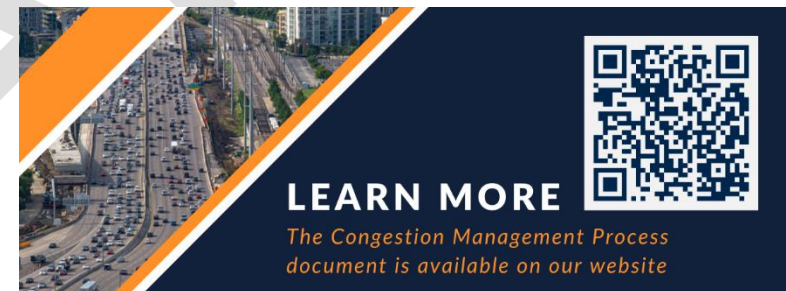# 5. OPERATIONAL EFFICIENCY

INTRODUCTION

Efficient, safe, and sustainable transportation is vital to the quality of life in North Central Texas. This chapter outlines key strategies aimed at managing congestion and enhancing the safety and security of our regional transportation system.

Operating the regional transportation network as efficiently as possible is crucial to delivering a reliable and safe system that improves livability. This chapter contains the multi-faceted *Dallas-Fort Worth Congestion Management Process*,[1] which encompasses a variety of cost-effective, quick implementation strategies. These include Travel Demand Management, Transportation System Management, Intelligent Transportation Systems, and Sustainable Development, all of which promote alternative travel modes and improve overall system efficiency. These efforts align with the broader framework established in Mobility 2050. The strategies outlined in this chapter work in unison to address both current challenges and future needs, contributing to improved mobility and livability in North Central Texas.

IN THIS CHAPTER

- Travel Demand Management
- Transportation System Management and Operations
- Transportation System Safety
- Transportation System Security
- Sustainable Development

LEARN MORE
The Congestion Management Process document is available on our website

https://nctcog.org/trans/manage/congestion-management-process

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[1] NCTCOG, Dallas-Fort Worth Congestion Management Process, http://www.nctcog.org/trans/cmp/

DID YOU KNOW?

TRAFFIC IS A TOP CONCERN: In Mobility 2050's public input survey, we received over 4,000 open-ended comments, and 1,196 of them mentioned traffic and roadway management—with many residents reporting growing congestion and calling for more road capacity to keep up with growth.

SAFETY CONCERNS LIMIT MOBILITY CHOICES: 400 comments highlighted safety issues, including dangerous intersections and feeling unsafe walking or biking. Many respondents said these concerns act as a barrier to choosing alternatives to driving.

5-1. TRAVEL DEMAND MANAGEMENT

OVERVIEW

Traffic moves more efficiently along a roadway when fewer vehicles are on the road, especially during peak travel periods. Travel Demand Management (TDM) strategies reduce the number of vehicles that travel on roadways by promoting alternatives to driving alone. These alternatives include rail and bus transit, ridesharing options like carpools and vanpools, and active transportation options like bicycling and walking. Higher-occupancy travel modes such as rail transit, lanes for high-occupancy vehicles (HOV), and managed lanes do more than reduce demand by single-occupant vehicles; they also have the capacity to transport a larger number of people. TDM programs improve mobility, accessibility, and air quality within the North Central Texas region.

Managing travel demand was identified as a top priority in public feedback. North Texas residents reveal they would be more willing to reduce single occupancy travel if there were viable alternatives. The TDM strategies described and recommended in this chapter are relatively low-cost, quick-implementation programs and projects that encourage alternatives to driving alone. The higher cost and more complex TDM projects, such as transit systems, HOV/managed lanes, and bicycle routes, are described in the **Mobility Options** chapter.

TDM activities can improve air quality by reducing the number of vehicles on the roads or by shifting drive alone travel to off-peak periods. TDM strategies that reduce peak-period travel include flexible work hours, compressed work weeks, and telecommuting.

TDM strategies that support high-occupancy modes and active transportation options, such as walking and bicycling, play a large role in Sustainable Development. In turn, sustainable land use and development can encourage commuters to utilize TDM options. Employers help reduce the demand on roadways when they locate their businesses in areas supported by transit and/or they allow employees to reduce the number of times they must travel to work or allow them to travel outside of peak travel hours.

MOBILITY 2050 SUPPORTED GOALS

MOBILITY

Improve the availability of transportation options for people and goods.

Support travel efficiency measures and system enhancements targeted at congestion reduction and management.

Ensure all communities are provided access to the regional transportation system and planning process.

QUALITY OF LIFE

Preserve and enhance the natural environment, improve air quality, and promote active lifestyles.

Encourage livable communities which support sustainability and economic vitality.

SYSTEM SUSTAINABILITY

Ensure adequate maintenance and enhance the safety and reliability of the existing transportation system.

Pursue long-term sustainable revenue sources to address regional transportation system needs.

IMPLEMENTATION

Provide for timely project planning and implementation.

Develop cost-effective projects and programs aimed at reducing the costs associated with constructing, operating, and maintaining the regional transportation system.

MOBILITY 2050 POLICIES AND PROGRAMS

Mobility 2050 includes policies and programs that address regional priorities and public needs. Policies guide decision-making and set the framework for long-term goals, while programs provide the funding and resources to turn plans into action across the transportation system.

Policies

MO3-001: Ensure the efficient operation of the existing multimodal transportation system by evaluating and/or implementing maintenance, rehabilitation, enhancement, and/or operational type projects in order to maintain safe, efficient travel conditions.

MO3-002: Ensure the existing multimodal transportation system operates efficiently by balancing the demand across all available assets and ensuring integration between systems.

TDM3-001: Support the Congestion Management Process, which includes explicit consideration and appropriate implementation of Travel Demand Management, Transportation System Management, and Intelligent Transportation Systems strategies during all stages of corridor development and operations.

TDM3-002: Support an integrated planning process that maximizes existing transportation system capacity before considering major capital infrastructure investment in the multimodal system.

TDM3-003: Implement Travel Demand Management strategies that assist in reducing the number of single-occupancy vehicle trips consistent with Regional Transportation Council Resolution R21-04,

which supports the establishment of a regional single-occupancy vehicle trip reduction target of 20 percent annually.

Programs

For more information on program funding and implementation, see the **Operational Efficiency a**ppendix**.**

TDM2-001: Regional Trip Reduction Program

TDM2-002: Regional Vanpool Program

TDM2-003: Park-and-Ride Facilities

TDM2-004: Transportation Management Associations

TDM STRATEGIES

In addition to policies and programs, Mobility 2050 also recommends the following TDM-related strategies to manage congestion.

Regional Single-Occupancy Vehicle Trip Reduction Target

The North Central Texas region experienced reductions in traffic congestion and improvements in air quality due to changes in traffic and commute patterns during COVID-19 restrictions. The North Central Texas Council of Governments (NCTCOG) TDM Program assessed the impact of establishing a regional trip reduction target to reduce single-occupancy vehicle (SOV) or drive alone commute trips during peak travel periods to sustain the positive benefits of changes in travel behavior on congestion experienced during the pandemic.

In 2021, the Regional Transportation Council (RTC) approved Resolution R21-04: Resolution Supporting the Establishment of a Regional Single-Occupancy Vehicle Trip Reduction Target to Reduce Drive Alone Vehicle Trips in North Central Texas: Sustaining Benefits of Changes in Travel Behavior on Congestion Levels Experienced During COVID-19. The resolution established an annual target to reduce SOV commute trips by 20 percent with the target maintained each year. Because TDM is not a one size fits all solution, all TDM strategies, including carpooling, vanpooling, transit, biking, walking, telecommuting, and flexible work schedules are encouraged to achieve the regional target. Its success is contingent upon solid public support, promotion, and involvement.

Components of the Regional Single-Occupancy Vehicle Trip Reduction Target Development Resolution are detailed below.

<u>Section 1.</u> The RTC supports the establishment of a regional trip reduction target of 20 percent to reduce the number of single-occupancy vehicle (SOV) commute trips during the peak period.

<u>Section 2.</u> The RTC strongly encourages both public and private sector employers to reduce employees' SOV trips consistent with Section 1 of this resolution through the establishment of a formal Employee Commute Program.

<u>Section 3.</u> The RTC strongly encourages both public and private sector employers to monitor and track agency participation of the program through an online commute tracking platform.

<u>Section 4.</u> To aid in program tracking and monitoring activities, both public and private sector agencies are strongly encouraged to utilize TryParkingIt.com, the region's commute tracking and ride-matching website and application. Employers may utilize an existing tracking platform comparable to Try Parking It for this purpose.

<u>Section 5.</u> For public sector agencies, the RTC will evaluate the agency's participation and implementation of the program through a new policy established as part of the Metropolitan Transportation Plan

Policy Bundle. Non-participation may impact the level of Transportation Development Credits received through the Policy Bundle Survey process.

Section 6. For private sector agencies, the RTC will monitor the agency's participation and implementation of the program through TryParkingIt.com or a comparable tracking platform. Participation may result in awarding regional funding for TDM-related efforts (e.g., transit passes).

Section 7. NCTCOG staff will provide the RTC with annual updates on the status of the Regional Trip Reduction target to reduce SOV commute trips. Reported performance measures shall include Try Parking It utilization rates, number of users, trips reduced, and emissions reduced.

Section 8. This resolution shall be in effect immediately upon its adoption.

Regional Trip Reduction Program

The Regional Trip Reduction Program is a cooperative educational program, implemented by NCTCOG, that seeks to reduce commute vehicle trips through the marketing and implementation of TDM strategies such as rideshare programs (carpooling and vanpooling), telecommuting, flexible work-hour schedules, transit, bicycling, and walking. Dallas Area Rapid Transit, Trinity Metro, Denton County Transportation Authority, and other public- and private-sector organizations are historical partners in this effort.

Try Parking It

An essential tool used within the Regional Trip Reduction Program is www.TryParkingIt.com, the regional commute tracking and ride-match system. The website enables commuters to locate carpool and vanpool ride matches, along with transit and bicycle matches. When commuters enter their alternative commute trips, the website generates a summary of miles saved, trips reduced, and harmful emissions reduced. Try Parking It users also receive reward points for tracking their alternative commute trips. www.TryParkingIt.com also helps regional planners develop and evaluate the regional transportation system, allowing them to calculate the mobility and air quality benefits of strategies to reduce vehicle trips.

Regional Trip Reduction Program Policy Guidance

The Regional Trip Reduction Program requires strong public and private employer support, promotion, and participation to ensure success. Public support is needed to recruit and retain employers, establish Transportation Management Associations, help employers implement programs to reduce trips, and train on-site employee transportation coordinators. The public sector also must collect and maintain data to determine how well the program performs. Leaders in the public sector are strongly encouraged to develop aggressive programs to reduce trips for their own employees. These programs can provide a model for private industry if they establish targets that go beyond average efforts to reduce trips and monitor effectiveness.

Rideshare Programs (Carpooling and Vanpooling)

Ridesharing programs, such as carpooling and vanpooling, are essential TDM strategies. Carpooling and vanpooling both seek to increase the number of travelers per vehicle during peak travel periods. Carpools usually include two to five people traveling in a private vehicle, while vanpools consist of 6 to 15 commuters. Vanpools are typically aimed at commutes of 25 miles or more. The Regional Vanpool Program is

implemented as a coordinated effort by NCTCOG, Trinity Metro, and Denton County Transportation Authority. Private vanpool providers also operate unsubsidized vanpool programs. Dallas Area Rapid Transit is a historical participant of the regional Vanpool Program and has plans to reimplement their program in the near future.

Federal funds for operating costs can help employers and employees participate in vanpools, but these funds should not exceed 50 percent of the operating costs. In recent years, NCTCOG and transportation/transit authorities have contributed funds needed to subsidize vanpool operating costs. The balance of the funds can come from employer subsidies, vanpool rider fares, private grants, advertisers, and other commercial sponsors. Opportunities exist for employers, private interest groups, Transportation Management Associations, and commuter groups to organize, fund, and operate vanpools without federal subsidy assistance. Representatives from NCTCOG, local transportation/transit authorities, and private vanpool providers can assist employers and commuters in setting up privately funded vanpool programs. Staff recently began assessing the program to look for ways to modernize and improve overall efficiency. NCTCOG is working with transportation/transit authorities to provide a comprehensive and cohesive program for the region, potentially beginning in Fiscal Year 2026.

Regional Vanpool Program Policy Guidance

Public- and private-sector vanpool programs must coordinate to ensure their programs are not overlapping and are operating efficiently. To protect the region's air quality, vanpools that use fuel-efficient or low-emitting vehicles or operate in the region's ozone nonattainment area should be encouraged. Regular performance reporting ensures that subsidies are standardized, and service is provided in the appropriate areas.

Employee Commute Programs

An Employee Commute Program is designed to reduce employee commute vehicle trips through the marketing and implementation of TDM strategies such as carpooling, vanpooling, telecommuting, alternative work schedule programs (compressed work week, flextime, staggered hours), transit, bicycling, and walking. In addition to supporting the regional goal of 20 percent reduction in SOV trips, the implementation of an Employee Commute Program can provide benefits such as decreased demand for parking spaces, reduced employee tardiness and absenteeism, expanded labor pool, enhanced public image, low-cost benefit to employees, increased employee satisfaction, reduced employee stress, and increased employee productivity.

Employee Commute Program Policy Guidance

Employers should establish formal Employee Commute Programs and monitor participation through online platforms. NCTCOG offers toolkits and policy guidance, including Policy TDM3-003, which further encourages employers to implement Travel Demand Management (TDM) strategies to reduce SOV trips. Employers can also explore cost-saving measures like subsidized transit passes or guaranteed ride home programs for employees.

Employee commute programs should be customized to fit the needs of an individual employer. It will be necessary to monitor and evaluate the success of the program and allow for it to change and evolve over time. Employers are encouraged to designate an Employee Transportation Coordinator (ETC) for the company. The ETC serves as a point of contact for employees that are interested in exploring alternative commute options. The ETC also acts as a liaison between the employer and NCTCOG in the administration of the program and program monitoring. NCTCOG will provide support to the ETC and employers

by offering marketing materials, ETC training and education, administering employee surveys to better determine what programs will work best at that work site, and providing information on incentives from which the employer may benefit.

Park-and-Ride Facilities

Park-and-ride facilities serve as collection areas for commuters transferring to higher occupancy vehicles. They are often located and designed to serve bus or rail transit, but many are also used by carpoolers and vanpoolers. Park-and-ride facilities can be located near a central business district to serve areas with public transit and pedestrians or in suburban areas to collect riders near the origin of their trips. Combined with HOV/managed lanes, park-and-ride facilities can be an effective incentive for increasing vehicle occupancy, thus reducing congestion and vehicle emissions.

Existing, planned, and candidate park-and-ride facilities are provided in **Figure 5-1**. While many park-and-ride facilities exist in areas served by transit, other facilities are planned for counties in the nonattainment area that are not currently served by transit authorities. Federal and local funding has been identified for several projects occurring outside of areas served by transit. The development of park-and-ride facilities in Hood, Hunt, and Wise counties may also be evaluated.

Even after considering the impact of new rail and roadway facilities expected to be constructed by 2050, the region will need 46 park-and-ride facilities in addition to the existing sites. These additional park-and-ride sites would serve 17,850 commuters. Technical studies, forecasted congestion levels, transit service planning and simulations, and local government initiatives are the main tools used to identify candidate park-and-ride facilities. Inventories and costs associated

with the existing, planned, and candidate park-and-ride facilities are provided in the **Operational Efficiency** appendix.

