Implementing Freight Fluidity in Texas

Bill Eisele

March 2019

Innovations in Freight Data Workshop, April 2019

Transportation Research Board

What is Freight Fluidity?

From end-to-end of a supply chain, the measurement of

Travel time

Travel time reliability

Cost of moving freight shipments

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Methodology

Three key parts to a fluidity analysis:

1. **Framework Development**, based on initial data collection
2. **Economic Assessment**, of state and region
3. **Performance Measurement**, application of performance measures in relation to supply chain corridors or routes

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Step 1: Framework Development

- **Provided a foundation** and roadmap for the fluidity analysis
- **Considered several questions**
  - What is “freight fluidity” and what does it mean for Texas?
  - What are specific freight fluidity performance measures?
  - What data are available to support the measures?
  - What are possible calculation procedures for the measures?
  - How can freight fluidity be communicated and used to support freight investment decisions in Texas?
- **Set a vision** for what TxDOT was trying to measure with fluidity, what data were needed, the best analysis options, and how the information would be used to communicate with decision-makers/leadership and the public

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Step 2: Economic Analysis for Texas

Identify economic opportunity and related supply chains needed to grow economic development

Understand the role of the statewide region for supply chains

Define Texas' current economic activity: general economy, transportation and supply chain

Identify available and required data sources & features for regional supply chain assessment

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Step 3: Apply Performance Measures to Key Supply Chain Routes

- **Perform bottleneck analysis on desired supply chain routes.**
  - TxDOT chose Houston, I-35, Dallas/Fort Worth and El Paso.
- **Connect findings to current and potential economic activity**.
  - What ways would investment improve bottlenecks and current and potential supply chains?
    - Shorten them?
    - Efficiencies?
    - Attract new business?

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Step 3: Sub-Steps to Apply Performance Measures

This Step has four activities:

1. **Consult the Urban Mobility Scorecard (UMS)** to know the rankings of the selected areas for congestion nationally.
2. **Review the Texas 100 Most Congested Roadways List (Texas 100)**
3. **Use tools like contour maps, heat maps and travel time**
4. **Calculate freight fluidity measures (identify and measure bottlenecks)**

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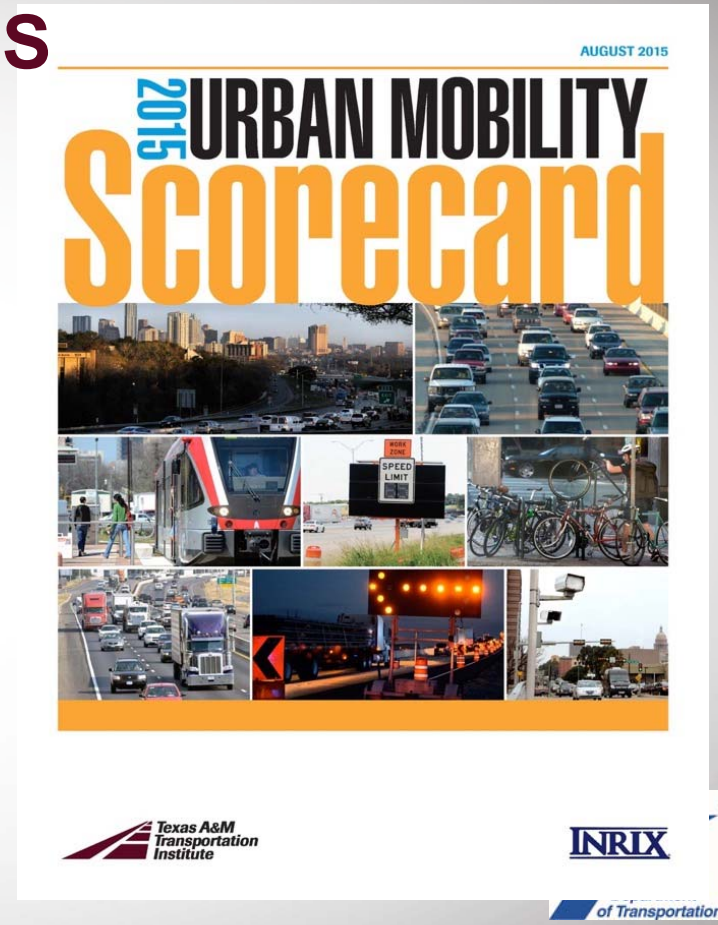
Step 3, Sub-step 1:Consult UMS

- Findings drawn from **traffic speed data** on 1.3 million miles of urban streets and highways
- **Highway performance data** from the Federal Highway Administration
- **Comprehensive analysis** of traffic conditions in 471 urban areas across the United States, including 33 in Texas.



