



# Lone Star UAS Center of Excellence & Innovation

## NASA TCL4 Visit

March 19, 2019



## News Release

Office of Communications and Public Affairs  
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**FOR IMMEDIATE RELEASE**

**DATE:** January 18, 2019

### **NASA Selects Texas A&M University-Corpus Christi to Test Drones in Urban Traffic Management**

***Island University is one of two sites selected nationwide***



CORPUS CHRISTI, Texas – As more drones take to the skies, whether for business, leisure, emergency response or package delivery, we need to make sure safety and efficiency are two key priorities.

To ensure that safety, NASA's Unmanned Aircraft Systems Traffic Management (UTM) project selected the Lone Star UAS Center of Excellence & Innovation at Texas A&M University-Corpus Christi to test drone traffic management. The Island University is one of only two test sites selected nationwide.

"The Lone Star Team is proud to have been selected by NASA to work on such critical testing efforts," said Mike Sanders, Acting Executive Director of the Lone Star UAS Center of Excellence & Innovation. "This series of tests is a critical step in enabling the safe integration of unmanned aircraft systems within an urban environment. We look forward to

**NASA's Concept for a possible UTM System that would safely manage diverse UAS Operations in the airspace above buildings and below crewed aircraft operations in suburban and urban areas.**



# NASA UTM Program Overview

## What is the problem?

- Many beneficial civilian applications of the UAS have been proposed, from goods delivery and infrastructure surveillance, to search and rescue, and agricultural monitoring.
- Currently, there is no established infrastructure **to enable and safely manage the widespread use of low-altitude airspace and UAS operations**, regardless of the type of UAS.
- A UAS traffic management (UTM) system for low-altitude airspace **may be needed**, perhaps leveraging concepts from the system of roads, lanes, stop signs, rules and lights that govern vehicles on the ground today, whether the vehicles are driven by humans or are automated.

***NASA is researching prototype technologies for a UAS Traffic Management (UTM) system that could develop airspace integration requirements for enabling safe, efficient low-altitude operations.***

<https://utm.arc.nasa.gov/index.shtml>

# How do we optimize safe utilization for lower altitude UAS Operations?



# NASA UTM Program Overview (contd)

*While incorporating lessons learned from the today's well-established air traffic management system, the UTM system would enable safe and efficient low-altitude airspace operations by providing services such as:*

- Airspace design
- Designated corridors
- Dynamic geofencing
- Severe weather and wind avoidance
- Congestion management
- Terrain avoidance
- Route planning and re-routing
- Separation management
- Sequencing and spacing and
- Contingency management

<https://utm.arc.nasa.gov/index.shtml>



*Bringing UAS to America's Skies  
All Information is LSUASC Proprietary*

# NASA UTM Program Overview (contd)

## NSA envisions concepts for two types of possible UTM systems:

- The first type would be a Portable UTM system, which would move from between geographical areas and support operations such as precision agriculture and disaster relief.
- The second type of system would be a Persistent UTM system, which would support low-altitude operations and provide continuous coverage for a geographical area. Either system would require persistent communication, navigation, and surveillance (CNS) coverage to track, ensure, and monitor conformance.

***NASA's goal is the development and demonstration of a possible future UTM system that could safely enable low-altitude airspace for UAS operations.***

<https://utm.arc.nasa.gov/index.shtml>



# NASA UTM Program Overview (contd)

**NASA is leading the research, development and testing that is taking place in a series of activities called "Technology Capability Levels (TCL)", each increasing in complexity**

**TCL1** concluded in August 2015. Technologies in this activity addressed operations for agriculture, firefighting and infrastructure monitoring, with a focus on geofencing, altitude "rules of the road" and scheduling of vehicle trajectories.

**TCL2** completed in October 2016, leveraged TCL1 results and focused on beyond visual line-of-sight operations in sparsely populated areas. Researchers tested technologies that allowed dynamic adjustments to availability of airspace and contingency management.

**TCL3** completed in May, 2018, and leveraged TCL2 results with focus on testing technologies that maintain safe spacing between cooperative (responsive) and non-cooperative (non-responsive) UAS over moderately populated areas.

***TCL4 will focus on UAS operations in higher-density urban areas for tasks such as news gathering and package delivery. It will also test technologies that could be used to manage large-scale contingencies.***

<https://utm.arc.nasa.gov/index.shtml>



# TCL4/T07 Overview

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**Who:** LSUASC and 7x UTM Service Suppliers (USS's).

**What:** Execute 5 Test Scenarios to assess UTM capabilities and/or technical considerations in an Urban environment.

**When:** 13-22 August 2019.

**Where:** Downtown Corpus Christi, TX.

**How:** Employing 10 Live UAS and up to 15 Simulated UAS simultaneously, LSUASC conducts LOS, ELOS & BVLOS operations across a controlled series of Test events.



# TCL4/TO7 Objective

**The LSUASC and our 7x UTM Service Supplier (USS) Partners conduct a complex UTM 5 Scenario Test in the greater Corpus Christi Metroplex to assess:**




- 6x USS ability to communicate with 10 Live UAS and up to 15 Simulated UAS and other USS's during each scenario.
- 1 USS provides integrated Common Operating Picture (COP) in the LSUASC Mission Control Center for added Command and Control & Safety.
- UAS & USS ability to operate in various Urban environments that range from simple (beachfront) to complex (Urban Canyon) to Hybrid (USS Lexington to Whataburger Field flying under the CCTX Bay Bridge).
- The Hybrid Scenario also includes operations over people considerations via a Concert event and other Tourist activities.
- GBDA Radar capabilities and coverage gaps across each environment.
- GPS and Spectrum issues that may arise from such a complex operation (Spectrum connectivity and propagation issues in the Urban Canyon for example).