Figure 5-1: Existing, Planned, and Candidate Park-and-Ride Facilities
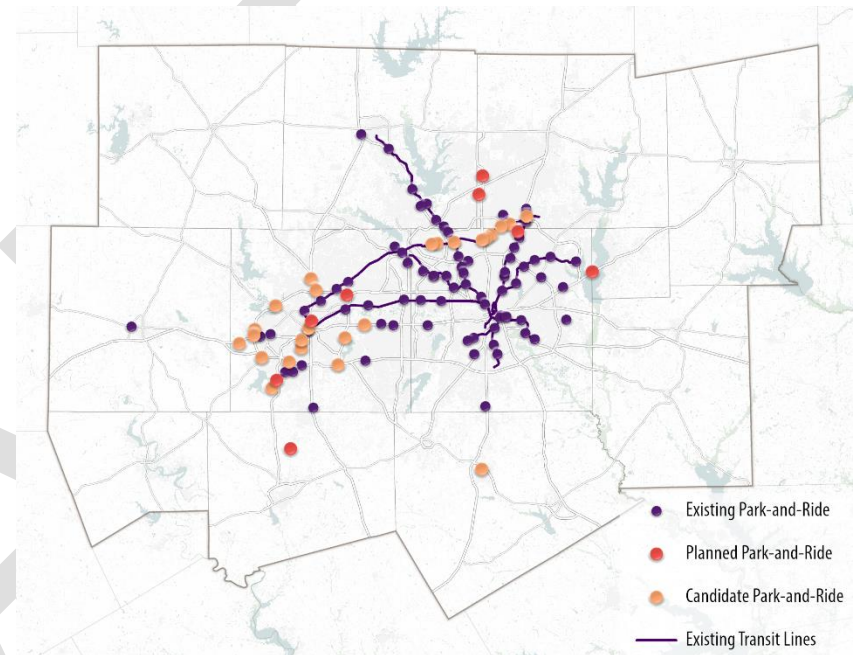
TRANSPORTATION MANAGEMENT ASSOCIATIONS

Transportation Management Associations (TMAs), also known as Transportation Management Organizations, are private and public-private organizations that implement strategies to mitigate congestion and work together on local transportation issues. Many are incorporated nonprofit organizations. They frequently are membership organizations composed of employers, developers, building owners, and local government representatives. Most TMAs are located in areas

of dense employment and focus on the TDM programs of public and private employers.

The principal role of a TMA is to involve the business community in transportation planning and to provide a forum for the private sector to impact strategy development and implementation. TMAs can be involved in the following activities:

- Advocacy on transit, roadway, bicycle, pedestrian, land use, and air quality issues
- Transit pass subsidy or voucher programs
- Shuttles or vanpools for employees, customers, or both
- Ride-matching services and support for carpools and vanpools
- Parking management programs
- Guaranteed or emergency ride home programs
- Telecommuting/teleconferencing center(s) operation
- Employee transportation coordinator training
- Promotional programs and incentives for alternative travel modes
- Educational programs

TMAs seeking to increase their influence on mobility and accessibility can take advantage of future rail and roadway options and partner with transportation or transit authorities and agencies. Two TMAs currently operate within North Central Texas. The LegacyConnect TMA operates in the city of Plano, inside the area circumscribed by Sam Rayburn Tollway/SH 121 to the north, Preston Road/SH 289 to the east, and Spring Creek Parkway to the south and west. The Southern Dallas County Inland Port TMA operates in the International Inland Port of Dallas, a 70,000+ acre intermodal and logistic district. Candidate TMA locations have also been recommended through corridor and feasibility studies. These locations have been identified based on employment densities in future years and the location and magnitude of traffic congestion. Candidate locations can be further

evaluated during the environmental process. Existing and candidate TMA service areas are listed in the **Operational Efficiency** appendix.

Transportation Management Associations Policy Guidance

TMAs requesting start-up funds from the RTC must provide a written business plan to access funding for a maximum of two years. Only primary and secondary transportation services are eligible for funding. Primary services reduce drive-alone or peak-period travel by either providing TDM services directly or by promoting the use of alternative travel modes. Secondary transportation services provide information on TDM program options and advocate for alternative travel modes.

SUMMARY

Travelers affect mobility, accessibility, and air quality by choosing when and how they travel. By reducing the number of people driving alone (demand), the capacity of the transportation system (supply) is more efficiently utilized. Mobility 2050 recommends a set of low-cost, quick-implementation options that complement the suite of transportation system recommendations.

Changes in technology, the workplace, business travel, and personal travel will improve the effectiveness of TDM strategies. More detailed information on travel demand management policies, programs, projects, and maps are provided in the **Operational Efficiency** appendix.

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5-2. TRANSPORTATION SYSTEM MANAGEMENT AND OPERATIONS

OVERVIEW

The Dallas-Fort Worth metropolitan area is experiencing increasingly severe traffic congestion, with residents consistently reporting growing frustration with excessive time spent in traffic. Public feedback views the current transportation infrastructure as inadequate for the region's rapid population growth, emphasizing that simply adding more lanes or constructing new highways will not solve the underlying mobility challenges. Residents are calling for comprehensive strategies that include improved traffic signal timing, alternative transportation routes, and innovative approaches to managing traffic flow across the increasingly sprawling metroplex.

Transportation System Management and Operations (TSMO) strategies focus on cost-effective methods to reduce congestion and improve traffic flow, system reliability, safety, and capacity. Unlike major infrastructure projects, TSMO strategies are typically low cost, quickly implemented, and require minimal physical changes to the transportation network. These strategies include Intelligent Transportation Systems (ITS), which use advanced communication technologies to enhance travel conditions. North Central Texas is exploring connected vehicle technologies, which enhance safety, traffic flow, and roadway conditions by enabling communication between vehicles and infrastructure, as well as between vehicles themselves.

Mobility 2050 supports several TSMO strategies to reduce congestion in North Central Texas, including:
- Capacity Investments Program
- Technology Investments Program
- Other Management Solutions

These projects improve safety, reduce travel time, lower emissions, and enhance air quality. Additionally, eliminating bottlenecks and implementing effective incident management further alleviates congestion by reducing clearance time and enhancing system reliability. Data from these projects will be analyzed to develop performance measures to prioritize regional project investments.

MOBILITY 2050 SUPPORTED GOALS

MOBILITY

Improve the availability of transportation options for people and goods.

Support travel efficiency measures and system enhancements targeted at congestion reduction and management.

Ensure all communities are provided access to the regional transportation system and planning process.

QUALITY OF LIFE

Preserve and enhance the natural environment, improve air quality, and promote active lifestyles.

Encourage livable communities which support sustainability and economic vitality.

SYSTEM SUSTAINABILITY

Ensure adequate maintenance and enhance the safety and reliability of the existing transportation system.

Pursue long-term sustainable revenue sources to address regional transportation system needs.

IMPLEMENTATION

Provide for timely project planning and implementation.

Develop cost-effective projects and programs aimed at reducing the costs associated with constructing, operating, and maintaining the regional transportation system.

MOBILITY 2050 POLICIES AND PROGRAMS

Mobility 2050 includes policies and programs that address regional priorities and public needs. Policies guide decision-making and set the framework for long-term goals, while programs provide the funding and resources to turn plans into action across the transportation system.

Policies

TSMO3-001: Installation of pedestrian facilities by local agencies as part of intersection improvement and traffic signal improvement programs shall provide access to usable walkways or sidewalks.

TSMO3-002: Require regional partners to coordinate during major special events or planned events to ensure minimal impact on the transportation system for individuals traveling to an event or through an event zone.

TSMO3-003: Priority funding consideration will be given to projects that meet the regional Intelligent Transportation Systems deployment initiatives as outlined in the Dallas-Fort Worth Regional Intelligent Transportation Systems Architecture.

TSMO3-004: Intelligent Transportation Systems projects must be consistent with the architecture and standards described in the Dallas-Fort Worth Regional Intelligent Transportation Systems Architecture.

TSMO3-005: Encourage, evaluate, and deploy new energy-efficient, low-cost technologies for Intelligent Transportation Systems and Transportation System Management and Operations projects.

TSMO3-006: Integrate all traffic operations systems between public sector entities, including sharing of data and videos.

TSMO3-007: Operate, maintain, and optimize functionality across the design-life cycle of Intelligent Transportation Systems field devices and traffic signals.

TSMO3-008: Projects with new signal construction and reconstruction of signals at intersections with configuration changes will include signal timing plans appropriate for the corridor. Additionally, if the signal is on a corridor with coordinated/synchronized signal operation, the timing plans are to be coordinated.

Programs

For more information on program funding and implementation, see the **Operational Efficiency a**ppendix**.**

TSMO2-001: Intersection Improvement Program

TSMO2-002: Signal Improvement Program

TSMO2-003: Bottleneck Improvement Program

TSMO2-004: Special Events Management Program

TSMO2-005: Bottleneck Program for Regional Corridors

TSMO2-006: Intelligent Transportation Systems Implementation Program

TSMO2-007: Regional Intelligent Transportation Systems Architecture Program

TSMO2-008: Advanced Traveler Information System Implementation Program

TSMO2-009: Advanced Traffic Management System Implementation Program

TSMO2-010: Advanced Public Transportation System Implementation Program

TSMO2-011: Intelligent Transportation Systems Interoperability Program

TSMO2-012: Arterial Grade Separation Program

Selected programs are described in more detail in the following section.

CAPACITY INVESTMENTS PROGRAMS

The Capacity Investments Program expands system capacity at key bottlenecks and intersections, reducing the need for new infrastructure. Projects under this program include restriping, roundabouts, grade separations, and adding turning lanes. Strategies implemented in North Central Texas to reduce congestion include:

- Intersection improvements
- Freeway and arterial bottleneck improvements
- Shoulder utilization during peak period

Intersection Improvements

Arterials link local streets to major roadways, providing access to various destinations. Intersections along these arterials often become points of conflict between drivers, pedestrians, and bicyclists. Improving intersections with features like turning lanes, grade separations, pavement striping, signage, lighting, bus turnouts, and traffic channelization can significantly enhance traffic flow. Additionally, installing Americans with Disabilities-compliant ramps during these projects ensures accessible walkways for all users.

Freeway and Arterial Bottleneck Improvements

Photo credit: NCTCOG staff

Bottleneck removal strategies are quick, low-cost solutions designed to address isolated congestion issues, and may include:

- Adding travel lanes, including by narrowing lanes or shoulders to create additional travel and/or auxiliary lanes
- Restriping/modifying weave patterns in merging/diverging areas
- Providing bypass routes and metering or closing entrance ramps
- Improving traffic signal timing on arterials
- Implementing high-occupancy vehicle/managed lanes

In addition to existing strategies, the region may explore and adopt innovative methods to manage and alleviate bottlenecks, such as:

- Temporary use of shoulder lanes during peak hours.
- Queue warning to inform drivers of the reason for slower speeds.
- Advance warning signs to guide drivers to use all lanes when congested to prevent high speed approaches to merge/conflict points.

While these strategies can enhance transportation system efficiency, larger-scale projects may be necessary to address bottlenecks stemming from roadway design flaws. The Bottleneck Improvement Program addresses issues such as insufficient acceleration and deceleration lanes, sharp curves, and narrow lanes/shoulders.

To maximize corridor reconstruction, it is essential to incorporate solutions for identified bottlenecks during the design phase. As corridors are reconstructed, additional locations will be evaluated for potential bottleneck improvements, ensuring a seamless transition between current and future projects. Ongoing monitoring of corridor work will help identify new congestion points, enabling early implementation of larger-scale solutions. Integrating all bottleneck removal efforts into the broader infrastructure plan will help reduce overall costs, minimize short-term congestion, and support the long-term development of the transportation system.

Shoulder Utilization During Peak Period

Traffic signs and overhead lane messages inform drivers when shoulder use is permitted and indicate the applicable speed limits.

TECHNOLOGY INVESTMENTS PROGRAMS

Automated systems and other technological strategies play a key role in enhancing traffic flow. For instance, signal optimization improves the operation, maintenance, timing, and placement of traffic signals, while ramp metering regulates the flow of vehicles entering freeways, easing congestion near entrance ramps, and discouraging short trips on busy freeways. These strategies are detailed in the Regional Intelligent Transportation System Architecture and Strategic Intelligent Transportation System Deployment Plan.

Technology investment strategies for managing congestion include:

- 511 and traveler information
- Arterial management
- Freeway management
- Transit management
- Commercial vehicle operations
- Other management solutions

Impact of Emerging Technologies

Emerging automotive, communications, and computing technologies will greatly enhance traffic flow and safety. Historically, vehicles are fully controlled by humans, with no communication between vehicles or with traffic control systems. However, as automation progresses, vehicles will increasingly handle driving and navigation. Vehicles will exchange data with each other and with transportation systems, necessitating clearly maintained pavement markings, providing accurate real-time data. Ongoing collaboration among transportation agencies, vehicle manufacturers, software developers, and communications providers will be crucial for advancing operations and safety improvements. For more information on emerging technologies, please see the **Transportation Technology** chapter.

Regional Intelligent Transportation Systems Architecture and Strategic Intelligent Transportation Systems Deployment Plan

The Regional ITS Architecture guides ITS usage across many agencies in the Metropolitan Planning Area, ensuring compliance with national standards and the systems engineering process for ITS projects funded through the Highway Trust Fund. The architecture includes:

- A description of the region
- Identification of participating agencies and stakeholders, as well as their roles and responsibilities
- Agreements required for operations affecting ITS project interoperability, use of ITS-related standards, and the operation of projects in the Regional ITS Architecture
- System functional and interface requirements
- ITS standards supporting regional and national interoperability
- A sequence of projects or Strategic ITS Deployment Plan

Additional information on the North Texas Regional ITS Architecture can be found at the following link https://ria.nctcog.org.

Subregional ITS plans prioritize projects, corridors, and systems by:
- Filling gaps in existing ITS infrastructure with critical linkages
- Targeting investments in facilities under reconstruction
- Building public-private partnerships for Regional ITS Architecture

511 and Traveler Information

Data from Traffic and Transportation Management Centers, transit systems, motorist assistance patrols, 911 calls, construction crews, traffic cameras, and roadway sensors feed into the 511DFW system.

Arterial Management

Traffic signals at intersections effectively manage the flow of vehicles, bicycles, and pedestrians on arterial streets. However, outdated traffic signals and plans may struggle to adapt to evolving traffic patterns or advanced signal systems. Recent advances in communication and information technology have greatly enhanced traffic signal management. Improved signal timing and computerized systems that communicate across intersections can significantly boost traffic flow. Traffic Management Centers (TMCs) further optimize this by allowing

real-time signal adjustments to address both recurring and incident-related congestion.

Photo credit: NCTCOG staff

Additionally, wireless communication technologies, such as Cellular Vehicle-to-Everything (C-V2X), hold the potential to revolutionize traffic signal control. By utilizing in-vehicle data, these technologies offer a comprehensive traffic view, enhanced traffic management, optimized signal timing, and system interconnection. Upcoming projects will focus on upgrading traffic signal hardware, software, and communications. The Transportation Improvement Program mandates the use of light-emitting diode lamps in all new and replacement signals. As technology advances, signal improvements can further reduce travel times and vehicle emissions by minimizing delays and idling at intersections.

