Texas SMART (Safety Mobility Autonomy Research & Testing) Track

Ports to Plains Annual Conference

TxDOT Austin District – Mike Arellano, P.E., Deputy DE

April 27, 2023

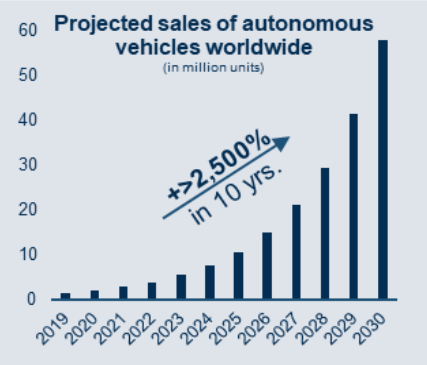
Mobility Trends and Disruptions

TEXAS SMARTTRACK

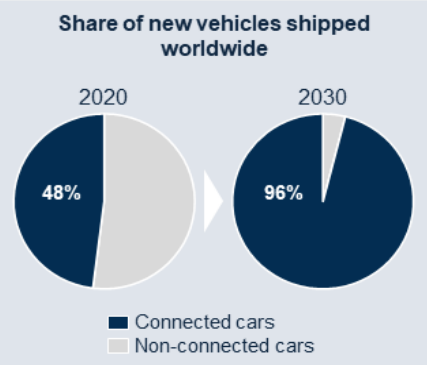
Mobility "Mega Trends"

Automation, Connectivity, Electrification, Sharing (ACES) Trends

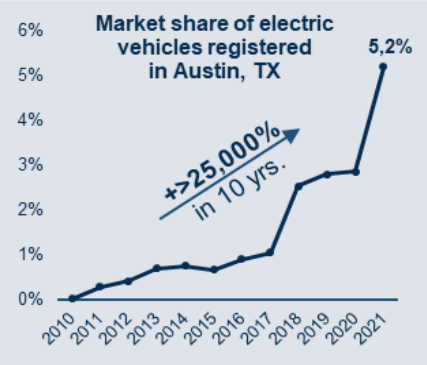
Automation



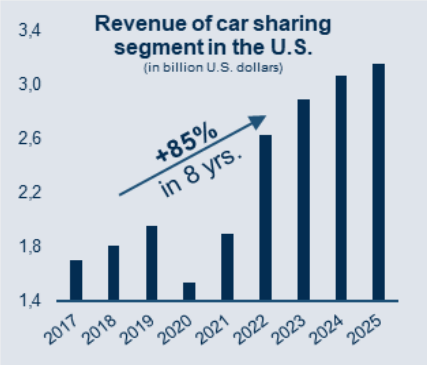
Connectivity



Electrification



Sharing



Mobility "mega trends" driven by the private sector lead to **increased testing needs, complexity in their validation methods and approval procedures**, and make it **difficult for the infrastructure provided by the public sector to catchup.**

Source: Statista, Austin Energy

Transportation Technology: Goals & Benefits

TEXAS SMARTTRACK

SAFETY **MOBILITY** **ECONOMY**

Technology: Unlocking Transportation Safety & Economic Benefits

Current situation

Fatal crashes in Texas (2021)

Fatalities	4,489	Cost	$ 112 billion
Incapacitating Injuries	19,448		
Non-Incapacitating Injuries	82,548		

Fatal crashes in US (2019)

39,500 – Fatalities (2019)

Fatalities and Severe Injuries — Cost — [1]$ 1.37 trillion

Congestion cost Texas (2020)

Roadway user delay
Wasted fuel — Cost — $ 13.3 billion

Problem

94% Of crashes are caused by **driver error (Source: NHTSA)**

Adoption of safer AV operation is hindered by:

- **Vehicle limitations**
- **Infrastructure limitations**

Opportunity

Solution: Texas SMART Track

1. **Safe** and **controlled environment** to test and evaluate technologies
2. Develop standards and specifications as **regional certification center**
3. Enable and optimize AV operation with a **public data feed** or Application Programming Interface (API)
4. **Accelerates** the **delivery** of the most advanced technology solutions on the market to public roadways

Potential impacts

***90%** **Reduction of fatal crashes**
*is possible when technologies like **infrastructure enabled connected and automated driving** are mature and widely implemented; studies show.*

>4,000 **Fatalities avoided**
Per year

>$94B **Yearly savings**
of indirect cost

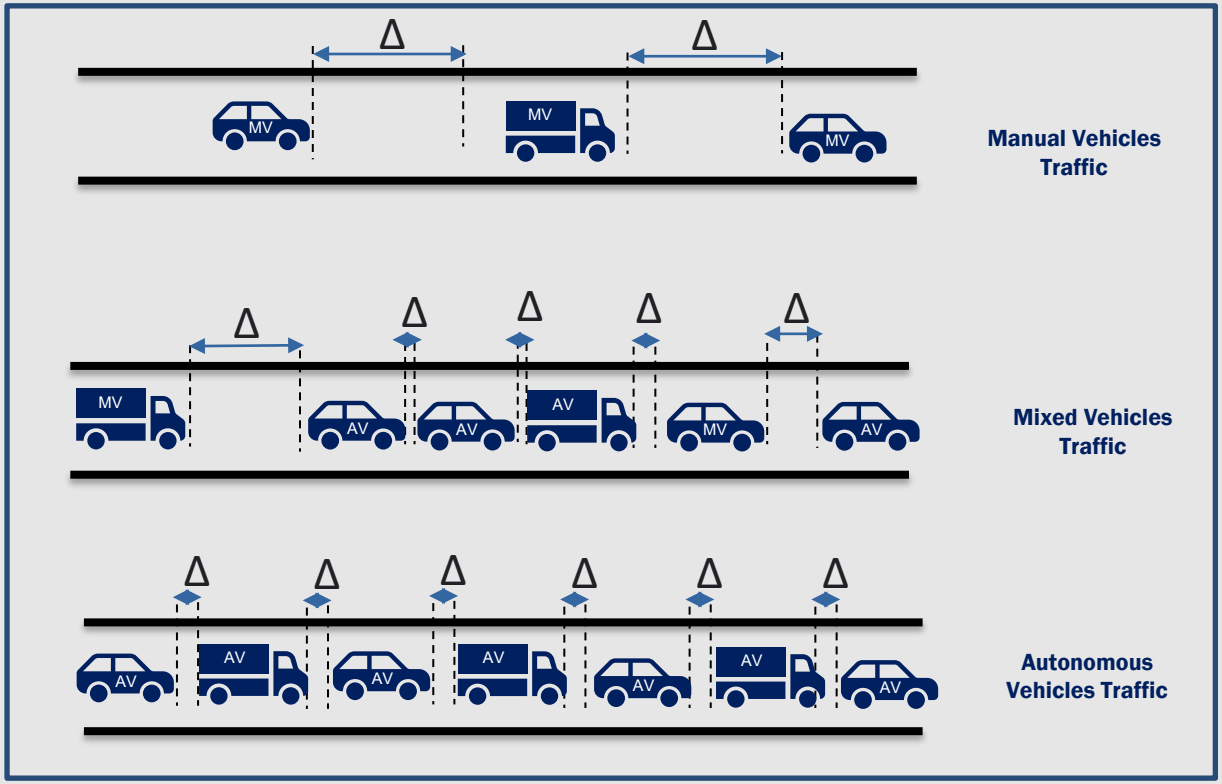
>$26M **Yearly savings**
of insurance damage claims to TxDOT infrastructure

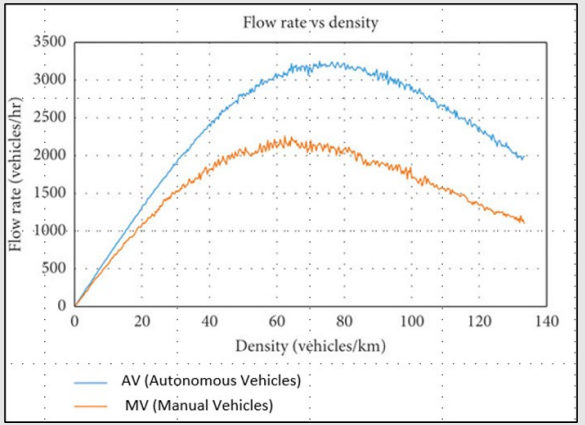
Substantial reduction of emissions
through reduced congestion and adoption of electric AVs