# Scenario 1

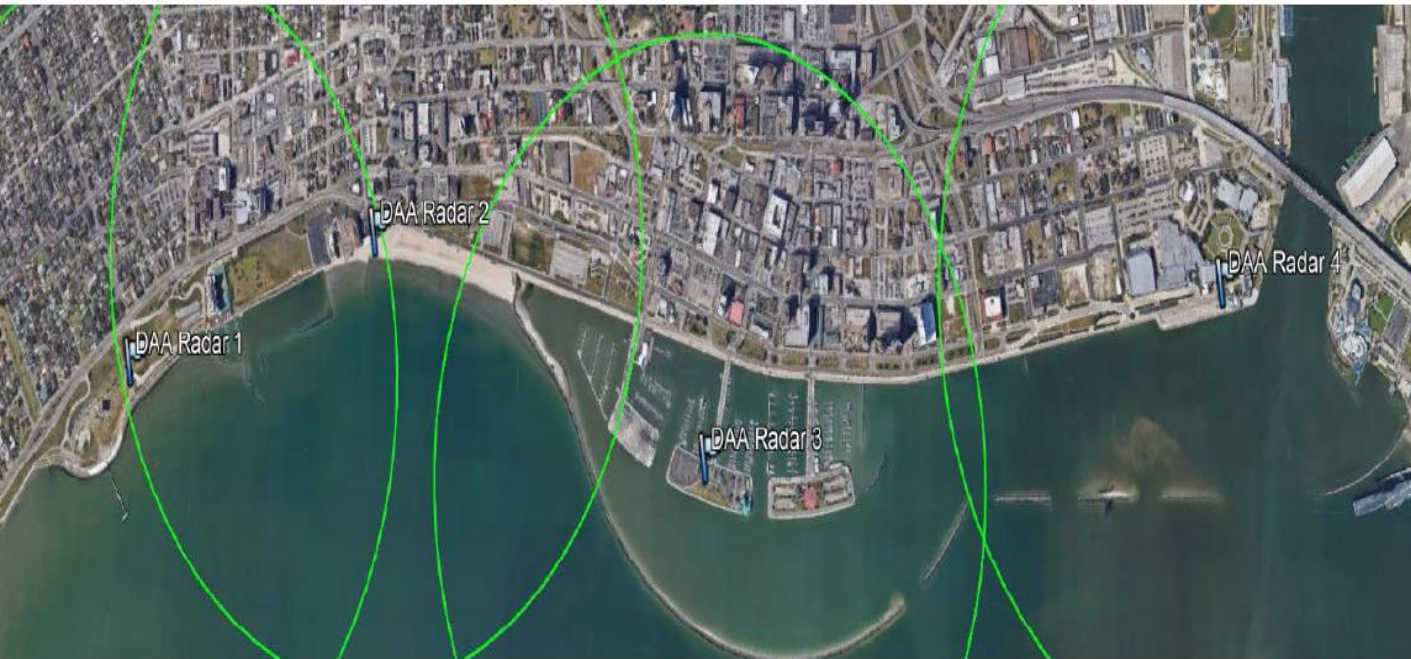


-  Visual Observer
-  Sensor
-  Primary LRZ (Color varies)
-  Safe Landing Location
-  Secondary LRZ (Color varies)
-  Trigger Event/Conflict

-  Planned Live Flight Path (Color varies per USS)
-  Planned Simulated Flight Path
-  Safety Pilot

