A Planning Tool to Quantify the Effects of Extreme Flooding on Network Accessibility in Lafayette Parish, LA

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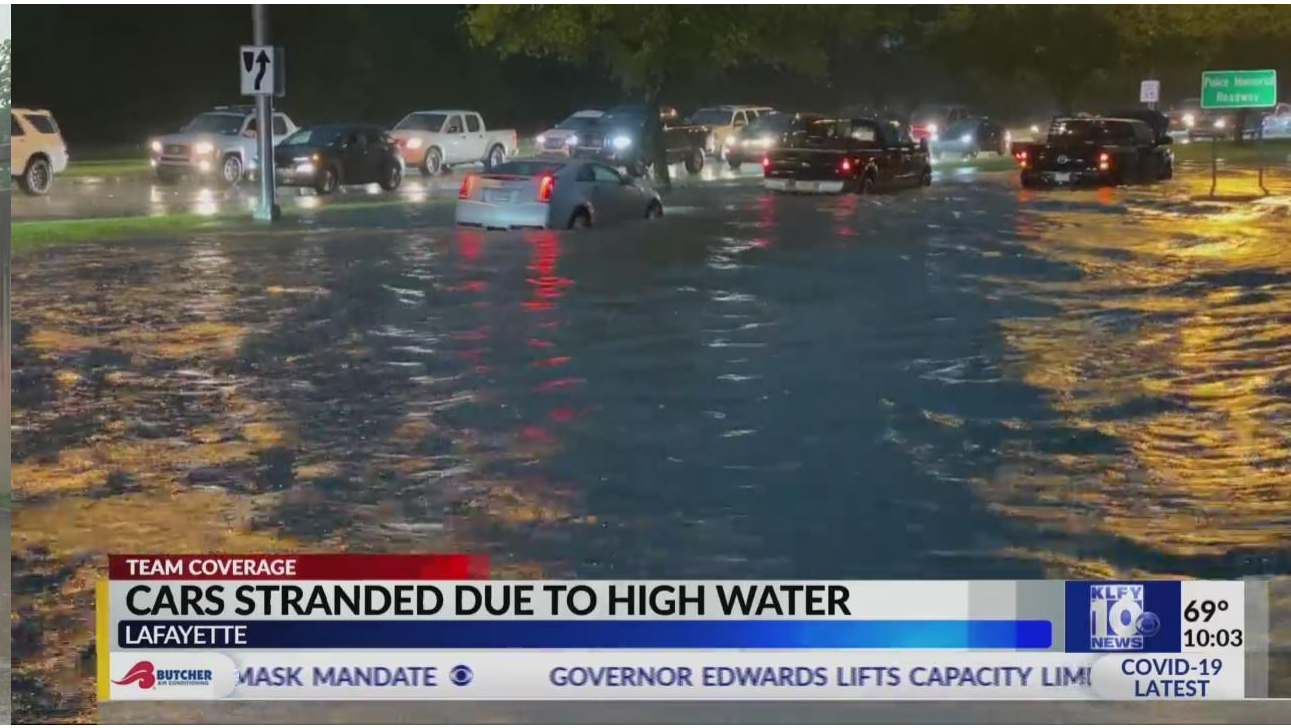