Freeway Management

Freeway management systems use strategies and technologies to check, control, and manage freeway traffic more efficiently. Available strategies and technologies include:

- Incident management
- Work Zone Management
- Monitoring and detection (e.g., vehicle speed/count detectors, weather sensors, over-height vehicle detection, CCTV)
- Traveler information systems (e.g., dynamic message signs, lane-use control signals) and other communications (e.g., social media)
- Ramp/lane control (e.g., ramp metering, reversible lanes, variable speed control), and priority control for high-occupancy vehicles

Freeway management often links TMCs to regional ITS components. In North Central Texas, the Texas Department of Transportation and toll operators manage freeways through TMCs, coordinating with local jurisdictions to handle congestion on arterials. TMC staff use CCTV, sensors, third-party data, and emergency responder reports to monitor traffic and coordinate responses.

Photo credit: Texas Department of Transportation

Transit Management

Transit Management Centers will act as communications hubs for regional transit agencies (Dallas Area Rapid Transit, Denton County Transportation Authority, Trinity Metro), integrating across service areas. Security systems, automatic vehicle location, fare collection, and traffic signal prioritization will boost transit service and safety. Mobility 2050 recommends developing an Advanced Public Transportation System to enhance transit operations, convenience, and safety. This includes investing in:

- Tools to refine bus and rail operations
- GPS-based automatic vehicle tracking and dispatching
- Automated safety controls, for high-speed heavy rail services
- Critical safety systems for light rail

Commercial Vehicle Operations

TSMO improves freight efficiency and safety. For more information, please refer to the **Freight** section of the **Mobility Options** chapter.

Other Technology Solutions

Connected and Autonomous Vehicle Systems with Real-Time-in-Vehicle Alerts

Connected and autonomous vehicle technologies facilitate wireless communication between vehicles, infrastructure (such as cell towers and roadside units), and personal devices, including those of bicyclists and pedestrians. These systems, classified as vehicle-to-vehicle, vehicle-to-infrastructure, and vehicle-to-others, share data on vehicle position and speed to improve safety, traffic flow, and reduce congestion and emissions. Autonomous vehicles enhance these benefits further through technologies like radar, GPS, image recognition, and computer vision, enabling navigation with minimal human input. Additionally, in-vehicle signage and warnings are provided through roadside units, transmitting real-time hazard information to motorists, improving reaction times, and reducing collisions.

Cloud Computing/Crowdsourcing

Cloud computing and crowdsourcing enhance transportation data services by providing online information technology infrastructure and gathering user-generated data. Together, they improve system management, efficiency, and public communication through advanced analytics.

More information on connected vehicles and technology solutions is in the **Connected/Automated Vehicles and Technologies** section.

OTHER MANAGEMENT SOLUTIONS

Work Zone Management

Construction disrupts travel patterns and often reduces roadway capacity, causing work zones to be more prone to traffic crashes. Traffic management strategies in work zones should consider corridor constraints, construction phasing, type of work zone, and anticipated impacts. These strategies must be consistently checked and coordinated for efficiency. Strategies to mitigate construction impacts include improving alternate routes, providing temporary facilities, staging work during off-peak hours, and offering additional enforcement and advance information to travelers. Lighting, signage, and safety devices are essential to protect travelers and work crews.

Special Events Management

North Central Texas hosts various sporting events and cultural activities (including festivals, fairs, and parades), often at major recreational facilities across urban and rural areas. These events pose

challenges to the transportation systems, particularly in adverse weather. Factors impacting performance include event timing, system capacity, parking availability, spectators, transportation modes, weather conditions, and availability of event-related information for drivers. Regional coordination during special events can improve transportation system efficiency and reduce the event's impact. An inventory should detail primary and secondary transportation effects, including size and duration, and post-event evaluations should assess impact and mitigation effectiveness.

To minimize traffic disruptions during special events and enhance mobility, effective strategies include advanced traffic management systems, parking and lane assignment controls, and customized signal timing plans. Additionally, three practices are recommended:

- Coordination among regional partners during major events to minimize the impact on the transportation system
- Input from regional partners within the event zone to prevent construction during major events
- Managed/high-occupancy vehicle lanes

Other strategies involve providing timely information to travelers, promoting transit and high-occupancy modes to reduce demand on the transportation system, and advanced planning for incident management. For more details on traffic incident management, refer to the **Transportation System Safety** section in this chapter.

SUMMARY

TSMO strategies are essential for reducing congestion and enhancing traffic flow, safety, and reliability in North Central Texas. These cost-effective alternatives to major infrastructure projects can be quickly implemented with minimal physical changes. Key initiatives include Intelligent Transportation Systems, leveraging advanced technologies like connected vehicles, for better traffic management. Mobility 2050 aims to optimize the transportation network through strategies such as intersection improvements, bottleneck alleviation, and advanced technology and communication projects to promote safer, more efficient travel, and improved air quality. The estimated total cost for TSMO strategies is $4.916 billion, reflecting the region's commitment to prioritizing effective and efficient transportation solutions.

5-3. TRANSPORTATION SYSTEM SAFETY

OVERVIEW

The Transportation System Safety Program focuses on improving traffic safety throughout the region for all users—a growing concern identified in public feedback. By developing safety policies, programs, and projects and supporting and coordinating planning efforts with local governments, Mobility 2050 aims to address the critical safety challenges faced by the public. The Regional Transportation Council adopted the regional safety position that even one death on the transportation system is unacceptable. As a result, the Safety Program works with our regional partners to develop projects, programs, and policies that assist in eliminating serious injuries and fatalities across all modes of travel within the region. The Safety Program also supports Vision Zero, a strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, equitable mobility for all.

Integrating the Five Es for a Safer Transportation System

The Safety Program works to implement solutions and countermeasures across each of the "five Es" of transportation safety: Engineering, Enforcement, Education, Emergency Response, and Equity. Because every crash has different causes and may require multiple solutions from one or more of these categories, the five Es of Transportation Safety continue to be integral components to improving the safety of the regional transportation system.

- **Engineering:** Highway design, traffic, maintenance, operations, and planning professionals
- **Enforcement:** State and local law enforcement agencies
- **Education:** Prevention specialists, communication professionals, educators, and citizen advocacy groups
- **Emergency Response:** First responders, paramedics, fire, and rescue
- **Equity:** Safe transportation options should be accessible to everyone

Because safety planning is a multidisciplinary effort and human behavior is a major factor in traffic safety, improvements that reduce roadway crashes, fatalities, injuries, and secondary crashes include a diverse set of activities implemented by a variety of stakeholders, including transportation professionals, enforcement agencies, educators, and the emergency response community. The Transportation System Safety Program involves these stakeholders and regional partners in creating a safer transportation system through four core concepts:

- Data analysis and information system development
- Performance reporting
- Safety planning and implementation efforts
- Safety education and training efforts

MOBILITY 2050 SUPPORTED GOALS

MOBILITY

Improve the availability of transportation options for people and goods.

Support travel efficiency measures and system enhancements targeted at congestion reduction and management.

Ensure all communities are provided access to the regional transportation system and planning process.

QUALITY OF LIFE

Preserve and enhance the natural environment, improve air quality, and promote active lifestyles.

Encourage livable communities which support sustainability and economic vitality.

SYSTEM SUSTAINABILITY

Ensure adequate maintenance and enhance the safety and reliability of the existing transportation system.

Pursue long-term sustainable revenue sources to address regional transportation system needs.

IMPLEMENTATION

Provide for timely project planning and implementation.

Develop cost-effective projects and programs aimed at reducing the costs associated with constructing, operating, and maintaining the regional transportation system.

What is Vision Zero?

Vision Zero recognizes that people will sometimes make mistakes, so the road system and related policies should be designed to ensure those inevitable mistakes do not result in severe injuries or fatalities. This means that system designers and policymakers are expected to improve the roadway environment, policies (such as speed management), and other related systems to lessen the severity of crashes.

Vision Zero is a multidisciplinary approach, bringing together diverse and necessary stakeholders to address this complex problem. In the past, meaningful, cross-disciplinary collaboration among local traffic planners and engineers, policy-makers, and public health professionals has not been the norm. Vision Zero acknowledges that many factors contribute to safe mobility—including roadway design, speeds, behaviors, technology, and policies—and sets clear goals to achieve the shared goal of zero fatalities and severe injuries.

MOBILITY 2050 POLICIES AND PROGRAMS

Mobility 2050 includes policies and programs that address regional priorities and public needs. Policies guide decision-making and set the framework for long-term goals, while programs provide the funding and resources to turn plans into action across the transportation system.

Policies

TSSF3-001: Implementation of safety strategies in work zones consistent with industry best practices.

TSSF3-002: Development of safety information projects and partnerships with the Texas Department of Transportation, local governments, local police departments, and other organizations to encourage the sharing of regional/jurisdictional safety data (including, but not limited to, crash data, fatality data, and incident response and clearance time data).

TSSF3-003: Implementation of programs, projects, and policies that assist in reducing roadway crashes in general and eliminating fatalities and serious injuries across all modes of travel toward zero deaths. (Vision Zero—the goal of eliminating traffic fatalities and severe injuries among all road users.)

TSSF3-004: Implementation of roadway improvement strategies that assist in reducing wrong-way driving incidents consistent with regional and/or industry best practices.

TSSF3-005: Implementation of low-cost, systemic safety countermeasures and improvements that assist in reducing fatalities and serious injury crashes consistent with strategies outlined in the

Intersection Safety Implementation Plan for North Central Texas, the *Regional Roadway Safety Plan*, the *Regional Strategic Plans for Pedestrian Safety and Bicycle Safety*, and other applicable safety-related plans that promote the implementation of safety countermeasures on the regional roadway system.

TSSF3-006: Implementation of a multiagency Traffic Incident Management Program that establishes a common and coordinated response to traffic incidents consistent with Regional Transportation Council Resolution R08-10, which is a resolution supporting a comprehensive, coordinated, interagency approach to traffic incident management in the North Central Texas region. It includes the implementation of programs and projects that aid in quick incident clearance and roadway crash mitigation.

Programs

For more information on program funding and implementation, see the **Operational Efficiency** appendix.

TSSF2-001: Traffic Incident Management Program

TSSF2-002: Regional Roadway Safety Assistance Patrol Program

TSSF2-003: Regional Safety Information System

TSSF2-004: Safety Education and Training Program

TSSF2-005: Roadway Safety Improvement Program

DATA ANALYSIS AND INFORMATION SYSTEM DEVELOPMENT

Problem identification is the first step in effective transportation safety planning. As a result, identifying, collecting, and analyzing crash, fatality, and other safety data is important to improving transportation safety in North Central Texas. Throughout the region and the state, transportation professionals, decision-makers, and governmental agencies utilize crash data to make all types of safety-related decisions. These decisions include an extensive range of activities such as warranting traffic signal installations, identifying locations for traffic enforcement, speed zones, identifying potential roadway maintenance issues, identifying safe routes to schools, improving emergency response times, and supporting the need to rehabilitate and design new roadways.

The Safety Program coordinates with the Texas Department of Transportation, local governments, local police departments, the Texas A&M Transportation Institute, Federal Highway Administration, and other organizations to collect and analyze the data needed throughout the safety planning process.

The Safety Program utilizes crash data to:
- Identify high-crash locations, intersections, or hot spots
- Determine types and severity of crashes
- Identify contributing factors for serious injury and fatality crashes
- Develop county, regional, and corridor-level crash rates for limited-access facilities

Regional Safety Information System

The Regional Safety Information System (RSIS) is a centralized database for traffic crash information in the North Central Texas region. Data from the Texas Department of Transportation's Crash Records Information System, the National Highway Traffic Safety Administration's Fatality Analysis Reporting System, and the National Response Center are used by the North Central Texas Council of Governments (NCTCOG) to analyze, map, and report performance measures through RSIS. Information from RSIS is used to identify locations with high crash occurrences, analyze crash rates, and evaluate analyses of factors that contribute to regional crashes. RSIS also provides the ability to determine the most prevalent types of fatal, injury, and non-injury crashes by type of roadway and to identify locations with above-average crash histories. RSIS is used to analyze crashes for the three main categories of regional transportation system users: 1) motor vehicles, 2) freight carriers, and 3) active transportation users.

Motor Vehicle Crash Analysis

In 2023, the NCTCOG Metropolitan Planning Area experienced 125,331 crashes; 3,694 resulted in serious injuries and 803 resulted in fatality. Through RSIS, NCTCOG calculates regional- and county-level crash rates on limited-access facilities. Maps that compare county-level crash rates to the regional crash rate are developed annually. **Figure 5-2** shows the county-level crash rates for North Central Texas in 2023. Counties that have a crash rate higher than the regional rate are shown in red, while counties with a rate below the regional rate are shown in green.
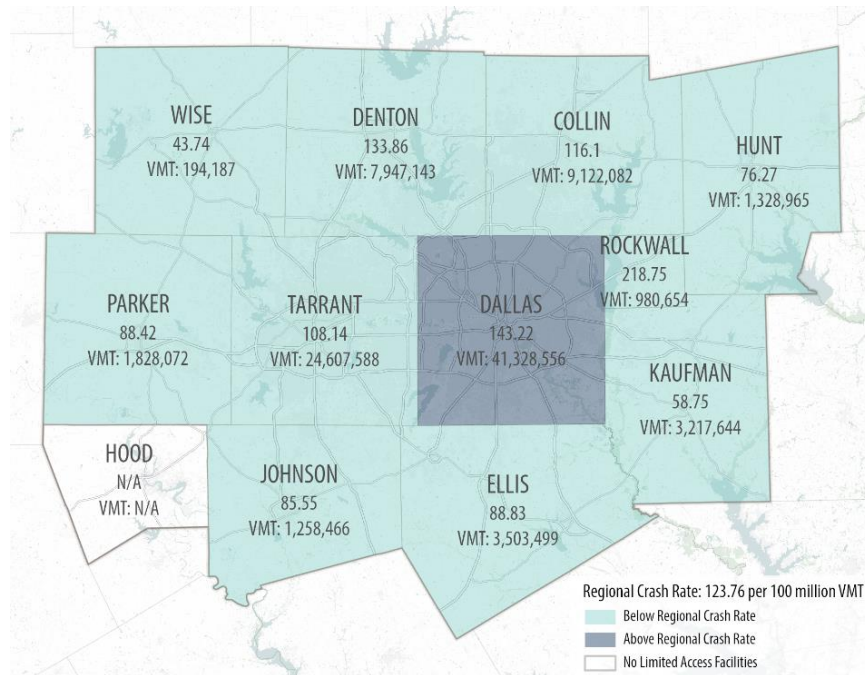
Figure 5-2: 2023 County-Level Crash Data

County	Crash Rate	VMT
WISE	43.74	194,187
DENTON	133.86	7,947,143
COLLIN	116.1	9,122,082
HUNT	76.27	1,328,965
ROCKWALL	218.75	980,654
PARKER	88.42	1,828,072
TARRANT	108.14	24,607,588
DALLAS	143.22	41,328,556
KAUFMAN	58.75	3,217,644
HOOD	N/A	N/A
JOHNSON	85.55	1,258,466
ELLIS	88.83	3,503,499