 GCS

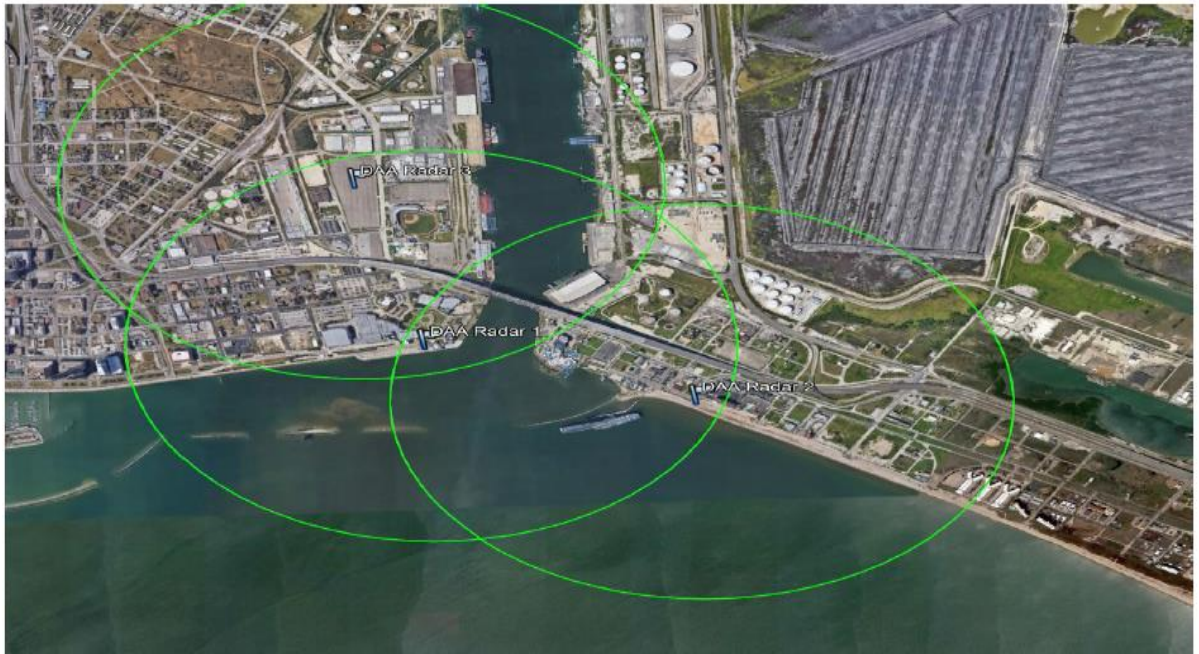
# Radar Coverage – Scenario 1



# Scenario 2 Overview



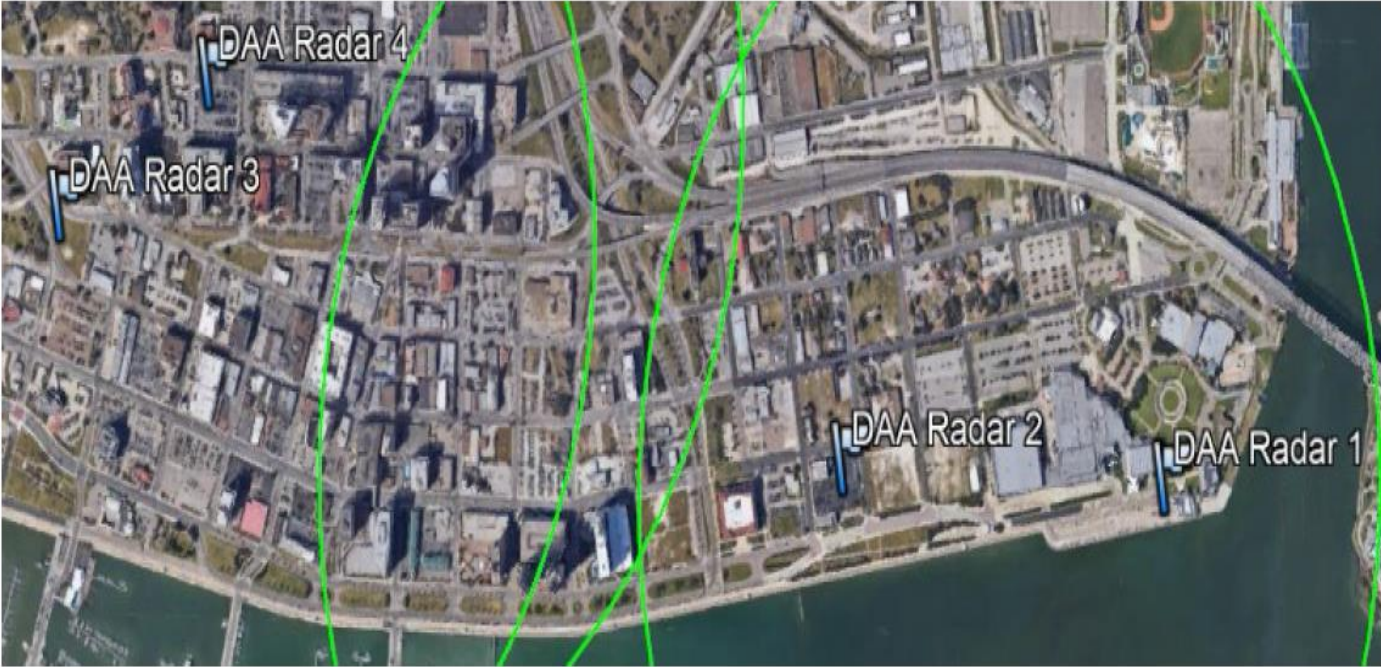
# Radar Coverage – Scenario 2



# Scenario 4 Overview



# Radar Coverage – Scenario 4





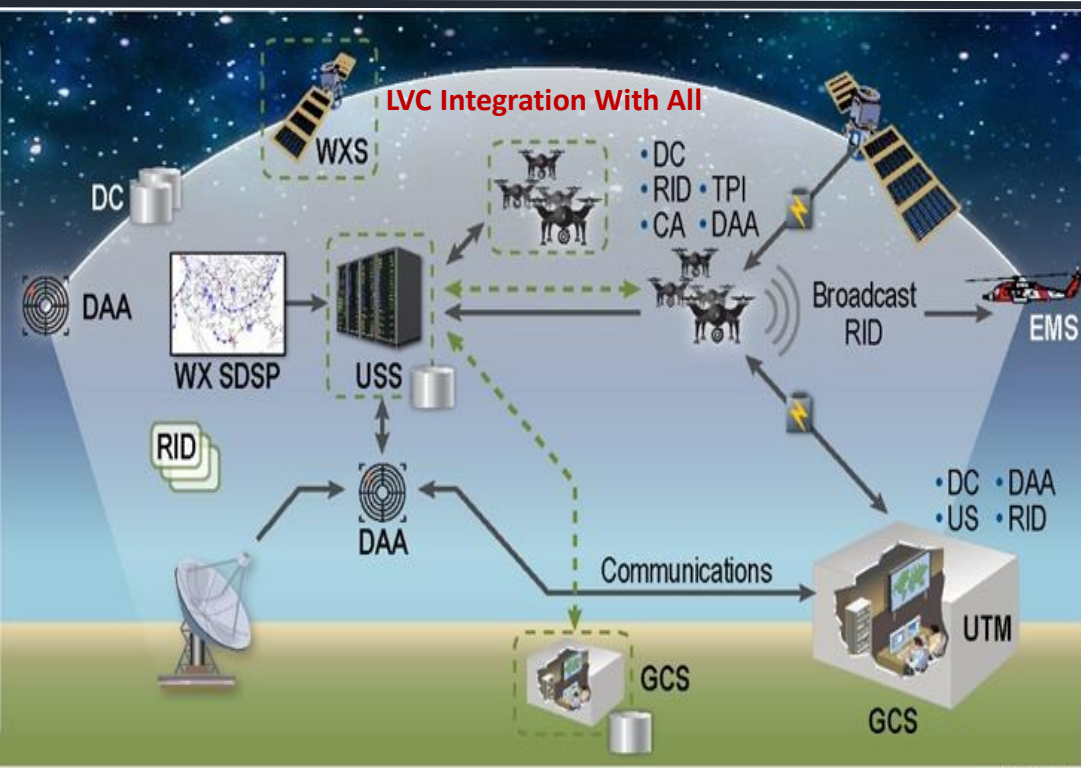
# Current Architecture

## (Opportunities to Partner)

**LEGEND**

→ Physical  
 - - - - - Simulation (LVC)

CA Collision Avoidance  
 DAA Detect and avoid  
 DC Data Collection  
 EMS Emergency Mgmt Svcs  
 GCS Ground Control Station  
 RID Remote ID  
 SDSP Supplemental Data Service Provider  
 TPI Truth Position Indicator  
 USS UTM Service Supplier  
 UTM Unmanned Traffic Mgmt  
 WX Weather



LoneStar UAS

MARKET: LARGE UAS & HALE



HALE UAS

UPPER CLASS E AIRSPACE

LARGE UAS



LARGE UAS



CLASS A AIRSPACE

MARKET: THIN / SHORT HAUL



AIRPORT



URBAN VERTIPORT



SMALL AIRPORT



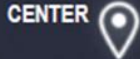
DRONEPORT



MARKET: URBAN AIR MOBILITY

# The LSUASC is Actively Working With NASA to Bring Urban Air Mobility Testing to Texas

DISTRIBUTION CENTER



MARKET: SMALL / MEDIUM UAS





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***The Urban Air Mobility Vision***

# TEXAS UASWERX

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A CATALYST FOR THE UNMANNED & AUTONOMOUS SYSTEM INDUSTRY SECTOR

PRESENTED TO THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS UAS TASKFORCE

MARCH 25, 2019

# BACKGROUND

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- UAS Consortium founded in 2012
- Governors Office of Economic Development
- Texas Workforce Commission
- Federal Agencies/FAA – 7 test ranges
- Wagner Peyser Grant funded curriculum study

# INTEGRATION

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## Federal Action

- February 14, 2012 – Mandate to integrate by 2015
- 2018 – FAA Reauthorization Act
- January 14, 2019 – DOT rule makings to accelerate integration

# MARKET

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- 1.3 million registered drones
- 116,000 trained pilots
- \$89 billion market projection

# NORTH CENTRAL TEXAS

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- Aerospace Products & Parts Manufacture (NAICS 3364)
  - 35,707 workers, 86 employers
- Aircraft Equipment Supplies & Wholesalers (NAICS 423860)
  - 2,912 workers, 126 employers
- Department of Defense
  - 286 suppliers world wide
  - 81 in US



# TEXAS UAS WERX

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- Mineral Wells Airport
- Dempsey Heliport
- Ft. Wolters, 26 staging areas
- FAA Certifications
- DOL Registered Apprenticeship Program

# PARTNERS, STAKEHOLDERS & SUPPORTERS

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- Governors of Economic Development
- Texas Department of Transportation, Aviation Division
- Texas Department of Agriculture
- Texas Workforce Commission
- Texas Education Agency
- Texas Army Guard
- North Central Texas Council of Governments
- UTA College of Business
- Dallas County Community College District
- Lone Star Test Center, Texas A&M Corpus
- City of Mineral Wells
- Palo Pinto County
- Mineral Wells Chamber of Commerce
- Mineral Wells Industrial Foundation
- Parker County Economic Development

# TRAINING ACADEMY

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- Training Academy

- Aviation
- Military
- First Responders
- Business
- Public Education

- Testing

- Industry
- Military

- Workforce

## Development

- Stem Skills
- UAS Specifics

# DEMAND

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- US Aerospace Industry will need 1.5 million new workers by 2025
- Texas employees 153,000 Texans at 1,300 establishments
- \$8.4 Billion GDP
- 300 identified Commercial Applications for UAV

# TEST CENTER

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- Innovation Zone, Palo Pinto & Parker Counties
- Area encompasses north to Graford, south to Brazos, east to Weatherford, and west to Palo Pinto.
- 4,000' ceiling for testing
- Designation of the Airport as “ Concurrent Manned Unmanned Operations”
- Designation of airspace as an (alert area based on unusual flight operations)
- FAA approval of the flight corridors

# RESEARCH

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- Accenture Technology Labs
- Deltek's "GoWin" Reports
- Marsh & McLennan
- Bloomberg
- Goldman Sachs Equity Research
- Teal Group Market Study
- Airbus "Blueprint for the Sky"

# SUMMATION

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- UAS Innovation Zone
- FAA Approved Flight Corridors
- Integration of Manned & Unmanned Flight ops
- Testing Capability
- Workforce Development for UAS Industry

# QUESTIONS/DISCUSSION

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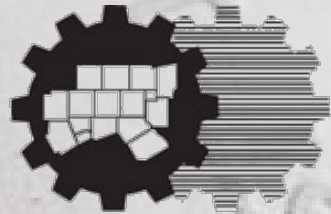
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# UAS Opportunities to Fill Mobility Gaps