*Based on projection from McKinsey Study

1. NHTSA Report No. DOT HS 813 403

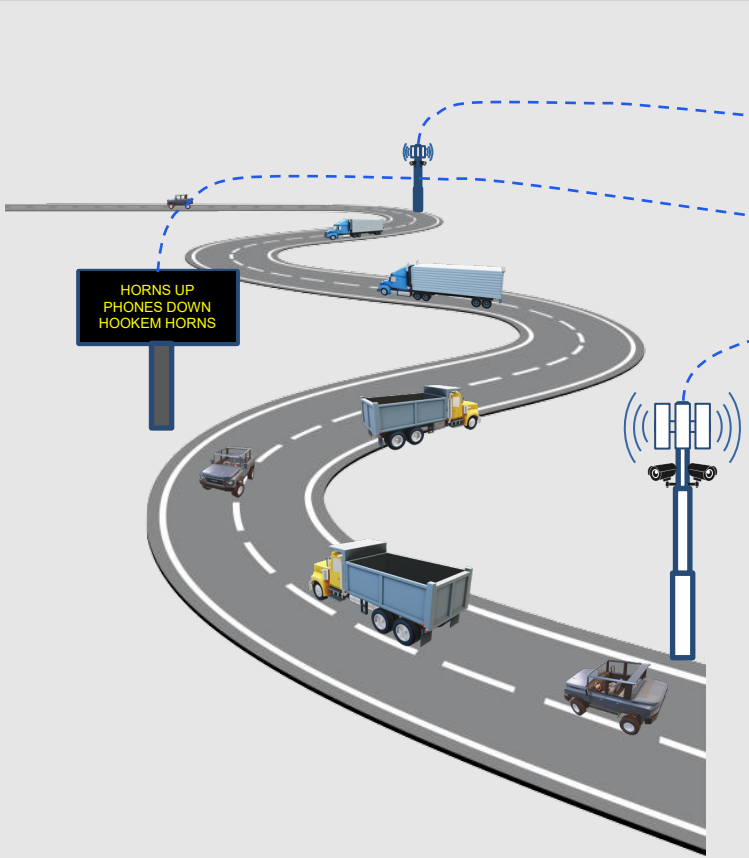
Technology: Mobility & Economic Benefits





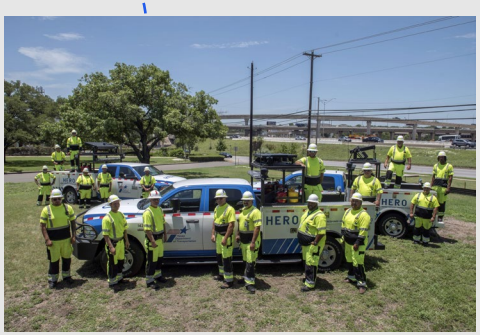
- **Optimized Capacity**
- **Reduce Congestion**
- **Reduce Travel Time**
- **Promote Economic growth**
- **Reduce Emissions**

Technology (Today): Mobility & Economic Benefits

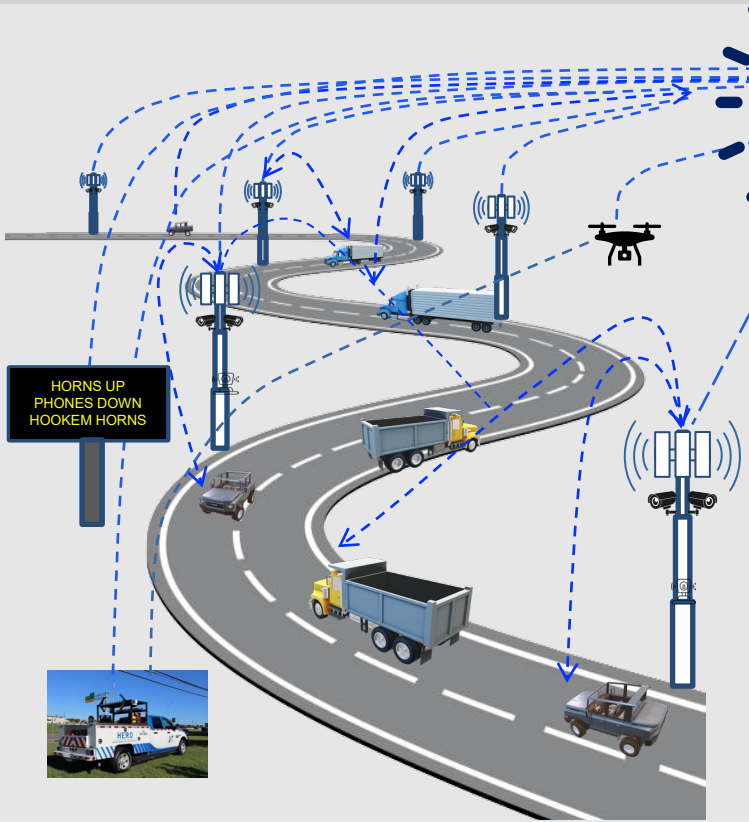


Traffic Management Center (TMC)
CTECC (Austin)

Emergency & Operations Partners



Technology (Future): Mobility & Economic Benefits



Traffic Monitoring Center
Common AI Platform

Emergency & Operations Partners

CAMPO
CAPITAL AREA METROPOLITAN PLANNING ORGANIZATION

Edge computing
< 1 sec.

REALTIME HIGH RES INTEL

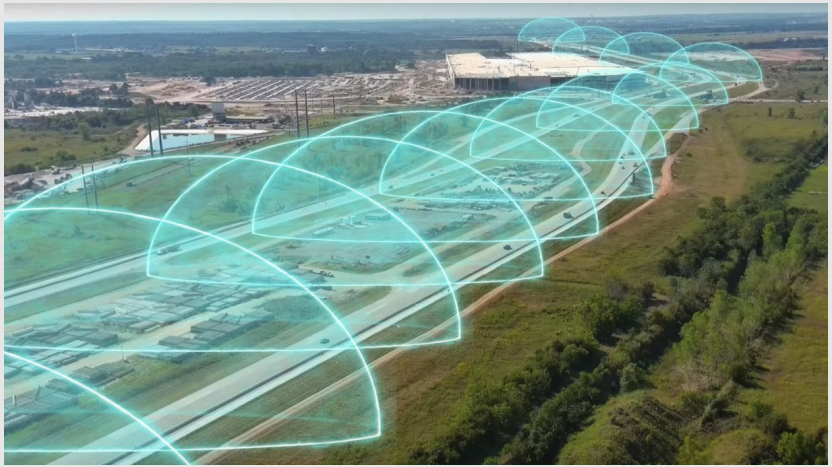
- Pedestrian alert
- Wrong way driver alert
- Incident notification
- Signal timing
- Work Zone
- Weather

Cameras / Sensors / UAV

Where are we doing today?

- Develop a framework for integrated digital infrastructure to deploy and test a vehicle-to everything (V2X) data ecosystem
- Define the technologies needed to enable CAV along other corridors in the region
- Provide vehicles with data about driving conditions prior to reaching locations
- Supporting improved emergency response times to vehicle incidents enabled by an infrastructure enabled roadway technology platform.
- Turnkey project for Contractor to do all installation, maintenance and services
- Innovative Zero Dollar best value procurement

SH 130 CAV Project will be the first connected freight corridor in Austin area



Where are we doing today?

- **REKOR Command** – AI-driven platform providing Transportation Management Centers a rapid and holistic view of what is happening on the roadways.
  - Adds digital layers fed from multiple real-time data sources
  - Provides actionable alerts for more incidents, at greater speed

Early Benefits of AI: Rekor Command (March to August)

34 %
Rekor uniquely identified incidents

11 min
median faster detection of incidents

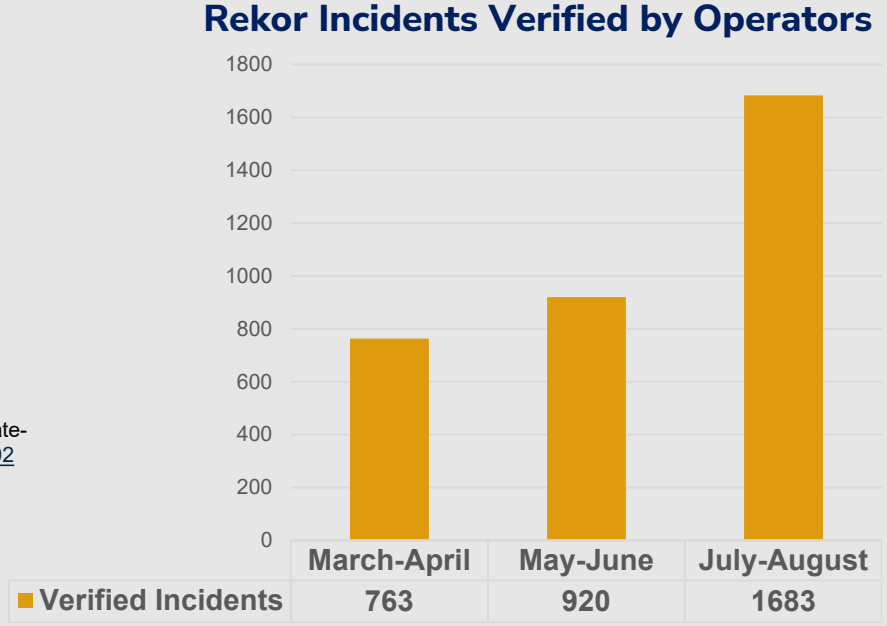
70 %
Of new incidents were verified by operators

