Planning and Operational Applications of TRANSIMS

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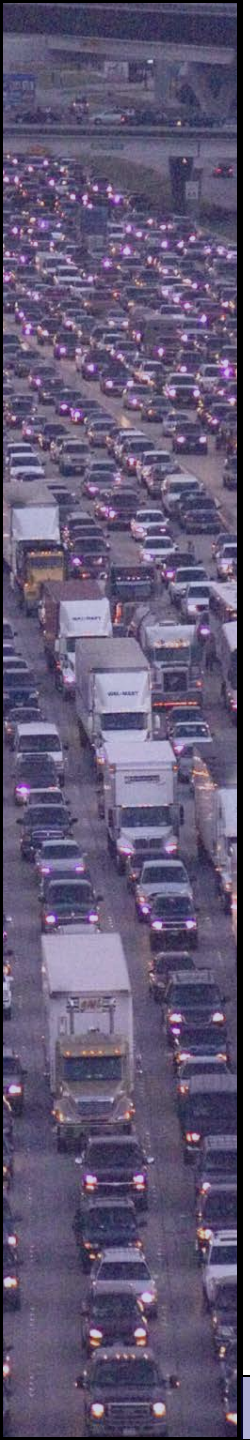
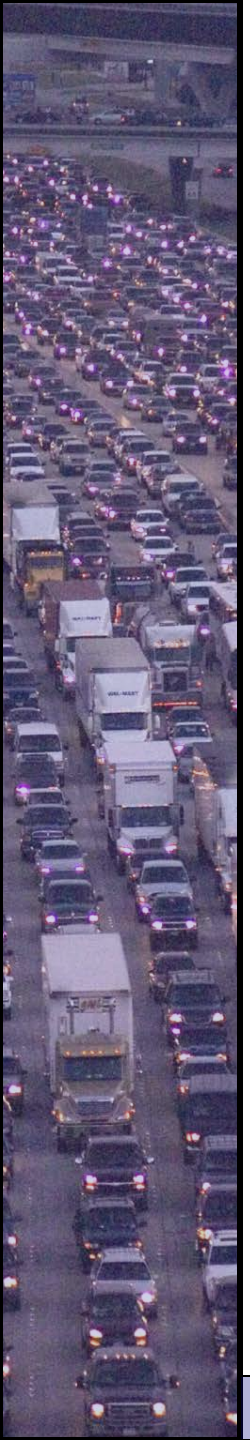
Louisiana State University



TRANSIMS Background

- ***Transportation Analysis and Simulation System***
- ***Sponsored by the USDOT, EPA, and DOE***
- ***Originally developed by the Los Alamos National Laboratory to address new transportation and air quality forecasting procedures required by the Clean Air Act, the Intermodal Surface Transportation Efficiency Act, and other regulations***
- ***Part of a long-term effort to redesign the modeling process from the ground-up to offer transportation planning agencies increased policy sensitivity, more detailed vehicle-emission estimates, and improved analysis and visualization***



The Pro's

- *It's Free*

  http://www.transims-opensource.net/

- *It's use is growing*

  http://tmip.fhwa.dot.gov/community/user_groups/transims

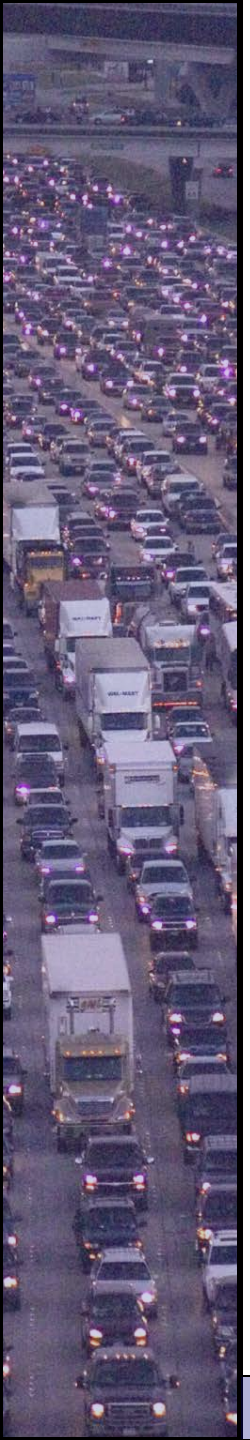
- *It is better documented*

  http://tmip.fhwa.dot.gov/resources/clearinghouse/docs/transims_fundamentals/

- *Training is free and available*

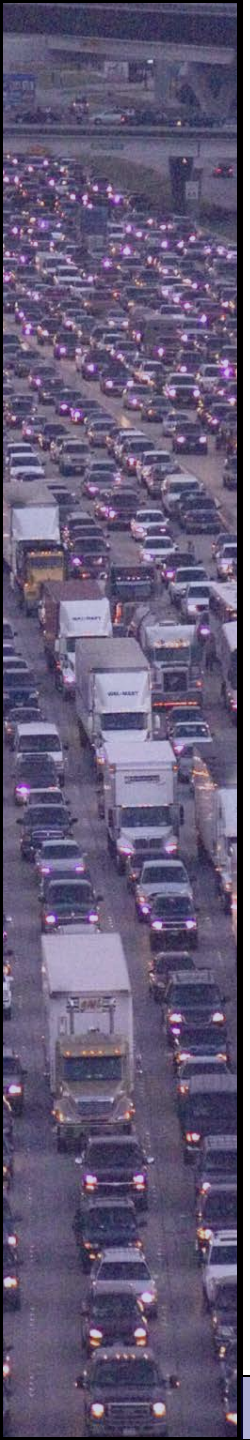
  http://tmip.fhwa.dot.gov/about/projects/49

- *Interfaces with available and popular formats*
- *It is being updated and simplified*



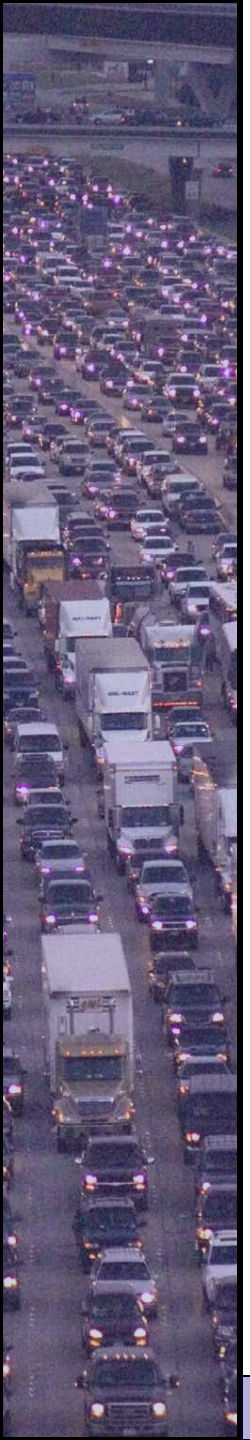
The Con's

- *Not nearly as widely used, known, or accepted, as other systems*
- *Does this effect its validity?*
- *Documentation still lags*
- *"Quirky" (ex. units in meters)*
- *User interface makes coding cumbersome and laborious*
- *Output format is primitive*
- *Output visualization capability is limited*
- *Can require significant computational resources and memory storage*



My Perspective

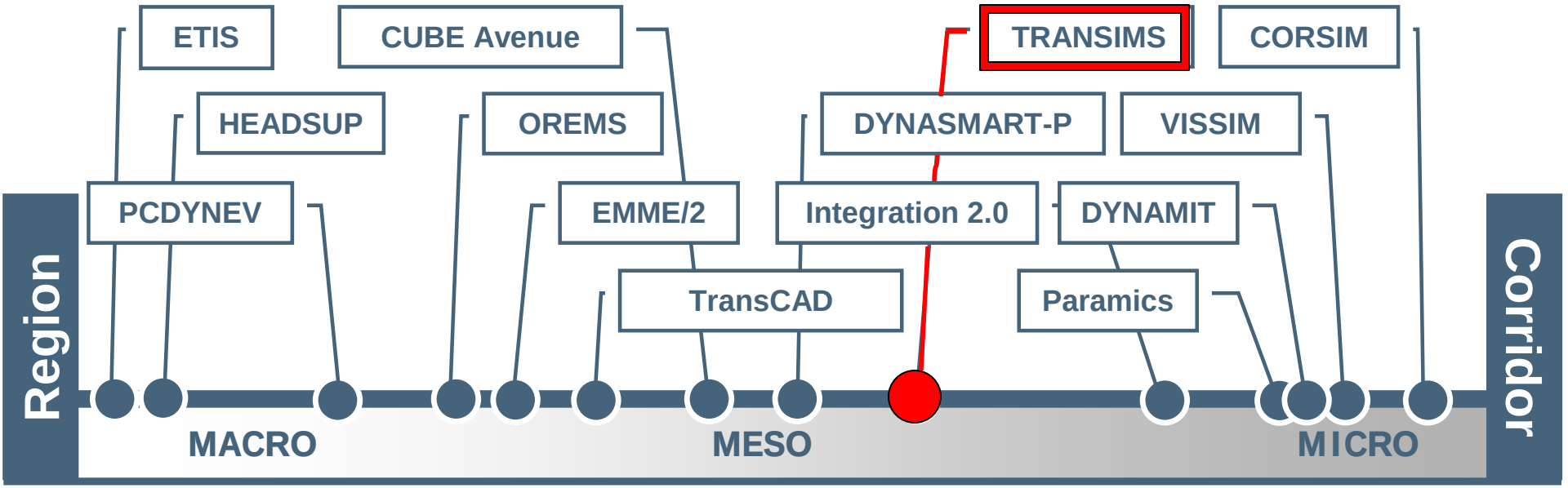
- *Like all software, there is a learning curve*
- *TRANSIMS has suffered from years of bad PR (a lot of it justified)*
- *Users tend to be "territorial" – don't listen to opinions from people who have never used it*
- *What it does, it does very well*
- *It is a one-stop-shop*
- *It has applications beyond traffic and transportation planning*
- *USDOT wants it out there*



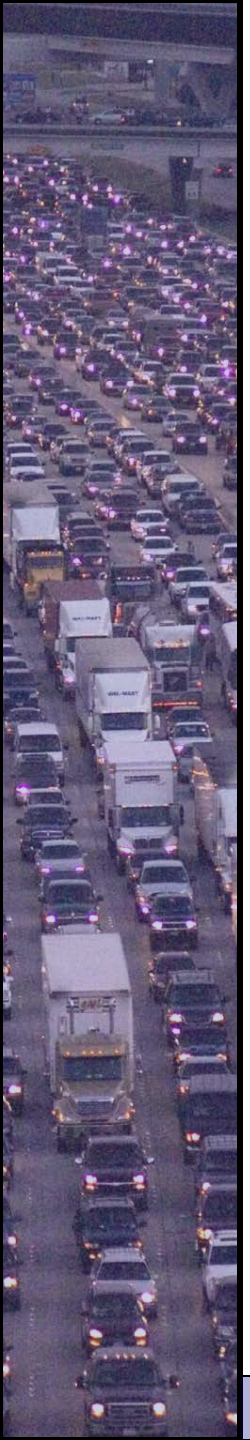
What is TRANSIMS?

