WHAT CAN WE DO?

SECTION 6

WHAT CAN WE DO?

What is a Multimodal Transportation Plan?

The SA Tomorrow Multimodal Transportation Plan is the first comprehensive, long-range transportation plan for the City of San Antonio. It lays out goals, policies and strategies to guide multimodal transportation planning, development, and maintenance of the City's transportation system for the next 25 years. It also identifies near-term improvements and a project prioritization methodology that will make it possible to quickly evaluate and consider projects once funding becomes available. It also includes considerations for project planning and funding, along with quality of life considerations. There will be three key areas influenced by this plan once adopted - **Planning, Development, and Maintenance**.

Planning – The plan provides a blueprint for creating safe, convenient and sustainable transportation options. This blueprint will help the City better participate in the transportation planning efforts led by the Alamo Area Metropolitan Planning Organization, as well as other agencies such as the VIA Metropolitan Transit and the Texas Department of Transportation. It also provides guidance on best practices for providing multimodal facilities as demonstrated via the corridor frameworks presented later in this section.

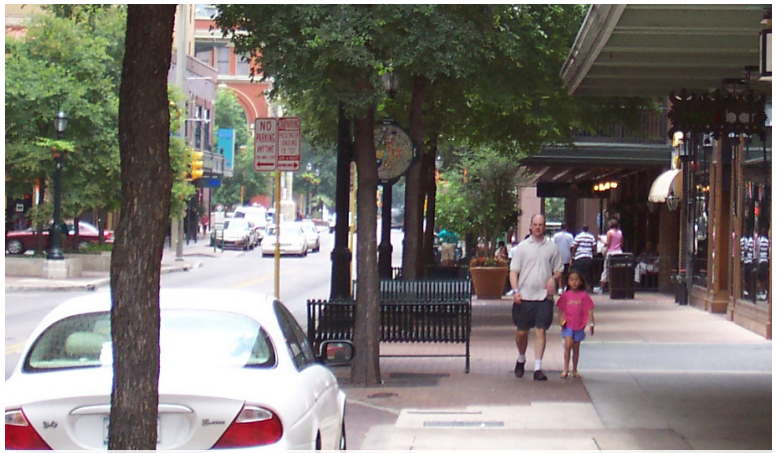
Development – Once a potential project advances through the planning stages, it goes into development. During development, funding is programmed, environmental impacts are considered, and detailed design takes place. The plan provides guidance regarding desired practices in street design that will help guide the engineering teams delivering projects. It will also help prioritize projects that may or may not be ready for funding.

Maintenance – Many of the near-term improvements proposed in the plan can be implemented in conjunction and/or coordinated with ongoing maintenance. Making the most of maintenance dollars is important. Correlating maintenance projects with area goals (e.g. re-striping a roadway to include on-street parking, following an overlay project) allows the City to take advantage of other projects without having to dedicate specific funds.

MULTIMODAL

Multimodal refers to planning and designing transportation infrastructure that considers all modes (vehicles, pedestrians, bicycles, public transit, freight, rail, etc.) and the connections between them.

A multimodal system allows for users to have choices regarding mobility. These choices can improve the quality of life for all citizens and visitors to San Antonio.



Allowing for transportation choices helps create a place people want to be.

Land Use and Transportation

Land use types are the commercial businesses, institutions, and residential facilities that create the context of the area. Existing land use patterns influence and are influenced by the transportation network. The design of roadways (modes they provide for, connectivity, available capacity, etc.) can encourage certain types of activity for the adjacent land uses. For example:

- A corridor with on-street parking and a comfortable pedestrian realm will likely encourage pedestrian activity.
- A corridor with many lanes and limited right-of-way (space) provided for the pedestrian realm will be more apt to have auto-centric land use types.

Over the last few decades in San Antonio, growth has gravitated to the northern and western portions of the City and Bexar County in an auto-centric focused manner. This growth pattern has put a significant strain on the transportation infrastructure on this part of the city. Development patterns are continuing to focus on this area however, they are predominantly auto-oriented.

The SA Tomorrow Comprehensive Plan is fundamental in the function of a multimodal network. The tie between land uses and modes of transportation is essential in operations. Dense, multi-use areas are more likely to encourage use of alternative modes of transportation.

Retail Mixed

Commercial

Residential

The types of land uses and the interaction between them often dictates the frequency of travel, the length of the trip, the time spent traveling and by what mode. As a result, land uses play a huge role in travel demand and vehicle miles traveled (VMT). If we can offer places for people to live that do not require travel by car, longer trip lengths or greater amounts of time spent traveling, we will have reduced congestion, improved capacity, improved air quality and potentially a better quality of life.

COMPREHENSIVE PLAN

A Goal of the Growth and City Form section of the SA Tomorrow Comprehensive Plan is to focus on sustainable infill and mixed use development to provide walkable and bikeable destinations for all residents. Another goal of the Plan is to have higher density uses focused within the City's Regional Centers and along its arterial and transit corridors.

Both of these goals acknowledge the importance of how land use types connect with corridors to influence activity patterns.

Complete Streets

A Complete Street is a roadway planned, designed and operated to enable safe access for all users, including people walking, biking, driving, and transit riders of all ages and abilities. Complete Streets vary greatly since roadways must serve different purposes for different land uses, so not all roadways will have bicycle lanes or be sized for freight trucks. Complete Streets are context-driven, with different components and amenities depending on the community being served. The commonalities are that all modes of travel are accommodated in a safe, accessible and comfortable manner.

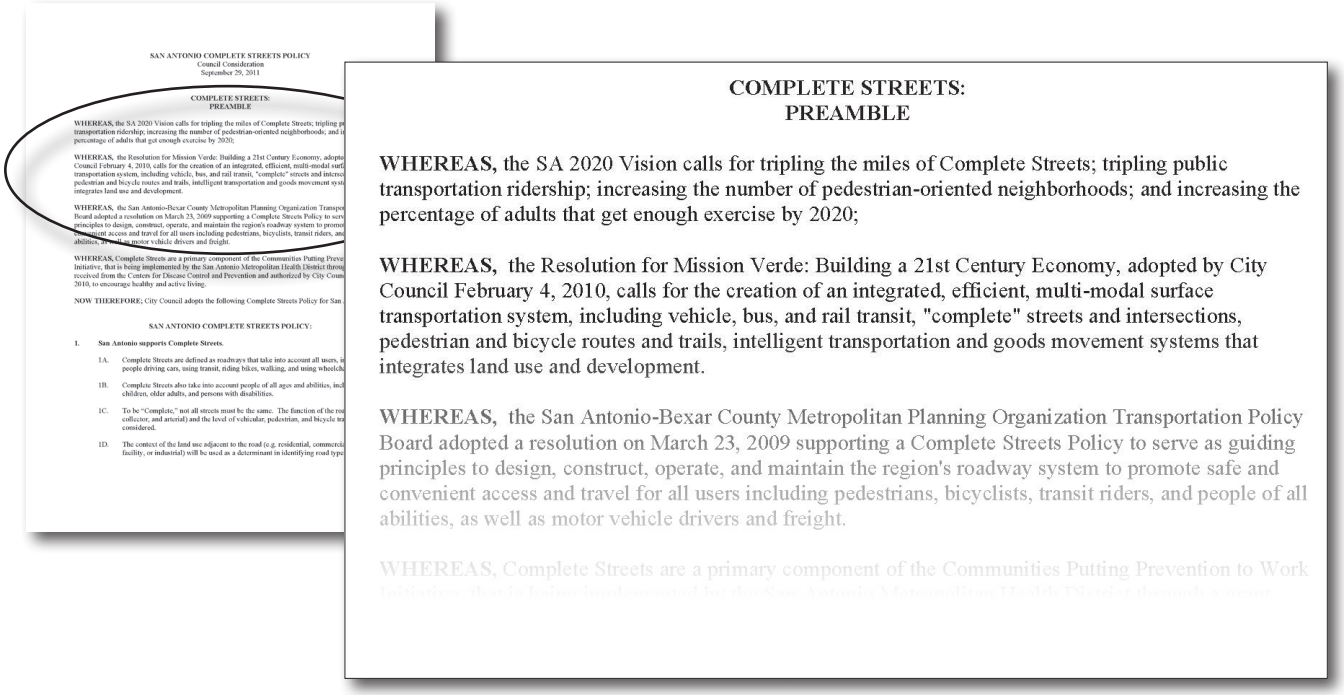
Auto-oriented Corridor

Multimodal Corridor

SAN ANTONIO COMPLETE STREETS POLICY

In 2011, San Antonio adopted this policy that:

- » Supports Complete Streets;
- » Promotes healthy living and fitness;
- » Supports pedestrian-oriented neighborhoods ;
- » Enhances commercial corridors and districts; AND
- » Maximizes benefits of investment in capital projects.



SAN ANTONIO COMPLETE STREETS POLICY
Council Consideration
September 29, 2011

COMPLETE STREETS:
PREAMBLE

WHEREAS, the SA 2020 Vision calls for tripling the miles of Complete Streets; tripling public transportation ridership; increasing the number of pedestrian-oriented neighborhoods; and increasing the percentage of adults that get enough exercise by 2020;

WHEREAS, the Resolution for Mission Verde: Building a 21st Century Economy, adopted by City Council February 4, 2010, calls for the creation of an integrated, efficient, multi-modal surface transportation system, including vehicle, bus, and rail transit, "complete" streets and intersections, pedestrian and bicycle routes and trails, intelligent transportation and goods movement systems that integrates land use and development.

WHEREAS, the San Antonio-Bexar County Metropolitan Planning Organization Transportation Policy Board adopted a resolution on March 23, 2009 supporting a Complete Streets Policy to serve as guiding principles to design, construct, operate, and maintain the region's roadway system to promote safe and convenient access and travel for all users including pedestrians, bicyclists, transit riders, and people of all abilities, as well as motor vehicle drivers and freight.

WHEREAS, Complete Streets are a primary component of the Communities Putting Prevention to Work

WHAT CAN WE DO? - ROADWAYS

Roadway/Highway Element

The most significant transportation investment San Antonio has made is a multi-billion dollar roadway/highway network currently in place. The City has the opportunity to capitalize on this baseline network to create a world class transportation system. This includes not only maintenance, and technology advancements, but also safety improvements through Vision Zero to maximize the use and function of this baseline network.

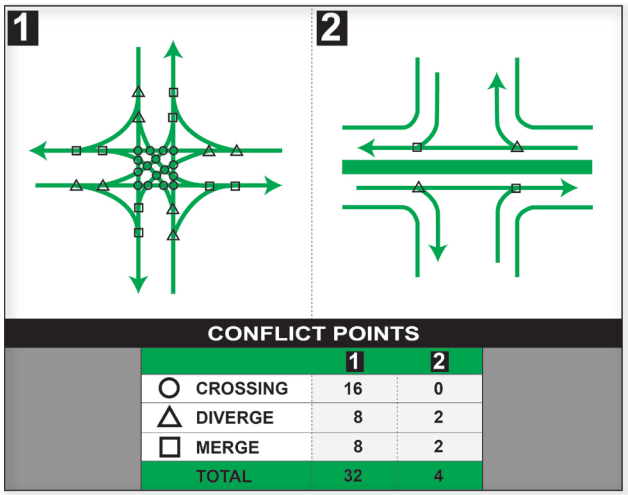
Safety

During the public outreach portion of SA Tomorrow, concern was expressed for the safety of all users whether traveling by automobile, transit, bike, or walking. The map in Figure 1 visually represents the location of crashes occurring in San Antonio whether involving one or two vehicles, or between a vehicle and bicyclist or pedestrian.

Fatal vehicular crashes in San Antonio are mainly found on interstates or major highways. As represented in Figure 2, between 2013 and 2015, 87 fatal and incapacitating crashes occurred. Figure 3 displays the fatal crashes between a vehicle and bicyclist or pedestrian. A higher number of fatal pedestrian crashes occurred as compared to fatal bike crashes.

In San Antonio, pedestrian activity is more predominant than bicycle activity. Without access to a personal vehicle, residents using transit typically complete their journey by walking to/from bus stops to their destinations. Many of the pedestrian fatalities in San Antonio occur during the nighttime hours, when many transit users are returning home from work. Poor visibility is a large factor in many of these occurrences.

Crashes occur for a variety of reasons. A significant number of crashes are caused by driver behavior. Other factors can include roadway or traffic control features like horizontal or vertical grade, wet pavement, pavement markings that are not visible, etc. Opportunities for crashes to occur at locations where the traffic control is assigned and one or more drivers must give up right of way, are referred to as conflict points. Intersections and driveways are locations with typically high numbers of conflict points. The Conflict Points graphic (above) shows a visual representation of the number of conflict points at an intersection and also along a divided thoroughfare.