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Sub-Step 1: Consult UMS for Dallas-Fort Worth Area

Freight Fluidity Example

Macro-level analysis

53 hours/year in delay per auto commuter	$702 million in total truck congestion cost	187 million person-hours of delay	$4.2 billion in wasted time and fuel
(11th in US, 2nd in Texas)	(7th in US)	(7th in US)	(7th in US)

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Step 3, Sub-step 2: Use The Texas 100/Texas 50 Lists

- Identify the most problematic segments in the area base on the lists. Lists are yearly bottleneck rankings

Table 1. Problematic Segments Identified in the Texas 100 Most Congested Roadways List

Top 100 Most Congested for Commuters		
#24: I-35W (SH 183 to I-30), 3.37 miles		
420K annual person-hours delay per mile	1.4M annual person-hours delay	$29.5M annual congestion cost ($8.8M/mile)
#28: I-35W (US 287 to SH 183), 6.39 miles		
404K hours delay per mile	2.6M hours delay	$52.9M cost ($8.3M/mile)
#88: I-35W (Alliance Gateway/SH 170 to US 287), 5.09 miles		
184K hours delay per mile	935K hours delay	$19.1M cost ($3.7M/mile)
Top 50 Most Congested Freight Bottlenecks		
#13: I-35W (SH 183 to I-30), 3.37 miles		
31K hours annual truck delay per mile	106K annual hours of truck delay	$5.4M annual truck congestion cost ($1.6M/mile)
#23: I-35W (US 287 to SH 183), 6.39 miles		
26K hours per mile	165K hours of delay	$8.5M cost ($1.3M/mile)
#55: I-35W (Alliance Gateway/SH 170 to US 287), 5.09 miles		
12K hours delay per mile	62K hours of delay	$3.1M cost ($0.6M/mile)

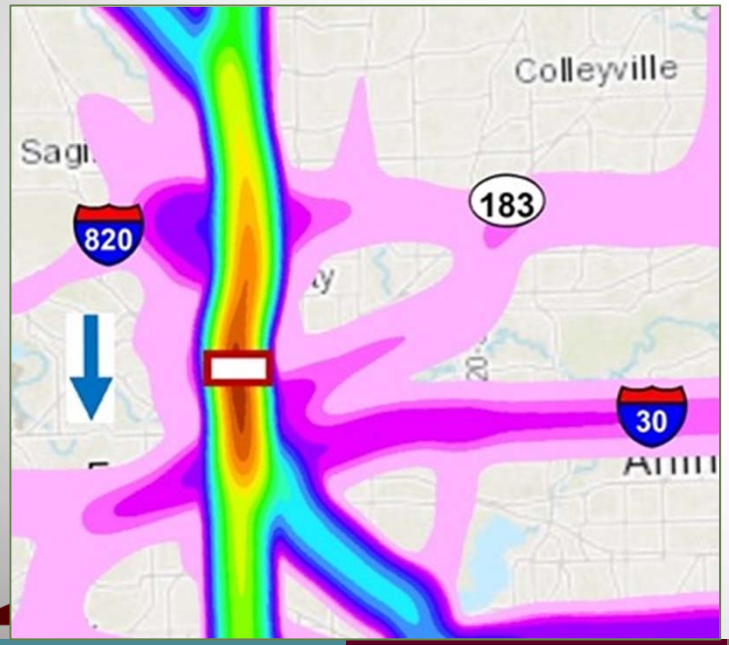
Most Congested **Under Construction**

Step 3, Sub-Step 3: Visualize Data

- **Use contour maps, travel-time traces and other tools to visualize the analysis.**