- *Uses census data and land use data*
- *Tracks individuals, households, and vehicles, not zonal aggregation of households and employment as do existing models*
- *Attempts to synthesize complete activity-travel pattern for synthetic populations in order to create a virtual study region with a complete representation of the real world. TRANSIMS builds a model of households and activity demand*
- *Tries to capture every important interaction between travel subsystems, such as an individual's activity plans and congestion on the transportation system*

Evacuation Modeling Spectrum

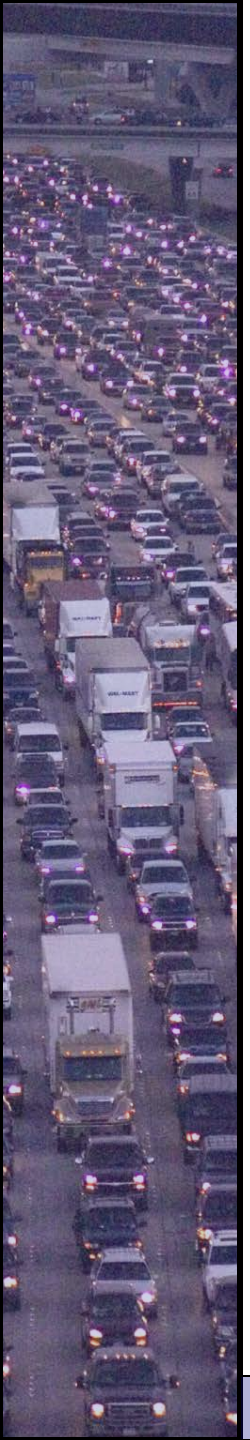


From: "Structuring Modeling and Simulation Analyses for Evacuation Planning and Operations"
By: Hardy, Wunderlich, Bunchand, and Smith



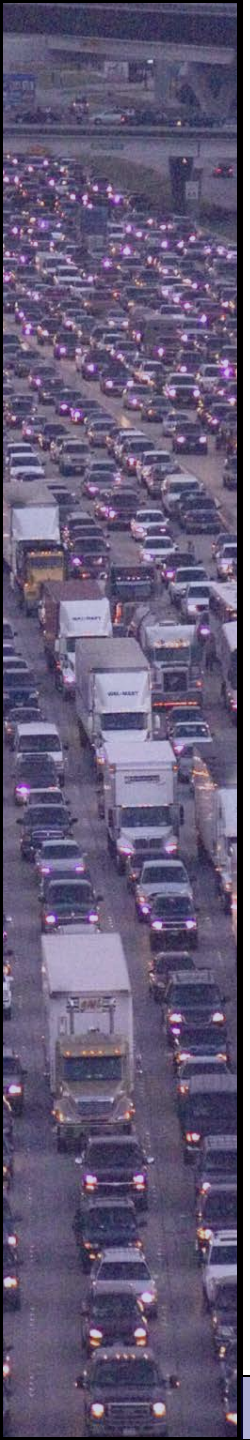
TRANSIMS Structure

- *Network Input*
  - *Structure and characteristics of the transportation network (control, capacity, etc.) and activity locations*
- *Population Synthesizer*
  - *Creates a disaggregate synthetic population based on aggregate census zonal information*
- *Activity Generator*
  - *Travel surveys or observation of past evacuations*
- *Router*
  - *Spatial and temporal travel behavior and route assignments*
- *Microsimulator*
  - *Tracks and compiles movements and statistics of each agent (vehciles & peds)*
- *Visualizer*
  - *3rd party developer Argonne National Labs , Balfour Technologies Inc., etc.*

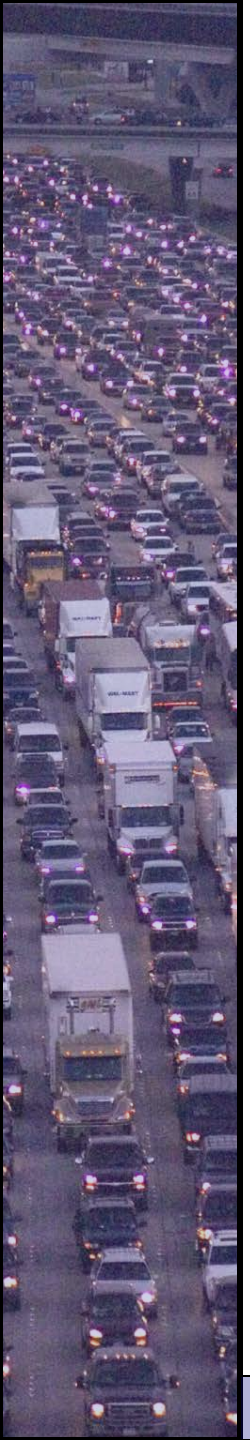


TRANSIMS System

- *Allows planning- / operational-level analyses*
- *Model large geographical regions and large numbers of travelers*
- *Model populations, travel activities, routing, and/or microsimulate separately*
- *Second-by-second movements*
- *Track individual agents*
- *Model multimodal systems*
- *Assess performance continuously and/or in separate time periods*
- *Verification, validation, and calibration issues*

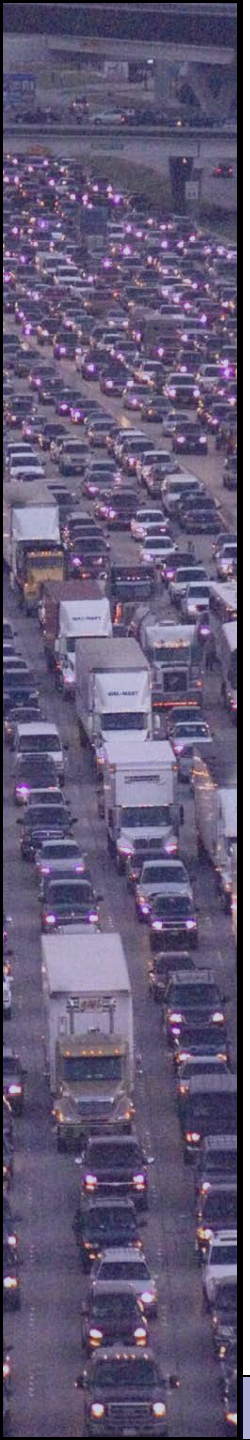


Louisiana TRANSIMS Demonstration Project



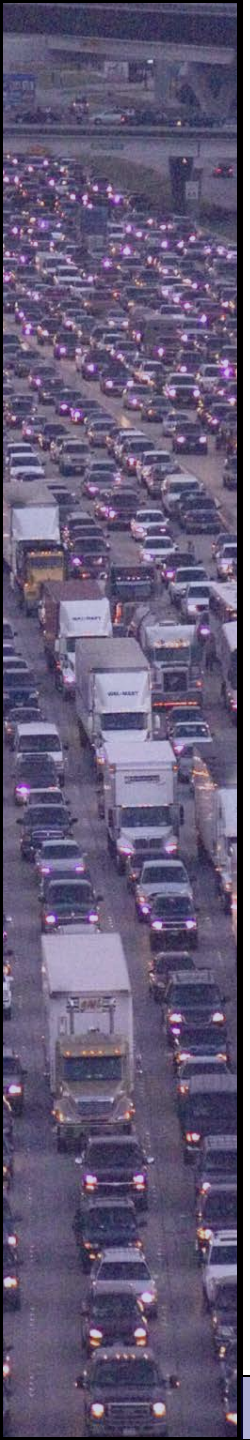
Recognized Limitations

- *Existing traffic/transportation simulation systems are not created to model evacuation conditions*
  - *Scale (e.g., number of vehicles)*
  - *Scope (e.g. duration, geographic area)*
- *Existing models do not permit the modeling and simulation of multiple modes of transportation simultaneously*
- *Most models are not able to give analysts the MOE's they'd like or decision-makers the answers to questions they pose*
- *Limited understanding and development of underlying behaviors of evacuation travel for different evacuee and mode types*



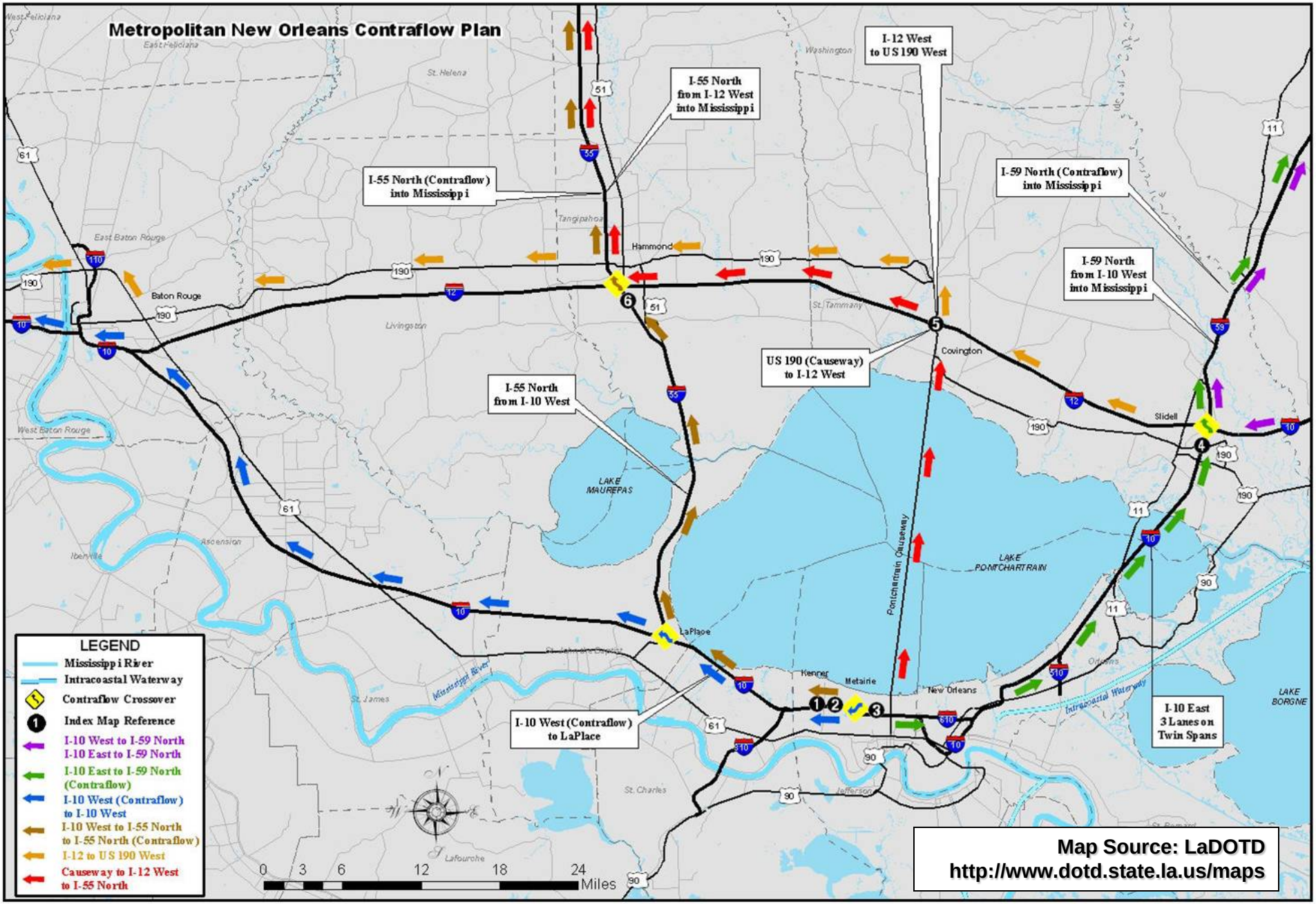
Assisted Evacuations

- *Evacuation planning has historically been targeted at persons with personal vehicles*
- *A substantial percentage of potential vulnerable populations do not have personal vehicles*
- *Plans to evacuate "carless" populations in many locations have been created relatively recently or are currently in development*
- *There have been few actual activations to gain knowledge and experience, nor tests, drills or simulations to evaluate potential weakness and needs*



Longitudinal Approach

- *Step 1 – Network development*
- *Step 2 - "Base Model" validation and calibration based on 2005 Katrina evacuation*
- *Step 3 - Code "New" New Orleans multimodal plan*
- *Step 4 - Code and test alternative plans and ideas in New Orleans and develop Houston models*
- *Step 5 – Develop and assess Mega-Region evacuation concepts*


