



CHAPTER 11

TRANSPORTATION

The transportation system is the framework upon which the city is built. A healthy transportation system can improve the economic, social, and cultural conditions of the city and its citizens by providing efficient goods movement and options for people to get to and from work, home, school, shopping and leisure activities.

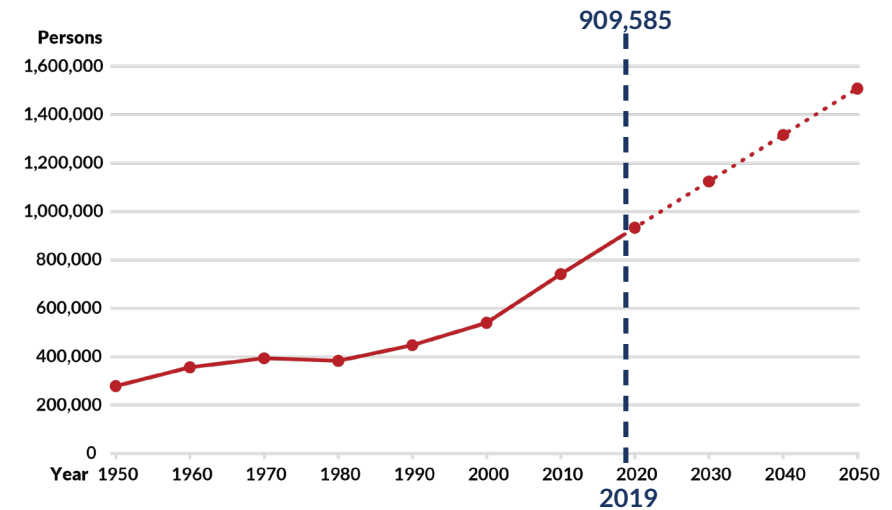
This chapter presents a multi-modal transportation approach that includes all forms of surface transportation (auto, bus, rail, bicycle, pedestrian, etc.), as well as aviation activities, to support the City's mobility goals.

The City of Fort Worth is committed to creating a balanced, comprehensive, context-sensitive transportation system to move people and goods safely and efficiently. This balanced system will increase:

1. **Mobility**, by providing regional connectivity for all modes and addressing existing/future congestion,
2. **Safety**, by accommodating all users and addressing safety hazards, and
3. **Opportunity**, by supporting strategic economic development and acting as a catalyst for redevelopment.

As the City continues to grow, it is important to provide a safe and efficient transportation system that responds to the growing needs of all the city's residents, businesses, and visitors.

POPULATION GROWTH AND INCREASING DEMAND



Source: NCTCOG and U.S. Census Bureau Annual Estimates of Resident Population.

EXISTING CONDITIONS

Fort Worth is estimated to have added 19,552 people between July of 2017 and July 2018, equating to 54 people per day. Between July 2014 and July 2018, Fort Worth added an additional 86,366 people, representing an annual average growth rate of 2.04 percent. The Population Trends chapter has more information on the population growth.



7,518

Miles of Street Surface Lanes



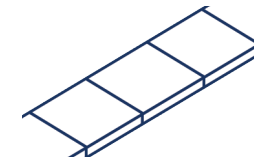
883

Signalized Intersections



66,000

Street Lights



2,551

Miles of sidewalks



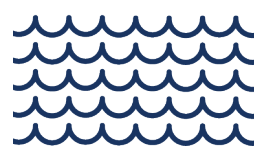
206

Railroad Crossings



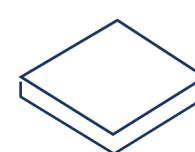
30,000

Storm Drains/Inlets



300

Miles of Engineered Drainage Channels



89

Miles of Paved Trails



30

Miles of Natural Trails



55

Linear Miles of On-Street Bicycle Lanes

LAND USE & TRANSPORTATION INTEGRATION

Sustainable development, as it relates to transportation, can be defined as:

- Land use and transportation practices that promote economic development while using limited resources in an efficient manner.
- Transportation decision-making that seeks to reduce the adverse impacts of congestion and vehicle miles traveled, while maximizing compatibility with adjacent land uses and the viability of alternative transportation modes.
- Planning efforts that effectively balance access, finance, mobility, affordability, community cohesion, and environmental quality.

Sustainable development leverages the land use and transportation relationship to improve mobility, enhance air quality, support economic growth, and ensure the financial stability of the transportation system. A successful multi-modal transportation system will support and encourage sustainable development. Transit-oriented development (TOD) is an important component

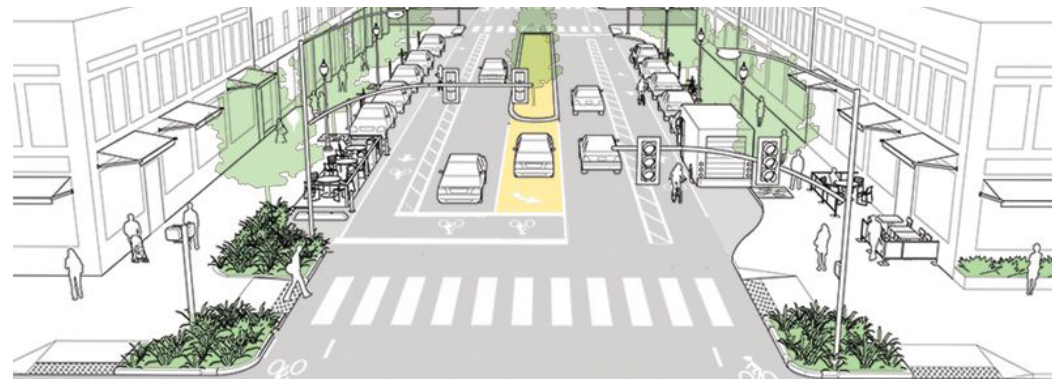
of sustainable development. TOD refers to a compact, walkable, urban village that is centered around and coordinated with a transit station in its use and design. The purpose of TOD is to establish land uses and to design structures and public spaces that will encourage residents, workers, and shoppers to drive their cars less while walking, cycling, and riding transit more.

In order to encourage mixed-use and transit-oriented development, the City of Fort Worth employs mixed-use and urban residential zoning classifications. These categories encourage mixed-use and higher density developments, especially in designated mixed-use growth centers and urban villages (see Chapter 4: Land Use). Mixed-use zoning significantly reduces parking requirements and provides urban design standards that are transit- and pedestrian friendly.

COMPLETE STREETS

An overarching theme for the transportation system in Fort Worth is the concept of Complete Streets. Complete Streets are planned, designed, constructed, and maintained to enable safe access for all road users, including people walking, bicycling, driving, or using public transportation. The Fort Worth Complete Streets Policy, adopted in 2016, directs projects to ensure that the entire right of way is safe and comfortable for all users, regardless of age, ability, or transportation mode choice.

A Complete Street is not one-size-fits-all. Each project is context-sensitive and designed to support mobility options, accessibility, healthy living, and economic benefit, and to ensure the safety, accessibility, comfort, and convenience of people of all ages and abilities. This policy is applicable to all development and redevelopment in the public domain within the City of Fort Worth and its extraterritorial jurisdiction.



Source: Neighborhood Main Street, National Association of City Transportation Officials Urban Street Design Guide.

COMPLETE STREETS VISION

“Provide a safe, accessible, complete, connected, comfortable, efficient, and community-oriented transportation system for all people that supports mobility options, healthy living, and economic benefit.”

MASTER THOROUGHFARE PLAN

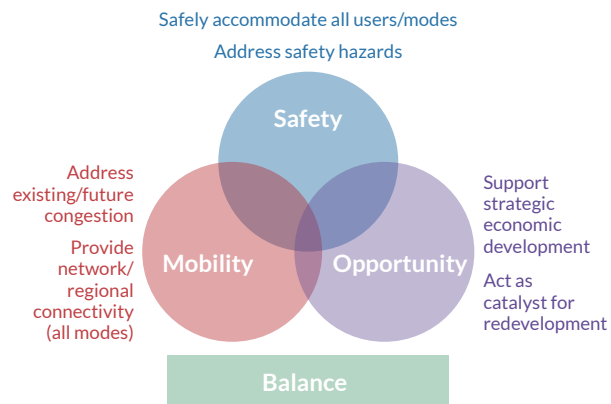
The City maintains a Master Thoroughfare Plan (MTP) and associated Street Development Standards to guide development of a complete, connected, context-sensitive transportation system. The Street Development Standards recommend specific cross sections for each street classification and provide the framework for a hierarchical system of freeways, arterials, collectors, and local streets.

The vision of the MTP is supported by three goals, each with a set of objectives. Ultimately, the MTP attempts to balance these goals in the following ways:

- **Mobility:** The MTP includes a network of thoroughfares to provide citywide transportation connectivity and capacity.
- **Safety:** The MTP includes street cross-sections that encourage moderate automobile speeds and provide safe accommodations for non-motorized transportation modes.
- **Opportunity:** The MTP includes future transportation facilities serving planned growth areas.

MTP VISION

“Provide a complete and connected, context-sensitive transportation system for all users that supports mobility, healthy living and economic benefit.”



Activity Street

Activity Streets are “destination streets”. They are typically retail-oriented, with generous parkway widths and room for sidewalk cafes and other such features. Automobile speeds are slow, and lanes are slightly narrower than typical. Parking is typically on-street, and building facades front the street. Buildings are typically one to three stories high. Streets are typically in a grid pattern, diffusing traffic. Bicycles may share the road depending on speeds, but bike lanes are also used.



Commerce/Mixed-Use Street

Commerce/Mixed-Use Streets have a business flavor and can often be found downtown. Buildings are typically multi-storied and are often office/commercial-oriented, but may have residential uses on the upper floors. Buildings front on the street and on-street parking is common, but parking garages are also common – meaning automobiles are often turning to and from the street. Wide sidewalks are prevalent and are especially busy during rush hours and the lunch hour. Streets are typically in a grid pattern, diffusing traffic. Commuter transit is prevalent, and traffic speeds are fairly slow. Lanes are slightly narrower than typical. Bicycles are often accommodated by bike lanes.



Neighborhood Connector

Neighborhood Connectors provide access from neighborhoods to services. They often run at the peripheries of residential areas, and landscaped medians are fairly common. Sidewalks or multi-use paths are typically separated from the street by a landscape buffer. Buildings (or residential fences) are generally set well back from the street. This Street Type is especially suited for on-street bicycle travel due to relatively infrequent driveways and cross-streets. Automobile speeds are moderate.



Commercial Connector

Commercial Connectors typically serve retail portions of the City. Many driveways may be present, and a mixture of medians and center turn lanes help to regulate movements to and from sites. Retail stores are generally separated from the street by surface parking lots. Automobile speeds are moderate to high. Bicycle facilities must be carefully designed due to the amount of driveways. Sidewalks are generally buffered from the street by landscaping.