I-35W from SH 183 to I-30 (3.37 miles)

#24 All-Traffic - #13 Freight

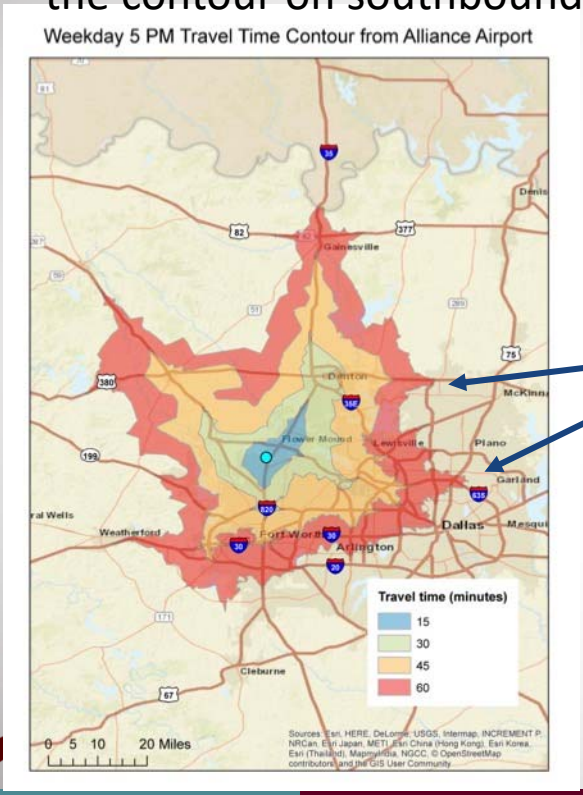


Congestion	Passenger	Truck
Annual delay per mile (hours)	420,000	31,000
Annual delay: person/truck hours	1,400,000	106,000
Annual congestion cost	$29,500,000	$5,400,000

Step 3, Sub-Step 3: Visualize Data

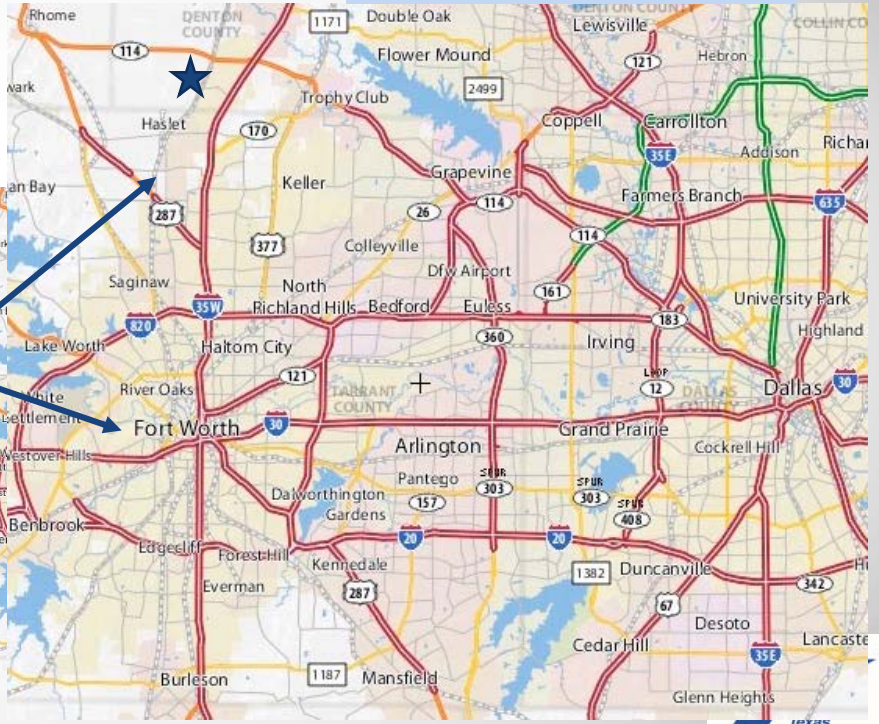
Use Contour Map to identify corridor delays