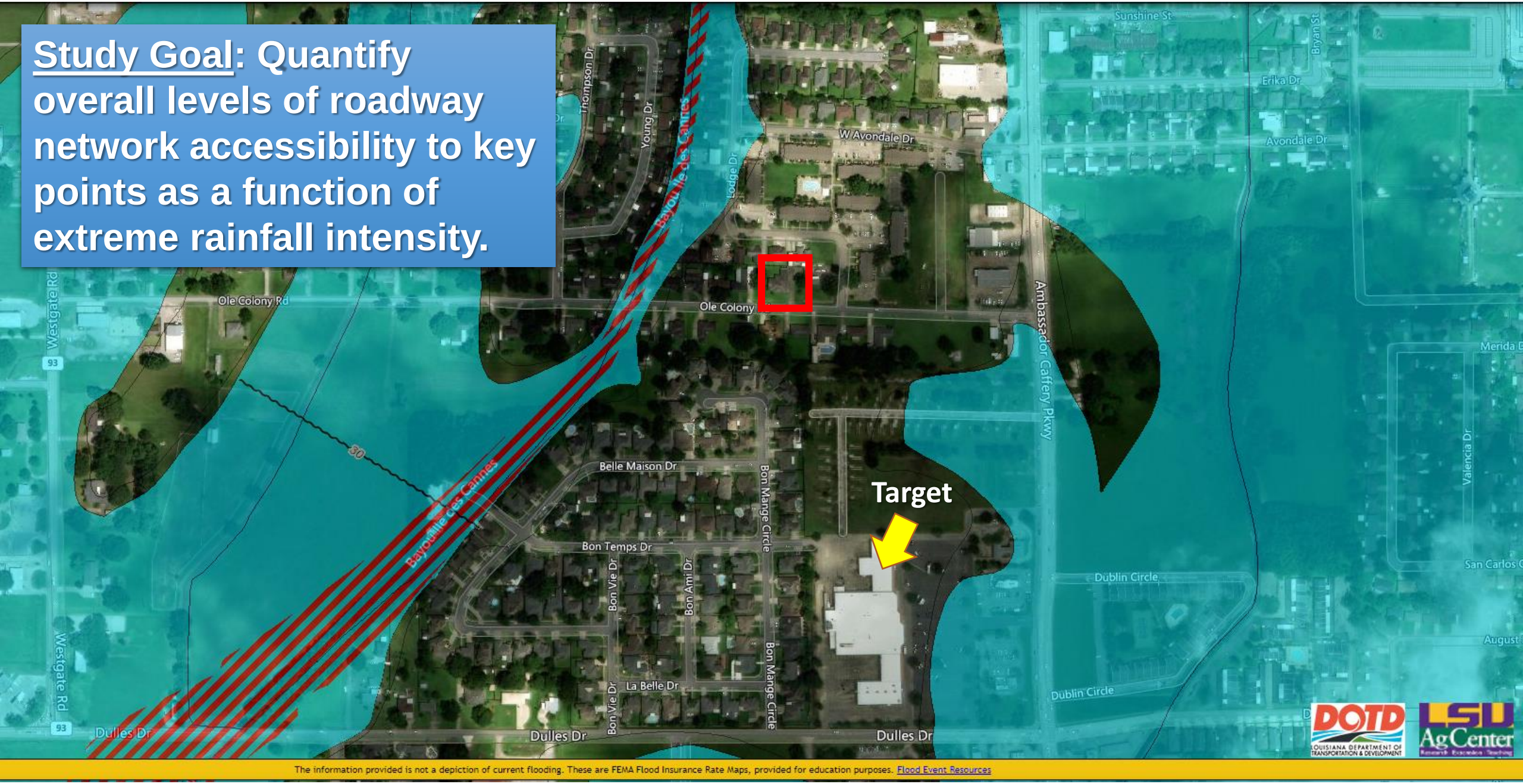
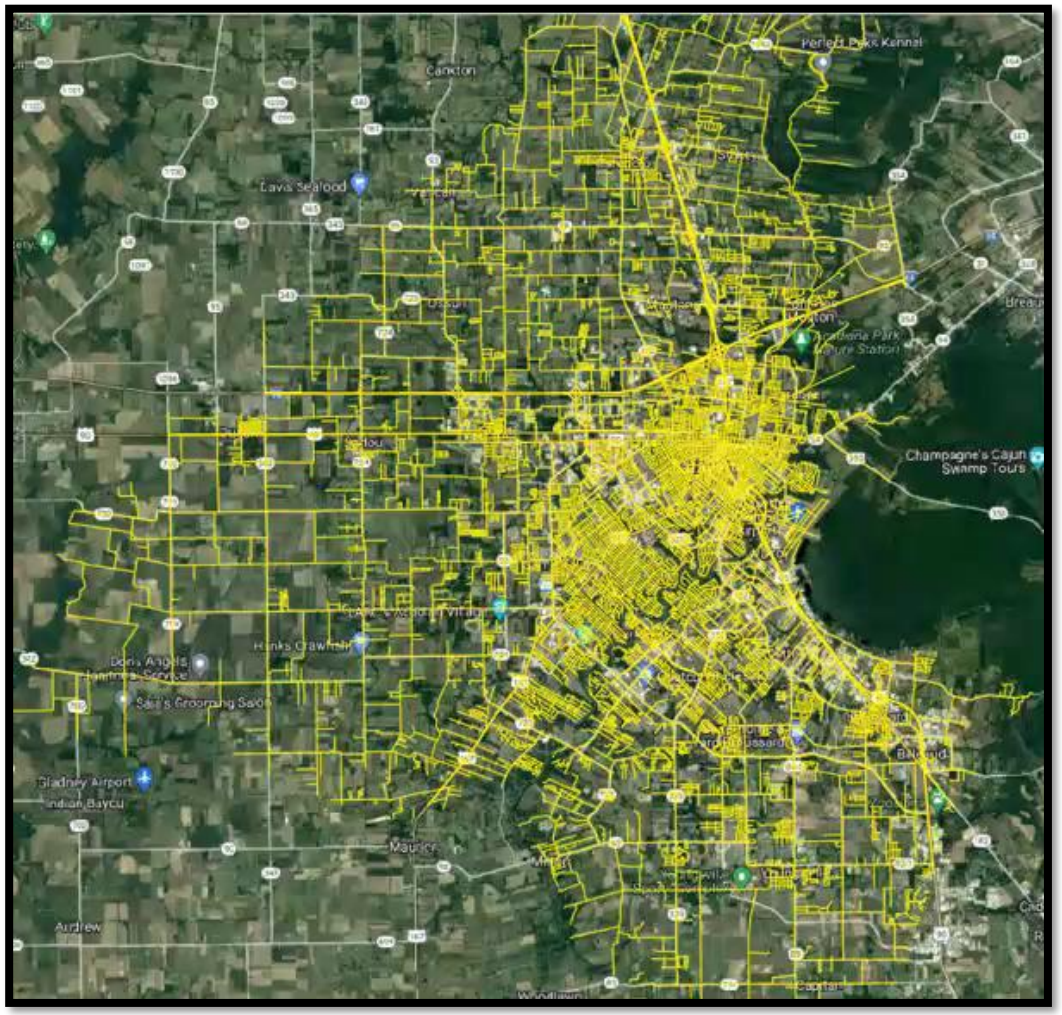
The *Accessibility* Problem

"My house is not flooded, but the roads around me ARE. So I can't reach my destination regardless of which route I try to take."