System Link

System Links tend to emphasize longer-distance automobile traffic, often providing connections to freeways. Automobile speeds are moderate to high. Pedestrians and bicyclists are buffered from traffic as much as possible; multi-use off-street paths are common. System Links always include raised medians to separate traffic directions and facilitate left turns. Most left turns occur at signalized intersections; access to driveways is typically via right turns.

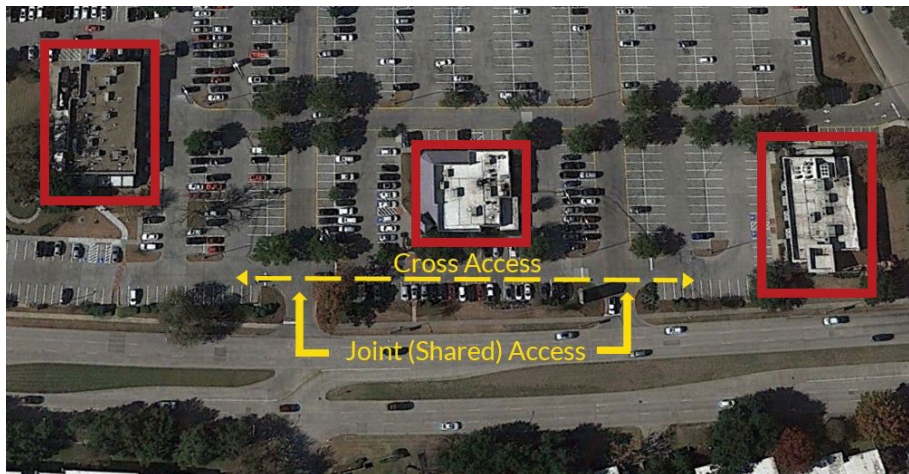


Source: Street Types from the City of Fort Worth Master Thoroughfare Plan, 2016.

ACCESS MANAGEMENT

In 2018, the City of Fort Worth adopted an Access Management Policy to reduce crashes, increase roadway capacity, and reduce travel time delay. (M&C G-19287 Ordinance No. 23225-06-2018)

The purpose of access management is to provide vehicular access to land development in a manner that preserves the safety and efficiency of the transportation system. This balance between access and traffic flow/safety is accomplished by guiding the location, spacing, design, and operation of intersections, driveways, median openings, and street connections on a roadway, as well as auxiliary turn lanes, and joint- and cross-access.

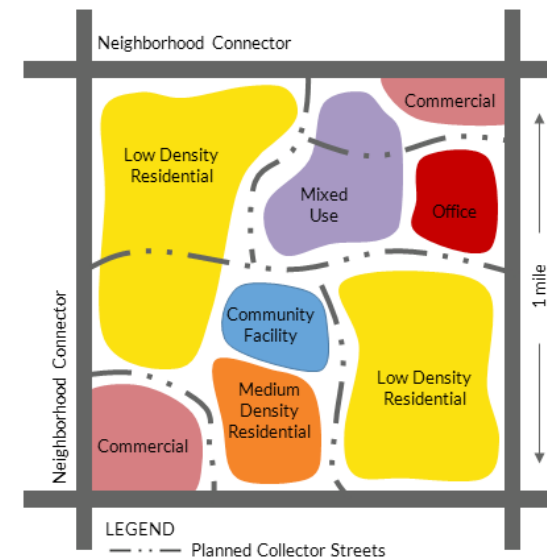


COLLECTOR STREETS

Local and collector street networks support the street system by providing alternative routes from major thoroughfares for short trips. Without this collector street network, all local trips are funneled onto a few major streets, resulting in significant traffic delays and driver frustration. Collectors provide critical connections throughout the network and bridge the gap between local streets and the major thoroughfares of a community.

Reasonable connectivity of the local street network is also important. Fragmented street systems impede emergency access and increase the number and length of individual trips. Residential street systems must be designed in a manner that discourages “through” traffic across multiple neighborhoods, without eliminating connectivity.

PLANNING FOR COLLECTOR STREETS



Source: City of Fort Worth, Planning & Data Analytics Department, 2020.

TRANSPORTATION ENGINEERING MANUAL

For the City of Fort Worth, the Transportation Engineering Manual defines the design requirements for transportation infrastructure. The design requirements outlined in this manual offer recommendations, standards, and criteria for design questions that frequently arise in transportation planning, traffic operations, street design, and site development.

The key intention of the manual is to provide consistency of traffic and transportation design practices for existing and future site development in the City. In addition, the Transportation Engineering Manual provides design criteria for street elements required by the City's adopted Master Thoroughfare Plan (MTP) and Complete Streets Policy.

This manual is intended for use as a professional design resource by the City, the professional development community, and any individuals or groups involved in the planning and design of the City's street network. The manual applies to all projects that impact public right-of-way along the City streets, including improvements to existing streets and alleys, construction of new streets, and redevelopments.

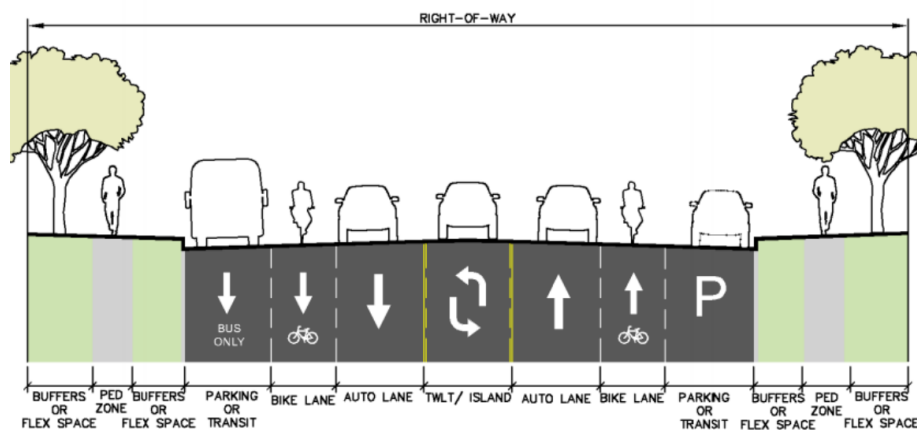


Figure 2-3. Sample Roadway Cross Section for Commerce/Mixed-Use Street.

Source: City of Fort Worth Transportation Engineering Manual, 2019 pages 2-6, 4-23, and 4-35.

Example graphics from the Transportation Engineering Manual.

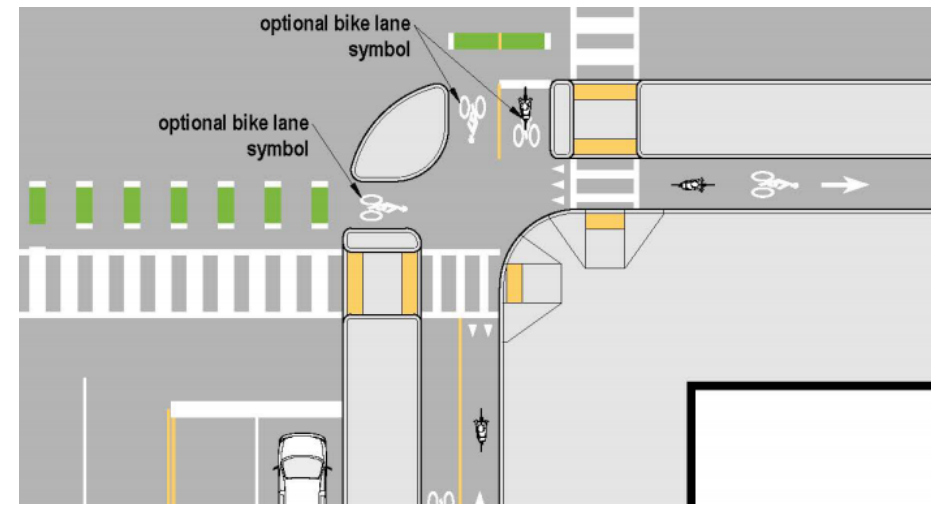


Figure 4-19. Preferred Design of a Two-Way Separated Bicycle Lane Transition to a One-Way Separated Bicycle Lane on a Cross Street.

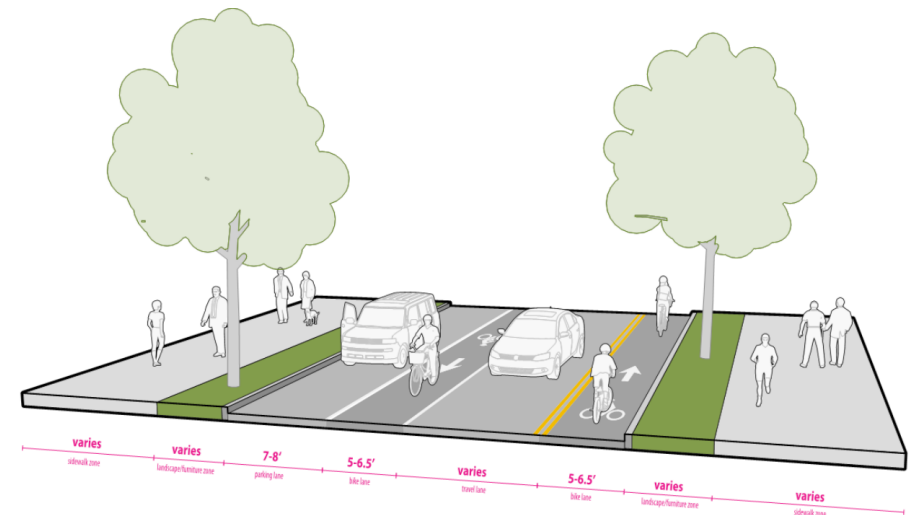
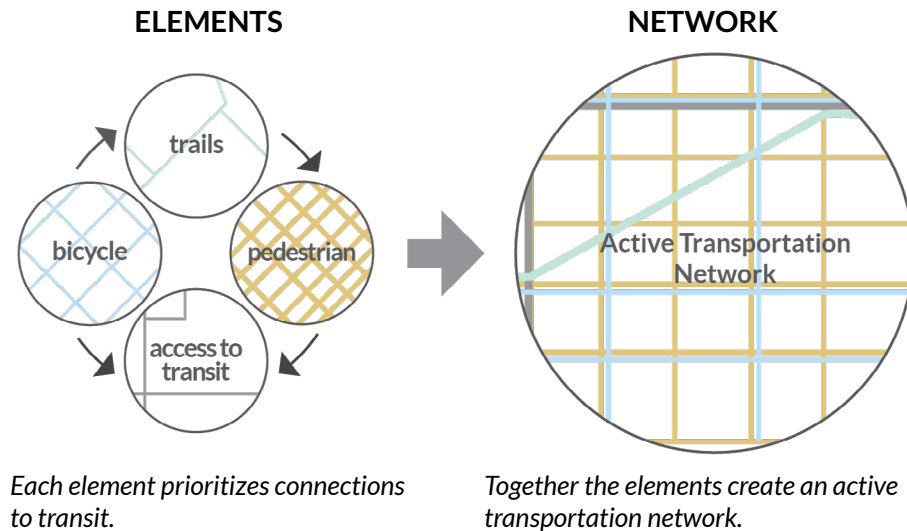


Figure 4-13. Example Cross Section with Contra-flow Bicycle Lanes.