Regional Crash Rate: 123.76 per 100 million VMT
- Below Regional Crash Rate
- Above Regional Crash Rate
- No Limited Access Facilities

Figure 5-3: 2019 to 2023 Bike and Pedestrian Crash Density

Crashes per square mile, 2019-2023
- 1 - 9
- 10 - 19
- 20 - 49
- 50 - 99
- 100+
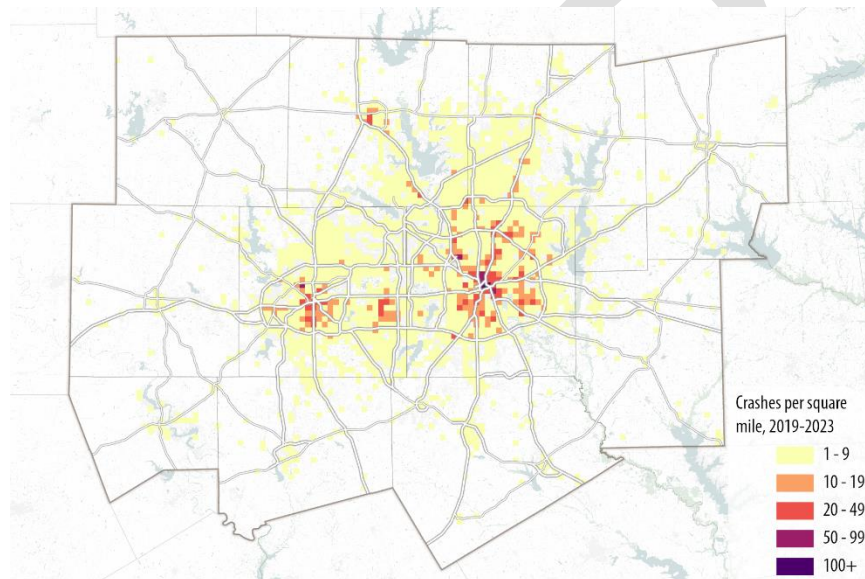
Freight Carriers Crash Analysis—Hazardous Materials

North Central Texas represents one of the nation's largest inland ports that transports freight to destinations across the state and around the world. The region experiences traffic associated not just with moving commercial products and goods, but also with trucks associated with the natural gas industry. As a result, safety issues are one of the most significant truck transportation issues within the region. Utilizing data from the National Response Center, RSIS is also used to evaluate and map hazardous material spills on regional limited-access facilities. This analysis helps identify possible roadway segments that are especially affected by hazardous materials carriers. The HazMat Mobile Incident Locations map for historical locations from 1990-2024 is included in the **Operational Efficiency** appendix.

Active Transportation Crash Analysis

Active transportation users, or bicyclists and pedestrians, are a growing segment of the regional transportation system. Public input received through our engagement process underscores the community's strong desire for safer cycling and walking facilities across the region. Over the past decade, the Federal Highway Administration (FHWA) has worked to aggressively reduce pedestrian deaths by focusing extra resources on the states and cities with the highest pedestrian fatalities and/or fatality rates. FHWA has designated Texas as a Focus Approach State for pedestrians due to the high number of pedestrian fatalities resulting from crashes with motor vehicles. Because of this designation, pedestrian safety efforts are emphasized within the region.

Figure 5-3 (left) identifies the density of pedestrian and bicycle crashes within the region.

Between 2019 and 2023, 6,934 pedestrian crashes; 2,471 bicycle crashes; and 945 bicycle and pedestrian fatalities were reported in North Central Texas.

Bicycle and pedestrian crashes in the region are generally clustered near central business districts, along major arterial roadways, and near other business or employment centers. Thirty-one percent of all bicycle and pedestrian crashes in the region occurred on state highways (on-system roadways) and represented 64 percent of all bicycle and pedestrian fatalities. **Table 5-1** identifies the number of reported crashes and fatalities in the region and identifies whether they occurred on on-system or off-system roadways.

Table 5-1: 2019 to 2023 Pedestrian and Bicycle Crashes and Fatalities in the 12-County Metropolitan Planning Area (MPA)

County	Roadway	Number of Crashes	Number of Fatalities
12-County MPA	Off-System	6,499 (69%)	340 (36%)
	On-System	2,906 (31%)	605 (64%)
Totals		9,405 (100%)	945 (100%)

While the construction and maintenance of sidewalks, crossings, and bike lanes fall under local jurisdiction, the regional transportation plan addresses safety through comprehensive planning and policy initiatives. This includes developing safety plans like the **Pedestrian Safety Action Plan** (view plan online ↗), providing tailored recommendations, and offering support or incentives to local governments to prioritize pedestrian and bicycle safety improvements. The Mobility Plan emphasizes safety and well-connected facilities as key criterion for funding projects. By aligning regional strategies with local efforts, the plan aims to create a safer and more accessible environment for bicyclists and pedestrians across North Central Texas.

PERFORMANCE REPORTING

The Safety Program annually publishes the *NCTCOG Safety Program Performance Measure Report,* which provides performance updates on NCTCOG safety programs, projects, and statistics such as regional crash and fatality data, contributing factors for regional crashes, county-level crash rates, Traffic Incident Management training statistics, and Roadway Safety Assistance Patrol Program statistics, along with updates on safety-related projects and special initiatives. These annual reports are available on the NCTCOG website at https://www.nctcog.org/trans/quality/safety/transportation-safety.

As part of the FHWA Transportation Performance Management Program—a strategic approach that uses system information to make investment and policy decisions to achieve national performance goals—NCTCOG continues to work closely with the Texas Department of Transportation to regionally establish five annual Safety Performance Targets to assist in reducing the number of fatalities and serious injury crashes on our regional roadway system. The five Safety Performance Targets include 1) number of fatalities, 2) rate of fatalities, 3) number of serious injuries, 4) rate of serious injuries, and 5) number of nonmotorized fatalities and nonmotorized serious injuries. More information on these five Safety Performance Targets is available in the **Regional Performance** chapter.

SAFETY PLANNING AND IMPLEMENTATION EFFORTS

Safety planning efforts include advancing initiatives to preserve, maintain, and improve transportation safety in North Central Texas and developing region-appropriate countermeasures that address crash types and locations. Mobility 2050 includes safety policies and

programs that directly impact the safety of the transportation system for all users, encourage the implementation of safety countermeasures and strategies that reduce wrong-way driving incidents, and decrease the number of severe injuries and fatalities on the transportation system. Many of these strategies can be incorporated into roadway improvements as standard practice.

To garner input and feedback from regional partners, NCTCOG hosts and coordinates safety-related committees and working groups. The Regional Safety Advisory Committee helps develop regional safety policies, programs, procedures, projects, and activities that improve traffic safety throughout the region. The Regional Safety Advisory Committee also provides technical expertise and public outreach support, and the committee reviews regional safety planning and helps select safety projects funded by the Regional Transportation Council and NCTCOG's Executive Board. **Table 5-2** is a summary of safety-related committees and working groups hosted and coordinated by NCTCOG. **Table 5-3** lists key strategies and products the committees and working groups produce.

Table 5-2: Regional Safety Committees and Working Groups

Safety Group	Members	Purpose
Regional Safety Advisory Committee	Transportation professionals, Texas Department of Transportation, law enforcement agencies, researchers	Help develop regional safety policies, programs, projects, and activities.
Bicycle and Pedestrian Advisory Committee	Transportation professionals, Texas Department of Transportation, transit and transportation agency representatives, technical staff	Provide technical expertise, public education and outreach support, and review of regional bicycle and pedestrian planning and policies, programs, projects, and activities.
Work Zone Safety	Transportation professionals	Investigate the use and effectiveness of strategies to reduce the number of fatalities and injuries in work zones; implement effective strategies to improve work zone safety; and integrate safety into the construction process.
Wrong-Way Driving	Transportation professionals, researchers	Investigate and recommend strategies that assist in reducing wrong-way driving incidents.
Roadway Safety Assistance Patrols	Transportation professionals, North Texas Tollway Authority, Texas Department of Transportation, law enforcement agencies, Roadway Safety Assistance Patrol representatives	Evaluate progress and effectiveness of program and maintain/develop routes.
Manual on Uniform Traffic Control Devices	Transportation professionals, emergency responders	Review pending changes to the Texas and federal Manual on Uniform Traffic Control Devices.
Incident Management Performance Measures	Transportation professionals, emergency responders	Develop consistent definitions for incident management performance measures; participate in annual Traffic Incident Management Self-Assessment.
Commercial Vehicle Enforcement	Transportation professionals, law enforcement agencies	Develop equipment and training programs that assist in effective commercial vehicle enforcement. Provide education opportunities to those that work with commercial motor vehicle violations in North Texas court systems.

Table 5-3: Strategies for Regional Safety Committees and Working Groups

Improvement Strategy	Development Partners	Final Product
NCTCOG Intersection Safety Implementation Plan	Regional Safety Advisory Committee, FHWA	List of low-cost, systemic intersection safety countermeasures for urban signalized intersections.
Regional Roadway Safety Plan	Transportation professionals	Includes regionwide safety analyses to identify the crash types that produce the most fatalities and serious injuries, then recommends countermeasures to prevent the crashes or reduce crash severity.
Wrong-Way Driving Mitigation Plan	Transportation professionals, researchers	Systemic improvements and design plan for diamond interchanges and highway travel lanes that help reduce wrong-way driving incidents.

Federal Highway Administration Guidance to Promote Safety Countermeasures

In 2017, FHWA issued the updated *Guidance Memorandum on Promoting the Implementation of Proven Safety Countermeasures* to reduce fatalities and serious injuries on the nation's highways. The updated guidance promotes the latest research to advance countermeasures that have been highly effective in improving safety. Mobility 2050 recommends this and future FHWA guidance be considered for federal, state, and local projects in the region.

Intersection Safety Implementation Plans

NCTCOG was the first agency in the State of Texas to partner with FHWA to develop an Intersection Safety Implementation Plan (ISIP) for North Central Texas. The goals of the NCTCOG ISIP were to identify intersections with high crash rates and to recommend low-cost, systemic countermeasures that may reduce intersection fatalities.

The NCTCOG ISIP recommended five systemic countermeasures that could assist in reducing severe crashes at these urban signalized intersections:

- Retime traffic signals for better coordination and for proper red and amber
- Install one signal head per approach
- Change permitted and protected/permitted left turn phasing to protected
- Improve basic pavement marking and signs
- Install advanced signs that warn of a signal ahead

In 2016, the Texas Department of Transportation, in partnership with FHWA and the five largest Metropolitan Planning Organizations (MPOs) across the state, finalized the development of the Texas ISIP.

The Texas ISIP focused on the following MPOs: Alamo Area MPO in the San Antonio region; Capital Area MPO in the Austin region; El Paso MPO in the El Paso region; Houston-Galveston Area Council in the Houston region; and NCTCOG in the Dallas-Fort Worth region.

The goal of the Texas ISIP was to implement effective, low-cost countermeasures at a large number of intersections to increase visibility and driver awareness and improve intersection design and operation. Countermeasures included, but were not limited to, sign and marking improvements, advanced warning signs, and signal retiming.

Regional Roadway Safety Plan

Approved by the Regional Transportation Council in March 2023, the NCTCOG Regional Roadway Safety Plan is the first regionwide plan developed to eliminate all fatalities on our roadways by 2050. The Roadway Safety Plan includes regionwide safety analyses to identify which crash types produce the most fatalities and serious injuries and then recommends countermeasures to prevent these crashes or reduce crash severity. The following eight emphasis areas were identified as part of the plan: 1) speeding, 2) distracted driving, 3) impaired driving, 4) intersection safety, 5) bicyclist and pedestrian safety, 6) roadway and lane departures, 7) occupant protection (seatbelts), and 8) motorcycles. The plan also identifies roadways with the highest history of fatal and serious injury crashes and scores those roadway segments as candidates for engineering upgrades or other safety countermeasures. The regional **Roadway Safety Plan** (view plan online ↗) will serve as a guide for the implementation of future systemic safety projects and programs throughout the NCTCOG region as we work towards a goal of zero fatalities on our region's roadways by 2050.

REGIONAL ROADWAY SAFETY PLAN GOALS

- Eliminate fatal crashes from all modes of travel by 2050.

- Prioritize safety in roadway project selection and provide guidance on countermeasure development to partner agencies.

- Work with partners to foster a culture of safety that utilizes the safe systems approach and develop behavioral and educational countermeasures to address dangerous driving behaviors.

- Fund and implement safety projects and policies equitably to ensure safe transportation access for all road users.

- Implement a proactive approach to roadway safety to identify problems before they occur.

- Work with police to effectively enforce traffic rules and traffic management professionals to improve quick clearance strategies.

Strategic Plans for Pedestrian Safety and Bicycle Safety

While mapping bicycle and pedestrian crash locations can reveal areas in the region with the highest concentrations of reported crashes, it does not identify what actions led to those crashes. Officers who arrive at the crash scene produce reports containing narratives and diagrams that can provide the information needed to determine the actions that led to a crash. FHWA and the Pedestrian and Bicycle Information Center have produced a list of common bicycle and pedestrian crash types with their accompanying diagrams. By coding this information, trends in the causes of crashes can be analyzed.

Mobility 2050 active transportation programs will continue to collect and analyze pedestrian and bicycle crash data, using crash density maps to relate trends in unsafe actions to their physical locations. This will provide a more comprehensive view of the safety issues that need to be addressed.

The **Regional Pedestrian Safety Action Plan** (view plan online ↗) endorsed by the Regional Transportation Council on June 10, 2021, with an update approved on August 18, 2022, and adopted by reference in Mobility 2050, includes crash density analysis leading to the identification of 105 corridors (Primary and Secondary Pedestrian Safety Corridors) with the highest density of pedestrian crashes. These corridors are targeted for project selection to implement safety countermeasures that will reduce pedestrian-automobile incidents. Goals of the Action Plan are to eliminate crashes across the Metropolitan Planning Area by 2050, balance the safety and needs of all roadway users with priority given to those most vulnerable, include Level of Comfort in the design and other phases of development,

integrate the most direct routes for pedestrians, and implement proven safety countermeasures on roadways where appropriate. Policies and action items outlined in the Pedestrian Safety Action Plan serve as the initial steps to reduce the total number of regionwide pedestrian crashes, and to comprehensively improve the level of safety and comfort of the pedestrian network across the Metropolitan Planning Area.

The future development of a Regional Bicycle Safety Action Plan will help guide appropriate strategies to reduce the number of bicycle crashes and fatalities across the region. This future plan will guide the strategic implementation of the regional bikeway network and proven countermeasures to improve safety and reduce barriers to bicycle travel as a means of transportation.

Wrong-Way Driving Mitigation Planning

The National Transportation Safety Board identifies wrong-way driving crashes on high-speed divided highways as the most serious type of highway collision. Although wrong-way driving collisions occur less frequently than other crashes, they are more likely to result in fatal and serious injuries than other types of crashes.[2] **Table 5-4** summarizes the wrong-way crashes that occurred in the region from 2019 to 2023.