Metropolitan New Orleans Contraflow Plan
I-12 West to US 190 West
I-55 North from I-12 West into Mississippi
I-55 North (Contraflow) into Mississippi
I-59 North (Contraflow) into Mississippi
I-59 North from I-10 West into Mississippi
US 190 (Causeway) to I-12 West
I-55 North from I-10 West
I-10 West (Contraflow) to LaPlace
I-10 East 3 Lanes on Twin Spans
LEGEND
Mississippi River
Intracoastal Waterway
Contraflow Crossover
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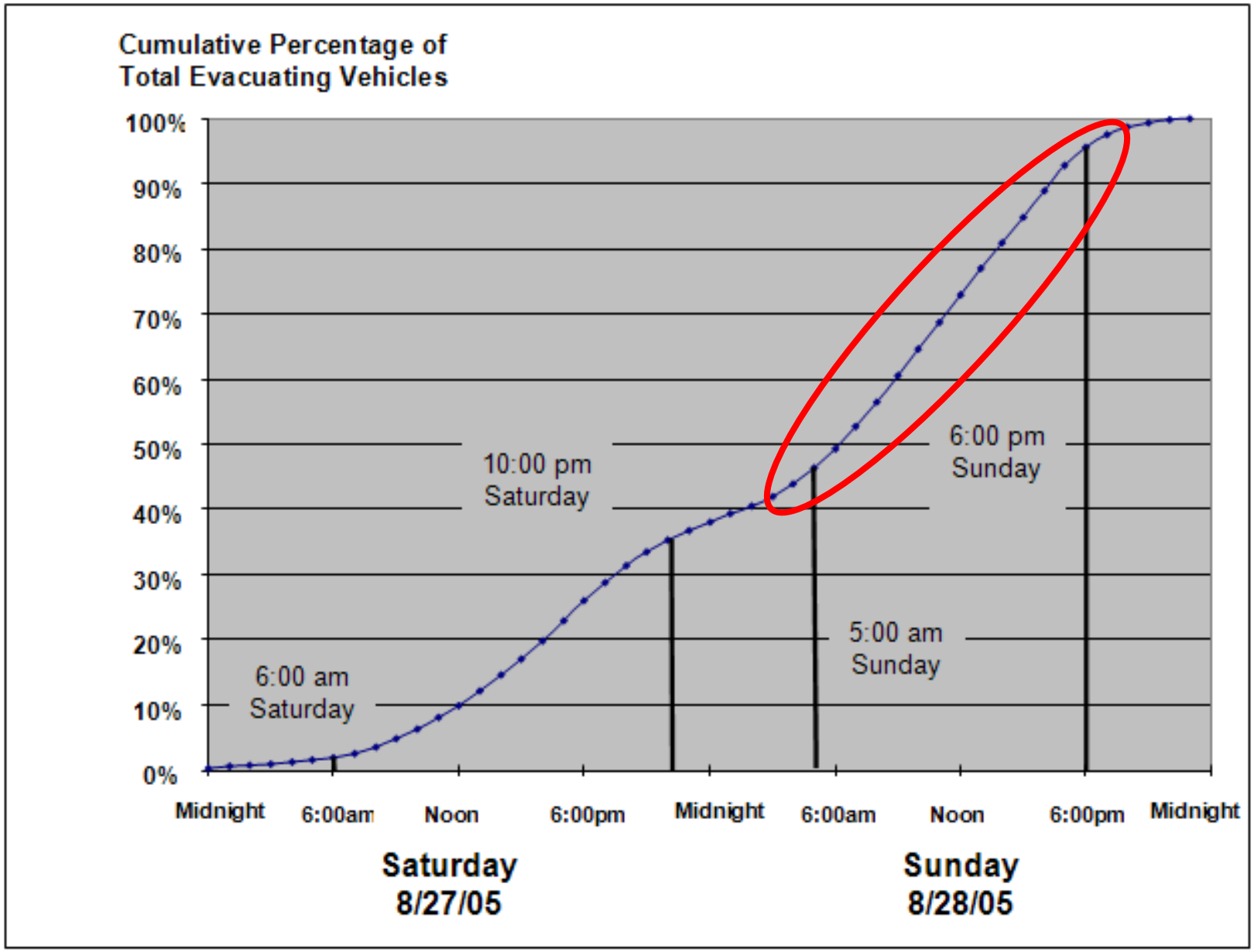
I-12 to US 190 West
Causeway to I-12 West to I-55 North
0 3 6 12 18 24 Miles
Map Source: LaDOTD
http://www.dotd.state.la.us/maps


Cumulative Percentage of
Total Evacuating Vehicles
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
6:00 am
Saturday
10:00 pm
Saturday
5:00 am
Sunday
6:00 pm
Sunday
Midnight
6:00am
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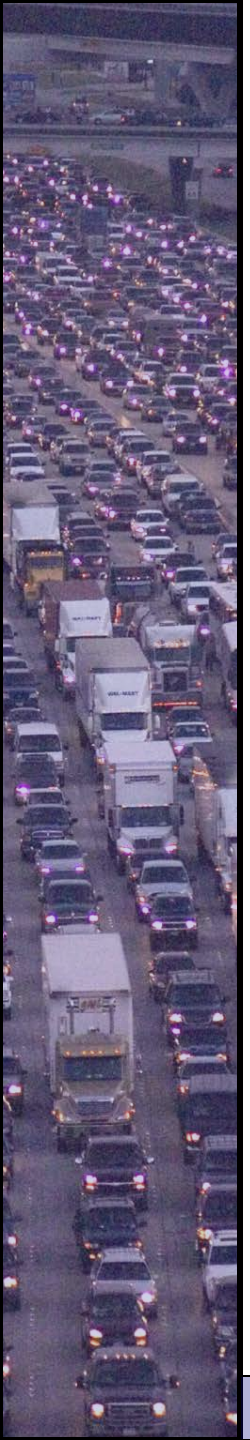
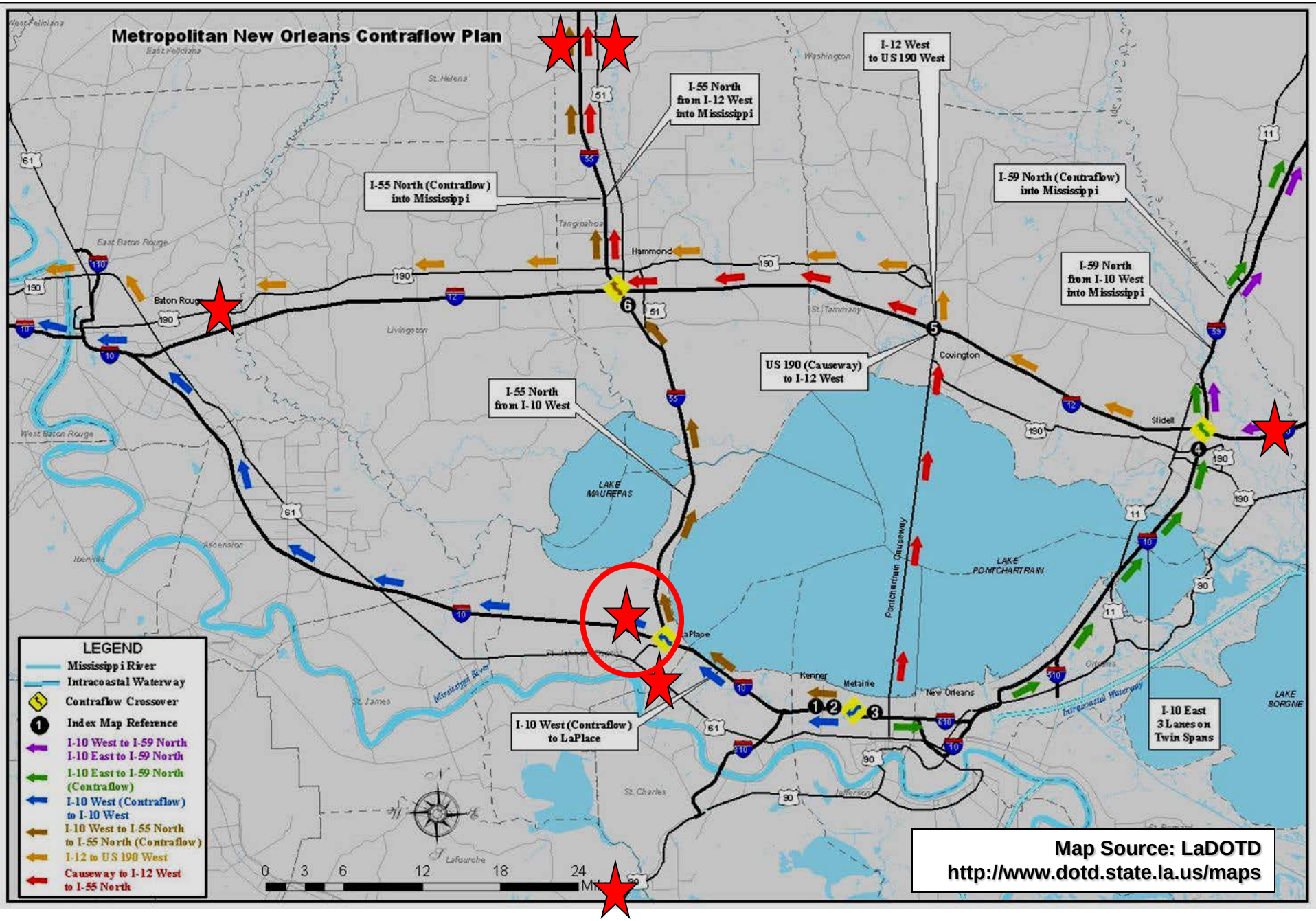
6:00pm
Midnight
Saturday
8/27/05
Sunday
8/28/05