Fort Worth’s goal is to develop an effective transportation system that provides multiple alternatives for travel, while supporting sustainable development patterns and economic opportunities. This includes walking, cycling and using transit, as well as the needs of wheelchair users and other types of non-motorized mobility devices. Active transportation is a means of getting around that is achieved through human-powered mobility.

ACTIVE TRANSPORTATION PLAN

The Fort Worth Active Transportation Plan (ATP) serves as an update to the Bike Fort Worth Plan and the Walk Fort Worth Plan, and it is Fort Worth’s first ever citywide trails master plan. Each of these elements supports access to the city’s transit network. “Access to transit” refers to a priority woven into all of the modal networks.



ATP VISION

“The Fort Worth Active Transportation Plan aims to create a regionally coordinated and locally connected bicycle and pedestrian system that provides a safe, comfortable, accessible, and equitable network of trails, sidewalks, and on-street bicycle facilities for people of all ages and abilities that encourages a healthy lifestyle, economic development, and increases community awareness and funding for alternative modes of transportation.”

In 2019, the City adopted the Fort Worth Active Transportation Plan. The Active Transportation Plan focused on walking and cycling, including connectivity between other modes such as transit. This plan integrates efforts such as the Walk Fort Worth and Bike Fort Worth plans, the Task Force on Race and Culture, trail planning, and coordination with the regional Transit Master Plan and Transit Moves Fort Worth Plan. The result is a unified citywide transportation network plan for people who walk, bike and use transit. The primary objectives of the Fort Worth Active Transportation Plan included the following:

1. Identify the Active Transportation network for people who walk, use transit, and ride bicycles, thereby creating a citywide seamless network of on- and off-street bicycle and pedestrian ways suitable for people of all ages and abilities.
2. Identify appropriate level of comfort scores or metrics across the Active Transportation network.
3. Update the City’s Bike Fort Worth and Walk Fort Worth plans and develop a new comprehensive Trails Master Plan.
4. Develop guiding principles and criteria for evaluating network alternatives and for prioritizing funding and projects that include equity, health, safety, economic development, and access.
5. Develop policies, performance targets, and design guidelines.
6. Prioritize projects.
7. Develop an implementation and funding plan.

Source: City of Fort Worth Active Transportation Plan, 2019.

ACTIVE TRANSPORTATION PLAN (CONT)

Two analyses were conducted on current conditions: a Bicycle Level of Traffic Stress (LTS) analysis and a Pedestrian Experience Index (PEI) of walking conditions.

PEDESTRIAN EXPERIENCE INDEX



The ATP developed a methodology to measure how comfortable a pedestrian will feel on a street. Several factors influence pedestrian comfort: scale, the design and orientation of buildings to the sidewalk (built form), the street grid, and other infrastructure. The methodology, called the Pedestrian Experience Index (PEI), uses existing public data to evaluate the pedestrian comfort of each block and intersection in Fort Worth.

BICYCLE LEVEL OF TRAFFIC STRESS ANALYSIS

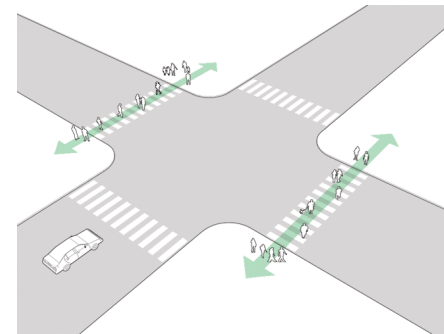


Bicycle Level of Traffic Stress (LTS) is a nationally recognized analysis that assesses each road segment and intersection in a community to estimate how comfortable each would be for different types of bicyclists. The methodology is based on national research that shows that roadway factors such as bike facility design, location, and traffic volumes influence the comfort of riding a bicycle. Busier roads are more stressful, so bicycle facilities that separate riders from traffic increase comfort.

PEDESTRIAN SAFETY IMPROVEMENTS DOWNTOWN

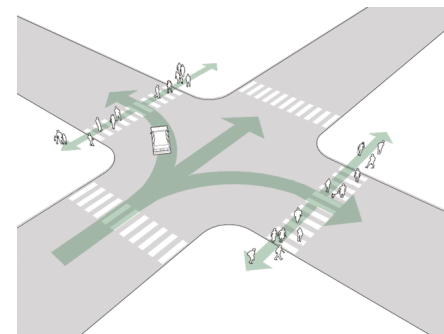
The City of Fort Worth has begun to implement Leading Pedestrian Intervals (LPIs) in the downtown area. An LPI gives people crossing the street a 3-7 second head start when entering the crosswalk before the corresponding green signal allows people driving to continue forward. LPIs enhance the visibility of people walking in the crosswalk and reinforce their right-of-way. The use of LPIs has been shown to reduce pedestrian-vehicle collisions as much as 60% at treated intersections¹.

¹Source: A.C. Fayish and Frank Gross, "Safety effectiveness of leading pedestrian intervals evaluated by a before-after study with comparison groups," *Transportation Research Record No. 2198* (2010): 15-22.



PHASE 1: PEDESTRIANS ONLY

Pedestrians are given a minimum 3-7 second head start entering the intersection.



PHASE 2: PEDESTRIANS & CARS

Through and turning traffic are given the green light. Turning traffic yields to pedestrians already in the crosswalk.

Source: National Association of City Transportation Officials Urban Street Design Guide.

SAFE ROUTES TO SCHOOL (SRTS)

The City of Fort Worth’s Safe Routes to School program designs and constructs new sidewalks, crosswalks, curb ramps, signs and bicycle facilities within a quarter-mile radius of selected schools. The Fort Worth City Council passed a resolution in May 2015 supporting the pursuit of funding to create safe routes for children to get to and from school.

10-14%

Morning traffic is attributed to dropping children off at K-12 schools.

48% in 1969

Of students walked or biked to school (national average).

44% decrease in pedestrian injuries

Where SRTS engineering, education and encouragement interventions have been implemented.

35,000

Pounds of pollutants out of the air if 100 students at one school walked or biked everyday for one school year.

13% in 2009

Of students walked or biked to school (national average).

25% increase in walking & biking

ISD COORDINATION/ OUTREACH PROGRAM

The ISD Coordination/Outreach Program works to ensure proper vehicular and pedestrian circulation at and near existing and planned schools. City staff works with ISD officials to obtain information on future school sites to ensure implementation of proper infrastructure (i.e. roadway, signals, sidewalks, school zone flashers, pavement markings, crosswalks, crossing guards, etc.) prior to opening day.

Source: NCTCOG Safe Routes to School.

UNDER DEVELOPMENT: VISION ZERO POLICY

The Vision Zero approach to traffic safety seeks to eliminate all traffic fatalities and severe injuries — while increasing safe, healthy, and equitable mobility for all. When adopted, Fort Worth will join Austin, San Antonio, and Laredo as Texas examples of this nationwide network making systemic changes in transportation planning in order to eliminate traffic fatalities.

TRADITIONAL APPROACH	VS	VISION ZERO
Traffic deaths are INEVITABLE		Traffic deaths are PREVENTABLE
Expect PERFECT human behavior		Integrate HUMAN FAILING in approach
Prevent COLLISIONS		Prevent FATAL and SEVERE crashes
INDIVIDUAL responsibility		SYSTEMATIC approach
Saving lives is too EXPENSIVE		Saving lives is NOT EXPENSIVE

Source: Vision Zero Network.

OVERALL CONDITION INDEX (OCI)

The city pavement condition assessment is performed on a 3-5 year basis. The assessment determines the Pavement Condition Index (PCI) for each street segment based on the severity and extent of the pavement defects. The defects for asphalt streets may consist of ride quality, rutting, raveling/flushing, alligator cracking, patching and transverse or longitudinal cracking. For concrete streets, defects such as ride quality, faulting, joint seal loss, joint spalling, scaling, patching, transverse and longitudinal cracking are evaluated. PCI is grouped into 6 categories: Failed, Poor, Fair, Good, Very Good, and Excellent. An Overall Condition Index (OCI) number is calculated for each street segment based on the PCI and flatworks (curb/gutters) condition and replacement percentage. The lower the number, the worse the overall street condition.

OVERALL CONDITION INDEX (OCI)

OCI is categorized in to 4 groups:

Poor/Failed Street Condition: Street in this category has an OCI rating less than 40 has severe cracking, numerous areas of failed pavement with possible sub-base failure with failed and high percentage of flatwork replacement, and exhibits an extremely rough ride. It is beyond repair and qualifies for a total reconstruction, meaning that a street may be replaced from the ground up.

Fair/Lower Good Condition: Street in this category has an OCI between 40-80 that consist of moderate cracking, minor potholes and has adequate drivability. It is typically in need of street preservation which requires proper street rehabilitation technique.

High Good Condition: Street in the high good condition has an OCI between 80-90 which exhibit minimal cracking or other distresses. It has good drivability and needs minimal remedial repairs.

Excellent Condition: Street has OCI above 95 has little or no cracking or other distresses. It has excellent drivability and does not require any maintenance.

STREET MAINTENANCE PROGRAM

The Annual Street Maintenance Program assists in the maintenance of all City streets, including asphalt, concrete, and brick surfaces. Streets that are maintained through the program are selected each year based on citizen's requests and staff evaluation of conditions. Some streets outside the city limits are also maintained through jointly funded interlocal agreements between the City and other jurisdictions.

STREET MANAGEMENT PROGRAM

The Street Management Program coordinates and manages all aspects of street construction, closures, and uses that affect vehicular and/or pedestrian traffic flow. This includes review of traffic control plans for street and sidewalk closures due to special events, construction, and utility work. The program aims to keep city streets and sidewalks open for public use to the extent possible.

HAZARDOUS ROADWAY OVERTOPPING

City of Fort Worth has many Hazardous Roadway Overtopping locations that vehicles drive into every year. The worst locations were initially identified and ranked in 2005 because those locations were known to flood frequently and some locations experienced incidents involving fatalities, bodily injury, or property damage. Some locations that did not have incidents were still known as frequently problematic locations based on complaints received from citizens.

