelt Road Interchange and I-440 Interchange
B. Turning Movement Counts were collected at the locations listed below (Shown as “B” on Exhibit 3).
   - B1 – Highway 67 SB Ramps/McCain Boulevard
   - B2 – Highway 67 NB Off Ramp/Landers Road

- B3 – Landers Road/McCain Boulevard
- B4 – I-40/Springhill Drive Ramp Terminal
- B5 – I-40 EB Off Ramp & Frontage Road/Hills Boulevard
- B6 – I-40 WB Off Ramp/JFK Boulevard
- B7 – I-40 WB On Ramp/JFK Boulevard
- B8 – I-40 EB Off Ramp & Access Road/JFK Boulevard
- B9 – JFK Boulevard & N. Main St./Pershing Boulevard
- B10 – I-30 WB Ramps/Curtis Sykes Drive
- B11 – I-30 EB Ramps/Curtis Sykes Drive
- B12 – Bishop Lindsey Avenue/N Locust Street
- B13 – Bishop Lindsey Avenue/N Cypress Street
- B14 – Broadway Street/N Locust Street
- B15 – Broadway Street/N Cypress Street
- B16 – Broadway Street/Riverfront Park Drive
- B17 – Broadway Street/N Poplar Street
- B18 – Cumberland Street/3rd Street
- B19 – Cumberland Street/2nd Street
- B20 – Cumberland Street/Markham Street
- B21 – Scott Street/2nd Street
- B22 – 2nd Street/I-30 Frontage Road
- B23 – 3rd Street/I-30 Frontage Road
- B24 – 3rd Street/Mahlon Martin Street
- B25 – 2nd Street/Mahlon Martin Street
- B26 – 6th Street/I-30 WB Frontage Road
- B27 – 6th Street/I-30 EB Frontage Road
- B28 – 9th Street/I-30 WB Frontage Road
- B29 – 9th Street/I-30 EB Frontage Road
- B30 – I-630 WB Off Ramp/Cumberland Street
- B31 – I-630 EB On Ramp/Cumberland Street
- B32 – College Street/15th Street
- B33 – Roosevelt Road/I-30 EB Frontage Road
- B34 – Roosevelt Road/I-30 WB Frontage Road
- B35 – Roosevelt Road/Main Street

- B36 – Roosevelt Road/Confederate Boulevard
- B37 – Springer Boulevard/I-440 EB Ramps
- B38 – Springer Boulevard/I-440 WB Ramps
- B39 – Dixon Road/Willie Thomas Road
- B40 – Dixon Road/I-530 SB Ramps
- B41 – Shamburger Lane/I-530 NB On Ramp
- B42 – Willie Thomas Road/I-530 NB Off Ramp
- B43 – 65th Street/I-30 WB Ramps
- B44 – 65th Street/I-30 EB Ramps & Frontage Road

The B counts listed above were collected during the same month (May 2014), with certain areas being grouped and counted during different weeks. Counts B1 through B11 and B13 were counted on May 5 and 6. Counts B14 through B17, B22 through B26, B28 and B29 were counted on May 6 and 7. Counts B12, B18 through B20, B27 and B30 through B36 were counted on May 7 and 8. Counts B21 and B37 through B44 were counted on May 12 and 13. The C counts listed above were collected from May 7 through May 20, 2013.

C. Supplementary 24-hour counts. Counts were performed in 15-minute increments and vehicle classification was collected (Shown as “C” on Exhibit 3). These counts were needed on ramps where no ramp terminal exists due to free-flow travel conditions.

- C1 – US 67 NB Off Ramp to McCain Boulevard EB
- C2 – Jacksonville Boulevard SB to US 67 SB On-Ramp

The counts below were previously counted in 2012 by AHTD and made available for use on this project.

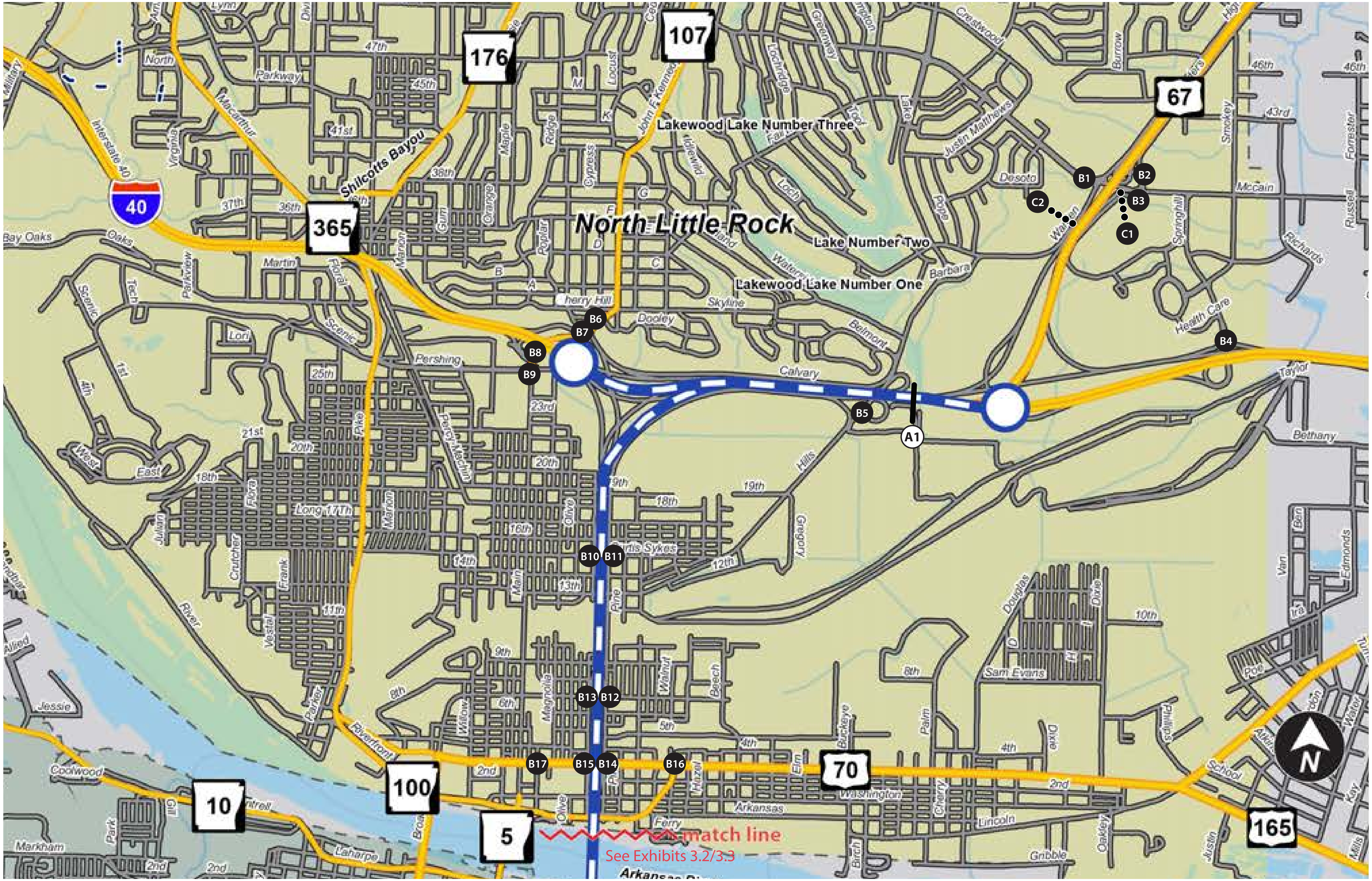
- C3 – I-40 WB to NB US 67/167 Ramp
- C4 – I-40 EB to NB US 67/167 Ramp
- C5 – US 67/167 SB to I-40 WB Ramp
- C6 – US 67/167 SB to I-40 EB Ramp
- C7 – Hills Blvd NB to I-40 WB Loop Ramp
- C8 – Hills Blvd SB to I-40 WB On Ramp
- C9 – Calvary RD WB to I-40 WB Slip Ramp
- C10 – I-40 EB Slip Ramp to Hills Blvd Loop Ramp
- C11 – EB Frontage Rd to Hills Blvd SB Ramp

- C12 – JFK Blvd NB to I-40 WB Loop Ramp
- C13 – JFK Blvd SB to I-40 EB Loop Ramp
- C14 – JFK Blvd SB to I-40 WB On Ramp
- C15 – I-40 EB Off Ramp to JFK Blvd.
- C16 – I-40 WB Off Ramp to JFK Blvd.
- C17 - I-30 EB Off Ramp to JFK Blvd.
- C18 - I-40 WB to I-40 WB
- C19 - I-40 EB to I-40 EB
- C20 - I-40 EB to I-30 WB
- C21 - I-30 EB to I-40 WB
- C22 - I-40 WB to I-30 WB
- C23 - I-30 EB to I-40 EB
- C24 - I-30 WB Off Ramp to Curtis Sykes Dr.
- C25 - I-30 EB Off Ramp to Curtis Sykes Dr.
- C26 - Curtis Sykes Dr to I-30 EB On Ramp
- C27 - Curtis Sykes Dr to I-30 WB On Ramp
- C28 - I-30 WB Off Ramp to Bishop Lindsey
- C29 - Bishop Lindsey to I-30 EB On Ramp
- C30 - Broadway to I-30 WB On Ramp
- C31 - I-30 EB Off Ramp to Broadway
- C32 - Cumberland to I-30 EB on ramp after fork
- C33 - I-30 EB off ramp to Cumberland between 2nd St loop ramp and I-30 WB off ramp
- C34 - I-30 WB Frontage Rd to I-30 EB On-Ramp Loop
- C35 - I-30 WB off ramp between 2nd St loop ramp and 2nd St slip ramp
- C36 - Cumberland to I-30 WB on ramp after fork
- C37 - 2nd St slip ramp from I-30 off ramps
- C38 - Cumberland NB slip ramp to I-30 on ramps
- C39 - I-30 WB Off Ramp to 6th St.
- C40 - 6th St to I-30 EB On Ramp
- C41 - I-30 WB Off Ramp to 9th St.
- C42 - I-30 WB to I-630 WB Ramp
- C43 - McGowan St SB to I-30 WB On-Ramp

- C44 - I-30 EB Off Ramp to I-30 EB Frontage Rd.
- C45 - I-630 EB to I-30 EB Ramp
- C46 - I-30 EB to I-630 WB Ramp
- C47 - I-630 EB Off Ramp to College St.
- C48 - I-630 EB to I-30 WB Ramp
- C49 - I-30 WB Off Ramp to Roosevelt Rd.
- C50 - Roosevelt Rd to I-30 EB On Ramp
- C51 - I-30 EB Off Ramp to Roosevelt Rd.
- C52 - Roosevelt Rd to I-30 WB On Ramp
- C53 - I-440 WB to I-30 EB Ramp
- C54 - I-440 WB to I-30 WB Ramp
- C55 - I-440 WB to I-530 SB Ramp
- C56 - I-30 WB to I-30 WB
- C57 - I-30 EB to I-30 EB
- C58 - I-530 NB to I-30 WB Ramp
- C59 - I-30 WB to I-440 EB Ramp
- C60 - I-530 NB to I-440 EB Ramp
- C61 - I-30 EB to I-530 SB Ramp
- C62 - I-30 EB to I-440 EB Ramp

EXHIBIT 3.1

CA0602- 1-30/I-40 Widening & Rehabilitation
Interstate 530 to Highway 67
Traffic Count Plan - Week A



Note: See Traffic Count Plan for count location descriptions.

Legend — 48-hour counts •••• 24-hour counts

Ⓐ **Mainline Count**
Ⓑ **Turning movement count**
Ⓒ **Ramp count**

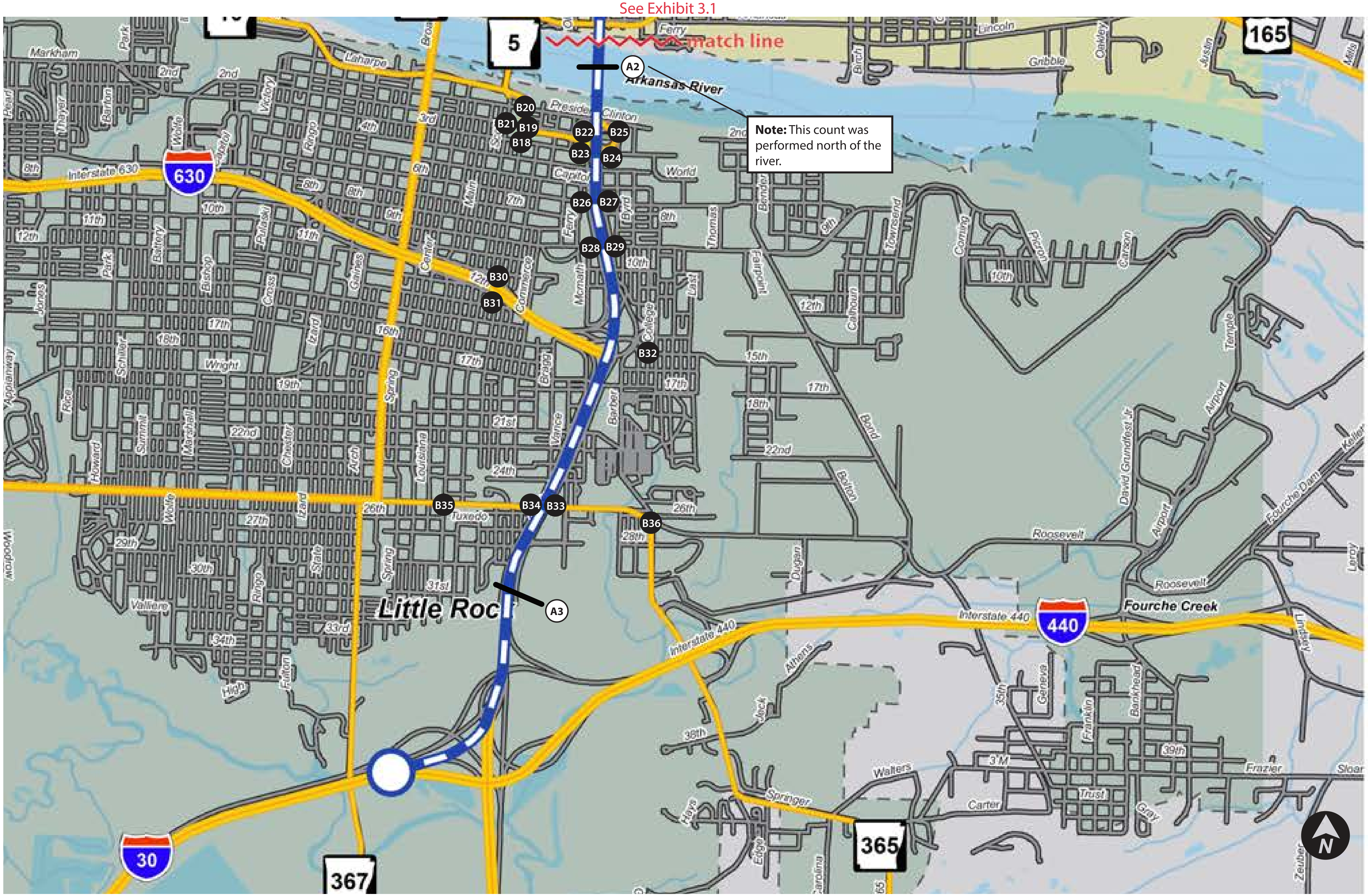
Proposed Work

CONNECTING ARKANSAS PROGRAM CAP

September 2014

EXHIBIT 3.2

CA0602- I-30/I-40 Widening & Rehabilitation Interstate 530 to Highway 67 Traffic Count Plan - Week B



Note: See Traffic Count Plan for count location descriptions.

Legend

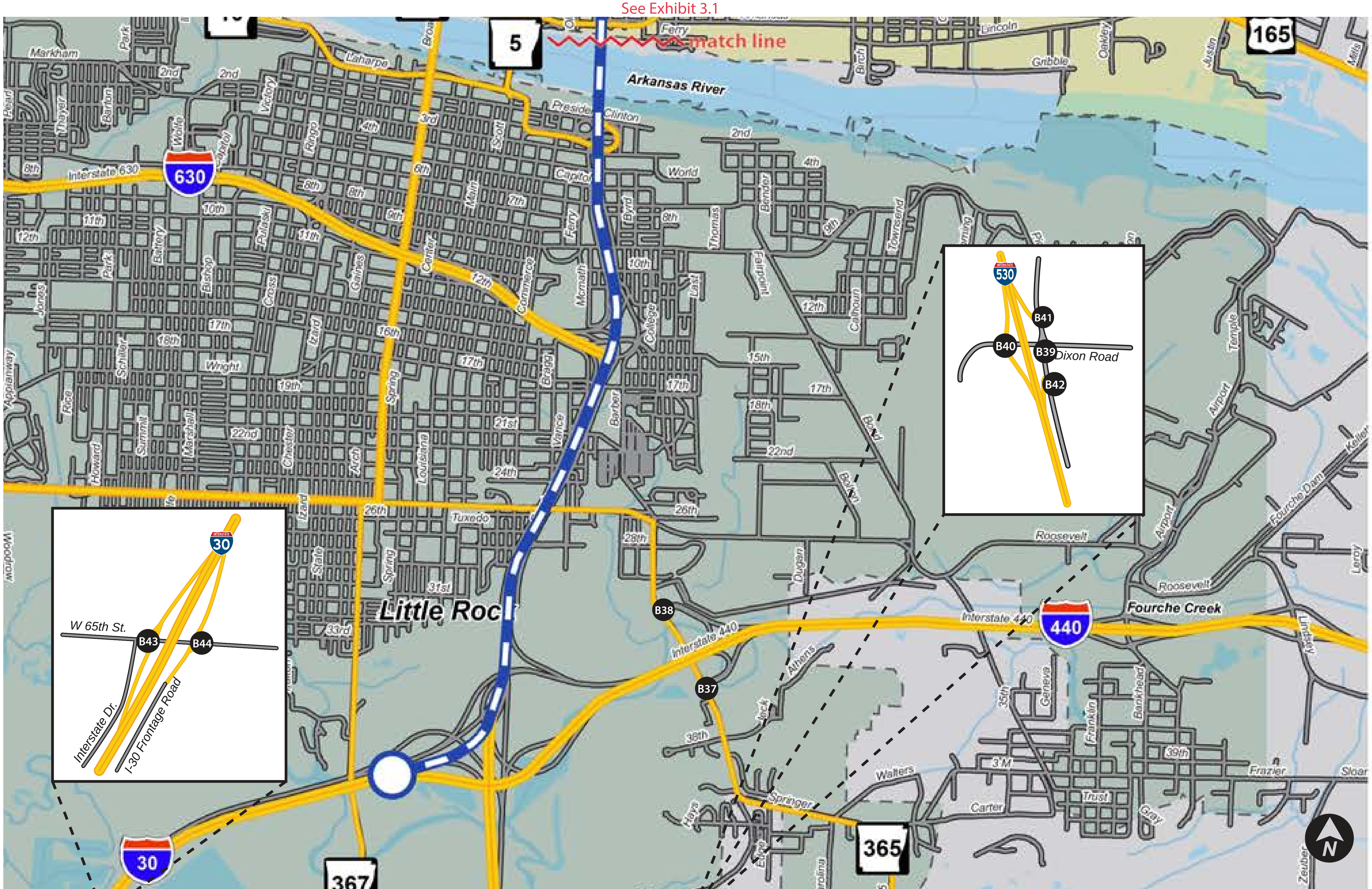
- 48-hour counts
- 24-hour counts
- (A) Mainline Count
- (B) Turning movement count
- (C) Ramp count
- Proposed Work

CONNECTING ARKANSAS PROGRAM CAP

September 2014

EXHIBIT 3.3

CA0602- 1-30/I-40 Widening & Rehabilitation
Interstate 530 to Highway 67
Traffic Count Plan - Week C



I-30 & 65th Street

I-530 & Dixon Road

Note: See Traffic Count Plan for count location descriptions.

Legend — 48-hour counts •••• 24-hour counts

Ⓐ **Mainline Count**
Ⓑ **Turning movement count**
Ⓒ **Ramp count**

Proposed Work

CONNECTING ARKANSAS PROGRAM CAP

September 2014

CHAPTER 4

TRAFFIC PROJECTION PLAN

The following section outlines the traffic projection plan for the CA0602 – I-30 (I-40) Widening & Rehabilitation, Interstate 530 to Highway 67 project.

Approach

The general traffic projection plan approach is to use available information to develop a 20-year forecast. The forecasts are based on historical trends, State and MPO travel demand model data (where available), previous forecasts from other studies, capacity constraints, and discussions with local planning partners of known projects that could impact traffic forecasts.

The following steps were taken to gather the data necessary for developing the forecast:

- Site visit to collect geometric information (number of lanes, access points, etc.)
- Obtained CARTS Travel Demand Model and coordinated with Metroplan and the AHTD
- Met with stakeholders to understand future land use
- Collected historical traffic counts from the AHTD website
- Used traffic data from the AHTD (truck percentages, seasonal factors, K factor, D factor, peak hour factor, etc.)
- Collected previous studies
    - Draft Final CARTS Area Freeway Study Phase 1 and 2

A graph containing both historical traffic and forecasted traffic profiles from available travel models was developed in Excel. Other published study forecasts were also included in the graph. A regression line based on historical data was also shown. LOS E capacity will be added to the graph to show the theoretical constraints of the roadway. Figure 2 is an example of what a forecast graph looks like. Based on the information above and meetings with the planning partners to understand future land use, letting, opening and design year projections were developed as shown in Table 1. Equivalent Single Axle Load (ESAL) calculations will also be performed for the letting year.

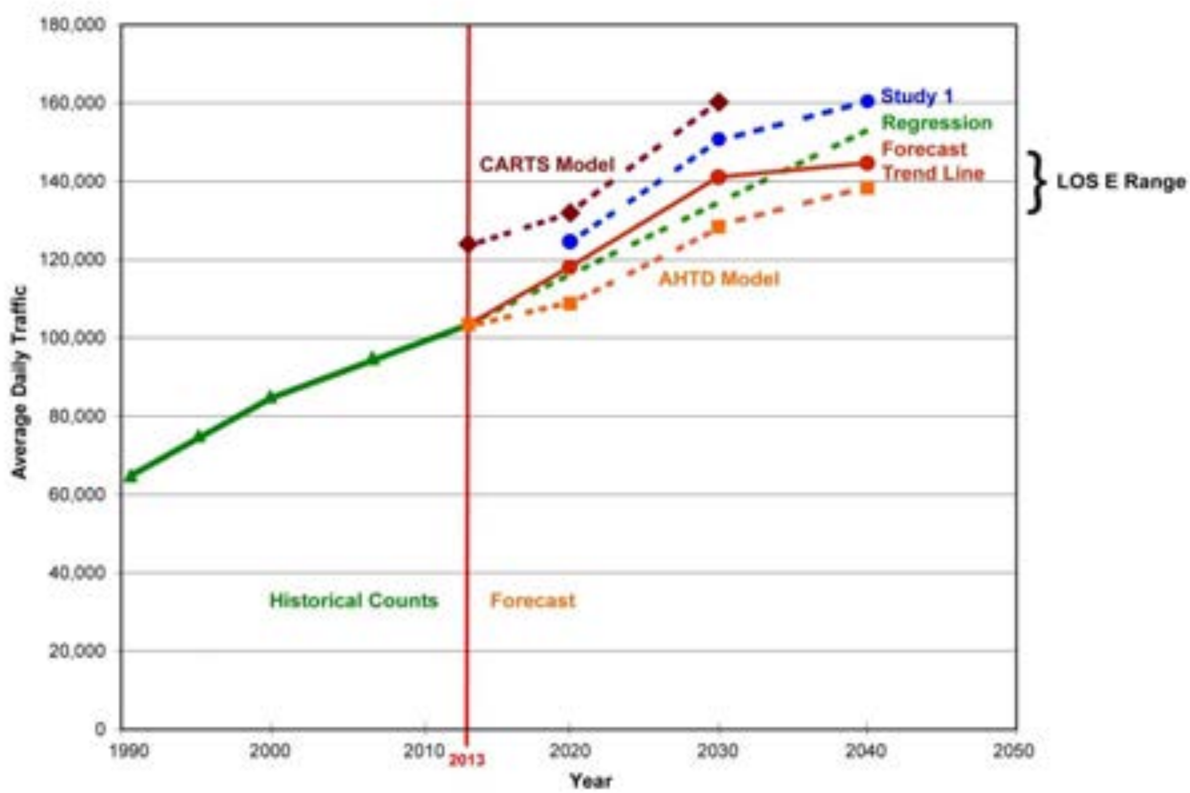
Table 1
CA0602 – I-30 / I-40 Widening & Rehabilitation, Interstate 530 to Highway 67
Letting, Opening and Design Years

Classification	Year
Letting Year[1]	2018
Opening Year	2021
Design Year	2041

1 Only used for EASL calculations in Chapter 6

All of the information included in the forecast graph, including the travel demand models, are tools in the forecasting toolbox and require engineering judgment to develop the final forecasts. The projected traffic growth was applied to the base year counts collected. Maps of forecasted peak hour turning movements were developed.

Figure 2
Example Daily Traffic Forecast Graph



Note: 2040 is the forecasted design year for CA0602.

Data Needs from AHTD

The data used for the traffic projection plan are listed below.

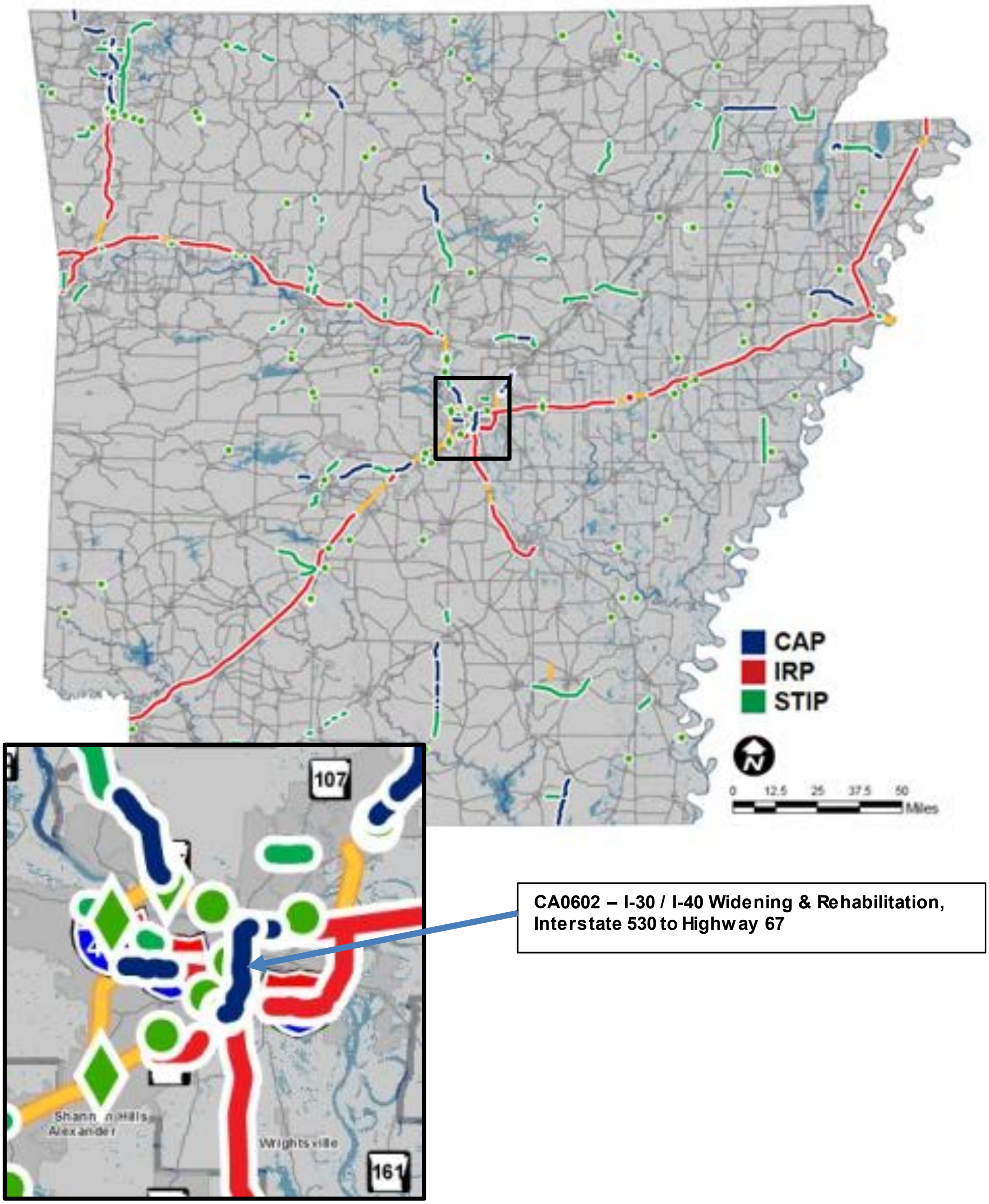
- CARTS Travel Demand Model from Metroplan
- Requested Traffic Data
- Previous Studies
    - Draft Final CARTS Area Freeway Study, Phase 1 and 2

Communications Outreach

In order to gain a comprehensive understanding of traffic growth potential, meetings with the Cities of Little Rock and North Little Rock, Metroplan and AHTD occurred during the CA0602 I-30 Planning and Environmental Linkages (PEL) study to present the project and purpose of the traffic forecasting task, understand the population and employment growth projections in the study area, and understand the local factors (including planned and committed CAP, IRP and STIP projects, as shown in Figure 3) that could affect land use and traffic growth within and outside the study area.

Figure 3

CAP, IRP and STIP Statewide Project Map



CHAPTER 5

TRAFFIC FORECAST

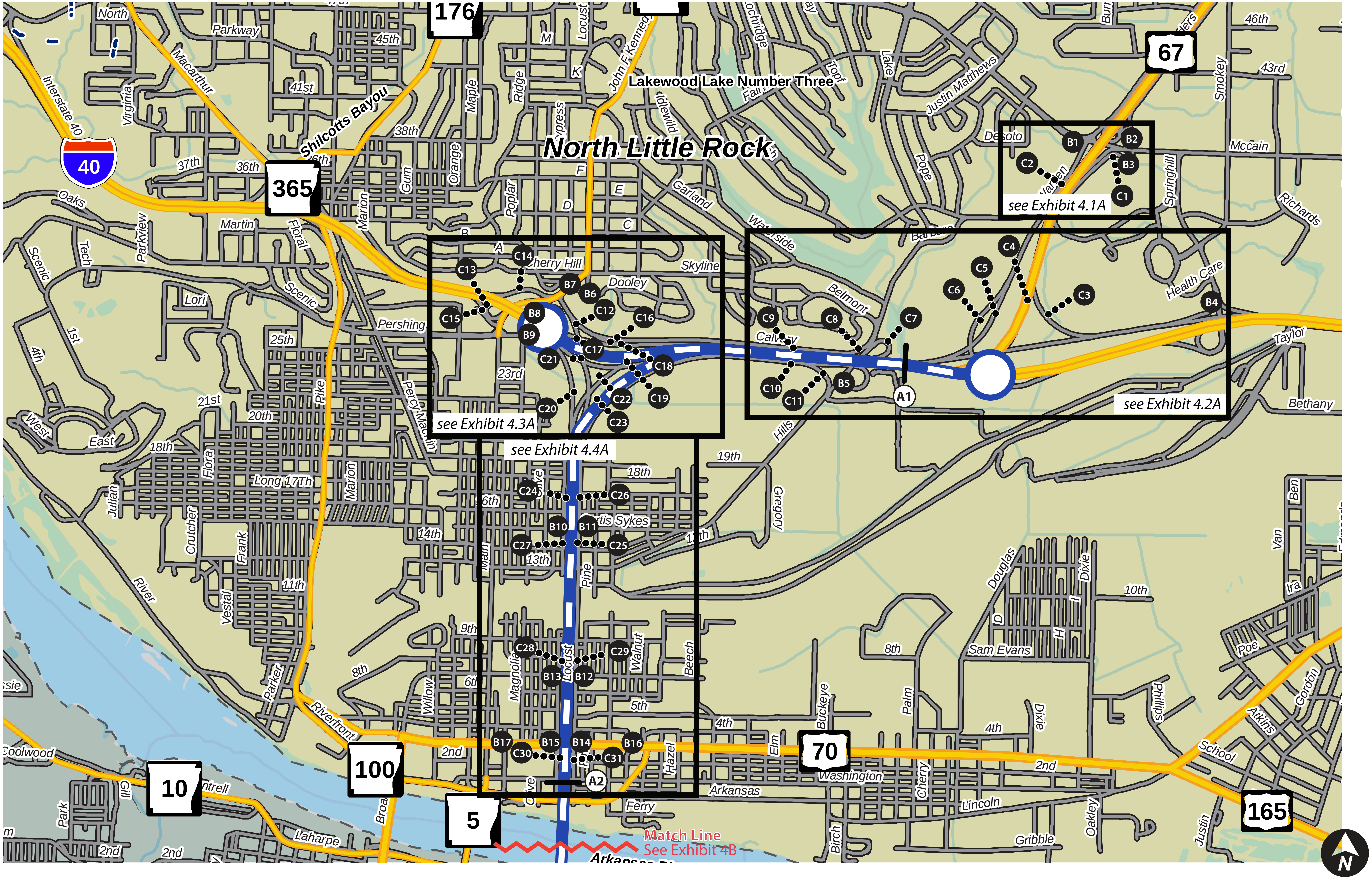
The following section outlines the traffic forecast for the CA0602 – I-30 / I-40 Widening & Rehabilitation, Interstate 530 to Highway 67 project.

Existing Traffic Counts

Existing traffic counts at the locations identified in Exhibit 3 were collected during the weekdays of May 5^{th} through 13^{th} 2014, for 24 and 48 hour periods. Wherever possible, data collected was summarized using days in the middle of the work week (Tuesday, Wednesday, or Thursday). Weather conditions were noted as clear on all days, except for May 12 and 13 when no data was given.

Existing traffic counts are shown on Exhibits 4A and 4B. Exhibit 4A shows the existing counts north of the Arkansas River and 4B shows the counts south of the river. Each exhibit has subsequent detail sheets. Existing traffic counts are the baseline for the traffic forecast. Future traffic volumes were grown from existing base traffic counts. No inconsistencies were found between the traffic counts collected by AHTD and the historical counts used to create the forecasts.

EXHIBIT 4A



CA0602 - I-30/I-40
Widening and Rehabilitation
Interstate 530 to Highway 67
Existing 2014 Traffic Counts

January 2015

Legend

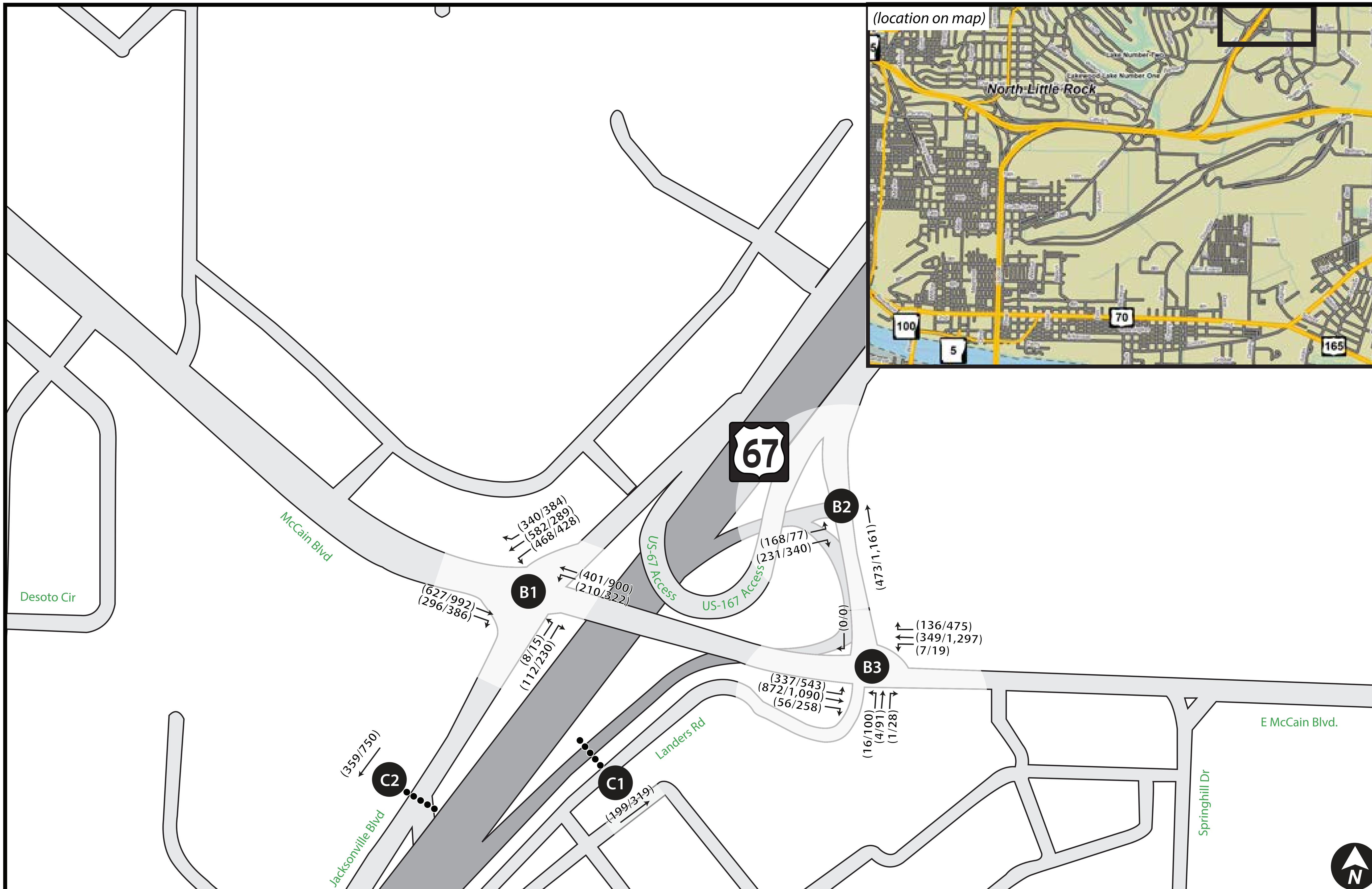
— 48-hour counts
•••• 24-hour counts

Ⓐ Mainline Count
Ⓑ Turning movement count
Ⓒ Ramp count

Proposed Work

EXHIBIT 4.1A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Existing 2014 Traffic Counts



January 2015

Legend

48-hour counts
••••• 24-hour counts

Ⓐ Mainline Count
Ⓑ Turning movement count
Ⓒ Ramp count

(AM/PM) Traffic Counts
(AM/PM) Truck Percent
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

[Intersection and Mainline Volumes shown are raw counts taken May 2014]
[Ramp Volumes shown are raw counts taken November 2012]

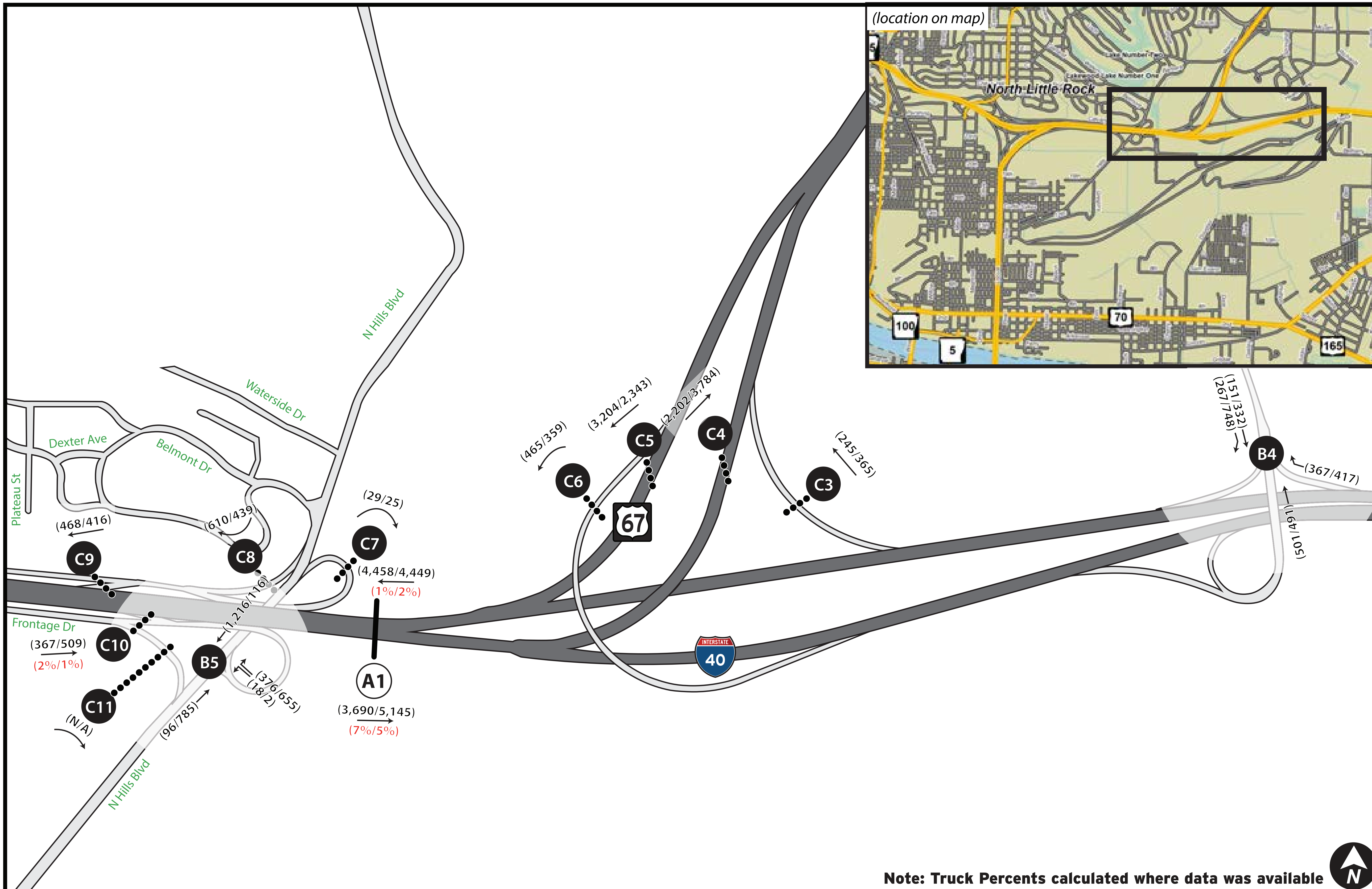


EXHIBIT 4.2A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Existing 2014 Traffic Counts

January 2015

Legend

48-hour counts ••••• 24-hour counts

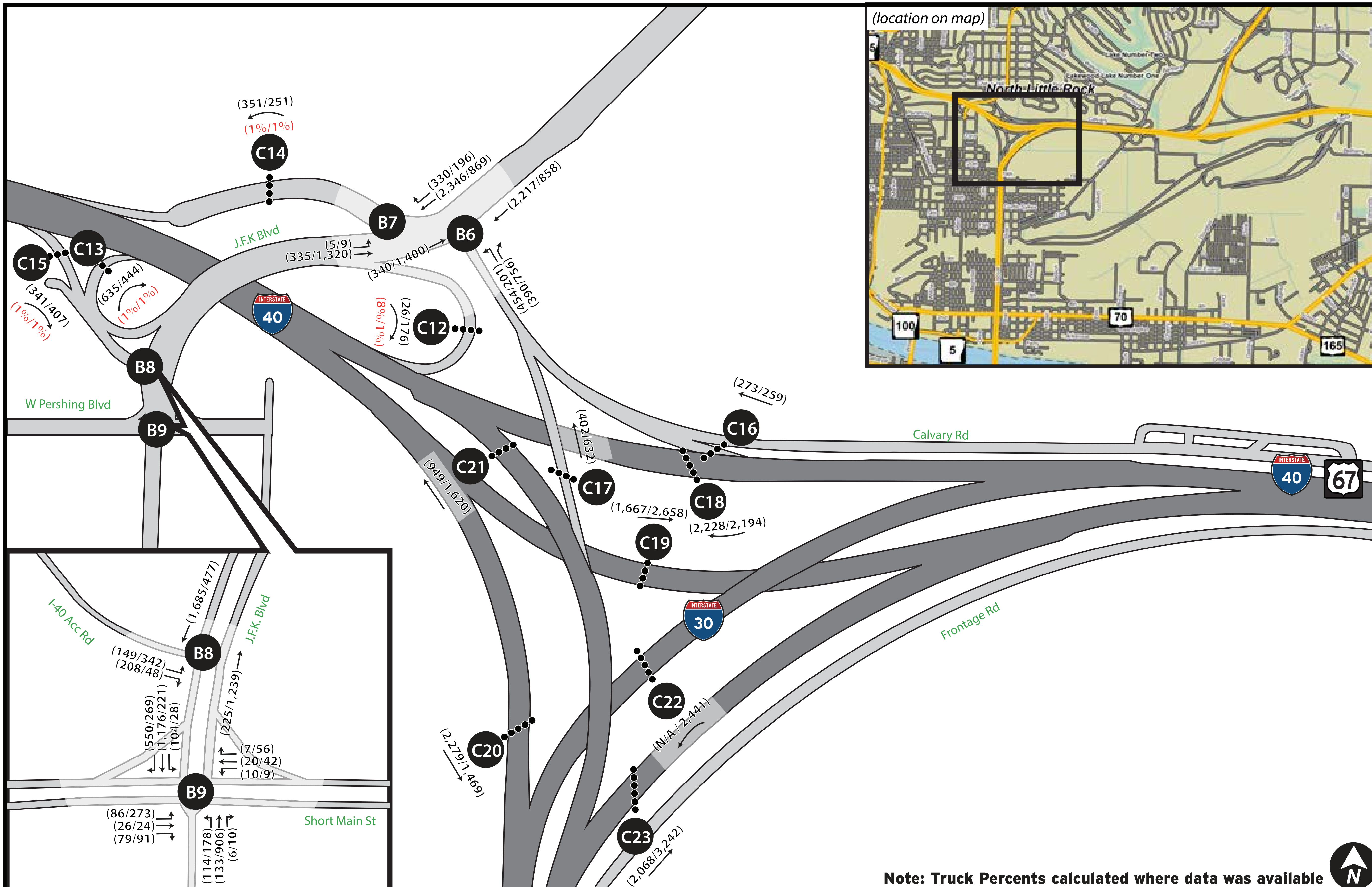
A Mainline Count
B Turning movement count
C Ramp count

(AM/PM) Traffic Counts
(AM/PM) Truck Percent
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

[Intersection and Mainline Volumes shown are raw counts taken May 2014]
[Ramp Volumes shown are raw counts taken November 2012]

EXHIBIT 4.3A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Existing 2014 Traffic Counts



Note: Truck Percents calculated where data was available

Legend

48-hour counts

24-hour counts

(A) Mainline Count

(B) Turning movement count

(C) Ramp count

(AM/PM) Traffic Counts

(AM/PM) Truck Percent

Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

[Intersection and Mainline Volumes shown are raw counts taken May 2014]

[Ramp Volumes shown are raw counts taken November 2012]

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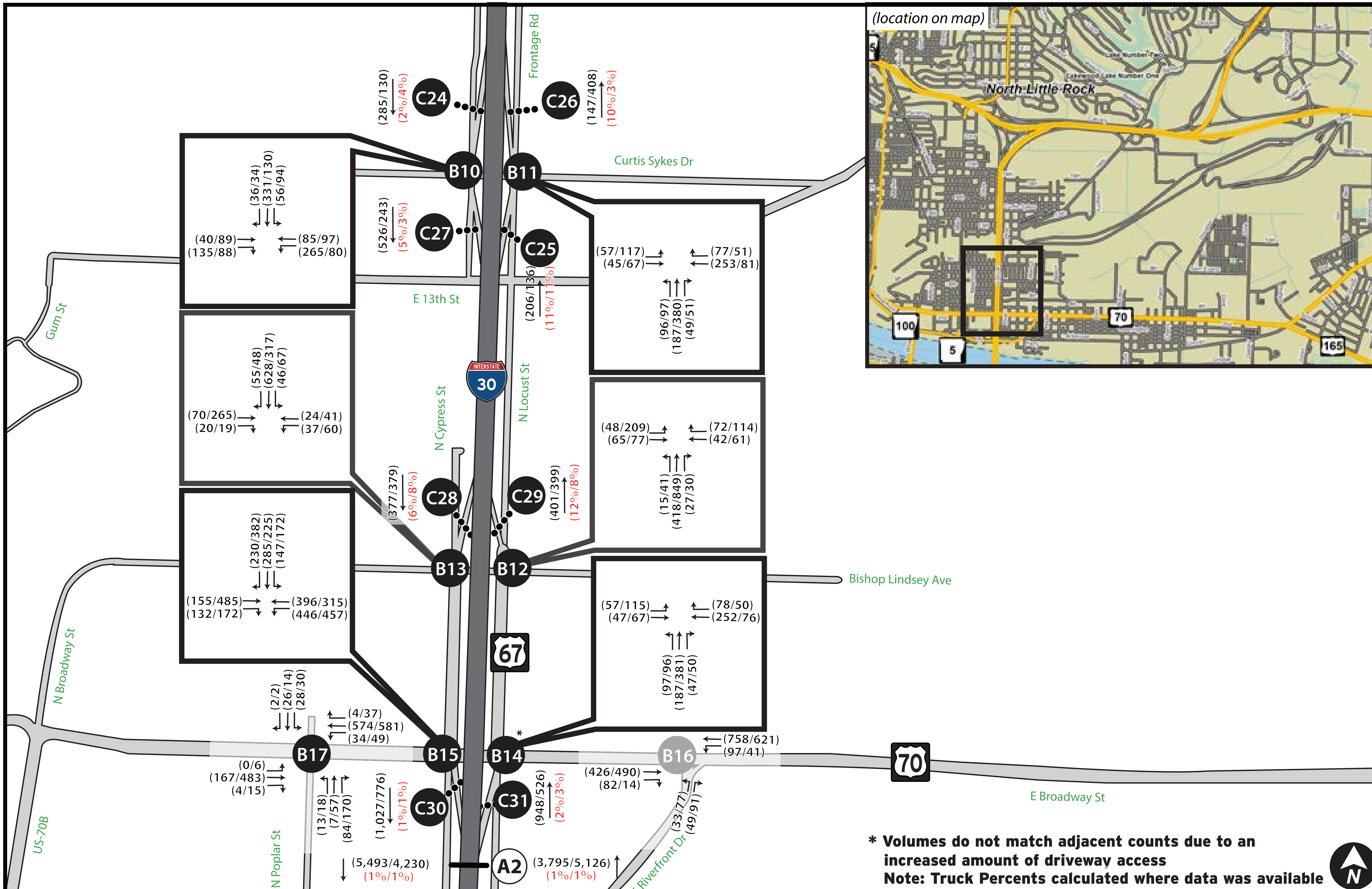
January 2015

EXHIBIT 4.4A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Existing 2014 Traffic Counts



* Volumes do not match adjacent counts due to an increased amount of driveway access

Note: Truck Percents calculated where data was available

Legend

48-hour counts ••••• 24-hour counts

(A) Mainline Count
(B) Turning movement count
(C) Ramp count

(AM/PM) Traffic Counts [Intersection and Mainline Volumes shown are raw counts taken May 2014]

(AM/PM) Truck Percent [Ramp Volumes shown are raw counts taken November 2012]

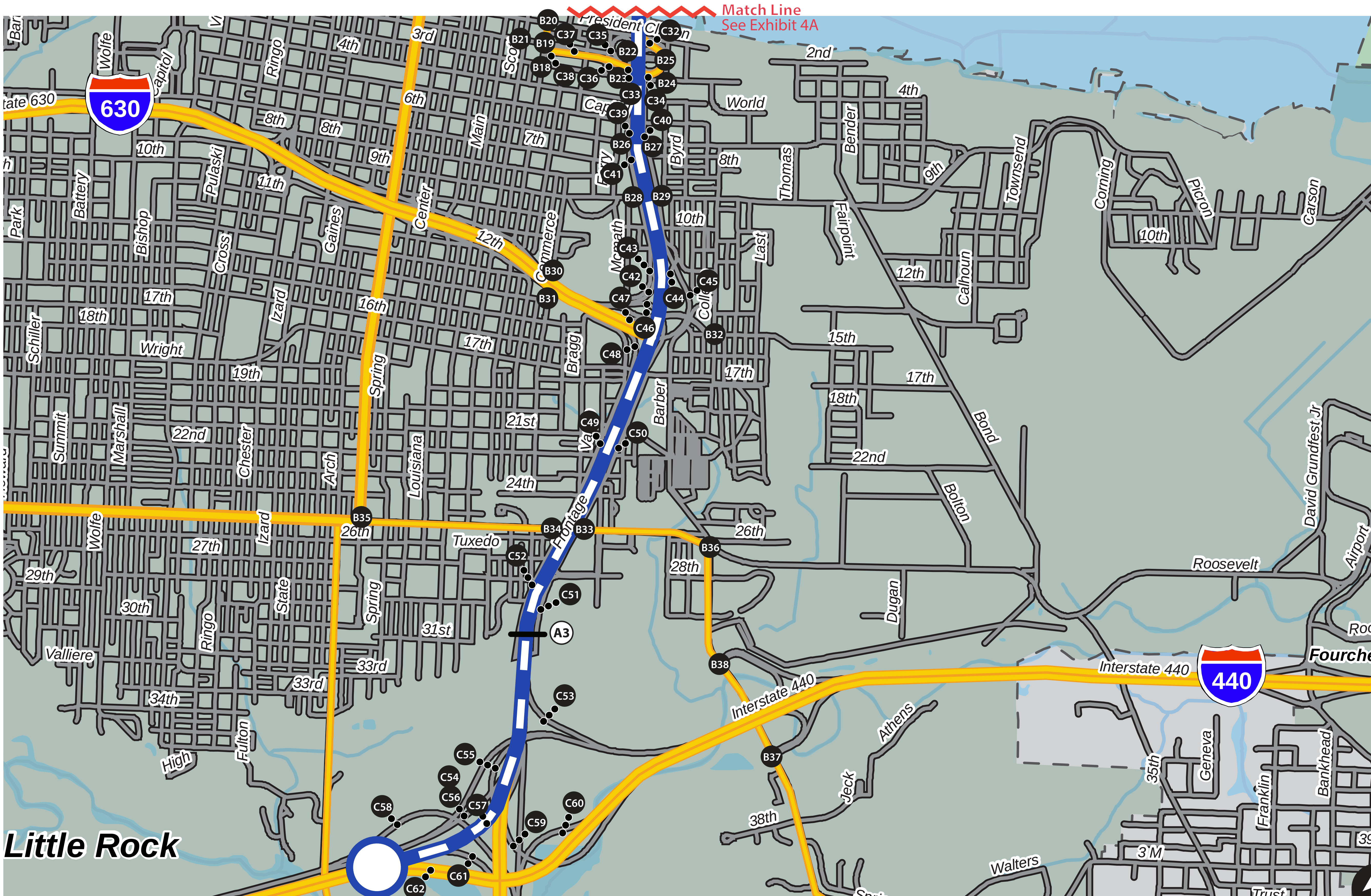
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 4B

CA0602 South - I-30/I-40
Widening and Rehabilitation
Interstate 530 to Highway 67
Existing 2014 Traffic Counts



Legend — 48-hour counts •••• 24-hour counts

Ⓐ Mainline Count
Ⓑ Turning movement count
Ⓒ Ramp count

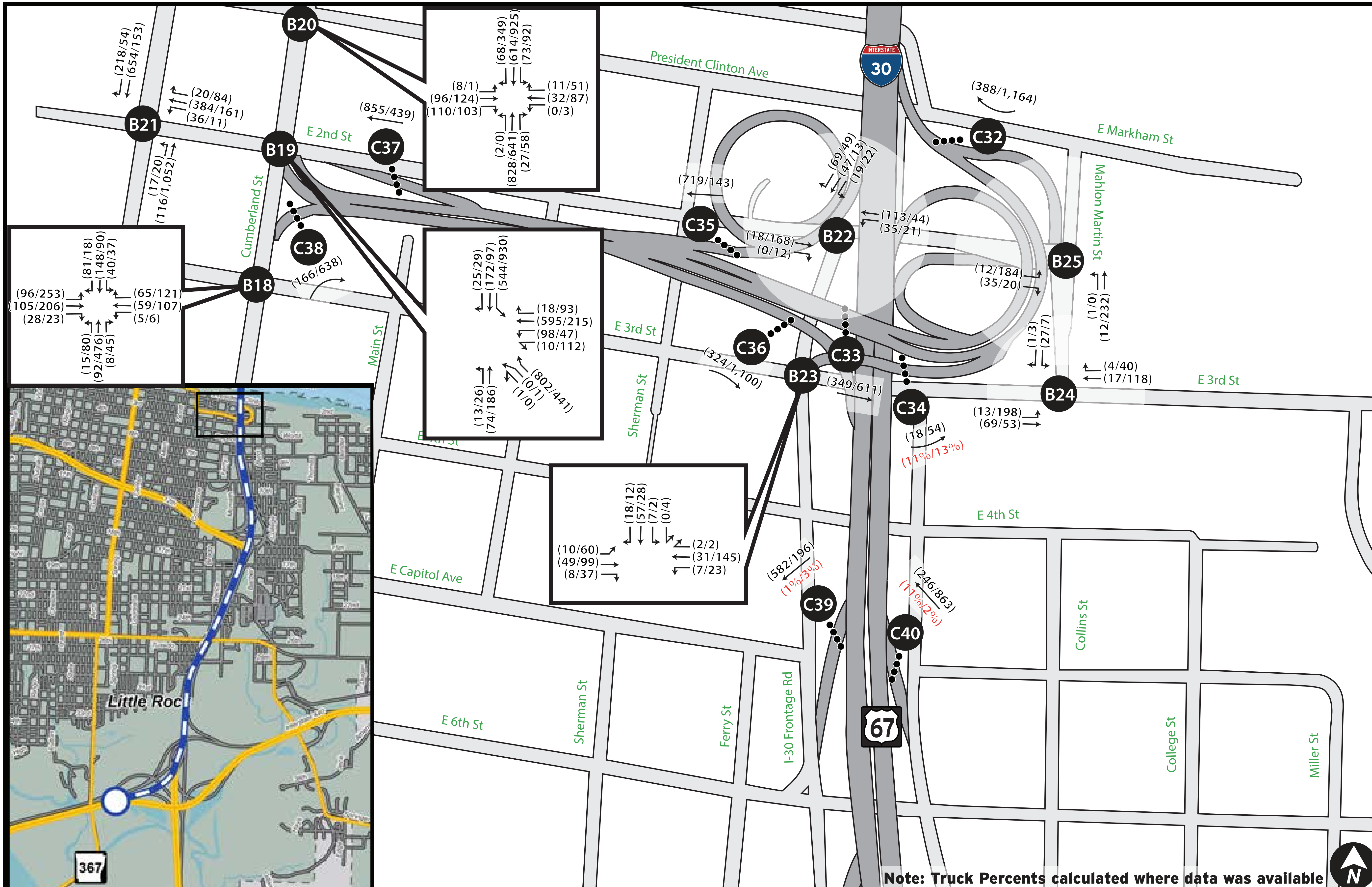
Proposed Work

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 4.1B

CA0602 South - I-30/I-40 Widening and Rehabilitation
Interstate 530 to Highway 67
Existing 2014 Traffic Counts



Legend

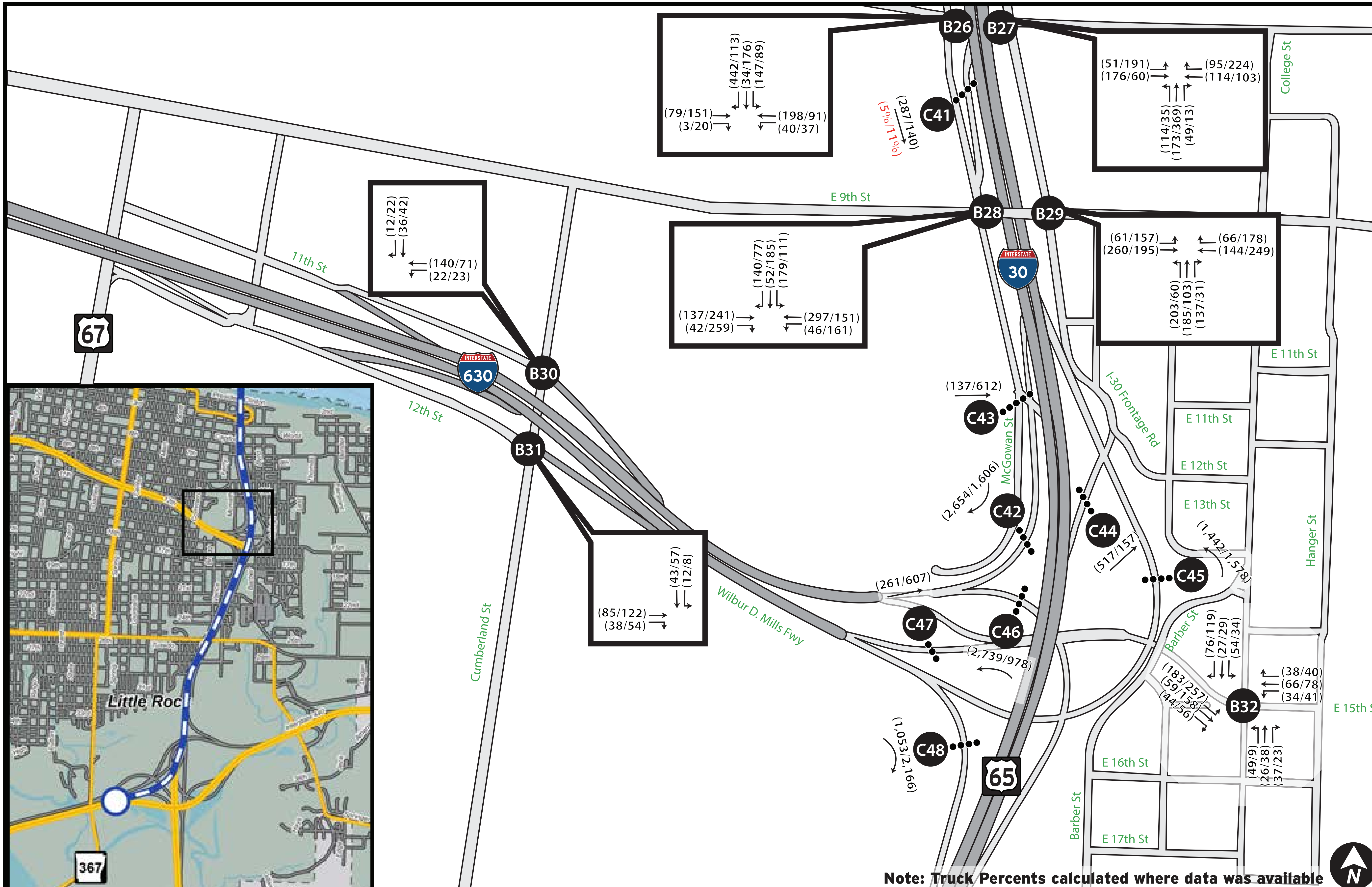
48-hour counts
24-hour counts
(A) Mainline Count
(B) Turning movement count
(C) Ramp count
(AM/PM) Traffic Counts
(AM/PM) Truck Percent
[Intersection and Mainline Volumes shown are raw counts taken May 2014]
[Ramp Volumes shown are raw counts taken November 2012]
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 4.2B

CA0602 South - I-30/I-40
Widening and Rehabilitation
Interstate 530 to Highway 67
Existing 2014 Traffic Counts



Legend

48-hour counts
24-hour counts
A Mainline Count
B Turning movement count
C Ramp count

(AM/PM) Traffic Counts
(AM/PM) Truck Percent
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

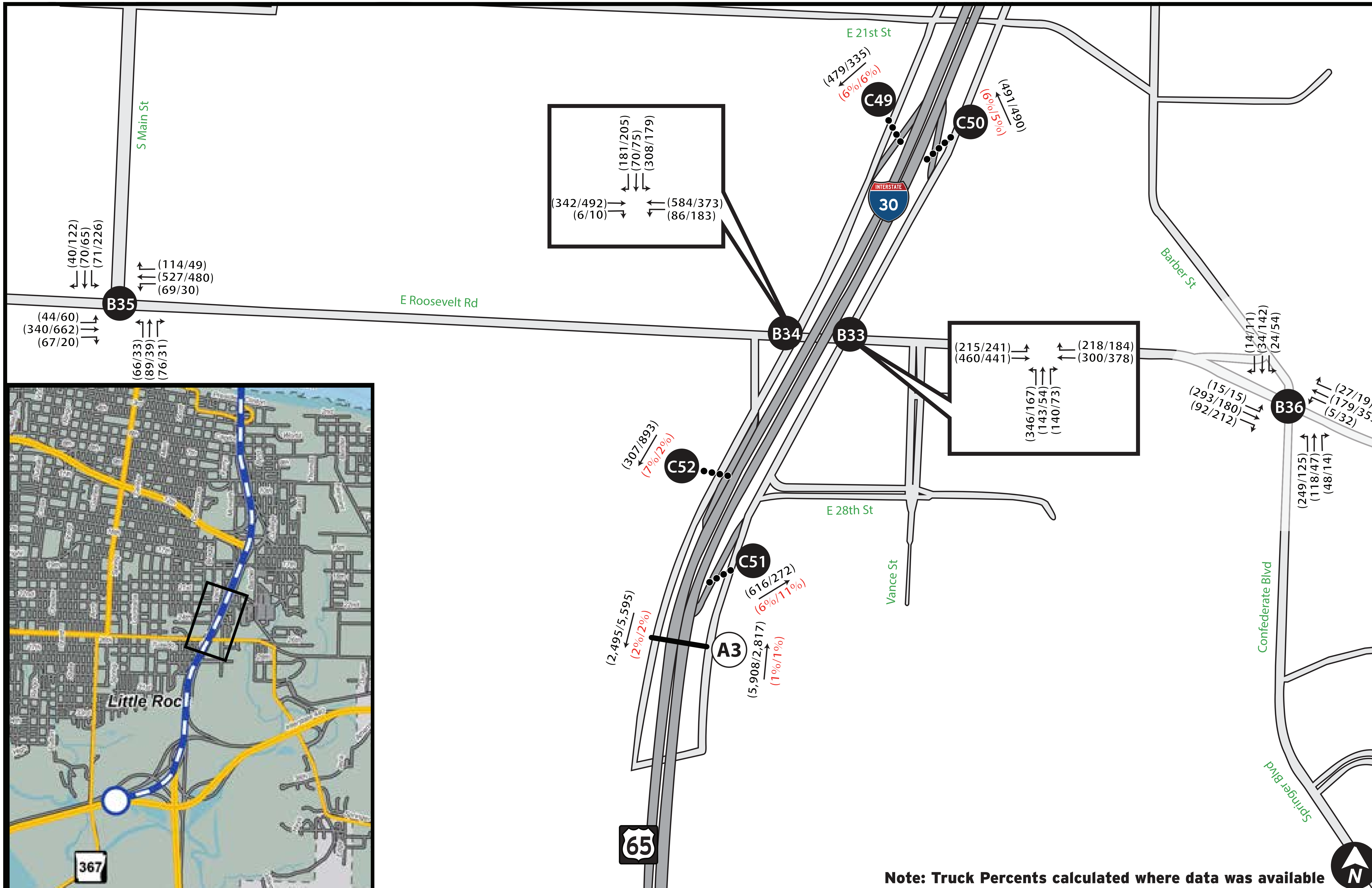
[Intersection and Mainline Volumes shown are raw counts taken May 2014]
[Ramp Volumes shown are raw counts taken November 2012]

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 4.3B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Existing 2014 Traffic Counts



Legend 48-hour counts •••••24-hour counts

Ⓐ Mainline Count
Ⓑ Turning movement count
Ⓒ Ramp count

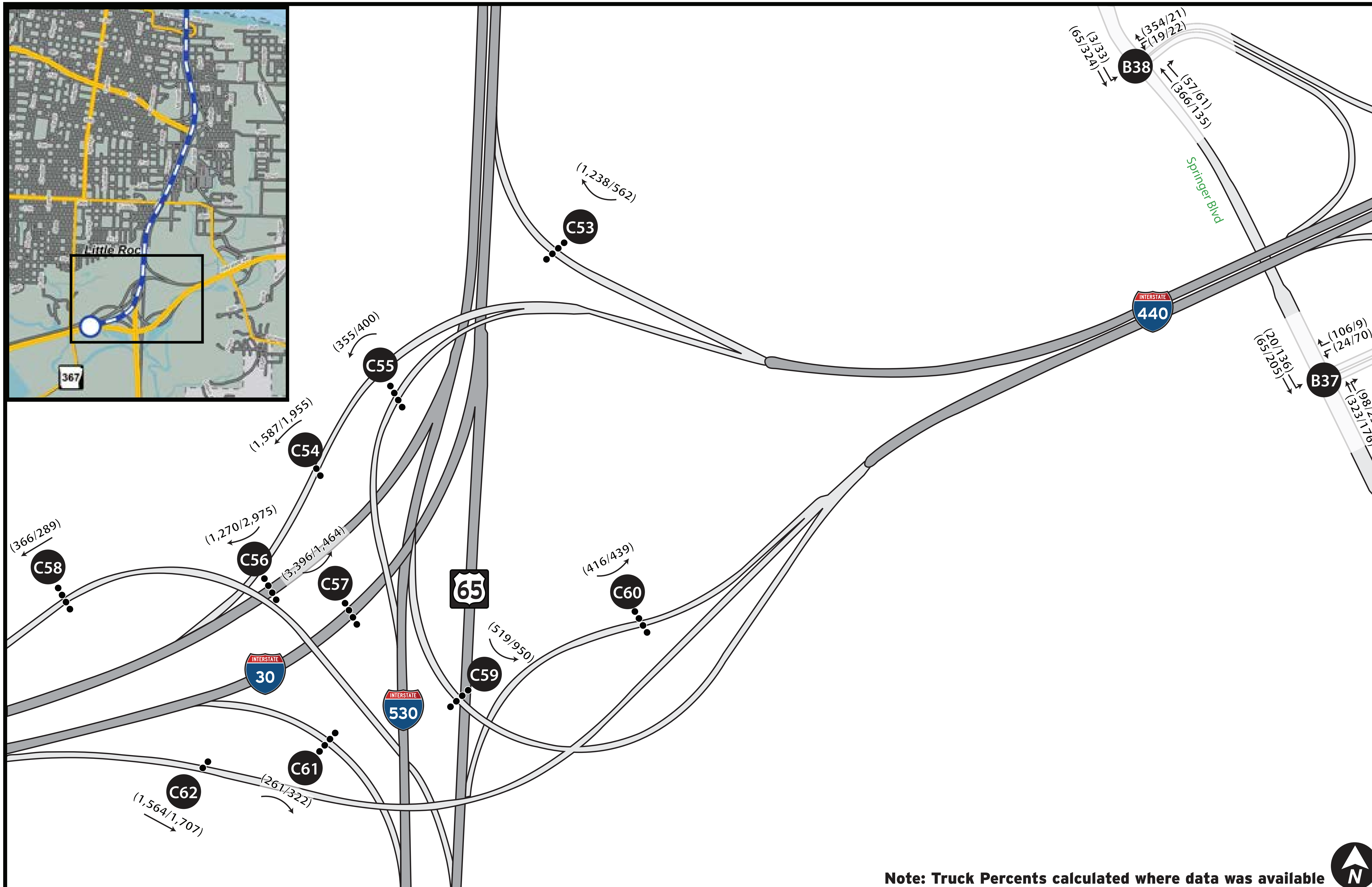
(AM/PM) Traffic Counts [Intersection and Mainline Volumes shown are raw counts taken May 2014]
(AM/PM) Truck Percent [Ramp Volumes shown are raw counts taken November 2012]
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 4.4B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Existing 2014 Traffic Counts



Note: Truck Percents calculated where data was available

Legend — 48-hour counts •••••24-hour counts

Ⓐ Mainline Count
Ⓑ Turning movement count
Ⓒ Ramp count

(AM/PM) Traffic Counts
(AM/PM) Truck Percent
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

[Intersection and Mainline Volumes shown are raw counts taken May 2014]
[Ramp Volumes shown are raw counts taken November 2012]

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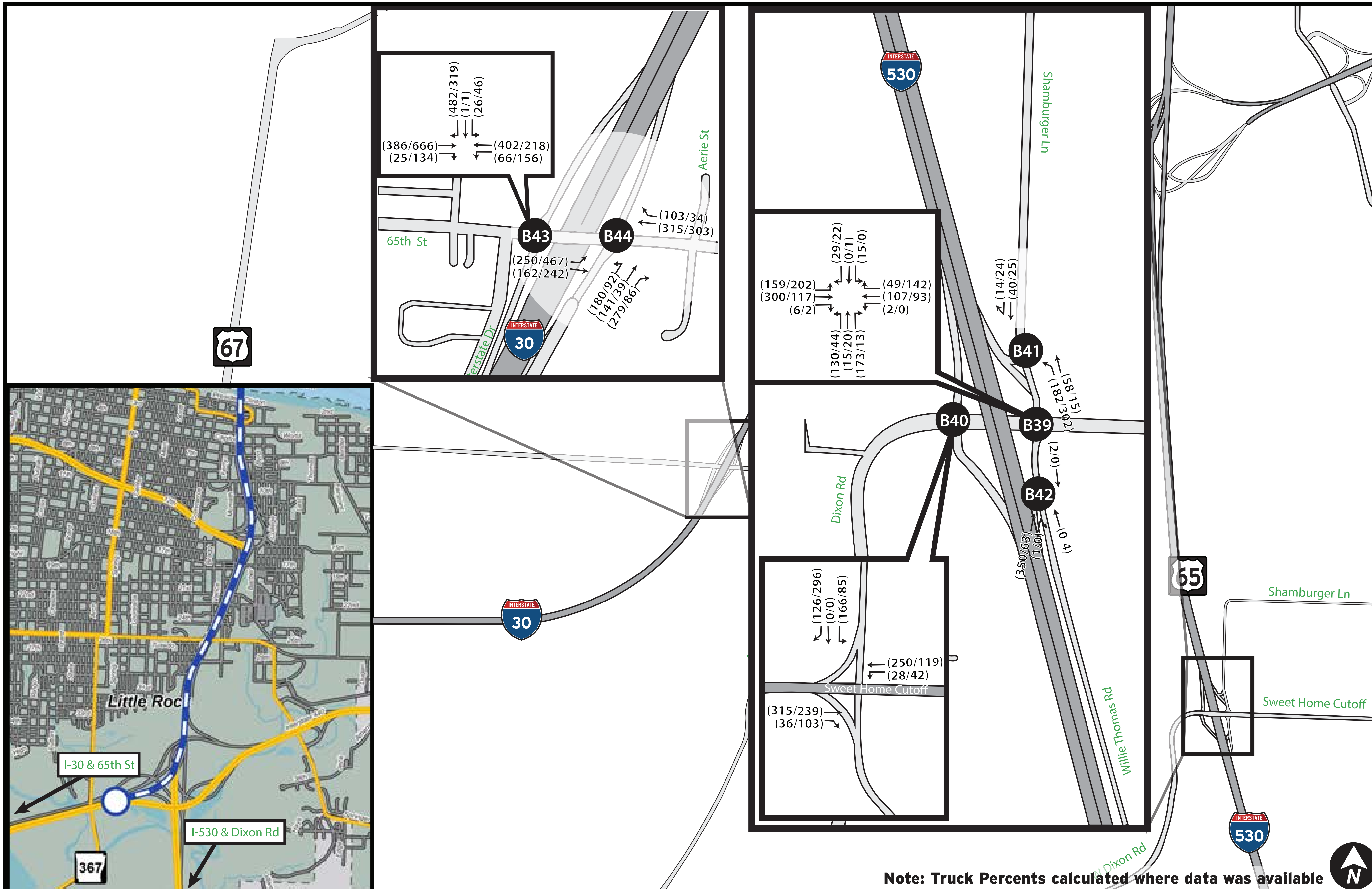
EXHIBIT 4.5B

CA0602 South - I-30/I-40 Widening and Rehabilitation
Interstate 530 to Highway 67
Existing 2014 Traffic Counts



Note: Truck Percents calculated where data was available

Legend — 48-hour counts ••••• 24-hour counts

Ⓐ Mainline Count
Ⓑ Turning movement count
Ⓒ Ramp count

(AM/PM) Traffic Counts
(AM/PM) Truck Percent
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

[Intersection and Mainline Volumes shown are raw counts taken May 2014]
[Ramp Volumes shown are raw counts taken November 2012]

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Outliers

The average peak hours for all traffic within the study area was estimated to be 7:15 AM – 8:15 AM and 4:30 PM – 5:30 PM. Most individual intersection (B) counts fell within this peak hour threshold; however there were three counts that did not:

- B3: McCain Boulevard and Landers Road – Peak hour 9:00 AM to 10:00AM
- B22: 2nd Street and I-30 Frontage Road – Peak hour 8:15 AM to 9:15 AM
- B25: 2nd Street and Mahlon Martin Street – Peak hour 8:15 AM to 9:15 AM

The difference in volume between the calculated peak hour for the study area and the peak hour of the two outliers on 2nd Street are minimal and would not impact the level of service at those intersections. The Intersection at McCain Boulevard is next to a variety of large commercial retail shops and Baptist Health Medical Center. These destinations could have an impact in determining the peak hour. This intersection is also outside the core study area.

Seasonal Adjustment

AHTD's seasonal adjustment factors were used as appropriate for the road facilities. These adjustments are used to estimate average annual daily traffic (AADT) from a single raw traffic count. Automatic Traffic Recorder (ATR) data was used to compute these factors. Existing traffic volumes collected in May, 2014 were balanced before they were used to forecast the 2021 and 2041 volumes.

Traffic Forecast

The traffic forecast was developed based on discussions with stakeholders and the historical and forecasted traffic profiles shown in Figures 4, 5 and 6. The historical and forecasted traffic profile summary is shown in Table 2.

Table 2

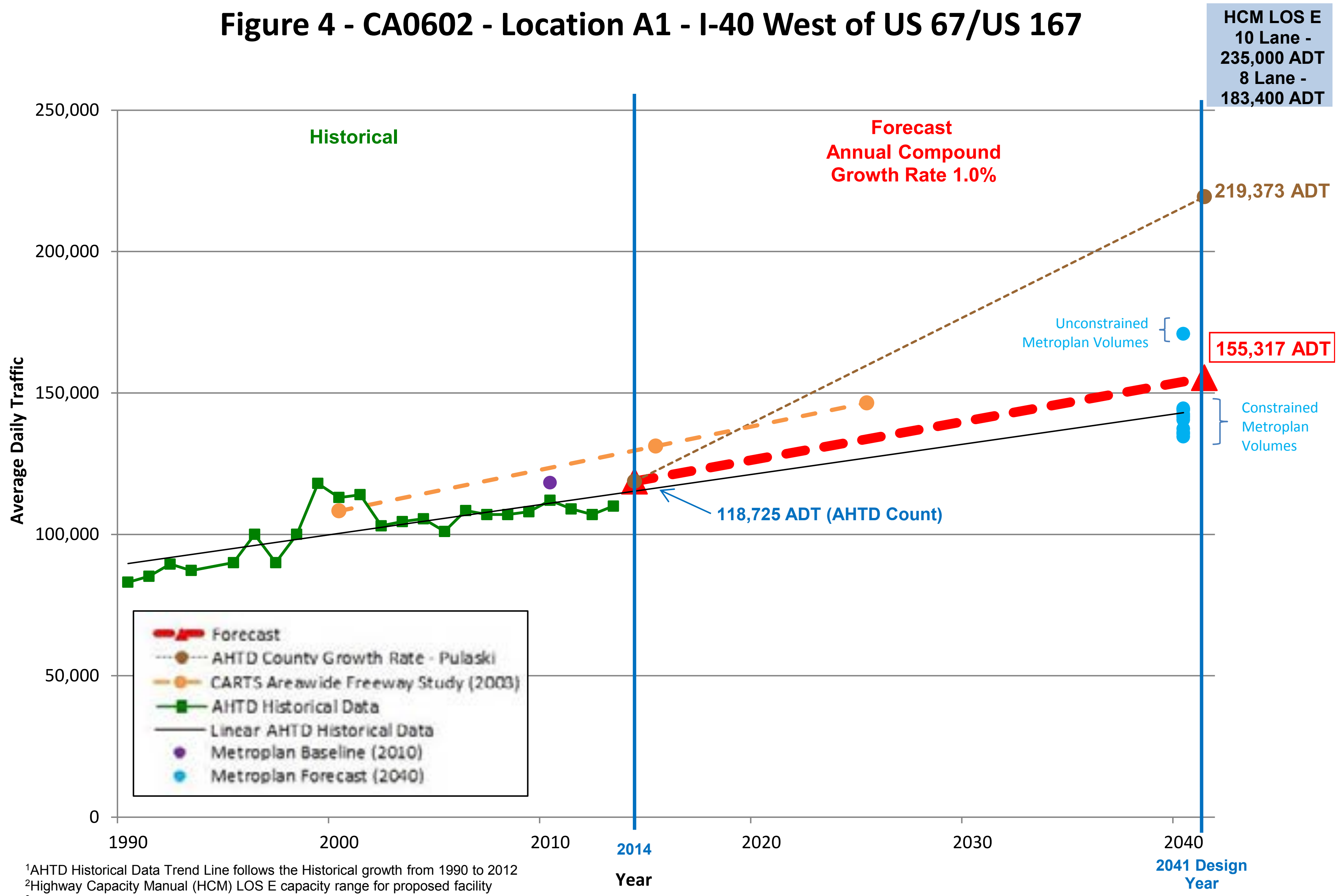
A1, A2 and A3 Annual Growth Rates

Available Data	**A1 - I-40 between N. Hills Blvd. and Highway 67**	**A2 - Arkansas River Bridge**	**A3 - I-30 between E. Roosevelt Rd. and I-440/I-530**
AHTD Historical Data 1990 - 2000 2000 - 2012	 3.1% -0.5%	 1.1% 0.7%	 2.6% 0.2%
AHTD County Growth - Pulaski	2.3%	2.3%	2.3%
CARTS Areawide Freeway Study 2000 - 2015 2015 - 2025 2025 - 2040	 1.3% 1.1% 1.0%	 0.8% 1.2%	 1.3% 1.0% 1.5%
Metroplan Models – Low[1]	0.43%	0.27%	0.43%
Metroplan Models – High[1]	1.24%	1.69%	1.36%
Recommended Growth Rate	**1.0%**	**1.0%**	**1.0%**

1. Based upon different Metroplan Model Scenarios.

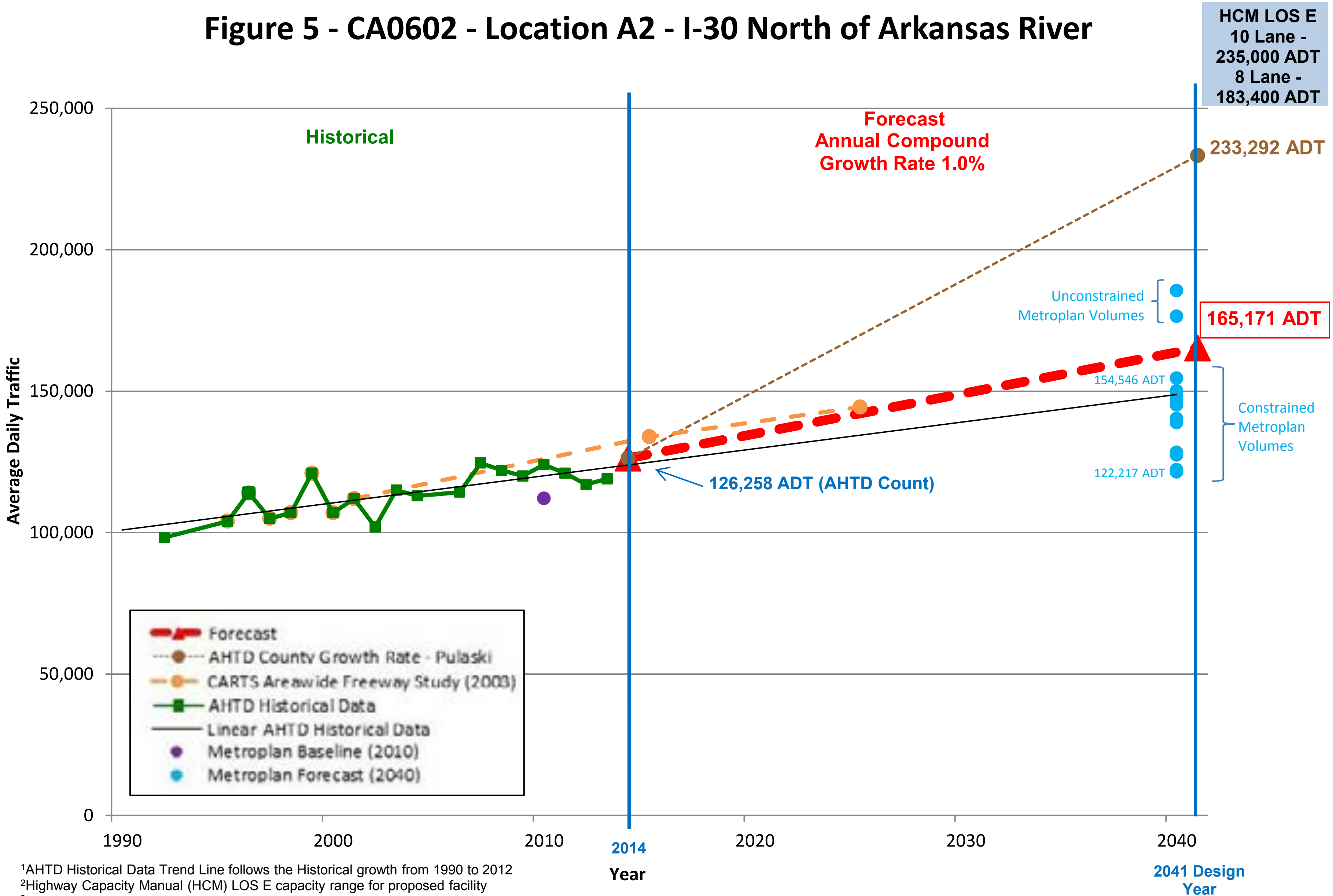
The recommended annual mainline growth rate of 1.0% represents the best fit growth rate. These annual growth rates were applied to existing traffic counts to develop the forecasted balanced traffic volumes.

Figure 4 - CA0602 - Location A1 - I-40 West of US 67/US 167



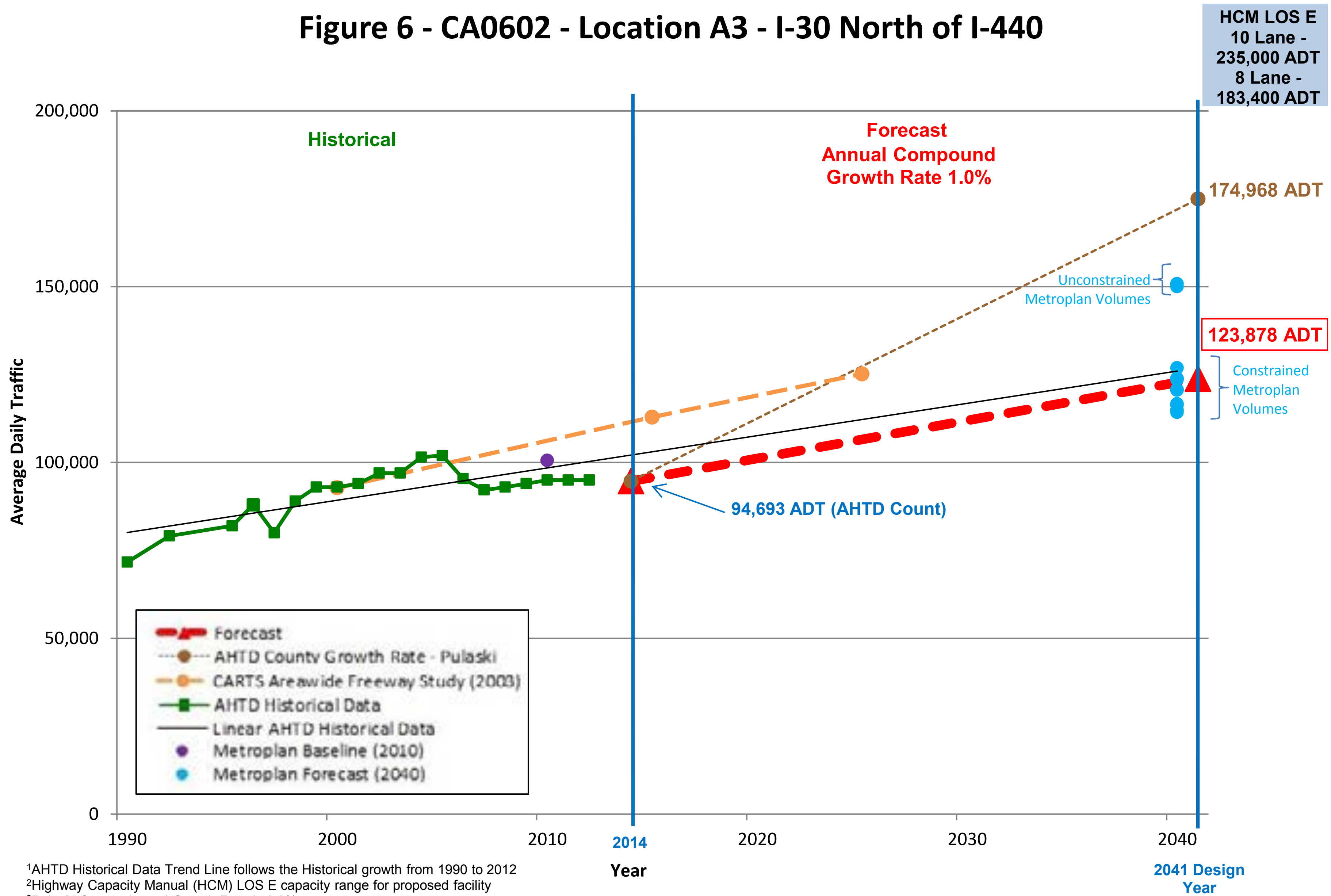
[1]AHTD Historical Data Trend Line follows the Historical growth from 1990 to 2012
[2]Highway Capacity Manual (HCM) LOS E capacity range for proposed facility
[3]Pulaski County Annual Growth Rate is 2.3%
[4]Metroplan Contains 15 Model Runs (2041 Volume High: 170,951 Low: 134,498)

Figure 5 - CA0602 - Location A2 - I-30 North of Arkansas River



[1]AHTD Historical Data Trend Line follows the Historical growth from 1990 to 2012
[2]Highway Capacity Manual (HCM) LOS E capacity range for proposed facility
[3]Pulaski County Annual Growth Rate is 2.3%
[4]Metroplan Contains 15 Model Runs (2041 Volume High: 185,525 Low: 121,507)

Figure 6 - CA0602 - Location A3 - I-30 North of I-440



[1]AHTD Historical Data Trend Line follows the Historical growth from 1990 to 2012
[2]Highway Capacity Manual (HCM) LOS E capacity range for proposed facility
[3]Pulaski County Annual Growth Rate is 2.3%
[4]Metroplan Contains 15 Model Runs (2041 Volume High: 150,845 Low: 114,267

Cross street growth rates are based on available historical data and MPO model data and differ from mainline growth rates. Table 3 shows the growth rates for select major side streets in the study area.

Table 3
Select Cross-Street Annual Growth Rates

Available Data	Cantrell	Broadway	Roosevelt
AHTD Historical Data	N/A	0.7%	0.0%
Metroplan Model – 2040 8-Lane Model	0.21%	0.30%	0.32%
Recommended Growth Rate	**0.5%**	**0.5%**	**0.5%**

The recommended annual cross-street growth rate is not constant with all local streets and ranges from 0% to 1%. Cantrell, Broadway and Roosevelt recommended annual cross-street growth rate is 0.5% as shown in Table 3. These annual growth rates were applied to existing traffic counts to develop the forecasted balanced traffic volumes.

Future Traffic Volumes

Hourly k-factors varied by location. Mainline (A-Counts) count k-factors ranged from 7.93% - 12.12% in the peak direction. K-Factors were reviewed and found to indicate oversaturated conditions (lower k-factors). ADT's were calculated by taking the raw counts, applying a seasonality factor, and applying the growth rate by the number of years. Through balancing with upstream under saturated counts, counts were increased to represent true demand. The balanced volumes are located in the Synchro electronic appendix files submitted with the report. Synchro was used as a platform to post process raw counts because of its ease of use and the ability to see the counts and volume differences on the network.

Future daily and peak hour traffic volumes at the locations identified in Exhibit 3 are based on growth rates developed from the historical and forecasted traffic profiles shown in Figures 4 through 6. This was done by inputting the existing raw traffic volumes into an excel spreadsheet where they were seasonally adjusted and grown to Opening Year 2021 and Design Year 2041 using growth rates as discussed above. These volumes were then imported into a Synchro model where they were “balanced up” to match the higher projected volumes along the corridor, which resulted in slightly higher average growth rates in parts of the corridor. Balancing up means that the volume which is higher controls the volumes at other locations. Synchro was used as a platform to post-process raw counts because of its ease of use and its ability to show volume differences on a road network while balancing. Finally, volumes were rounded per AHTD methodology. Existing and Future average daily traffic (ADT) are shown in Table 4. Future peak hour traffic volumes for Opening Year 2021 of the project are shown on Exhibit 6 (including 6.1 A/B through 6.4 A/B) and Design Year 2041 are shown on Exhibit 7 (including 7.1 A/B through 7.4 A/B). Existing, Opening Year and Design Year daily traffic are shown on Exhibit 5. Daily traffic was calculated by taking the raw traffic volumes, applying the correct seasonality factor and applying the growth rate by number of years.

Table 4
Mainline Average Daily Traffic at “A” Sites

Available Data	A1	A2	A3
2014 Existing	124,000	126,000	97,500
2021 Opening Year	134,000	135,000	105,000
2041 Design Year	165,000	165,000	128,000
Daily Truck Percent	9%	6%	8%

Truth-In-Data Principle

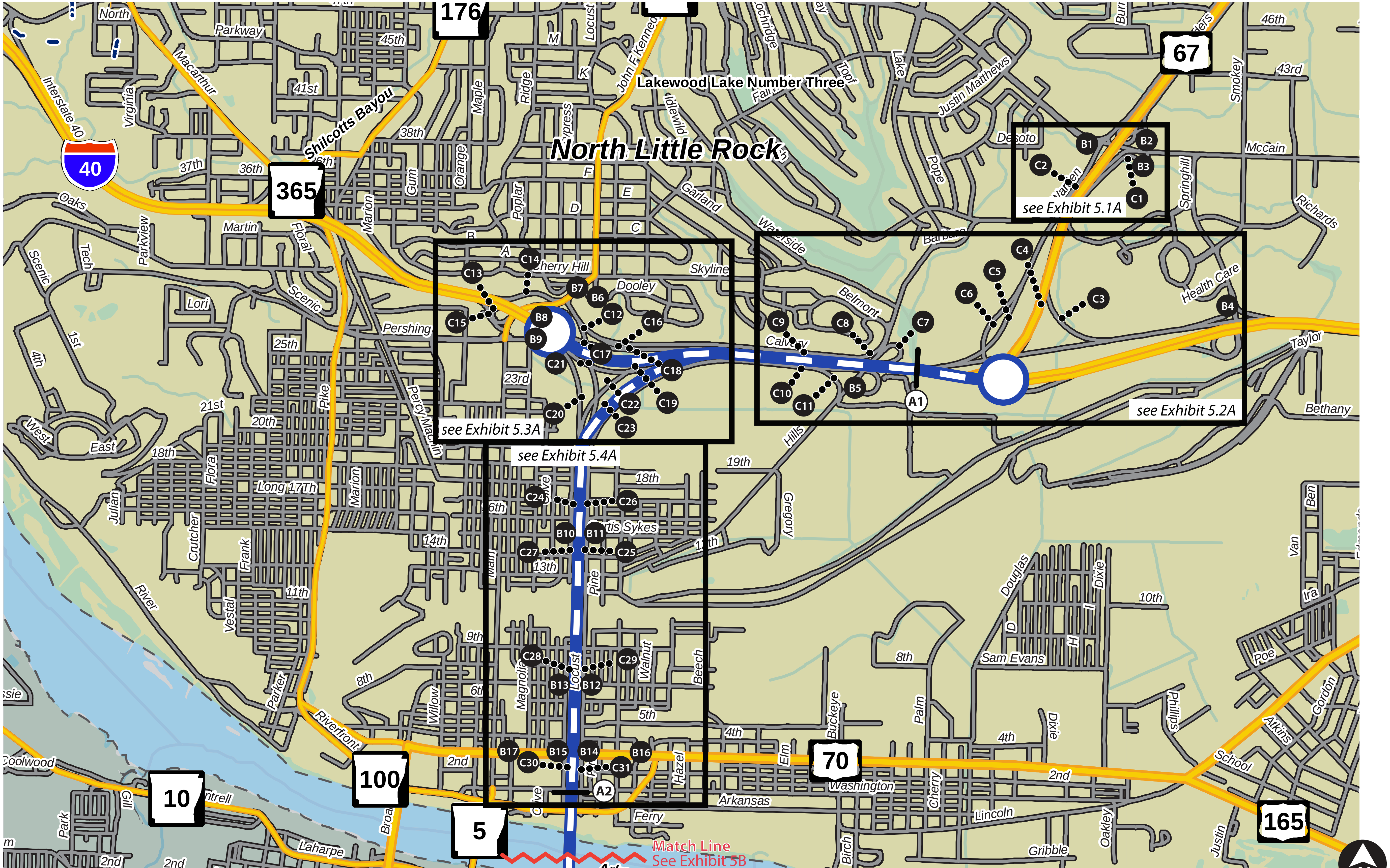
The controlling truth-in-data principle for making traffic forecasts is to document the sources and any uncertainties in the forecast.

1. The recommended improvement from the I-30 PEL or the later NEPA phases may cause a change in the forecast based upon the recommended configuration. This traffic forecast assumed an 8-Lane I-30 and no Chester Street Bridge.
2. Changes in economic conditions could have impacts on the forecast.
3. Unexpected growth or special generators outside the study area may influence the study area forecast.

4. Metroplan provided two model assignments. The assignment with the CAP/STIP/IRP/IRP projects shown in the LRTP was used to develop growth rates in the corridor. If an alternative assignment were used that included construction of the North Belt Freeway project, growth rates could be expected to decrease by less than 0.5% having minimal impact on the traffic forecasts.
5. Changes in technology by the year 2041 may result in changes in demand or supply.

EXHIBIT 5A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Annual Daily Traffic (ADT)



Legend — 48-hour counts •••• 24-hour counts

(A) Mainline Count
(B) Turning movement count
(C) Ramp count

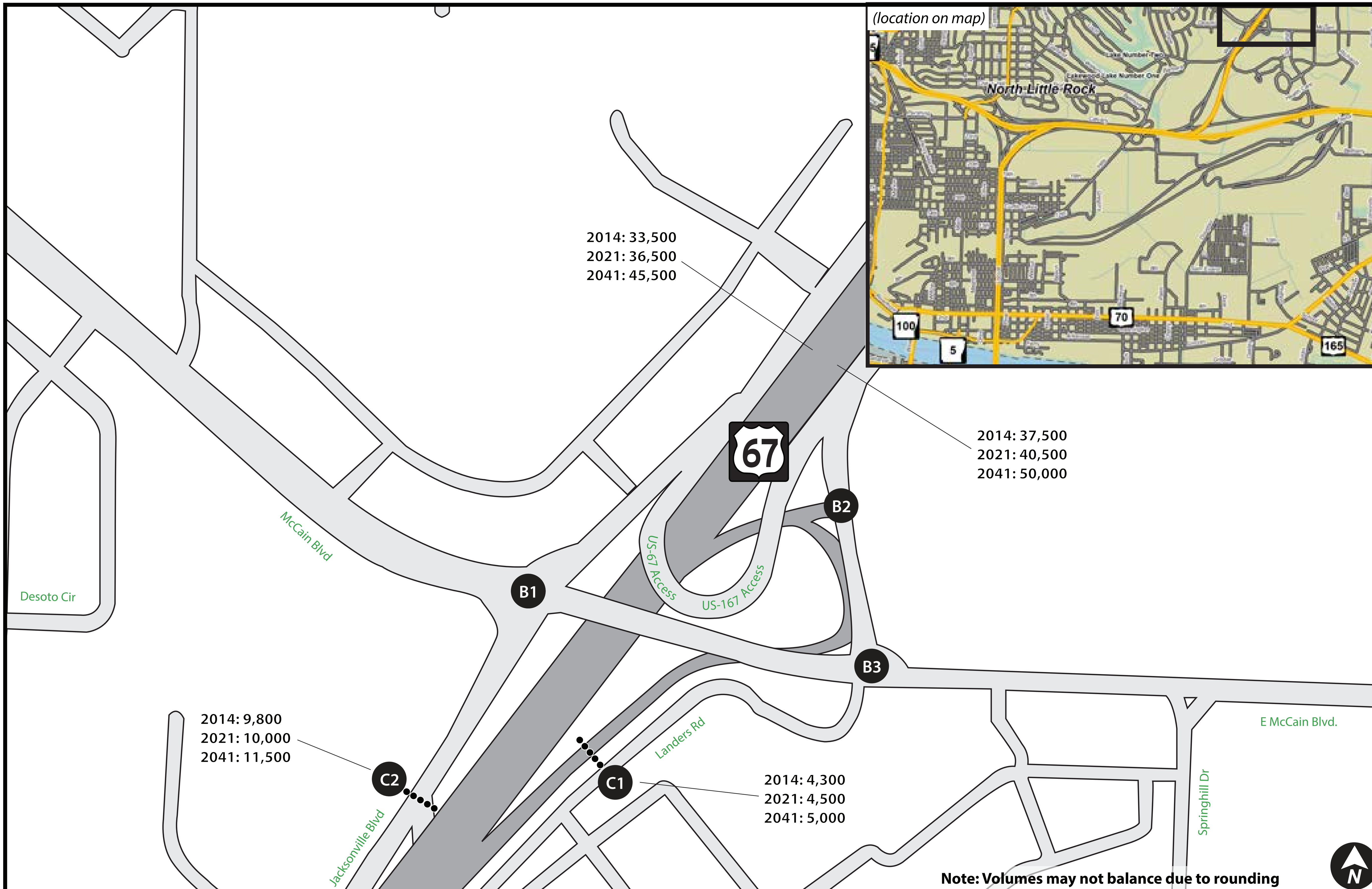
Proposed Work

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 5.1A

CA0602 - I-30/I-40
Widening and Rehabilitation
Interstate 530 to Highway 67
Annual Daily Traffic (ADT)



Legend

- (A) **Mainline Count**
- (B) **Turning movement count**
- (C) **Ramp count**

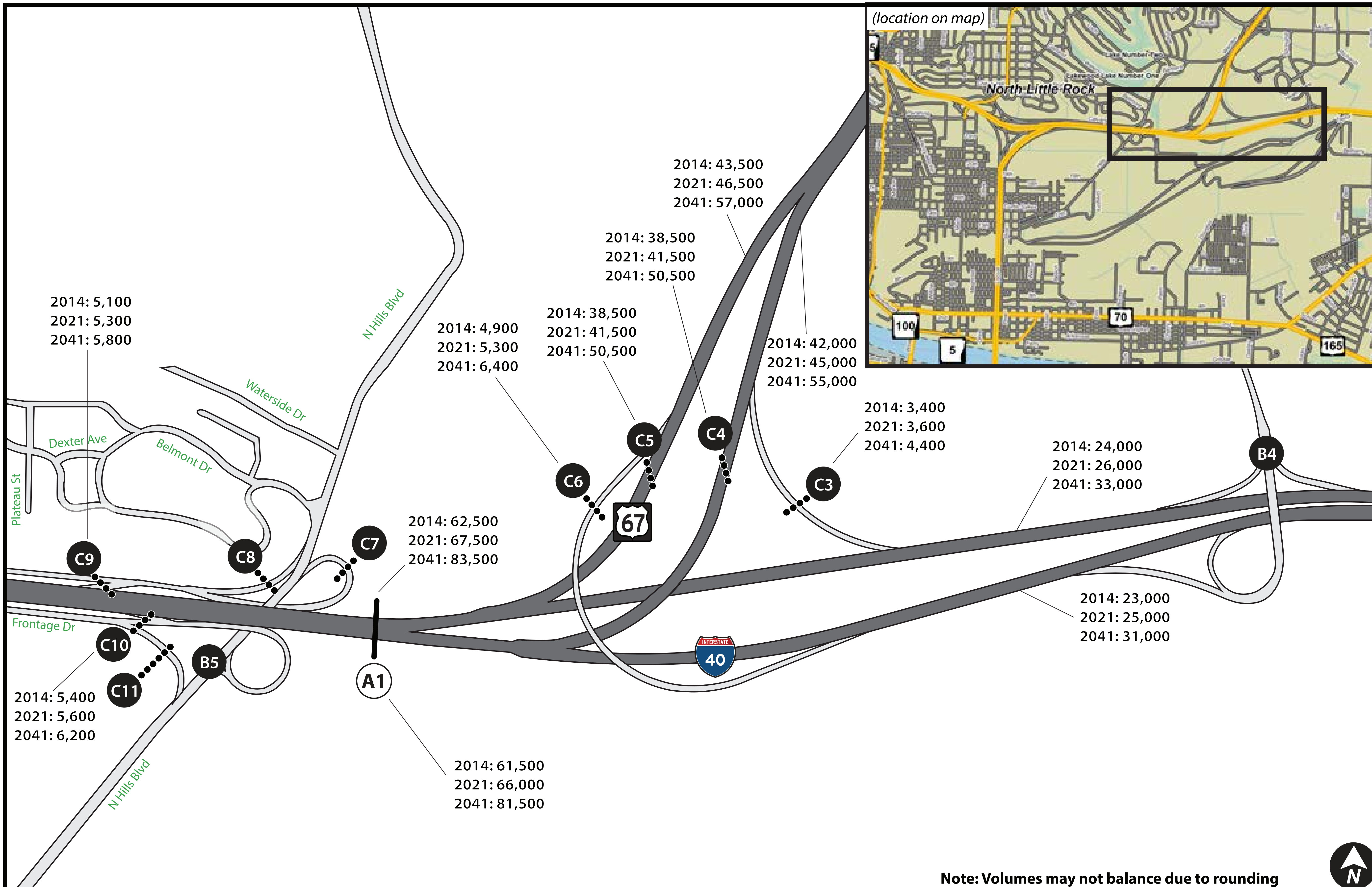
2014: Existing Count
2021: Opening Year
2041: Design Year

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 5.2A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Annual Daily Traffic (ADT)



Note: Volumes may not balance due to rounding

Legend

- Ⓐ **Mainline Count**
- Ⓑ **Turning movement count**
- Ⓒ **Ramp count**

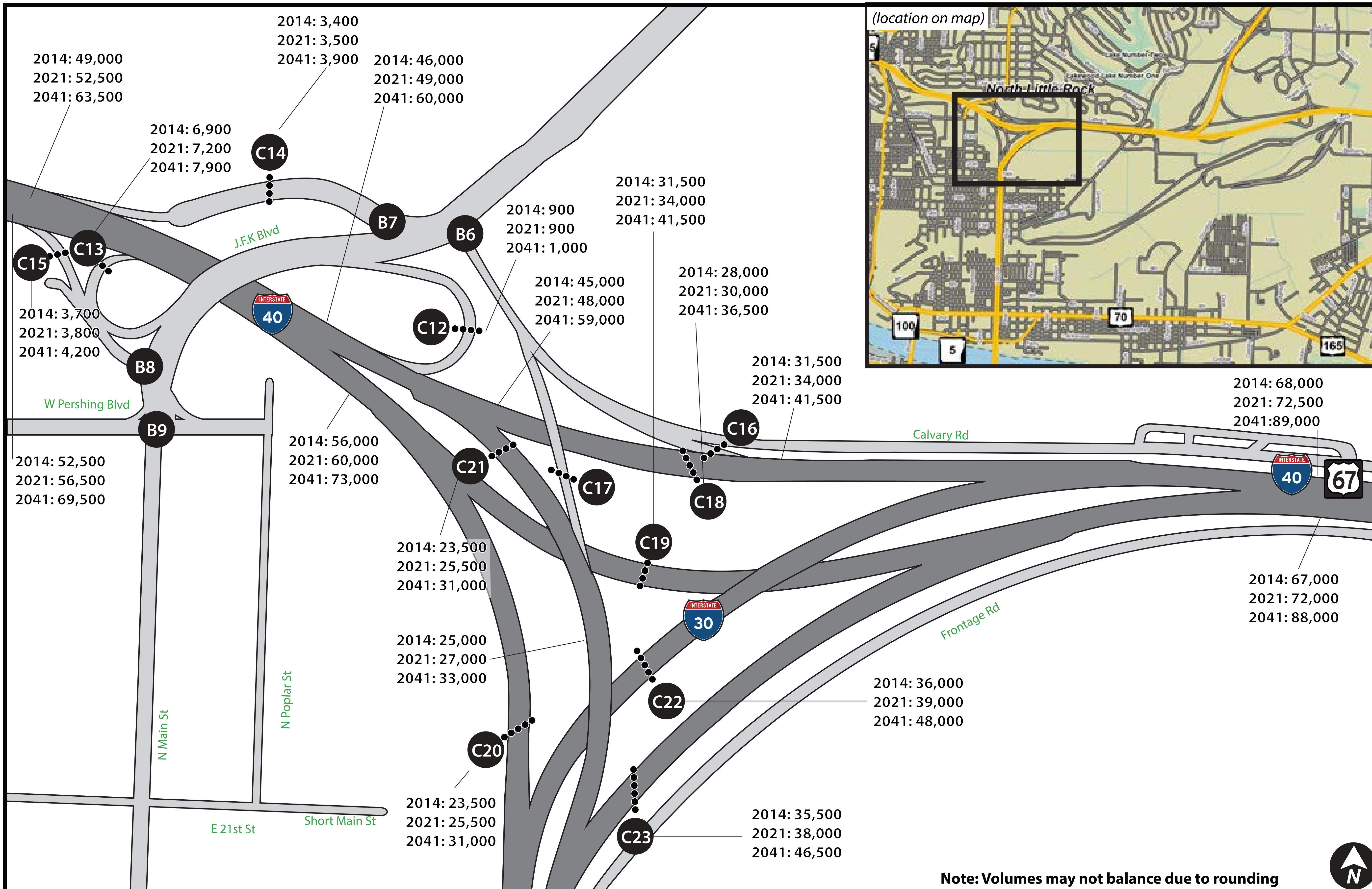
2014: Existing Count
2021: Opening Year
2041: Design Year

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 5.3A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Annual Daily Traffic (ADT)



Legend

- A Mainline Count
- B Turning movement count
- C Ramp count

2014: Existing Count
2021: Opening Year
2041: Design Year

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January 2015

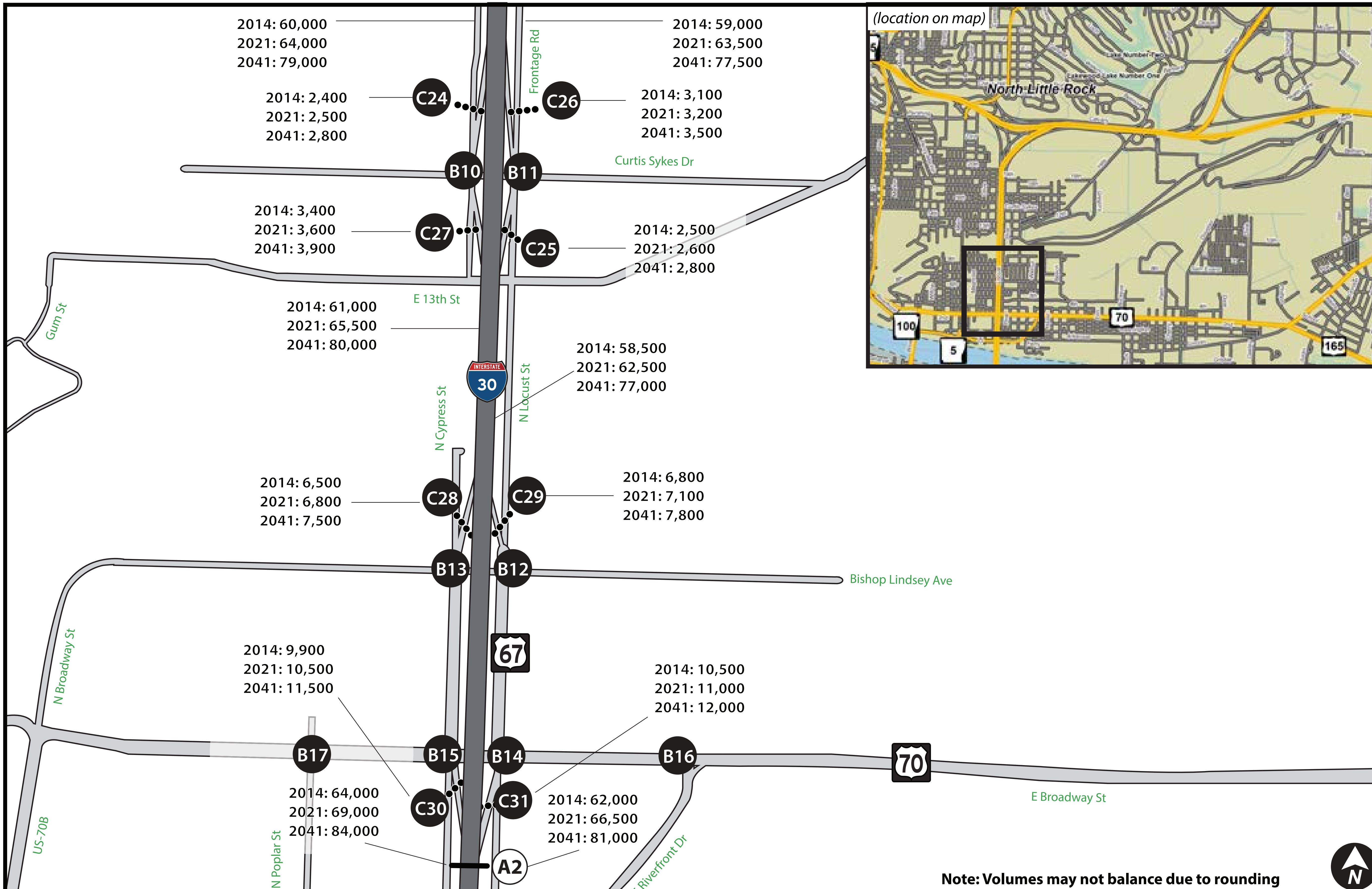


EXHIBIT 5.4A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Annual Daily Traffic (ADT)

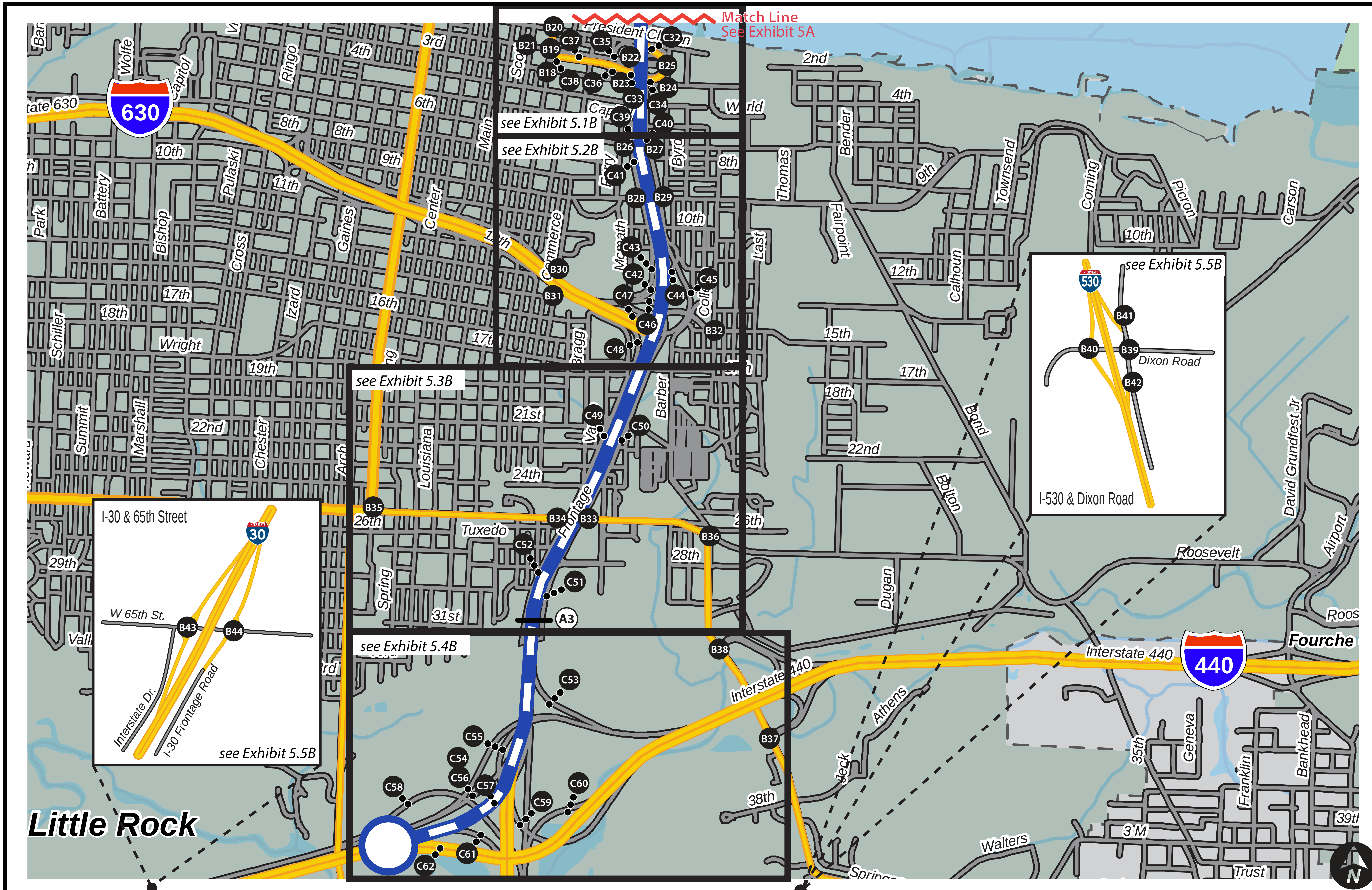
January 2015

Legend

- A Mainline Count
- B Turning movement count
- C Ramp count

2014: Existing Count
2021: Opening Year
2041: Design Year

EXHIBIT 5B



Legend

— 48-hour counts •••• 24-hour counts

Ⓐ Mainline Count
Ⓑ Turning movement count
Ⓒ Ramp count

Proposed Work

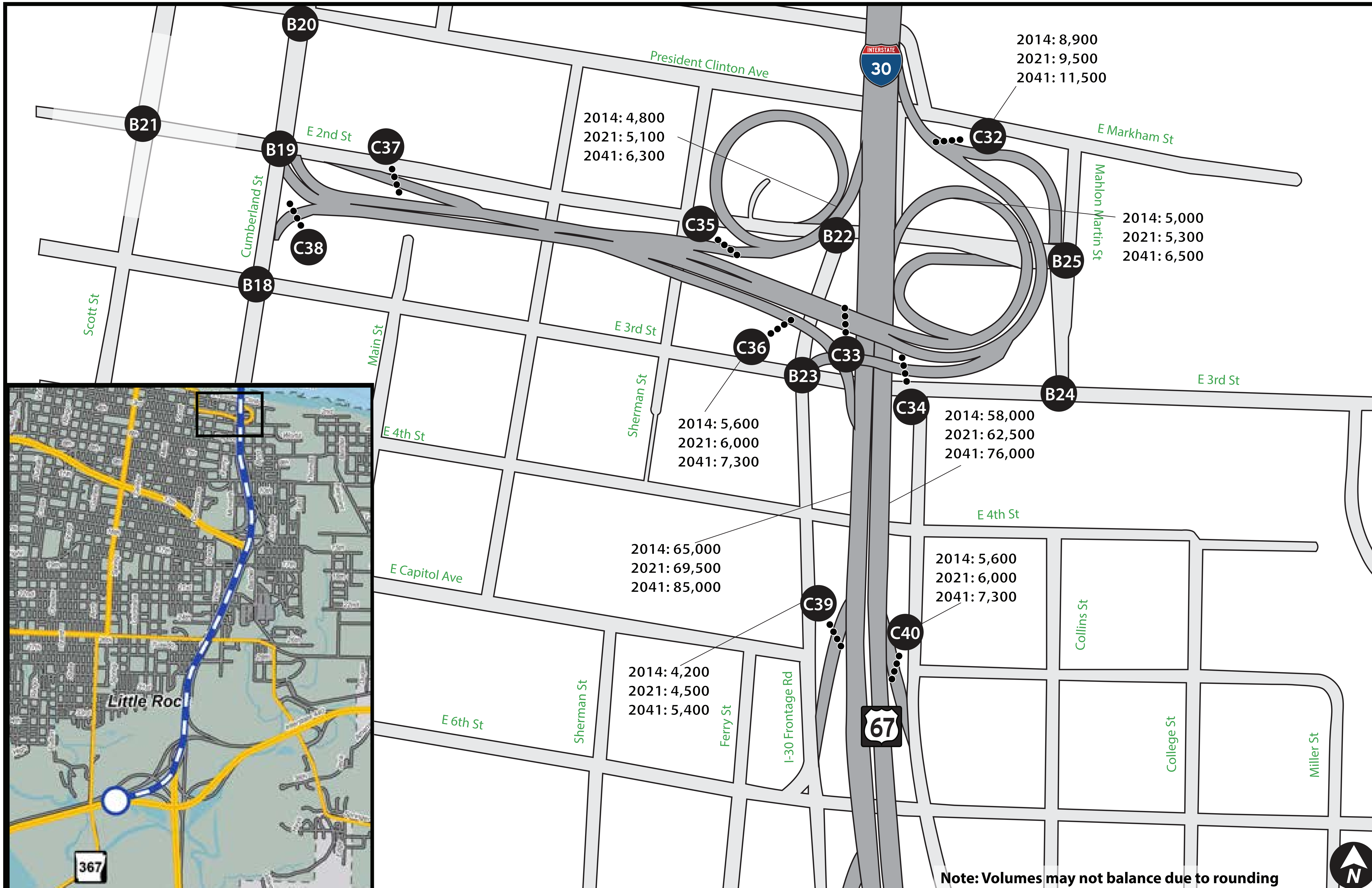
CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Annual Daily Traffic (ADT)

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 5.1B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Annual Daily Traffic (ADT)