Study Goal: Quantify overall levels of roadway network accessibility to key points as a function of extreme rainfall intensity.
Target
Thompson Dr
Young Dr
Bayou Ile des Cannes
Lodge Dr
W Avondale Dr
Sunshine St
Bryan St
Erika Dr
Avondale Dr
Ole Colony Rd
Ole Colony
Westgate Rd
93
Ambassador Caffery Pkwy
Belle Maison Dr
Bon Mange Circle
Bon Temps Dr
Bon Vie Dr
Bon Ami Dr
La Belle Dr
Dublin Circle
Valencia Dr
Merida
San Carlos
August
Dulles Dr
30
DOTD
LSU AgCenter
The information provided is not a depiction of current flooding. These are FEMA Flood Insurance Rate Maps, provided for education purposes. Flood Event Resources

Study Method



Domain Definition

Lafayette Parish, LA:
2,603.9 km of roadways

Grid Creation

20m x 20m roadways w/LiDAR elevations

16 sub-watershed numerical model domains

Hydrodynamics

MIKE Powered by DHI

1,912,576 spatial calculation points; Rain-on-Grid (RoG)

100-yr and 500-yr 24-hr extreme event scenarios

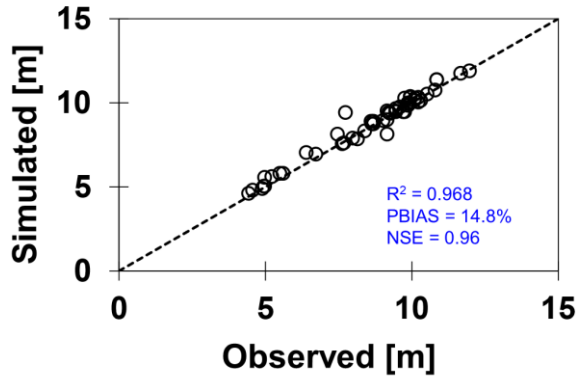
72-hour simulation period; 5-second $\Delta t \rightarrow$ 51,840 computational steps at each calculation point; 4 hour output

High water mark comparison at 55 locations; and photo verification of flooded roads