	1	2
CROSSING	16	0
DIVERGE	8	2
MERGE	8	2
TOTAL	32	4

Conflict Points

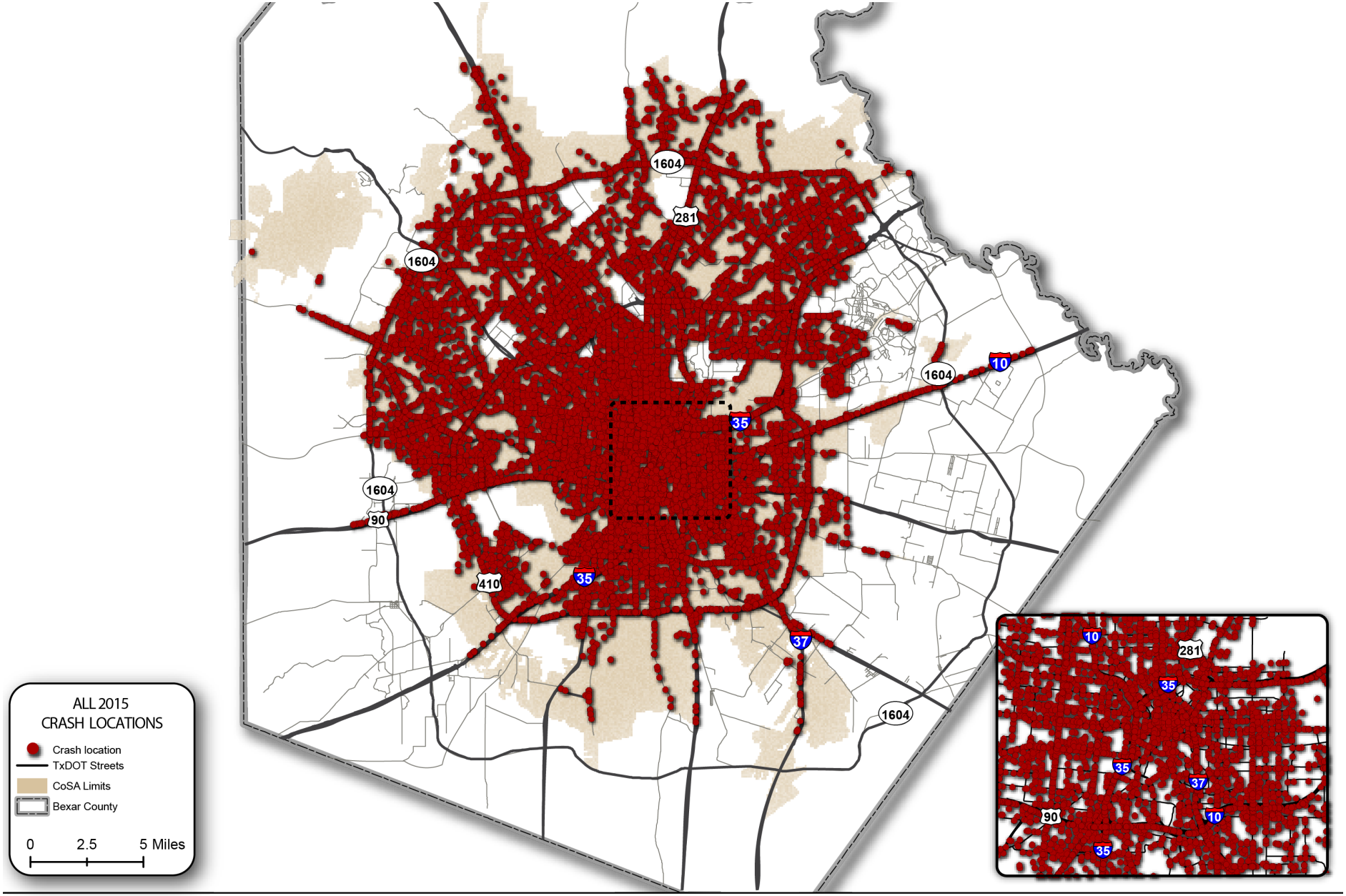


Figure 1: 2015 Crash Locations

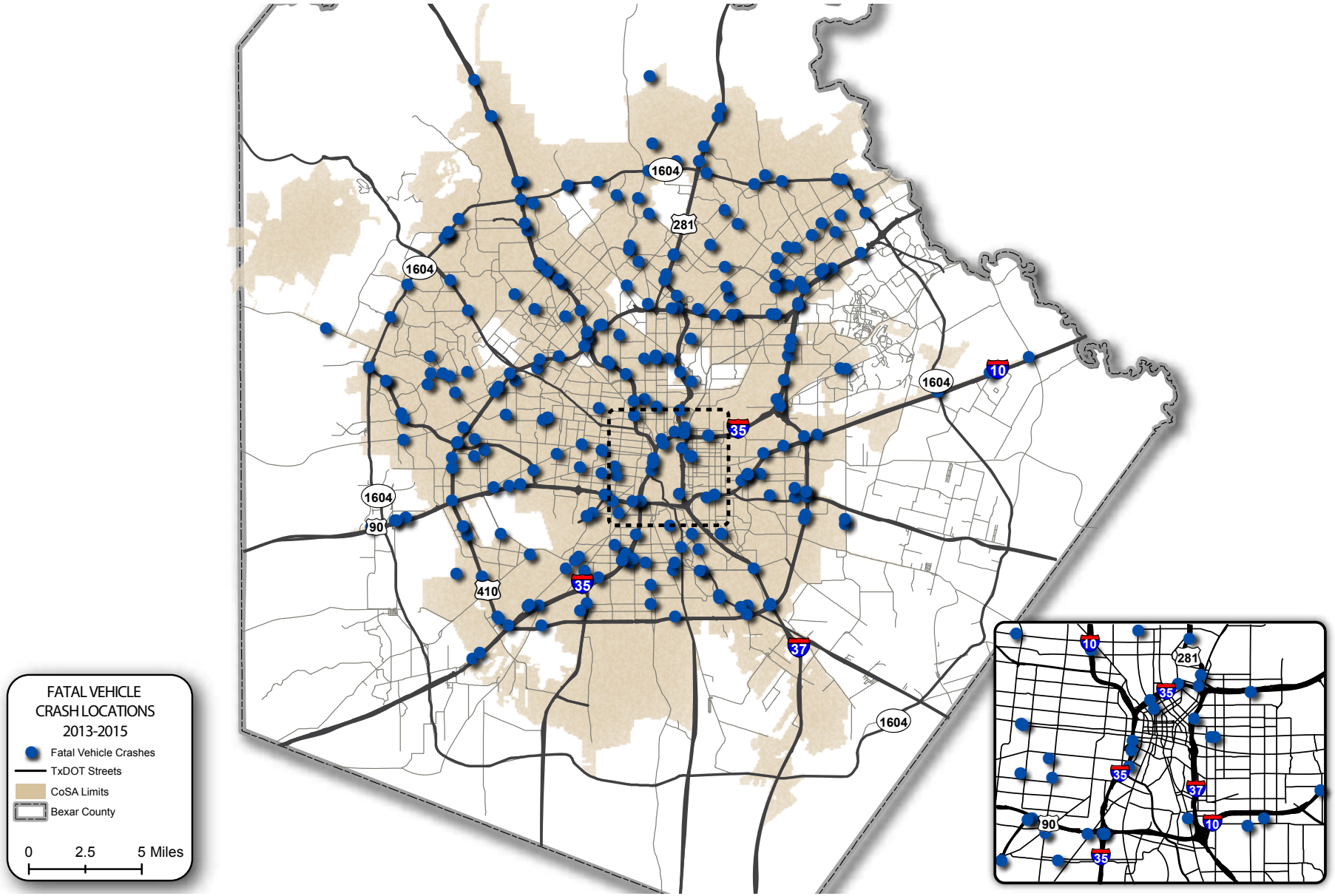


Figure 2: Fatal Vehicle Crash Locations

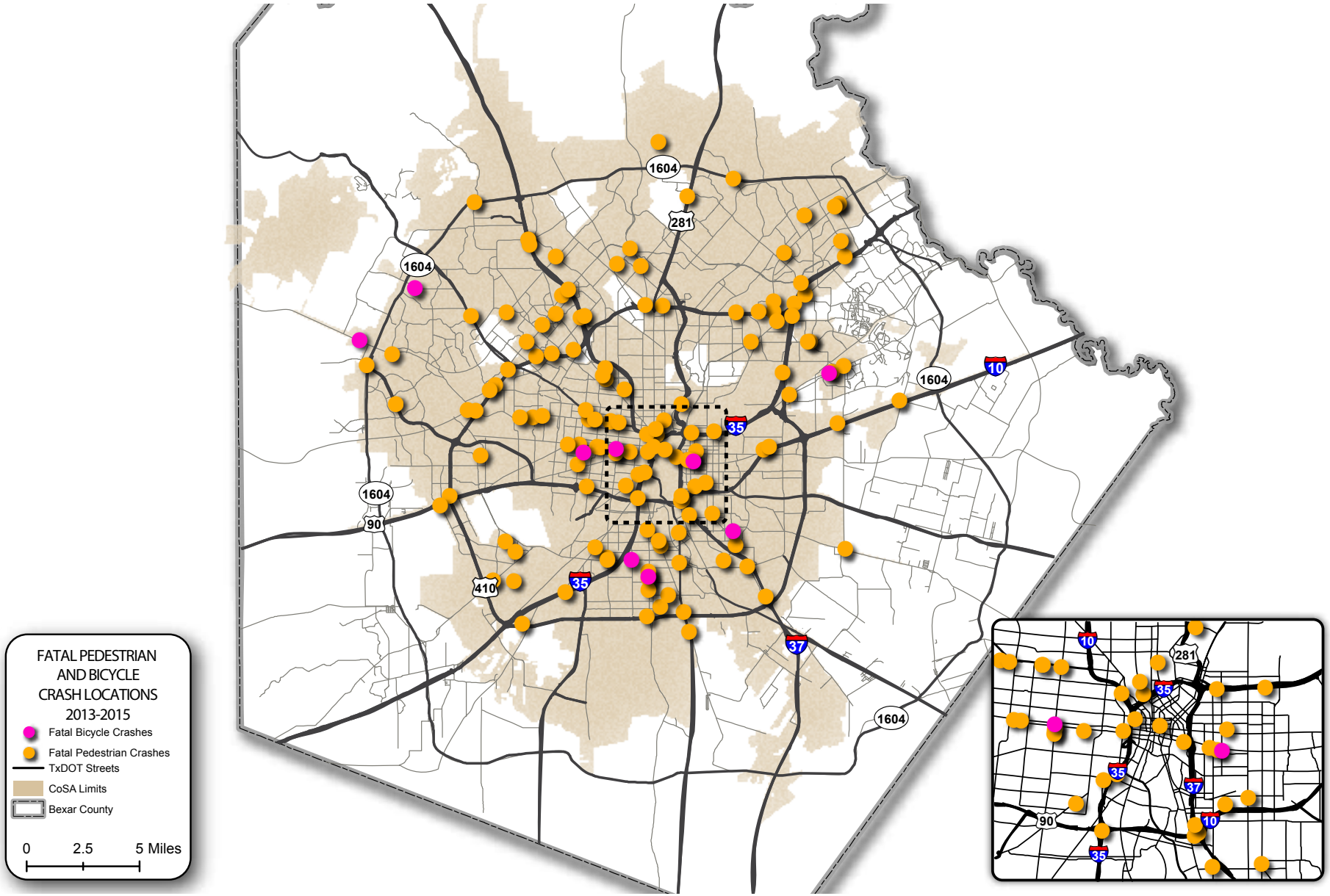


Figure 3: Fatal Pedestrian and Bicycle Crash Locations

As you can see from the Conflict Points graphic, a regular driveway opening or intersection has a substantially higher number of conflict points versus that with a median. San Antonio already utilizes medians in many areas of the City. The use of medians to control or prohibit left turn movements at selected driveways and intersections is an effective access management treatment to improve safety by reducing right-angle and left-turn vehicle crashes. These types of crashes are generally associated with the most severe types of injuries. Reducing conflict points at driveways and intersections also improves safety for pedestrians and bicyclists. Medians result in fewer vehicles turning into and out of driveways and intersections where pedestrians and cyclists cross. Medians also offer pedestrians a refuge allowing them to cross each direction of travel separately. Examples where medians have been implemented in San Antonio include Blanco Road, Culebra Road and Bulverde Road.

Congestion Issues (AAMPO)

The Alamo Area MPO developed a 2040 transportation model to forecast the operation of the future roadway network. One of the indicators generated by the model is level of service (LOS) by corridors. Corridors are rated on a scale of A to F, with A as an acceptable rating and F as failing. Based on the AAMPO 2040 Model, congestion is evident all over the region, but it will be most prevalent in the northwest portion of the City. There are areas where thoroughfares, as well as small sections of roadway combine to make a heavily congested area. Figure 4 represents the LOS rating for the regional thoroughfares. Daily LOS is based on the volume-to-capacity ratio (V/C). This is an indicator of how well the roadway accommodates the volume of traffic.

The highlighted roads in the map show where the volume meets or exceeds capacity. We can see from the map that in 2040, we will have many of our roadways and some of our intersections at or over capacity. The color of the roadways indicates the extent that a road is over capacity. Yellow, gold, orange and red roadways indicate that there is 2.5 to 5 times the level of volume as compared to the available capacity. The greatest clusters of these locations seem to be on the west side and to the far northeast, east and southeast sections outside the city. The west side has experienced extensive growth and development. The outer areas beyond the city limits do not have a built-up road network with sufficient connectivity and capacity to handle the increase in volumes due to growth.

San Pedro Avenue

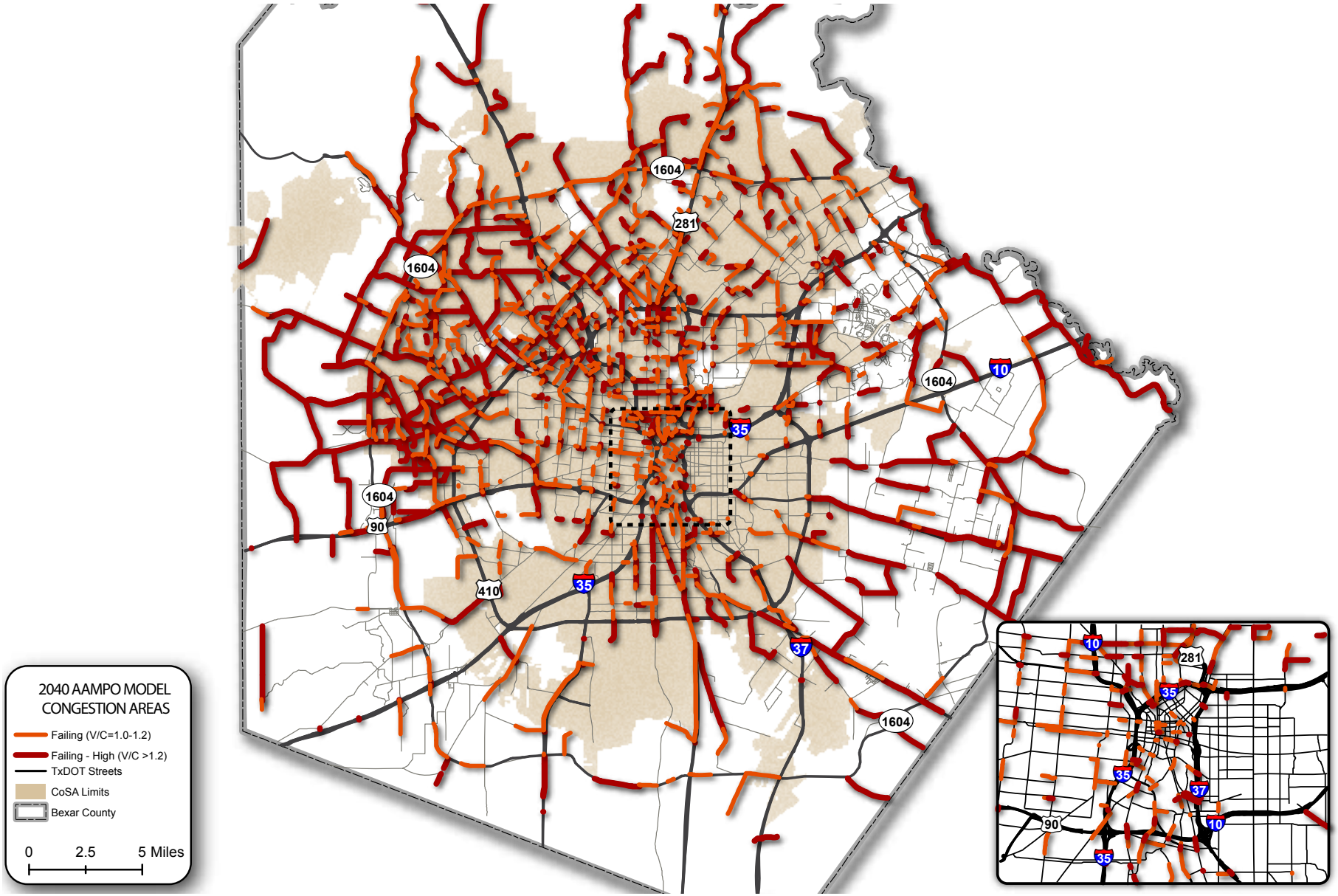


Figure 4: Congestion Map

COMPREHENSIVE PLAN

The Regional Activity Centers were identified as existing and emerging centers of high population and/or employment.

Regional Activity Centers

The regional activity centers referenced throughout this report were initially identified during the Alamo Area Metropolitan Planning Organizations (AAMPO) 2040 Metropolitan Transportation Plan. During subsequent planning and refining, the activity centers (See Figure 5) were used in the SA Tomorrow planning process. These centers for commercial, business, entertainment, and residential development are expected to entice residents and people moving into San Antonio to these areas. These major activity centers, such as the Texas A&M San Antonio Campus, or the Medical Center, were a factor in the scenario modeling process as well as the corridor evaluations for determining potential corridor improvements.