Since 2005, the list of hazardous crossings in Fort Worth has expanded from 40 to approximately 300 locations, which were further investigated and prioritized based on several criteria and site observations.

To address these safety issues, high water warning systems have been installed at some locations and culverts were upsized to provide more conveyance capacity. In the future, further improvements such as guard rails, lighting, flood warning flashers, and capacity improvements will be implemented.

The Stormwater Management group is planning to invest more resources into addressing Hazardous Roadway overtopping locations going forward. This group will refine the ranking system to prioritize safety and capacity improvements based on most hazardous crossings and cost for improving the crossings. Due to limited funding resources and competing needs for storm drain rehab, channel rehab, flood mitigation and other reactive needs, the Stormwater group has been actively working to estimate the total project costs to improve the 50 most hazardous locations.



Location: Morningside at South Main, June 2019.

When you see water on the road, Turn Around Don't Drive.

Each year, more deaths occur due to flooding than from any other weather related hazard because people underestimate the force and power of the water. Many of the deaths occur in automobiles as they are swept downstream. Whether you are driving or walking, if you come to a flooded road, **Turn Around Don't Drive.**

Follow these safety rules:

- Be on the lookout for flashing signs or barricades warning of high water. **NEVER** drive around or move barriers blocking the high water.
- If flooding occurs, get to higher ground. Get out of areas subject to flooding.
- Avoid areas already flooded, especially if the water is flowing fast. Do not attempt to cross flowing streams.
- Road beds may be washed out under flood water. **NEVER** drive through flooded roadways. If your vehicle is suddenly caught in rising water, leave it immediately and seek higher ground.
- Do not camp or park your vehicle along streams and washes, particularly during threatening conditions.
- Be especially cautious at night when it is harder to recognize flood dangers.

The city has installed high-water warning flashers at some of the most dangerous road flooding areas. **WHEN YOU SEE LIGHTS FLASHING, follow these simple safety rules:**

- Turn around; the roadway is closed because water is covering the road.
- **NEVER** drive around barricades. Water on the roadway can be much deeper than it appears and water levels can rise quickly.
- If lights are not flashing and water is coming over the road, do not drive through water. The best warning system is common sense.

WARNING WATCH FOR FLASH FLOODING

Source: Transportation Public Works.



Location: Old Granbury Road, July 2019.

INTELLIGENT TRANSPORTATION SYSTEMS (ITS) PLAN

ITS uses technology and management strategies to ease real-time traffic congestion with the adjustment of traffic signal timing and the coordination of response activities with local or regional transportation and emergency services. Fort Worth's ITS plan was developed in coordination with TxDOT's regional ITS plan and in cooperation with NCTCOG. This plan includes:

- Incident management system to provide timely information to responding agencies such as fire, police, and emergency medical services.
- Coordinated traffic signal system to manage the timing of signals to improve traffic flow.
- Methods to alert motorists of congested areas and offer alternative routes or modes of travel.
- Traffic monitoring system to monitor system flow.

As part of the ITS Communication Master Plan, the City installed cable modems and radio systems into several hundred intelligent transportation system (ITS) devices citywide. This allows the ITS devices to be managed from the City's Traffic Management Center downtown.

FLOOD WARNING SYSTEM

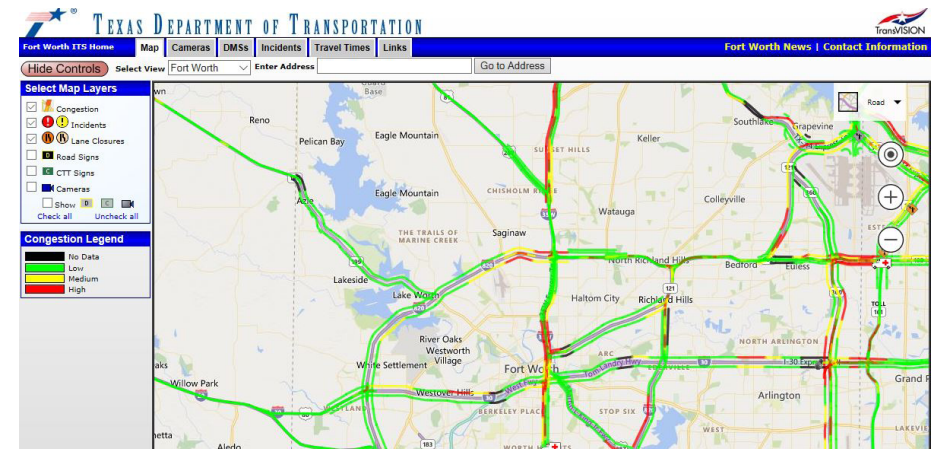
Fort Worth experiences rapidly moving storm fronts that can lead to hazardous flooding at roadways. The flood warning system in Fort Worth, also known as the High Water Warning System (HWWS), relies on real-time water level measurements at 52 of the most hazardous low-water crossing locations. Roadside flashers at these locations immediately warn drivers of the flood hazard. Email alarms are sent to first responders and emergency managers from the City, County, School Districts, the National Weather Service, and other partners when the water level sensors of each flasher system are triggered from rising water. First responders from the Stormwater Division of TPW barricade the roads to prevent vehicles from entering the flooded areas. Many of the locations without the flashers have road side flood warning signage.

Transportation Public Works – Stormwater launched a publicly accessible webpage displaying real-time road flooding information gathered from sensors located at the HWWS crossings. This makes vital public safety information readily available to the community to help residents plan ahead and avoid dangerous road flooding conditions. The flood warning information collected by the sensor network will be integrated with the Office of Emergency Management's notification system in the near future. Recent improvements to the Flood Warning System consist of:

- Improved system reliability by upgrading communication equipment with ALERT2 and software.
- Twenty one new weather stations to better capture rainfall intensity and location.
- A public facing webpage showing real-time flood risk information.
- Development of a Flood Response Plan to document the response to flooding prior to, during, and following major events.

TRANSVISION

TxDOT Fort Worth District manages and operates TransVISION, the traffic management center in Tarrant County which provides real-time information on congestion, traffic incidents, and lane closures.



Source: City of Fort Worth, Transportation and Public Works, Texas Department of Transportation.



Location: Great Southwest and Mark IV Parkways.

Parking Management involves the employment of policies and strategies to balance both the supply of parking as well as demand. Efficient parking management is critical as the City of Fort Worth’s population grows, land uses change, economic development occurs, and parking demand increases. Studies have shown that urban motorists spend excessive amounts of time searching for parking due to inefficient parking management. This increases travel time for motorists and contributes to idling and diminished air quality in cities. For the City of Fort Worth, improvements in parking management will come through deployment of smart technology and information sharing across interconnected platforms.

SMART PARKING TECHNOLOGY

The City of Fort Worth’s goal is to use its parking assets (i.e. on-street parking, surface lots, and garages) in the most efficient manner to increase the availability and ease of parking and to promote economic development. Toward that end, deployment of Smart Parking Technology can be used to 1) facilitate optimal utilization of the City’s parking assets, 2) manage parking demand, 3) reduce congestion, thus improving air quality, and 4) communicate with drivers visiting the City’s business and entertainment districts. Smart Parking Technology also provides the City with invaluable data used to plan for future parking needs.

CURB LANE MANAGEMENT

There are competing demands for curbside space in urban centers. Some of these competing demands include transit, bicycle facilities, commercial loading, valet, transportation network companies, bus loading zones, and ground transportation (i.e. taxi limousine, shuttle, non-motorized). In time, the expanded use of smart parking technology will enable the City of Fort Worth to efficiently manage demand for curbside space and improve mobility.

EXISTING AND PLANNED SMART PARKING TECHNOLOGY

Parking Applications

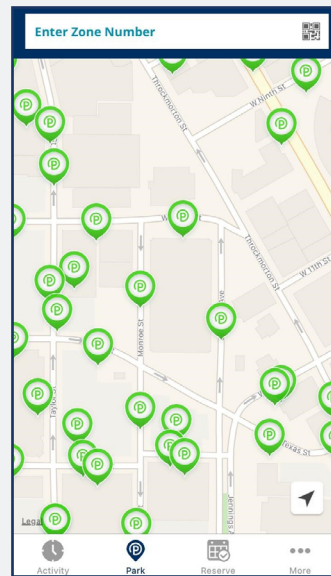
Parking applications are software on mobile devices that enable remote payment. These applications also provide data on parking options and availability near the user’s location. Over 100,000 unique users utilize FW Park, the City of Fort Worth’s parking application.

License Plate Enabled (LPE) Technology

LPE allows the parker to pay using their vehicle plate number as the identifier in the parking transaction. This eliminates the need to pay at a physical location and enables remote payment. This technology is currently in use in the FW Park app.

Parking Reservation System (PRS)

PRS enables the parker to use a mobile application or a website to make a parking reservation. The parker pays in advance of an event or appointment, which guarantees a space for the user and eliminates variability in parking availability. PRS also enables access to premium parking spaces which reduces and simplifies parking transaction time.



FW Park App.

Radio Frequency Identification (RFID)

RFID technology uses radio waves via a fixed reader to collect and identify tags on vehicles in City garages. The use of RFID provides a faster process time per vehicle, especially in times of high demand.

Parking Guidance System (PGS)

PGS enables parkers to locate desired parking and obtain pricing and occupancy information on those spaces in the location they desire to visit. PGS also creates a path from a parker’s current location or any location identified as a starting point to the place that they would like to visit.

Smart Meters

Smart meters are configured to take multiple forms of payments, including credit and debit cards. They also deliver event and local information to citizens.



Parking meter on Monroe Street.

NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS (NCTCOG)

Regional transportation planning in North Central Texas is conducted by the federally designated Metropolitan Planning Organization (MPO), comprised of the NCTCOG Transportation Department, NCTCOG Executive Board, Regional Transportation Council (RTC), and several technical committees. The planning area of the MPO consists of 12 counties including Tarrant County. Major products produced by the MPO include:

- Long-range Metropolitan Transportation Plan (MTP)
- Shorter-term Transportation Improvement Program (TIP)
- Congestion Management Process (CMP)
- Unified Planning Work Program (UPWP)

The City works closely with the MPO to plan and recommend transportation projects that will improve mobility, increase safety, and provide opportunities for economic development. The City coordinates with the MPO on a number of different planning efforts:

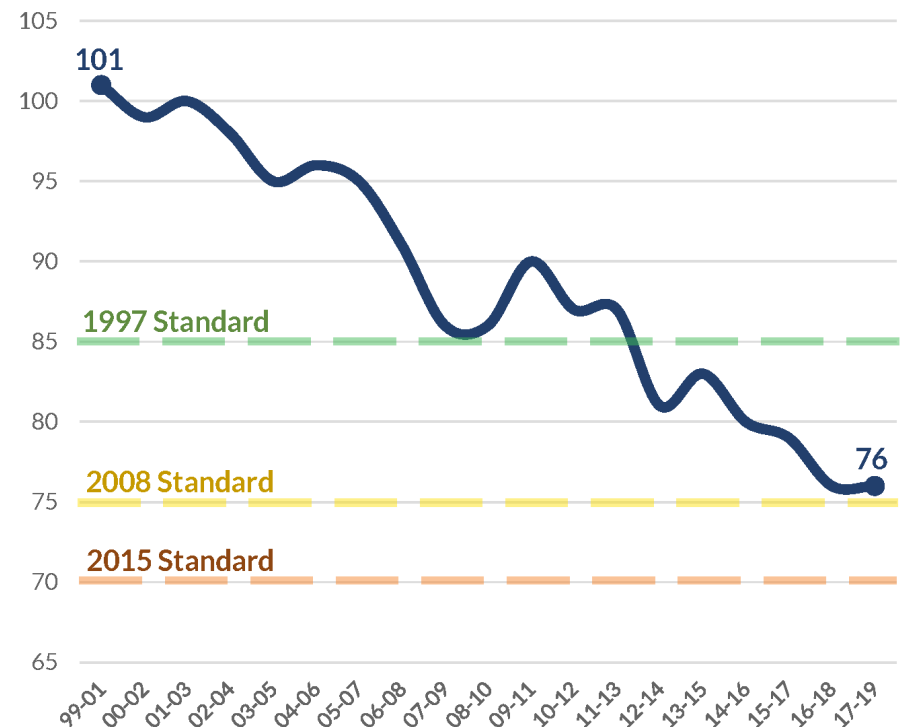


AIR QUALITY

A key goal of regional coordination is to improve the efficiency of our transportation system and in turn improve our air quality. While the ozone concentration of North Texas is still above 2015 US EPA National Ambient Air Quality Standards, the regional, coordinated efforts have led to much improvement in overall air quality since 1999.

Attainment Goal - According to the US EPA National Ambient Air Quality Standards, attainment is reached when, at each monitor, the Design Value (three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentration) is equal to or less than 70 parts per billion (ppb).

Air Quality: Region continues to reach increasingly higher standards.



Data Source: North Central Texas Council of Governments (NCTCOG).

UNDER DEVELOPMENT: TRANSIT MOVES FORT WORTH

To increase transit's role in Fort Worth's overall transportation system, the City is implementing Transit Moves | Fort Worth. This comprehensive long-range plan for improving the City's transit system is comprised of four main elements:

1. A transit vision for Fort Worth to guide improvements through 2045.
2. Specific improvements that should be implemented to achieve the vision.
3. Identification of potential new sources of funding for the improvements.
4. Governance changes recommended to facilitate implementation of the plan and improve transit service delivery.

BUSES, PARATRANSIT, & COMMUTER RAIL

Transit service in Fort Worth is primarily provided by Trinity Metro, and existing services include a network of fixed-route bus service, door-to-door paratransit service, and commuter rail service via the recently completed TEXRail. Trinity Metro also jointly own and operates the Trinity Railway Express (TRE) through a partnership with Dallas Area Rapid Transit (DART). Trinity Metro maintains a number of passenger facilities associated with these services. These include:

- 10 transfer centers
- 2,000 bus stops
- 16 park and ride lots
- 15 rail stations serving TEXRail and the TRE within Tarrant County.

Fort Worth Central Station in downtown Fort Worth, serves as the hub of the Trinity Metro System and provides connections to:

- 24 bus routes
- TRE to Dallas
- TEXRail to DFW Airport
- Greyhound buses
- Amtrak passenger service from Fort Worth to Houston, Oklahoma City, and San Antonio.

Source: Transit Moves Fort Worth State of the System Report 2019.



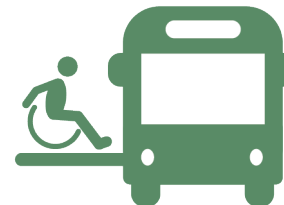
39 Local Bus Routes

provide fixed-route bus service in and around Fort Worth



7 Express Bus Routes

connect Fort Worth to regional activity centers



Paratransit Service

is available through Trinity Metro's door-to-door ACCESS program

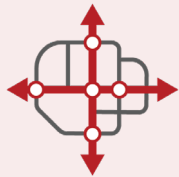


2 Regional Rail Lines

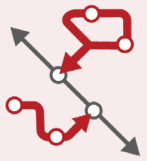
provide commuter service via Trinity Railway Express (TRE) and TEXRail

Source: Transit Moves Fort Worth State of the System Report 2019.

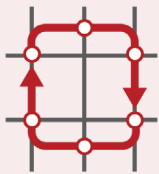
The transit network in Fort Worth includes four primary types of routes: radial routes, feeder routes, circulator routes, and crosstown routes. Generally, these routes are arranged in a hub-and-spoke system primarily oriented towards serving the downtown core of Fort Worth.



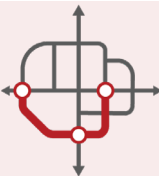
Radial routes act as the spokes of the network and are designed to move large numbers of riders along major travel corridors. These include local corridor bus routes as well as regional express bus and rail routes.



Feeder routes are designed to provide a connection to other transit services and transportation options, such as radial routes on major travel corridors. They expand the coverage of the transit network.



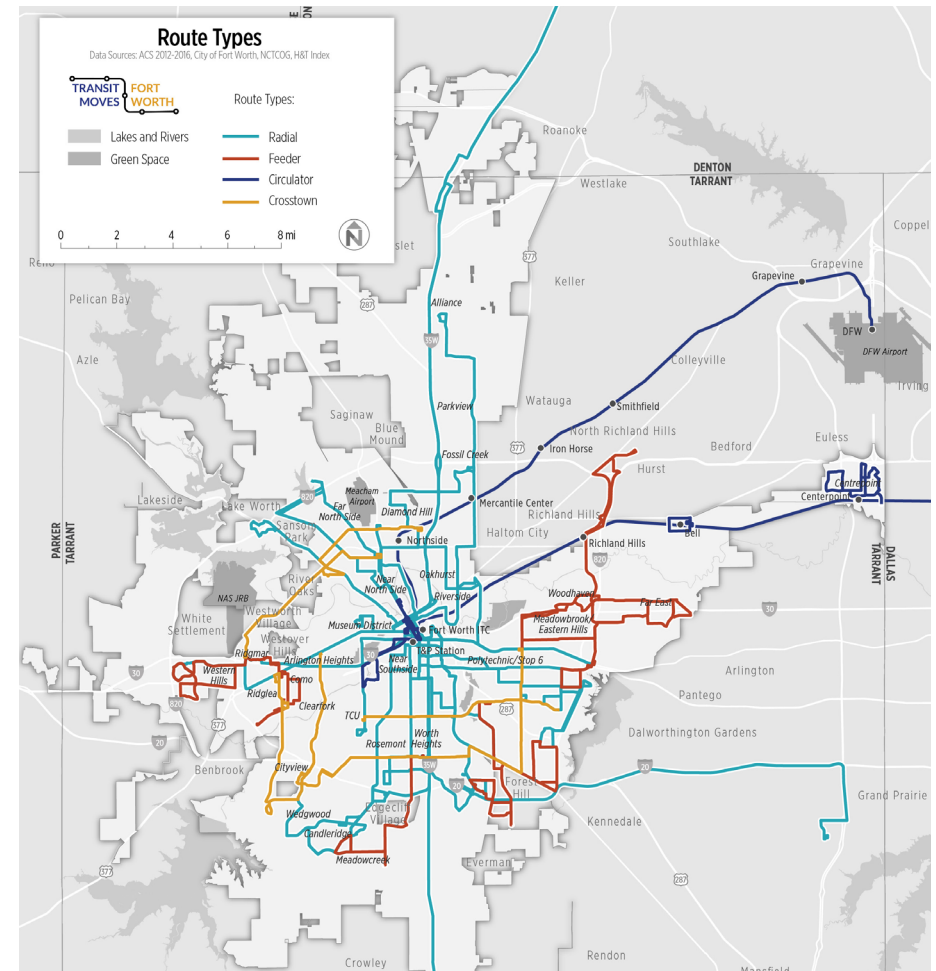
Circulator routes provide frequent local service within major activity centers. These routes may offer service all day long, or may be limited to peak travel periods.



Crosstown routes create opportunities to connect between neighborhoods and activity centers without requiring a trip through downtown. These routes can help reduce the number of transfers riders are required to make.

Source: *Transit Moves Fort Worth State of the System Report, 2019.*

TRINITY METRO ROUTE MAP



Source: *Transit Moves Fort Worth State of the System Report, 2019.*

TARRANT TRANSIT ALLIANCE



Started in 2018, the Tarrant Transit Alliance (TTA), a nonprofit community advocacy group, works with contributors, community officials, and regional leaders to build support for funding regional transit in Fort Worth and Tarrant County. Their purpose is to educate, empower, and mobilize policy to serve the region.

FIRST & LAST MILE CONNECTIONS: BICYCLES

All buses on Trinity Metro routes include folding bicycle racks on the front of vehicles. Cyclists are permitted to bring their bikes on TEXRail and TRE trains. TEXRail trains include on-board bike racks, while TRE trains include designated areas for riders to stand with bikes. These accommodations provide opportunities for potential transit riders to use bikes for making first and last mile connections.



FIRST & LAST MILE CONNECTIONS: ZIPZONES

The first area Trinity Metro is offering the new ZIPZONE service is in the Alliance corridor. Alliance ZIPZONE is the result of a regional partnership with the Denton County Transportation Authority (DCTA), allowing riders to connect with the North Texas Xpress that operates between downtown Fort Worth and Alliance and Denton. Alliance ZIPZONE replaces the Alliance Link, a first mile/last mile pilot started by Toyota.

Alliance ZIPZONE service is provided through Lyft, an on-demand Transportation Network Company. Trinity Metro passengers can conveniently use the Lyft app, entering a specific code to gain access to the first mile/last mile rides.

FORT WORTH BIKE SHARE (FWBS)

The City of Fort Worth's bike share program is provided by Fort Worth Bike Sharing (FWBS), a 501(c)(3) nonprofit organization in charge of operating Fort Worth B-Cycle. Fort Worth Bike Sharing launched the system in 2013 with stations set up across Downtown, the Cultural District, the Trinity Trails, the Stockyards, Near Southside, and on TCU's campus. In 2019, Fort Worth Bike Sharing introduced electric assist bikes to its fleet. Electric-assist bicycles provide a faster, less strenuous option for getting people where they need to go, but with the same minimal impact on our environment and efficient use of public space.