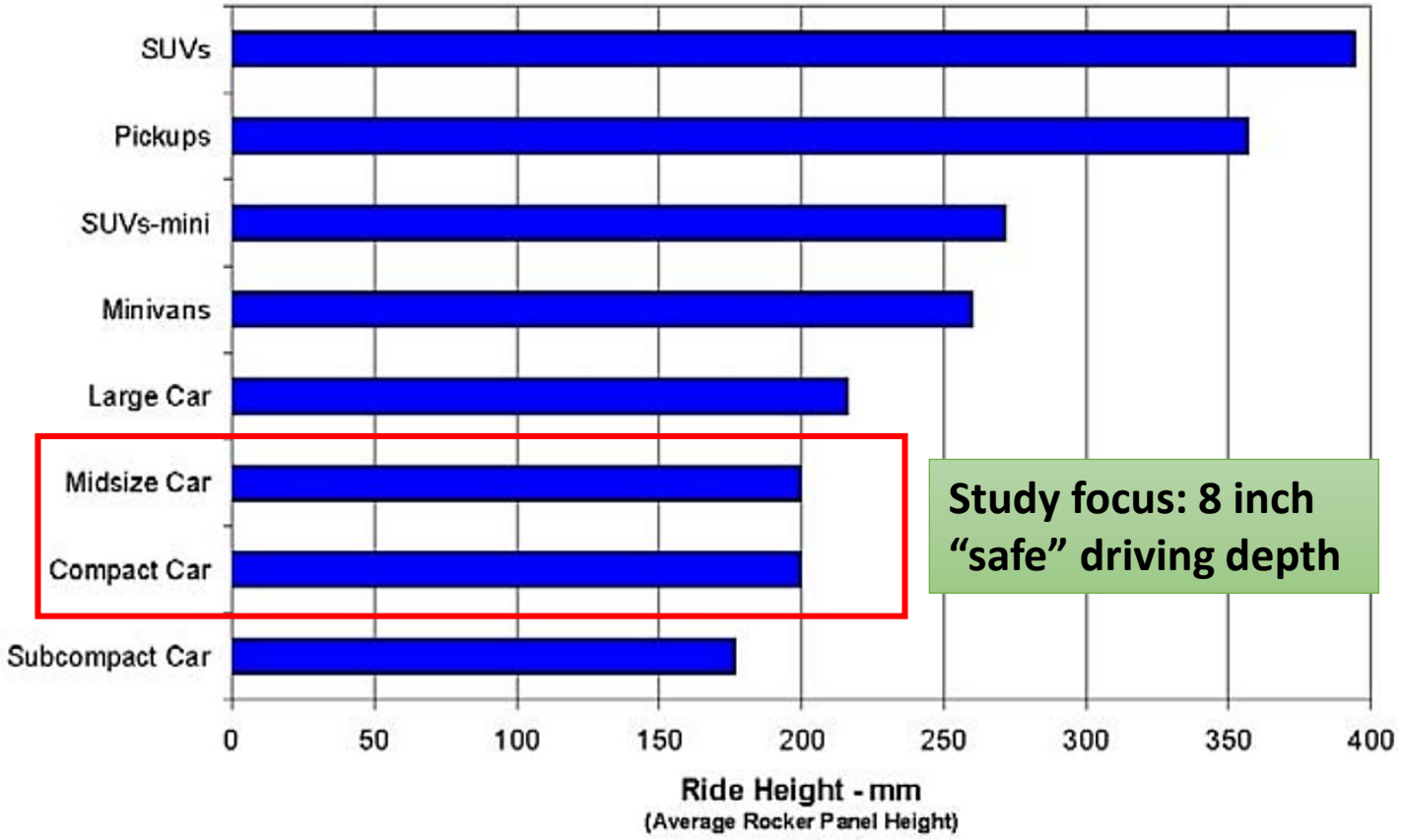
Target Point/Search Analysis

D8 flood-fill search technique based on avg. safe driving depth

Overall Accessibility Evaluation



Safe Travels…



Source: Gabler, H.C., Hollowell, W.T. The **Aggressivity of Light Trucks and Vans in Traffic Crashes**. U.S. National Highway Traffic Safety Administration, 1998

Source: Maria Pregnolato, Alistair Ford, Sean M. Wilkinson, Richard J. Dawson, **The impact of flooding on road transport: A depth-disruption function**, Transportation Research Part D: Transport and Environment, Volume 55, 2017, Pages 67-81,

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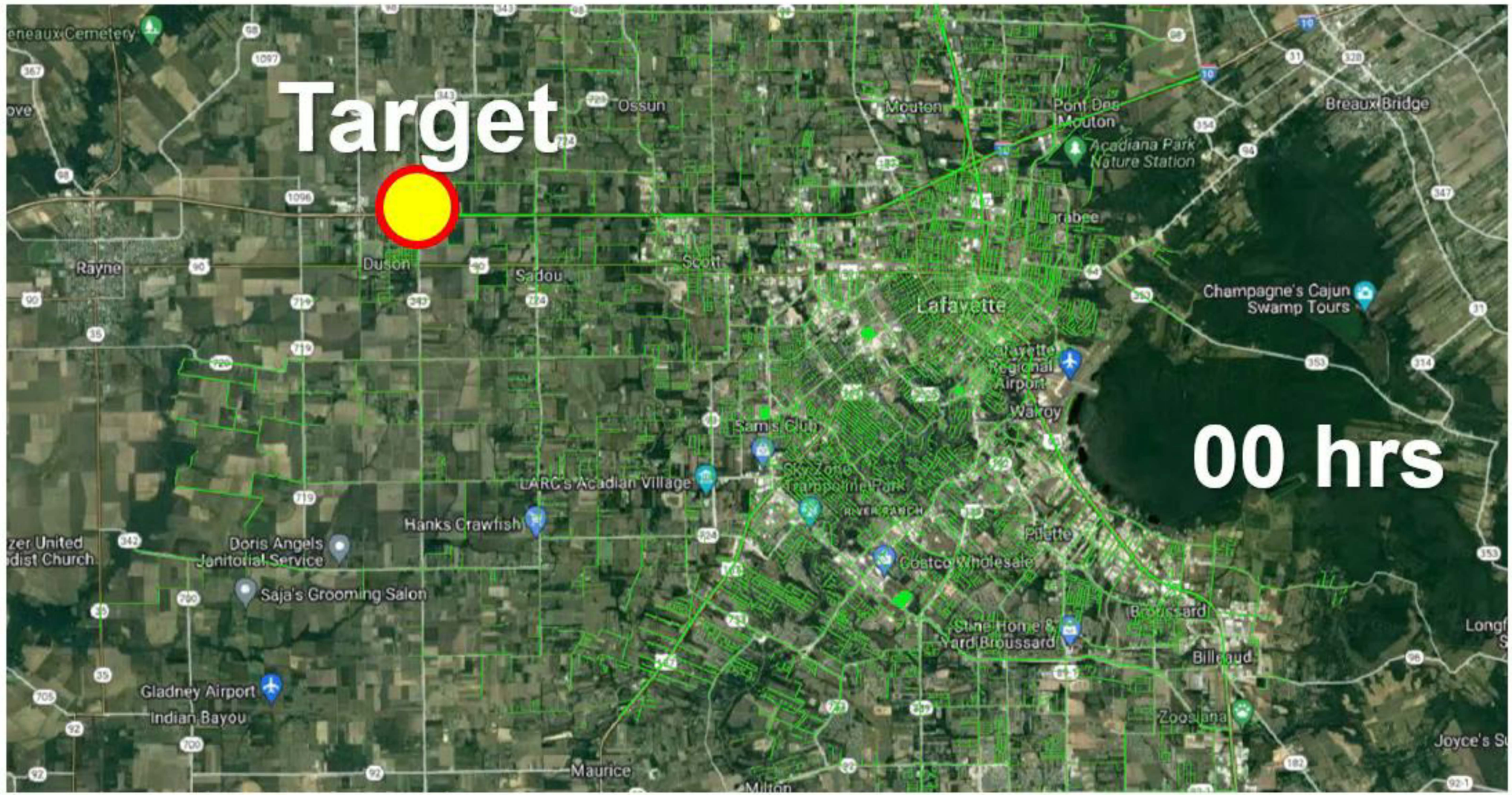
Accessibility: Lafayette Metro