North Central Texas  
Council of Governments



Unmanned Aircraft Systems  
Safety + Integration

**Dan Lamers, P.E. – Senior Program Manager**

# Mobility Gaps Where Technology Can Help

## Network Gap

Occurs in areas lacking roadway network infrastructure

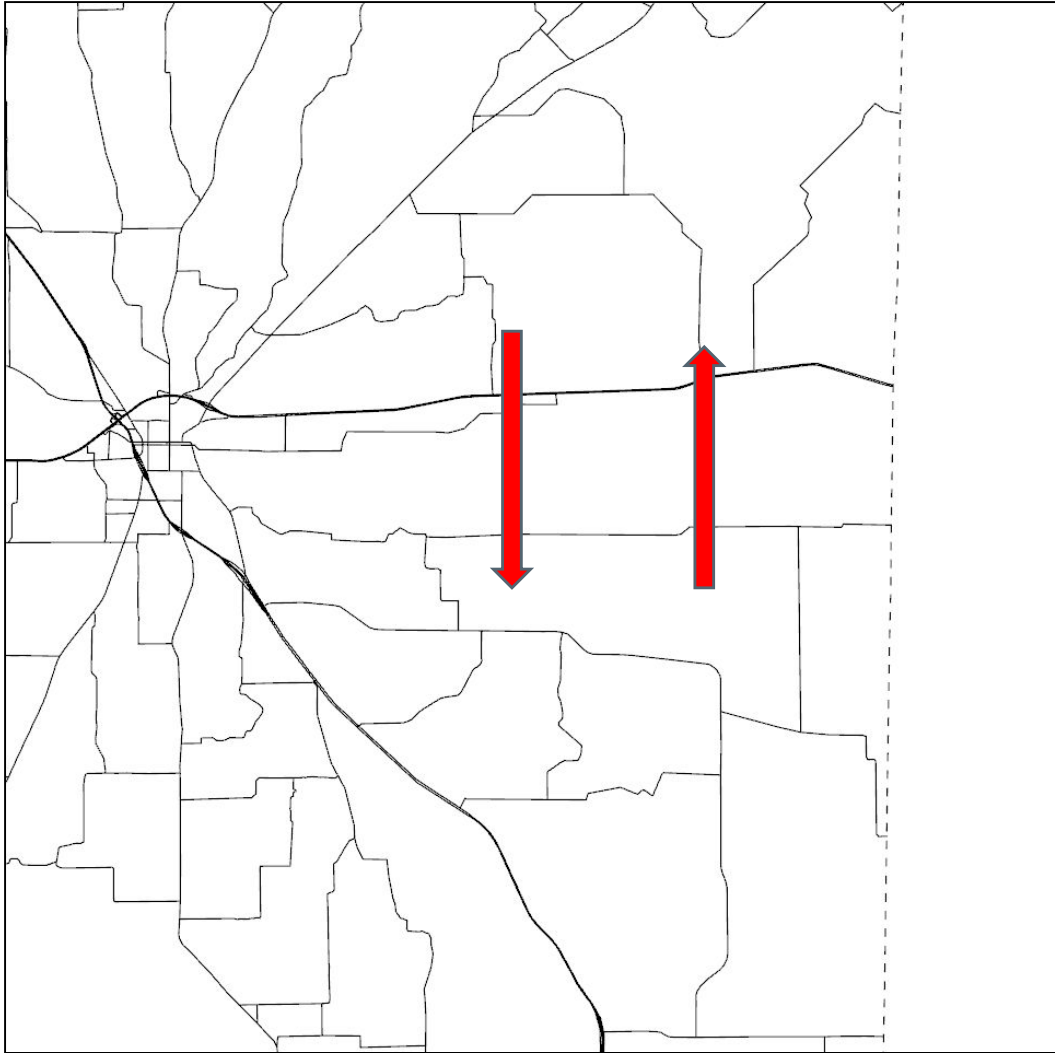
## Geographic Gap

Occurs in areas containing geographic obstacles such as lakes or unsuitable terrain

## Congestion Gap

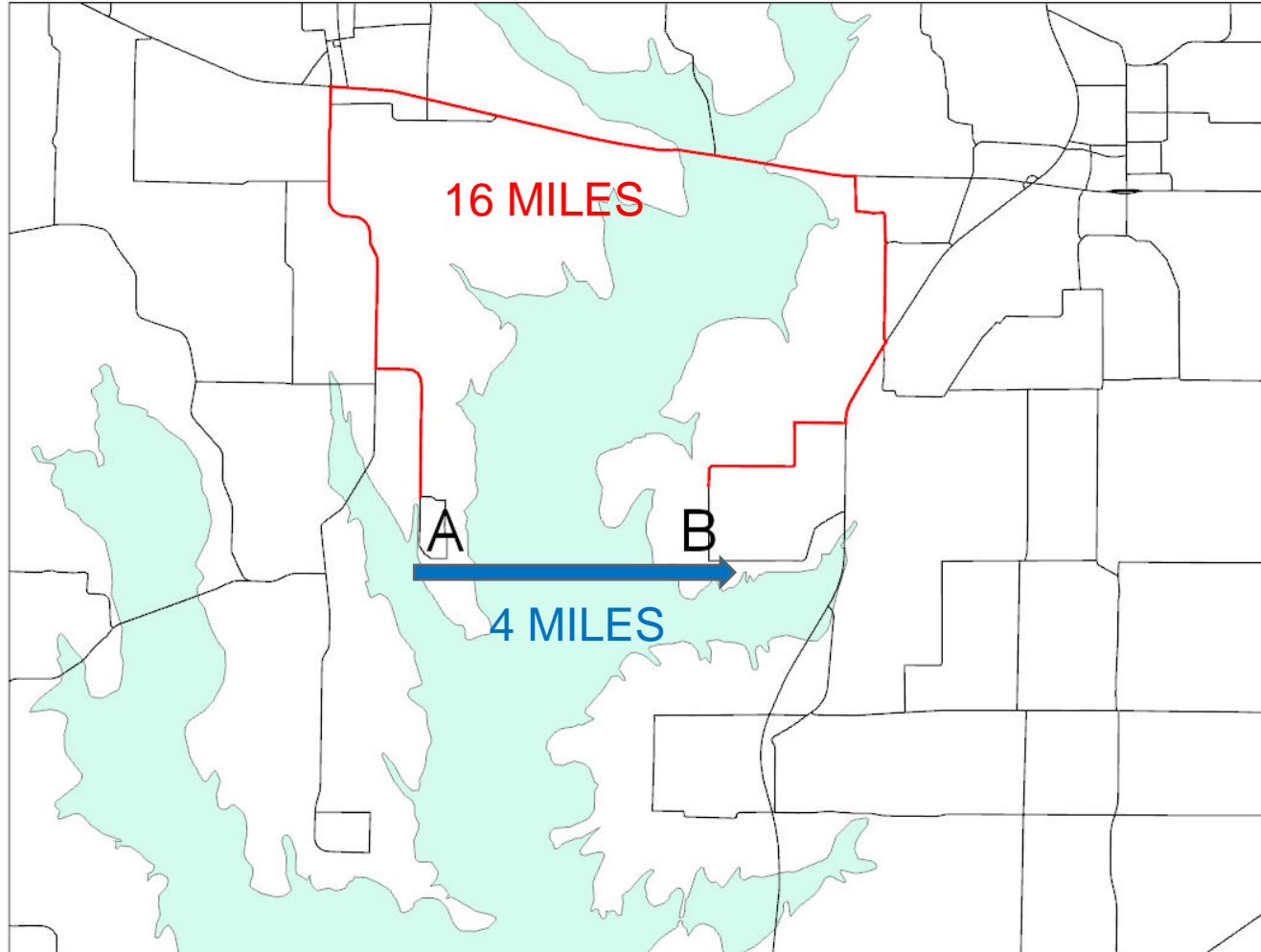
Occurs in areas that are heavily congested, causing drivers to seek alternate routes