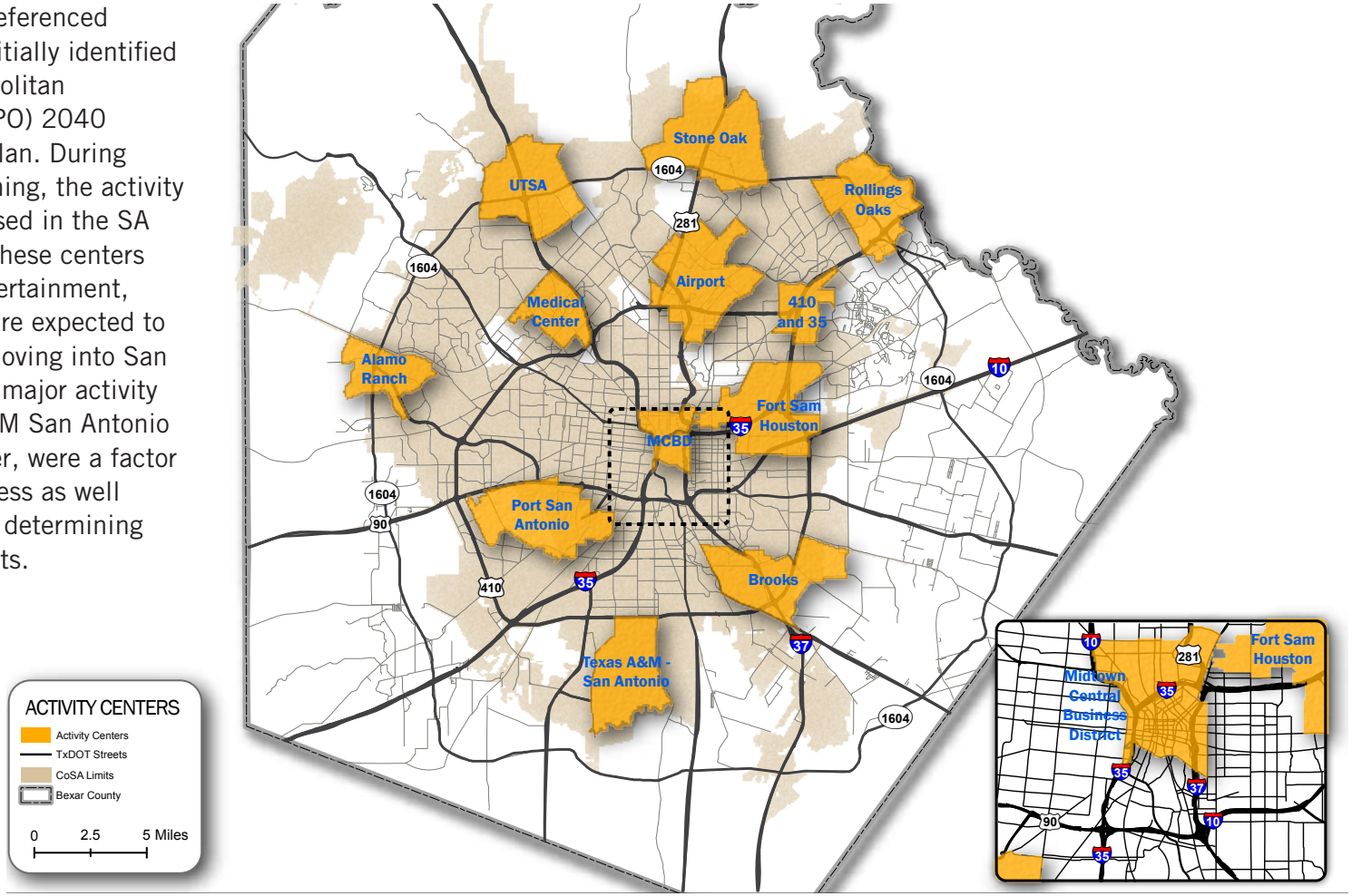


Figure 5: Regional Activity Centers

Multimodal Priority Areas

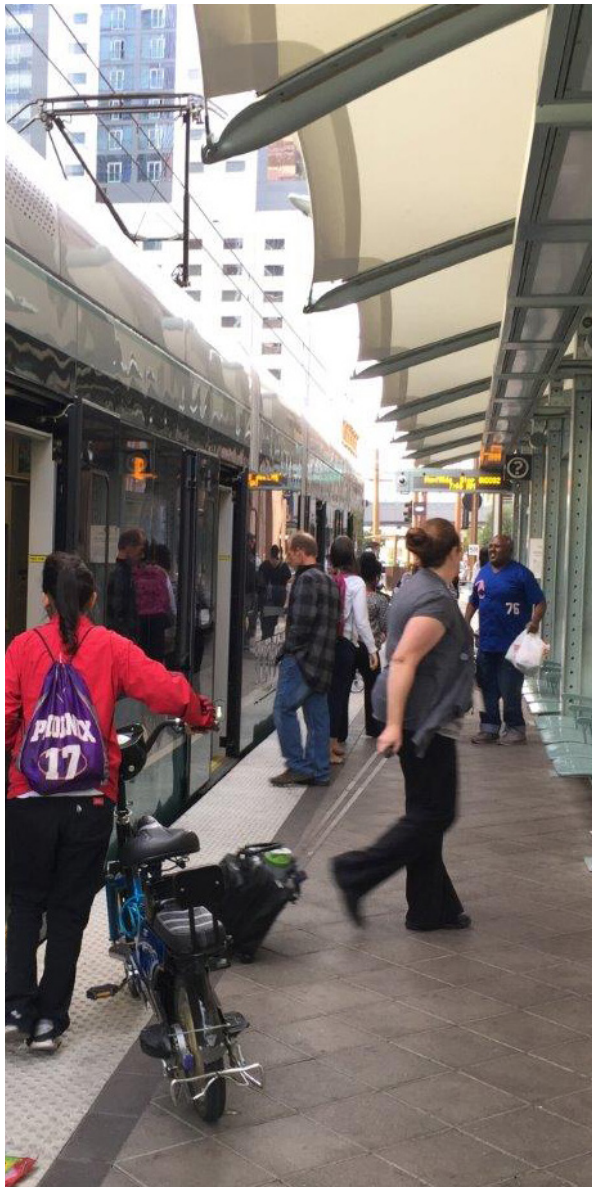
Each of these elements - safety, congestion, regional activity centers – individually have a large impact on the transportation network. The layering of these elements (which can be seen in Figure 6) visually displays areas where multiple modes of transportation intersect and interact, where facilities are planned or missing, and areas where enhancing safety is a concern. By combining these elements, the Project Team was able to identify corridors that should be given priority consideration for redevelopment.

5 Year Action Plan

- Promote pedestrian activity by prioritizing the completion of the pedestrian network that serves major activity centers, transit stops, etc.
- Prioritize the completion of the bikeway network that serves bicyclists' travel to employment centers, commercial districts, transit stations, institutions, and recreational destinations.
- Work with major employers and institutions to develop parking regulations and promote travel management measures such as carpooling and ride-share, flexible work hours and telecommuting, and subsidized transit passes.
- Encourage increased residential and employment densities along transit streets and major regional centers.
- Develop policies to encourage interregional and long trips through San Antonio to use alternative routes, especially during peak hours.
- Educate residents of San Antonio on Complete Streets and how they can benefit them to enhance and connect neighborhoods and Regional Centers.

MILITARY INSTALLATIONS

Where thoroughfares travel through military installations, the interaction of their regulations with through vehicle, pedestrian, and bicycle activity needs to be reviewed in detail. Military protocol may affect how/where transit activity is accommodated on base (similarly for other modes of transportation).



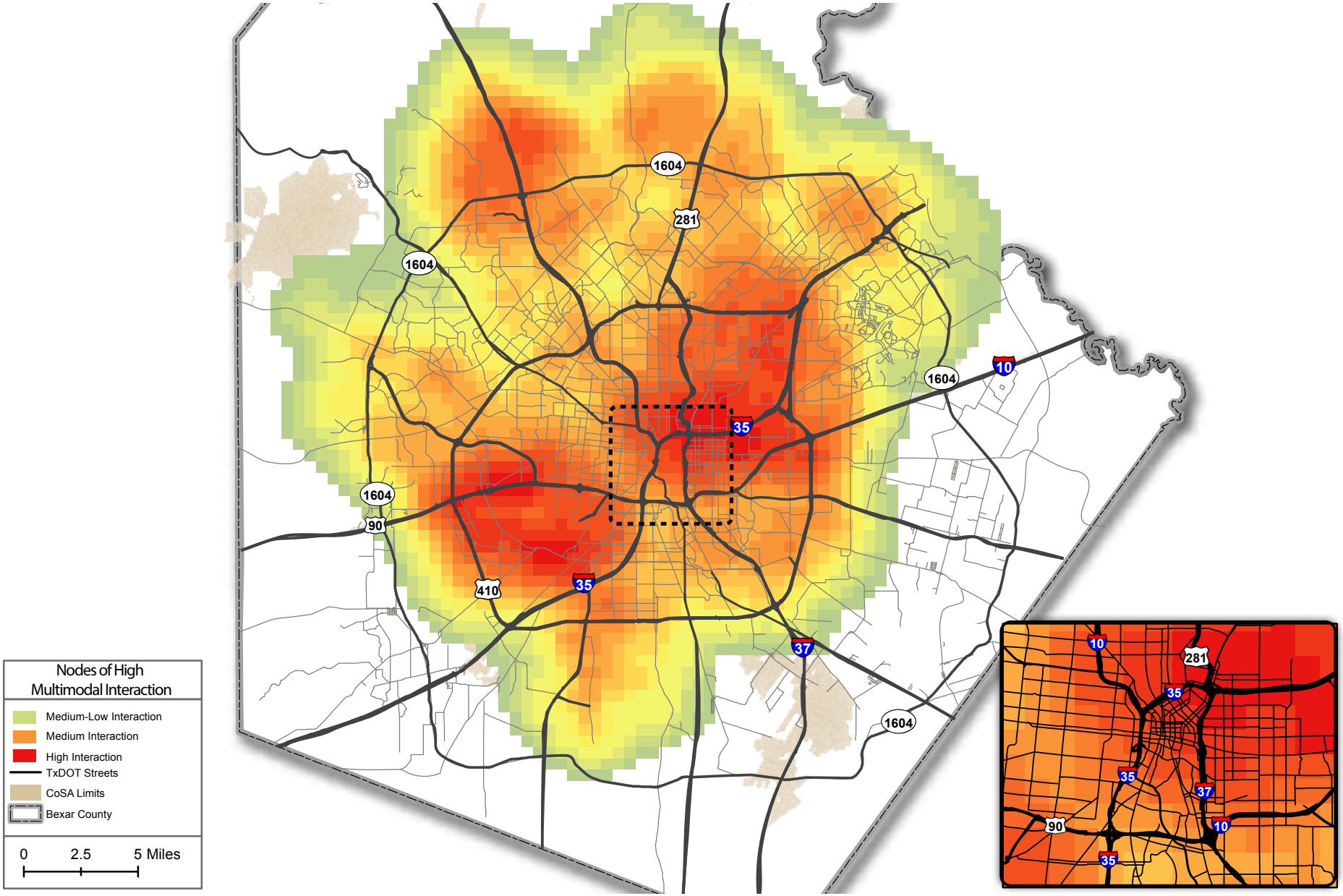


Figure 6: Nodes of High Multimodal Interaction

Parking

Parking in San Antonio follows the typical pattern of Texas - there's lots of it! In areas of newer development, most business/activity centers have ample parking spaces for everyday usage. The trade-off however is this: parking is not free. What does this mean?

When finding a parking space is easy and does not require a fee, people tend to feel less inclined to use alternative forms of transportation (like biking or transit). This cost of parking is the higher number of single-occupant vehicles on the road. Another way that parking indirectly costs the community is the physical space it occupies. Excessive parking lots, especially in dense areas, hinder businesses from creating a dense, walkable environment- thus opening up more economic activity.

> "...minimum parking requirements can increase development costs by more than 10 times the impact fees for all other public purposes combined. Eliminating minimum parking requirements would reduce the cost of urban development, improve urban design, reduce automobile dependency, and restrain urban sprawl (Shoup)".[1]

[1]Shoup, D. (1997). The High Cost of Free Parking. Journal of Planning Education and Research, 17(351), 3-20. Retrieved 2015, from http://www.uctc.net/research/papers/351.pdf

Considerations

Parking in an urban context versus suburban context provides two very different sets of challenges and opportunities. Parking policies need to consider many factors including, but not limited to: street design and context, interaction with other modes, availability for retail/commercial/offices, safety, demand, and available right-of-way.

In an urban context, available Right-of-way, and finding the balance between supply and demand is crucial. Too much parking leads to vast lots and is detrimental to creating a pedestrian friendly environment. Limited supply can also be a disincentive if the ability to get to urban areas by other modes is not convenient. Ways to improve parking in urban areas can include:

- Paid parking
- Parking garages
- Shared parking lots

In a suburban context, parking is usually more abundant, especially in the form of parking lots. In commercial centers, vast parking lots provide ease of parking, but also deter from use of alternative modes of transportation. Neighborhoods in suburban areas face different challenges and opportunities with on-street parking. The interactions between vehicles and residents here is different than any other context. Focusing on the safety and aesthetics elements of parking are of a higher priority in these areas.

Satellite parking locations or Park and Rides are also important parking factors, especially in conjunction with VIA Metropolitan. Utilizing spaces, such as under major interstate/freeway underpasses, can be a great way to use what would typically be 'wasted space'.

5 year Action Item:

- Develop policies for parking management that focus on improving air quality, reducing congestion, promoting alternatives to single-occupant vehicle trips.
- Maintain existing on-street parking in established neighborhoods and commercial districts, except where parking removal is necessary to accommodate alternatives to the automobile.
- Working with the community and businesses, consider policies to reduce or eliminate on- and off-street parking where there is existing or planned major connections in the transit, bicycle, and/or pedestrian networks.
- Focus on developing and implementing Smart City Technology and Applications

Major Thoroughfare Plan - "The Map"

The Major Thoroughfare Plan (MTP) is a guiding document typically supported with a map of thoroughfare alignments. The MTP document is a long range plan that identifies the location (alignment) and type (function) of roadway facilities that are needed to meet projected long term growth for the San Antonio area. The current San Antonio MTP was developed in 1978, with minor updates to the MTP Map (alignments) occurring relatively often.

This Major Thoroughfare Plan section will also discuss roadway cross sections and guidelines for when and how different facilities should be utilized. These cross sections are identified by the functional classification of the thoroughfares (Figure 7).

Evaluating the MTP

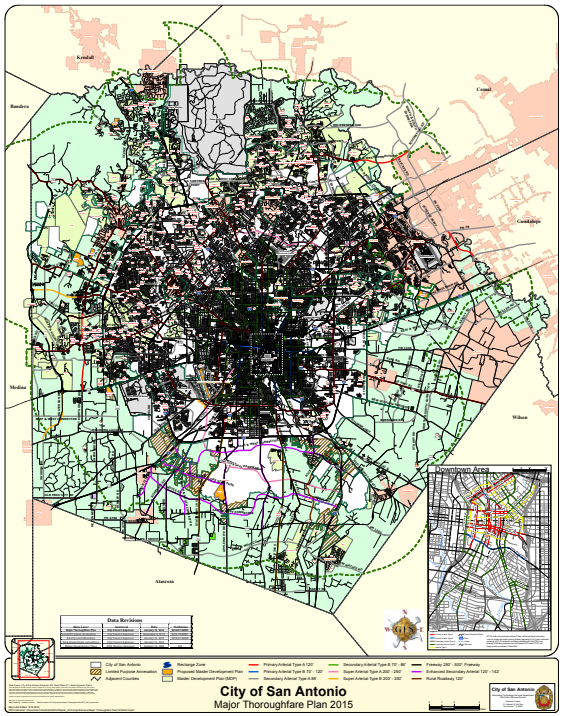
Constraints Analysis

The first step in analyzing the feasibility of the currently adopted MTP was an evaluation of the existing physical constraints. Northwest Bexar County's terrain is partially comprised of 'Texas Hill Country'. This area is characterized by steep slopes, karst features, and environmentally sensitive areas. Creeks and channels wind their way through the region creating obstacles for roadways and consequently the need for bridges or drainage culverts due to water crossings and floodplains. Development patterns show that growth is expected to continue in the northwest, even though this is the area with the most apparent physical constraints.

Man-made constraints were also studied during this review of the MTP. These constraints include such physical barriers as existing developments, railroad crossings, property boundaries, quarries, etc. Man-made constraints can also be challenging to overcome in the design process. Public opinion, political will-power, and costs are among some of the factors that drive down the feasibility of a project (Figure 8 [Constraints Map]).

Alignment Evaluation

Part of the MTP evaluation process included looking at existing alignments (what is already built) and comparing that to the current MTP. Due to platting changes and other factors, there were several locations found on the MTP Map that did not align to what was recently built. These differences were documented and integrated into the proposed MTP. Currently approved master planned developments were also mapped and proposed modifications were made.



City of San Antonio
Major Thoroughfare Plan 2015

(See Figure 9: Master Planned Development Example]

New roadway alignments and connectivity gaps on the current MTP were assessed. Potential changes were measured against the constraints, modeling results, and how they would factor into the overall network. From this analysis, the current recommendations for changes to the 2015 MTP Map were made.