(note the short distance from Alliance to the contour on southbound I-35W)



I-35W, SH 170 to I-30

Alliance Airport



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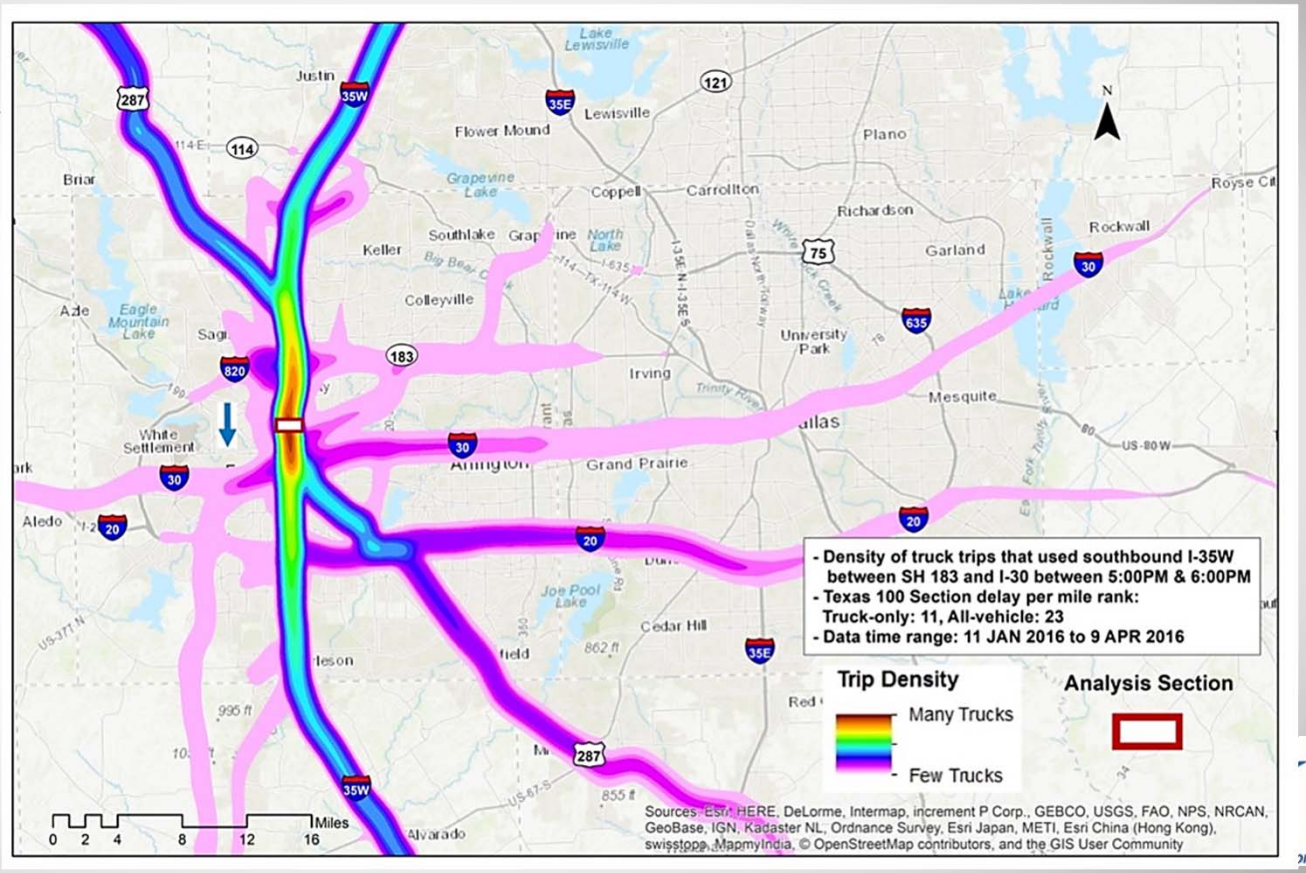
Step 3, Sub-Step 3: Visualize Data