Legend

- (A) Mainline Count
- (B) Turning movement count
- (C) Ramp count

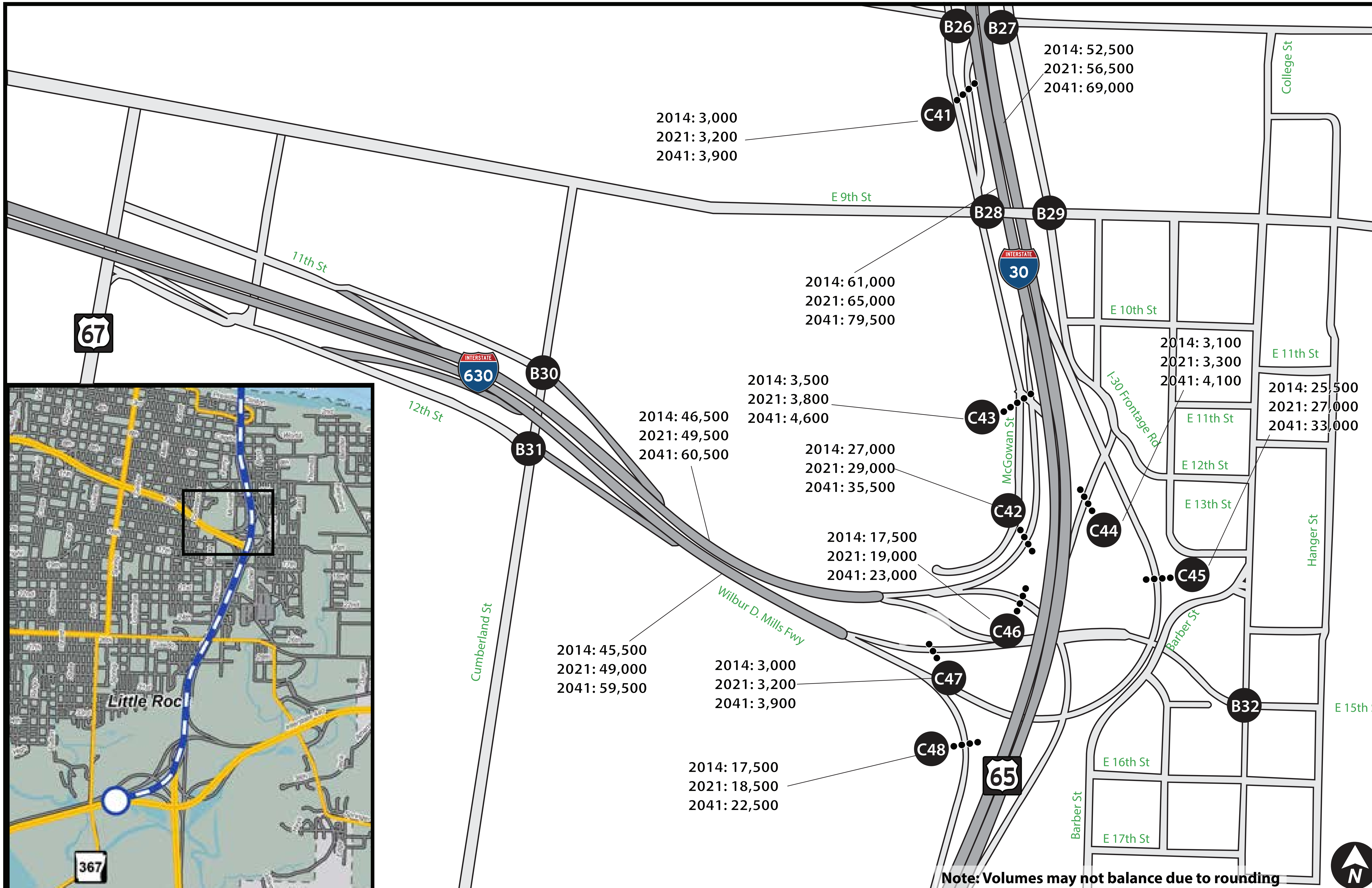
2014: Existing Count
2021: Opening Year
2041: Design Year

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 5.2B

CA0602 South - I-30/I-40 Widening and Rehabilitation
Interstate 530 to Highway 67
Annual Daily Traffic (ADT)



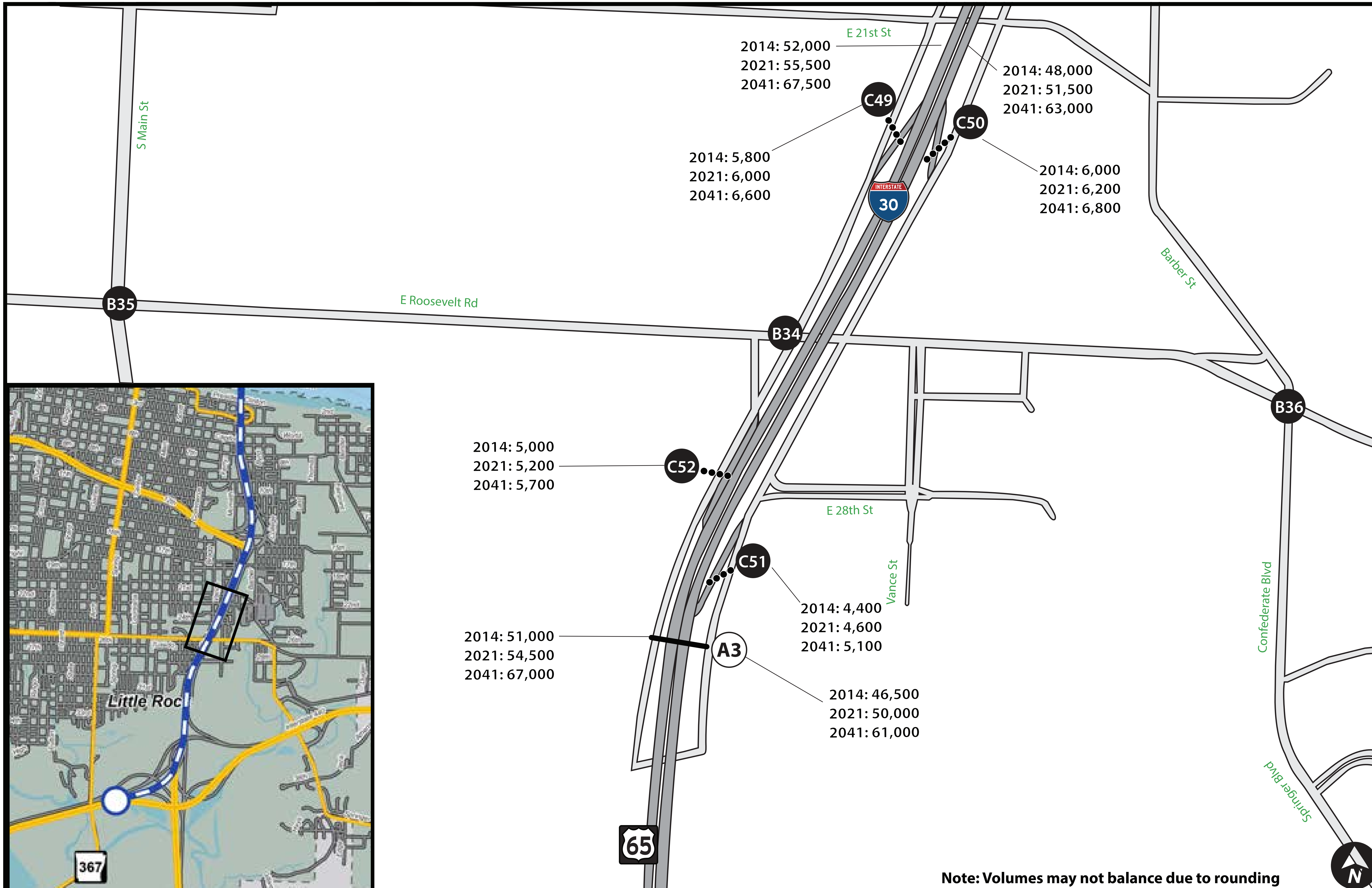
Legend

- A Mainline Count
- B Turning movement count
- C Ramp count

2014: Existing Count
2021: Opening Year
2041: Design Year

CONNECTING ARKANSAS PROGRAM CAP

January 2015



Legend

A Mainline Count
B Turning movement count
C Ramp count

2014: Existing Count
2021: Opening Year
2041: Design Year

EXHIBIT 5.3B

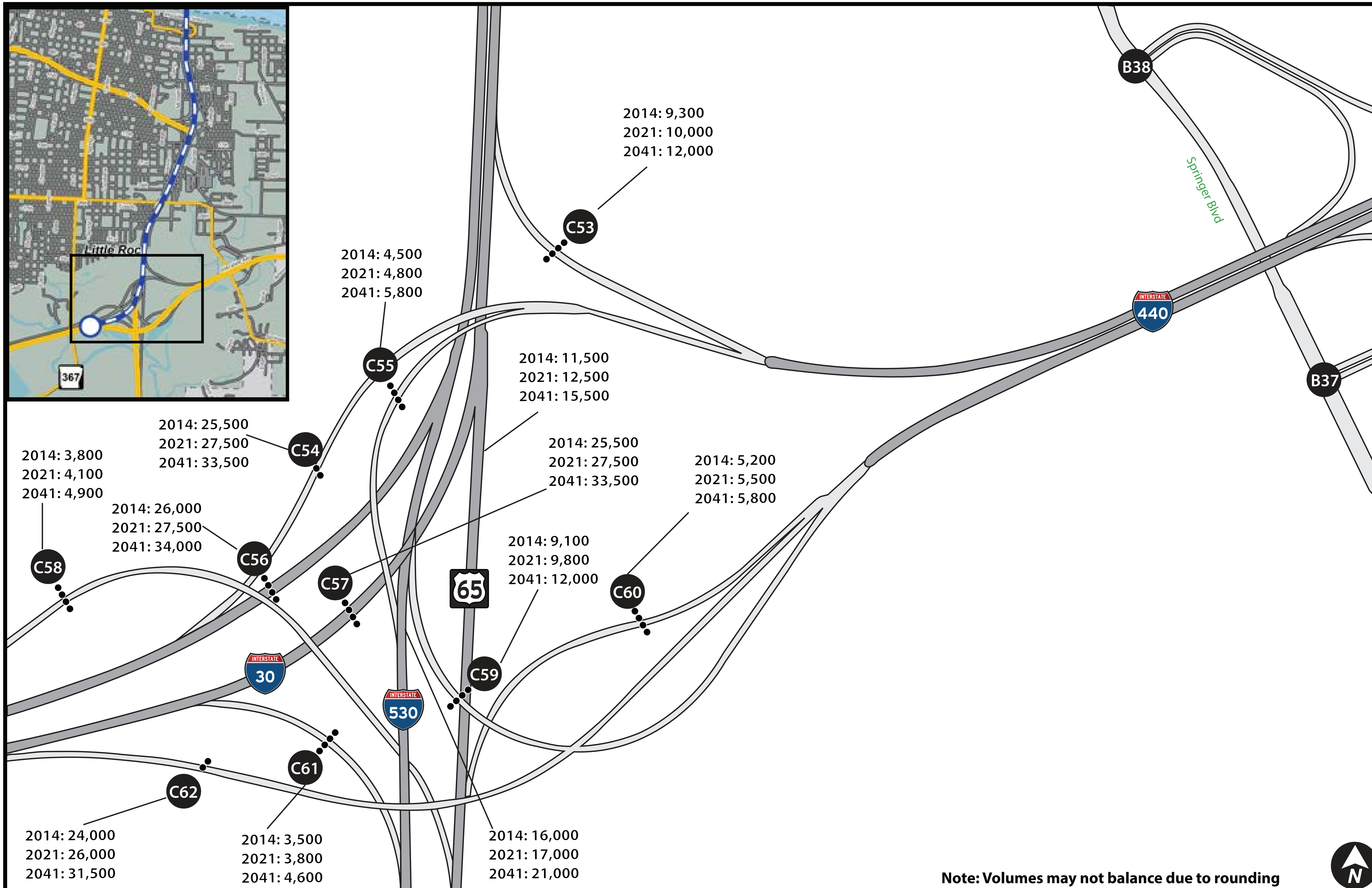
CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Annual Daily Traffic (ADT)

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 5.4B

CA0602 South - I-30/I-40
Widening and Rehabilitation
Interstate 530 to Highway 67
Annual Daily Traffic (ADT)



Legend

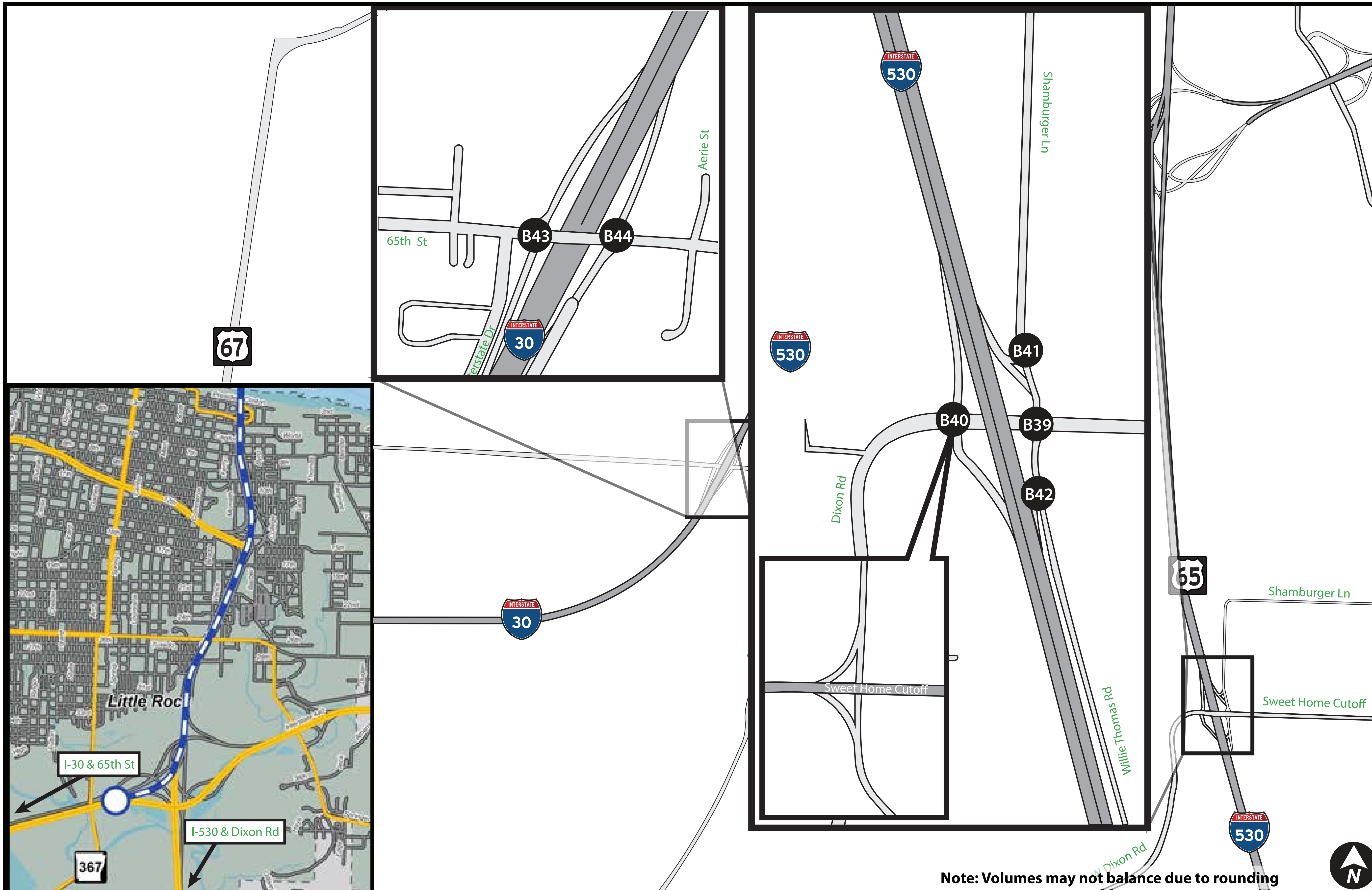
A Mainline Count
B Turning movement count
C Ramp count

2014: Existing Count
2021: Opening Year
2041: Design Year

January 2015

EXHIBIT 5.5B

CA0602 South - I-30/I-40
Widening and Rehabilitation
Interstate 530 to Highway 67
Annual Daily Traffic (ADT)



Legend

Ⓐ Mainline Count
Ⓑ Turning movement count
Ⓒ Ramp count

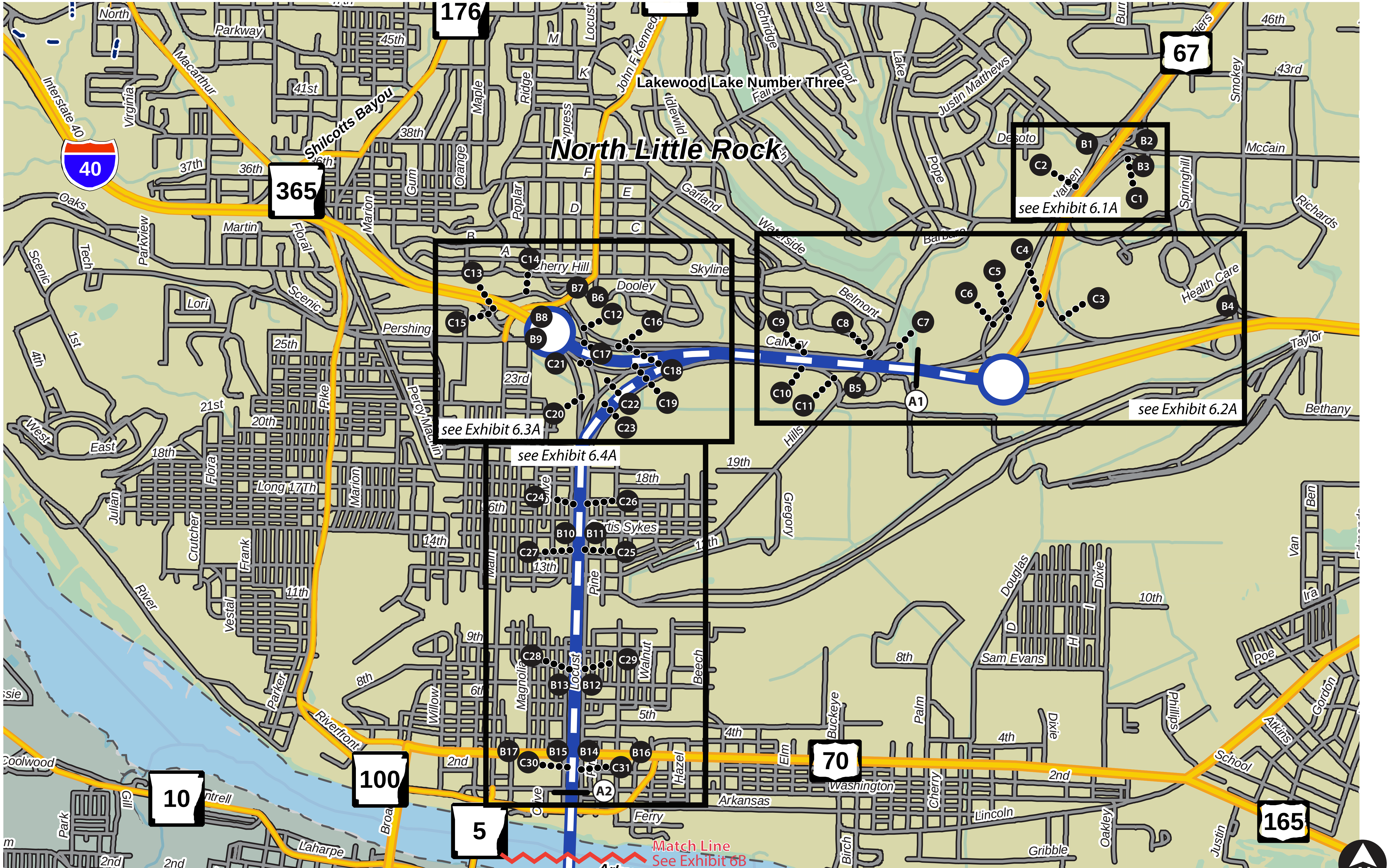
2014: Existing Count
2021: Opening Year
2041: Design Year

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 6A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Opening Year 2021 Traffic Forecast



Legend

48-hour counts

24-hour counts

A Mainline Count

B Turning movement count

C Ramp count

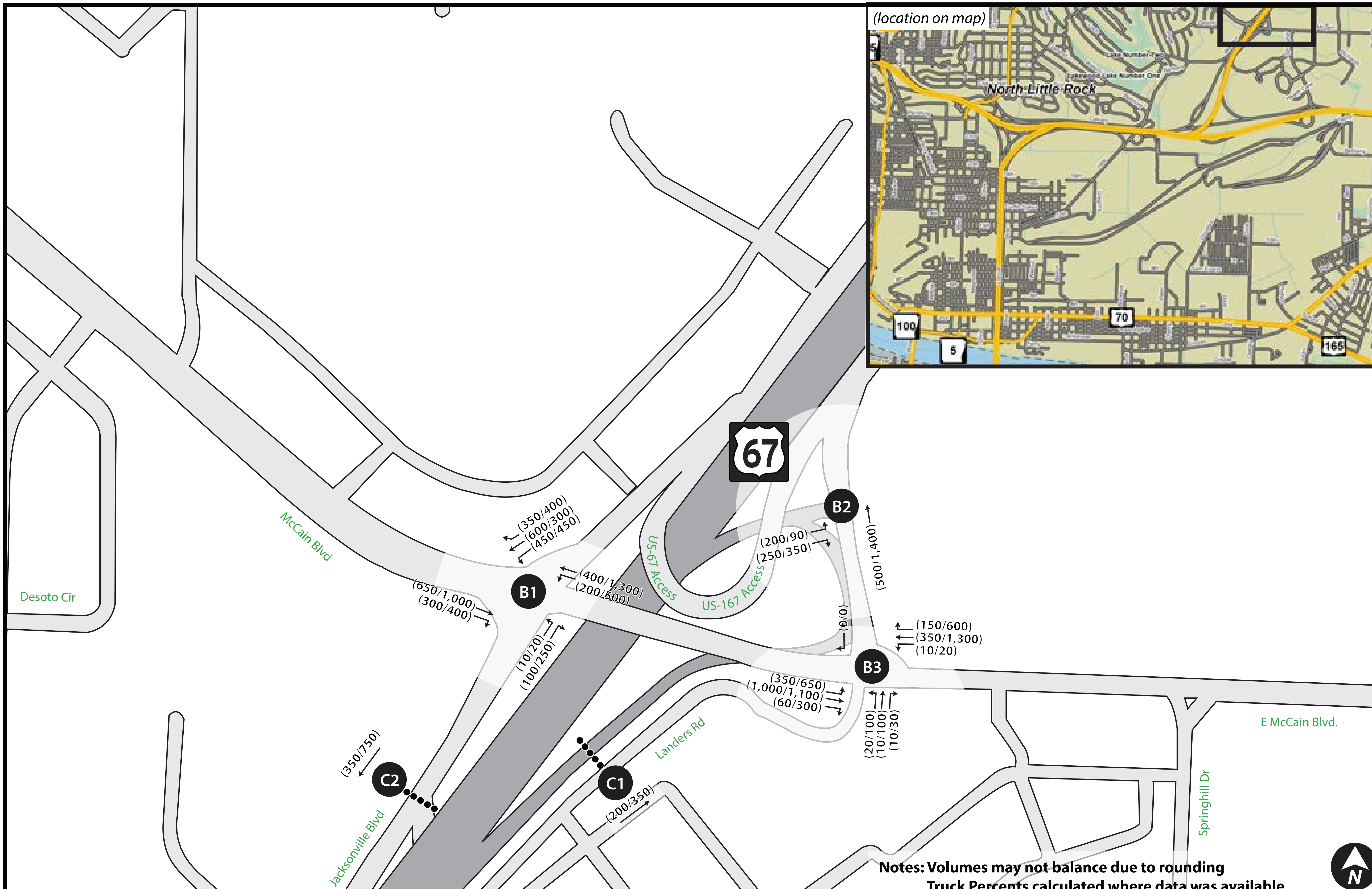
Proposed Work

CAP Connecting Arkansas Program

January 2015

EXHIBIT 6.1A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Opening Year 2021 Traffic Forecast



Legend 48-hour counts ••••• 24-hour counts

A Mainline Count
B Turning movement count
C Ramp count

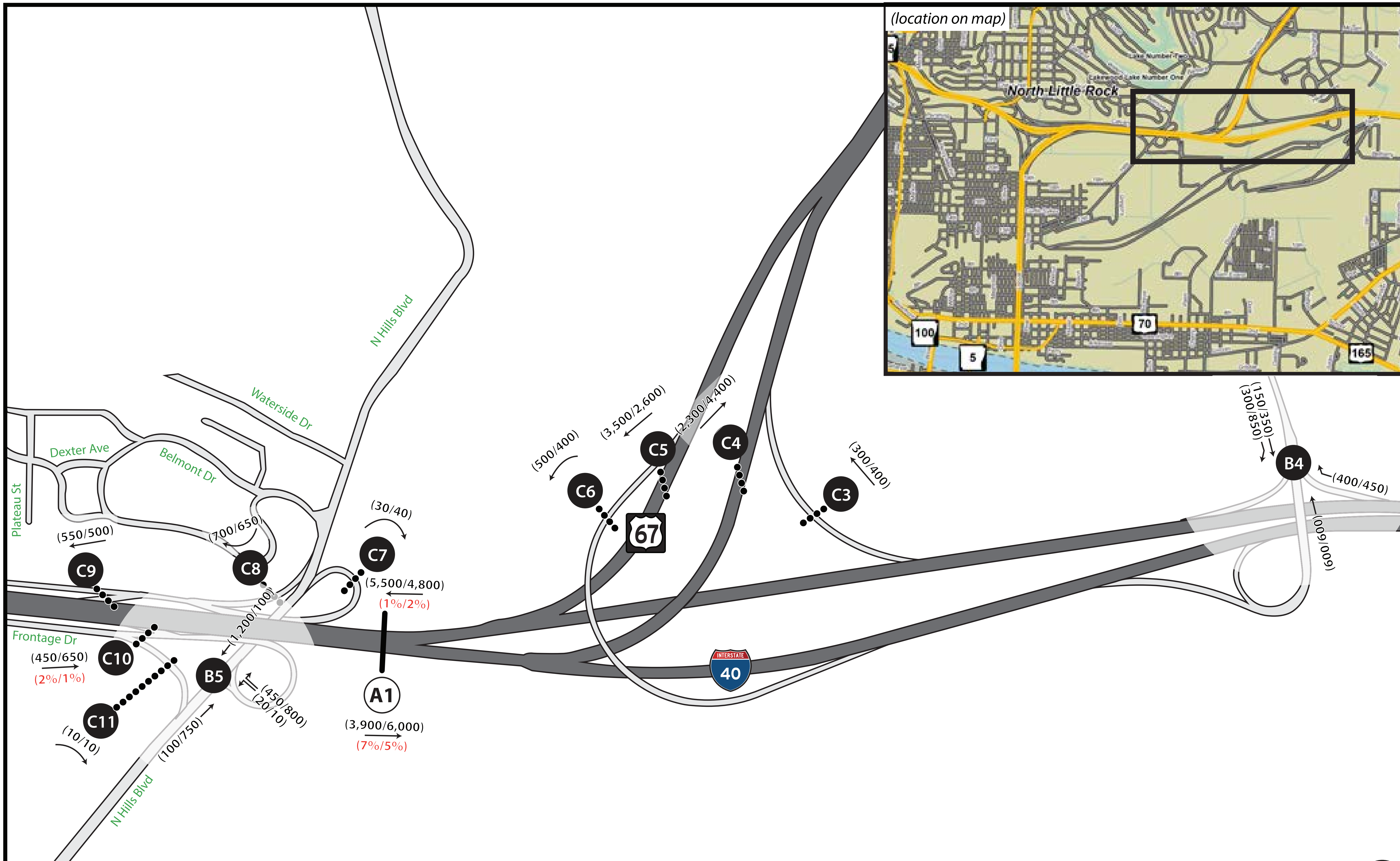
(AM/PM) Traffic Counts
(AM/PM) Truck Percent
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 6.2A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Opening Year 2021 Traffic Forecast



Notes: Volumes may not balance due to rounding
Truck Percents calculated where data was available

Legend

48-hour counts

24-hour counts

A Mainline Count

B Turning movement count

C Ramp count

(AM/PM) Traffic Counts

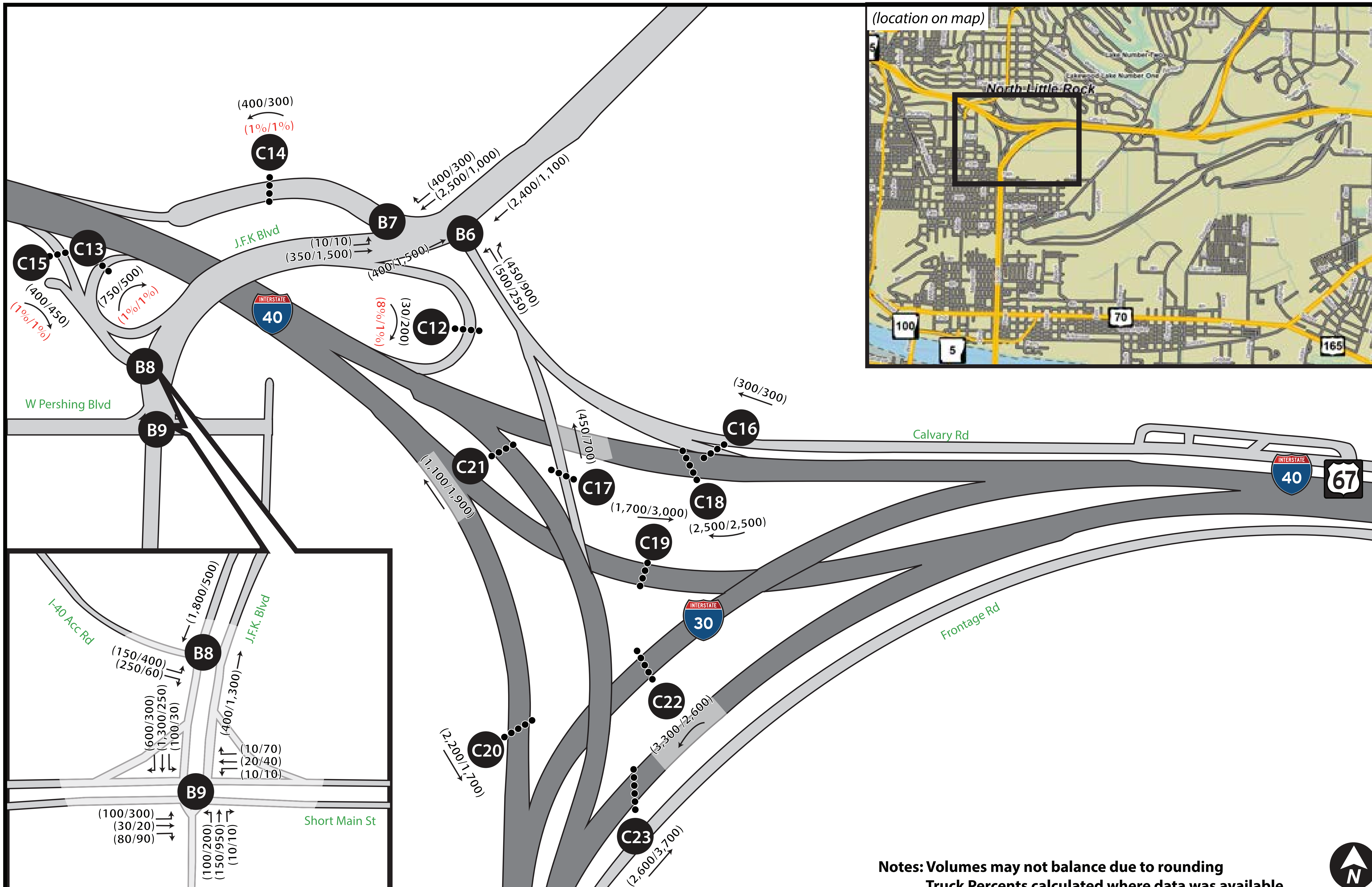
(AM/PM) Truck Percent

Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

January 2015

EXHIBIT 6.3A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Opening Year 2021 Traffic Forecast



Notes: Volumes may not balance due to rounding
Truck Percents calculated where data was available

Legend

48-hour counts

24-hour counts

(A) Mainline Count

(B) Turning movement count

(C) Ramp count

(AM/PM) Traffic Counts

(AM/PM) Truck Percent

Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

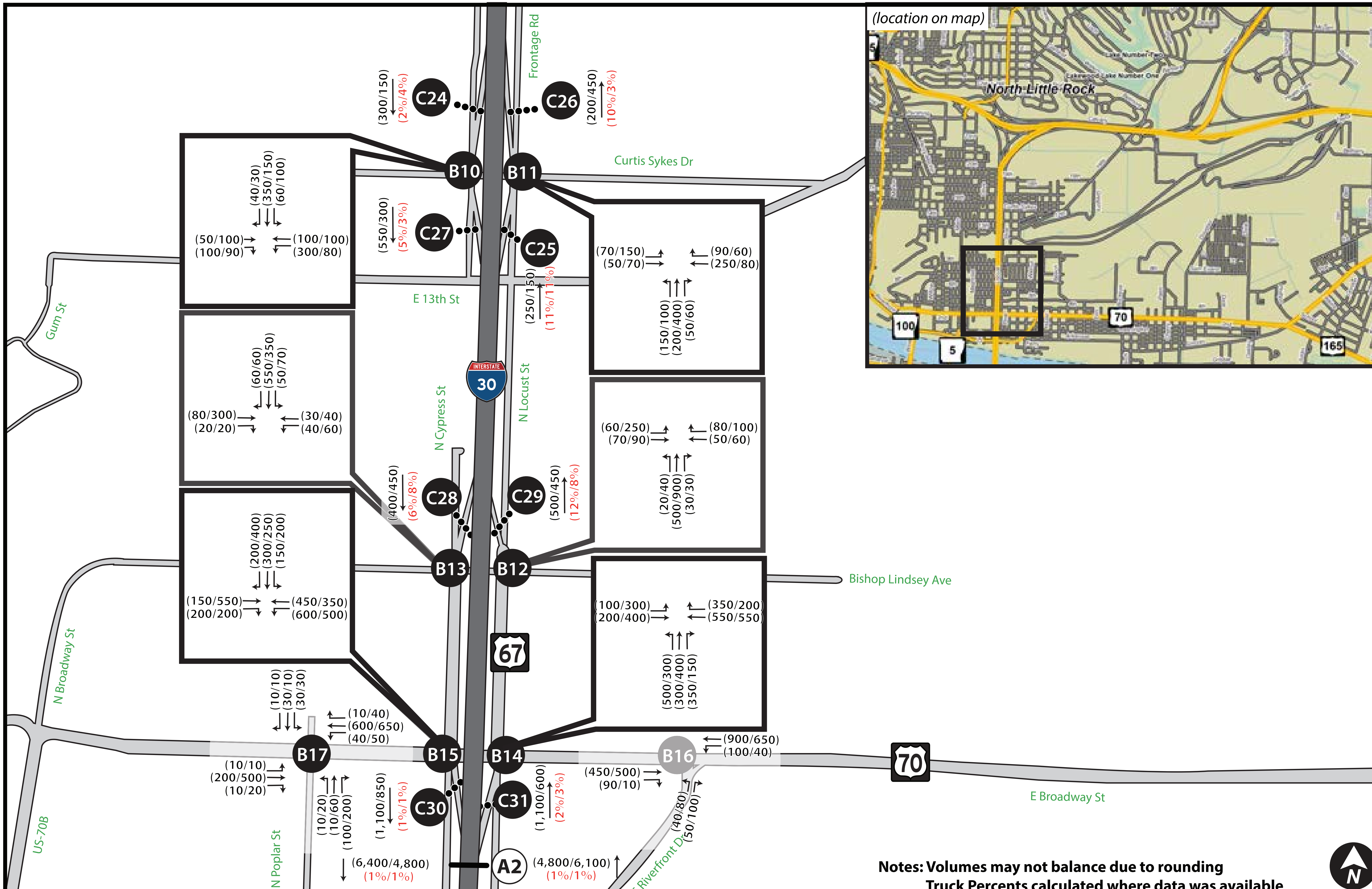
AHTD

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 6.4A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Opening Year 2021 Traffic Forecast



Legend

48-hour counts

24-hour counts

A Mainline Count

B Turning movement count

C Ramp count

(AM/PM) Traffic Counts

(AM/PM) Truck Percent

Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

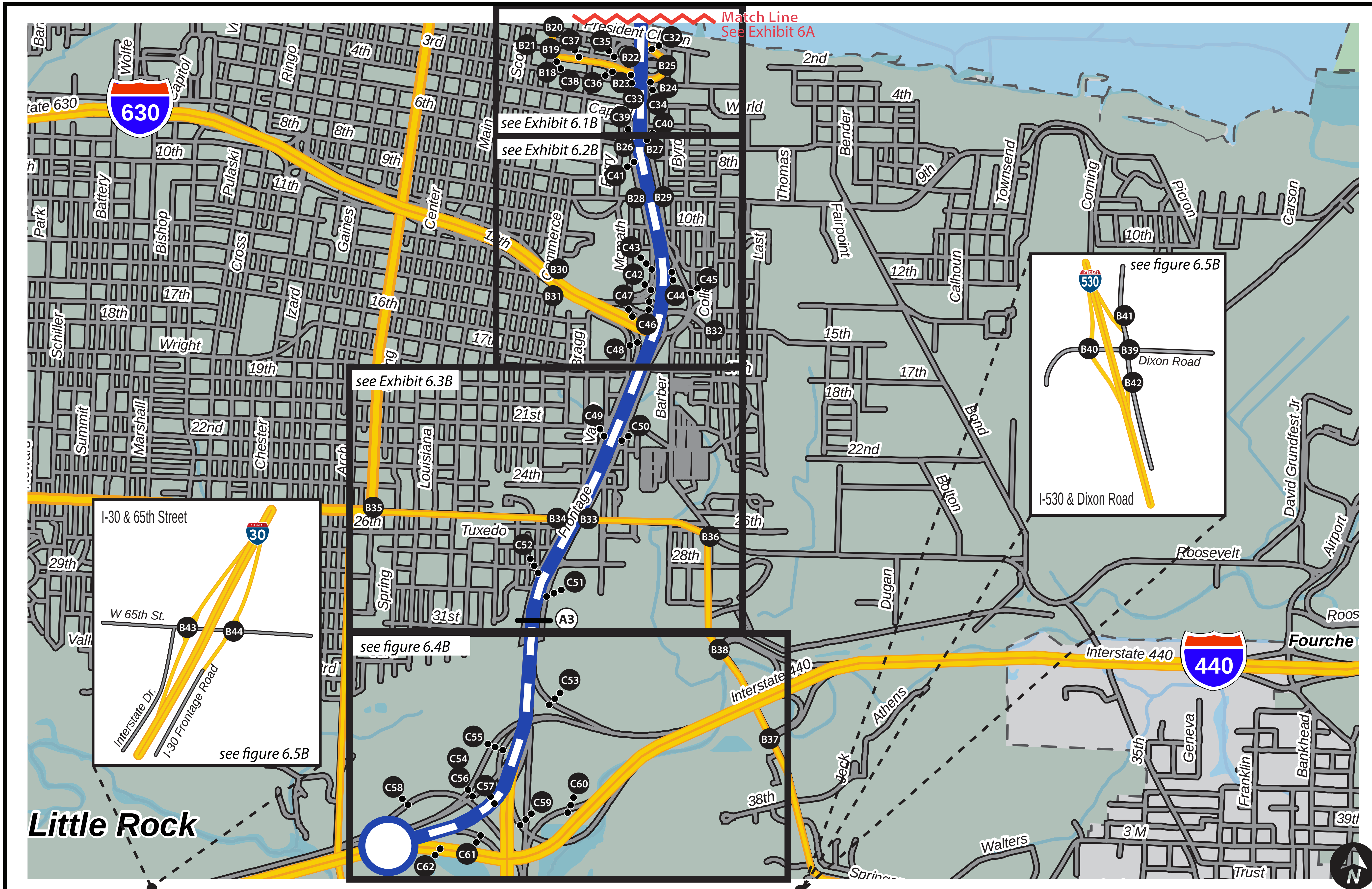


EXHIBIT 6B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Opening Year 2021 Traffic Forecast

Legend — 48-hour counts •••• 24-hour counts

(A) Mainline Count
(B) Turning movement count
(C) Ramp count

Proposed Work

CONNECTING ARKANSAS PROGRAM CAP

January 2015

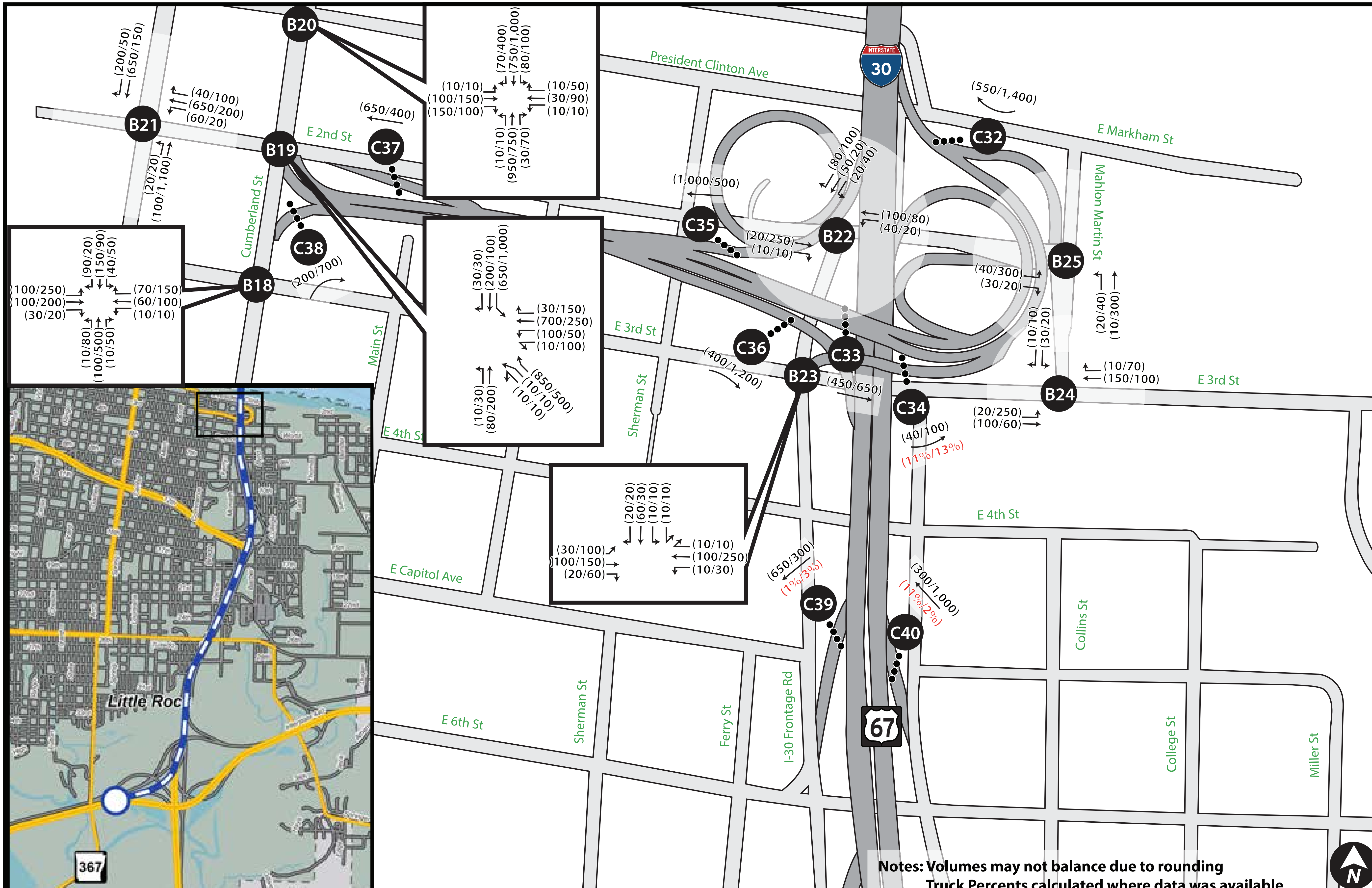


EXHIBIT 6.1B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Opening Year 2021 Traffic Forecast

CONNECTING ARKANSAS PROGRAM CAP

January 2015

Legend — 48-hour counts ••••• 24-hour counts

Ⓐ Mainline Count
Ⓑ Turning movement count
Ⓒ Ramp count

(AM/PM) Traffic Counts
(AM/PM) Truck Percent
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

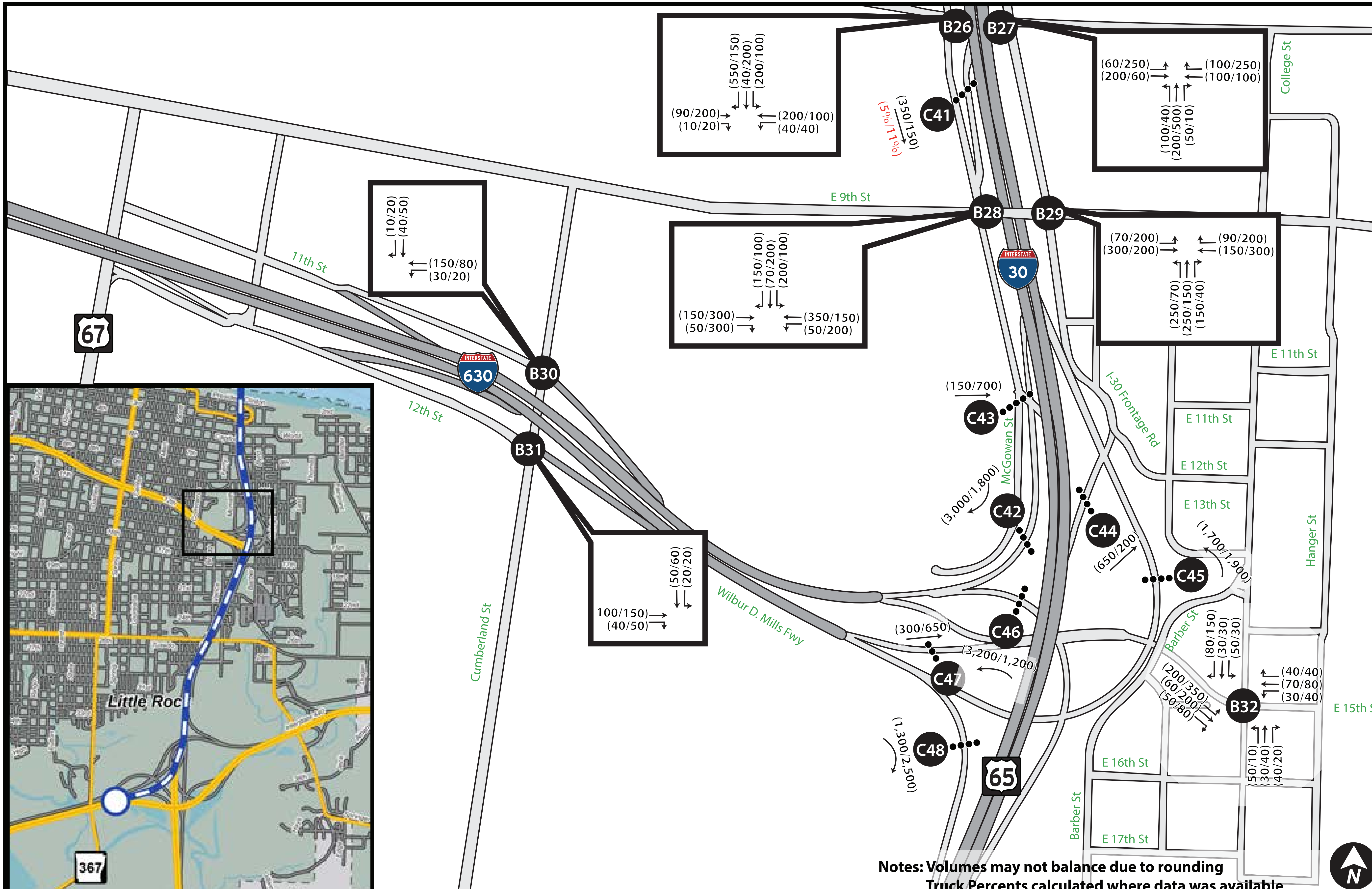


EXHIBIT 6.2B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Opening Year 2021 Traffic Forecast

CONNECTING ARKANSAS PROGRAM CAP

January 2015

Legend

48-hour counts

24-hour counts

A Mainline Count

B Turning movement count

C Ramp count

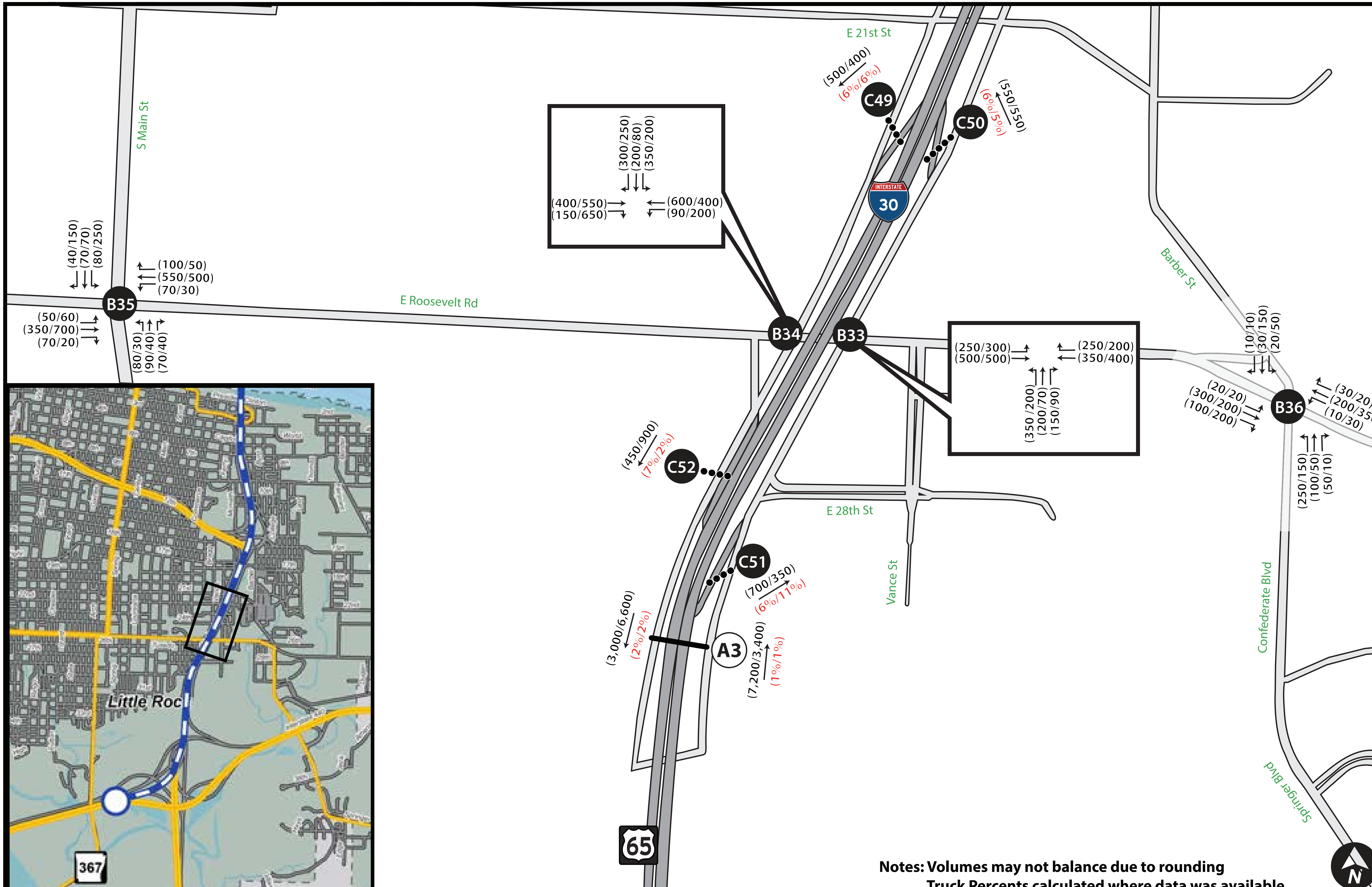
(AM/PM) Traffic Counts

(AM/PM) Truck Percent

Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

EXHIBIT 6.3B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Opening Year 2021 Traffic Forecast



Legend

48-hour counts

24-hour counts

A Mainline Count

B Turning movement count

C Ramp count

(AM/PM) Traffic Counts

(AM/PM) Truck Percent

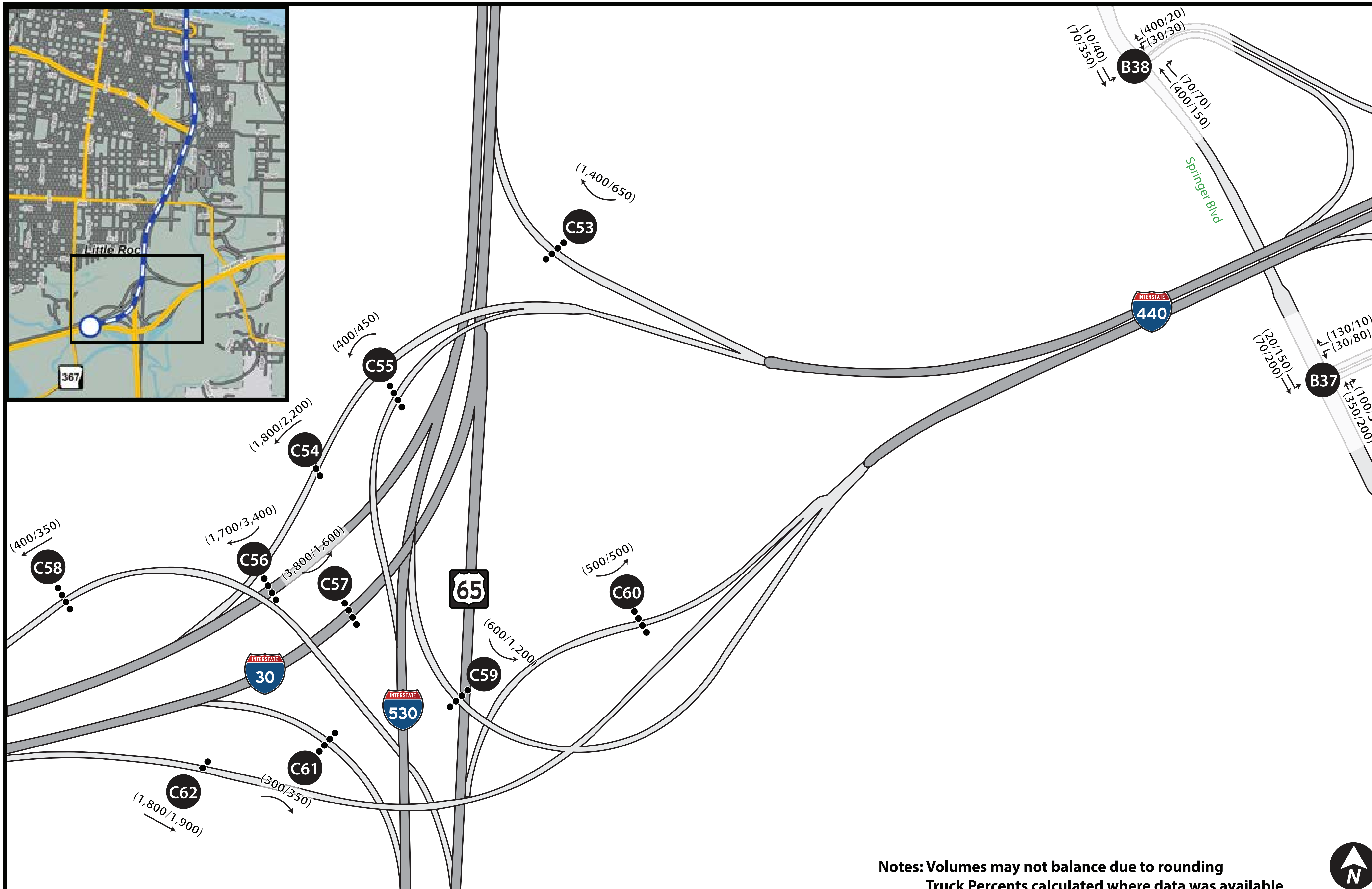
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 6.4B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Opening Year 2021 Traffic Forecast



Notes: Volumes may not balance due to rounding
Truck Percents calculated where data was available

Legend

48-hour counts

24-hour counts

A Mainline Count

B Turning movement count

C Ramp count

(AM/PM) Traffic Counts

(AM/PM) Truck Percent

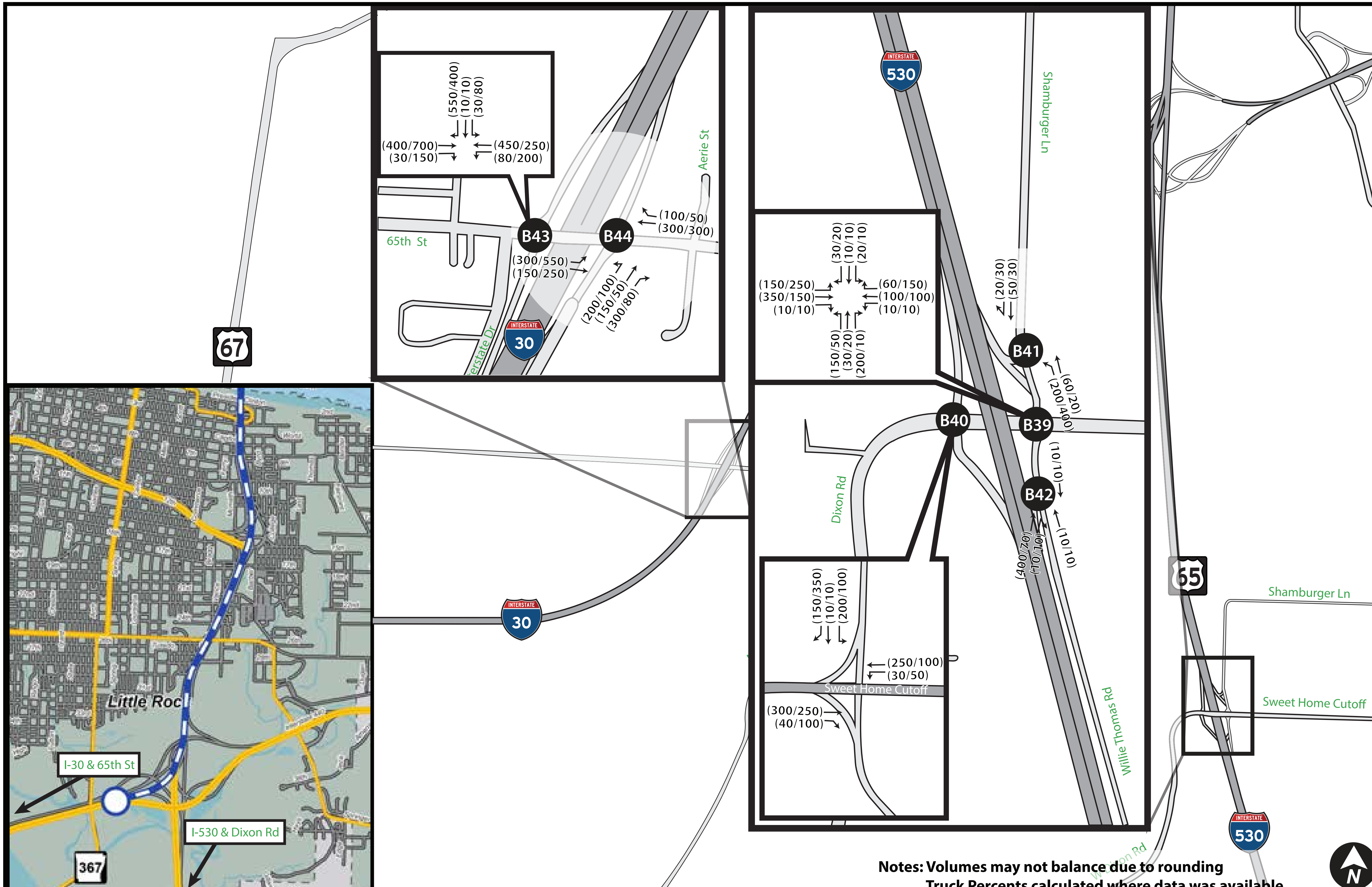
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 6.5B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Opening Year 2021 Traffic Forecast



Notes: Volumes may not balance due to rounding
Truck Percents calculated where data was available

Legend

48-hour counts
24-hour counts

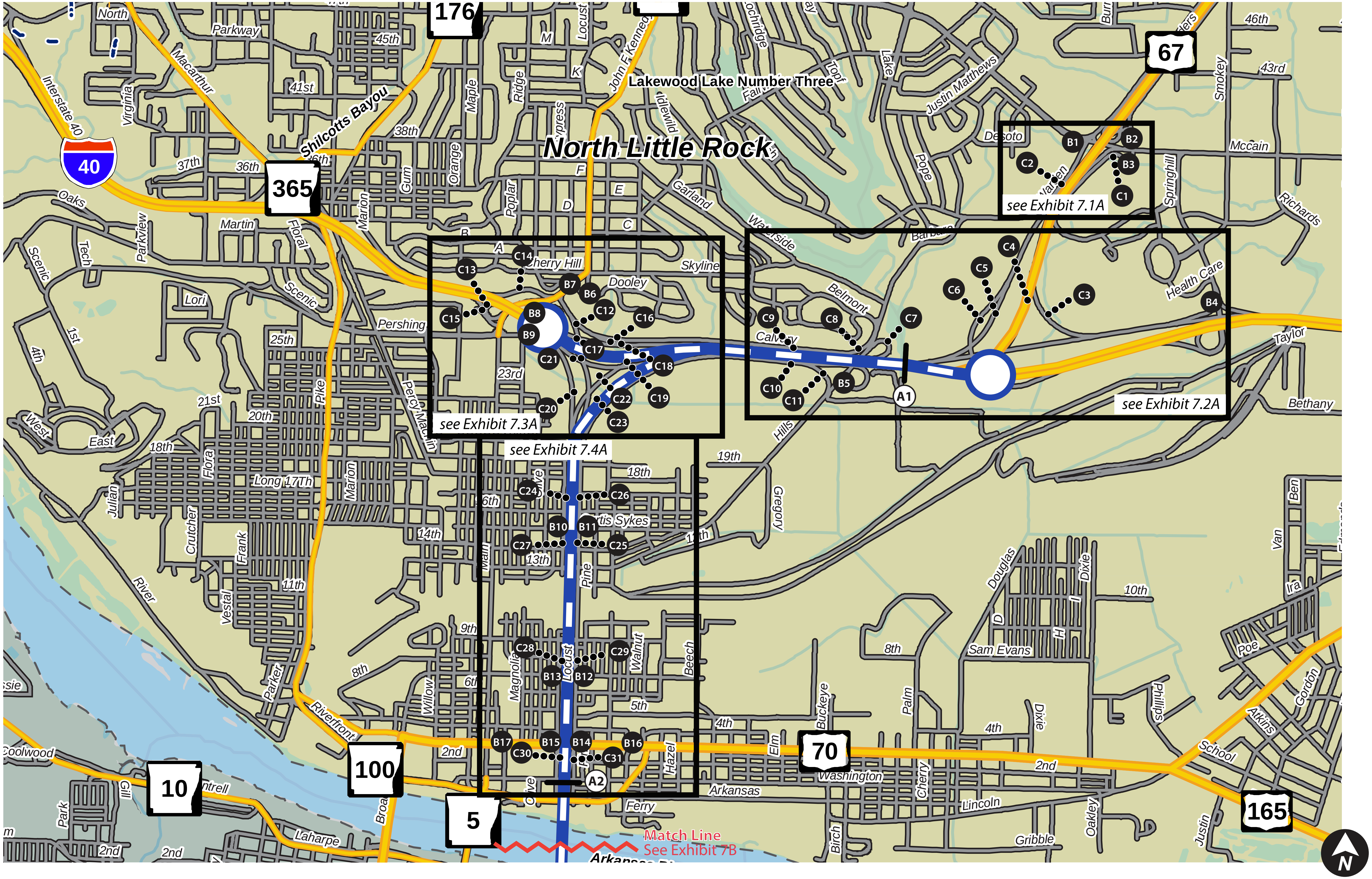
Ⓐ Mainline Count
Ⓑ Turning movement count
Ⓒ Ramp count

(AM/PM) Traffic Counts
(AM/PM) Truck Percent
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 7A



Legend 48-hour counts 24-hour counts

A Mainline Count

B Turning movement count

C Ramp count

Proposed Work

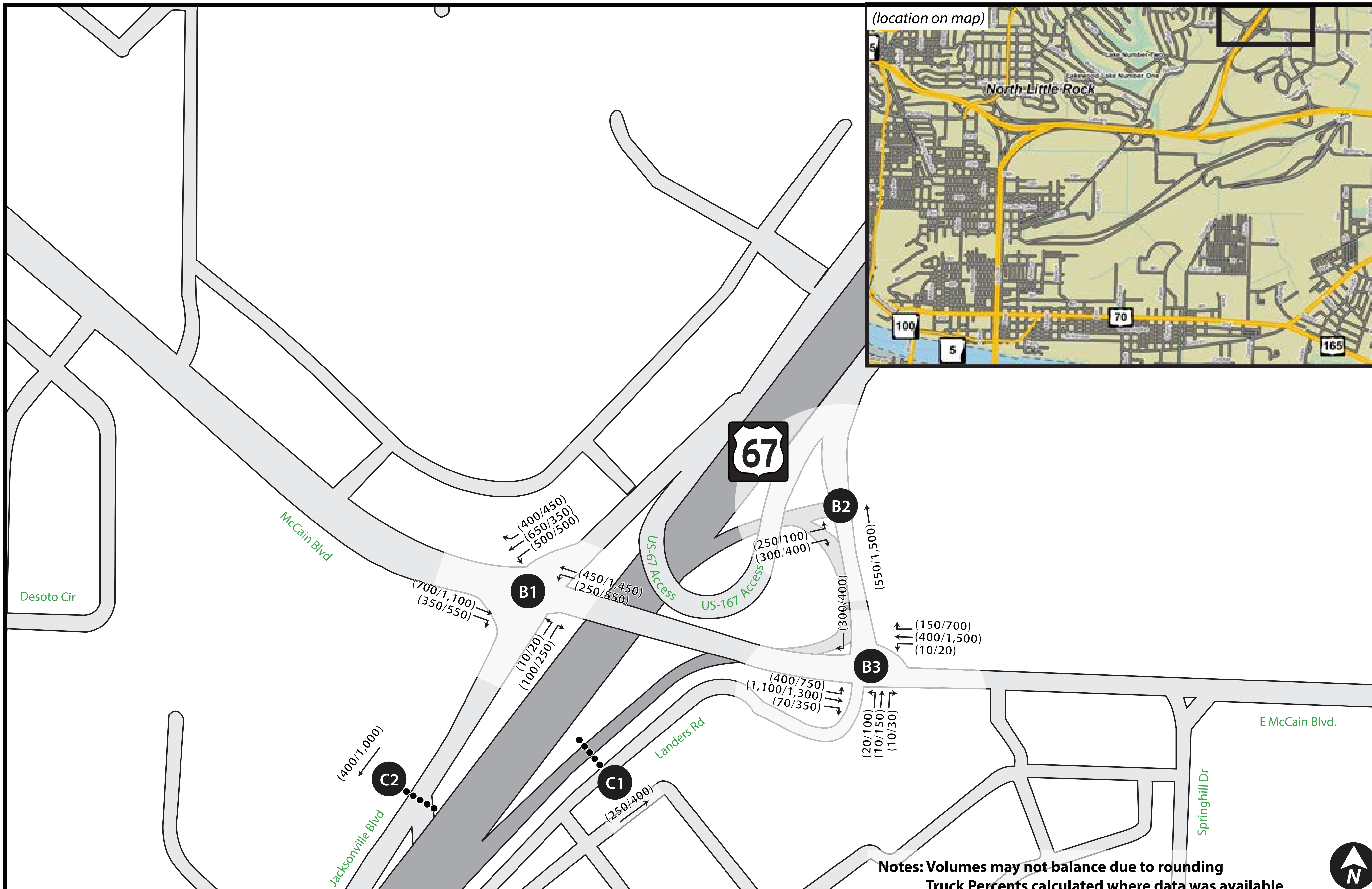
CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Design Year 2041 Traffic Forecast

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 7.1A

CA0602 - I-30/I-40
Widening and Rehabilitation
Interstate 530 to Highway 67
Design Year 2041 Traffic Forecast



Notes: Volumes may not balance due to rounding
Truck Percents calculated where data was available

Legend

48-hour counts
24-hour counts

(A) Mainline Count
(B) Turning movement count
(C) Ramp count

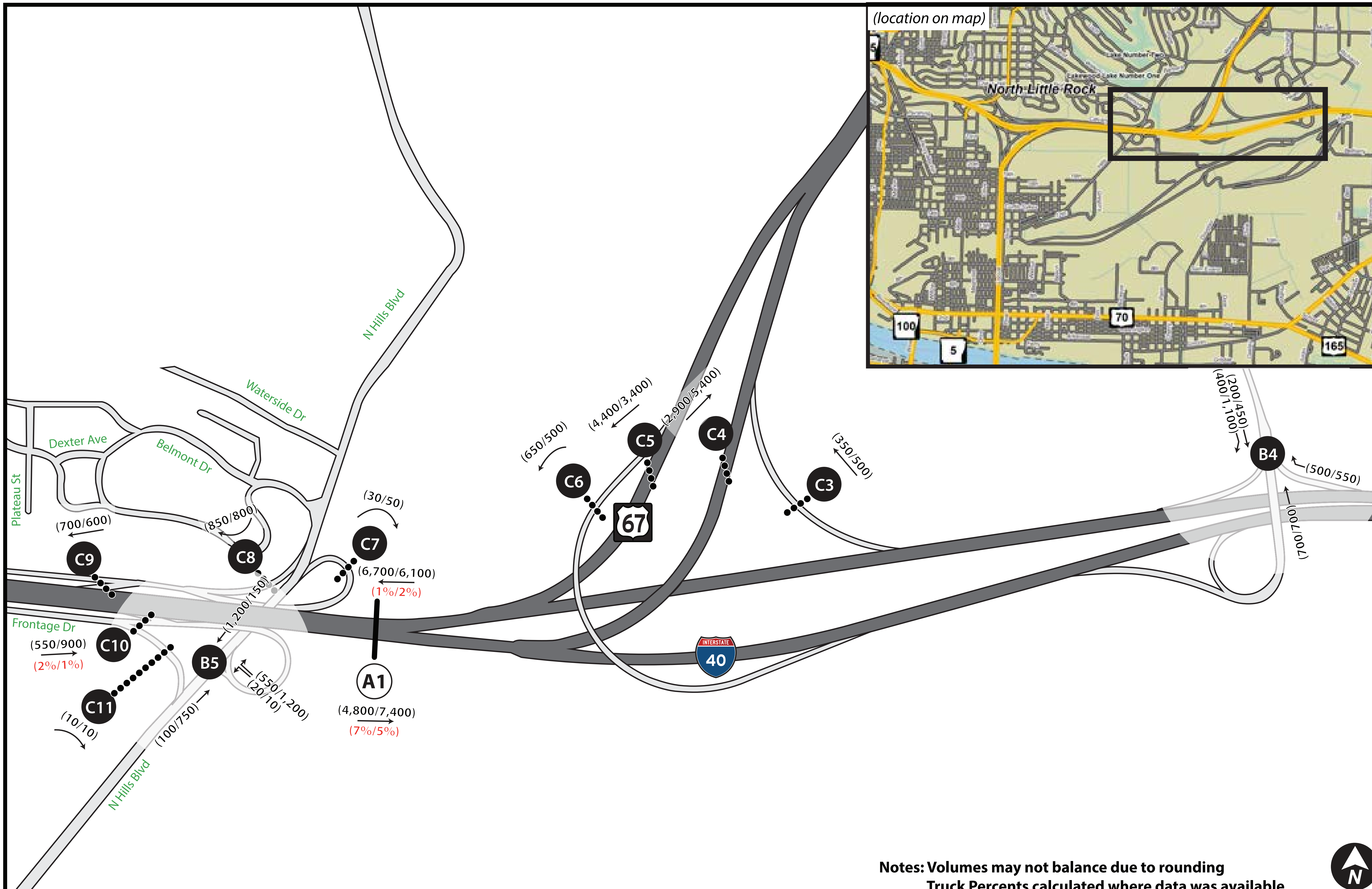
(AM/PM) Traffic Counts
(AM/PM) Truck Percent
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 7.2A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Design Year 2041 Traffic Forecast



Notes: Volumes may not balance due to rounding
Truck Percents calculated where data was available

Legend — 48-hour counts ••••• 24-hour counts

A Mainline Count
B Turning movement count
C Ramp count

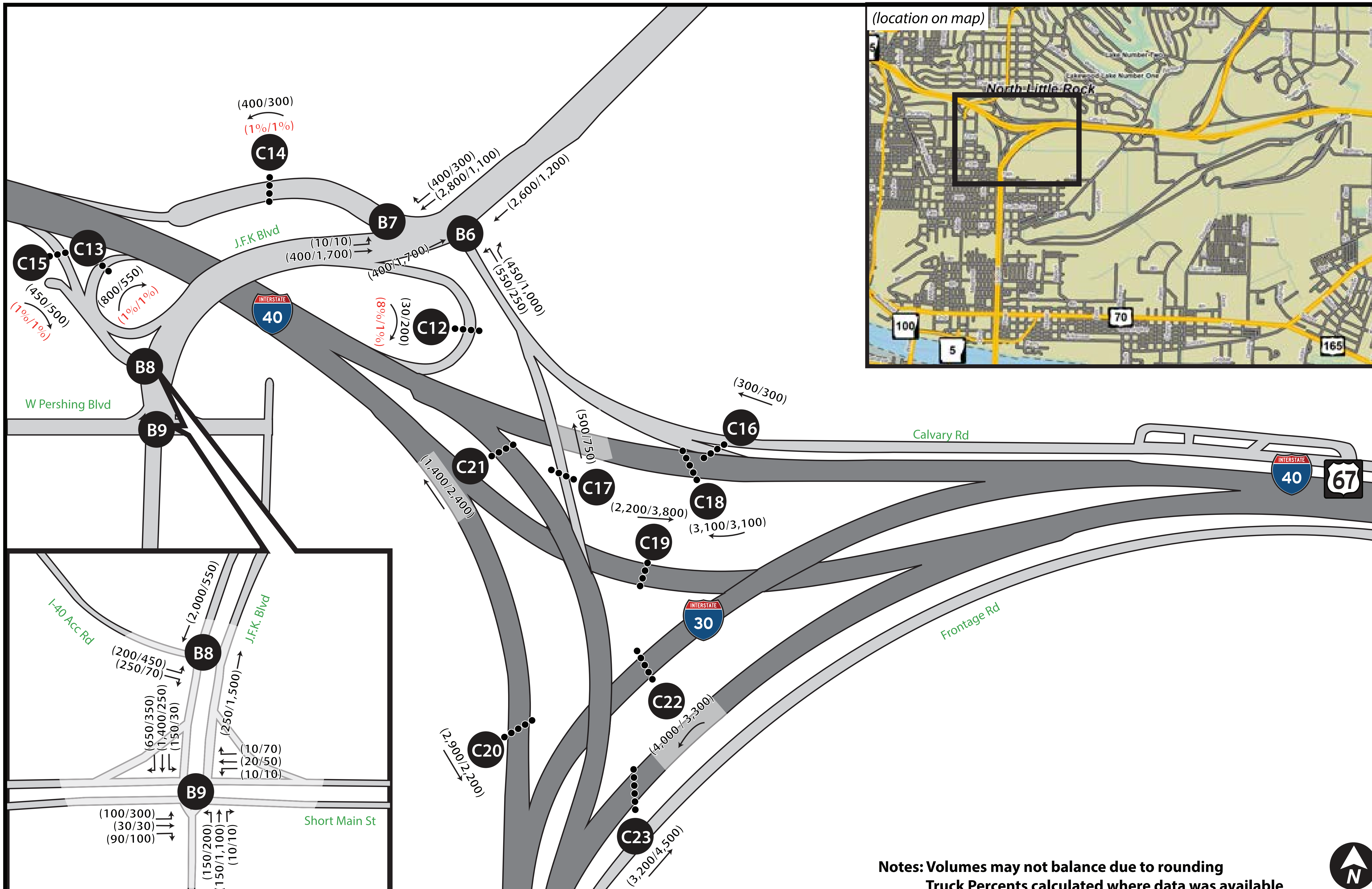
(AM/PM) Traffic Counts
(AM/PM) Truck Percent
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 7.3A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Design Year 2041 Traffic Forecast



Notes: Volumes may not balance due to rounding
Truck Percents calculated where data was available

Legend

48-hour counts

24-hour counts

A Mainline Count

B Turning movement count

C Ramp count

(AM/PM) Traffic Counts

(AM/PM) Truck Percent

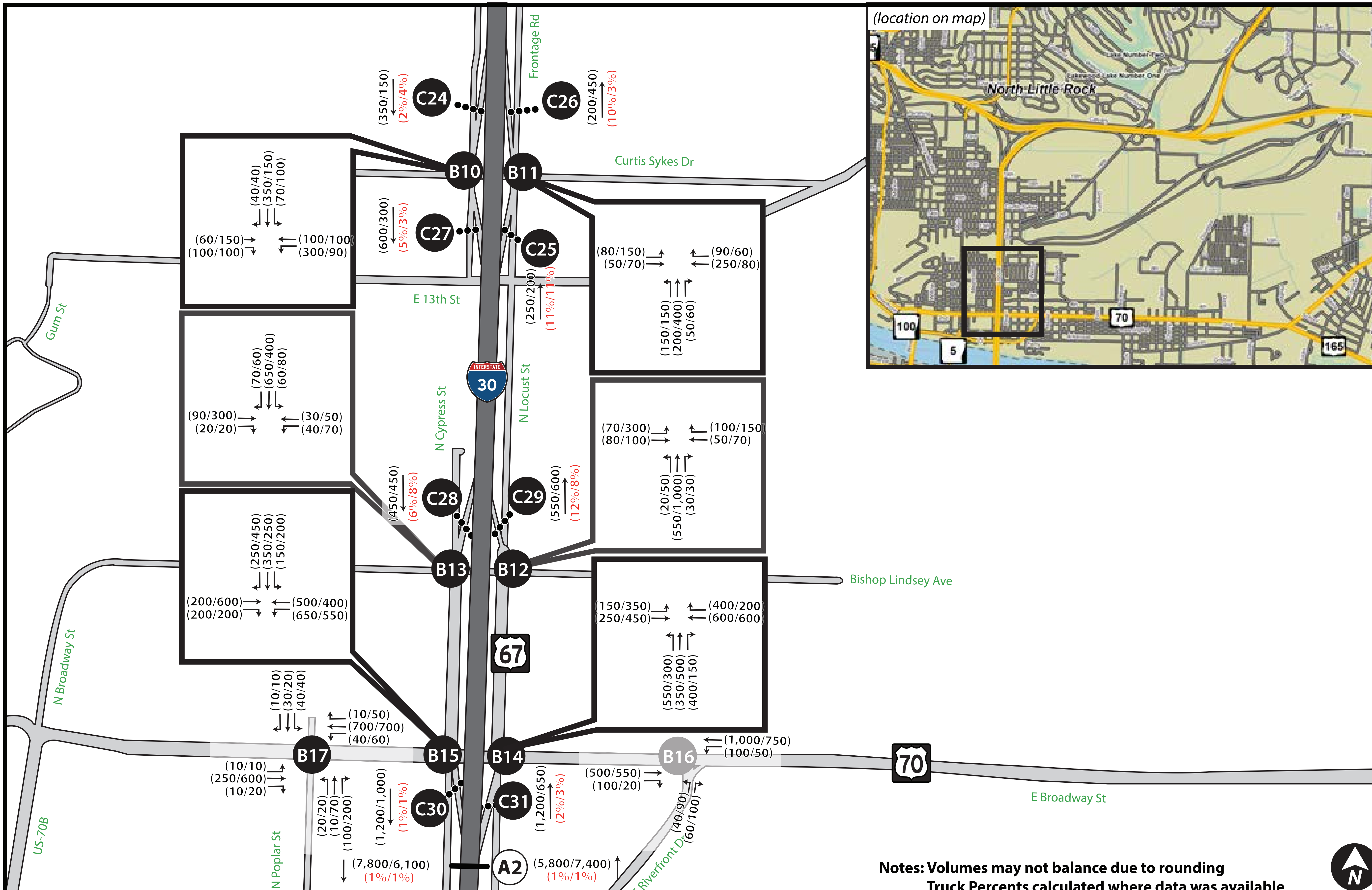
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 7.4A

CA0602 - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Design Year 2041 Traffic Forecast



Notes: Volumes may not balance due to rounding
Truck Percents calculated where data was available

Legend

48-hour counts ••••• 24-hour counts

(A) Mainline Count
(B) Turning movement count
(C) Ramp count

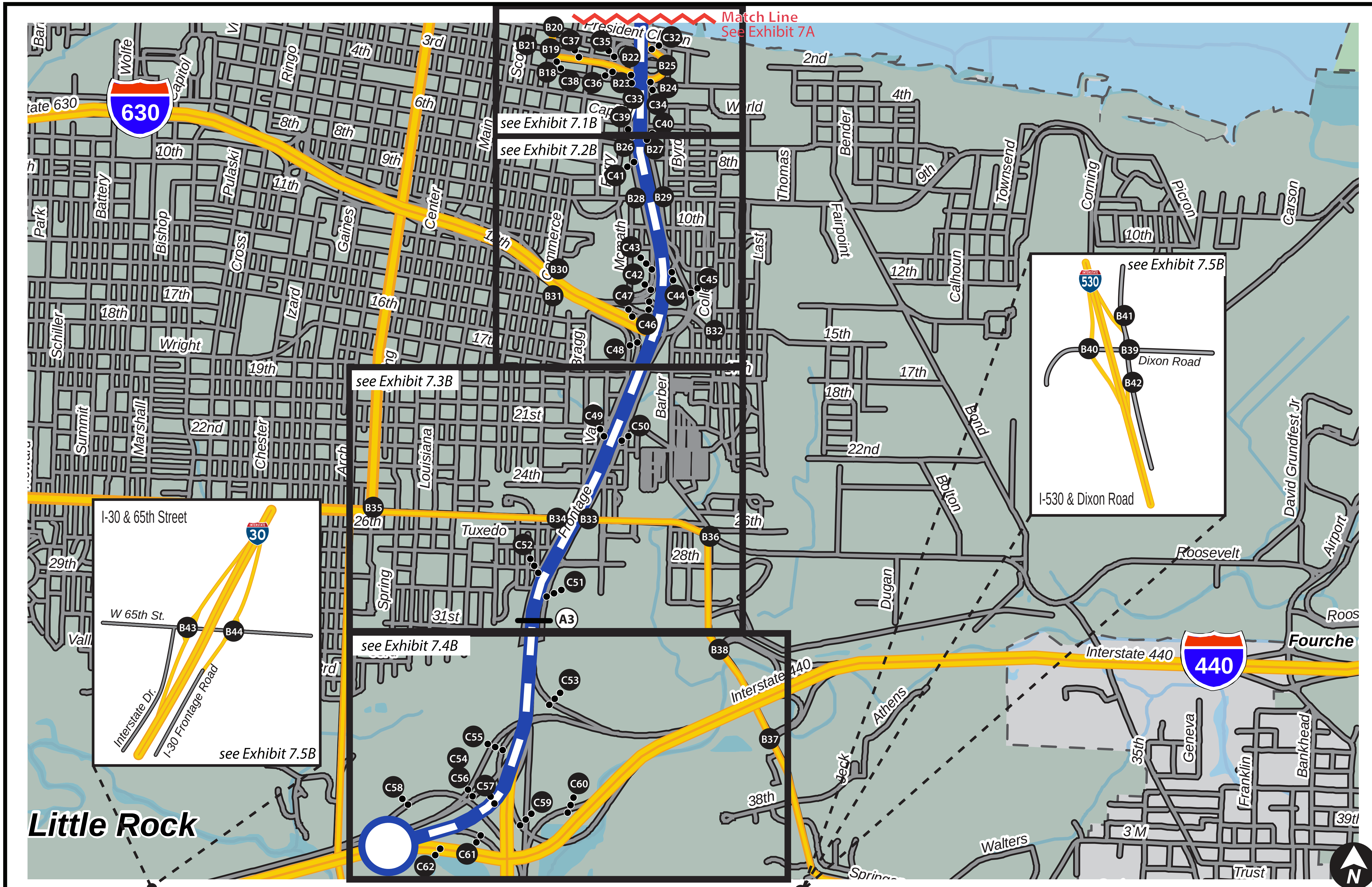
(AM/PM) Traffic Counts
(AM/PM) Truck Percent
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 7B

CA0602 South - I-30/I-40 Widening and Rehabilitation
Interstate 530 to Highway 67
Design Year 2041 Traffic Forecast



Legend

48-hour counts

24-hour counts

Ⓐ Mainline Count

Ⓑ Turning movement count

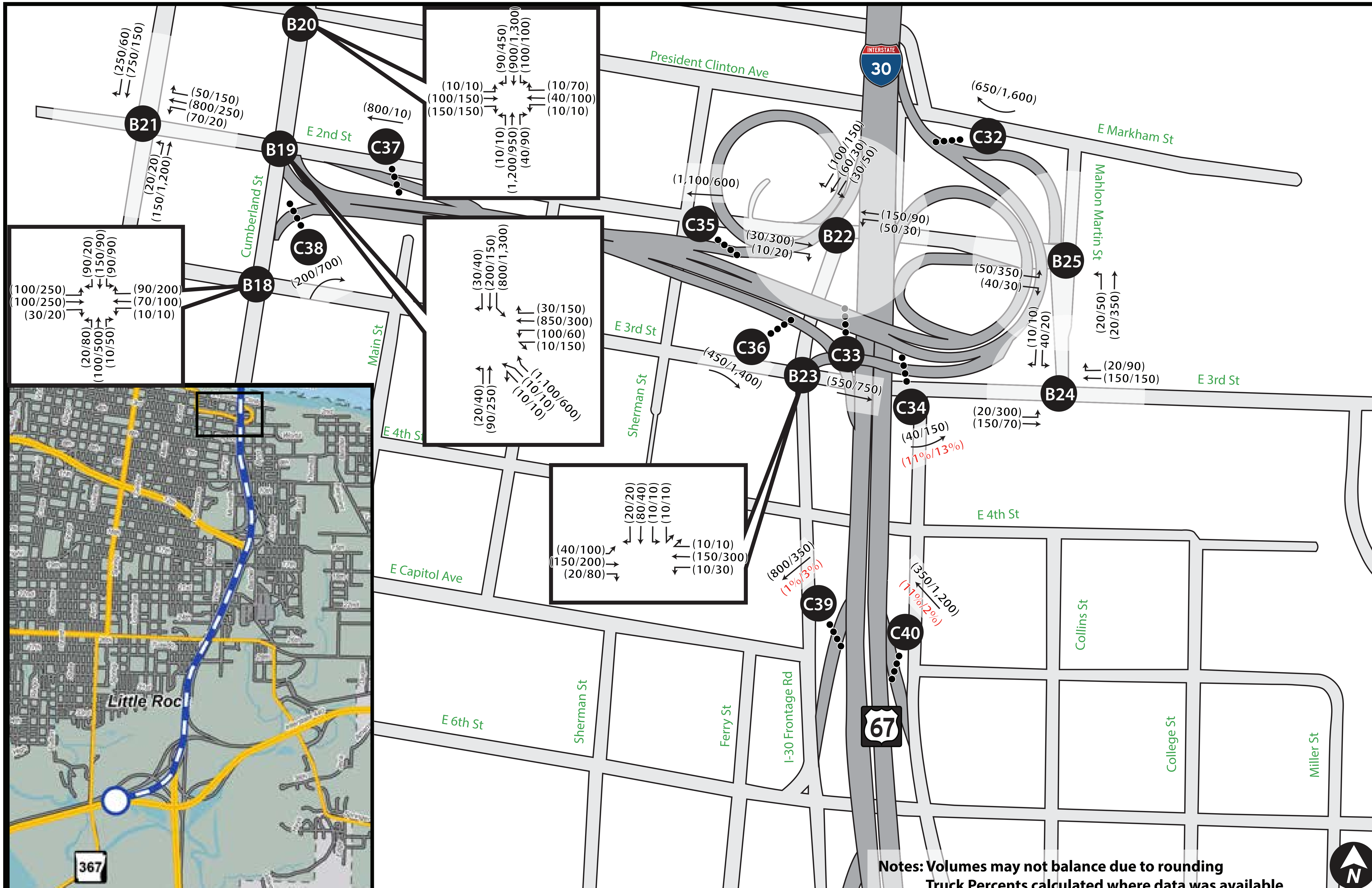
Ⓒ Ramp count

Proposed Work

January 2015

EXHIBIT 7.1B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Design Year 2041 Traffic Forecast



Legend

48-hour counts

24-hour counts

Ⓐ Mainline Count

Ⓑ Turning movement count

Ⓒ Ramp count

(AM/PM) Traffic Counts

(AM/PM) Truck Percent

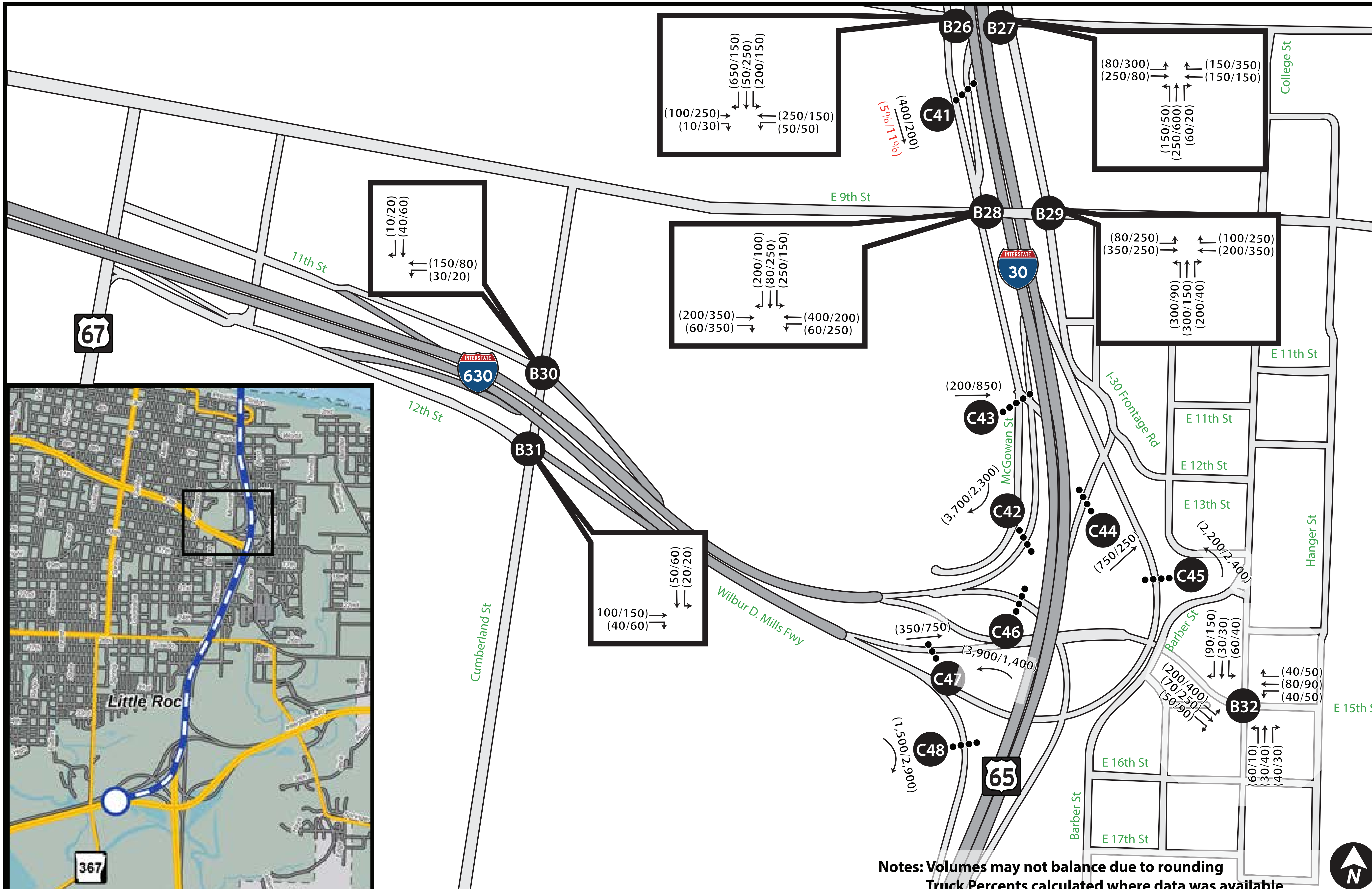
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 7.2B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Design Year 2041 Traffic Forecast



Legend

48-hour counts

24-hour counts

A Mainline Count

B Turning movement count

C Ramp count

(AM/PM) Traffic Counts

(AM/PM) Truck Percent

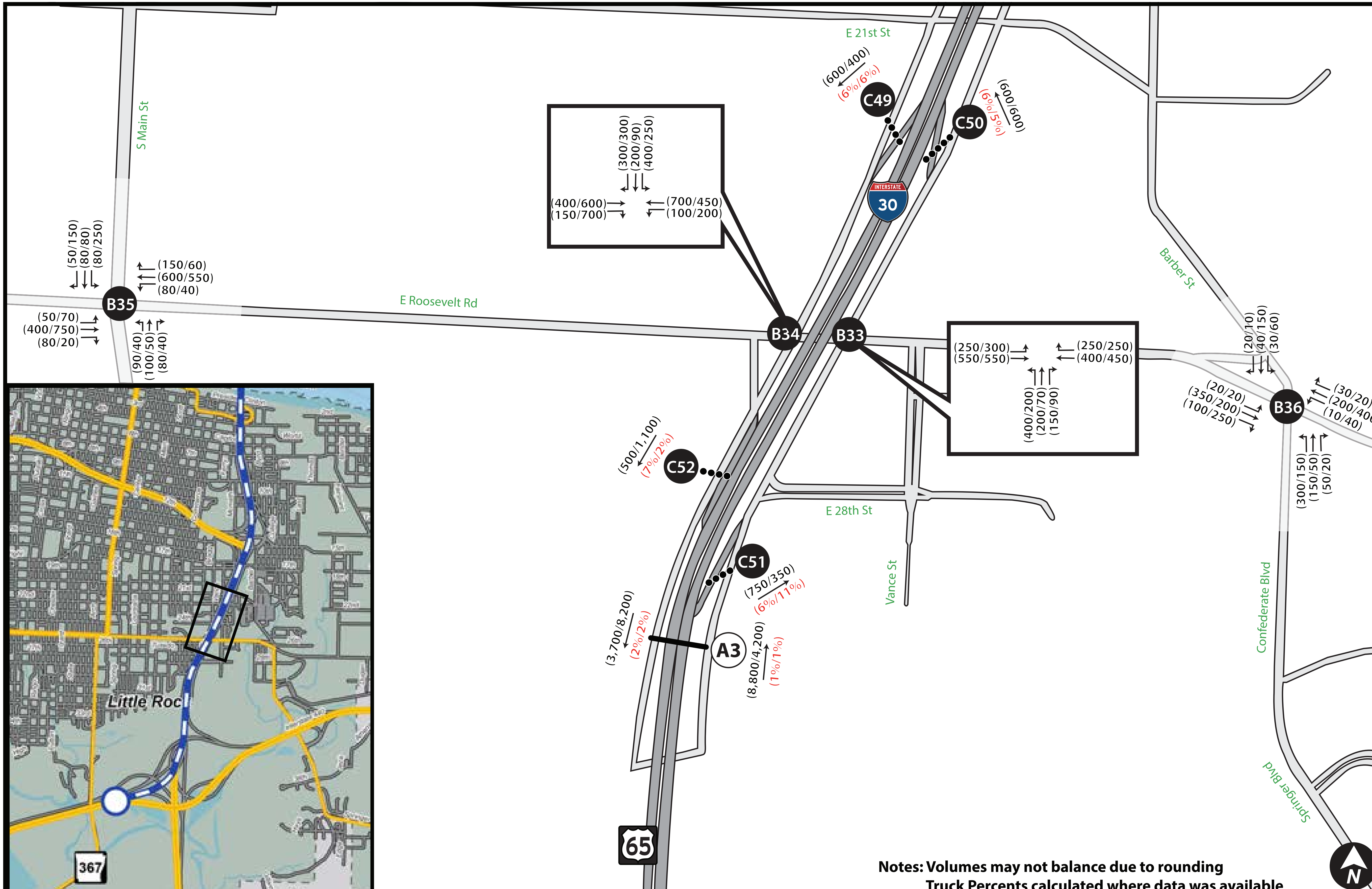
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

EXHIBIT 7.3B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Design Year 2041 Traffic Forecast



Notes: Volumes may not balance due to rounding
Truck Percents calculated where data was available

Legend

48-hour counts

24-hour counts

A Mainline Count

B Turning movement count

C Ramp count

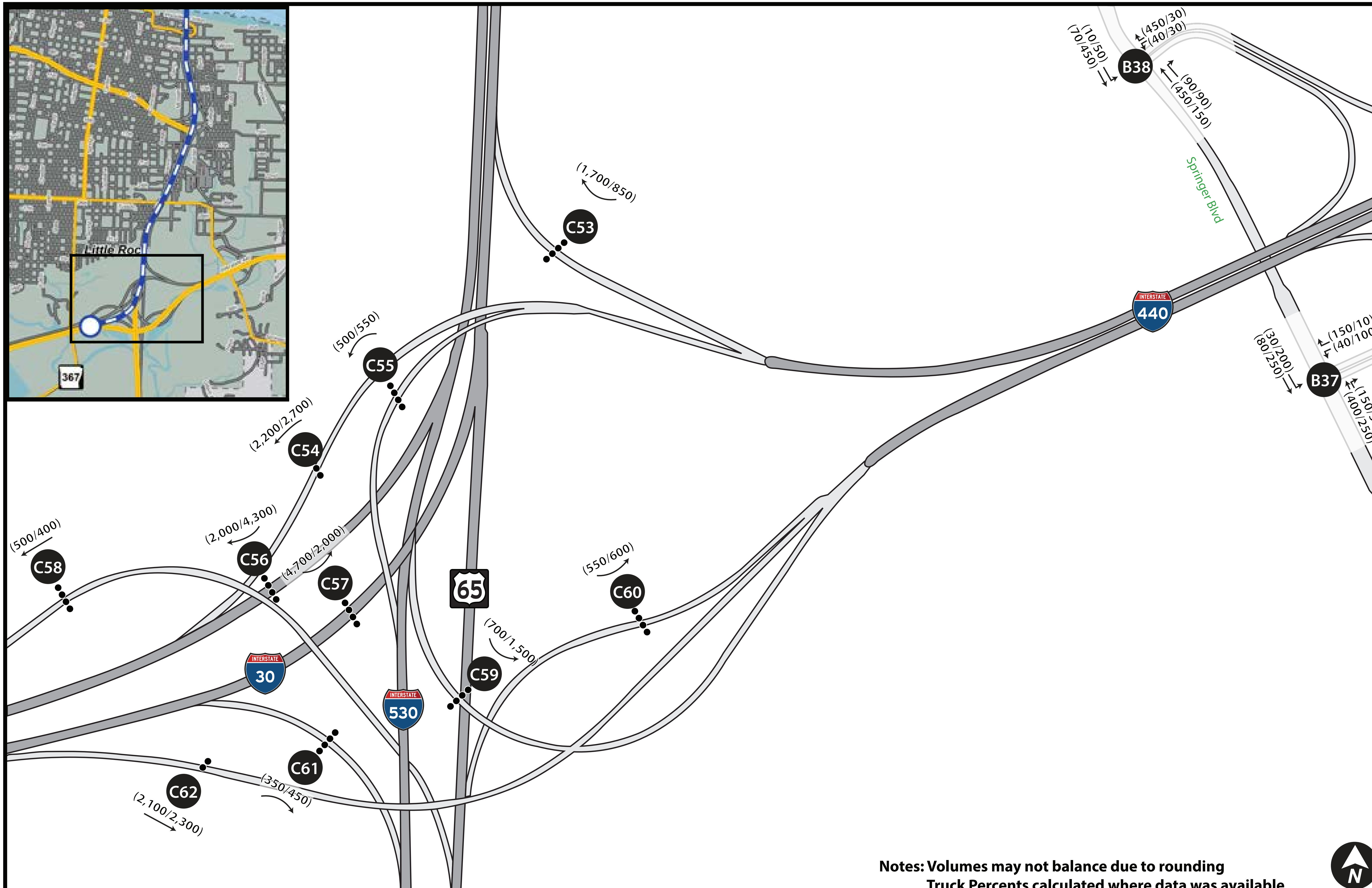
(AM/PM) Traffic Counts

(AM/PM) Truck Percent

Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015



Notes: Volumes may not balance due to rounding
Truck Percents calculated where data was available

EXHIBIT 7.4B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Design Year 2041 Traffic Forecast

CONNECTING ARKANSAS PROGRAM CAP

January 2015

Legend

48-hour counts

24-hour counts

(A) Mainline Count

(B) Turning movement count

(C) Ramp count

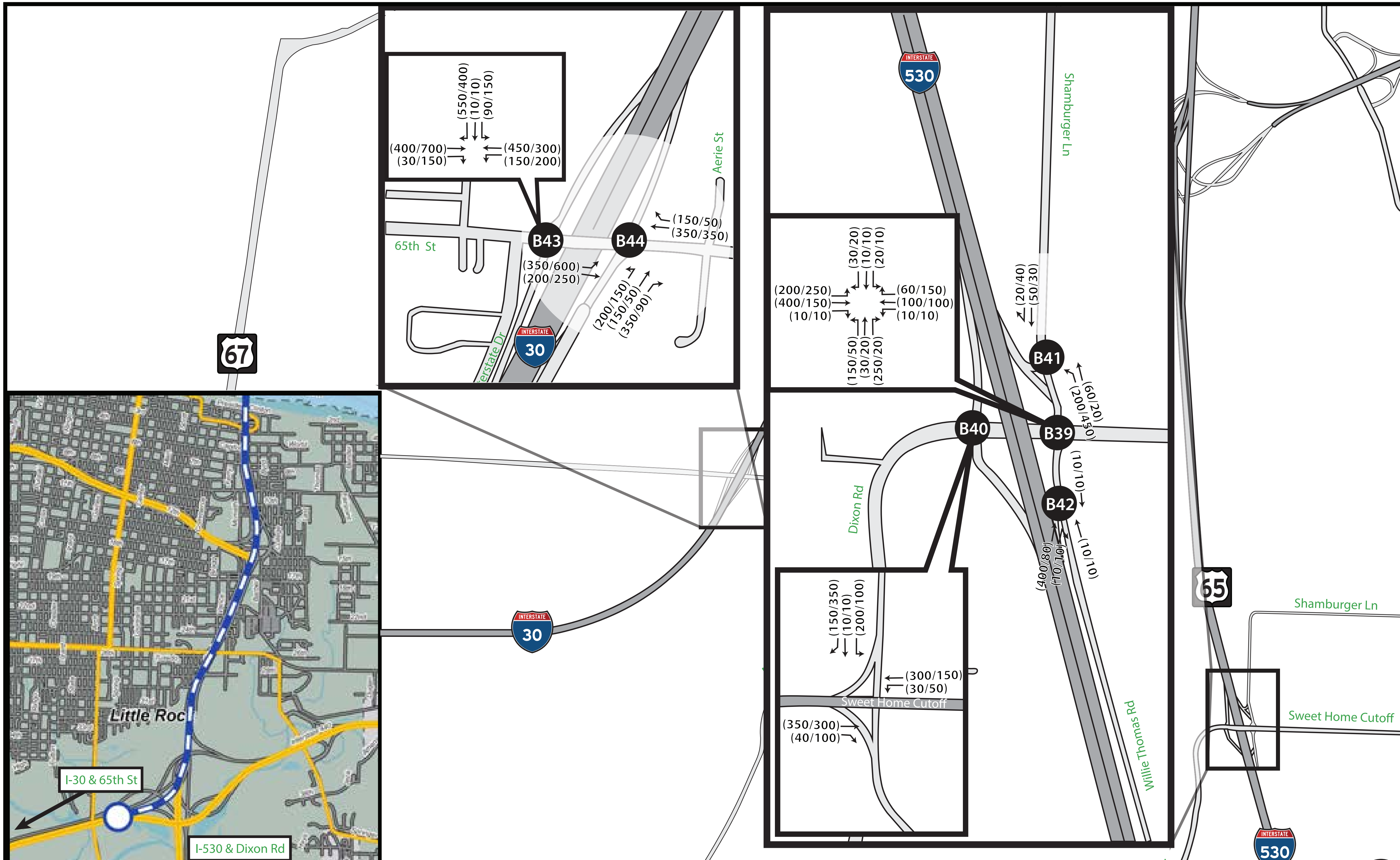
(AM/PM) Traffic Counts

(AM/PM) Truck Percent

Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

EXHIBIT 7.5B

CA0602 South - I-30/I-40 Widening and Rehabilitation Interstate 530 to Highway 67 Design Year 2041 Traffic Forecast



Notes: Volumes may not balance due to rounding
Truck Percents calculated where data was available

Legend

48-hour counts
24-hour counts

A Mainline Count
B Turning movement count
C Ramp count

(AM/PM) Traffic Counts
(AM/PM) Truck Percent
Peak Hour Times: 7:15 AM–8:15 AM and 4:30 PM–5:30 PM

CONNECTING ARKANSAS PROGRAM CAP

January 2015

CHAPTER 6

EQUIVALENT SINGLE AXLE LOAD FORECAST

The following section outlines the equivalent single axle load forecast (ESSL) for the CA0602 – I-30/I-40 Widening & Rehabilitation, Interstate 530 to Highway 67. All of the locations in Table 3 are located within the study area. To calculate the ESALs the following information was used:

1. Develop projected ADT and Truck % based on 2018 letting year and 2041 design year forecast
2. Establish roadway inventory code
3. Cross reference that with functional class table to get correct table # to put in ESAL calculation excel sheet.
4. Enter data in 18keals_2000.xls worksheet

Table 5 includes a summary of the data needed to calculate the project ESALs. Project ESAL information in located in the electronic Appendix.

Table 5

ESAL Summary Data

	A2 **On I-30 Arkansas River Bridge**	**Cantrell** **East of Cumberland**	**Broadway** **Between Ramps**	**Roosevelt** **Between Ramps**
Projected 2018 ADT	131,000	26,500	17,500	15,000
Projected (2038) Letting Year + 20 Year ADT	160,000	29,000	19,500	17,000
Projected T%	6%	4%	5%	5%
Functional class	11/12	11/12	14	14
Table number	6	6	46	46
SN and/or D	Above SN 6 or between D10 and D11	Between SN 5 and SN 6 or D 9	Between SN 5 and SN 6	Between SN 5 and SN 6

* Consultant to perform Structural Number calculation based on geotechnical report.
**SN: Structural Number – A function of layer coefficients based upon material types and layer thicknesses.
***D: Depth (in) – as determined by the structural number and coefficient of the material type used.

APPENDIX

Electronic Appendix of Data Submitted to AHTD

5. Base Traffic Counts
6. ESAL Calculations
7. Forecast Data Spreadsheets
8. Synchro Files

Appendix 2: Traffic Technical Report

ARKANSAS STATE HIGHWAY AND

TRANSPORTATION DEPARTMENT

Connecting Arkansas Program (CAP)

Planning and Environmental Linkages (PEL)

Traffic Technical Report

Appendix

CA0602 – I-30 / I-40 Widening & Rehabilitation

Interstate 530 to Highway 67

April 2, 2015

Table of Contents

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1 CHAPTER 1: INTRODUCTION AND OVERVIEW

With the passage of the temporary Arkansas one-half cent sales tax program in November 2012, the Arkansas State Highway and Transportation Department (AHTD) will finance an accelerated $1.8 billion four-lane State Highway Construction and Improvement Program (Program) that will be completed within approximately ten years called - Connecting Arkansas Program (CAP).

As part of the CAP, a planning and environmental linkages (PEL) study is being performed for CA0602 – Interstate 30 (I-30) / Interstate 40 (I-40) Widening & Rehabilitation, Interstate 530 (I-530) to Highway 67 (Hwy 67). This report will document the traffic analysis associated with the PEL.

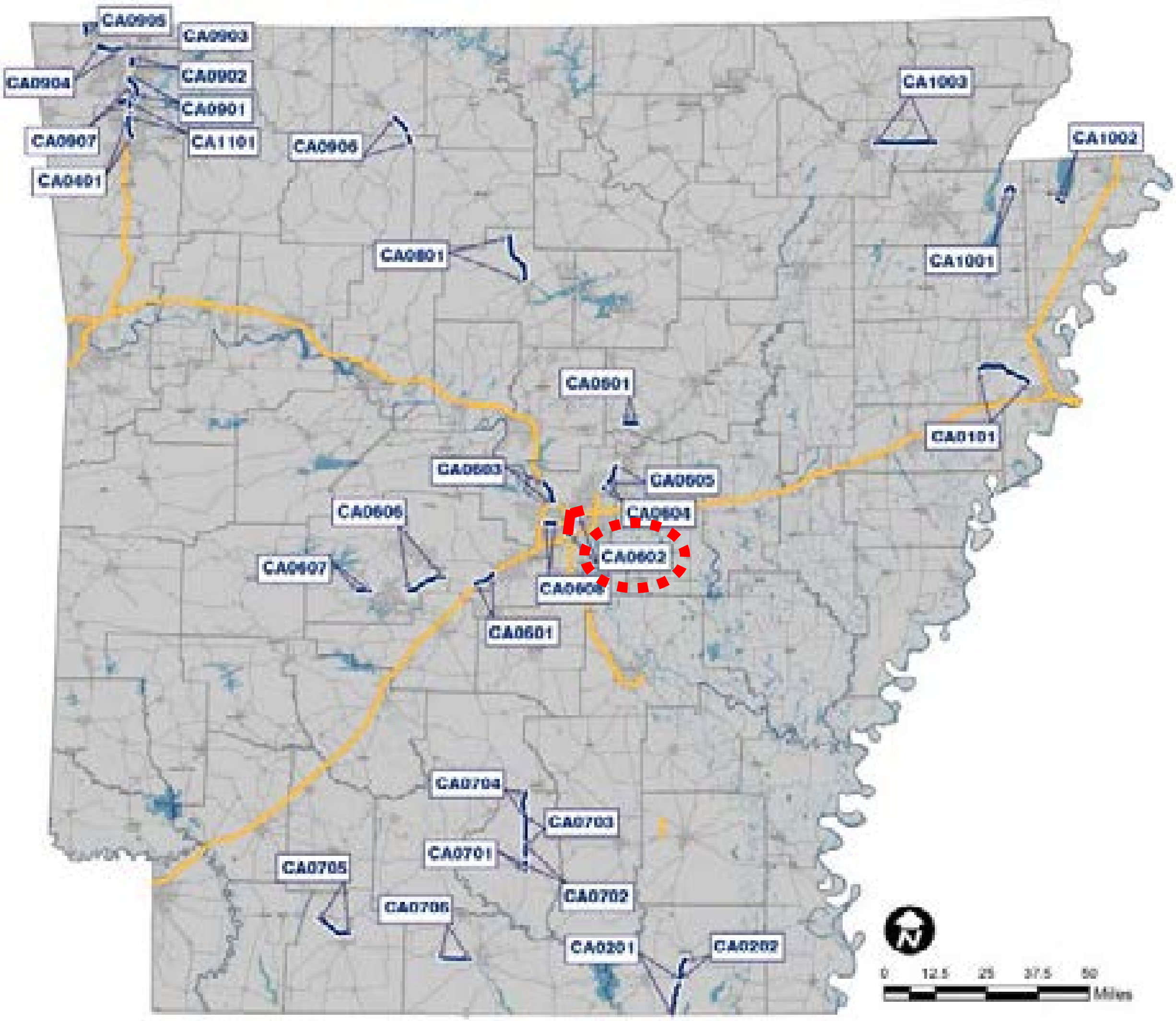
1.1 Study Area Description

The Interstate 30 (I-30) corridor is primarily a north/south corridor in central Arkansas, while Interstate 40 (I-40) is an east/west corridor. **Figure 1** shows the location of the corridor within the State. **Figure 2** illustrates a more detailed description of the project study area and the surrounding roadway network.

The study corridor is centrally located within the core area of the Little Rock metropolitan planning boundary. The corridor provides regional mobility throughout the Little Rock metropolitan area and the entire state. The corridor provides access to major activity centers including but not limited to:

- Little Rock Central Business District (CBD)
- William J. Clinton Presidential Center
- Bill and Hillary Clinton National Airport
- Julius Breckling Riverfront Park
- Little Rock Union Station
- Dickey-Stephens Ballpark
- Verizon Arena
- River Market
- Argenta

Figure 1: CAP Statewide Projects & CA0602 – I-30 / I-40 Widening & Rehabilitation, I-530 to Hwy 67



Source: Connecting Arkansas Program: https://connectingarkansasprogram.com/

Figure 2: CA0602 – I-30 / I-40 Widening & Rehabilitation, Interstate 530 to Highway 67 Study Area

Source: HNTB

1.2 Relevant Studies

A number of studies have been completed that provide background or will have an impact on the I-30 / I-40 PEL. These studies are summarized below.

Central Arkansas Regional Transportation Study, Areawide Freeway Study, Phase 1 and 2, 2003. The purpose of the Central Arkansas Regional Transportation Study (CARTS) *Areawide Freeway Study* was to evaluate and recommend system improvements to the approximately 200-mile existing and committed CARTS freeway system based on anticipated demands and needs for the next 25 years. The study was performed in two phases. Phase I of the study examined the Arkansas River Bridge crossing needs in the Little Rock - North Little Rock Central Business District (CBD), including the need for and feasibility of an additional river crossing. The deficiencies of the three existing bridges (I-30, Main Street and Broadway) were evaluated. The examination included existing (2003) and forecast (2025) levels of service on the bridges as well as their structural condition. Options available for accommodating traffic demand and reducing current and future congestion were compared. Consideration was given to major improvements to the I-30 corridor from I-630 to I-40 as well as a potential new river crossing, the Pike Avenue Extension. The study also considered potential future expansions of the metropolitan transit system. Phase II of the study evaluated the approximately 200-mile existing and committed freeway system within the CARTS boundary in Pulaski, Saline, Lonoke, and Faulkner Counties. Existing and forecast needs within the next 25 years were identified for development of a freeway plan. The freeway plan included operations and management improvements, incorporated into the CARTS Metro 2030 Regional Transportation Plan.

I-630 Fixed Guideway Alignment Study, 2010. The I-630 *Fixed Guideway Alignment Study* was prepared to identify a feasible and desirable transit right-of-way that can be preserved for future construction in the I-630 corridor. Highway construction and private-sector investments have continued incrementally in the study corridor for decades. A fixed guideway offers an alternative mode of travel that must be planned for or it will not be addressed and realized. The study provides plan and profile drawings detailing the alignment and transit station locations to be preserved. Thus, future roadway projects can take the transit improvements into consideration and private-sector improvements can capitalize on the transit opportunity. **Figure 3** shows the 12.3-mile alignment with 12 initial station locations and two future station locations on an aerial photograph.

Figure 3: Alignment and Station Locations

Source: I-630 Fixed Guideway Alignment Study, 2010

River Rail Airport Study, Phase 2 Final Report, 2011. In March 2009, Metroplan studied the feasibility of extending fixed guideway transit service from Downtown Little Rock to the Little Rock National Airport (‘Airport’). The *River Rail Airport Study* was divided into two study phases. The *River Rail Airport Study Phase One Final Report* (Phase One Study) was completed in October 2009 and primarily included the evaluation of the extension of streetcar service between Downtown Little Rock and the Little Rock National Airport. Phase Two of the *River Rail Airport Study* (Phase Two Study), which was initiated in November 2010, was expanded to evaluate other viable options for connecting streetcar service to the Airport from other areas of Little Rock as well as to and from North Little Rock. **Figure 4**, taken from Phase Two Study, shows proposed alternatives throughout the corridor.

Figure 4: Corridor Alternatives

Source: River Rail Airport Study, Phase 2 Final Report, 2011

Metroplan Long-Range Transportation Plan, 2010. About every five years Metroplan undertakes the task of developing a long-range transportation plan for central Arkansas. Imagine Central Arkansas, the current plan, was adopted in December 2015. As congestion increases on area roads, due to growth, development, and more travel through the region; it is clear that the current roadway system will not be sufficient to accommodate future needs. In addition, citizens of the region are asking for increased travel options, consistent with recent federal legislation promoting their use. Federal funds make up a significant portion of the region's transportation dollars. To use these funds, the Federal government requires long-range transportation planning and plan documentation for metropolitan planning organizations like Metroplan.

1.3 I-30 / I-40 Corridor Description

The following section provides a description of the I-30 / I-40 study corridor. The interstate components of the main lane, cross streets, pedestrian facilities, interchanges, and frontage road system are described.

1.3.1 Main Lane Corridor

The "basic number of lanes" is defined as "[the] minimum number of lanes designated and maintained over a significant length, irrespective of changes in traffic volume and lane-balance needs" (AASHTO Geometric Design of Policy and Streets). The number of basic lanes throughout the I-30/I-40 study corridor is defined in **Table 1**.

An "auxiliary" lane is "the portion of the roadway adjoining the through lanes for speed change, turning, storage for turning, weaving, truck climbing, and other purposes that supplement through-traffic movement." (AASHTO Geometric Design of Policy and Streets) The I-30/I-40 main lane has intermittent auxiliary lanes throughout the study area. Auxiliary lanes are used to balance the traffic load and maintain a more uniform level of service on the highway.

Table 1: Basic Lane Configuration along I-30/I-40 (from north to South)

From	To	Distance (miles)	Number of Basic Main lane (Auxiliary) Lanes Southbound	Number of Basic Main lane (Auxiliary) Lanes Northbound	Total Number of Main lane (Auxiliary)Lanes
I-40/167 E Interchange	**I-40/167 W Interchange**	1.5	2	2	4
I-40/167 W Interchange	**I-30/I-40 E Interchange**	0.60	2	2	4
I-30/I-40 E Interchange	**Curtis Sykes Dr**	0.30	4	3	7
Curtis Sykes Dr	**2nd St. N Interchange**	1.40	3	3	6
2nd St. N Interchange	**2nd St. S Interchange**	0.10	3	3	6
2nd St. S Interchange	**E 6th St. Interchange**	0.20	4	3(1)	7(1)
E 6th St. Interchange	**I-30/I-630 N Interchange**	0.30	4	4	8
I-30/I-630 N Interchange	**I-30/630 S Interchange**	0.60	3	3	6
I-30/630 S Interchange	**E Roosevelt Interchange**	0.20	3(1)	3(1)	6(2)
E Roosevelt Interchange	**I-30/440 N Interchange**	0.80	3	3(1)	6(1)
I-30/440 N Interchange	**I-30/440 W Interchange**	0.60	2	2	4

Source: HNTB

1.3.2 Cross Streets and Pedestrian Facilities

There are numerous cross streets along the I-30/I-40 corridor. **Table 2** summarizes each crossroad, including its functional classification, access type, and pedestrian access within the study area. By and large, pedestrian facilities within the corridor are prevalent

Table 2: Major Cross streets (North to South)

Cross Streets	Access Type	Functional Classification	Pedestrian Access
Highway 167	System Interchange	Interstate	No
N Hills Blvd	Service Interchange	Arterial	No
I-30	System Interchange	Interstate	No
E 19th St	Underpass	Collector	Yes
Curtis Sykes Dr	Service Interchange	Collector	Yes
E 13th St	Underpass	Arterial	Yes
E 9th St	Underpass	Collector	Yes
Bishop Lindsey Ave	Service Interchange	Collector	Yes
E Broadway St	Service Interchange	Arterial	Yes
E Washington Ave	Underpass	Collector	Yes
East Riverfront Dr	Underpass	Arterial	Yes
E 2nd St	Service Interchange	Collector	Yes
E 4th St	Underpass	Collector	Yes
E 6th St	Service Interchange	Arterial	Yes
E 9th St	Overpass	Arterial	Yes
I-630	System Interchange	Interstate	No
E 21st St	Overpass	Collector	Yes
E Roosevelt Rd	Service Interchange	Arterial	Yes
I-440/I-530	System Interchange	Interstate	No

Source: HNTB

1.3.3 Interchanges

Within the 6.7-mile study area, there are 11 interchanges. Access management guidelines recommend a spacing of 1 to 2 miles between interchanges on freeways in urban areas; currently, none of the interchange spacing in the corridor meets these guidelines. These interchanges are described in **Table 3**.

Table 3: I-30/I-40 Study Area Interchange Descriptions

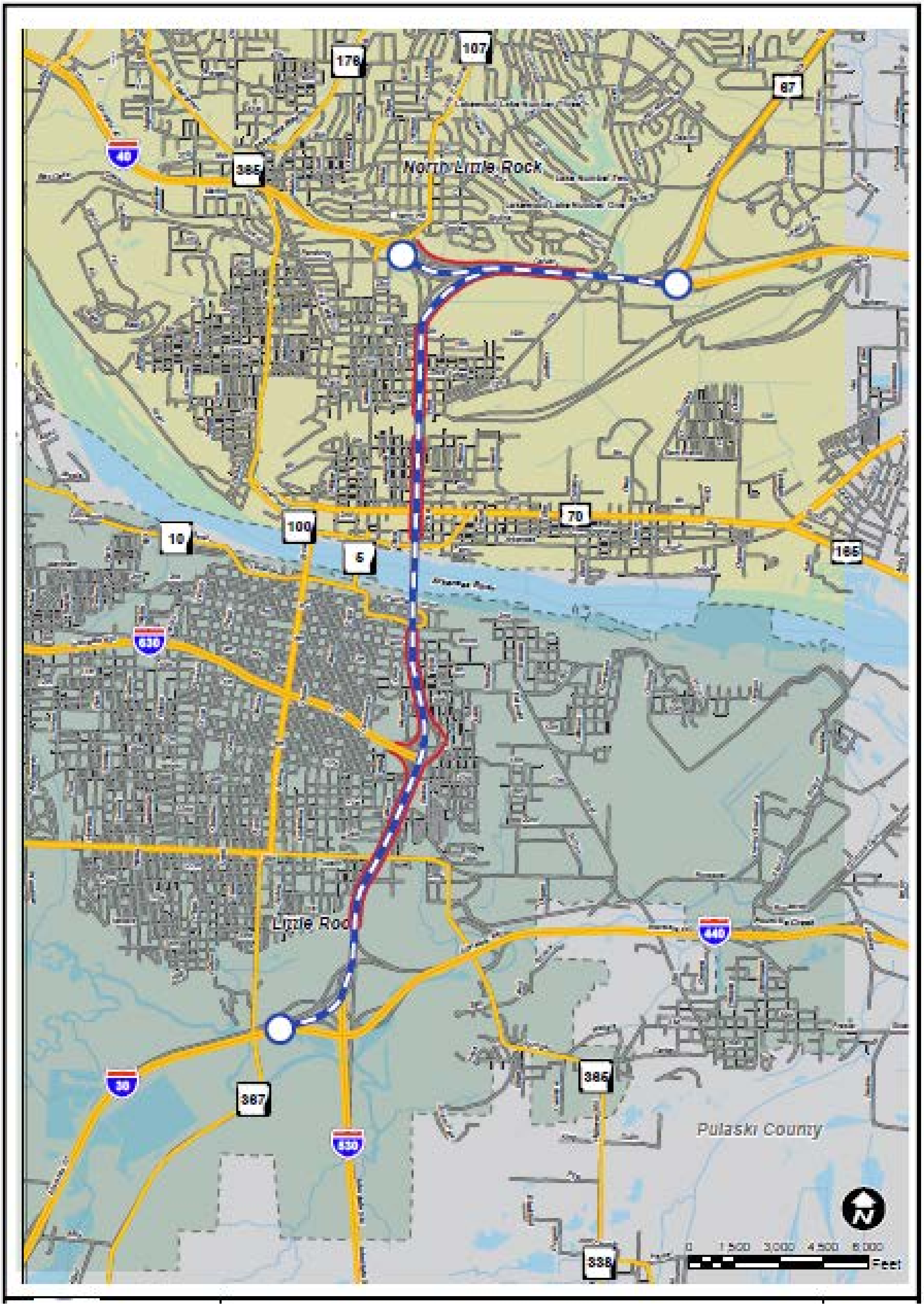
Interchange	Type	Description
Highway 167	Fully Directional	Highway 167 connects to I-40 W and I-40 E.
N Hills Blvd	Partial Cloverleaf	Connects to Frontage Rd to I-40 W.
I-30	Fully Directional	I-40 connects to I-30 on the right. I-30 N and I-40 W connect to J.F.K. Blvd. J.F.K. Blvd enters onto I-40 W and I-40 E. Left entrance onto I-40 W.
Curtis Sykes Dr	Diamond	Allows access to I-30 N and I-30 S.
Bishop Lindsey Ave	Split Diamond	Connects to I-30 N.
E Broadway St	Split Diamond	Connects to I-30 S.
E 2nd St	Modified Trumpet	Connects to I-30 N.
E 6th St	Split Diamond	Connects to I-30 N.
I-630	Fully Directional	I-30 N connects to I-630 W and Frontage Rd. I-30 S connects to I-630 W and I-630 E has access to I-30 S, I-30 N, and College St. College St connects to I-630 W.
E Roosevelt Rd	Split Diamond	Connects to Frontage Roads which have access to I-30 N and I-30 S.
I-440/I-530	Fully Directional	EB I-30, I-30 S, and NB I-530 exit to I-440 E. I-440 W connects to I-30 N, I-30 W and I-530 S. I-550 N connects to I-30 W with a left exit. I-30 E connects to I-530 S from a left entrance.