FWBS MISSION STATEMENT

"To enhance our community by providing an affordable, efficient, environmentally-friendly bike share program that complements our existing public transportation system and provides both residents and visitors a healthy, convenient way to move around our city."

350

Bicycles

From system launch in April 2013 through the end of 2018:

67k

Total Riders

46M

Est. Calories Burned

46

Stations

254k

Total Trips Taken

1.1M

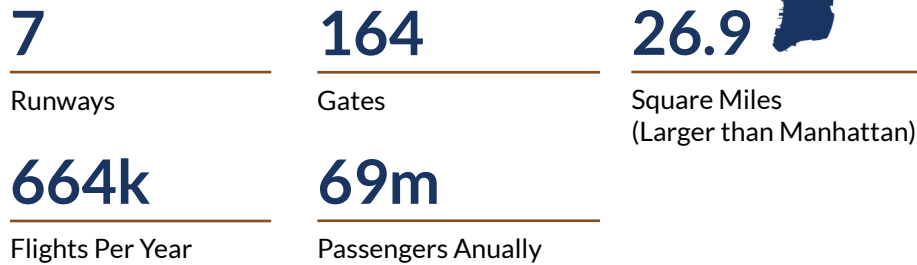
Est. Pounds of Carbon Offset



Source: Fort Worth Bike Sharing.

DALLAS-FORT WORTH INTERNATIONAL AIRPORT

Dallas-Fort Worth International Airport (DFW), jointly owned by the cities of Fort Worth and Dallas, is a large hub airport serving the North Texas region, and providing nonstop service to over 200 cities worldwide. Opened in 1974, DFW is now providing an economic impact of \$37 billion annually, supporting 228,000 full time jobs. DFW is the largest hub for American Airlines, which is headquartered in Fort Worth



CITY OF FORT WORTH AVIATION SYSTEM

The City of Fort Worth Aviation System is home to three world-class airports – Alliance, Meacham International, and Spinks. Owned by the City of Fort Worth, each airport offers a diverse industrial base, which makes it an attractive location for a variety of businesses.

	Alliance	Meacham	Spinks
Year Activated	1989	1925	1989
Area (Acres)	1,200	900	800
Hangar Facilities	73	30	30
Based Aircraft	400	200	200
Purpose/Use	Freight	General/Freight	General



DFW International



Alliance

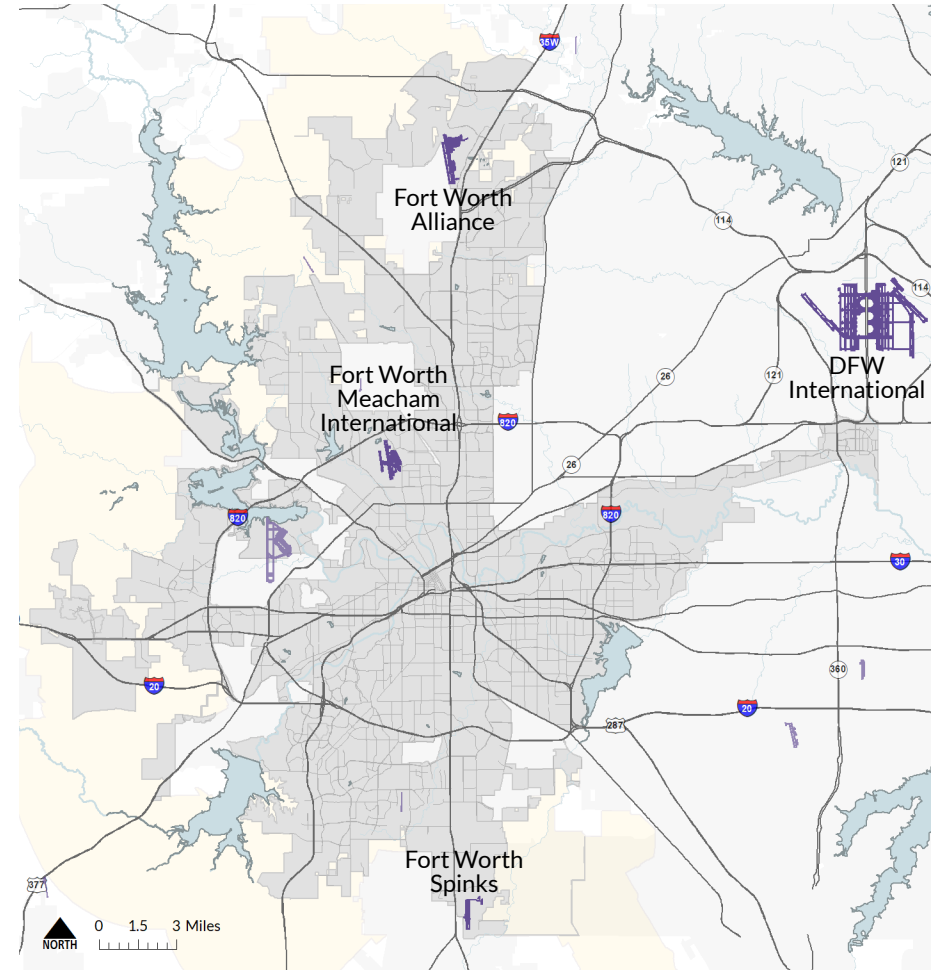


Meacham



Spinks

AIRPORT LOCATIONS



Source: City of Fort Worth, Planning & Data Analytics Department, 2020.

INTERSTATES, RAILROAD CORRIDORS, & AIR CARGO

The movement of goods is a key component of the regional economy in North Texas. The region serves as one of the largest inland ports in the nation, where freight is moved, transferred, and distributed worldwide.

Interstate Highway 35, which runs north/south through the center of Fort Worth, has served as the North American Free Trade Agreement (NAFTA) corridor since 2015. In addition to truck freight, national railroad corridors and air cargo hubs make the City a national logistics hub. Emerging technologies in vehicle automation are on track to influence how freight moves in the future. For more information on these trends please reference “Future Transportation Trends” on page # of this chapter.

98%

Of the U.S. population can be reached within **48 hours** by truck from Fort Worth.

Source: NCTCOG

GRADE CROSSINGS & QUIET ZONES

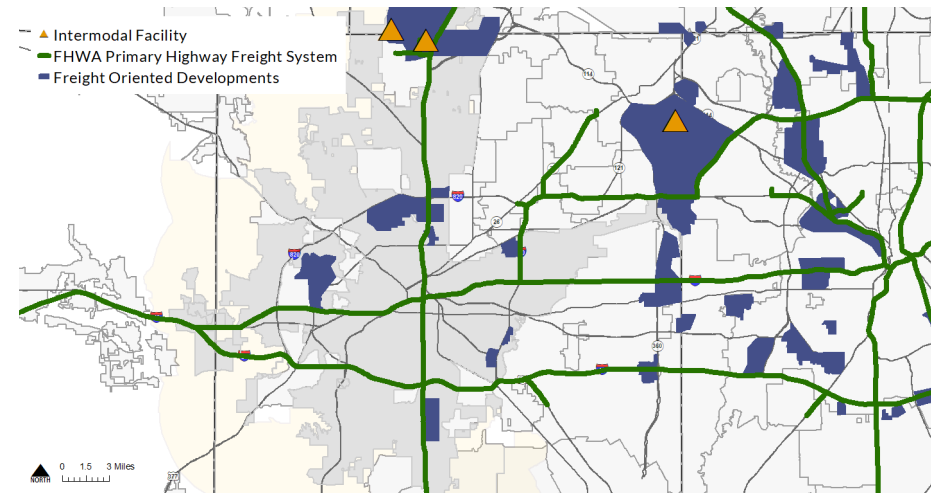
With the high amount of train activity and large number of railroad crossings in Fort Worth, the City is committed to improving railroad crossing safety and developing new quiet zones. Quiet zones are improved railroad grade crossings where locomotives are not required to sound their horn. A quiet zone can therefore significantly improve the environmental quality of a neighborhood. A crossing or a group of railroad crossings can qualify for a quiet zone if, in addition to modern crossing flashers and gates, additional specific crossing devices are used to increase the safety of each crossing. City projects underway include quiet zone projects, new railroad crossing signal upgrades, crossing surface projects, grade separations (bridges and underpasses), and other rail projects.



Example of an enhanced crossing in a quiet zone on Museum Way. In order to prevent drivers from deliberately driving around lowered railroad gates in this quiet zone, a median barrier is placed in the center of the roadway.

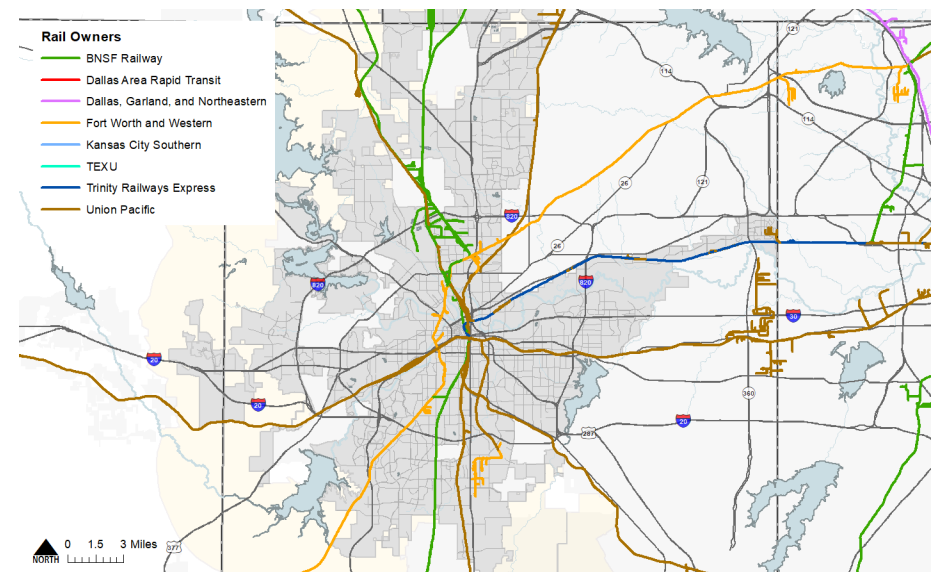


FHWA PRIMARY HIGHWAY FREIGHT SYSTEM



Source: NCTCOG, City of Fort Worth, Planning & Data Analytics Department, 2020.

RAIL OWNERSHIP



Source: NCTCOG, City of Fort Worth, Planning & Data Analytics Department, 2020.

Funding transportation projects can be categorized based on the project phase, target user, and funding source. A project’s type, such as roadway, bridge, intersection, trail, or wayside facility, can also affect which funding programs to target. Its location can affect this decision as well. When pursuing funding, smaller projects can often be grouped in with larger, more complex projects that may require a mix of funding sources. These sources include the General Fund, Bond Programs, Public Improvement Districts (PIDs)/Tax Increment Financing, federal funding, and private and nonprofit partnerships.