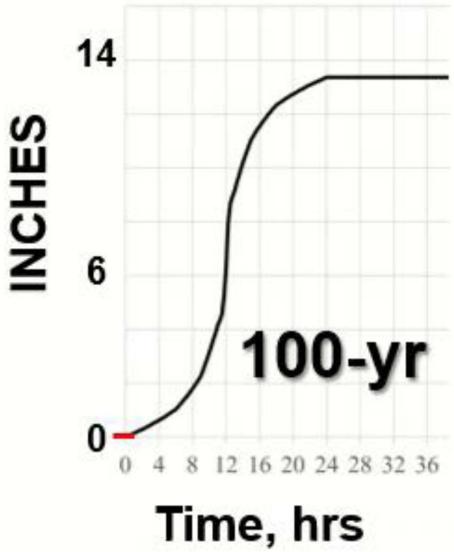
Safe driving depth:
8 inches

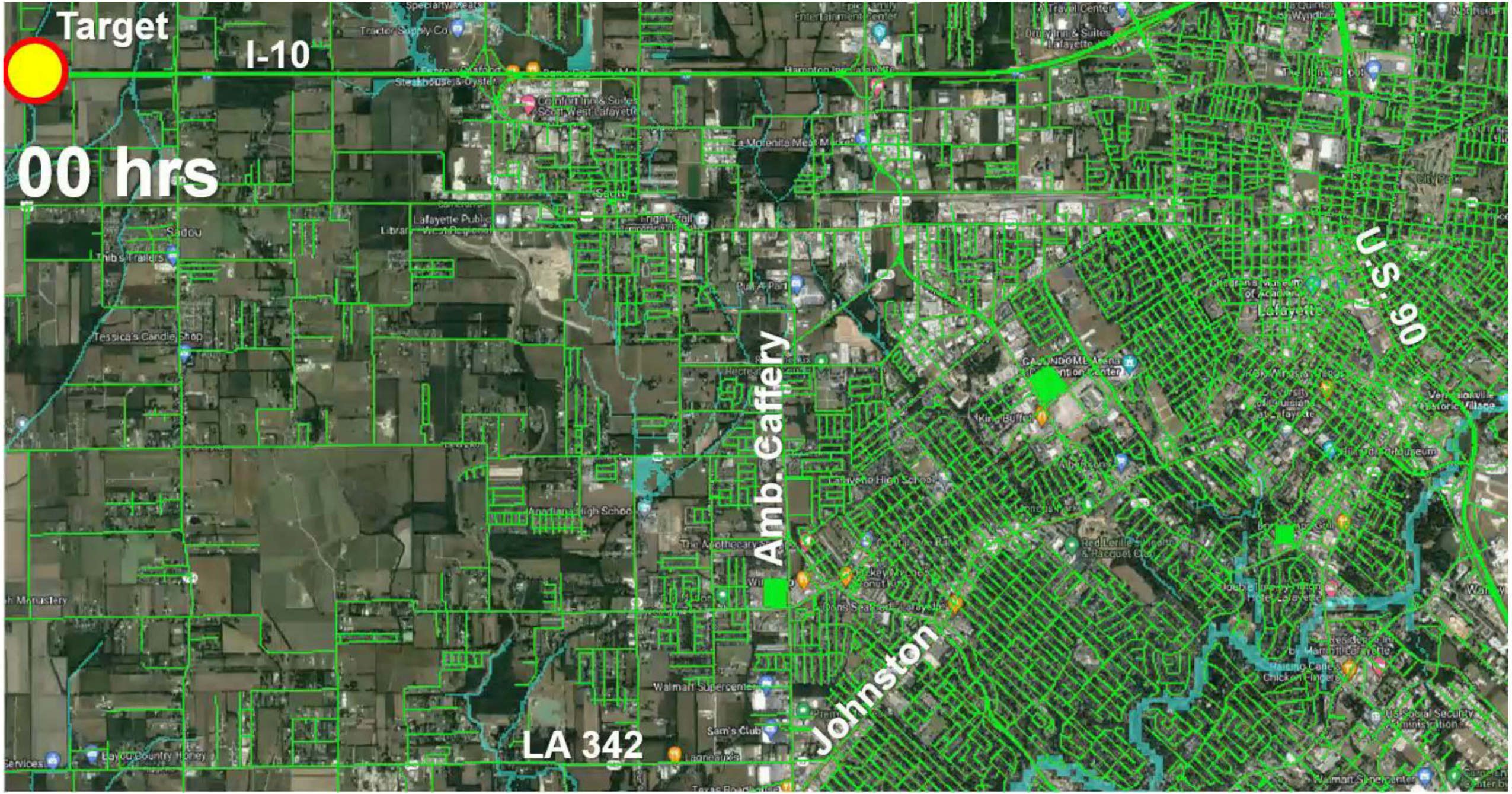
Accessible