Source: HNTB

1.3.4 Frontage Road System

An important feature of the I-30/I-40 corridor is the frontage road system that helps connect local roadways to I-30/I-40. The frontage roads mainly consist of 2-lane one-way roads with northbound traffic flow on the East side of I-30 and Southbound traffic on the West side. The exception to this rule is over the railroad tracks in North Little Rock, where the frontage road is briefly a four-lane two-way road that runs on the east side of the freeway. Stop signs control turning and through movements at most intersections. The rest are controlled by signals. The frontage road system is shown using red lines in **Figure 5**.

Figure 5: Frontage Road System

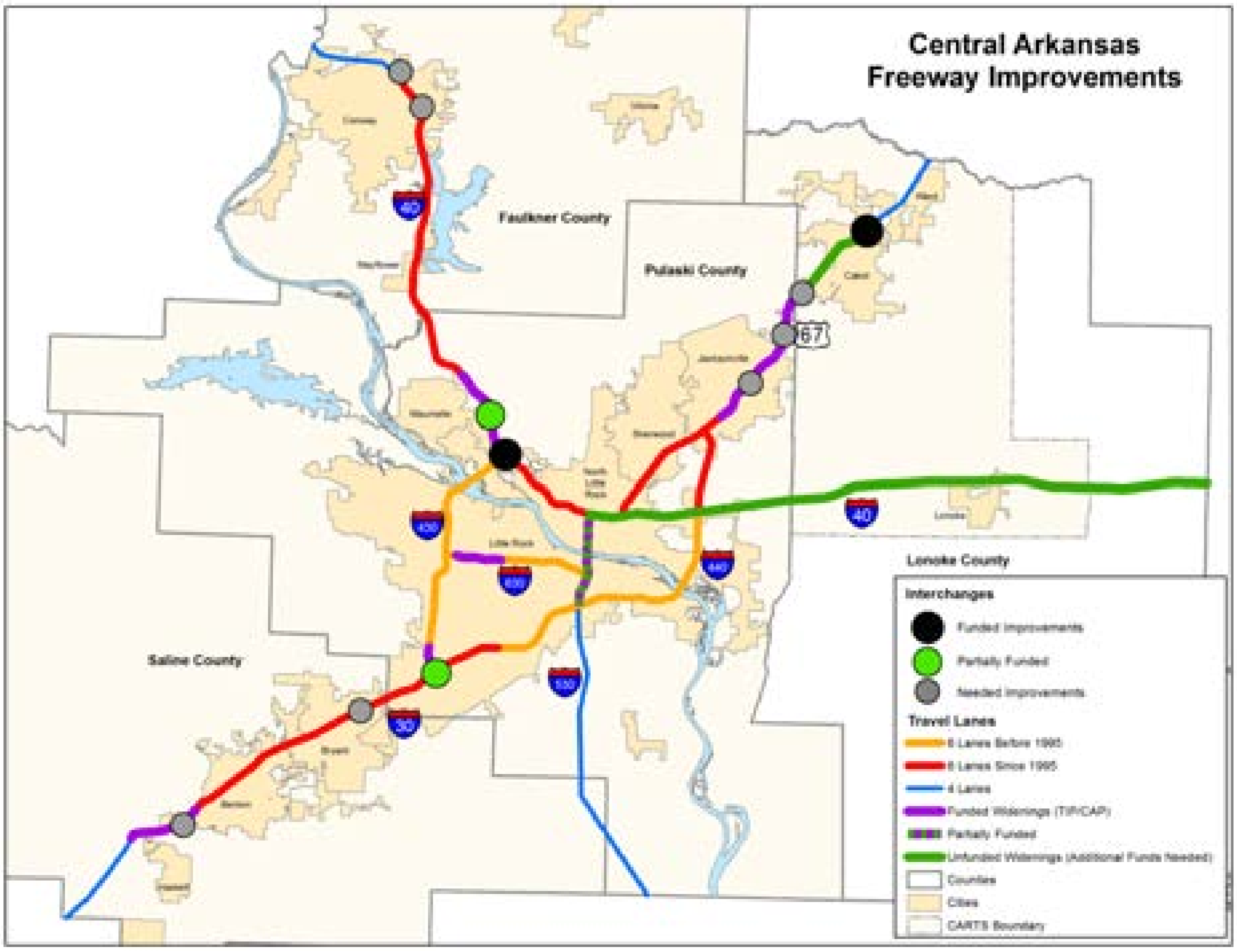


Source: HNTB

1.3.5 Planned Improvements

The Metroplan long range transportation plan, *Imagine Central Arkansas*, adopted in December 2014, was reviewed and incorporated into the study. **Figure 6** shows the planned long-range area-wide freeway system, and **Figure 7** shows the 10-Year financially constrained project List.

Figure 6: Area-Wide Freeway System



Imagine Central Arkansas, http://www.metroplan.org/files/53/2014-12LongRangePlan.pdf

Figure 7: 10-Year Financially Constrained Project List

Imagine Central Arkansas, http://www.metroplan.org/files/53/2014-12LongRangePlan.pdf

According to the Metroplan Long-Range Transportation Plan, bike and pedestrian improvements will be added as roadway improvements are made within the study area. This includes the construction of sidewalks during roadway and bike construction, along with the addition of bike lanes in prime locations. There are also plans for public transit to grow. Certain bus routes will use the Main Street Bridge instead of the Broadway Bridge. Others will use I-40 and I-30 to connect current routes.

2 CHAPTER 2: PLANNING ASSUMPTIONS AND ANALYTICAL METHODS

2.1 Introduction

The traffic forecast was performed in two phases. Phase 1 was a high level traffic forecast performed for the PEL, and Phase 2 was a detailed traffic forecast for the CAP Program.

2.2 Traffic Forecast

2.2.1 Phase 1 Forecast

From the Arkansas State Highway and Transportation Department's (AHTD's) database, Average Daily Traffic (ADT) counting stations along I-30, I-40 and side roads within the project limits were identified. In general, counting stations on I-30 and I-40 had over 20 years of data while those located on ramps only had four years of data at most. The counting stations located on the side roads had varying amounts of data. The stations had intermittent time frames of missing data. In instances where one year of data was missing, the average of the year before and the year after were used to fill in the missing data point. In instances where two or more consecutive years of data were missing, the trend function was used to interpolate to the missing years.

Several methods were investigated to project future volumes. First, the trend function was used in Excel to project 2020 and 2041 traffic volumes based on the historic volumes. This function is based on the equation y=mx+b, where y represents the traffic volume and x represents the year. For these calculations, the true "b" value was selected. Second, future volumes were projected by using the growth rate calculated based on Equation 1:

Equation 1: $VF = VP * GF^n$

Where: $GF = (1+AGR/100)$

VF = future volume

VP = present volume

GF = growth factor

AGR = annual growth rate (%)

n = number of years

The annual growth rate was calculated based on the 2013 ADT, when available, and the oldest available volume up to twenty years old for each station. The calculated growth rates were then used to project 2018, 2020 and 2041 traffic volumes.

Third, other sources were investigated for annual growth rates. The Traffic Monitoring System Handbook, produced by AHTD in November 2013, provided a table of 2012 County and Statewide Growth Factors on page B-3. From this table, growth factors calculated three different ways were provided for each county. The "Annual Growth Factor 2011-2012" divided the 2012 volume by the 2011 volume to determine the annual growth factor. The "20-year Average Annual Growth Factor" averaged the annual growth factors for the previous twenty years. The “20-Year Growth Factor” used linear regression to determine the growth factor using the previous twenty year’s counts. Of the three calculation methods, the average of the previous twenty years is the least likely to be skewed by temporary fluctuations in growth. This method of calculation provided a growth factor of 1.023 (AGR = 2.3%) for Pulaski County. These growth rates were used to project traffic volumes for 2020 and 2038.

A fourth source utilized for traffic projections was the Central Arkansas Regional Transportation Study (CARTS) travel demand model provided by Metroplan. Metroplan provided 2010 and 2041 volumes from the model which were then used to calculate the annual growth rates. The calculated growth rates along with 2013 ADTs, when available, were used to project 2020 and 2041 traffic volumes as shown in the **Appendix 7**. It should be noted that the 2010/2041 models have not gone through a rigorous QA/QC process by AHTD and thus should be used for planning purposes only.

A summary of the calculated growth rates and projected volumes from all sources are shown in the **Appendix 7**. When calculating the average, engineering judgment was used to determine which volumes were applicable. An average AGR was determined based on the various sources. Where a negative AGR or higher than normal growth rate were shown, the AGR were not used to calculate the average. (Note – The values not used are highlighted in yellow.) The volumes for both the average and the recommended were then calculated based on the AGR shown in the respective columns.

2.2.2 Phase 2 Forecast

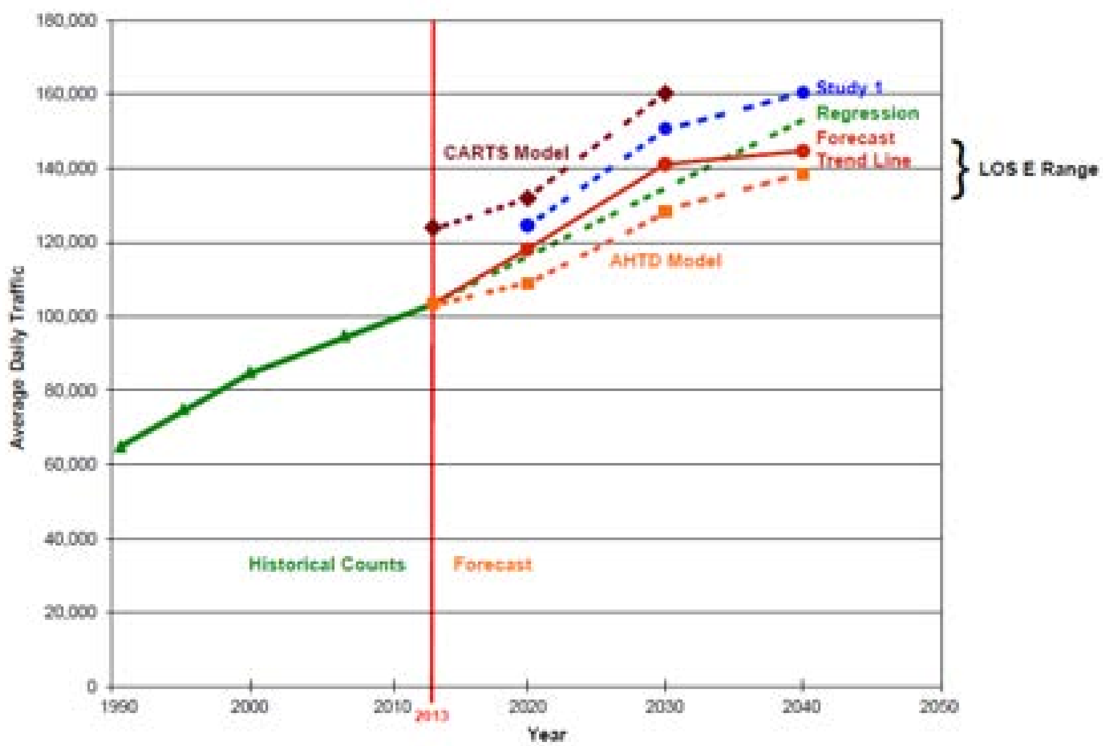
In Phase 2, a detailed forecast was performed similarly to other CAP projects within the Metroplan MPO boundary. The general traffic projection plan approach was to use available information to develop 2041 build traffic forecasts. The forecasts were based on historical trends, State and MPO (where available) travel demand model data, previous forecasts from other studies, capacity constraints, and discussions with local planning partners of known projects that could impact traffic forecasts.

Data was collected in the following ways:

- Visited site to collect geometric information (number of lanes, access points, etc.) to develop traffic forecasts based on geometric conditions,
- Obtained CARTS Travel Demand Model and coordinated with Metroplan and the AHTD on future traffic projections,
- Met with cities of Little Rock and North Little Rock to understand future land use and their impacts on future traffic,
- Collected historical traffic counts from the AHTD website,
- Used traffic data from the AHTD (truck percentages, seasonal factors, K factor, D factor, peak hour factor, etc.), and
- Collected previous studies to include their forecasts in the overall forecasting approach.
    - I-630/I-430 Interchange
    - Draft Final CARTS Area Freeway Study Phase 1 and 2

A graph containing both historical traffic and forecasted traffic profiles from available travel models was developed in Excel. Other study forecasts were included in the graph, along with a regression line based on historical data. An indicator of LOS E capacity was added to the graph to show the theoretical constraints of the roadway. **Figure 8** below is an example of what a forecast graph may look like. Based on the data collected as detailed above and meetings with the planning partners to understand future land use, a 2041 projection was developed. All of the information included in the forecast graph, including the travel demand models, were tools in the forecasting toolbox and required engineering judgment to develop the final forecasts. The projected traffic growth was then applied to the base year counts collected.

Figure 8: Example Daily Traffic Forecast Graph



2.3 Future Build Alternative Forecasts

The following section describes the future build alternatives that were created from the Metroplan travel demand model, a 2010 traffic model of Saline, Pulaski, Faulkner, and Lonoke Counties. **Table 4** shows the 15 models used to analyze the various alternatives. The attributes that define each model run are as follows:

Run ID is the unique identifier for each run.

Trend is either emerging or supportive. The emerging trend assumes that population and employment will continue to spread in the same manner that it has in the past. The supportive trend is also called the "transit supportive vision". This trend considers fixed guideway transit services along I-630 connecting the financial center, medical institutions, and the airport. It also considers transit services to Cabot, Conway, and Benton. The supportive trend assumes that population and employment growth will concentrate near transit stations.

Year is either 2010 (existing) or 2041 (future).

No. of Lanes is the number of lanes assumed in the model run.

Chester Bridge is a proposed but not committed project to add an additional river crossing between Little Rock and North Little Rock. "Yes" means the bridge is included in the model run, and "No" means the bridge is not included in the model run.

Observations gives more detail on the type of run. "Full Model" Is a regular run. "One iteration (all or nothing)" is an unconstrained model run which shows how many vehicles would use the network if factors such as congestion and throughput were not considered. "Transit" means that the model considered full transit buildout as discussed in the Trend section.

Scenario is defined as follows:

1. Base calibrated 2010 model
2. Future LRTP 2041 Model (No Action I-30/I-40 6-lanes)
3. Future 2041 Build (I-30/I-40 with 8-lanes from Highway 67 to I-530)
4. Future 2041 Build (I-30/I-40 with 10-lanes from Highway 67 to I-530)
5. Future LRTP 2041 Model (10-lane I-30/I-40 6-lanes) – Unconstrained

Table 4: Model Run Characteristics

Run ID	Trend	Model Delivery Phase	Year	I-30/I-40 No. of Lanes	Chester Bridge	Observations	Scenario (p.1)	Select Link Analysis Output	Mode Split Analysis Output
1	Emerging	I	2010	6	No	Full Model	1		Yes
2	Emerging	II	2010	6	Yes	Full Model	1		
3	Emerging	I	2041	6	No	Full Model	2	Yes	Yes
4	Emerging	II	2041	6	Yes	Full Model	2	Yes	
5	Emerging	I	2041	8	No	Full Model	3	Yes	Yes
6	Emerging	II	2041	8	Yes	Full Model	3	Yes	Yes
7	Emerging	I	2041	10	No	Full Model	4		
8	Emerging	II	2041	10	No	One Iteration (all or nothing)	5		
9	Emerging	I	2041	10	Yes	Full Model	4		
10	Emerging	II	2041	10	Yes	One Iteration (all or nothing)	5		
11	Supportive	III	2041	6	No	Full Model Transit			
12	Supportive	III	2041	6	Yes	Full Model Transit			Yes
13	Supportive	III	2041	8	No	Full Model Transit		Yes	
14	Supportive	III	2041	8	Yes	Full Model Transit		Yes	
15	Supportive	III	2041	10	Yes	Full Model Transit			Yes

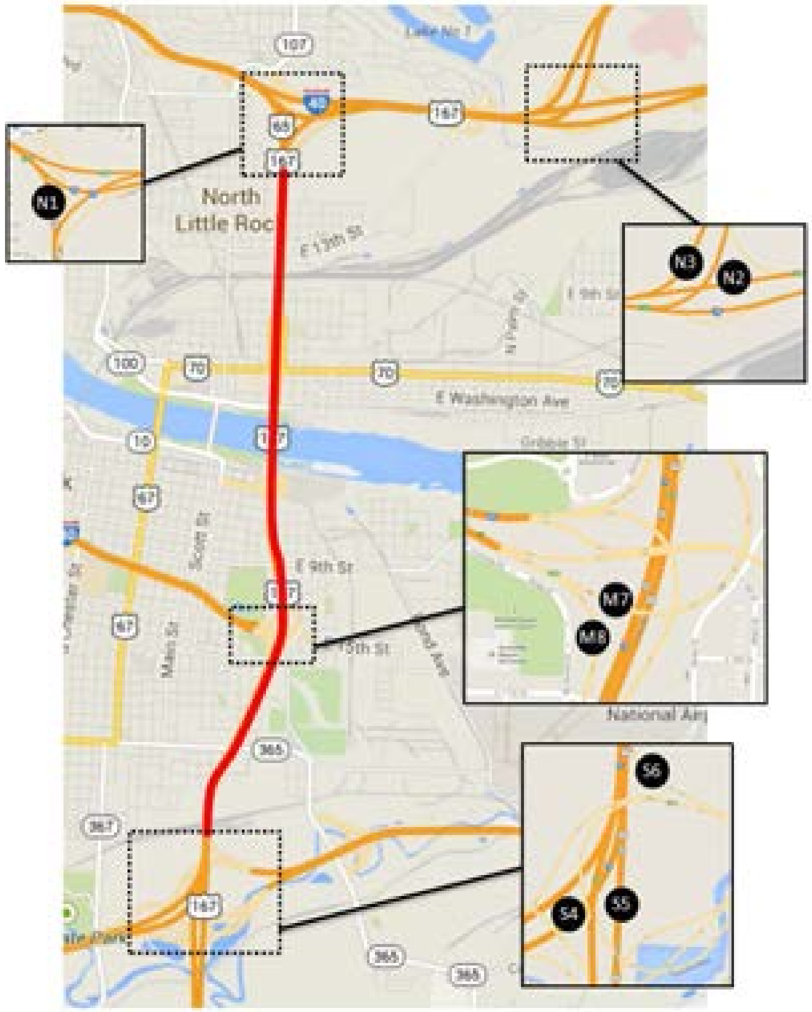
Source: Metroplan Travel Demand Model, 2010

2.3.1 Select Link Model Runs

A “select link analysis” is used to compare the volumes of local and through traffic in a given corridor. In this study, the Metroplan travel demand model was used to analyze the total number of vehicle trips exiting I-30 within a defined area through downtown Little Rock and North Little Rock, along with the number of vehicle trips continuing on I-30 through the area. The area is defined in **Figure 9**, along with 8 locations from which the exiting and entering volumes would be retrieved. Select link analyses were conducted for Run IDs 3, 4, 5, 6, 13, and 14. Each Run ID is defined by a set of attributes that can be reviewed in **Table 4** above.

Figure 11 defines the area in red between the I-30/I-40 interchange and the I-30/I-530/I-440 interchange in red, which is considered to contain traffic with a local destination. The figure also shows locations N1, N2, N3, S4, S5, S6, M7, and M8, which represent the limits of the area being analyzed.

Figure 9: Select Link Locations and "Local" Area

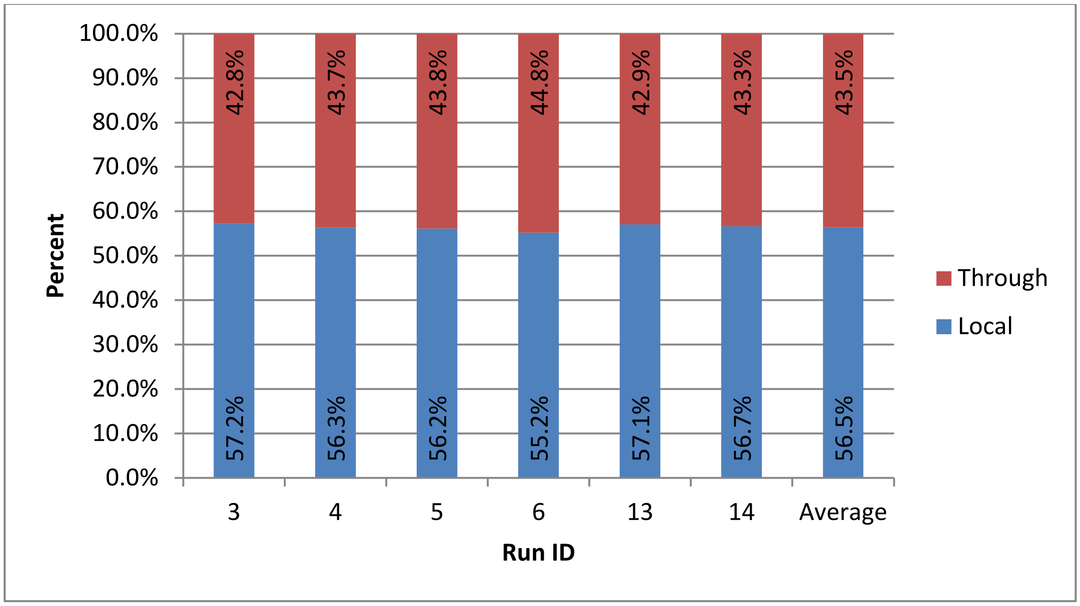


Source: Metroplan Travel Demand Model, 2010

In this analysis, "local" traffic is defined as the number of vehicles originating from one of the 8 locations shown above and exiting I-30 within the red area. "Through" traffic is defined as the number of vehicles originating from one of the 8 locations shown above, and exiting through another of the 8 locations. "North" represents values retrieved from locations N1, N2, and N3. "South" refers to values that were retrieved from locations S4, S5, and S6. The values within the column labeled "Middle" were retrieved from locations M7 and M8 as shown in **Figure 9**.

Figure 10 shows the average daily percent of local vs. through trips for each Run ID.

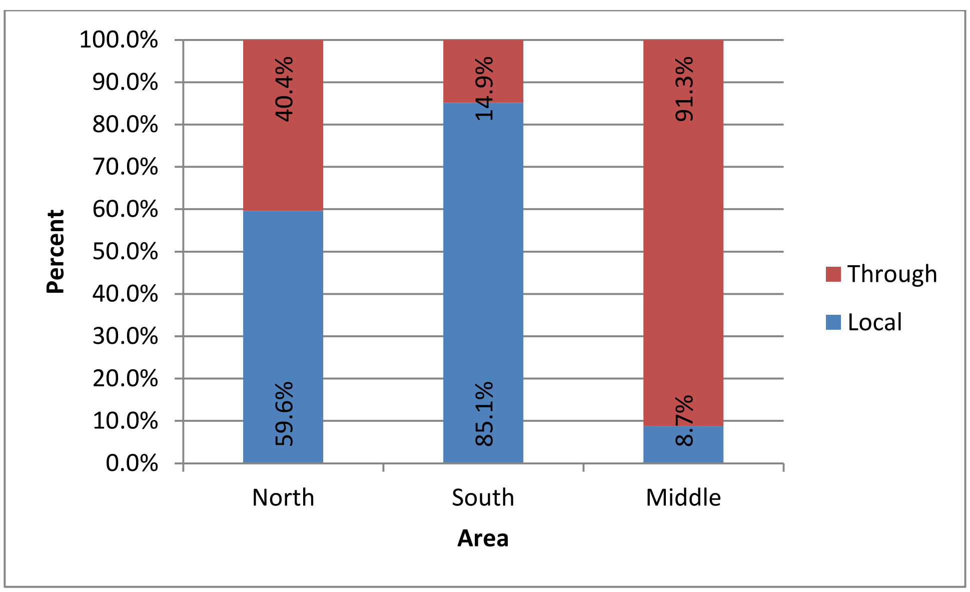
Figure 10: Average Daily Vehicle Trips per Run ID



Source: Metroplan Travel Demand Model, 2010

Figure 10 shows that, while the attributes of the runs are different, the percentage of local vs. through traffic stays consistent. Therefore, **Figure 11** shows the average daily vehicle trips of all Run IDs in relation to the entrance area.

Figure 11: Run ID Average Vehicle Trips per Entrance Area

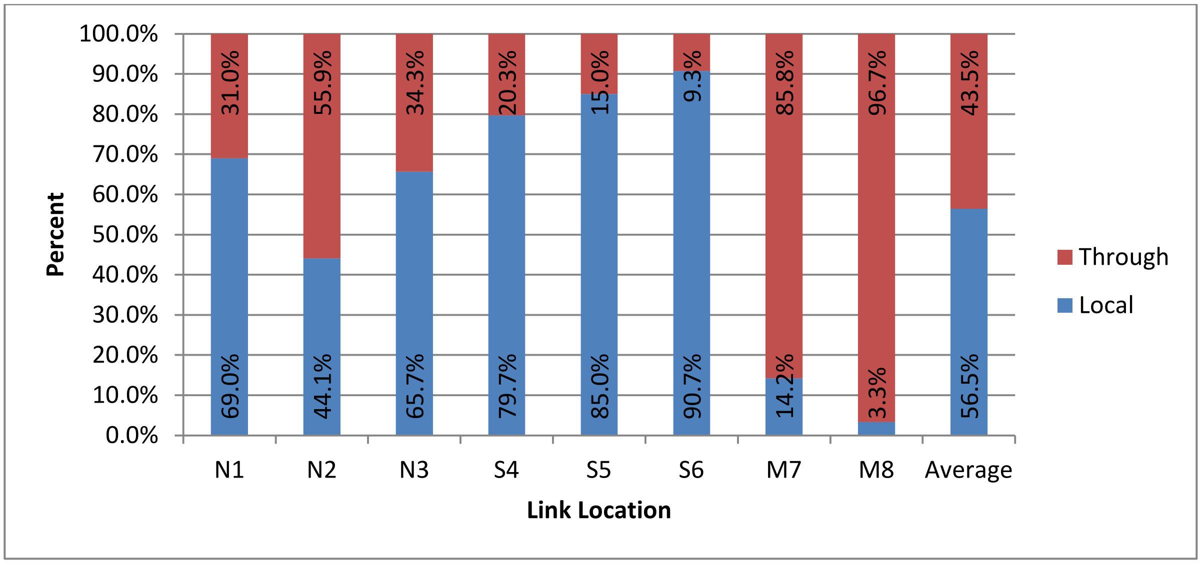


Source: Metroplan Travel Demand Model, 2010

As the figure shows, nearly 60% of traffic originating from the north and 85% of traffic originating from the south is local traffic. In contrast, less than 10% of traffic entering I-30 from I-630 is local traffic. Given the roadway network present near the “middle” area, it makes sense that not many vehicles originating from M7 or M8 use the highway for “local” trips.

Figure 12 shows the average daily vehicle trips, local or through, coming from each location.

Figure 12: Average Daily Vehicle Trips per Location



Source: Metroplan Travel Demand Model, 2010

Further breakdown of the data from area to individual location is shown to produce similar results. The “south” locations all have the highest percentage of local traffic, while both “middle” locations have the lowest percentage of local traffic.

2.3.2 Alternative Modes

The purpose of mode split analysis is to analyze the relative use of various transportation modes along the corridor given several scenarios. In this study, the Metroplan travel demand model was used to analyze the daily volumes of auto, transit, and fixed guideway trips. Run IDs 1, 3, 5, 6, 12, and 15 were used. Their attributes can be found in **Table 5** above. “Transit” refers to the number of daily person trips via buses, and “fixed guideway” refers to any public transportation system with dedicated lanes.

Table 5 shows the average percent of daily volumes for auto, transit, and fixed guideway trips along the I-30 corridor.

Table 5: Average Mode Split per Run ID

Run ID	Year	Bridge	Lanes	Trend	Volume	Auto	Transit	Fixed Guideway
1	2010	No	6	Emerging	112,019	99.4%	0.5%	0.1%
3	2041	No	6	Emerging	127,405	99.5%	0.4%	0.0%
5	2041	No	8	Emerging	145,150	99.6%	0.4%	0.0%
6	2041	Yes	8	Emerging	138,899	99.6%	0.4%	0.0%
12	2041	Yes	6	Supportive	122,217	96.2%	0.8%	3.1%
15	2041	Yes	10	Supportive	150,064	96.4%	0.7%	2.9%
Average	-		-	-		98.4%	0.5%	1.0%

Source: Metroplan Travel Demand Model, 2010

Since the supportive models include an enhanced transit system, their mode splits display a higher percentage of transit and fixed guideway use. As runs 12 and 15 indicate, constraining the number of lanes from 10 to 6 results in 0.3% more transit and fixed guideway use. However, it also restricts the overall auto volume by about 19%. This indicates that transit alone cannot satisfy the projected demand for I-30 in 2041.

Table 5 shows that by keeping I-30 at 6-lanes from 2010 to 2041, the volume of daily auto trips increases by 15,000 vehicles. The 6-lane supportive model shows that 10,000 more vehicles per day are using I-30 with the combination of building the Chester Bridge and increased transit use, which is 5,000 fewer than the emerging model without the Chester bridge. This indicates that the combination of increased transit use and the addition of a bridge can divert approximately 5,000 vehicles from the future 6-lane I-30 condition.

By increasing the number of lanes from 6 in 2010 to 8 in 2041, the volume of daily auto-trips increases by 33,000 vehicles per day. With the addition of the Chester Bridge and increasing the number of lanes from 6 to 8, the volume of 2041 daily auto-trips increases by only 26,000 vehicles on I-30. This indicates that around 7,000 vehicles may have switched travel routes from I-30 to Chester Bridge.

2.3.3 Summary

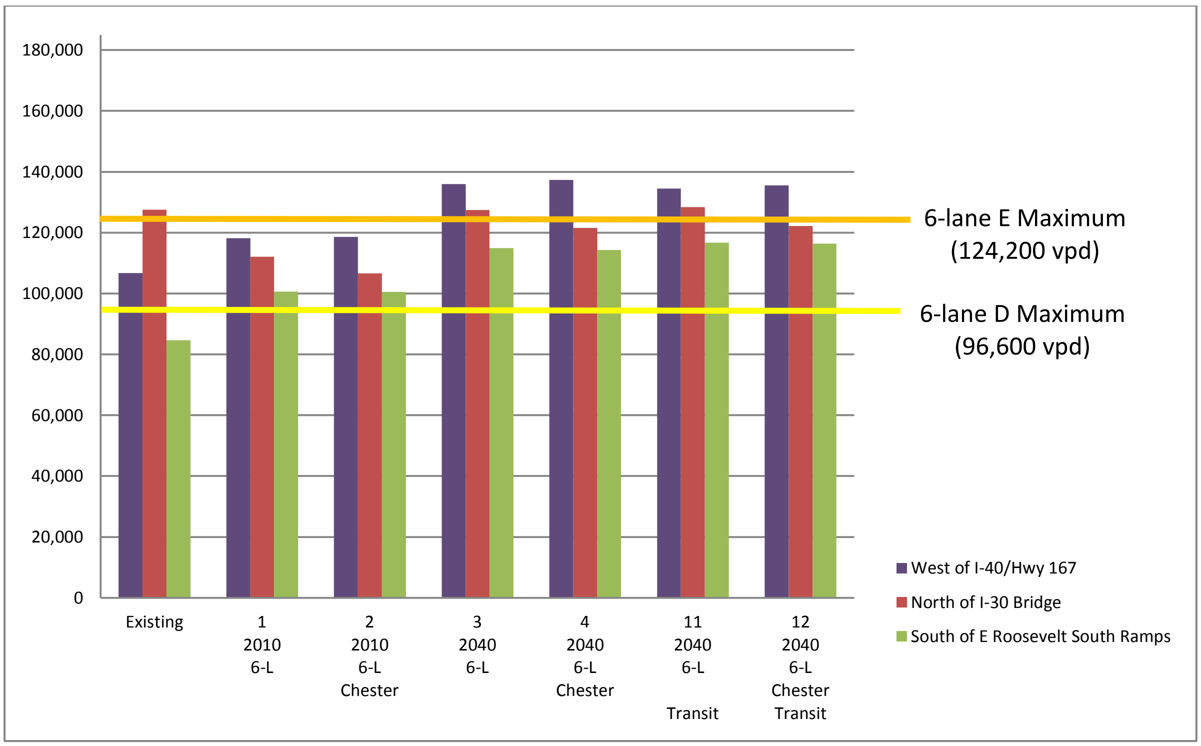
Raw 2041 forecasted volumes were retrieved from three locations in the Metroplan travel demand model along the I-30 main lane. These locations include west of I-40/Hwy 167, just north of the I-30 Bridge, and south of E Roosevelt Road southern ramps; these locations correspond with the "A" counts. The purpose was to analyze the daily traffic volumes for each model run and note how they compare to the LOS D and E Thresholds.

For **Figures 14, 15, and 16**, bars that go above the "E Maximum" line are LOS F. Bars that fall between the "D Maximum" and "E Maximum" lines are LOS E. Bars below the "D Maximum" line are LOS D or better. The thresholds are based on general corridor assumptions and do not precisely indicate the LOS threshold at any one location. In later analyses, these assumptions were refined based on data available. General corridor assumptions are as follows:

- Freeway Facility Type: Urban
- D Factor: 0.64 (average measured)
- K Factor: 0.09 (average measured)
- Truck Percent: 2% (base assumption)
- Interchanges/Mile: 1

Figure 13 shows the total daily 2041 volume for each 6-lane Run ID.

Figure 13: 2041 6-Lane Metroplan Travel Demand Model Volumes

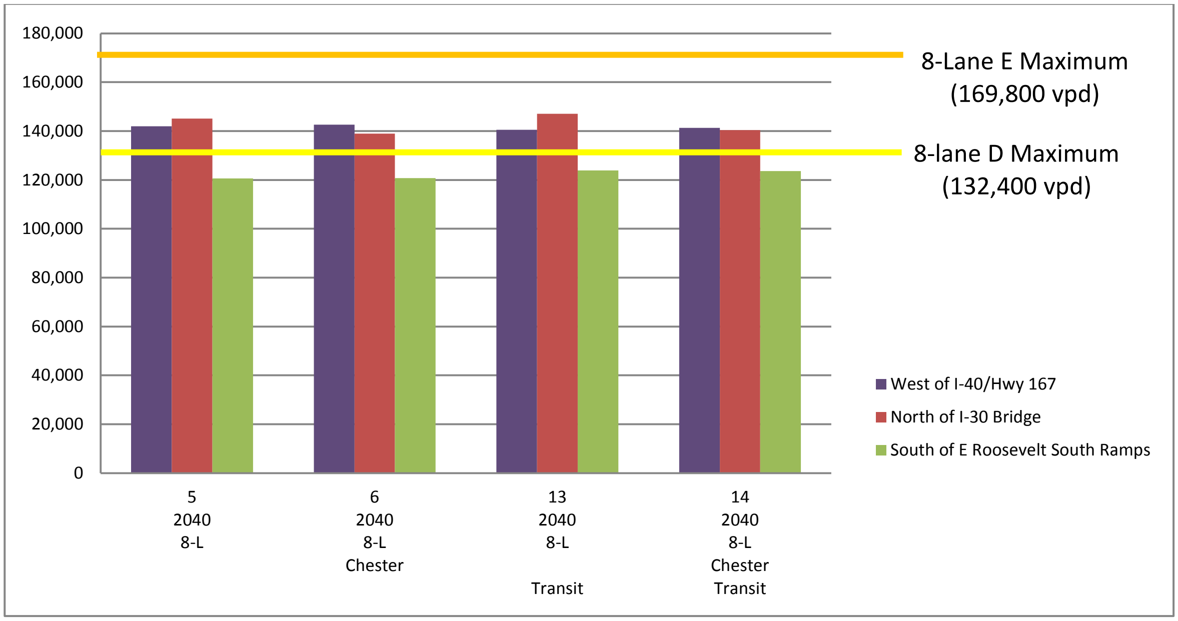


Source: Metroplan Travel Demand Model, 2010 (these forecasts were directly from the Metroplan model output)

As the graph shows, none of the locations for the 2041 6-lane models meet the LOS D criteria, and one or two locations for each model run reach LOS F volumes.

Figure 14 shows the total daily 2041 volume for each 8-lane Run ID.

Figure 14: 2041 8-Lane Metroplan Travel Demand Model Volumes

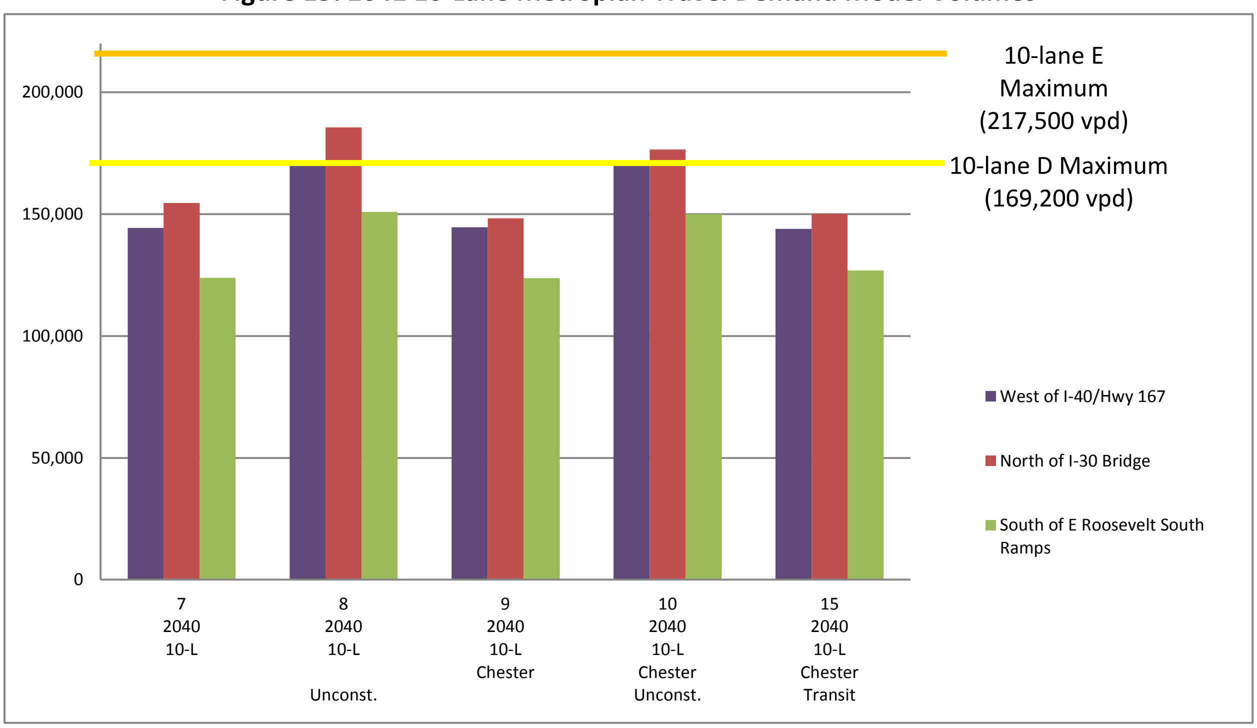


Source: Metroplan Travel Demand Model, 2010

For each 8-lane model run, traffic volumes for two of the locations fall within the LOS E range while the third location maintains volumes below the LOS D threshold.

Figure 15 shows the total daily 2041 volume for each 10-lane Run ID.

Figure 15: 2041 10-Lane Metroplan Travel Demand Model Volumes

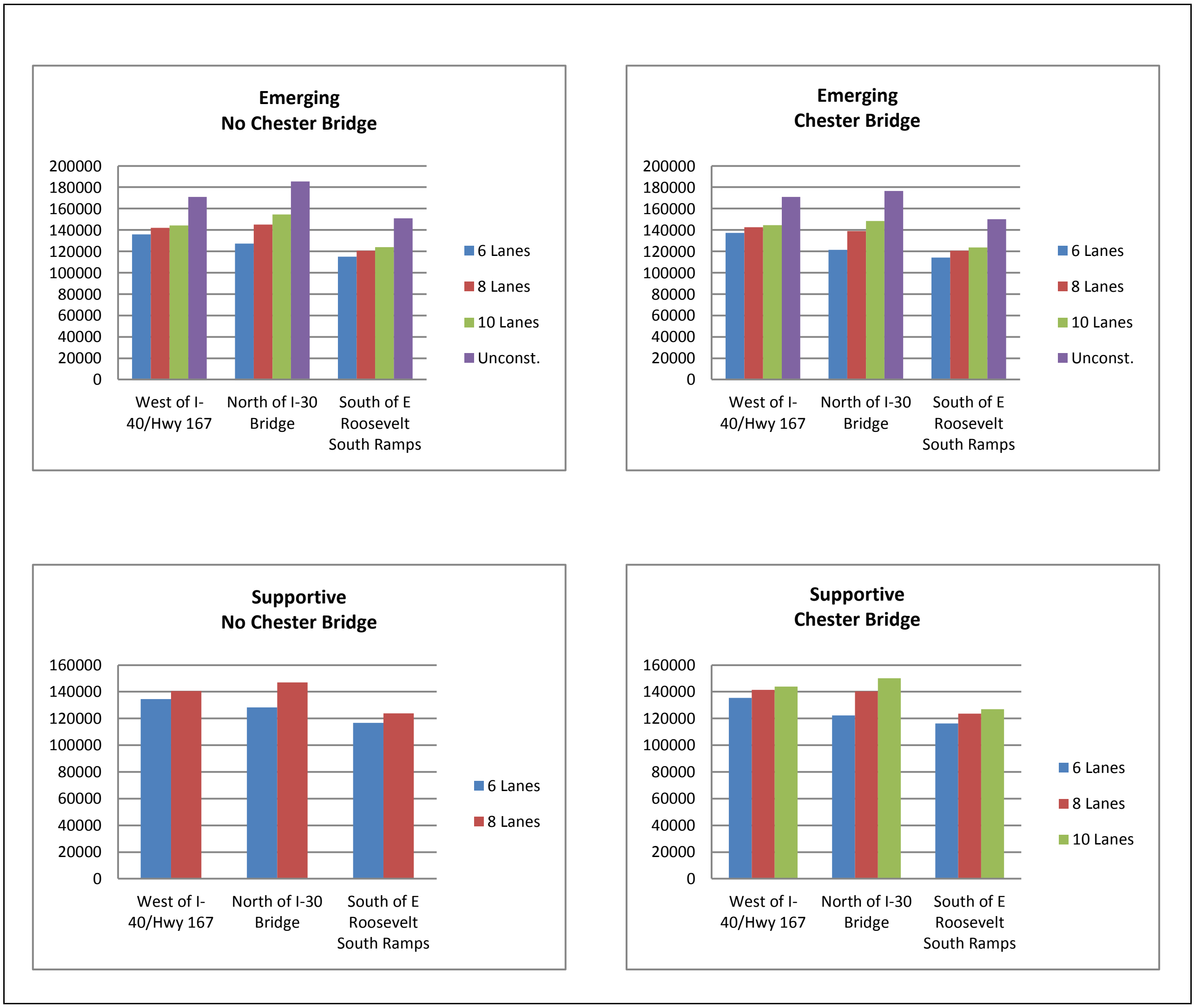


Source: Metroplan Travel Demand Model, 2010

In the 10-lane runs, most volumes are LOS D or better, and all volumes are LOS E or better.

Figure 16 illustrates the effect that the number of lanes has on daily volume. The graphs were created by grouping runs with similar attributes.

Figure 16: Daily volume increase per Lane



Source: Metroplan Travel Demand Model, 2010

The figure indicates that, in general, a larger increase in daily volume occurs when transitioning from 6 to 8 lanes than from 8 to 10 lanes. However, a significant jump in volume is noted in the unconstrained model. This suggests that the 2041 demand for I-30 is much larger than the volume that 10 lanes can accommodate. Other traffic management strategies may need to be implemented in order to mitigate the forecasted excess demand.

2.4 Operational Analysis Approach

The operational analysis of the study corridor was conducted in two phases: a high level phase and a more detailed micro simulation phase. The high level phase was performed using the Highway Capacity

Manual (HCM) for each basic, merge, diverge, and weave segment in the study area. It was performed early in the study to help define the purpose and need. Once additional data was developed and the study progressed, a more detailed micro simulation model was developed to provide a comprehensive analysis of the corridor.

AHTD's undocumented policy is to design to a Highway Capacity Manual (HCM) level of service (LOS) D for its facilities. This includes main lane, weaves, merges and diverges and ramp terminal intersections. Some departments of transportation around the country have begun relaxing these criteria and are planning and designing to a lower threshold due to fiscal constraints and environmental stewardship. AHTD has expressed interest in this approach. Therefore, analysis included planning to a LOS D in addition to a lower LOS E threshold in order to compare the trade-offs. In addition, analysis included an assessment of the duration of the LOS.

Figure 17: Vissim Network

Source: HNTB

2.4.1 VISSIM Simulation and Calibration

The I-30/I-40 traffic analysis was performed using a micro-simulation modeling software called Vissim version 7.0. **Figure 17** shows what the network looks like in Vissim. A detailed report that outlines the methodology used to create the model is provided in **Appendix 3**. The two-hour peak periods were analyzed in the morning from 6:45-8:45 AM and in the afternoon from 4:00 - 6:00 PM.

In the micro-simulation phase, very large amounts of data were collected for the model. This data included AHTD traffic counts, travel time runs, field reconnaissance, Google Traffic, HERE data, I-30 cameras, signal timing data, existing grades, public transit route information, and Metroplan model data.

Once data was collected and input to the traffic simulation model, the model was calibrated. Calibration is the process of replicating a regional driver behavior in the model. FHWA has standards for simulations which must be met in order for a model to be considered calibrated. Once the model is calibrated, it can output massive amounts of data for use in analyzing the existing and future conditions of a roadway. The model's geometry can also be modified to simulate various future build alternative scenarios.

Once the model was calibrated to existing conditions, future (2041) traffic volumes were applied assuming a No Action (6-lane) condition. The No Action model is intended to show how existing problem areas become worse as well as to show where new problem areas are likely to emerge.

The final major step in the model creation process was to create "build" versions of the model based on three potential freeway solutions: 10 main lanes, 8-lane collector/distributor (C/D) system, and 10-lane C/D system.

Table 6 shows the various measures of effectiveness (MOEs) that were output from Vissim and used to compare the performance of each model:

Table 6: VISSIM Mobility Measures of Effectiveness

PEL Corridor	System-Wide (Entire Network)

• Throughput
• Travel Time
    • Emergency Routes
    • Key Destinations
    • Corridor Segment
• Delay
• Speed
• LOS by freeway segment
• Percent LOS E & F
• LOS E & F Duration
• Percent LOS F
• LOS F Duration
•
	• VMT – Vehicle Miles Traveled
	• VHT – Vehicle Hours Traveled
	• VHD – Vehicle Hours of Delay
	• Percent LOS E & F
	• Percent LOS F
	• Unserved Vehicles
	
	Arterial Intersections
	• Percent LOS E & F
	• Percent LOS F

Source: HNTB

3 CHAPTER 3: EXISTING TRAFFIC CONDITIONS

3.1 Introduction

The following section describes the existing traffic conditions in the I-30 / I-40 study corridor. Existing traffic conditions were developed based on stakeholder meetings, field observations, alternative modes, mode split and traffic operations.

3.2 Stakeholder Meetings

Meetings were held with the City of Little Rock, North Little Rock, Metroplan and AHTD in May 2014. The purpose of the meetings was to discuss existing traffic and safety concerns in the study corridor. **Table 7** summarizes their comments.

Table 7: Existing I-30 Discussion Summary (Little Rock, North Little Rock, Metroplan and AHTD)

1. Short ramps.
2. Weaving problems.
3. Cantrell (highway 10) tight circle interchange.
4. I-630 NB to I-30 NB congestion.
5. Hard to maintain median lighting.
6. 9th St. access is preferred over 6th St.
7. 6th St. has become less important.
8. Future growth north of Airport expected.
9. SB on-ramp at McArthur Park is a sight distance problem.
10. 6th St. between 3rd St. and 6th St. frontage road is dangerous.
11. SB I-30 at Roosevelt.
12. I-30 and Roosevelt is a high accident location.
13. Hwy. 10 at I-30 and I-630 at I-30 are the major problems.
14. Broadway is a congested parallel roadway.
15. Discontinuous frontage road is a problem.
16. Schools on the east side with students on the west side of I-30.
17. Signal improvements were not thought to improve existing problems.
18. City has a traffic operations center but there is no regional ITS infrastructure.
19. Too many ramps.
20. I-30 is a north/south barrier.
21. Six freeways merge within six miles.
22. Inadequate interchange designs and too many.
23. I-30 Bridge used to be 4-lanes with shoulders.
24. Weaving problems on I-40 from I-30 to Hwy 67.
25. Lane split – one to I-30 NB and one to JFK.
26. Cantrell is on 4 sq. blocks of prime real estate.
27. Heavy pedestrian crossings near Cantrell (700 peds/hr).
28. Improvements to the existing frontage roads needed.
29. Cap freeway and reconnect east/west street grid.
30. Broadway Bridge has been designed for rail in the future.
31. Signage/wayfinding improvements needed.
32. N. Hills Interchange is difficult.
33. Main St. / JFK Interchange is difficult with missing movements.
34. Consider access to underutilized Hwy. 100 on north side of river.
35. Signal improvements at Broadway may improve operations.
36. NB off ramp to Broadway backs up onto I-30.
37. Consider emergency access and schools in corridor.
38. AHTD is considering high friction pavement surface for ramps at Cantrell and I-630.
39. Focus on locations that are 2-lane ramps necked down to 1-lane.
40. Deceleration occurs in I-30 through lanes due to short deceleration lanes.
41. Poor ramp geometrics at I-630.
42. I-30 SB to I-530 on-ramp problems.
43. AHTD considers LOS D as the goal but may consider LOS E or worse and duration of impacts.

Source: Individual stakeholder meetings May 20th and 21st 2014.

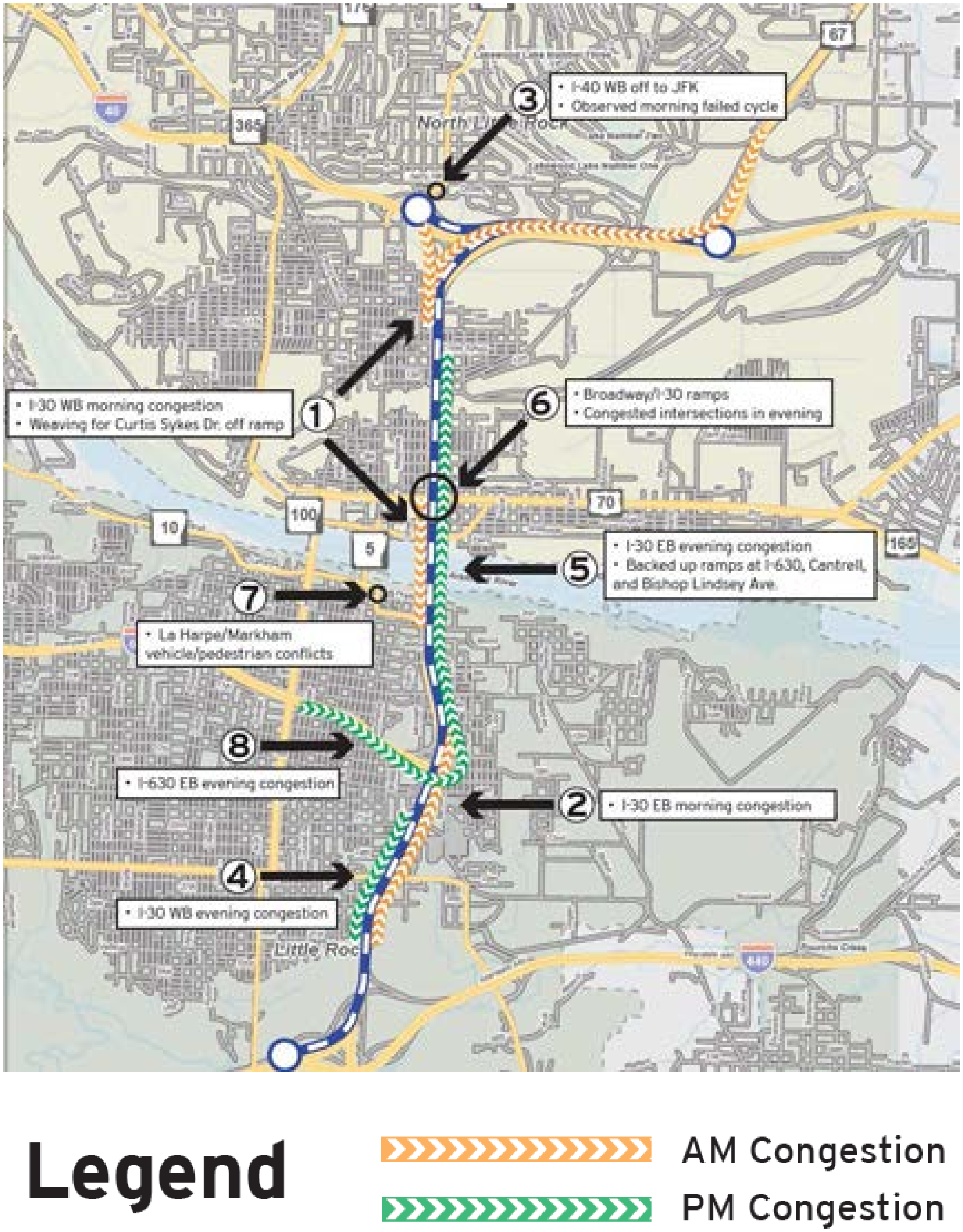
3.3 Field Observations

Firsthand knowledge of the I-30/I-40 corridor is an essential part to understanding its traffic operational strengths and shortcomings. Field observations were performed throughout the corridor during the peak periods. A total of four peak times were observed, as follows:

- AM Peak
  - Tuesday, 05/20 from 7-9am
  - Wednesday, 05/21 from 6:30-9am
- PM Peak
  - Monday, 05/19 from 4-6pm
  - Tuesday, 05/20 from 3:30-6pm

Figure 18 is a graphical summary of the field observations. The following text provides an overview of the field observations. Numbers next to each summary correspond to the exhibit.

Figure 18: Field Observation Summary



Source: HNTB Field Notes

3.3.1 General Observations

In general, most congestion appeared to occur on the main lane. Only a few intersections displayed signs of congestion during the peak periods.

All AM and PM peak hour movements (south/westbound in the morning, north/eastbound in the evening) were consistently congested on the bridge over the Arkansas River. Generally speaking, lanes heading into Little Rock were congested in the morning and outbound lanes were congested in the evening.

Bottlenecks on the main lane were observed near the Curtis Sykes entrance/exit ramps, the Broadway entrance ramps, the 2nd Street entrance ramps, and the I-630 interchange.

AM Peak Observations

I-30 WB North of I-630 Interchange

In both morning observations, congestion on I-30/I-440 corridor was noted from the point where I-40 West and Highway 67 South converge until the Curtis Sykes Drive exit. I-40 East also experienced congestion between JFK Boulevard and Curtis Sykes Drive. For southbound drivers, the location of the Curtis Sykes Drive exit shortly after the I-40/I-30 interchange caused weaving for the I-40 West drivers who are trying to exit at Curtis Sykes Drive.

On both days, traffic became less congested south of Curtis Sykes Drive. However, it became congested again at the entrance from Broadway and cleared up after the 2nd Street ramps.

I-30 EB South of I-630 Interchange

Heavy but uncongested traffic was observed both days starting west of the I-530/I-440/I-30 Interchange. After the interchange, traffic became congested. It remained congested until just north of the I-630 interchange. An incident was noted on the shoulder where I-30 East and I-530 North merge during the second AM observation.

I-40 WB Off ramp to JFK Boulevard

The only intersection to have notable delay during the AM peak was at the I-40 West off ramp onto JFK Blvd. This intersection was showing backups on the first day of observation. No other notable backups occurred at this location.

PM Peak Observation

I-30 WB South of I-630 Interchange

Starting south of the I-630 interchange, congestion on I-30 WB was noted in both PM observations. Free flow conditions were cited as soon as traffic reached the I-530/I-440/I-30 interchange.

I-30 EB North of I-630 Interchange

On both days, traffic was stop-and-go between the I-630 ramp and Curtis Sykes Drive. At one point during the observation, the I-630 EB to I-30 EB on ramp was backed up all the way to main lane I-630. It was noted that the I-630 ramp transitions from two lanes down to one lane just before merging with I-30 East.

Two separate incidents (one in each of the PM observations) occurred in the same approximate location just north of the I-630/I-30 eastbound merge. One was a minor crash and the other was a stalled vehicle.

The looped on-ramp to I-30 EB from 2nd Street was also experiencing backups related to the congestion on I-30 EB. Backups on the ramp can be partially attributed to the fact that three separate on-ramps merge into one before merging with main lane traffic.

N Cypress Street/E. Broadway Street/N. Locust Street
During the first PM Peak, backups at the Cypress/Broadway/Locust intersection were noted from several directions. The most prominent backup was on the I-30 EB off ramp due to traffic trying to use the through lane. It appeared that the left turn lane was hardly used, while the single through lane was backed up.

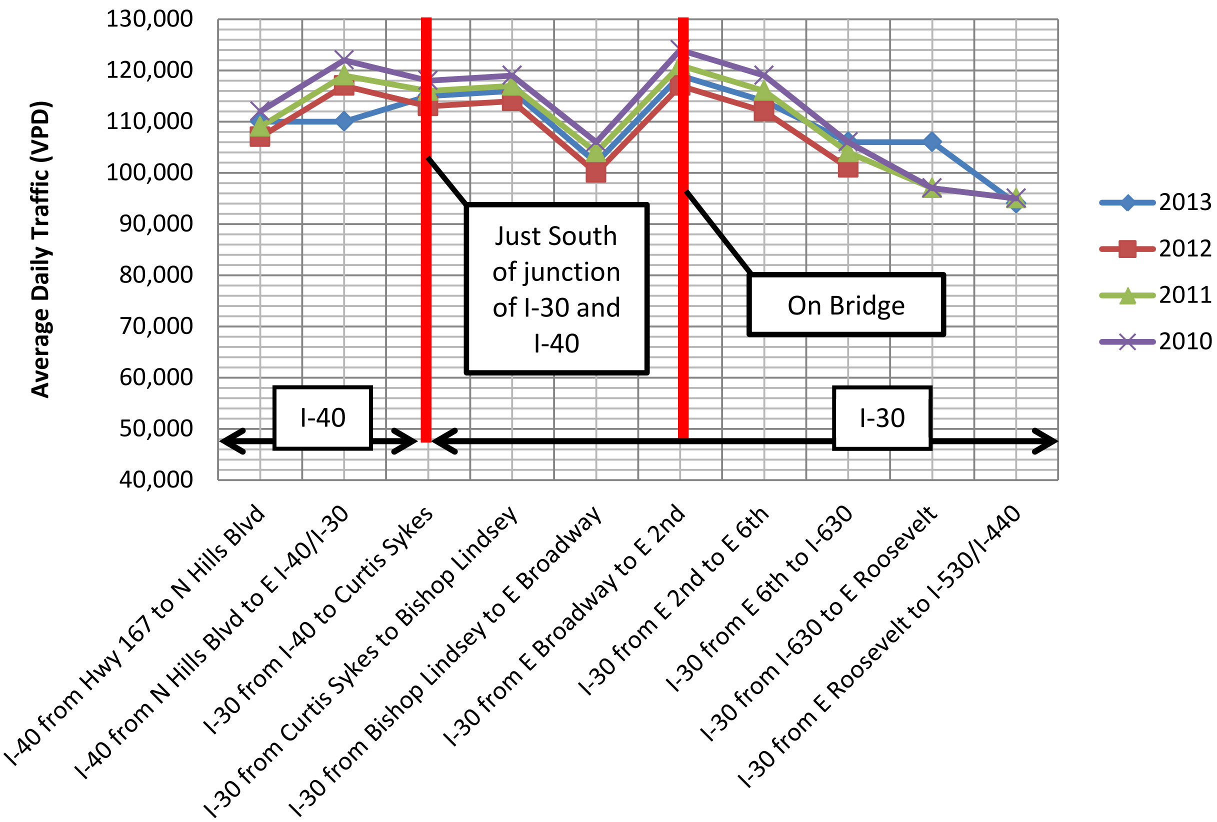
On both days, delays were noted for EB through traffic on Broadway Street. Cars were observed being in the queue for up to two full signal cycles. Much of the traffic appeared to be going through the Cypress Street intersection and turning left onto Locust Street.

LaHarpe Boulevard and Markham Street
On the first day of observation, a near 5 minute delay was noted for south bound traffic at the LaHarpe Boulevard and Markham Street intersection. The traffic was backed up for approximately 3½ blocks. However, this congestion was not noted again after the first day. A significant number of pedestrians cross at this intersection, which can attribute to vehicle backups.

3.4 Traffic Demand

Figure 19 shows the trend of daily traffic demand starting from the north end (left side of graph) of the study area and working its way south (right side of graph). In order to ensure that the trends are typical, multiple years of data are included (2010 – 2013). Red lines are drawn at two points of interest: south of the I-40/I-30 interchange and on the bridge over the Arkansas River.

Figure 19: I-30/I-40 2013 Annual Average Daily Traffic by Location



Source: AHTD Historical traffic counts

As shown, existing traffic volumes in the study corridor range from 102,000 to 119,000 daily vehicles. As expected, the Arkansas Bridge has the highest daily volume at 119,000 daily vehicles.

There is a sudden drop and then rise in volume just north of the bridge, which suggests that many vehicles use the Bishop Lindsey exit and the Broadway entrance to thefreeway. South of the bridge, traffic declines as it gets farther from the bridge.

Travel Characteristics

In order to understand travel characteristics in the I-30 corridor, the Metroplan 2041 travel demand model was used. **Figures 20 and 21** show the trip origins and destinations for all trips passing through the location where 100% is shown. From these exhibits the number of trips to each interchange is shown as well as the number of local vs. through trips. The analysis showed that:

- 41-52% of traffic exits using local ramps in the I-30 PEL study area
- 30-45% of traffic is headed to I-630
- 14-18% of traffic is passing through the I-30 PEL study area

Figure 20: Flow of Traffic Entering North Terminal

Figure 21: Flow of Traffic Entering South Terminal

Source: Metroplan

3.5 Alternative Modes

There are a number of alternative transportation modes using the I-30/I-40 corridor. Alternative transportation modes include trucks, transit, and pedestrian/bicycle.

3.5.1 Trucks

Trucks can have an impact on traffic operations and safety of the study corridor. Truck percentages were collected from AHTD. **Table 8** shows historical truck percentages in the I-30 corridor, Highway 67 north of the study corridor, and on the local street network on Cumberland Street west of I-30. As shown, available AHTD truck data is sporadic.

Table 8: Historical Truck Percentages

	Year														
Location	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
I-30 Study Corridor															
I-30 between Roosevelt and I-440 interchange					6										
I-30 between Curtis Sykes and Broadway					8	7									
Other Locations															
Hwy 67 between McCain Blvd and I-40 interchange	11	9	8												
Cumberland St between Markham and I-30 Off ramps							2	2	2	3	5				

Source: AHTD

As shown in the table, daily truck percentages on I-30 are in the range of 6-8%. On Highway 67, north of the study corridor, truck percentages are higher, ranging from 8-11%. Truck percentages on Cumberland Street, west of I-30, range from 2-5% over the course of five years.

In 2014, AHTD collected truck data at the three freeway count locations associated with the I-30 PEL study. Results are shown in **Table 9.**

Table 9: Measured Truck Percentages

Daily Truck Percent		AADT	Daily Trucks	Truck %
I-40 between Hwy 67 and Hills Blvd	EB	59,386	5,037	8.48%
	WB	61,164	5,450	8.91%
	Total	**120,550**	**10,487**	**8.70%**
I-30 at the Arkansas River Bridge	EB	62,725	3,603	5.74%
	WB	64,808	3,795	5.86%
	Total	**127,532**	**7,398**	**5.80%**
I-30 between Roosevelt and the I-30/I-440/I-530 Interchange	EB	47,806	3,726	7.79%
	WB	47,843	3,841	8.03%
	Total	**95,648**	**7,566**	**7.91%**

Trucks carrying hazardous materials are not allowed to use I-30 within the project limits unless they are delivering to that area (e.g. gasoline being delivered to a gas station). Permits for oversized trucks are specific as to the route the truck can take, and like HAZMAT, they don't route them to I-30 unless they are delivering to that area.

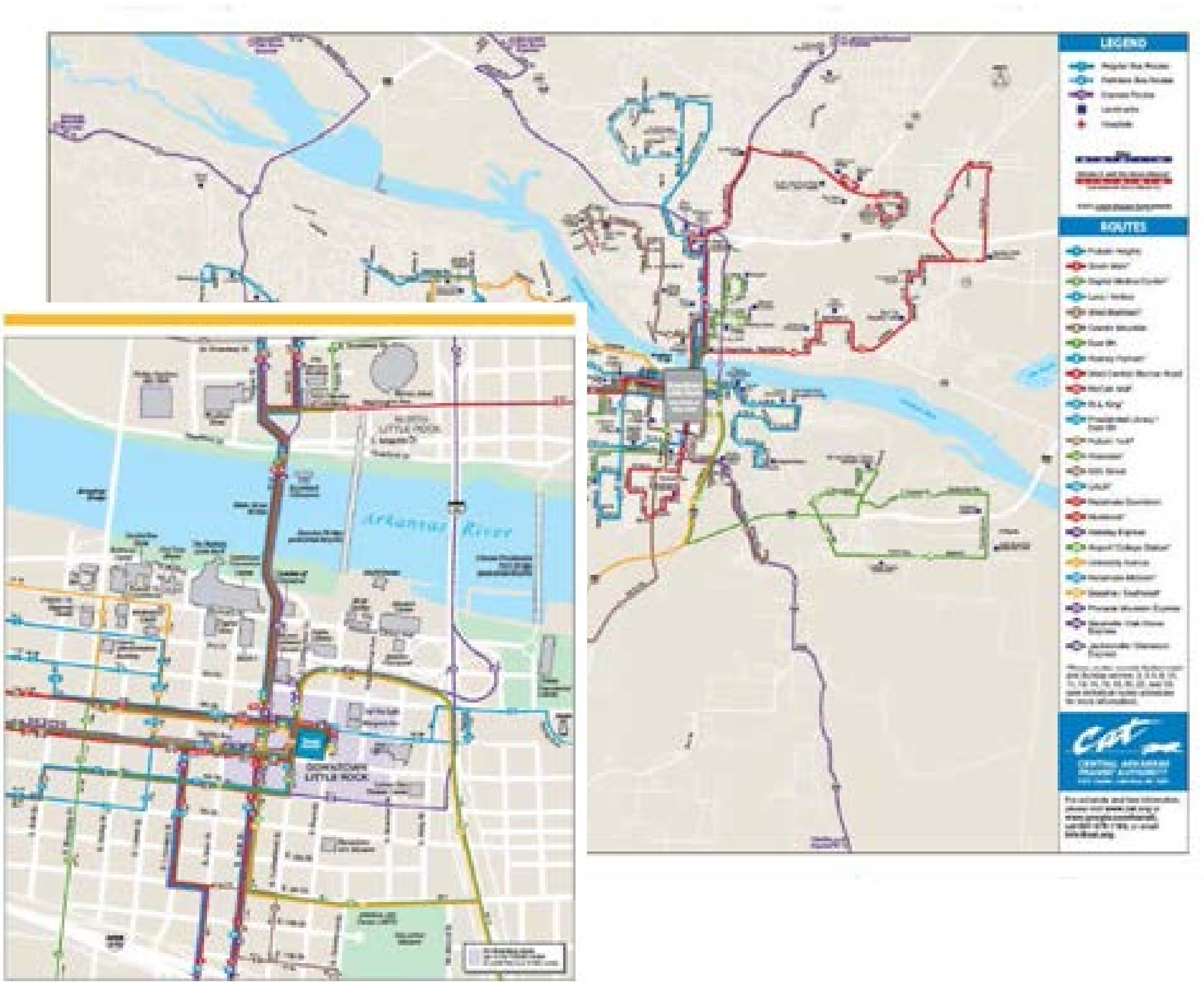
3.5.2 Transit

The Central Arkansas Transit Authority (CATA) operates 36 transit routes within the Little Rock metropolitan area. A summary of bus operations from the CATA website indicates the following:

- Buses in peak hour service – 49
- Buses in fleet – 59
- Weekday fixed route service miles – almost 8,500
- 2012 Passenger Trips – 2,823,695
- 20% increase in ridership since 2009
- Less than 1% increase in revenue hours since 2009
- More than 1% decrease in revenue miles since 2009

A few of the 36 CATA transit routes use the I-30/I-40 corridor, as shown on their system map in **Figure 22**.

Figure 22: Central Arkansas Transit Authority (CATA) Transit Routes



Source: Central Arkansas Transit Authority System Map http://www.cat.org/wp-content/uploads/2013/05/System-Map1.pdf

Route 26 (Maumelle Express) is the only route to travel over the I-30 bridge. It runs 5 times a day, beginning at the River Cities Travel Center at the following times: 6:30 am, 7:00 am, 4:10 pm, 5:10 pm, and 5:40 pm. Routes 20 (Airport/College) and 23 (Baseline/Southwest) travel south on I-30 from the River Cities Travel Center from 5:30 am to 8:30 pm with 50-60 minute headways.

3.5.3 Pedestrian / Bicycle

By and large, pedestrian facilities within the corridor are prevalent. **Table 2**, as shown previously, indicates that of the 19 system and service interchanges, 14 locations provide some sort of pedestrian access. Of the five locations that do not provide pedestrian access, four of them are system interchanges. The only service interchange that does not provide pedestrian access is at I-40 and N. Hills Boulevard.

3.6 Mobility

Exhibits 1-15 of **Appendix 8** show the existing (2014) conditions of the PEL study area. As shown in the exhibits, the existing Vissim model shows congestion in several expected locations heading generally into the downtown areas in the morning and heading generally away from the downtown areas in the evening. **Table 10** below summarizes the existing travel conditions as analyzed by Vissim.

Table 10: Existing Measures of Effectiveness

Total Simulation	Variable	AM	PM
Total System		Existing (2014)	Existing (2014)
VHD	Total Vehicle Hours of Delay	1,622	2,202
% LOS E or F	% LOS E or F (miles)	20%	15%
% LOS F	% LOS F (miles)	15%	11%
Unserved Vehicles	Total vehicles unserved	0	0

Note: This table includes results for the entire simulation area, and not just the PEL study area.

Eastbound	Variable	AM	PM
I-30/I-40 (from I-440 to Hwy 67)		Existing (2014)	Existing (2014)
Travel Time	Average Vehicle Travel Time in Minutes	6	11
Delay	Seconds delay compared to free flow speed per veh.	74	326
Speed	Average Speed in MPH	54	33
LOS E or F	% LOS E or F (miles)	16%	43%
Duration	Hours LOS E or F for any portion of the corridor	1.00	2.00
LOS F	% LOS F (miles)	16%	43%
Duration	Hours LOS F for any portion of the corridor	0.50	2.00

Note: This table includes results for the eastbound direction of the PEL study area only.

Westbound	Variable	AM	PM
I-30/I-40 (from Hwy 67 to I-440)		Existing (2014)	Existing (2014)
Travel Time	Average Vehicle Travel Time in Minutes	12	7
Delay	Seconds delay compared to free flow speed per veh.	392	100
Speed	Average Speed in MPH	30	51
LOS E or F	% LOS E or F (miles)	58%	16%
Duration	Hours LOS E or F for any portion of the corridor	2.00	2.00
LOS F	% LOS F (miles)	58%	12%
Duration	Hours LOS F for any portion of the corridor	1.50	1.75

Note: This table includes results for the westbound direction of the PEL study area only.

Source: HNTB. A complete table can be found in **Appendix 9**

3.7 Summary

In summary, peak direction travel speeds were approximately 30-33 miles per hour on average, which resulted in delays of around 5-7 minutes (about twice as long as normal). At least one level of service segment received a LOS F for the entire two-hour simulation. Most of the analyzed intersections in the corridor performed at LOS A-D.

4 CHAPTER 4: FUTURE NO ACTION CONDITIONS

4.1 Introduction

The future No Action scenario is very similar to the existing scenario with a few modifications and assumptions:

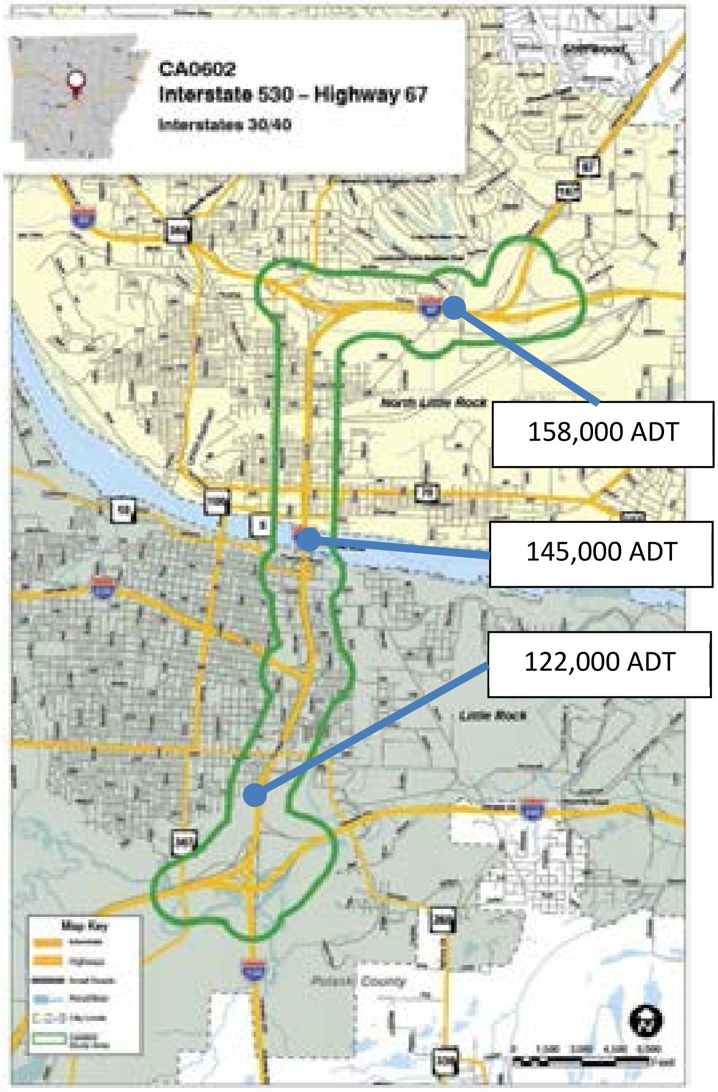
- Traffic changes from 2014 to 2041 (see the Traffic Forecast Plan in **Appendix 1**)
- Traffic signals are optimized to meet future demand
- Other regional improvements are implemented as identified in the Metroplan Long-Range Transportation Plan http://www.metroplan.org/files/53/2014-12LongRangePlan.pdf (December 2014).

No capital improvements are assumed in the future No Action scenario.

4.2 Traffic Demand

Future No Action traffic volumes were forecasted for the year 2041 as described in chapter 2 and are shown in **Figure 23**.

Figure 23: Future (2041) No Action Average Daily Traffic



Source: Metroplan Travel Demand Model

4.3 Mobility

Exhibits 16-30 in **Appendix 8** show the future (2041) No Action conditions of the I-30 PEL study area.

As shown in the exhibits, the problems that were evident in the existing model are now extending beyond the edge of the model. It is important to note that in this 2041 No Action scenario, severe bottlenecks in certain areas such as I-30 south/westbound at the Arkansas River Bridge are causing artificial downstream free flow conditions.

Table 11 below summarizes the future No Action travel conditions compared to the existing travel conditions as analyzed by Vissim.

Table 11: Future No Action Measures of Effectiveness

Total Simulation	Variable	AM		PM	
Total System		Existing (2014)	Future No-Build (2041)	Existing (2014)	Future No-Build (2041)
VHD	Total Vehicle Hours of Delay	1,622	8,541	2,202	13,352
% LOS E or F	% LOS E or F (miles)	20%	45%	15%	56%
% LOS F	% LOS F (miles)	15%	44%	11%	44%
Unserved Vehicles	Total vehicles unserved	0	6191	0	15518

Note: This table includes results for the entire simulation area, and not just the PEL study area.

Eastbound	Variable	AM		PM	
I-30/I-40 (from I-440 to Hwy 67)		Existing (2014)	Future No-Build (2041)	Existing (2014)	Future No-Build (2041)
Travel Time	Average Vehicle Travel Time in Minutes	6	8	11	18
Delay	Seconds delay compared to free flow speed per veh.	74	155	326	743
Speed	Average Speed in MPH	54	45	33	20
LOS E or F	% LOS E or F (miles)	16%	21%	43%	95%
Duration	Hours LOS E or F for any portion of the corridor	1.00	1.75	2.00	2.00
LOS F	% LOS F (miles)	16%	21%	43%	95%
Duration	Hours LOS F for any portion of the corridor	0.50	1.50	2.00	2.00

Note: This table includes results for the eastbound direction of the PEL study area only.

Westbound	Variable	AM		PM	
I-30/I-40 (from Hwy 67 to I-440)		Existing (2014)	Future No-Build (2041)	Existing (2014)	Future No-Build (2041)
Travel Time	Average Vehicle Travel Time in Minutes	12	16	7	18
Delay	Seconds delay compared to free flow speed per veh.	392	671	100	774
Speed	Average Speed in MPH	30	22	51	19
LOS E or F	% LOS E or F (miles)	58%	58%	16%	100%
Duration	Hours LOS E or F for any portion of the corridor	2.00	2.00	2.00	2.00
LOS F	% LOS F (miles)	58%	58%	12%	100%
Duration	Hours LOS F for any portion of the corridor	1.50	2.00	1.75	2.00

Note: This table includes results for the westbound direction of the PEL study area only.

Source: HNTB. A complete table can be found in **Appendix 9**

4.4 Summary

Areas of high congestion in the existing scenario are made worse by the future increase in traffic demand. In addition, new areas of concern are beginning to emerge as side street congestion causes vehicles to back up onto the freeway in the off-peak directions.

5 CHAPTER 5: FUTURE BUILD ALTERNATIVES

5.1 Introduction

The I-30 PEL study identified three build alternatives to advance to more detailed analysis in Level 3. The build alternatives include the primary highway build and complementary improvements as described below.

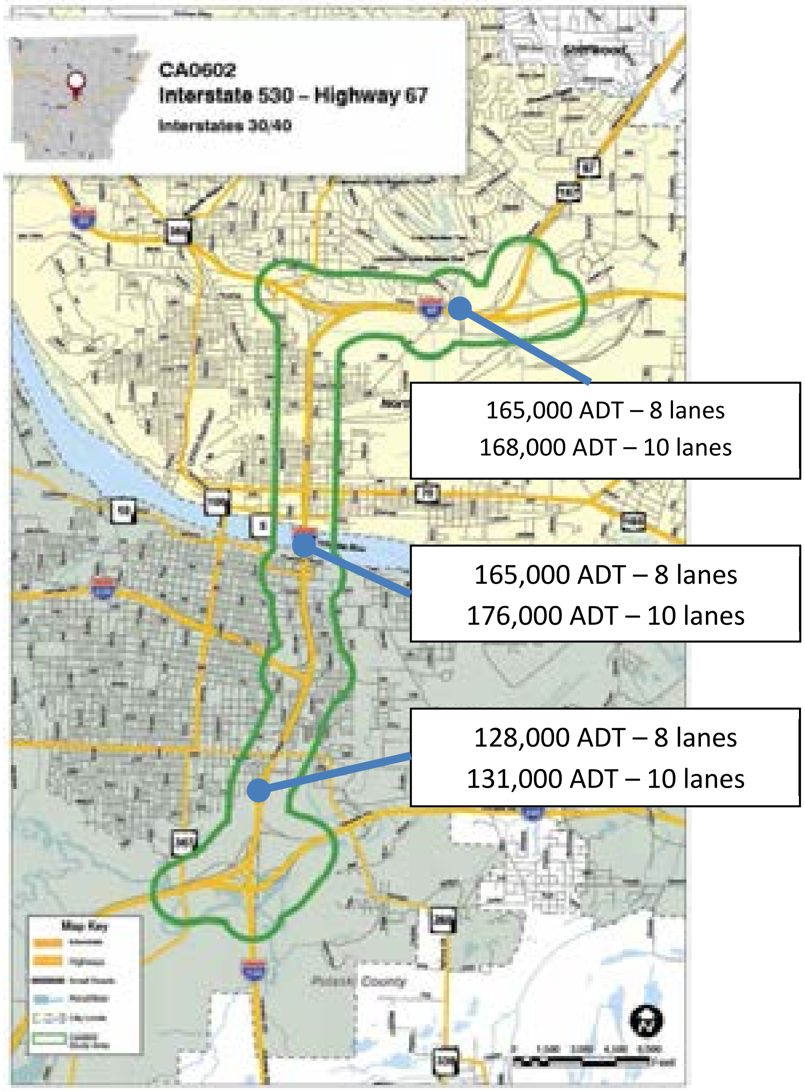
- **10 main lanes (5 main lanes in each direction) East and West Basic Scenarios** – This scenario included widening on both sides of the current 6-Lane facility to 10 main lanes throughout the corridor, 5 lanes in each direction, with the new I-30 Bridge over the Arkansas River being constructed to the east or to the west of the existing bridge.
- **8-lane C/D (3 main lanes + 1 C/D lane in each direction) East and West Scenarios** – This scenario included adding 1 C/D lane in each direction from Broadway in North Little Rock to just south of Broadway Street in North Little Rock. Outside the location of the C/D road, the new facility included 4 main lanes in each direction. This scenario also included replacement of the I-30 Bridge over the Arkansas River, with the new bridge width extending to the east or to the west of the existing bridge location.

- **10-lane C/D (3 main lanes + 2 C/D lane in each direction) –** This scenario included adding 2 C/D lanes in each direction from Broadway in North Little Rock to just south of 6th Street in Little Rock. Outside the location of the C/D roads, the new facility included 5 main lanes in each direction, with the same footprint as the 10 Main Lane Scenarios. This scenario also included replacement of the I-30 Bridge over the Arkansas River.

5.2 Traffic Demand

As discussed in chapter 2, traffic demand for each scenario was calculated using Metroplan's travel demand model. Modifications to volumes were considered for each of the complementary alternatives, and were the same for all three build scenarios. Since the 10 main lane and the 10-lane C/D alternatives are both 10 lanes, they use the same volumes. Daily volumes are shown in **Figure 24**.

Figure 24: Future (2041) Average Daily Traffic



Source: HNTB Level 2B Analysis

5.3 Mobility

The projected typical driver experience was analyzed separately for each of the aforementioned build scenarios

5.3.1 8-Lane C/D

Exhibits 31-45 in **Appendix 8** show the future (2041) conditions of the PEL study area assuming that the 8-Lane C/D Scenario is built.

The exhibits show that the 8-Lane C/D scenario is marginally better than the future No Action condition, and severe bottlenecks upstream can cause artificial free flow sections downstream.

5.3.2 10 Main Lane

Exhibits 46-60 of **Appendix 8** show the future (2041) conditions of the PEL study area assuming that the 10 Main Lane Scenario is built.

As is evident in the exhibits, the 10 Main Lane build alternative offers a significant improvement over the future No Action scenario from a traffic standpoint. The two areas where slowdowns are evident are related to constraints outside of the study area. In the AM north/eastbound direction, traffic experiences a slowdown just south of I-630. This is because the demand exceeds the capacity for vehicles using the flyover ramp to I-630 WB. In the PM south/westbound direction, slowdowns occur mostly outside of the study area due to demand exceeding capacity on I-30 WB at 65th street. As shown in the speed profile exhibits, the slowdowns only occur for a brief amount of time in the simulation. Compared to the future No Action and even the existing scenarios, the duration and severity of congestion is minimal in this 10 Main Lane scenario.

5.3.3 10-Lane C/D

Exhibits 61-75 of **Appendix 8** show the future (2041) conditions of the PEL study area assuming that the 10-Lane C/D system is built.

As can be seen in the exhibits, the 10-Lane C/D scenario operates very similarly to the 10 main lane scenario. The two areas where slowdowns are evident are related to constraints outside of the study area. In the AM north/eastbound direction, traffic experiences a slowdown just south of I-630. This is because the demand exceeds the capacity for vehicles using the flyover ramp to I-630 WB. In the PM south/westbound direction, slowdowns occur mostly outside of the study area due to demand exceeding capacity on I-30 WB at 65th street. As with the 10 Main Lane scenario, the slowdowns only occur for a brief amount of time in the simulation. Compared to the future No Action and even the existing scenarios, the duration and severity of congestion is minimal in this 10-lane C/D scenario.

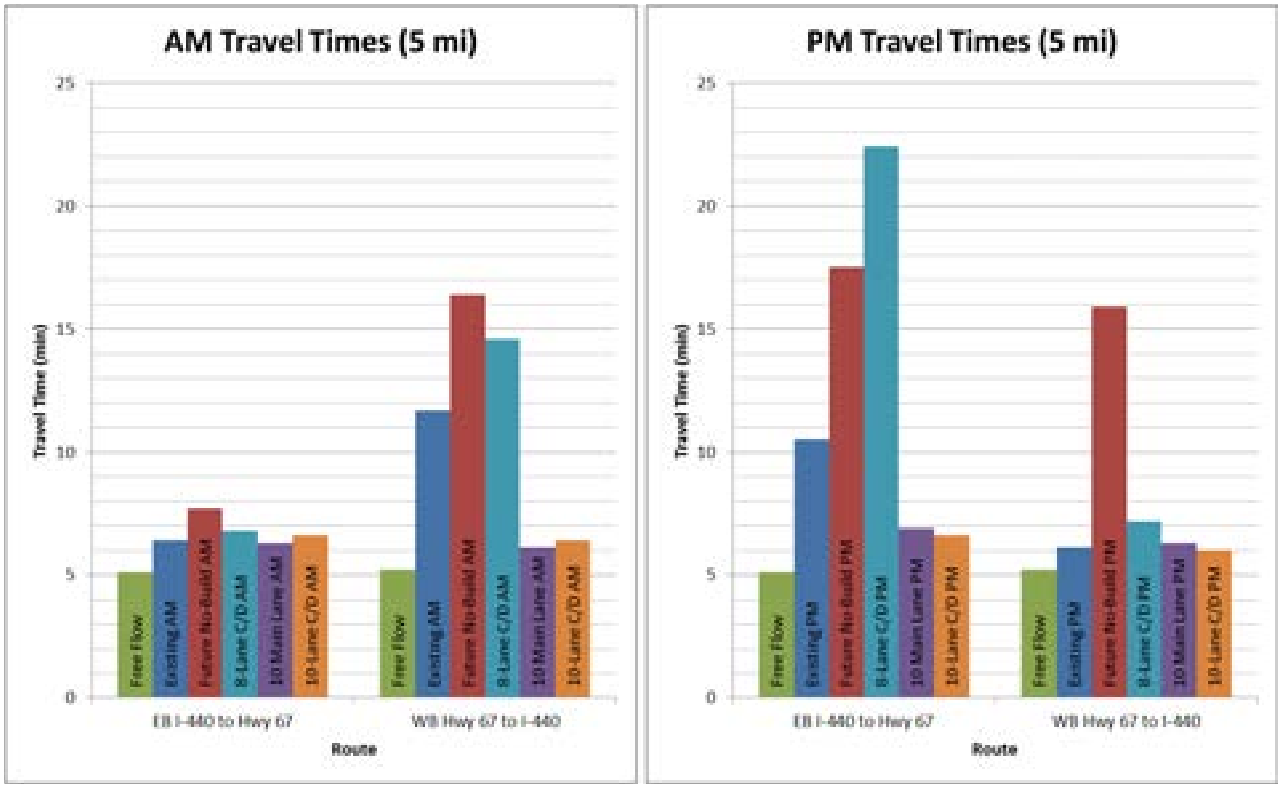
From a traffic standpoint, the 10 Main Lane scenario and the 10-Lane C/D scenario function very similarly.

5.3.4 Build Alternative Mobility Comparison

There are countless ways to compare the traffic operations of build alternatives, and many factors must be taken into consideration before selecting the optimal solution.

In **Figure 25** on the following page, the average travel time for several scenarios has been compared. The travel time was measured for vehicles traveling between US-67 at McCain and the the south interchange of the I-30 PEL study area, which is approximately a 6.7-mile segment. Only vehicles that traversed the entire distance were considered in the travel time calculation. A baseline “free flow” travel time was also added. This is the amount of time it would take to traverse the corridor in ideal off-peak conditions, such as at 9am on a Saturday when the roads are fairly clear. The free flow travel time is a baseline for comparing the various scenarios.

Figure 25: Travel Time Comparisons



Source: HNTB

From **Figure 25**, it becomes evident that the future No Action condition and the 8-lane C/D scenario both exhibit significantly increased travel times compared to the existing condition. In the existing condition, it can take up to twice as long to travel the corridor as it does during off-peak (free flow) times. In each peak and each direction, the 10 Main Lane scenario and the 10-Lane C/D scenario both have very comparable travel times to free flow times.

Tables 12 and 13 below compares the travel conditions of each build alternative to the future No Action and existing conditions. For each measure of effectiveness, the best performing alternative is indicated with gray shading.

Table 12: Measures of Effectiveness - AM

Total Simulation	Variable	AM				
Total System		Existing (2014)	Future No-Build (2041)	8-Lane C/D	10 Main Lanes	10-Lane C/D
VHD	Total Vehicle Hours of Delay	1,622	8,541	11,486	1,582	1,649
% LOS E or F	% LOS E or F (miles)	20%	45%	40%	13%	17%
% LOS F	% LOS F (miles)	15%	44%	35%	10%	9%
Unserved Vehicles	Total vehicles unserved	0	6191	11082	0	0

Note: This table includes results for the entire simulation area, and not just the PEL study area.

Eastbound	Variable	AM				
I-30/I-40 (from I-440 to Hwy 67)		Existing (2014)	Future No-Build (2041)	8-Lane C/D	10 Main Lanes	10-Lane C/D
Travel Time	Average Vehicle Travel Time in Minutes	6	8	7	6	6
Delay	Seconds delay compared to free flow speed per veh.	74	155	102	72	80
Speed	Average Speed in MPH	54	45	48	51	50
LOS E or F	% LOS E or F (miles)	16%	21%	68%	21%	29%
Duration	Hours LOS E or F for any portion of the corridor	1.00	1.75	1.25	1.00	1.00
LOS F	% LOS F (miles)	16%	21%	68%	21%	20%
Duration	Hours LOS F for any portion of the corridor	0.50	1.50	1.00	0.75	0.75

Note: This table includes results for the eastbound direction of the PEL study area only.

Westbound	Variable	AM				
I-30/I-40 (from Hwy 67 to I-440)		Existing (2014)	Future No-Build (2041)	8-Lane C/D	10 Main Lanes	10-Lane C/D
Travel Time	Average Vehicle Travel Time in Minutes	12	16	15	6	6
Delay	Seconds delay compared to free flow speed per veh.	392	671	561	51	53
Speed	Average Speed in MPH	30	22	24	58	58
LOS E or F	% LOS E or F (miles)	58%	58%	45%	0%	0%
Duration	Hours LOS E or F for any portion of the corridor	2.00	2.00	2.00	0.00	0.00
LOS F	% LOS F (miles)	58%	58%	45%	0%	0%
Duration	Hours LOS F for any portion of the corridor	1.50	2.00	2.00	0.00	0.00

Note: This table includes results for the westbound direction of the PEL study area only.

Source: HNTB. A complete table can be found in **Appendix 9**

Table 13: Measures of Effectiveness – PM

Total Simulation	Variable	PM				
Total System		Existing (2014)	Future No-Build (2041)	8-Lane C/D	10 Main Lanes	10-Lane C/D
VHD	Total Vehicle Hours of Delay	2,202	13,352	8,409	4,095	3,427
% LOS E or F	% LOS E or F (miles)	15%	56%	29%	16%	14%
% LOS F	% LOS F (miles)	11%	44%	23%	15%	12%
Unserved Vehicles	Total vehicles unserved	0	15518	8158	461	869

Note: This table includes results for the entire simulation area, and not just the PEL study area.

Eastbound	Variable	PM				
I-30/I-40 (from I-440 to Hwy 67)		Existing (2014)	Future No-Build (2041)	8-Lane C/D	10 Main Lanes	10-Lane C/D
Travel Time	Average Vehicle Travel Time in Minutes	11	18	22	7	6
Delay	Seconds delay compared to free flow speed per veh.	326	743	1,037	29	25
Speed	Average Speed in MPH	33	20	15	58	59
LOS E or F	% LOS E or F (miles)	43%	95%	60%	0%	0%
Duration	Hours LOS E or F for any portion of the corridor	2.00	2.00	2.00	0.00	0.00
LOS F	% LOS F (miles)	43%	95%	47%	0%	0%
Duration	Hours LOS F for any portion of the corridor	2.00	2.00	2.00	0.00	0.00

Note: This table includes results for the eastbound direction of the PEL study area only.

Westbound	Variable	PM				
I-30/I-40 (from Hwy 67 to I-440)		Existing (2014)	Future No-Build (2041)	8-Lane C/D	10 Main Lanes	10-Lane C/D
Travel Time	Average Vehicle Travel Time in Minutes	7	18	7	6	6
Delay	Seconds delay compared to free flow speed per veh.	100	774	118	61	49
Speed	Average Speed in MPH	51	19	49	57	58
LOS E or F	% LOS E or F (miles)	16%	100%	45%	6%	10%
Duration	Hours LOS E or F for any portion of the corridor	2.00	2.00	2.00	1.00	1.25
LOS F	% LOS F (miles)	12%	100%	45%	6%	10%
Duration	Hours LOS F for any portion of the corridor	1.75	2.00	2.00	0.75	1.25

Note: This table includes results for the westbound direction of the PEL study area only.

Source: HNTB. A complete table can be found in **Appendix 9**

As the measures of effectiveness indicate, the 8-lane C/D alternative falls significantly short of the 10 Main Lane and the 10-Lane C/D alternatives. While the 10 Main Lane and the 10-Lane C/D alternatives have somewhat similar results, the 10-Lane C/D provides an overall better driving experience

6 CHAPTER 6: PEL RECOMMENDED ALTERNATIVE ANALYSIS

6.1 Introduction

It was determined that the 10-lane C/D system with a few modifications would provide the best traffic and safety solution for the I-30 PEL study corridor. Safety analyses are documented in **Appendix 4**. For further analysis, the 10-lane C/D system will be altered in the following ways:

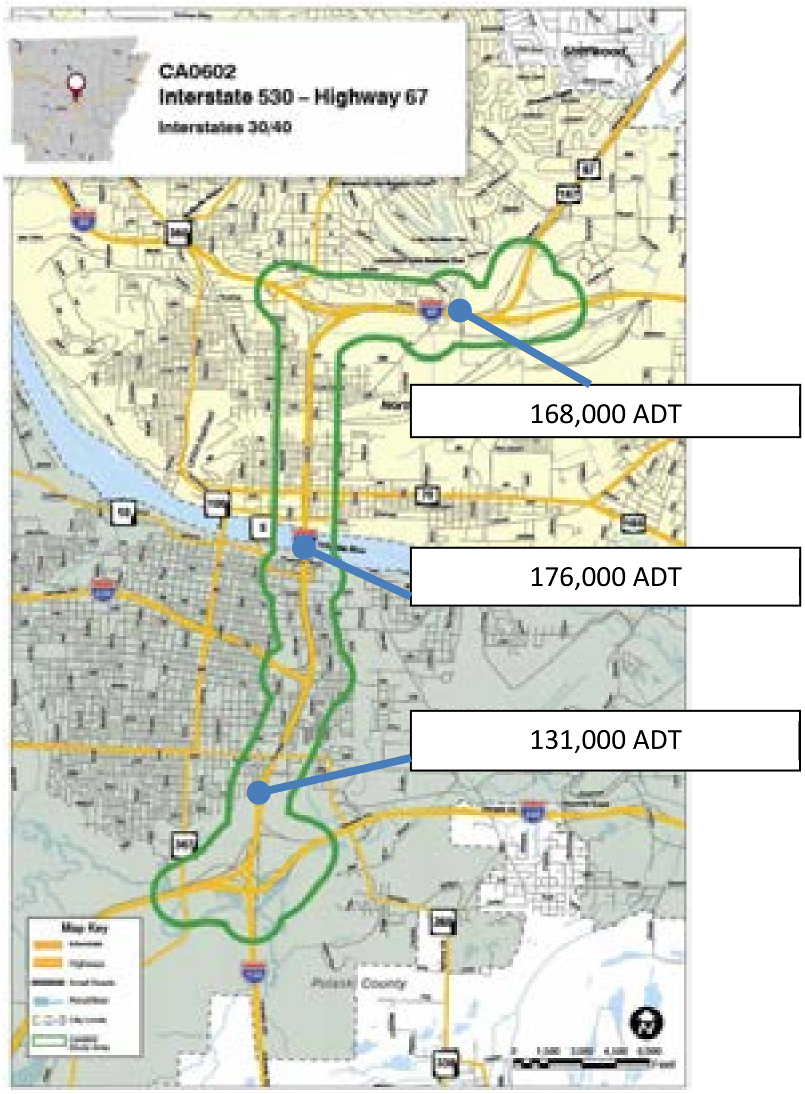
- Move the northern limits of the C/D road further south to increase the weaving distance from the north terminus of the C/D system to the north terminal.

- Add bus-on-shoulder in each direction on I-30
- Removed the intersection of Cantrell and River Market back to its original grade-separated condition

6.1.1 Traffic Demand

The preferred alternative used the same traffic volumes as the 10-Lane C/D alternative with minor changes to reflect more likely driver choices in the new scenario. **Figure 26** shows the ADTs for the 10-Lane scenario.

Figure 26: Future (2041) PEL Recommended Alternative Average Daily Traffic



Source: HNTB Level 2B Analysis

6.2 Mobility

Exhibits 76-90 in **Appendix 8** show the future (2041) conditions for the PEL Recommended alternative. As the exhibits show, the PEL recommended alternative scenario operates very similarly to the 10 main lane and 10-Lane C/D scenarios. The two areas where slowdowns are evident are related to constraints outside of the study area. In the AM north/eastbound direction, traffic experiences a slowdown just south of I-630. This is because the demand exceeds the capacity for vehicles using the flyover ramp to I-630 WB. In the PM south/westbound direction, slowdowns occur mostly outside of the study area due to demand exceeding capacity on I-30 WB at 65th street. As with the 10 Main Lane and 10-Lane C/D scenarios, the slowdowns only occur for a brief amount of time in the simulation. Compared to the future No Action and even the existing scenarios, the duration and severity of congestion is minimal in this PEL Recommended scenario. A complete table for comparison of all alternatives can be found in **Appendix 9.**

Appendix 3: Vissim Model Methodology Report

CA0602 I-30 PEL Study

Vissim Micro-Simulation Model Methodology

Technical Report

December 8, 2014

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1.0 INTRODUCTION

At the request of the Arkansas Highway and Transportation Department, the study team is conducting the I-30 Planning and Environmental Linkages (PEL) Study to identify the purpose and need for improvements within the I-30 PEL study area, determine possible viable alternatives for a long-term solution, and recommend alternatives for further evaluation. The study team, with public and agency input, developed the Universe of Alternatives, which contains the possible solutions to the issues in the study corridor identified in the purpose and need and the study goals. A tiered screening process was used to narrow the Universe of Alternatives to the PEL Recommendations that can be advanced seamlessly into a National Environmental Policy Act (NEPA) study.

The proposed I-30 PEL study area is located in central Arkansas, and stretches approximately 6.7 miles through Little Rock and North Little Rock. The study area begins at I-530 in the south and extends to I-40 in the north, and along I-40 eastwardly to its interchange with Hwy 67 in North Little Rock as shown in **Figure 1**.

This document presents Vissim model development, calibration methodology, measures of effectiveness used to analyze the study area, and Existing, Future No Action, and Build Scenario results from the simulation model.

Figure 1: I-30 PEL Study Area

2.0 MOBILITY ANALYSIS USING VISSIM

Mobility is one of the key purpose and need elements of the I-30 PEL study corridor. The I-30 corridor is a complex corridor of freeway components consisting of main lane, merge, diverge and weave elements in addition to arterial street connections and frontage roads. In order to understand the relationship between all of these transportation elements, a micro-simulation modeler called Vissim was chosen as the mobility analysis tool. The Vissim model outputs data that can be applied with Highway Capacity Manual (HCM) 2010 level of service criteria to analyze traffic operations. A micro-simulation model is beneficial because it provides insight about the effects of subtle geometric impacts, lane-specific conditions, choke points, and variations in volume over the peak hour, to name a few. The following report describes the methodology used in the development of the Vissim micro-simulation model.

2.1.1 Model Development

Development of the I-30 PEL micro-simulation model utilized Vissim version 7.0. This section will discuss the data sources and assumptions used to create the model.

2.2 LINKS AND GEOMETRY

2.2.1 LINKS / CONNECTORS / LANES:

Network links and lanes were first developed in Synchro (version 8) using the scaled aerial backgrounds included with the program. This files were initially created prior to the PEL study to be used for traffic forecasting. The Synchro files were imported into Vissim and refined using Google Earth, Google Maps, and intersection plans provided by Little Rock and North Little Rock.

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2.2.2 Grades

AHTD Microstation files with grades on I-30 between the I-40 interchange and the I-530 interchange were used. No grades were provided on I-40 or south of the I-530 interchange, therefore, these locations were assumed to have small enough grades that they would not impact traffic operations. Additionally, the profiles showed the grade at the roadway centerline only. Since the centerline falls between the two directions of travel, no grades were available over the bridges except for the I-30 Bridge over the Arkansas River. Only grades steeper than +/-2% were coded into Vissim; grades of less than 2% were assumed to have a negligible impact on traffic operations.

2.2.3 Desired Speed Decisions

Desired speed decisions were placed at every network input and every location with a speed limit change. The Vissim default speed distributions were compared to the field-measured speed distributions during free-flow conditions. Generally, Vissim's default speed distributions were appropriate. In cases where they were not appropriate, a new distribution was created for the segment to match the field-measured distribution. Trucks, buses, and cars were all assigned the same speed distributions unless the speed limit signs stated otherwise. This only occurred on the outer extremities of the freeways in the model. Speed limit data was largely collected via Google Street view. However, in locations where speed limit data could not be found in Street view, field data was collected. This data was collected in the summer of 2014.

2.2.4 Reduced Speed Areas

Reduced speed areas were placed at every intersection turning movement. Heavy vehicles were assigned a lower speed than cars. Left turns and channelized right turns were given slightly higher speeds than traditional right turns. Engineering judgment was used to determine these speeds, and they are generally consistent throughout the network. Reduced speed areas were also used anywhere with an advisory speed sign. These locations were predominantly at freeway entrance ramps . The I-30 WB to Cantrell exit ramp, for instance, has an advisory speed limit of 25 mph. On system-to-system ramps with no advisory signs, engineering judgment was used to slightly reduce the speed through the ramp.

2.3 Intersections

Arterial intersections require a significant amount of Vissim coding. The coding is primarily made up of conflict areas, priority rules, stop signs, signals, and detectors.

2.3.1 Conflict Areas

Conflict areas were used at every intersection and other potential conflict point. At signalized intersections, conflict areas were not placed for conflicting turning movements controlled by the signal (NBL and WBT, for instance). This is because the timing of the signal would not allow those conflicting movements to go at the same time.

2.3.2 Priority Rules

Priority rules were only used in locations where conflict areas could not effectively simulate a yield sign. There are fewer than five in the model. They are used in locations with slip ramps that add lanes to the frontage road but still require a yield on the frontage road. Yield sign placement was determined using Google Streetview.

2.3.3 Stop Signs, Signals and Detectors

Stop signs, signals, and detectors were placed in the model based on data provided by Little Rock and North Little Rock. Timings were set in each model based on the peak hour timings provided by each City and detectors were only used in locations where specified by the signal timing sheets. While pedestrians are not modeled, the signal timings provided by each City accommodate walk times for pedestrians.

2.4 Traffic Demand

Traffic demand represents the AM and PM peak period demand in the study area. Demand was determined for Existing (2014) conditions and Future (2041) conditions. Existing and future traffic demand is documented in the *CA0602 Traffic Count and Forecasted Count Plan, January 2015* submitted to AHTD. The following section describes how the routes of the demand were developed, as well as vehicle inputs into the model.

2.4.1 Origin/Destination (O/D) Matrix Development (Vehicle Routes)

An Origin/Destination (O/D) matrix was developed based on the *CA0602 Traffic Count and Forecasted Count Plan, January 2015*. The O/D Matrix for this network contains 173 possible origins and/or destinations. If there was one O/D matrix for the entire network, there would be over 25,000 possible routes (or O/D pairs). In order to simplify this to a manageable amount, origins and destinations were split into several sub-matrices: one main lane O/D matrix with routes along the freeways and origins and destinations at ramps and project limits, and generally one O/D matrix for each set of local streets that are serviced by a freeway interchange. This made it possible to decrease the total number of routes from 25,000 to around 1,100 O/D pairs. This change drastically reduced the time spent on O/D matrices without compromising the quality of the O/D matrices.

> *O/D Pair Example - A vehicle enters the network heading south on JFK Blvd. That vehicle has an arterial O/D pair for JFK. Their destination is the entrance ramp for I-40 EB. Once they reach that destination, they pick up a freeway main lane O/D pair. This O/D pair takes them from the JFK I-40 EB entrance ramp to the I-30 WB exit ramp at Roosevelt. Once they are on the Roosevelt exitramp, they pick up a new O/D pair for Roosevelt, which takes them out of the network.*

Some routes were considered prohibited routes. For instance, generally an arterial route will not have a route from an exit ramp to an entrance ramp. While it is possible to make these movements on the actual network, it was assumed that drivers would not make these unorthodox movements.

(1) Volumes

Vehicle traffic volumes for the entire network were based on the *CA0602 Traffic Count and Forecasted Count Plan, January 2015*. Turning movement volumes from this report were set as the target values (or check values) for the model. At intersections, this process was straightforward. However, on the freeway, the only measured counts were at the three “A” locations defined in the Traffic Count and Forecasted Plan, entrance-and-exit ramps, and system-to-system ramps. To further ensure precision in the model, additional target values came from 23 intermediate cordons (or screens) that were considered on the main lane (lettered A-W). Volumes at each cordon were available from the balanced counts. All route volumes were configured with the goal of matching all turning movement, ramp, and cordon volumes in the model to the target values. See **Figure 2** for a map of cordon and A-count locations.

Figure 2: Cordon and A-Count Locations

(2) Main lane O/D Matrix

The main lane O/D matrix includes 1 O/D matrix with 37 origins and/or destinations. For the freeway network, Metroplan provided a seed O/D matrix based on their existing travel demand model. Using the industry-standard Fratar method, the seed matrix volumes were proportionally increased to match as many of the targets as possible. Further balancing was required to ensure that each segment of the freeway met its target values. In some cases, as a calibration parameter, volumes were shifted from one O/D pair to another to simulate higher- or lower-intensity weaving through a segment. In these cases, target values were still matched at all locations.

(3) Arterial O/D Matrices

There are 14 arterial O/D matrices, each with anywhere from 4 to 19 origins and/or destination pairs. No travel demand model data was available for these matrices. Therefore, engineering judgment was used to determine which routes would be used most or least in each matrix. More traffic volume was assigned to routes that came from a heavily traveled origin to a heavily traveled destination. Less traffic volume was assigned to routes with redundant movements. The ramp and turning movement targets were used as a guide to fill in and balance the remaining O/D pairs.

2.4.2 Vehicle Inputs

(1) Volumes

The peak hour input traffic volumes were determined from the balanced counts developed in the Synchro models (Section 2.1). For each 15-minute period of the simulation, an input volume was computed based on known peaking characteristics from data collected by AHTD at the “A” count locations. For the main lane inputs, the peaking characteristics were computed based on the nearest “A” count. For the arterial inputs, the peaking characteristics were based on the average peaking of the entire network. The 15-minute volumes were computed so that the peak hour as a whole experienced the correct peak hour number of vehicles.

(2) Truck Percents

For the main lane inputs, the truck percents were calculated based on the nearest A-count. Of all the available truck percent data, the A-counts were the closest to the main lane inputs and represented the most recent data. For the arterials, truck percent data was available from the B-counts (B-Counts are study intersections).

2.4.3 Public Transit

Public transit routes were coded into the model based on available routes and schedules from CATA’s website (\\www.cat.org).

2.5 Model Data Collection

2.5.1 Nodes

Nodes were placed at every B-count location and at every cordon location. Nodes measure the number of vehicles that pass through them in a given time span. For this model, data is aggregated in 15-minute (or 900-second) increments. At the cordon locations on the freeway, the nodes simply measure how many vehicles pass through the node in each direction. At the intersections, the nodes count the number of vehicles that make each turning movement. This data is used to determine how closely the traffic volumes in the model are reflecting the actual counted network volumes.

2.5.2 Data Collection Points

Data collection points are placed at every freeway cordon location (one per lane) and are named to match the cordon letter. Data collection points were grouped so that the output data represents the entire cordon in each direction as opposed to each individual lane. The data collection points determine the number of vehicles passing over them as well as the speed at which they are traveling. This data is aggregated in 15-minute (or 900 second) increments, and can be used to create graphs of the average speed at each time period. See the map in section 2.3.1(1) for a map of the data collection points.

2.5.3 Vehicle Travel Times

Travel times were collected in the field between several segments along the main lane during each peak hour in September 2014. For comparison, the same travel time segments are coded into the model. Existing travel time data was used during the calibration phase and was also used with model output to compare the performance of the Existing, Future No Action, and Future Build alternatives.

Six travel time runs were conducted for each peak period. Travel times were measured from US 67 at McCain Blvd to: I-630 west of the I-30 interchange, I-30 west of the I-530/I-440 Interchange, and I-530 south of the I-530/I-440 interchange. The runs were broken up into segments between the interchanges. **Figure 3** shows the travel time segments.

Figure 3: Travel Time Segments

2.5.4 Link Evaluation

Link evaluation is active for all main lane links. Connectors do not have link evaluation active since their length is negligible. The link evaluation feature captures speed and density data needed to calculate level of service along the main lane.

2.6 Other Model Attributes

This section describes other parameters that were used in the Visim model.

2.6.1 Simulation Parameters

The following simulation seeds were used for every model run. Using the same seeds for every simulation provides an increased level of reproducibility. These numbers come from a random seed of 1000 and a random seed increment of 767, which is of no significance except that it is consistent between models. Fifteen iterations were run for each model and the results were averaged together and are shown in **Table 1**

Table 1: Random Seeds

Iteration	Seed
1	1000
2	1767
3	2534
4	3301
5	4068
6	4835
7	5602
8	6369
9	7136
10	7903
11	8670
12	9437
13	10204
14	10971
15	11738

The simulation resolution was set to 10 time steps/simulation second. This means that the program performs 10 calculations per second. Vissim allows anywhere from 1-20 time steps/simulation second. However, a lower resolution is less precise and a higher resolution requires much more time and computer power to run the simulation.

2.6.2 Simulation Times

A two hour simulation period was analyzed during the morning and afternoon. In addition to the peak period, a seeding period was included. The simulation timings are shown in **Table 2.**

Table 2: Simulation Timings

	Seeding period	Pre- Peak	Peak Hour	Post-Peak
Duration	15 minutes	30 minutes	60 minutes	30 minutes
Simulation Seconds	0-900 sec	900-2700 sec	2700-6300 sec	6300-8100 sec
AM Model	6:30-6:45 am	6:45-7:15 am	7:15-8:15 am	8:15-8:45 am
PM Model	15:45-16:00 (3:45-4:00 pm)	16:00-16:30 (4:00-4:30 pm)	16:30-17:30 (4:30-5:30 pm)	17:30-18:00 (5:30-6:00 pm)

3.0 MODEL CALIBRATION

Model calibration is the process of adjusting the Vissim model to replicate existing I-30 PEL study area traffic characteristics based on data collected in the study area. Calibration of the I-30 PEL Vissim Model was based on the following data.

1. AHTD-collected traffic volumes and speeds
2. Field-collected travel times
3. Field-observed congestion
4. I-30 camera observations
5. Google traffic view
6. HERE Data

The following section describes the model calibration approach and model results spreadsheet.

3.1 FHWA Calibration Standards

Calibration of the model was conducted using the *FHWA toolbox (Traffic Analysis Tools Volume III,* July 2004) Table 4: Wisconsin DOT Freeway Model Calibration Criteria. The calibration criteria are discussed in further detail in the results spreadsheet tab descriptions below.

3.2 Results Spreadsheet Tabs

The results spreadsheet is where the raw AM and PM peak period quantitative results from the simulation model are exported and organized into meaningful measures of effectiveness. It is useful in the calibration phase to compare collected data to modeled results. It is also useful in comparing various future alternatives. An example of the spreadsheet can be found on the accompanying CD, and thehe following section presents each tab in the results spreadsheet and includes a description of how the tab is used.

3.2.1 Network Performance Tab

This tab has two tables. The first shows results on a network-wide level of travel time, delay, speed, distance, and number of vehicles. The second table provides information about each simulation run: date/time, seed number, simulation start time, and length of the simulation.

3.2.2 Vehicle Travel Times Tab

The vehicle travel times tab gives a description of each of the 20 travel time segments and compares the model travel time with the field travel times. According to the FHWA toolbox, it is necessary for >85% of the model travel times to be within 15% or 1 minute of the measured travel times. Calculations of model calibration can be found in columns S-U of this spreadsheet. This tab also includes calculations for Emergency Vehicle and Key Destination travel times. **Table 3** shows the vehicle travel time calibration results:

Table 3: Vehicle Travel Time Calibration

	AM	PM
Number of Travel Times within 15% or 1 minute (meets criteria)	23	27
Number of Travel Times NOT within 15% or 1 minute (does not meet criteria)	3	1
Total % of Travel Times Meeting Criteria	88%	96%
Calibrated?	Yes	Yes

3.2.3 Speed Tabs

This section discusses the speed data collected from the model.

(1) Data Collection Points

Data in this tab represents the raw output data from the data collection points in the model, which is used in the “Data Collection Summary” tab.

(2) Data Collection Summary

Rows 1-20 of this tab compare model and field freeway speed data at the three A-count locations. Six graphs of the data can be found to the right of the table. In the graphs, the blue line represents field data and the red line represents the model data. The horizontal axes represent the time (in simulation seconds), and the horizontal axes represent average speed (in mph).

FHWA Toolbox guidelines state that the link speeds should match “to the analyst’s satisfaction”. This means that the link speeds are a qualitative comparison between field and model data instead of quantitative. While it is desirable for the speed profiles to match closely (or at least to match the general shape), profiles that match too closely could indicate overcalibration of the model. An overcalibrated model may not respond (i.e. show logical, different results) to proposed changes to the network in later build alternatives.

Rows 22-72 of the results spreadsheet show the model speeds at each cordon location over the course of the simulation. The two color-coded graphs to the right (near M47) show a visual representation of the data. The horizontal axis represents time and the vertical axis represents the location along the main lane (see the cordon map). The color represents the average speed at a given location and time. Red is slower and green is faster.

Figures 4 and 5 show the AM and PM Speed Profiles. The blue line is field-collected data and the red line is the data output from the model. These speed profiles were determined by the analyst to represent a calibrated model.

Figure 4: AM Speed Profiles

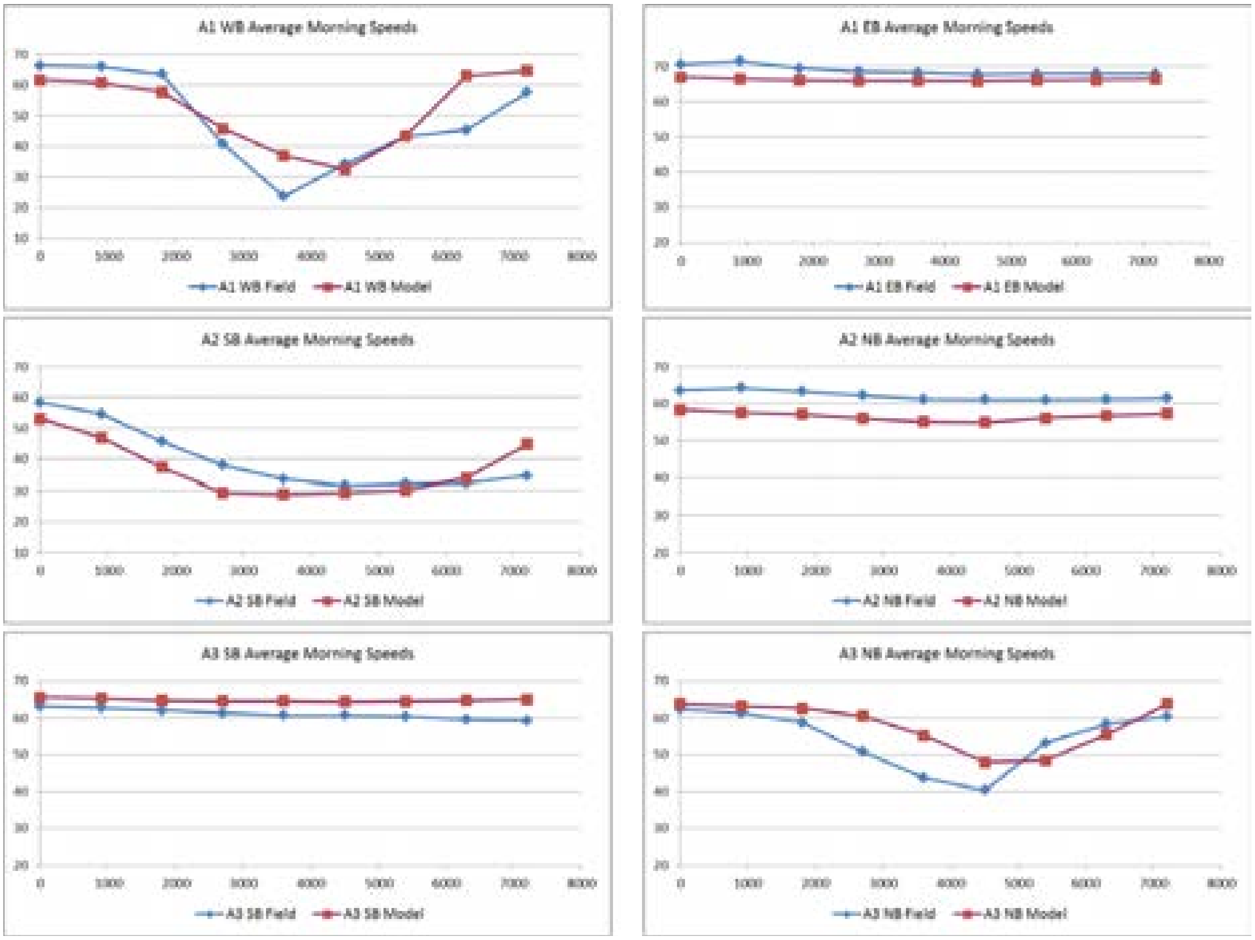
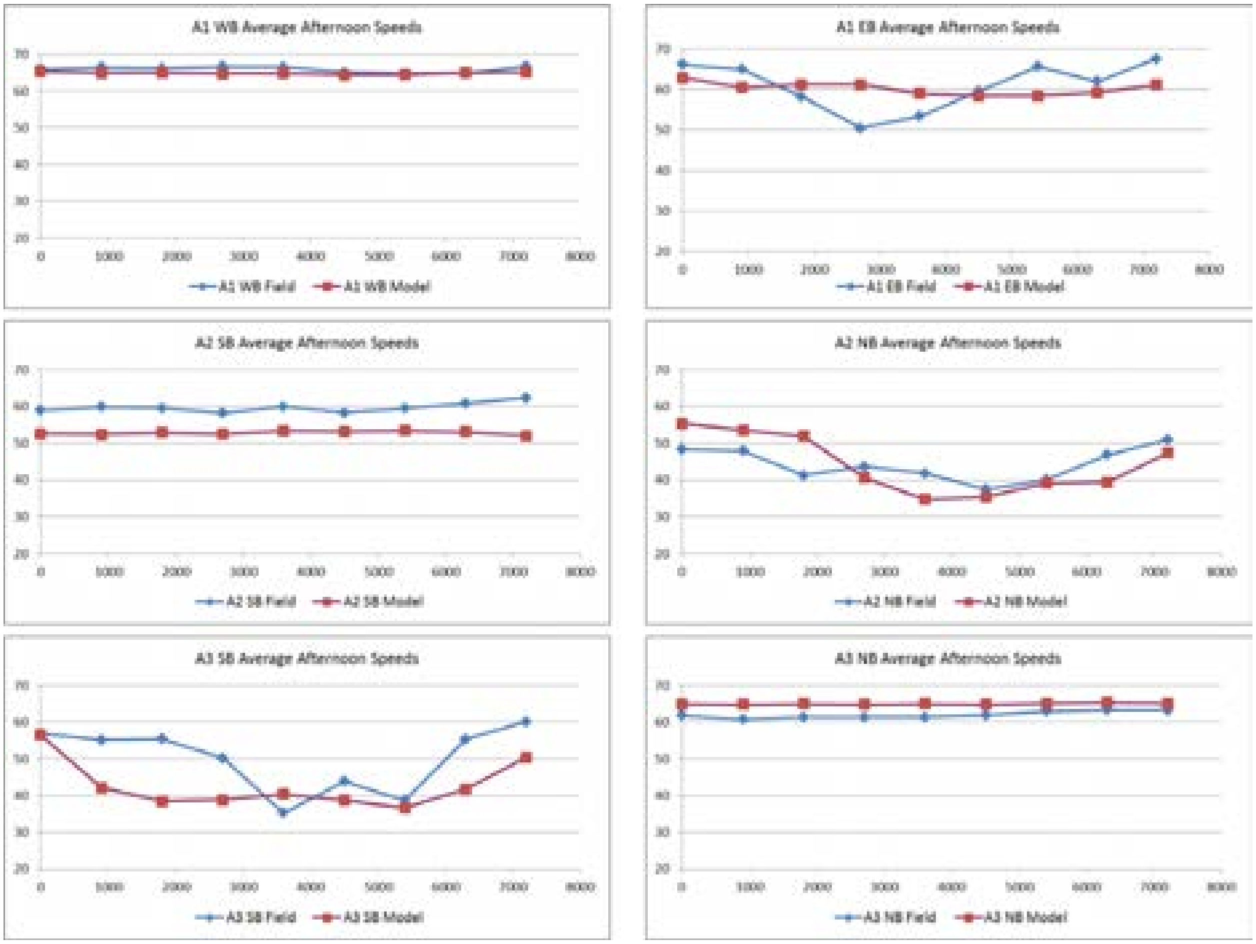


Figure 5: PM Speed Profiles



3.2.4 Intersection Data Tabs

(1) Raw Intersections

The raw intersections tab compares the model volumes to the balanced counts for turning movements and freeway cordons. Columns A-I represent the 15-minute values, and columns K-Q represent the entire peak hour. Column S contains the balanced counts, and columns T-Y show the volume comparisons. Orange cells near the top and bottom of the hourly averages and totals show the results of calibration. There are several ways to determine the calibration of this data:

New Way: For each turning movement or cordon volume, the following criteria must be met in >85% of cases:

- If Flow <700 veh/h, then within 100 veh
- If 700 veh/h < Flow < 2700 veh/h, then within 15%
- If Flow > 2700 veh/h, then within 400 veh

The sum of all link flows must be within 5%.