GENERAL FUND ANNUAL BUDGET

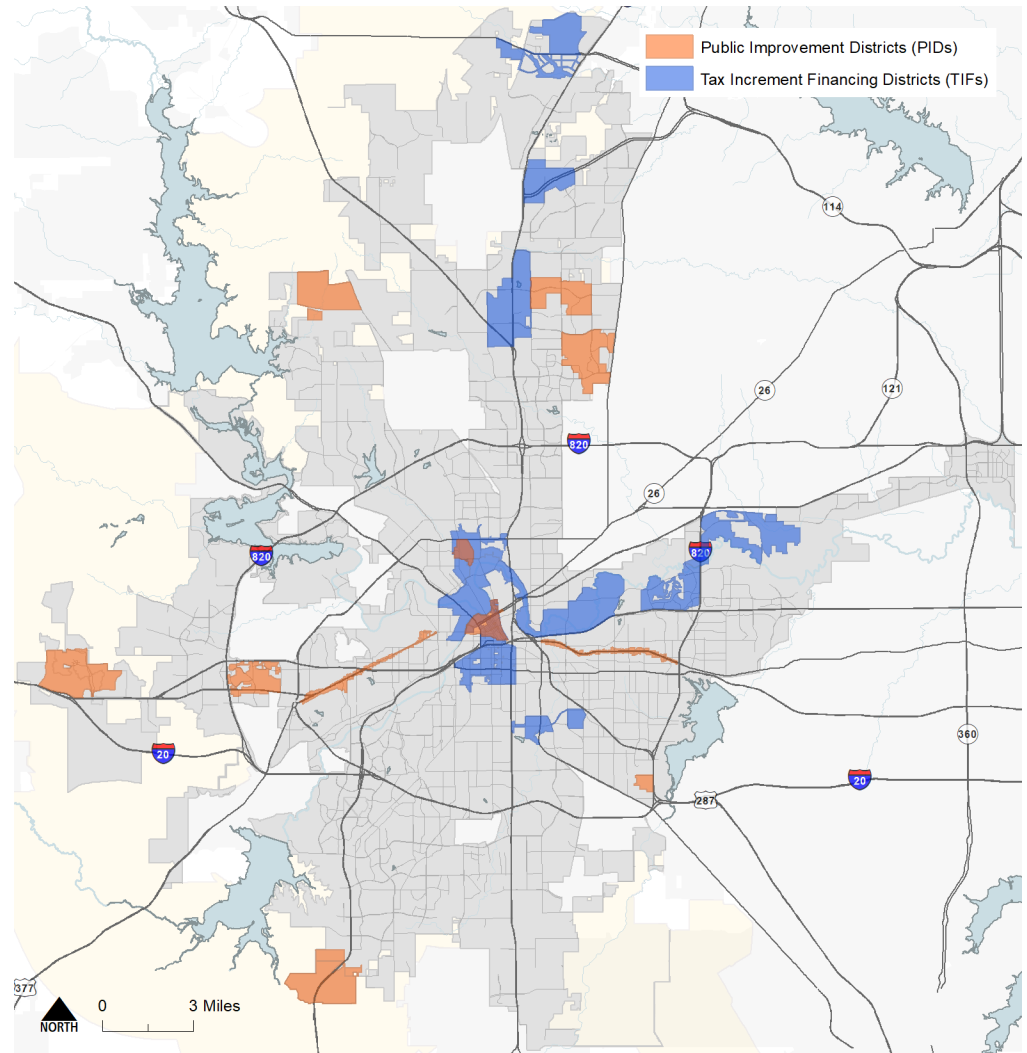
The General Fund is the largest fund within the City with the largest amount of revenue in the overall City budget. The General Fund revenues include property tax; sales tax; operating transfers; charges for service; license and permit fees; fines forfeitures; and special assessment, and other miscellaneous revenues. The Transportation and Public Works Department is funded through four different funds:

- General Fund
- Stormwater Utility Fund
- Municipal Parking Fund
- Capital Project Services Fund

PUBLIC IMPROVEMENT DISTRICTS (PID) & TAX INCREMENT FINANCING DISTRICTS (TIF)

Transportation improvements can often be included as part of larger efforts of business improvement and retail district beautification. Similar to benefit assessments, PIDs collect levies on businesses in order to fund area-wide improvements that benefit businesses and improve access for customers.

PIDS AND TIFS



Source: City of Fort Worth, Planning & Data Analytics Department, 2020.

TRANSPORTATION IMPACT FEES

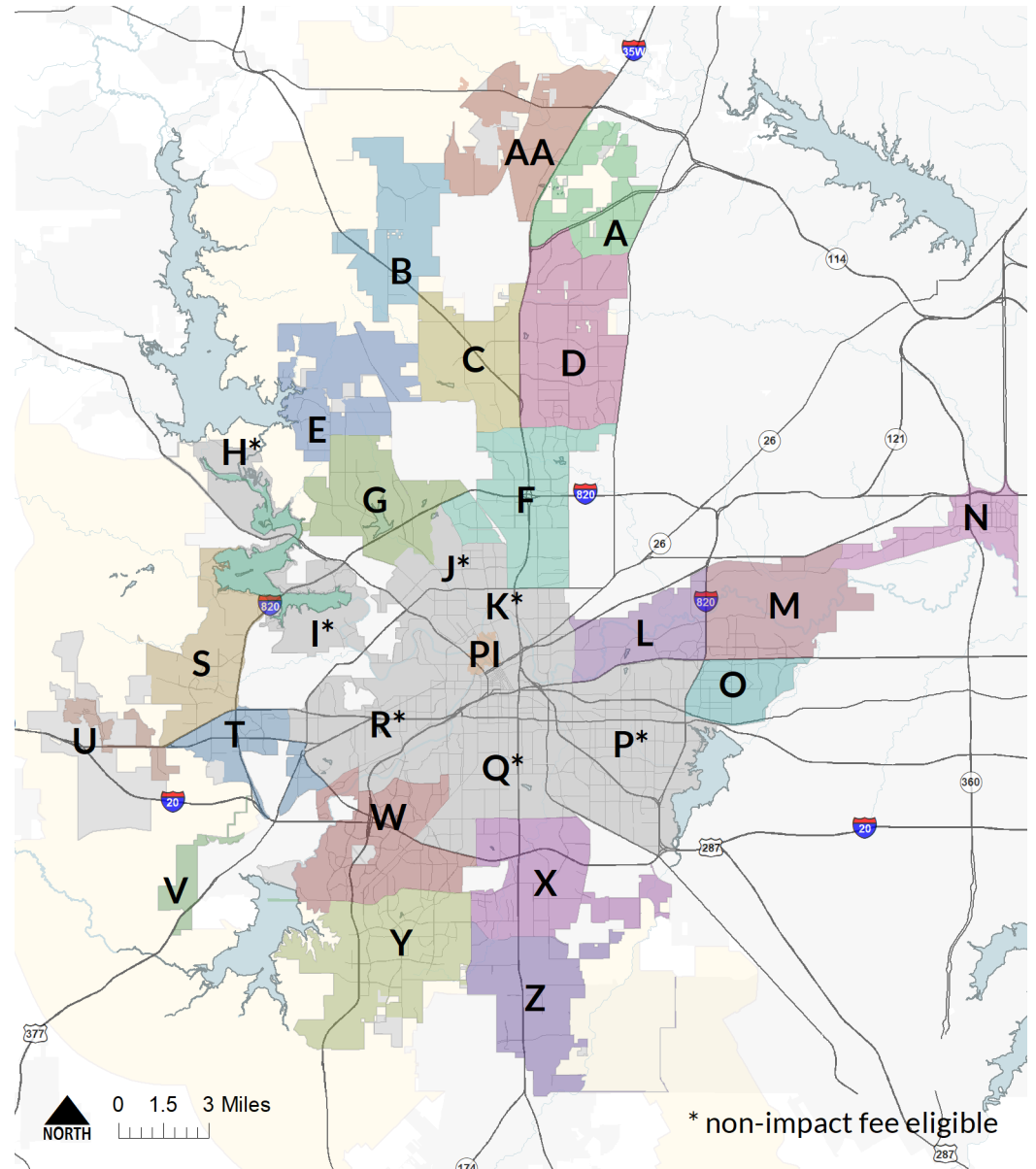
Transportation impact fees:

1. Collected by the City from new development projects to help fund transportation improvements that will be needed to support a balanced transportation network.
2. Applied to individual building permits and collected prior to issuance of the building permit.
3. Collected funds are used within a defined Transportation Service Area (TSA).

In order to assess an impact fee, land use assumptions must be developed to provide the basis for residential and employment growth projections within a transportation service area. As defined by Chapter 395 of the Texas Local Government Code, these assumptions include a description of changes in land uses, densities, and development in the TSA.

The City completed a study to define these land use assumptions and subdivided the City into 21 TSAs. The land use assumptions are then used in determining the need and timing of transportation improvements to serve future development.

TRANSPORTATION IMPACT FEE SERVICE AREAS



Source: City of Fort Worth, Planning & Data Analytics Department, 2020.

PROJECT PRIORITIZATION: RACE & CULTURE TASK FORCE TRANSPORTATION RECOMMENDATIONS (2018)

The City of Fort Worth’s Race and Culture Task Force provided recommendations on disparities in majority minority areas, including the topic of transportation. The report found that Super-Majority Minority Areas (S-MMAs) of Fort Worth, defined as those census block groups that have a minority population of 75% or greater, have a disproportionate share of streets, sidewalks, and street lights in poor condition and are disproportionately affected by pedestrian and bicycle crashes, including fatal crashes. Three recommendations were proposed and a dashboard for tracking progress was created:



1. Adopt a Transportation Equity Policy and Five-Year Action Plan.
2. Change transportation funding criteria to emphasize S-MMAs.
3. After-Action reviews of pedestrian and bicycle crashes.

Recommended Strategy	Racial and Cultural Disparities to be Addressed	Estimated Extent of Disparity, 2018 or Earlier Year	Projected Extent of Disparity 2023
Transportation equity policy and five-year action plan	Street conditions	Super Majority-Minority Areas of Fort Worth have 35% of street lane-miles, but 50% of poor-condition streets	40% of poor-condition streets
Transportation funding criteria	Sidewalk conditions	Super Majority-Minority Areas of Fort Worth have 30% of built sidewalks, but 67% of poor-condition sidewalks	47% of poor-condition sidewalks
After-action reviews of pedestrian and bicycle crashes	Street light conditions	Super Majority-Minority Areas of Fort Worth have 32% of installed street lights, but 43% of poor-condition street lights	33% of poor-condition streetlights
	Crash incidences	Super-Majority Minority Areas comprise 25% of the city’s land area, but had 49% of total bike and pedestrian crashes and 51% of fatal bike and pedestrian crashes from 2013 to 2017	39% of total bike and pedestrian crashes, and 41% of fatal bike and pedestrian crashes

Source: Fort Worth Task Force on Race and Culture Final Recommendations, November 2018.