# Network Gap



Lack of north/south  
network connections

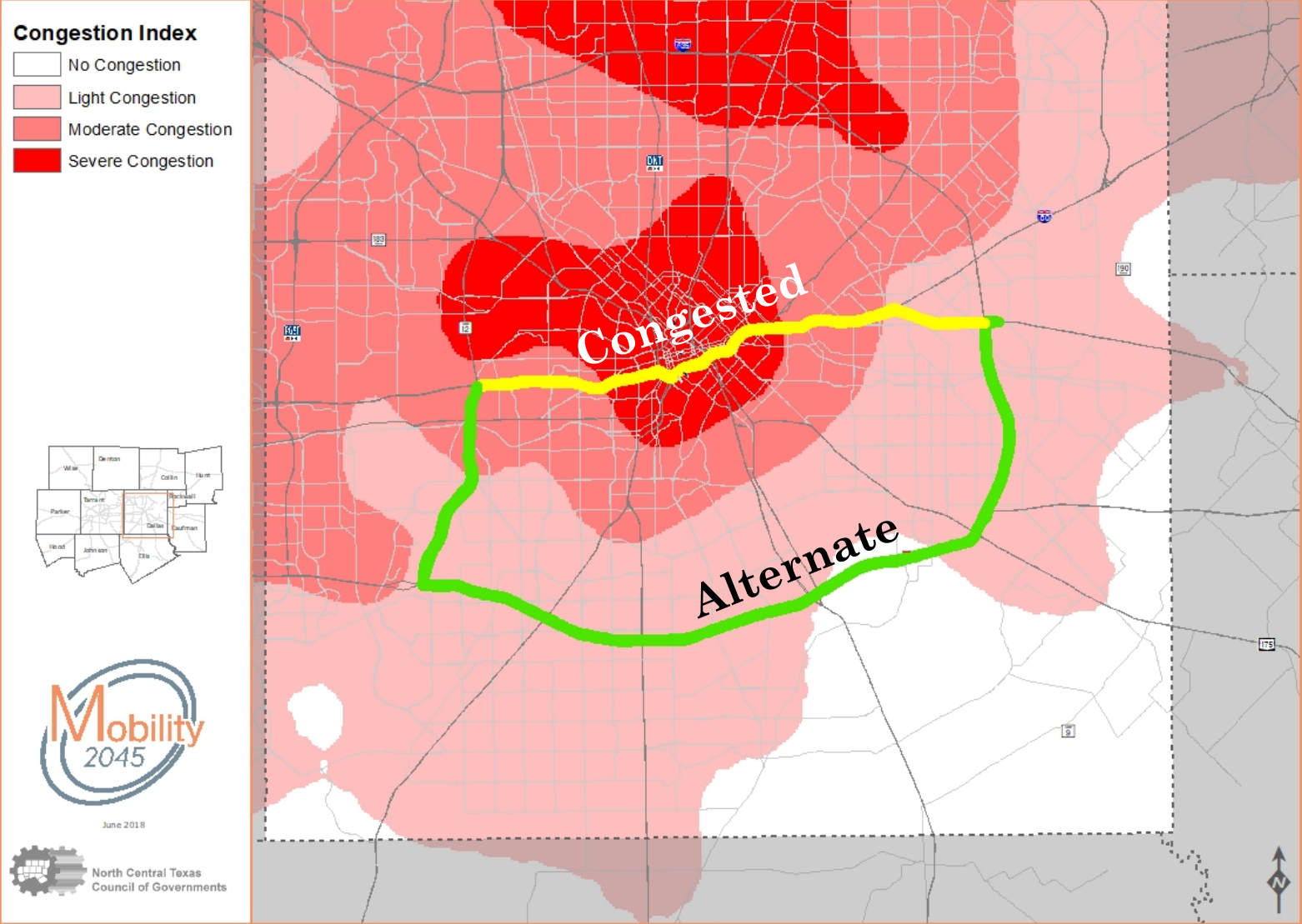
# Geographic Gap



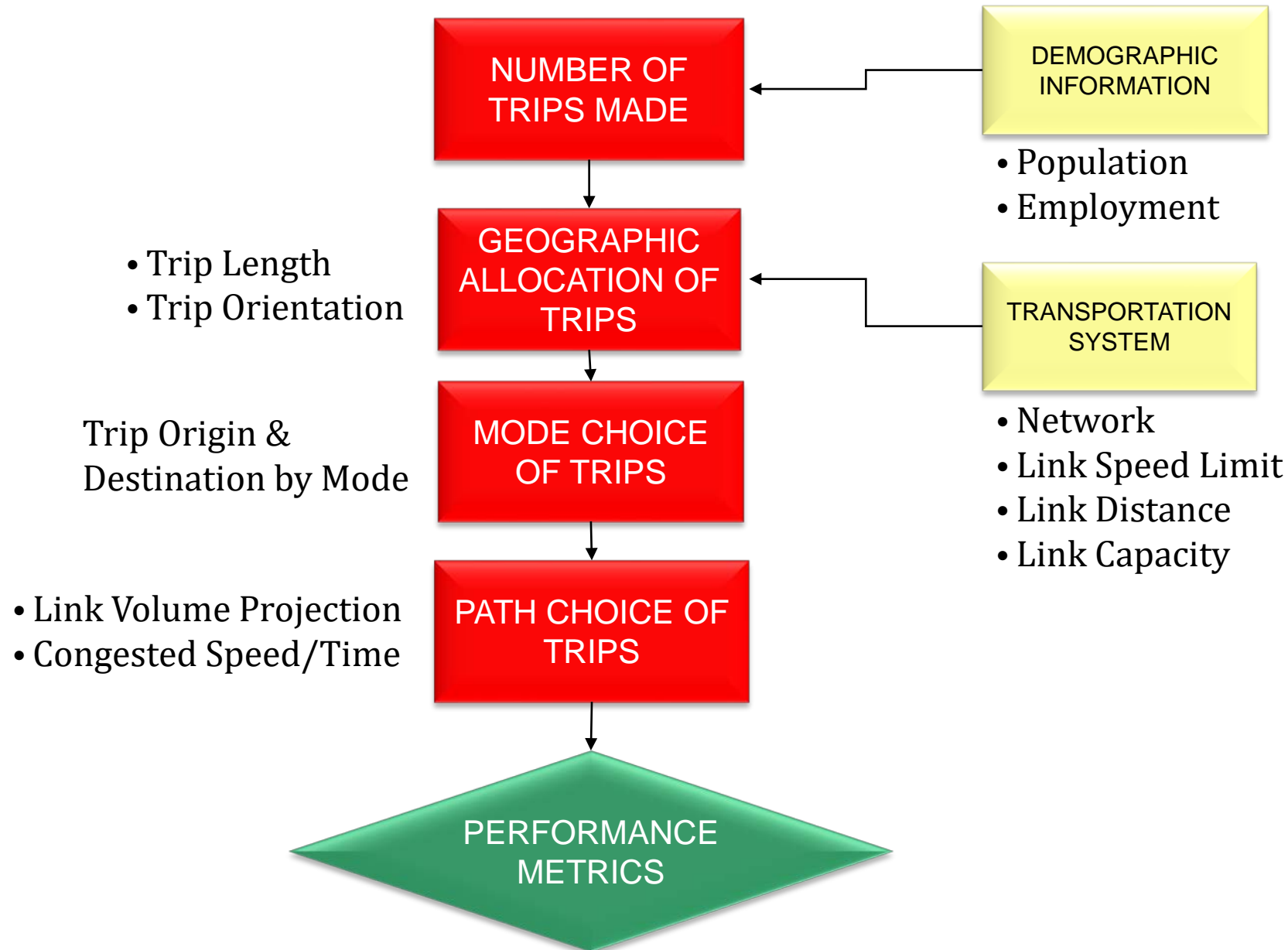
Lack of east/west connections, causing drivers to increase distance traveled by 12 miles