Old Way: For each turning movement or cordon volume, the following criteria must be met in >85% of cases: within 15% or 50 veh/h

GEH: For each turning movement or cordon volume, the GEH statistic must be <5 for >85% of cases. For the sum of all link flows, the GEH statistic must be <4.

$$GEH = \sqrt{\frac{(E-V)^3}{\frac{(E+V)}{2}}}$$

Where:
E=model estimated volume
V=field count
Source: FHWA Toolbox, July 2004

Table 4 shows the results of calibrating to the new criteria:

Table 4: Turning Movement Calibration Results

	Turning Movement Matching		GEH Statistic	
	AM	PM	AM	PM
Intersections Meeting Criteria	319	320	313	320
Intersections NOT Meeting Criteria	2	1	8	1
% Compliance	99%	100%	98%	100%
Calibrated?	Yes	Yes	Yes	Yes

(2) Intersection Summary

This tab presents the level of service results from Vissim for each intersection. Formulas in row 56 and below are for calculation purposes only. Some intersections are also analyzed in the next tab, “2010 Interchange”. These intersections are denoted by grey cells and a comment in the comments column.

(3) 2010 Interchange

This tab presents the level of service for interchanges as directed in the 2010 Highway Capacity Manual. Formulas below row 26 are for calculation purposes only.

(4) Movement Lookup

This tab contains calculations used to create the 2010 interchange tab.

3.2.5 Link Evaluation Tabs

The following tabs are used to calculate the level of service on the main lane.

(1) Raw Link Import

Used to populate the Raw Link Data tab

(2) Raw Link Data

Used to populate the Link Calcs tab

(3) Link Calcs

Column M shows the segment number. This number is referenced in the level of service map key. As seen in column N, the link segments are separated by freeway and direction. Column O denotes the segment type. Columns Z-AO detail the density and speed for the segment at every 15 minute period. The LOS result is shown in column BB. Columns BC and BD calculate the duration (in minutes) that each segment remains at LOS E and F, respectively.

3.3 Visual Audits

In addition to the quantitative calibration standards listed above, several qualitative attributes of the network were also considered.

3.3.1 Traffic Cameras

Traffic cameras were observed once during each peak period in the following locations: The I-30/I-40 interchange, I-30 at the Cantrell Interchange, and at the I-30/I-530/I-440 interchange. The cameras were observed from 4-6pm on Thursday, November 20, 2014 and from 6:30-9:00am on Friday, November 21. These observation periods gave insight on weaving and merging characteristics in a few of the more congested areas, particularly near the I-30/I-40 interchange.

3.3.2 Google Traffic

Google Maps has a feature called “Typical Traffic” which shows typical traffic patterns for every half hour of each day of the week. By looking within the simulation time ranges during a typical Tuesday, Wednesday, and Thursday, it is possible to see where congestion is most common. In addition,5-minute traffic data has been provided during the PM peak on December 9th, 2014 and during the AM peak on December 10th, 2014. This more detailed data can give more information about where congestion originates, how long it lasts, and when it dissipates.

3.3.3 HERE Data

AHTD provided HERE data, which records the average speeds during each peak period over the course of months. Data was provided for the mean, median,and 80th percentile speeds at around 20 locations throughout the corridor.

4.0 MEASURES OF EFFECTIVENESS (MOES)

This section will discuss the transportation measures of effectiveness (MOEs) and how they are being measured with the Vissim model. The measures of effectiveness were identified and defined in the *Alternative Screening Methodology* report for the I-30 PEL. Results of the MOEs can be found in the main body of the report as well as in **Appendix 2** or **Appendix 8**.

4.1 Enhance Mobility

4.1.1 Mobility in PEL Study Area

In the MOEs tab of the results spreadsheet, the results for average delay (sec/veh), system speed (mph), vehicle miles traveled (VMT), and Vehicle Hours Traveled (VHT) are presented in the first table entitled “Mobility in the PEL Study Area”.

4.1.2 Total Travel Time Savings

In the MOEs tab of the results spreadsheet, the results for the segment travel times are given in rows 12-33. Additionally, a map entitled “Segment Travel Times” gives a graphical representation of the segments. There is a map for both the AM and PM peak periods (two maps total shown in **Appendix 8**)

4.1.3 Average Peak Hour Travel Speed through Corridor

A map entitled “Speed Profile Reference Map” has been created which includes the speed profile graphs discussed in the Data Collection Summary tab. There is a map for each direction for each peak (four maps per model shown in **Appendix 8**).

4.2 Access to Downtown

4.2.1 Mobility of Key intersections within PEL Study Area

The Intersection Summary and 2010 Interchange tabs of the results spreadsheet provide information on the mobility of key intersections within the PEL study area. In addition, LOS maps are provided in **Appendix 8**.

4.2.2 Travel Time to key destinations in PEL Study Area

In the MOEs tab of the results spreadsheet, rows 42-49 show the key destination travel time results. In addition, these results will be shown on a map entitled Key Destination Travel Times in **Appendix 8**.

4.3 System Reliability

4.3.1 Emergency Vehicle Travel Time

In the MOEs tab of the results spreadsheet, rows 34-41 show the emergency vehicle travel time results. In addition, these results are shown on a map entitled Emergency Vehicle Travel Times in **Appendix 8**.

4.4 Opportunity for Economic Development

4.4.1 Access to Existing/Potential business sites within the PEL Study area

See Total Travel Time Savings. Shorter travel times are assumed to relate to better access.

Appendix 4: Safety Technical Report

Table of Contents – Volume 1

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1.0 Introduction

Safety is a key component in evaluating the impacts of the proposed roadway alternatives. For this analysis, the safety project limits consisted of Interstate 30 (I-30) from the Interstate 530 (I-530)/Interstate 440 (I-440) (south terminal) to the Interstate 40 (I-40) interchange (north terminal) and I-40 from the north terminal to the Highway 67 (Hwy 67) interchange. These study limits will be referred to as the PEL study area.

A quantitative safety analysis was performed for the existing crashes, arterial connection conflict points, main lane conflict points, collector distributor (C/D) road conflict points, deficient acceleration and deceleration ramp lengths, deficient weaving lengths, main lane ramps, and C/D ramps. In addition, potential crash reductions were estimated based on crash modification factors for a particular design element.

2.0 Historical Crashes

Crash data from 2010, 2011, and 2012 (the latest three years of available data) were reviewed for I-30 from the south terminal to the north terminal, and along I-40 to the Hwy 67 interchange on the east. The locations of crashes along the main lanes throughout the study area were plotted by crash type and log mile as shown in in **Figures 1-2**. These crashes were also plotted graphically by year for main lanes and cross streets shown in **Figures 3-14**.

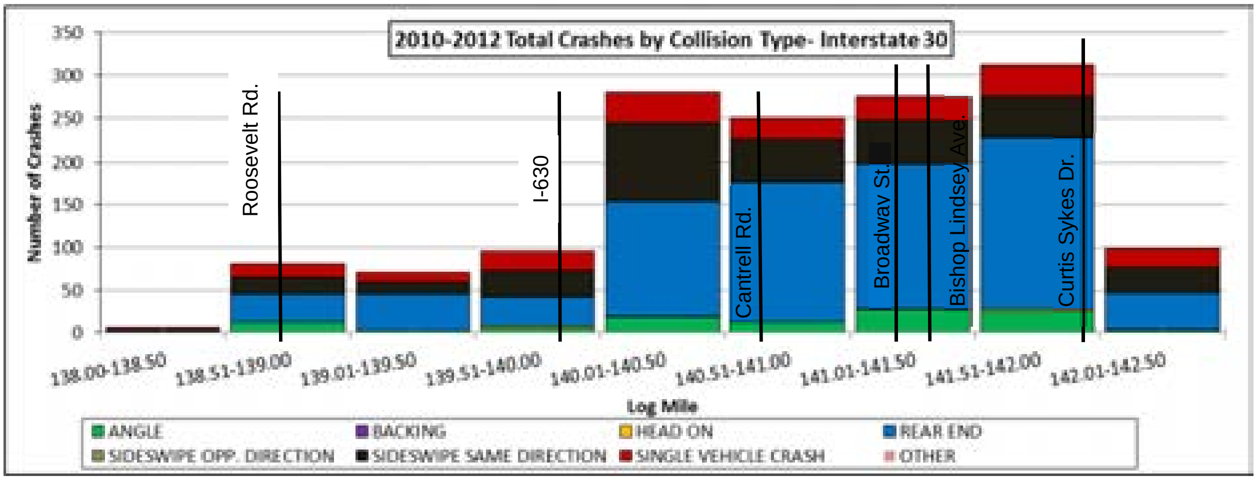


Figure 1: 2010-2012 Crash Locations along I-30

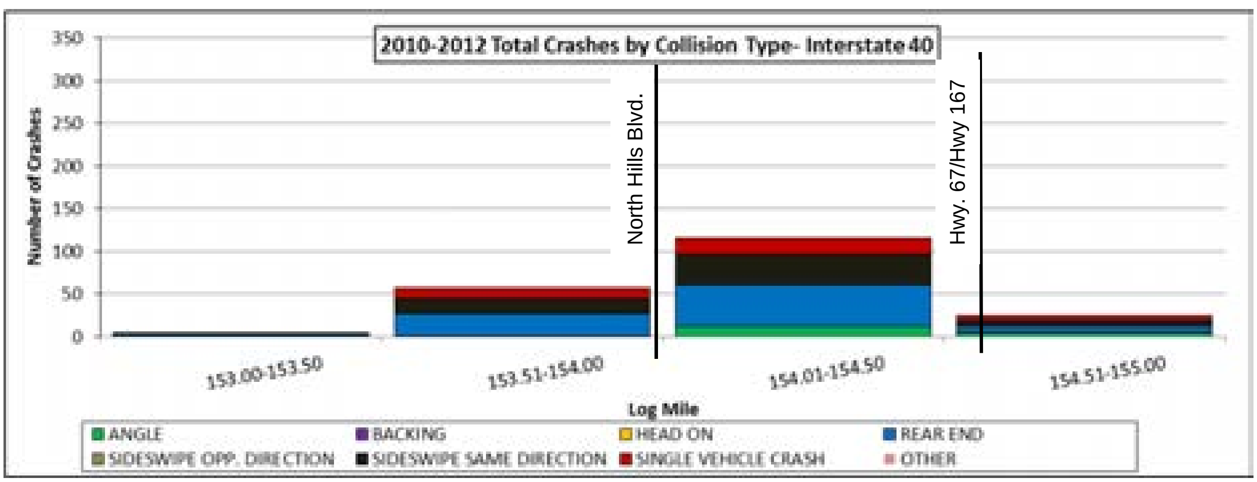


Figure 2: 2010-2012 Crash Locations along I-40

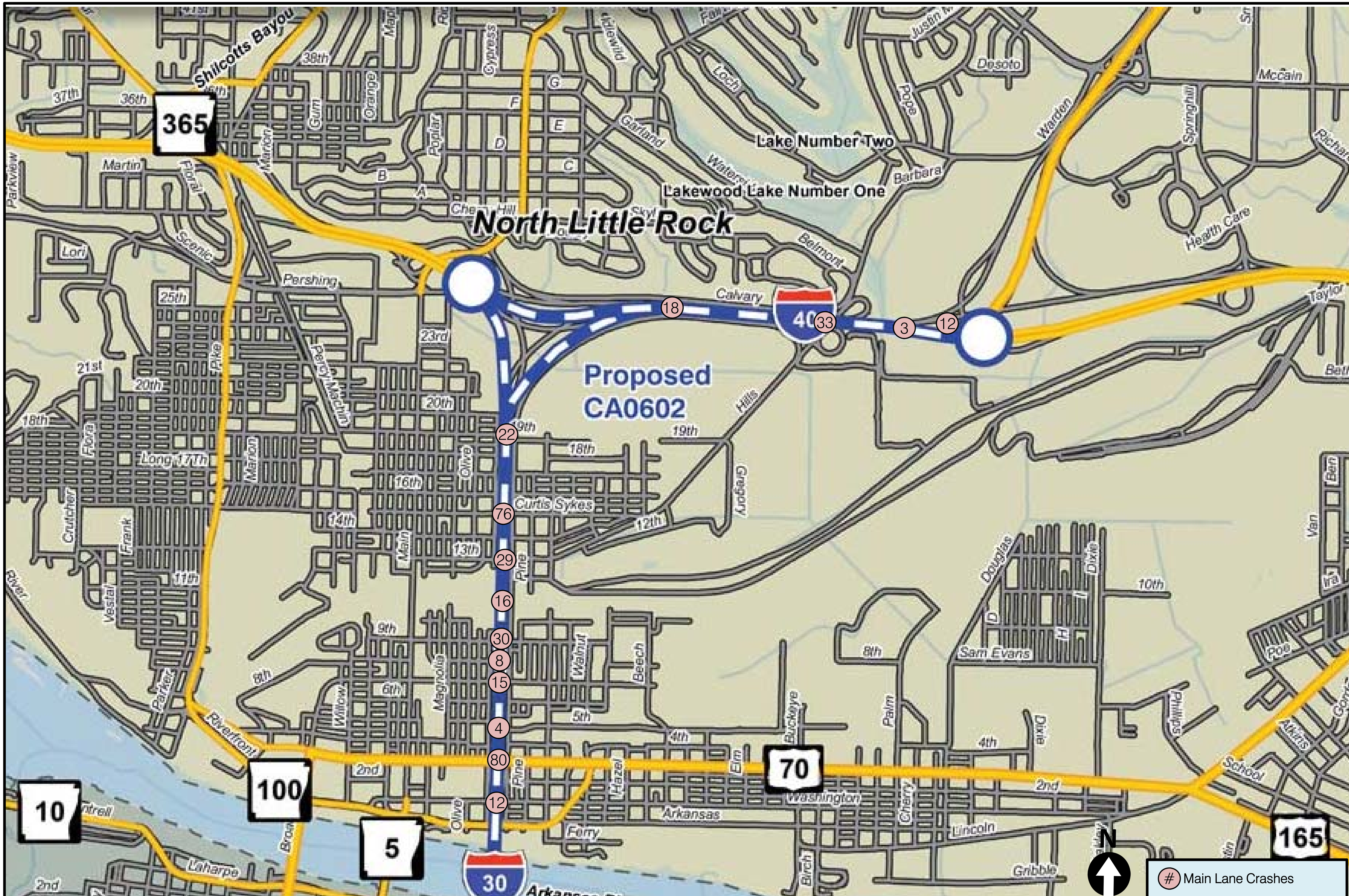
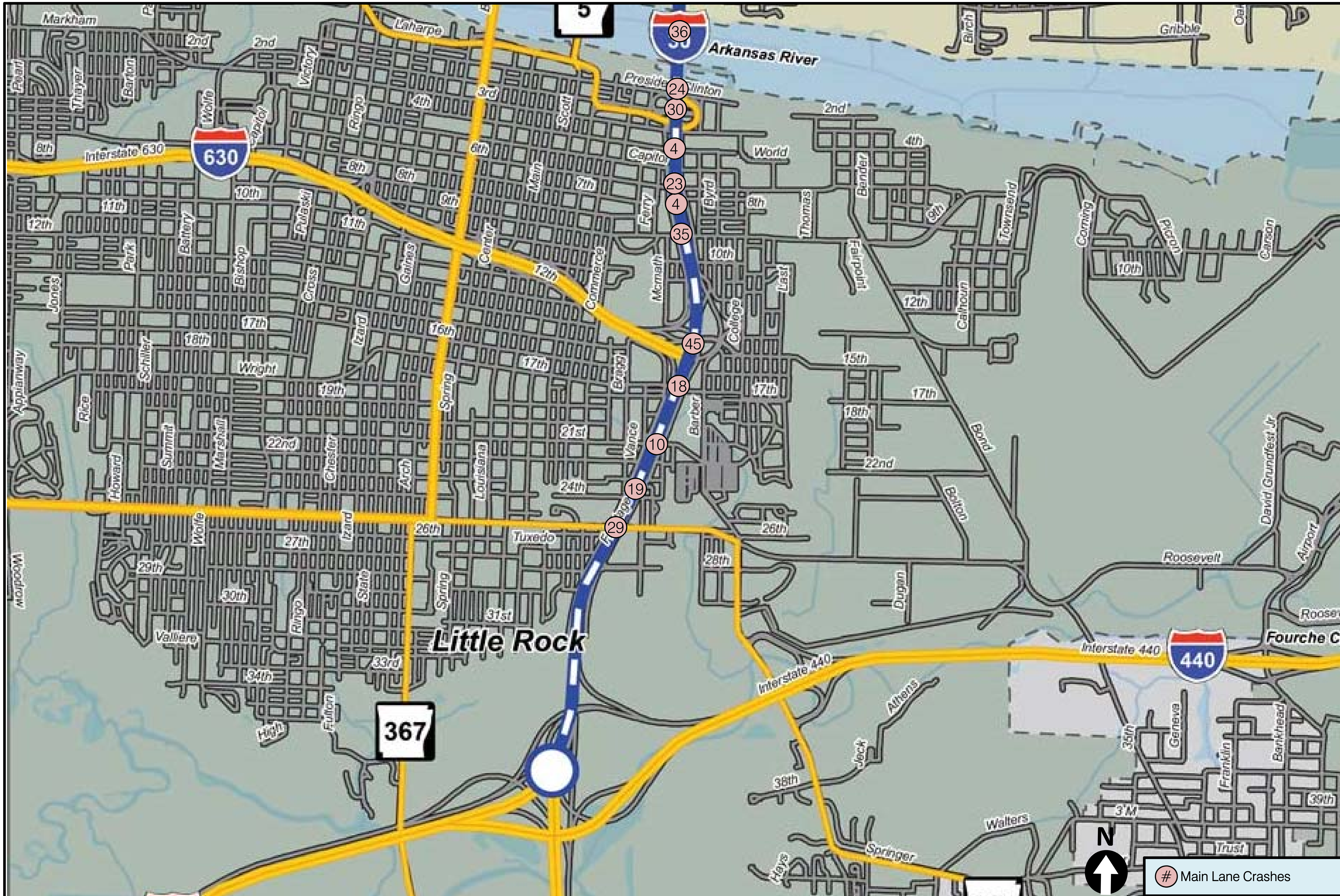


Figure 3

CA0602
I-30/I-40, North Little Rock
2010 Main Lane Crash Locations

Figure 4



CA0602
I-30/I-40, Little Rock
2010 Main Lane Crash Locations

Figure 5

CA0602
I-30/I-40, North Little Rock
2011 Main Lane Crash Locations

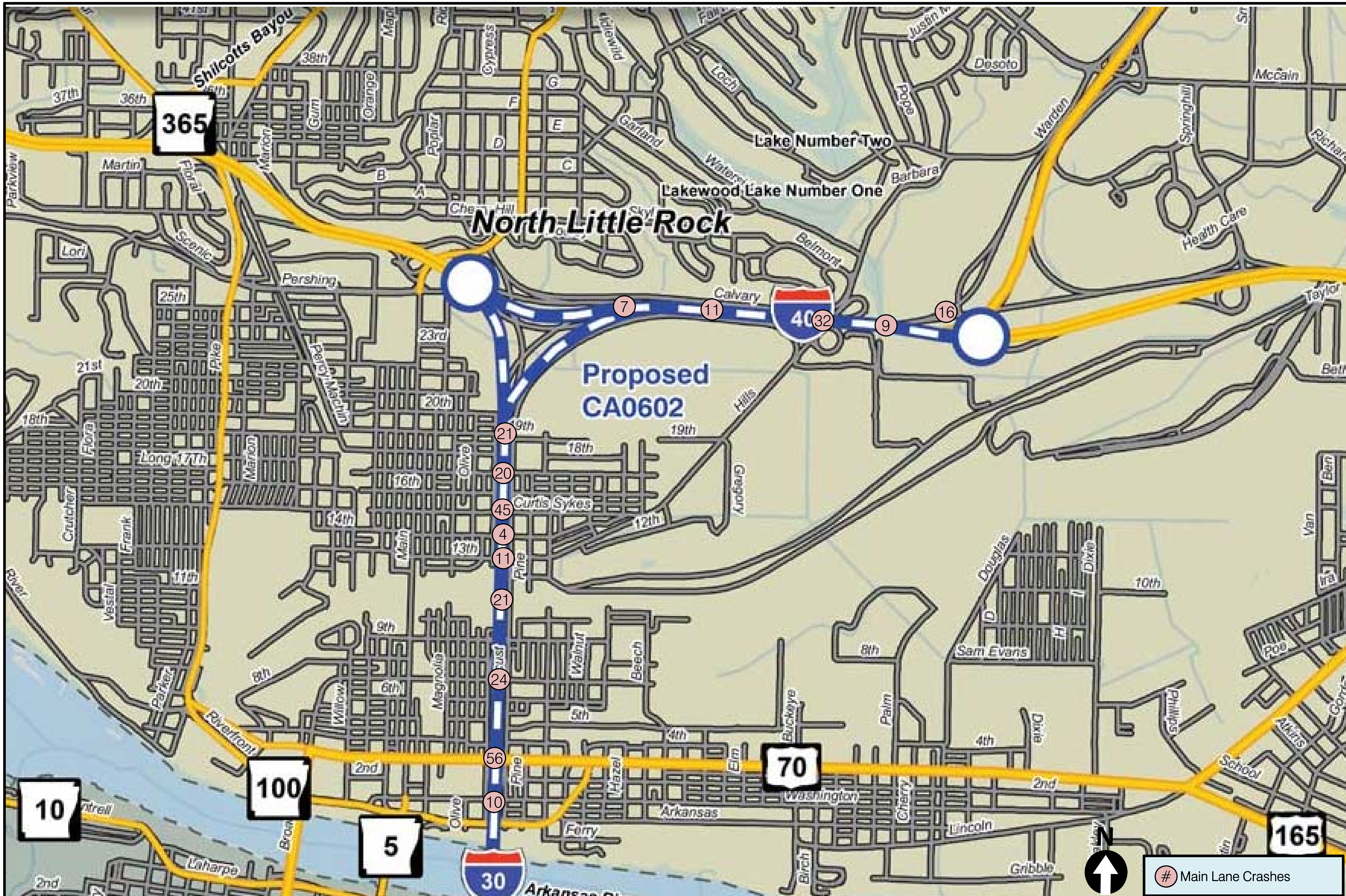


Figure 6

CA0602
I-30/I-40, Little Rock
2011 Main Lane Crash Locations

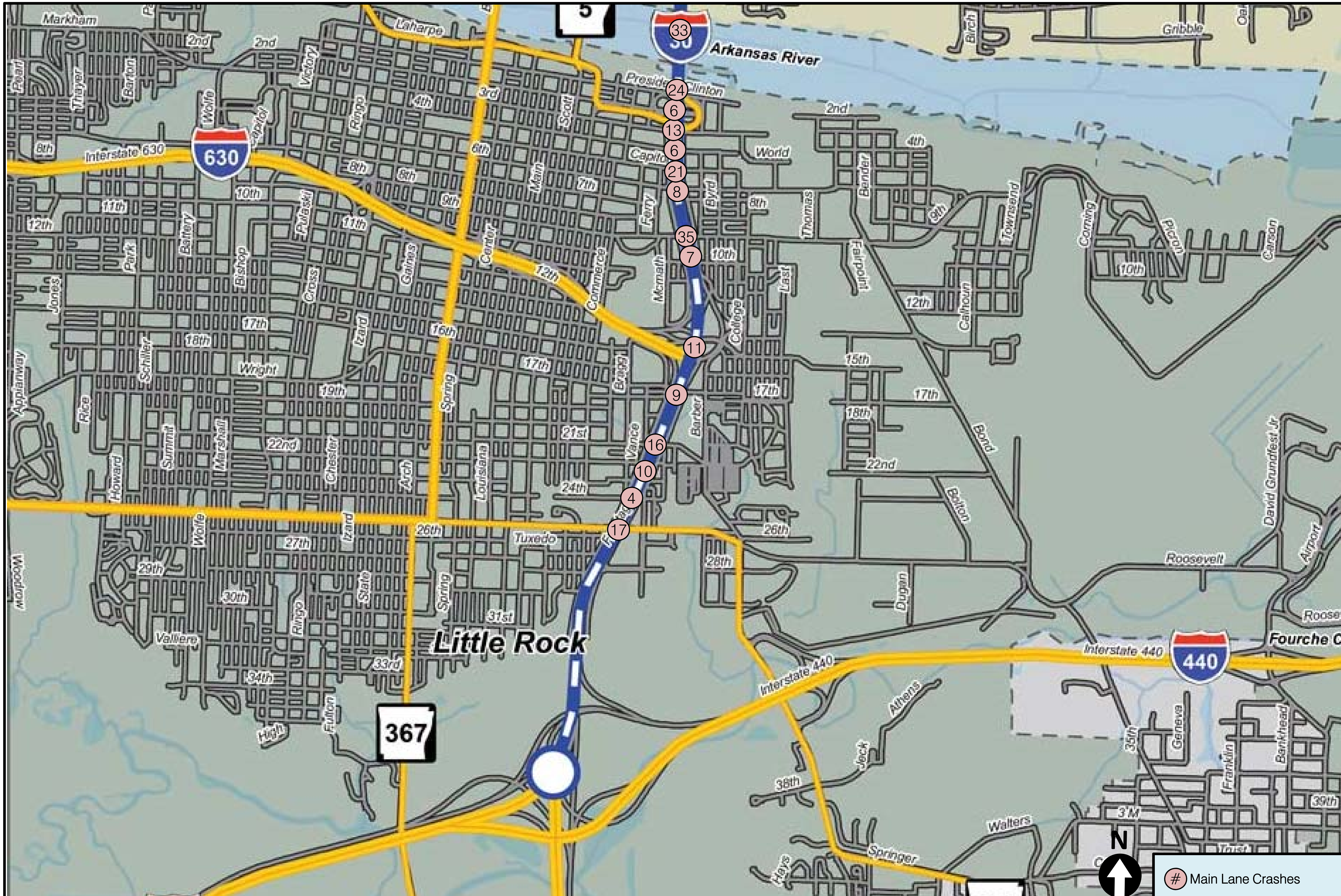
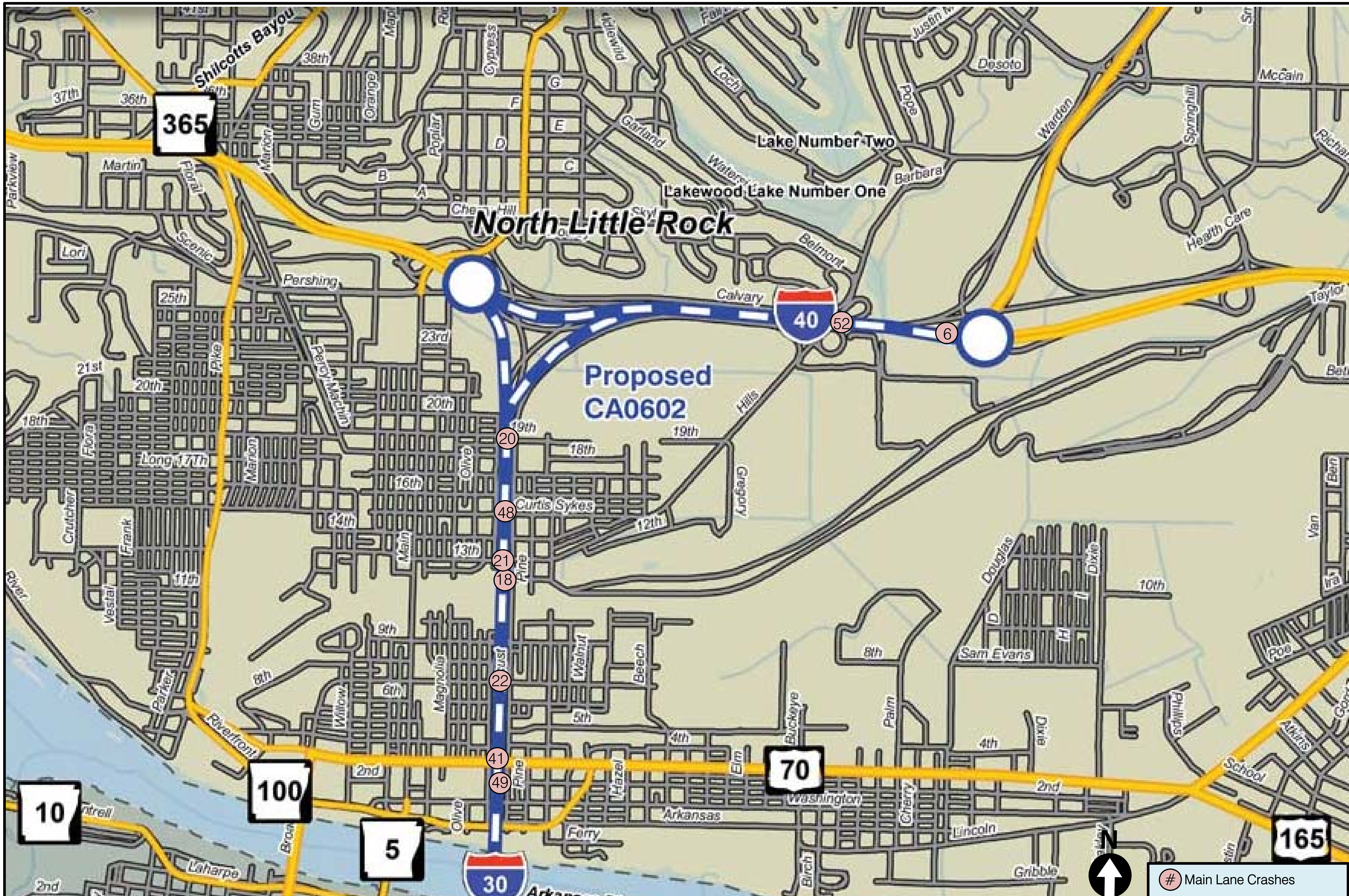


Figure 7

CA0602
I-30/I-40, North Little Rock
2012 Main Lane Crash Locations



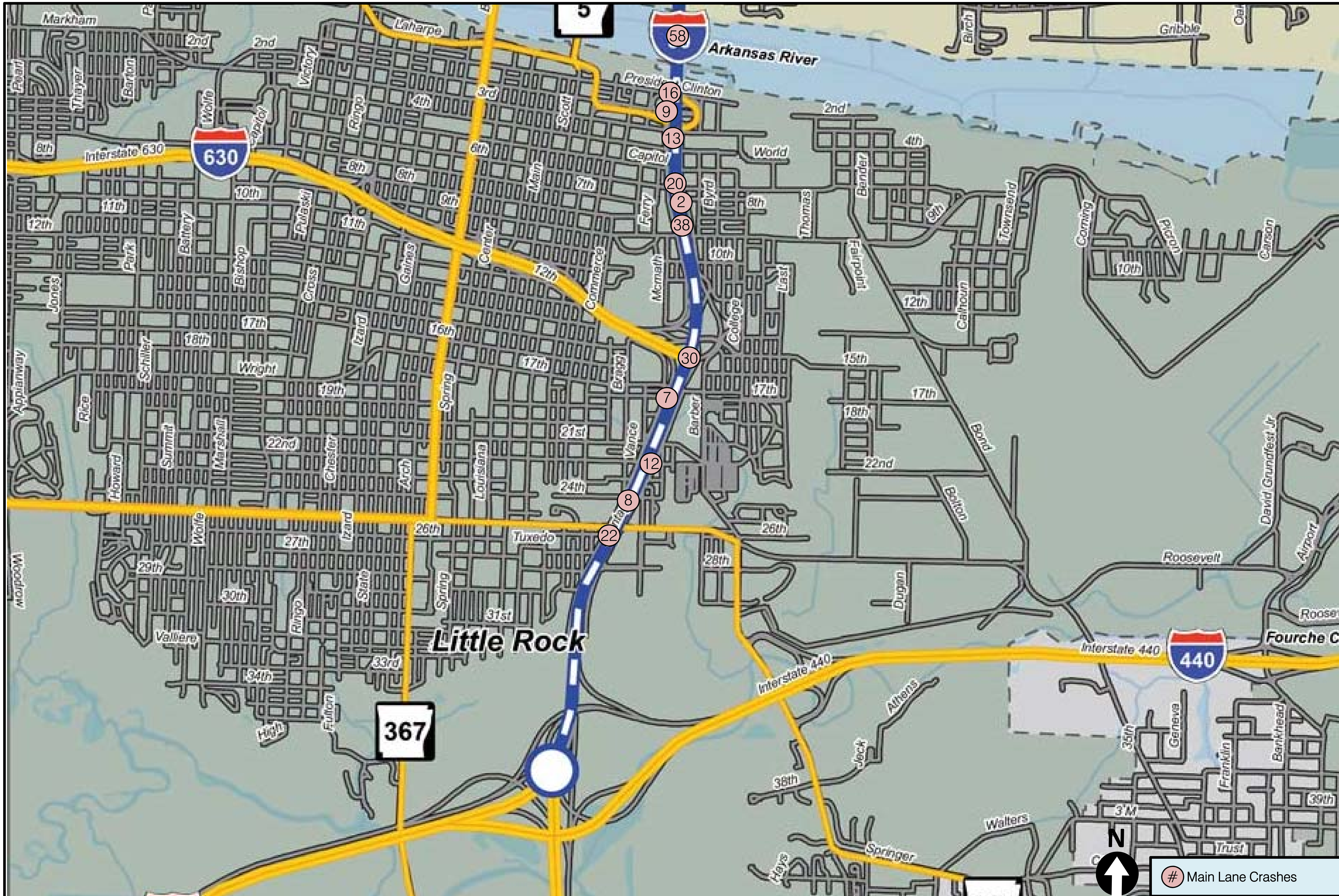
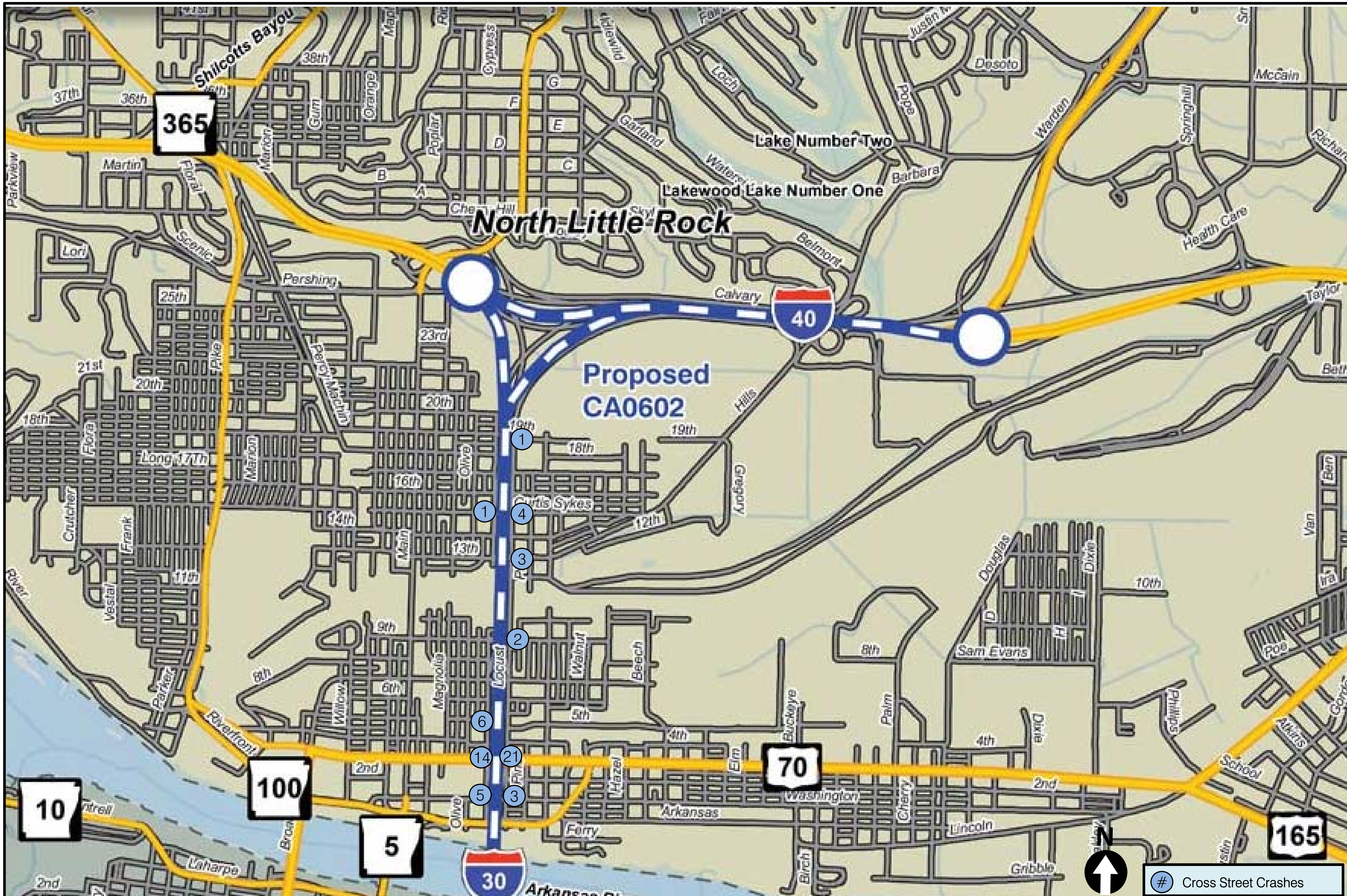


Figure 8

CA0602
I-30/I-40, Little Rock
2012 Main Lane Crash Locations

Figure 9



CA0602
I-30/I-40, North Little Rock
2010 Cross Street Crash Locations

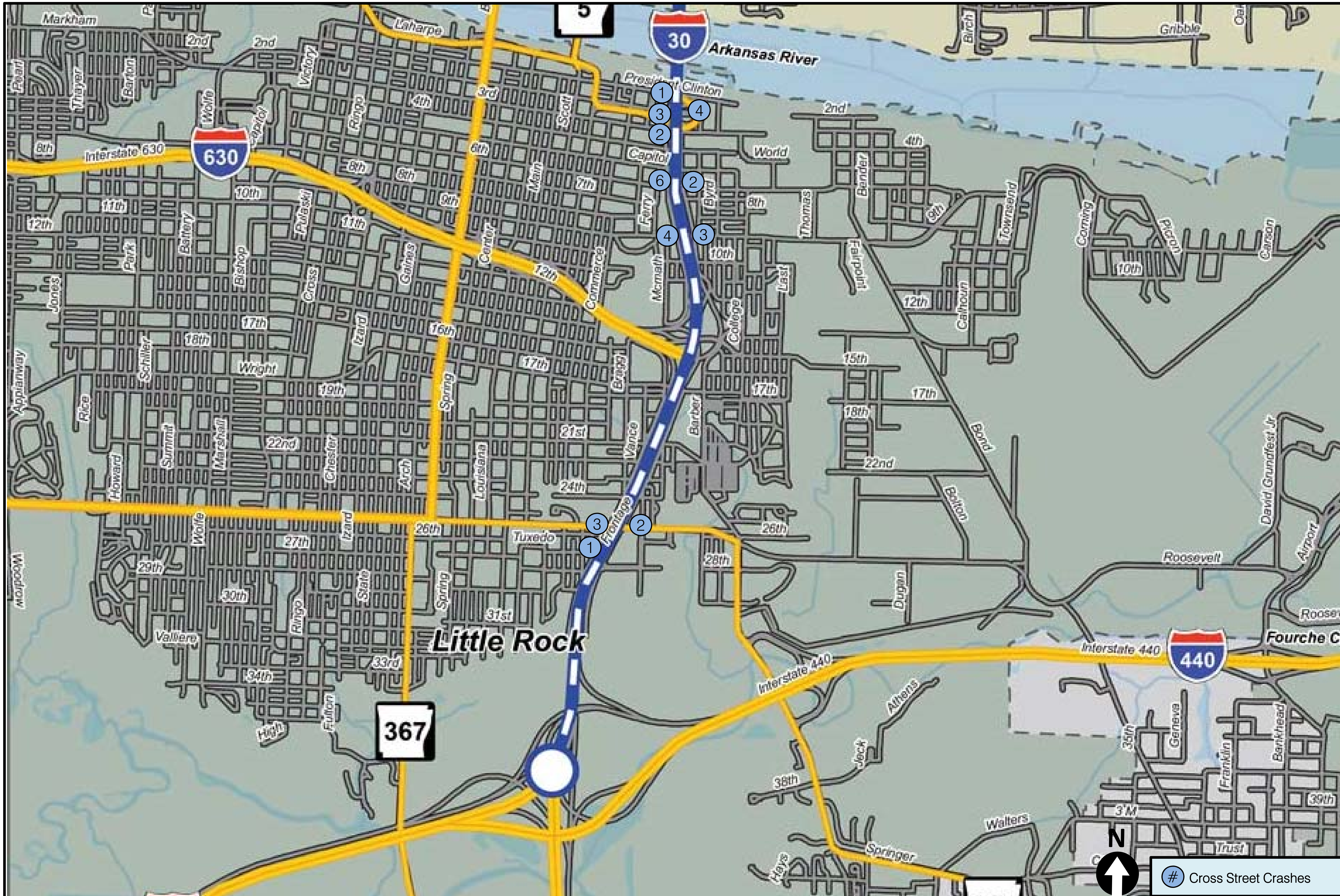
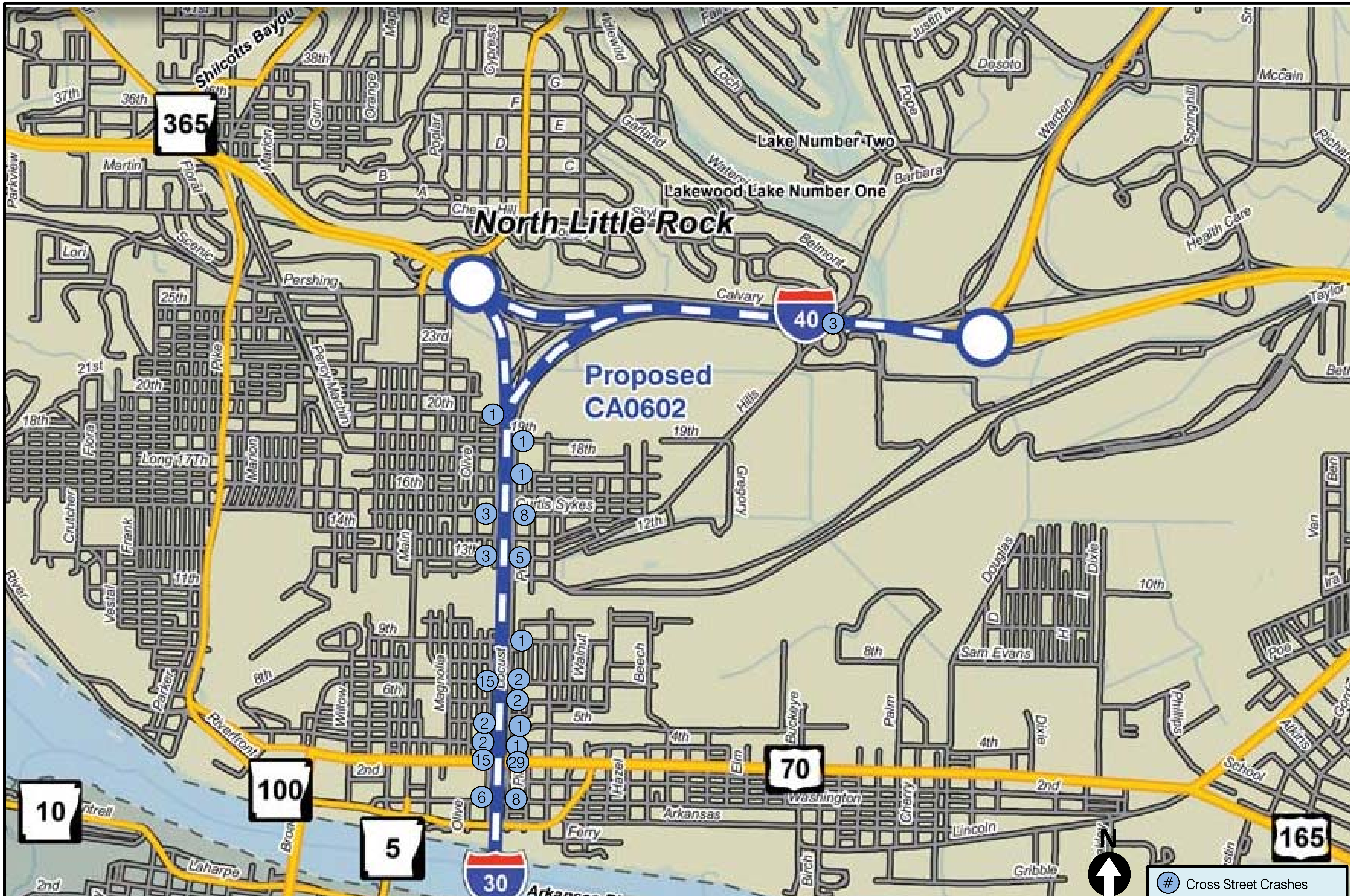


Figure 10

CA0602
I-30/I-40, Little Rock
2010 Cross Street Crash Locations

Figure 11

CA0602
I-30/I-40, North Little Rock
2011 Cross Street Crash Locations



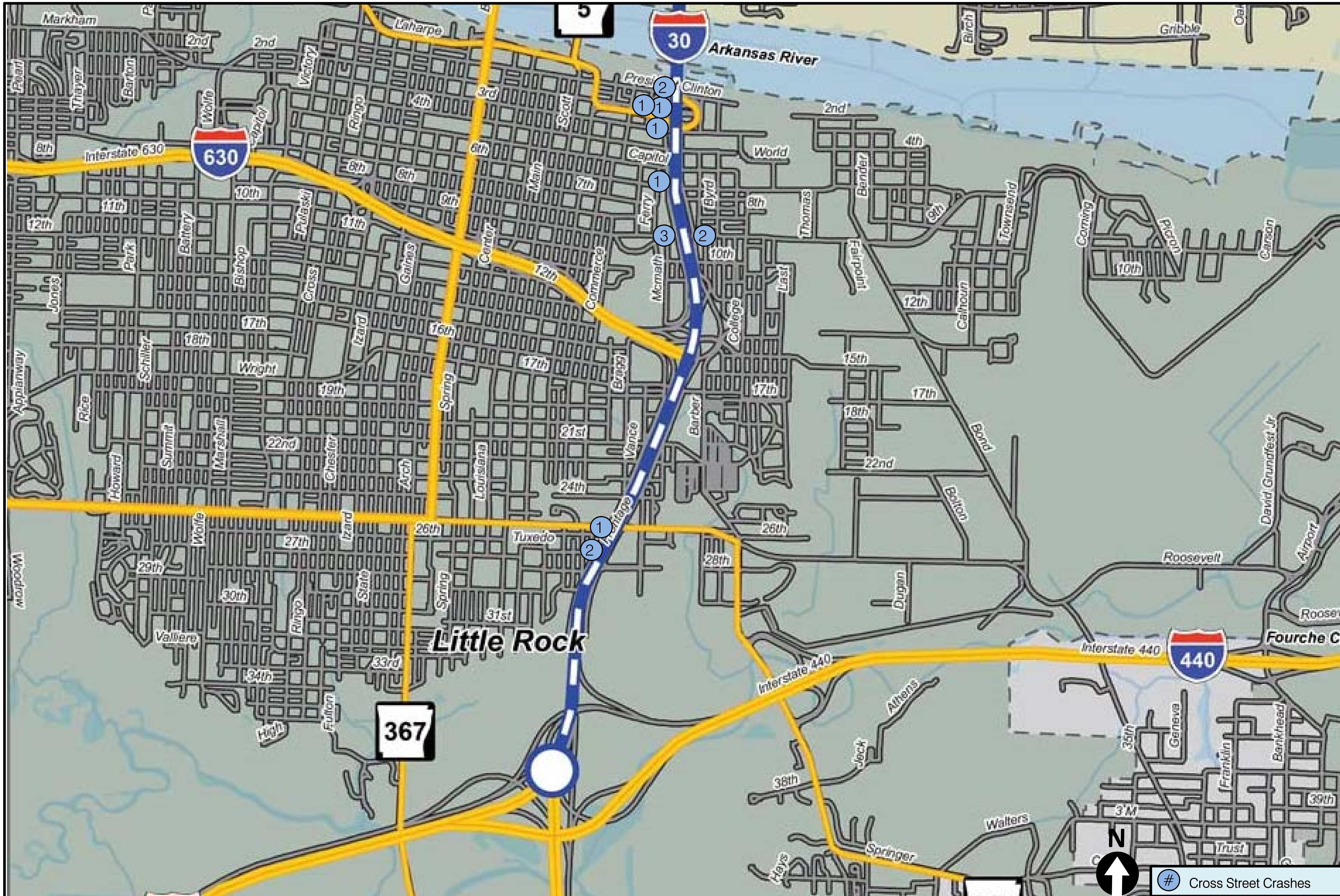
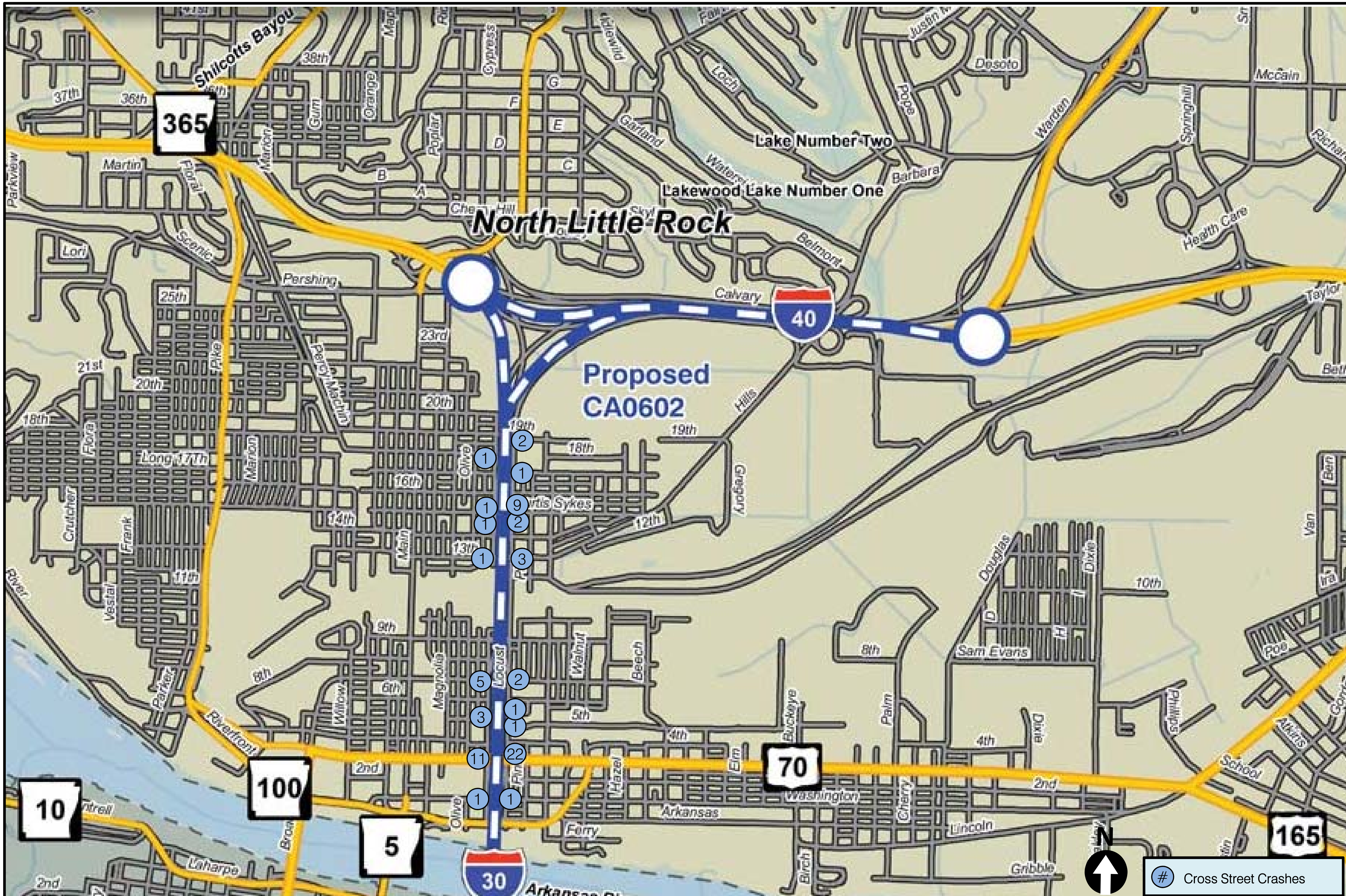


Figure 12

CA0602
I-30/I-40, Little Rock
2011 Cross Street Crash Locations

Figure 13

CA0602
I-30/I-40, North Little Rock
2012 Cross Street Crash Locations



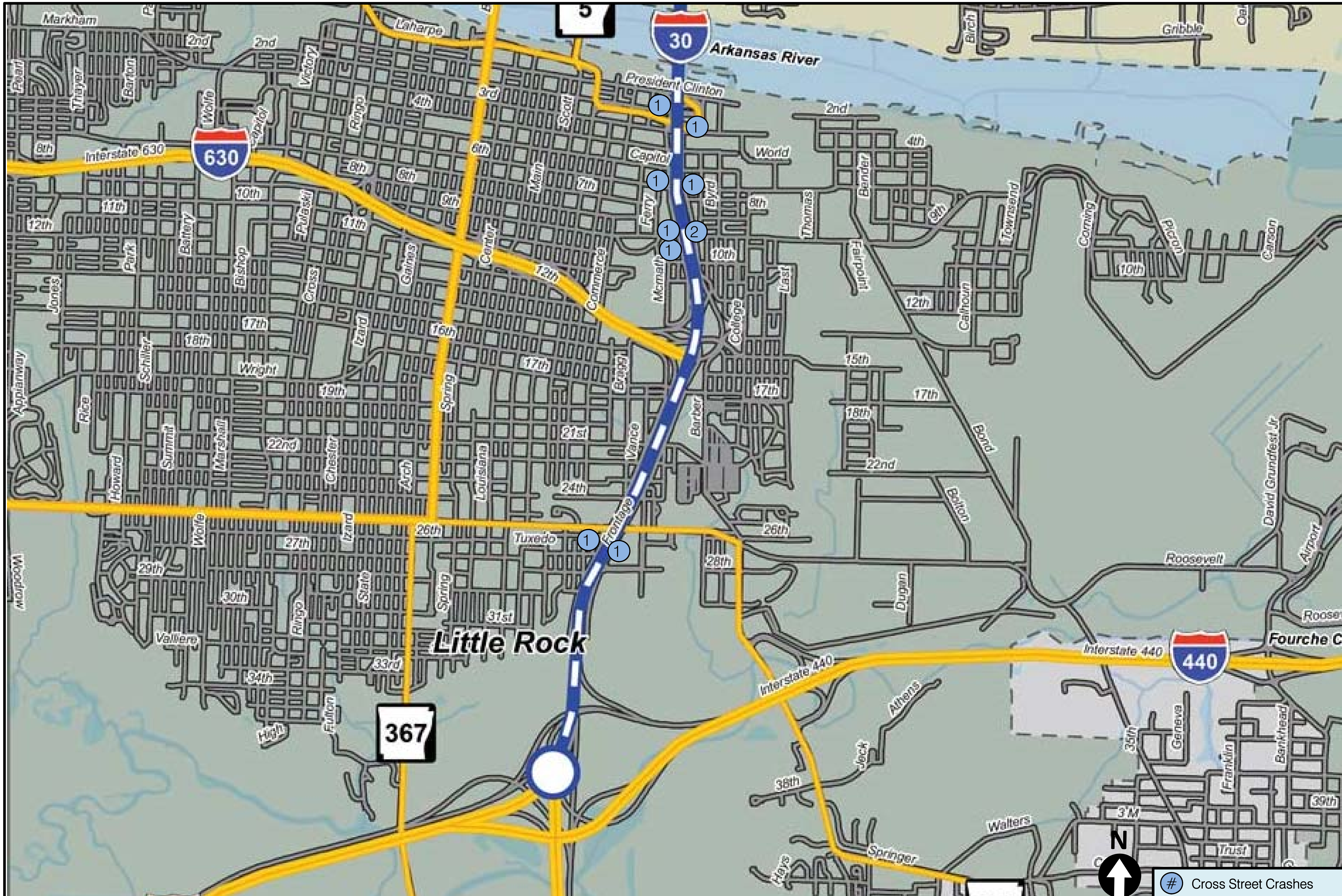
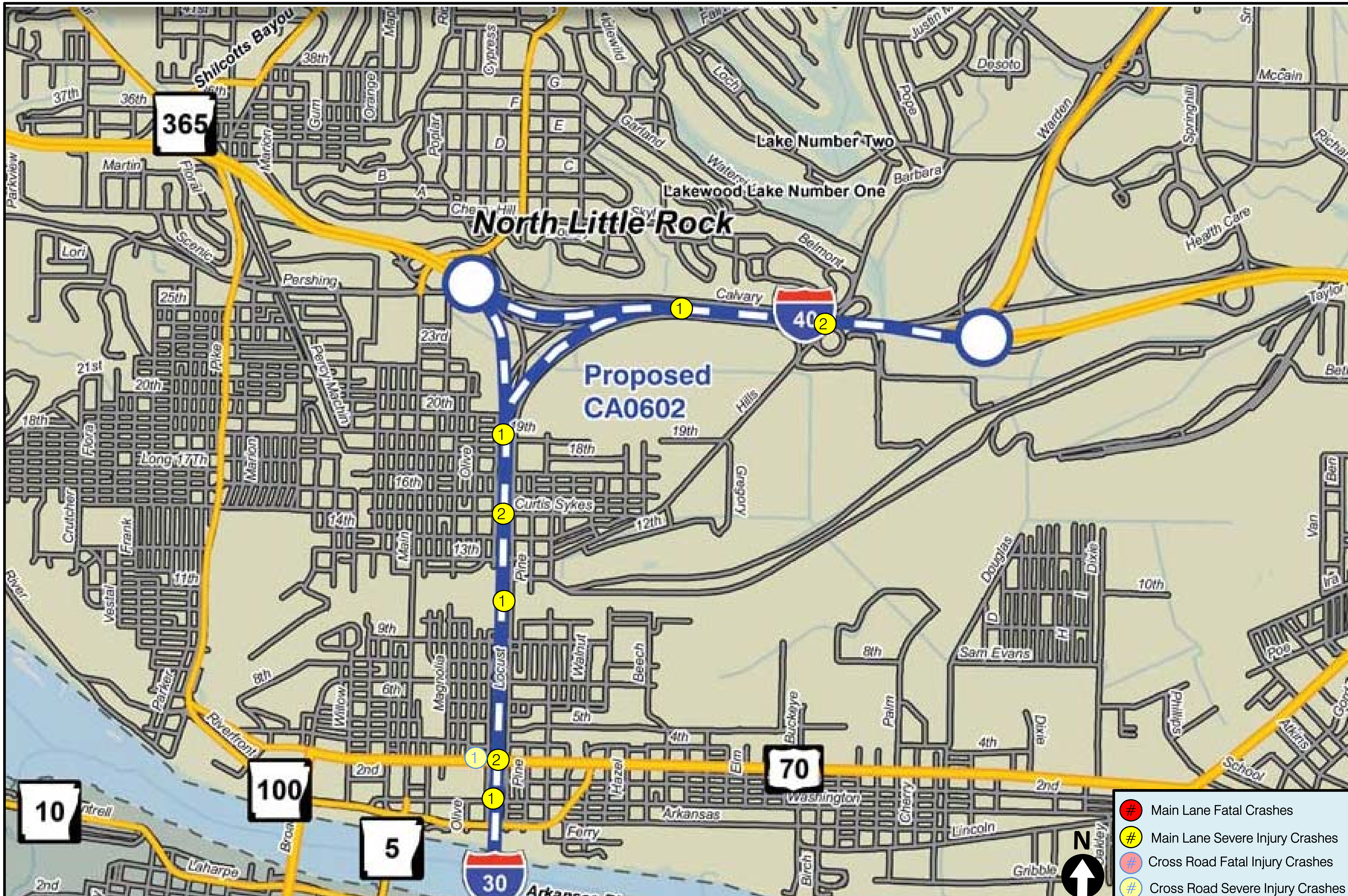


Figure 14

CA0602
I-30/I-40, Little Rock
2012 Cross Street Crash Locations

As shown by these graphics, a few key locations exhibit large clusters of crashes consistently throughout the three year study period. I-30 at E. Broadway Street is notable with consistently high numbers of crashes both along I-30 and along the cross streets (S. Cypress Street and S. Locust Street). Another area with elevated numbers of crashes is I-30 at Curtis Sykes Drive. The crashes within the study area were narrowed to view the locations of only fatal (K) and serious injury (A) and crashes, as shown in **Figures 15-20**.

Figure 15



CA0602
I-30/I-40, North Little Rock
2010 Severe and Fatal Crash Locations

Figure 16

CA0602
I-30/I-40, Little Rock
2010 Severe and Fatal Crash Locations

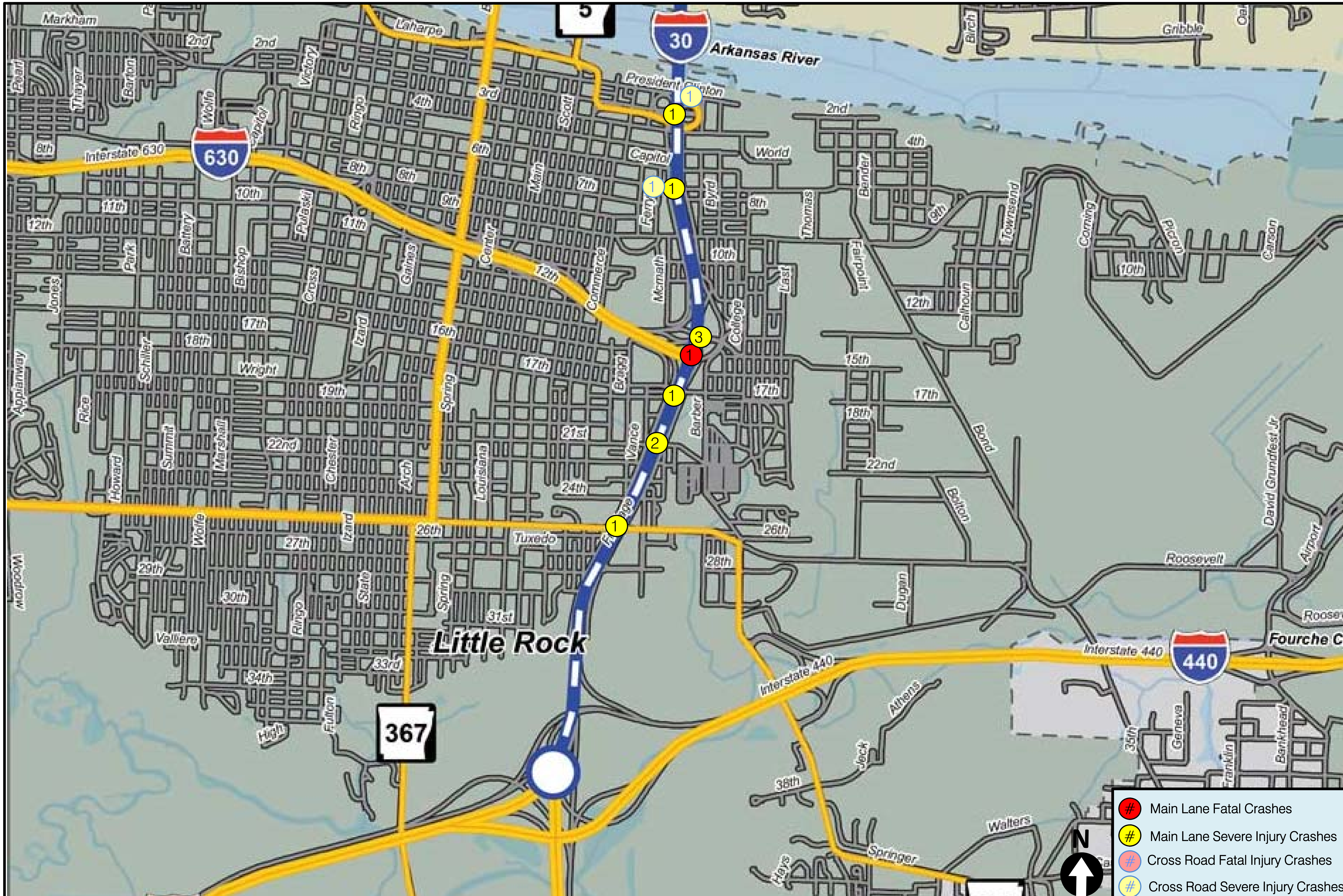
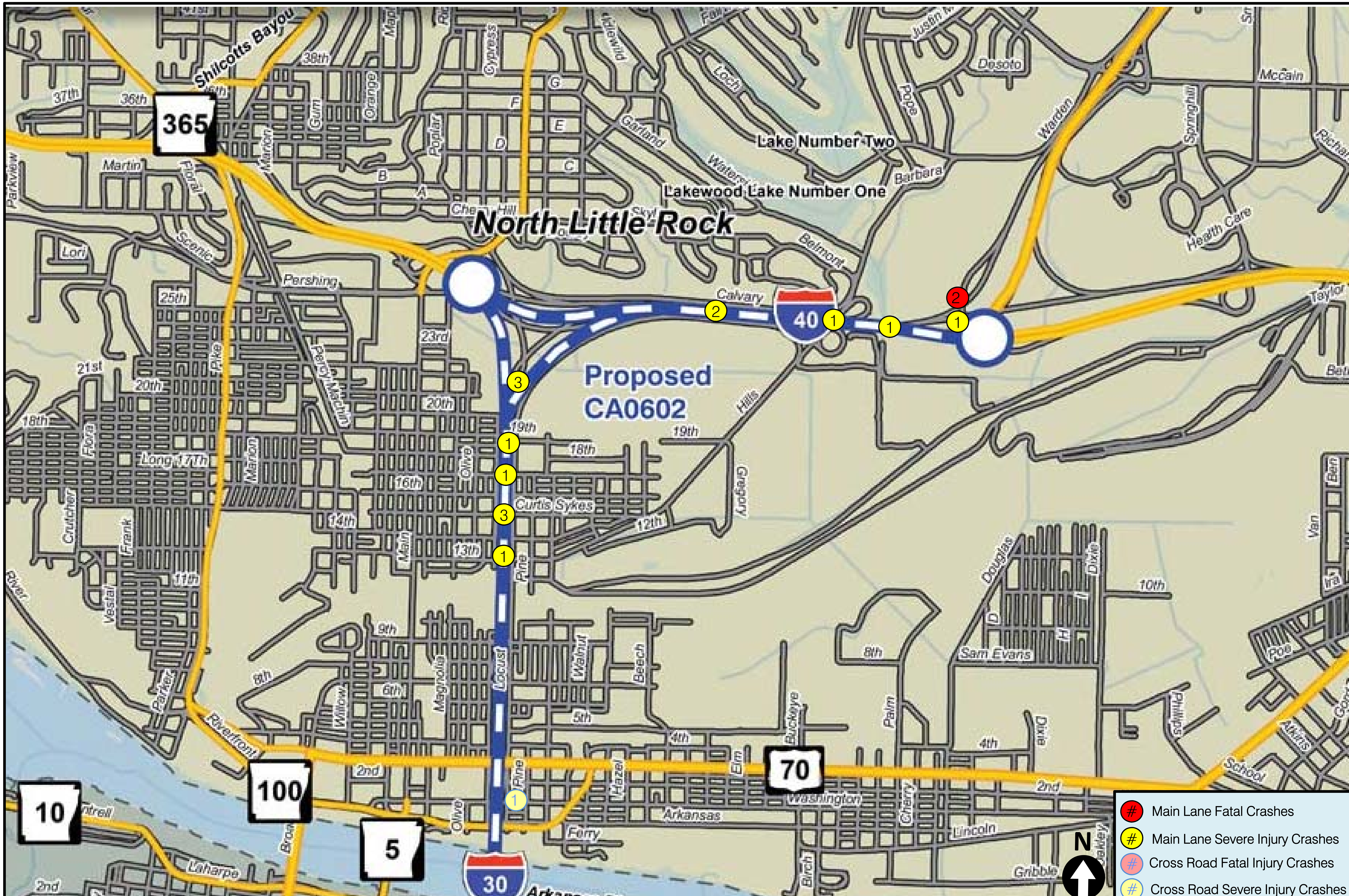


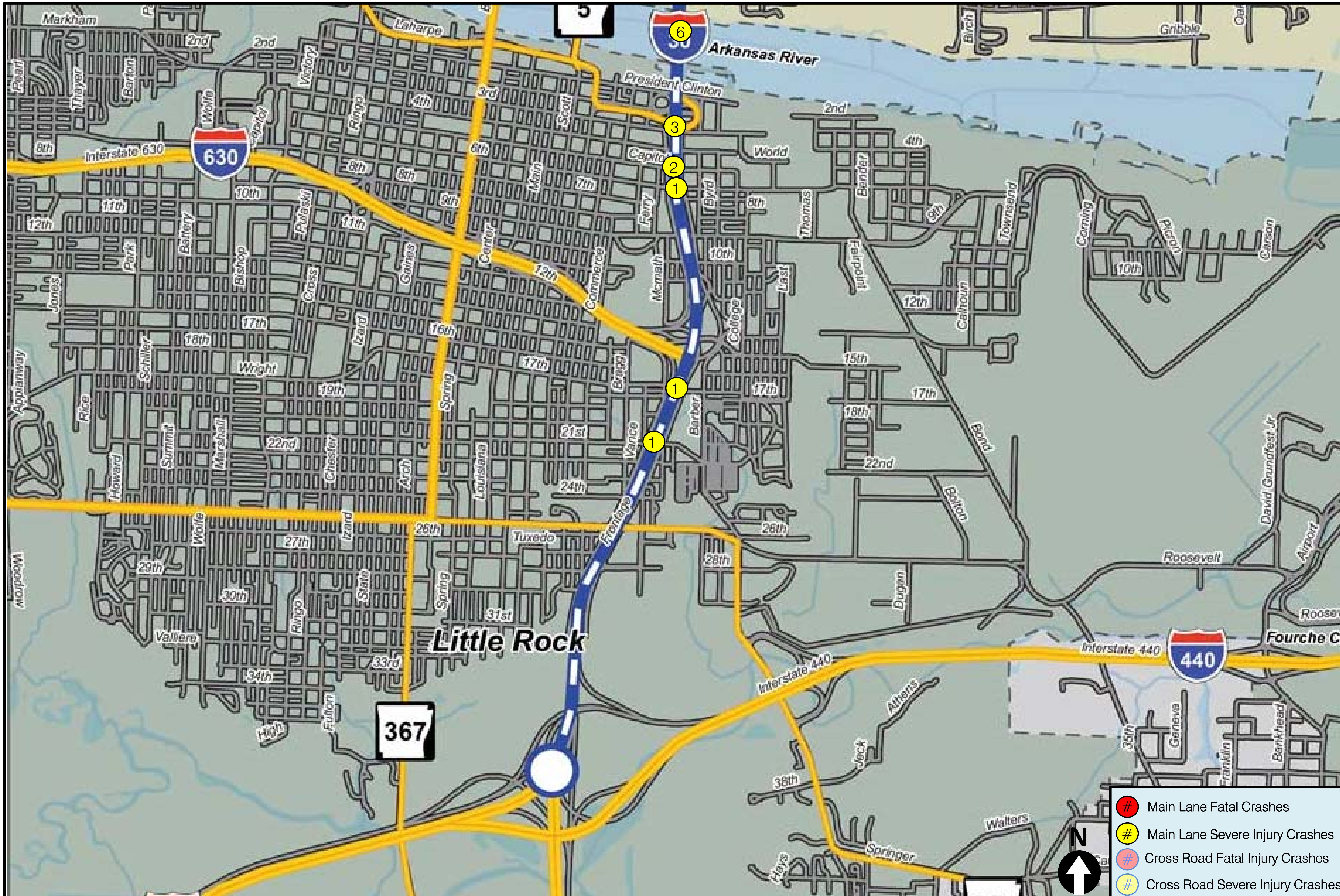
Figure 17



CA0602
I-30/I-40, North Little Rock
2011 Severe and Fatal Crash Locations

Figure 18

CA0602
I-30/I-40, Little Rock
2011 Severe and Fatal Crash Locations



CAP
CONNECTING ARKANSAS PROGRAM

Figure 19

CA0602

I-30/I-40, North Little Rock

2012 Severe and Fatal Crash Locations

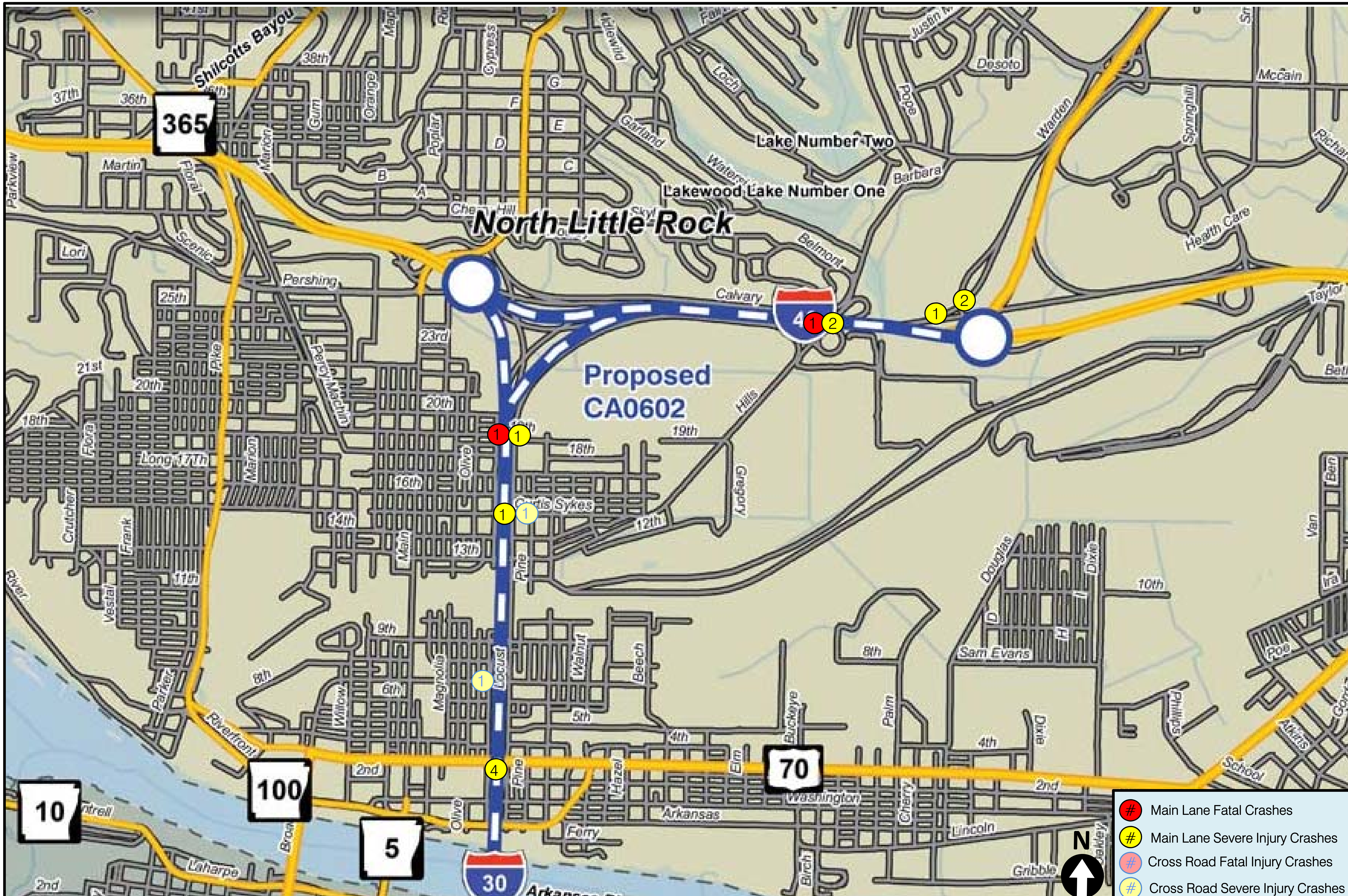
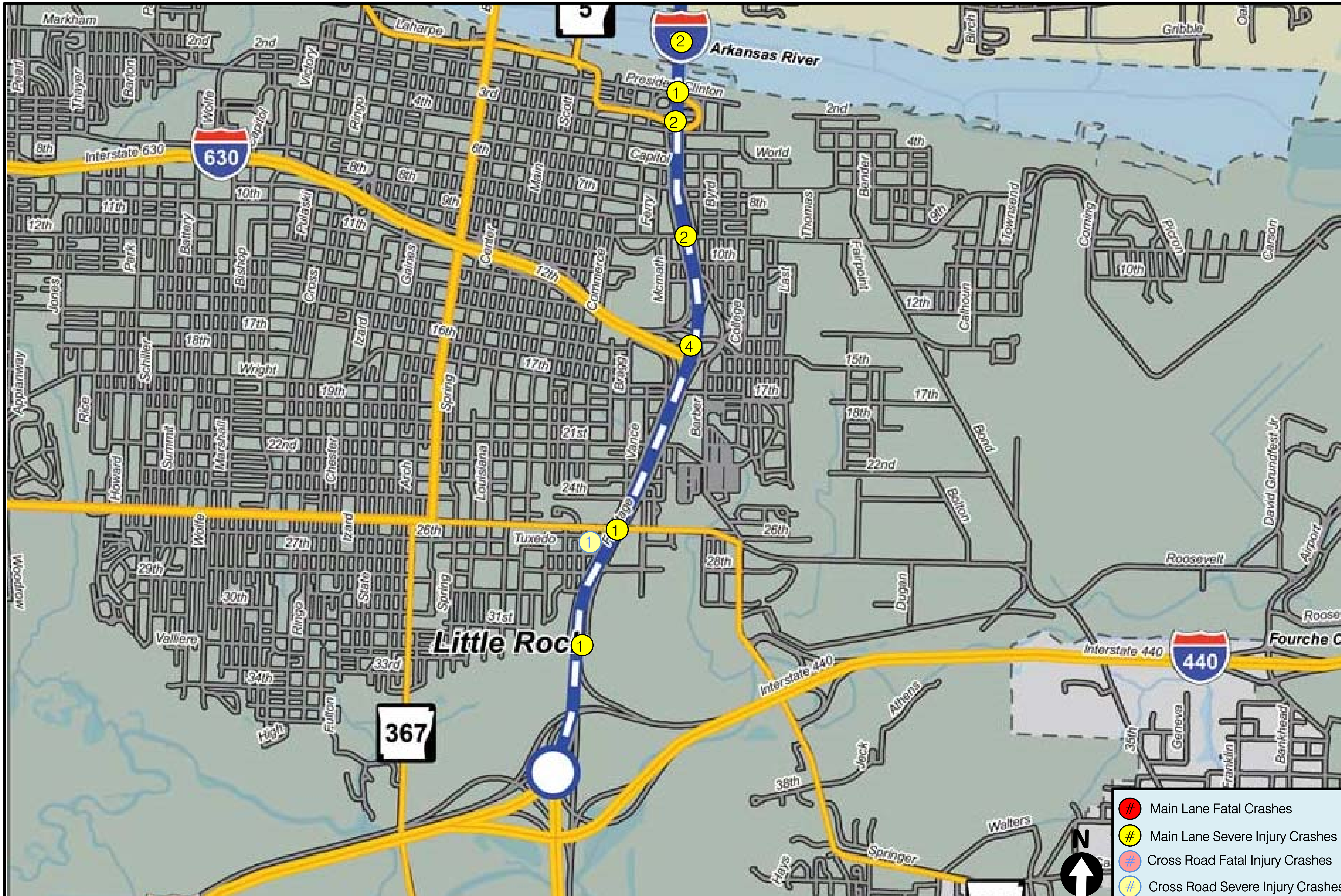


Figure 20



CA0602
I-30/I-40, Little Rock
2012 Severe and Fatal Crash Locations

These figures show that the same segment of I-30 between Interstate 630 (I-630) and I-40, which has the extremely high total crash rates year after year, also contains most of the serious injury (A) crashes during these time periods. The fatal (K) crashes are mostly concentrated in the interchange areas. The interchange of I-40 at Hwy 67 experienced two fatal crashes in 2011 and one fatal crash in 2010. Two fatal crashes occurred along I-30 during the three years analyzed. One fatal crash occurred near 19th Street in 2012, and one fatal crash occurred at the interchange of I-30 with I-630 in 2010. None of the crashes on the cross streets were fatal, and only a few were serious. The locations of these serious injuries along cross streets were not consistent and did not tend to cluster in any particular area. These findings are summarized in **Table 1** below.

Table 1: Historic Fatal and Serious Injury Crash Locations

I-30, Section 230, Log Mile 138.39-139.67 (I-530/I-440 to I-630)		
Year	# Fatal Crashes	# Serious Crashes
2010	1	7
2011	0	2
2012	0	6
I-30, Section 230, Log Mile 139.67-142.02 (I-630 to I-40)		
Year	# Fatal Crashes	# Serious Crashes
2010	0	9
2011	0	21
2012	1	13
I-40, Section 330, Log Mile 153.25-154.88 (I-30 to Hwy 67)		
Year	# Fatal Crashes	# Serious Crashes
2010	1	2
2011	2	5
2012	1	5

The crashes within the PEL study area were particularly concentrated along I-30 at E. Broadway Street and at Curtis Sykes Drive. Therefore, the crashes at these two locations were investigated in further detail. Neither location reported many crashes occurring in a construction zone, so construction can be eliminated as a cause for the high number of crashes at this location. The crashes reported in these areas resulted in mostly property damage only or very low severity injuries. The types of crashes were examined along the I-30 main lane, ramps, and intersections at Cypress Street and Locust Street for both the E Broadway Street and the Curtis Sykes Drive exits. The results are shown in **Table 2**.

Table 2: Historic Crash Types at E Broadway Street and at Curtis Sykes Drive

Number of Crashes 2010								
	I-30 at E Broadway Street				I-30 at Curtis Sykes Drive			
Type	I-30 Main Lane	I-30 Ramps	E Broadway St at Cypress St	E Broadway St at Locust St	I-30 Main Lane	I-30 Ramps	Curtis Sykes Dr at Cypress St	Curtis Sykes Dr at Locust St
Angle	1	6	4	9	1	2	5	5
Backing	0	0	0	1	0	0	0	0
Rear End	32	23	6	4	25	19	0	2
Sideswipe Same Direction	6	6	2	7	8	4	0	0
Single Vehicle	4	2	2	0	8	1	0	0
Number of Crashes 2011								
	I-30 at E Broadway Street				I-30 at Curtis Sykes Drive			
Type	I-30 Main Lane	I-30 Ramps	E Broadway St at Cypress St	E Broadway St at Locust St	I-30 Main Lane	I-30 Ramps	Curtis Sykes Dr at Cypress St	Curtis Sykes Dr at Locust St
Angle	5	0	6	13	0	1	1	1
Backing	0	1	1	0	0	0	0	0
Rear End	20	11	6	14	23	9	1	0
Sideswipe Same Direction	9	4	0	3	1	1	0	0
Single Vehicle	5	1	1	0	4	3	1	0
Number of Crashes 2012								
	I-30 at E Broadway Street				I-30 at Curtis Sykes Drive			
Type	I-30 Main Lane	I-30 Ramps	E Broadway St at Cypress St	E Broadway St at Locust St	I-30 Main Lane	I-30 Ramps	Curtis Sykes Dr at Cypress St	Curtis Sykes Dr at Locust St
Angle	3	0	0	0	2	0	1	6
Backing	0	0	0	1	0	0	0	1
Head On	0	0	0	0	0	0	1	0
Rear End	52	10	0	0	29	4	0	2
Sideswipe Same Direction	11	6	0	0	6	2	0	0
Single Vehicle	5	2	0	1	2	0	0	2

As depicted in **Table 2**, crashes occurred mostly along the I-30 main lanes followed by the ramps. The majority of these crashes were rear end crashes. This is most likely attributed to the insufficient acceleration and deceleration lengths that cause speed differential on the main lanes and ramps. All the proposed alternatives will have ramp acceleration and deceleration lengths that meet current standards.

In addition, there are several crashes occurring at the interchanges with E. Broadway Street and Curtis Sykes Drive. The E. Broadway Street intersections with Cypress Street and Locust Street had about as many angle crashes as rear end crashes. At the intersections with Curtis Sykes Drive and Locust Street, angle crashes were most common. These crashes are most likely attributed to growing congestion at the signalized intersections. Therefore, the proposed alternatives have capacity improvements to help mitigate these type of crashes.

The crashes along I-30 were mostly rear end crashes. This is most likely attributed to the speed differential from the entrance and exit ramps having insufficient acceleration and deceleration lengths or no deceleration length.

Crash rates were calculated for each of the three years of crash data in order to evaluate the safety performance of the study corridors as compared to statewide averages for similar highways in Arkansas. Crash rates were calculated for total collisions with all severity types as well as collisions with only fatal (K) and severe injury (A) (KA Crash Rate). These crash rates are shown in **Table 3** below.

Table 3: Historic Crash Rates

			Number of Crashes		Crash Rate (MVMT)		AR Avg. Crash Rate			Crash Rate/ AR Avg Crash Rate	
Year	Length (miles)	Weighted ADT	All Severity Types	KA	All Severity Types	KA	All Severity Types	KA	Type	All Severity Types	KA
I-30, Section 230, Log Mile 138.39-139.67 (I-530/I-440 to I-630)											
2010	1.28	96,000	99	8	2.20	0.18	1.53	0.06	Six-Lane Access Control	1.44	3.22
2011	1.28	96,000	62	2	1.37	0.04	1.22	0.06	Six-Lane Access Control	1.12	0.75
2012	1.28	96,000	64	6	1.43	0.13	0.95	0.05	Six-Lane Access Control	1.50	2.63
I-30, Section 230, Log Mile 139.67-142.02 (I-630 to I-40)											
2010	2.35	116,000	471	9	4.73	0.09	1.53	0.06	Six-Lane Access Control	3.09	1.63
2011	2.35	113,000	371	21	3.82	0.22	1.22	0.06	Six-Lane Access Control	3.13	3.65
2012	2.35	110,000	406	14	4.30	0.15	0.95	0.05	Six-Lane Access Control	4.53	2.92
I-40, Section 330, Log Mile 153.25-154.88 (I-30 to Hwy 67)											
2010	1.63	119,000	66	3	0.93	0.04	1.53	0.06	Six-Lane Access Control	0.61	0.76
2011	1.63	116,000	75	7	1.09	0.10	1.22	0.06	Six-Lane Access Control	0.89	1.71
2012	1.63	114,000	58	6	0.85	0.09	0.95	0.05	Six-Lane Access Control	0.89	1.74

As exhibited in **Table 3**, the total crash rates were about three times the statewide average along I-30 between I-630 and I-40 in 2010 and 2011, and in 2012 the total crash rate was 4.54 times the statewide average. The KA crash rate for this segment ranged from 1.63 times the statewide average in 2010 to 3.65 times the statewide average in 2011. For the segment of I-30 between the south terminal and I-630, total crash rates were slightly higher than statewide averages for all three years. The KA crash rate was around three times the statewide average in 2010 and 2012 but slightly below average in 2011. Total crash rates were slightly below average for all three years along I-40 between the north terminal and Hwy 67. However, the KA crash rates were nearly twice the statewide average in 2011 and 2012. These crash rates indicate a great need for improvements throughout the study corridor, particularly along the portion of I-30 between I-630 and I-40. In addition to consistently having a total crash rate over three times the statewide average and a KA crash rate significantly above average, this segment also contains the interchange at E. Broadway Street which shows the highest number of crashes for any single location within the study area. This interchange area should be given special attention during the analysis of improvement options.

In addition to vehicular crashes, pedestrian/bicycle crashes were considered. As noted in Metroplan's *CARTS Pedestrian/Bicyclist Crash Analysis* dated January 9, 2012, pedestrian and bicycle crashes from the Arkansas State Police Database were mapped through GIS.

Figures 21 and **22** on the following pages show the pedestrian and bicycle crash clusters in the study area from 2001 to 2010. As shown, there was a high concentration of pedestrian crashes at the Broadway Street interchange in North Little Rock and at the Cantrell Road interchange in Little Rock, especially near the ramp termination at Cumberland Street. Both of these areas attract pedestrians especially during the evening. A lesser concentration of bicycle clusters was in the Curtis Sykes interchange area.

Furthermore, the CARTS document provided graphics showing the number of crashes for both pedestrians and vehicles. As shown in **Figures 23** and **24** on the following pages, the majority of bicycle crashes in the central area are not along the corridor with the exception of the ramp intersections at 13th Street. The number of pedestrian crashes was greatest near the west ramp termini of the Cantrell interchange at Cumberland Street. It is likely that most of those are occurring one block north at the intersection of Markham Street/ President Clinton Avenue and Cumberland Street. Additionally, there were multiple pedestrian crashes just west of the Broadway Street interchange in addition to a single pedestrian crash at the Broadway Street ramp intersection.

The Metroplan website has a map showing bicycle/pedestrian fatalities. According to this map, there was one pedestrian/bicycle fatality at I-630 interchange, one fatality just north of the Broadway Street interchange, three fatalities between the north terminal and the North Hills Boulevard interchange, and one at the Highway 67 interchange.

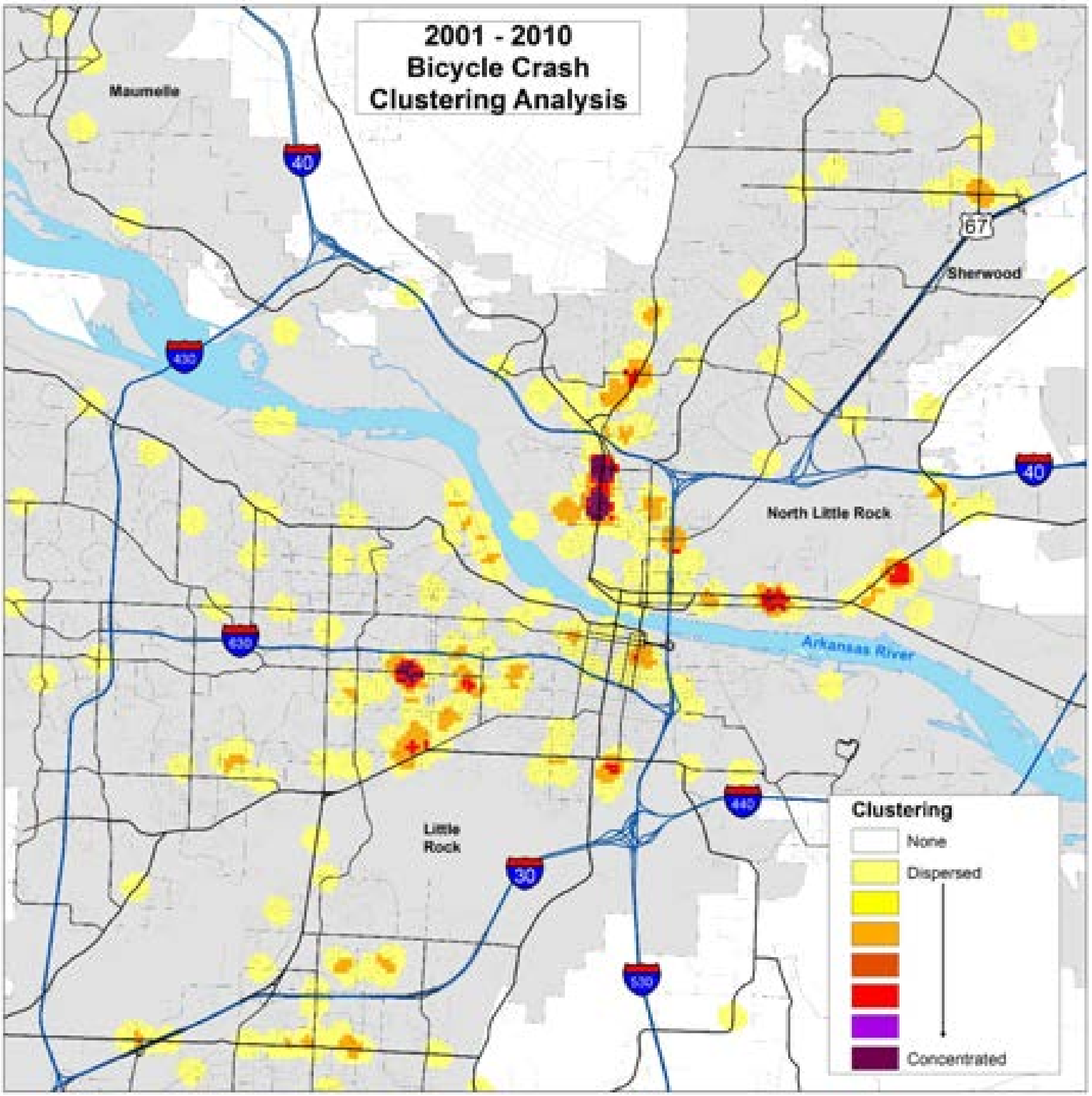


Figure 21: Bicycle Crash Clusters (2001-2010)
*Source: CARTS Pedestrian/Bicyclist Crash Analysis

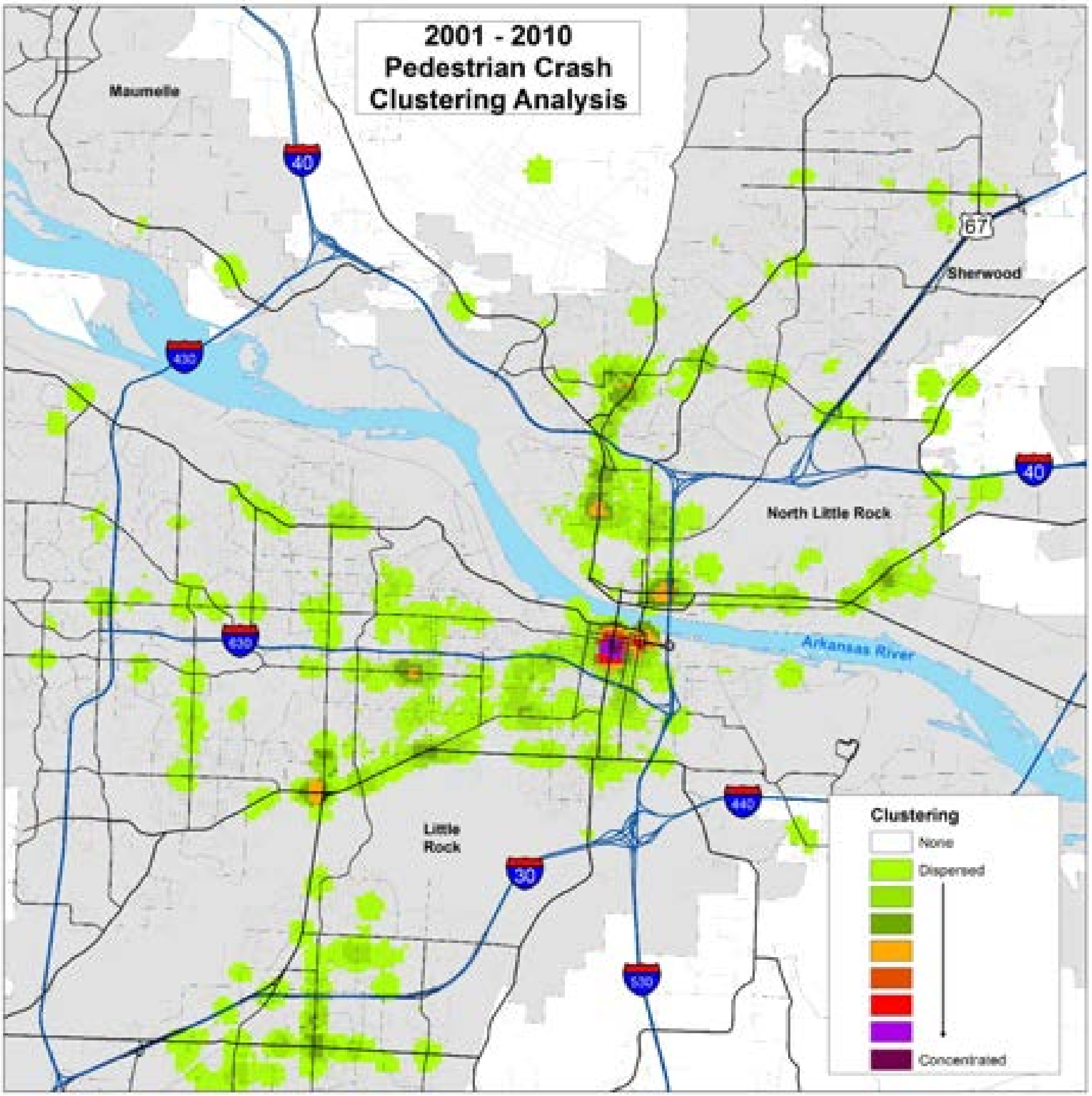


Figure 22: Pedestrian Crash Clusters (2001-2010)
*Source: CARTS Pedestrian/Bicyclist Crash Analysis

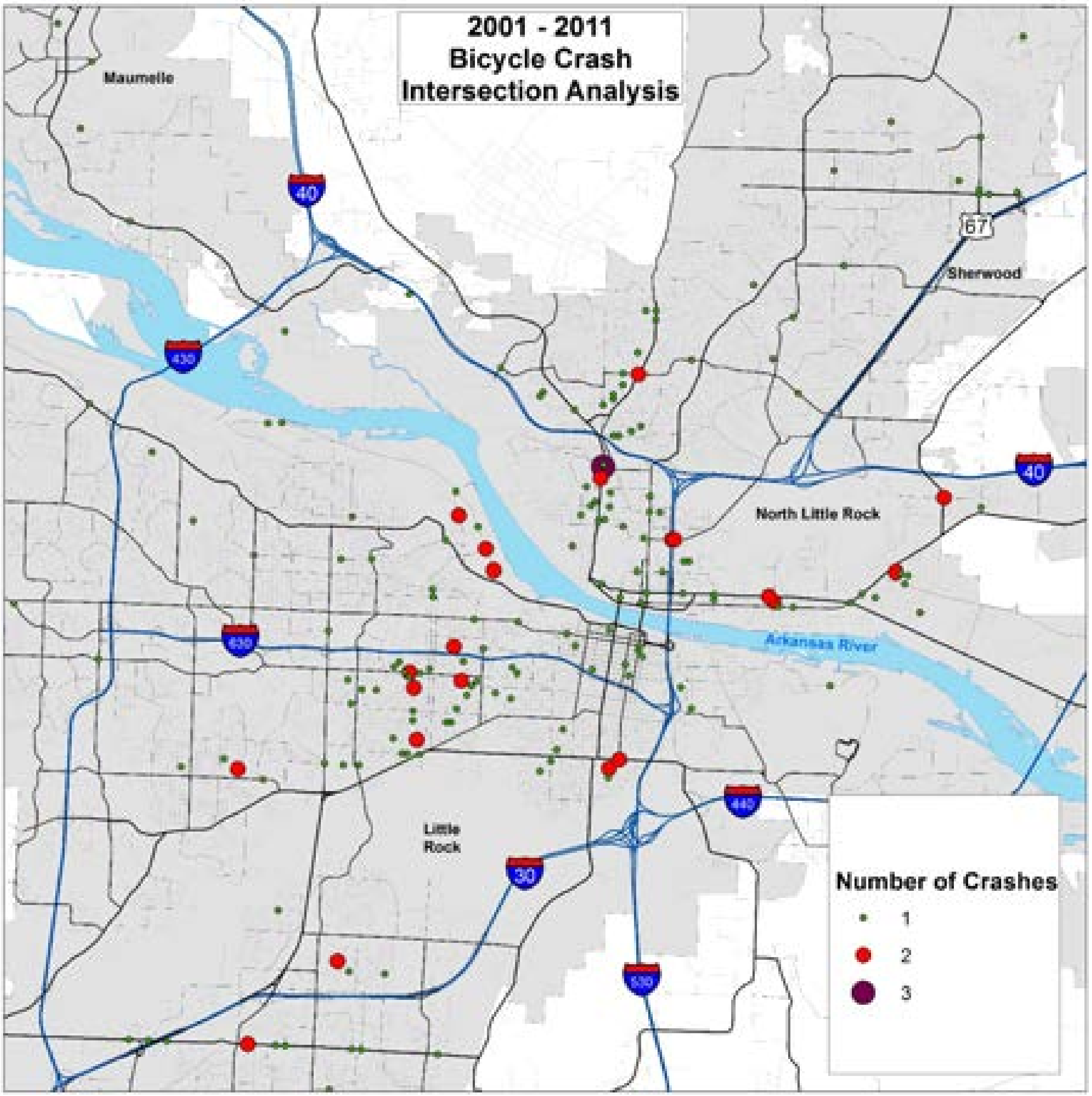


Figure 23: Numbers of Bicycle Crashes (2001-2010)
*Source: CARTS Pedestrian/Bicyclist Crash Analysis

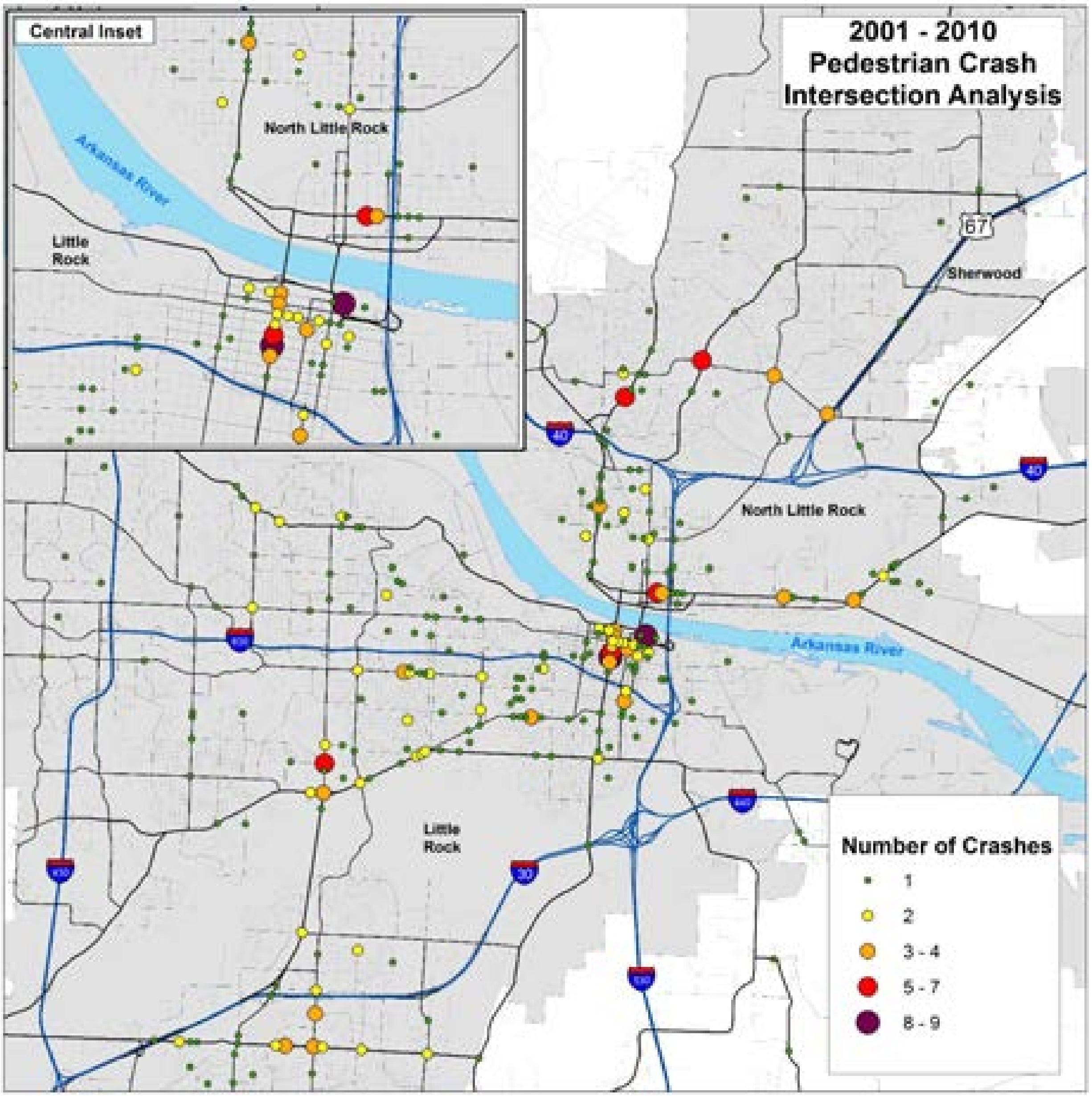


Figure 24: Numbers of Pedestrian Crashes (2001-2010)
*Source: CARTS Pedestrian/Bicyclist Crash Analysis

3.0 Future No Action Crashes

Crash rates were previously calculated based on historic crash data for I-30 and I-40 from the south terminal in Little Rock to west of the I-40 at Highway 107 interchange and east of the I-40 at Hwy 67 interchange. An average crash rate between the three study years (2010-2012) was estimated for the main lane sections of I-30 from I-530/I-440 to I-630, I-30 from I-630 to I-40, and I-40 from I-30 to Hwy 67. With the assumption that the roadway condition remains the same and no safety measures will be implemented, the average crash rate is assumed to remain constant through the design year. To project the number of crashes for 2041, the average crash rate was applied to the future No Action volumes. Since statistics for statewide average crash rates for future years do not exist yet, the 2041 statewide average crash rate was assumed to be the same as the statewide average crash rate of the existing three study years. Average crash rates and projected numbers of crashes for 2041 are shown in **Table 4**.

Table 4: Projected Number of Crashes

I-30, Section 230, Log Mile 138.39-139.67 (I-530/I-440 to I-630)							
Year	Length (miles)	Average Crash Rate (MVMT)	Projected Weighted ADT (No Action)	Projected # Crashes	Assumed AR 2041 Avg Crash Rate	Type	Avg Crash Rate/ Assumed AR 2041 Avg Crash Rate
2041	1.28	1.66	122,000	95	0.95	Six-Lane Access Control	1.75
I-30, Section 230, Log Mile 139.67-142.02 (I-630 to I-40)							
Year	Length (miles)	Average Crash Rate (MVMT)	Projected Weighted ADT (No Action)	Projected # Crashes	Assumed AR 2041 Avg Crash Rate	Type	Avg Crash Rate/ Assumed AR 2041 Avg Crash Rate
2041	2.35	4.29	145,000	533	0.95	Six-Lane Access Control	4.51
I-40, Section 330, Log Mile 153.25-154.88 (I-30 to Hwy 67)							
Year	Length (miles)	Average Crash Rate (MVMT)	Projected Weighted ADT (No Action)	Projected # Crashes	Assumed AR 2041 Avg Crash Rate	Type	Avg Crash Rate/ Assumed AR 2041 Avg Crash Rate
2041	1.63	0.96	158,000	90	0.95	Six-Lane Access Control	1.01

As exhibited in **Table 4**, the projected 2041 average crash rate along I-30 between I-530/I-440 and I-630 will be nearly twice that of the statewide average and will be nearly five times the statewide average for the I-30 segment between I-630 and I-40. Along I-40 between I-30 and Hwy 67, the average crash rate will be about the same as the statewide average. These crash rates indicate a great need for improvements along I-30, particularly the portion between I-630 and I-40.

4.0 Proposed Alternatives

For this analysis, the following alternatives were considered:

- No Action: Existing conditions
- An 8-Lane C/D typical section (three traffic lanes and one collector-distributor lane for each direction of travel)
- A 10 Main Lanes typical section (five traffic lanes for each direction of travel)
- A 10-Lane C/D typical section (three traffic lanes and two collector-distributor lanes for each direction of travel)

5.0 Safety Quantitative Analysis

In order to quantify safety, a variety of safety parameters were analyzed for existing conditions as well as the various build alternatives. The following sections detail these analyses.

5.1 Main Lane System Ramps

The total number of ramps were compared between existing and build alternatives for both directions of travel along the PEL Study Area. **Tables 5-8** show all ramps for each alternative, and **Table 9** shows a comparison of the overall number of ramps for the alternatives.

Table 5: Main Lane Ramps for No Action Alternative

Roadway	Direction of Travel	Ramp (s)	Roadway	Direction of Travel	Ramp (s)
I-40	WB	Entrance ramp from North Hills Blvd./Calvary Rd.	I-30	EB	Entrance ramp from I-440
I-30	WB	Exit ramp to I-30 WB	I-30	EB	Exit ramp to Roosevelt Rd.
I-30	WB	Exit ramp to Curtis Sykes Dr.	I-30	EB	Entrance ramp from Roosevelt Rd.
I-30	WB	Entrance ramp from Curtis Sykes Dr.	I-30	EB	Exit ramp to I-630
I-30	WB	Exit ramp to Bishop Lindsey Ave. / Broadway St.	I-30	EB	Exit ramp to 9th St.
I-30	WB	Entrance ramp from Broadway St.	I-30	EB	Entrance ramp from I-630
I-30	WB	Exit ramp to Cantrell Rd.	I-30	EB	Entrance ramp from 9th St.
I-30	WB	Entrance ramp from Cumberland St.	I-30	EB	Entrance ramp from 6th St.
I-30	WB	Exit ramp to E. 6th St.	I-30	EB	Exit ramp to Cantrell Rd.
I-30	WB	Exit ramp to E. 9th St.	I-30	EB	Entrance ramp from Cumberland St.
I-30	WB	Exit ramp to I-630	I-30	EB	Exit ramp to Broadway St.
I-30	WB	Entrance ramp from 9th St.	I-30	EB	Entrance ramp from Bishop Lindsey Ave.
I-30	WB	Entrance ramp from I-630	I-30	EB	Exit ramp to Curtis Sykes Dr.
I-30	WB	Exit ramp to Roosevelt Rd.	I-30	EB	Entrance ramp from Curtis Sykes Dr.
I-30	WB	Entrance ramp from Roosevelt Rd.	I-40	EB	Exit ramp to North Hills Blvd.

Table 6: Main Lane Ramps for 8-Lane C/D Alternative

Roadway	Direction of Travel	Ramp (s)	Roadway	Direction of Travel	Ramp (s)
I-40	WB	Entrance ramp from North Hills Blvd.	I-30	EB	Entrance ramp from I-440
I-30	WB	Exit ramp to I-30 WB	I-30	EB	Exit ramp to Roosevelt Rd.
I-30	WB	Entrance ramp from 19th St.	I-30	EB	Entrance ramp from Roosevelt Rd.
I-30	WB	Exit ramp to Bishop Lindsey Ave.	I-31	EB	Exit ramp to I-630
I-30	WB	Exit ramp to C/D, North of River	I-30	EB	Exit ramp to 9th St.
I-30	WB	Entrance ramp from C/D, South of River	I-30	EB	Entrance ramp from I-630
I-30	WB	Entrance ramp from Cumberland St	I-30	EB	Exit ramp to 3rd St./Cantrell Rd.
I-30	WB	Exit ramp to I-630	I-30	EB	Exit ramp to C/D, South of River
I-30	WB	Entrance ramp from I-630	I-30	EB	Entrance ramp from C/D, North of River
I-30	WB	Exit ramp to Roosevelt Rd.	I-30	EB	Entrance ramp from Broadway St.
I-30	WB	Entrance ramp to Roosevelt Rd.	I-30	EB	Exit ramp to 19th St.
			I-30	EB	Entrance ramp from Frontage Rd.
			I-40	EB	Exit ramp to N. Hills Blvd.

Table 7: Main Lane Ramps for 10 Main Lane Alternative

Roadway	Direction of Travel	Ramp (s)	Roadway	Direction of Travel	Ramp (s)
I-40	WB	Entrance ramp from North Hills Blvd./Calvary Rd.	I-30	EB	Entrance ramp from I-440
I-30	WB	Exit ramp to I-30 WB	I-30	EB	Exit ramp to Roosevelt Rd.
I-30	WB	Entrance ramp from E 19th St.	I-30	EB	Entrance ramp from Roosevelt Rd.
I-30	WB	Exit ramp to Bishop Lindsey Ave.	I-30	EB	Exit ramp to I-630
I-30	WB	Entrance ramp from Broadway St.	I-30	EB	Exit ramp to 9th St.
I-30	WB	Exit ramp to Cantrell Rd.	I-30	EB	Entrance ramp from I-630
I-30	WB	Exit ramp to 6th St.	I-30	EB	Exit ramp to Cantrell Rd.
I-30	WB	Entrance ramp from Cumberland St.	I-30	EB	Entrance ramp from 6th St.
I-30	WB	Exit ramp to I-630	I-30	EB	Entrance ramp from Cumberland St.
I-30	WB	Entrance ramp to I-630	I-30	EB	Exit ramp to Broadway St.
I-30	WB	Exit ramp to Roosevelt Rd.	I-30	EB	Entrance ramp from Broadway St.
I-30	WB	Entrance ramp from Roosevelt Rd.	I-30	EB	Exit ramp to 19th St.
			I-30	EB	Entrance ramp from Frontage Rd.
			I-40	EB	Exit ramp to N. Hills Blvd.

Table 8: Main Lane Ramps for 10-Lane C/D Alternative

Roadway	Direction of Travel	Ramp (s)	Roadway	Direction of Travel	Ramp (s)
I-40	WB	Entrance ramp from N. Hills Blvd.	I-30	EB	Entrance ramp from I-440
I-30	WB	Exit ramp to I-30 EB	I-30	EB	Exit ramp to Roosevelt Rd.
I-30	WB	Exit ramp to C/D and Bishop Lindsey St.	I-30	EB	Entrance ramp from Roosevelt Rd.
I-30	WB	Exit ramp to C/D and Cantrell Rd.	I-30	EB	Exit ramp to I-630
I-30	WB	Entrance ramp from C/D and Broadway St.	I-30	EB	Exit ramp to 9th St.
I-30	WB	Entrance ramp from 3rd Street	I-30	EB	Entrance ramp from I-630
I-30	WB	Exit ramp to I-630	I-30	EB	Exit ramp to 3rd St.
I-30	WB	Entrance ramp from I-630	I-30	EB	Exit ramp to C/D to Broadway
I-30	WB	Exit ramp to Roosevelt Rd.	I-30	EB	Entrance Ramp from C/D
I-30	WB	Entrance ramp from Roosevelt Rd.	I-30	EB	Exit ramp to 19th Street
			I-30	EB	Entrance ramp from Frontage Rd.
			I-40	EB	Exit ramp to North Hills Blvd

Table 9: Total Main Lane Ramps for All Alternatives

	EB I-30 & EB I-40: From I-530 Interchange to US-67 Interchange			
	No Action	8Lane C/D	10 Main Lane	10-Lane C/D
Total Ramps	15	13	14	12
	WB 1-30 & WB I-40: From I-530 Interchange to US-67 Interchange			
	No Action	8 Lane C/D	10 Main Lane	10-Lane C/D
Total Ramps	15	11	12	10

As shown in **Table 10**, all proposed alternatives would result in fewer total main lane ramps throughout the corridor. The 10-Lane C/D alternative would have the fewest ramps with 12 in the eastbound direction and 10 in the westbound direction. This is a reduction over the No Action alternative which has 15 ramps in the eastbound and westbound direction. The 8-Lane C/D and 10-Lane C/D will also have the C/D system that will be evaluated separately.

5.2 Collector Distributor System Ramps

The Collector Distributor system was proposed in the 8-Lane C/D and 10-Lane C/D. The C/D system interacts with the freeway system to help remove some of the weaving movements and ramps movements from the freeway main lanes. The C/D system will have lower operating speeds and traffic volumes. The C/D system lengths were not the same for the proposed alternatives. The C/D system for the 8-Lane C/D is from 6th Street in Little Rock to E. Broadway Street in North Little Rock (approximately 1 mile) and the 10-Lane C/D alternative has a C/D System from 6th Street in Little Rock to 17th Street in North Little Rock (approximately 2 miles). **Tables 10-11** show the C/D ramps for each alternative.

Table 10: C/D Ramps for 8-Lane C/D Alternative

Roadway	Direction of Travel	Ramp (s)	Roadway	Direction of Travel	Ramp (s)
I-30	WB	Entrance ramp to Broadway St.	I-30	EB	Entrance ramp from 6th St.
I-30	WB	Exit ramp to Cantrell Rd.	I-30	EB	Entrance ramp from Cumberland St.
I-30	WB	Exit ramp to 6th St.	I-30	EB	Exit ramp to E. Broadway St.

Table 11: C/D Ramps for 10-Lane C/D Alternative

Roadway	Direction of Travel	Ramp (s)	Roadway	Direction of Travel	Ramp (s)
I-30	WB	Entrance ramp from 19th St.	I-30	EB	Entrance ramp from 6th St.
I-30	WB	Exit ramp to Curtis Sykes	I-30	EB	Entrance ramp from Cumberland St.
I-30	WB	Exit ramp to Broadway St.	I-30	EB	Exit ramp to E. Broadway St.
I-30	WB	Exit ramp to Cantrell Rd.			
I-30	WB	Exit ramp to 6th St.			

Table 12 shows a comparison of the overall number of C/D ramps for the 8-Lane C/D and 10-Lane C/D. The 8-Lane C/D system is approximately one mile long and the 10-Lane C/D system is approximately two miles long.

Table 12: Total C/D Ramps for the 8-Lane C/D and 10-Lane C/D

	Total C/D Ramps for Each Direction	
	8-Lane C/D	10-Lane C/D
Total Ramps EB	3	3
Total Ramps WB	3	5

5.3 Arterial Connection Conflict Points

Arterial connection conflict points were determined for all relevant intersections of existing and future alternatives. The number of conflict points was determined from the number of vehicle paths that cross, merge, and diverge with another vehicle path based on legitimate movements through an intersection. In instances where a movement is prohibited, only legal movements were considered. **Figure 25** shows these calculations for the existing intersection of Bishop Lindsey Avenue at N. Locust Street as an example. The number of intersections analyzed varied from the No Action alternative to the various proposed alternatives due to the changes in geometry and lane configurations. However, results were identical for the 8-Lane C/D, 10 Main Lane, and 10-Lane C/D alternatives. Therefore, these results are shown together. **Table 13** on the following page summarizes the number of arterial connection conflict points for each intersection for the No Action, the 8-Lane C/D, the 10 Main Lanes, and the 10-Lane C/D alternatives.

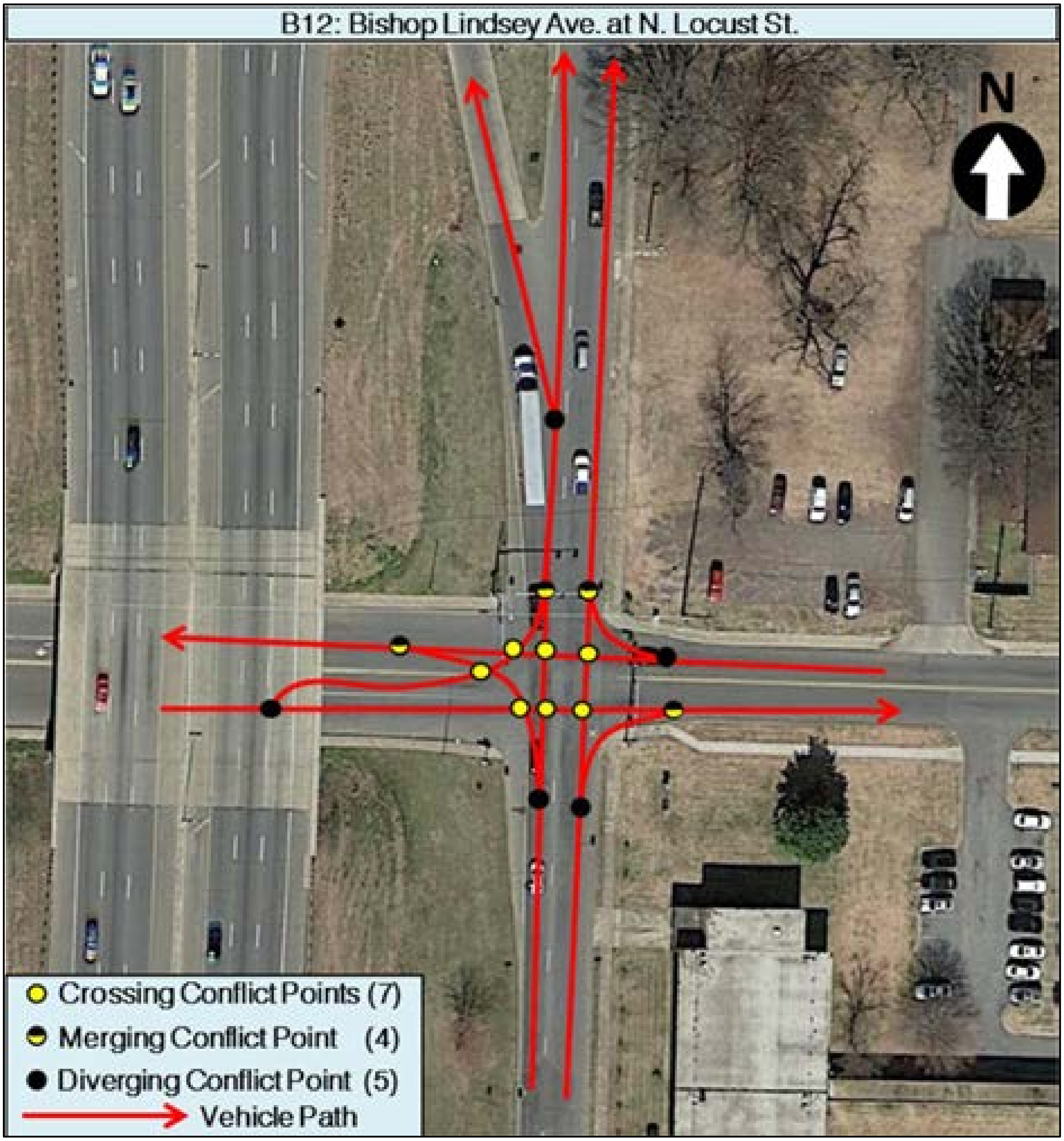


Figure 25: Example Calculations for Arterial Connection Conflict Points

Table 13: Arterial Connection Conflict Points

Location	No Action				8-Lane C/D, 10 Main Lanes, and 10-Lane C/D			
	Cross	Merge	Diverge	Total	Cross	Merge	Diverge	Total
N. Hills & I-40 EB Exit ramp	1	1	1	3	1	1	1	3
Curtis Sykes & N. Cypress	7	4	4	15	7	4	4	15
Curtis Sykes & N. Locust	7	4	4	15	7	4	3	14
Bishop Lindsey & N. Locust	7	4	5	16	7	4	4	15
Bishop Lindsey & N. Cypress	7	5	4	16	7	3	3	13
E. Broadway & N. Locust	13	4	2	19	27	5	3	35
E. Broadway & N. Cypress	9	3	3	15	21	4	2	27
Cumberland & E. 3rd	24	8	9	41	17	6	6	29
Cumberland & E. 2nd	23	8	6	37	21	6	4	31
Cumberland & E. Markham	11	4	3	18	16	6	5	27
Scott & E. 2nd	13	4	4	21	13	4	4	21
I-30 SB Frontage & E. 2nd	4	3	4	11	n/a	n/a	n/a	n/a
I-30 SB Frontage & E. 3rd	18	7	7	32	n/a	n/a	n/a	n/a
Mahlon Martin & E. 3rd	3	3	3	9	4	3	3	10
Mahlon Martin & E. 2nd	3	4	3	10	n/a	n/a	n/a	n/a
I-30 SB Frontage & E. 6th	10	4	4	18	10	4	4	18
I-30 NB Frontage & E. 6th	10	4	5	19	10	4	4	18
I-30 SB Frontage & E. 9th	17	7	6	30	17	5	4	26
I-30 Frontage & E. 9th	17	5	4	26	16	5	4	25
I-30 NB Frontage & E. Roosevelt	13	4	3	20	13	4	3	20
I-30 SB Frontage & E. Roosevelt	13	4	3	20	13	4	3	20
N. Cypress & E. 19th	n/a	n/a	n/a	n/a	7	4	4	15
N. Locust & E. 19th	n/a	n/a	n/a	n/a	7	4	4	15
E. 13th & N. Cypress	n/a	n/a	n/a	n/a	7	3	3	13
E. 13th & N. Locust	n/a	n/a	n/a	n/a	10	4	3	17
N. Cypress & E. 9th	n/a	n/a	n/a	n/a	7	4	4	15
N. Locust & E. 9th	n/a	n/a	n/a	n/a	7	4	4	15
Sherman & E. 2nd	n/a	n/a	n/a	n/a	3	2	3	8
Sherman & E. 3rd	n/a	n/a	n/a	n/a	5	3	3	11
River Market & E. 3rd	n/a	n/a	n/a	n/a	3	3	3	9
River Market & E. 2nd	n/a	n/a	n/a	n/a	16	7	7	30

As shown in **Table 13,** some intersections experienced an increase in conflict points from the No Action to the proposed build alternatives. This is typically due to the addition of lanes to provide greater capacity. For example, E. Broadway Street at N. Locust Street increased from 19 total conflict points at the existing intersection to 35 total conflict points for the proposed alternatives. The intersection will go from having two westbound thru lanes and a westbound right lane to having three westbound thru lanes and a shared thru/right lane. This will add a significant amount of capacity to E. Broadway Street. In spite of the added capacity at select intersections, the overall average number of conflict points per intersection is still reduced for all of the proposed alternatives. **Table 14** below summarizes the overall arterial conflict points for each alternative over the entire corridor.