Potential Impact

- 29% reduction of chances of secondary crashes *

44 min avg faster traffic return to normal **

$8M reduction in direct cost to TxDOT Austin /YR **



*Goodall, N. J. (2017). Probability of Secondary Crash Occurrence on Freeways with the Use of Private-Sector Speed Data. Transportation Research Record, 2635(1), 11–18. https://doi.org/10.3141/2635-02

**"Federal Highway Administration Focus States Initiative: Traffic Incident Management Performance Measures Final Report." *Introduction - FHWA Focus States Initiative: Traffic Incident Management Performance Measures Final Report - FHWA Emergency Transportation Operations*, ops.fhwa.dot.gov/publications/fhwahop10010/sec1.htm. Accessed 28 Aug. 2023.

***The Economic and Societal Impact of Motor Vehicle Crashes, 2010 (Revised)*, crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812013. Accessed 28 Aug. 2023.

Real-Time AI Generated Communication

Mobility Authority reposted

Mobility Authority TIM Center
@RMATIMCenter

Major crash 183A Toll frontage at Hero Way has all lanes closed. Traffic is being diverted onto the tolled lanes at this time. #ATXTraffic

How do we implement transportation technology?

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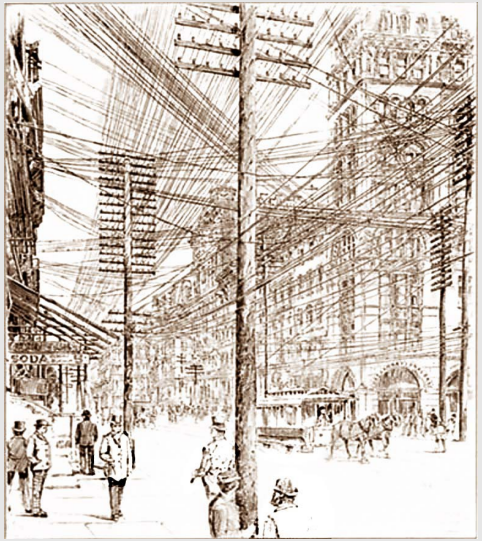
Solution ↔ Standard ↔ System



1879 1890 1882

Transportation Technology Implementation?

TEXAS SMARTTRACK

Solution ↔ Standard ↔ System

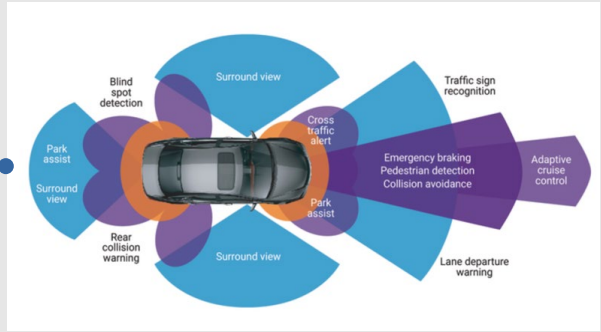
Cameras
Sensors
UAV

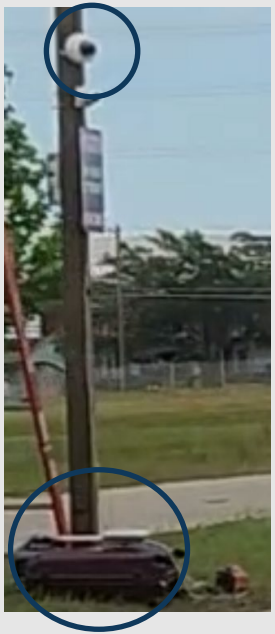
Edge computing

REALTIME HIGH RES INTEL

- Pedestrian alert
- Wrong way driver alert
- Incident notification
- Signal timing
- Work Zone
- Weather

CV2X





Regional Approach to Technology Implementation

TEXAS SMARTTRACK

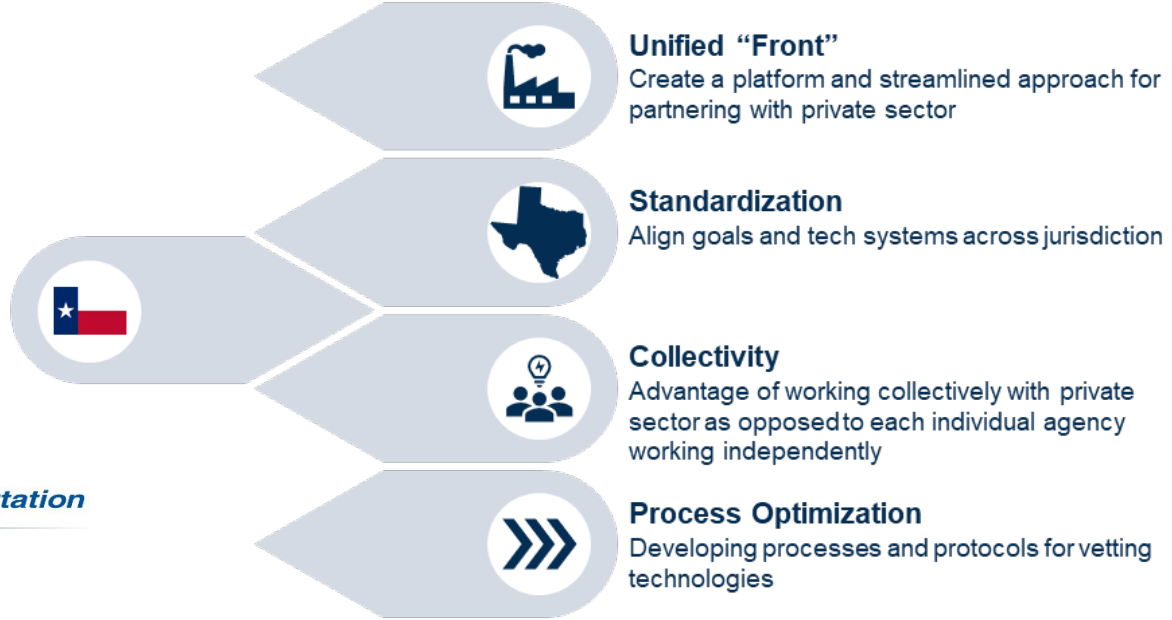
SmartTrack Concept's Implications: Regional Approach

CAMPO
CAPITAL AREA METROPOLITAN PLANNING ORGANIZATION

Texas Department of Transportation

Collective Regional Approach

Alignment of regional goals, systems and resources for a standardized customer experience within Texas without interruptions between services



Unified "Front"