Study Questions

- *Proof-of-Concept - Can TRANSIMS be used for evacuation analysis? Are its results reasonable?*
- *Develop a variety and range of hazard-response scenarios*
- *How many buses might be needed under various scenarios? What routes should they take?*
- *Potential to estimate the number of location of evacuees*
- *Examine the potential of alternate plans*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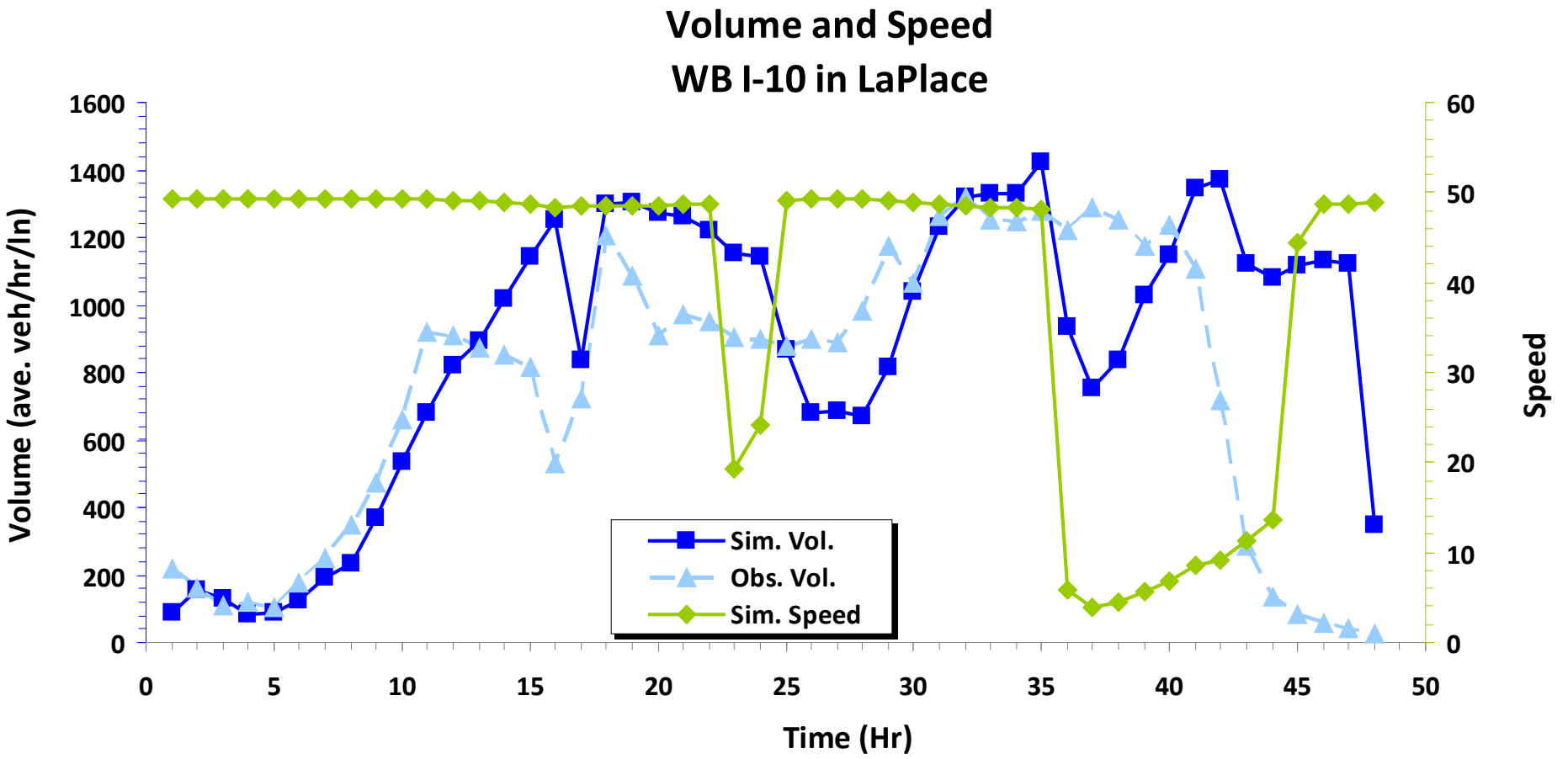
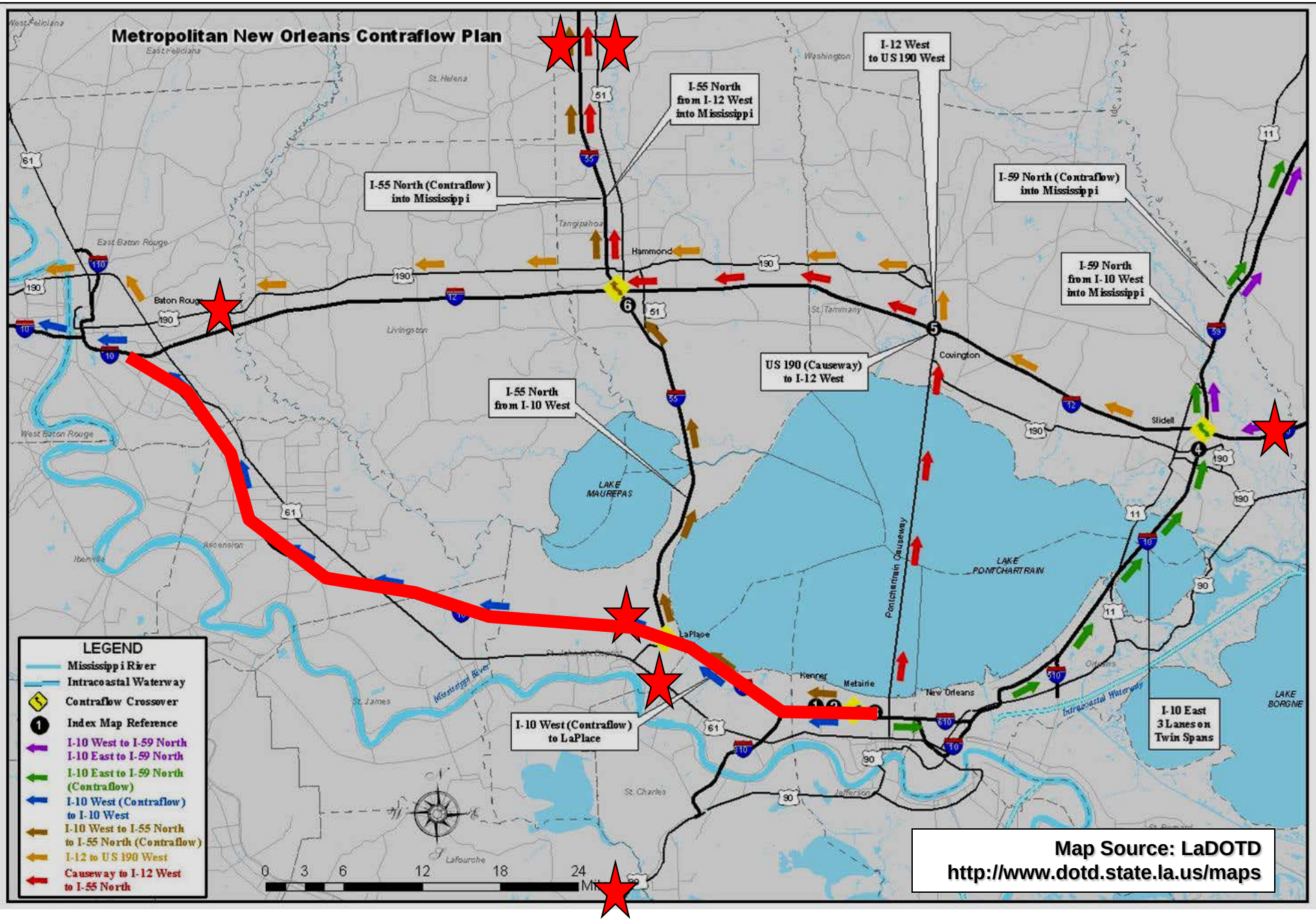


Network Link 58296 (DOTD Station 54 --2 miles W of US 51/I-55 Jct)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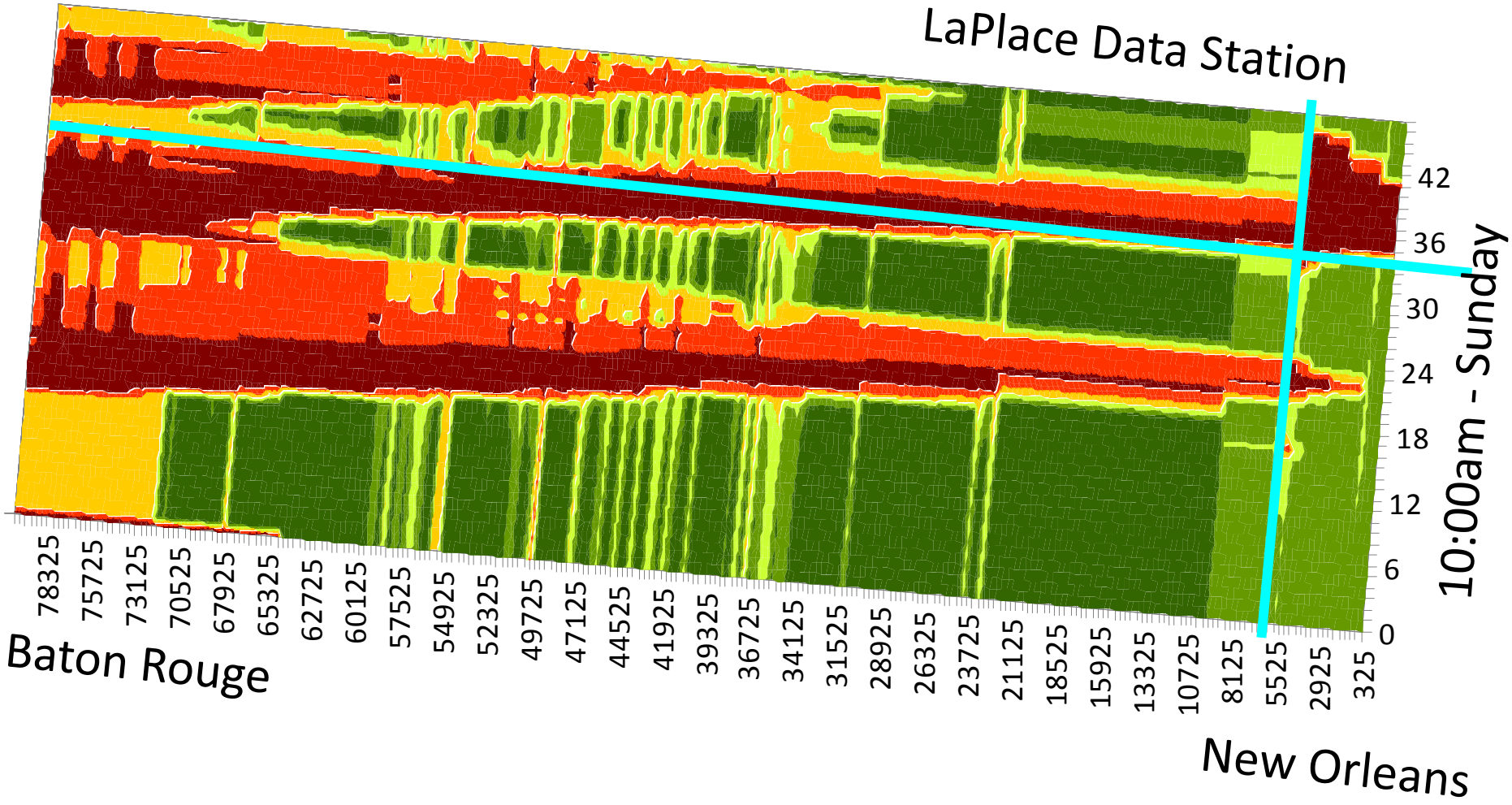
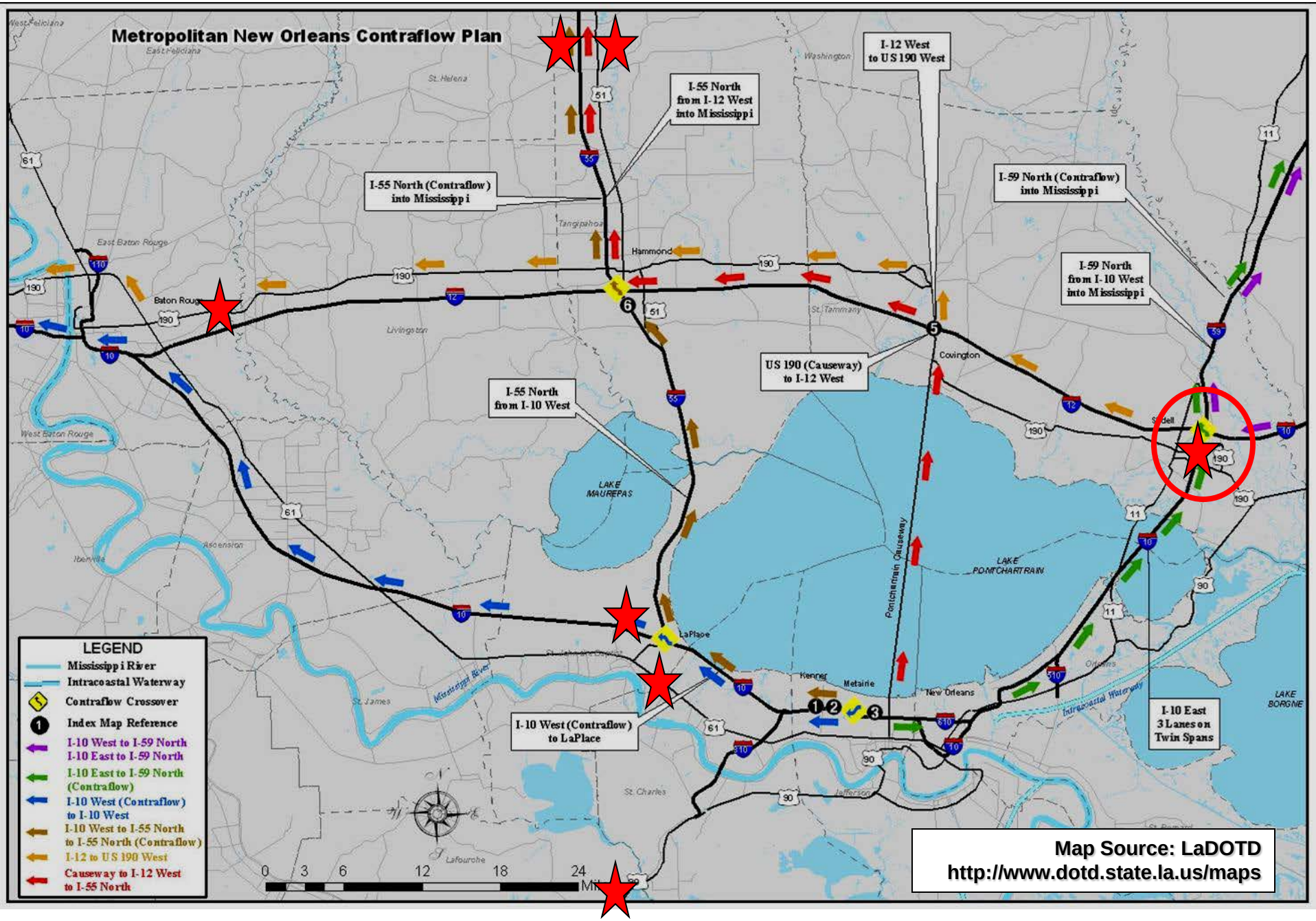