Table 14: Summary of Arterial Connection Conflict Points for Alternatives

	No Action	8-Lane C/D, 10 Main Lanes, 10-Lane C/D
Total # Conflict Points	411	515
# Intersections	21	28
Avg. Conflict Points per Intersection	19.6	18.4

As **Table 14** shows, the average number of conflict points per intersection is reduced from 19.6 conflict points per intersection for No Action to 18.4 conflict points per intersection for the 8-Lane C/D, 10 Main Lanes, and 10-Lane C/D. This is accomplished by changing the geometry of some intersections and eliminating select movements that created high numbers of conflict points. For example, many of the I-30 entrance/exit ramps that are in close proximity to other intersections, such as the ramp on the north approach of Cumberland Street at E. 3rd Street, will be eliminated.

5.4 Main Lane Conflict Points

Main lane conflict points were quantified for the No Action, 8-Lane C/D, 10 Main Lanes, and 10-Lane C/D. The conflict points were quantified from the merge and diverge points on the main lanes. The conflict points occurred at entrance and exit ramps, drop lanes, and lane splits. If a ramp had a designated lane and no lane change was required to stay on the main lanes then no conflict point was counted. The results are shown in **Tables 15-18.**

Table 15: No Action Main Lane Conflict Points

Roadway	Description	Type	# of Conflict Points
I-40 WB	Entrance ramp from North Hills Blvd./Calvary Rd.	Merge	1
I-30 WB	Exit ramp to Curtis Sykes Dr.	Diverge	1
I-30 WB	Entrance ramp to Curtis Sykes Dr.	Merge	1
I-30 WB	Exit ramp Bishop Lindsey Ave./ Broadway	Diverge	1
I-30 WB	Entrance ramp Broadway St.	Merge	1
I-30 WB	Exit ramp Cantrell Rd.	Diverge	1
I-30 WB	Entrance ramp Cumberland St.	Merge	1
I-30 WB	Exit ramp to 6th St.	Diverge	1
I-30 WB	Exit ramp to 9th St.	Diverge	1
I-30 WB	Exit ramp to I-630	Diverge	1
I-30 WB	Entrance ramp from 9th St.	Merge	1
I-30 WB	Entrance ramp from I-630	Merge	1
I-30 WB	Exit ramp to Roosevelt Rd.	Diverge	1
I-30 WB	Entrance ramp from Roosevelt Rd.	Merge	1
I-30 WB	I-30 and I-530 Split - Center lane splits	Diverge	1
I-30 EB	Entrance ramp from I-440	Merge	1
I-30 EB	Exit ramp to Roosevelt Rd.	Diverge	1
I-30 EB	Entrance ramp from Roosevelt Rd.	Merge	1
I-30 EB	Exit ramp to I-630	Diverge	1
I-30 EB	Exit ramp to 9th St.	Diverge	1
I-30 EB	Entrance ramp from I-630	Merge	1
I-30 EB	Entrance ramp from 6th St.	Merge	2
I-30 EB	Exit ramp to Cantrell Rd.	Diverge	1
I-30 EB	Entrance ramp from Cumberland St.	Merge	1
I-30 EB	Exit ramp to Broadway St.	Diverge	1
I-30 EB	Entrance ramp from Bishop Lindsey Ave.	Merge	1
I-30 EB	Exit ramp to Curtis Sykes Dr.	Diverge	1
I-30 EB	Entrance ramp from Curtis Sykes Dr.	Merge	1
I-30 EB	I-40 EB and WB Center Lane Split	Diverge	1
I-40 EB	Exit ramp to North Hills Blvd.	Diverge	1
		Total	31

Table 16: 8-Lane C/D Main Lane Conflict Points

Roadway	Description	Type	# of Conflict Points
I-40 WB	Entrance ramp from N. Hills Blvd.	Merge	1
I-30 WB	Exit ramp C/D and Bishop Lindsey St.	Diverge	1
I-30 WB	Exit ramp to C/D to Cantrell Rd.	Diverge	1
I-30 WB	Entrance ramp from C/D from Broadway St. New Lane		
I-30 WB	Entrance ramp to Cumberland St.	Merge	1
I-30 WB	Exit ramp to I-630	Diverge	1
I-30 WB	Entrance ramp to I-630 – Junction		
I-30 WB	Exit ramp to Roosevelt Road	Diverge	1
I-30 WB	Entrance ramp from Roosevelt Road	Merge	1
I-30 WB	I-30 and I-530 Split - Center lane splits	Diverge	1
I-30 EB	Entrance ramp from I-440	Merge	1
I-30 EB	Exit ramp to Roosevelt Rd.	Diverge	1
I-30 EB	Entrance ramp from Roosevelt Rd.	Merge	1
I-30 EB	Exit ramp to I-630	Diverge	1
I-30 EB	Exit ramp to 9th Street	Diverge	1
I-30 EB	Entrance ramp from I-630	Diverge	1
I-30 EB	Exit ramp to 3rd St.	Merge	1
I-30 EB	Exit ramp to C/D to Broadway	Diverge	1
I-30 EB	Entrance ramp from C/D – New lane		
I-30 EB	Entrance ramp from Broadway St	Merge	1
I-30 EB	Exit ramp to 19th Street	Diverge	1
I-30 EB	Entrance ramp from Frontage Road	Merge	1
I-40 EB	Exit ramp to North Hills Blvd	Diverge	1
		Total	20

Table 17: 10 Main Lanes Conflict Points

Roadway	Description	Type	# of Conflict Points
I-40 WB	Entrance ramp from North Hills Blvd.	Merge	1
I-30 WB	Entrance ramp from19th St.	Merge	1
I-30 WB	Exit ramp Bishop Lindsey Ave.	Diverge	1
I-30 WB	Entrance ramp from Broadway St.	Merge	1
I-30 WB	Exit ramp to Cantrell Rd.	Diverge	1
I-30 WB	Exit ramp to 6th St.	Diverge	1
I-30 WB	Entrance ramp to Cumberland St.	Merge	1
I-30 WB	Exit ramp to I-630	Diverge	1
I-30 WB	Entrance ramp to I-630	Merge	1
I-30 WB	Exit ramp to Roosevelt Road	Diverge	1
I-30 WB	Entrance ramp from Roosevelt Road	Merge	1
I-30 WB	I-30 and I-530 Split - Center lane splits	Diverge	1
I-30 EB	Entrance ramp from I-440	Merge	1
I-30 EB	Exit ramp to Roosevelt Rd.	Diverge	1
I-30 EB	Entrance ramp from Roosevelt Rd.	Merge	1
I-30 EB	Exit ramp to I-630	Diverge	1
I-30 EB	Exit ramp to 9th St.	Diverge	1
I-30 EB	Entrance ramp from I-630 Own lanes	Merge	
I-30 EB	Exit ramp to Cantrell Rd.	Diverge	1
I-30 EB	Entrance ramp from 6th St.	Merge	1
I-30 EB	Entrance ramp from Cumberland St.	Merge	1
I-30 EB	Exit ramp to Broadway St.	Diverge	1
I-30 EB	Entrance ramp from Broadway St.	Merge	1
I-30 EB	Main Lane- Lane Drop	Merge	1
I-30 EB	Exit ramp to 19th St.	Diverge	1
I-30 EB	Entrance ramp from Frontage Rd.	Merge	1
I-40 EB	Exit ramp to North Hills Blvd	Diverge	1
		Total	26

Table 18: 10-Lane C/D Main Lane Conflict Points

Roadway	Description	Type	# of Conflict Points
I-40 WB	Entrance ramp from N. Hills Blvd.	Merge	1
I-30 WB	Exit ramp C/D and Bishop Lindsey St.	Diverge	1
I-30 WB	Main Lane - Lane Drop	Merge	1
I-30 WB	Exit ramp to C/D to Cantrell Rd.	Diverge	1
I-30 WB	Entrance ramp from C/D from Broadway St. New Lane		
I-30 WB	Entrance ramp from Cumberland St. New Lane		
I-30 WB	Entrance ramp from 3rd Street	Merge	1
I-30 WB	Exit ramp to I-630	Diverge	1
I-30 WB	Entrance ramp to I-630 Own Lanes		
I-30 WB	Exit ramp to Roosevelt Road	Diverge	1
I-30 WB	Entrance ramp from Roosevelt Road	Merge	1
I-30 WB	I-30 and I-530 Split - Center lane splits	Diverge	1
I-30 EB	Entrance ramp from I-440	Merge	1
I-30 EB	Exit ramp to Roosevelt Rd.	Diverge	1
I-30 EB	Entrance ramp from Roosevelt Rd.	Merge	1
I-30 EB	Exit ramp to I-630	Diverge	1
I-30 EB	Exit ramp to 9th Street	Diverge	1
I-30 EB	Entrance ramp from I-630 Junction	Diverge	
I-30 EB	Exit ramp to 3rd St.	Merge	1
I-30 EB	Exit ramp to C/D to Broadway	Diverge	1
I-30 EB	Entrance ramp from C/D – New lanes		
I-30 EB	Exit ramp to 19th Street	Diverge	1
I-30 EB	Entrance ramp from Frontage Road	Merge	1
I-40 EB	Exit ramp to North Hills Blvd	Diverge	1
		Total	19

As shown in **Table 19**, the No Action alternative has the most conflict points on the freeway system. The 8-Lane C/D and 10-Lane C/D will also have a C/D system that will be quantified below. 10 Main Lanes does not have a C/D system so the conflict points at 26 is lower than the existing freeway system.

Table 19: Total Main Lane Conflict Point All Alternatives

	No Action	8Lane C/D	10 Main Lanes	10-Lane C/D
# Total Conflict Points	31	20	26	19

5.5 Collector Distributor Conflict Points

The C/D conflict points were quantified for 8-Lane C/D and 10-Lane C/D alternatives. The conflict points were quantified from the merge and diverge points on the C/D system. The conflict points occurred at entrance and exit ramps, drop lanes, and lane splits. If a ramp feed its own lane and no lane change was required to stay on the collector distributor system then no conflict point was counted. The results are shown in **Tables 20-21** and a comparative analysis of the total of all alternatives on **Table 22**.

Table 20: 8-Lane C/D – C/D Conflict Points

Roadway	Description	Type	# of Conflict Points
C/D WB	Entrance ramp from Broadway	Merge	1
C/D WB	Entrance ramp from Main lanes for Downtown Own Lane		
C/D WB	Exit ramp to Cantrell Rd.	Diverge	1
C/D WB	Exit ramp to 6th Street	Diverge	1
C/D EB	Entrance ramp from 6th Street and Main lanes	Merge	1
C/D EB	Entrance ramp from Cumberland St.	Merge	1
C/D EB	Exit ramp to Broadway	Diverge	1
		Total	6

Table 21: 10-Lane C/D – C/D Conflict Points

Roadway	Description	Type	# of Conflict Points
C/D WB	Entrance ramp from 19th Street Own Lane		
C/D WB	Exit ramp to Bishop Lindsey	Diverge	1
C/D WB	CD Lane Drop	Merge	1
C/D WB	Entrance ramp from Main lanes Own Lane		
C/D WB	Entrance ramp from Broadway	Merge	1
C/D WB	Exit ramp to Cantrell Rd.	Diverge	1
C/D WB	Exit ramp to 6th St.	Diverge	1
C/D EB	Entrance ramp from 6th Street Own Lane		
C/D EB	Entrance ramp from Cumberland St.	Merge	1
C/D EB	Exit ramp to Broadway	Diverge	1
		Total	7

Table 22: Summary of Collector Distributor System Conflict Points

	8-Lane C/D	10-Lane C/D
Total # Conflict Points	6	7

The 8-Lane C/D did have one less conflict point than the 10-Lane C/D. However, the 10-Lane C/D was twice the length as the 8-Lane C/D.

5.6 Deficient Ramp and Weaving Lengths

To ensure the safety and mobility of the freeway system, the access to and from the interstate is a critical component. Freeway systems have a series of entrance and exit ramps including interchange ramps that allow the vehicles to take access. The entrance ramps and exit ramps require acceleration and deceleration lengths to allow for the necessary vehicle speed changes for the different roadway facilities. In addition, the succession of ramps on the freeway system causes weaving movements. Therefore, all of these ramp scenarios were evaluated for the safety study corridor.

5.6.1 Acceleration and Deceleration Lengths of Ramps

The existing acceleration and deceleration lengths were measured in order to identify which ramps currently do not meet the minimum requirements. All lengths were measured from/to the gores as they appeared in Google Earth and are approximate. The freeway design speed for I-30 is 60 miles per hour, and the design speed for all ramps is ideally 50 miles per hour. According to Table 10-3 of the *AASHTO Green Book*, the acceleration length should be 180 feet for an entrance ramp going from 50 miles per hour to 60 miles per hour. According to Table 10-5 of the *Green Book*, the deceleration length should be 240 feet for an exit ramp going from 60 miles per hour to 50 miles per hour. However, the Arkansas State Highway and Transportation Department (AHTD) standard requires a minimum of 700 feet for parallel access lanes and 300 feet for tapers. For evaluation of the existing lengths, the largest applicable minimum was applied. **Table 23** shows the results of this analysis.

Table 23: Acceleration and Deceleration Lengths

Description	Length (ft)	Meets Standard?
Roosevelt WB entrance	450' Accel + 300' Taper	no
I-630 EB entrance	510' Accel + 300' Taper	no
Cantrell Rd EB Entrance	430' Accel + 230' Taper	no
Broadway St WB Entrance	330' Accel + 300' Taper	no
7th St EB Entrance	380' Accel + 200' Taper	no
Curtis Sykes Dr. WB Entrance	175' Accel + 200' Taper	no
Curtis Sykes Dr. EB Entrance	No Accel Lane + 320' Taper	no
N. Hills WB Entrance	675' Accel + 350' Taper	yes

As shown in **Table 23**, seven ramps with acceleration or deceleration lengths do not currently meet the minimum standards. The deficient lengths are located throughout the entire corridor with one close to the southern limit of the study area in Little Rock, two in downtown Little Rock, and four in North Little Rock.

In addition, there are eight existing ramps with no measurable deceleration lane with the controlling curve at the ramp taper, as shown in **Table 24**. Some of these ramps are located within auxiliary lanes and the deceleration could occur in that lane. Other ramps require the vehicles to decelerate in the through lanes on the freeway main lanes. This will cause an interruption to the overall flow and speed of vehicles.

Table 24: Ramps with no Deceleration Lane Lengths

Description	Length (ft)
9th St WB exit	No Decel Lane Length
6th St WB exit	No Decel Lane Length
Cantrell Rd WB Loop Exit	No Decel Lane Length
Broadway St EB Exit	No Decel Lane Length
7th St WB Exit	No Decel Lane Length
Curtis Sykes Dr. EB Exit	No Decel Lane Length
Curtis Sykes Dr. WB Exit	No Decel Lane Length
N. Hills EB Exit	No Decel Lane Length

5.6.2 Weaving Lengths

Weaving lengths were evaluated based on Figure 10-106 of the *AASHTO Green Book* which shows minimum ramp terminal spacing as follows:

- Entrance to Exit: 1000 feet
- Exit to Exit: 1000 feet
- Exit to Entrance: 500 feet
- Entrance to Exit: 2000 feet

For this analysis, only the full freeway distances are shown since no C/D roads or service interchanges exist within the existing corridor. **Table 25** shows the results of this analysis.

Table 25: Weaving Lengths

From	To	Length (ft)	Requirement (ft)	Meets Standard?
I-440 EB Entrance	Roosevelt EB Exit	1200	2000	no
Roosevelt Rd EB Entrance	I-630 WB Exit	1350	2000	no
I-630 EB Entrance	Roosevelt WB Exit	970	2000	no
9th St WB Exit	6th St WB Exit	650	1000	no
6th St EB Entrance	Cantrell Rd EB Exit	1000	2000	no
Cantrell Rd WB Entrance	6th St WB Exit	550	2000	no
Cantrell Road WB Entrance	9th St WB Exit	1200	2000	no
7th St EB Entrance (to Broadway St)	Curtis Sykes St Exit	1600	2000	no
Curtis Sykes WB Entrance	7th St WB Exit (to Broadway St)	1600	2000	no
Curtis Sykes EB Entrance	I-40 Split	1100	2000*	no*
I-40 Converge	15th Street WB Exit	1000	2000*	no*
N. Hills WB Entrance	I-40/I-30 Split	2000	2000*	yes*

*These weaving distances should ideally be greater than 2000 feet because they contain left exits/entrances.

As shown in **Table 25**, only one existing weaving length (located between the N. Hills Boulevard westbound entrance and the north terminal) meets the minimum requirement. The existing placement of ramps throughout the entire corridor creates several areas of weaving with inadequate length to accommodate safe execution of the necessary movements.

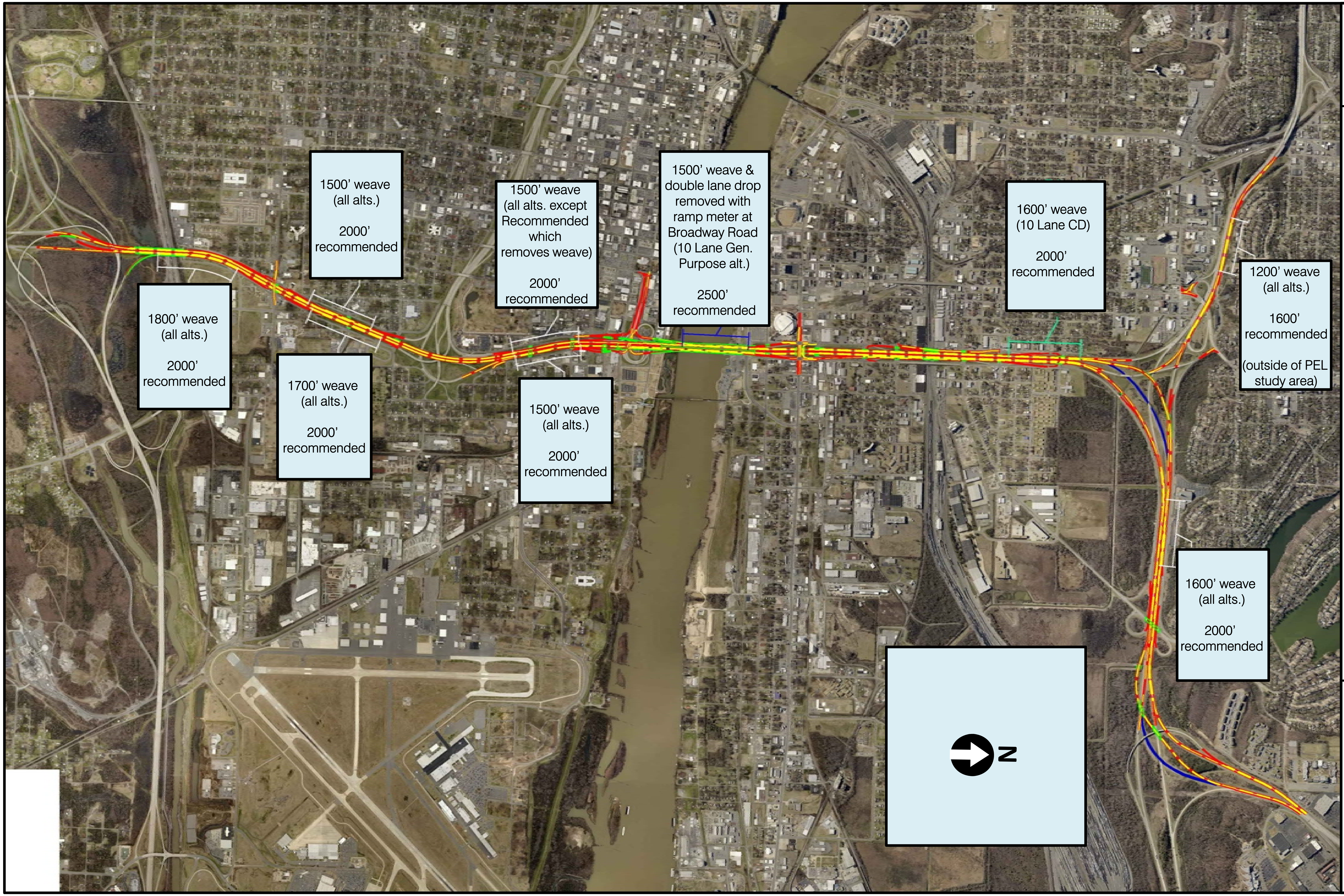
The proposed alternatives will address many of the weaving length issues throughout the corridor. **Figure 26** on the following page shows the remaining areas for each alternative where weaving length will still fall short of the minimum requirement. The proposed modifications for all the proposed alternatives will include changing the existing left exits along the I-40 corridor from the north terminal to Hwy 67 to right exits. For the 10 Main Lane alternative, the weaving issue between the E. Broadway Street interchange and the Cantrell Road interchange will be eliminated by using a ramp meter to bring in only one lane from E. Broadway Street.

Figure 26

CA0602

I-30/I-40, Little Rock & North Little Rock

Deficient Weaving Lengths for Proposed Alternatives



5.7 Potential Crash Reductions

Crashes are random events that need to be carefully analyzed. In predicting the potential crash reductions from a high level, crash modification factors were used for the different design elements of each alternative. It is recommended that further analysis be performed using the *Highway Safety Manual 2010* (HSM) predictive methods to estimate average crash frequency for freeways, collector-distributor roads, and ramps as an entire system.

In the HSM and FHWA's CMF Clearinghouse, there are Crash Modification Factors (CMFs) that can be applied multiplicatively to predict the relative increase/decrease in crashes that a particular design element will provide. For example, a CMF of 0.95 indicates that a design element would have a possible 5% crash reduction from the base condition. These CMFs are developed after years of research and study of a particular design feature and regressed to the mean.

For this analysis, the projected crashes for 2041 were used (See **Section 3**). These were broken down by segment and location. CMFs were then applied to quantify the potential crash reductions in the proposed alternatives. It was assumed that the No Action alternative would not have these improvements. The CMFs used for all proposed alternatives crashes along the entire freeway corridor include: installing changeable speed warning signs (CMF 0.54), and changeable crash ahead warning signs (CMF 0.56). The CMF for left exits converted to right exits (CMF 0.51), removing deficient weaving lengths (CMF equation based on entrance-exit ramp spacing and auxiliary lane use), and ramp meter at Broadway (CMF 0.36) were applied to the applicable crashes in that area.

The 8-Lane C/D and the 10-Lane C/D had the addition of a C/D system adjacent to the freeway that also needed to be analyzed for safety. The purpose of this system is to transfer most of the turbulence to the C/D road which results in a safer freeway with greater capacity and higher speeds.

Currently, there is not a CMF developed for C/D roads. Therefore, the C/D system was quantified based on a *Study of Collector-Distributor Roads* from a *Joint Highway Research Project with FHWA* that showed C/D roads can reduce main lane weaving crashes by 25% by removing the weaving and speed change lanes from the high speed facility. In addition, the C/D system for the alternatives is proposed in the area (I-30 from I-630 to I-40) where the majority of crashes were occurring. Therefore, for this high level analysis it was assumed that the majority of the crashes were caused by the close successive ramps and weaving movements between those ramps.

As shown in **Table 26**, the 10-Lane C/D alternative had the most potential for crash reduction due to the fact the C/D system extended further north to include the existing high crash segment between Bishop Lindsey to Curtis Sykes. However, this high level analysis doesn't quantify the system as a whole.

Table 26: Potential Crash Reductions

No Action	8-Lane C/D	10 Main Lanes	10-Lane C/D
0	175	159	229

It is recommended that further analysis be conducted during the NEPA phase using the HSM predictive method for freeways, C/D roads, and ramps. The HSM method follows *NCHRP 17-45 report, Safety Prediction Methodology and Analysis Tool for Freeways and Interchanges, 2012* and *FHWA's ISAT (Interchange Safety Analysis Tool)*. The predictive method uses safety performance functions along with the crash modification factors that can predict the average crash frequency for the entire system (main lanes, C/D road, and ramps).

6.0 PEL Recommended 10-Lane with Downtown C/D Alternative

After careful analysis, the 10-Lane with Downtown C/D alternative was proposed as the PEL Recommendation. This alternative proposes 10 Main Lanes with a C/D system that serves the downtown area of Little Rock and North Little Rock. This alternative has a C/D system that is shorter than the 10-Lane C/D alternative and therefore removes the deficient weaving length from the eastbound exit ramp at 19th Street and the major split at I-40. In addition, it has fewer arterial conflict points per intersection and fewer deficient weaving lengths. The quantitative analysis is included below.

6.1 Main Lane and C/D Ramps

The main lane and C/D ramps were quantified separately for the PEL Recommended 10-Lane with Downtown C/D Alternative. As shown below **Tables 27-28** include the main lane and C/D ramps. The total main lane and C/D ramps are shown in **Table 29**.

Table 27: Main Lane Ramps for PEL Recommended 10-Lane with Downtown C/D Alternative

Roadway	Direction of Travel	Ramp (s)	Roadway	Direction of Travel	Ramp (s)
I-40	WB	Entrance ramp from N. Hills Blvd.	I-30	EB	Entrance ramp from I-440
I-30	WB	Exit ramp to I-30 WB	I-30	EB	Exit ramp to Roosevelt Rd.
I-30	WB	Entrance ramp from 19th St.	I-30	EB	Entrance ramp from Roosevelt Rd.
I-30	WB	Exit ramp to U-turn at Bishop Lindsey.	I-30	EB	Exit ramp to I-630
I-30	WB	Exit ramp to C/D, North of Broadway St.	I-30	EB	Exit ramp to 9th Street
I-30	WB	Exit ramp to C/D, North of River	I-30	EB	Entrance ramp from I-630
I-30	WB	Entrance ramp from C/D, South of River	I-30	EB	Exit ramp 3rd St./Cantrell Rd.
I-30	WB	Entrance ramp from Cumberland St	I-30	EB	Exit ramp to C/D, South of River
I-30	WB	Exit ramp to I-630	I-30	EB	Entrance ramp from C/D, North of River
I-30	WB	Entrance ramp from I-630	I-30	EB	Entrance ramp from Broadway St.
I-30	WB	Exit ramp to Roosevelt Rd.	I-30	EB	Exit ramp to U-turn near 19th St
I-30	WB	Entrance ramp to Roosevelt Rd.	I-30	EB	Entrance ramp from Frontage Rd.
			I-40	EB	Exit ramp to N. Hills Blvd.

Table 28: C/D Ramps for PEL Recommended 10-Lane with Downtown C/D

Roadway	Direction of Travel	Ramp (s)	Roadway	Direction of Travel	Ramp (s)
I-30	WB	Exit ramp to Broadway St.	I-30	EB	Entrance ramp from 6th St.
I-30	WB	Exit ramp to Cantrell Rd.	I-30	EB	Entrance ramp from Cumberland St.
I-30	WB	Exit ramp to 6th St.	I-30	EB	Exit ramp to E. Broadway St.

Table 29: Total Main Lane and C/D Ramps for PEL Recommended

PEL Recommended 10-Lane with Downtown C/D		
	Main Lane System	C/D System
Total EB Ramps	13	3
	Main Lane System	C/D System
Total WB Ramps	12	3

The PEL Recommended 10-Lane with Downtown C/D alternative has 13 eastbound and 12 westbound main lane ramps. The C/D system has 3 ramps in each direction. This is comparable to the other alternatives (See **Tables 9 and 12**).

6.2 Arterial Conflict Points

Arterial conflict points were also quantified for the PEL Recommended 10-Lane with Downtown C/D alternative. The PEL Recommended 10-Lane with Downtown C/D alternative had slightly fewer conflict points than the other build alternatives due to the removal of the at grade intersection at River Market Street and at Sherman Street. In addition, it had the lowest average conflict points per intersection. See **Tables 30-31.**

Table 30: Comparison of Arterial Conflict Points

Location	No Action				8-Lane C/D, 10 Main Lane, and 10-Lane C/D				PEL Recommended 10-Lane with Downtown C/D			
	Cross	Merge	Diverge	Total	Cross	Merge	Diverge	Total	Cross	Merge	Diverge	Total
N. Hills & I-40 EB Exit ramp	1	1	1	3	1	1	1	3	1	1	1	3
Curtis Sykes & N. Cypress	7	4	4	15	7	4	4	15	7	4	4	15
Curtis Sykes & N. Locust	7	4	4	15	7	4	3	14	7	4	3	14
Bishop Lindsey & N. Locust	7	4	5	16	7	4	4	15	7	4	4	15
Bishop Lindsey & N. Cypress	7	5	4	16	7	3	3	13	7	3	3	13
E. Broadway & N. Locust	13	4	2	19	27	5	3	35	27	5	3	35
E. Broadway & N. Cypress	9	3	3	15	21	4	2	27	21	4	2	27
Cumberland & E. 3rd	24	8	9	41	17	6	6	29	19	6	5	30
Cumberland & E. 2nd	23	8	6	37	21	6	4	31	15	5	5	25
Cumberland & E. Markham	11	4	3	18	16	6	5	27	16	6	5	27
Scott & E. 2nd	13	4	4	21	13	4	4	21	13	4	4	21
I-30 SB Frontage & E. 2nd	4	3	4	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
I-30 SB Frontage & E. 3rd	18	7	7	32	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mahlon Martin & E. 3rd	3	3	3	9	4	3	3	10	4	3	3	10
Mahlon Martin & E. 2nd	3	4	3	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
I-30 SB Frontage & E. 6th	10	4	4	18	10	4	4	18	11	5	5	21
I-30 NB Frontage & E. 6th	10	4	5	19	10	4	4	18	10	4	4	18
I-30 SB Frontage & E. 9th	17	7	6	30	17	5	4	26	17	5	4	26
I-30 Frontage & E. 9th	17	5	4	26	16	5	4	25	16	5	4	25
I-30 NB Frontage & E. Roosevelt	13	4	3	20	13	4	3	20	13	4	3	20
I-30 SB Frontage & E. Roosevelt	13	4	3	20	13	4	3	20	13	4	3	20
N. Cypress & E. 19th	n/a	n/a	n/a	n/a	7	4	4	15	7	4	4	15
N. Locust & E. 19th	n/a	n/a	n/a	n/a	7	4	4	15	7	4	4	15
E. 13th & N. Cypress	n/a	n/a	n/a	n/a	7	3	3	13	7	3	3	13
E. 13th & N. Locust	n/a	n/a	n/a	n/a	10	4	3	17	10	4	3	17
N. Cypress & E. 9th	n/a	n/a	n/a	n/a	7	4	4	15	7	4	4	15
N. Locust & E. 9th	n/a	n/a	n/a	n/a	7	4	4	15	7	4	4	15
Sherman & E. 2nd	n/a	n/a	n/a	n/a	3	2	3	8	3	2	3	8
Sherman & E. 3rd	n/a	n/a	n/a	n/a	5	3	3	11	5	3	3	11
River Market & E. 3rd	n/a	n/a	n/a	n/a	3	3	3	9	3	3	3	9
River Market & E. 2nd	n/a	n/a	n/a	n/a	16	7	7	30	n/a	n/a	n/a	n/a

Table 31: Comparison of Arterial Conflict Points

	No Action	8-Lane C/D, 10 Main Lanes, 10-Lane C/D	PEL Recommended 10-Lane with Downtown C/D
Total # Conflict Points	411	515	483
# Intersections	21	28	27
Avg. Conflict Points per Intersection	19.6	18.4	17.9

6.3 Main Lane and C/D Conflict Points

The main lane and C/D system conflicts points were quantified separately for the PEL study area. As shown in **Tables 32-33**, the total main lane conflict points are 21 and the total C/D conflict points are 4. This alternative has the least amount of conflict points on the C/D system with the new lanes beginning at the entrance ramps.

Table 32: PEL Recommended 10-Lane with Downtown C/D Main Lane Conflict Points

Roadway	Description	Type	# of Conflict Points
I-40 WB	Entrance ramp from N. Hills Blvd.	Merge	1
I-30 WB	Entrance ramp from 19th Street	Merge	1
I-30 WB	Exit ramp to U-turn at Bishop Lindsey	Diverge	1
I-30 WB	Exit ramp to C/D, North of River Lane Balance	Diverge	1
I-30 WB	Entrance ramp from C/D, South of River- New Lane		
I-30 WB	Entrance ramp to Cumberland St. – New Lane		
I-30 WB	Exit ramp to I-630	Diverge	1
I-30 WB	Entrance ramp to I-630 – New Lanes		
I-30 WB	Exit ramp to Roosevelt Rd.	Diverge	1
I-30 WB	Entrance ramp from Roosevelt Rd.	Merge	1
I-30 WB	I-30 and I-530 Split - Center lane splits	Diverge	1
I-30 EB	Entrance ramp from I-440	Merge	1
I-30 EB	Exit ramp to Roosevelt Rd.	Diverge	1
I-30 EB	Entrance ramp from Roosevelt Rd.	Merge	1
I-30 EB	Exit ramp to I-630	Diverge	1
I-30 EB	Exit ramp to 9th Street	Diverge	1
I-30 EB	Entrance ramp from I-630	Merge	1
I-30 EB	Exit ramp to 3rd St./Cantrell Rd.	Diverge	1
I-30 EB	Exit ramp from C/D, South of River	Merge	1
I-30 EB	Entrance ramp from C/D, North of River New Lanes		
I-30 EB	Entrance ramp Broadway St.	Merge	1
I-30 EB	Lane Drop	Merge	1
I-30 EB	Exit ramp to 19th Street	Diverge	1
I-30 EB	Entrance ramp from Frontage Road	Merge	1
I-40 EB	Exit ramp to N. Hills Blvd	Diverge	1
		Total	21

Table 33: PEL Recommended 10-Lane with Downtown C/D – C/D Conflict Points

Roadway	Description	Type	# of Conflict Points
C/D WB	Entrance ramp from Broadway	Merge	1
C/D WB	Entrance ramp from Main lanes for Downtown Own Lane		
C/D WB	Exit ramp to Cantrell Rd.	Diverge	1
C/D WB	Exit ramp to 6th Street	Diverge	1
C/D EB	Entrance ramp from 6th Street Own Lane		
C/D EB	Entrance ramp to Cumberland St. Own Lane		
C/D EB	Exit ramp to Broadway	Diverge	1
		Total	4

6.4 Deficient Ramps and Weaving Lengths

The PEL Recommended 10-Lane with Downtown C/D will not have any deficient acceleration or deceleration ramp lengths and will have the least amount of deficient weaving lengths of any of the proposed build alternatives with only five deficient lengths. The westbound deficient weaving length between the Cantrell Road interchange entrance ramp and I-630 interchange exit ramp will be eliminated by moving the Cantrell Road entrance ramp north to accommodate the recommended weaving length of 2000 feet. This is an improvement to the 1500 weaving length that is proposed in the other build alternatives.

6.5 Potential Crash Reductions

Using the crash modification factors as discussed in the **Section 5.7**, the potential crash reductions were quantified for the PEL Recommended 10-Lane with Downtown C/D alternative.

Table 34: Potential Crash Reductions

No Action	10 Main Lanes	8-Lane C/D	10-Lane C/D	PEL Recommended 10-Lane with Downtown C/D
0	159	175	229	197

The PEL Recommended 10-Lane with Downtown C/D did have the potential to reduce crashes in 2041 by almost 200. The 10-Lane C/D had the greatest potential to reduce crashes with the C/D system extending through the high crash location between Curtis Sykes and Bishop Lindsey. However, this doesn't capture the mobility issue with the major weave between the C/D entrance ramp and the major split at I-40 as shown in the microsimulation model. Further analysis will be performed in the NEPA phase using the HSM predictive methods. This will quantify the system as a whole and predict the average crash frequency in 2041.

Appendix 5: Level 2B Assessment

Traffic Analysis to Support Level 2B Assessment

Traffic Analysis to Support Level 2B Assessment	Source	Notes
2041 Base Forecast Demand	CA0602 Traffic Count and Forecast Plan	2041 HNTB forecast. Based on 8-lane metroplan forecast. This forecast represents the **Base** condition. The Base condition is highlighted.
Highway - Build		
Interchange Improvements		
Mainline Widening	Metroplan - \\kcow00\jobs4\59984\TransPlan\Traffic_Counts\20140708_AHTD_CA0602_Traffic.xlsx	Run 3 = 6-lane, Run 5 = Base, Run 7 = 10-lane. Look at raw data from AHTD to determine percent vehicles traveling in peak hour. Percent change in model volumes was applied to base condition.
I-30 Arkansas River Bridge		
Replacement		No Impact on I-30 demand
Rehabilitation		
Complimentary Strategies		
Highway - Build		
Ramp Consolidation / Elimination		No Impact on I-30 demand
Intersection Improvements		No Impact on I-30 demand
Bottleneck Removal		No Impact on I-30 demand
Auxiliary Lanes		No Impact on I-30 demand
Roadway Shoulder Improvements		No Impact on I-30 demand
Horizontal / Vertical Curve Improvements		No Impact on I-30 demand
Frontage Road Improvements		No Impact on I-30 demand
Collector/Distributor (C/D) Roads	Assumption	Assumes GP lanes plus CD (ie. 8-Lane = 8 GP plus 1 CD). No volume change as it is either GP lanes or C/D road.
Mainline Pavement Rehabilitation		No Impact on I-30 demand
Bypass Route	Metroplan	Run 4 = 6-lane, Run 6 = 8 lane (base), Run 9 = 10 lane. How much traffic came off mainline comparing run 4 to run 3, etc.
Other Modes		
I-30 Express Bus Transit	I-30 PEL Transit Analysis	450 - 580 autos reduced (1.1 occupancy). Used graduated scale.
Bus on Shoulder	I-30 PEL Transit Analysis	6% ridership increase
Bicycle / Pedestrian		No Impact on I-30 demand
Arterial Bus Transit		No Impact on I-30 demand
Commuter Rail	Metroplan	Commuter Rail and light rail was combined. Under fixed guideway. Compare run 5 to run 13 for eight lane, compare run 3 to run 11 for six-lane, for 10 and 12 lane we will have to make some assumptions. Assumes the same outcome for 10 and 12 lane since no scenario for fixed guideway was analyzed for 10 and 12 lane.
Light Rail (Street Car)	Metroplan	Leave as zero's, because fixed guideway includes both commuter rail and light rail.
Arterial Bus Rapid Transit		No Impact on I-30 demand
Arterial Bus Lanes		No Impact on I-30 demand
Congestion Management		
Travel Demand Management	http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c19.pdf	TRB Publication. Page 19-15. Using a 2% reduction.
Information Systems / Advanced Traveler Information	Research	Insufficient data available
Transportation System Management (TSM)	Research	http://www.its.berkeley.edu/publications/UCB/2011/RR/UCB-ITS-RR-2011-2.pdf. The present findings unveil a mechanism of periodic flow recovery through a freeway bottleneck. Repeated experiments indicate that this mechanism can be modulated to favorable ends. The resulting 3% average gain in long-run discharge flow. Data is zero because of Arterial only benefits.
Wayfinding / Signage		
Ramp Metering	http://www.dot.state.mn.us/rampmeter/study.html	9% increase in vol. w/ ramp meters due to increased throughput
Arterial Improvements		No Impact on I-30 demand
Reversible Lanes		
Hard Shoulder Running		
Land Use Policy		
Managed Lanes		
Non-Recurring Congestion		
Crash Investigation Sites		
Roadside / Motorist Assist Enhancements		
Improvements to Detour Routes		
Variable Speed Limits (Speed Harmonization)		
Queue Warning		
Adjusted Base Forecast / **Change in Volume** / **Change in Percent**		
Overall HCM LOS Result		
Alternative being eliminated from 2A		

AM Peak Direction Only

	6-Lane	8-Lane	10-Lane	12-Lane
	A3 NB	A3 NB	A3 NB	A3 NB
2041 Base Forecast Demand	8,800	8,800	8,800	8,800
Mainline Widening	-415		239	477
Collector/Distributor (C/D) Roads		0	0	0
I-30 Express Bus Transit	-534	-497	-459	-422
Bus on Shoulder	-32	-30	-28	-25
Travel Demand Management	-168	-176	-181	-186
Information Systems / Advanced Traveler Information	0	0	0	0
Transportation System Management (TSM)	0	0	0	0
Ramp Metering	755	704	633	557
Adjusted Base Forecast	8,406	8,801	9,004	9,201
Change in Volume	-394	1	204	401
Change in Percent	-5%	0%	2%	4%
Overall HCM LOS Result	F	F	D	C
AM	6-Lane A3 NB	8-Lane A3 NB	10-Lane A3 NB	12-Lane A3 NB

AM Peak Direction Only

	6-Lane A1 SB	6-Lane A2 SB	8-Lane A1 SB	8-Lane A2 SB	10-Lane A1 SB	10-Lane A2 SB	12-Lane A1 SB	12-Lane A2 SB
2041 Base Forecast Demand	6,100	7,600	6,700	7,800	6,100	7,600	6,100	7,600
Mainline Widening	-255	-929			101	492	203	984
Collector/Distributor (C/D) Roads			0	0	0	0	0	0
I-30 Express Bus Transit	-704	-608	-655	-565	-605	-523	-556	-480
Bus on Shoulder	-42	-36	-39	-34	-36	-31	-33	-29
Travel Demand Management	-117	-133	-134	-156	-124	-162	-126	-172
Information Systems / Advanced Traveler Information	0	0	0	0	0	0	0	0
Transportation System Management (TSM)	0	0	0	0	0	0	0	0
Ramp Metering	526	600	536	624	434	566	378	515
		-0.15331				0.035609		0.097717
Adjusted Base Forecast	5,507	6,493	6,408	7,669	5,870	7,942	5,965	8,418
Change in Volume	-593	-1,107	-292	-131	-230	342	-135	818
Change in Percent	-10%	-15%	-4%	-2%	-4%	5%	-2%	11%
Overall HCM LOS Result	D	E	D	E	C	D	B	C
AM	6-Lane A1 SB	6-Lane A2 SB	8-Lane A1 SB	8-Lane A2 SB	10-Lane A1 SB	10-Lane A2 SB	12-Lane A1 SB	12-Lane A2 SB

PM Peak Direction Only

	6-Lane A1 NB	6-Lane A2 NB	8-Lane A1 NB	8-Lane A2 NB	10-Lane A1 NB	10-Lane A2 NB	12-Lane A1 NB	12-Lane A2 NB
2041 Base Forecast Demand	7,400	7,400	7,400	7,400	7,400	7,400	7,400	7,400
Mainline Widening	-310	-905			123	479	246	958
Collector/Distributor (C/D) Roads			0	0	0	0	0	0
I-30 Express Bus Transit	-704	-608	-655	-565	-605	-523	-556	-480
Bus on Shoulder	-42	-36	-39	-34	-36	-31	-33	-29
Travel Demand Management	-142	-130	-148	-148	-150	-158	-153	-167
Information Systems / Advanced Traveler Information	0	0	0	0	0	0	0	0
Transportation System Management (TSM)	0	0	0	0	0	0	0	0
Ramp Metering	638	585	592	592	527	552	459	501
		-0.12968				0.065354		0.129532
Adjusted Base Forecast	6,840	6,306	7,150	7,245	7,258	7,719	7,362	8,184
Change in Volume	-560	-1,094	-250	-155	-142	319	-38	784
Change in Percent	-8%	-15%	-3%	-2%	-2%	4%	-1%	11%
Overall HCM LOS Result	F	E	D	D	C	C	C	C
PM	6-Lane A1 NB	6-Lane A2 NB	8-Lane A1 NB	8-Lane A2 NB	10-Lane A1 NB	10-Lane A2 NB	12-Lane A1 NB	12-Lane A2 NB

PM Peak Direction Only

	6-Lane A3 SB	8-Lane A3 SB	10-Lane A3 SB	12-Lane A3 SB
2041 Base Forecast Demand	8,500	8,200	8,500	8,500
Mainline Widening	-401		230	461
Collector/Distributor (C/D) Roads		0	0	0
I-30 Express Bus Transit	-534	-497	-459	-422
Bus on Shoulder	-32	-30	-28	-25
Travel Demand Management	-162	-164	-175	-179
Information Systems / Advanced Traveler Information	0	0	0	0
Transportation System Management (TSM)	0	0	0	0
Ramp Metering	729	656	611	538
Adjusted Base Forecast	8,100	8,165	8,680	8,872
Change in Volume	-400	-35	180	372
Change in Percent	-5%	0%	2%	4%
Overall HCM LOS Result	F	E	D	C
PM	6-Lane A3 SB	8-Lane A3 SB	10-Lane A3 SB	12-Lane A3 SB

0.12121

	2041 Peak Direction AM		A-D	E	F	2041 Peak Direction PM		A-D	E	F
	6					6				
A1	I-40	A1, SB	1			I-40	A1, NB			1
A2	I-30 N. Bridge	A2, SB		1		I-30 N. Bridge	A2, NB		1	
A3	I-30 South	A3, NB			1	I-30 South	A3, SB			1
	8					8				
A1	I-40	A1, SB	1			I-40	A1, NB	1		
A2	I-30 N. Bridge	A2, SB		1		I-30 N. Bridge	A2, NB	1		
A3	I-30 South	A3, NB			1	I-30 South	A3, SB		1	
	10					10				
A1	I-40	A1, SB	1			I-40	A1, NB	1		
A2	I-30 N. Bridge	A2, SB	1			I-30 N. Bridge	A2, NB	1		
A3	I-30 South	A3, NB	1			I-30 South	A3, SB	1		
	12					12				
A1	I-40	A1, SB	1			I-40	A1, NB	1		
A2	I-30 N. Bridge	A2, SB	1			I-30 N. Bridge	A2, NB	1		
A3	I-30 South	A3, NB	1			I-30 South	A3, SB	1		

HCM Basic Mainline Analysis

Notes:

1. Analysis performed in the peak direction only.
2. High level traffic analysis at 3 locations along the study corridor defined as A1, A2 and A3 as shown on the map.
3. Analysis would not include traffic operations as a result of weaving, merging, diverging, or downsteam congestion.
4. Base traffic demand developed in the *CA0602 Traffic and Forecast Plan submitted to AHTD, December, 2014.*
5. *LOS was calculated based on the following table based on HCM 2010 information.*

HCS 2010 LOS Thresholds

	A	B	C	D	E	F
6-Lane	0	2090	3416	4701	5729	6507
8-Lane	0	2786	4554	6268	7638	8676
10-Lane	0	3483	5692	7835	9547	10844
12-Lane	0	4179	6831	9401	11457	13013

Appendix 6: Transit Report

CA0602 I-30 PEL
Transit Analysis

Introduction
Transit demand in the Central Arkansas I-30 corridor was analyzed at a high-level as part of the I-30 Planning and Environmental Linkages (PEL) project. Would an investment in commuter-oriented express transit service during the peak hours of travel reduce the demand on I-30 to lessen the need for adding roadway capacity? The transit benefits to I-30 were analyzed by answering the following two questions:

1. Using available Metroplan information on travel patterns, commuter patterns, and land use, what is the estimated mode shift under the most ideal reasonable transit scenario?
2. What mode shift is required, in terms of auto trips diverted to transit, to achieve a material positive effect on traffic volumes and volume/capacity relationship on I-30?

In addition to transit, transportation demand management (TDM) strategies can complement the transit strategy and generally improve the landscape of transportation in Central Arkansas. TDM strategies are most effective when multiple strategies are used to complement each other. TDM strategies will also be explored in this analysis.

Previous Public Transit Study
As part of the Central Arkansas Regional Transportation Study (CARTS) *Areawide Freeway Study, Phase I, 2003*, a transit study was conducted to evaluate the feasibility of light rail along four corridors in the Central Arkansas region: I-30 SW, I-40 NW, Route 67 NE and I-630 east. The study covered up to 25 miles from the central business district (CBD) and used Portland, Oregon as a basis for mode split. The study also based the evaluation on daily ridership projections. The study concluded that light rail transit in two of the four corridors would result in up to a three percent decrease in daily vehicular bridge crossings, which would not have a significant effect on the future bridge level of service (LOS) and operational characteristics. The Areawide Freeway Study was used in this analysis for informational and comparative purposes only. Comparison to this study can be found in the conclusion.

Methodology
The following section describes the methodology used in the I-30 PEL transit analysis. **Figure 1** provides a graphical representation of destinations, catchment areas, other origins, and screen lines. An express bus transit service is best suited for commuters who follow consistent work trip patterns. Therefore, while it is possible for transit users to have other trip purposes, this analysis will solely consider home-based-work (HBW) trips.

Destinations

For the purpose of this analysis, the "destination" is defined as the area where higher-density employment is likely to attract commuters using I-30. Four key work destinations were identified based on the 2040 Metroplan CARTS Model prediction for the CBD. They are:

A. Downtown Little Rock
B. Downtown North Little Rock
C. University of Arkansas for Medical Sciences Area
D. University of Arkansas at Little Rock campus

Origins

For the purpose of this analysis, the "origin" is defined as the area where a commuter lives. Ten primary origin areas were identified and divided into two categories: catchment areas and other origins.

Catchment Areas

In this analysis, the term "catchment area" defines an area with relatively high population density that can be served by a single park-and-ride lot. Catchment areas are conical in shape with a 3-5 mile radius. Commuters who live between the bus stop and CBD are likely to drive to their destination instead of taking the bus. Park-and-ride lots are most effective when located 10 to 20 miles from key destinations.

These catchment areas would be part of an express bus service network rather than a traditional route network which relies primarily on walk access. In the morning, the bus would stop at a limited number of locations, operate non-stop service to the CBD, and follow a route through the CBD to drop off commuters. The reverse would occur in the evening.

Key locations for catchment areas were identified using the CARTS Model, which divides the region into traffic analysis zones (TAZs). Clusters of TAZs with a population density of 3,000+ people per square mile were considered suitable locations.

Six suitable park-and-ride catchment areas were identified for this analysis:

- North of North Little Rock
    1. Cabot
    2. Jacksonville
    3. Maumelle
- South of Little Rock
    4. West side of Little Rock
    5. Bryant
    6. Benton

Other Origins

Several origins of interest exist within the 10-mile radius around the Little Rock CBD. Like the catchment areas, these regions have a population density of at least 3,000 people per square mile. However, unlike the catchment areas, their proximity to the destinations may make park-and-ride access less effective. These regions include:

1. Pulaski Tech South Campus
2. Shannon Hills
3. Mabelvale
4. North Little Rock just southwest of I-40/I-30 interchange extending up to the Sherwood area

These regions would likely be served by traditional transit routes instead of express services.

Origin/Destination Pairing

The fundamental data source for the analysis was Metroplan's CARTS model data for the year 2040. Metroplan developed 15 different future scenarios for travel between individual traffic analysis zones (TAZs). The future model scenario that was identified for this analysis was Scenario 12. This scenario represents increased transit land use, 6-lane I-30 Bridge, and a new Chester Street Bridge crossing the Arkansas River. This scenario was chosen as the most aggressive transit scenario to test the attractiveness of transit in the I-30 corridor.

The CARTS model included an origin/destination matrix for each TAZ in the metropolitan region. Each origin and destination cluster of TAZs was grouped together. The volume of HBW trips for each origin/destination pair was calculated as the sum of all trips from each group of origin TAZs to each group of destination TAZs. **Table 1** shows the daily volume from home to work. The study team assumed that weekday commuters will drive to work and then drive home from work. Therefore, it is assumed that all origin-destination trips will reverse in the evening. In other words, 1,715 commuters travel from 1 to A in the morning. In the evening, 1,715 commuters will travel from A to 1.

Table 1: Daily 2040 Volume Home to Work Trips

Daily Volume From Home to Work						
		Destination				
		A	B	C	D	Total
Origin	1	1,715	328	152	121	2,316
	2	1,472	297	120	93	1,983
	3	1,980	401	254	180	2,814
	4	3,008	148	656	384	4,197
	5	3,414	216	437	439	4,506
	6	3,434	175	426	372	4,406
	7	1,245	69	193	202	1,710
	8	546	30	65	73	715
	9	6,327	316	757	969	8,369
	10	8,121	1,894	506	335	10,856
	Tot	31,263	3,874	3,567	3,168	41,872

Source: Metroplan CARTS Model.
See Figure 1 for graphical representation of origins and destinations.

As previously stated, this analysis will only consider HBW trips as projected in the 2040 Metroplan CARTS model. Based on work trip distributions from other metropolitan areas, 50% of all HBW trips to the CBD occur during the AM peak hour, and 50% of all HBW trips from the CBD occur during the PM Peak hour. Therefore, the AM and PM peak hour matrices will be mirrored. **Table 2** shows peak hour HBW trips, which are 50% of the daily HBW trips.

Table 2: Peak Hour 2040 Volume Home to Work Trips

From Daily to Peak Hour Volume (50%)						
		Destination				
		A	B	C	D	Total
Origin	1	857	164	76	61	1,158
	2	736	149	60	47	991
	3	990	200	127	90	1,407
	4	1,504	74	328	192	2,098
	5	1,707	108	218	219	2,253
	6	1,717	87	213	186	2,203
	7	623	35	97	101	855
	8	273	15	33	36	357
	9	3,164	158	379	484	4,185
	10	4,061	947	253	168	5,428
	Tot	15,632	1,937	1,783	1,584	20,936

Source: Metroplan CARTS Model
See Figure 1 for graphical representation of origins and destinations.

Transit Service Concept for I-30

To estimate the number of commuters who might reasonably shift from auto to transit, it was necessary to conceptually define the transit system that would serve the origin areas previously identified. Given this concept, it would then be possible to estimate the percentage of diverted trips.

The Central Arkansas Transit Authority (CATA) currently operates local transit services throughout the residential areas of Central Arkansas, providing good coverage for a metropolitan area the size of Little Rock. CATA serves approximately 10,000 daily trips with a fleet of about 60 buses. CATA does not, however, operate many express routes dedicated to work trips from outlying residential areas to the CBD and other high density employment areas. CATA's operation is, however, comparable to other transit agencies in the Midwest. **Table 3** compares CATA with other transit agencies in the Midwest.

Table 3: Midwest Transit Agency Comparison

Metropolitan Area	Transit Agency	Bus Fleet	Weekday Ridership
Little Rock	**CATA**	**60 buses**	**9,980**
Oklahoma City	COTPA	69 buses	10,240
Tulsa	MTTA	79 buses	10,600
Des Moines	DART	113 buses	16,700
Omaha	Metro	142 buses	15,200
Kansas City	KCATA and JCT	318 buses	57,100

Source: 2012 National Transit Data Base, FTA

The proposed transit concept needed to divert auto trips to transit on I-30 in the 2040 No Action condition would have multiple express routes operating on I-30 and other parts of the freeway system. These routes would be based on park-and-ride lots in the origin areas, which would allow commuters the option to access express transit routes by driving to the park-and-ride lots. The express buses would then operate directly to the CBD or other destination areas, providing a transit trip similar to auto trips in terms of travel time and convenience. This type of express service has been shown to be effective in attracting commuter trips from lower density outlying residential areas. The frequency of service, or headways, would be 30 minutes or better. More frequent service would add transit capacity and convenience, and result in more transit riders.

Transit Mode Shift Estimation

Because Central Arkansas does not currently have this type of premium express service, Kansas City was selected as an analogy from which to "borrow" mode split data. Although a larger metropolitan area, Kansas City is a Midwestern city with demographics and travel patterns similar to Central Arkansas. Three Kansas City commuter corridors were selected as analogies to the I-30 corridor, all of which are 10 to 20 miles in length and connect with the Kansas City CBD. They are: I-35 Olathe, Kansas; I-70 Blue Springs, Missouri; and I-435/470 Lee's Summit, Missouri. These corridors have express transit service with large park-and-ride lots and service frequencies of 20 to 30 minutes. Data available from the transit agency and the 2000 Census CTTP was used to estimate the transit share of the CBD commuter market. Each of the three corridors has a mode split of approximately 10 percent transit during the peak hour. Based on this experience, a mode split of 10 percent was used as the base mode split assumption for the potential Central Arkansas express bus service.

To provide a range for the estimated potential mode shift, two service concepts were defined representing a reasonable range of service applications. The first, referred to as the “Baseline” concept, assumes seven express routes would operate with 30 minute frequency during the peak periods. The second concept, referred to as the “Enhanced” concept, assumes the seven routes would operate with more frequent service between 10 and 15 minutes.

Conceptual Ridership Estimates

Service frequency is one of the most important attributes commuters consider in making decisions regarding the use of transit, and increasing frequency is a proven way to increase transit usage. Transit researchers use service elasticity to predict the change in ridership likely to result from a change in service level. Research has determined a service elasticity of -0.4 for changes in headway. That is, a 40 percent increase in ridership can be expected given a 100 percent reduction in headway. With a change in headway from 30 minutes to 10 minutes (67 percent) an increase in ridership of 27 percent can be expected.

Table 4 shows the potential AM peak hour ridership for each O/D pair given a 30-minute headway.

Table 4: Potential Peak Hour Ridership: Baseline Service (30 Minute Service Frequency)

Potential Ridership: 30-minute Headway					
	A	B	C	D	Total
1	86	16	8	6	116
2	74	15	6	5	99
3	99	20	13	9	141
4	150	7	33	19	210
5	171	11	22	22	225
6	172	9	21	19	220
7	62	3	10	10	85
8	27	2	3	4	36
9	316	16	38	48	418
10	406	95	25	17	543
Tot	1,563	194	178	158	2,094

Source: HNTB
See Figure 1 for graphical representation of origins and destinations.

Enhanced Service Mode Shift Estimates

Table 5 shows the potential AM peak hour ridership for each O/D pair given more frequent headways of 10 to 15 minutes.

Table 5: Potential Peak Hour Ridership: Enhanced Service (10-15 Minute Service Frequency)

Peak Hour Transit: 10-Minute Headway						
		Destination				
		A	B	C	D	Total
Origin	1	109	21	10	8	147
	2	93	19	8	6	126
	3	125	25	16	11	178
	4	191	9	42	24	266
	5	216	14	28	28	285
	6	217	11	27	24	279
	7	79	4	12	13	108
	8	35	2	4	5	45
	9	401	20	48	61	530
	10	514	120	32	21	688
	Tot	1,980	245	226	201	2,652

Source: HNTB
See Figure 1 for graphical representation of origins and destinations.

Transit Bus-on-Shoulder Operation

Further enhancements such as transit priority measures would make the service even more attractive, and possibly attract a higher number of commuters than the baseline or enhanced service described above. Bus-on-shoulder operation, which allows buses to use the freeway shoulder to bypass congested traffic, is a proven approach to making express transit service more effective and attractive. Bus-on-shoulder operation offers many of the same benefits of rail transit, but is less costly to implement. This priority measure would allow buses to use the shoulder when general purpose lane speeds drop below approximately 35 miles per hour, and requires highway shoulders that are 10 to 11 feet wide. Bus-on-shoulder operations are proven to be safe, requiring driver training and discretion on the appropriate uses of the shoulder. Additionally, the speed differential between the freeway general purpose lanes and the bus-on-shoulder does not exceed 10 miles per hour. In Kansas City, a six percent ridership increase was noted in the first year of bus-on-shoulder implementation, and users experienced a 2-7 minute travel time savings, on average. Bus-on-shoulder is not a new concept for Midwestern cities. Other cities such as Minneapolis, MN and Chicago, IL utilize bus-on-shoulder as well. With proper implementation procedures, bus-on-shoulder can be an effective means of increasing ridership.

I-30 Impacts

Not all commuter travel between O/D pairs in this analysis would realistically use I-30 to get from their origin to their destination. To determine the actual vehicle reduction volume on I-30, three screens were used, as shown on **Figure 1**.

- Screen 1: South of the I-30/I-40 interchange (north end of corridor)
- Screen 2: I-30 Arkansas River Bridge (middle of corridor)
- Screen 3: North of the I-30/I-440/I-530 (south end of corridor)

By evaluating trip patterns and the roadway network, it was possible to determine the O/D pairs that would contribute commuter trips crossing each of the screen lines. In some cases, it was determined that no vehicles from an O/D pair would pass over a screen line. In other cases, it was determined that a portion of vehicles from the O/D pair would pass over a screen line. Results are shown in **Tables 6** and **7** in the "Total O/D Pair Trips" column. The 10 percent transit mode split factor was then applied to each of the O/D pair trip volumes to determine the potential diversion to transit. To this point, person trips have been used. To estimate the reduction in the number of auto trips, the transit trips were factored by the auto occupancy rate. The peak period auto occupancy for I-30 is estimated by Metroplan at 1.10. **Tables 6** and **7** show the results of the analysis. The AM/PM mainline volumes are taken from 24-hour traffic counts conducted in 2014 and grown at a 1% growth rate up to projected 2040 volumes.

Table 6: 2040 I-30 AM Peak Hour Work Trips and Transit Trips

Location on I-30	2040 AM Mainline Volume	Total O/D Pair Trips	Total Transit Trips		Total Auto Trips Diverted	
			Baseline Scenario (30 min headway)	Enhanced Service (10 min headway)	Baseline Scenario (30 min headway)	Enhanced Service (10 min headway)
Screen 1 - North Little Rock WB	7,545	6,450	640	820	580	750
Screen 1 - North Little Rock EB	4,427	No O/D Pair trips passing the screen in this direction				
Screen 2 - I-30 River Bridge WB	7,565	5,569	560	710	510	650
Screen 2 - I-30 River Bridge EB	4,915	403	40	50	40	50
Screen 3 - South of CBD WB	3,263	No O/D Pair trips passing the screen in this direction				
Screen 3 - South of CBD EB	5,255	4,893	490	620	450	560

Source: HNTB

Table 7: 2040 I-30 PM Peak Hour Work Trips and Transit Trips

Location on I-30	2040 PM Mainline Volume	Total O/D Pair Trips	Total Transit Trips		Total Auto Trips Diverted	
			Baseline Scenario (30 min headway)	Enhanced Service (10 min headway)	Baseline Scenario (30 min headway)	Enhanced Service (10 min headway)
Screen 1 - North Little Rock WB	5,602	No O/D Pair trips passing the screen in this direction				
Screen 1 - North Little Rock EB	6,563	6,450	640	820	580	750
Screen 2 - I-30 River Bridge WB	5,478	403	40	50	40	50
Screen 2 - I-30 River Bridge EB	6,914	5,569	560	710	510	650
Screen 3 - South of CBD WB	7,246	4,893	490	620	450	560
Screen 3 - South of CBD EB	3,006	No O/D Pair trips passing the screen in this direction				

Source: HNTB

As shown in **Tables 6 and 7,** the baseline express service can divert 450 to 580 autos over the different screen lines in the peak direction, which is a 6-9% decrease in autos. By reducing the headway from 30 minutes to 10 minutes, 560 to 750 autos can be diverted over the different screen lines in the AM and PM peak directions. That equates to an 8-11% decrease in total mainline auto volume across the three screen lines.

In terms of daily mode shift, the baseline service would provide a 1.33% reduction in vehicles, while the enhanced service would provide a 1.7% reduction in vehicles. While this value seems low in a daily perspective, the service focuses on the peak hours when congestion is most likely to occur. Therefore, the impacts are much larger during the peak hours as illustrated in the preceding paragraph.

Level of Service Impacts

The goal of the I-30 PEL is to achieve LOS D or E during the 2040 peak hour. The following analysis calculates the number of auto users in the I-30 corridor that would need to shift their mode to public transit during the peak hour in order to achieve LOS D or E.

Existing (2014) traffic data was gathered across the I-30 Bridge (screenline 2), which serves as a bottleneck for congestion in existing conditions. The 2040 volume was calculated using a high-level forecast growth rate of 1% per year. LOS thresholds were determined using 2010 Highway Capacity Software (HCS) assuming No Action on I-30, which would be 3 lanes in each direction. Vehicle volumes were then converted to person trips using a 1.10 persons/vehicle auto occupancy factor described above. **Table 8** shows the number of person trips that would need to be diverted in order to reach a level of service E and D for the peak direction. The "threshold" is the maximum number of vehicles per hour for the given level of service. The needed vehicle reduction is the difference between the 2040 volume and the threshold, and the needed person trip reduction is the needed vehicle reduction with the occupancy factor applied. Only the peak direction of travel, AM westbound/PM eastbound, was analyzed.

Table 8: 2040 I-30 Required Number of Diverted Person Trips in the Peak Direction of Travel at Arkansas River Bridge (6-Lane Facility)[1] to Achieve the Desired LOS

			LOS E			LOS D		
Peak Hour Volumes By Direction (Screenline 2)	**2014[2] Vo lume**	**2040 Volume**	**Threshold**	**Needed Vehicle Reduction**	**Needed Person Trip Reduction**	**Threshold**	**Needed Vehicle Reduction**	**Needed Person Trip Reduction**
AM WB	5,841	7,565	6,770	795	874	5,961	1,604	1,764
PM EB	5,338	6,914	6,633	281	309	5,840	1,074	1,181

Source: HNTB

[1] This analysis is a high level spot analysis at the Arkansas River Bridge and is not a system-wide analysis.
[1] A 0.075 k factor indicates that a higher percent of traffic is occurring outside of the traditional peak hour than normal conditions of 0.08 – 0.12
[2] The traffic volumes represent existing throughput and not demand.

As shown in the table, the AM peak hour would require a larger vehicle and person trip reduction to achieve a desired level of service than the PM peak hour. This is due to the fact that the measured traffic characteristics are different in the AM and PM peak hours, and also differ by direction.

To effectively improve the level of service from F to E with public transit alone, over 870 people (800 vehicles) would need to shift from a personal auto to transit during the morning peak hour in 2040. To improve the level of service from F to D, over 1,750 people (1,600 vehicles) would need to shift form a personal auto to transit during the morning peak hour in 2040.

Table 9 is a summary of the projected and required shift in autos on I-30. The projected auto trip diversions come from **Table 6** across screen line 2. The required auto trip diversions come from **Table 8** during the AM Peak because it shows the largest required vehicle reduction.

Table 9: 2040 I-30 No Action Comparison of Feasible and Required Mode Shifts

Feasible Auto Trips (Screenline 2)		**Required Mode Shift to Achieve Desired LOS**			
		LOS E	**Deficit**	**LOS D**	**Deficit**
Baseline (30 min. headways)	510	795	**-285**	1,604	**-1,094**
Enhanced (10 - 15 min. headways)	650		**-145**		**-954**

Source: HNTB

As the table shows, a minimum of 795 vehicles would need to be diverted in 2040 to improve to LOS E. However, the maximum feasible number of vehicles that can be diverted is 650, assuming route headways of 10 minutes. Therefore, even under the best case transit-only scenario, there is an overflow of nearly 150 vehicles during the peak hour. This does not take into account other TDM strategies that can be used to complement the transit system. While the proposed express service cannot feasibly eliminate the need for capacity improvements on I-30, it can still help to reduce the magnitude of said improvements.

Transit System Concept – System Elements and Costs

This section describes the transit system that could achieve the mode shift and trip diversion described in the previous sections. Although the transit system description is at a very high conceptual level, it is sufficiently developed to prepare an order-of-magnitude estimate of capital and operating costs to evaluate the feasibility of the approach. Both the Baseline Transit Option (30 minute headways) and the Enhanced Transit Service Option (10 minute headways) are described.

The transit system would be comprised of multiple express routes using standard transit buses similar to those currently operated by CATA. A key component of the transit system is a series of park-and-ride lots located in the origin areas. The vast majority of transit commuters from suburban areas use auto access due to the configuration of the transit service and the convenience. The ability of transit to provide travel times similar to auto times is critical to attracting suburban commuters. Thus, express service using the freeway system with limited stops is a requirement.

Transit Service Plan Development

Table 10 shows the estimated ridership over screen 2 for seven hypothetical express bus transit routes that would use I-30 to link the defined origin zones with central employment areas in Central Arkansas. This portion of the analysis considers the cost to implement a transit system that will reduce traffic on I-30. Therefore, the ridership shown below is the number of passengers passing over screen 2. Since the O/D matrix used for this high level analysis is mirrored between the AM and PM peaks, the following ridership applies to either the AM or the PM peak. It is assumed that all AM passengers travel from home to work and all PM passengers travel from work to home. **Attachment 1** shows the defined origin and destination zones.

Table 10: Estimated Ridership by Origin Zone – Daily One-way Person Trips

Origin Zone	Baseline	Enhanced	Route
Area 1	116	147	1
Area 2	99	126	2
Area 3	99	125	3
Area 4	0	0	
Area 5	182	230	57
Area 6	180	229	6
Area 7	66	83	57
Area 8	29	37	89
Area 9	332	421	89
Area 10	543	688	10
Totals	1,645	2,084	

Source: HNTB

Note that trips to and from area 4 did not have an impact on I-30. Therefore, it was not considered in the cost analysis.

Tables 11a and **11b** show elements of the service plan for these routes. It was necessary to create a conceptual service plan for the basis of estimating capital and operating costs.

Table 11a: Service Plan Elements and Required Buses – Baseline Scenario

Routes	1-way Distance (miles)	Average Speed (MPH)	Round Trip Time (minutes)	Headway (minutes)	Trips Per Peak Period	Buses
1	20	20	125	30	6	4.2
2	16	20	101	30	6	3.4
3	13	20	83	30	6	2.8
57	15	17	111	20	9	5.5
6	20	20	125	20	9	6.3
89	12	17	90	15	12	6.0
10	10	15	85	10	18	8.5
Total						37

Source: HNTB

Table 11b: Service Plan Elements and Required Buses – Enhanced Scenario

Routes	1-way Distance (miles)	Average Speed (MPH)	Round Trip Time (minutes)	Headway (minutes)	Trips Per Peak Period	Buses
1	20	20	125	15	12	8.3
2	16	20	101	15	12	6.7
3	13	20	83	15	12	5.5
57	15	17	111	15	12	7.4
6	20	20	125	15	12	8.3
89	12	17	90	10	18	9.0
10	10	15	85	10	18	8.5
Total						54

Source: HNTB

Capital Cost Estimation

Capital costs were estimated for both scenarios for three elements: buses, park and ride lots and maintenance and operating facilities. CATA's current fixed bus fleet is about 60 vehicles. It was assumed that a substantial increase in fleet size would require a new facility or a major expansion of the existing facility. Capital costs were based on the following assumptions:

- All costs are in 2014 dollars.
- Buses - $450,000 per unit with 20 percent spare vehicles.
- Park and ride lots – each of the seven routes would have at least one lot, sized based on the estimated ridership. Costs were based on a unit cost of $10,000 per space to cover items including passenger amenities, landscaping, lighting, drainage and property acquisition, as well as constructing the lot itself.
- Facility costs were estimated as a range from $7 million to $13 million.

Tables 12a and **12b** show the capital cost estimates.

Table 12a: Capital Cost Estimates - Baseline Scenario

Routes	Bus cost (inc. spares)	Park & Ride Spaces	P&R Lot Cost	Facility	Total
1	$2,250,000	127	$1,273,656		
2	$1,818,000	109	$1,090,555		
3	$1,494,000	109	$1,088,848		
57	$2,993,824	272	$2,719,571		
6	$3,375,000	198	$1,984,776		
89	$3,229,412	397	$1,985,412		
10	$4,590,000	299	$2,985,451		
Total	$19,750,235	1,511	$13,128,268	$7,000,000	$39,880,000

Source: HNTB

Table 12b: Capital Cost Estimates - Enhanced Scenario

Routes	Bus cost (inc. spares)	Park & Ride Spaces	P&R Lot Cost	Facility	Total
1	$4,500,000	161	$1,613,298		
2	$3,636,000	138	$1,381,369		
3	$2,988,000	138	$1,379,207		
57	$3,991,765	344	$3,444,790		
6	$4,500,000	251	$2,514,049		
89	$4,844,118	503	$2,514,855		
10	$4,590,000	378	$3,781,572		
Total	$29,049,882	1,914	$16,629,140	$13,000,000	$58,681,000

Source: HNTB

Operating Cost Estimation

Operating costs were estimated by applying an hourly unit cost to estimated revenue hours taken from the conceptual service plans. The unit cost was taken from CATA's 2012 National Transit Database (NTD) submittal, and escalated by 3 percent per year to 2014. Fully allocated costs were used, which is appropriate for this magnitude of service increase.

Tables 13a and **13b** show the estimated annual operating costs.

Table 13a: Operating Cost Estimates - Baseline Scenario

Routes	Revenue Hours	Operating Cost	Passenger Revenue	Net Cost
1	8,925	$741,000	$118,000	$623,000
2	7,701	$639,000	$101,000	$538,000
3	6,783	$563,000	$101,000	$462,000
57	11,033	$916,000	$252,000	$664,000
6	12,113	$1,005,000	$184,000	$821,000
89	11,700	$971,000	$368,000	$603,000
10	15,555	$1,291,000	$554,000	$737,000
Total	73,809	$6,126,000	$1,678,000	$4,448,000

Source: HNTB

Table 13b: Operating Cost Estimates - Enhanced Scenario

Routes	Revenue Hours	Operating Cost	Passenger Revenue	Net Cost
1	15,300	$1,270,000	$150,000	$1,120,000
2	12,852	$1,067,000	$128,000	$939,000
3	11,016	$914,000	$128,000	$786,000
57	13,860	$1,150,000	$319,000	$831,000
6	15,300	$1,270,000	$233,000	$1,037,000
89	16,275	$1,351,000	$466,000	$885,000
10	15,555	$1,291,000	$701,000	$590,000
Total	100,158	$8,313,000	$2,125,000	$6,188,000

Source: HNTB

Cost Summary

Table 14 shows the capital and operating costs (in millions) for both scenarios.

Table 14: Cost Summary

Scenario	Capital Cost	Annual Operating Cost
Baseline Scenario	$39.9	$4.4
Enhanced Scenario	$58.7	$6.2

Source: HNTB

Transportation Demand Management (TDM)

There are a number of transportation demand management (TDM) strategies that can be utilized to complement the transit system and generally improve the landscape of transportation in Central Arkansas. TDM strategies are most effective when multiple strategies are used to complement each other. For instance: enhancing transit services and improving sidewalks from bus stops to the final destination. A comprehensive assessment of the benefits of Transportation Demand Management is discussed in a separate report.

Comparison to Areawide Freeway Study (2003)

The Central Arkansas Regional Transportation Study (CARTS) Areawide Freeway Study, Phase I, 2003 included a transit study to evaluate the feasibility of light rail along four corridors in the Central Arkansas region: I-30 SW, I-40 NW, Route 67 NE and I-630 east. In comparison, this transit analysis evaluates the feasibility of a limited express commuter bus service in the 2040 No Action condition in order to determine possible benefits to the I-30 PEL study area.

The Areawide Freeway Study covered up to 25 miles from the central business district (CBD) and used Portland, Oregon as a basis for mode split, while this transit analysis investigates commuter patterns up to approximately 20 miles from the Little Rock CBD and uses three comparable bus routes in the Kansas City area as a basis for mode split. Conclusions for the Areawide Freeway Study were based on daily ridership projections, and concluded that light rail transit in two of the four corridors would result in up to a 3% decrease in daily vehicular bridge crossings, which would not have a significant effect on the future bridge level of service (LOS) and operational characteristics. Comparatively, this analysis evaluated the AM and PM peak hours transit benefits to the I-30 PEL Study area. Peak hour mode shift is thought to be more relevant when considering the potential effect that transit can have on I-30 capacity than the daily mode shift provided in the 2003 study.

Table 15 shows the comparison between the results of the Areawide Freeway Study (2003) and I-30 PEL transit analysis.

Table 15: Mode Shift Comparisons

	Areawide Freeway Study (2003)	I-30 PEL	
	Proposed Condition	Baseline Service	Enhanced Service
Peak Hour Mode Shift	--	6-9%	8-11%
Daily Mode Shift	up to 3%	1.33%	1.70%

This study predicts approximately half the daily mode shift that the Areawide Freeway Study predicts. However, the peak hour mode shift illustrates the potential usefulness of a commuter bus system.

Conclusions

Transit in the Central Arkansas I-30 corridor was analyzed at a high-level as part of the CA0602 I-30 Planning and Environmental Linkages (PEL) project. The transit analysis answered the following questions.

1. **Using available Metroplan information on travel patterns, commuter patterns, and land use, what is the estimated mode shift under the most ideal reasonable transit scenario?**
   The transit analysis concluded that the baseline express service, with a 30 minute headway, can divert 450 to 580 autos in the peak direction, which represents a 6% - 9% decrease in autos on I-30. By increasing transit service frequency from 30 minutes to 10 minutes, 560 to 760 autos can be diverted in the peak directions. That equates to an 8% - 11% decrease in total mainline auto volume across the three screen lines.

2. **What mode shift is required, in terms of auto trips diverted to transit, to achieve a material positive effect on traffic volumes and volume/capacity relationship on I-30?**
   The transit analysis concluded that a minimum of 795 vehicles passing over screenline 2 (I-30 Arkansas River Bridge) would need to be diverted from auto to transit on I-30 in 2040 to improve from LOS F to LOS E with the existing 6-lane facility. However, the maximum feasible number of vehicles that can be diverted over screenline 2 is 650, assuming route headways of 10 minutes. Therefore, even under the best case transit-only scenario, there is a deficit of nearly 150 vehicles during the 2040 No Action peak hour to achieve LOS E. Bus on shoulder does provide an additional 6 percent ridership increase over the baseline condition based on empirical Kansas City data. Other communities where bus on shoulder exists may have an even greater ridership increase. **Table 16** summarizes these results.

Table 16: 2040 No Action (6-lane I-30) Comparison of Feasible and Required Mode Shifts

Feasible Auto Trips (Screenline 2)		**Required Mode Shift to Achieve Desired LOS**			
		LOS E	**Deficit**	**LOS D**	**Deficit**
Baseline (30 min. headways)	510	795	**-285**	1,604	**-1,094**
Enhanced (10 - 15 min. headways)	650		**-145**		**-954**

Source: HNTB

The transit enhancements of this type have both capital and operating cost components. A key element of the transit system is a series of park-and-ride lots. **Table 17** shows the estimated capital and operating costs for new buses, park-and-ride lots, and facilities.

Table 17: Transit System Costs (Millions of 2014 Dollars)[1]

Scenario	Capital Cost	Annual Operating Cost
Baseline Scenario	$39.9	$4.4
Enhanced Scenario	$58.7	$6.2

Source: HNTB

[1] Does not include Bus on Shoulder improvements.

While neither of the proposed express transit systems alone can eliminate the need for I-30 infrastructure improvements, transit enhancements can reduce the magnitude of improvements needed. Other transit enhancements such as Bus on Shoulder or Transportation Demand Management strategies can also be used to complement the transit system and the overall I-30 solution.

Appendix 7: Traffic Forecast Tables

A summary of the calculated growth rates and projected volumes from all sources are shown in **Tables 1-39**. When calculating the average, engineering judgment was used to determine which volumes were applicable. An average AGR was determined based on the various sources. Where a negative AGR occurred, the value was adjusted to zero in the average calculation. Where a higher than normal AGR was shown, the value was adjusted to the County AGR. (Note – The values that were adjusted used are highlighted in yellow.)

Table 1: Summary of ADT and Growth Rates – Hwy. 67 at McCain Blvd. - Main Lane

Highway 67 Interchange at McCain Boulevard - Main Lane						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
Highway 67 - North of McCain Boulevard						
2013	72,000					
AGR (%)	0.15	0.51	2.30	-	0.99	1.00
2021	67,000	75,000	86,500	-	78,000	78,000
2041	69,000	83,000	136,000	-	95,000	95,000
Highway 67 - South of McCain Boulevard						
2013	83,000					
AGR (%)	0.30	0.95	2.30	-	1.18	1.20
2021	82,269	89,500	99,500	-	91,000	91,500
2041	95,639	108,000	157,000	-	115,000	116,000

[1]Based on AHTD Historical AADT

Table 2: Summary of ADT and Growth Rates – Hwy. 67 at McCain Blvd. – Ramps

Highway 67 Interchange at McCain Boulevard - Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
Highway 67 - NB On Ramp from McCain Boulevard						
2013	10,000					
AGR (%)	0.63	0.34	2.30	-	1.09	1.10
2021	10,500	10,500	12,000	-	11,000	11,000
2041	12,000	11,000	19,000	-	13,500	13,500
Highway 67 - NB Off Ramp to McCain EB						
2013	2,000					
AGR (%)	n/a	-18.54	2.30	-	0.77	0.75
2021	-1,200	400	2,400	-	2,100	2,100
2041	-10,500	10	3,800	-	2,500	2,500
Highway 67 - NB Off Ramp to Landers Road						
2013	4,200					
AGR (%)	-6.65	-2.27	2.30	-	0.77	0.75
2021	3,200	3,500	5,000	-	4,500	4,500
2041	800	2,200	7,900	-	5,200	5,200
Highway 67 - NB Off Ramp to McCain						
2013	1,000					
AGR (%)	1.77	2.08	2.30	-	2.05	2.05
2021	1,200	1,200	1,200	-	1,200	1,200
2041	1,700	1,800	1,900	-	1,800	1,800
Highway 67 - SB On Ramp from McCain						
2013	9,000					
AGR (%)	-2.78	-2.13	2.30	-	0.77	0.75
2021	7,400	7,600	11,000	-	9,600	9,600
2041	4,200	4,900	17,000	-	11,000	11,000
Highway 67 - SB Off Ramp to McCain						
2013	13,000					
AGR (%)	3.32	11.02	2.30	-	2.64	2.70
2021	19,000	30,000	15,500	-	16,000	16,000
2041	36,500	243,000	24,500	-	27,000	27,500
US 167 Access Road						
2013	5,000					
AGR (%)	1.81	2.08	2.30	-	2.07	2.10
2021	6,000	5,900	6,000	-	5,900	5,900
2041	8,600	8,900	9,500	-	8,900	8,900

[1]Based on AHTD Historical AADT

Note – only four years of historical data was available

Table 3: Summary of ADT and Growth Rates – Hwy. 67 at McCain Blvd. – Cross Street

Highway 67 Interchange at McCain Boulevard - Cross Street						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
McCain Boulevard - West of Highway 67						
2013	29,000					
AGR (%)	1.08	1.55	2.30	-	1.64	1.65
2021	37,000	33,000	35,000	-	33,000	33,000
2041	46,000	44,500	55,000	-	46,000	46,000
McCain Boulevard - West of Highway 67						
2013	11,000					
AGR (%)	-2.92	-2.55	2.30	-	0.77	0.75
2021	10,000	8,900	13,000	-	11,500	11,500
2041	5,600	5,300	21,000	-	13,500	13,500

[1]Based on AHTD Historical AADT

Table 4: Summary of ADT and Growth Rates – I-40 at Hwy. 67 – Main Lane

I-40 Interchange at Highway 67 - Main Lane						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-40 - West of Highway 67						
2013	110,000					
AGR (%)	0.70	1.17	2.30	0.61	1.20	1.20
2021	120,000	121,000	132,000	116,000	121,000	121,000
2041	138,000	152,000	208,000	131,000	153,000	154,000
I-40 - East of Highway 67						
2013	45,000					
AGR (%)	-2.76	-1.21	2.30	-	0.77	0.75
2021	38,500	41,000	54,000	-	48,000	48,000
2041	22,000	32,000	85,000	-	55,500	55,500

[1]Based on AHTD Historical AADT

Table 5: Summary of ADT and Growth Rates – I-40 at Hwy. 67 – Ramps

I-40 Interchange at Highway 67 - Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-40 - WB On Ramp from Highway 67						
2013	36,000					
AGR (%)	0.00	0.00	2.30	0.49	0.70	0.70
2021	34,500	36,000	43,000	37,500	38,000	38,000
2041	34,500	36,000	68,000	41,500	43,500	44,000
I-40 - WB Off Ramp to Highway 67						
2013	3,200					
AGR (%)	-5.59	-2.94	2.30	-	0.77	0.75
2021	2,300	2,500	3,800	-	3,400	3,400
2041	750	1,400	6,000	-	4,000	3,900
I-40 - EB On Ramp from Highway 67						
2013	4,800					
AGR (%)	0.21	0.00	2.30	0.49	0.75	0.75
2021	4,600	4,800	5,800	5,000	5,100	5,100
2041	4,800	4,800	9,100	5,500	5,900	5,900
I-40 - EB Off Ramp to Highway 67						
2013	37,000					
AGR (%)	0.51	0.00	2.30	0.47	0.82	0.80
2021	37,500	37,000	44,500	38,500	39,500	39,500
2041	41,500	37,000	70,000	42,000	46,500	46,000

[1]Based on AHTD Historical AADT

Table 6: Summary of ADT and Growth Rates – I-40 at North Hills Blvd. - Main Lane

I-40 Interchange at North Hills - Main Lane						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-40 - West of North Hills						
2013	119,000					
AGR (%)	1.05	1.14	2.30	0.65	1.29	1.30
2021	137,000	130,000	143,000	125,000	132,000	132,000
2041	169,000	164,000	225,000	143,000	170,000	171,000
I-40 - East of North Hills						
2013	110,000					
AGR (%)	1.40	1.17	2.30	0.61	1.37	1.40
2021	138,000	121,000	132,000	116,000	123,000	123,000
2041	182,000	152,000	208,000	131,000	161,000	162,000

[1]Based on AHTD Historical AADT

Table 7: Summary of ADT and Growth Rates – I-40 at North Hills Blvd. - Ramps

I-40 Interchange at North Hills - Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-40 - WB On Ramp from North Hills						
2013	5,600					
AGR (%)	3.42	9.20	2.30	2.13	2.26	2.25
2021	9,000	11,500	6,700	6,600	6,700	6,700
2041	17,500	66,000	10,500	10,000	10,500	10,500
I-40 - EB Off Ramp to North Hills						
2013	5,400					
AGR (%)	n/a	-4.50	2.30	0.99	0.82	0.80
2021	3,300	3,700	6,500	5,800	5,800	5,800
2041	-2,100	1,500	10,000	7,100	6,800	6,700

[1]Based on AHTD Historical AADT

Note – only four years of historical data was available

Table 8: Summary of ADT and Growth Rates – I-40 at North Hills Blvd. - Cross Street

I-40 Interchange at North Hills - Cross Street						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
North Hills - West of I-40						
2013	17,000					
AGR (%)	0.84	1.08	2.30	0.70	1.23	1.25
2021	20,500	18,500	20,500	18,000	18,500	19,000
2041	24,000	23,000	32,000	20,500	24,000	24,000
North Hills - West of I-40						
2013	6,300					
AGR (%)	-0.13	-0.26	2.30	0.23	0.63	0.65
2021	6,500	6,200	7,600	6,400	6,600	6,600
2041	6,300	5,900	12,000	6,700	7,500	7,600

[1]Based on AHTD Historical AADT

Table 9: Summary of ADT and Growth Rates –North Terminal - Main Lane

North Terminal - Main Lane						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-40 - West of JFK						
2013	90,000					
AGR (%)	1.40	1.74	2.30	-	1.81	1.80
2021	101,000	103,000	108,000	-	104,000	104,000
2041	134,000	146,000	170,000	-	149,000	148,000
I-40 - West of I-30						
2013	84,000					
AGR (%)	0.90	1.61	2.30	-	1.60	1.60
2021	90,500	95,500	101,000	-	95,500	95,500
2041	108,000	131,000	159,000	-	131,000	131,000
I-40 - East of I-30						
2013	119,000					
AGR (%)	1.05	1.14	2.30	0.65	1.29	1.30
2021	137,000	130,000	143,000	125,000	132,000	132,000
2041	169,000	164,000	225,000	143,000	170,000	171,000

[1]Based on AHTD Historical AADT

Table 10: Summary of ADT and Growth Rates –North Terminal – EB Ramps

North Terminal - Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-40 - EB On Ramp from I-30						
2013	33,000					
AGR (%)	n/a	-4.59	2.30	0.89	0.80	0.80
2021	20,000	22,500	39,500	35,500	35,000	35,000
2041	-10,000	8,800	62,500	42,500	41,000	41,000
I-40 - EB Off Ramp to I-30						
2013	22,000					
AGR (%)	-6.07	-2.86	2.30	-	0.77	0.75
2021	17,000	17,500	26,500	-	23,500	23,500
2041	4,800	9,800	41,500	-	27,000	27,000
I-40 - EB On Ramp from JFK						
2013	5,900					
AGR (%)	n/a	-5.09	2.30	-	0.77	0.75
2021	2,800	3,900	7,100	-	6,300	6,300
2041	-4,400	1,400	11,000	-	7,300	7,300
I-40 - EB Off Ramp to JFK						
2013	3,400					
AGR (%)	-2.01	-1.89	2.30	-	0.77	0.75
2021	3,000	2,900	4,100	-	3,600	3,600
2041	2,000	2,000	6,400	-	4,200	4,200

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 11: Summary of ADT and Growth Rates – North Terminal – WB Ramps

North Terminal - WB Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-40 - WB On Ramp from I-30						
2013	16,000					
AGR (%)	-5.19	-2.00	2.30	-	0.77	0.75
2021	12,000	13,500	19,000	-	17,000	17,000
2041	4,200	9,100	30,000	-	20,000	19,500
I-40 - WB Off Ramp to I-30						
2013	35,000					
AGR (%)	n/a	-3.54	2.30	0.94	0.81	0.80
2021	22,000	26,000	42,000	36,500	37,500	37,500
2041	-5,800	12,500	66,000	44,000	44,000	43,500
I-40 - WB On Ramp from JFK						
2013	3,200					
AGR (%)	-1.16	-1.02	2.30	-	0.77	0.75
2021	2,900	2,900	3,800	-	3,400	3,400
2041	2,300	2,400	6,000	-	4,000	3,900
I-40 - WB On Ramp from JFK						
2013	860					
AGR (%)	-1.86	-2.22	2.30	-	0.77	0.75
2021	750	700	1,000	-	900	900
2041	550	450	1,600	-	1,100	1,100
I-40 - WB Off Ramp to JFK						
2013	3,500					
AGR (%)	n/a	-3.54	2.30	-	0.77	0.75
2021	2,400	2,600	4,200	-	3,700	3,700
2041	-200	1,300	6,600	-	4,300	4,300
I-40 - WB Off Ramp West of JFK Ramp						
2013	23,000					
AGR (%)	n/a	-10.94	2.30	-	0.77	1.15
2021	-650	9,100	27,500	-	24,500	25,000
2041	-60,500	900	43,500	-	28,500	31,500
I-40 - WB Off Ramp East of JFK Ramp						
2013	28,000					
AGR (%)	1.38	1.84	2.30	-	1.84	1.85
2021	32,000	32,500	33,500	-	32,500	32,500
2041	42,000	46,500	53,000	-	46,500	47,000

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 12: Summary of ADT and Growth Rates – North Terminal – NB Ramps

North Terminal – NB Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - NB Off Ramp to I-40						
2013	23,000					
AGR (%)	2.52	4.55	2.30	-	2.37	2.40
2021	31,000	33,000	27,500	-	27,500	28,000
2041	51,000	80,000	43,500	-	44,500	44,500
I-30 - NB Off Ramp to JFK						
2013	6,900					
AGR (%)	n/a	-6.72	2.30	-	0.77	0.75
2021	2,200	4,000	8,300	-	7,300	7,300
2041	-9,200	1,000	13,000	-	8,500	8,500

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 13: Summary of ADT and Growth Rates – North Terminal – Cross Street

North Terminal - Cross Street						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
JFK - North of I-40						
2013	34,000					
AGR (%)	0.36	1.08	2.30	-	1.25	1.25
2021	34,000	37,000	41,000	-	37,500	37,500
2041	36,500	46,000	64,500	-	48,000	48,000
JFK - North of I-40						
2013	13,000					
AGR (%)	0.77	0.45	2.30	-	1.17	1.15
2021	15,000	13,500	15,500	-	14,500	14,000
2041	17,500	14,500	24,500	-	18,000	18,000

[1]Based on AHTD Historical AADT

Table 14: Summary of ADT and Growth Rates – I-30 at Curtis Sykes Dr. – Main Lane

I-30 Interchange at Curtis Sykes Boulevard - Main Lane						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - South of Curtis Sykes Boulevard						
2013	116,000					
AGR (%)	0.57	1.00	2.30	-	1.29	1.30
2021	122,000	126,000	139,000	-	129,000	129,000
2041	137,000	153,000	219,000	-	166,000	167,000
I-30 - North of Curtis Sykes Boulevard						
2013	115,000					
AGR (%)	0.83	1.07	2.30	0.94	1.28	1.30
2021	126,000	125,000	138,000	124,000	127,000	128,000
2041	148,000	155,000	217,000	149,000	164,000	165,000

[1]Based on AHTD Historical AADT

Table 15: Summary of ADT and Growth Rates – I-30 at Curtis Sykes Dr. – Ramps

I-30 Interchange at Curtis Sykes Boulevard - Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - SB On Ramp from Curtis Sykes Boulevard						
2013	3,300					
AGR (%)	n/a	-4.59	2.30	-	0.77	0.75
2021	2,000	2,300	4,000	-	3,500	3,500
2041	-1,200	900	6,200	-	4,100	4,100
I-30 - SB Off Ramp to Curtis Sykes Boulevard						
2013	2,400					
AGR (%)	-0.46	-1.35	2.30	0.30	0.65	0.65
2021	2,300	2,200	2,900	2,500	2,500	2,500
2041	2,100	1,600	4,500	2,600	2,900	2,900
I-30 - NB On Ramp from Curtis Sykes Boulevard						
2013	3,000					
AGR (%)	0.87	1.14	2.30	0.34	1.16	1.15
2021	3,200	3,300	3,600	3,100	3,300	3,300
2041	3,800	4,100	5,700	3,300	4,100	4,100
I-30 - NB Off Ramp to Curtis Sykes Boulevard						
2013	2,500					
AGR (%)	-20.19	-3.71	2.30	0.60	0.72	0.70
2021	1,800	1,800	3,000	2,600	2,600	2,600
2041	20	850	4,700	3,000	3,100	3,000

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 16: Summary of ADT and Growth Rates – I-30 at Curtis Sykes Dr. - Cross Street

I-30 Interchange at Curtis Sykes Boulevard - Cross Street						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
Curtis Sykes Boulevard - West of I-30						
2013	4,400					
AGR (%)	0.94	1.16	2.30	-	1.47	1.45
2021	4,900	4,800	5,300	-	4,900	4,900
2041	5,900	6,100	8,300	-	6,600	6,600
Curtis Sykes Boulevard - East of I-30						
2013	2,000					
AGR (%)	0.64	4.16	2.30	-	1.75	1.75
2021	2,500	2,800	2,400	-	2,300	2,300
2041	2,800	6,300	3,800	-	3,200	3,300

[1]Based on AHTD Historical AADT

Note – only two years of historical data was available West of I-30

Table 17: Summary of ADT and Growth Rates – I-30 at Bishop Lindsey Ave./Broadway St. – Main Lane

I-30 Interchange at Bishop Lindsey Avenue/Broadway Street - Main Lane						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - South of Broadway Street						
2013	119,000					
AGR (%)	0.63	0.75	2.30	0.87	1.14	1.15
2021	129,000	126,000	143,000	128,000	130,000	130,000
2041	146,000	147,000	225,000	152,000	163,000	164,000
I-30 -Between Broadway Street and Bishop Lindsey Avenue						
2013	102,000					
AGR (%)	0.63	1.02	2.30	0.93	1.22	1.20
2021	112,000	111,000	122,000	110,000	112,000	112,000
2041	127,000	135,000	193,000	132,000	143,000	142,000
I-30 - North of Bishop Lindsey Avenue						
2013	116,000					
AGR (%)	0.57	1.00	2.30	-	1.29	1.30
2021	122,000	126,000	139,000	-	129,000	129,000
2041	137,000	153,000	219,000	-	166,000	167,000

[1]Based on AHTD Historical AADT

Table 18: Summary of ADT and Growth Rates – I-30 at Bishop Lindsey Ave./Broadway St. – Ramps

I-30 Interchange at Bishop Lindsey Avenue/Broadway Street - Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - SB On Ramp from Broadway Street						
2013	9,400					
AGR (%)	0.11	0.00	2.30	-	0.80	0.80
2021	9,100	9,400	11,500	-	10,000	10,000
2041	9,300	9,400	18,000	-	12,000	11,500
I-30 - SB Off Ramp to Bishop Lindsey Avenue						
2013	6,800					
AGR (%)	0.53	1.00	2.30	0.44	1.07	1.10
2021	7,200	7,400	8,200	8,200	7,400	7,400
2041	8,000	9,000	13,000	13,000	9,100	9,200
I-30 - NB On Ramp from Bishop Lindsey Avenue						
2013	7,500					
AGR (%)	2.18	4.35	2.30	-	2.26	2.30
2021	9,600	10,500	9,000	-	9,000	9,000
2041	15,000	24,500	14,000	-	14,000	14,000
I-30 - NB Off Ramp to Broadway Street						
2013	8,100					
AGR (%)	n/a	-5.18	2.30	0.18	0.62	0.60
2021	5,100	5,300	9,700	9,700	8,500	8,500
2041	-2,500	1,800	15,500	15,500	9,600	9,600

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 19: Summary of ADT and Growth Rates – I-30 at Bishop Lindsey Ave./Broadway St. – Cross Streets

I-30 Interchange at Bishop Lindsey Avenue/Broadway Street - Cross Streets						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
Bishop Lindsey Avenue - West of I-30						
2013	2,600					
AGR (%)	n/a	-8.42	2.30	0.17	0.62	0.60
2021	700	1,300	3,100	3,100	2,700	2,700
2041	-4,300	200	4,900	4,900	3,100	3,100
Bishop Lindsey Avenue - East of I-30						
2013	3,200					
AGR (%)	1.23	1.60	2.30	0.47	1.40	1.40
2021	3,600	3,600	3,800	3,800	3,600	3,600
2041	4,600	5,000	6,000	6,000	4,700	4,700
Broadway Street - West of I-30						
2013	12,000					
AGR (%)	-0.05	0.51	2.30	0.35	0.79	0.80
2021	11,000	12,500	14,500	12,500	13,000	13,000
2041	10,500	14,000	22,500	13,000	15,000	15,000
Broadway Street - East of I-30						
2013	21,000					
AGR (%)	0.06	-0.50	2.30	0.37	0.68	0.70
2021	20,000	20,000	25,000	21,500	22,000	22,000
2041	20,000	18,000	39,500	23,500	25,500	25,500
Riverfront Drive - West of I-30						
2013	4,300					
AGR (%)	0.72	3.29	2.30	-	1.77	1.80
2021	5,300	5,600	5,600	-	4,900	5,000
2041	6,100	10,500	10,500	-	7,000	7,100
Riverfront Drive - West of I-30						
2013	2,700					
AGR (%)	-1.57	-0.98	2.30	-	0.77	0.75
2021	2,900	2,500	2,500	-	2,900	2,900
2041	2,100	2,000	2,000	-	3,300	3,300

[1]Based on AHTD Historical AADT

Note – Only three years of data at Bishop Lindsey Avenue

Table 20: Summary of ADT and Growth Rates – I-30 at Cantrell Rd. - Main Lane

I-30 Interchange at Markham Street - Main Lane						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - South of 2nd Street						
2013	114,000					
AGR (%)	0.79	0.73	2.30	0.89	1.18	1.20
2021	127,000	121,000	137,000	122,000	125,000	125,000
2041	148,000	140,000	215,000	146,000	158,000	159,000
I-30 - North of 2nd Street						
2013	119,000					
AGR (%)	0.63	0.75	2.30	0.87	1.14	1.15
2021	129,000	126,000	143,000	128,000	130,000	130,000
2041	146,000	147,000	225,000	152,000	163,000	164,000

[1]Based on AHTD Historical AADT

Table 21: Summary of ADT and Growth Rates – I-30 at Cantrell Rd. – NB Ramps

I-30 Interchange at Markham Street - NB Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - NB On Ramp						
2013	8,000					
AGR (%)	n/a	-5.23	2.30	-	0.77	0.75
2021	4,100	5,200	9,600	-	8,500	8,500
2041	-5,500	1,800	15,000	-	9,900	9,900
I-30 - NB On Ramp Split from East Loop						
2013	6,900					
AGR (%)	-3.76	-1.41	2.30	-	0.77	0.75
2021	5,600	6,200	8,300	-	7,300	7,300
2041	2,600	4,600	13,000	-	8,500	8,500
I-30 - NB On Ramp Split from Mahlon Martin						
2013	1,100					
AGR (%)	n/a	-13.51	2.30	-	0.77	0.75
2021	-150	350	1,300	-	1,200	1,200
2041	-3,800	20	2,100	-	1,400	1,400
I-30 - NB On Ramp Split from I-30 Frontage Road						
2013	480					
AGR (%)	0.20	0.00	2.30	-	0.83	0.85
2021	500	500	600	-	500	500
2041	500	500	900	-	600	600
I-30 - NB Off Ramp						
2013	4,600					
AGR (%)	n/a	-1.41	2.30	0.47	0.69	0.70
2021	70	4,100	5,500	4,800	4,900	4,900
2041	-7,700	3,100	8,700	-	5,600	5,600
I-30 - NB Off Ramp Split to 2nd Street/President Clinton Avenue						
2013	4,700					
AGR (%)	-1.32	-1.05	2.30	-	0.77	0.75
2021	4,300	4,300	5,600	-	5,000	5,000
2041	3,300	3,500	8,900	-	5,800	5,800
I-30 - NB Off Ramp Split to 2nd Street						
2013	280					
AGR (%)	-0.32	0.00	2.30	-	0.77	0.75
2021	3,200	3,500	4,200	-	3,700	3,700
2041	3,000	3,500	6,600	-	4,300	4,300

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 22: Summary of ADT and Growth Rates – I-30 at Cantrell Rd. – SB Ramps

I-30 Interchange at Markham Street - SB Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - SB On Ramp						
2013	6,300					
AGR (%)	2.96	6.61	2.30	0.65	2.05	2.10
2021	8,600	10,500	7,600	7,700	7,400	7,400
2041	15,500	38,000	12,000	8,800	11,000	11,500
I-30 - SB Off Ramp						
2013	7,300					
AGR (%)	2.87	1.40	2.30	-	2.19	2.20
2021	10,500	8,200	8,800	-	8,700	8,700
2041	18,500	11,000	14,000	-	13,500	13,500
I-30 - SB Off Ramp Split to Cumberland Street						
2013	5,800					
AGR (%)	-7.69	-2.72	2.30	-	0.77	0.75
2021	4,300	4,700	7,000	-	6,200	6,200
2041	850	2,700	11,000	-	7,200	7,100
I-30 - SB Off Ramp Split to 2nd Street/Frontage Road						
2013	1,500					
AGR (%)	2.46	4.89	2.30	-	2.35	2.35
2021	1,900	2,200	1,800	-	1,800	1,800
2041	3,100	5,700	2,800	-	2,900	2,900
I-30 - SB Off Ramp Split to 2nd Street EB						
2013	740					
AGR (%)	4.10	16.34	2.30	-	2.30	2.30
2021	1,500	2,500	900	-	900	900
2041	3,300	51,000	1,400	-	1,400	1,400
I-30 - SB Off Ramp Split to 2nd Street WB						
2013	780					
AGR (%)	2.04	2.70	2.30	-	2.35	2.35
2021	950	950	950	-	950	950
2041	1,400	1,600	1,500	-	1,500	1,500

[1]Based on AHTD Historical AADT

Note – only four years of historical data was available

Table 23: Summary of ADT and Growth Rates – I-30 at Cantrell Rd. – Cumberland Ramps

I-30 Interchange at Markham Street - Cumberland Street Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
West Side WB Off Ramp to Cumberland Street						
2013	5,900					
AGR (%)	n/a	-9.65	2.30	-	0.77	0.75
2021	70	2,600	7,100	-	6,300	6,300
2041	-12,500	350	11,000	-	7,300	7,300
I-30 - NB On Ramp Split from Cumberland Street						
2013	6,400					
AGR (%)	n/a	-3.40	2.30	-	0.77	0.75
2021	4,300	4,900	7,700	-	6,800	6,800
2041	-250	2,400	12,000	-	7,900	7,900
West Side On Ramp from NB Cumberland Street						
2013	4,300					
AGR (%)	1.21	-11.80	2.30	-	1.17	1.15
2021	7,400	1,600	5,200	-	4,700	4,700
2041	2,600	7,100	-	-	6,000	5,900
West Side On Ramp from SB Cumberland Street						
2013	8,400					
AGR (%)	3.67	11.87	2.30	-	2.76	2.80
2021	15,000	20,500	10,000	-	10,500	10,500
2041	6,600	-	0	-	18,000	18,000
West Side EB On Ramp from Cumberland Street						
2013	12,000					
AGR (%)	2.46	2.94	2.30	-	2.57	2.60
2021	16,000	15,000	14,500	-	14,500	14,500
2041	-	0	0	-	24,500	24,500

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 24: Summary of ADT and Growth Rates – I-30 at Cantrell Rd. – Cross Street

I-30 Interchange at 2nd Street - Cross Streets						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
Cumberland Street - North of 2nd Street						
2013	16,000					
AGR (%)	0.60	0.74	2.30	-	1.22	1.20
2021	17,000	17,000	19,000	-	17,500	17,500
2041	19,500	19,500	30,000	-	22,500	22,500
Cumberland Street - South of 2nd Street						
2013	2,100					
AGR (%)	-4.83	0.27	2.30	-	0.86	0.85
2021	1,500	2,100	2,500	-	2,200	2,200
2041	550	2,300	4,000	-	2,700	2,700

[1]Based on AHTD Historical AADT

Table 25: Summary of ADT and Growth Rates – I-30 at E. 6th St. and E. 9th St. – Main Lane

I-30 Interchange at 6th Street and 9th Street - Main Lane						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - South of 6th Street						
2013	106,000					
AGR (%)	0.37	0.46	2.30	-	1.04	1.05
2021	110,000	110,000	127,000	-	115,000	115,000
2041	118,000	121,000	200,000	-	142,000	142,000
I-30 - North of 6th Street						
2013	114,000					
AGR (%)	0.79	0.73	2.30	0.89	1.18	1.20
2021	127,000	121,000	137,000	122,000	125,000	125,000
2041	148,000	140,000	215,000	146,000	158,000	159,000

[1]Projected data – Per AHTD, the 2013 volumes in the database are not good
[2]Based on AHTD Historical AADT

Table 26: Summary of ADT and Growth Rates – I-30 at E. 6th St. and E. 9th St. – Ramps

I-30 Interchange at 6th Street and 9th Street - Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - SB Off Ramp to 6th Street						
2013	3,900					
AGR (%)	n/a	-6.03	2.30	1.31	0.90	0.90
2021	1,500	2,400	4,700	4,700	4,200	4,200
2041	-4,300	700	7,400	7,400	5,000	5,000
I-30 - SB Off Ramp to 9th Street						
2013	2,800					
AGR (%)	0.34	-1.16	2.30	1.25	0.97	0.95
2021	2,900	2,500	3,400	3,400	3,000	3,000
2041	3,100	2,000	5,300	5,300	3,700	3,600
I-30 - NB On Ramp from 6th Street						
2013	5,200					
AGR (%)	n/a	-4.66	2.30	0.91	0.80	0.80
2021	3,300	3,600	6,200	6,200	5,500	5,500
2041	-1,300	1,400	9,800	9,800	6,500	6,500

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 27: Summary of ADT and Growth Rates – I-30 at E. 6th St. and E. 9th St. – Cross Streets

I-30 Interchange at 6th Street and 9th Street - Cross Streets						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
6th Street - West of I-30						
2013	3,100					
AGR (%)	-2.84	-2.17	2.30	1.28	0.90	0.90
2021	2,800	2,600	3,700	3,400	3,300	3,300
2041	1,600	1,700	5,900	4,400	4,000	4,000
6th Street - West of I-30						
2013	1,800					
AGR (%)	-3.23	-4.72	2.30	0.79	0.77	0.75
2021	3,200	1,200	2,200	1,900	1,900	1,900
2041	1,700	450	3,400	2,200	2,200	2,200
9th Street - West of I-30						
2013	3,800					
AGR (%)	-0.69	-0.93	2.30	0.70	0.75	0.75
2021	3,900	3,500	4,600	4,000	4,000	4,000
2041	3,400	2,900	7,200	4,600	4,700	4,700
9th Street - West of I-30						
2013	5,200					
AGR (%)	-3.94	-1.40	2.30	0.89	0.80	0.80
2021	4,300	4,600	6,200	5,600	5,500	5,500
2041	1,900	3,500	9,800	6,700	6,500	6,500

[1]Based on AHTD Historical AADT

Table 28: Summary of ADT and Growth Rates – I-30 at I-630 - Main Lane

I-30 Interchange at I-630 - Main Lane						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - South of I-630						
2013	106,000					
AGR (%)	0.94	1.79	2.30	0.33	1.34	1.35
2021	110,000	122,000	127,000	109,000	118,000	118,000
2041	133,000	174,000	200,000	116,000	154,000	154,000
I-30 - North of I-630						
2013	106,000					
AGR (%)	0.37	0.70	2.30	-	1.13	1.15
2021	110,000	112,000	127,000	-	116,000	116,000
2041	118,000	129,000	200,000	-	145,000	146,000
I-630 - West of I-30						
2013	85,000					
AGR (%)	0.91	1.33	2.30	-	1.51	1.50
2021	100,000	94,500	102,000	-	96,000	96,000
2041	120,000	123,000	161,000	-	129,000	129,000

[1]Projected data – Per AHTD, the 2013 volumes in the database are not good
[2]Based on AHTD Historical AADT

Table 29: Summary of ADT and Growth Rates – I-30 at I-630 – Ramps

I-30 Interchange at I-630 - Ramps						
Method	Trend Function	Calculated VF=VP*GFn	County	CARTS Model	Average	Recommended
I-30 - NB On Ramp from I-630						
2013	24,000					
AGR (%)	-3.53	-2.63	2.30	1.08	0.84	0.85
2021	19,500	19,500	29,000	29,000	25,500	25,500
2041	9,500	11,500	45,500	45,500	30,500	30,500
I-30 - NB Off Ramp to I-630						
2013	23,000					
AGR (%)	2.92	6.58	2.30	0.29	0.65	0.65
2021	31,000	38,500	27,500	27,500	24,000	24,000
2041	55,000	137,000	43,500	43,500	27,500	27,500
I-30 - NB Off Ramp to East Frontage Road						
2013	2,400					
AGR (%)	n/a	-10.96	2.30	0.96	0.82	0.80
2021	150	950	2,900	2,900	2,600	2,600
2041	-5,800	90	4,500	4,500	3,000	3,000
I-30 - SB On Ramp from I-630						
2013	16,000					
AGR (%)	-4.85	-2.00	2.30	0.23	0.63	0.65
2021	12,500	13,500	19,000	19,000	17,000	17,000
2041	4,700	9,100	30,000	30,000	19,000	19,000
I-30 - SB On Ramp from West Frontage Road						
2013	3,600					
AGR (%)	-0.30	-0.91	2.30	0.58	0.72	0.70
2021	3,500	3,300	4,300	4,300	3,800	3,800
2041	3,300	2,800	6,800	6,800	4,400	4,400
I-30 - SB Off Ramp to I-630						
2013	17,000					
AGR (%)	n/a	-14.29	2.30	0.94	0.81	0.80
2021	-3,800	-3,800	20,500	20,500	18,000	18,000
2041	-62,000	-62,000	32,000	32,000	21,500	21,000
I-630 - WB On Ramp from 15th Street						
2013	1,700					
AGR (%)	n/a	-6.80	2.30	-	0.77	0.75
2021	800	950	2,000	-	1,800	1,800
2041	-1,400	250	3,200	-	2,100	2,100
I-630 - EB Off Ramp to 15th Street						
2013	2,400					
AGR (%)	n/a	-9.14	2.30	-	0.77	0.75
2021	300	1,100	2,900	-	2,600	2,500
2041	-4,900	150	4,500	-	3,000	3,000

[1]Based on AHTD Historical AADT

Table 30: Summary of ADT and Growth Rates – I-30 at Roosevelt Rd. - Main Lane

I-30 Interchange at Roosevelt Road - Main Lane						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - South of Roosevelt Road						
2013	100,000					
AGR (%)	0.62	0.92	2.30	0.55	1.10	1.10
2021	105,000	108,000	120,000	104,000	109,000	109,000
2041	119,000	129,000	189,000	117,000	136,000	136,000
I-30 - North of Roosevelt Road						
2013	106,000					
AGR (%)	0.90	1.45	2.30	0.33	1.25	1.25
2021	109,000	119,000	127,000	109,000	117,000	117,000
2041	131,000	159,000	200,000	116,000	150,000	150,000

[1]Projected data – Per AHTD, the 2013 volumes in the database are not good
[2]Based on AHTD Historical AADT

Table 31: Summary of ADT and Growth Rates – I-30 at Roosevelt Rd. – Ramps

I-30 Interchange at Roosevelt Road - Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - NB On Ramp from Roosevelt Road						
2013	5,700					
AGR (%)	-9.02	-3.28	2.30	0.24	0.63	0.65
2021	4,200	4,400	6,800	6,800	6,000	6,000
2041	650	2,200	11,000	11,000	6,800	6,800
I-30 - NB Off Ramp to Roosevelt Road						
2013	4,700					
AGR (%)	0.41	0.72	2.30	0.25	0.92	0.90
2021	4,700	5,000	5,600	5,600	5,100	5,000
2041	5,100	5,700	8,900	8,900	6,100	6,000
I-30 - SB On Ramp from Roosevelt Road						
2013	4,500					
AGR (%)	n/a	-4.09	2.30	0.94	0.81	0.80
2021	3,000	3,200	5,400	5,400	4,800	4,800
2041	-600	1,400	8,500	8,500	5,600	5,600
I-30 - SB Off Ramp to Roosevelt Road						
2013	5,600					
AGR (%)	-8.15	-3.85	2.30	0.13	0.61	0.60
2021	4,200	4,100	6,700	6,700	5,900	5,900
2041	750	1,900	10,500	10,500	6,600	6,600

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 32: Summary of ADT and Growth Rates – I-30 at Roosevelt Rd. – Cross Street

I-30 Interchange at Roosevelt Road - Cross Street						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
Roosevelt Road - West of I-30						
2013	13,000					
AGR (%)	-0.47	-0.79	2.30	-	0.77	0.75
2021	13,000	12,000	15,500	-	14,000	14,000
2041	12,000	10,500	24,500	-	16,000	16,000
Roosevelt Road - East of I-30						
2013	13,000					
AGR (%)	-0.89	-0.43	2.30	-	0.77	0.75
2021	13,000	12,500	15,500	-	14,000	14,000
2041	11,000	11,500	24,500	-	16,000	16,000

[1]Based on AHTD Historical AADT

Table 33: Summary of ADT and Growth Rates – I-30 at South Terminal - Main Lane

I-30 Interchange at Roosevelt Road - Main Lane						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - West of South Terminal						
2013	86,000					
AGR (%)	0.80	1.03	2.30	0.38	1.13	1.15
2021	92,500	93,500	103,000	88,500	94,000	94,000
2041	108,000	114,000	163,000	95,500	118,000	118,000
I-30 - North of South Terminal						
2013	100,000					
AGR (%)	0.62	0.92	2.30	0.55	1.10	1.10
2021	105,000	108,000	120,000	104,000	109,000	109,000
2041	119,000	129,000	189,000	117,000	136,000	136,000

[1]Based on AHTD Historical AADT
[2]Projected data – Per AHTD, the 2013 volumes in the database are not good

Table 34: Summary of ADT and Growth Rates – South Terminal – I-30 NB/EB Ramps

I-30 Interchange at South Terminal - Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - NB On Ramp from I-530						
2013	13,000					
AGR (%)	n/a	-6.69	2.30	0.55	0.71	0.70
2021	5,000	7,500	15,500	13,500	14,000	13,500
2041	-15,000	1,900	24,500	15,000	16,000	16,000
I-30 - NB On Ramp from I-440						
2013	7,700					
AGR (%)	n/a	-5.07	2.30	1.22	0.88	0.90
2021	3,500	5,100	9,200	8,500	8,300	8,300
2041	-4,500	1,800	14,500	11,000	9,800	9,900
I-30 - EB Off Ramp to I-530						
2013	2,900					
AGR (%)	n/a	-6.08	2.30	-1.85	0.58	0.60
2021	1,100	1,800	3,500	2,500	3,000	3,000
2041	-3,100	500	5,500	1,700	3,400	3,400
I-30 - EB Off Ramp to I-440						
2013	11,000					
AGR (%)	n/a	-16.65	2.30	0.51	0.70	0.70
2021	-6,600	2,600	13,000	14,500	11,500	11,500
2041	-52,500	70	21,000	16,000	13,500	13,500

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 35: Summary of ADT and Growth Rates – South Terminal – I-30 SB/WB Ramps

South Terminal - I-30 SB/WB Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - WB On Ramp from I-530						
2013	3,200					
AGR (%)	0.00	0.00	2.30	-0.13	0.58	0.60
2021	3,200	3,200	3,800	3,200	3,400	3,400
2041	3,200	3,200	6,000	3,100	3,800	3,800
I-30 - WB On Ramp from I-440						
2013	17,000					
AGR (%)	n/a	-12.06	2.30	0.48	0.70	0.70
2021	-2,600	6,100	20,500	17,500	18,000	18,000
2041	-48,500	450	32,000	19,500	20,500	20,500
I-30 - SB Off Ramp Split to I-530						
2013	3,400					
AGR (%)	n/a	-7.53	2.30	-	0.77	0.75
2021	1,200	1,800	4,100	-	3,600	3,600
2041	-4,000	400	6,400	-	4,200	4,200
I-30 - SB Off Ramp Split to I-440						
2013	7,500					
AGR (%)	n/a	-7.25	2.30	-	0.77	0.75
2021	2,100	4,100	9,000	-	8,000	8,000
2041	-9,900	900	14,000	-	9,300	9,200
I-30 - SB Off Ramp to I-530 and I-440						
2013	20,000					
AGR (%)	0.00	0.00	2.30	-	0.77	0.75
2021	20,000	20,000	24,000	-	21,500	21,000
2041	20,000	20,000	38,000	-	25,000	24,500

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 36: Summary of ADT and Growth Rates – South Terminal – I-530/I-440 Ramps

South Terminal - I-530/I-440 Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-530 SB On Ramp Split from I-440						
2013	3,200					
AGR (%)	2.64	5.05	2.30	-	2.41	2.45
2021	4,400	4,700	3,800	-	3,900	3,900
2041	7,400	12,500	6,000	-	6,200	6,300
I-530 SB On Ramp from I-30 and I-440						
2013	16,000					
AGR (%)	n/a	-7.17	2.30	-	0.77	0.70
2021	4,200	8,800	19,000	-	17,000	17,000
2041	-24,000	2,000	30,000	-	20,000	19,500
I-530 - NB Off Ramp to I-440						
2013	3,700					
AGR (%)	n/a	-5.61	2.30	-	-1.66	0.75
2021	1,600	2,300	4,400	-	3,200	3,900
2041	-3,400	750	7,000	-	2,300	4,600
I-440 - WB Off Ramp to I-30 and I-530						
2013	20,000					
AGR (%)	3.30	8.47	2.30	-	2.63	0.75
2021	33,000	38,500	24,000	-	24,500	21,000
2041	63,000	195,000	38,000	-	41,500	24,500

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 37: Summary of ADT and Growth Rates – I-440 at Springer Blvd. - Main Lane

I-440 Interchange at Springer Boulevard - Main Lane						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-440 - West of Springer Boulevard						
2013	50,000					
AGR (%)	0.44	0.97	2.30	-	1.24	1.25
2021	56,500	54,000	60,000	-	55,000	55,000
2041	62,000	65,500	94,500	-	70,500	71,000
I-440 - East of Springer Boulevard						
2013	50,000					
AGR (%)	0.85	1.25	2.30	-	1.46	1.45
2021	60,500	55,000	60,000	-	56,000	56,000
2041	72,000	70,500	94,500	-	75,000	75,000

[1]Based on AHTD Historical AADT

Table 38: Summary of ADT and Growth Rates – I-440 at Springer Blvd. – Ramps

I-440 Interchange at Springer Boulevard – Ramps						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
I-30 - EB On Ramp from Springer Boulevard						
2013	1,300					
AGR (%)	n/a	-4.66	2.30	-	0.77	0.75
2021	500	900	1,600	-	1,400	1,400
2041	-950	350	2,500	-	1,600	1,600
I-440 - EB Off Ramp to Springer Boulevard						
2013	1,200					
AGR (%)	n/a	-9.14	2.30	-	0.77	0.75
2021	350	550	1,400	-	1,300	1,300
2041	-1,900	80	2,300	-	1,500	1,500
I-440 - WB On Ramp from Springer Boulevard						
2013	960					
AGR (%)	n/a	-9.61	2.30	-	0.77	0.75
2021	250	450	1,200	-	1,000	1,000
2041	-1,800	60	1,800	-	1,200	1,200
I-440 - WB Off Ramp to Springer Boulevard						
2013	860					
AGR (%)	n/a	-14.99	2.30	-	0.77	0.75
2021	-700	250	1,000	-	900	900
2041	-4,400	10	1,600	-	1,100	1,100

[1]Based on AHTD Historical AADT
Note – only four years of historical data was available

Table 39: Summary of ADT and Growth Rates – I-440 at Springer Blvd. – Cross Street