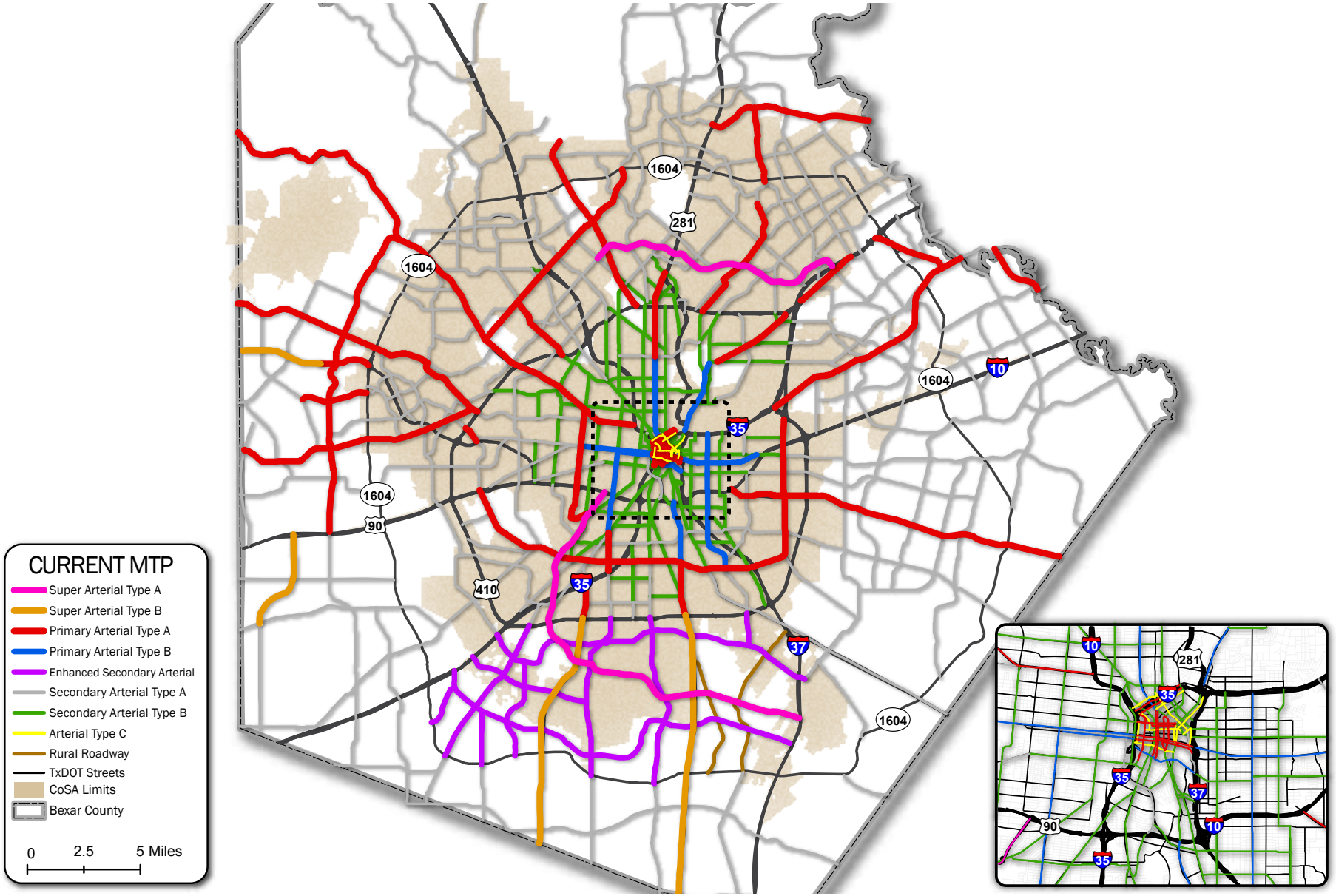


Figure 7: Current MTP

Figure 8: Constraints Map

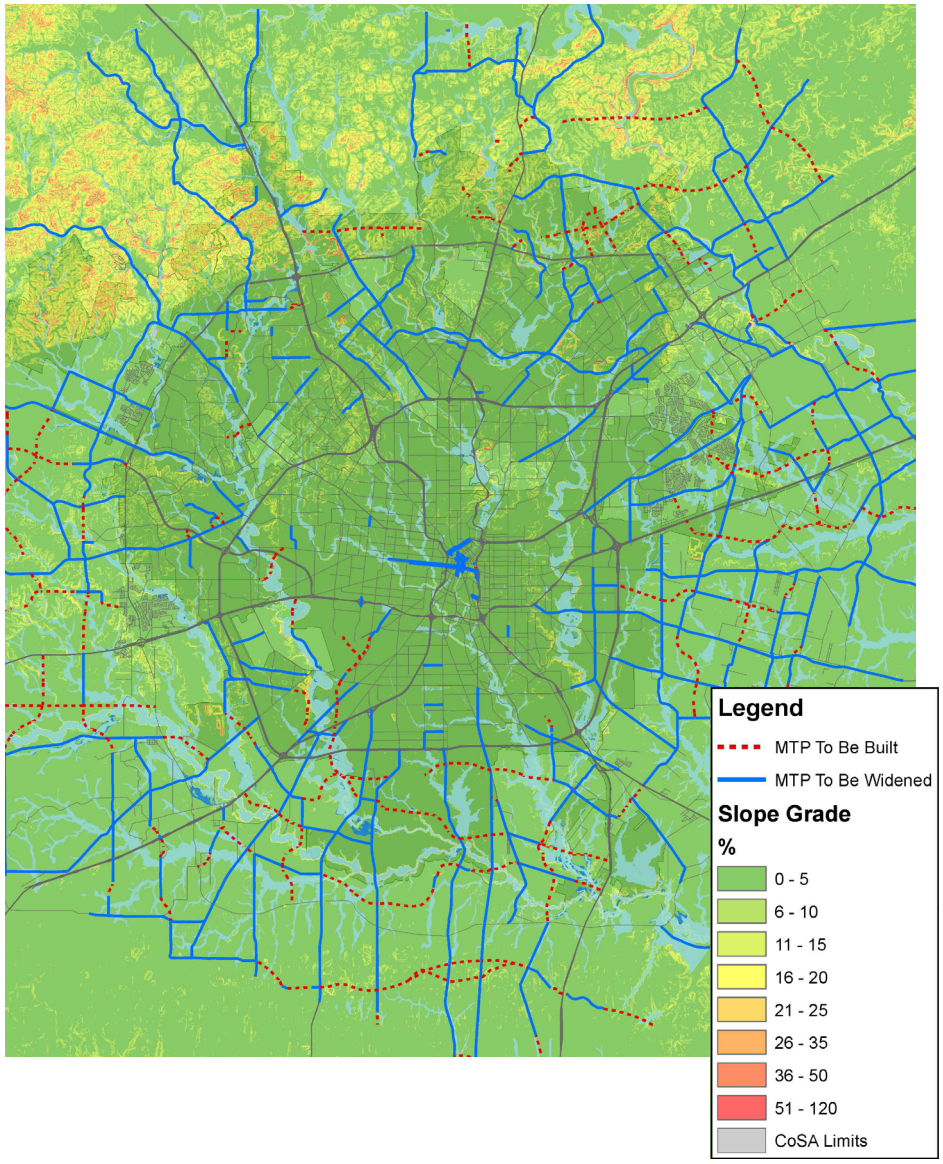
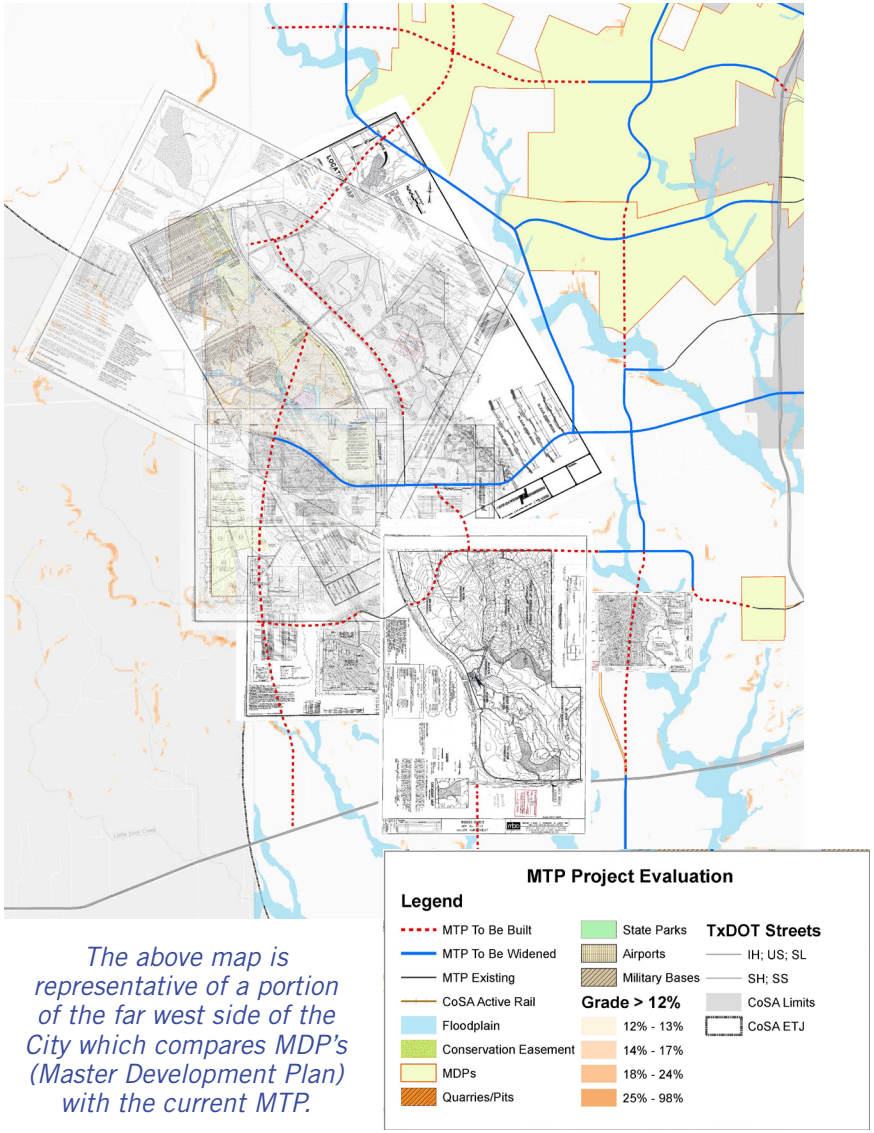
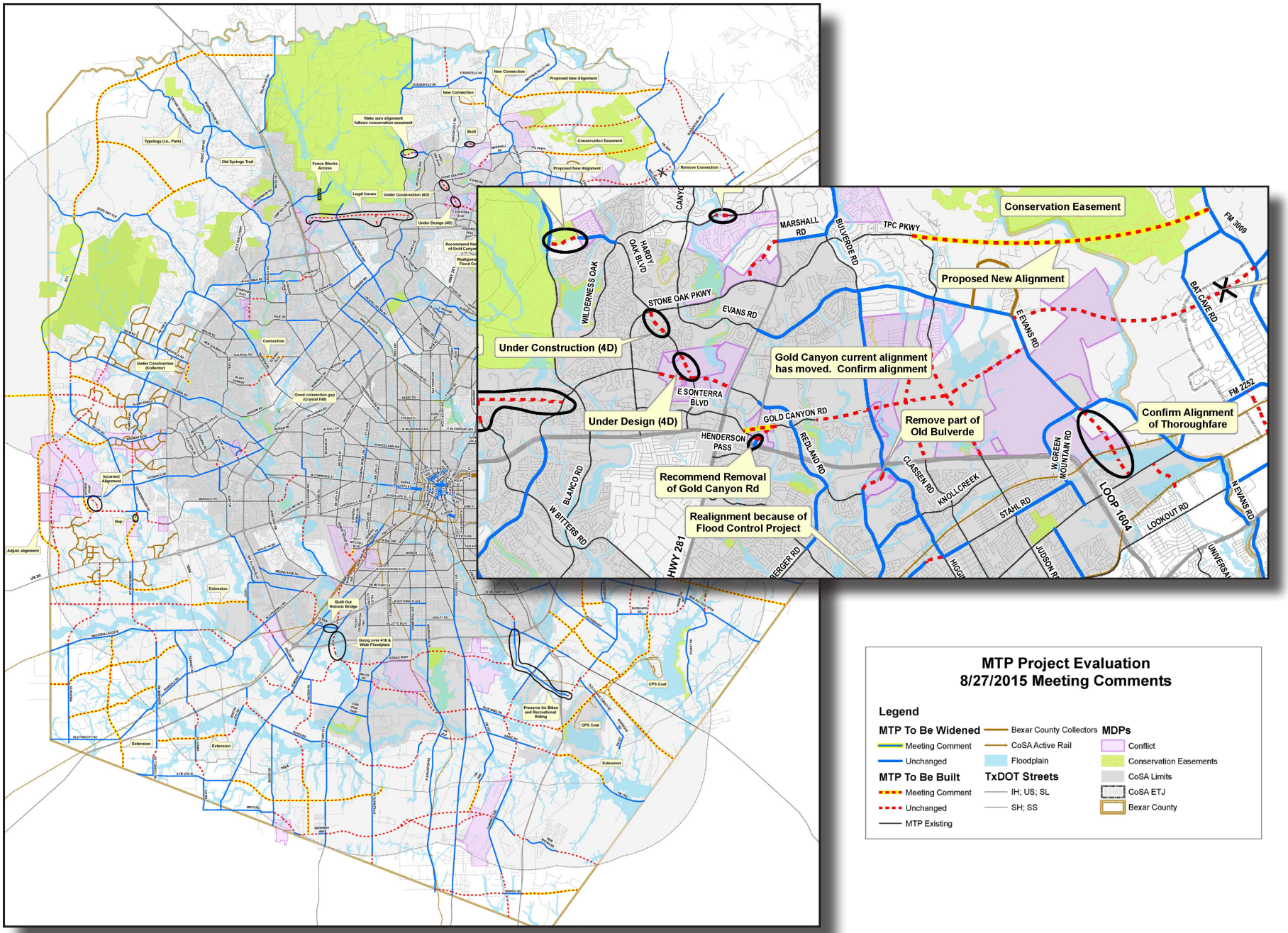


Figure 9: Master Planned Development Example



The above map is representative of a portion of the far west side of the City which compares MDP's (Master Development Plan) with the current MTP.

Figure 10: Stakeholder Comments Map



Functional Classification and Modeling Evaluation

As discussed in the Future Forecasts section of this document, three future transportation network scenarios were developed for the San Antonio region. These scenarios were modeled using the AAMPO's transportation demand model. The V/C ratio (volume-to-capacity) - produced as an output of the model - portrayed the forecasted levels of congestion for the network. Corridors with high levels of congestion were evaluated for capacity issues. Based on these findings, corridors were re-examined to see if they needed additional lane capacity, or in the case of low levels of congestion, if a reduction of lanes would be beneficial to the area.

Based on this evaluation, the functional classification system was reviewed. The existing functional classification is often unclear on the design of the facility that is recommended for a particular segment. Currently, San Antonio has eight major classifications for the region and an additional classification for the downtown area. To try and help minimize the confusion associated with the Major Thoroughfare Plan and associated cross sections, the design of the cross sections (set values for each realm) was evaluated and redesigned. A further review of the existing functional classification system is needed to identify if there are places where additional classifications (such as collectors) could help to supplement the gaps, or altering existing types, would benefit the entire system.

Note, the existing right-of-way ranges provided in the thoroughfare designations are in some instances, large and leave room for inconsistent roadway design. Developing a more regulated structure to the design standards will help identify a clear path to the City and developers. Later in this section, a detailed explanation of how the functional classifications were assigned specific attributes and cross sections will be described (Major Thoroughfare Plan – "Cross Sections and right-of-way").

Stakeholder Input

A technical committee, comprised of City staff from different departments and members of other local agencies that deal with the MTP and are most familiar with ongoing issues, was organized to review the modifications made to the MTP. This technical evaluation committee provided local knowledge and insight. Committee members understand the history of the network – political dynamics, neighborhood opinions, funding constraints, etc. (See Figure 10: Stakeholder Comments].

MTP Committee

The MTP Committee is a group comprised of individuals from City departments and regional transportation agencies. This Committee meets to review and evaluate proposed amendments (changes) to the Major Thoroughfare Plan. Their review takes into account a variety of factors including: feasibility, property boundaries/ changes, cost, historical importance, alternative alignment options, planned and proposed development, etc. They may then make a recommendation for the proposed amendment before it continues to a Planning Commission, Technical Advisory Committee, then ultimately before the City Council public hearing. The proposed new network thoroughfare changes developed as part of the SA Tomorrow process displayed in Figure 11 and Figure 12 highlight the recommended changes. The maps are displayed in two ways to allow comparison between: the adopted MTP (Figure 11); and the existing roadways (Figure 12). These changes should continue to be vetted by the MTP committee, before any changes are brought to the City Council for approval.