NCTCOG continues to work with the Texas Department of Transportation, local jurisdictions, and counties throughout North Central Texas to implement projects and improvements to assist in reducing wrong-way driving occurrences through the Wrong-Way Driving Mitigation project. The project goal is to prevent wrong-way driving along regional corridors by improving intersections, signage, and/or other countermeasures. The project initially focused on 350

diamond interchanges, which connect streets and highways throughout Dallas County. Recommended project improvements include eliminating conflicting lane assignment signs and pavement markings; placing straight arrow markings in extended bays; modifying signage message, size, and location; and making minor traffic signal enhancements such as installing light-emitting diode bulbs and utilizing vertical green arrows instead of the traditional green balls.

Table 5-4: Regional Wrong-Way Driving Crash Statistics, All Roadways

County	2019	2020	2021	2022	2023	Total
Dallas	265	281	297	314	297	1454
Tarrant	170	128	154	129	123	704
Denton	54	51	44	52	39	240
Collin	48	54	42	51	43	238
Johnson	30	25	29	27	14	125
Hunt	35	19	34	15	17	120
Ellis	25	15	20	14	13	87
Kaufman	21	16	12	17	12	78
Parker	14	14	24	21	15	88
Hood	13	15	14	11	11	64
Wise	7	6	13	13	10	49
Rockwall	4	5	4	8	9	30
Total	**686**	**629**	**687**	**672**	**603**	**3277**

Phase One of the Wrong-Way Driving Mitigation project began in Collin, Dallas, and Denton counties, and has expanded to several additional counties, as listed in **Table 5-5**.

Implemented in Tarrant County, Phase Two focused on 54.2 miles along seven priority corridors in Arlington and Fort Worth, as shown in **Table 5-6**. Phase Two concentrated on limited-access facilities, and countermeasures include installing wrong-way pavement markings in

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[2] National Transportation Safety Board, 2012, Wrong-Way Driving, Highway Special Investigation Report NTSB/SIR-12/01

the travel lanes, enhanced signage with active detection units, modified sign placement, and use of technology for wrong-way driving incident notifications.

Table 5-5: Expanded Phase One—Cities and Counties Participating in the Wrong-Way Driving Mitigation Project in North Central Texas

Area	City/County	Completed Intersections
Dallas County	Carrollton	11
	Dallas	181
	Farmers Branch	2
	Garland	17
	Grand Prairie	25
	Irving	38
	Mesquite	17
	Richardson	6
	Rowlett	5
	TxDOT	34
	Subtotal	**336**
Additional Counties	Collin	56
	Denton	20
	Ellis	12
	Rockwall	4
	Navarro	3
	Kaufman	6
	Dallas North Tollway*	13
	Subtotal	**114**
Grand Total		**450**

* Dallas North Tollway intersections are listed separately from other Dallas County intersections.

Table 5-6: Phase Two—Priority Corridors for Wrong-Way Driving Countermeasure Deployment in Tarrant County

Priority	Corridor Area	From	To	Miles
1	IH 30 West Freeway	University Drive	Bridgewood Drive	6.2
2	North Downtown Fort Worth	Spur 280	Yucca Avenue/Northside Drive	2.4
3	SH 360	Spur 303/Pioneer Parkway	Trinity Boulevard	7.9
4	SH 199/Jacksboro Highway	IH 820	FM 730	11.0
5	IH 820 West Loop	Old Decatur Road	Winscott Road	14.0
6	IH 820 East Loop	Trinity Boulevard	IH 20/Business 287/Mansfield Highway	8.2

| 7 | IH 30 Entertainment District | Fielder Road | SH 360 | 4.5 |

Roadway Safety Assistance Patrol Program

The Roadway Safety Assistance Patrol Program (RSAPP) is an essential element of the region's safety program and incident management operations. The goals of RSAPP are to improve roadway safety and alleviate congestion on area freeways and tollways. The RSAPP coverage area includes congested roadway systems in Dallas and Tarrant counties and portions of Collin and Denton counties. RSAPP provides free assistance to stalled and stranded motorists by helping them to move disabled vehicles from the mainlanes; assisting with flat tires, stalled vehicles, and minor crashes; and ultimately getting the vehicles operating or off the facility. The program also assists law enforcement with traffic control when deemed necessary or when requested by law enforcement.

RSAPP is currently operated by the Dallas County Sheriff's Office, Tarrant County Sheriff's Office, and the North Texas Tollway Authority. Portions of operations in Dallas and Tarrant counties are currently patrolled by private-sector partner agencies who serve the LBJ, DFW Connector, and North Tarrant Express TEXpress corridors. More information on RSAPP is included in the **Operational Efficiency** appendix.

SAFETY EDUCATION AND TRAINING EFFORTS

Traffic Incident Management Training Program

Educating stakeholders and increasing public awareness about safety issues is important to promoting safety in the region. NCTCOG was the first agency in the nation to formalize training in Traffic Incident Management for all responders, including police, fire, emergency medical services, towing, and transportation agencies. The training is designed to increase awareness of safety issues for responders and motorists, improve multiagency coordination, reduce response and clearance times for traffic incidents, and reduce on-scene confusion over responder roles, responsibilities, and jurisdictional line. To emphasize the importance and need to coordinate incident management, the Regional Transportation Council adopted Resolution R08-10: Resolution Supporting a Comprehensive, Coordinated, Interagency Approach to Freeway Incident Management. Policy TSSF3-006 requires the implementation of a multiagency Traffic Incident Management Program that is consistent with this resolution. More information on the NCTCOG Traffic Incident Management Training Program and Resolution R08-10 is included in the **Operational Efficiency** appendix.

Examples of regional safety education and training efforts are shown in **Table 5-7**.

Table 5-7: NCTCOG-Supported Regional Safety Education and Training Opportunities

Training Goal	Training Outcomes	Audience
Traffic Incident Management		
Initiate common, coordinated response to traffic incidents that builds partnerships, enhances safety for emergency responders, reduces upstream traffic accidents, improves system efficiency, and improves air quality	Improves safety by notifying motorists of incidents, reducing rear-end collisions due to vehicle queue, and improves the safety of responders and commuters at the scene.	First responders, managers, executive-level policy makers
Crash Reconstruction Training		
Complements Traffic Incident Management training, crash reconstruction, and forensic measurements	Uses available technology to capture details of a crash scene on site, with the ability to go back and reconstruct the crash scene and perform analysis in office	Traffic incident responders
Educational Webinars and Training		
Provide safety training opportunities for regional professionals	Varied based on topic	Varied
Driver Safety Initiatives		
Teens in the Driver Seat Educational Program to improve safety for teen drivers	Focuses on driving at night, distractions, speeding, failure to wear safety belts, and drinking and driving	Texas schools
Distracted driving educational awareness outreach	Raises public awareness, reduces distractions within the vehicle, avoids crashes caused by distractions, and improves driver behavior	All drivers
Drive Aware North Texas (driver behavior social marketing campaign)	Geared toward improving negative driver behaviors and decreasing motor vehicle crashes in the North Central Texas region using targeted social marketing messages	All drivers
Commercial Vehicle Enforcement Safety		
Commercial Vehicle Enforcement Equipment and Training Program	Improves safety by focusing on the enforcement of overweight commercial vehicles	Police agencies
Commercial motor vehicle violations training for judges and prosecutors	NCTCOG partners with the National District Attorneys Association to provide training on commercial driver's licenses, common vehicle violations, and penalties	Area judges and prosecutors

SUMMARY

The goal of the Transportation System Safety Program is to improve safety for all users of the transportation system by supporting and coordinating planning efforts to develop safety policies, programs, and projects. Because safety planning is a multidisciplinary effort and human behavior is a major factor in traffic safety, effective safety improvements must be equitable for all roadway users and involve input by stakeholders from the engineering, enforcement, education, and emergency response communities. As the North Central Texas population continues to grow, implementing and funding safety initiatives that include training, data collection, and various regional safety programs is essential to save lives and to improve the reliability, efficiency, and maintenance of the transportation system.

5-4. TRANSPORTATION SYSTEM SECURITY

OVERVIEW

The security of the transportation system is a national and regional priority. The goal of Transportation System Security is to support ongoing local, state, and federal initiatives to address security and emergency preparedness planning in North Central Texas. Local governments, transportation providers, and emergency responders in the region are working to coordinate response plans, response capabilities, and emergency medical services in the event of a major incident or catastrophic event.

In addition, these partners are identifying critical transportation infrastructure so they can increase surveillance of these systems.

Furthermore, the region's Intelligent Transportation System (ITS) infrastructure is an integral part of the Transportation System Security Program. For more information on ITS, please see **Transportation System Management and Operations**.

MOBILITY 2050 SUPPORTED GOALS

MOBILITY

Improve the availability of transportation options for people and goods.

Support travel efficiency measures and system enhancements targeted at congestion reduction and management.

Ensure all communities are provided access to the regional transportation system and planning process.

QUALITY OF LIFE

Preserve and enhance the natural environment, improve air quality, and promote active lifestyles.

Encourage livable communities which support sustainability and economic vitality.

SYSTEM SUSTAINABILITY

Ensure adequate maintenance and enhance the safety and reliability of the existing transportation system.

Pursue long-term sustainable revenue sources to address regional transportation system needs.

IMPLEMENTATION

Provide for timely project planning and implementation.

Develop cost-effective projects and programs aimed at reducing the costs associated with constructing, operating, and maintaining the regional transportation system.

MOBILITY 2050 POLICIES AND PROGRAMS

Mobility 2050 includes policies and programs that address regional priorities and public needs. Policies guide decision-making and set the framework for long-term goals, while programs provide the funding and resources to turn plans into action across the transportation system.

Policies

TSSC3-001: Support integration of traffic management and emergency management centers through the sharing of data and video.

TSSC3-002: Transportation System Security and Resiliency should be considered, and mitigation strategies put in place, during planning, engineering, construction, and operation stages of corridor implementation for roadway and transit operations, with emphasis on identified critical infrastructure or key resources affected by human-made or natural disasters.

TSSC3-003: Identify regional transportation components of key resources and critical infrastructure and develop protective methodologies to reduce risk to assets from damage due to natural or human-implemented attacks.

Programs

For more information on program funding and implementation, see the **Operational Efficiency** appendix**.**

TSSC2-001: Transportation System Security Improvements, Expansions, Management, and Operations

TSSC2-002: Transportation Security Education and Training

TSSC2-003: Regional Response Plan Development

SUPPORTING EMERGENCY PREPAREDNESS AND TRANSPORTATION SYSTEM SECURITY

Coordination Plans to Provide Support for Mass Evacuation Events

The North Central Texas Council of Governments (NCTCOG) and partner agencies in the region are establishing procedures to use transportation resources during mass evacuations. The partner agencies are assessing the use of land, air, rail, or other resources to facilitate effective and efficient emergency response or assistance operations.

The *Texas Homeland Security Strategic Plan 2021-2025*[4] is a high-level roadmap for all homeland security efforts across the state. A regional goal stemming from the plan is to develop the capability to provide an overwhelming response to any catastrophic incident that poses a significant threat to communities within Texas. To focus on North Central Texas, regional partners are working closely together to develop a Multiagency Coordination Plan. This plan will address topics such as regional emergency management, comprehensive resource

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[4] Texas Department of Public Safety, *Texas Homeland Security Strategic Plan 2021-2025*, https://gov.texas.gov/uploads/files/press/HSSP_2021-2025.pdf

planning, readiness and response levels, regional coordination centers, situational awareness, pre-positioning of resources, and evacuations.

One need related to regional readiness is the potential to accommodate hurricane evacuees. The region continues to prepare for possible evacuees from the Gulf Coast by participating in hurricane exercise projects. The region's roles include:

- Coordinating with local jurisdictions and state operations centers through shelter hubs to manage shelters in accordance with priorities established in state and local plans and procedures.
- Managing evacuation in accordance with state and local traffic management plans to ensure desired outcomes.

Data and Information Flows in Evacuation Planning

The regional ITS infrastructure is an integral part of the evacuation planning toolkit. Such tools include contra-flow, traveler information sources, signal timing for emergency conditions, ramp closures, supply of heavy equipment and barriers, and ITS components such as closed-circuit television and vehicle detection. While it is critical to obtain information about the status of regional transportation facilities, it is equally important to provide a mechanism to distribute information to the public. Several potential methods of disseminating information include dynamic message signs, websites, the 511DFW Traveler Information System, and highway advisory radio.

National Strategic Stockpile

The Centers for Disease Control and Prevention, the Texas Department of State Health Services, and NCTCOG work with local jurisdictions to prepare to make full and effective use of the Strategic National Stockpile in the event of a possible biological terrorist attack. The Strategic National Stockpile is the Centers for Disease Control and Prevention's collection of medicine and medical supplies available to communities that run out of such supplies during an emergency.[5]

The region is evaluating and planning transportation options for distributing Strategic National Stockpile items within 48 hours of an attack. These planning efforts include evaluating traffic and transit conditions and analyzing usage.

The region is also planning for major incidents that require emergency response efforts. This planning includes traffic conditions analysis, transit system usage analysis, and analysis of various conditions.

Transportation Critical Infrastructure

NCTCOG has developed a Memorandum of Understanding[6] that is leading to a regional agreement for ITS partner agencies to share fiber and data with each other, the Texas Department of Transportation, and NCTCOG. The Memorandum of Understanding outlines the roles and responsibilities of each party.

Sharing Security-Related Messages with the Public

Methods to share security-related messages with the public are being developed. Dynamic message signs and 511DFW are among the

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[5] Centers for Disease Control and Prevention's Strategic National Stockpile, http://www.cdc.gov/phpr/stockpile/stockpile.htm

[6] NCTCOG Memorandum of Understanding: https://nctcog.org/getmedia/31e2e0bf-4938-4601-9581-b8ab4203d8cd/ITS_MOU_080116.pdf

mechanisms that could be used to share information about security issues such as severe weather, flooding, infrastructure failure, and other potential emergencies. Connected vehicle systems may also be instrumental by using dashboard displays and warnings.

Social Media and Crowdsourced Data

Social media has emerged as an important part of the transportation safety and security infrastructure. Crowdsourced travel navigation apps are a valuable source of real-time information about highway conditions and provide platforms for public agencies to communicate information to other agencies and to the public.

SUMMARY

The primary goal of Transportation System Security is to support ongoing local, state, and federal initiatives that address emergency preparedness and the security of the transportation system. The policies and programs discussed in this section are intended to achieve this goal in North Central Texas. All security policies, programs, and projects are provided in the **Operational Efficiency** appendix.

5-5. CONNECTED/AUTOMATED VEHICLES AND TECHNOLOGIES

OVERVIEW

In 2016, the North Central Texas Council of Governments (NCTCOG) established an Automated Transportation Program in response to the accelerating trend toward highway transportation automation. Such automation may significantly impact the transportation system, presenting both challenges and opportunities for improvement. Recent public feedback in North Texas has shown a positive, forward-thinking attitude towards deploying emerging technologies to address transportation system challenges. There is a collective desire for innovative approaches and tested solutions to tackle traffic congestion, air pollution, safety, and efficiency.

This chapter expands on the previous edition by describing not only the rise and impetus of vehicle automation, but also the emergence of connected vehicles and related technologies. It also highlights the growing importance of broadband internet in facilitating innovative solutions to transportation issues like air quality and accessibility. This chapter outlines policies designed to ensure that connected and automated vehicles, along with other technology solutions, will be deployed in a way that best serves North Central Texas.

MOBILITY 2050 SUPPORTED GOALS

MOBILITY

Improve the availability of transportation options for people and goods.

Support travel efficiency measures and system enhancements targeted at congestion reduction and management.