# Congestion Gap

Dallas County: 2018 Levels of Congestion/Delay



# Travel Demand Model



# Performance Measures

Roadway Volume Projections

Transit Ridership Forecast





Zone-to-Zone Travel Times

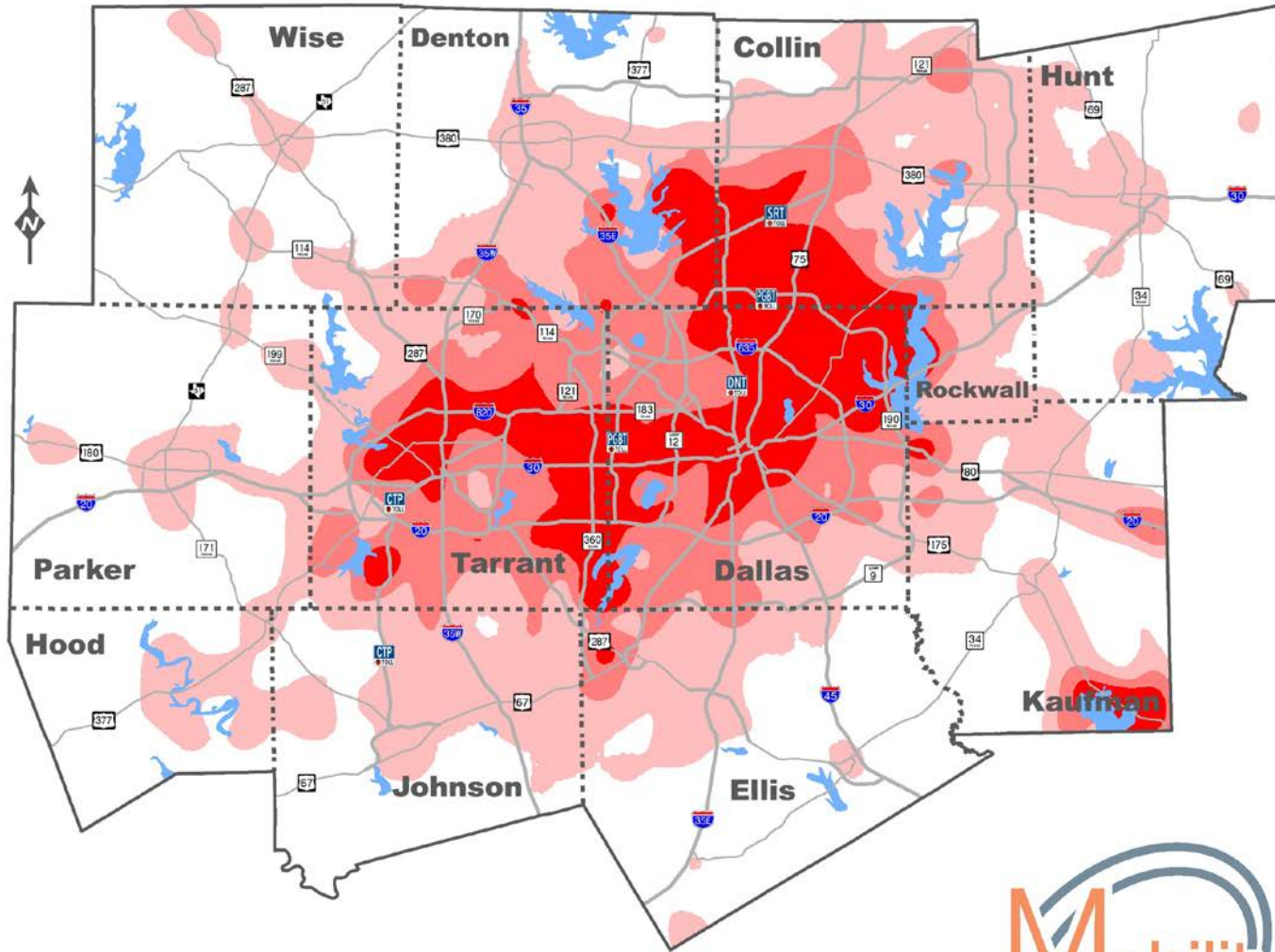
Link-to-Link Travel Distance & Time

Speeds Congested & Uncongested

Congestion Levels

# 2045 Levels of Congestion/Delay

- Congestion Index**
-  No Congestion
  -  Light Congestion
  -  Moderate Congestion
  -  Severe Congestion



**Cost of Congestion/Delay: \$27.2 billion**

Congestion Index is based on a percent increase in travel time.