I-440 Interchange at Springer Boulevard - Cross Street						
Method	**Trend Function**	**Calculated VF=VP*GFn**	**County**	**CARTS Model**	**Average**	**Recommended**
Sprnger Boulevard - North of I-440						
2013	5,400					
AGR (%)	-2.45	-1.88	2.30	-	0.77	0.75
2021	4,400	4,600	6,500	-	5,700	5,700
2041	2,700	3,200	10,000	-	6,700	6,700

[1]Based on AHTD Historical AADT

Appendix 8: Mobility Exhibits

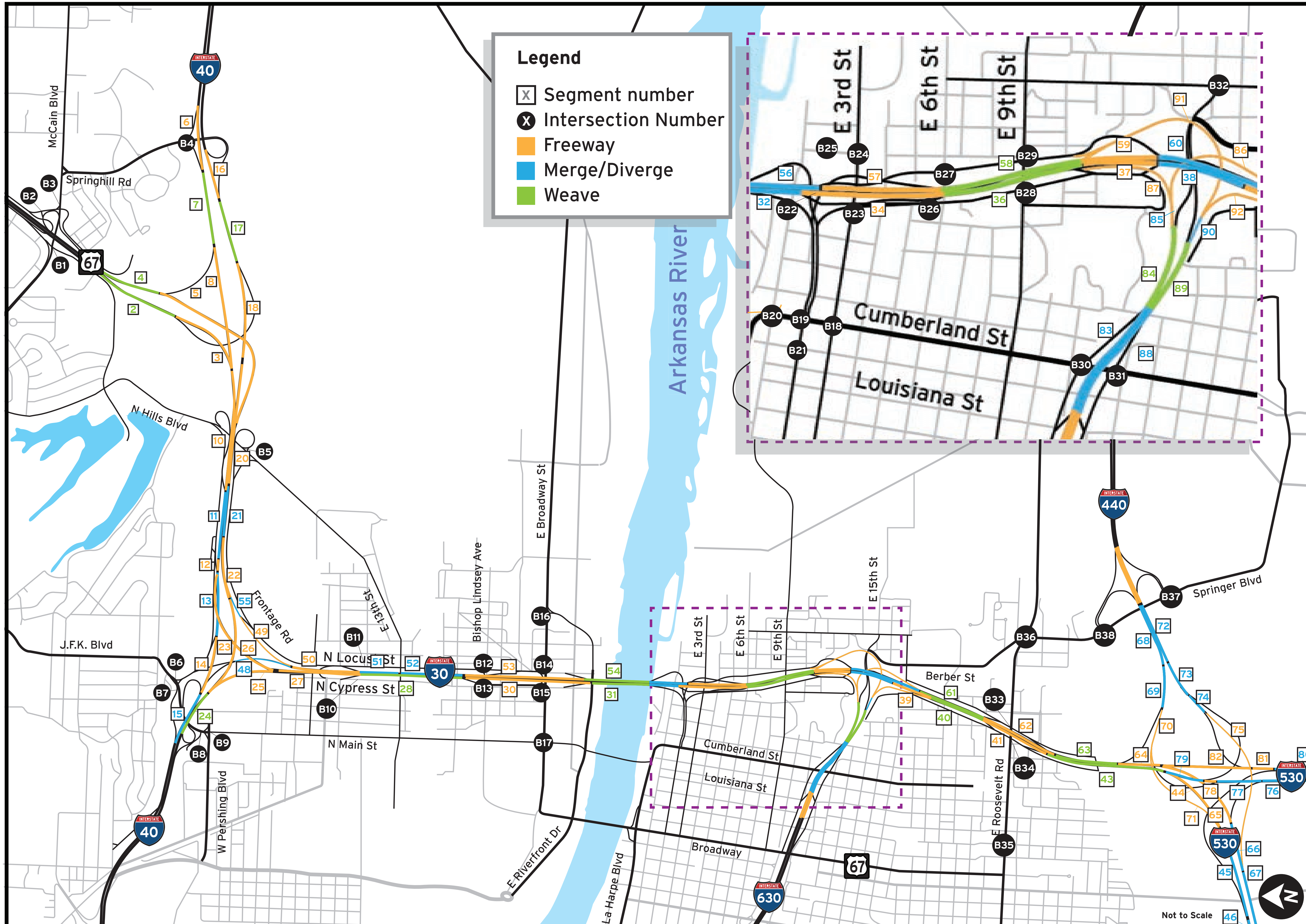


EXHIBIT 1

DRAFT
2-18-15

Analysis Locator Key
Build 1 Alternative

INTERSTATE 30

Planning and Environmental Linkages

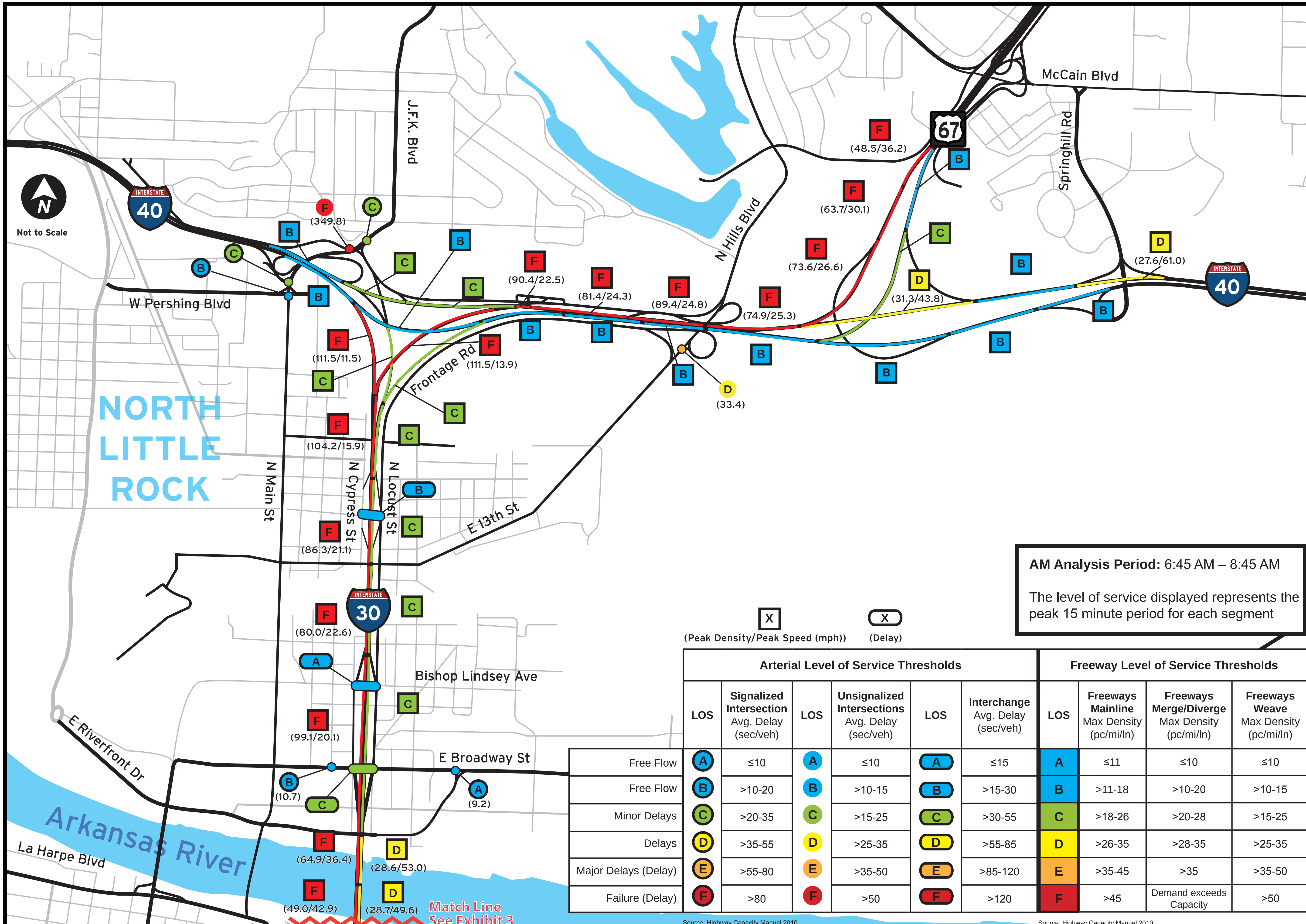
CONNECTING ARKANSAS PROGRAM CAP

February 2015

EXHIBIT 2

DRAFT 3-24-15

I -30 PEL
2014 AM Existing Conditions
Level of Service
North of Arkansas River



AM Analysis Period: 6:45 AM – 8:45 AM

The level of service displayed represents the peak 15 minute period for each segment

X (Peak Density/Peak Speed (mph))

X (Delay)

	Arterial Level of Service Thresholds						Freeway Level of Service Thresholds			
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

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AM Analysis Period: 6:45 AM – 8:45 AM

The level of service displayed represents the peak 15 minute period for each segment

Arterial Level of Service Thresholds

	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)
Free Flow	A	≤10	A	≤10	A	≤15
Free Flow	B	>10-20	B	>10-15	B	>15-30
Minor Delays	C	>20-35	C	>15-25	C	>30-55
Delays	D	>35-55	D	>25-35	D	>55-85
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120
Failure (Delay)	F	>80	F	>50	F	>120

Source: Highway Capacity Manual 2010

Freeway Level of Service Thresholds

LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
A	≤11	≤10	≤10
B	>11-18	>10-20	>10-15
C	>18-26	>20-28	>15-25
D	>26-35	>28-35	>25-35
E	>35-45	>35	>35-50
F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

EXHIBIT 3

DRAFT 3-24-15

I-30 PEL 2014 AM Existing Conditions Level of Service South of Arkansas River

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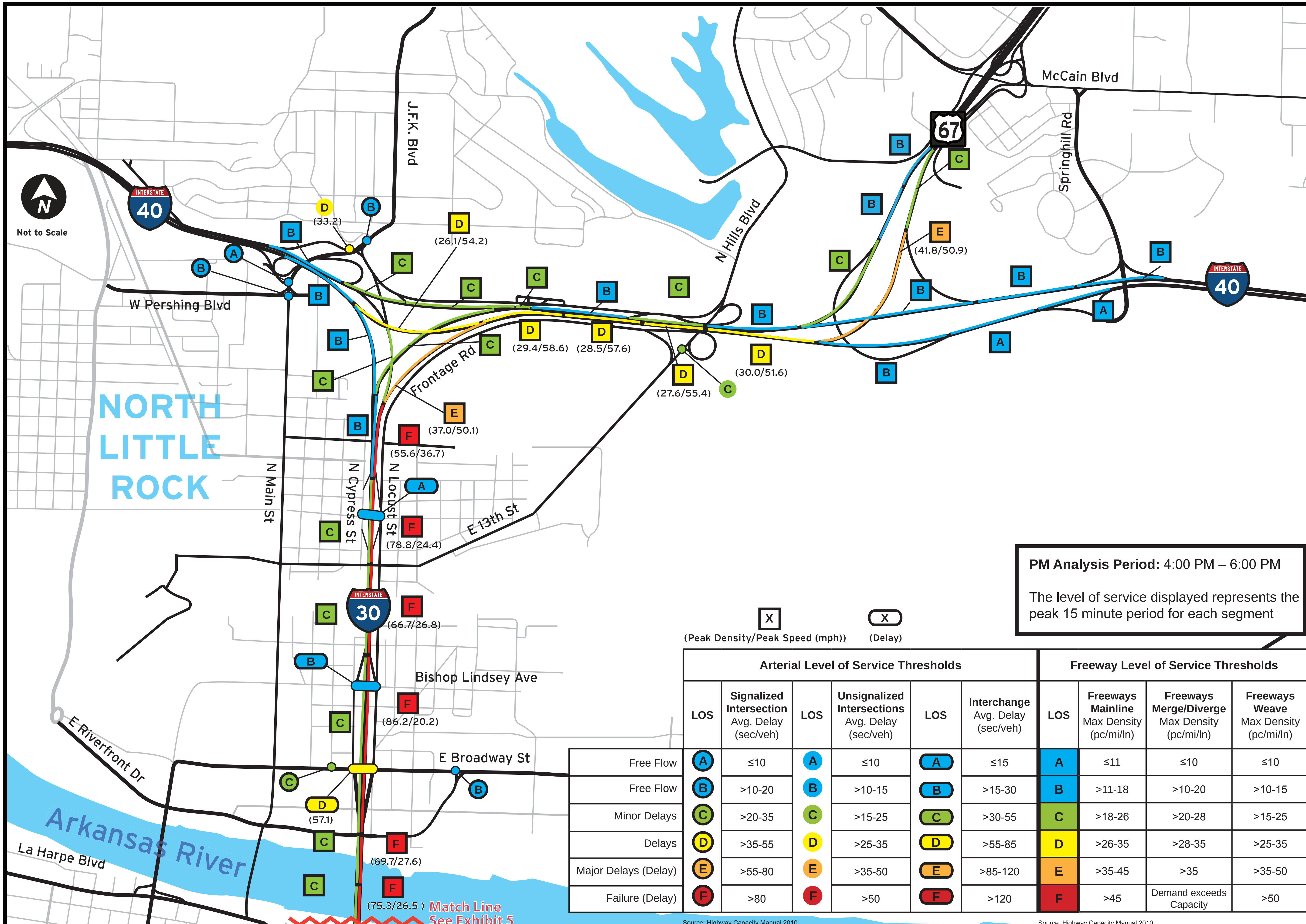
EXHIBIT 4

DRAFT 3-24-15

I-30 PEL
2014 PM Existing Conditions Level of Service North of Arkansas River



PM Analysis Period: 4:00 PM – 6:00 PM

The level of service displayed represents the peak 15 minute period for each segment

	Arterial Level of Service Thresholds						Freeway Level of Service Thresholds			
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

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CONNECTING ARKANSAS PROGRAM CAP

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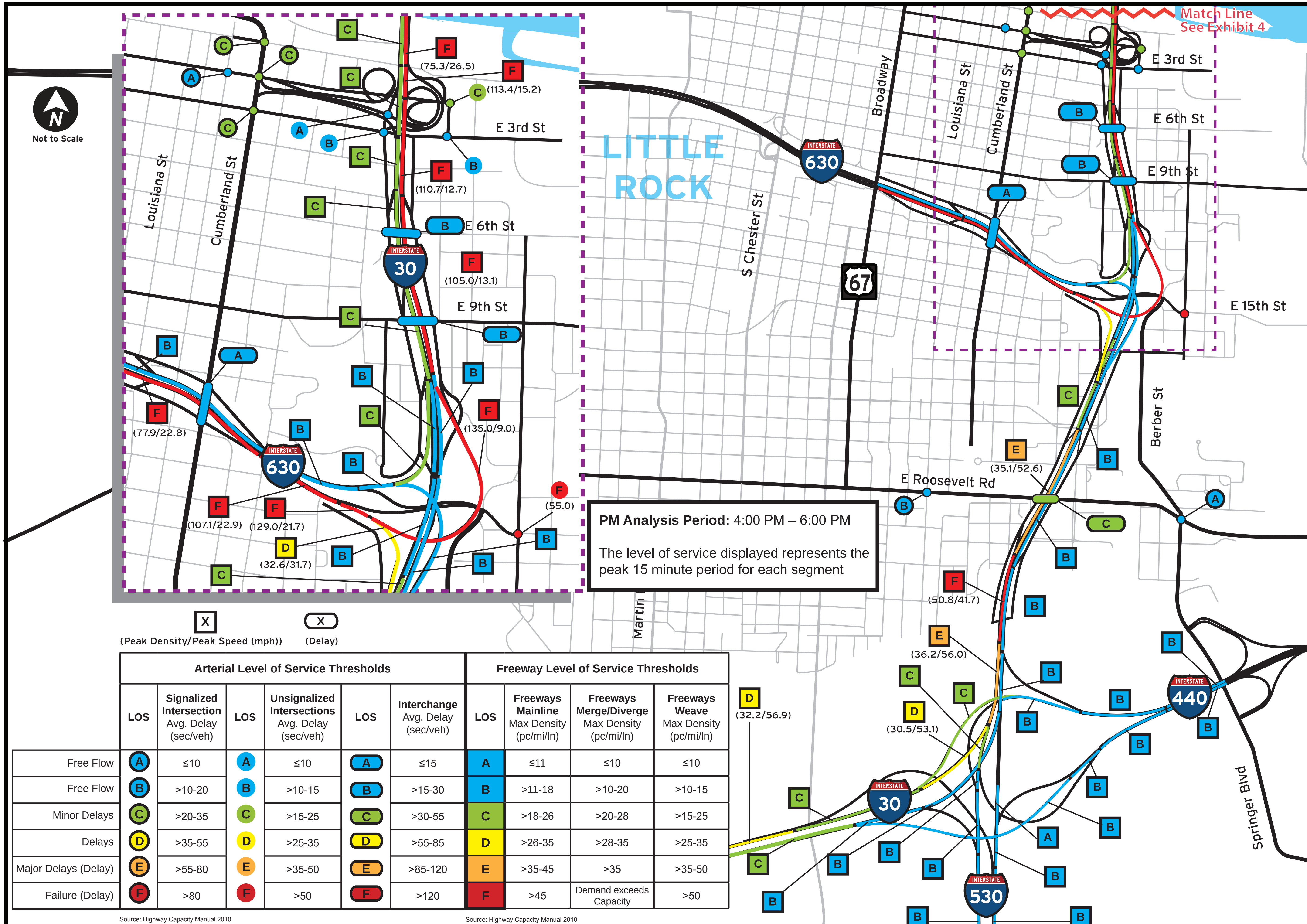
EXHIBIT 5

DRAFT
3-24-15

I-30 PEL
2014 PM Existing Conditions Level of Service South of Arkansas River



Arterial Level of Service Thresholds / Freeway Level of Service Thresholds

	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

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Planning and Environmental Linkages

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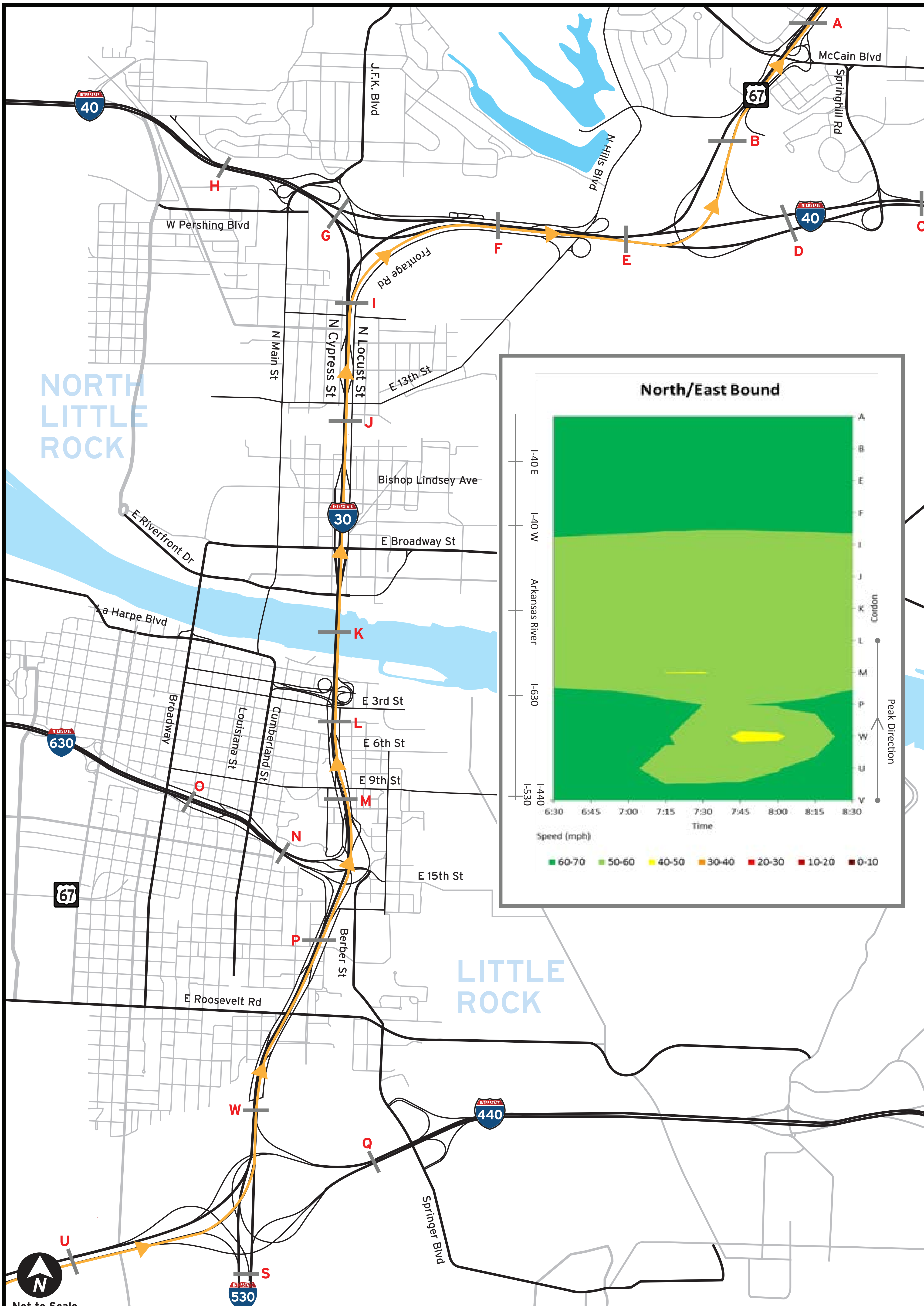


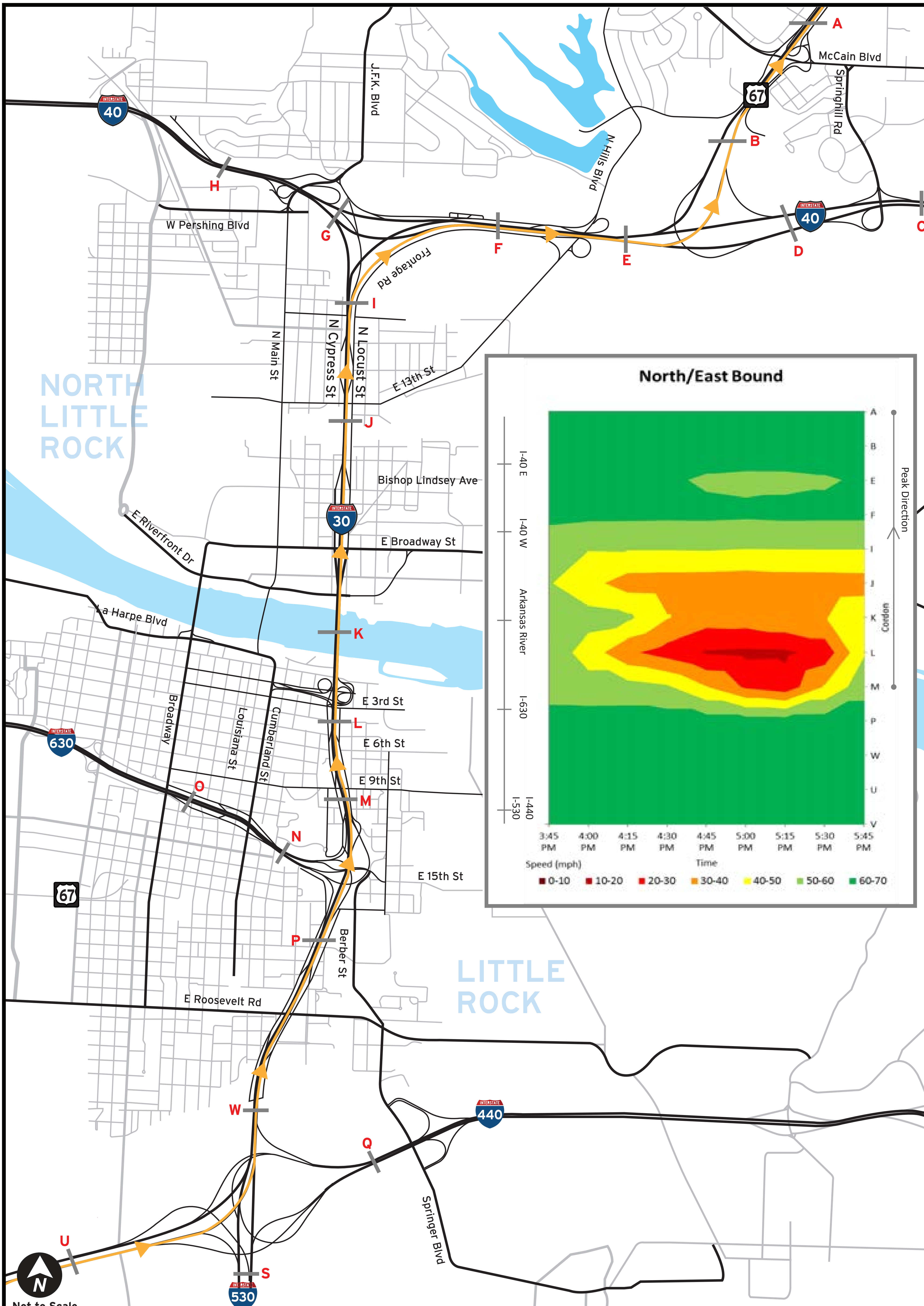
January 2015

Planning and Environmental Linkages

I-30 PEL
2014 AM Speed Profile Map North/East Bound

DRAFT 3-24-15

EXHIBIT 6



January 2015

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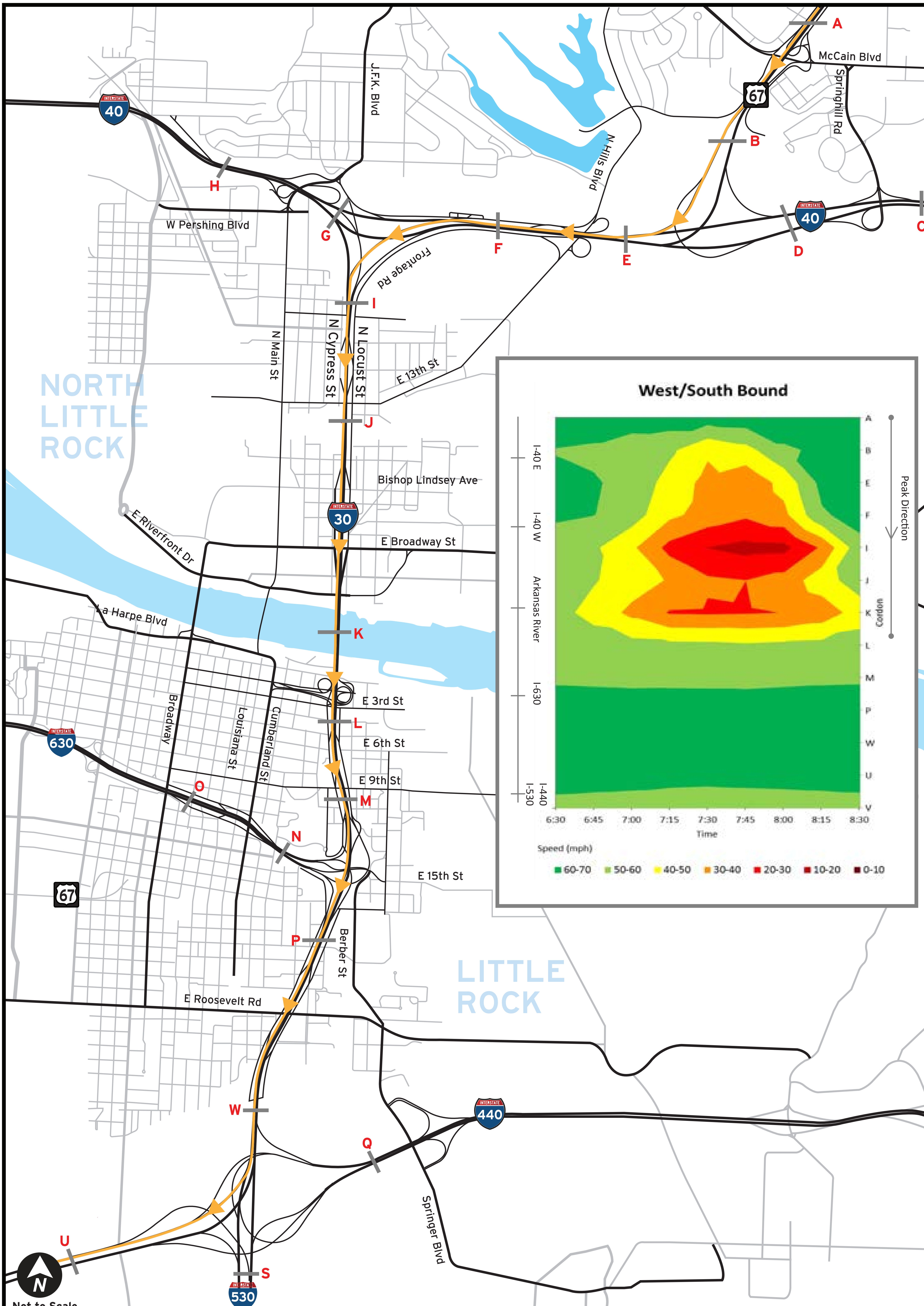
I-30 PEL
2014 PM Speed Profile Map North/East Bound

DRAFT 3-24-15

EXHIBIT 7



January 2015

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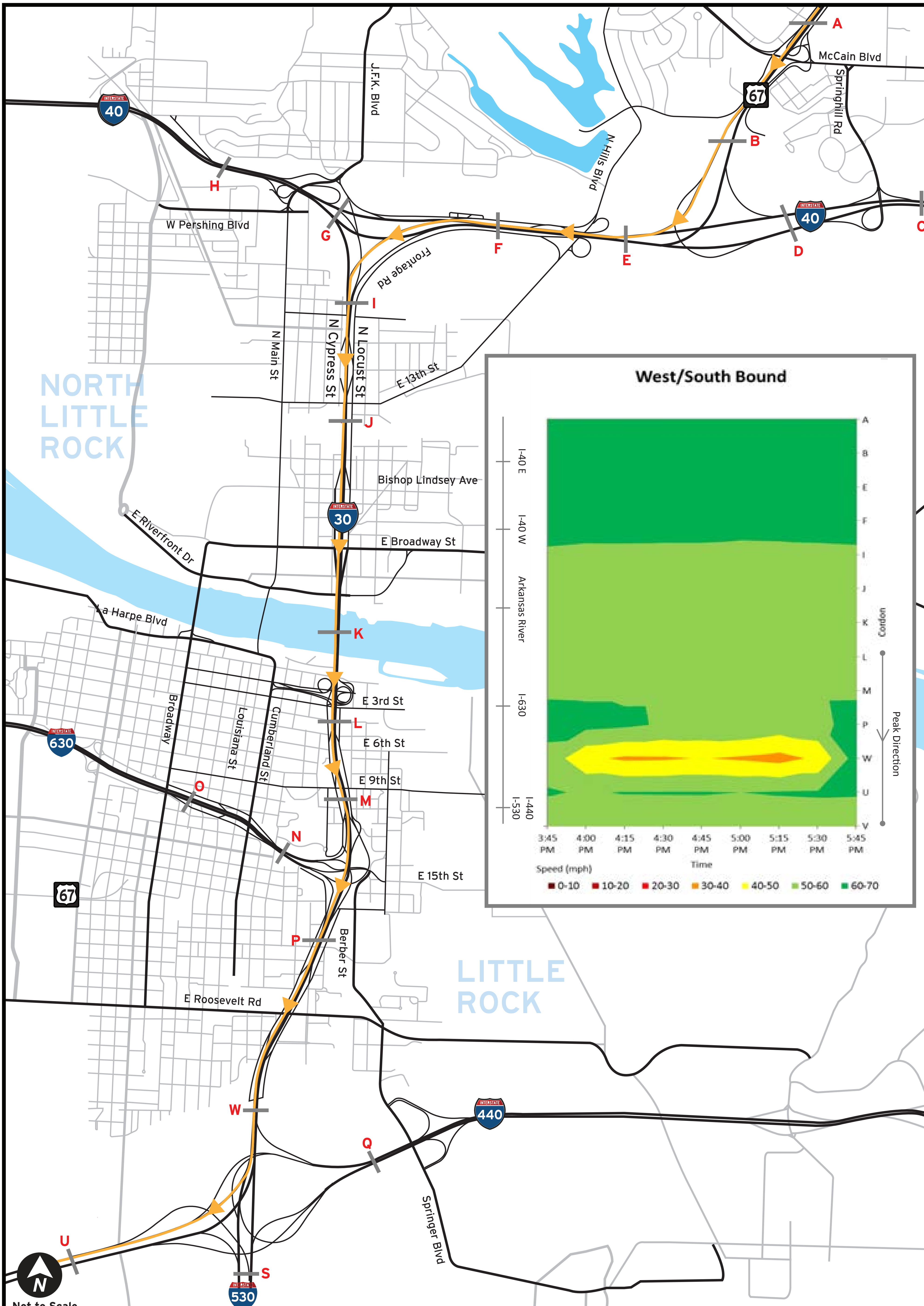
Planning and Environmental Linkages

I-30 PEL
2014 AM Speed Profile Map
West/South Bound

DRAFT 3-24-15

EXHIBIT 8



January 2015

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Planning and Environmental Linkages

I-30 PEL
2014 PM Speed Profile Map
West/South Bound

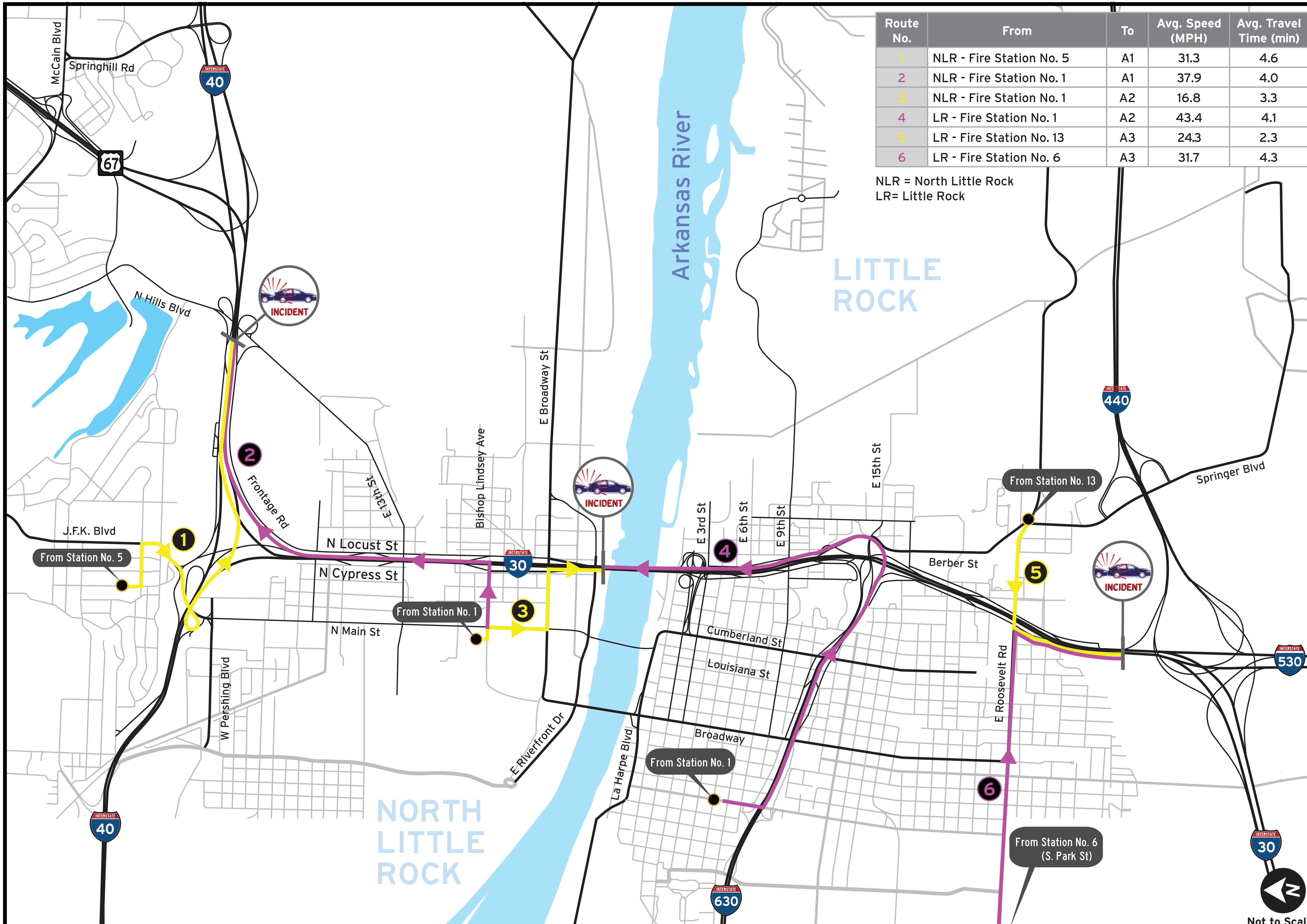
DRAFT 3-24-15

EXHIBIT 9

EXHIBIT 10

DRAFT
3-27-15

I-30 PEL
2014 AM Existing
Emergency Route Travel Time



Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	NLR - Fire Station No. 5	A1	31.3	4.6
2	NLR - Fire Station No. 1	A1	37.9	4.0
3	NLR - Fire Station No. 1	A2	16.8	3.3
4	LR - Fire Station No. 1	A2	43.4	4.1
5	LR - Fire Station No. 13	A3	24.3	2.3
6	LR - Fire Station No. 6	A3	31.7	4.3

NLR = North Little Rock
LR= Little Rock

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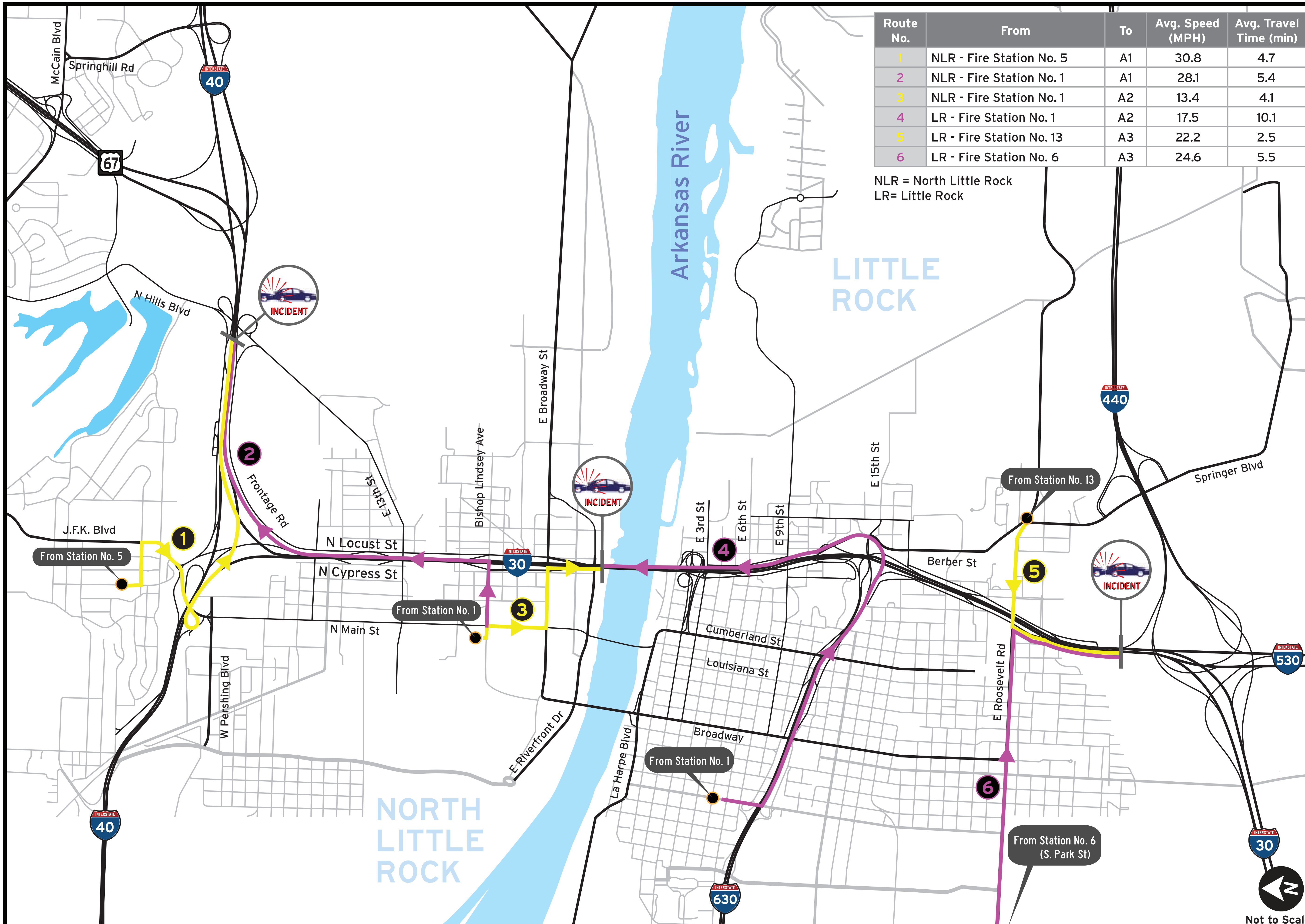
EXHIBIT 11

DRAFT 3-27-15

I-30 PEL 2014 PM Existing Emergency Route Travel Time

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	NLR - Fire Station No. 5	A1	30.8	4.7
2	NLR - Fire Station No. 1	A1	28.1	5.4
3	NLR - Fire Station No. 1	A2	13.4	4.1
4	LR - Fire Station No. 1	A2	17.5	10.1
5	LR - Fire Station No. 13	A3	22.2	2.5
6	LR - Fire Station No. 6	A3	24.6	5.5

NLR = North Little Rock
LR= Little Rock



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Planning and Environmental Linkages

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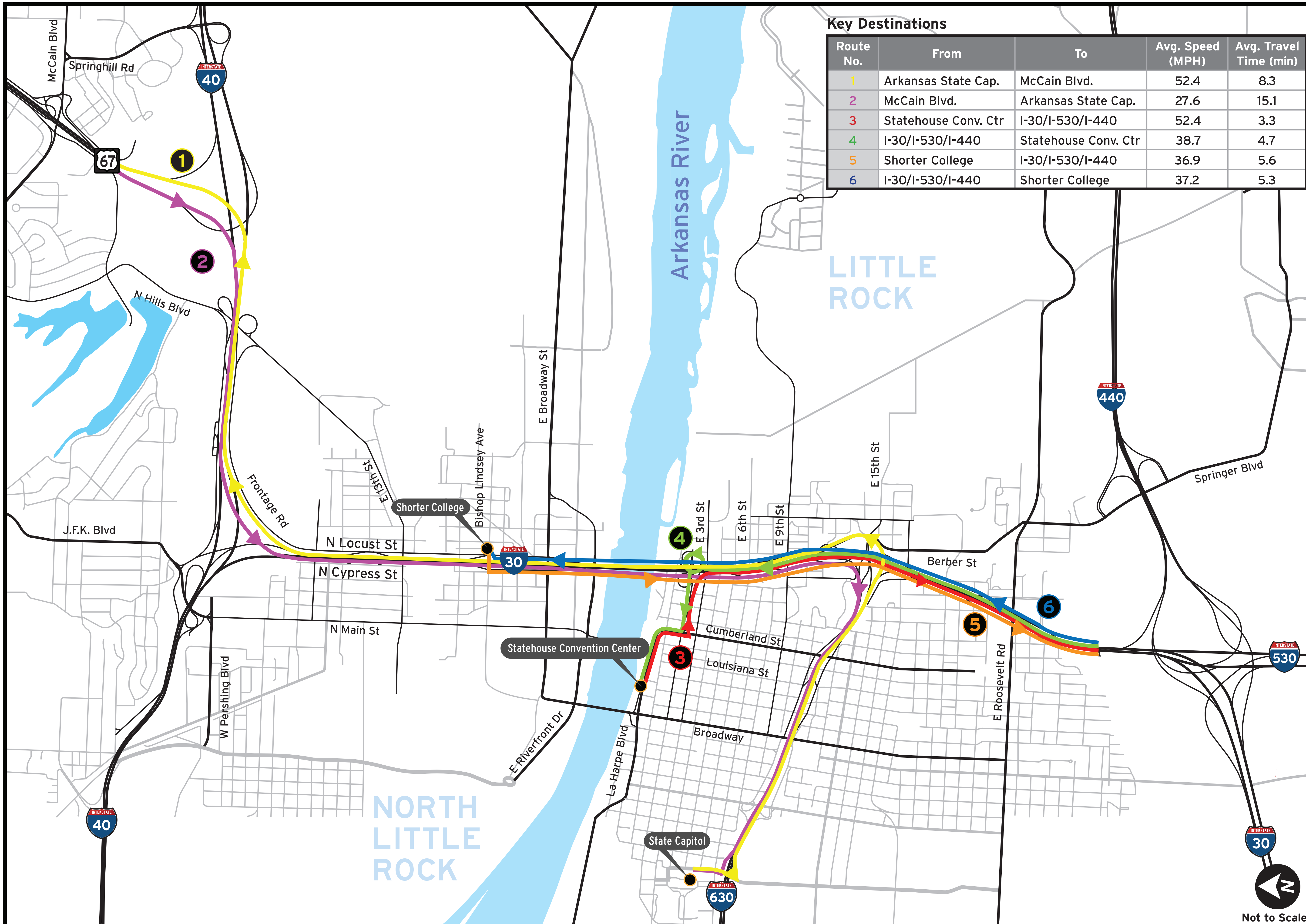
EXHIBIT 12

DRAFT
3-27-15

I-30 PEL
2014 AM Existing Key Destination Travel Time

Key Destinations

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	Arkansas State Cap.	McCain Blvd.	52.4	8.3
2	McCain Blvd.	Arkansas State Cap.	27.6	15.1
3	Statehouse Conv. Ctr	I-30/I-530/I-440	52.4	3.3
4	I-30/I-530/I-440	Statehouse Conv. Ctr	38.7	4.7
5	Shorter College	I-30/I-530/I-440	36.9	5.6
6	I-30/I-530/I-440	Shorter College	37.2	5.3



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Planning and Environmental Linkages

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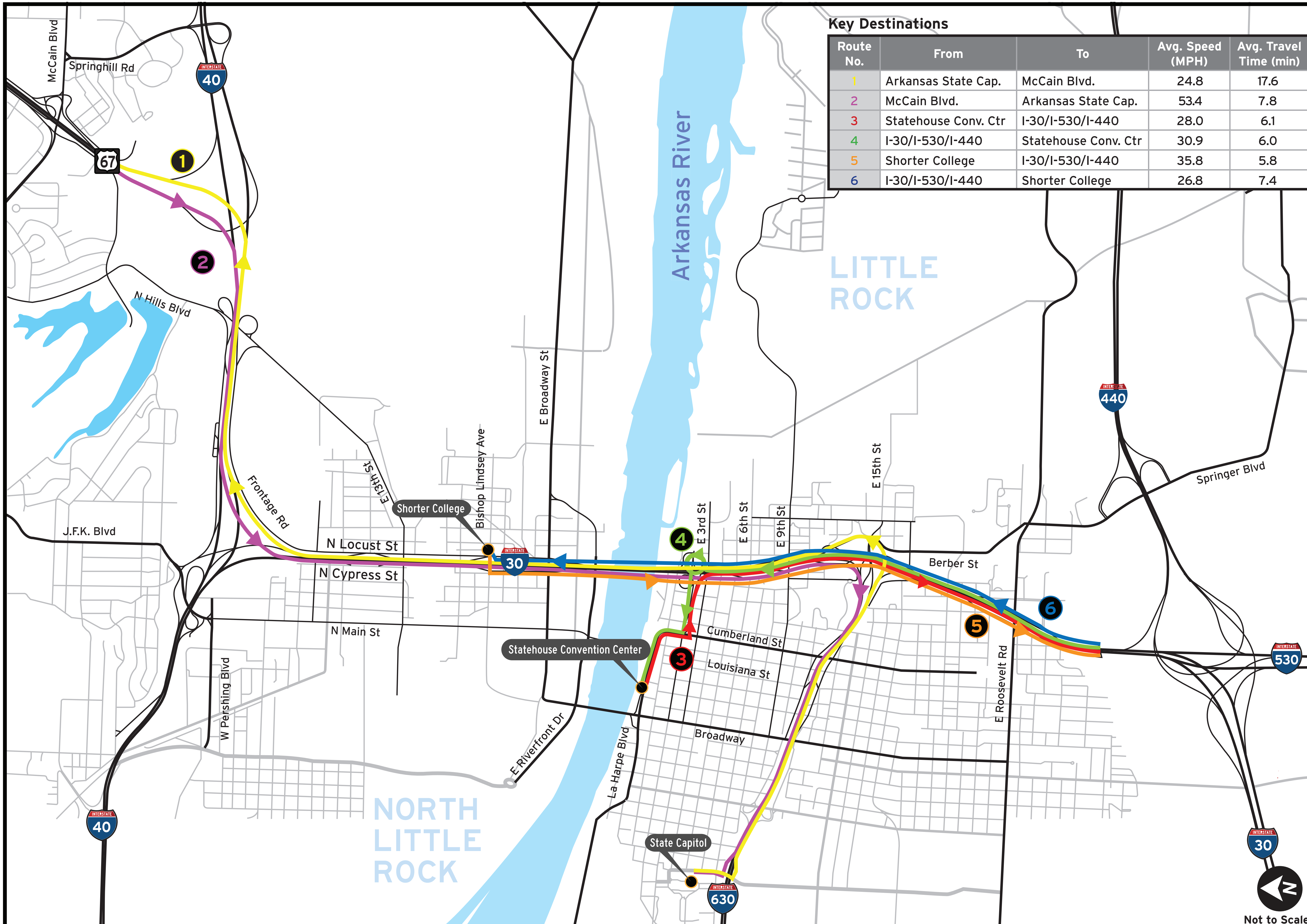
EXHIBIT 13

DRAFT
3-27-15

I-30 PEL
2014 PM Existing
Key Destination Travel Time



Key Destinations

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	Arkansas State Cap.	McCain Blvd.	24.8	17.6
2	McCain Blvd.	Arkansas State Cap.	53.4	7.8
3	Statehouse Conv. Ctr	I-30/I-530/I-440	28.0	6.1
4	I-30/I-530/I-440	Statehouse Conv. Ctr	30.9	6.0
5	Shorter College	I-30/I-530/I-440	35.8	5.8
6	I-30/I-530/I-440	Shorter College	26.8	7.4

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Planning and Environmental Linkages

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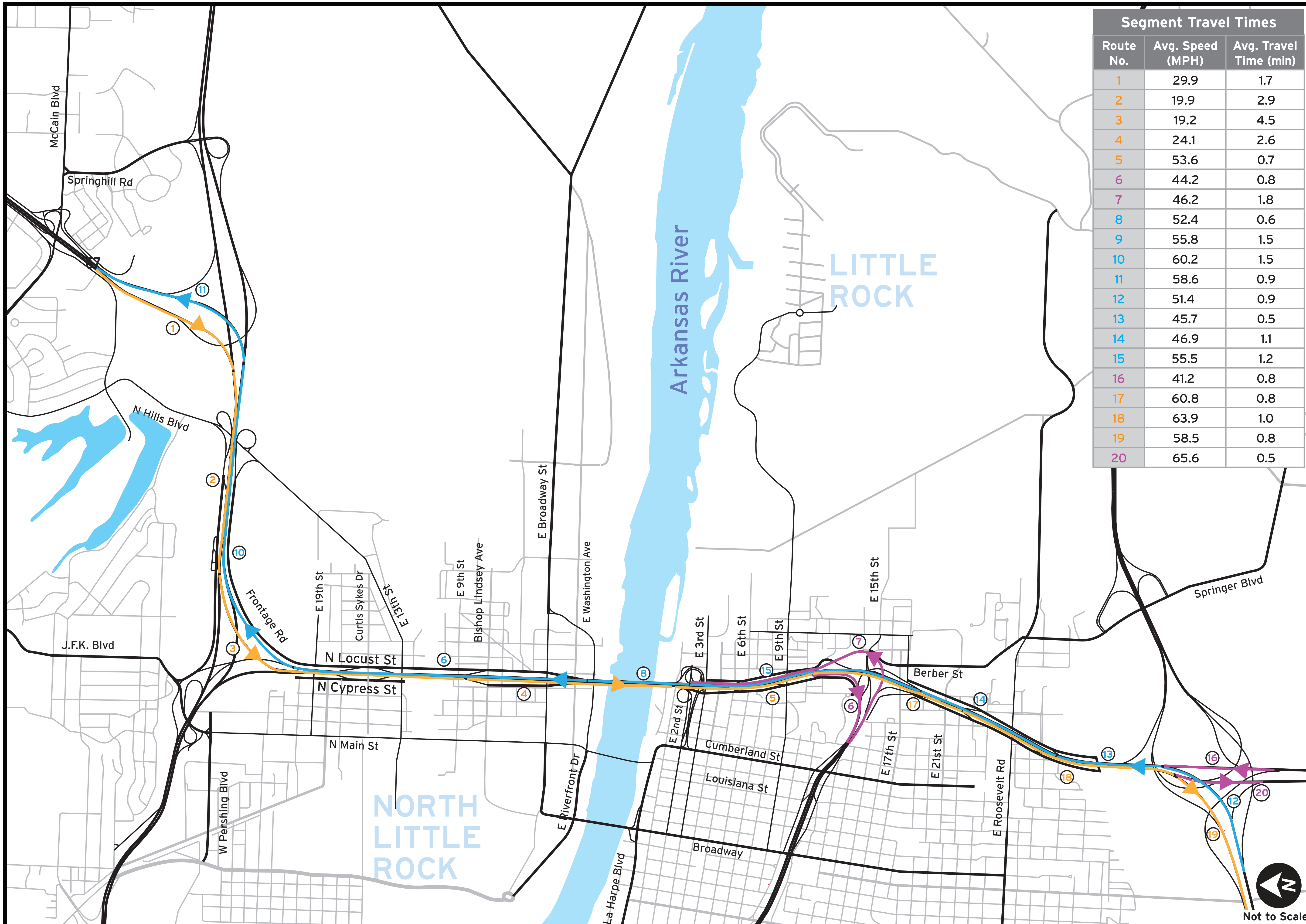
EXHIBIT 14

DRAFT
3-31-15

I-30 PEL
2014 AM Existing
Study Corridor Travel Time



Segment Travel Times		
Route No.	Avg. Speed (MPH)	Avg. Travel Time (min)
1	29.9	1.7
2	19.9	2.9
3	19.2	4.5
4	24.1	2.6
5	53.6	0.7
6	44.2	0.8
7	46.2	1.8
8	52.4	0.6
9	55.8	1.5
10	60.2	1.5
11	58.6	0.9
12	51.4	0.9
13	45.7	0.5
14	46.9	1.1
15	55.5	1.2
16	41.2	0.8
17	60.8	0.8
18	63.9	1.0
19	58.5	0.8
20	65.6	0.5

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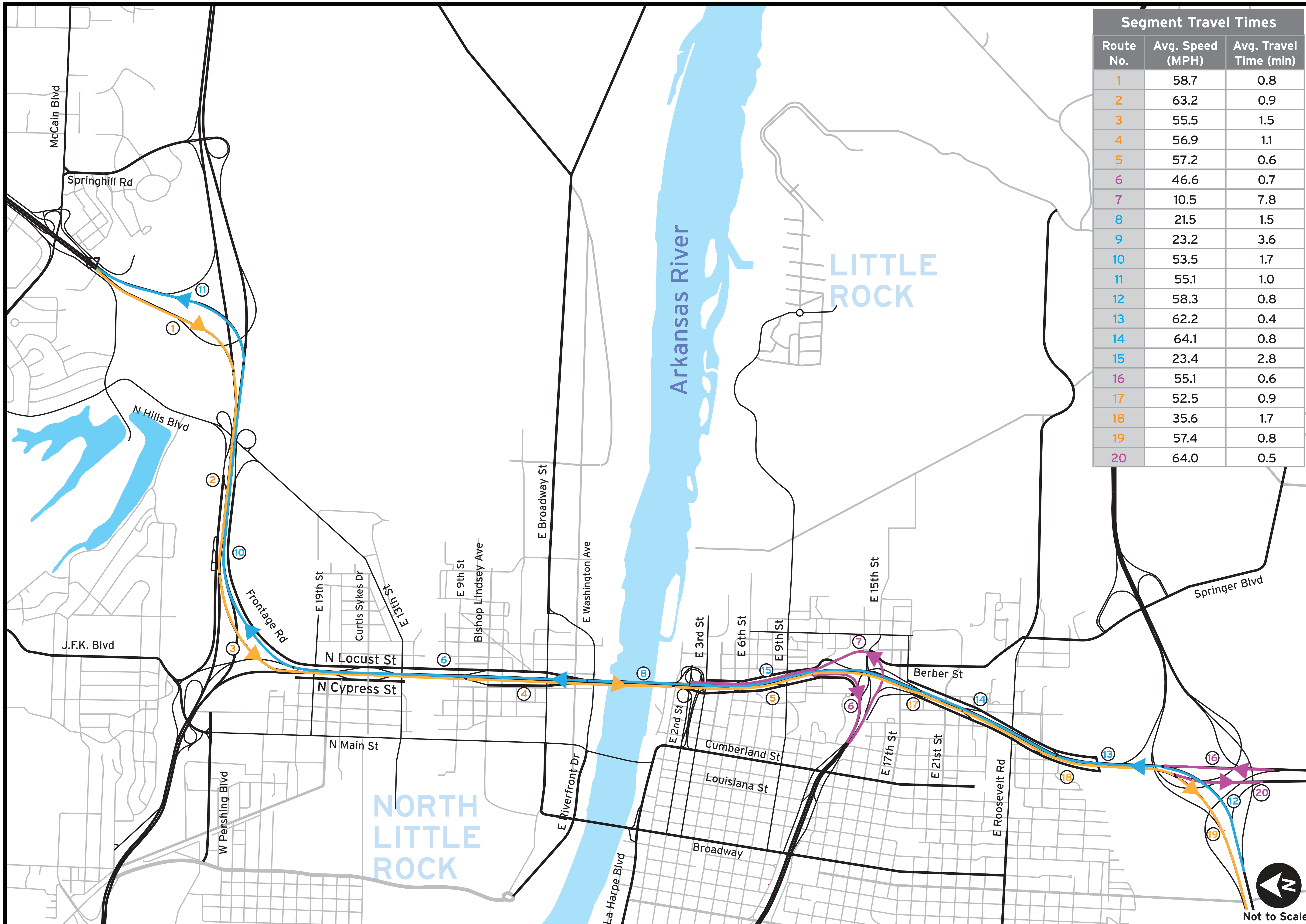
EXHIBIT 15

DRAFT
3-31-15

I-30 PEL
2014 PM Existing
Study Corridor Travel Time



Segment Travel Times		
Route No.	Avg. Speed (MPH)	Avg. Travel Time (min)
1	58.7	0.8
2	63.2	0.9
3	55.5	1.5
4	56.9	1.1
5	57.2	0.6
6	46.6	0.7
7	10.5	7.8
8	21.5	1.5
9	23.2	3.6
10	53.5	1.7
11	55.1	1.0
12	58.3	0.8
13	62.2	0.4
14	64.1	0.8
15	23.4	2.8
16	55.1	0.6
17	52.5	0.9
18	35.6	1.7
19	57.4	0.8
20	64.0	0.5

INTERSTATE 30

Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

January 2015

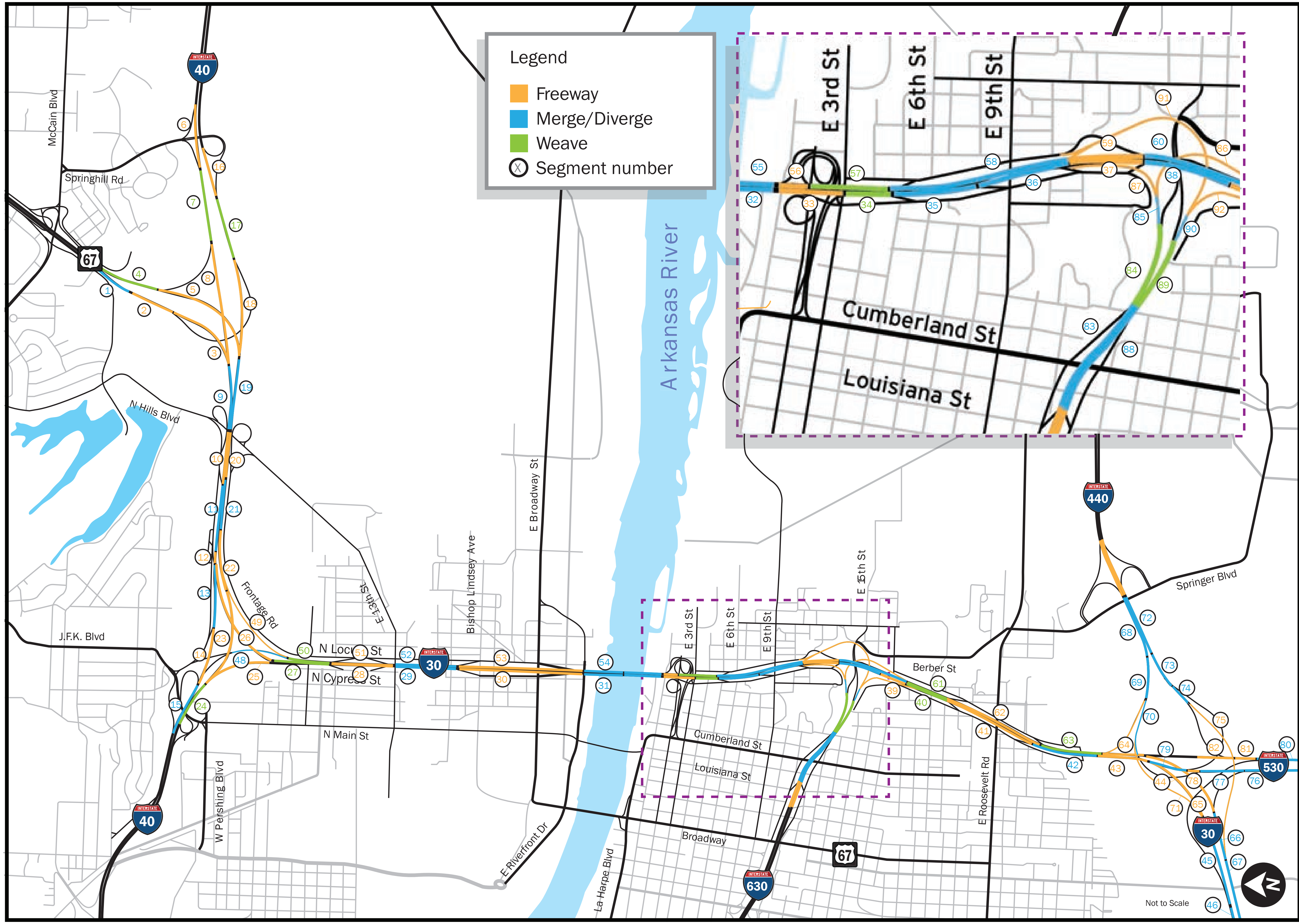


EXHIBIT 16

DRAFT
3-30-15

Analysis Locator Key No-Build

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Planning and Environmental Linkages

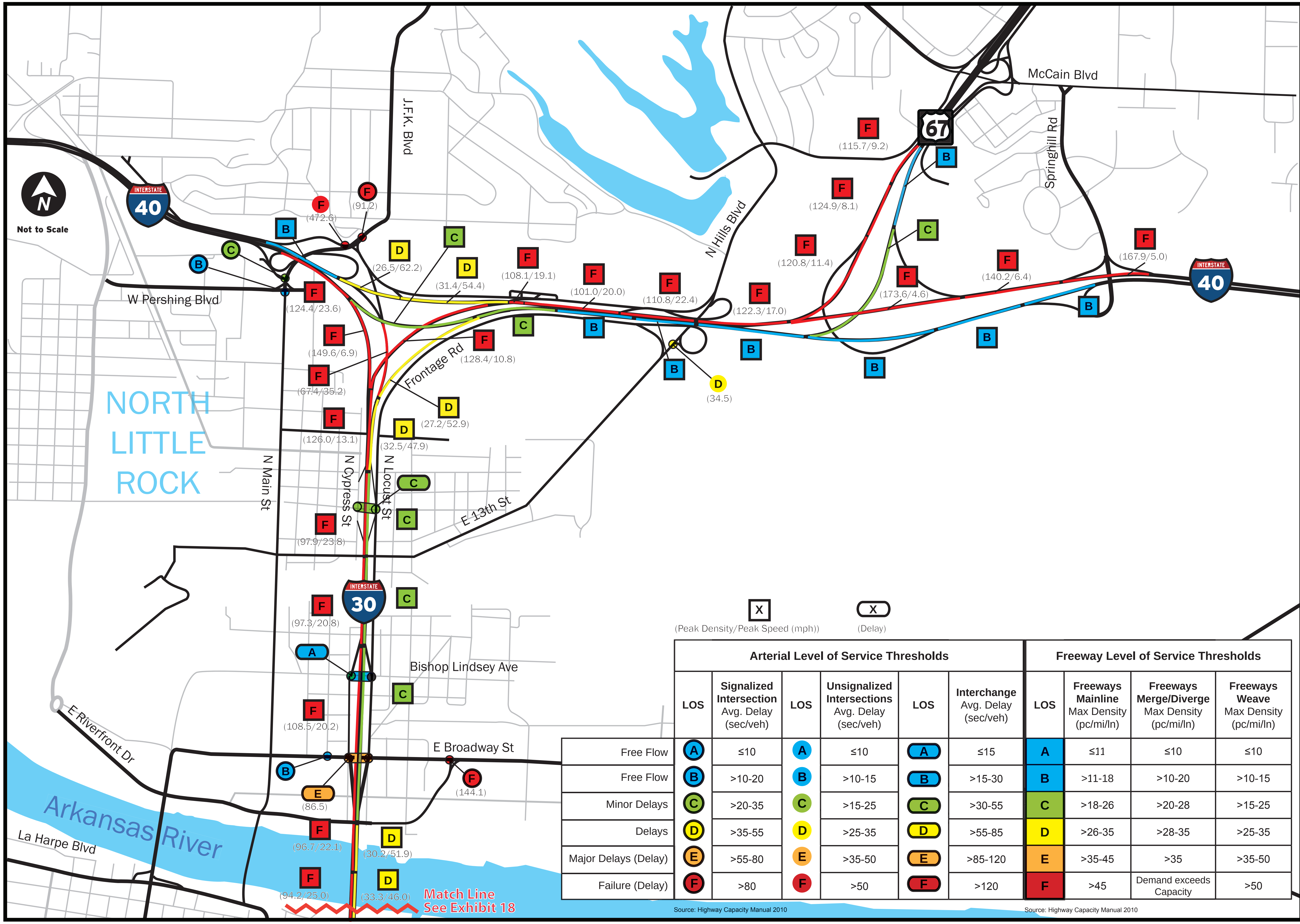
CONNECTING ARKANSAS PROGRAM CAP

April 2015

EXHIBIT 17

DRAFT
3-30-15

I-30 PEL
2041 AM No-Build Conditions
Level of Service
North of Arkansas River



Arterial Level of Service Thresholds

	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)
Free Flow	A	≤10	A	≤10	A	≤15
Free Flow	B	>10-20	B	>10-15	B	>15-30
Minor Delays	C	>20-35	C	>15-25	C	>30-55
Delays	D	>35-55	D	>25-35	D	>55-85
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120
Failure (Delay)	F	>80	F	>50	F	>120

Source: Highway Capacity Manual 2010

Freeway Level of Service Thresholds

LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
A	≤11	≤10	≤10
B	>11-18	>10-20	>10-15
C	>18-26	>20-28	>15-25
D	>26-35	>28-35	>25-35
E	>35-45	>35	>35-50
F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

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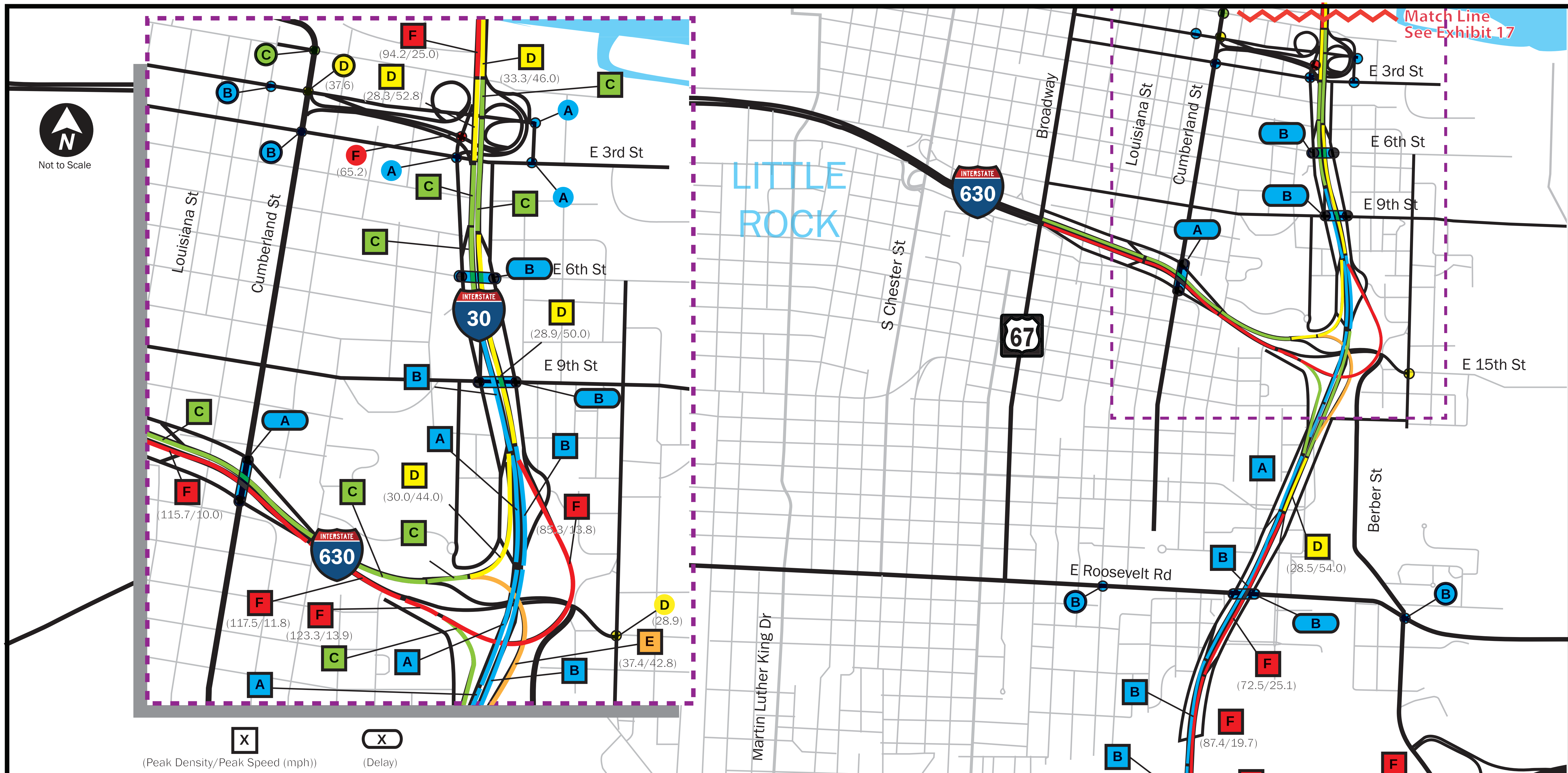
EXHIBIT 18

DRAFT 3-30-15

I-30 PEL
2041 AM No-Build Conditions Level of Service South of Arkansas River



	Arterial Level of Service Thresholds						Freeway Level of Service Thresholds			
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

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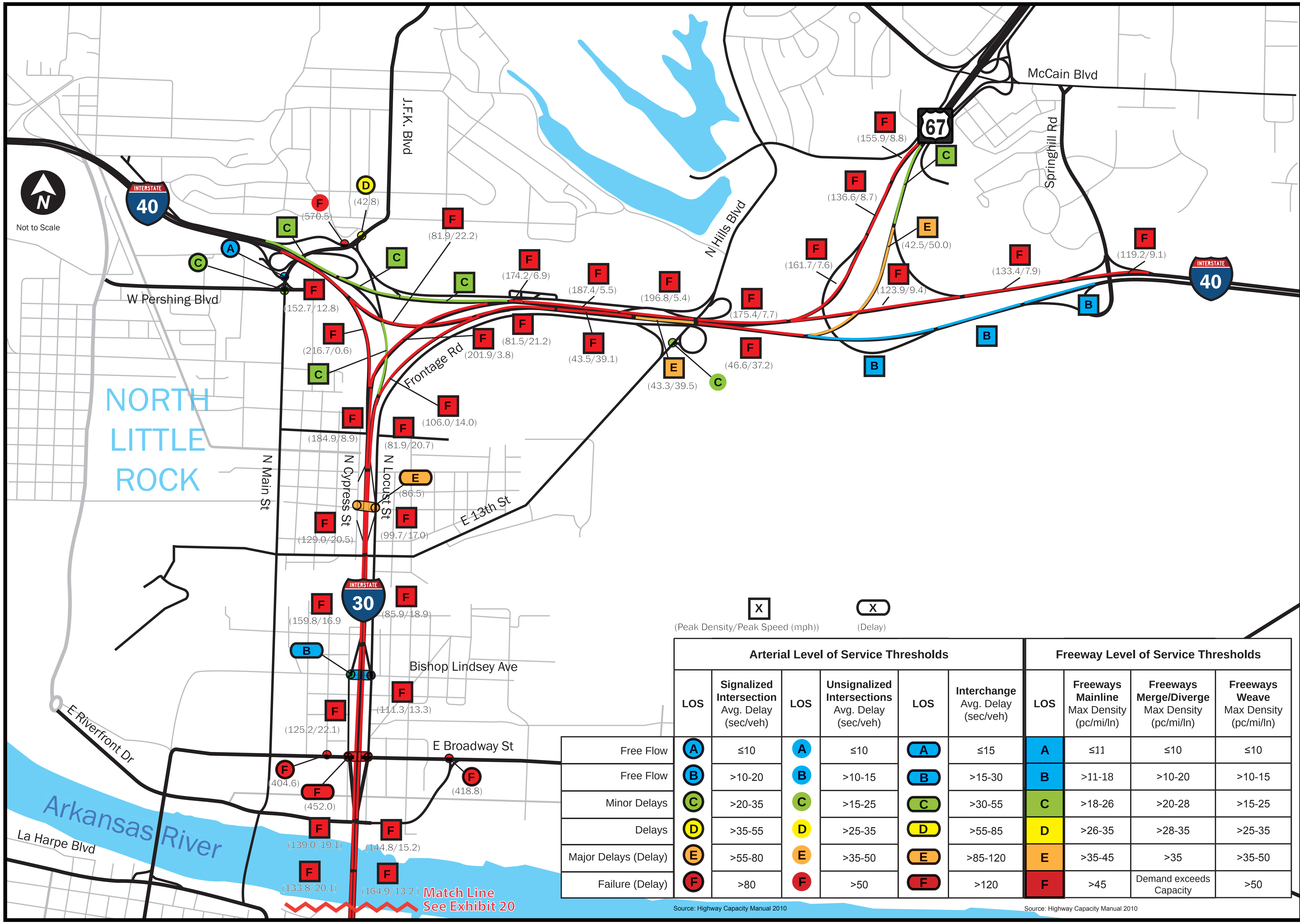
EXHIBIT 19

DRAFT 3-30-15

I-30 PEL
2041 PM No-Build Conditions Level of Service North of Arkansas River



	Arterial Level of Service Thresholds					
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)
Free Flow	A	≤10	A	≤10	A	≤15
Free Flow	B	>10-20	B	>10-15	B	>15-30
Minor Delays	C	>20-35	C	>15-25	C	>30-55
Delays	D	>35-55	D	>25-35	D	>55-85
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120
Failure (Delay)	F	>80	F	>50	F	>120

Source: Highway Capacity Manual 2010

Freeway Level of Service Thresholds			
LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
A	≤11	≤10	≤10
B	>11-18	>10-20	>10-15
C	>18-26	>20-28	>15-25
D	>26-35	>28-35	>25-35
E	>35-45	>35	>35-50
F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

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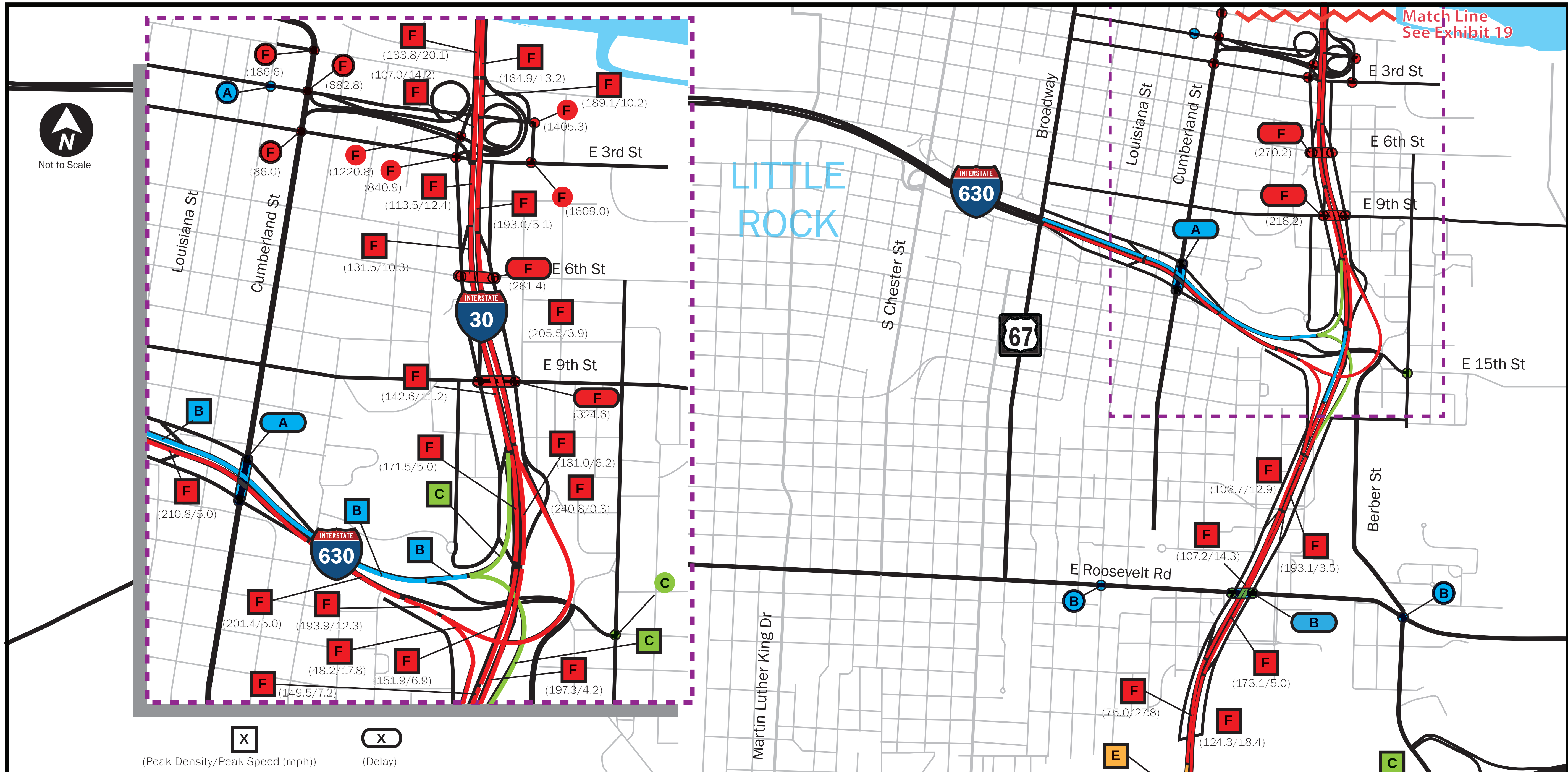
EXHIBIT 20

DRAFT
3-30-15

I-30 PEL
2041 PM No-Build Conditions
Level of Service
South of Arkansas River



	Arterial Level of Service Thresholds						Freeway Level of Service Thresholds			
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

CA0602
Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

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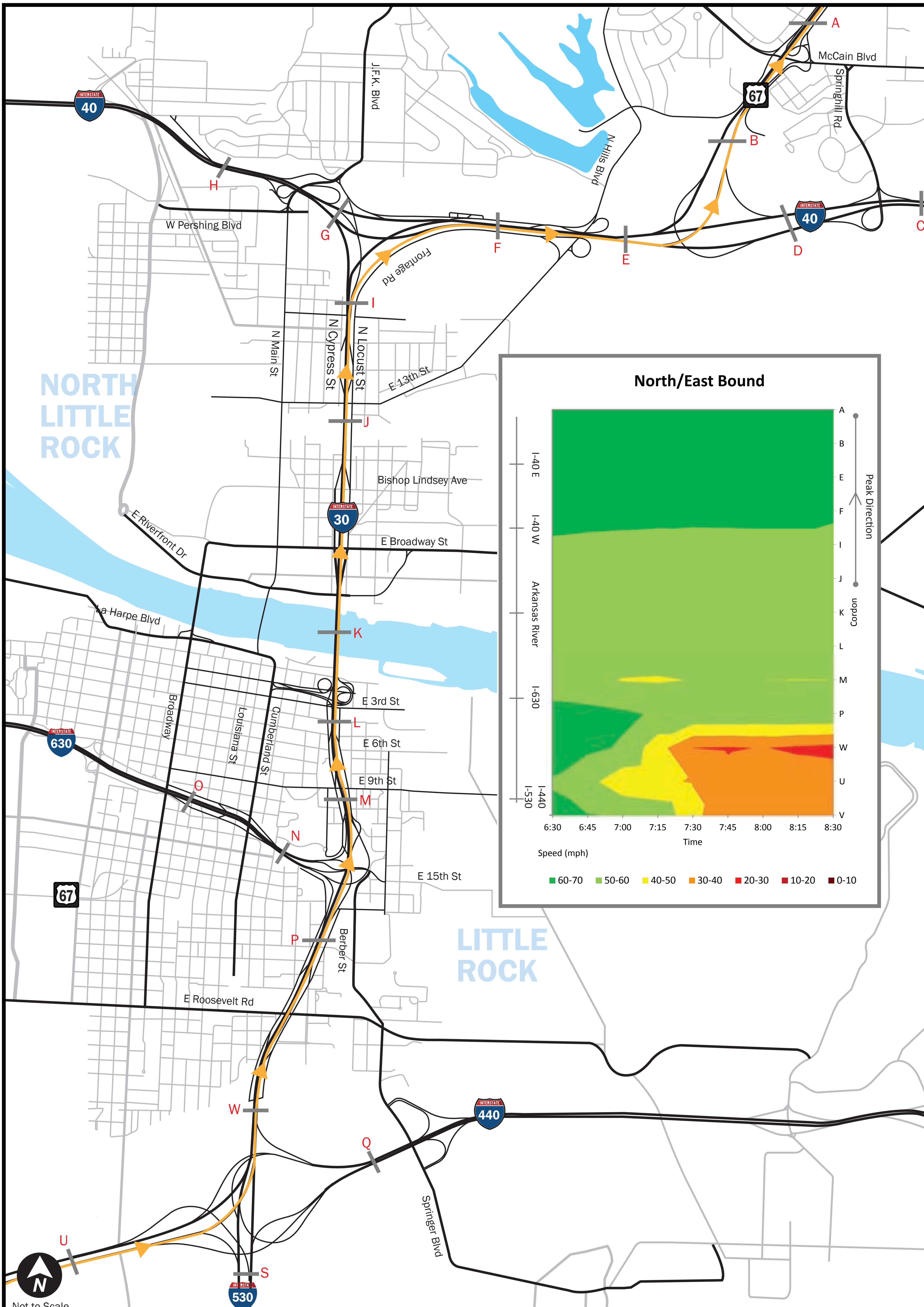


April 2015

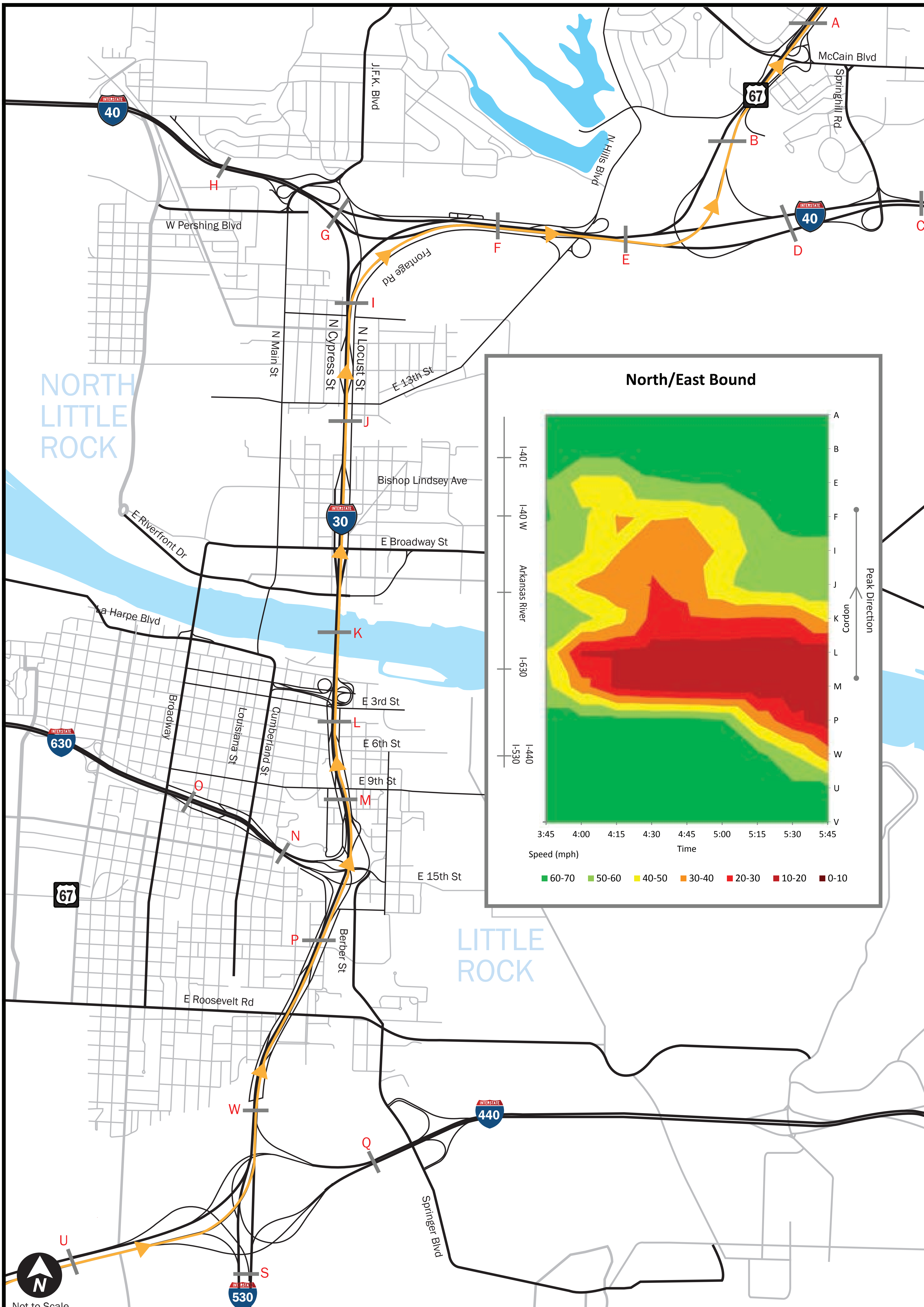
CAP CONNECTING ARKANSAS PROGRAM

Planning and Environmental Linkages

I-30 PEL
2041 AM No-Build Conditions
Speed Profile Map
North/East Bound

DRAFT 3-30-15

EXHIBIT 21



I-30 PEL
2041 PM No-Build Conditions Speed Profile Map North/East Bound

EXHIBIT 22

DRAFT 3-30-15

April 2015

CAP Connecting Arkansas Program

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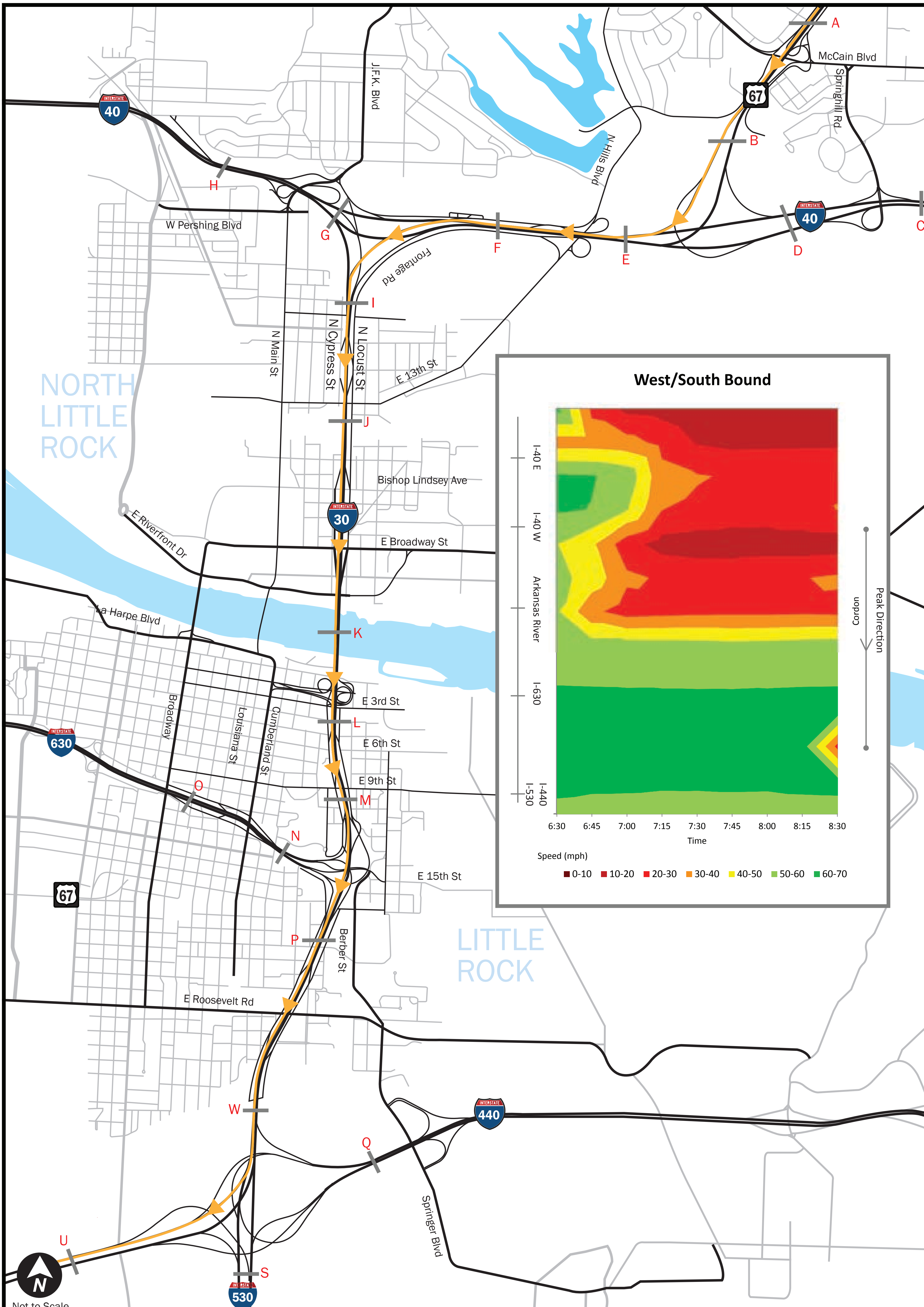


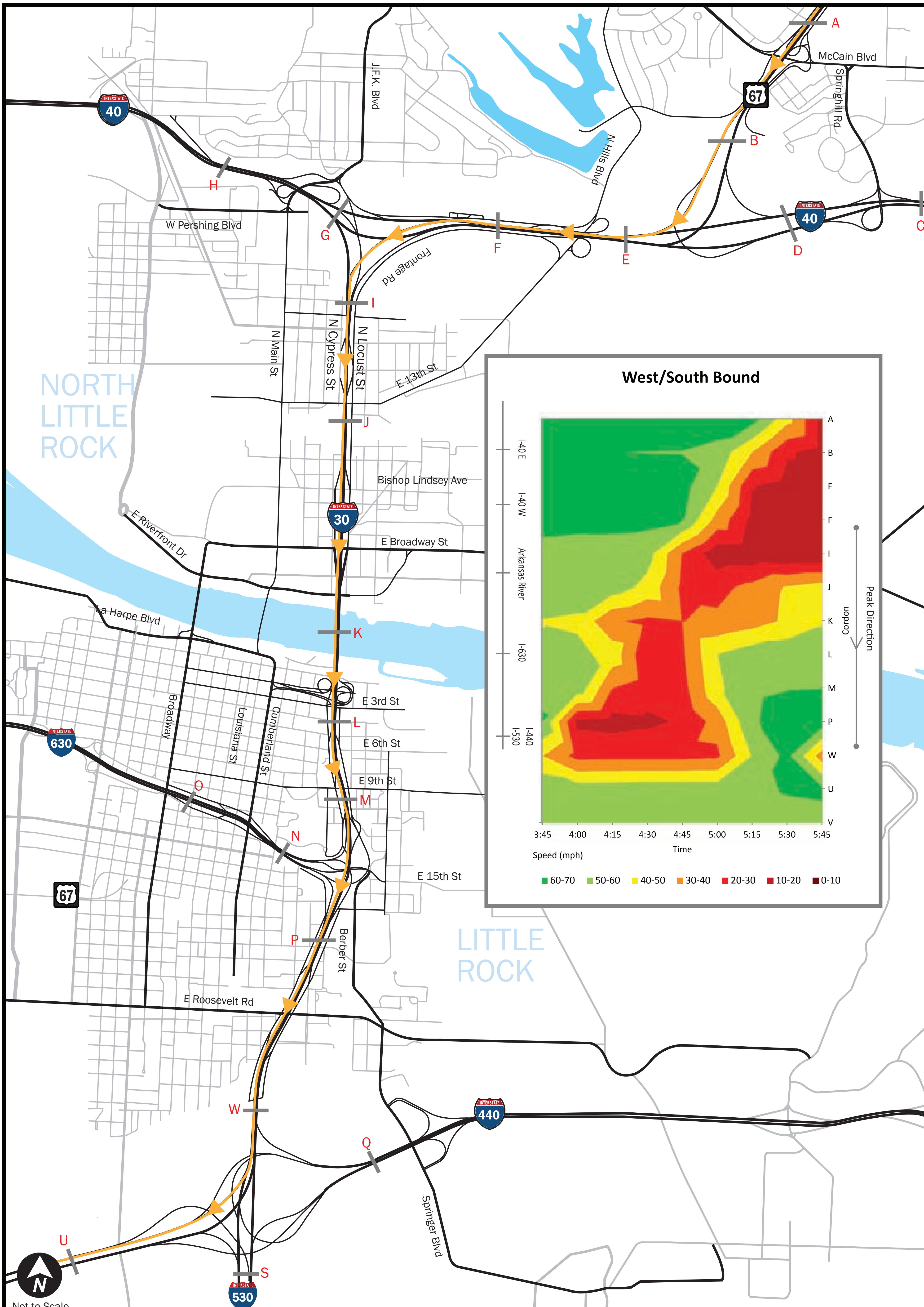
April 2015

Planning and Environmental Linkages

I-30 PEL
2041 AM No-Build Conditions
Speed Profile Map
West/South Bound

DRAFT 3-30-15

EXHIBIT 23



April 2015

Planning and Environmental Linkages

I-30 PEL
2041 PM No-Build Conditions
Speed Profile Map
West/South Bound

DRAFT 3-30-15

EXHIBIT 24

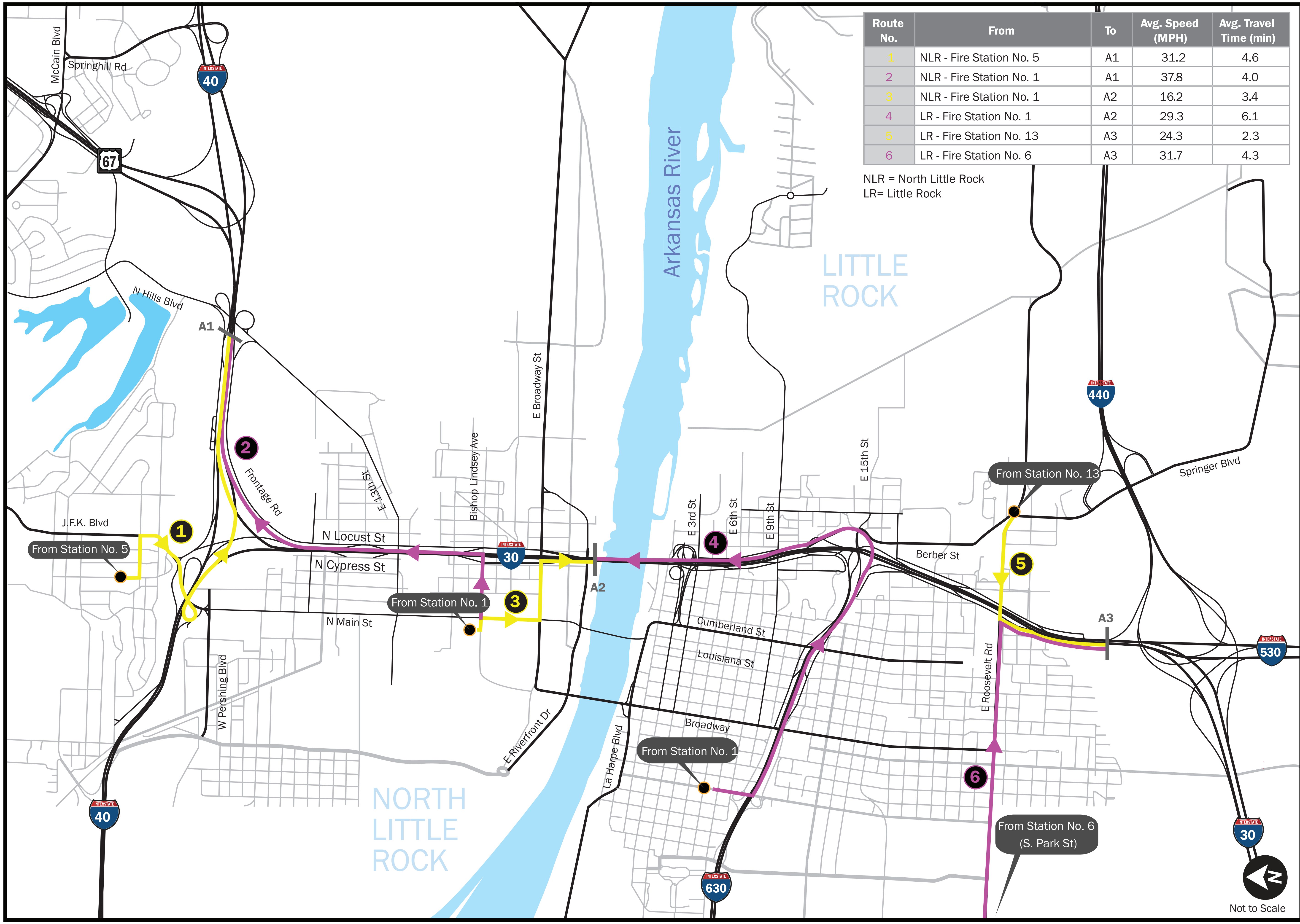
EXHIBIT 25

DRAFT 3-30-15

I-30 PEL
2041 AM No-Build Conditions Emergency Route Travel Time

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	NLR - Fire Station No. 5	A1	31.2	4.6
2	NLR - Fire Station No. 1	A1	37.8	4.0
3	NLR - Fire Station No. 1	A2	16.2	3.4
4	LR - Fire Station No. 1	A2	29.3	6.1
5	LR - Fire Station No. 13	A3	24.3	2.3
6	LR - Fire Station No. 6	A3	31.7	4.3

NLR = North Little Rock
LR= Little Rock



Planning and Environmental Linkages

April 2015

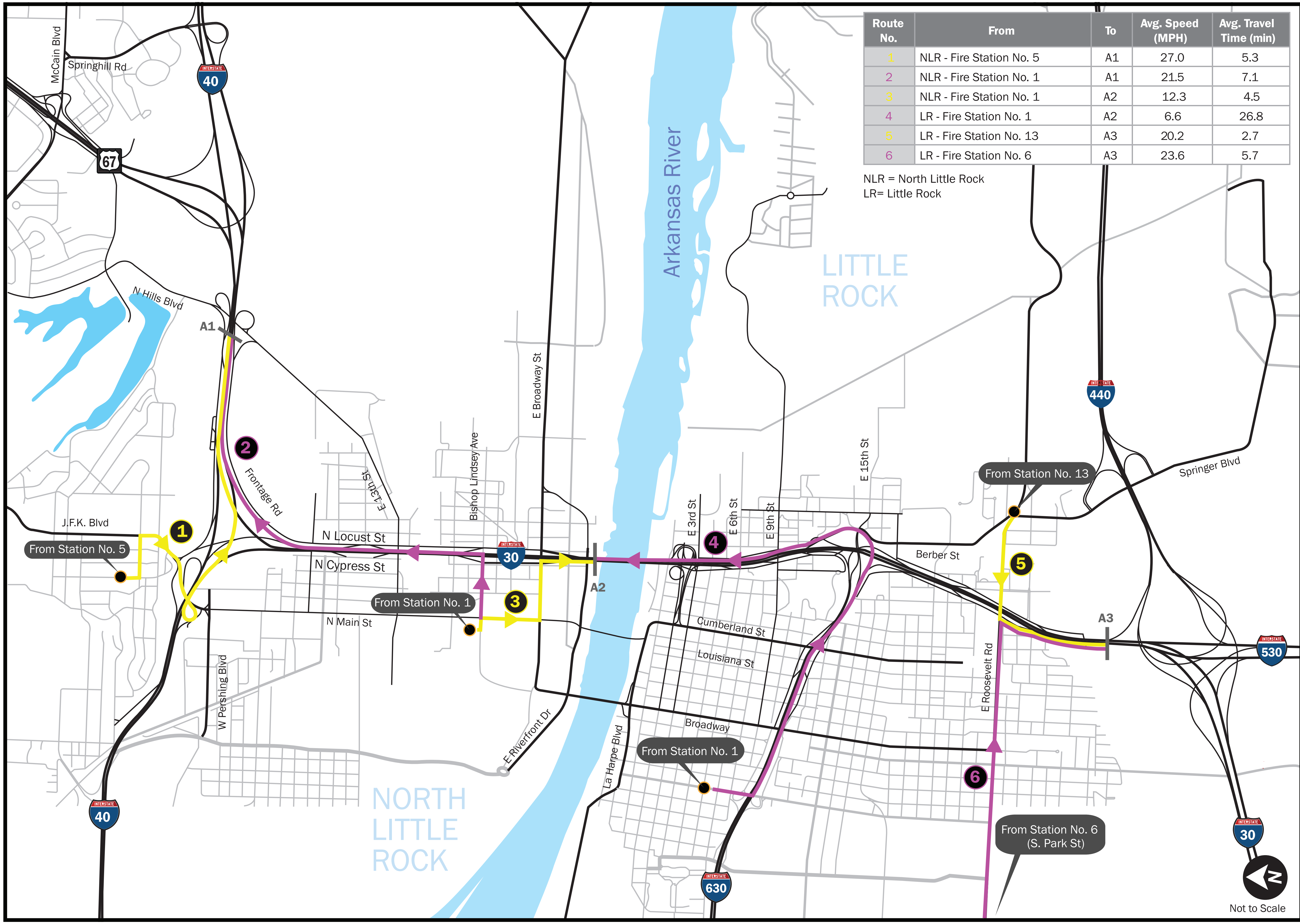
EXHIBIT 26

DRAFT
3-30-15

I-30 PEL
2041 PM No-Build Conditions Emergency Route Travel Time

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	NLR - Fire Station No. 5	A1	27.0	5.3
2	NLR - Fire Station No. 1	A1	21.5	7.1
3	NLR - Fire Station No. 1	A2	12.3	4.5
4	LR - Fire Station No. 1	A2	6.6	26.8
5	LR - Fire Station No. 13	A3	20.2	2.7
6	LR - Fire Station No. 6	A3	23.6	5.7

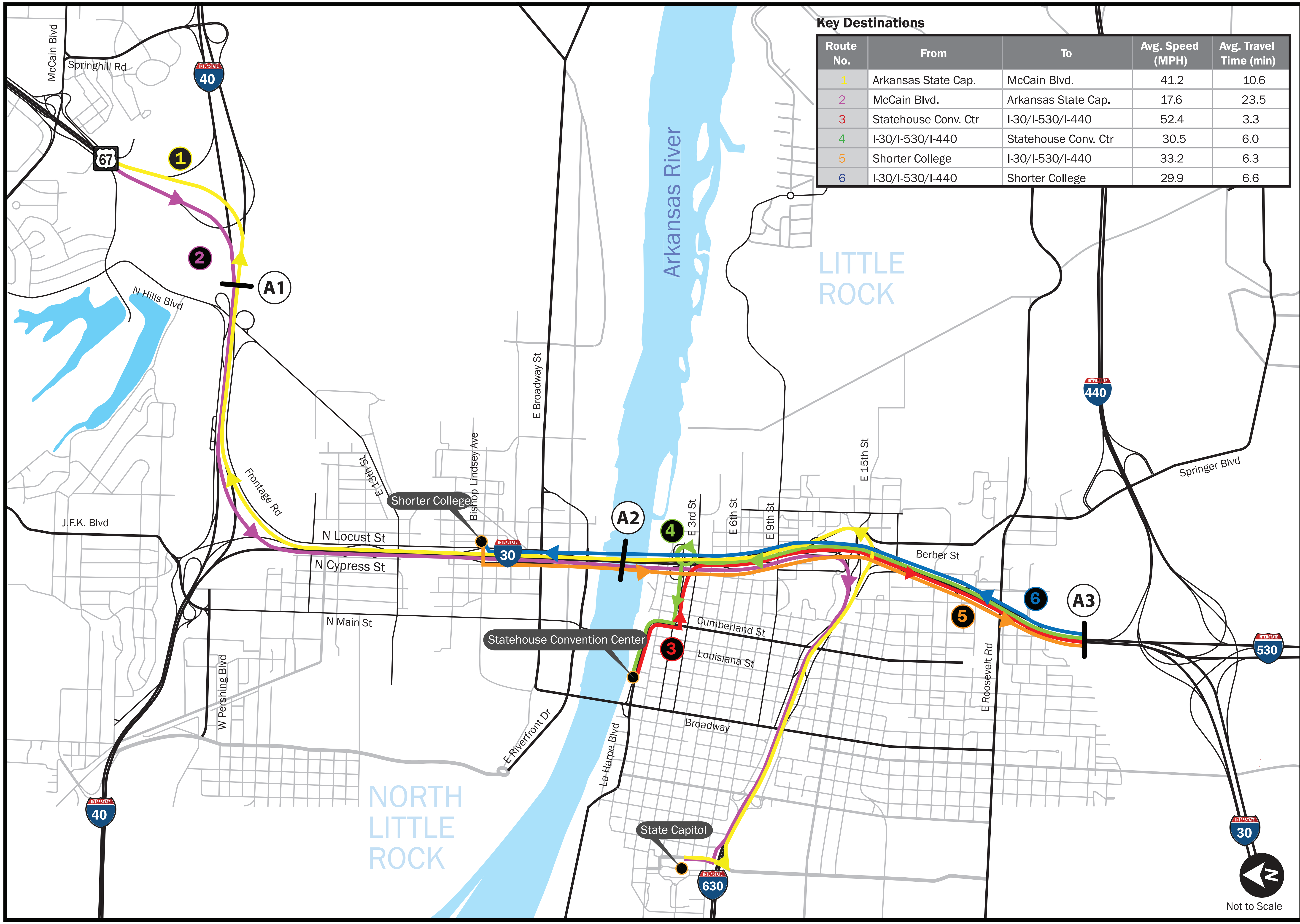
NLR = North Little Rock
LR= Little Rock



Interstate 30
Planning and Environmental Linkages

CAP Connecting Arkansas Program

April 2015



Key Destinations

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	Arkansas State Cap.	McCain Blvd.	41.2	10.6
2	McCain Blvd.	Arkansas State Cap.	17.6	23.5
3	Statehouse Conv. Ctr	I-30/I-530/I-440	52.4	3.3
4	I-30/I-530/I-440	Statehouse Conv. Ctr	30.5	6.0
5	Shorter College	I-30/I-530/I-440	33.2	6.3
6	I-30/I-530/I-440	Shorter College	29.9	6.6

EXHIBIT 27

DRAFT
3-30-15

I-30 PEL
2041 AM No-Build Conditions
Key Destination Travel Time

INTERSTATE 30

Planning and Environmental Linkages

April 2015

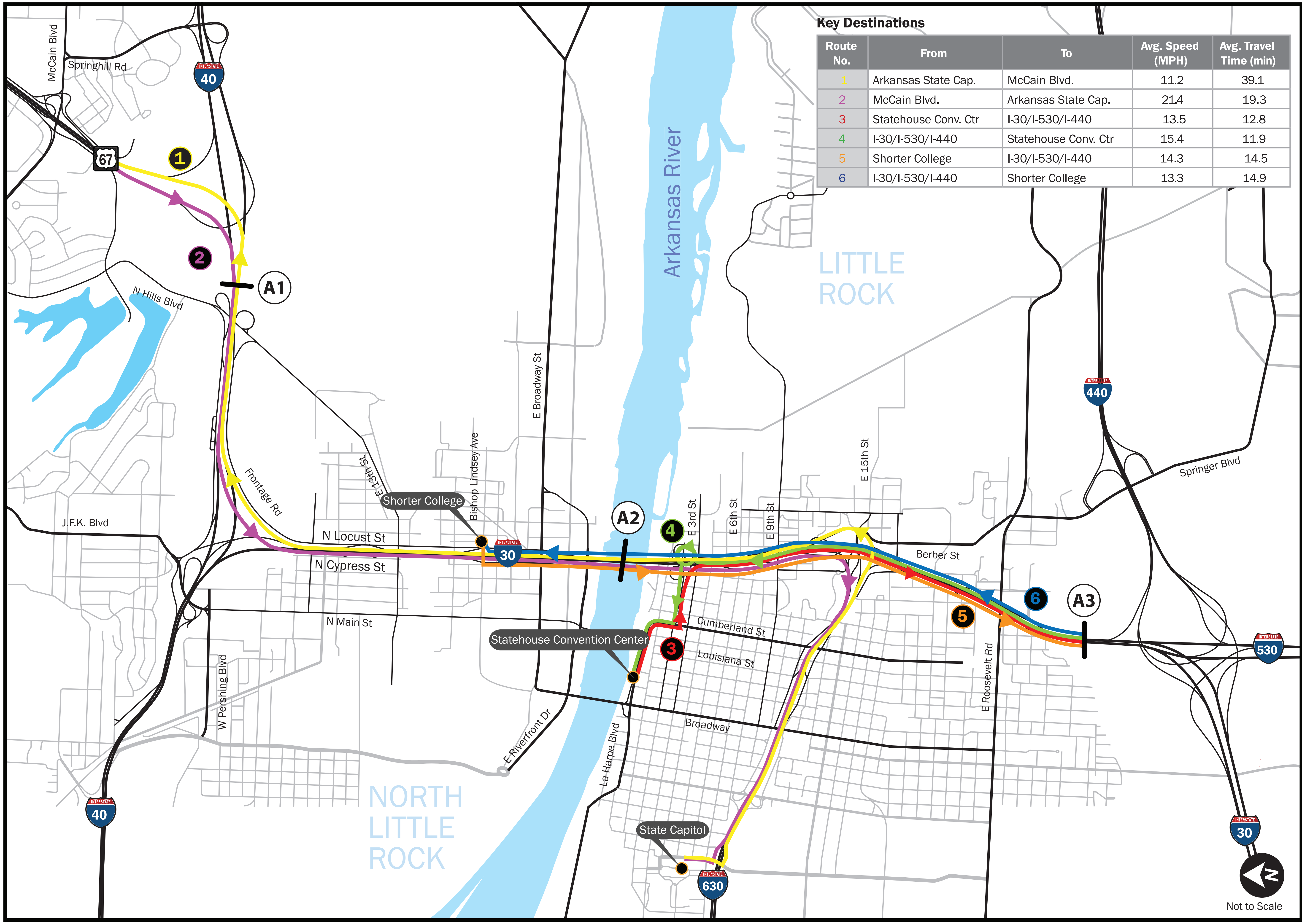
EXHIBIT 28

DRAFT
3-30-15

I-30 PEL
2041 PM No-Build Conditions
Key Destination Travel Time

Key Destinations

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	Arkansas State Cap.	McCain Blvd.	11.2	39.1
2	McCain Blvd.	Arkansas State Cap.	21.4	19.3
3	Statehouse Conv. Ctr	I-30/I-530/I-440	13.5	12.8
4	I-30/I-530/I-440	Statehouse Conv. Ctr	15.4	11.9
5	Shorter College	I-30/I-530/I-440	14.3	14.5
6	I-30/I-530/I-440	Shorter College	13.3	14.9



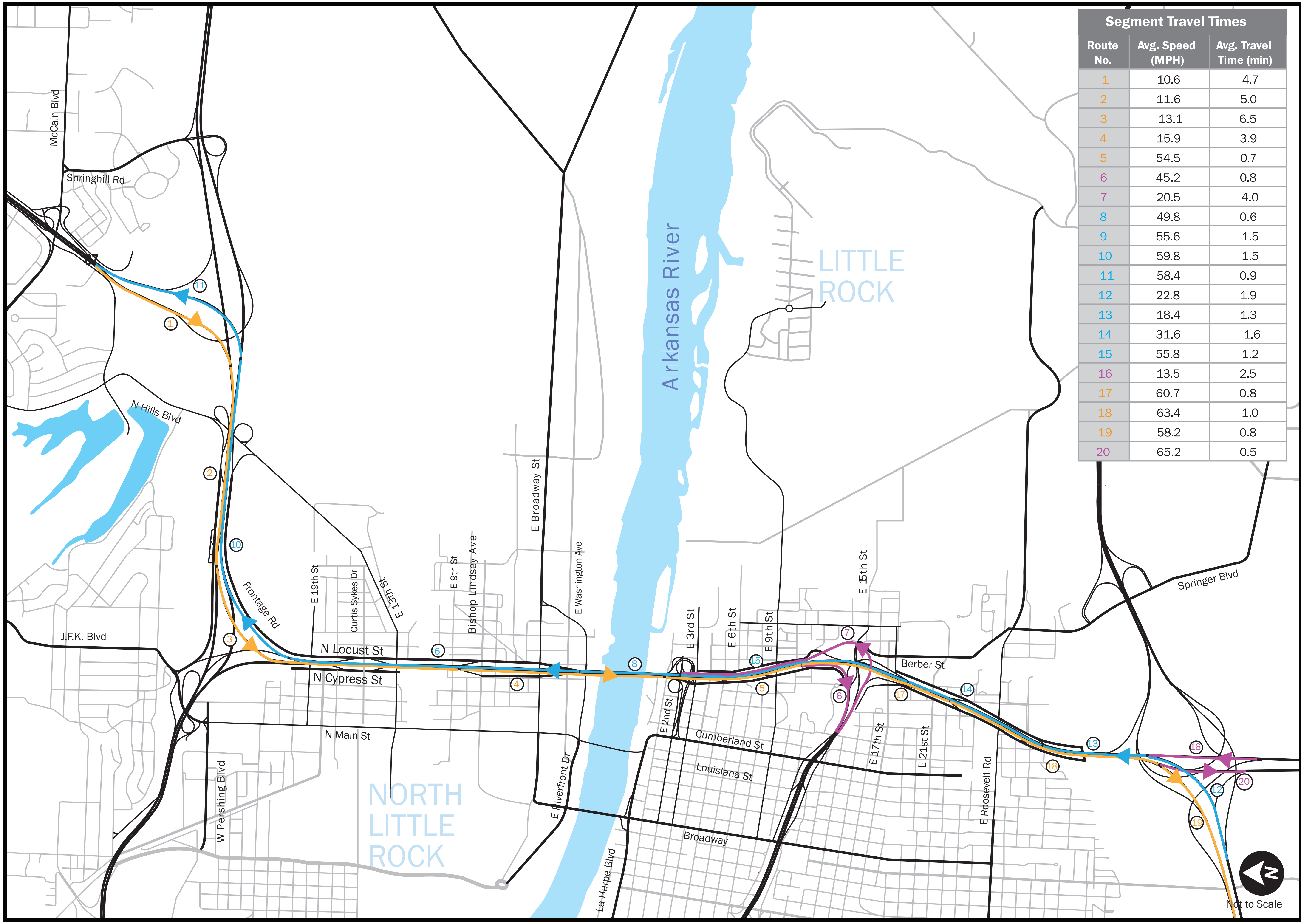
Planning and Environmental Linkages

April 2015

EXHIBIT 29

DRAFT
3-30-15

I-30 PEL
2041 AM No-Build Conditions Study Corridor Travel Time



Segment Travel Times

Route No.	Avg. Speed (MPH)	Avg. Travel Time (min)
1	10.6	4.7
2	11.6	5.0
3	13.1	6.5
4	15.9	3.9
5	54.5	0.7
6	45.2	0.8
7	20.5	4.0
8	49.8	0.6
9	55.6	1.5
10	59.8	1.5
11	58.4	0.9
12	22.8	1.9
13	18.4	1.3
14	31.6	1.6
15	55.8	1.2
16	13.5	2.5
17	60.7	0.8
18	63.4	1.0
19	58.2	0.8
20	65.2	0.5

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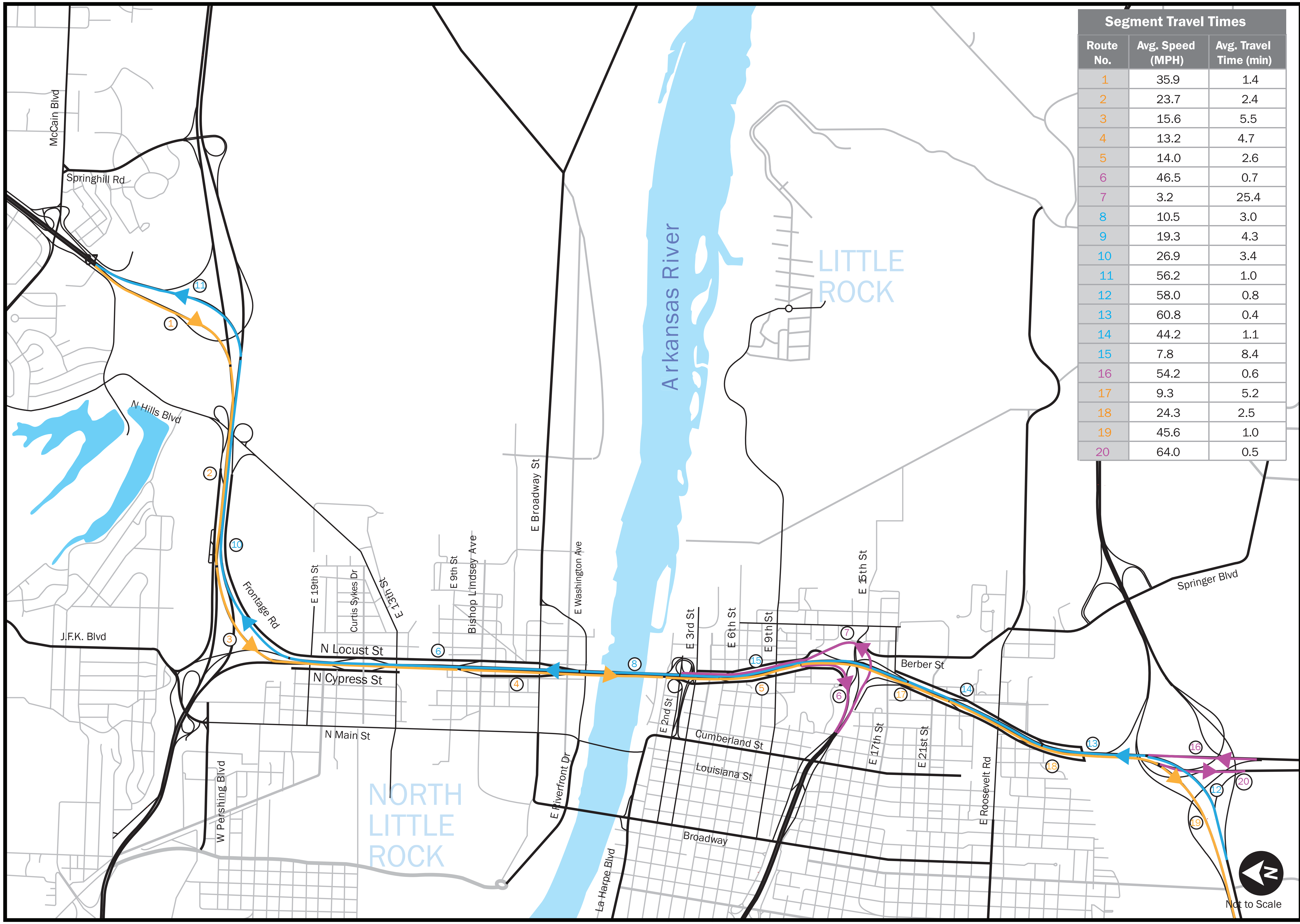
EXHIBIT 30

DRAFT
3-30-15

I-30 PEL
2041 PM No-Build Conditions Study Corridor Travel Time



Segment Travel Times

Route No.	Avg. Speed (MPH)	Avg. Travel Time (min)
1	35.9	1.4
2	23.7	2.4
3	15.6	5.5
4	13.2	4.7
5	14.0	2.6
6	46.5	0.7
7	3.2	25.4
8	10.5	3.0
9	19.3	4.3
10	26.9	3.4
11	56.2	1.0
12	58.0	0.8
13	60.8	0.4
14	44.2	1.1
15	7.8	8.4
16	54.2	0.6
17	9.3	5.2
18	24.3	2.5
19	45.6	1.0
20	64.0	0.5

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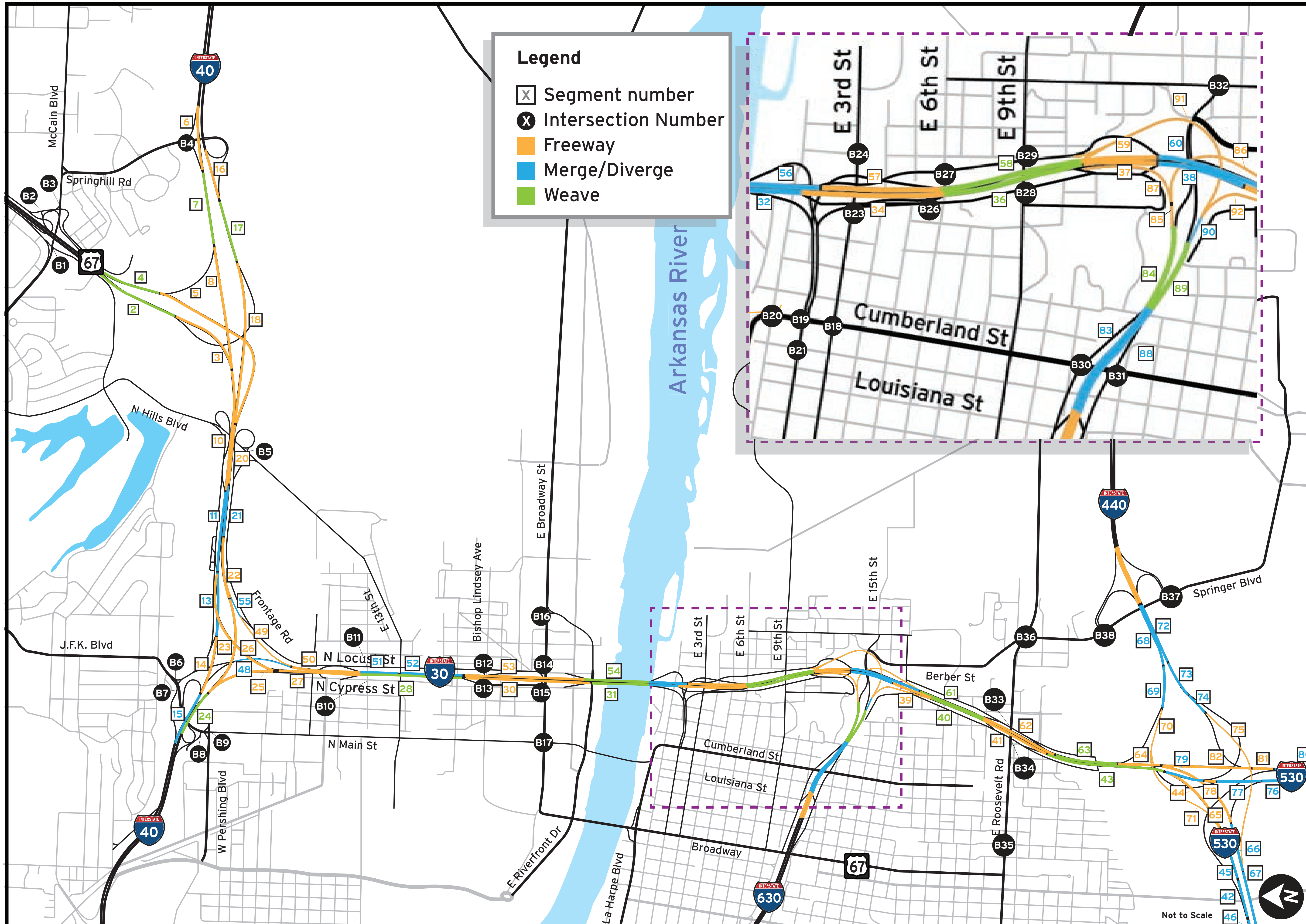

EXHIBIT 31

DRAFT
3-27-15

Analysis Locator Key
10 Main Lane

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CAP
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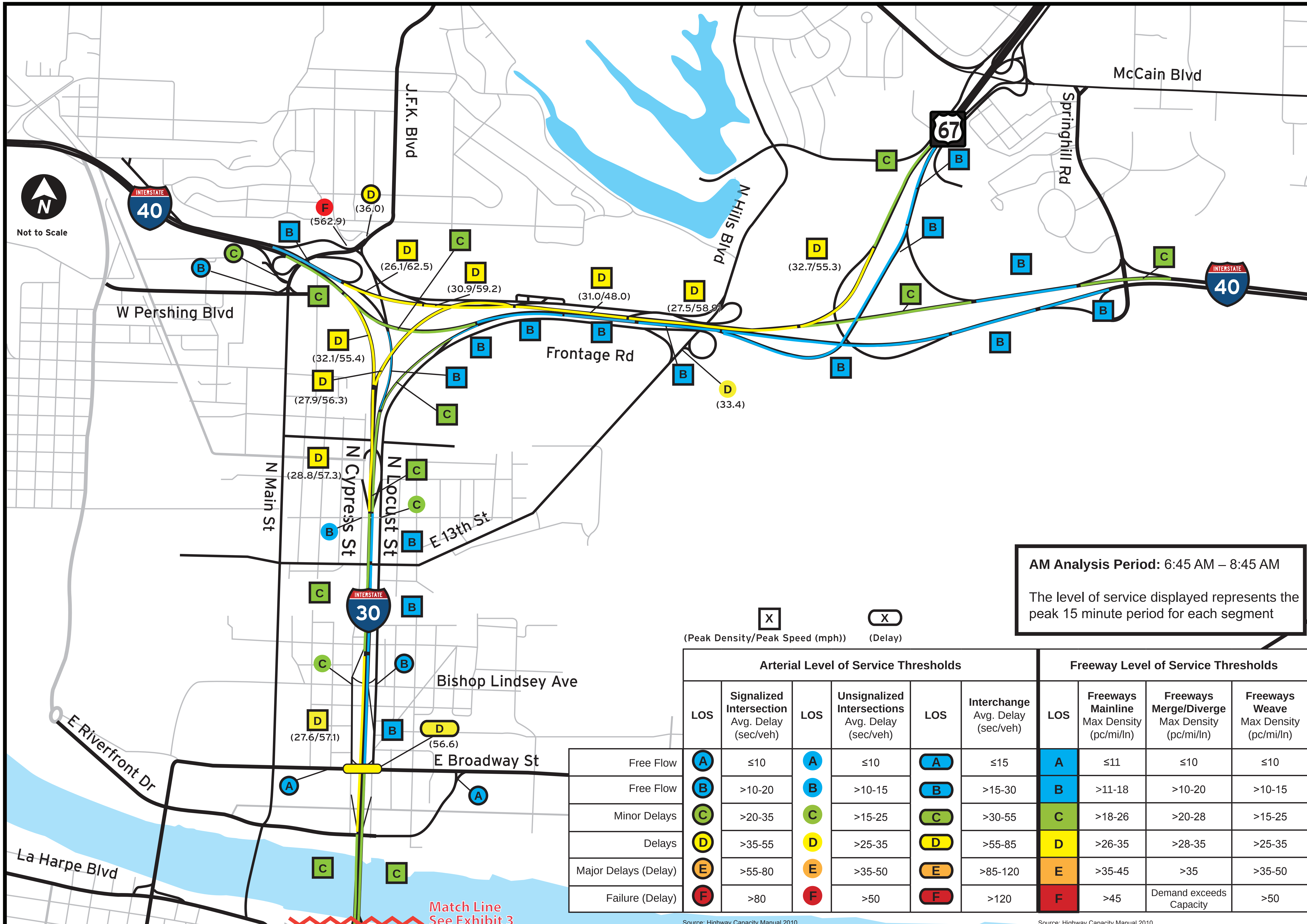
EXHIBIT 32

DRAFT 3-25-15

I -30 PEL
2041 AM 10 Main Lane Level of Service North of Arkansas River



AM Analysis Period: 6:45 AM – 8:45 AM

The level of service displayed represents the peak 15 minute period for each segment

X (Peak Density/Peak Speed (mph))

X (Delay)

	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)
Free Flow	A	≤10	A	≤10	A	≤15
Free Flow	B	>10-20	B	>10-15	B	>15-30
Minor Delays	C	>20-35	C	>15-25	C	>30-55
Delays	D	>35-55	D	>25-35	D	>55-85
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120
Failure (Delay)	F	>80	F	>50	F	>120

Arterial Level of Service Thresholds. Source: Highway Capacity Manual 2010

LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
A	≤11	≤10	≤10
B	>11-18	>10-20	>10-15
C	>18-26	>20-28	>15-25
D	>26-35	>28-35	>25-35
E	>35-45	>35	>35-50
F	>45	Demand exceeds Capacity	>50

Freeway Level of Service Thresholds. Source: Highway Capacity Manual 2010

CA0602
Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

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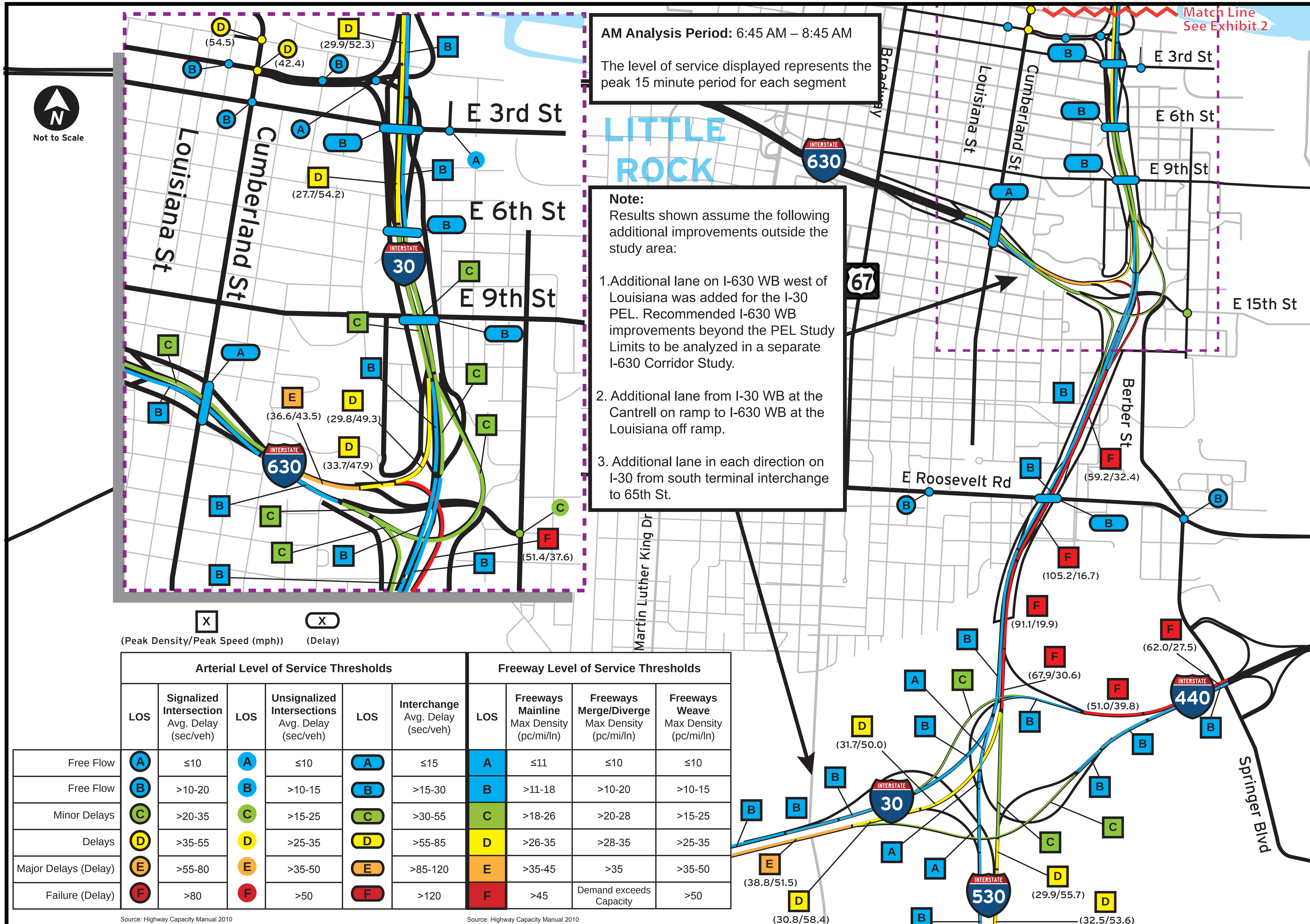

AM Analysis Period: 6:45 AM – 8:45 AM

The level of service displayed represents the peak 15 minute period for each segment

Note:
Results shown assume the following additional improvements outside the study area:

1. Additional lane on I-630 WB west of Louisiana was added for the I-30 PEL. Recommended I-630 WB improvements beyond the PEL Study Limits to be analyzed in a separate I-630 Corridor Study.
2. Additional lane from I-30 WB at the Cantrell on ramp to I-630 WB at the Louisiana off ramp.
3. Additional lane in each direction on I-30 from south terminal interchange to 65th St.