Ensure all communities are provided access to the regional transportation system and planning process.

QUALITY OF LIFE

Preserve and enhance the natural environment, improve air quality, and promote active lifestyles.

Encourage livable communities which support sustainability and economic vitality.

SYSTEM SUSTAINABILITY

Ensure adequate maintenance and enhance the safety and reliability of the existing transportation system.

Pursue long-term sustainable revenue sources to address regional transportation system needs.

IMPLEMENTATION

Provide for timely project planning and implementation.

Develop cost-effective projects and programs aimed at reducing the costs associated with constructing, operating, and maintaining the regional transportation system.

MOBILITY 2050 POLICIES AND PROGRAMS

Mobility 2050 includes policies and programs that address regional priorities and public needs. Policies guide decision-making and set the framework for long-term goals, while programs provide the funding and resources to turn plans into action across the transportation system.

Policies

TT3-001: The region will develop and implement data sharing best practices that are project- and outcome-focused, serve the public interest, and comply with privacy and cybersecurity requirements, without infringing upon private sector proprietary information requirements.

TT3-002: The region will support automated vehicle and related transportation technology deployments that advance the goals of Mobility 2050 by fostering public-private partnerships among local transportation authorities, technology developers, and commercial/industrial hubs.

TT3-003: The region will support consistent and high-quality maintenance and operations of its transportation system, including utilization of new technologies which offer a cost-efficient method of linking asset management to data collection.

TT3-004: The region will pursue its goal of becoming a "Region of Choice" by exploring emerging mobility technologies which offer new modes of transportation and those which enhance existing modes of transportation.

TT3-005: New transportation technologies must be deployed in a manner consistent with Mobility 2050 goals of providing the public with a transportation system that is equitable, protects the safety of all users, offers the public more travel options, is well maintained and operated, is environmentally responsible, and prepares the region for innovations in transportation and mobility infrastructure that will accelerate its future economic development.

TT3-006: The region will prepare for future innovations in both transportation and infrastructure by developing analytical tools capable of assessing traditional transportation projects against alternatives such as new mobility technologies, connected vehicle-to-everything (C-V2X) innovations, more effective use of existing assets, and demand management tools.

TT3-007: The region will work with educational institutions at all levels to develop workforce training solutions to prepare area residents for job opportunities in the emerging transportation technologies sector, to pursue funding opportunities, and to support deployments of automated vehicles and other emerging transportation technologies.

TT3-008: The region will prioritize the safety of all transportation system users in and through the deployment of emerging modes of transportation such as e-scooters, e-bikes, automated vehicles, and delivery robots through the use of strategic technology, design, and policy solutions.

Programs

For more information on program funding and implementation, see the **Operational Efficiency** appendix.

TT2-001: Automated/Connected Vehicles

TT2-002: Freight Optimization

TT2-003: University Partnerships to Promote Emerging Technologies

TT2-004: Connected Vehicle Data for Operations

TT2-005: Workforce Development

TT2-006: Emerging Transportation Technology Deployments

TT2-007: Innovation Grants for Local Partners

Additional details on these programs can be found in the **Transportation Technology** appendix.

TRANSPORTATION TECHNOLOGY AND INNOVATION PROGRAM

The Transportation Technology and Innovation Program (TTIP) is NCTCOG's response to the future. To prepare for the future while shaping an envisioned future for North Central Texas, the program is built along three lines of effort (LOE):

LOE 1: Transportation Technology and Innovation: Catalyzing technology development and deployments.

LOE 2: Connectivity and Innovation Workforce: Expanding broadband access/usage across Dallas-Fort Worth—necessary to make C-V2X available to all and promote telecommuting and other virtual connections—and building next-gen transportation workforce via "agile curricula."

LOE 3: Connected Vehicle-to-Everything and Transportation Data Infrastructure: Data infrastructure to support C-V2X, leverage the Cloud to improve operations, and level the playing field through regional licensing/programs giving all local partners access to emerging connected vehicle data tools.

Seven project categories fall within these levels of effort, as described in **Table 5-8**.

Exhibit 5-8: Transportation Technology and Innovation Program Level of Effort Project Categories

Project Category	Description
Regional Innovation	Competitive grant program for transportation-related innovative projects
Emerging Vehicle Pilots	Encompassing wider range of vehicle types
Broadband/ Communications	Improve broadband access/virtual connections to jobs, education, medicine
Workforce/Universities	Next generation transportation workforce development; build Dallas-Fort Worth tech talent base in transportation
Connected Vehicle Data Infrastructure	Getting infrastructure data (e.g., road closures, crashes) to automated vehicles/connected vehicles to improve operations
Cloud-Based Roadway Optimizations	Build on tech platform to improve vehicle flows/operations on roadways (e.g., transit signal priority, green light speed advisories)
Connected Vehicle Data Platforms for Partners	Regional licenses so all local partners can access data platforms to improve safety/operations; extensive training
Connected Vehicle Data and System Standards	Develop connected vehicle systems interface requirements to allow systems to be certified and data to be exchanged in a standard format.

BROADBAND AS A TRANSPORTATION MODE

Using computers, mobile devices, and broadband communications, many people work, learn, receive medical treatment, worship, engage with family members, and the like virtually rather than via physical travel.

A key purpose of the transportation system is to connect people to their destinations. As more people connect virtually to more of their destinations and activities, it becomes necessary to think of "broadband as a transportation mode" as a growing complement of travel in physical space.

Such virtual travel may replace some trips. Telecommuting, for example, may be a valuable way to reduce demand for roadway travel at peak AM and PM periods, which is when most congestion occurs; however, it is better to think of virtual travel as a way to help people access more destinations and life activities in a given amount of time—some trips via physical travel and some trips via virtual means. Providing people with both modes of travel gives them access to more opportunities and activities than if they have access to only one mode.

Broadband Internet

Broadband internet is of growing importance to transportation. The core elements affected by this important topic are access to the internet (see the **Social Considerations** chapter), physical infrastructure and the uses of internet for transportation (see the **Operational Efficiency** chapter), and the transportation-communications nexus (in this chapter). Broadband internet's importance is demonstrated by the following:

- Air quality benefits result from telework, which is the most prominent use of internet in transportation.
- The internet increases access in the same way railroads or planes have done in the past.
- Physical rights-of-way are evolving to more than pavement, meaning urban environments will see more varied use of this public infrastructure in the future (incorporating fiber, solar panels, charging stations, etc.).

VEHICLE AUTOMATION

Automated vehicles (AVs) use advanced systems (e.g., sensors, cameras, Light Detection and Ranging, radar) to perform driving tasks with minimal or no human intervention. Technologies related to the rise of automation have gained more traction and are moving to the fore of development and adoption. At this time, it is unclear where these developments will go and their impact on the transportation system. However, North Central Texas should be prepared for the possibility of significant changes between 2026 and 2050.

While the actual impacts of widespread vehicle automation remain hidden from us, modelling conducted by a range of sources has identified some of the potential challenges that driverless cars might bring:

1. Automated vehicles take up as much space as standard vehicles, which means that swapping automated vehicles for today's vehicles will not reduce the space requirements—roadways and storage—for vehicles.
2. Introduction of new safety/security risks associated with automated driving technologies.

3. If roadways remain largely unpriced, automated vehicles may reduce the cost of distance by a significant margin, which will lead to more vehicle miles traveled.
4. The timeline for widespread public adoption of shared automated vehicles remains uncertain, posing challenges to managing potential increases in vehicle miles traveled from automated vehicles.

These are some of the possible downsides of automated vehicles. However, in recent years, automated vehicle developers and transportation network companies have viewed several challenges facing the existing transportation system as opportunities for technological and business innovation. The developers of automated vehicles have identified two things that roadway operators can do to optimize the operations and safety of automated vehicles. First, well-maintained roads with good quality lane striping are key to successful operations. Second, by sharing accurate information about changes to roadway conditions as a result of events, such as lane closures for construction work, roadway operators can help improve the operation of automated vehicles. It is noteworthy that the actions taken to advance the successful operation of automated vehicles will also improve the operation and safety of human-driven vehicles.

Levels of Automation

Automation is well established in the transportation sector. Dallas Fort Worth International Airport, for example, has an automated people mover system. Buildings in the region have elevators that travel automatically. Much of the flight time for the commercial aircraft accessing Dallas Fort Worth and Love Field airports is done on autopilot.

There have been efforts to automate highway transportation for over a century. These efforts cover a spectrum that, at one end, features "smart vehicles" that are designed to perform all of the driving functions themselves, commonly known as "autonomous vehicles," and the other end of the spectrum features "smart highways" that direct vehicle operation. For the purposes of Mobility 2050, the term "automated vehicles" is used to cover the whole spectrum.

There are multiple levels of vehicle automation (**Figure 5-4**), as illustrated by this Society of Automotive Engineers classification that was adopted by the US Department of Transportation.[6]

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[6] Society of Automotive Engineers, 2021, https://www.sae.org/blog/sae-j3016-update

Figure 5-4: Levels of Vehicle Automation

SAE **J3016**™ LEVELS OF DRIVING AUTOMATION™

Learn more here: sae.org/standards/content/j3016_202104

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	SAE LEVEL 0™	SAE LEVEL 1™	SAE LEVEL 2™	SAE LEVEL 3™	SAE LEVEL 4™	SAE LEVEL 5™
What does the human in the driver's seat have to do?	You <u>are</u> **driving** whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You <u>are not</u> **driving** when these automated driving features are engaged – even if you are seated in "the driver's seat"		
	You must **constantly supervise** these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, **you must drive**	These automated driving features will not require you to take over driving	

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	These are driver support features			**These are automated driving features**		
What do these features do?	These features are limited to providing warnings and momentary assistance	These features provide steering **OR** brake/ acceleration support to the driver	These features provide steering **AND** brake/ acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met		This feature can drive the vehicle under all conditions
Example Features	• automatic emergency braking • blind spot warning • lane departure warning	• lane centering **OR** • adaptive cruise control	• lane centering **AND** • adaptive cruise control at the same time	• traffic jam chauffeur	• local driverless taxi • pedals/ steering wheel may or may not be installed	• same as level 4, but feature can drive everywhere in all conditions

In the past decade, automated vehicle developers have utilized improvements in computing power, sensors, and artificial intelligence to make strides toward rolling out vehicles with a high degree (Level 4) of automation. Auto manufacturers are developing and testing automated vehicles for street and highway use. These vehicles have the same general design as today's vehicles, but with additional sensors, computing power, and automated driving software.

Types of Automated Vehicles

Low-Speed Automated Shuttles

Low-speed automated shuttles are another important category of automated vehicles. These shuttles typically accommodate about 10 people, travel at up to 25 miles an hour, and have a service range of roughly two miles. They are currently being deployed in closed campus-like environments. Test deployments of such vehicles are now occurring on low-speed public streets.

Freight Sector

The freight sector has emerged as a key automated vehicles sector and North Central Texas is a center of development. Many firms that have automated long-distance freight transportation have operations hubs in the region. Other developers in North Central Texas focus on automating vehicles in other segments such as business-to-business deliveries and freight yard operations. Others are automating last-mile deliveries with sidewalk delivery bots. Experts predict vehicle automation will proceed more quickly in the freight sector than in the human passenger sector.[7]

Teleassist, Teleoperation, and Robot Valet Services

Two other related technology advancements deserve mention. First, automated vehicle developers are increasingly using teleassist and teleoperations to supplement automated vehicles. In teleassist, remote operators respond to questions posed by the automated vehicle as it navigates through difficult situations such as unexpected road blockage. Teleoperation involves the actual driving of a vehicle by a remote operator using a robust communications network.

The city of Arlington operates the Milo autonomous vehicle during events in the Entertainment District. Photo credit: City of Arlington

The second advancement is robot valet services, namely having a vehicle park itself at a parking facility after its occupants disembark at a destination. Robot valet services can increase the storage capacity of parking facilities by approximately 20 percent and potentially eliminate the often-long treks to and from parking facilities.[8] If robot valet technology becomes established, it may have significant implications for how both destinations and parking facilities are designed.

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[7] Steven E. Shladove, "'Self-Driving' Cars Begin to Emerge from a Cloud of Hype," 'Self-Driving' Cars Begin to Emerge from a Cloud of Hype - Scientific American

[8] Bosch Mobility, 2024, https://www.bosch-mobility.com/en/solutions/parking/automated-valet-parking/

Automated Vehicle Public Policy

Automated vehicles are being actively developed around the world by auto manufacturers, tech companies, and universities. Governments at all levels throughout the world have supported automated vehicle research and development in recognition of the potential transportation and economic development benefits of such technology.

Most automated vehicle developers today are focused on developing autonomous vehicles, observing that it might take decades for the public sector to invest in the kind of roadside infrastructure necessary to allow semi-autonomous vehicles to run in full automation mode. Such developers have identified two key things the public sector can do to support the deployment of automated vehicles:

- Implement high roadway maintenance standards such as high-quality lane marking; this is essential in helping automated vehicles "see" roadway elements and navigate accordingly.
- Share the data governments have about roadways—especially road and lane closure information—to help support the safe operation of automated vehicles.

Within the next decade, and certainly by 2050, most vehicle fleets will have a direct high-speed connection to the internet. This connection will allow vehicles to share information about roadway conditions with each other. For example, a vehicle that encounters a lane closure can share that information with the mapping firms that provide real-time roadway information to automated vehicles. Such firms will update the maps for the automated vehicles approaching the lane closure.

5G wireless communication will allow fast communication among vehicles and between vehicles and internet-based services and software. It will be important that highways and streets have robust wireless coverage in order to support automated vehicle operation.

CONNECTED VEHICLES AND EMERGING MOBILITY TECHNOLOGIES

The new, durable transportation technology regime is anchored around communications, mapping, and vehicle-generated data. Connected Vehicles (CVs) are equipped with communication technology to receive real-time alerts about traffic, accidents, or hazardous conditions, and to share information with other vehicles. The existing roadway system relies on a complex web of physical and non-physical communications systems to operate freely. Physical systems (e.g., traffic lights, signs, markings) create the roads we navigate. Invisible systems (e.g., the legal code establishing the rights and rules of driving) serve as the framework that ensures orderly movement on the roads. Additionally, drivers rely on physical gestures, special driving tactics, and the tools of the vehicle (e.g., signals) to coordinate their movements further.

Thinking about the way drivers operate in this intricate communication network of visible and invisible systems allows us to fully appreciate the role that communications technologies are beginning to play in the future of driving. Three examples below highlight technology responses to these visible and invisible systems.

5G and Connected Vehicle-to-Everything. The direct communication between vehicles and between vehicles and infrastructure will rely on robust cellular networks capable of low-latency communication.

Edge Computing and Cloud Computing. This is a vital element in the success of a cellular communications order as it facilitates the ability for automated vehicles to communicate with each other in a way that allows robot drivers to make decisions.

Mapping via Vehicle Data. Automated vehicles require up-to-date and highly accurate information about roadway rules and conditions. Data collected from vehicle sensors, analyzed using Artificial Intelligence/Machine Learning tools, and distributed to vehicles via the Cloud will be the key components of this system.