Westbound I-10 Traffic Speed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Hammond
Baton Rouge
East Baton Rouge
West Baton Rouge
Livingston
St. Tammany
Covington
Slidell
LaPlace
Kenner
Metairie
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St. Charles
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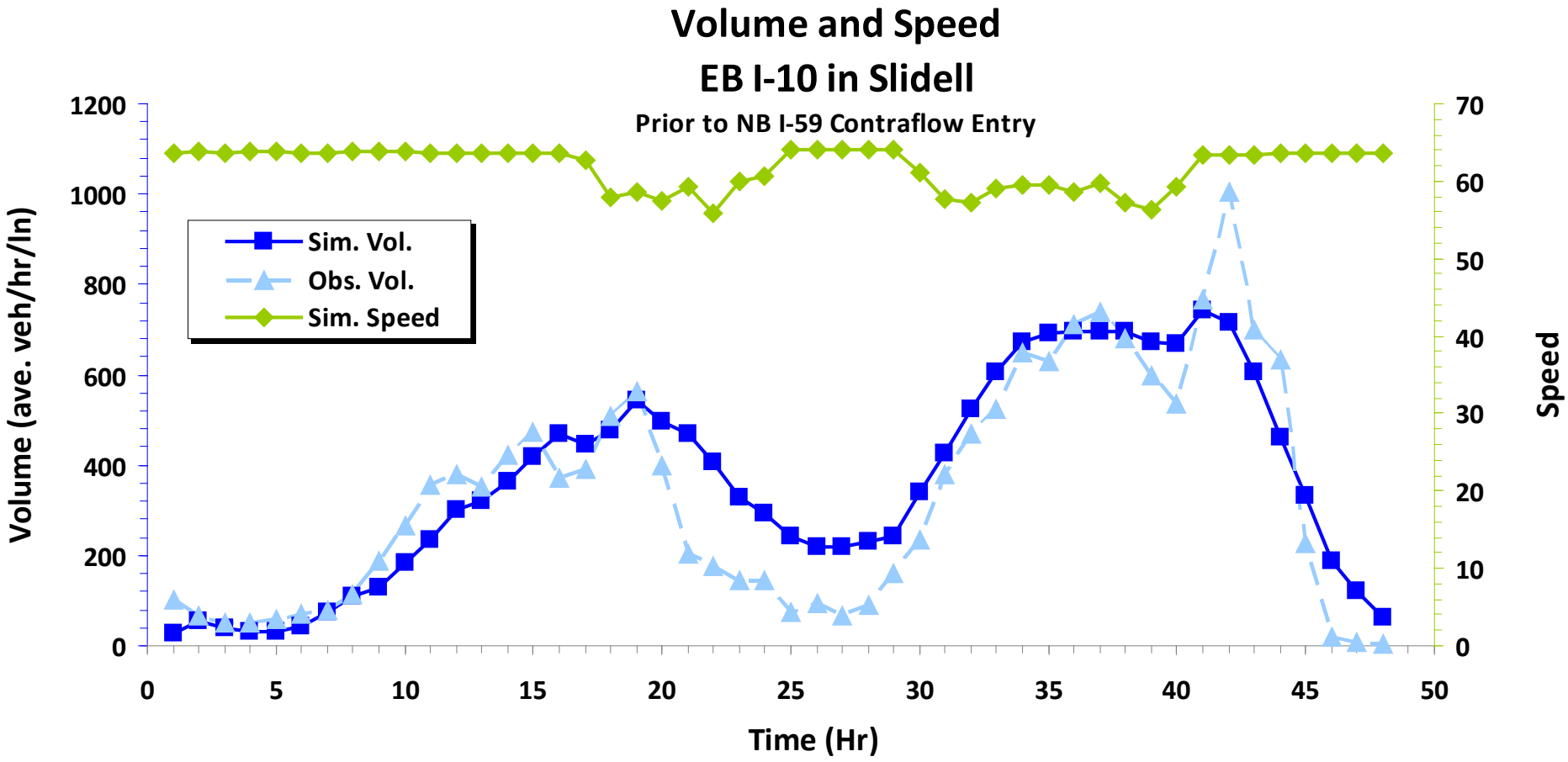
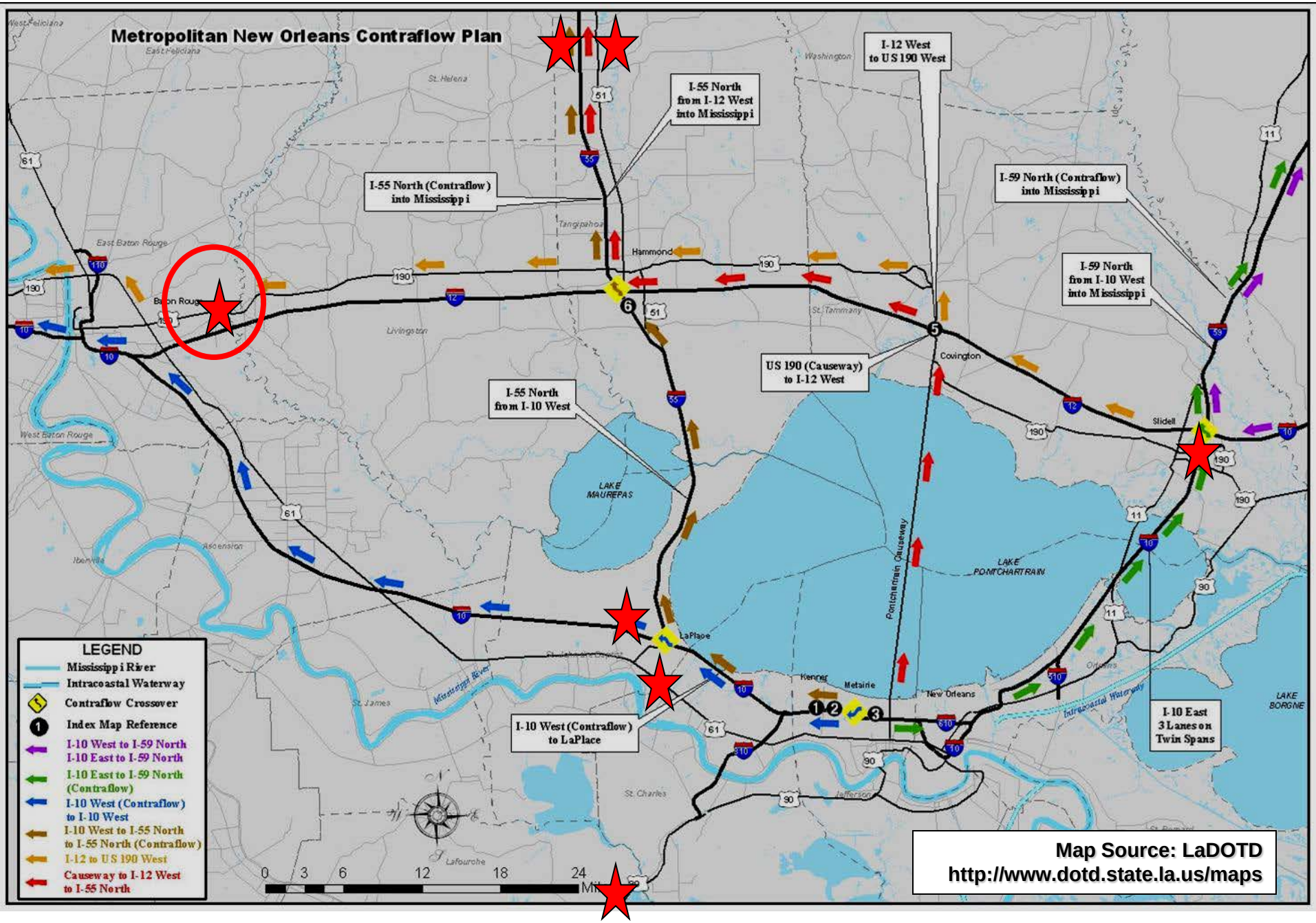