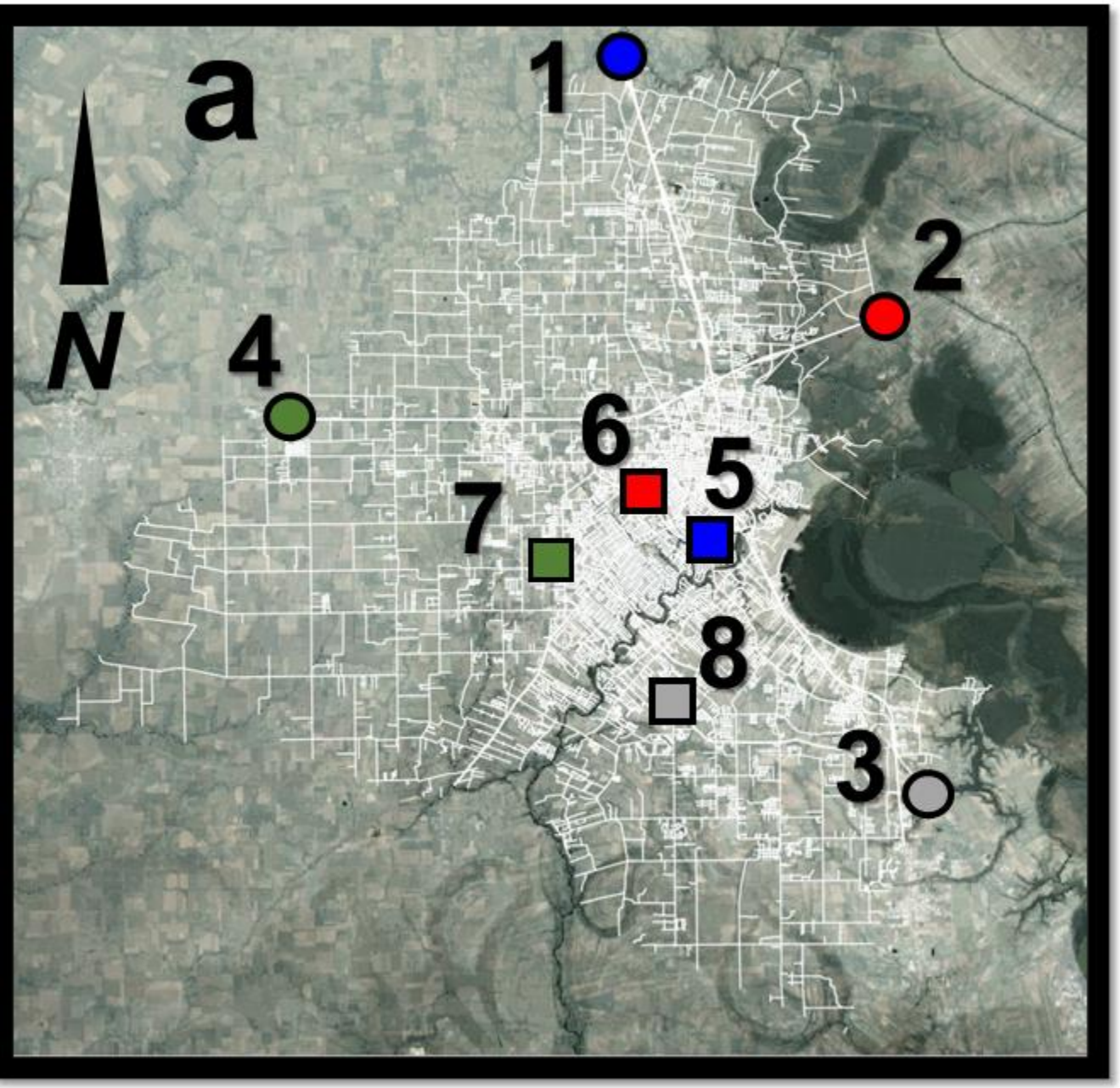
Inaccessible

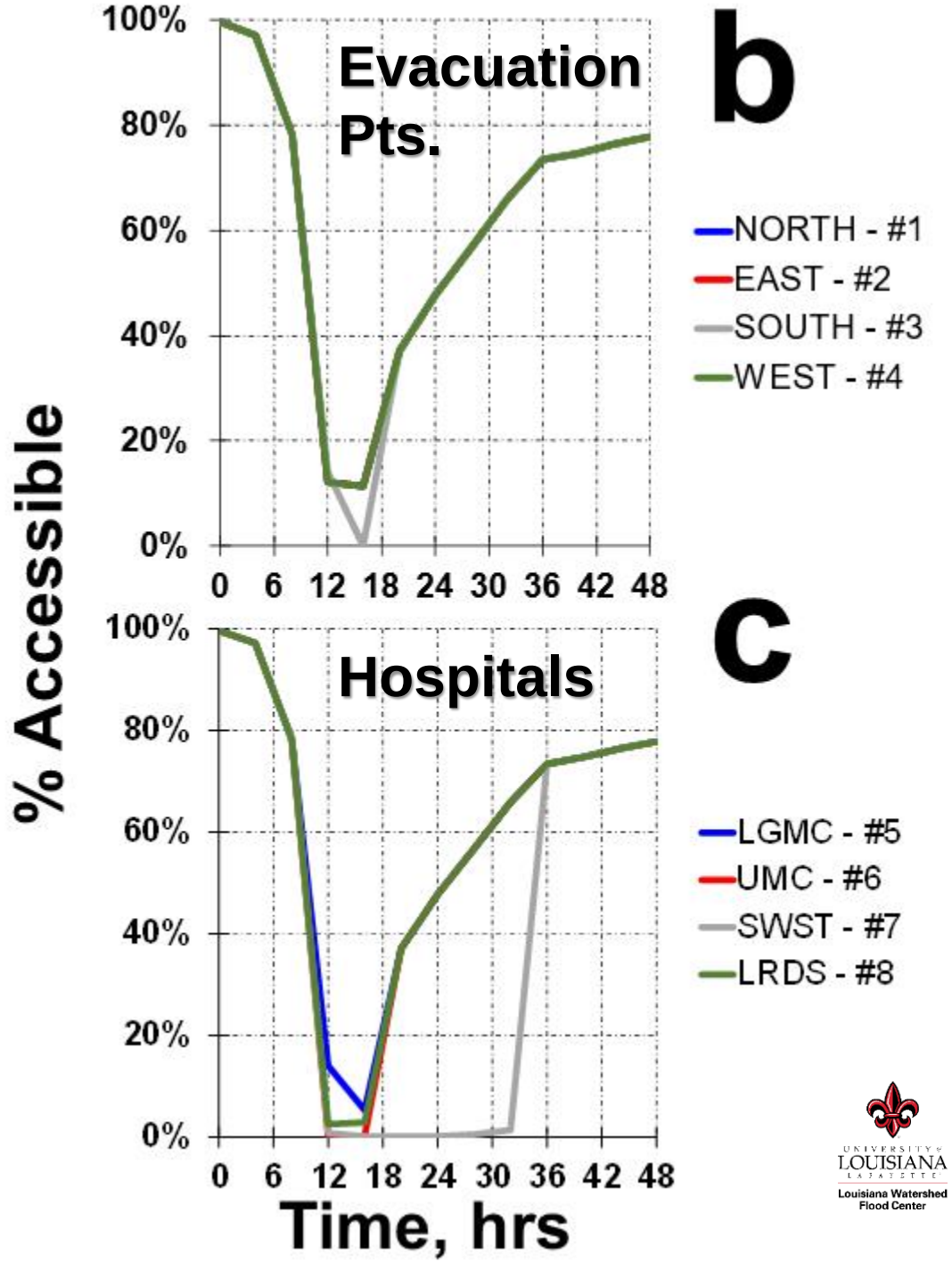


Total Rainfall




Target
I-10
00 hrs
U.S. 90
Amb. Caffery