Create a platform and streamlined approach for partnering with private sector

Standardization

Align goals and tech systems across jurisdiction

Collectivity

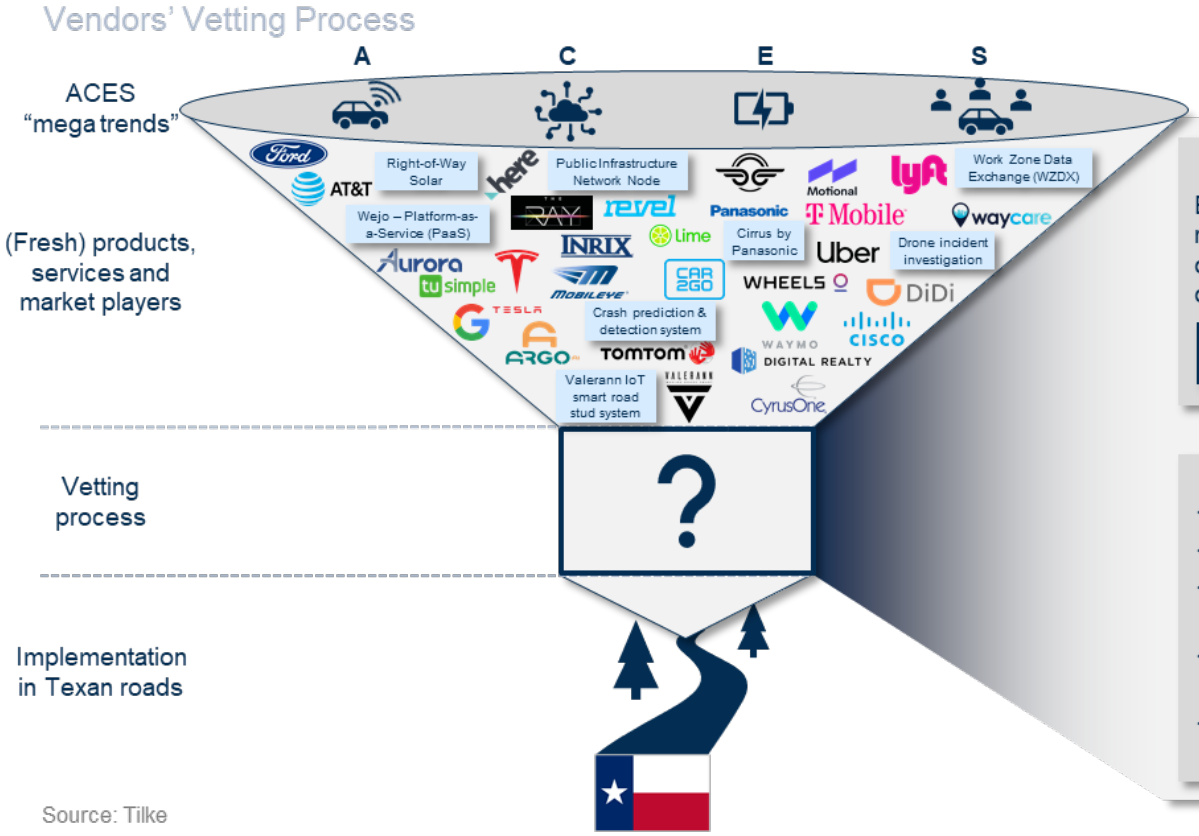
Advantage of working collectively with private sector as opposed to each individual agency working independently

Process Optimization

Developing processes and protocols for vetting technologies

Source: Tilke

Mobility Trends and Disruptions



Key Challenge

Ensure **regional interoperability** following standard requirements and **maintain transparency** while leveraging only the **most promising technologies** for the improvement of TxDOT's main goals in Texan local to interstate roads:

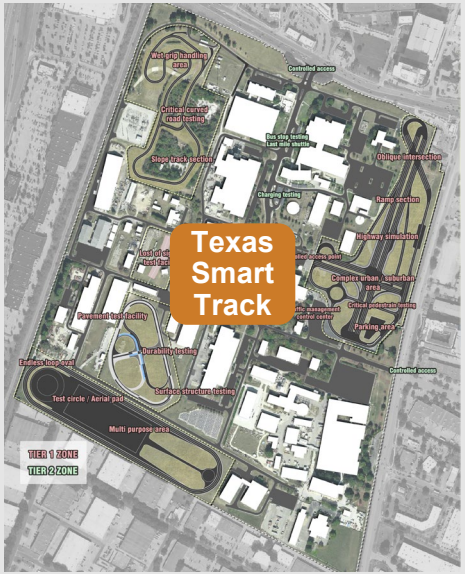
Traffic safety | **Traffic operations** | **Traffic management**

SmartTrack solution

- ✓ Keep Texas at the forefront of mobility innovation
- ✓ Standardize vendors' vetting process
- ✓ Establish data platform to share with cities, counties and state agencies
- ✓ Create a sustainable method to react towards future mega trends
- ✓ Collaborate with the private sector to speed up mobility innovations

Public Driven Project

SmartTrack Concept's Implications on Agencies' Objectives



TxDOT leads innovation in the mobility industry, inviting the **private sector to the test site** to **demonstrate its capabilities in real-life scenarios.**

TxDOT

Connecting you with Texas and improving traffic safety, operations and management

CAMPO

Improve mobility, and ultimately, quality of life equally across all demographics

The University of Texas at Austin

High impact research in the area of Connected and Automated Vehicles and Smart Infrastructure

Central TX Reg. Mobility Authority

Enhance life quality by evolving, engaging with communities and protecting the environment

Source: Tilke

1. Operating Standards

Cameras
Sensors
UAV

Edge computing

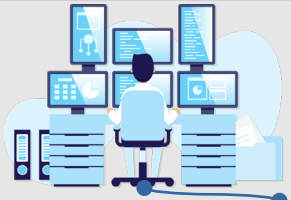
REALTIME HIGH RES INTEL

- Pedestrian alert
- Wrong way driver alert
- Incident notification
- Signal timing
- Work Zone
- Weather