Arterial Level of Service Thresholds

	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)
Free Flow	A	≤10	A	≤10	A	≤15
Free Flow	B	>10-20	B	>10-15	B	>15-30
Minor Delays	C	>20-35	C	>15-25	C	>30-55
Delays	D	>35-55	D	>25-35	D	>55-85
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120
Failure (Delay)	F	>80	F	>50	F	>120

Source: Highway Capacity Manual 2010

Freeway Level of Service Thresholds

LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
A	≤11	≤10	≤10
B	>11-18	>10-20	>10-15
C	>18-26	>20-28	>15-25
D	>26-35	>28-35	>25-35
E	>35-45	>35	>35-50
F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

EXHIBIT 33

DRAFT
3-25-15

I-30 PEL
2041 AM 10 Main Lane Level of Service South of Arkansas River

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Planning and Environmental Linkages

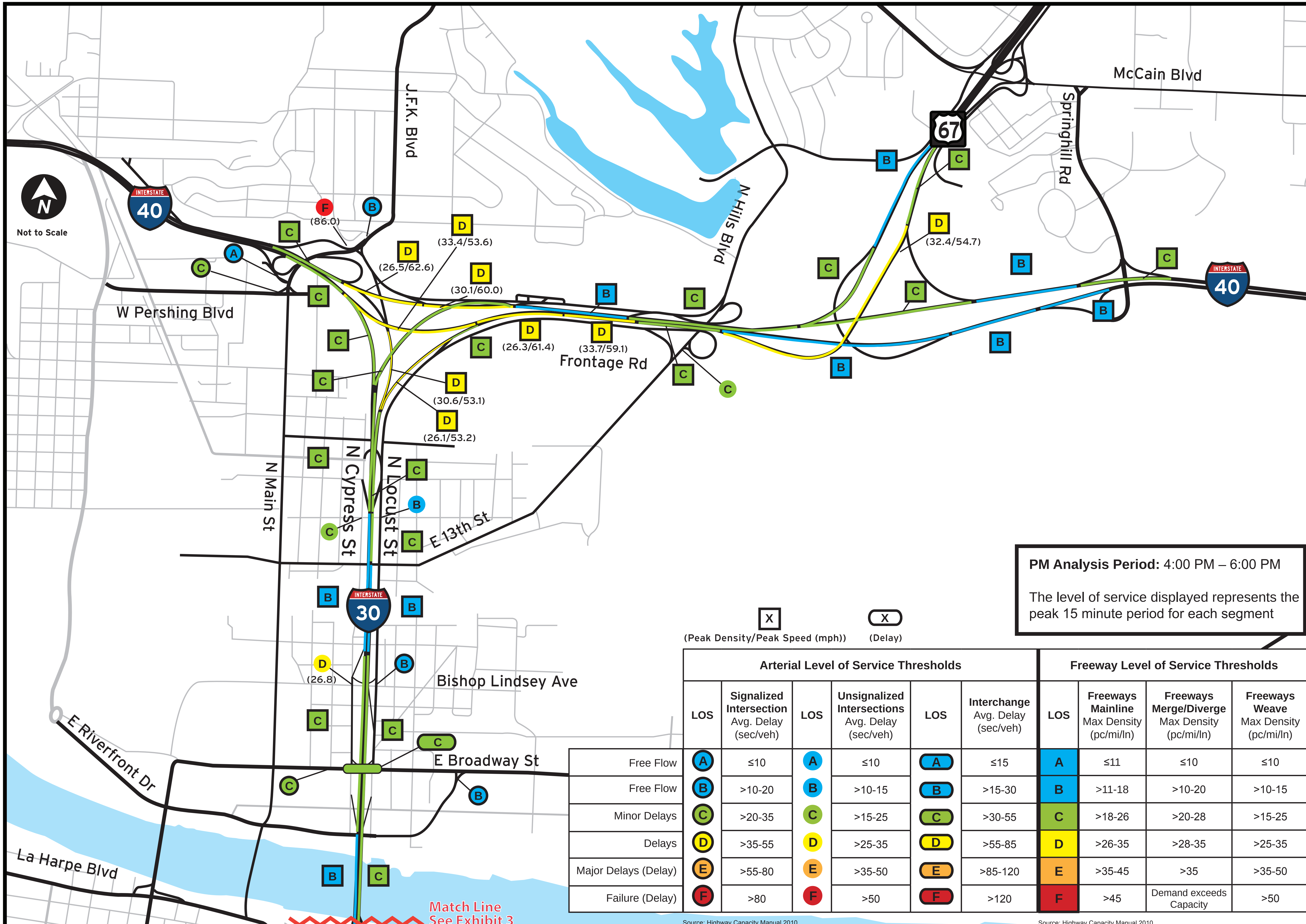
CONNECTING ARKANSAS PROGRAM CAP

February 2015

EXHIBIT 34

DRAFT
3-25-15

I -30 PEL
2041 PM 10 Main Lane Level of Service North of Arkansas River



PM Analysis Period: 4:00 PM – 6:00 PM

The level of service displayed represents the peak 15 minute period for each segment

X (Peak Density/Peak Speed (mph)) X (Delay)

	Arterial Level of Service Thresholds						Freeway Level of Service Thresholds			
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

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EXHIBIT 35

DRAFT
3-25-15

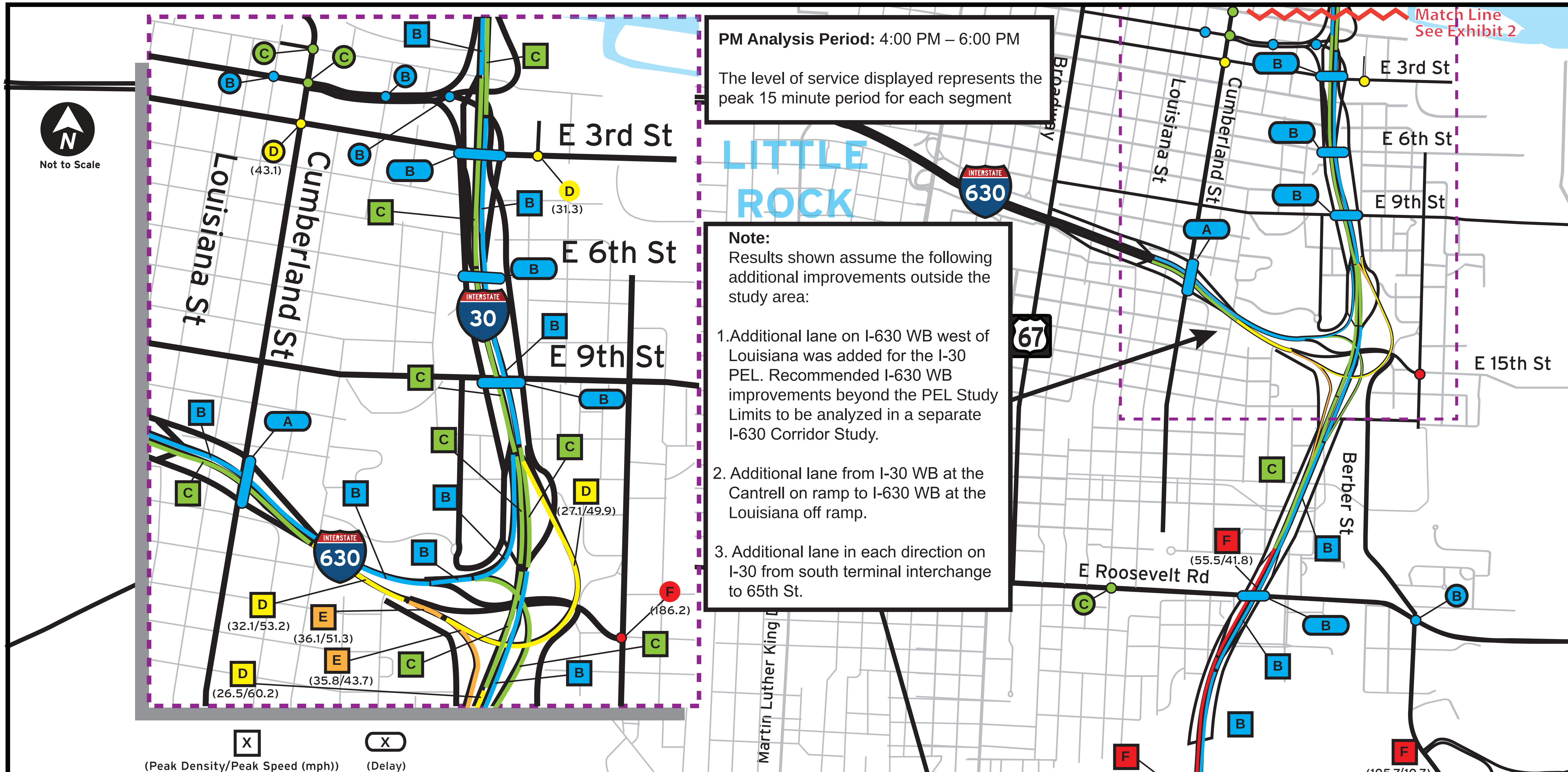
I-30 PEL
2041 PM 10 Main Lane Level of Service South of Arkansas River

PM Analysis Period: 4:00 PM – 6:00 PM

The level of service displayed represents the peak 15 minute period for each segment

Note:
Results shown assume the following additional improvements outside the study area:

1. Additional lane on I-630 WB west of Louisiana was added for the I-30 PEL. Recommended I-630 WB improvements beyond the PEL Study Limits to be analyzed in a separate I-630 Corridor Study.
2. Additional lane from I-30 WB at the Cantrell on ramp to I-630 WB at the Louisiana off ramp.
3. Additional lane in each direction on I-30 from south terminal interchange to 65th St.



	Arterial Level of Service Thresholds						Freeway Level of Service Thresholds			
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

CA0602
Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

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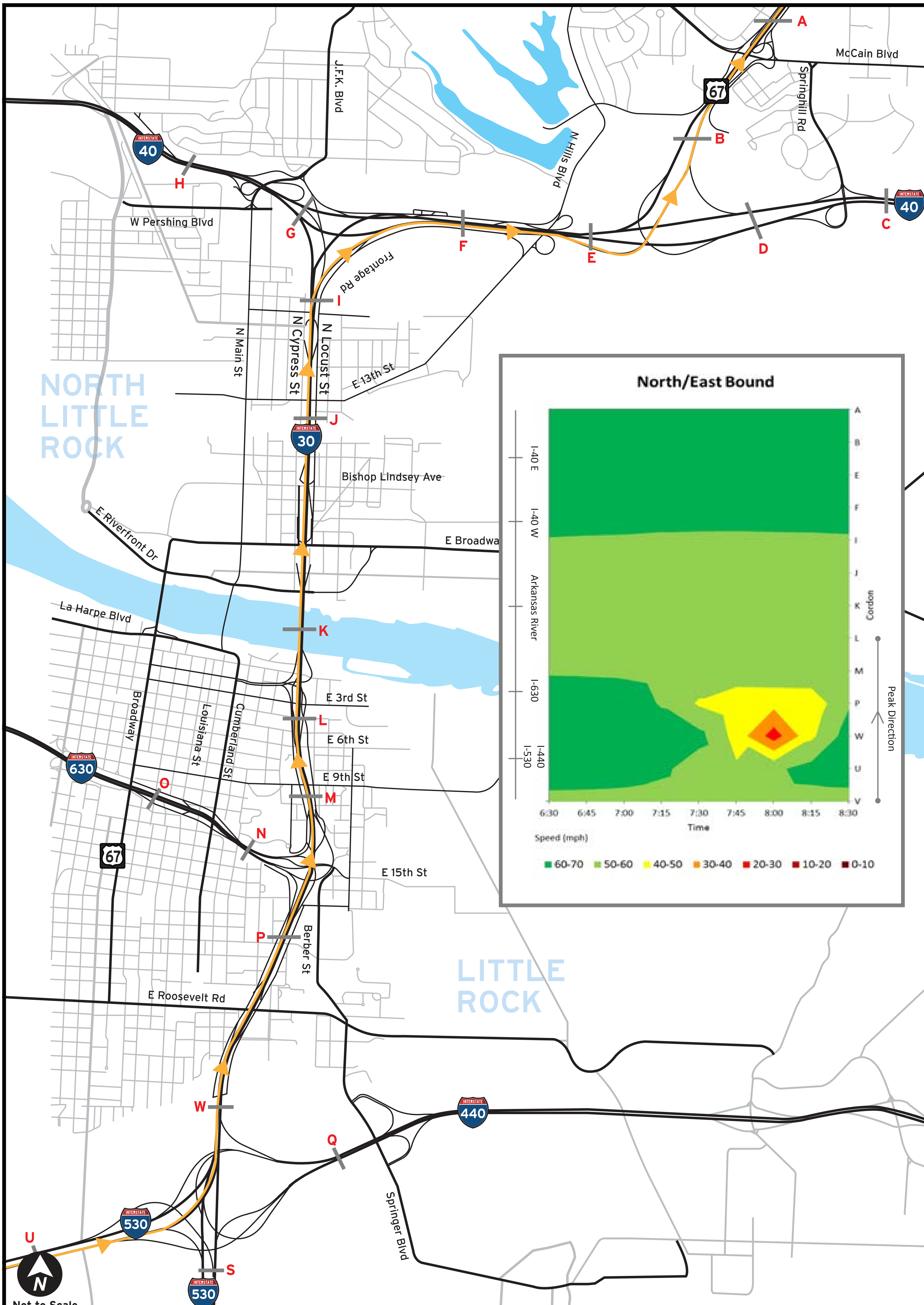

February 2015

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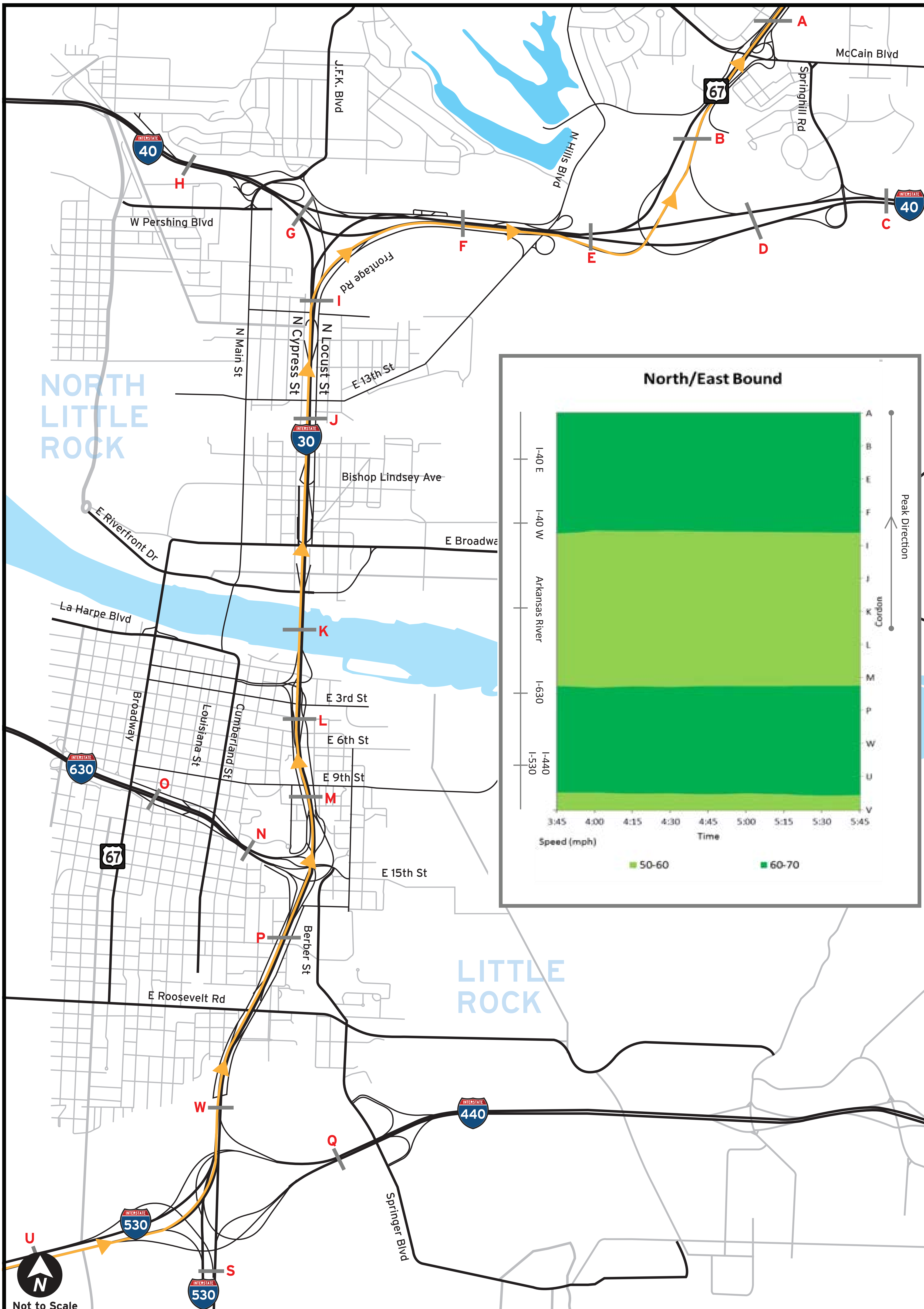
Planning and Environmental Linkages

I-30 PEL
2041 AM 10 Main Lane Speed Profile Map North/East Bound

DRAFT 3-11-15

EXHIBIT 36



February 2015

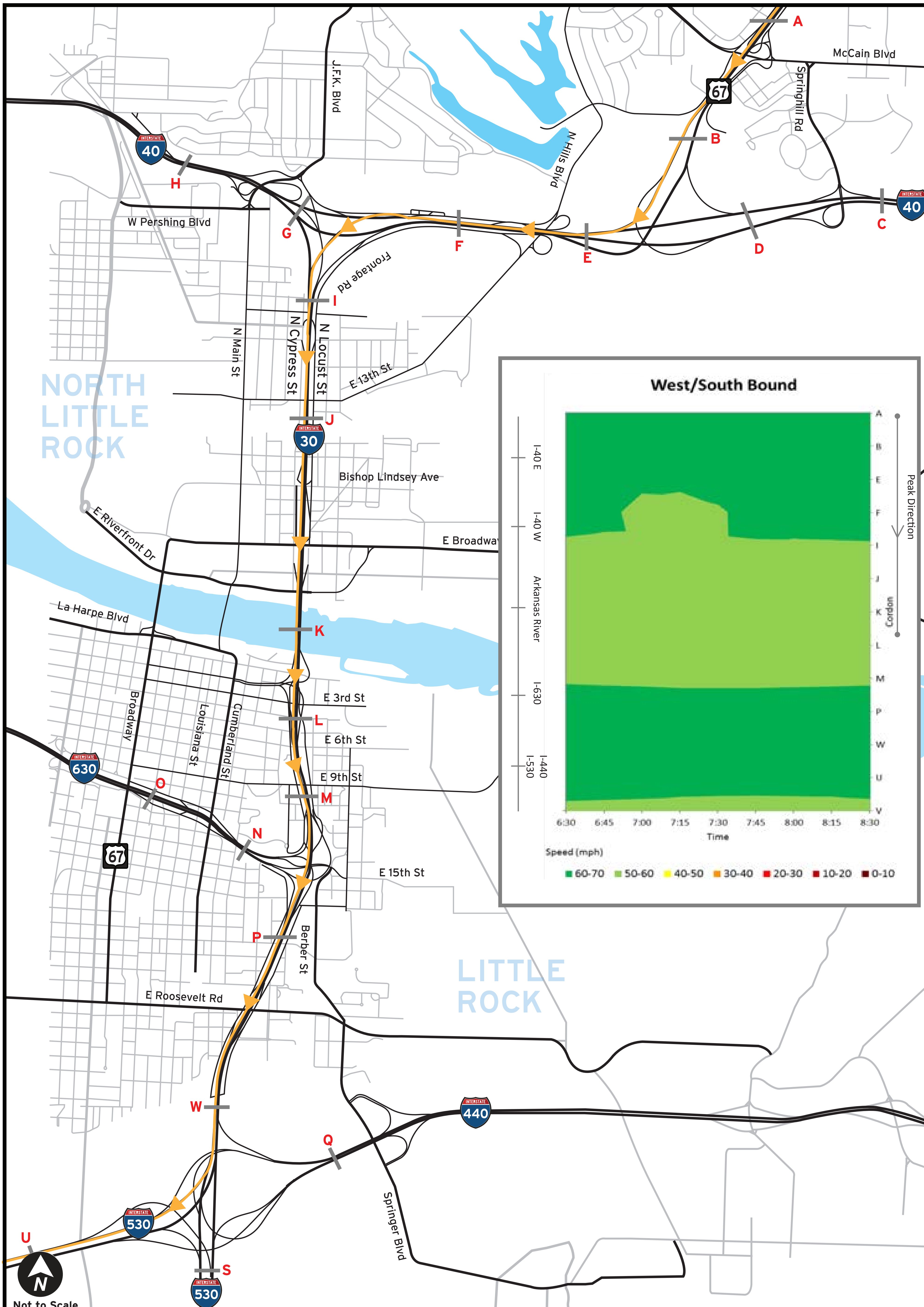
CAP CONNECTING ARKANSAS PROGRAM

Planning and Environmental Linkages

I-30 PEL
2041 PM 10 Main Lane Speed Profile Map North/East Bound

DRAFT 3-11-15

EXHIBIT 37



I-30 PEL
2041 AM 10 Main Lane Speed Profile Map West/South Bound

EXHIBIT 38

DRAFT 3-11-15

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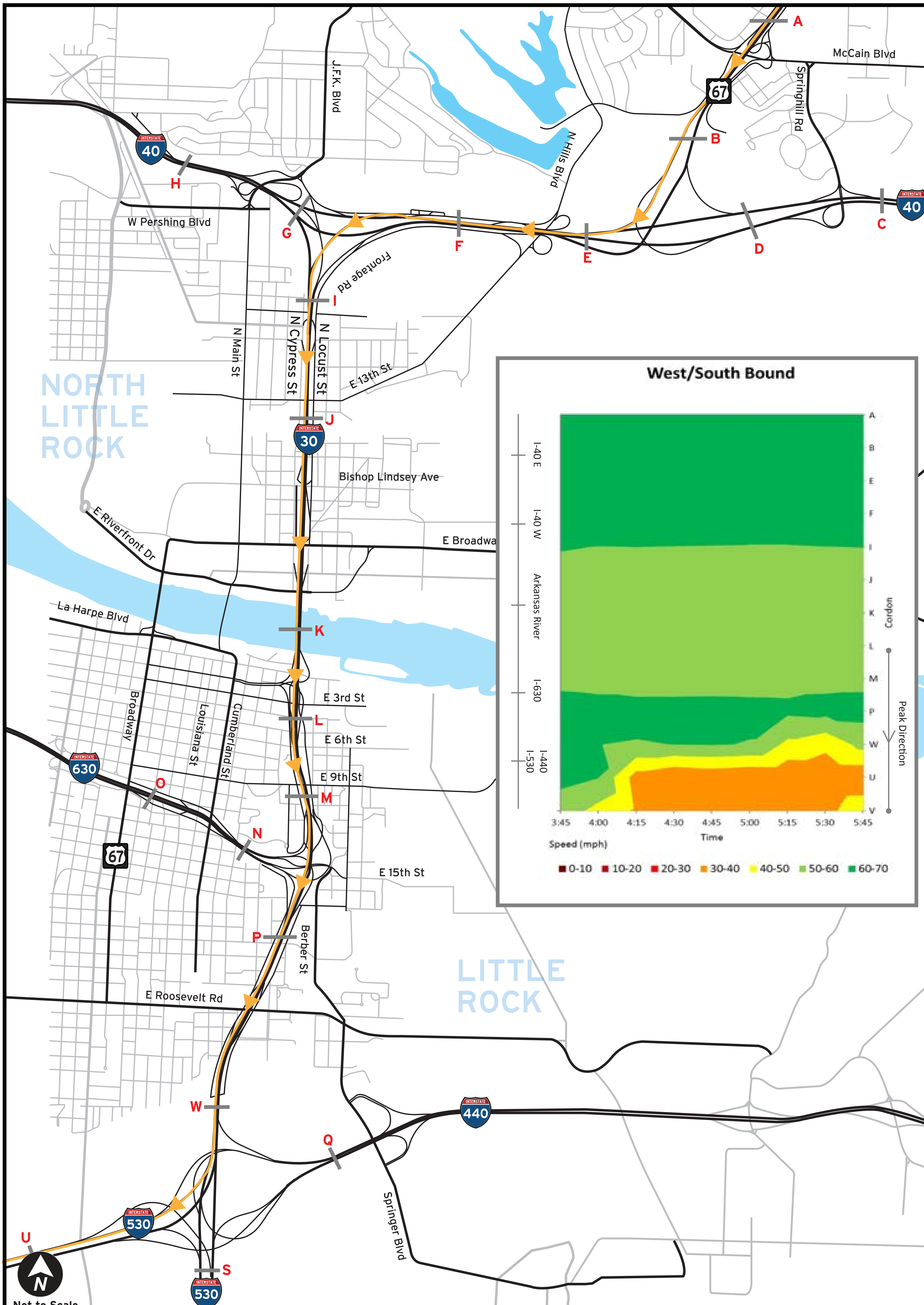

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I-30 PEL
2041 PM 10 Main Lane Speed Profile Map West/South Bound

DRAFT 3-11-15

EXHIBIT 39

EXHIBIT 40

DRAFT
3-31-15

I-30 PEL
2041 AM 10 Main Lane Emergency Route Travel Time

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	NLR - Fire Station No. 5	1	31.2	4.6
2	NLR - Fire Station No. 1	1	33.2	5.0
3	NLR - Fire Station No. 1	2	17.7	3.1
4	LR - Fire Station No. 1	2	45.6	3.9
5	LR - Fire Station No. 13	3	24.4	2.3
6	LR - Fire Station No. 6	3	31.7	4.3

NLR = North Little Rock
LR= Little Rock

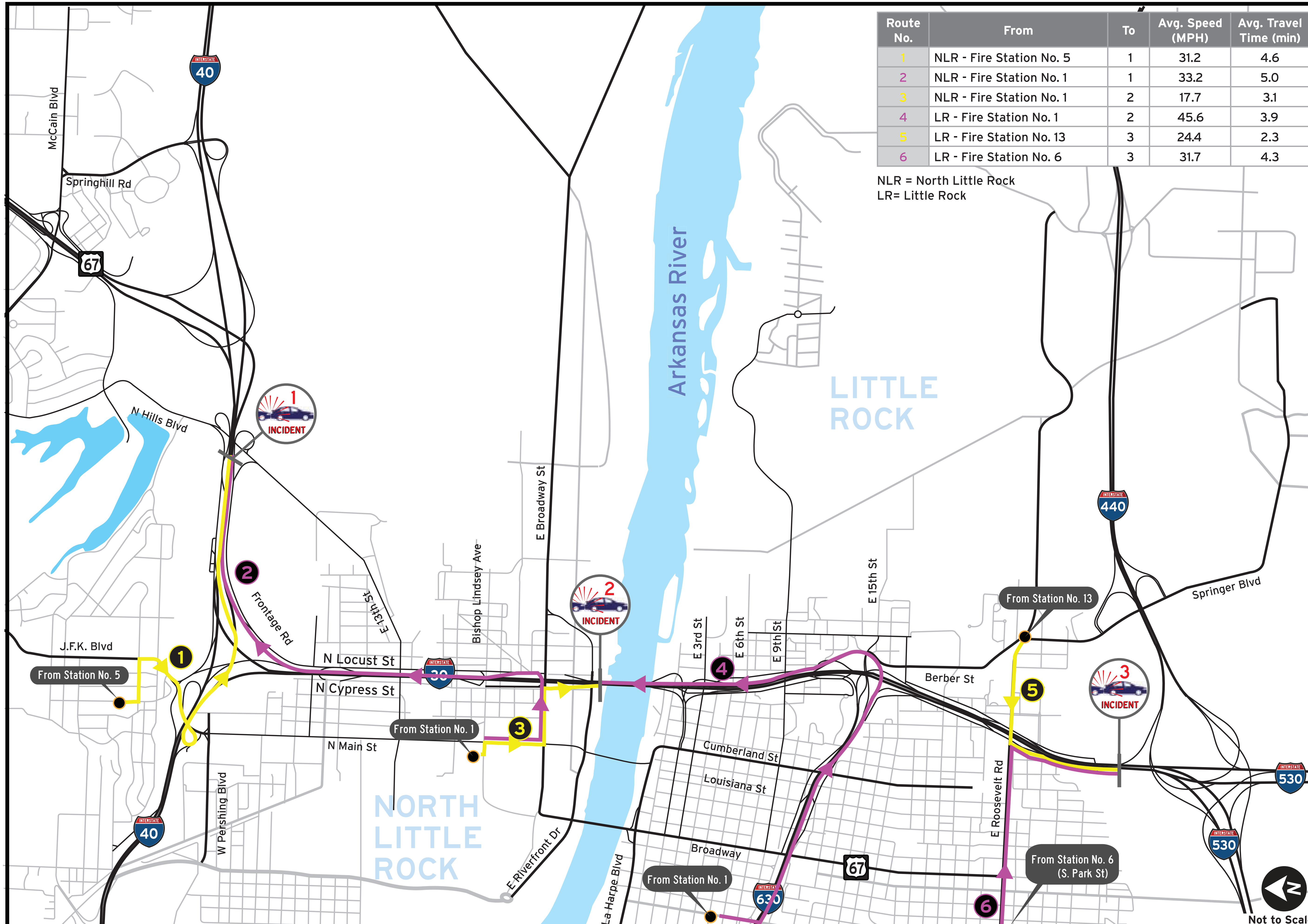

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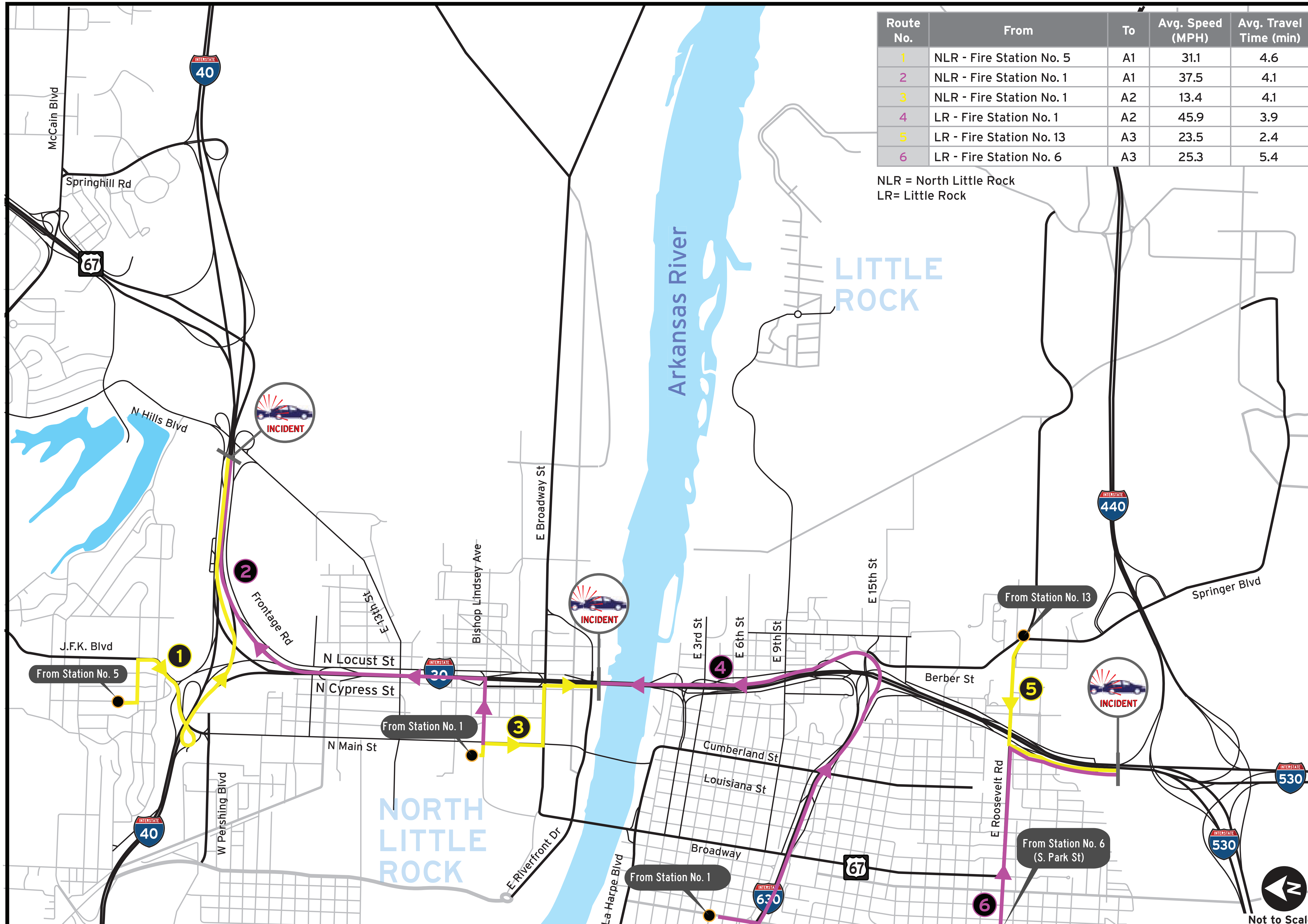
EXHIBIT 41

DRAFT
3-31-15

I-30 PEL
2041 PM 10 Main Lane Emergency Route Travel Time

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	NLR - Fire Station No. 5	A1	31.1	4.6
2	NLR - Fire Station No. 1	A1	37.5	4.1
3	NLR - Fire Station No. 1	A2	13.4	4.1
4	LR - Fire Station No. 1	A2	45.9	3.9
5	LR - Fire Station No. 13	A3	23.5	2.4
6	LR - Fire Station No. 6	A3	25.3	5.4

NLR = North Little Rock
LR= Little Rock



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Planning and Environmental Linkages

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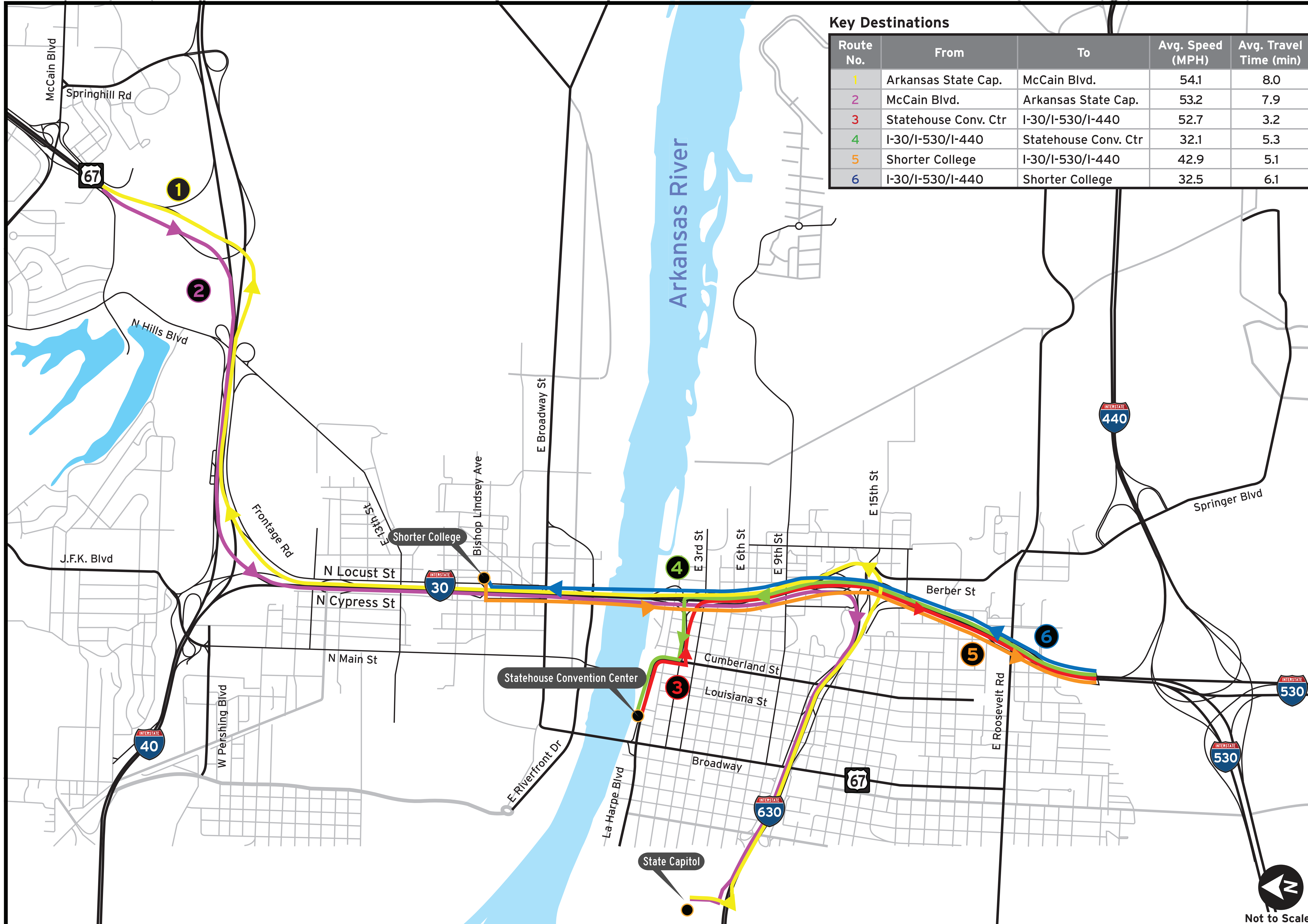
EXHIBIT 42

DRAFT
3-31-15

I-30 PEL
2041 AM 10 Main Lane Key Destination Travel Time



Key Destinations

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	Arkansas State Cap.	McCain Blvd.	54.1	8.0
2	McCain Blvd.	Arkansas State Cap.	53.2	7.9
3	Statehouse Conv. Ctr	I-30/I-530/I-440	52.7	3.2
4	I-30/I-530/I-440	Statehouse Conv. Ctr	32.1	5.3
5	Shorter College	I-30/I-530/I-440	42.9	5.1
6	I-30/I-530/I-440	Shorter College	32.5	6.1

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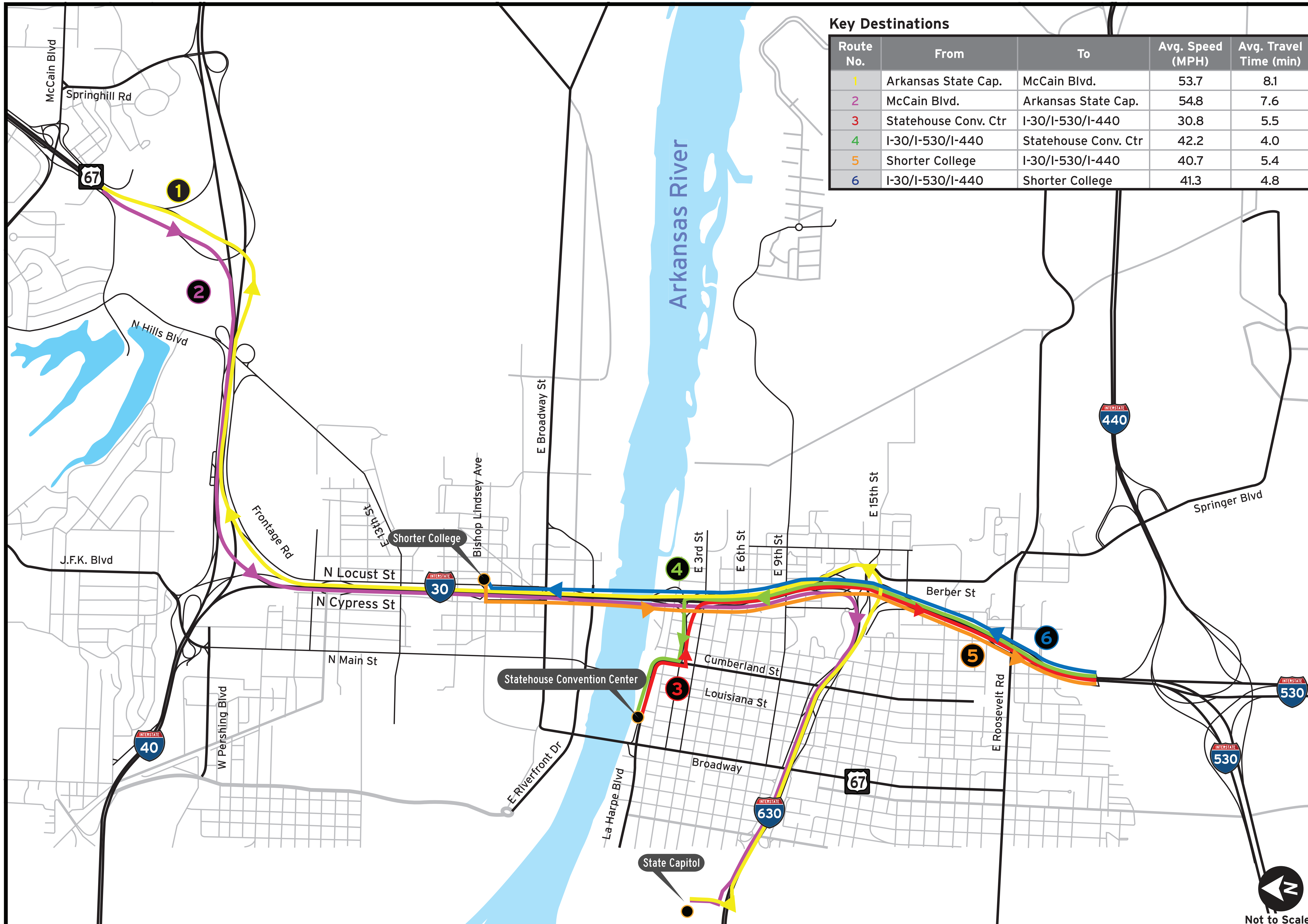
EXHIBIT 43

DRAFT
3-31-15

I-30 PEL
2041 PM 10 Main Lane
Key Destination Travel Time



Key Destinations

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	Arkansas State Cap.	McCain Blvd.	53.7	8.1
2	McCain Blvd.	Arkansas State Cap.	54.8	7.6
3	Statehouse Conv. Ctr	I-30/I-530/I-440	30.8	5.5
4	I-30/I-530/I-440	Statehouse Conv. Ctr	42.2	4.0
5	Shorter College	I-30/I-530/I-440	40.7	5.4
6	I-30/I-530/I-440	Shorter College	41.3	4.8

Interstate 30
Planning and Environmental Linkages

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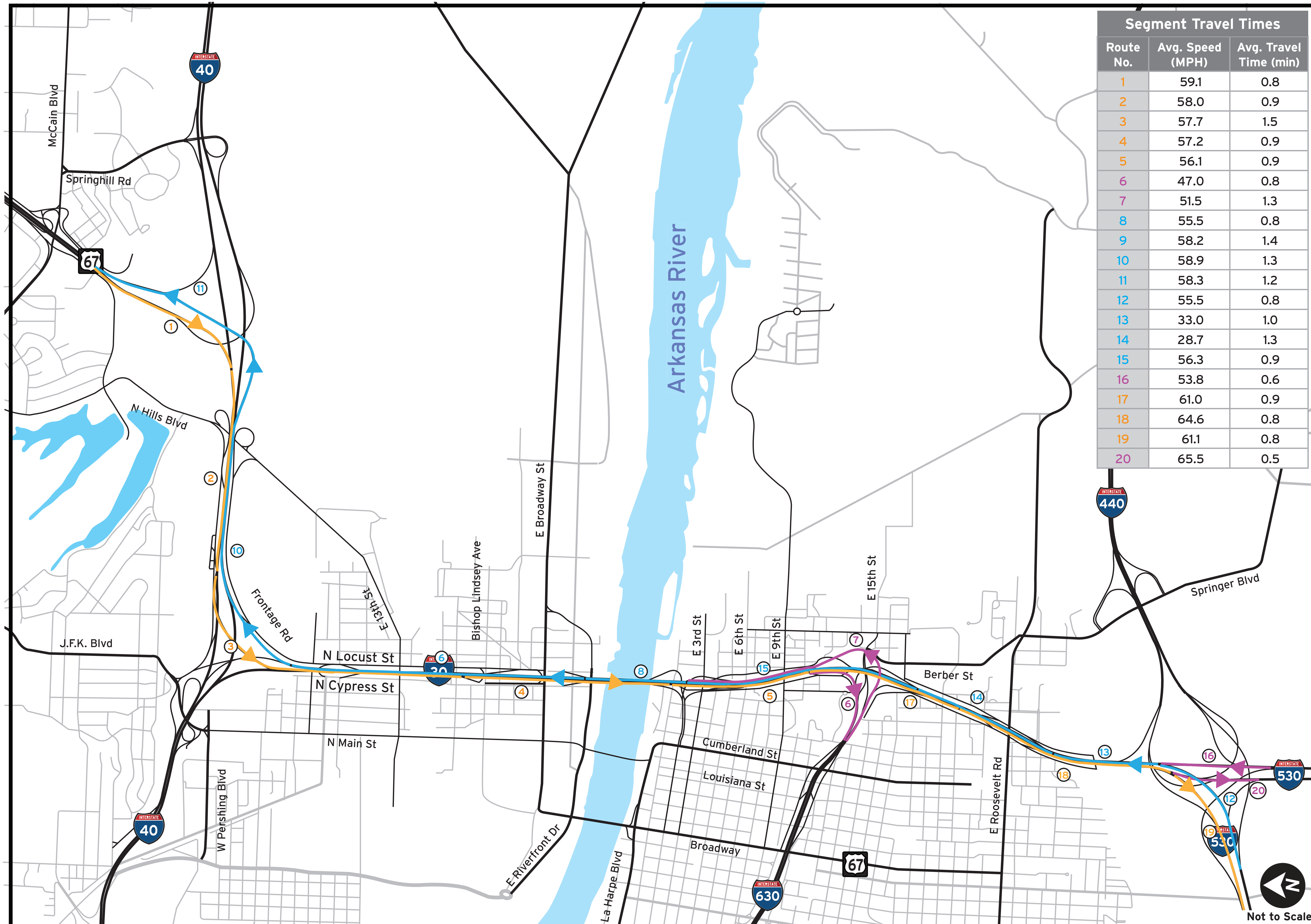
EXHIBIT 44

DRAFT 3-31-15

I-30 PEL
2041 AM 10 Main Lane Study Corridor Travel Time



Segment Travel Times

Route No.	Avg. Speed (MPH)	Avg. Travel Time (min)
1	59.1	0.8
2	58.0	0.9
3	57.7	1.5
4	57.2	0.9
5	56.1	0.9
6	47.0	0.8
7	51.5	1.3
8	55.5	0.8
9	58.2	1.4
10	58.9	1.3
11	58.3	1.2
12	55.5	0.8
13	33.0	1.0
14	28.7	1.3
15	56.3	0.9
16	53.8	0.6
17	61.0	0.9
18	64.6	0.8
19	61.1	0.8
20	65.5	0.5

INTERSTATE 30

Planning and Environmental Linkages

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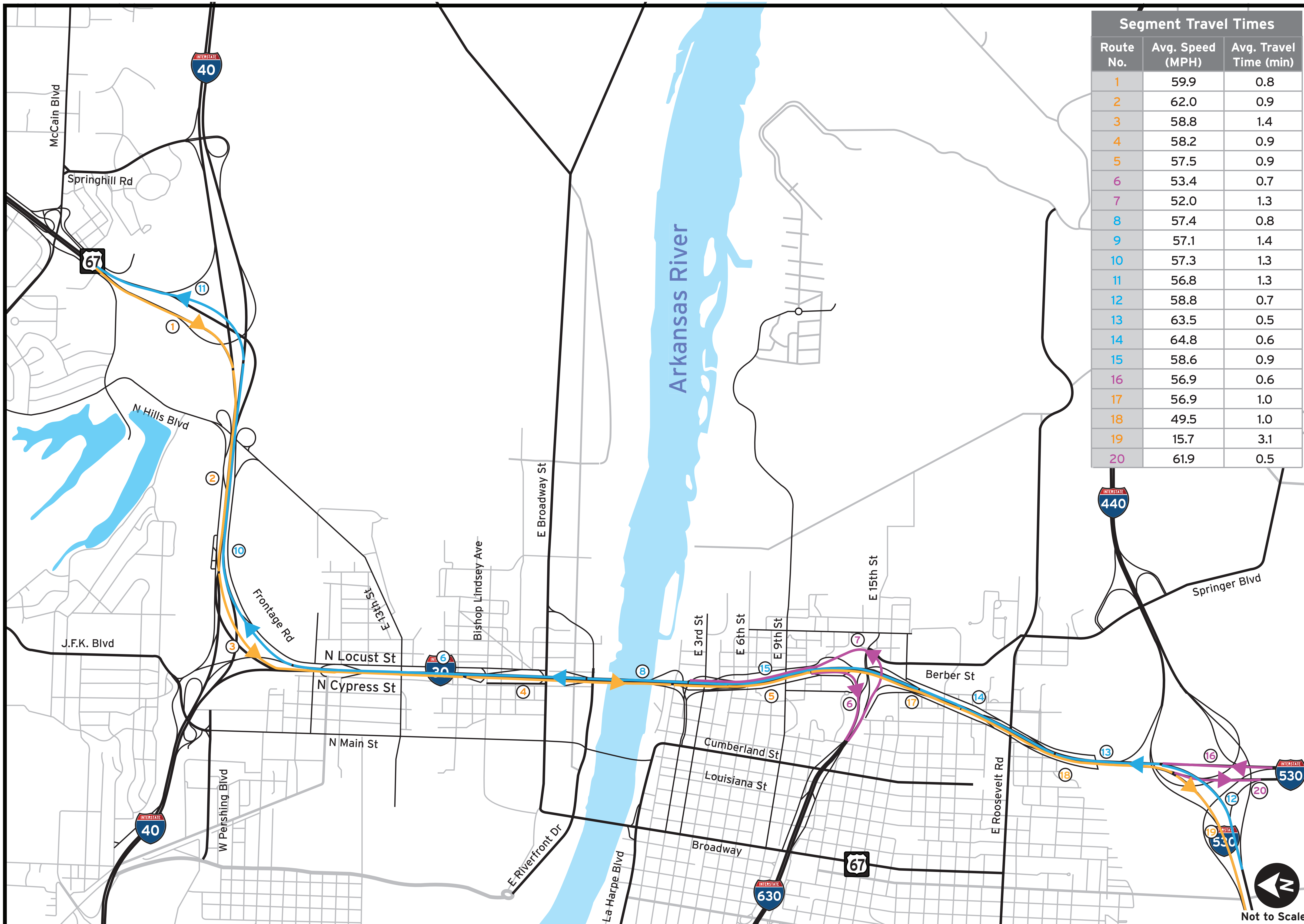


Segment Travel Times		
Route No.	Avg. Speed (MPH)	Avg. Travel Time (min)
1	59.9	0.8
2	62.0	0.9
3	58.8	1.4
4	58.2	0.9
5	57.5	0.9
6	53.4	0.7
7	52.0	1.3
8	57.4	0.8
9	57.1	1.4
10	57.3	1.3
11	56.8	1.3
12	58.8	0.7
13	63.5	0.5
14	64.8	0.6
15	58.6	0.9
16	56.9	0.6
17	56.9	1.0
18	49.5	1.0
19	15.7	3.1
20	61.9	0.5

EXHIBIT 45

DRAFT
3-31-15

I-30 PEL
2041 PM 10 Main Lane Study Corridor Travel Time

30
Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

January 2015

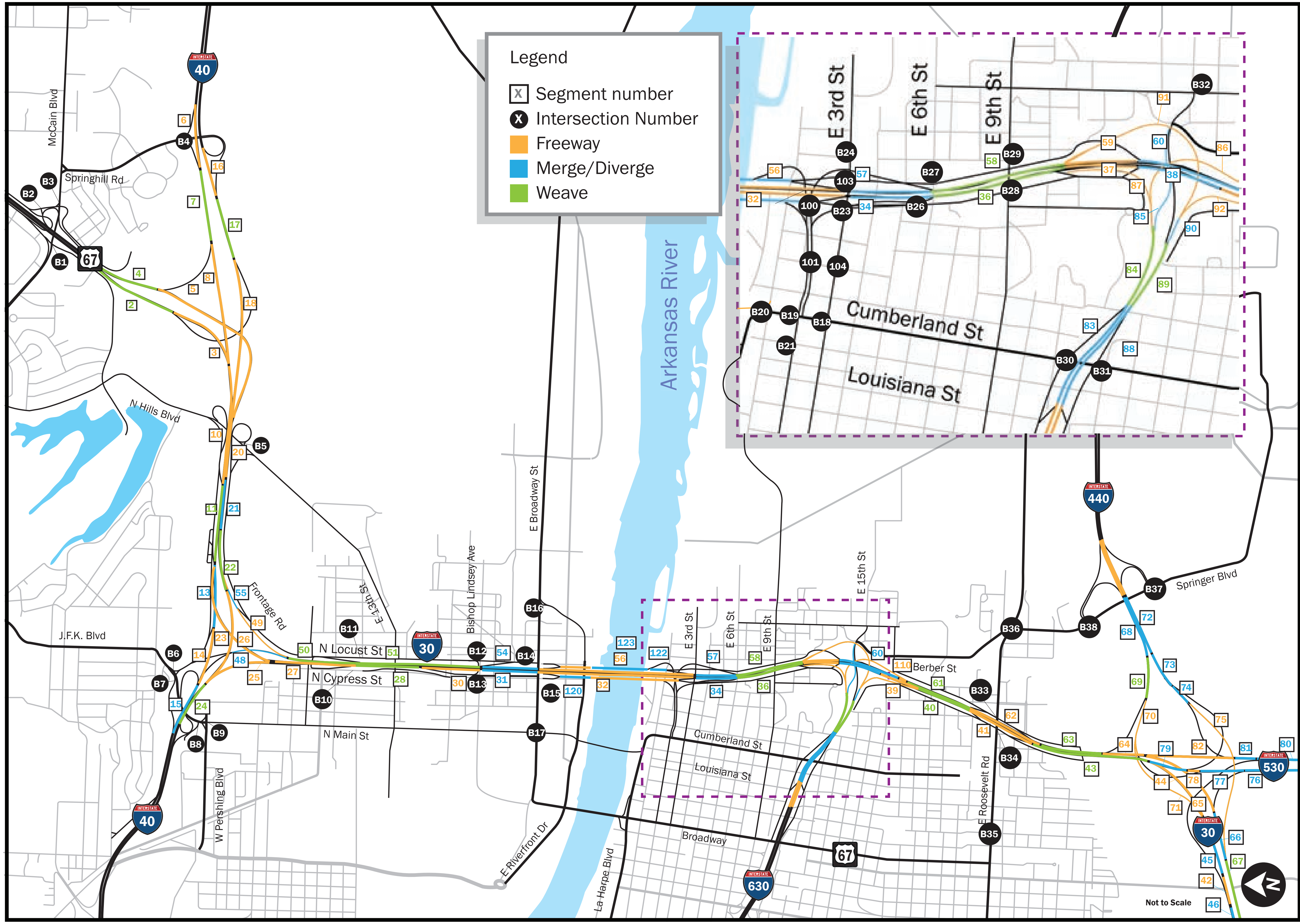


EXHIBIT 46

DRAFT 3-17-15

Analysis Locator Key 8-Lane C/D

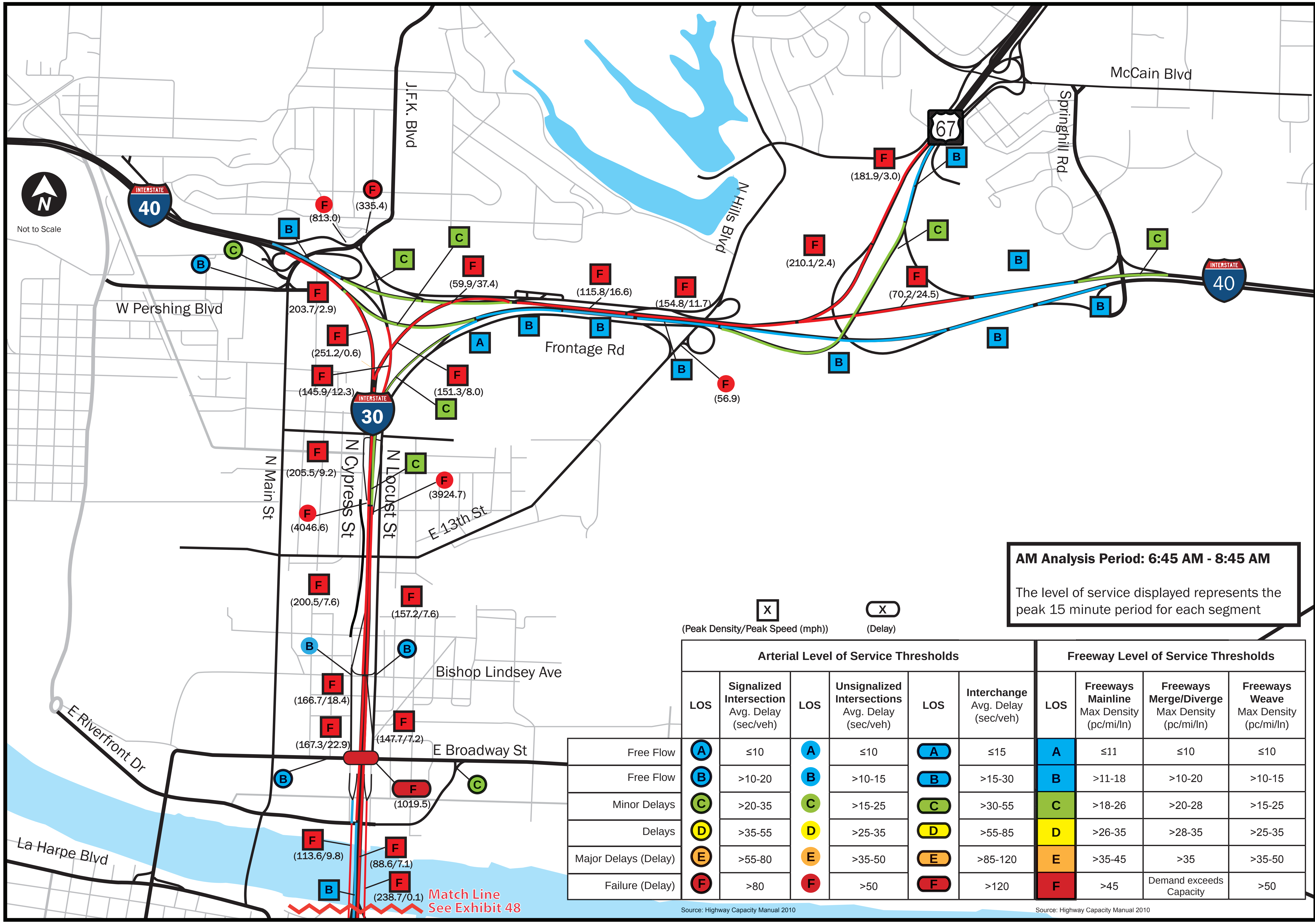
Planning and Environmental Linkages

April 2015

EXHIBIT 47

DRAFT 3-17-15

I-30 PEL
2041 AM 8-Lane C/D Level of Service North of Arkansas River



Arterial Level of Service Thresholds

	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)
Free Flow	A	≤10	A	≤10	A	≤15
Free Flow	B	>10-20	B	>10-15	B	>15-30
Minor Delays	C	>20-35	C	>15-25	C	>30-55
Delays	D	>35-55	D	>25-35	D	>55-85
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120
Failure (Delay)	F	>80	F	>50	F	>120

Source: Highway Capacity Manual 2010

Freeway Level of Service Thresholds

LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
A	≤11	≤10	≤10
B	>11-18	>10-20	>10-15
C	>18-26	>20-28	>15-25
D	>26-35	>28-35	>25-35
E	>35-45	>35	>35-50
F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

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CA0602 Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

April 2015

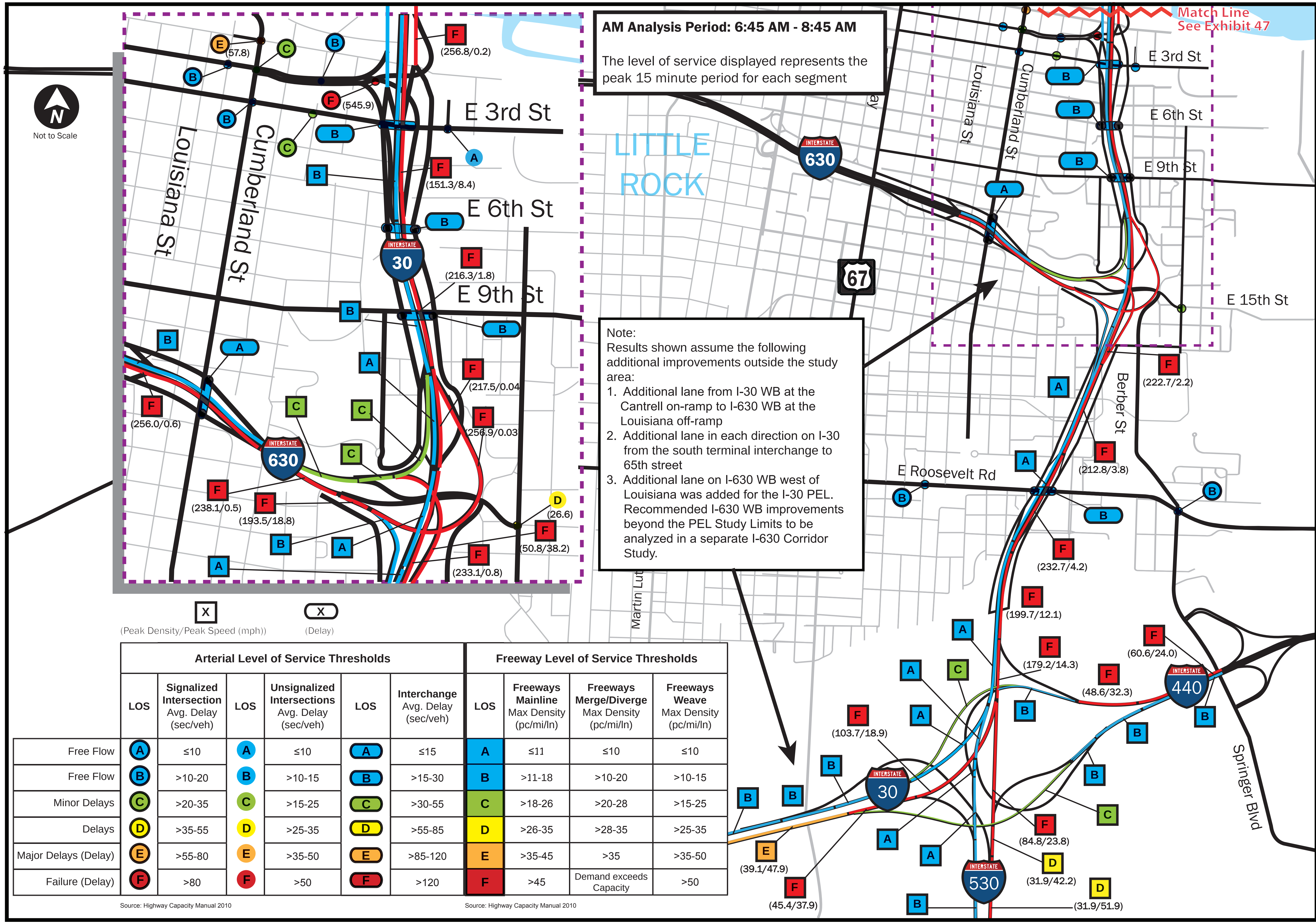
EXHIBIT 48

DRAFT
3-17-15

I-30 PEL
2041 AM 8-Lane C/D Level of Service South of Arkansas River

AM Analysis Period: 6:45 AM - 8:45 AM

The level of service displayed represents the peak 15 minute period for each segment



Note:
Results shown assume the following additional improvements outside the study area:

1. Additional lane from I-30 WB at the Cantrell on-ramp to I-630 WB at the Louisiana off-ramp
2. Additional lane in each direction on I-30 from the south terminal interchange to 65th street
3. Additional lane on I-630 WB west of Louisiana was added for the I-30 PEL. Recommended I-630 WB improvements beyond the PEL Study Limits to be analyzed in a separate I-630 Corridor Study.

	Arterial Level of Service Thresholds						Freeway Level of Service Thresholds			
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

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Planning and Environmental Linkages

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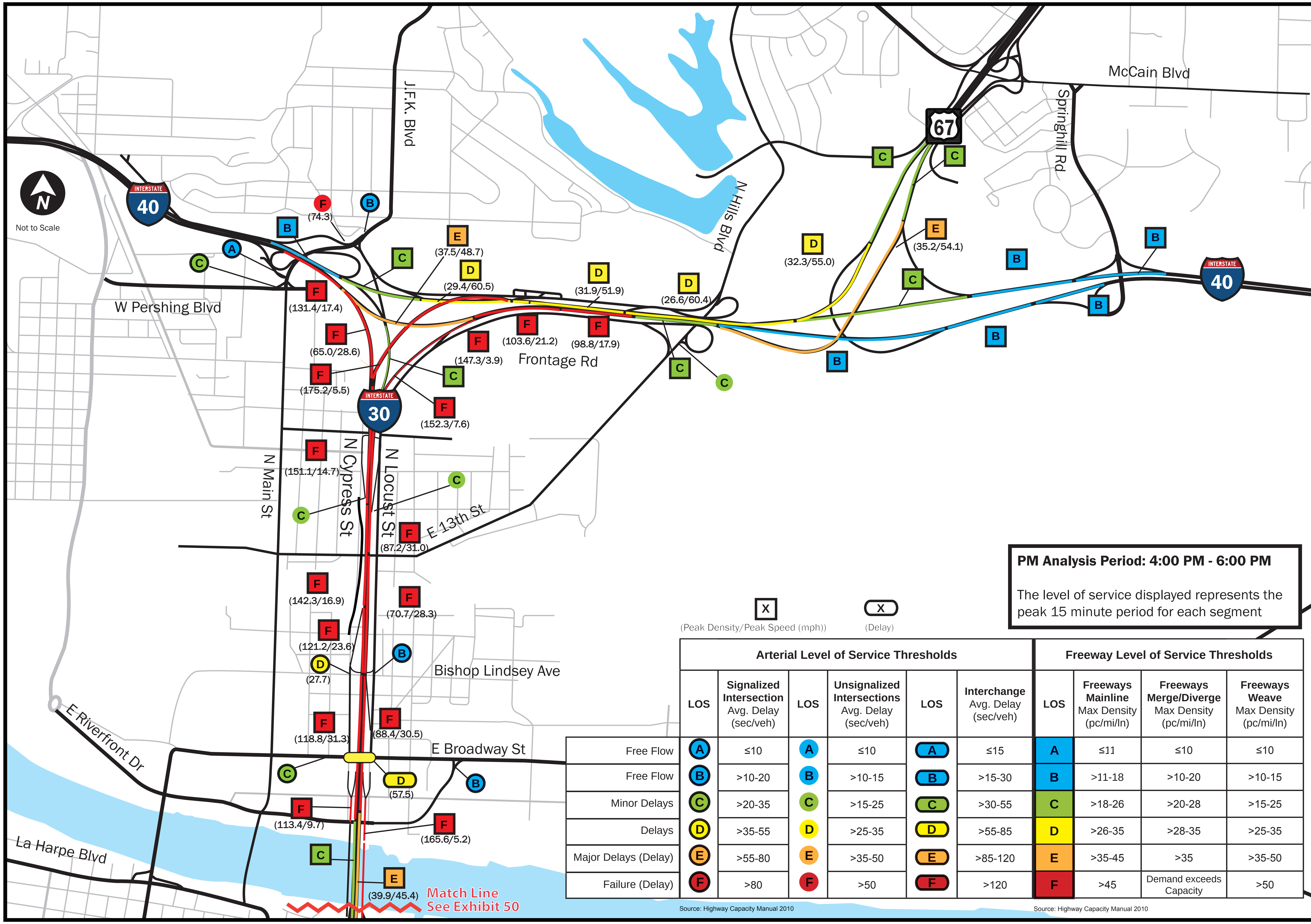
April 2015

EXHIBIT 49

DRAFT
3-17-15

I -30 PEL
2041 PM 8-Lane C/D
Level of Service
North of Arkansas River



PM Analysis Period: 4:00 PM - 6:00 PM

The level of service displayed represents the peak 15 minute period for each segment

Arterial Level of Service Thresholds

	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)
Free Flow	A	≤10	A	≤10	A	≤15
Free Flow	B	>10-20	B	>10-15	B	>15-30
Minor Delays	C	>20-35	C	>15-25	C	>30-55
Delays	D	>35-55	D	>25-35	D	>55-85
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120
Failure (Delay)	F	>80	F	>50	F	>120

Source: Highway Capacity Manual 2010

Freeway Level of Service Thresholds

LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
A	≤11	≤10	≤10
B	>11-18	>10-20	>10-15
C	>18-26	>20-28	>15-25
D	>26-35	>28-35	>25-35
E	>35-45	>35	>35-50
F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

INTERSTATE 30

CA0602 Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

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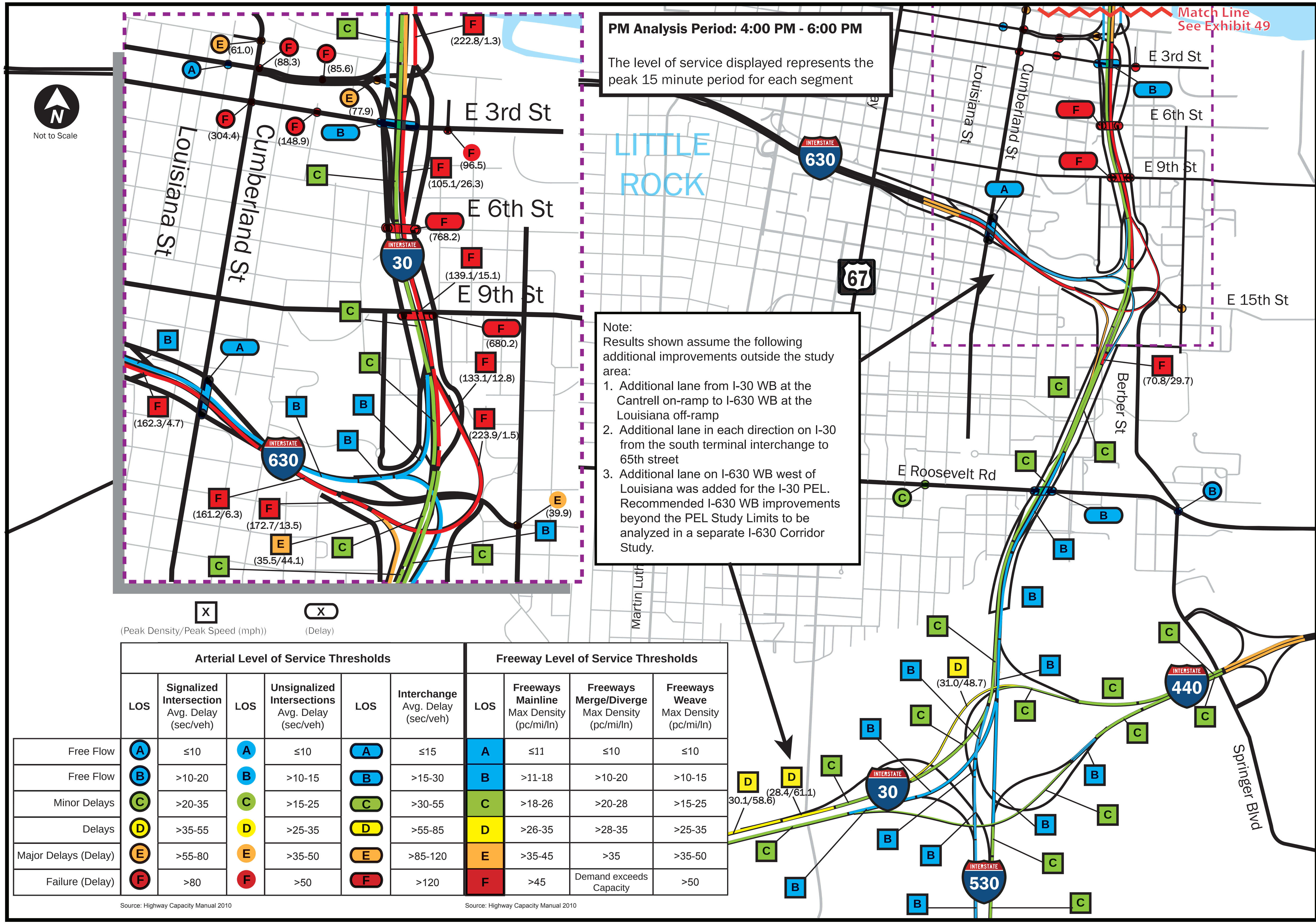
EXHIBIT 50

DRAFT 3-17-15

I-30 PEL
2041 PM 8-Lane C/D Level of Service South of Arkansas River

PM Analysis Period: 4:00 PM - 6:00 PM

The level of service displayed represents the peak 15 minute period for each segment



Note:
Results shown assume the following additional improvements outside the study area:

1. Additional lane from I-30 WB at the Cantrell on-ramp to I-630 WB at the Louisiana off-ramp
2. Additional lane in each direction on I-30 from the south terminal interchange to 65th street
3. Additional lane on I-630 WB west of Louisiana was added for the I-30 PEL. Recommended I-630 WB improvements beyond the PEL Study Limits to be analyzed in a separate I-630 Corridor Study.

	Arterial Level of Service Thresholds						Freeway Level of Service Thresholds			
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

CA0602 Planning and Environmental Linkages

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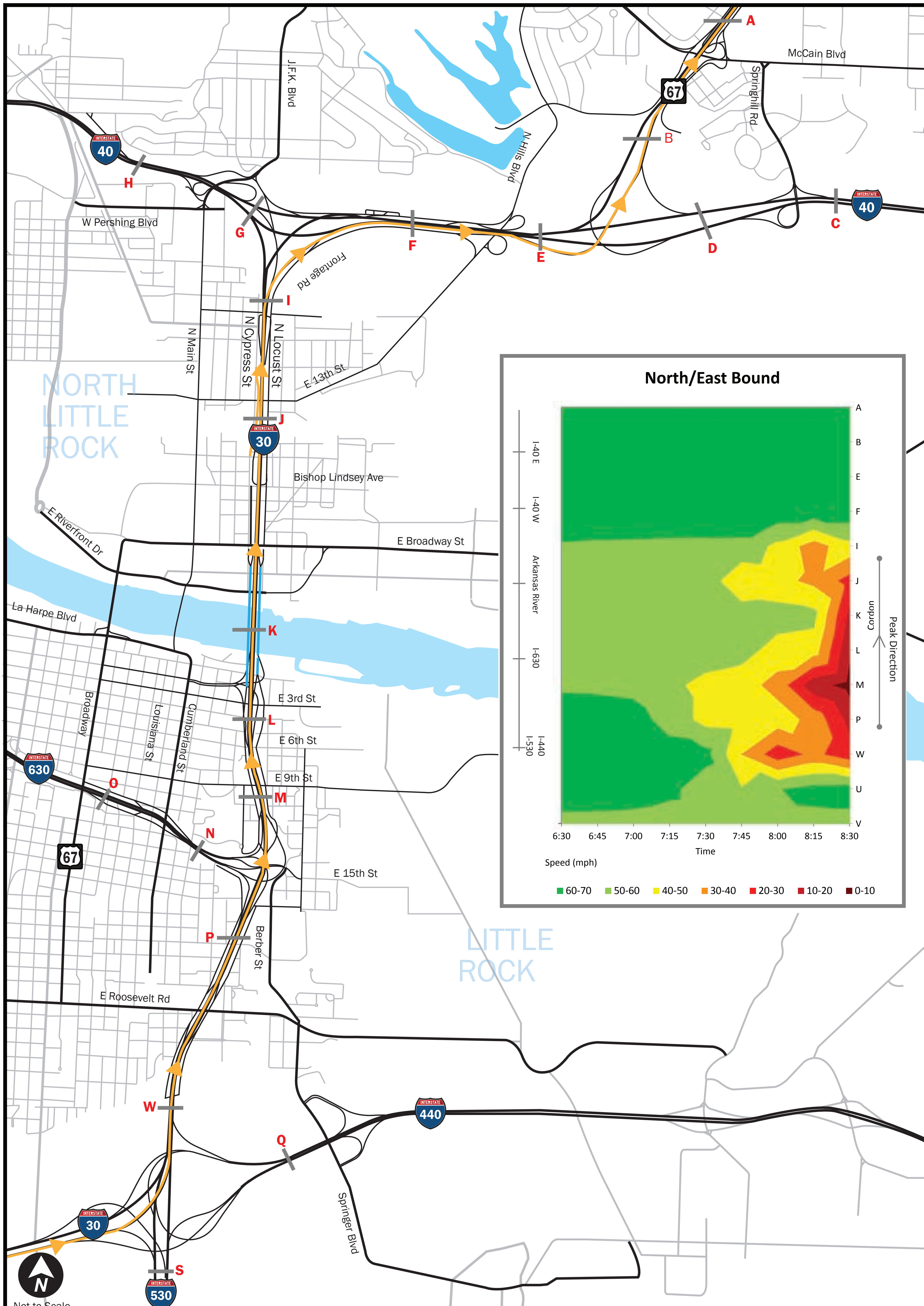
April 2015



April 2015

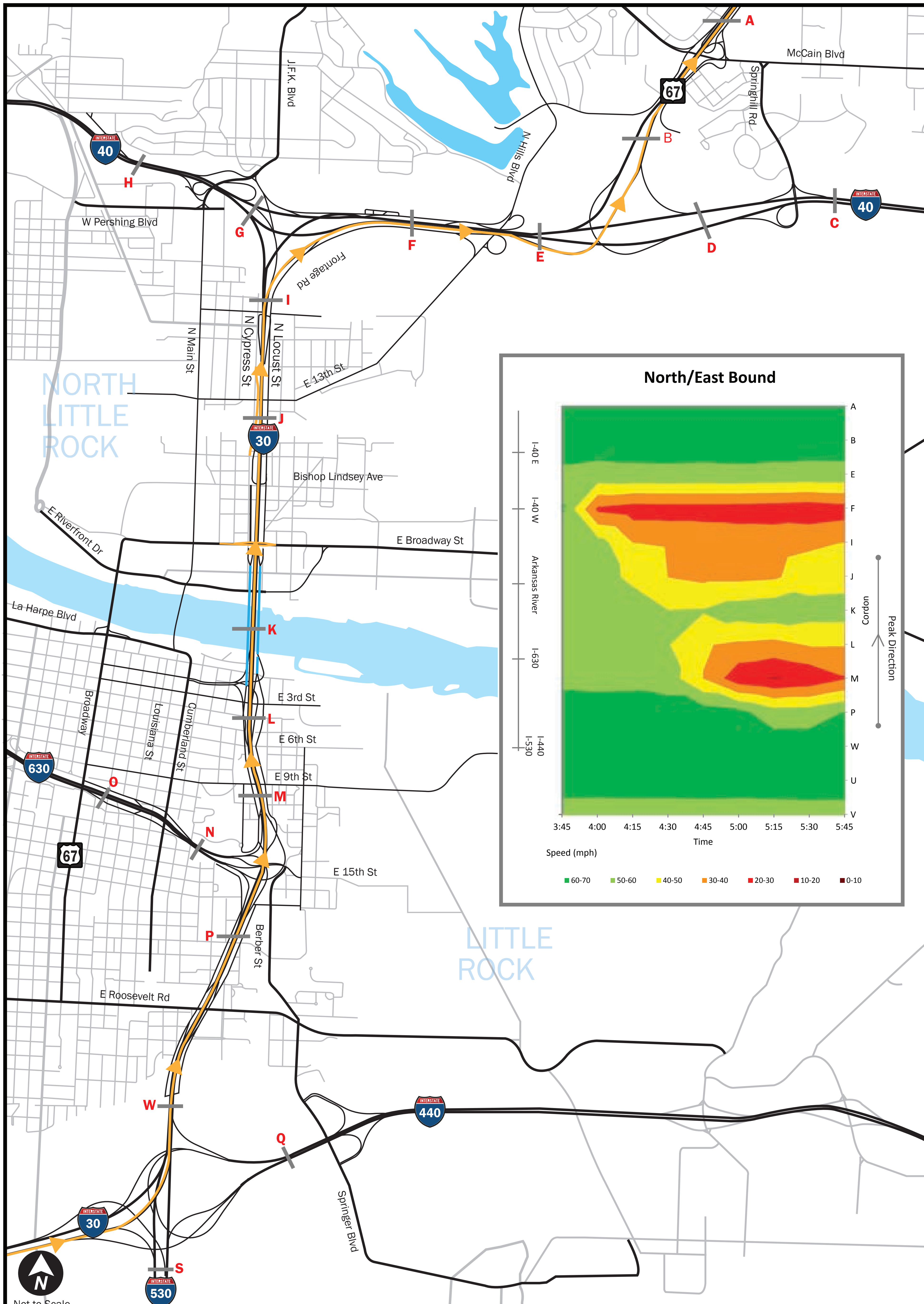
CONNECTING ARKANSAS PROGRAM

Planning and Environmental Linkages

I-30 PEL
2041 AM 8-Lane C/D
Speed Profile Map
North/East Bound

DRAFT 3-17-15

EXHIBIT 51



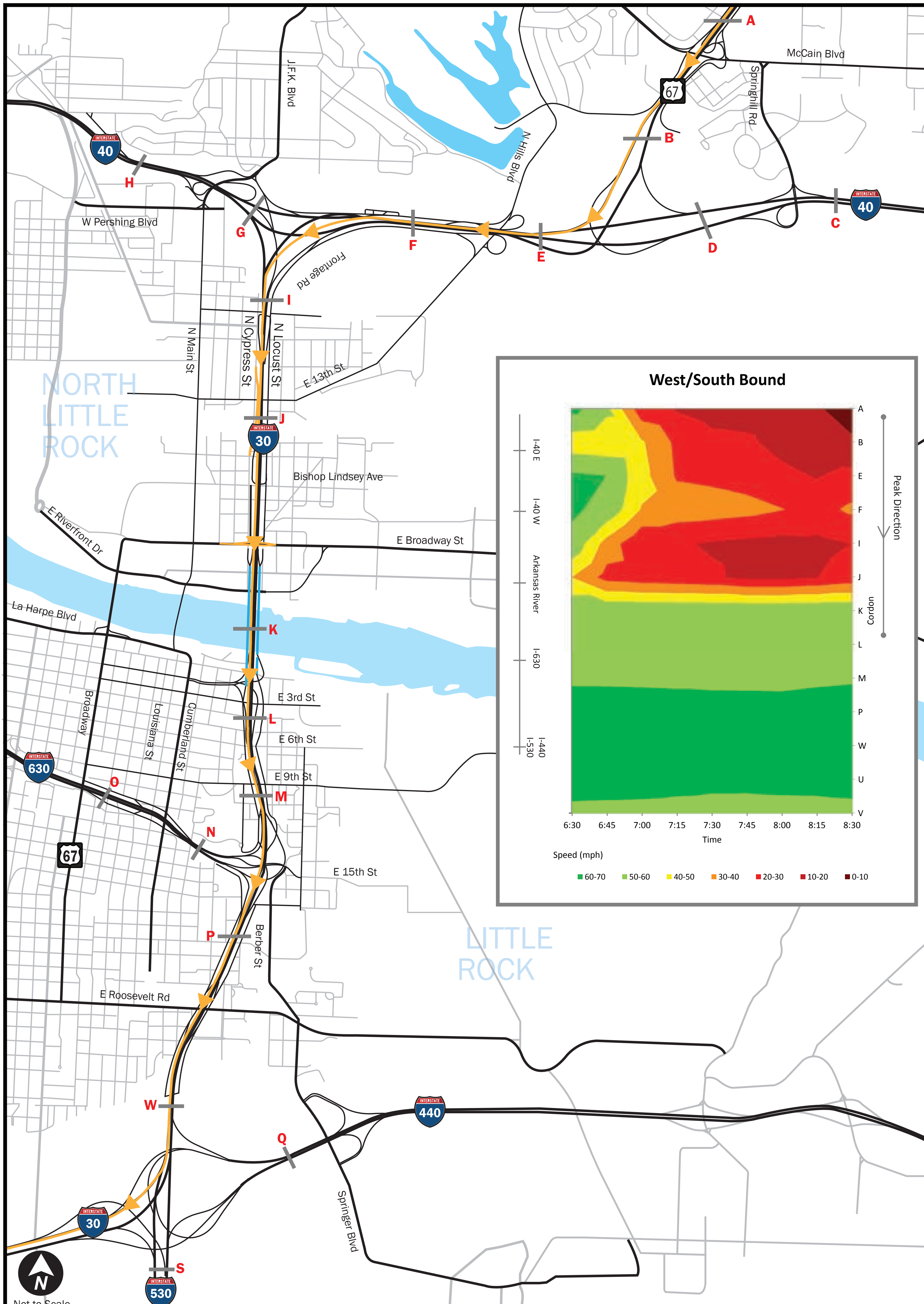
April 2015

Planning and Environmental Linkages

I-30 PEL
2041 PM 8-Lane C/D
Speed Profile Map
North/East Bound

DRAFT
3-17-15

EXHIBIT 52



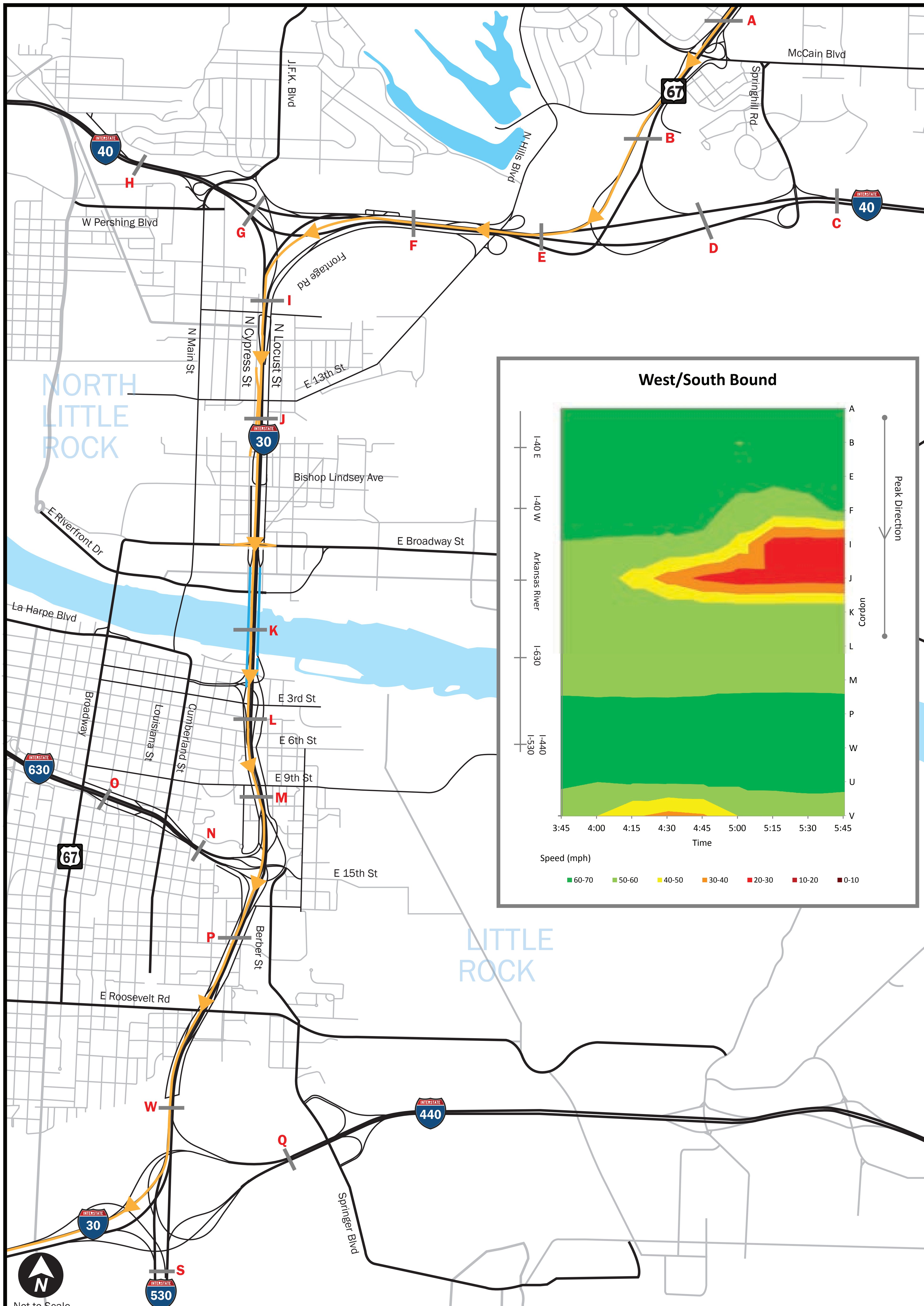
April 2015

Planning and Environmental Linkages

I-30 PEL
2041 AM 8-Lane C/D
Speed Profile Map
West/South Bound

DRAFT 3-17-15

EXHIBIT 53



April 2015

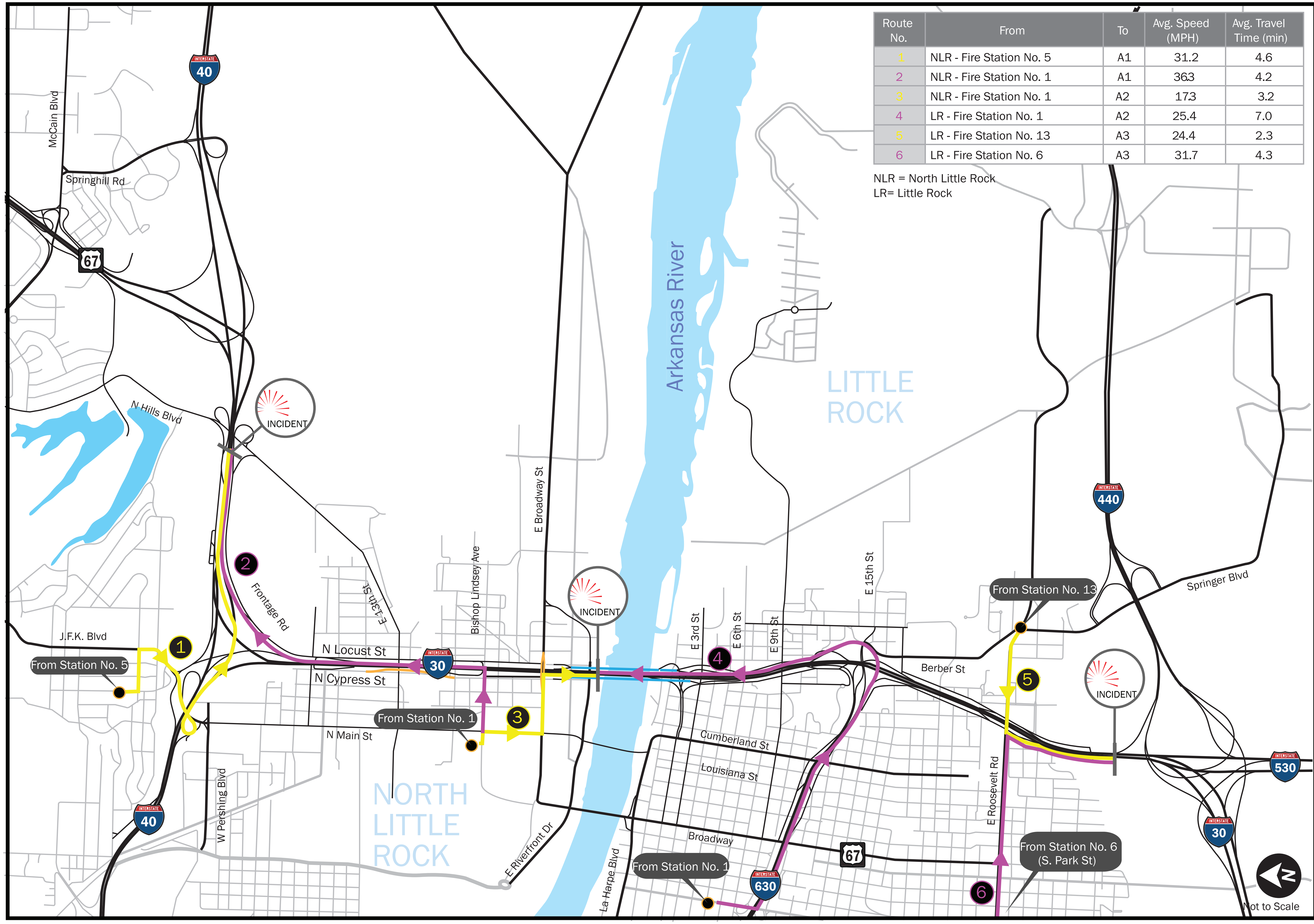
CAP CONNECTING ARKANSAS PROGRAM

Planning and Environmental Linkages

I-30 PEL
2041 PM 8-Lane C/D
Speed Profile Map
West/South Bound

DRAFT 3-17-15

EXHIBIT 54



Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	NLR - Fire Station No. 5	A1	31.2	4.6
2	NLR - Fire Station No. 1	A1	36.3	4.2
3	NLR - Fire Station No. 1	A2	17.3	3.2
4	LR - Fire Station No. 1	A2	25.4	7.0
5	LR - Fire Station No. 13	A3	24.4	2.3
6	LR - Fire Station No. 6	A3	31.7	4.3

NLR = North Little Rock
LR= Little Rock

EXHIBIT 55

DRAFT
3-17-15

I-30 PEL
2041 AM 8-Lane C/D
Emergency Route Travel Time

Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

April 2015

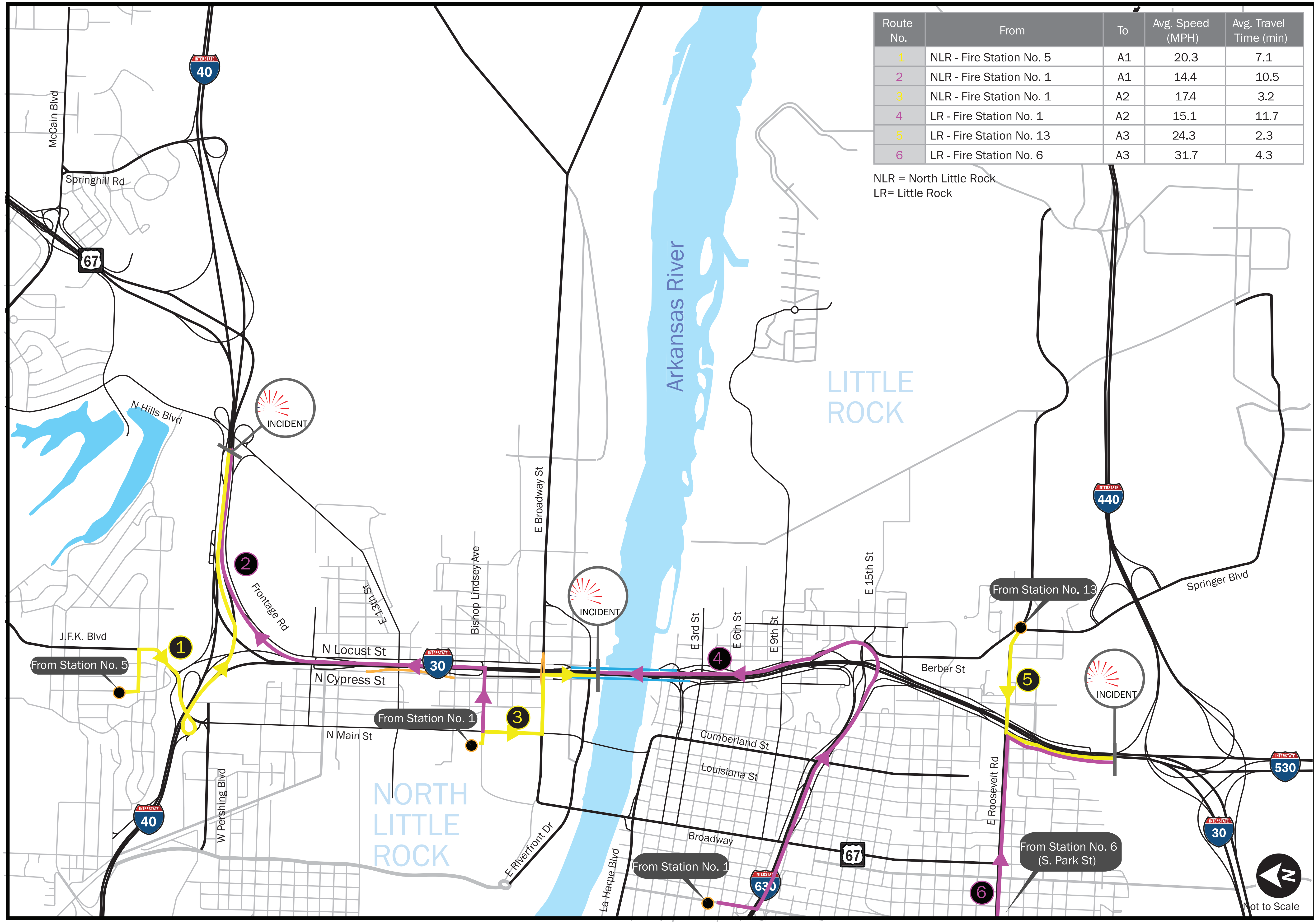
EXHIBIT 56

DRAFT
3-17-15

I-30 PEL
2041 PM 8-Lane C/D
Emergency Route Travel Time

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	NLR - Fire Station No. 5	A1	20.3	7.1
2	NLR - Fire Station No. 1	A1	14.4	10.5
3	NLR - Fire Station No. 1	A2	17.4	3.2
4	LR - Fire Station No. 1	A2	15.1	11.7
5	LR - Fire Station No. 13	A3	24.3	2.3
6	LR - Fire Station No. 6	A3	31.7	4.3

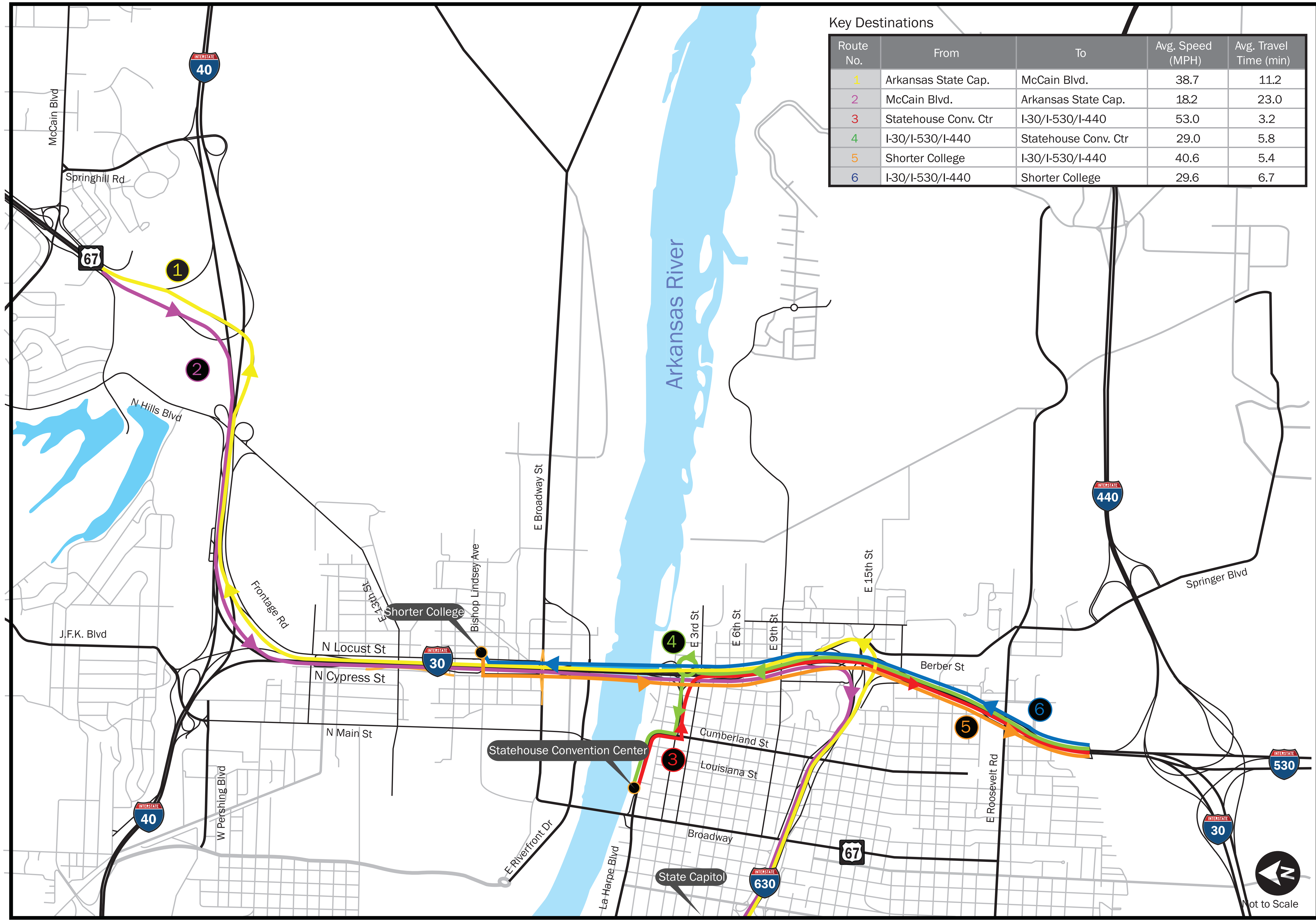
NLR = North Little Rock
LR= Little Rock



INTERSTATE 30
Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM
CAP

April 2015



Key Destinations

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	Arkansas State Cap.	McCain Blvd.	38.7	11.2
2	McCain Blvd.	Arkansas State Cap.	18.2	23.0
3	Statehouse Conv. Ctr	I-30/I-530/I-440	53.0	3.2
4	I-30/I-530/I-440	Statehouse Conv. Ctr	29.0	5.8
5	Shorter College	I-30/I-530/I-440	40.6	5.4
6	I-30/I-530/I-440	Shorter College	29.6	6.7

EXHIBIT 57

DRAFT

3-17-15

I-30 PEL
2041 AM 8-Lane C/D
Key Destination Travel Time

INTERSTATE 30

Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

April 2015

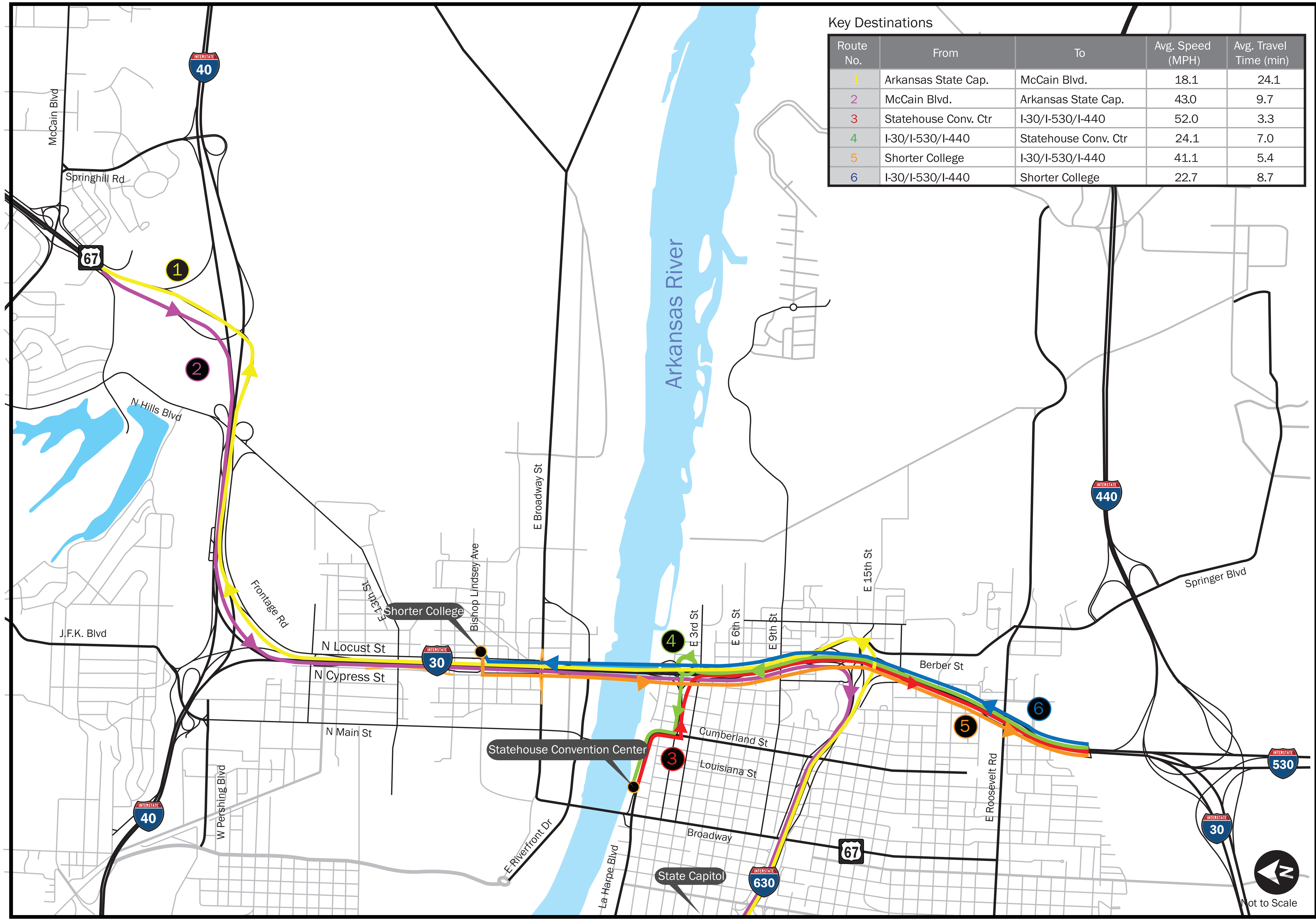
EXHIBIT 58

DRAFT
3-17-15

I-30 PEL
2041 PM 8-Lane C/D
Key Destination Travel Time

Key Destinations

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	Arkansas State Cap.	McCain Blvd.	18.1	24.1
2	McCain Blvd.	Arkansas State Cap.	43.0	9.7
3	Statehouse Conv. Ctr	I-30/I-530/I-440	52.0	3.3
4	I-30/I-530/I-440	Statehouse Conv. Ctr	24.1	7.0
5	Shorter College	I-30/I-530/I-440	41.1	5.4
6	I-30/I-530/I-440	Shorter College	22.7	8.7



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Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM
CAP

April 2015

EXHIBIT 59

DRAFT
3-17-15

I-30 PEL
2041 AM 8-Lane C/D
Study Corridor Travel Time

Segment Travel Times		
Route No.	Avg. Speed (MPH)	Avg. Travel Time (min)
1	9.6	5.2
2	12.8	4.2
3	10.1	8.4
4	34.6	1.6
5	58.6	0.9
6	45.7	0.8
7	16.2	4.1
8	53.0	0.9
9	47.7	1.7
10	59.0	1.3
11	58.1	1.2
12	54.2	0.8
13	27.6	1.2
14	26.5	1.4
15	44.3	1.2
16	45.5	0.8
17	60.4	0.9
18	65.1	0.8
19	61.1	0.8
20	65.7	0.5

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Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM
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EXHIBIT 60

DRAFT
3-17-15

I-30 PEL
2041 PM 8-Lane C/D
Study Corridor Travel Time

Segment Travel Times

Route No.	Avg. Speed (MPH)	Avg. Travel Time (min)
1	57.8	0.9
2	58.3	0.9
3	28.0	3.0
4	41.9	1.3
5	58.0	0.9
6	47.1	0.8
7	8.2	8.1
8	26.9	1.7
9	18.7	4.4
10	11.5	6.6
11	56.6	1.3
12	58.7	0.7
13	63.6	0.5
14	56.3	0.7
15	13.6	3.8
16	56.9	0.6
17	58.6	1.0
18	62.7	0.8
19	60.1	0.8
20	64.3	0.5

30 Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

April 2015

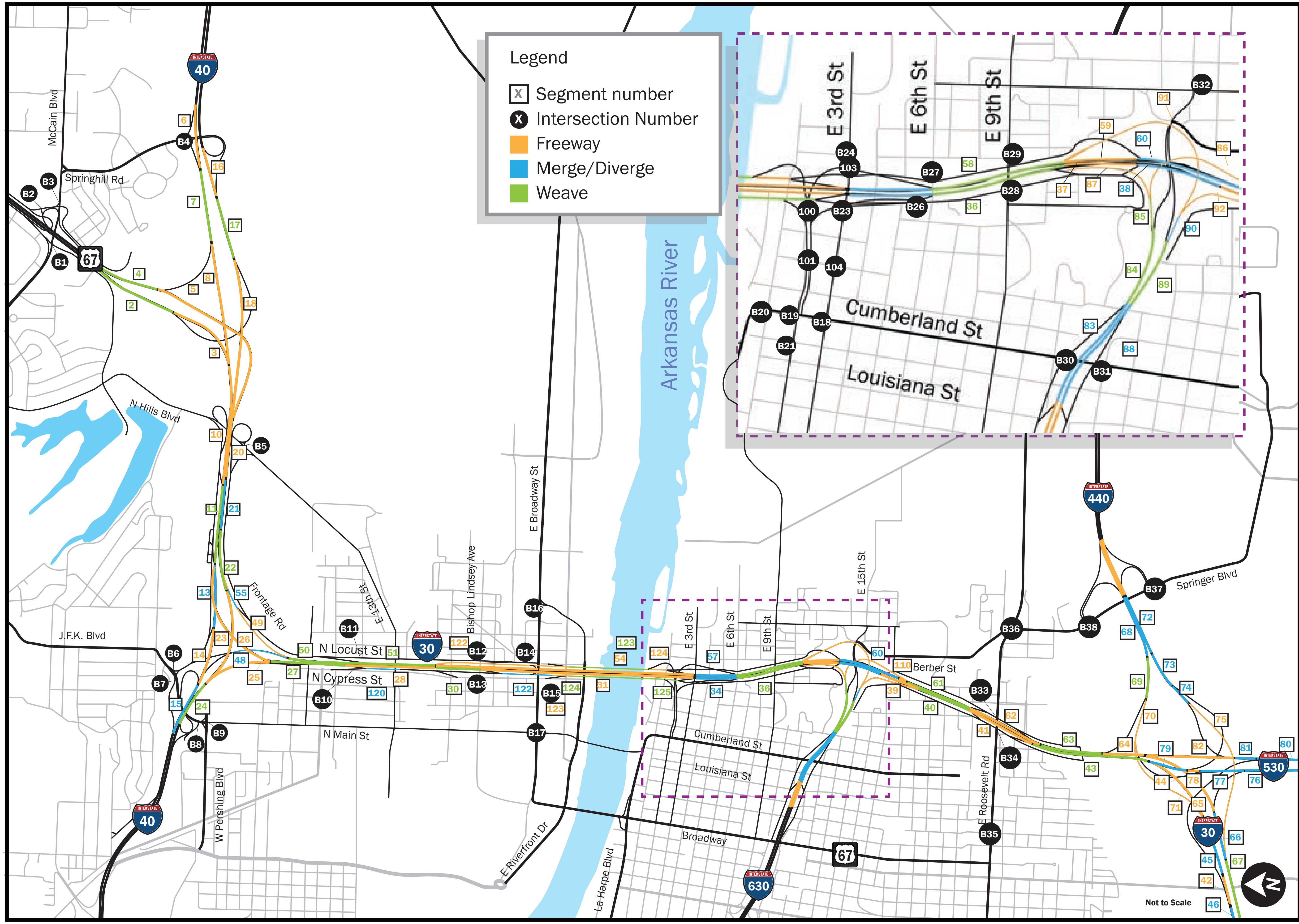


EXHIBIT 61

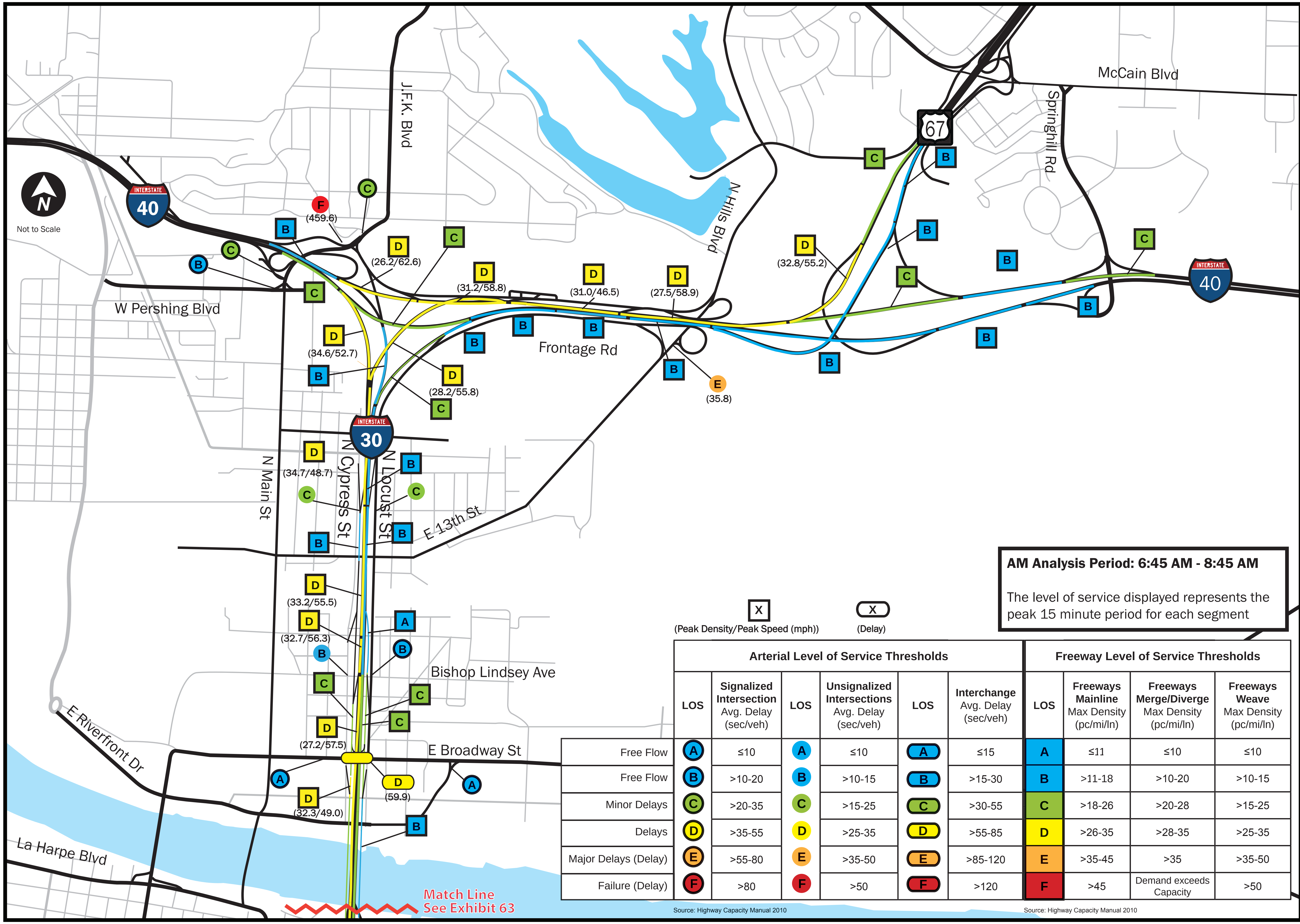
DRAFT
3-20-15

Analysis Locator Key
10-Lane C/D

INTERSTATE 30
Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM
CAP

April 2015



AM Analysis Period: 6:45 AM - 8:45 AM

The level of service displayed represents the peak 15 minute period for each segment

	Arterial Level of Service Thresholds					
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)
Free Flow	A	≤10	A	≤10	A	≤15
Free Flow	B	>10-20	B	>10-15	B	>15-30
Minor Delays	C	>20-35	C	>15-25	C	>30-55
Delays	D	>35-55	D	>25-35	D	>55-85
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120
Failure (Delay)	F	>80	F	>50	F	>120

Source: Highway Capacity Manual 2010

Freeway Level of Service Thresholds			
LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
A	≤11	≤10	≤10
B	>11-18	>10-20	>10-15
C	>18-26	>20-28	>15-25
D	>26-35	>28-35	>25-35
E	>35-45	>35	>35-50
F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

EXHIBIT 62

DRAFT
3-20-15

I-30 PEL 2041 AM 10-Lane C/D Level of Service North of Arkansas River

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CA0602 Planning and Environmental Linkages

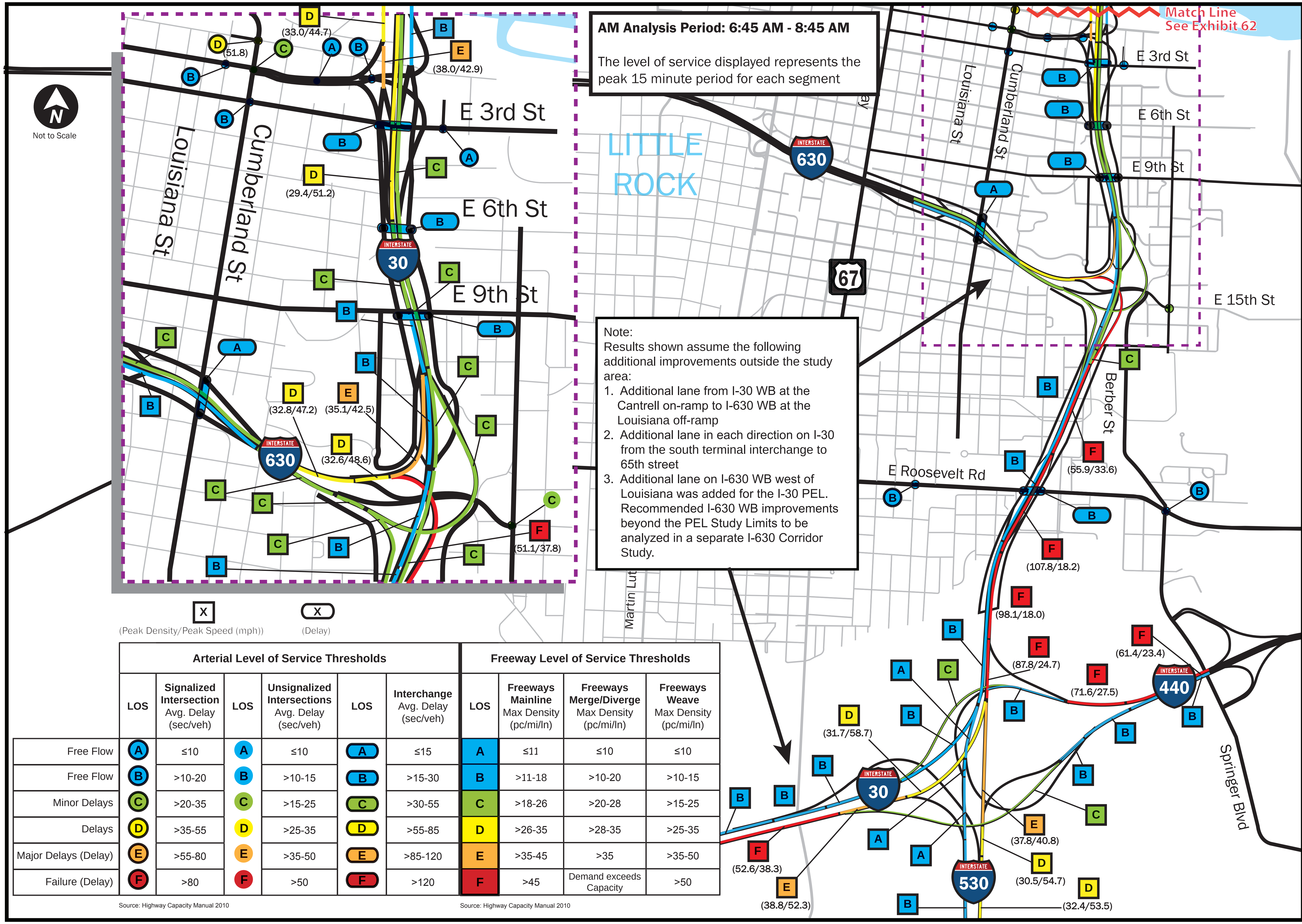
CONNECTING ARKANSAS PROGRAM CAP

April 2015

EXHIBIT 63

DRAFT
3-20-15

I-30 PEL
2041 AM 10-Lane C/D
Level of Service
South of Arkansas River



	Arterial Level of Service Thresholds					
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)
Free Flow	A	≤10	A	≤10	A	≤15
Free Flow	B	>10-20	B	>10-15	B	>15-30
Minor Delays	C	>20-35	C	>15-25	C	>30-55
Delays	D	>35-55	D	>25-35	D	>55-85
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120
Failure (Delay)	F	>80	F	>50	F	>120

Source: Highway Capacity Manual 2010

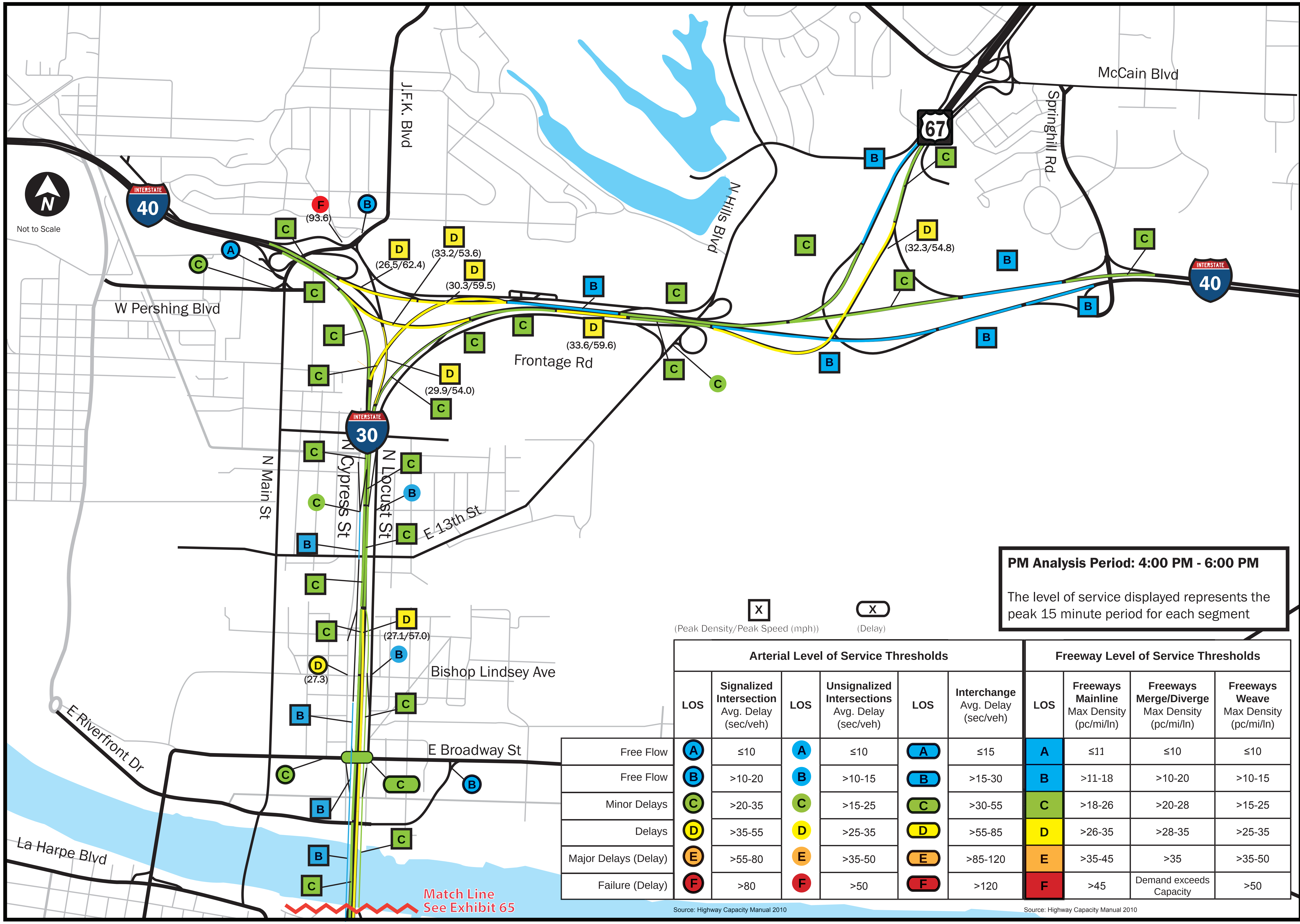
Freeway Level of Service Thresholds			
LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
A	≤11	≤10	≤10
B	>11-18	>10-20	>10-15
C	>18-26	>20-28	>15-25
D	>26-35	>28-35	>25-35
E	>35-45	>35	>35-50
F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

CA0602
Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM
CAP

April 2015



(Peak Density/Peak Speed (mph))

(Delay)

PM Analysis Period: 4:00 PM - 6:00 PM

The level of service displayed represents the peak 15 minute period for each segment

	Arterial Level of Service Thresholds						Freeway Level of Service Thresholds			
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

EXHIBIT 64

DRAFT 3-20-15

I -30 PEL 2041 PM 10-Lane C/D Level of Service North of Arkansas River

CA0602 Planning and Environmental Linkages

April 2015

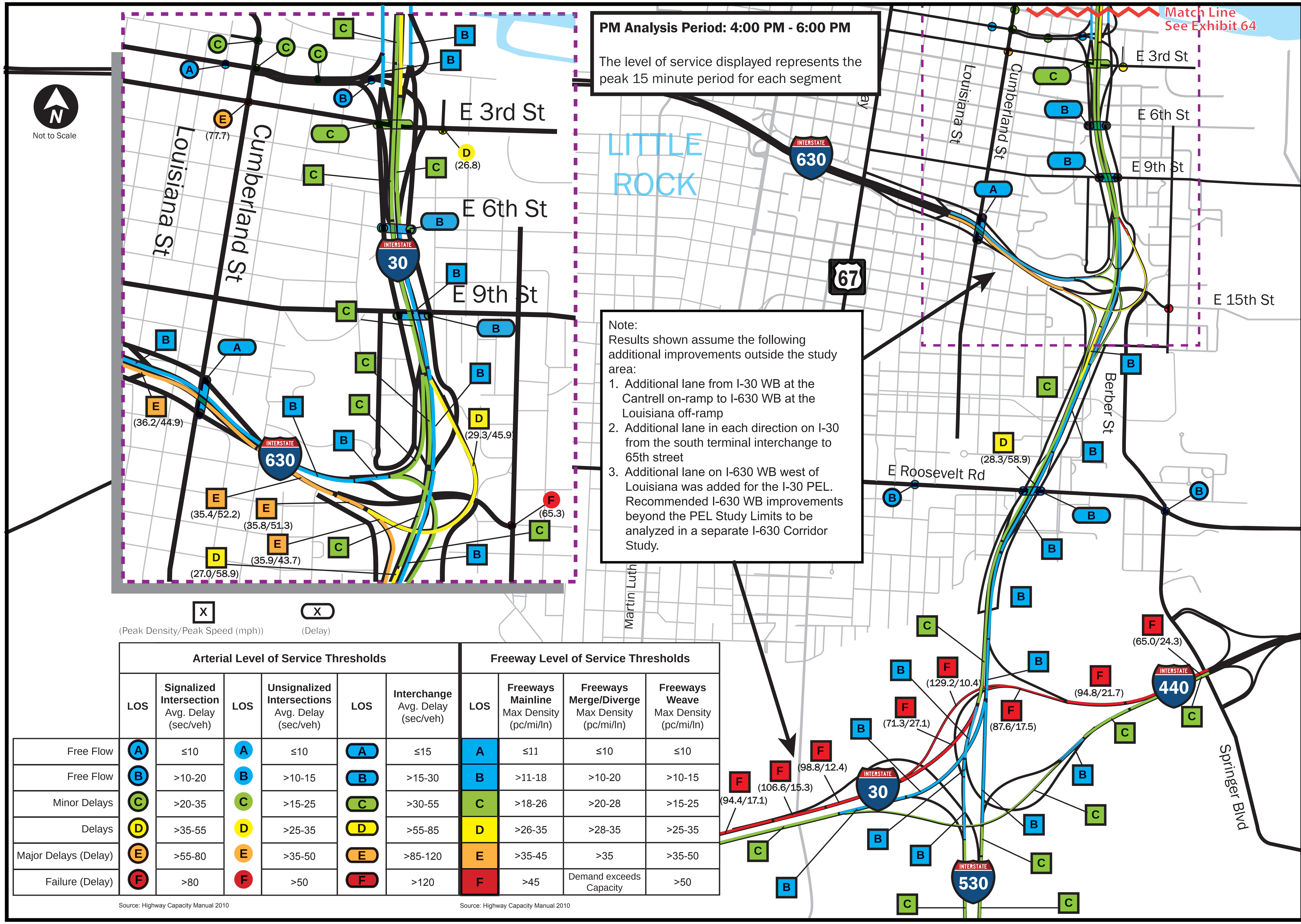
EXHIBIT 65

DRAFT 3-20-15

I-30 PEL 2041 PM 10-Lane C/D Level of Service South of Arkansas River

PM Analysis Period: 4:00 PM - 6:00 PM

The level of service displayed represents the peak 15 minute period for each segment



Note:
Results shown assume the following additional improvements outside the study area:

1. Additional lane from I-30 WB at the Cantrell on-ramp to I-630 WB at the Louisiana off-ramp
2. Additional lane in each direction on I-30 from the south terminal interchange to 65th street
3. Additional lane on I-630 WB west of Louisiana was added for the I-30 PEL. Recommended I-630 WB improvements beyond the PEL Study Limits to be analyzed in a separate I-630 Corridor Study.