Network Link 56039 (Near DOTD Station 67 -- 1 mile S of I-12 , I-59 Jct)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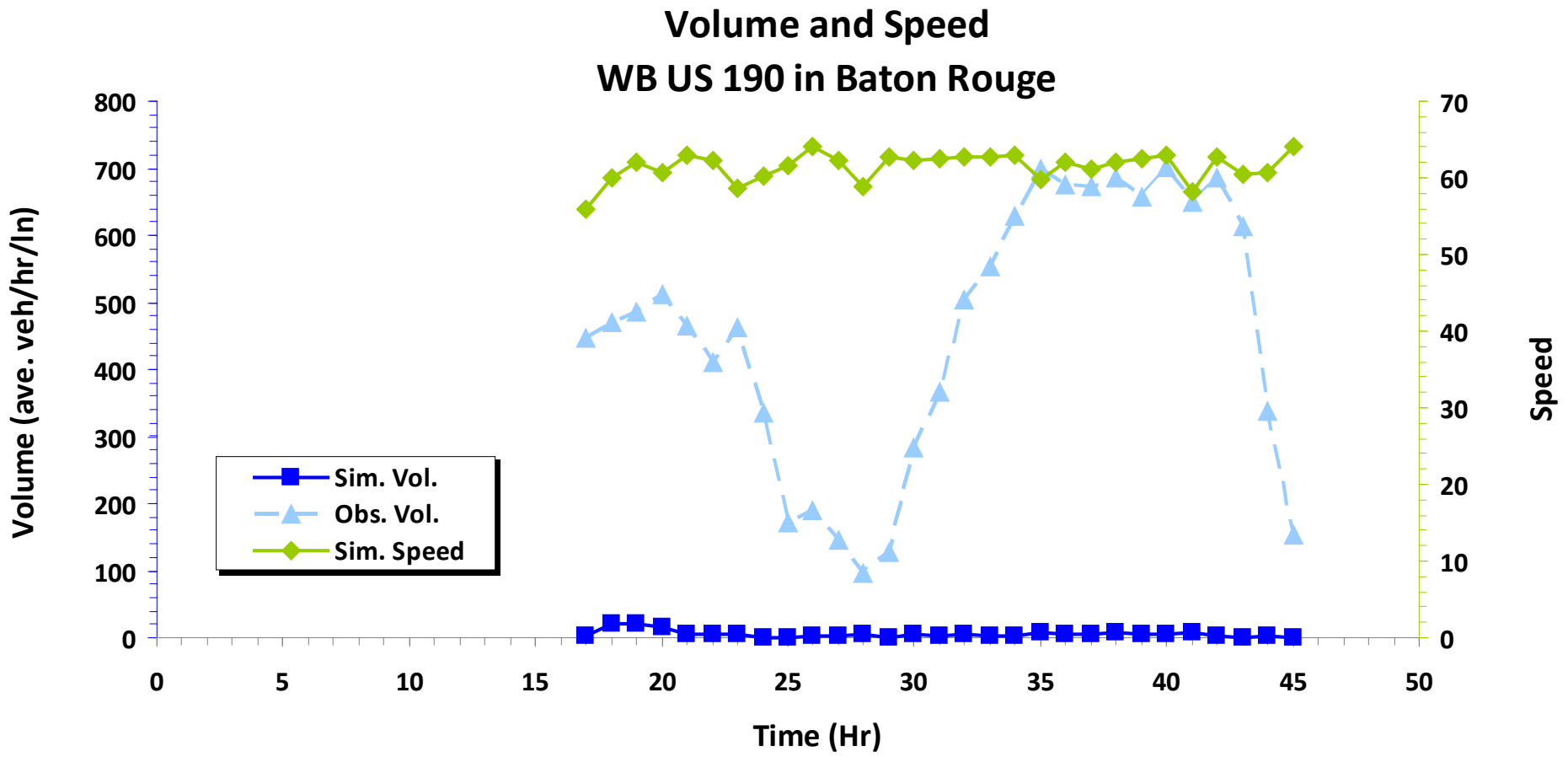
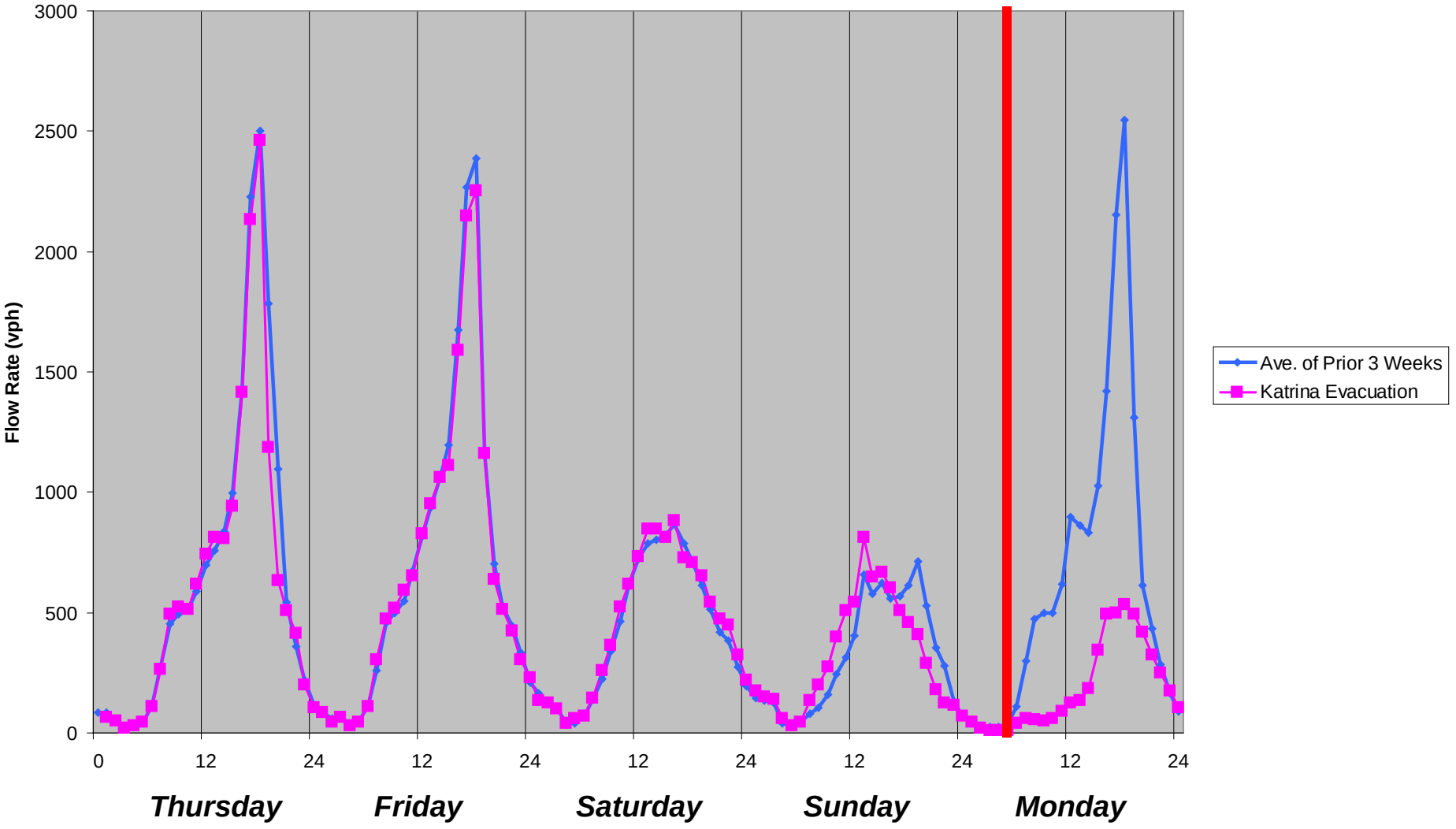
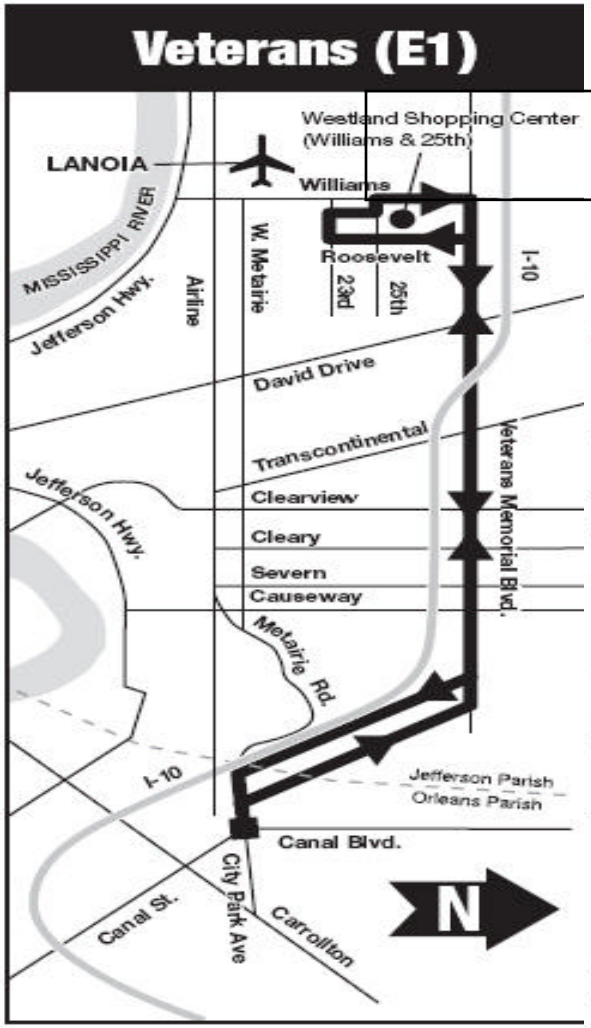


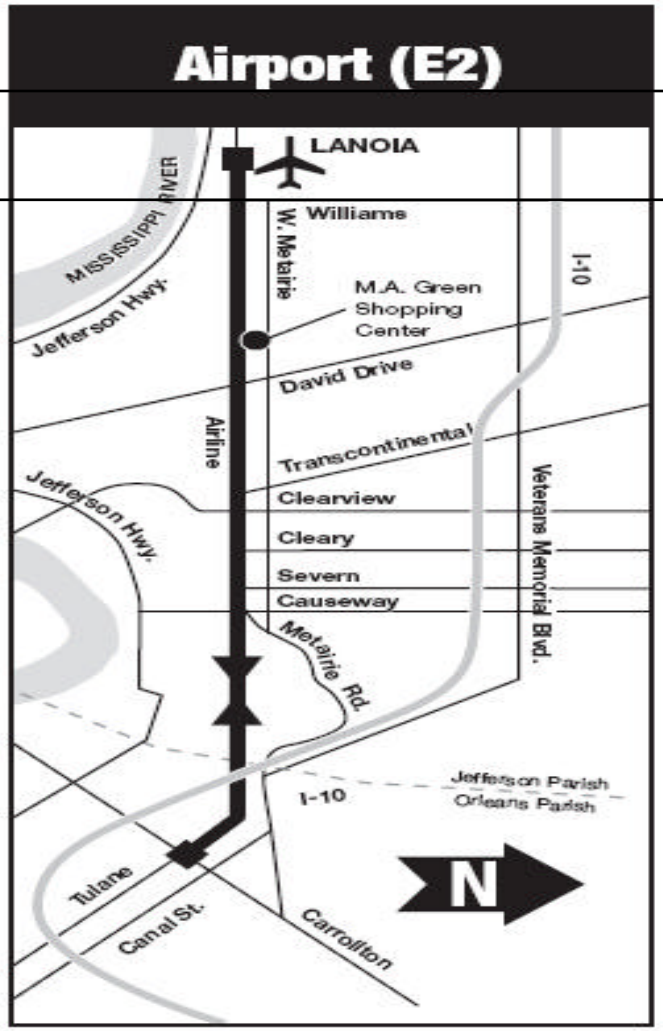
Network Link 57784 (DOTD Station 18 -- 1.1 miles E of O'Neal Ln Jct)

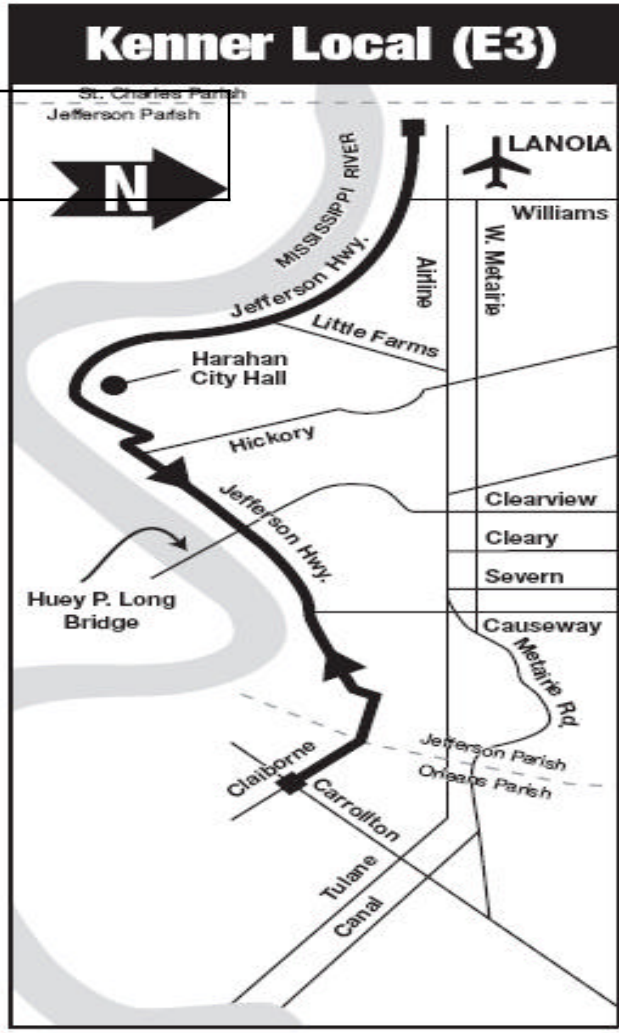
US 190 WESTBOUND
Denham Springs@Amite River Bridge