These three systems represent a shift from traditional transportation data-gathering tools, which were primarily installed and operated by transportation departments and used to convey information to human drivers. Instead, autonomous vehicle manufacturers, governments, and others will be harvesting extensive data from vehicles and using this information to guide both automated vehicles and human drivers as they navigate roadways. Departments of Transportation (DOTs) will contribute key information to this roadway data ecosystem such as up-to-date information about lane closures at construction sites and will license information based on vehicle sensor data rather than investing heavily in their own closed system of roadway sensors.

It has also become apparent that automated vehicle developers are not relying on DOTs to take responsibility for any of the driving tasks handled by automated vehicles. Today, DOTs provide streets and signage but are not involved in the driving tasks handled by human drivers. Likewise, DOTs will continue to provide streets and signage for automated vehicles—perhaps in the form of digital road rules—but the driving tasks will be the responsibility of automated vehicles, not the DOTs. This development likely means that initiatives will have to shift away from US Department of Transportation and others from the public sector playing a central role in supporting automated driving (through public vehicle-to-vehicle and vehicle-to-infrastructure using dedicated wireless spectrum).

Vehicle Electrification

A global shift to electric vehicles is currently under way. China and a number of European countries have committed to phasing out new internal combustion engine vehicles by 2045 or earlier. Reductions in the cost of batteries and other improvements have made electric vehicles more price- and performance-competitive with internal combustion engines.

Notably, California became the first state to require that by 2030 all light-duty automated vehicles must be fully electric.[7] Through similar legislation or incentives, this state might use automated vehicles to help accelerate the electrification of our vehicle fleet.

Electric powertrains support a wide variety of vehicle types, including automated shuttles and personal vehicle "pods" that may someday be automated. Electric vehicles whose forms and functions fill the gap between electric bikes and the standard automobile may be developed. These vehicles will include the automated shuttles that are being deployed on a pilot program basis at sites around the world. For more on electric vehicles, see the Air Quality section in the Environmental Considerations chapter.

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[7] The Verge, 2021, https://www.theverge.com/2021/9/24/22691410/california-autonomous-vehicles-zero-emission-2030-newsom

Emerging Technology Opportunities

Automated vehicle freight and shipping

Fiber network and 5G connectivity: broadband access for all

Automated delivery

A variety of automated delivery formats are in development or already in use across Dallas-Fort Worth. This ranges from small sidewalk delivery robots to larger golfcart-sized delivery bots. Automated delivery technology extends upward in size to vans and small trucks (e.g., Ford Transit).

Vehicle data platforms: open-source data and asset management technologies

Transit connections and transit-oriented development footprint expansion

Workforce development: Dallas-Fort Worth university strength in transportation

Shared Mobility

Shared mobility services, including car sharing, ridesharing, and bike sharing platforms, have emerged in the past decade, and have impacted the transportation system. These services have attracted consumers with the services' flexible and convenient mobility, powered by apps that handle ride hailing, payment, and navigation.

Nationally, shared mobility services have been forecast to expand dramatically, driven by urbanization and the growing demand for cost-effective and sustainable travel options. For example, micromobility services alone are projected to account for up to 10 percent of the shared mobility market by 2030, and robo-taxi development could transform how individuals use shared mobility services in urban areas.[8]

Developers around the world are working with these three elements—automation, vehicle electrification, and shared mobility—to advance major changes to the surface transportation system. Most automated vehicles are being developed on an electric vehicle platform. Shared mobility services—not individual consumers—are likely to be the first big customers of automated vehicles. Unmanned electric vehicles in continuous operation deployed in fleets could offer mobility at a lower per-mile cost than today's privately-owned vehicle. Shared mobility services, where multiple users ride in the vehicle at any one time, could drive down the per-mile cost even more.

According to this vision of the future, the cost of automated vehicle services would drop below the cost of operating a personal vehicle. This would lead people to shift to a model of mobility as a service. Rather than investing in an expensive capital asset on wheels that sits idle most of the time, many people would prefer to pay for just the amount of mobility they need. Just as people book and pay for only the amount of airline travel they need rather than owning their own jetliner, they would be able to do the same with their surface transportation, namely, consuming just the amount of vehicular mobility they need. The consumers' cost-driven preference for lower-cost automated vehicles would increase the demand for automated shared mobility services and accelerate the transition to automated vehicles. Ultimately, more mobility would be consumed by more people at a lower per-mile cost and a greater level of safety than before. However, there is uncertainty in this popular vision of the future, as discussed in the next section.

POSSIBLE IMPACTS ON TRANSPORTATION SYSTEM

A great deal of uncertainty is associated with automated vehicles. Automated vehicle technology would need to improve, consumers would have to accept riding in shared automated vehicles, and automated vehicle fleet operators would have to be able to develop a sustainable business model.

Despite progress, there is no assurance that automated vehicle technology will advance sufficiently to support pervasive Level 4 automation. There is no assurance that consumers will accept automated vehicles or embrace a shift from private vehicle ownership to mobility as a service. Likewise, there is no assurance that consumers will embrace multi-occupant vehicle shared mobility services that, with automation and electrification, can greatly improve the performance of the highway transportation system.

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[8] McKinsey & Company, 2023,
https://www.mckinsey.com/industries/automotiveandassembly/our-insights/share-mobility-sustainable-cities-shared-destinations

Just as there is no consensus about the timing and extent of the widespread adoption of vehicle automation, there is no consensus about the impact of automated vehicles should they be introduced successfully and embraced by consumers. Some of the anticipated impacts include:

- An increase in demand for mobility might result if automated vehicles can reduce the per-mile cost of mobility and eliminate the age and other requirements of a driver's license. As noted previously, the upward pressure on vehicle miles traveled and the North Central Texas roadway system could be mitigated, if not counteracted entirely, by shared mobility vehicles carrying multiple occupants.
- The land-use impacts of automated vehicles may be significant, depending on whether automated vehicles are deployed mainly in fleets or in the current model of private vehicle ownership. Possible impacts might include:
  - Reduced amount of land required to accommodate vehicle parking, freeing up the land for other uses.
  - Increased demand for housing in outlying areas by people who are willing to tolerate long commutes because they can do work while traveling in automated vehicles.
  - Increased demand for housing in higher density urbanized areas as people opt to end or limit their private vehicle ownership in favor of pay-as-you-go mobility through automated vehicle fleets.
  - Increased clustering of housing and businesses because of the reduced need for surface parking.
- Building design may change because electric vehicles are able to operate inside enclosed facilities, allowing for in-building pick-up and drop-off zones; likewise, robot valet services may change circulation patterns at major destinations.

- Roadway design may change to accommodate automated vehicles. These changes might include:
  - Narrower lanes.
  - Heavier investment in infrastructure, such as fiber and small cells, which supports robust wireless communication solutions, such as 5G, that enable automated vehicles.
  - Road markings and other visual features to help automated vehicles better read the roadway path.
  - Electronic beacons to help guide automated vehicles and help reduce the distance between vehicles, increasing roadway capacity.
  - Reduced signage and dynamic message signs targeted at human drivers.
  - Dedicated lanes for special uses, such as automated vehicles or truck platooning, when trucks communicate with each other to coordinate their movements.
  - Accommodation of new vehicle types that emerge from the intersection of vehicle automation and electrification such as smaller vehicles that require less lane width.
- Gas tax revenues could drop faster than otherwise projected if automated vehicles, developed primarily on an electric powertrain platform, capture a significant share of trips. This could necessitate a fee associated with vehicle miles traveled or other tax to provide revenue to fund the building, maintenance, and rehabilitation of roads.
- Highway operations and planning could change as a result of the extensive data vehicles will gather and disseminate in real time. Such data, which will include video and Light Detection and Ranging (LiDAR), will allow emergency responders to assess the nature and severity of an incident before deploying emergency resources, potentially improving the quality of the response and reducing the costs associated with emergency response. Such

data will be mined to identify roadway trouble spots, such as areas where vehicles are swerving or braking suddenly, that can be targeted for investments that improve safety. Such data can also assess the efficacy of roadway investments.

- Changes in transportation and land use policies and incentives, prompted by the public's support for active transportation options or the need to reduce carbon dioxide emissions, may reduce the demand for vehicle trips as people access more destinations using methods other than standard-sized vehicles.

The impact of automated vehicles on travel behavior is not known at this time. It is unknown whether:

- Automated vehicle technology will mature sufficiently to be widely deployed.
- Consumers will accept automated vehicle technology even if that technology matures sufficiently to allow for widespread deployment.
- The private vehicle ownership model will continue with the arrival of automated vehicles or whether consumers will embrace a mobility-as-a-service model where they pay for the mobility they need from mobility services providers rather than own their own vehicle.
- The evolution of vehicles to become places where drivers and other occupants can work, shop, and consume entertainment while en route will change the consumer tolerance for trip lengths and times.
- Automated vehicles will advance transportation equity by giving more people access to affordable transportation or whether the benefits of automated vehicles will be limited to more fortunate socio-economic groups.

These and other uncertainties make it impossible to confidently predict the deployment and impact of automated vehicles. What is certain is that after a stable operating model for the past half century, the highway transportation sector is being impacted by the same advances in digital technology that have transformed other sectors of our economy and society such as retail, banking, entertainment, and communications.

SUMMARY

The various technology developments discussed above will not, by themselves, alleviate many of the challenges associated with the current transportation system: affordability, safety, access, equity, and environmental concerns. In planning its transportation investments, the region must still ask basic planning questions; namely, will the transportation investment connect people to more destinations and opportunities, improve safety, promote equity, and advance environmental sustainability? Leveraging technological developments will follow and assist in achieving these broader regional goals into the future.

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5-6. SUSTAINABLE DEVELOPMENT

OVERVIEW

Sustainable Development is an important tool that can be used to increase mobility and improve air quality in North Central Texas. Sustainable Development, as it relates to transportation, can be defined as:

- Land use and transportation practices that promote economic development while using limited resources efficiently.
- Transportation decision-making based on land use impacts, congestion, vehicle miles traveled, and the viability of alternative transportation modes.
- Planning efforts that seek to balance access, finance, mobility, affordability, community cohesion, environmental quality, and community health.

To maximize limited resources, infrastructure in transportation will be prioritized to support sustainable land uses (offering more than one land use choice or within a connected two-mile proximity to other land uses) within the urban core and to support similar nodes of development investment in more rural areas.

Growth trends that increase population density can support increases in infill development and improve the feasibility of transit options. Regional forecasts indicate that population density (people per square mile) for the 12-county Metropolitan Planning Area will increase by 43 percent between 2026 and 2050, from 910 people per square mile to

1,302 people per square mile.[11] Regional forecasts indicate the largest share of population growth will occur in Collin, Dallas, Denton, and Tarrant counties, the four urban core North Central Texas counties. Density—a recurring theme in public feedback—is the key to sustainable transportation and land use such as transit-oriented development. Additional discussion of regional demographic and growth trends is included in the **Social Considerations** chapter.

Three Es of Sustainability

Sustainable Development can be defined as "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs."[12] Sustainable Development combines the three "Es" of Economic development, Environmental protection, and social Equity.

Economic Development: Transportation policies often drive the maintenance and construction of transportation systems, which impact economic development. Transportation systems can impact the economy, tourism, property values, affordability, and wealth accumulation. Economic sustainability focuses on innovative financial tools and mechanisms that promote economic revitalization.

Environmental Protection: The type and location of transportation infrastructure and the process by which transportation systems are built impact environmental resources, including air quality, open space, and watersheds. Mobility 2050 aims to improve transportation systems while minimizing negative environmental impacts.

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[11] North Central Texas Council of Governments, 2050 Population Forecasts

[12] World Commission on Environment and Development (WCED), Our Common Future (First ed.), Oxford: Oxford University Press, Oxford and New York, 1987

Environmental sustainability development strategies range from location efficiency to green development to context-sensitive street design and more, including:

- Land use-transportation connections
- Reduction or mitigation of stormwater impacts of surface transportation
- Brownfield redevelopment
- Habitat conservation

Social Equity: Transportation systems need to accommodate all commuters who need to travel to jobs, education, and services. Social equity focuses on providing a variety of transportation systems such as transit, sidewalks, and bike lanes, allowing people to travel without the need for personal vehicles. This approach ensures that transportation is affordable and accessible to individuals of all income levels. Social equity focus areas include housing choice, compliance with the Americans with Disabilities Act, improved community health, and elimination of food deserts. Additionally, strategies aimed at reducing or eliminating displacement due to gentrification related to transportation activities focus on ensuring equitable and affordable outcomes.

Because transportation is linked to the three Es, it is critical for planners to involve and coordinate with responsible agencies from multiple disciplines.

MOBILITY 2050 SUPPORTED GOALS

MOBILITY

Improve the availability of transportation options for people and goods.

Support travel efficiency measures and system enhancements targeted at congestion reduction and management.

Ensure all communities are provided access to the regional transportation system and planning process.

QUALITY OF LIFE

Preserve and enhance the natural environment, improve air quality, and promote active lifestyles.

Encourage livable communities which support sustainability and economic vitality.

SYSTEM SUSTAINABILITY

Ensure adequate maintenance and enhance the safety and reliability of the existing transportation system.

Pursue long-term sustainable revenue sources to address regional transportation system needs.

IMPLEMENTATION

Provide for timely project planning and implementation.

Develop cost-effective projects and programs aimed at reducing the costs associated with constructing, operating, and maintaining the regional transportation system.

MOBILITY 2050 POLICIES AND PROGRAMS

Mobility 2050 includes policies and programs that address regional priorities and public needs. Policies guide decision-making and set the framework for long-term goals, while programs provide the funding and resources to turn plans into action across the transportation system.

The foundation of the Sustainable Development policies listed below are Livability Principles provided by the US Department of Housing and Urban Development-Department of Transportation-Environmental Protection Agency Interagency Partnership, the 12 Principles of Development Excellence, the *North Texas 2050* guidebook developed by the Vision North Texas process, and Mobility 2050 Goals. More details on these principles are located in the **Sustainable Development** section of the **Operational Efficiency** appendix.

Policies

SD3-001: Support mixed-use and infill developments that utilize system capacity, reduce vehicle miles traveled, and improve air quality through improved rail mobility and access management as shown in **Figure 5-5**.

SD3-002: Promote transit-oriented development for all station types that improves the jobs/housing balance, "last mile" connections, and appropriate land-use density to encourage diverse transportation mode choices.

SD3-003: Plan for land use-transportation connections, including a variety of land uses from natural areas to the urban core connected by multimodal transportation options through strategies such as smart zoning code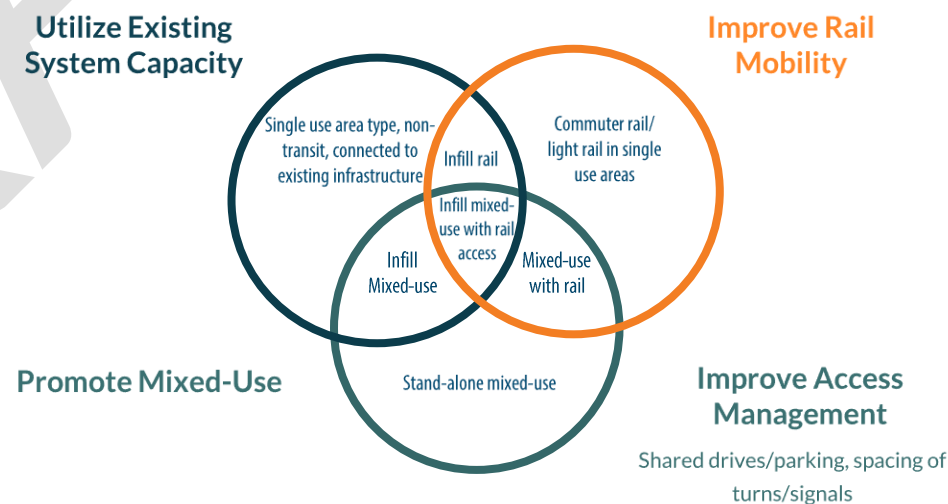s, green infrastructure, affordable housing, preservation of agricultural land, healthy communities, economic development tools, parking, innovative financing, etc.