(See Figures 11 and 12: MTP Recommendations]

MTP Map Implementation Strategies (5 Year Action Plan)

- » MTP Update to be evaluated and recommended by MTP Committee with consideration of VIsion Zero
- » Approved updates carried forward and approved as amendments to the MTP
- » Establish/Revise policies for reviewing and recommending MTP changes
- » Amend the UDC to coincide with changes

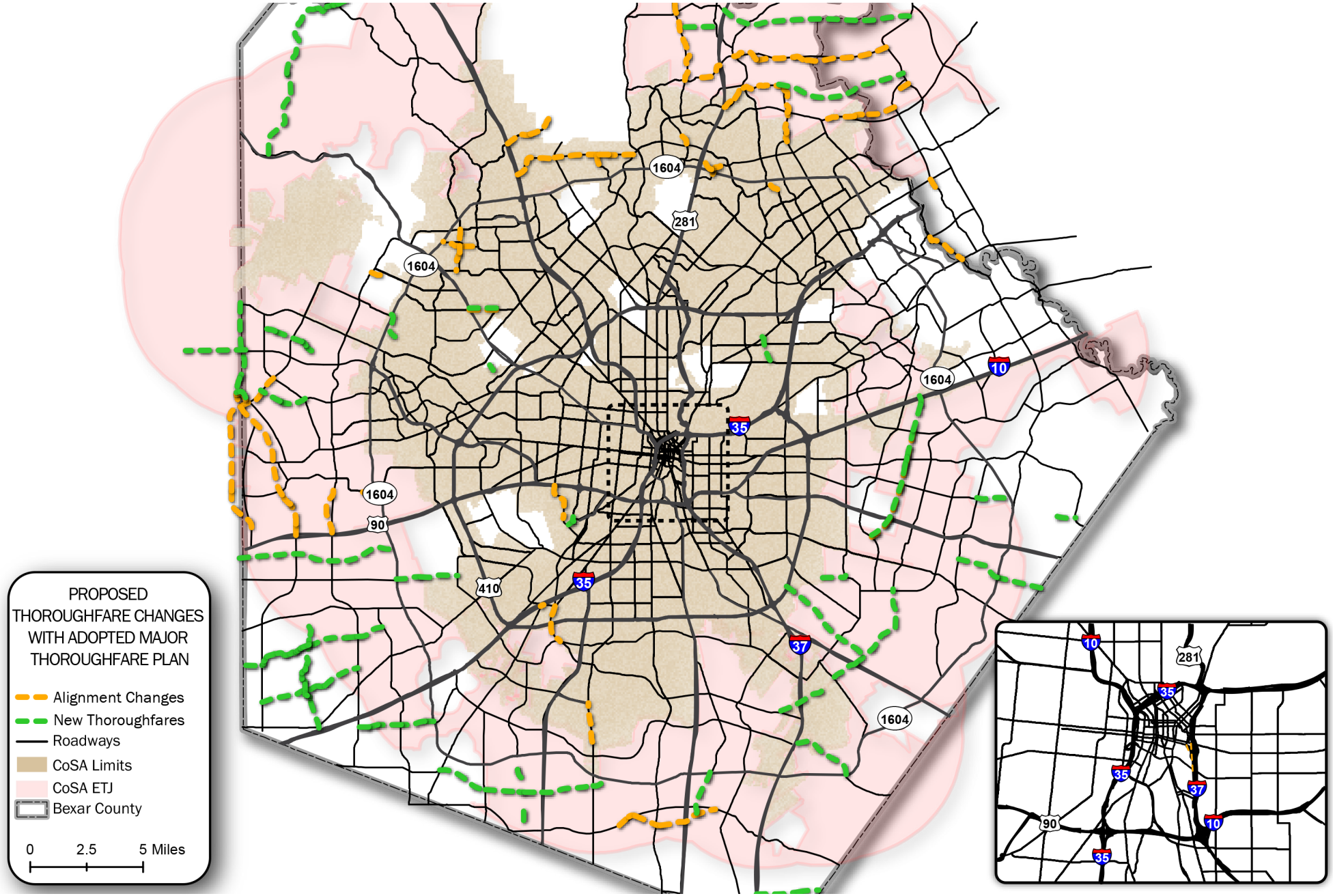


Figure 11: Proposed Changes with Adopted Major Thoroughfare Plan

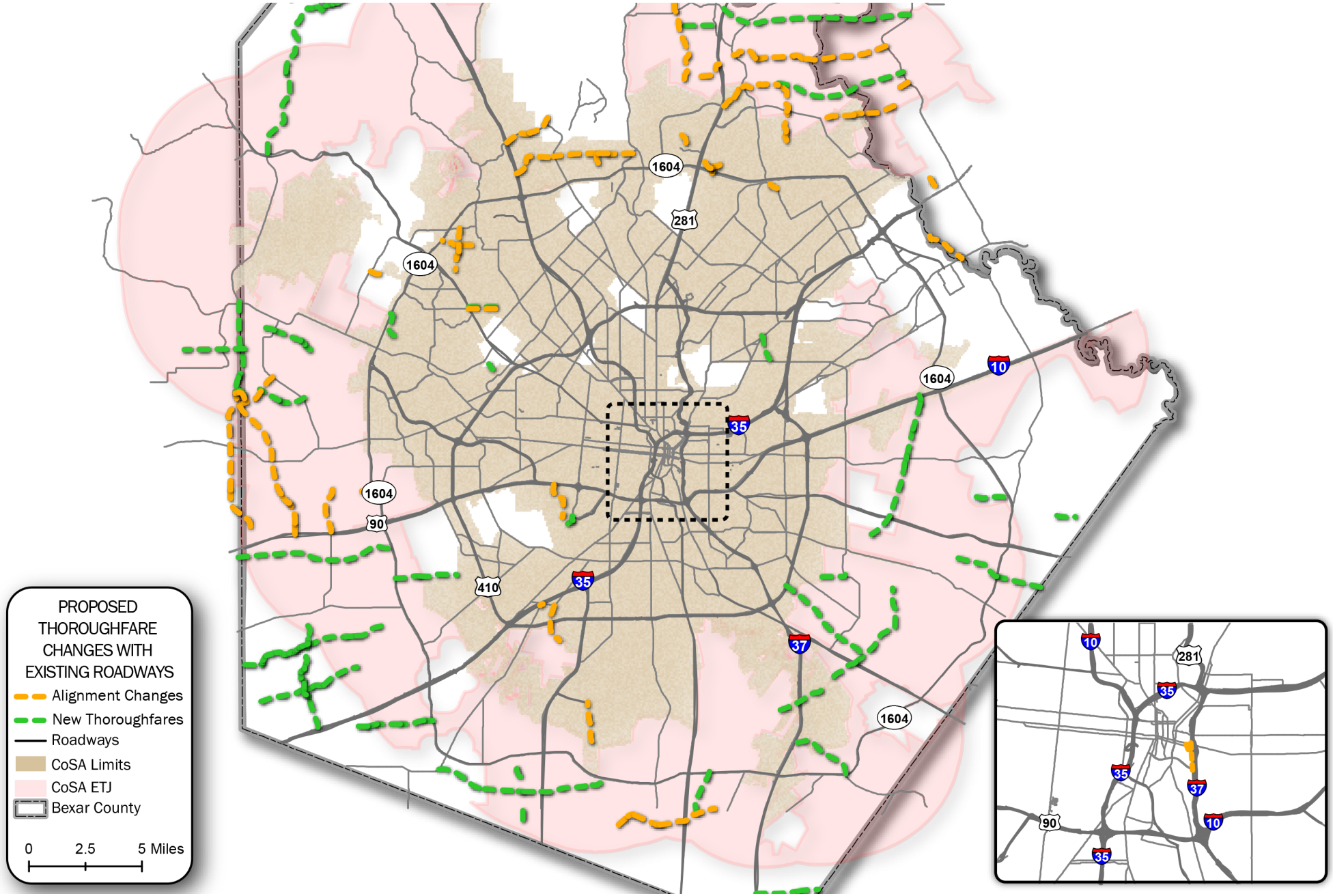


Figure 12: Proposed Changes with Existing Roadways

Major Thoroughfare Plan - "Cross Sections and Right-of-Way"

What is the Current Design Process?

San Antonio's current process for defining the look and feel of a corridor is based on several documents that guide cross section development:

1. 1978 Major Thoroughfare Plan (MTP) document; The MTP document is concise, detailing the functional classification system for San Antonio, right-of-way dimension and other requirements, an explanation of the Major Thoroughfare System, and the systems' two Objectives and Policies. The General Roadway Standards table does not include all roadway classifications that are on the current MTP Map, leading to a lack of consistency;
2. Unified Development Code; The Unified Development Code (UDC) is a guiding document for the City of San Antonio. This Code directs development in the region. The current UDC includes numerous charts, tables, and notes related to design criteria that make it difficult to understand the goals and objectives the City has for the design of transportation facilities. There is not a clear connection between the MTP, the Complete Streets Policy, and the UDC, which would be ideal for future progress and development; and
3. Complete Streets Policy. On September 9, 2011, San Antonio City Council adopted a resolution supporting a Complete Streets Policy to serve as a guiding document. The policy iterates the support for using Complete Streets as a guiding principle in the design, construction, operation, and maintenances of the region's roadway system to promote safe and convenient access for users of all modes of transportation.

The combination of these documents has led to the current cross sections and corresponding right-of-way requirements. Referencing these multiple documents can lead to confusion and result in discrepancy on specific roadways elements. Often times when there are discrepancies, arguments over which document supersedes occur.

What needs to change?

During the evaluation process, it was necessary to look at the current functional classifications standards. Upon examination of the existing guidelines, it is recommended that the design criteria be restructured to have more defined standards. Historically, a one-sized fits all for right-of-way has been applied across San Antonio regardless of the land use and roadway context. This has limited the City's ability to have enough right-of-way for new or improved facilities for people bicycling and walking. Four specific cross section design elements were reviewed.

1. Update cross sections from right-of-way to right-of-way instead of curb-to-curb;
2. Clearly identify the number of lanes;
3. Provide a connection between the cross sections and other transportation plans; and
4. Update right-of-way requirement.

In addition three (3) elements were identified that should be further reviewed:

1. Established priorities in constrained right-of-way;
2. Implement context sensitive roadway design policy and develop flexibility through established criteria options; and
3. Revision of current naming convention used for MTP (see recommendation in "The Map" section).

Think Right-of-Way to Right-of-Way

Cross sections can set the stage for how all modes of transportation and design elements are handled within the predetermined Rights-of-Way. Cross sections that relate to thoroughfare classifications are a medium for visually displaying the minimum and desired requirements for each realm of the thoroughfare (context, pedestrian, mode transition, travelway).

Current design options are limited in San Antonio due in part to the lack of design requirements. Without this, it is difficult for City employees and developers to know the different ways they can design streets to fit within the ROW while optimizing multimodal options that benefit the entire network.

Little consideration is currently given to areas beyond the travelway (curb-to-curb). Historically, road construction focuses on one question, "How many lanes?" and proceeds from there to design the roadway. However, cross sections/road design is instead encouraged to think "right-of-way to right-of-way". This means focus should be put into how the land use context plays into the design of the corridor. Road design should be thought of in "Realms". These Realms are Pedestrian, Mode Transition, and Travelway. (See 'Four Realms' Graphic below)

Identify Number of Lanes

The functional classifications in the 1978 MTP document includes a definition for number of lanes. However the additional functional classifications (as seen on the 2015 MTP map) and classifications/types listed in the UDC (Table 506-1) do not list a lane designation. This has historically led to developers using the lowest width of right-of-way listed (typically around 86') and using the majority of said right-of-way for curb-to-curb purposes. Another drawback of this process is that sidewalks are typically located at the back of the curb and constructed with the minimum width - lacking a buffer between the pedestrian and vehicular traffic. Developing a consistent association between number of lanes and classification is essential to moving forward.

Determining the number of lanes will also impact the multimodal aspect of the Major Thoroughfare Plan. The minimum number of lanes a thoroughfare classification requires will influence the other elements/modes of the corridor. Incorporating Multimodal aspects into the design of a thoroughfare works most efficient and effectively when it is premeditated as part of the standards. The influence of which modes are a priority is an important consideration. VIA's long range plans and the Bicycle Master Plan should also be consulted and incorporated as part of the multimodal design of corridors, where their existence will have direct impacts to ROW.

'Four Realms' Graphic

Connections to Other Transportation Framework Plans

The Complete Streets Policy for San Antonio was adopted by City Council in 2011. This policy strives to support complete streets by promoting healthy living and fitness, supporting pedestrian-oriented neighborhoods, enhancing commercial corridors and districts, and maximizing benefits of investment in capital projects. Providing cross section options that allow for multimodal uses further promotes the ability of the City to encourage the goals represented in the Complete Streets Policy.

The UDC is an important tool for influencing development in San Antonio. Applying the same cross-section standards from the MTP to the UDC would create a single design criteria for developers and the City to follow. This would result in more consistent cross section and a unified tool to help achieve the transportation goals established by SA Tomorrow. Amending the Unified Development Code (UDC) to have these cross sections approved by City Council is vital in creating consistency through the previously described plans.

A Deeper Look at Right-of-Way

Right-of-way is an essential and primary component of a Major Thoroughfare Plan (MTP). The right-of-way is the building block for which all other elements of the MTP. Right-Of-Way dictates the physical scale of a road and its ability to incorporate design features by detailing the amount of space available. San Antonio currently requires a lot less right-of-way dedication that many comparable Cities. However, in order to provide space for multimodal enhancements, more right-of-way is sometimes necessary.

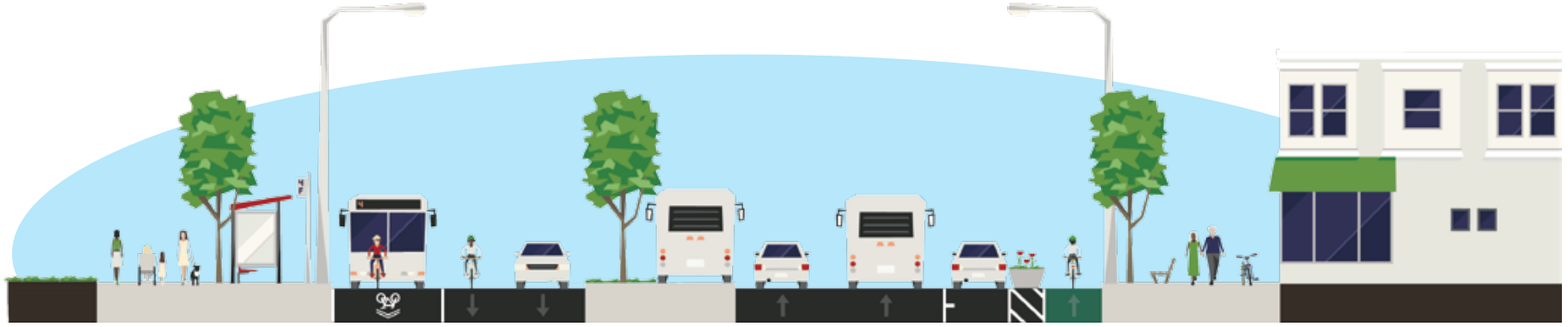
San Antonio currently faces dynamic issues in regards to right-of-way. Due to the age and historic nature of the City, many of the existing thoroughfares are constrained by limited right-of-way. Areas within Loop 410, especially in the downtown area, are characterized by buildings fronting the roads with little anticipation for gaining additional right-of-way with future redevelopment. These roadways would be considered constrained and would not obtain more right-of-way beyond their existing amount.

Areas of new development are facing a different issue. A lack of consistent design criteria and requirements by governing agencies has created inconsistent thoroughfare design. Wide ranges for thoroughfares designated by the MTP, and a typical push by developers to use the minimum standard, has led to inconsistent ROW. This poses the question of necessity/purpose of acquiring a consistent ROW throughout a thoroughfare based on a developed right-of-way Map. For example, Culebra, transitions from Primary Arterial Type A 120', to Secondary Arterial Type A 86', then back to a Primary Arterial Type A (120'). Even more inconsistent is that right-of-way within the Primary Arterial Type A section in some areas measures only 95', while in the Secondary Arterial Type A section it measures 70'. These roadways would be considered unconstrained and the City could obtain more right-of-way. This right-of-way should be specifically identified in the MTP. The City needs to create an inventory map that identifies constrained ROW (existing) and unconstrained ROW (desired).

Toolbox for Realms

Although consistency of cross sections is vital for an efficient network, achieving this is not always possible. This is especially true in communities such as San Antonio where, due to the age of the City, right-of-way availability is limited in older areas. This requires some flexibility in the cross sections. There is no standard 'one size fits all' approach. The adjoining toolbox shows the different attributes associated with each "Realm". As you can see, some attributes are found in more than one Realm. Page 6-25 and 6-26 provide guidance to develop an approach for updating cross sections associated with the MTP. This allows for some flexibility in right-of-way dedication requirements. (See REALMS ELEMENT TOOLBOX PAGE 6-26).

The corridor recommendations are consistent with NACTO and AASHTO standards which allow for 10 to 12-foot travel lanes as standard, but the wiidth allocated two lanes for moving vehicles, bikes, and parked vehicles is a sensitive and crucial aspect of street design. Lane widths should be considered within the assemblage of a given street delineating to serve all needs, including travel lanes, safety islands, bike lanes. Each lane width discussion should be informed by an understanding of the goals for traffic calming as well as making adequate space for larger vehilces, such as trucks and buses.

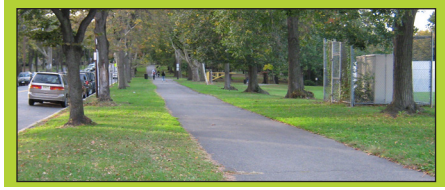


Context	Pedestrian Realm	Mode Transition Realm	Travelway Realm	Mode Transition Realm	Pedestrian Realm	Context Realm
Business/Commercial Residential Industrial Government Public etc.	Stoop Area Yards Building Setbacks Walkways Trees Sidewalk Furniture Driveways Sidewalk Sidepath	Door Zone Walkways Trees Sidewalk Furniture Driveways Curbs Bicycle /Protected Bicycle Lanes Parking Turn Lanes Bus Stops Bulb Outs	Travel Lanes Bus Lanes Bicycle Lanes Center Turn Lane Median Landscaping Pedestrian Refuges Bus Rapid Transit	Door Zone Walkways Trees Sidewalk Furniture Driveways Curbs Bicycle /Protected Bicycle Lanes Parking Turn Lanes Bus Stops Bulb Outs	Stoop Area Yards Building Setbacks Walkways Trees Sidewalk Furniture Driveways	Business/Commercial Residential Industrial Government Public etc.