Hypothetical Scenario



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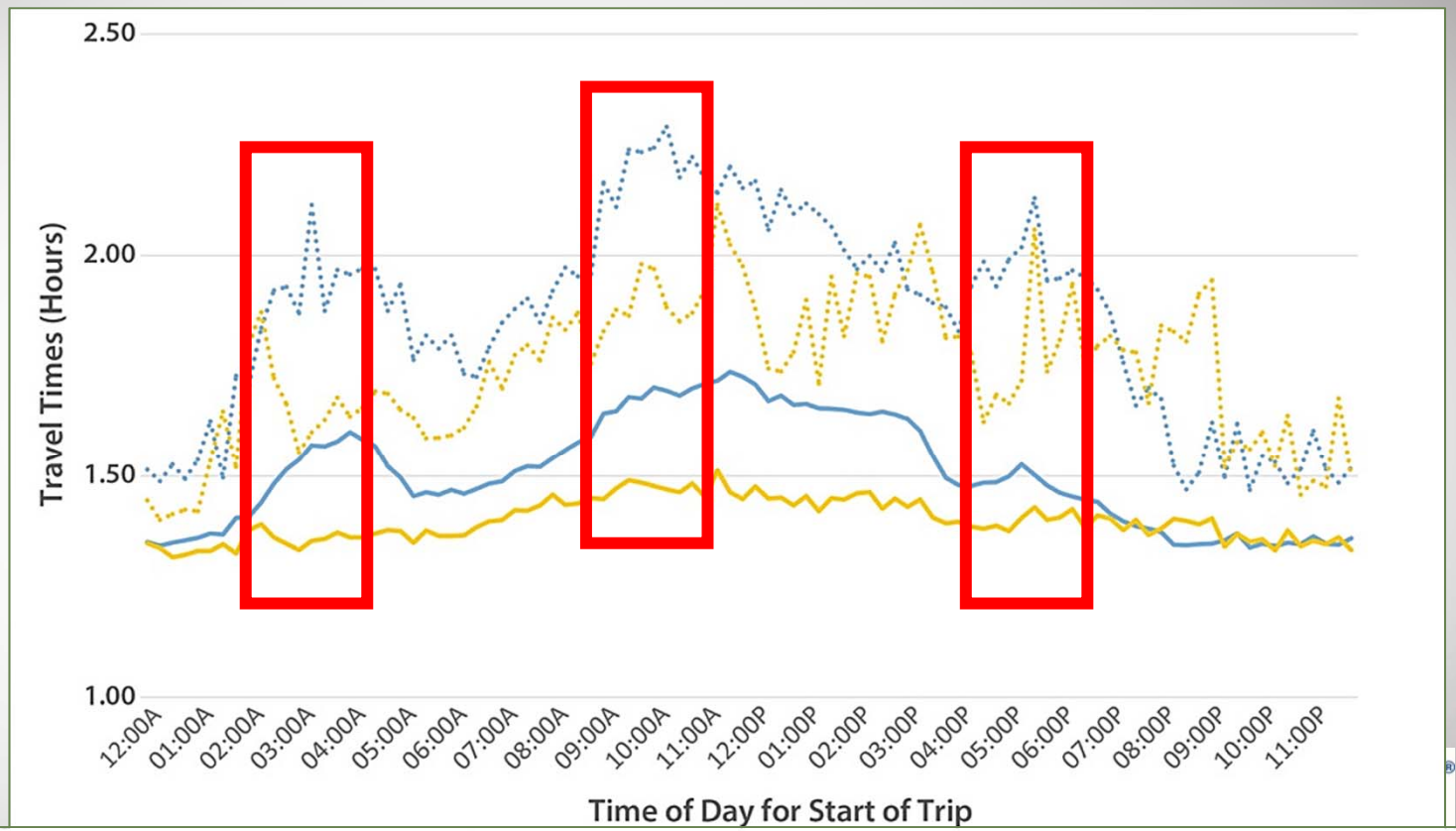
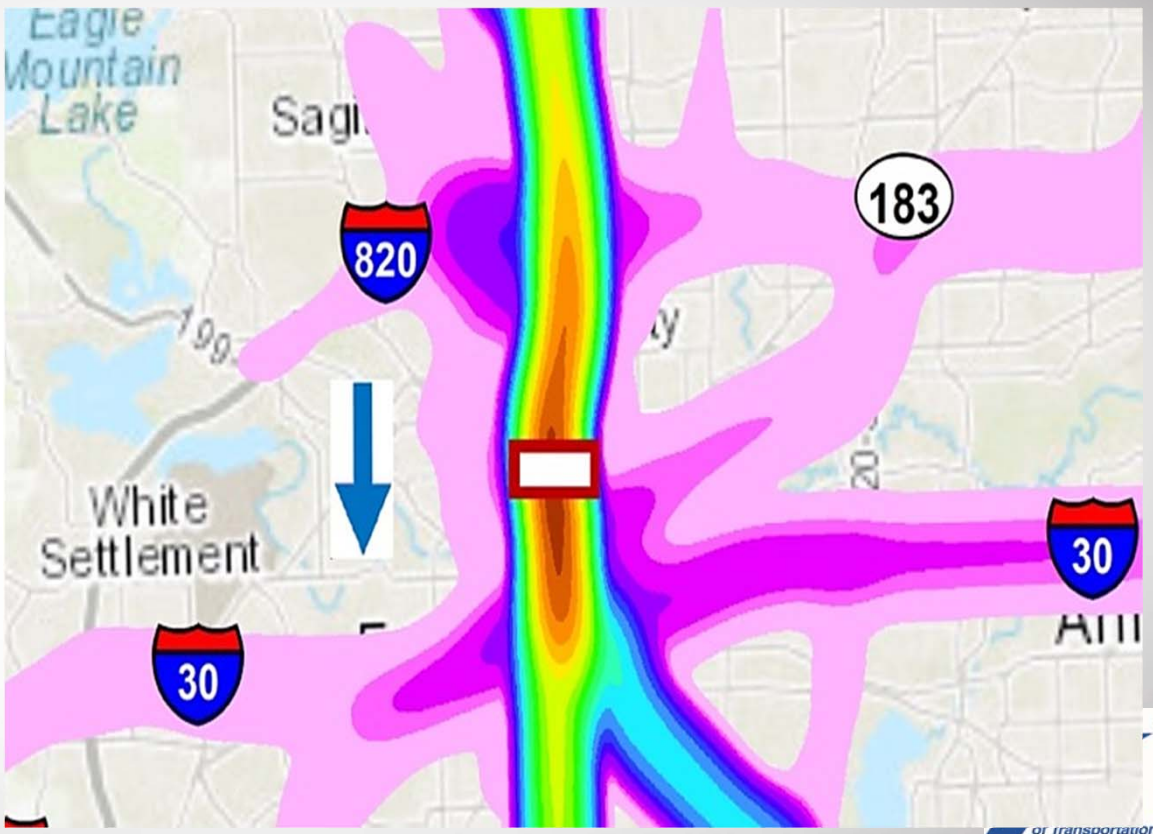
Step 3, Sub-Step 3: Visualize Data (Travel Time Traces)



Step 3, Sub-Step 3: Visualize Data

<u>Identify solution</u>:

Suggest benefit potential by addressing problems along the 3.37-mile segment of I-35W between SH 183 and I-30.



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Step 4: Performance Measures for Freight Fluidity

- Apply measures of travel time, travel time reliability and costs to the routes/corridors identified.
- Use cross-checks of Texas 100 and Texas 50 bottleneck lists.

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Advantages Of The Freight Fluidity Approach

Helps prioritize freight projects

Focuses on improvements that can also create and attract jobs

Better defines possible solutions

Aids in improving the Texas economy by improving local freight infrastructure

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Freight Fluidity Analysis Is A Useful Tool, But Not The Only Tool

FF analysis will help to identify segments for improvement

Can justify the cost of improvements

Can show regional considerations

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Other Factors Must Be Considered

- Current or planned construction in the area
- Event venues nearby
- Factors unique to the area
- Other considerations
- Project Planning, Modeling

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Contact Information

Bill Eisele
Texas A&M Transportation Institute
979-317-2461 (This is New!)
b-eisele@tti.tamu.edu
(And find me on LinkedIn)

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