SD3-004: Support independent school districts and local governments through various programs and projects as supported by the Regional Transportation Council policy supporting school districts.

SD3-005: Develop and encourage strategies to enhance street connectivity through the use of connected street grids in new development or redevelopment projects, subdivisions, and/or local roadway construction.

SD3-006: Advance parking management to maximize the efficiency and effectiveness of current parking resources with the intent to reduce single-occupancy vehicles commute and promote alternative modes of transportation with the goal of reducing traffic congestion and improving air quality

Figure 5-5: Regional Transportation Council Sustainable Development Policy

Utilize Existing System Capacity

Improve Rail Mobility

Single use area type, non-transit, connected to existing infrastructure

Infill rail

Commuter rail/ light rail in single use areas

Infill mixed-use with rail access

Infill Mixed-use

Mixed-use with rail

Promote Mixed-Use

Stand-alone mixed-use

Improve Access Management

Shared drives/parking, spacing of turns/signals

Programs

For more information on program funding and implementation, see the **Operational Efficiency a**ppendix.

SD2-001: Land Use-Transportation Connections Program

SD2-002: Community Schools and Transportation Program

SD2-003: Transit-Oriented Development Program

SD2-004: Sustainable Development Funding Program

SD2-005: Parking Management Program

PROGRAM STRATEGIES

SD2-001: Land Use-Transportation Connections Program

Land use and transportation systems must be planned concurrently due to their interdependent nature. Land use influences air quality and the frequency of trips, as mixed-use areas can reduce the necessity for automobile travel. When residential areas are situated within walking or biking distance of employment, retail, and entertainment, vehicle miles traveled decrease, resulting in fewer emissions and improved air quality. Additionally, the availability of viable housing in urban mixed-use centers can diminish the need for suburban residential development, further reducing travel from suburban areas to urban employment locations.

Strategies and projects addressing land use-transportation connections include:

- Supporting mixed-use and infill developments to more efficiently use system capacity and reduce vehicle miles traveled.
- Promote transit-oriented development, including appropriate density, parking, and pedestrian/bicyclist connections to encourage diverse transportation modes and jobs/housing balance.
- Plan for land use-transportation connections through strategies such as smart zoning codes, green infrastructure, right-sized parking, and innovative financing.
- Encourage mixed-use zoning and form-based codes, including Smart Growth[13] and New Urbanism Principles.[14]
- Encourage development of workforce, mixed income, affordable, and missing middle housing for diverse demographic groups.
- Promoting smart zoning ordinances and building codes that allow varying land uses, densities, layouts, and heights.
- Preserving agricultural land in rural areas to promote compact development in infill areas.
- Utilizing economic development tools and providing financial incentives to promote sustainable developments.
- Planning for healthy communities to promote active lifestyles, improving access to stores with healthy food, and improving air quality.
- Coordinating with various agencies through data collection, best practices, and planning to look at land use and transportation connections and improvements.
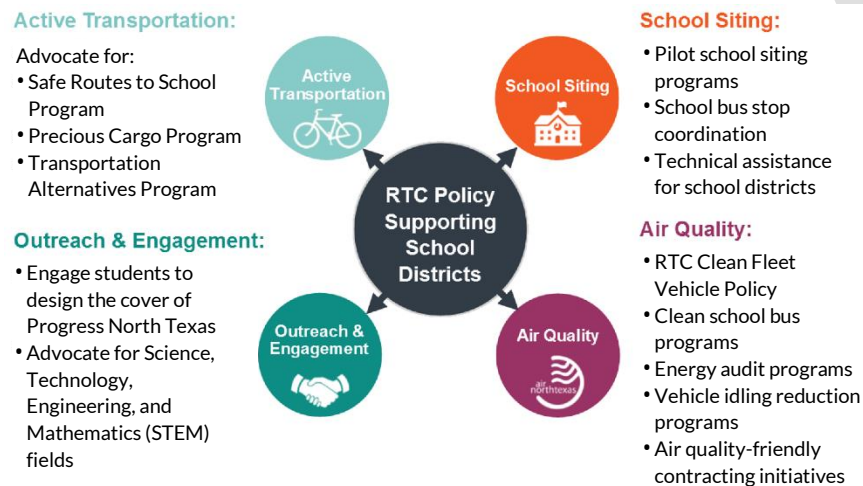
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[13] Smart Growth Network, About Smart Growth, https://www.epa.gov/smartgrowth/about-smart-growth

[14] New Urbanism, Principles of Urbanism, http://www.newurbanism.org/newurbanism/principles.html

SD2-002: Community Schools and Transportation Program

The Regional Transportation Council (RTC) approved a school policy in 2013 to promote coordination between municipalities and school districts located within the Metropolitan Planning Area. Like local governments, school districts are also members of the North Central Texas Council of Governments. The policy, P13-02, recognizes the independence of the school districts and contains innovative and multidisciplinary strategies for collaboration by addressing candidate areas of interest between school districts, local governments, and the RTC. The policy includes a variety of topics and projects described in **Figure 5-6**.

Exhibit 5-6: Regional Transportation Council Policy Supporting School Districts

Active Transportation:
Advocate for:
• Safe Routes to School Program
• Precious Cargo Program
• Transportation Alternatives Program

Outreach & Engagement:
• Engage students to design the cover of Progress North Texas
• Advocate for Science, Technology, Engineering, and Mathematics (STEM) fields

School Siting:
• Pilot school siting programs
• School bus stop coordination
• Technical assistance for school districts

Air Quality:
• RTC Clean Fleet Vehicle Policy
• Clean school bus programs
• Energy audit programs
• Vehicle idling reduction programs
• Air quality-friendly contracting initiatives

The number of school-age children (aged 5 to 17 years) is projected to increase 43 percent from 2026 to 2050—an addition of more than 650,000 students.[15] By addressing current school siting and transportation issues such as the trend of locating schools along major roadways at the edge of communities and the decline in the number of students that walk or bicycle to school, the Community Schools and Transportation Program is intended to be a holistic approach to mitigating and improving traffic congestion, air pollution, and safety around the region's most vulnerable population group.

Specific initiatives of the Community Schools and Transportation Program include:

• Encouraging greater coordination and communication between school districts, local governments, and transportation agencies.
• Supporting Safe Routes to School through education, funding for infrastructure, and planning projects to enable more children to walk and bicycle to school.
• Promoting more sustainable school siting and facility planning practices through technical assistance and sharing best practices.

The Safe Routes to School Regional Action Plan, endorsed by the RTC, is adopted by reference in Mobility 2050. The plan includes an analysis that prioritizes elementary and middle schools in the Metropolitan Planning Area using safety-related criteria to identify schools most in need of pedestrian and bicycle improvements to encourage and enable school-aged children to walk to school. Areas containing high-ranking schools may be targeted for project selection and technical assistance to implement safety countermeasures, as well as education, encouragement, and enforcement strategies to reduce automobile and pedestrian crashes involving school-aged children.

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[15] North Central Texas Council of Governments Population Projections, 2022 American Community Survey 5-Year Estimates

SD2-003: Transit-Oriented Development Program

Transit Oriented Development (TOD) is a style of planning and development that encourages pedestrian activity by mixing higher density employment, housing, and commercial land uses within a half-mile walking distance of a passenger rail station. TOD encourages commuters to bike or walk in combination with transit. It accomplishes this through a well-designed, accessible built environment and a network that connects bike and pedestrian facilities, thus reducing automobile dependence. TOD may include development within a half mile around stations for bus rapid transit, street cars, and people movers based on transit context.

TOD is not a one-size-fits-all approach; developments can and should be planned specific to the unique needs of communities. Additionally, TOD is a complement to existing development, largely focused on (and critical to) meeting projected growth. Based on previous studies by the North Central Texas Council of Governments (NCTCOG), key challenges to TOD include a lack of TOD supportive zoning, including high parking requirements, limited safe pedestrian and bicycle facilities and crossings, and historic freight corridors with incompatible land uses around regional rail transit.

Expanding transit use requires addressing these challenges through a continued regional commitment to initiatives supporting TOD. The Transit-Oriented Development Program will focus on the following key initiatives:

- Provide technical assistance and research best practices to plan and implement transit-oriented development, thereby optimizing investments in transit systems and reducing the need for expanding other facilities.

- Foster regional coordination and data sharing through working group and training events to encourage transit-oriented development.
- Lead and conduct regional transit-oriented development data collection efforts to create a robust and reliable source of information that improves decision-making and facilitates transit-oriented development.
- Improve the job/housing balance and overall access to destinations near transit by increasing density of development in station areas.
- Support the location of higher density, mixed income, and affordable housing options around transit stations that leads to increased ridership.
- Support parking management for transit-oriented development through best practices research, data collection, training, and practical application.

SD2-004: Sustainable Development Funding Program

NCTCOG's Sustainable Development Funding Program is one of the best examples of regional programs that support livability principles in the region, state, and country. The program was created by the RTC to encourage public-private partnerships that positively address existing transportation system capacity, rail access, air quality concerns, and/or mixed land uses. Three calls for projects have been conducted since 2001. In addition, one process of project prioritization has been completed, which focused on context-sensitive street design. This funding program resulted in the implementation of planning, infrastructure, and land banking projects that support livability principles, Mobility 2050 Sustainable Development policies, and other regional and national goals.

This funding program promotes bicycle, pedestrian, and transit infrastructure projects that are located within walking distance to existing or potential rail stations and that support mixed-use development. Land banking activities have been funded to provide cities with a financially strategic incentive to reactivate underused parcels, thus encouraging revitalization, supporting sustainable transportation infrastructure, and promoting efficient land use patterns.

Sustainable Development Funding Program amounts, location of currently active projects, areas of interest, and land banking projects that have been awarded funding are summarized in the **Sustainable Development** section of the **Operational Efficiency** appendix.

SD2-005: Parking Management Program

Parking management involves programs and policies aimed at optimizing the use of parking resources. This can encompass a variety of strategies, from operational changes to policy updates and incentives. These strategies can be implemented individually or in combination to make the most of both existing and planned parking facilities. The goals of parking management can include:

- Reducing development costs, thus increasing affordability
- Enhancing shared parking capacity and wayfinding to available parking
- Improving utilization of parking facilities, thus reducing the need for excess parking
- More efficiently responding to curb (on-street) parking demand and open up higher and better use of the curb
- Encourage use of alternative modes to single-occupant vehicle use (thereby reducing traffic, congestion, accidents and pollution)

To advance parking management in the North Central Texas region, NCTCOG's Sustainable Development Program will:

- Provide technical assistance to support parking management planning and implementation at various locations throughout the Dallas-Fort Worth region.
- Study parking demand in relevant locations to increase local knowledge of observed parking demand and insights for efficient parking management and development codes.
- Gather and share best practices in parking management, including technology tools for local governments based on local to national insights for parking topics of interest.

IMPLEMENTING SUSTAINABLE DEVELOPMENT

As the region grows and demand for housing and transportation options change, Sustainable Development principles that promote density and diversity and improve the economic, social, and environmental vitality of communities will become more important.

Sustainable Development Initiatives

In addition to planning for and funding Sustainable Development in the region, Sustainable Development Initiatives focus on implementation of planned or funded projects. Mobility 2050 Sustainable Development policies are supported by the following initiatives:

- Respond to local initiatives for town centers, mixed-use growth centers, transit-oriented developments, infill/brownfield developments, and pedestrian-oriented projects.
- Complement rail investments with coordinated investments in bicycle and pedestrian and first/last mile facilities.
- Promote coordination among planning and zoning officials, development communities, and transportation interests.

- Coordinate with transit agencies and the development community to incorporate access to facilities early in the design process.
- Incorporate livable and healthy communities factors as criteria in funding programs.
- Support the reduction or mitigation of stormwater impacts of surface transportation through programs such as Transportation *integrated* Stormwater Management.
- Encourage multimodal transportation options, including transit, bicycle, and pedestrian activities and programs.
- Encourage elements that reduce traffic congestion and pollution and offer traffic calming impacts, which result in safer environments for pedestrians.

HEALTHY COMMUNITIES

In addition to increasing mobility and improving air quality, Sustainable Development can promote healthy communities. Many factors influence the health of individuals and communities. These include health behaviors, access to health care, income, employment, air pollution, water quality, access to housing, and the characteristics of an individual's commute to work. The County Health Rankings & Roadmaps[16] project measures how counties score for these factors. The factors listed below are influenced by the transportation system:

- Access to exercise opportunities
- Alcohol-impaired driving deaths
- Driving alone to work
- Income inequality
- Injury deaths
- Long commute – driving alone

- Unemployment

The North Texas County rankings for each of these health factors can be found in the **Operational Efficiency** appendix.

Community design can support walking by locating residences within walking or bicycling distance of employment, retail, schools, and public transportation; and by building well-connected and safe sidewalks and paths between destinations. Context-sensitive street design can also encourage walking and make walking safer through measures that improve street lighting, reduce traffic speed, and increase the number of safe pedestrian crossings. [17]

SUPPORTING ECONOMIC DEVELOPMENT

Coordinating land use with transportation such as in mixed-use walkable, and transit-oriented development is a key component of sustainable economic development. According to the US Economic Development Administration, economic development "creates the conditions for economic growth and improved quality of life by expanding the capacity of individuals, firms, and communities to maximize the use of their talents and skills to support innovation, lower transaction costs, and responsibly produce and trade valuable goods and services." Public investment in transportation is one of the best ways communities can expand the capacity of North Texans to advance economically.

NCTCOG's Sustainable Development team will promote and provide guidance on economic development with transportation infrastructure through:

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[16] County Health Rankings & Roadmaps, http://www.countyhealthrankings.org/

[17] US Department of Health and Human Services (2015). Step It Up! The Surgeon General's Call to Action to Promote Walking and Walkable Communities, Washington, DC: US Department of Health and Human Services, Office of the Surgeon General

- Strategic technical assistance with local governments in areas of need
- Coordination with strategic land use development opportunities through planning and implementation support
- Study of key transportation and economic issues and regional coordination

SUMMARY

As the North Central Texas region becomes home to millions more people and jobs by 2050, the demand placed on the transportation system will continue to grow. Encouraging and implementing sustainable growth patterns will be important to supporting and maintaining a high quality of life for the region's residents. Mobility 2050 supports Sustainable Development and the land use-transportation connection as key initiatives to create an efficient transportation system that supports a livable and sustainable region.

NCTCOG, in coordination with federal, state, and local government partners, the development community, and other stakeholders, will strive to improve the economic, environmental, and social equity of development by offering sustainable transportation and promoting connections between land use and transportation. Providing the tools to create livable communities in the region is the goal and vision for the future.

More details on Sustainable Development policies, programs, projects, and maps are provided in the **Sustainable Development** section of the **Operational Efficiency** appendix.