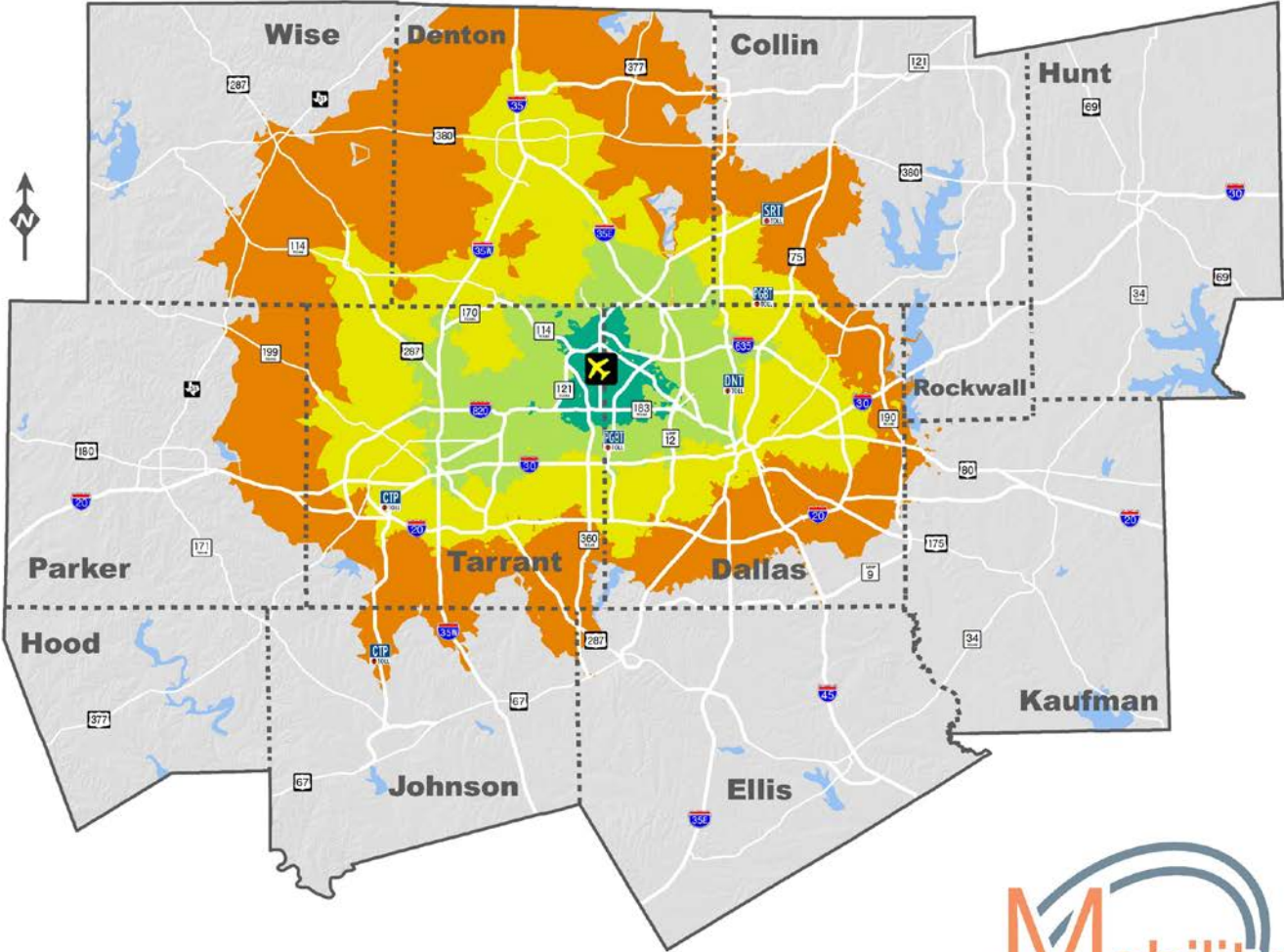
# Travel Time Contours: DFW Airport



DFW Airport

**Travel Times**

- Up to 15 Minutes
- Up to 30 Minutes
- Up to 45 Minutes
- Up to 60 Minutes

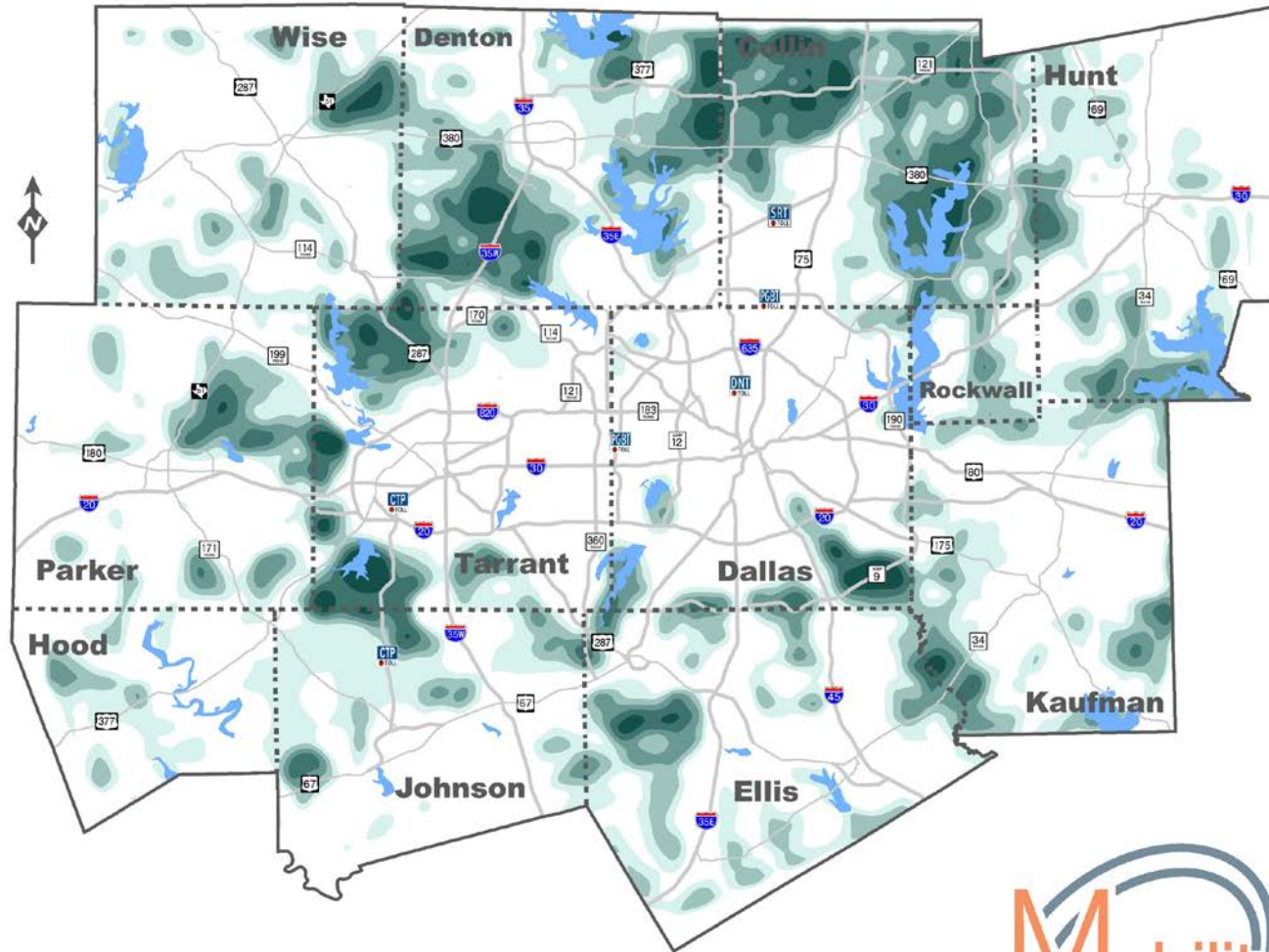
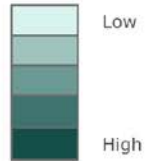


Contours based on modeled average peak period travel times in 2045.