REALM ELEMENTS TOOLBOX

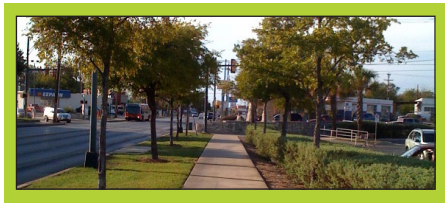
PEDESTRIAN REALM

Sidewalks are recommended to be 5' on a collector with a minimum 3' buffer and 6' on an arterial with a minimum 2' buffer from the street.



A **sidepath** is wider than a sidewalk and recommended to be 10', but could be a minimum of 8' in a constrained environment.

Providing comfortable and aesthetically pleasing **sidewalk furniture** is a way to encourage pedestrians to use and feel safe in the Pedestrian Realm.



Trees provide shading which is crucial to a friendly pedestrian realm, especially during hot Texas summers.

MODE TRANSITION REALM - PEDESTRIAN

The **walkway** will provide an extra buffer between the travelway and pedestrian realm.

Bulb Outs are used to shorten the distance pedestrians must cross at an intersection, among other uses.

The **curb zone** acts as a buffer, similar to a "door swing". It provides additional right-of-way for the interaction of different modes and users.

Bus Stops in this realm should provide a well-marked and safely lit area for transit users. Where able they should also provide shelter.

MODE TRANSITION REALM - TRAVELWAY

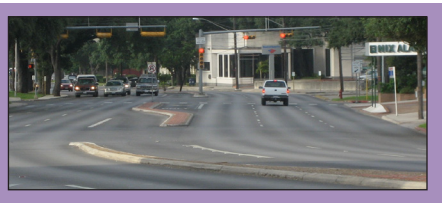
On-street **parking** should provide enough space for "door swing" meaning that the interaction of a parked car does not interfere with other users.

Bicycle/Protected bicycle lanes are on-street facilities that provide a dedicated space for cyclists. They are separated from vehicular traffic by some means.

Turn lanes provide a place for traffic to queue while reducing backup in moving traffic lanes.

Bus only lanes are a dedicated portion of the travelway for Transit. Due to the regular interaction with transit riders, it is regarded as a part of the transitional realm.

TRAVELWAY REALM



Travel Lanes are the primary component of a corridor. Their design should be in harmony with the adjacent land use and preferred modes.

A **median** acts as an access management device, traffic calming, and an aesthetically pleasing element of the travelway.

A **pedestrian refuge** is an area at the center of a roadway which provides a safe place for pedestrians to wait when crossing major or busy corridors.

Bus Rapid Transit does not have as many stops as typical bus service. It's primary purposes is for shorter travel times and has less interaction with the transition realm.

Further Review

Constrained Right-of-Way - Establish Priorities

Many of San Antonio's right-of-ways have been established for over fifty years. Due to this historic right-of-way, challenges are present through constrained available land. Previous MTP updates (where the priority was only the number of lanes) did not take this into consideration, applying functional classifications based only on vehicular capacity needs.

A method that determines what mode is the priority for the corridor is needed. It is important that adequate space is provided to supply the needs of the priority mode. Working within each realm to fully utilize space can help capitalize on the existing roadway. **The City needs to establish a policy for determining what additional mode to the automobile is a priority on a particular roadway.** One tool that is currently available is the City's Complete Street Checklist. This automated spreadsheet helps determine what user should be given priority and what is possible within the available right-of-way in terms of implementing a Complete Street.

An example of the uses found within each Realm is displayed in the Realm Toolbox. Understanding what attributes are associated with each Realm changes the way the roadway is viewed and can improve understanding of how to create more effective and efficient spaces.

Right-of-Way Analysis

San Antonio currently does not have a data set for the existing right-of-way of all the roadways it maintains. Due to the varying right-of-way along corridors, this becomes a particular challenge when trying to identify consistent cross-section options.

If San Antonio is unable to gather this data manually, there is potential for a GIS application to provide a reliable estimate of the right-of-way at 10 foot intervals along corridors. The GIS tool estimates right-of-way width use parcel boundaries (measuring from property line to property line). Not all corridors are good candidates for using this type of GIS application, but it would help San Antonio create an initial database to expand and improve upon.

Implement Context Sensitive Solution Policies

Context Sensitive Solutions are a method of evaluating streets to determine their priority needs based on their context. San Antonio will need to use this type of approach when evaluating which cross-section should be applied to roadways, both new and existing thoroughfares. The recommended process to evaluate the corridor:

- Determine thoroughfare classification and available ROW;
- Identify any agency plans related to the corridor (transit, bike, etc.);
- Identify the land-use context prominent along the corridor;
- Look at traffic counts along the corridor;
- Based on ROW, determine what modes can be accommodated on the corridor; and
- Identify the priority of the user(s) along the roadway by reviewing current demand and future potential of the roadway.

Collectors and Inner Cities:

Like other major metropolitan areas, San Antonio has several enclave cities it surrounds including Alamo Heights, Terrell Hills, Olmos Park, Hollywood Park, Hill Country Village, Castle Hills, Windcrest, Kirby, Balcones Heights, and Shavano Park. These independent Cities are not directly controlled by the City of San Antonio. Coordination with these communities when developing and implementing planned thoroughfares is necessary for smooth transitions of roadways.

Also, there are areas in the current MTP which appear to have “gaps” or missing connections (which would typically be collectors). For example there are gaps in the areas adjacent to US Highway 281 area in between downtown and Alamo Heights. Streets like St Mary’s, Josephine, Mulberry look and act as collectors but are not designated as such on the MTP. This is an issue throughout the City. Many roadways designated as arterials on the MTP are really functioning as collectors.

5 Year Action Plan

- The Current MTP needs to be reviewed by the MTP Committee in light of the recommendations provided in this Multimodal Plan with consideration to Vision Zero
- For future changes to the MTP, the MTP Committee needs to complete a thorough evaluation before allowing an alignment to be up- or downgraded, or removed from the MTP. Overall Connectivity and function of the corridor should be considered as part of the evaluation process
- Based on Right-of-Way, determine what modes can be accomodated on the corridor
- Identify the priority of the user(s) along the roadway by reviewing current demand and future potential of the roadway

Innovative Ideas & Technologies

THE STATE OF AUTONOMOUS VEHICLES

The state of autonomous vehicle technology seems likely to advance with or without legislative and agency actions at the federal level. However, the manner in which autonomous vehicle technologies progress and will eventually be implemented depends heavily on these efforts. Intelligent planning, meaningful vision, and regulatory action and reform are required.

- "Preparing a Nation for Autonomous Vehicles: Opportunities, Barriers, and Policy Recommendations," Eno Center for Transportation

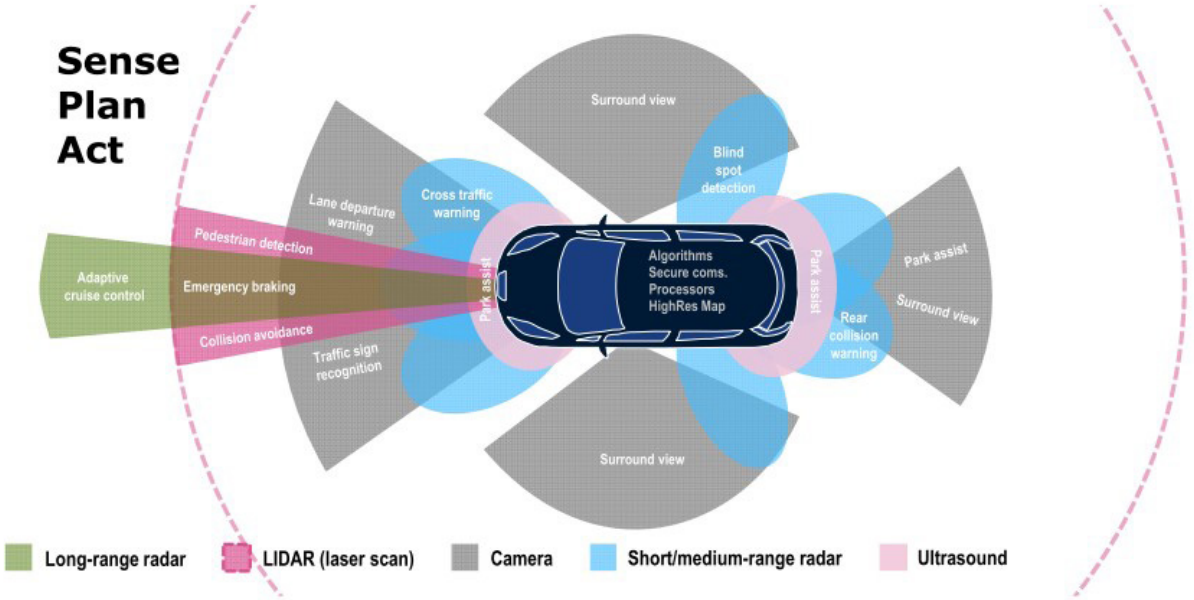
Autonomous Vehicles

Automated and connected vehicles have the potential to change all aspects of mobility – from driver safety and insurance liability to car ownership and how Americans commute. It has the potential to disrupt both public and private transportation as we know it. As Google, Uber, the automobile industry, and other organizations continue to make rapid technological advances, it is vital that the City of San Antonio (along with its federal, state, and local government partners) establish policies, laws and regulations that account for these disruptions. Of utmost importance for the City is finding a balance between guarding public safety while still leveraging the many positive mobility impacts that automated and connected vehicles can provide.

Definitions

Fully automated cars, also referred to as driverless cars, autonomous vehicles (AV) or self-driving cars, are capable of sensing their environment and navigating roads without human input. They rely on technologies like GPS, LIDAR, and radar to read their surroundings and make intelligent decisions about the car's direction and speed. Both the National Highway Traffic Safety Administration (NHTSA) and SAE International have defined levels of vehicle automation, ranging from driver assistance for a single vehicle function, to full automation with no driver required.

Connected vehicle (CV) technology is being developed concurrently. Connected vehicle applications provide connectivity:(1) among



Source: http://www.internationaltransportforum.org/Pub/pdf/15CPB_AutonomousDriving.pdf

vehicles to enable crash prevention, (2) between vehicles and the infrastructure to enable safety, mobility and environmental benefits, and (3) among vehicles, infrastructure, and wireless devices to provide continuous real-time connectivity to all system users.[1] Examples of connected vehicle technologies can be found on the US Department of Transportation's website.

The relationship between connected and automated vehicles is still yet to be determined. Most driverless cars under development today use technology that exists solely within the car, along with satellite positioning systems; this technology can read standard traffic signs, identify bicyclists' hand signals, sense pedestrians, etc. Connected vehicles, on the other hand, rely on two-way communications (e.g., traffic signals communicating with cars). Connected vehicles could be driverless, but that is not a necessity. Driverless cars may have connected vehicle features, but that's not a necessity.

Connected and Automated Vehicle Timeline

Google, Uber, every major auto maker, and other organizations are investing significantly in the advancement of automated technology (some focused on full automation while others are introducing it incrementally). The United States Department of Transportation (US DOT) has invested in connected vehicle pilots around the country and they are investing in research for both connected and automated vehicles. Many research institutions are partnering with automakers to provide research support and testing sites, among other things.

Industry experts and stakeholders have wide-varying opinions on when driverless and connected vehicles will be available. Automakers and technology developers estimate that driverless vehicle technology will be publicly-available in the 2018-2020 timeframe; however, there are other factors that will influence the driverless vehicle timeline, including consumer acceptance and adoption, government regulation, privacy and security regulations, and insurance industry adjustments. Anthony Foxx, US DOT Secretary of Transportation, stated "I am very optimistic that we will see [driverless cars] everywhere in the world in ten years ."[2]

Because the greatest benefits of connected vehicle technologies can only be achieved with broad fleet penetration and an interoperable system across all manufacturers, regulatory action is required. NHTSA announced in early 2016 that a draft Notice of Proposed Rulemaking (NPRM) requiring vehicle-to-vehicle (V2V) technologies to be installed in all new light vehicles has been sent to the White House for approval, and the proposed rule is anticipated to be circulated for public comment in the second quarter of 2016. This process is anticipated to result in V2V technology deployed in all new production vehicles as early as the 2018 model year. However, various industry estimates indicate a nearly 15-year cycle to turn over the majority of the nation's vehicle fleet. Given this long timeline, it's likely that aftermarket systems will play a role in accelerating deployment

NATIONAL POLICIES RELATED TO AUTONOMOUS VEHICLES

"On February 4 [2016], driverless cars took one step closer to becoming mainstream when the National Highway Transportation Safety Administration stated that computers could be considered legal drivers of vehicles.

With both technology companies and automakers busy developing driverless cars, it falls to state and national policymakers to draft a set of regulations that pave the way.

The money and effort being put into developing the technology, both in industry and now in government, makes near-term arrival increasingly likely. Policymakers and consumers should start preparing for a world with much fewer human drivers."

- "Driverless cars could arrive sooner than you think", J. Karsten, D.M. West, Brookings Institute Tech Tank

[1] http://www.its.dot.gov/connected_vehicle/connected_vehicles_FAQs.htm, January 21, 2016

[2] http://www.faz.net/aktuell/wirtschaft/unternehmen/verkehrsminister-foxx-selbstfahrende-autos-in-10-jahren-standard-13811022.html, January 21, 2016

SUSTAINABILITY PLAN

A desired outcome of the SA Tomorrow Sustainability Plan is for San Antonio to have new development that is affordable, mixed-use, transit oriented and is designed for walking, biking, and electric vehicle infrastructure.

The Sustainability Plan also encourages San Antonio to lead by example by: Providing incentives to CoSA employees who commute to work using clean sources and introducing a "Green" city fleet of vehicles and habits to reduce fuel use.

once sufficient equipped vehicles are present in the fleet to obtain benefits from the system.

While the relationship and potential confluence of connected and driverless vehicle development remains unclear, it is clear today that the evolution of both of these technologies will continue in parallel for some time. Some industry experts see connected vehicles as an important evolutionary step towards a driverless car society, some see connected vehicles as the end goal, while others believe driverless cars can be developed and fully integrated into society without any connected vehicle features.

CV/AV Impacts

The potential impact of autonomous vehicles on society is vast, with both positive and negative implications. Generally, public safety is the largest positive impact cited – with the potential elimination of 90 percent of automobile accidents that are caused by human error.[3] Other potential positive impacts include: greater roadway efficiency, more efficient land use, reduced parking requirements, and improved mobility for the elderly, disabled, and youth. Potential negative impacts include: increased vehicle miles travelled (VMT) (which could increase road congestion and travel times), increased urban sprawl, and job loss in certain sectors.

Planning Considerations for the City of San Antonio

Automated and connected vehicles have the potential to impact the City of San Antonio in a number of ways: traffic congestion and tax revenues may increase or decrease, VIA may need to be adapted, parking needs may decrease, and roadway infrastructure may need to be adapted (to name a few). The City of San Antonio needs to plan for these many changes and the ideal starting place is to incorporate CV/AV into the City's goals, especially if they can be aligned with a Vision Zero initiative, greenhouse gas reduction goal, transit cost-effectiveness goal, enhanced freight mobility, etc.

3 http://deepblue.lib.umich.edu/handle/2027.42/64993, Tri-Level Study of the Causes of Traffic Accidents, May 20, 2015

It is vital that the City of San Antonio stay informed about the state of this constantly-evolving industry. City staff should follow driverless vehicle developments – both in technology advancement and national policy development, in the United States and internationally. While many aspects of the technology are being developed confidentially, there is plenty of publicly-available information to learn from.

The following planning considerations are organized in the following categories: mobility, infrastructure, transit, and revenue.

Mobility. There are many factors that will influence the level of congestion within and around our cities. For example:

- People may continue to own their vehicles and mostly travel alone, or the shared economy model (e.g., Uber business model) may become more prevalent;
- More people may travel due to increased mobility options for elderly, disabled, and youth populations;
- People may be willing to live farther from the jobs (i.e., increased urban sprawl); and
- Cars will likely have shorter headways, roads may have more capacity, and parking circulation may be reduced

The City of San Antonio should consider the following planning and policy activities to manage the impact of CV/AV on the city:

Automated capabilities for personal automobiles and transit vehicles are being rapidly introduced into the current fleet.

- Update the City's travel demand model. The City's travel demand models should ideally reflect updated information regarding who is traveling (e.g., elderly and disabled may travel more due to AVs), where people are living and working, how many trips they are taking, people's value of time while traveling, what level of shared rides are occurring, and the vehicle ownership model. It should also capture any changes associated with freight delivery. This update needs to be on the City's horizon as the industry matures its approach to forecasting this new future
- Encourage open data sharing. While it is important to preserve people's privacy, open, anonymized data can improve the City's decision-making and help to develop more informed policies and plans.
- Introduce polices that can influence how driverless vehicles can affect VMT, urban sprawl, and/or parking requirements. Examples include tolls for single-occupancy vehicles, new HOV/HOT lanes, create and enforce urban growth boundaries, reduce (or even subsidize) costs and parking fees for shared ride services, and explore parking requirements in zoning laws and encourage more pick-up/drop-off locations at developments

Infrastructure. Depending on the evolution of autonomous and connected vehicles, local infrastructure will need to keep pace. Specifically, local governments may need to update and reconfigure signage, speed limits, signal timing, roadways and parking spaces. Most forecasts and studies assume that vehicles of the future will utilize electric-powered vehicles. This technology is still evolving; however, it is likely that public infrastructure, including parking spaces and pick-up/drop-off locations could better support mobility by providing electric charging stations.