Arterial Level of Service Thresholds

	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)
Free Flow	A	≤10	A	≤10	A	≤15
Free Flow	B	>10-20	B	>10-15	B	>15-30
Minor Delays	C	>20-35	C	>15-25	C	>30-55
Delays	D	>35-55	D	>25-35	D	>55-85
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120
Failure (Delay)	F	>80	F	>50	F	>120

Source: Highway Capacity Manual 2010

Freeway Level of Service Thresholds

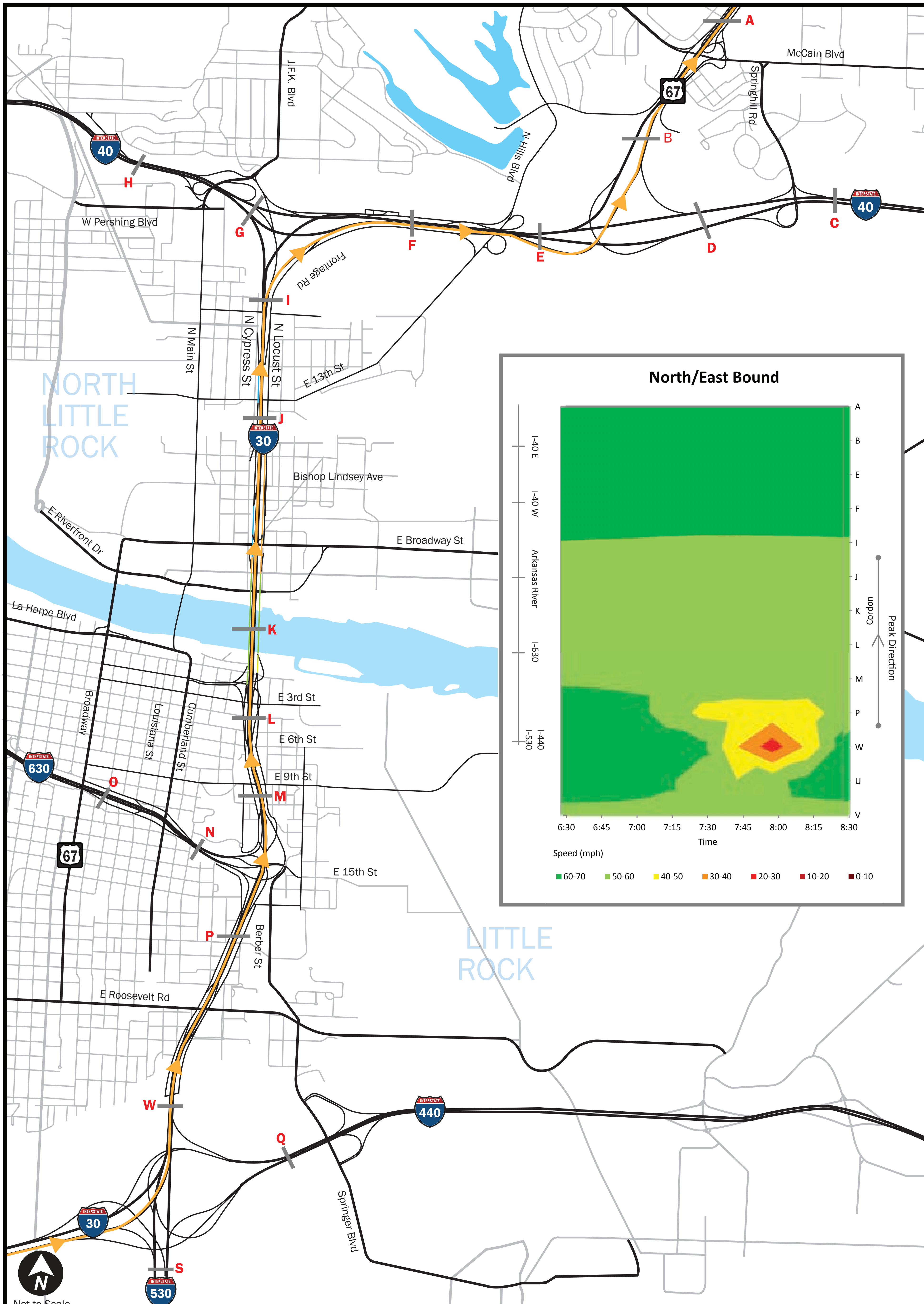
LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
A	≤11	≤10	≤10
B	>11-18	>10-20	>10-15
C	>18-26	>20-28	>15-25
D	>26-35	>28-35	>25-35
E	>35-45	>35	>35-50
F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

CA0602 Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

April 2015



April 2015

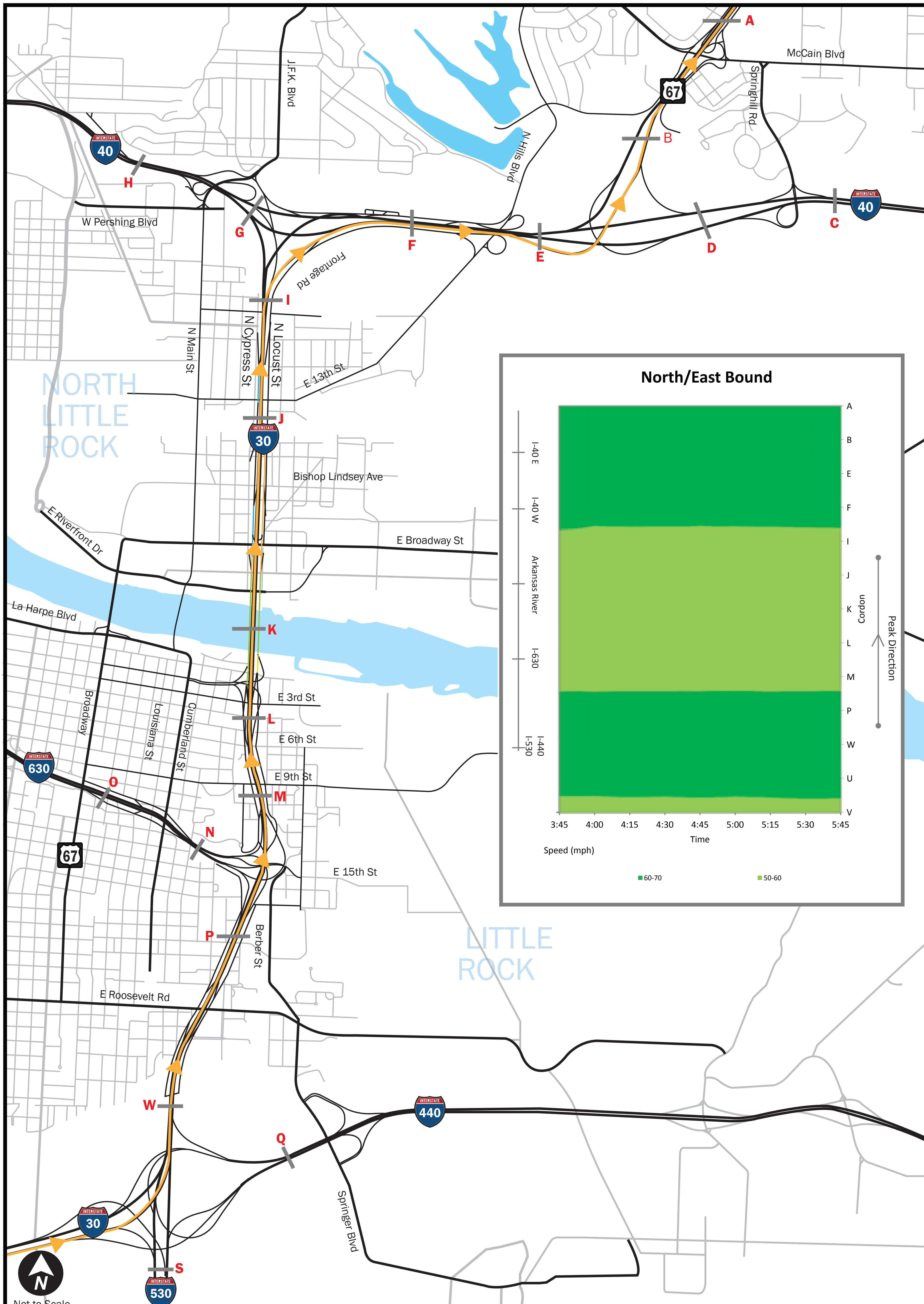
CAP CONNECTING ARKANSAS PROGRAM

30 Planning and Environmental Linkages

I-30 PEL
2041 AM 10-Lane C/D
Speed Profile Map
North/East Bound

DRAFT 3-20-15

EXHIBIT 66



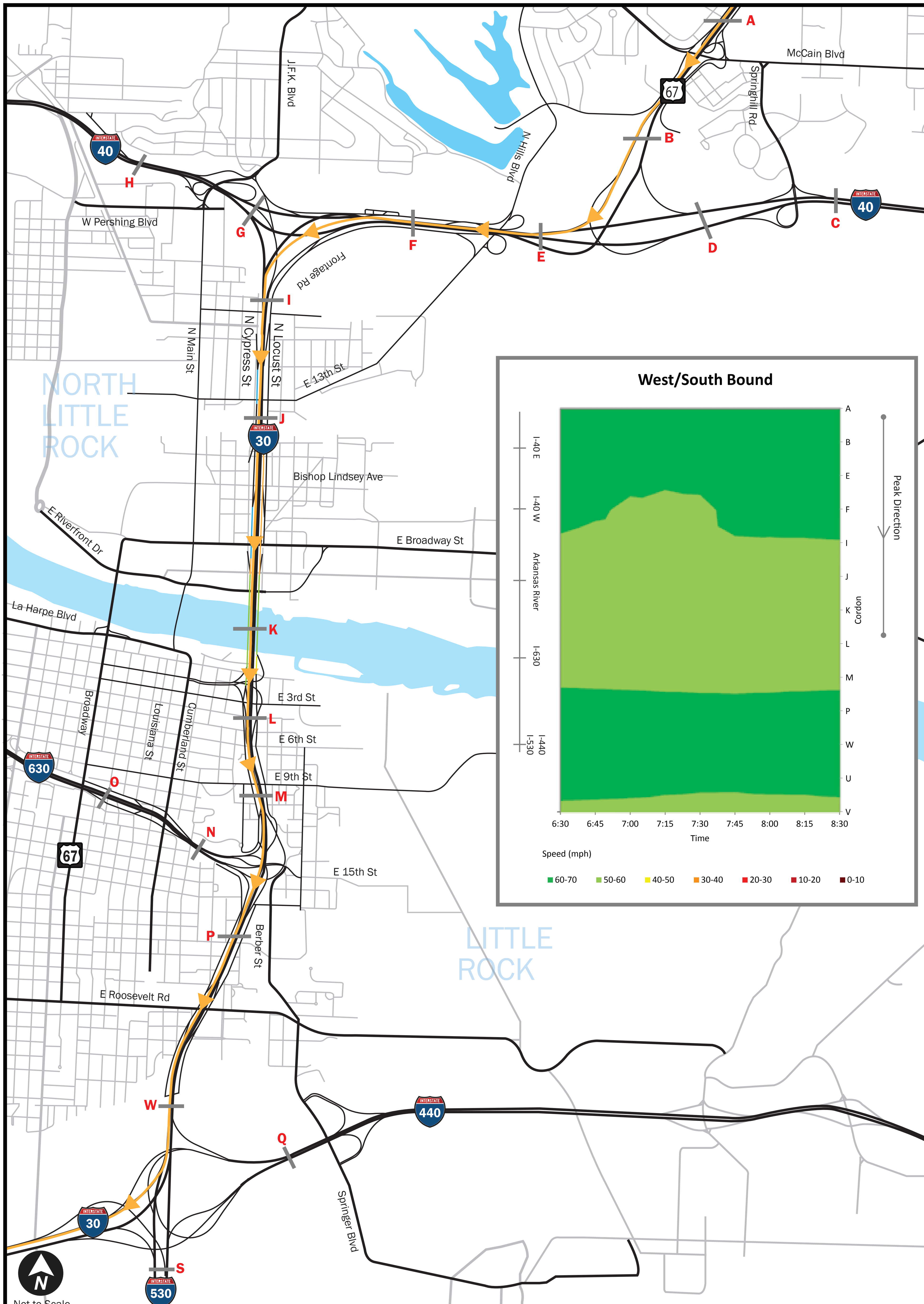
April 2015

Planning and Environmental Linkages

I-30 PEL
2041 PM 10-Lane C/D
Speed Profile Map
North/East Bound

DRAFT 3-20-15

EXHIBIT 67



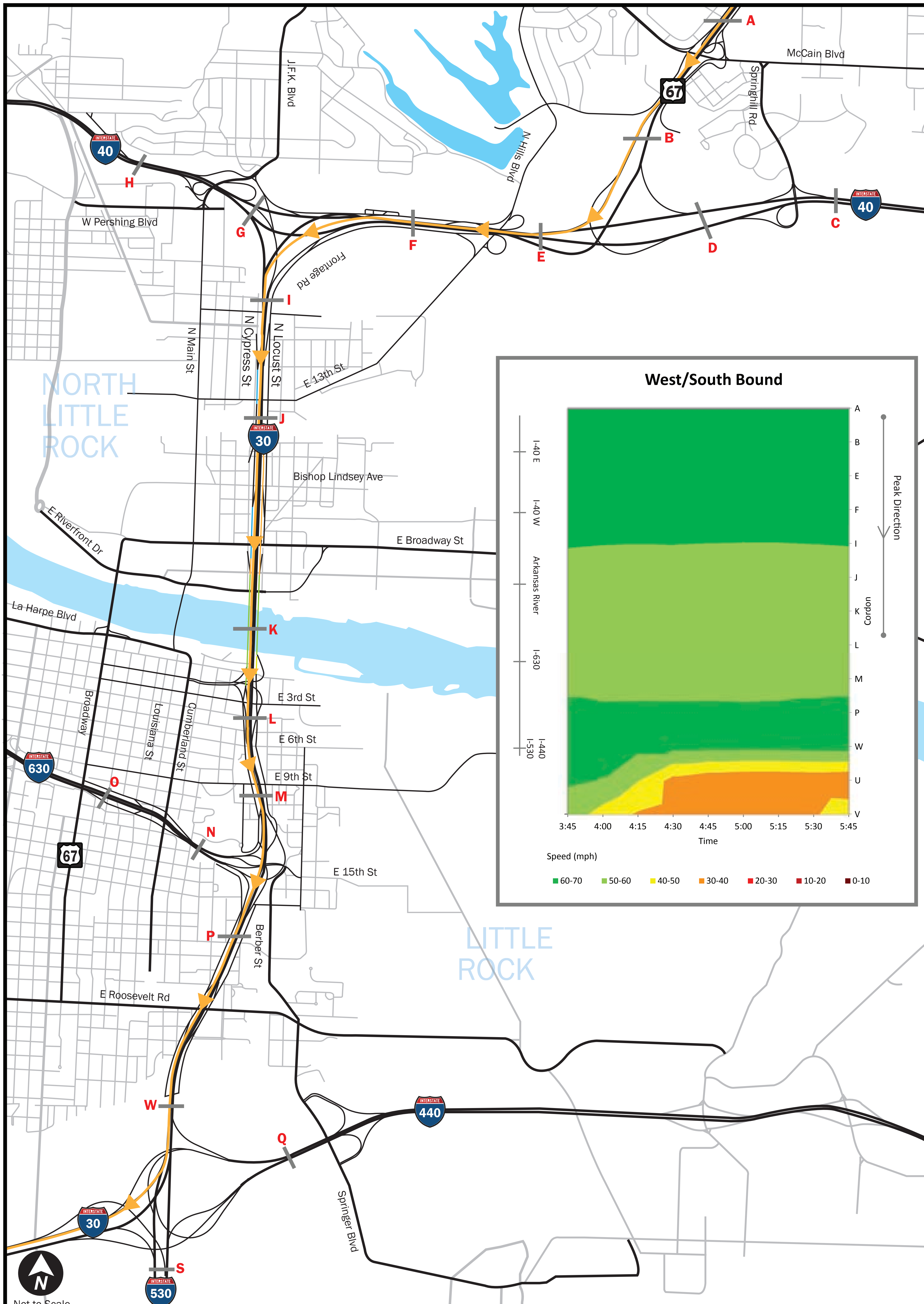
April 2015

Planning and Environmental Linkages

I-30 PEL
2041 AM 10-Lane C/D
Speed Profile Map
West/South Bound

DRAFT 3-20-15

EXHIBIT 68



April 2015

Planning and Environmental Linkages

I-30 PEL
2041 PM 10-Lane C/D Speed Profile Map West/South Bound

DRAFT 3-20-15

EXHIBIT 69

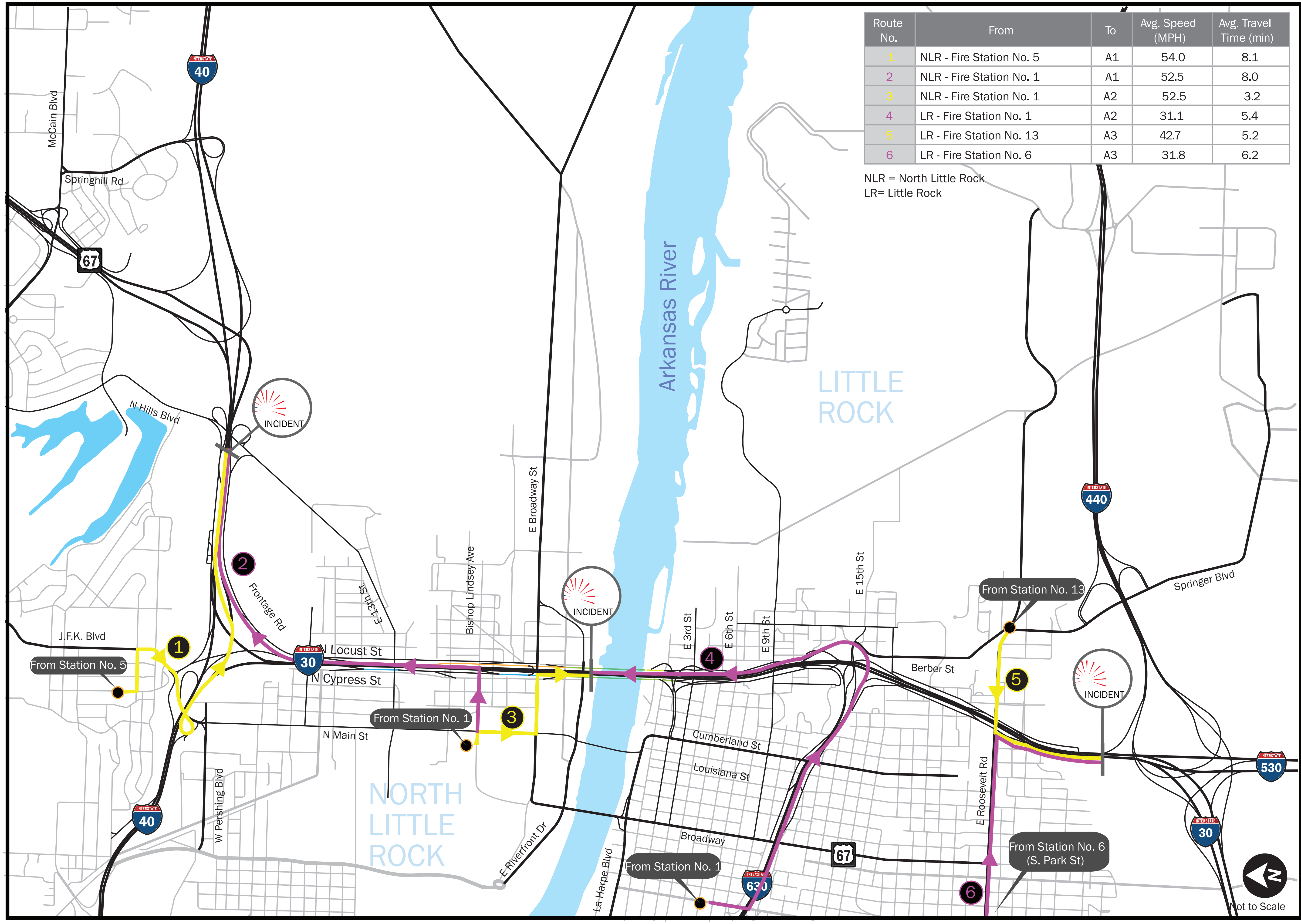
EXHIBIT 70

DRAFT
3-20-15

I-30 PEL
2041 AM 10-Lane C/D
Emergency Route Travel Time

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	NLR - Fire Station No. 5	A1	54.0	8.1
2	NLR - Fire Station No. 1	A1	52.5	8.0
3	NLR - Fire Station No. 1	A2	52.5	3.2
4	LR - Fire Station No. 1	A2	31.1	5.4
5	LR - Fire Station No. 13	A3	42.7	5.2
6	LR - Fire Station No. 6	A3	31.8	6.2

NLR = North Little Rock
LR= Little Rock



Planning and Environmental Linkages

April 2015

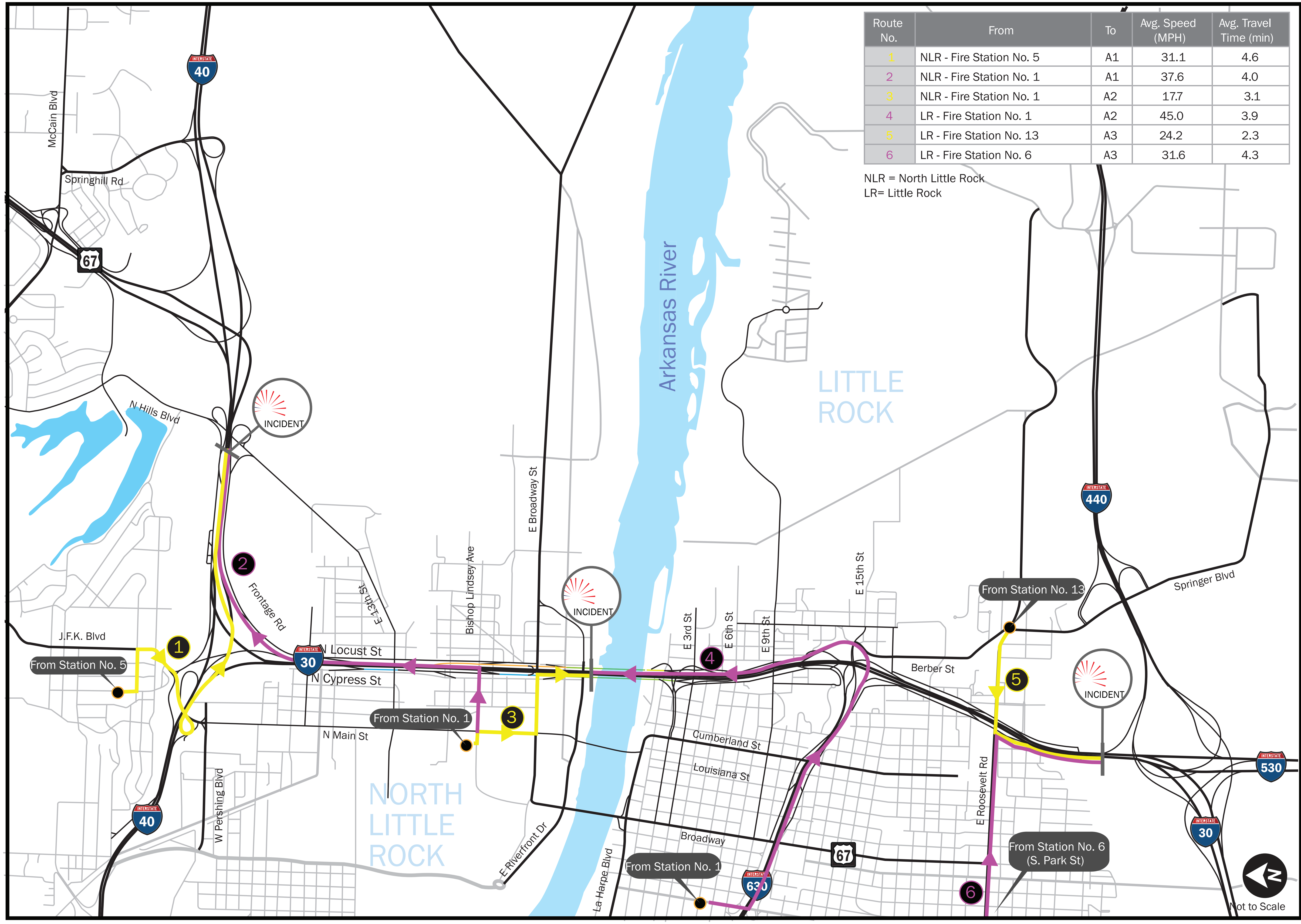
EXHIBIT 71

DRAFT
3-20-15

I-30 PEL
2041 PM 10-Lane C/D
Emergency Route Travel Time

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	NLR - Fire Station No. 5	A1	31.1	4.6
2	NLR - Fire Station No. 1	A1	37.6	4.0
3	NLR - Fire Station No. 1	A2	17.7	3.1
4	LR - Fire Station No. 1	A2	45.0	3.9
5	LR - Fire Station No. 13	A3	24.2	2.3
6	LR - Fire Station No. 6	A3	31.6	4.3

NLR = North Little Rock
LR= Little Rock



Planning and Environmental Linkages

April 2015

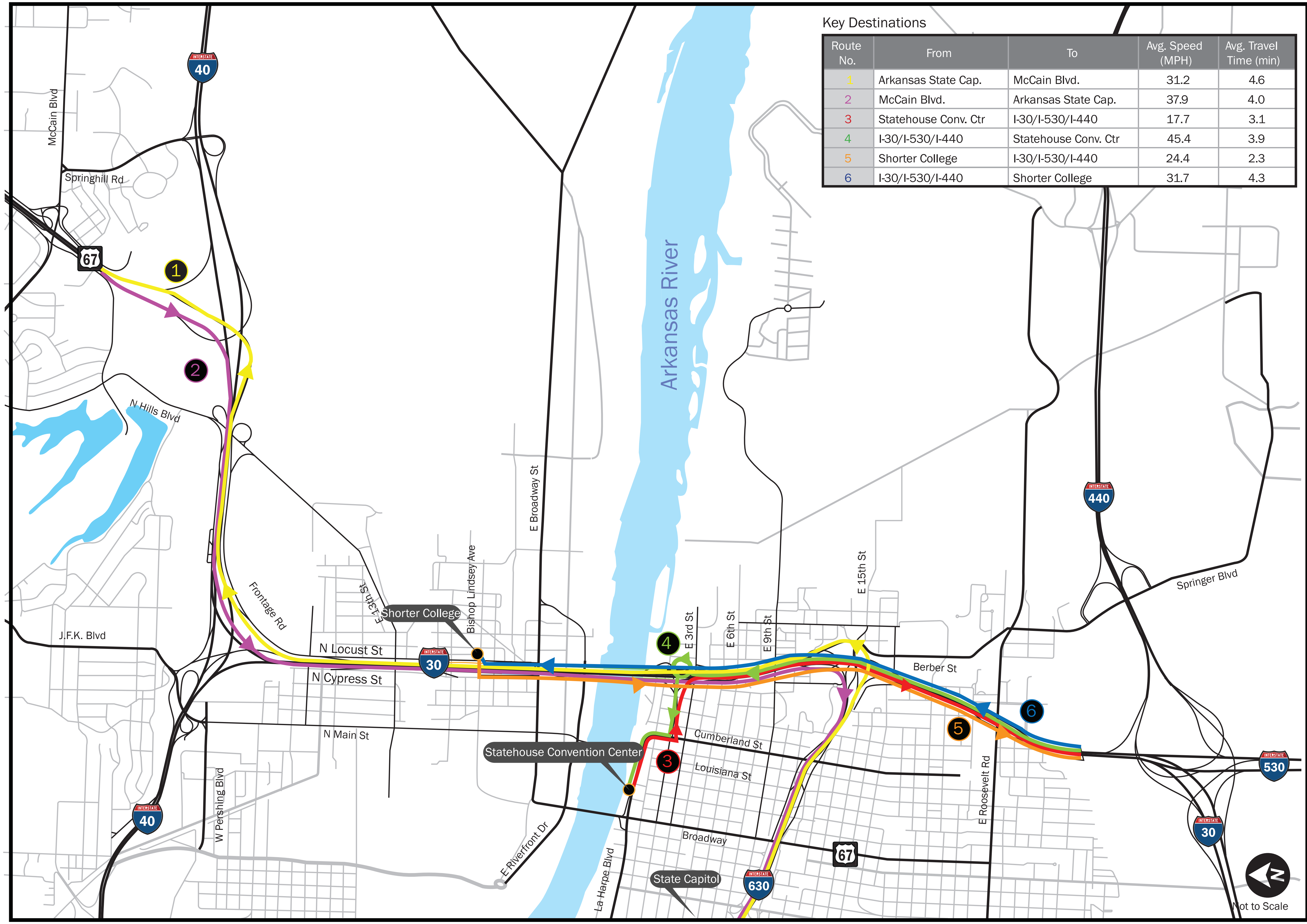
EXHIBIT 72

DRAFT 3-20-15

I-30 PEL
2041 AM 10-Lane C/D
Key Destination Travel Time

Key Destinations

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	Arkansas State Cap.	McCain Blvd.	31.2	4.6
2	McCain Blvd.	Arkansas State Cap.	37.9	4.0
3	Statehouse Conv. Ctr	I-30/I-530/I-440	17.7	3.1
4	I-30/I-530/I-440	Statehouse Conv. Ctr	45.4	3.9
5	Shorter College	I-30/I-530/I-440	24.4	2.3
6	I-30/I-530/I-440	Shorter College	31.7	4.3



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Planning and Environmental Linkages

CAP
CONNECTING ARKANSAS PROGRAM

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EXHIBIT 73

DRAFT
3-20-15

I-30 PEL
2041 PM 10-Lane C/D
Key Destination Travel Time

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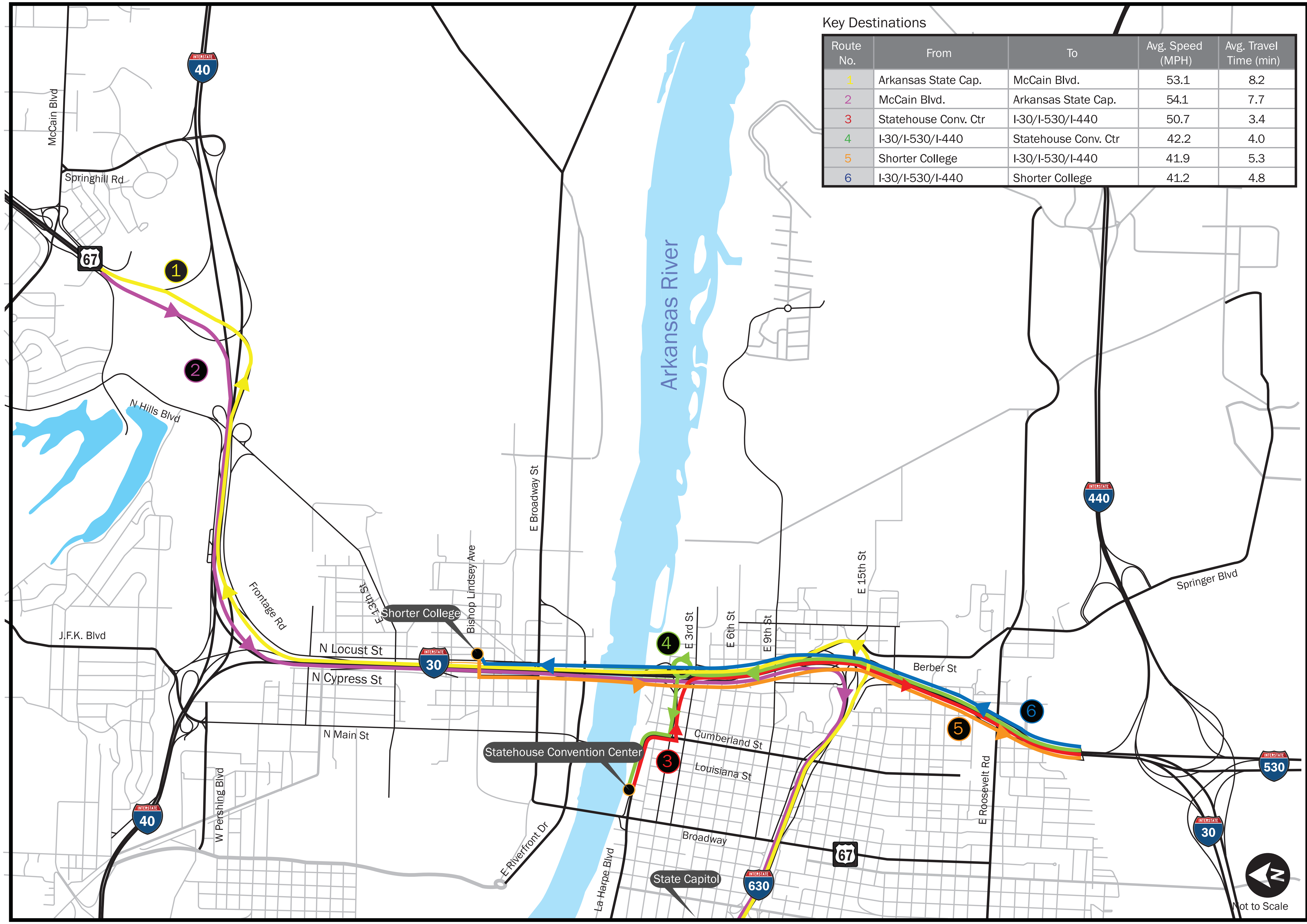
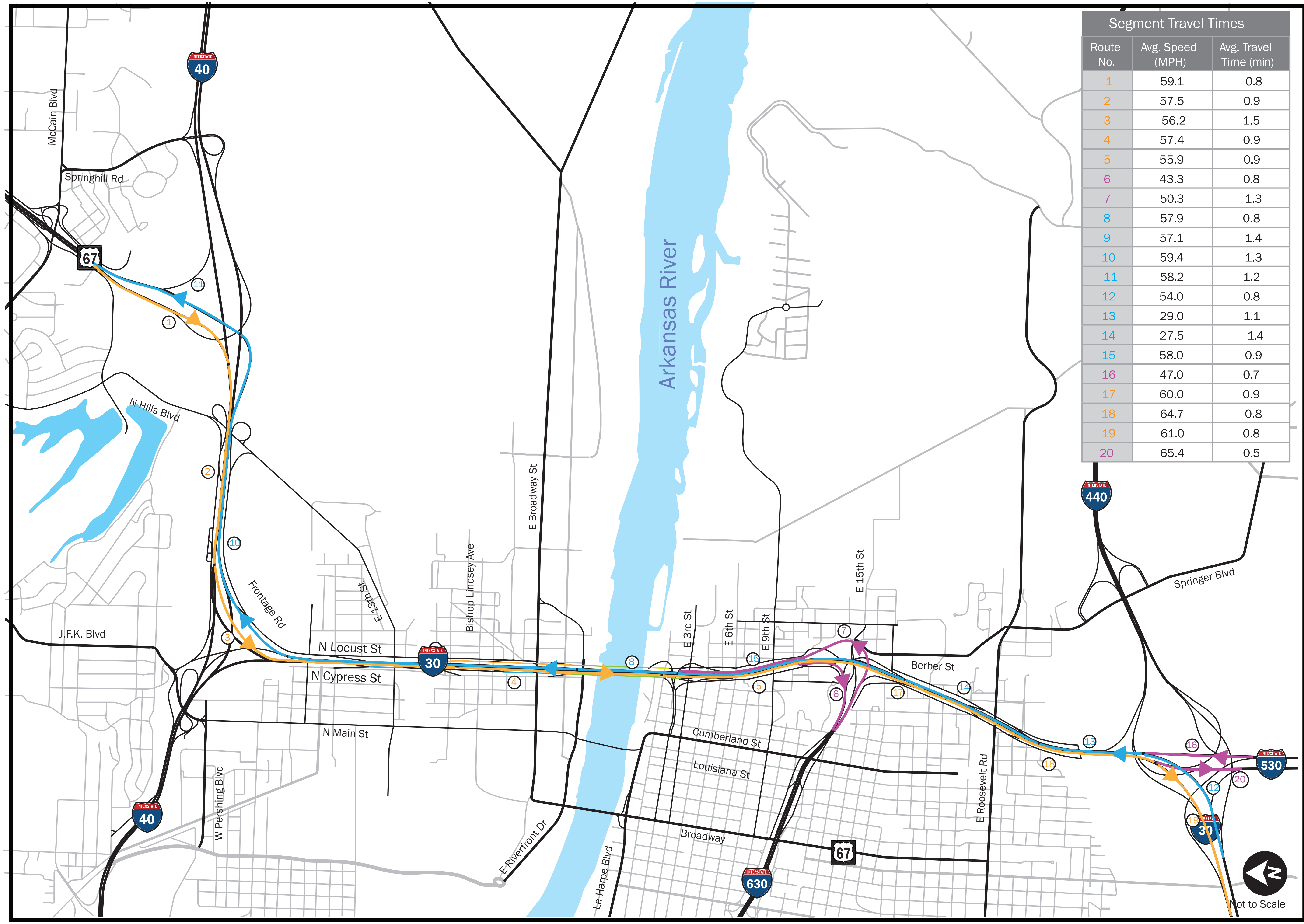
Key Destinations

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	Arkansas State Cap.	McCain Blvd.	53.1	8.2
2	McCain Blvd.	Arkansas State Cap.	54.1	7.7
3	Statehouse Conv. Ctr	I-30/I-530/I-440	50.7	3.4
4	I-30/I-530/I-440	Statehouse Conv. Ctr	42.2	4.0
5	Shorter College	I-30/I-530/I-440	41.9	5.3
6	I-30/I-530/I-440	Shorter College	41.2	4.8





Segment Travel Times

Route No.	Avg. Speed (MPH)	Avg. Travel Time (min)
1	59.1	0.8
2	57.5	0.9
3	56.2	1.5
4	57.4	0.9
5	55.9	0.9
6	43.3	0.8
7	50.3	1.3
8	57.9	0.8
9	57.1	1.4
10	59.4	1.3
11	58.2	1.2
12	54.0	0.8
13	29.0	1.1
14	27.5	1.4
15	58.0	0.9
16	47.0	0.7
17	60.0	0.9
18	64.7	0.8
19	61.0	0.8
20	65.4	0.5

EXHIBIT 74

DRAFT
3-20-15

I-30 PEL
2041 AM 10-Lane C/D
Study Corridor Travel Time

INTERSTATE 30
Planning and Environmental Linkages

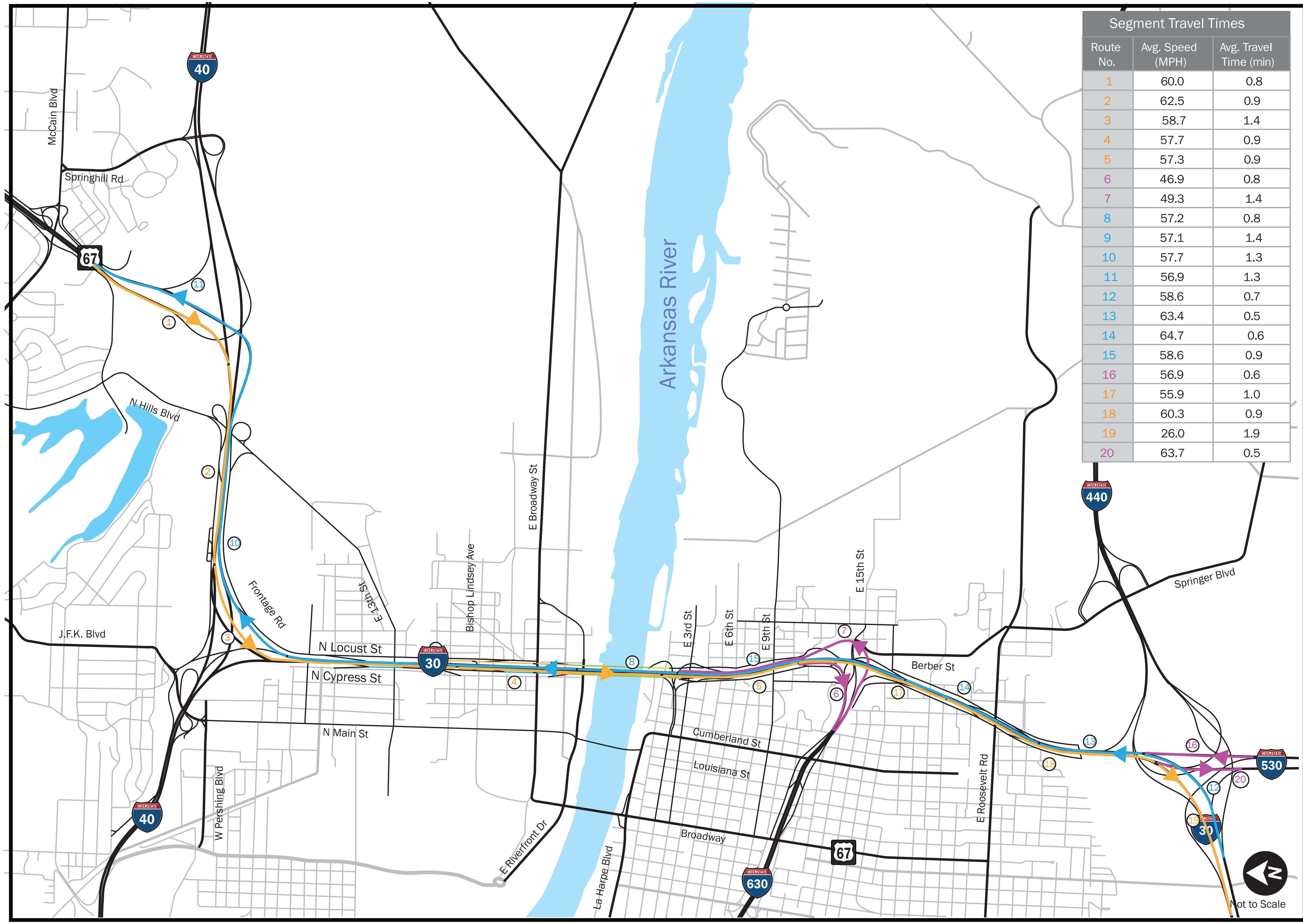
CONNECTING ARKANSAS PROGRAM
CAP

April 2015

EXHIBIT 75

DRAFT
3-20-15

I-30 PEL
2041 PM 10-Lane C/D
Study Corridor Travel Time



Segment Travel Times

Route No.	Avg. Speed (MPH)	Avg. Travel Time (min)
1	60.0	0.8
2	62.5	0.9
3	58.7	1.4
4	57.7	0.9
5	57.3	0.9
6	46.9	0.8
7	49.3	1.4
8	57.2	0.8
9	57.1	1.4
10	57.7	1.3
11	56.9	1.3
12	58.6	0.7
13	63.4	0.5
14	64.7	0.6
15	58.6	0.9
16	56.9	0.6
17	55.9	1.0
18	60.3	0.9
19	26.0	1.9
20	63.7	0.5

Interstate 30
Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

April 2015

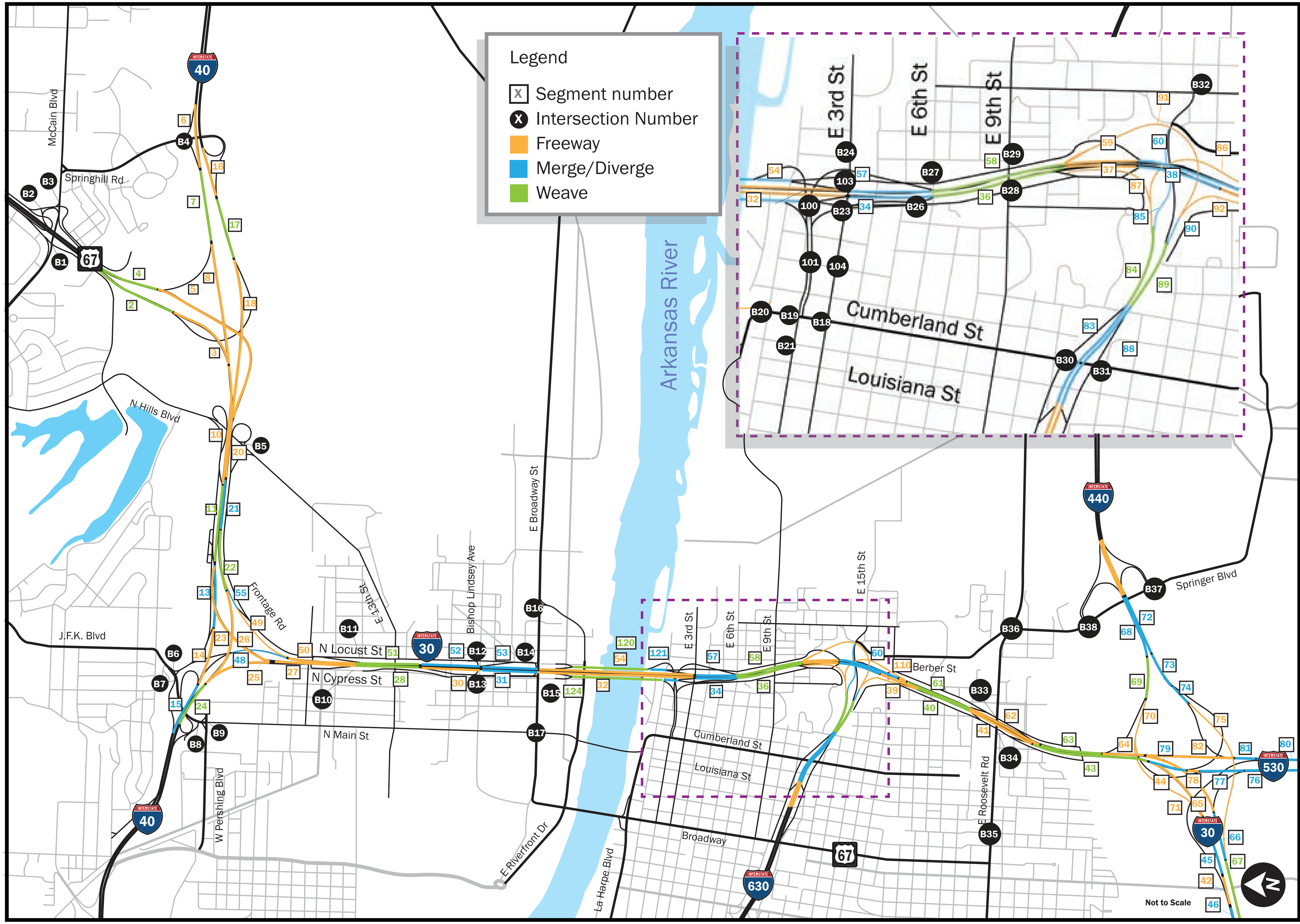


EXHIBIT 76

DRAFT
3-30-15

Analysis Locator Key
PEL Recommended
10-Lane with Downtown C/D

Interstate 30
Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM
CAP

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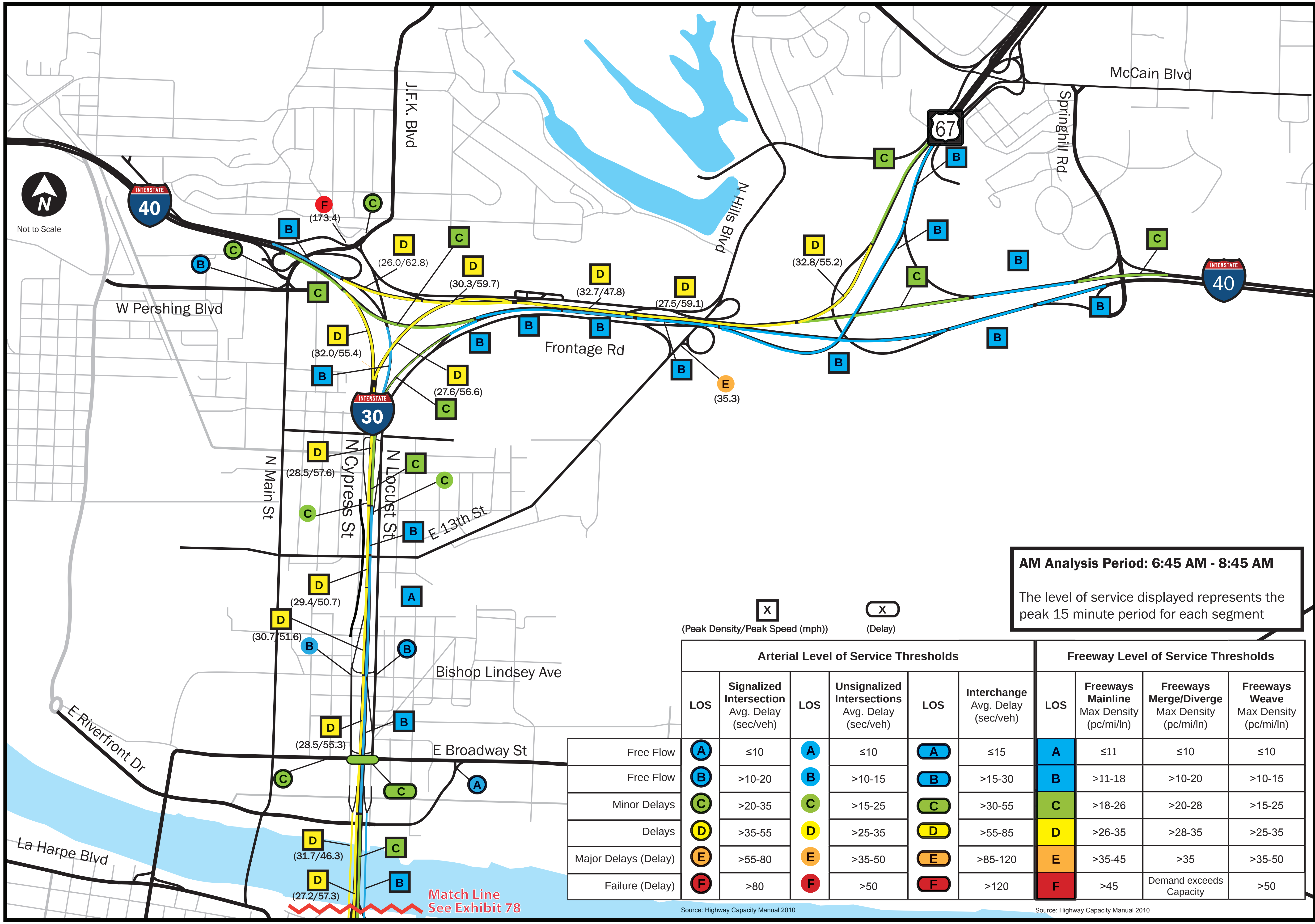

AM Analysis Period: 6:45 AM - 8:45 AM

The level of service displayed represents the peak 15 minute period for each segment

X (Peak Density/Peak Speed (mph))

X (Delay)

	Arterial Level of Service Thresholds						Freeway Level of Service Thresholds			
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

EXHIBIT 77

DRAFT 3-30-15

I-30 PEL Recommended 2041 AM 10 Lane with Downtown C/D Level of Service North of Arkansas River

30

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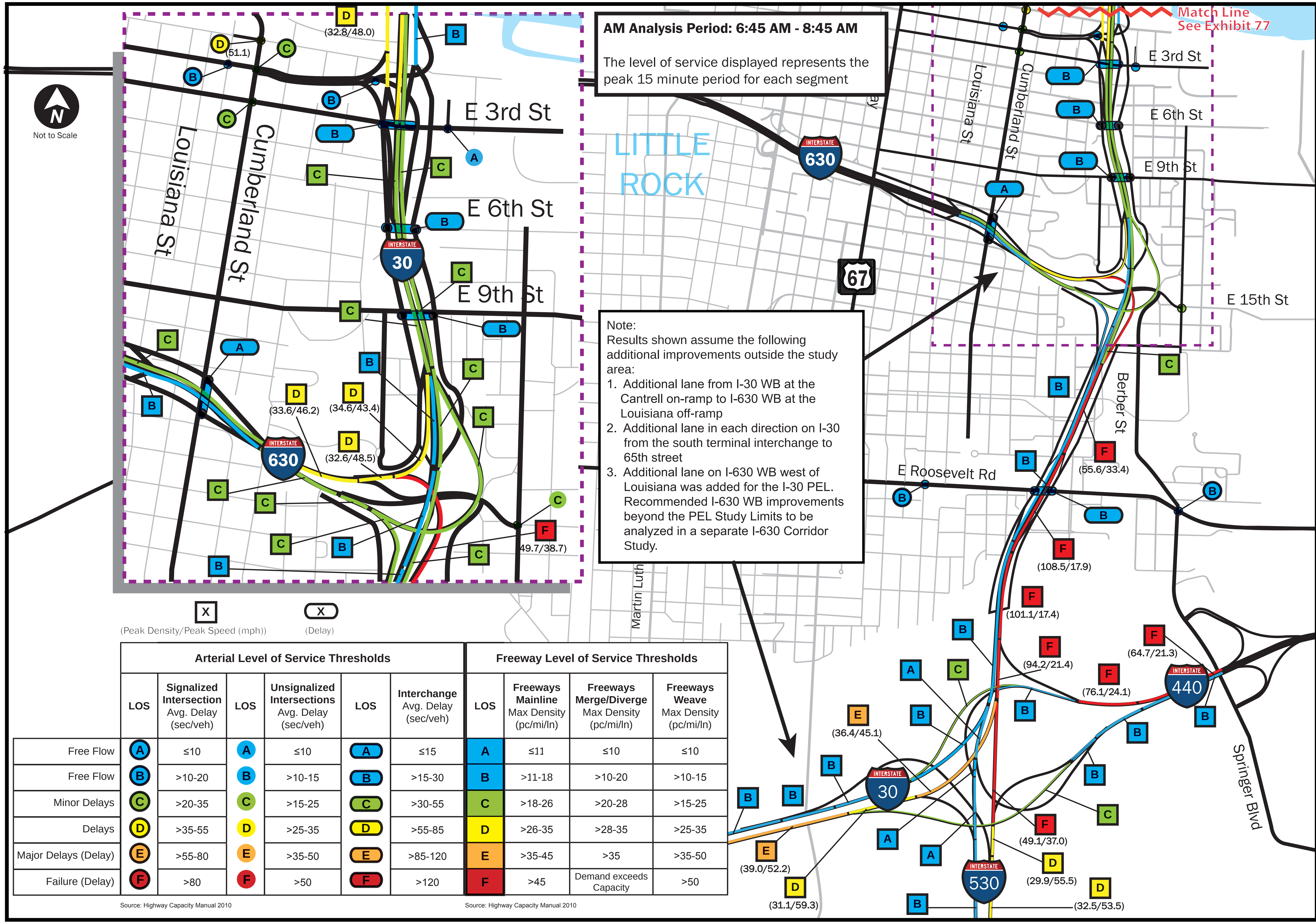
CONNECTING ARKANSAS PROGRAM CAP

April 2015

EXHIBIT 78

DRAFT
3-30-15

I-30 PEL Recommended 2041 AM 10 Lane with Downtown C/D Level of Service South of Arkansas River



AM Analysis Period: 6:45 AM - 8:45 AM

The level of service displayed represents the peak 15 minute period for each segment

Note:
Results shown assume the following additional improvements outside the study area:

1. Additional lane from I-30 WB at the Cantrell on-ramp to I-630 WB at the Louisiana off-ramp
2. Additional lane in each direction on I-30 from the south terminal interchange to 65th street
3. Additional lane on I-630 WB west of Louisiana was added for the I-30 PEL. Recommended I-630 WB improvements beyond the PEL Study Limits to be analyzed in a separate I-630 Corridor Study.

Arterial Level of Service Thresholds

	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)
Free Flow	A	≤10	A	≤10	A	≤15
Free Flow	B	>10-20	B	>10-15	B	>15-30
Minor Delays	C	>20-35	C	>15-25	C	>30-55
Delays	D	>35-55	D	>25-35	D	>55-85
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120
Failure (Delay)	F	>80	F	>50	F	>120

Source: Highway Capacity Manual 2010

Freeway Level of Service Thresholds

LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
A	≤11	≤10	≤10
B	>11-18	>10-20	>10-15
C	>18-26	>20-28	>15-25
D	>26-35	>28-35	>25-35
E	>35-45	>35	>35-50
F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

INTERSTATE 30

CA0602
Planning and Environmental Linkages

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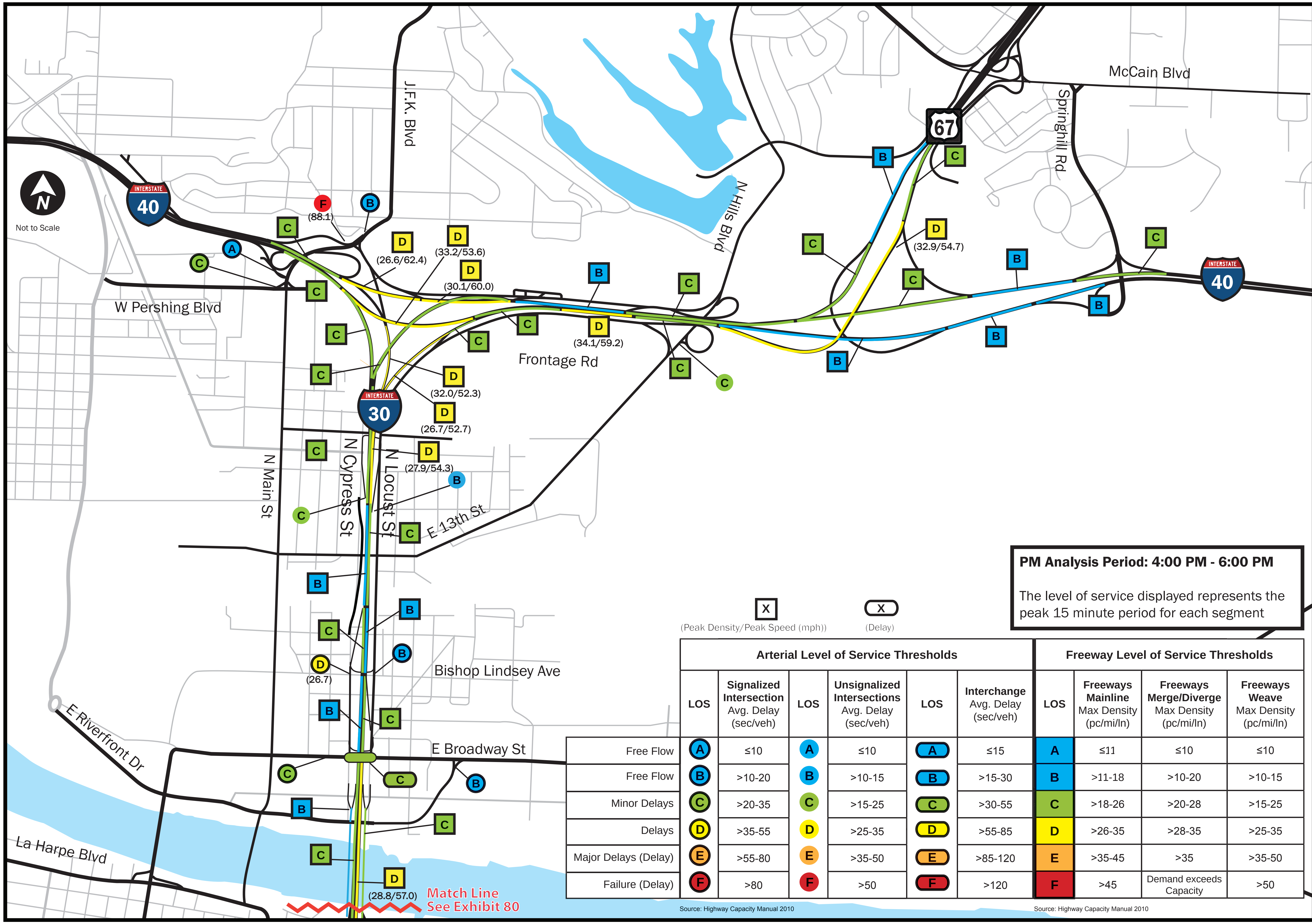

PM Analysis Period: 4:00 PM - 6:00 PM

The level of service displayed represents the peak 15 minute period for each segment

	Arterial Level of Service Thresholds						Freeway Level of Service Thresholds			
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

EXHIBIT 79

DRAFT
3-30-15

I -30 PEL Recommended 2041 PM 10-Lane with Downtown C/D Level of Service North of Arkansas River

30

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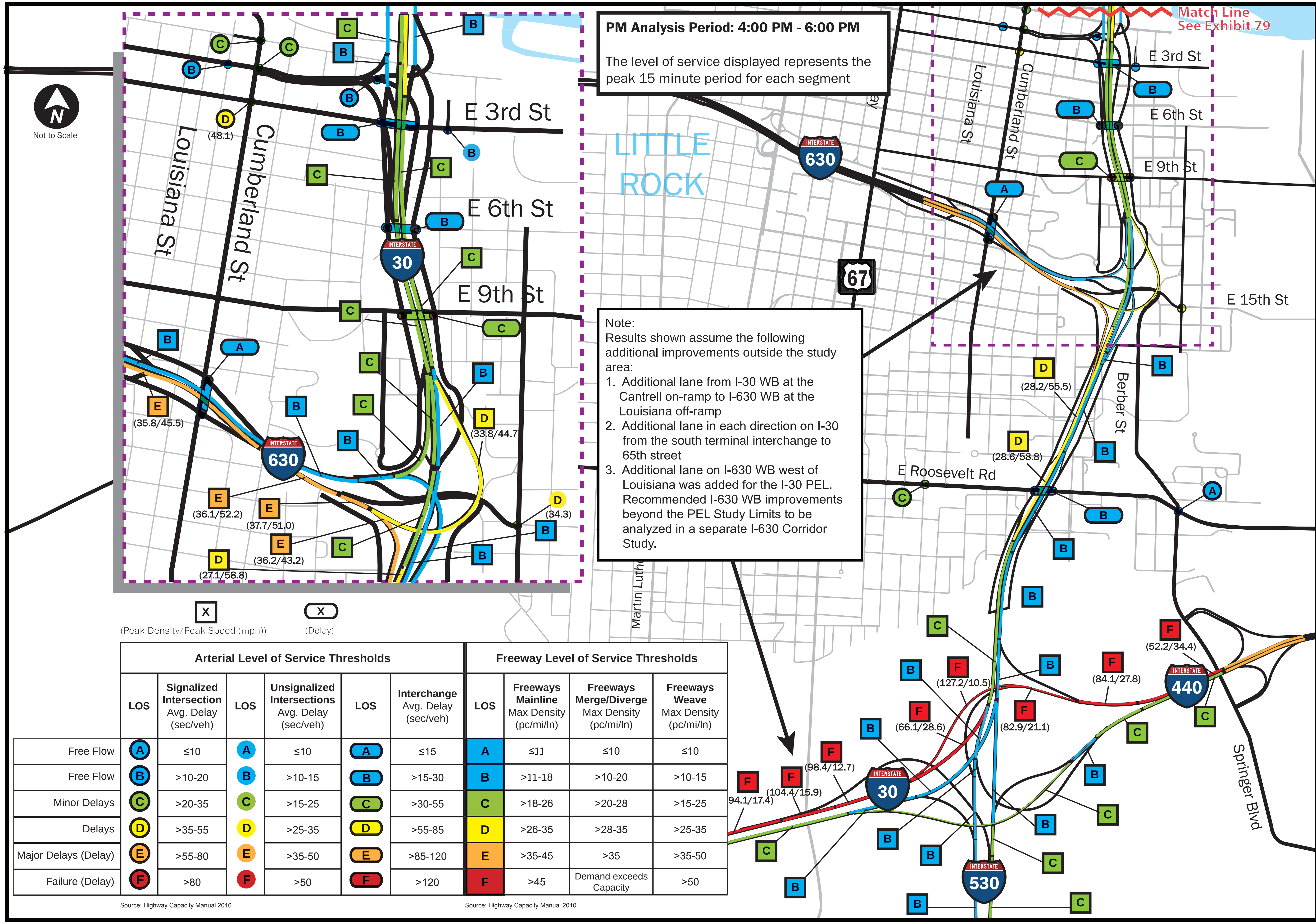
EXHIBIT 80

DRAFT
3-30-15

I-30 PEL Recommended 2041 PM 10-Lane with Downtown C/D Level of Service South of Arkansas River



PM Analysis Period: 4:00 PM - 6:00 PM

The level of service displayed represents the peak 15 minute period for each segment

Note:
Results shown assume the following additional improvements outside the study area:

1. Additional lane from I-30 WB at the Cantrell on-ramp to I-630 WB at the Louisiana off-ramp
2. Additional lane in each direction on I-30 from the south terminal interchange to 65th street
3. Additional lane on I-630 WB west of Louisiana was added for the I-30 PEL. Recommended I-630 WB improvements beyond the PEL Study Limits to be analyzed in a separate I-630 Corridor Study.

	Arterial Level of Service Thresholds						Freeway Level of Service Thresholds			
	LOS	Signalized Intersection Avg. Delay (sec/veh)	LOS	Unsignalized Intersections Avg. Delay (sec/veh)	LOS	Interchange Avg. Delay (sec/veh)	LOS	Freeways Mainline Max Density (pc/mi/ln)	Freeways Merge/Diverge Max Density (pc/mi/ln)	Freeways Weave Max Density (pc/mi/ln)
Free Flow	A	≤10	A	≤10	A	≤15	A	≤11	≤10	≤10
Free Flow	B	>10-20	B	>10-15	B	>15-30	B	>11-18	>10-20	>10-15
Minor Delays	C	>20-35	C	>15-25	C	>30-55	C	>18-26	>20-28	>15-25
Delays	D	>35-55	D	>25-35	D	>55-85	D	>26-35	>28-35	>25-35
Major Delays (Delay)	E	>55-80	E	>35-50	E	>85-120	E	>35-45	>35	>35-50
Failure (Delay)	F	>80	F	>50	F	>120	F	>45	Demand exceeds Capacity	>50

Source: Highway Capacity Manual 2010

Source: Highway Capacity Manual 2010

CA0602
Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

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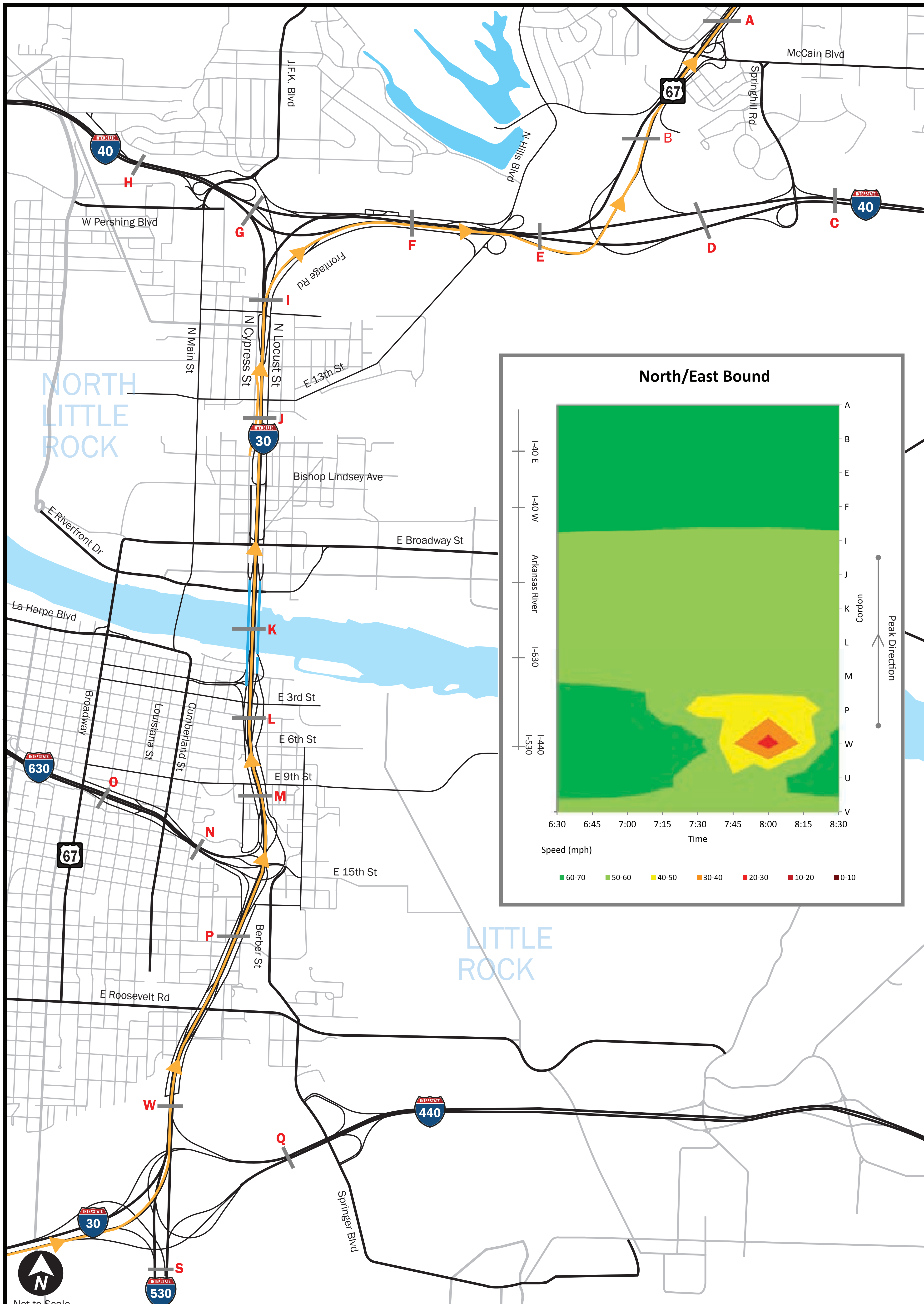


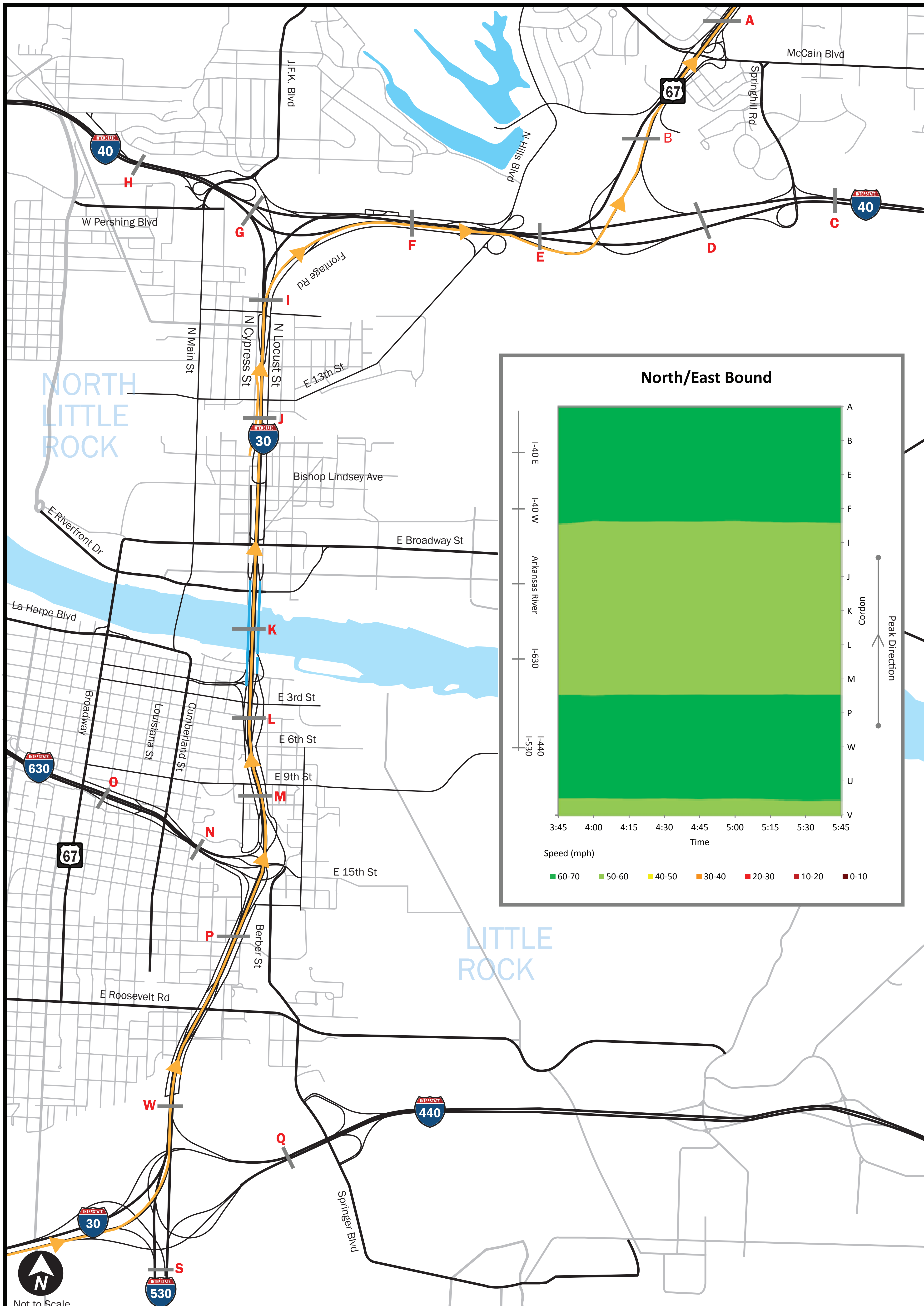
April 2015

Planning and Environmental Linkages

I-30 PEL Recommended 2041 AM 10-Lane with Downtown C/D Speed Profile Map North/East Bound

DRAFT 3-30-15

EXHIBIT 81



April 2015

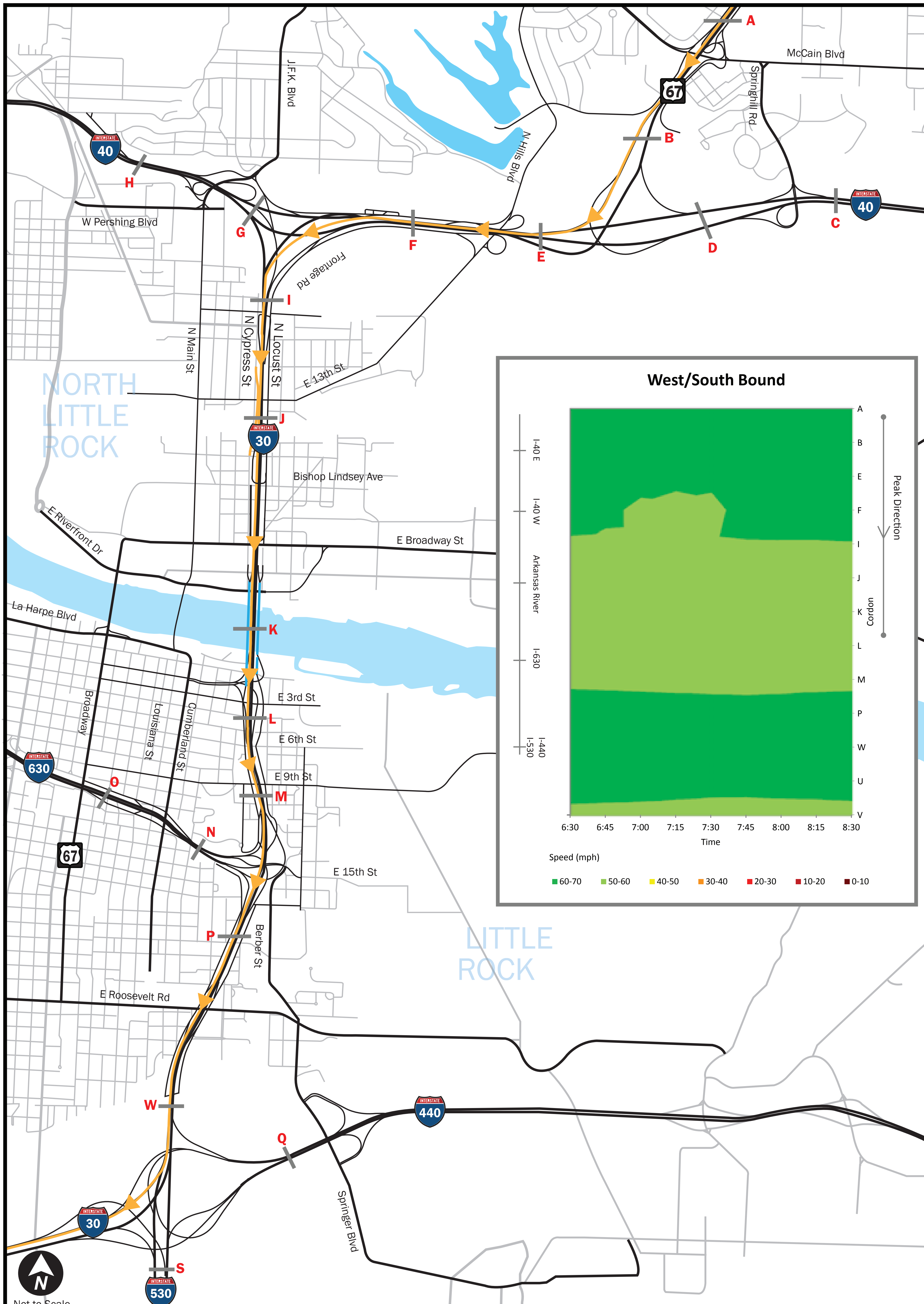
CAP CONNECTING ARKANSAS PROGRAM

30 Planning and Environmental Linkages

I-30 PEL Recommended 2041 PM 10-Lane with Downtown C/D Speed Profile Map North/East Bound

DRAFT 3-30-15

EXHIBIT 82



April 2015

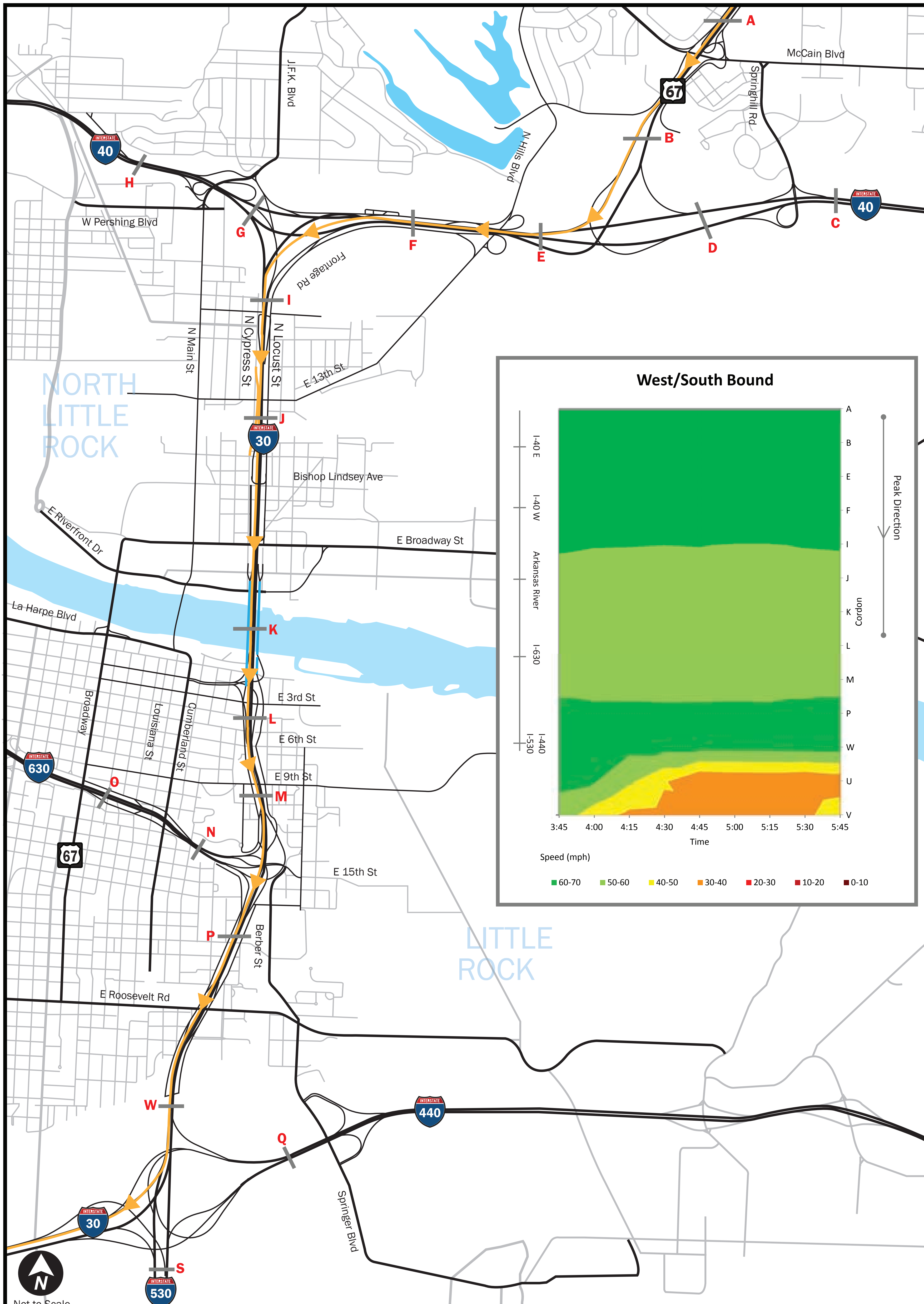
CAP CONNECTING ARKANSAS PROGRAM

Planning and Environmental Linkages

I-30 PEL Recommended 2041 AM 10-Lane with Downtown C/D Speed Profile Map West/South Bound

DRAFT 3-30-15

EXHIBIT 83



April 2015

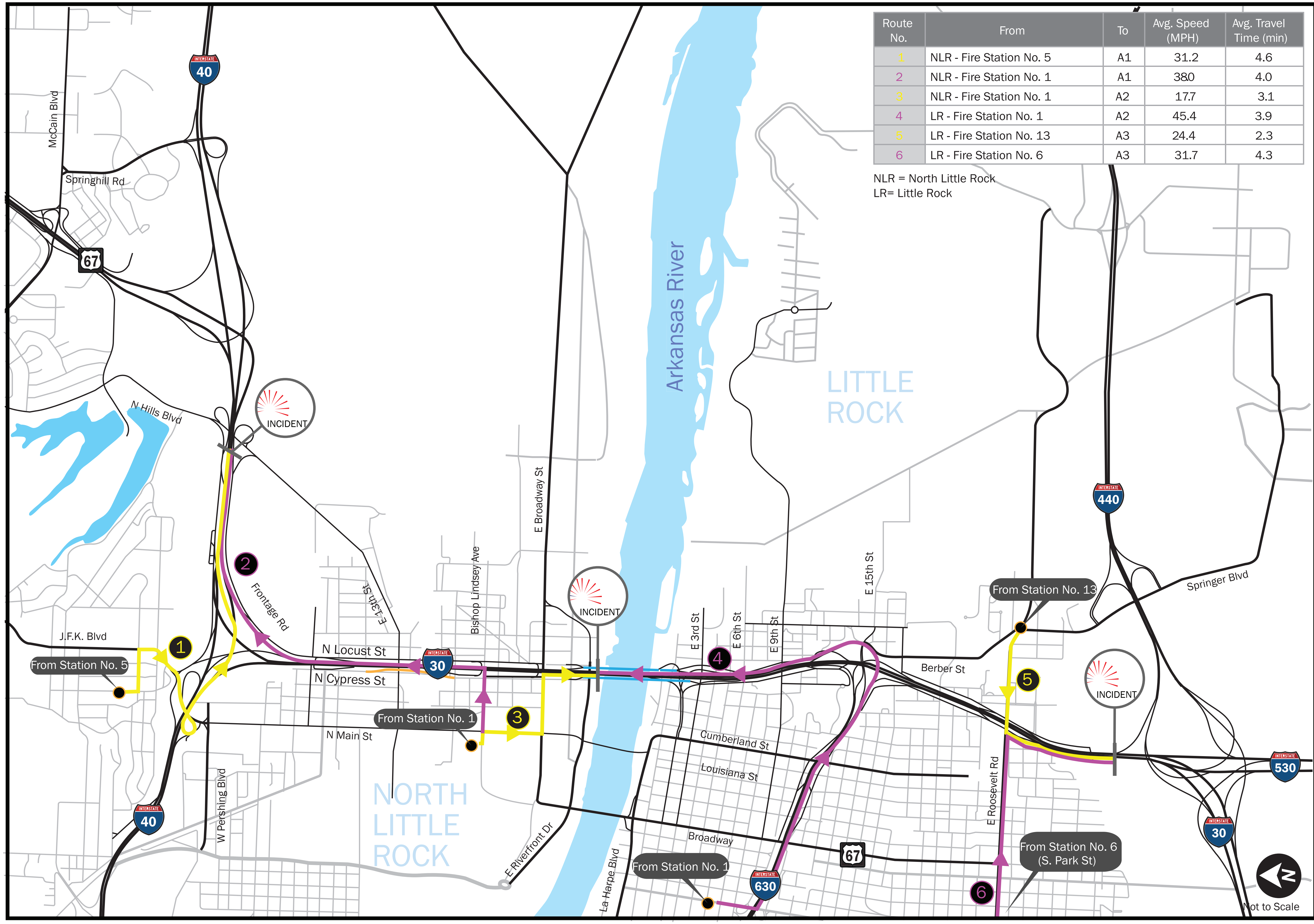
CAP CONNECTING ARKANSAS PROGRAM

Planning and Environmental Linkages

I-30 PEL Recommended 2041 PM 10-Lane with Downtown C/D Speed Profile Map West/South Bound

DRAFT 3-30-15

EXHIBIT 84



Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	NLR - Fire Station No. 5	A1	31.2	4.6
2	NLR - Fire Station No. 1	A1	38.0	4.0
3	NLR - Fire Station No. 1	A2	17.7	3.1
4	LR - Fire Station No. 1	A2	45.4	3.9
5	LR - Fire Station No. 13	A3	24.4	2.3
6	LR - Fire Station No. 6	A3	31.7	4.3

NLR = North Little Rock
LR= Little Rock

EXHIBIT 85

DRAFT
3-30-15

I-30 PEL Recommended 2041 AM 10-Lane with Downtown C/D Emergency Route Travel Time

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Planning and Environmental Linkages

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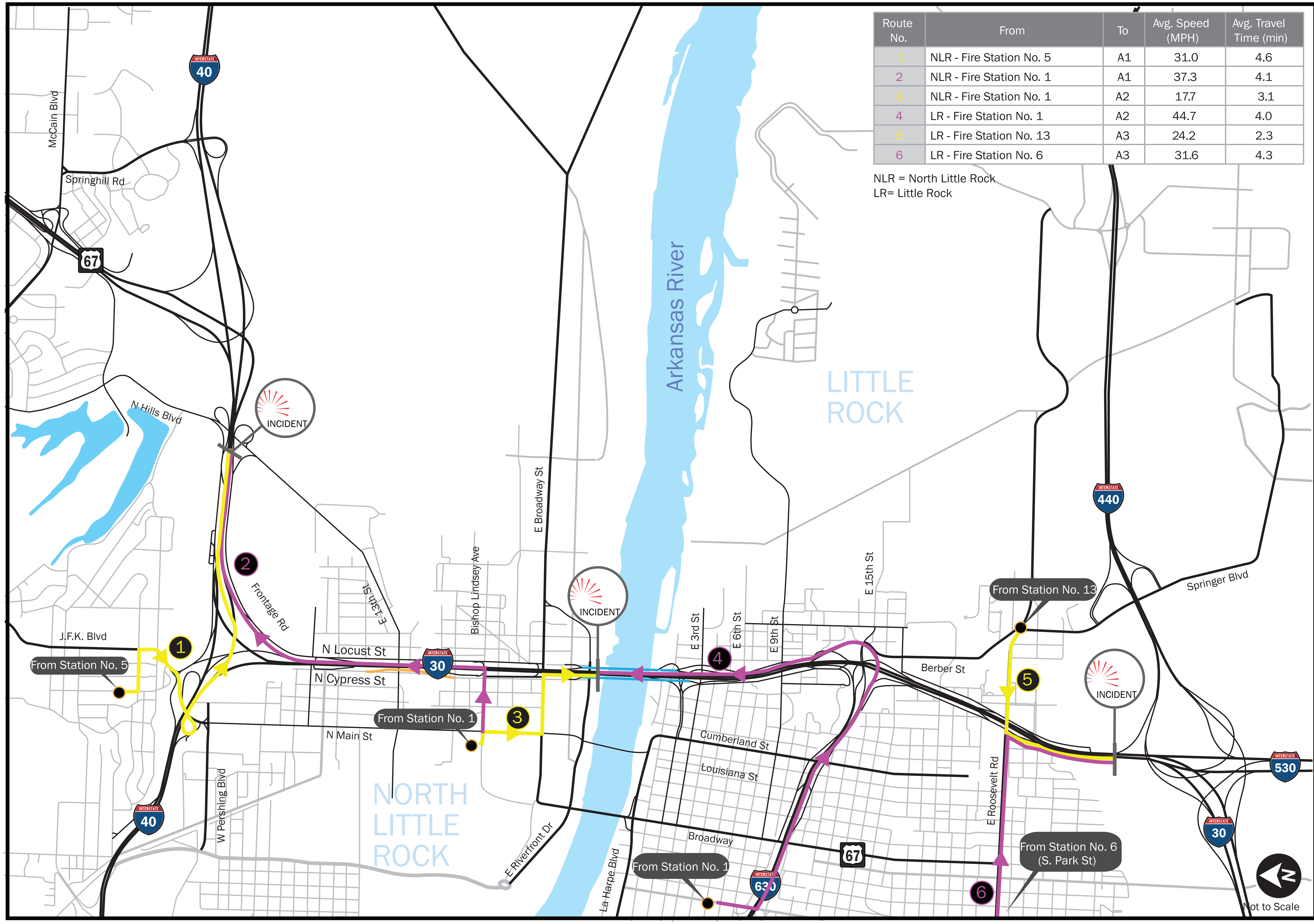
EXHIBIT 86

DRAFT
3-30-15

I-30 PEL Recommended 2041 PM 10-Lane with Downtown C/D Emergency Route Travel Time

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	NLR - Fire Station No. 5	A1	31.0	4.6
2	NLR - Fire Station No. 1	A1	37.3	4.1
3	NLR - Fire Station No. 1	A2	17.7	3.1
4	LR - Fire Station No. 1	A2	44.7	4.0
5	LR - Fire Station No. 13	A3	24.2	2.3
6	LR - Fire Station No. 6	A3	31.6	4.3

NLR = North Little Rock
LR= Little Rock



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Planning and Environmental Linkages

April 2015

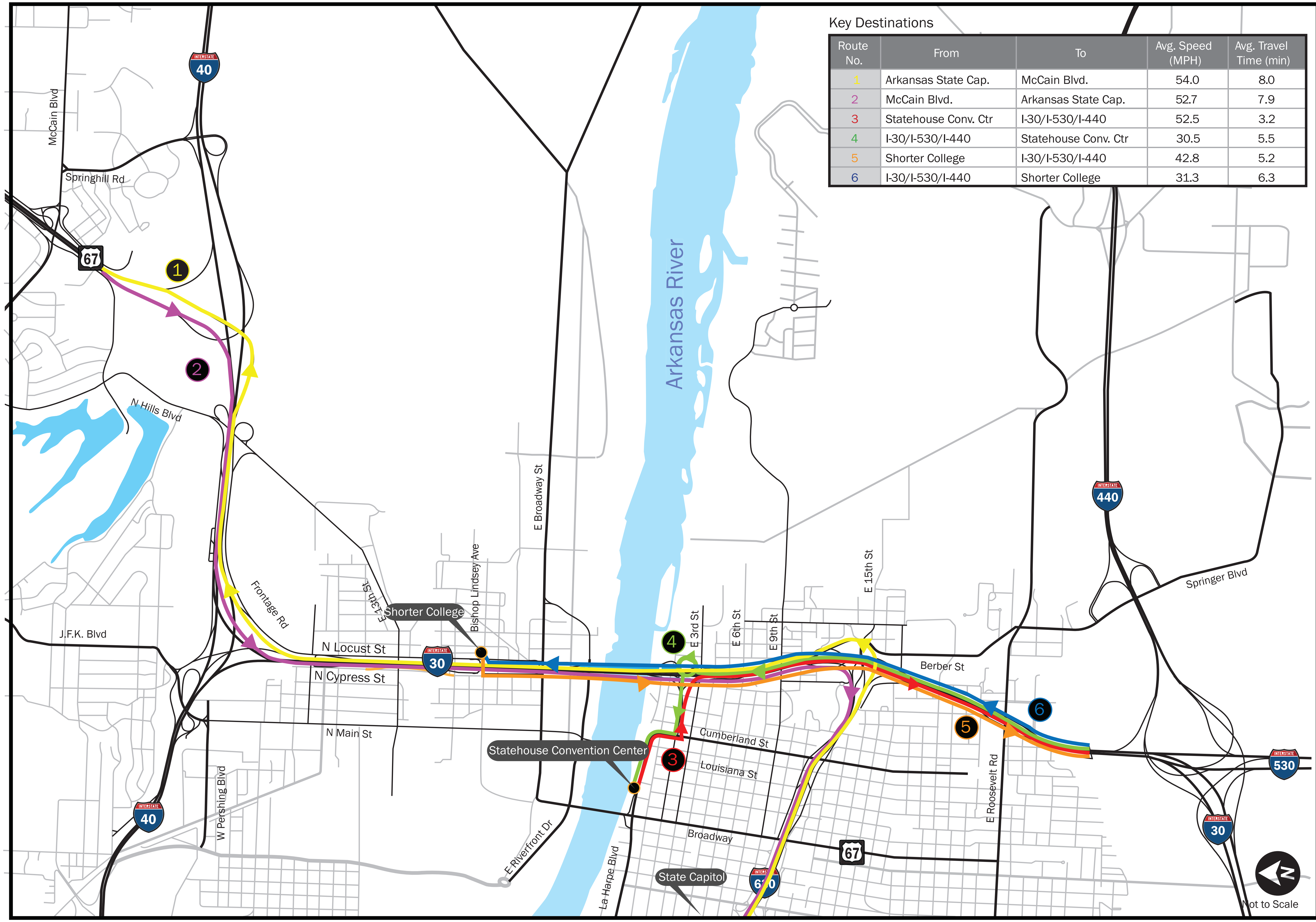
EXHIBIT 87

DRAFT
3-30-15

I-30 PEL Recommended 2041 AM 10-Lane with Downtown C/D Key Destination Travel Time

Key Destinations

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	Arkansas State Cap.	McCain Blvd.	54.0	8.0
2	McCain Blvd.	Arkansas State Cap.	52.7	7.9
3	Statehouse Conv. Ctr	I-30/I-530/I-440	52.5	3.2
4	I-30/I-530/I-440	Statehouse Conv. Ctr	30.5	5.5
5	Shorter College	I-30/I-530/I-440	42.8	5.2
6	I-30/I-530/I-440	Shorter College	31.3	6.3



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Planning and Environmental Linkages

CONNECTING ARKANSAS PROGRAM CAP

April 2015

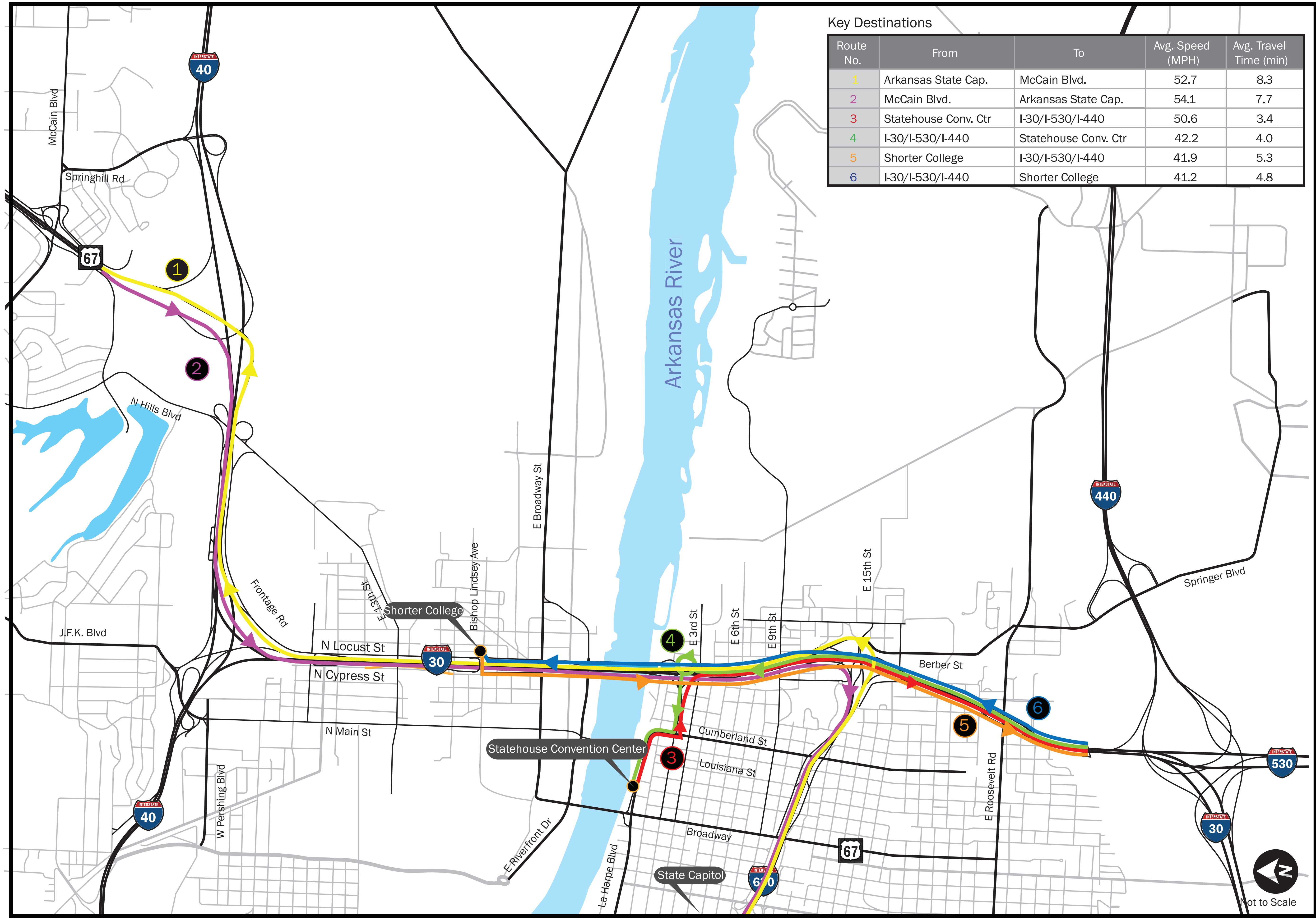
EXHIBIT 88

DRAFT 3-30-15

I-30 PEL Recommended 2041 PM 10-Lane with Downtown C/D Key Destination Travel Time

Key Destinations

Route No.	From	To	Avg. Speed (MPH)	Avg. Travel Time (min)
1	Arkansas State Cap.	McCain Blvd.	52.7	8.3
2	McCain Blvd.	Arkansas State Cap.	54.1	7.7
3	Statehouse Conv. Ctr	I-30/I-530/I-440	50.6	3.4
4	I-30/I-530/I-440	Statehouse Conv. Ctr	42.2	4.0
5	Shorter College	I-30/I-530/I-440	41.9	5.3
6	I-30/I-530/I-440	Shorter College	41.2	4.8



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Planning and Environmental Linkages

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EXHIBIT 89

DRAFT
3-30-15

I-30 PEL Recommended 2041 AM 10-Lane with Downtown C/D Study Corridor Travel Time

Segment Travel Times		
Route No.	Avg. Speed (MPH)	Avg. Travel Time (min)
1	59.1	0.8
2	57.6	0.9
3	57.4	1.5
4	56.8	1.0
5	56.5	0.9
6	43.0	0.8
7	50.3	1.3
8	57.9	0.8
9	57.6	1.4
10	59.1	1.3
11	58.2	1.2
12	53.8	0.8
13	27.7	1.2
14	26.8	1.4
15	57.9	0.9
16	42.8	0.8
17	60.0	0.9
18	64.7	0.8
19	61.0	0.8
20	65.5	0.5

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Segment Travel Times		
Route No.	Avg. Speed (MPH)	Avg. Travel Time (min)
1	59.9	0.8
2	62.2	0.9
3	58.9	1.4
4	57.9	0.9
5	57.3	0.9
6	46.9	0.8
7	48.4	1.4
8	57.0	0.8
9	55.7	1.5
10	57.0	1.3
11	56.8	1.3
12	58.6	0.7
13	63.5	0.5
14	64.7	0.6
15	58.6	0.9
16	56.9	0.6
17	55.8	1.0
18	60.4	0.9
19	28.1	1.7
20	63.6	0.5

EXHIBIT 90

DRAFT
3-30-15

I-30 PEL Recommended 2041 PM 10-Lane with Downtown C/D Study Corridor Travel Time

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Appendix 9: Measures of Effectiveness

I-30 PEL
VISSIM Measures of Effectiveness

Total Simulation	Variable	AM						PM					
Total System		Existing (2014)	Future No-Build (2041)	8-Lane C/D	10 Main Lanes	10-Lane C/D	Recommended Alternative	Existing (2014)	Future No-Build (2041)	8-Lane C/D	10 Main Lanes	10-Lane C/D	Recommended Alternative
VHT	Total Vehicle Hours Traveled	6,935	14,243	16,661	8,360	8,507	8,513	7,998	18,843	15,312	12,069	11,427	11,400
VHD	Total Vehicle Hours of Delay	1,622	8,541	11,486	1,582	1,649	1,658	2,202	13,352	8,409	4,095	3,427	3,352
VMT	Total Vehicle Miles Traveled	303,069	325,612	291,944	384,662	386,984	386,919	332,338	311,247	385,933	446,907	446,894	449,692
% LOS E or F	% LOS E or F (miles)	20%	45%	40%	13%	17%	17%	15%	56%	29%	16%	14%	14%
% LOS F	% LOS F (miles)	15%	44%	35%	10%	9%	11%	11%	44%	23%	15%	12%	11%
Unserved Vehicles	Total vehicles unserved	0	6191	11082	0	0	1	0	15518	8158	461	869	723
Emergency Vehicles	Emergency Vehicle Travel Time[1] (min)	-	-	-	-	-	-	5	7	11	4	4	4
Key Destinations	Travel Time to Key Destination[2] (min)	15	24	23	9	8	8	18	37	24	8	8	8

Note: This table includes results for the entire simulation area, and not just the PEL study area.

[1]Emergency Vehicle Travel Time is measured from Fire Station 1 to Incident west of N. Hills Blvd. in the PM

[2]Travel Time to Key Destination is measured between McCain and Capitol (To Capitol in the AM and From Capitol in the PM)

Eastbound	Variable	AM						PM					
I-30/I-40 (from I-440 to Hwy 67)		Existing (2014)	Future No-Build (2041)	8-Lane C/D	10 Main Lanes	10-Lane C/D	Recommended Alternative	Existing (2014)	Future No-Build (2041)	8-Lane C/D	10 Main Lanes	10-Lane C/D	Recommended Alternative
Throughput	Total Vehicles in Peak Hour	382	355	275	563	581	578	422	454	382	664	647	646
Travel Time	Average Vehicle Travel Time in Minutes	6	8	7	6	6	6	11	18	22	7	6	6
Delay	Seconds delay compared to free flow speed per veh.	74	155	102	72	80	80	326	743	1,037	29	25	28
Speed	Average Speed in MPH	54	45	48	51	50	50	33	20	15	58	59	58
LOS E or F	% LOS E or F (miles)	16%	21%	68%	21%	29%	21%	43%	95%	60%	0%	0%	0%
Duration	Hours LOS E or F for any portion of the corridor	1.00	1.75	1.25	1.00	1.00	1.00	2.00	2.00	2.00	0.00	0.00	0.00
LOS F	% LOS F (miles)	16%	21%	68%	21%	20%	21%	43%	95%	47%	0%	0%	0%
Duration	Hours LOS F for any portion of the corridor	0.50	1.50	1.00	0.75	0.75	1.00	2.00	2.00	2.00	0.00	0.00	0.00

Note: This table includes results for the eastbound direction of the PEL study area only.

Westbound	Variable	AM						PM					
I-30/I-40 (from Hwy 67 to I-440)		Existing (2014)	Future No-Build (2041)	8-Lane C/D	10 Main Lanes	10-Lane C/D	Recommended Alternative	Existing (2014)	Future No-Build (2041)	8-Lane C/D	10 Main Lanes	10-Lane C/D	Recommended Alternative
Throughput	Total Vehicles in Peak Hour	487	352	357	437	436	437	565	758	1,015	1,102	1,112	1,107
Travel Time	Average Vehicle Travel Time in Minutes	12	16	15	6	6	6	7	18	7	6	6	6
Delay	Seconds delay compared to free flow speed per veh.	392	671	561	51	53	51	100	774	118	61	49	47
Speed	Average Speed in MPH	30	22	24	58	58	58	51	19	49	57	58	58
LOS E or F	% LOS E or F (miles)	58%	58%	45%	0%	0%	0%	16%	100%	45%	6%	0%	0%
Duration	Hours LOS E or F for any portion of the corridor	2.00	2.00	2.00	0.00	0.00	0.00	2.00	2.00	2.00	1.00	0.00	0.00
LOS F	% LOS F (miles)	58%	58%	45%	0%	0%	0%	12%	100%	45%	6%	0%	0%
Duration	Hours LOS F for any portion of the corridor	1.50	2.00	2.00	0.00	0.00	0.00	1.75	2.00	2.00	0.75	0.00	0.00

Note: This table includes results for the westbound direction of the PEL study area only.

Source: I-30 PEL Vissim Models