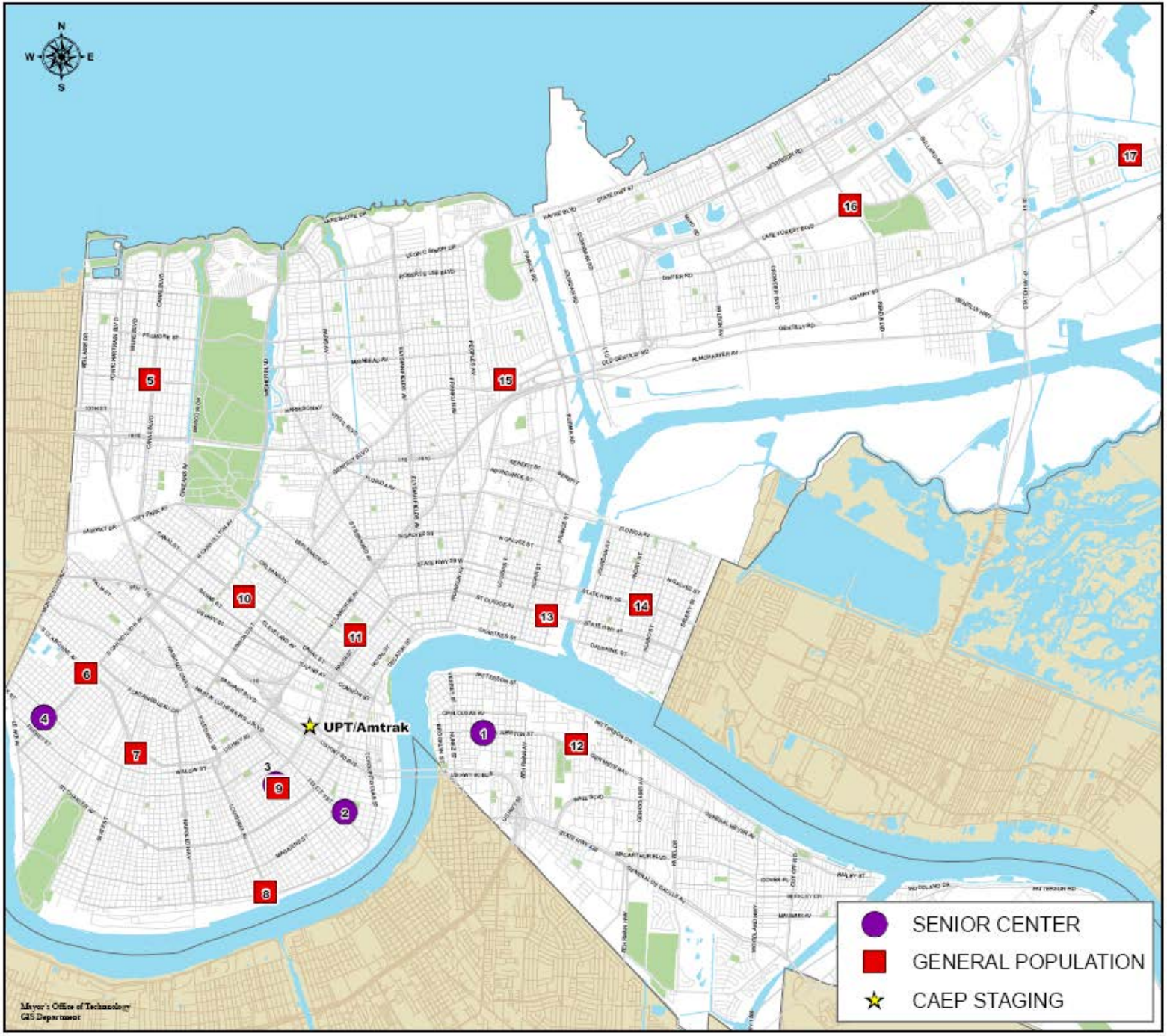


Jefferson Parish Bus Routes









Evacuation Pick-Up Locations

SENIOR CENTER LOCATIONS

1. Arthur Mondy Center
1111 Newton Avenue, Algiers

2. Kingsley House
1600 Constance Street,
Lower Garden District

3. Central City Senior Center
2020 Philip Street, Central City

4. Mater Dolorosa
1226 S. Carrollton Ave, Carrollton

GENERAL POPULATION

5. Smith Library Bus Stop
6300 Canal Blvd., Lakeview

6. Palmer Park
S. Claiborne and S. Carrollton,
West Carrollton

7. McMain High School
5712 S. Claiborne Ave, Broadmoor

8. Lyons Community Center
624 Louisiana Ave, Irish Channel

9. Dryades YMCA
1924 Philip Street, Central City

10. Warren Easton High School
3019 Canal Street, Treme

11. Municipal Auditorium
801 N. Rampart, 7th Ward

12. O. Perry Walker High School
2832 General Meyer, Algiers

13. Stallings Community Center
4300 St. Claude, Bywater

14. Sanchez Center
Caffin & N. Claiborne, Lower 9th Ward

15. Gentilly Mall Parking Lot
Chef Menteur & Press Dr., Gentilly

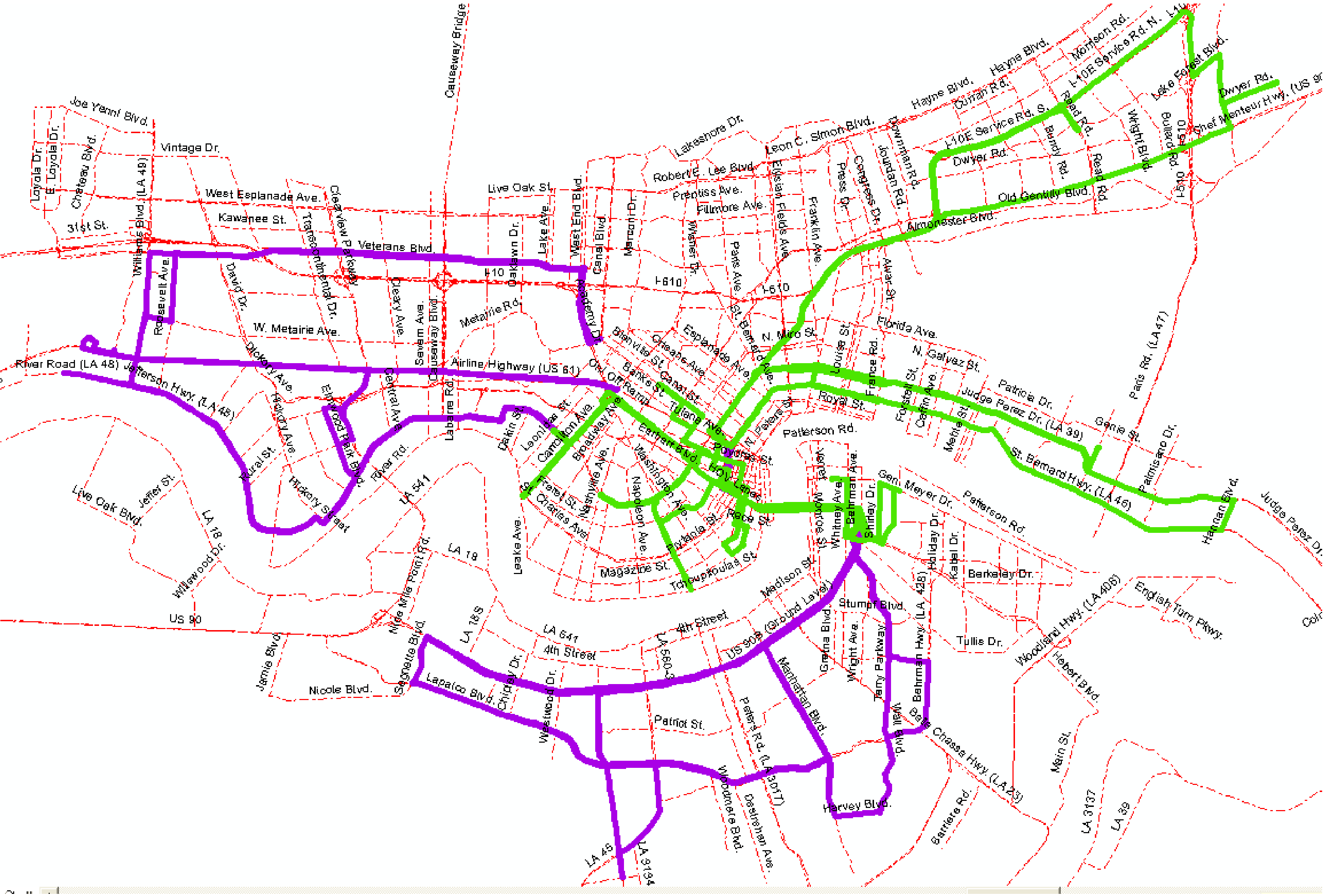
16. Walgreen's
Lake Forest & Read Blvd, NO East

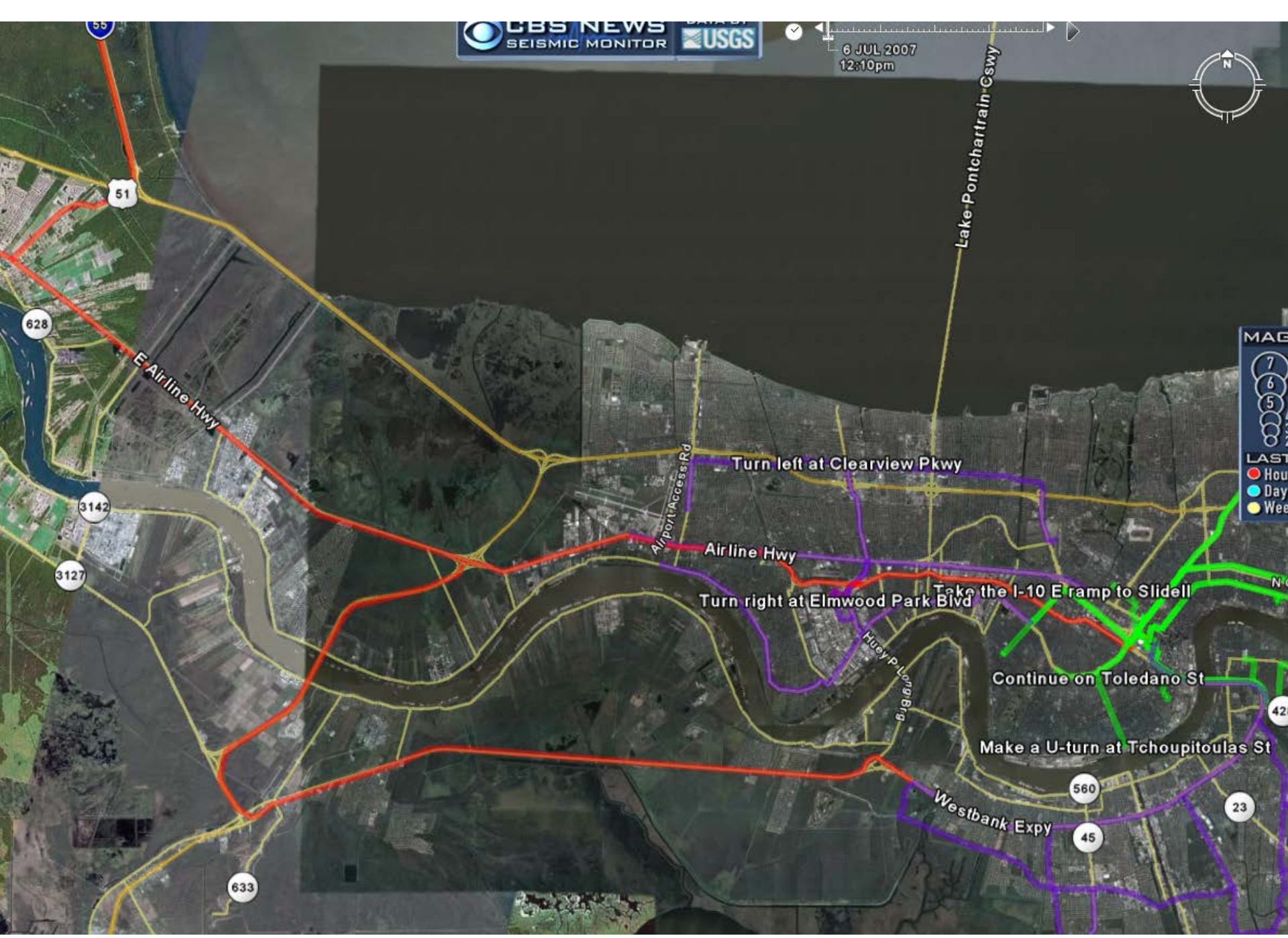
17. Mary Queen of Vietnam
14001 Dwyer, New Orleans East