While the exact role of connected vehicle roadside infrastructure remains uncertain, there are a number of foundational things the City of San Antonio can do to prepare for connected vehicle opportunities in the near-term. For transportation agencies, the advent of connected and automated vehicles will mean a shift in organizational focus towards data and technology to a greater degree than today. A system will ultimately be needed to collect data gathered over CV systems, and to broadcast infrastructure-based messages (such as signal timing, or work zone information, or road weather warnings) to vehicles by multiple means. Message standards and system architectures are rapidly maturing to the point where forward-leaning agencies can begin deploying such systems in the near-term to prepare for the first wave of equipped vehicles, as well as by using an increasing number of mobile applications. It is recommended that this process start by 1) evaluating organizational capability to address this new technology,

including identifying skill gaps and the means to fill them (internal/external), and 2) developing a plan and architecture for managing the CV infrastructure and back-end systems within the city's IT framework.

Transit. As CV/AV technology evolves, everything from service coverage to vehicle technologies to labor requirements stands to change for VIA. VIA's leadership will need to completely re-think their services and fee structure in order to stay competitive in the new transportation environment. VIA might consider the following:

- Leverage private mobility companies to provide first/last mile solutions to longer-distance transit services;
- Transition the transit fleet to leverage driverless technology – potentially beginning with bus rapid transit and other services operating in protected guideways; AND
- Transition or subsidize paratransit services to private mobility companies

VIA will also need to re-evaluate its fleet management plan in order to incorporate driverless and connected vehicles in its fleet. This will have significant implications for labor requirements (and Union agreements), maintenance facilities, maintenance workers, safety and security of passengers, etc.

In the near-term, connected vehicle systems could begin to replicate or replace existing transit technology, such as Automated Vehicle Locator (AVL) and Transit Signal Priority (TSP) systems. As more vehicles and traffic signals are equipped with connected vehicle technologies, the Dedicated Short Range Communications (DSRC) radio technology could ultimately replace stand-alone AVL and TSP systems, reducing VIA's deployment, operations and maintenance costs. This potential should be considered as part of any evaluation of further AVL or TSP system investments.

Revenue. The City of San Antonio will have significant financial consequences associated with driverless cars. Examples of budget line items to consider are:

- Parking revenues (or alternate revenues associated with land previously used for parking)
- Speed ticket violation fees
- Tax revenues related to vehicle purchases, registration fees, and VMT
- Health and life insurance costs
- VIA costs and revenues
- Incident management costs
- Insurance costs
- Government fleet transition to driverless vehicles
- New enforcement activities
- Unemployment insurance

Driverless and connected vehicles may provide opportunities for municipal services to be delivered more cost-effectively as well. The City of San Antonio should understand the impact of this technology ahead of time and prepare accordingly.

Driverless and connected vehicle technologies are coming and they present great potential for mobility and safety improvements for our cities. The City of San Antonio has the opportunity to proactively establish regulations, policies, and plans that can continue to support the driverless car revolution while keeping the traveling public safe and providing a positive example for city governments around the world.

Transportation Network Companies

Technology with the potential to transform the transportation system has emerged in the form of a millennial friendly taxi industry. The most well-known companies of this market include Uber, Lyft, and other shared vehicle programs. Current operation of these companies is generally to provide transportation to a destination by the use of a mobile application, reducing the need for a personal automobile, and the hassle and costs parking sometimes creates.

The future of these markets alongside automated vehicles has the potential to completely change the transportation network. According to a recent edition of the Mobility Lab e-newsletter (September 2015), an article entitled "Uber's Plan for Self-Driving Cars Bigger than Its Taxi Disruption", portrays the potential for self-driving cars to affect the job market, car manufacturers, dealerships, transit, and the urban lifestyle itself. For instance, the report states:

> "The ride-hailing company has invested in autonomous-vehicle research, and its [Uber's] CEO Travis Kalanick has indicated that consumers can expect a driverless Uber fleet by 2030. Uber expects its service to be so inexpensive and ubiquitous as to make car ownership obsolete. Such ambitious plans could make its disruption of the taxi industry look quaint in comparison . . . A study by Columbia University calculates that with a fleet of just 9,000 autonomous cars, Uber could replace every taxicab in New York City—with a passenger wait time of 36 seconds and a cost of $.50 per mile . . . Going further to an economy-wide perspective, Pricewaterhouse-Coopers estimates, as noted by writer and entrepreneur Zack Kanter that 'autonomous vehicles would reduce the number of vehicles on the road by 99 percent, and the fleet of cars in the U.S. would fall from 245 million to 2.4 million."

The sharing of autonomous vehicles for hire may reduce the number of vehicles somewhat (the 99% stated above may be high). Vehicle ownership, could very well be reduced significantly with the onset of autonomous TNC vehicles. However, the number of trips made on the network may be comparable to current levels. San Antonio will need to stay up to date with current industry innovations to prepare their transportation network for the possibilities and ramifications of Automated Vehicles and its potential positive and negative impacts.

Within a very short time, Uber and other TNC's have changed the "Taxi" industry, showing how quickly these "disruptions" can occur.

Intelligent Transportation Systems (ITS)

Transportation networks can be managed much more efficiently when real time information about traffic conditions can be gathered and disseminated quickly to the system users. Intelligent Transportation Systems (ITS) is the implementation of innovation and technology to allow traffic management staff to monitor transportation network conditions and to respond accordingly.

Components such as traffic monitoring cameras and vehicle counting devices are used to collect traffic data for analysis. Dynamic message signs are used to inform drivers of expected travel times, incidents ahead, and relay other information that can help drivers make routing decisions. A communications network is used for both collecting and distributing information throughout the system.

Benefits of ITS include the following:

- Provide real-time information about traffic flow, roadway conditions, incidents, etc. delivered to the appropriate personnel;
- Recall historical information for traffic management staff to utilize for analysis, planning, and metrics recording;
- Ability to modify signal timing operations to adapt to expected or unexpected changes in traffic demand;
- Communication to travelers about roadway, traffic conditions, as well as public safety; and
- Incident management resulting in reduced response times, improved clearance times and more accurate information regarding incidents.

ATMS/KITS

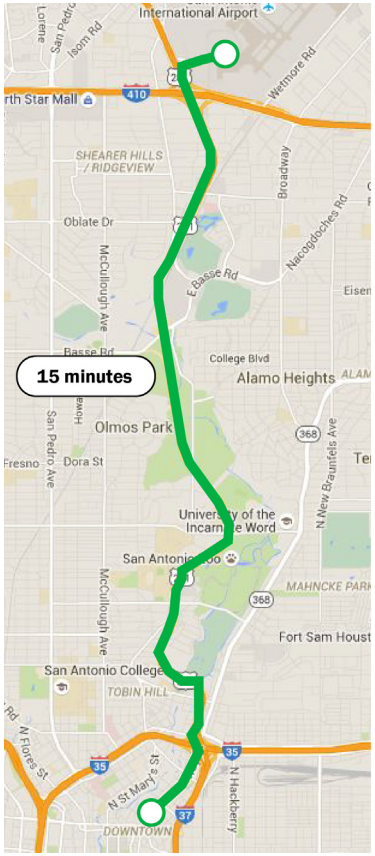
The City of San Antonio is currently undergoing a process to upgrade its ATMS (Advanced Traffic Management System) via the KITS (Kimley-Horn Integrated Transportation System) Central System software. This update allows the City to more closely monitor operations across the network - including traffic signals, arterial flow, incident monitoring, CCTV, and digital Dynamic Message Signs (DMS). This investment allows the City to better manage its available capacity, improve its ability to identify and respond to incidents, and continue to improve the system all from a central location.

The ATMS software has the potential to optimize traffic signal timing to balance performance benefits for safety and efficiency. The system is not intended to replace the need for sound traffic engineering, but rather to supplement the traffic engineer's toolbox with another tool that can handle fluctuations in demand and short and long-term changes in land use and traffic patterns.

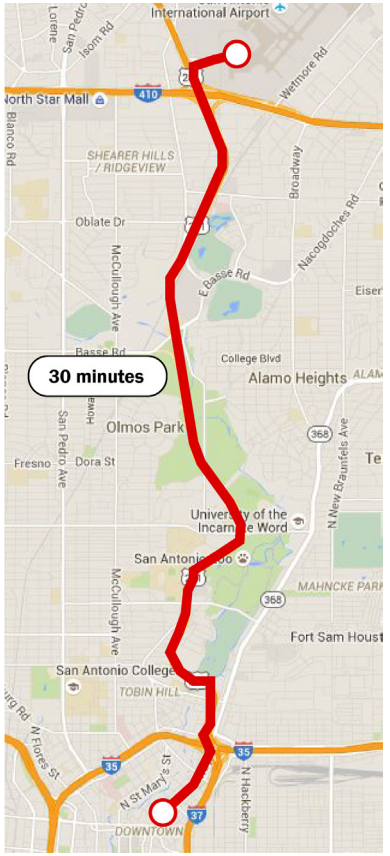
Incident Management System

Incidents such as crashes, debris, disabled vehicles, etc. are extremely disruptive to traffic flow. Traffic Incident Management (TIM) consists of a planned and coordinated multimodal disciplinary process to direct, respond to, and clear traffic incidents so that normal traffic flow may be restored as safely and quickly as possible.

While effective TIM is one of the most important ways officials can respond to traffic, there a few critical components that must be present. It is important to have well-developed TIM procedures documented so that there is a clear direction for officials. Each type and location of an incident can then be resolved with a minimized response time. The effects of delay due to an incident compounds over time the longer it takes for the roadway to clear. Also, incidents do not solely affect the freeway on which they occur; their impact reaches to surrounding roadways as well. Therefore it is important to identify alternate routes that can be utilized during an incident. The transportation network must also be outfitted with the appropriate ITS components so that officials can monitor traffic conditions and convey messages to travelers, while also dispatching incident responders (police, fire, EMS) to the correct location.



CURRENT



POTENTIAL FUTURE

RELIABILITY

The reliability of commute times are an integral part to how residents view the function of the transportation network. With the expected growth in population, commute times are forecast to almost double as compared to current travel times. Investing in the entire transportation system encourage use of alternative modes and enhance technology (such as ITS) to maintain consistent travel times is imperative.

When properly implemented, TIM is an essential component to traffic management. Crashes, debris, disabled vehicles, or other similar disturbances can severely impact the capacity and flow of a freeway. Taking appropriate TIM action can mitigate the effects, and help reroute vehicles in order to reduce congestion as much as possible. The benefit of an effective TIM system is improved reliability, reduced secondary crashes, reduced impacts to goods movement, and a reduction in air quality impacts.

The San Antonio Enhanced Regional Incident Management Techniques and Evaluation of Intelligent Transportation Systems developed in August of 2015 created the following vision for San Antonio Regional Traffic Incident Management (TIM): To rapidly clear all incidents and debris from the freeway travel lanes while ensuring safety for first responders, support teams, and the public. The mission of the program is to:

- Provide a safe and secure transportation environment for people and goods;
- Communicate and coordinate activities in advance to provide a consistent response; and
- Maintain as much transportation capacity and safety as practical during the incident.

Managed Lanes

With the increasing traffic demand in Texas, it is not always possible to provide a transportation network that operates at a desired level of service. However, providing a reliable route for travelers can be a valuable solution and allow drivers to have a more predictable travel time thereby, improving the reliability of the transportation system. Managed lanes are dedicated traffic lanes on a freeway facility whose demand and capacity are actively managed to provide a consistent travel time.

PRICE & DEMAND

Almost everything we purchase - from gas to the movies to buying a plane ticket to paying our bills - is priced based on demand. Managed lanes are a tool to value the available capacity at a higher rate during peak periods.

There are a multitude of ways that lanes can be managed, whether by just one of the following, or by a combination of the following:

- Lanes can be tolled at a cost per vehicle that is higher during congested times and lower during free flow conditions, also known as dynamic pricing;
- Lanes can allow high occupancy vehicles (2 or more passengers in a vehicle), either at no cost or at a discounted price;
- Lanes can permit only buses or trucks;
- Lanes can be reversible based on the peak direction of travel.

Managed lanes almost always require the implementation of ITS equipment to monitor use, display dynamic messages to drivers, collect tolling information, or count vehicles to evaluate performance. Managed lanes are a good solution in places where transportation funding is limited, but a reliable route is still desired by drivers.

HOV Lanes

Transportation professionals have a goal to move people, goods, and services in an efficient and safe manner. High Occupancy Vehicle (HOV) lanes are restricted to vehicles that are carrying two or more passengers. These lanes emphasize moving people efficiently by prioritizing and incentivizing vehicles with multiple passengers.

Not only do HOV lanes move people traveling together more efficiently, but it also encourages travelers to carpool, and thus decreases the total number of vehicles using the freeway. Historically these lanes also have less demand on them, and therefore typically operate at a higher speed.

There are also a few challenges to successfully implement HOV lanes on a freeway. Enforcement is one of the biggest challenges. Depending on the projected violation rate, enforcement may focus on ensuring that only vehicles with the appropriate ridership are utilizing the lanes (although it should be notes that automated enforcement tools are being developed). HOV lanes also take some capacity away from normal main lanes, so the likelihood that travelers will actually adopt carpooling must be evaluated before they are implemented.

5 Year Action Plan

- Embrace tools that optimize available system capacity (such as development of new timing plans or programs to educate first responders on best practices with incident management).
- Leverage autonomous vehicle and TNC's (investments coming from others) to allow San Antonio to be a leader in the next generation transportation system.
- Dedicate a portion of funding towards implementing innovative technologies to the City's transportation system.
- Develop Smart Cities program to inform City staff of emerging technologies.

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WHAT CAN WE DO?

WHAT CAN WE DO? - PEDESTRIAN

Pedestrian Element

Everyone is a Pedestrian

Walking is our oldest form of transportation and even today, every trip begins and ends with walking. It has been found that when safe and comfortable pedestrian facilities are easily accessible, people are more likely to walk more often and walk further. A key factor in rates of people walking is the quality of the walking infrastructure. In other words, high-quality pedestrian environments tend to have more people walking.

Ensuring the safety of all roadway users is important particularly when you consider that everyone walks. The renewed focus on encouraging walking over driving for both environmental and health reasons also points to the need to make pedestrian safety a priority. As more and more neighborhoods and residents continue to recognize the positive impact walkable neighborhoods have on health and wellness as well as economic benefits

on property values, jobs, tourism, and local spending, the ability to walk safely takes on a new level of importance.

Existing Condition

Our Story

Many neighborhoods of San Antonio are traditionally walkable and provide comfortable and connected sidewalks. Working towards San Antonio's Vision Zero goal, San Antonio continues to invest in improving the pedestrian infrastructure

VISION ZERO SAN ANTONIO

Drive safe. Bike safe. Walk safe.

through reducing sidewalk gaps, ensuring universal accessibility for all, and implementing pedestrian friendly policies.

San Antonio is a safe city, but recently has experienced a higher pedestrian fatality count in 2014. The National Highway Traffic Safety Administration (NHTSA) designated San Antonio as a focus city with higher than the national average number of pedestrian deaths.

2014 Traffic Fatality Data

» In 2015, 54 people were killed while walking in San Antonio. This is an average of one life lost per week. In 2015, the number is improved slightly, at 46 people killed while walking.
» Of the 138 fatal crashes in 2014, 40% were walking or riding a bicycle.
» On average, two people walking are involved in a crash every day.
» One in three pedestrian fatalities involved a person between the ages of 40 years old and 64 years old with the average age of a person killed while walking being 49 years old.
» 94% of people killed while walking were 18 years old or older.
» 74% of fatalities involving a person walking in 2014 occurred between 7:00 pm and 7:00 am.

Vision Zero

In September of 2015, San Antonio adopted the Vision Zero goal of achieving zero traffic fatalities and serious injuries on our roads. The mission of Vision Zero San Antonio is to create a community culture that prioritizes traffic safety and ensures that mistakes on our roadways do not result in severe injury or death. The goal to achieve zero fatalities on public roads is an endeavor that all cities must strive for and San Antonio is no exception.

The mission statement of Vision Zero is:

TOGETHER, WE CAN ACHIEVE ZERO FATALITIES ON OUR ROADWAYS BECAUSE EVERY PERSON IN OUR COMMUNITY MATTERS.