Johnston
LA 342





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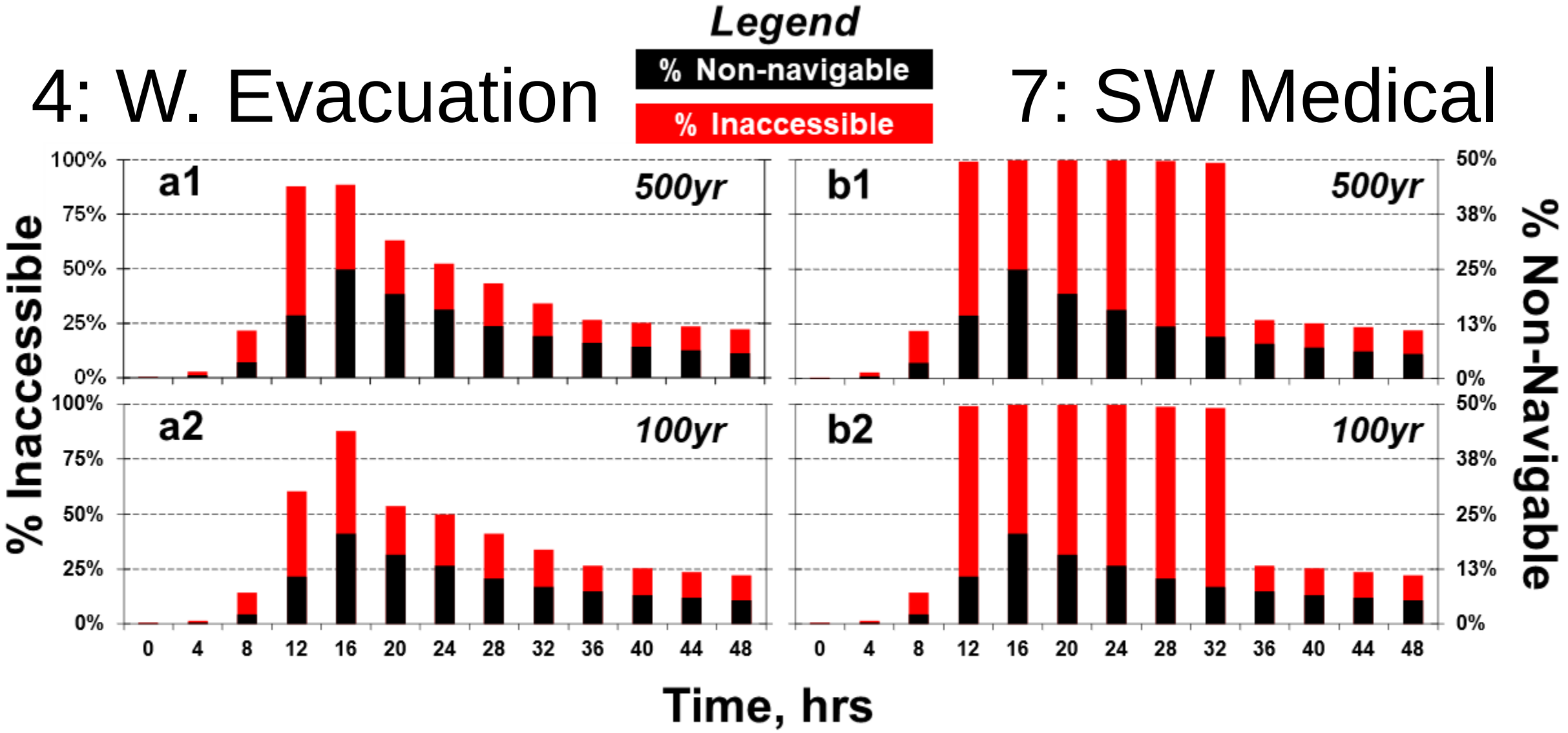
4: W. Evacuation