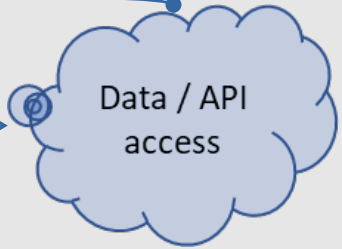
5G

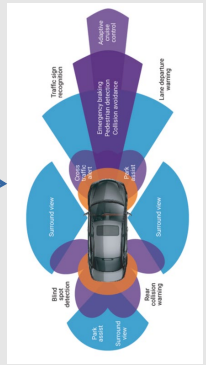
CV2
X

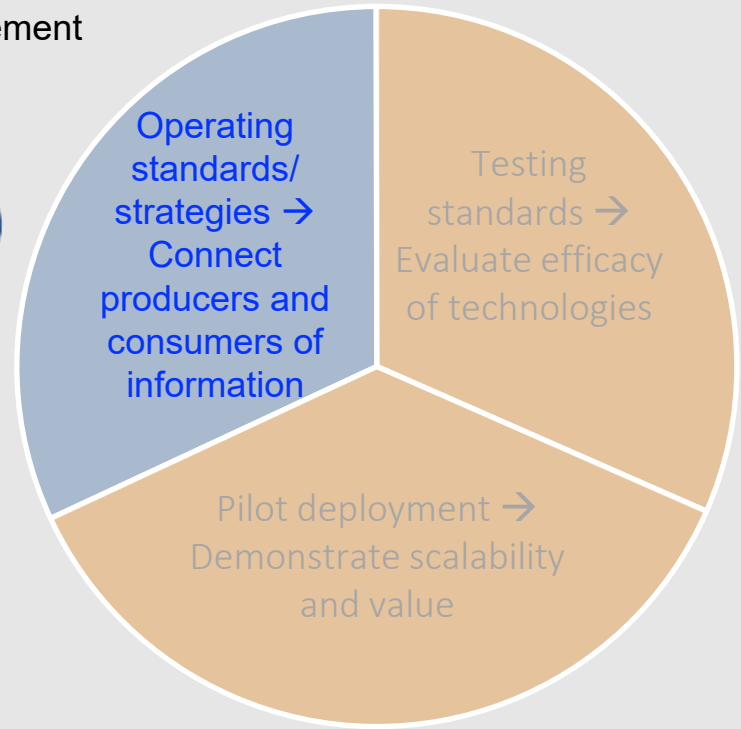
OFC



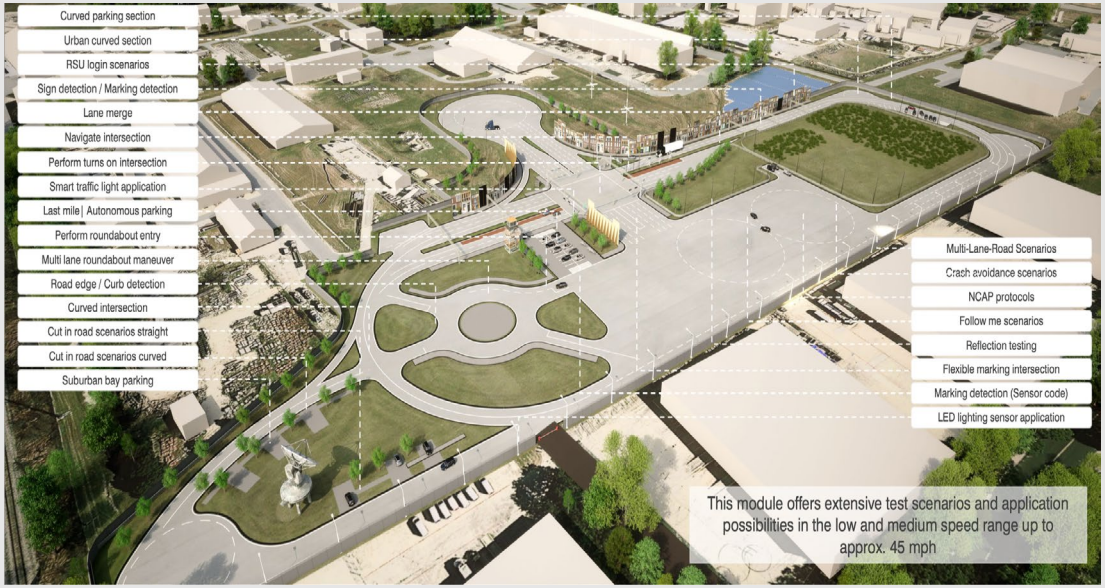
AI Traffic
Management

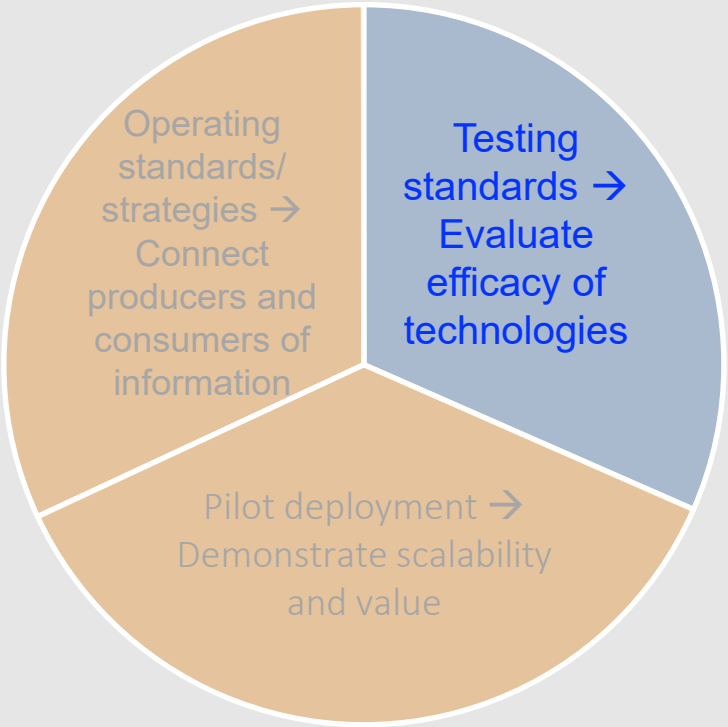




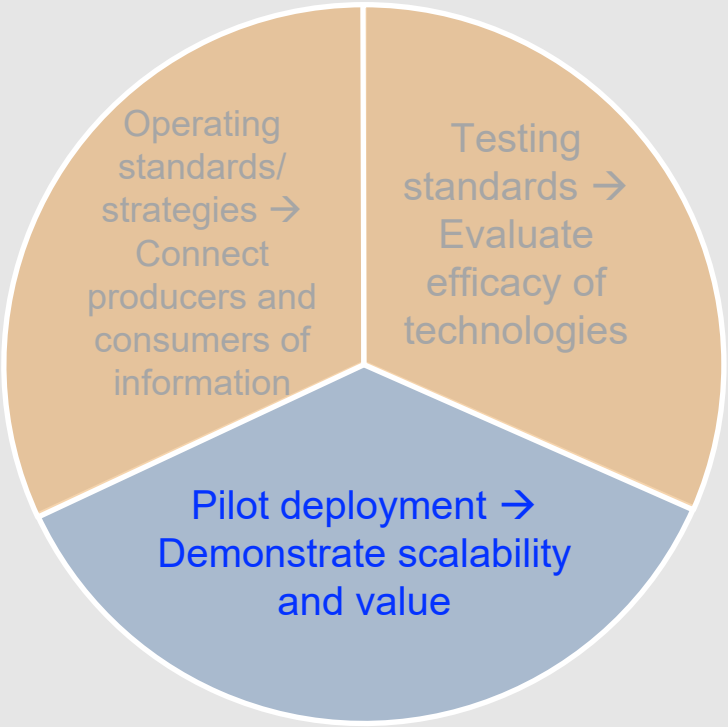


2. Testing Standards





3. Pilot Deployment



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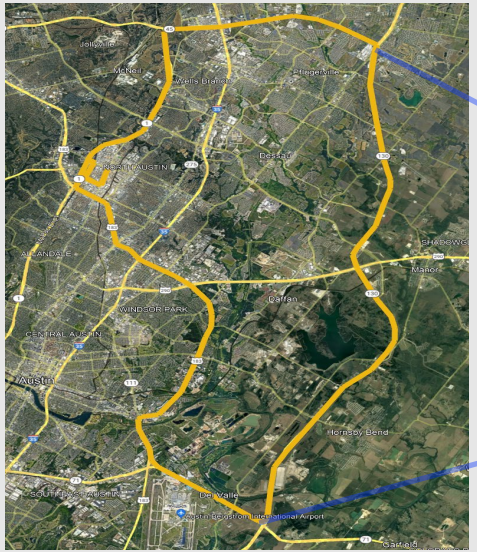
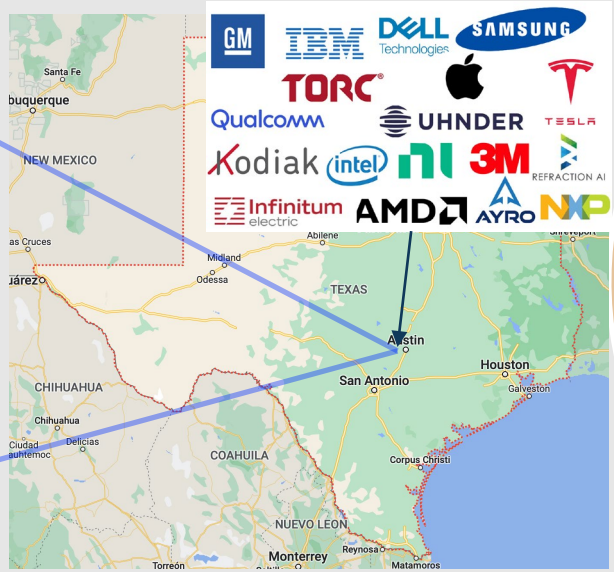


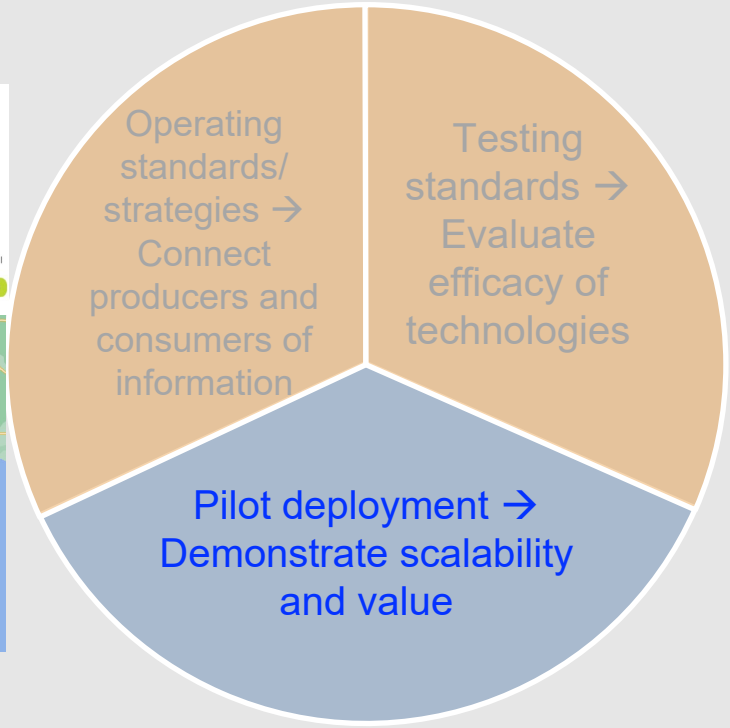


TEXAS The University of Texas at Austin

Texas Department of Transportation

CAMPO Capital Area Metropolitan Planning Organization

Central Texas Regional Mobility Authority



Overview Texas SMART Track

Texas SMART Track will boast a state of-the-art testbed and a broad portfolio of enhancing and complementing offerings tailored to the requirements of all user groups.