# Existing Arterial Network Deficiency Areas

## Arterial Needs Analysis



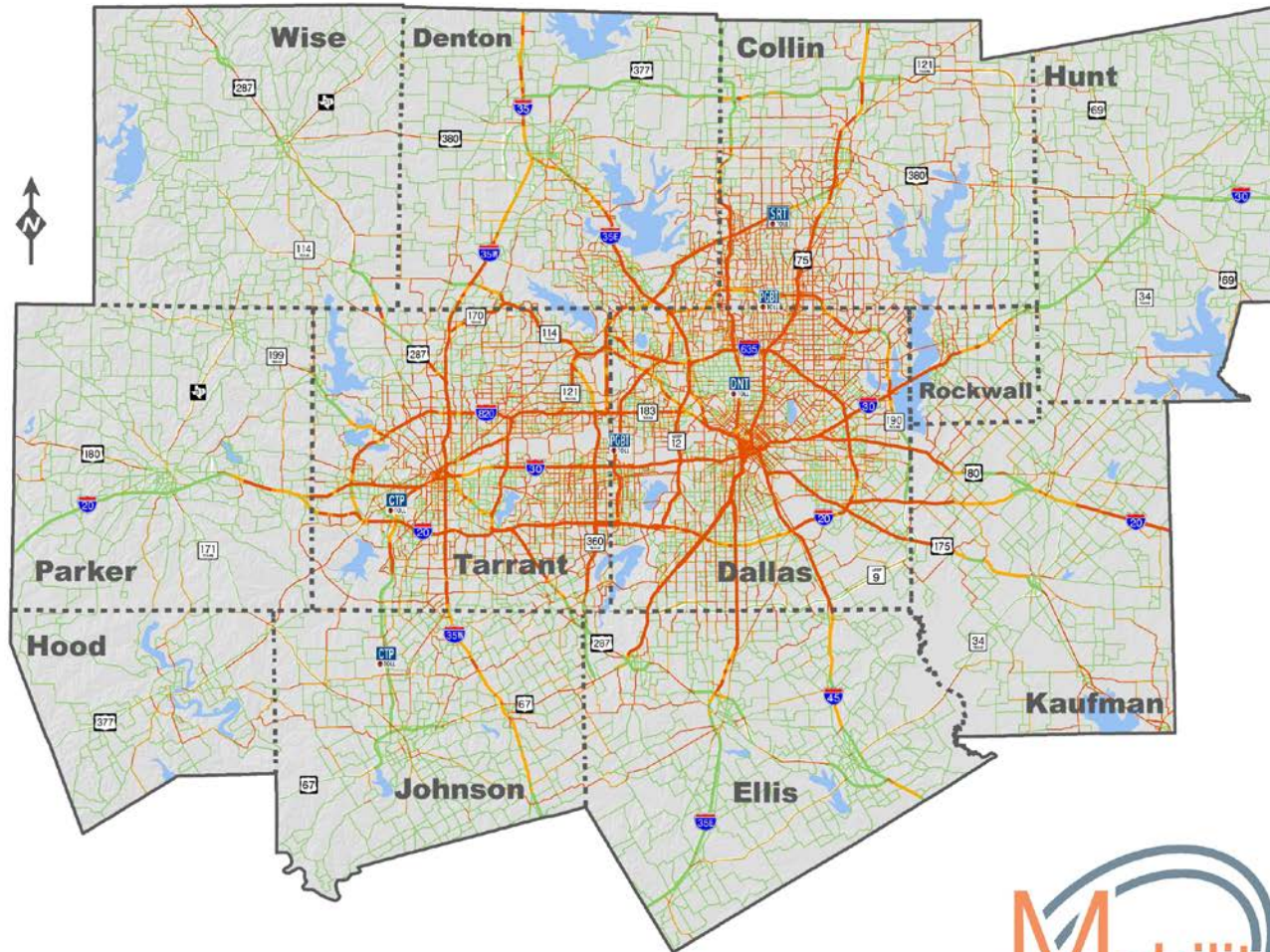
Shaded areas are not project recommendations. These areas have population/employment growth, congestion, and deficiencies in the existing arterial network that may warrant further study for arterial improvements. Higher arterial needs analysis scores depict areas of greater arterial need.



# 2045 Peak Hour Level of Service

## Level of Service

- ABC
- DE
- F



Dallas CBD



Fort Worth CBD



June 2018



# Next Steps

Identify network, geographic, and congestion gaps via **zone-to-zone** analysis using data derived from the travel demand model

## **Network/Geographic Gaps (Distance)**

- Identify the zones most impacted by circuitous paths
- Ratio of **Shortest Network Path/Straight-Line Path**

## **Congestion Gaps (Time)**

- Identify the zones most impacted by significant time delays
- Ratio of **Loaded Network Travel Time/Free Network**

### **Travel Time**

Stated another way... **Rush Hour Travel Time/3 AM  
Travel Time**

# Contacts

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# UAS Legislative Update

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NICHOLAS ALLEN

UAS SAFETY AND INTEGRATION TASKFORCE

NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

MARCH 25, 2019

# Bills of Interest - Unmanned Aircraft

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## Images

- **SB 59 (Zaffirini)**- Commercial delivery purposes
- **HB 2512 (Miller)**- Assessing unsafe environmental conditions
- **HB 2912 (Zerwas)**- Disaster preparation
- **HB 3164 (Clardy)**- 911 services or mapping project

## UAS Study

- **HB 2340 (Dominguez)** Creates a study for emergency and disaster management, response and recovery

# Bills of Interest - Unmanned Aircraft

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## Operations

- **SB 1701 (Whitmire) / HB 4084 (Walle)**- Restricts flight over, near schools
- **SB 2299 (Powell)**- Restricts flight over military installations, adds to current critical infrastructure in code
- **HB 3082 (Murphy) / SB 1996 (Birdwell)**- Adds 'criminal negligence' to code
- **HB 3494 (Cole)**- Restricts flight over commercial airports, adds to current critical infrastructure in code; restricts cities and counties from enforcing UAS ordinances



# Questions and Comments

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[www.nctcog.org/legislative](http://www.nctcog.org/legislative)

# North Texas UAS Safety and Integration Task Force



## Task Force Working Group Updates

### Working Group Leaders

Maggie Schuster – Education and Public Awareness

Michael Hill – Legislative

Wes Jurey – Training

Russel Julian – Integration

# Education and Public Awareness

## Prioritized Initiatives

- ▶ Know Before You Fly Workshops
- ▶ Public Outreach Strategy
- ▶ Outreach Events
- ▶ Bring Your Drone to the Park Day
- ▶ Outreach via Local Governments' Web/Social Media

# Education and Public Awareness

## How Can You Help?

1. Register with the North Texas Aviation Education Speakers Bureau to volunteer for outreach events
2. Help us with compiling 2019 Outreach Event List

# Legislative

## Prioritized Initiatives

- ▶ Provide comments for pending UAS Legislation
- ▶ Provide comments on Notice for Rule Changes from government
- ▶ Hold general informational sessions for legislature/policy makers

# Legislative

## How Can You Help?

1. Provide comments on pending legislation
2. Provide comments on FAA Notice of Proposed Rulemaking
3. Be available to attend legislative information sessions

# Training

## Prioritized Initiatives

- ▶ Meeting with FAA Regional Administrator
- ▶ Teacher/CTE Director Externships
- ▶ Create or endorse a pilot credentialing standard
- ▶ Create or endorse baseline training curriculum
- ▶ Survey regional stakeholders for employee demand
- ▶ Secure funding for Public Safety UAS Response Team (PSURT)

# Training

## How Can You Help?

1. Be available to attend legislative information sessions
2. Start thinking about providing Externships for CTE Directors/Teachers
3. Participate in employer survey effort



# Integration

## Prioritized Initiatives

- ▶ Urban Air Mobility Integration Study
- ▶ Coordinate with municipalities
- ▶ Designate viable test sites
- ▶ Find tech solutions for weather avoidance and detection
- ▶ Research tech solutions for remote ID

# Integration

## How Can You Help?

1. Air Taxi Manufactures provide a checklist of Infrastructure needs
2. If you represent a municipality that is interested in hosting testing, inform the working group leader

# What's Next

## Working Group Meetings – April 3

Education and Public Awareness, 9:00 am – 10:00 am

Legislation, 10:30 am – 11:30 pm

Training, 1:00 pm – 2:00 pm

Integration, 2:30 pm – 3:30 pm

# Questions?

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