7: SW Medical



Findings & Conclusions

- August 2016 event ≈ 500-yr storm (Brown et al., 2020).
- 25% flooded roads → 80%+ inaccessibility; 100-yr and 500-yr results similar.
- Accessibility to hospitals **is generally worse** than accessibility to parish evacuation points.
- Scalable approach well-suited for planning & mitigation exercises – can evaluate different storms and vehicle types.
- **Future**: analyze other constraints (e.g., reachability, driver fatigue, night conditions, etc.) and identify mitigation targets.

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Sponsors and Data Sources: THANK YOU!!

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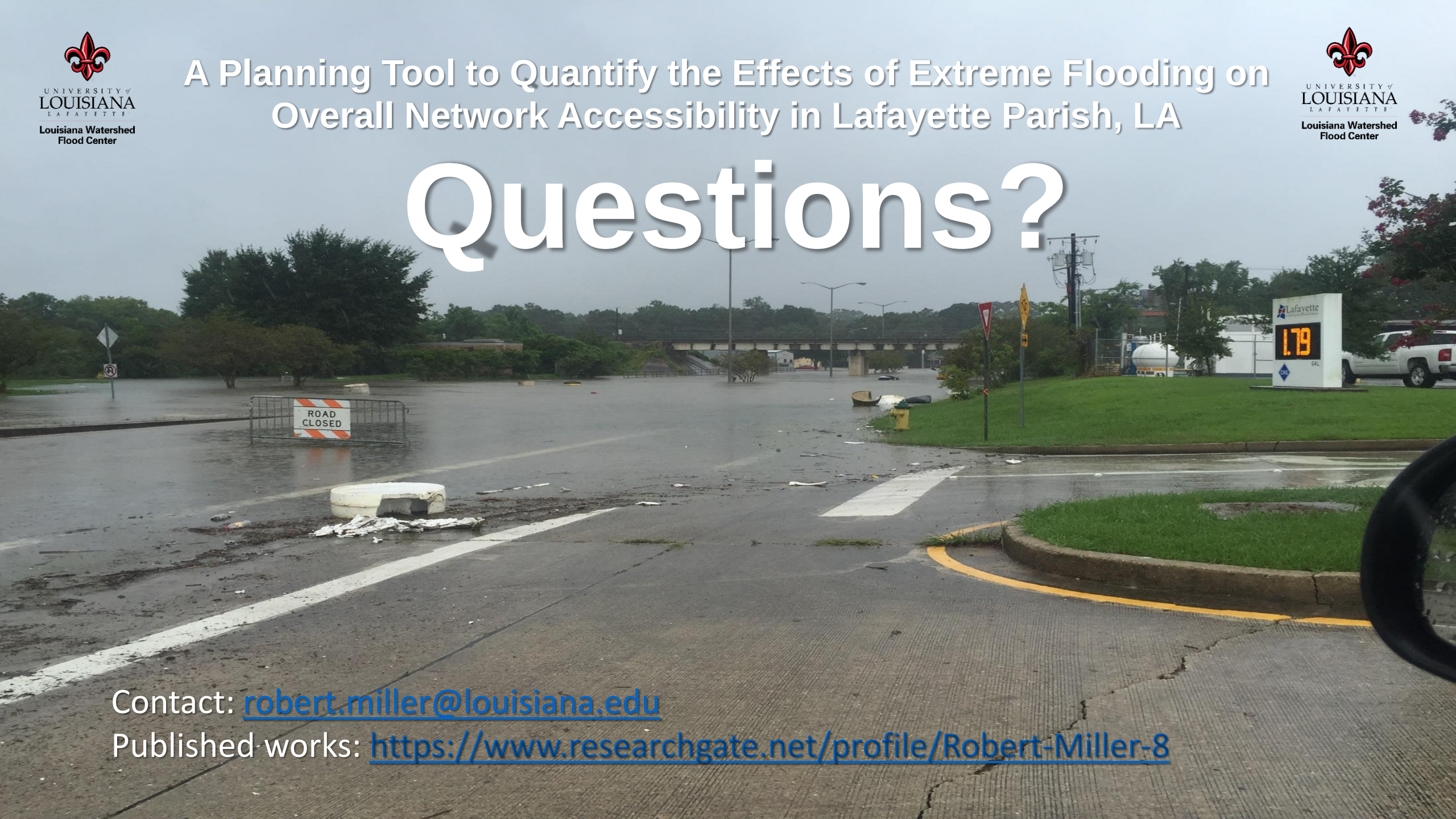
Questions?



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