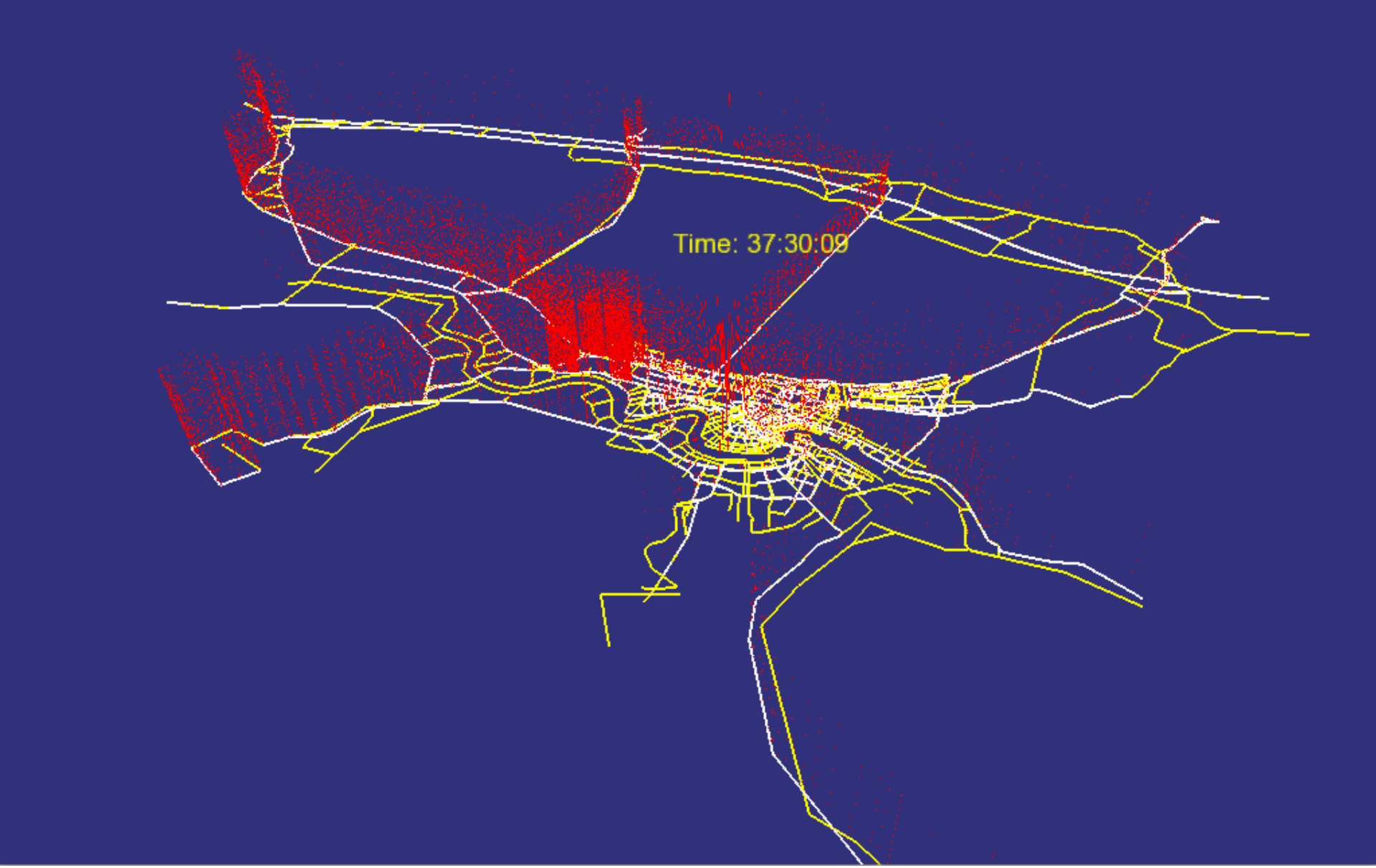
CITY OF NEW ORLEANS

City Assisted Evacuation Plan

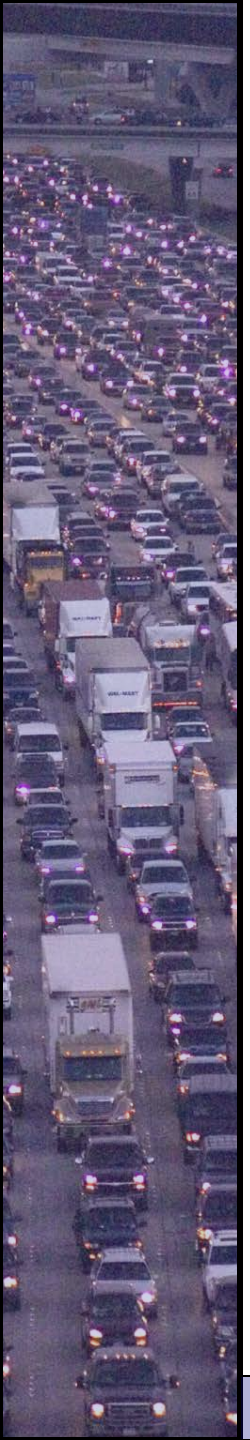
0 0.45 0.9 1.8 Miles


Joe Yenni Blvd.
Vintage Dr.
Loyola Dr.
E. Loyola Dr.
Chateau Blvd.
Williams Blvd. (LA 49)
31st St.
West Esplanade Ave.
Kawanee St.
Clearview Parkway
Transcontinental Dr.
Veterans Blvd.
Causeway Bridge
Live Oak St.
Oakdawn Dr.
Lake Ave.
West End Blvd.
Canal Blvd.
Marconi Dr.
I-10
I-610
Metairie Rd.
Roosevelt Ave.
David Dr.
W. Metairie Ave.
Cleary Ave.
Severn Ave.
Causeway Blvd.
Pontchartrain Dr.
Airline Highway (US 61)
River Road (LA 48)
Jefferson Hwy. (LA 48)
Dickory Ave.
Hickory Ave.
Elmwood Park Blvd.
Central Ave.
Labarre Rd.
Dakin St.
Leonidas St.
Carrollton Ave.
Broadway Ave.
River Rd.
Rural St.
Hickory St.
LA 541
Live Oak Blvd.
Jeffer St.
LA 18
Wildwood Dr.
US 90
Jamie Blvd.
Nicole Blvd.
Nine Mile Point Rd.
LA 18S
Segnette Blvd.
Lapalco Blvd.
Leake Ave.
Lakeshore Dr.
Robert E. Lee Blvd.
Prentiss Ave.
Fillmore Ave.
Leon C. Simon Blvd.
Elysian Fields Ave.
Wisner Dr.
Paris Ave.
Franklin Ave.
Press Dr.
Congress Dr.
Jourdan Rd.
Downman Rd.
Hayne Blvd.
Hayne Blvd.
Curran Rd.
Morrison Rd.
I-10E Service Rd. N.
I-10E Service Rd. S.
Dwyer Rd.
Read Rd.
Bundy Rd.
Wright Blvd.
Bullard Rd.
I-510
Lake Forest Blvd.
Dwyer Rd.
Chef Menteur Hwy. (US 90)
Old Gentilly Blvd.
Almonaster Blvd.
Alvar St.
Bienville St.
Orleans Ave.
Esplanade Ave.
St. Bernard Ave.
N. Miro St.
Canal St.
Banks St.
Tulane Ave.
Earhart Blvd.
Poydras St.
HOV Lanes
Washington Ave.
Napoleon Ave.
Nashville Ave.
Freret St.
St. Charles Ave.
Magazine St.
Tchoupitoulas St.
Jackson Ave.
Race St.
Louisa St.
France Rd.
Florida Ave.
N. Galvez St.
Royal St.
Foster St.
Caffin Ave.
Patricia Dr.
Judge Perez Dr. (LA 39)
Genie St.
St. Bernard Hwy. (LA 46)
Paris Rd. (LA 47)
Palmisano Dr.
Hannan Blvd.
Judge Perez Dr.
Patterson Rd.
Gen. Meyer Dr.
Patterson Rd.
Whitney Ave.
Behrman Ave.
Shirley Dr.
Holiday Dr.
Kabel Dr.
Berkeley Dr.
Madison St.
4th Street
US 90B (Ground Level)
Stumpf Blvd.
LA 428
Gretna Blvd.
Wright Ave.
Terry Parkway
Behrman Hwy.
Tullis Dr.
Woodland Hwy. (LA 406)
English Turn Pkwy.
Hebert Blvd.
Belle Chasse Hwy. (LA 23)
LA 541
4th Street
Westwood Dr.
Patriot St.
Peters Rd. (LA 3017)
Manhattan Blvd.
Woodmere Blvd.
Destrehan Ave.
Harvey Blvd.
Barriere Rd.
Main St.
LA 3137
LA 39
LA 45
LA 3134
Col


CBS NEWS
SEISMIC MONITOR
USGS
6 JUL 2007
12:10pm
Lake Pontchartrain Cswy
E Airline Hwy
Airport Access Rd
Turn left at Clearview Pkwy
Airline Hwy
Take the I-10 E ramp to Slidell
Turn right at Elmwood Park Blvd
Huey P Long Brg
Continue on Toledano St
Make a U-turn at Tchoupitoulas St
Westbank Expy
51
628
3142
3127
633
560
45
23

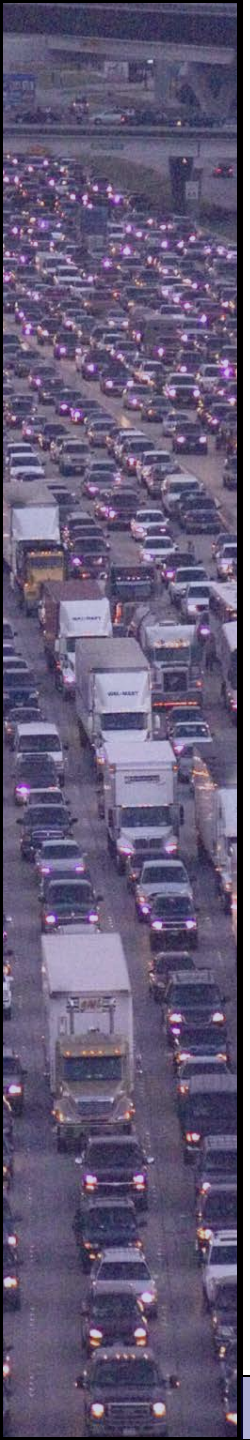


Demo Video



Conclusions and Contributions

- *Evidence that TRANSIMS can be an effective tool for regional multi-modal evacuation modeling and planning*
- *Constituent models can be useful in whole or when used separately (e.g., Wilmot predictive evacuation demand model)*
- *Development of new mathematical methods to calibrate models and analyze output data*
- *Current work focuses on analyses of alternative strategies that could be incorporated in future plans*



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For more information

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