AUTONOMOUS & CONNECTED VEHICLES

Autonomous vehicles use advanced technology including sensors, actuators, and a central computer to “perceive” or “view” their surrounding environment and automate the driving process. This results in little to no human involvement in moving around a city. In addition to autonomous vehicles, connected vehicles include communication devices (embedded or portable) that enable in-car connectivity with other devices present in the vehicle and/or enable connection of the vehicle to external devices, networks, applications, and services.

In the future, autonomous and/or connected vehicles may be used in urban shuttle routes, on-demand services, and trucking companies to move people and goods. Fort Worth will partner with the North Central Council of Governments to exercise proactive leadership to ensure that these emerging technologies will safely benefit the public.

Shuttle Routes

Fixed, low-speed shuttle routes could be implemented in urban residential communities, office parks, large events, or school campuses to provide first-and last-mile options, expanding the reach of trains and buses. Shuttle routes are a possible gateway technology to on-demand routes. Concerns for safety, especially the interaction between vehicles and people walking and bicycling, must be addressed before non-route specific services could become available.

Connected Freight

Autonomous, connected freight trucks could take advantage of advanced technologies on interstate highways. The reduced number of vulnerable road users, traffic lights, and visual distractions, combined with the consistent speeds, clear marks, and gradual turns, lend interstate highways to be a favorable environment for autonomous vehicles.

Trucking companies could reduce costs by decreasing the number of drivers and taking advantage of platooning. In truck platooning, a lead truck sends wireless commands to one or more following trucks to regulate speed, steering, braking and distance between the trucks. Air drag is reduced, reducing fuel consumption by up to 15%. Safety distance between trucks can be reduced, thereby reducing highway congestion. Platooning could reduce the driver’s workload, or remove the driver entirely. This application is controversial because reducing the number of drivers will also affect many people’s livelihoods, as there are currently 3.5 million truck drivers in the US alone.

Society of Automotive Engineers (SAE) Automation Levels



No Automation

Zero autonomy; the driver performs all driving tasks.



Driver Assistance

Vehicle is controlled by the driver, but some driving assist features may be included in the vehicle design.



Partial Automation

Vehicle has combined automated functions, like acceleration and steering, but the driver must remain engaged with the driving task and monitor the environment at all times.



Conditional Automation

Driver is a necessity, but is not required to monitor the environment. The driver must be ready to take control of the vehicle at all times with notice.



High Automation

The vehicle is capable of performing all driving functions under certain conditions. The driver may have the option to control the vehicle.



Full Automation

The vehicle is capable of performing all driving functions under all conditions. The driver may have the option to control the vehicle.

Source: U.S. Department of Transportation Federal Highway Administration, 2018.

MICROMOBILITY

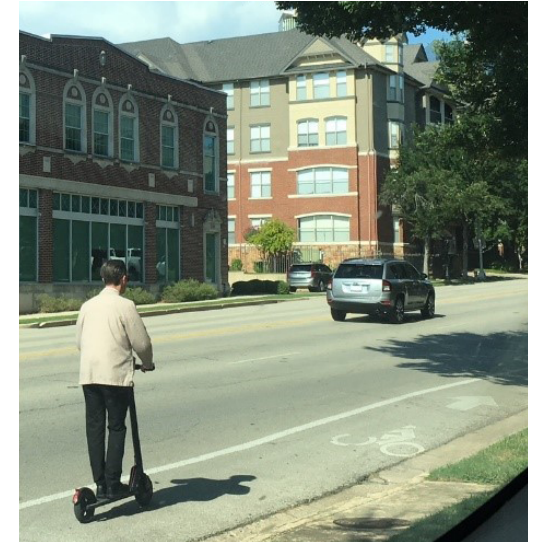
Globally, dockless bike and scooter sharing systems are popular ways to allow the short-term use of bicycles and scooters for transportation or recreation trips. Traditional bike share systems have utilized fixed stations that require a user to dock the bicycle in a station at the end of a trip.

Dockless bikes/scooters:

- App-based systems.
- Users locate and check out a vehicle using their phone.
- Users leave the vehicle at their final destination without needing a station.
- Onboard locks prohibit the vehicle from being ridden until it is unlocked via the app.

These systems have been found to provide first and last mile connections to transit and provide a convenient alternative transportation mode for short trips. However, these systems have raised concerns. When not in use, the vehicles may be left in the public right-of-way and, if not parked correctly, can obstruct ADA curb ramps and clutter pedestrian paths. Other U.S. cities have created legal processes and permits to regulate and mitigate some of these concerns.

At this time, the City does not have a legal process to allow dockless bike or scooter companies from conducting commercial activity in the City’s right-of-way. Personal, privately-owned electric scooters however are currently not prohibited to operate on streets and sidewalks in Fort Worth.



Location: Scooter on West 7th Street.
 Photo Credit: City of Fort Worth, Planning & Data Analytics, 2019.

UNMANNED AIRCRAFT SYSTEMS

Unmanned aircraft systems have significantly grown in popularity for commercial and civilian use over the last decade. The introduction of these systems into regional airspace provides both opportunities and challenges. The NCTCOG has convened the North Texas Unmanned Aircraft Systems (UAS) Safety and Integration Task. This task force will help mitigate reckless UAS operation and promote the safe integration of UAS technology into the DFW regional airspace. The Task Force is comprised of public-sector representatives at the federal, state, and local levels as well as private-sector representatives from the Aviation and UAS Industries, Academia, Military, and others.



Source: NCTCOG.

The City of Fort Worth uses the following goals and objectives to provide a multimodal transportation system that builds community, supports economic growth, and improves air quality.

1 Improve mobility and air quality by providing a multimodal transportation system that is effectively coordinated with existing and planned adjacent land uses.

- Work with Trinity Metro to improve transit services in Fort Worth.
- Plan for and implement Transit-Oriented Development adjacent to regional rail stations in Fort Worth.
- Create a Transit-Oriented Development Plan and implementing Form-Based Code for the Northside/Stockyards TEXRail Station area.
- Implement the Complete Streets policy through the Master Thoroughfare Plan.
- Develop new bikeways and trails to connect neighborhoods to the Trinity River, Downtown, schools, parks, and other destinations.
- Implement projects identified in the Active Transportation Plan.

2 Develop and maintain a safe, efficient, and economically sound transportation system that meets the needs of all users.

- Periodically review safety, operation, and construction activities that impact the efficient movement of all modes of transportation.
- Evaluate traffic, cyclist, and pedestrian safety near shopping, schools, and other pedestrian-oriented areas on a continuous basis.
- Work closely with property owners and developers to plan and implement an effective and well connected collector street network.
- Implement the City's access management policy in conjunction with new development and redevelopment.
- Update the transportation impact fee study and collect appropriate fees to ensure new growth pays its share of roadway and infrastructure costs.
- Keep the percentage of City streets in good and excellent condition above 75 percent (%).

3 Improve transportation coordination with area Transportation agencies.

- Coordinate with TxDOT on State projects within the city's boundary.
- Coordinate with the NCTCOGs Metropolitan Planning Organization.
- Coordinate closely with other City departments on transportation projects.
- Coordinate with Independent School Districts on new school locations and needs.

The City of Fort Worth uses the following policies and strategies to provide a multimodal transportation system that builds community, supports economic growth, and improves air quality.

POLICIES

- Evaluate development proposals and transportation investments based on the impacts of land use and platting decisions on the overall transportation system, and the impacts of transportation decisions on land use.
- Emphasize public transportation, bicycle, and pedestrian improvements in designated growth centers, urban villages, and transit-oriented developments.
- Support and encourage appropriate mixed-use zoning and mixed-use development in designated growth centers, urban villages, and transit-oriented developments.
- Promote street system patterns that provide greater connectivity between streets and between developments to reduce traffic demands on arterial streets, improve emergency access, and make bicycling and walking more attractive transportation options.
- Preserve and maintain the existing street infrastructure.
- Promote sustainable development patterns that include greater density at appropriate locations, mixed-use development, public transit, park-and-ride facilities, and access management (e.g. encouraging shared driveways and limiting the number of curb cuts) to reduce vehicle trips.
- Encourage the use of parallel local access streets along collector and minor arterial roadways to allow the front façade of homes to face the street without the need for multiple driveway curb-cuts on the main street, thereby preserving traffic safety while increasing the pedestrian friendliness of the collector or minor arterial.
- Protect residential and historic areas from the impacts of excessive traffic.
- Encourage appropriate development through the planning and implementation of a multimodal transportation system.
- Incorporate the needs of pedestrians, bicyclists, transit riders, and persons of all ages and abilities when planning and designing transportation projects.
- Use the existing Community Facilities Agreement (CFA) program to develop transportation facilities in conjunction with new private development.
- Integrate the City’s airport system as part of the overall transportation system.

STRATEGIES

- Promote the expansion of rail transit.
- Identify and promote potential locations for transit-oriented development, especially in designated growth centers and urban villages.
- Protect planned transit-oriented development locations from inappropriate new low-density development by adopting high-intensity mixed-use zoning or form-based codes in planned TOD areas.
- Continue to work with Trinity Metro to expand and integrate public transit, including rail transit, into the City’s transportation system.
- Implement the Complete Streets policy that requires streets to be designed to accommodate all likely users.
- Ensure collaboration among City departments, Trinity Metro, and the community to ensure effective coordination among the various transportation modes.
- Promote park-and-ride facilities to increase the use of public transit.
- Incorporate all modes of transportation in corridor studies.
- Seek input from other entities, including schools, cities, counties, Trinity Metro, NCTCOG, and TxDOT when making land use and transportation decisions.
- Continue to coordinate with NCTCOG to use the travel forecasting model.
- Implement the Intelligent Transportation System Plan for Fort Worth, in coordination with TxDOT, NCTCOG, Trinity Metro, and other Metroplex cities.
- Establish links for pedestrians and bicyclists to cross natural barriers, such as rivers and creeks, and man-made obstacles, such as railroads and highways.
- Improve linkages between adjacent neighborhoods and integrate nearby land uses to decrease vehicle miles traveled.
- Provide pedestrian access from residential areas to shopping, parks, public buildings, and neighboring subdivisions.
- Promote and participate in local and regional activities that encourage bicycling and walking as a means of transportation.
- Foster roadway designs that decrease noise and improve air quality along major arterials.
- Include landscaping plans in corridor projects.
- Develop an appropriate strategy to address the maintenance of public alleys.