Tier 1 – closed testbed

Tier 2 – semi-open testbed

Tier 3 – open testbed

Testbed

Real estate

Workshops

Storage & garages

Offices

Infrastructure

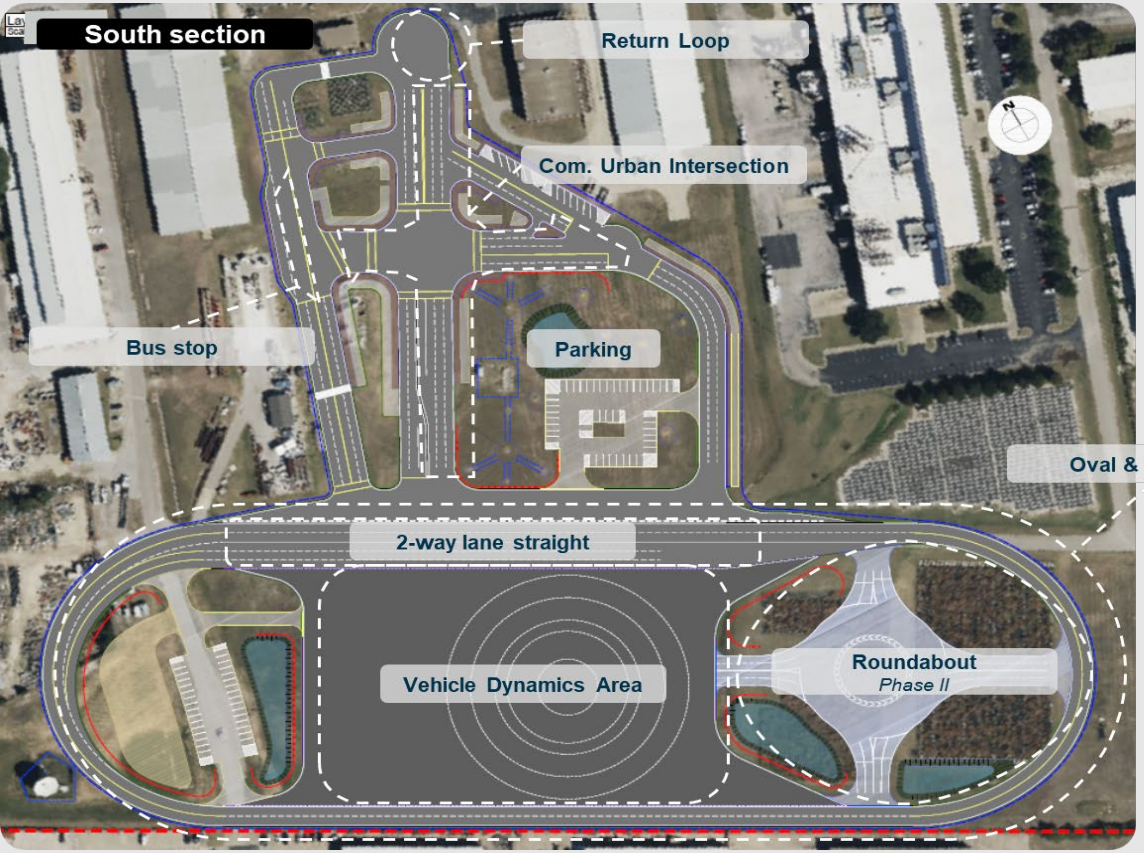
ITS Poles

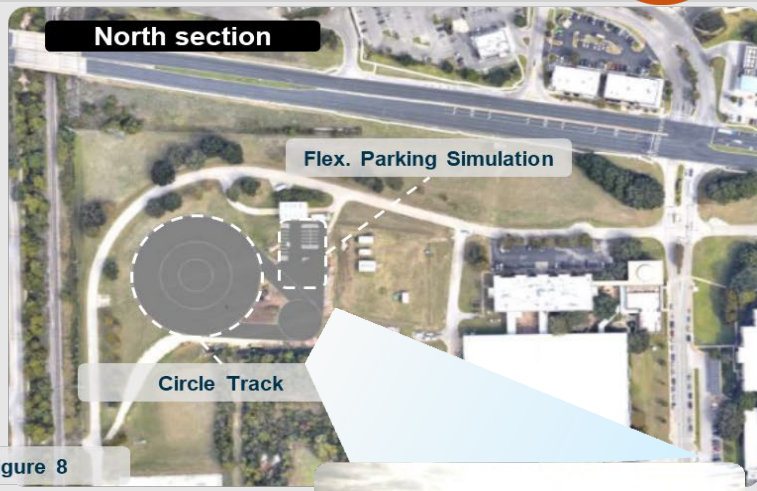
Charging infrastructure

Lighting

Digital twin

Texas SMART Track – TIER I





Facility rendering

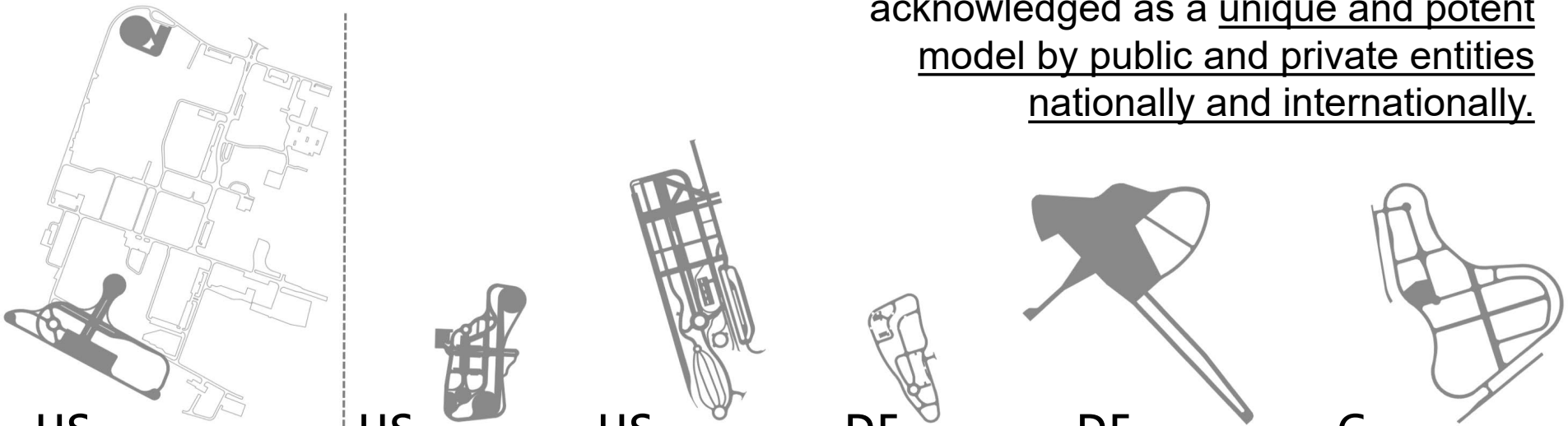
Facility rendering

Benchmarking and Business Plan

Pickle Research Campus

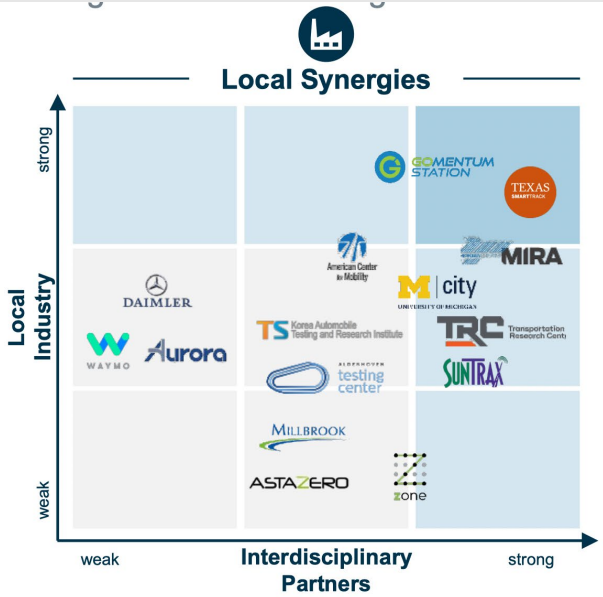
Comparing sizes of existing AV test tracks

Our three tier layout has been acknowledged as a unique and potent model by public and private entities nationally and internationally.



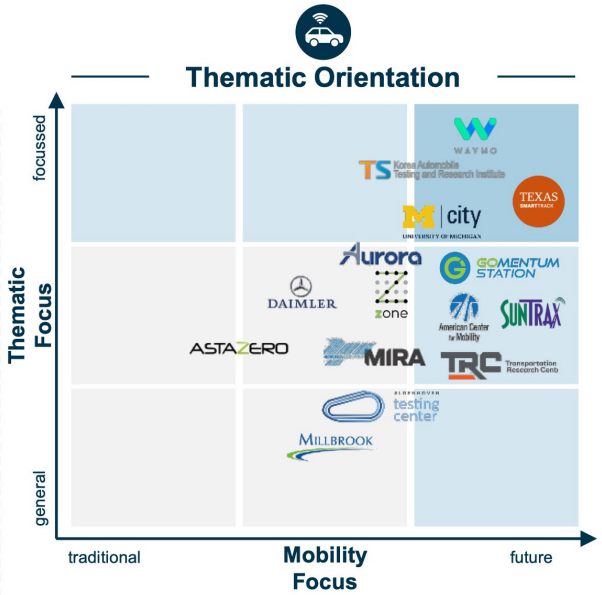
US	US	US	DE	DE	G
Pickle Research Campus Austin | USA	M-City Michigan | USA	FDOT Suntrax PG | USA	Daimler City Grid | GER	BERTHA Test Grid | GER	MIRA PG City Grid | UK
With the Tier 1/2 concept the PRC is a compatible large testing facility for low and mid speed testing profiles	Combined module with TCU for LTE based communication (uU) & modem for C-V2X based direct communication (PC5)	The Suntrax proving ground in Florida is designed as a one shop stop for testing AV vehicles along the entire V-model	The Daimler City Grid focusing on last mile testing scenarios mainly for vehicle development without infrastructure	The BERTHA test area is a large VDA focusing on early prototyping and the development of AV function under idealized conditions	The Mira PG offers a large city grid with a high speed profile for mid-speed scenarios between 30-60 mph including rural road conditions

Benchmarking and business plan



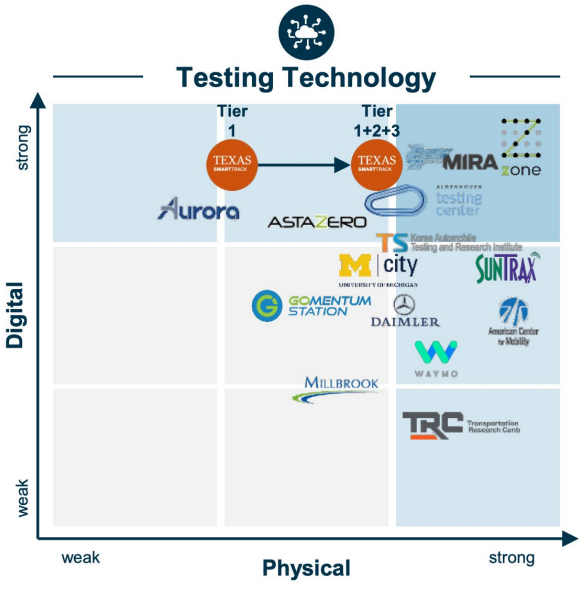
Local Industry: resident industry from the automotive sector
Interdisciplinary Partners: diversity of partners involved in project

Texas SMARTTrack benefits from **strong economic environment** of Austin as well as the **interdisciplinarity** of involved stakeholders



Thematic Focus: variety of testing capab. for different mobility technol.
Mobility Focus: Future orientation of the testing infrastructure

Texas SMARTTrack stands out due to the focus on **infrastructure** technology and **autonomous driving** and future viability of these areas



Digital: extent of available digital testing infrastructure
Physical: extent of available testing infrastructure

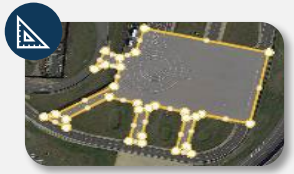
Due to limited physical capacities, Texas SMARTTrack can also differentiate itself through **digital offerings**

Source: Mücke Roth & Company

13

Pricing Methodology

Benchmarks



Price in USD / day	÷	Area in sqm.
M city	7,505 USD	42,000 sqm.
	5,000 USD	19,000 sqm.
ITTC	4,500 USD	157,500 sqm.
	7,200 USD	40,000 sqm.
UTAC	6,212 USD	11,000 sqm.
MIRA	3,350 USD	4,400 sqm.

Comparable ratios:
Non-profit: 0.163 USD / sqm.
For-profit: 0.66 USD / sqm.

Expert Validation

Industry expert interviews

MÜCKE ROTH

Tilke ENGINEERS & ARCHITECTS

Qualitative factors
- Location
- Module quality
- Size
- Constr. cost
- Objective
- …

Adjusted ratios:
North: 0.3 USD / sqm.
South: 0.18 USD / sqm.

Pricing TST

Pricing SMARTTrack

North:
2,700 USD

South:
8,000 USD

Financial Performance

Assumptions

Usage split

30%	30%	40%

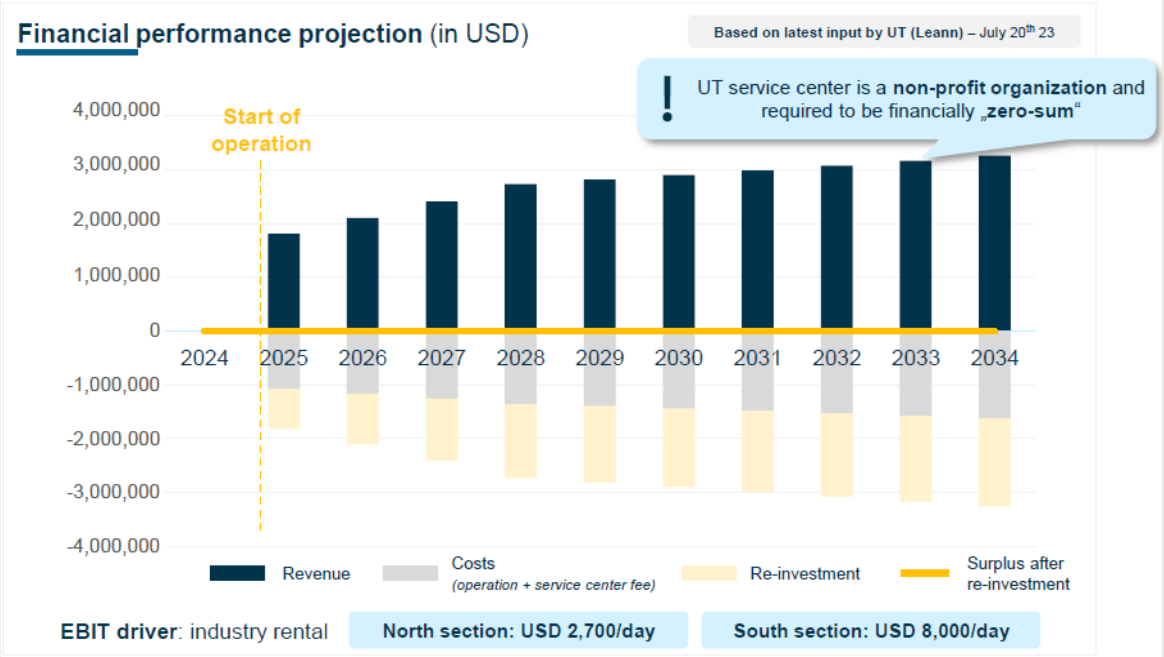
Ramp-up

Year	Utilization
1	70%*
2	80%
3	90%
4	100%
5 & ongoing	100%

Operations

300 Operating days/ year	50 Operating nights/ year

With an industry utilization of 40%, TST revenue will cover the operating costs and re-investment for new uses cases and upgrading digital infrastructure.



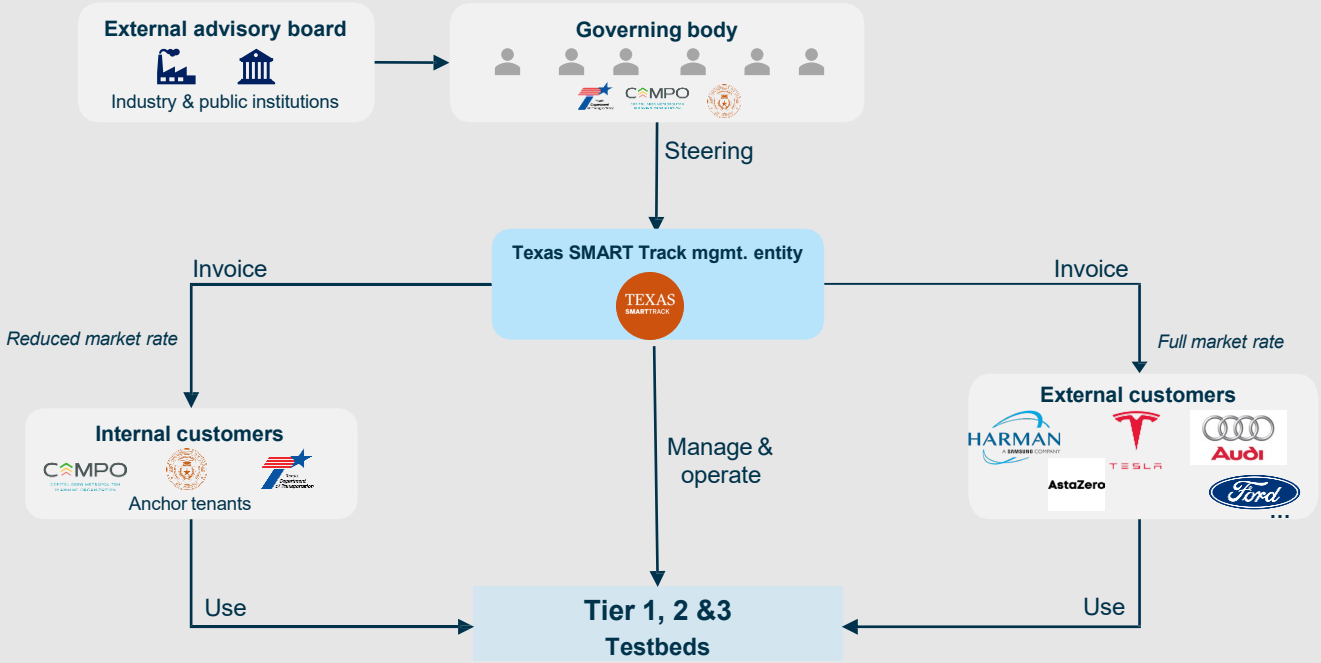
* high utilization start due to existing LOIs with industry partners & high research interest

Texas SMART Track – Funding

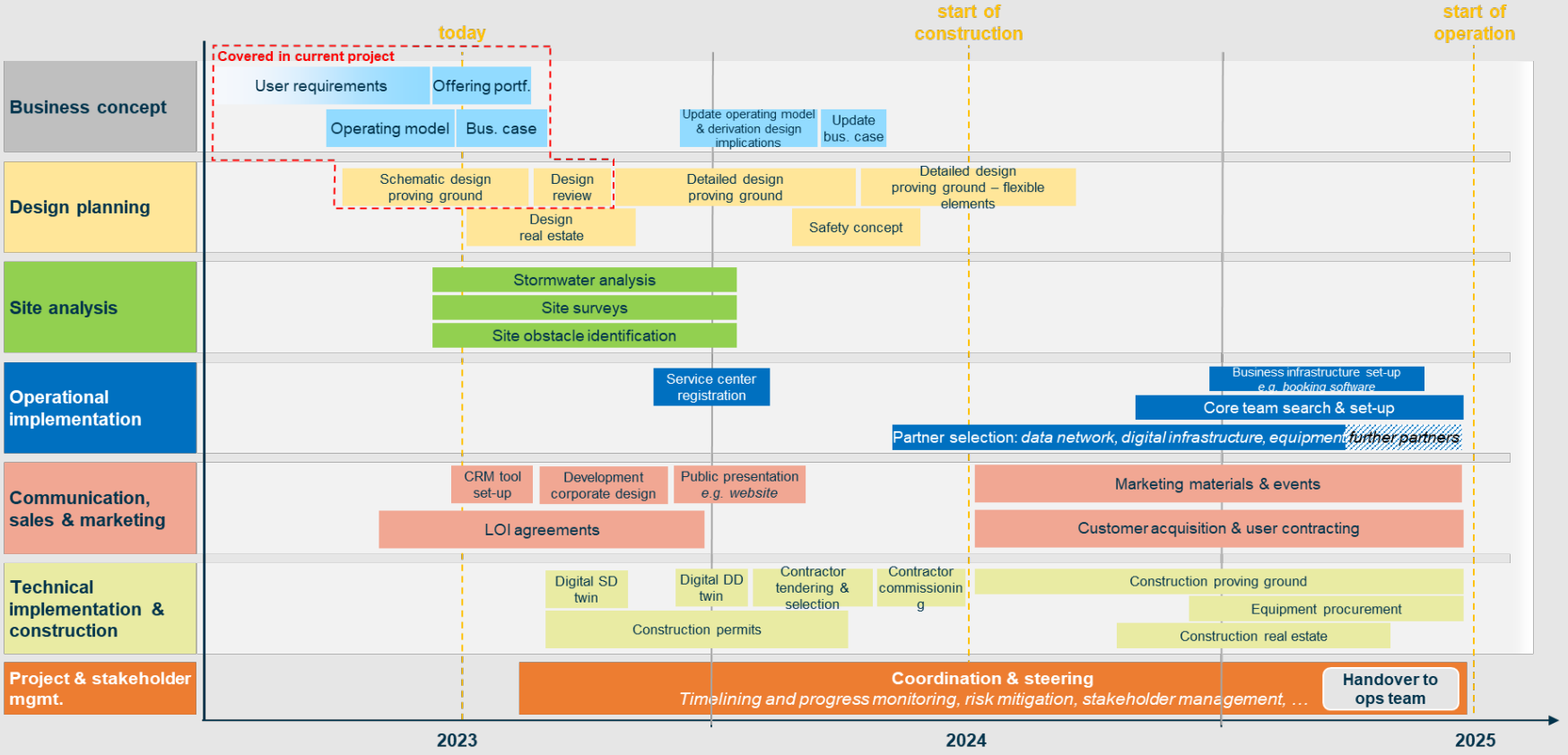
TST requires initial capital in the amount of USD 43.8m. This includes costs for construction, pre-operational tasks, 1st year of operation as well as a risk premium.

Operational Governance

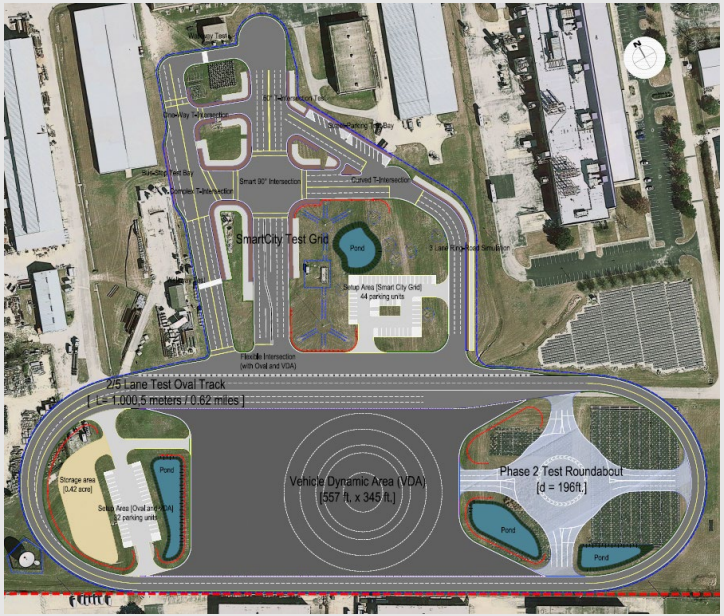
The Texas SMART Track management entity operates the facility for both external and internal customers. A governing body oversees the management.



Next Steps


today
start of construction
start of operation
Covered in current project
Business concept
User requirements
Offering portf.
Operating model
Bus. case
Update operating model & derivation design implications
Update bus. case
Design planning
Schematic design proving ground
Design review
Detailed design proving ground
Detailed design proving ground – flexible elements
Design real estate
Safety concept
Site analysis
Stormwater analysis
Site surveys
Site obstacle identification
Operational implementation
Service center registration
Business infrastructure set-up e.g. booking software
Core team search & set-up
Partner selection: data network, digital infrastructure, equipment, further partners
Communication, sales & marketing
CRM tool set-up
Development corporate design
Public presentation e.g. website
Marketing materials & events
LOI agreements
Customer acquisition & user contracting
Technical implementation & construction
Digital SD twin
Digital DD twin
Contractor tendering & selection
Contractor commissioning
Construction proving ground
Equipment procurement
Construction permits
Construction real estate
Project & stakeholder mgmt.
Coordination & steering
Timelining and progress monitoring, risk mitigation, stakeholder management, …
Handover to ops team
2023
2024
2025

QUESTIONS



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