Core Principles that guide Vision Zero:

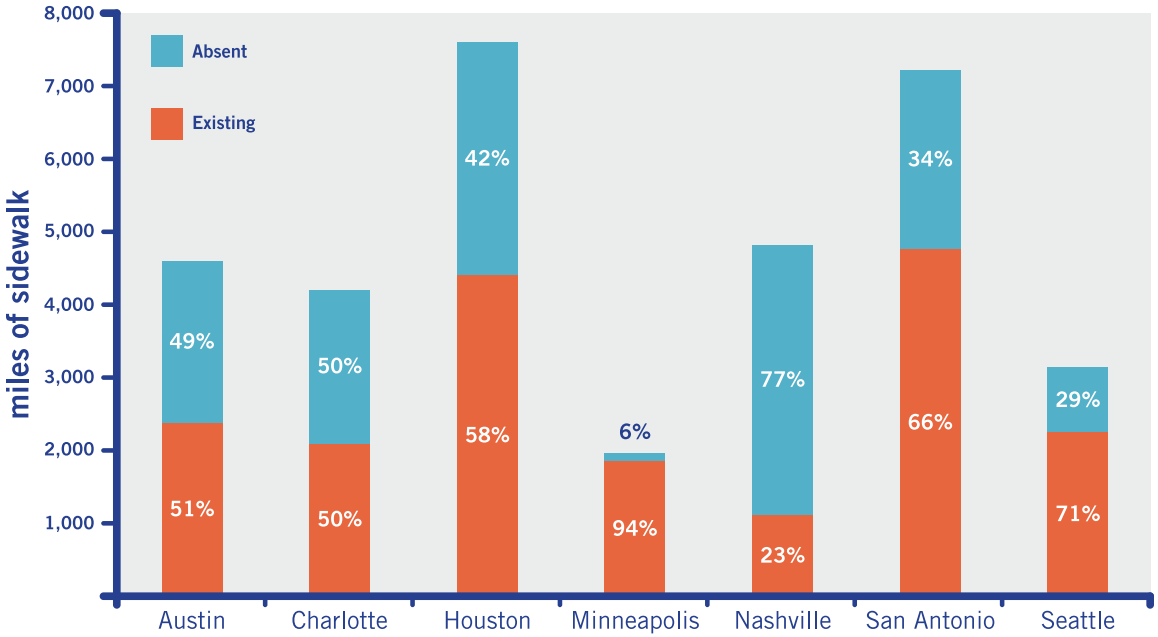
» Traffic deaths are preventable and unacceptable.
» Human life takes priority over mobility and other objectives of the road system. The street system should be safe for all users, for all modes of transportation, in all communities and for all people of all ages and abilities.
» Human error is inevitable and unpredictable. The transportation system should be designed to anticipate error so that the consequence is not severe injury or death. Advancements in vehicle design and technology are a necessary component toward avoiding the safety impacts of human errors and poor behaviors.
» People are inherently vulnerable and speed is a fundamental predictor of crash survival. The transportation system should be designed for speeds that protect human life.
» Safe human behaviors, education and enforcement are essential contributors to a safe system.
» Policies at all levels of government need to align with making safety the highest priority for roadways.

Reducing Sidewalk Gaps

The City of Austin published the Sidewalks Peer Cities Report in July 2015 that compared seven United States cities: Austin, Charlotte, Houston, Minneapolis, Nashville, San Antonio, and Seattle. Out of the seven cities in the study, San Antonio had the most miles of existing sidewalks at 4,769 miles. The miles of existing sidewalks in San Antonio would be more than enough sidewalks for each of the cities of Austin, Charlotte, Minneapolis, and Seattle. Despite the high number of miles of sidewalks, San Antonio has a large number of sidewalk gaps. Among the seven cities compared, San Antonio ranked third at 66% for the percentage of roads with existing sidewalks behind Minneapolis (94%) and Seattle (71%).

Currently, abutting property owners are responsible for maintaining sidewalks. The City does not have a program to maintain sidewalks but rather the sidewalk infrastructure improvement program is used to fill sidewalk gaps. The 2015 Infrastructure Maintenance Program (IMP) provided $1 million for pavement markings, $7.9 million to reduce sidewalk gaps, and $960,000 for on-road bicycle facilities. For fiscal year 2016, the City Council increased funding for sidewalks in the IMP from $8 million to $15 million to increase the construction of new sidewalks.

Sidewalk Network Inventory



	Austin	Charlotte	Houston	Minneapolis	Nashville	San Antonio	Seattle
Absent	2,270	2,114	3,200	108	3,744	2,484	900
Existing	2,359	2,094	4,400	1,845	1,087	4,769	2,235

Source: City of Austin, Sidewalks Peer Cities Report, July 22, 2015.

As a result of the strategic use of data and target investment in engineering, enforcement, and education, the City of San Antonio started a program to improve walking around area schools by way of the Pedestrian Safety Program. Through investment in safety around schools, San Antonio has witnessed a reduction in crashes and fatalities and also a decrease in severe injuries while traveling in and around school zones.

Ensuring Universal Accessibility

The City's Disability Access Office (DAO) works toward a universally designed environment that makes it easy for all people, regardless of ability, to participate fully in community life. This echoes the spirit of the Americans with Disabilities Act (ADA) of 1990 and Section 504 of the Rehabilitation Act of 1973.

The DAO coordinates with other City Departments to review and amend city codes, policies, and procedures to assure they are universally usable to all. The DAO oversees an interdepartmental Sidewalk Compliance Team, trains and provides technical assistance to City Departments and the private sector in meeting the requirements of the ADA.

As part of meeting ADA requirements, the City includes curb ramps in alteration projects as part of the Infrastructure Maintenance Program (IMP). The City has prioritized addressing sidewalk hazards and ensuring that they addressed. The DAO has also established a formal ADA grievance process.

Implementing Pedestrian Friendly Policies

San Antonio voters approved sales tax propositions for the Howard Peak Greenway Trails in 2000, 2005, and 2010 in order for the City to construct 46 miles of off-road multiuse paths for bicycling and walking with an additional 40 miles currently underway. In 2015, voters again approved a sales tax proposition to continue to fund the greenway trail system for an additional $80 million.

In 2010, San Antonio adopted a "safe passage" ordinance to provide the foundation for an educational campaign of tolerance and acceptance for active forms of transportation that furthers the City's goals of promoting San Antonio as a bicycle friendly community as well as for the enhancement of walkable streets and neighborhoods. (Ord. 2010-02-04-0097)

The City of San Antonio adopted a Complete Streets policy in 2011 that promotes healthy living and fitness, supports pedestrian-oriented neighborhoods, enhancement of commercial corridors, and maximizes capital project investments through the application of Complete Streets.

The City of San Antonio is a member of the Alamo Area Metropolitan Planning Organization's (AAMPO) Pedestrian Mobility Advisory Committee (PMAC) whose goal is to improve pedestrian mobility in the region. The AAMPO adopted the Pedestrian Safety Action Plan in 2012 which defines a set of actions to encourage walking and to make it safer. The Pedestrian Safety Study under coordination with the City led by the AAMPO as part of the Regional Bicycle and Pedestrian Plan is currently underway. The study will establish a system to determine how to select pedestrian priority zones and a tiered investment strategy to improve pedestrian safety in these priority zones.

In November 2014, San Antonio enacted a hands-free ordinance citywide. The hands-free ordinance took effect on January 1, 2015. (Ord. 2014-11-06-0843) The City installed 187 regulatory signs instructing people driving when they entered the City of this ordinance at a cost of $150,000.

Planning for Another Million

Approximately 2% of San Antonio residents commute by walking while a great majority, 90%, commutes by driving alone. If the City would like to increase the percentage of people commuting by walking to 5% or even 10% by 2040, the key to this transportation "mode shift" is ensuring that San Antonio streets are safe for all users, particularly for people who walk and bike, and people who are young and old.

Prioritizing Pedestrian Areas

The AAMPO Regional Bicycle and Pedestrian Planning Study established a prioritization system based on pedestrian demand. The term pedestrian demand refers to the level of pedestrian activity an area would expect based on density of people and jobs, places to go or walk to, and safe walking paths and crossings. In some cases there may be a lack of pedestrians because of a lack of infrastructure, such as sidewalks or crosswalks. Another reason may be

because existing sidewalks are difficult to use or feel unsafe due to their being too narrow, too close to a busy roadway, or in a state of disrepair. Creating a prioritization system assists in directing design efforts and funding towards areas which are likely to see the highest increase in people walking once facilities are installed or upgraded. These areas are prioritized based on factors such a proximity to schools, neighborhoods, jobs, and cultural institutions as well as areas where walking may be the more common mode of travel for socio-economic reasons.

Establishing Pedestrian Demand

For the study, twenty eight indicators were selected and consolidated into three main categories, which included demographics, attractors, and safety.

- Demographics – Pedestrian demand is driven by where people work and live. Higher pedestrian activity is also seen in places with high concentrations of dependent populations (i.e., children and senior citizens), and by the concentration of residents without a car.
- The following demographic factors were included in the analysis:
  - employment density
  - population density
  - population under the poverty line
  - rates of disabled residents
  - senior population density
  - transit modeshare
  - walk modeshare
  - density of zero-car households
- Attractors – Pedestrian demand is also affected by the location and accessibility of key destinations for residents, workers, and visitors.
- The following attractors were included in the analysis:
  - tourist destinations
  - historic landmarks
  - hospitals
  - libraries
  - major employers
  - military facilities
  - Universities
  - Multiuse paths and park trails
  - Parks and greenways
  - Public comments received via crowdsourcing map
  - VIA transit stops
- Safety – This category included measures affecting the comfort and safety of pedestrians.
- The following safety factors were included in the analysis:
  - pedestrian crash density
  - average annual daily traffic (AADT)
  - block area/size
  - public comments received regarding barriers to mobility

Building a Better City

To achieve Vision Zero, San Antonio needs to invest in the pedestrian network. Below is a list of potential pedestrian facitilities and amenities types that can be implemented in San Antonio to encourage walking and improve the sense of feeling safe while walking.

Pedestrian Facility Types and Accommodations

Pedestrian facility accommodations fall under four facility types: walking paths; crossings; signals; and other. Walking paths are spaces for non-vehicular travel such as people walking by way of foot power, wheelchair, Segway or other type of mobilization device that is not classified as a vehicle. Crossings are where vehicular and non-vehicular traffic intersect and where a safe designated space is provided for pedestrians to cross. Where crossings may be more dangerous, additional traffic signals may be included for traffic management. The different pedestrian accommodations

are not mutually exclusive but rather can be combined in order to create a more pedestrian friendly environment that is not only safe for people walking but also very comfortable.

Walking Paths

Sidewalk - Sidewalks and walkways provide people with space to travel within the public right-of-way that is separated from motor vehicles. Sidewalks are associated with significant reductions in

Joggers on Howard Peak Trail, San Antonio, TX

pedestrian collisions with motor vehicles. A sidewalk with a clear width of at least 5 feet and a clear height of at least 8 feet ensures access for all sidewalk travelers. The clear width area of a sidewalk (sometimes referred to as the pedestrian zone) should be clear of obstructions such as poles, fire hydrants, street furniture, signposts, newspaper racks and other obstacles that could block the path.

Multiuse or Shared Use Path - A multiuse or shared use path means a trail or path that is physically separated from motorized vehicular traffic by an open space or barrier. The path is used for non-motorized use such as for walking, jogging and biking. The path may be located either within a street right-of-way or within an independent right-of-way.

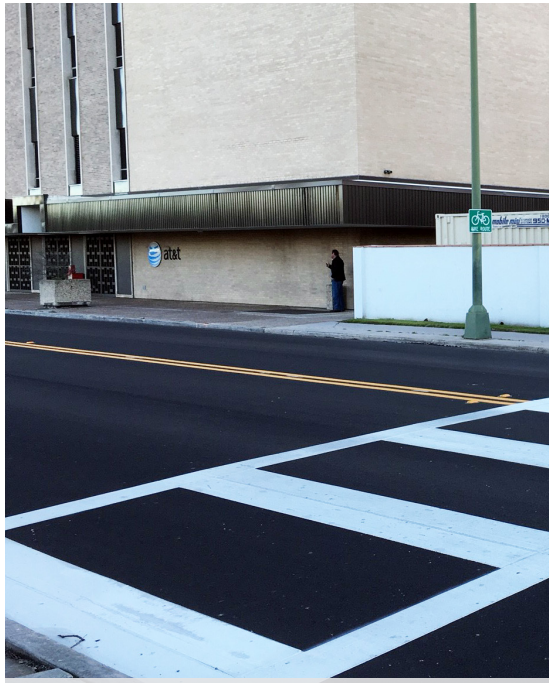
Curb Ramp - A curb ramp is a short ramp that provides a smooth transition from the sidewalk to the street at intersections and mid-block crossings, thus facilitating street crossing for people using wheelchairs, strollers, walkers, crutches, handcarts, bicycles, and also for pedestrians with mobility impairments who have trouble stepping up and down high curbs. Proper curb ramp placement and design ensures that pedestrians cross in crosswalks, close to the intersection where drivers can see them, and without undue delay.

Curb Extension/Bulb-Out - Curb extensions minimize the "exposure time" of pedestrians crossing the street by reducing the total crossing distance. They also increase visibility between people walking and driving. The waiting pedestrian can better see approaching traffic and drivers can better see pedestrians waiting to cross the road as their view is not obstructed by parked cars. Curb extensions may be installed at intersections as well as at mid-block crossings on roadways with well-utilized on-street parking.

Crossings

High Visibility Crosswalk - High visibility crosswalk markings aid drivers in seeing the crosswalk, not just the pedestrian. Ladder style (also known as piano keys) markings should always be used at locations without positive traffic control (signals, stop signs) and are advised at locations with positive traffic control.

Marked Crosswalk - Marked crosswalks indicate optimal or preferred locations for pedestrians to cross and help delineate where vehicles are to stop so as not to interfere with the pedestrian crossing. Marked crosswalks should only be installed where there is an expectation of a significant number of pedestrians such as near a school, park or other generator. It is recommended that a higher priority be placed on the use of marked crosswalks at locations having a minimum of 15 to 20 pedestrian crossings per peak. Typically it is best to align the crosswalk at the intersection rather than set it back from the intersection so that pedestrians in the crosswalk are more visible to turning vehicles. Pedestrian convenience must also be kept in mind when aligning the crosswalk. Pedestrians are generally reluctant to travel out of their way when crossing the street even if it is a short distance and will choose their path of travel based on directness and convenience. It is important to align marked crosswalks with the path of travel, which typically means aligning the



Midblock Marked Crosswalk, North St. Mary's Street, San Antonio, TX

Children Using Z-Crossing on Commerce Street, San Antonio, TX

crosswalk with the sidewalk on either side of the street.

Crossing Island - Crossing islands (also known as center islands, refuge islands, pedestrian islands, or median slow points) are raised islands placed in the center of the street at intersections or mid-block. Crossing islands allow pedestrians to deal with only one direction of traffic at a time by enabling them to stop partway across the street and wait for an adequate gap in traffic before crossing the second half of the street. They are especially effective at reducing crashes at uncontrolled locations on busy multi-lane roadways where gaps are difficult to find, particularly for slower pedestrians, such as pedestrians with disabilities, older pedestrians, and children. They are also appropriate at signalized crossings and may improve safety for vehicles by dividing traffic streams. If there is enough width, center crossing islands and curb extensions can be used together to create a highly visible pedestrian crossing and effective traffic calming.

Midblock Crossing or Z-Crossing - A midblock, staggered, two-stage traffic signal at a crossing island also known as a Z-crossing can reduce impacts on motor vehicle flow while helping pedestrians cross multi-lane roadways. The two crossings are separated by a median that provides a walk/wait area as a person walking crosses one direction of traffic at a time.

Signals

Pedestrian Indicator - Countdown Signal and Timing - Countdown pedestrian signals inform pedestrians of the amount of time in seconds that is available to safely cross the street. Where there are high concentrations of children, seniors, or disabled pedestrians, signals should be timed to accommodate slower pedestrian crossing speeds.

Push Button - Push buttons are electronic buttons used by pedestrians to request a pedestrian crossing phase. Pedestrian push buttons are typically installed at locations where pedestrians are expected

Midblock Z-Crossing on Broadway at the DoSeum Children's Museum, San Antonio, TX

intermittently. Only about 50 percent of pedestrians actually push the buttons based on a FHWA research project, which indicates that push buttons need to be well signed, easily locatable and within reach of all pedestrians.

Leading Pedestrian Interval - The Leading Pedestrian Interval (LPI) is a signal phasing strategy to improve pedestrian visibility in locations with heavy volumes of turning traffic and frequent pedestrian crossings. During the LPI, motor vehicles expecting the next green phase are stopped for four to seven seconds while pedestrians are given the WALK signal. This is designed to allow pedestrians to begin crossing in advance of vehicular turning movements, which allows them to clearly establish themselves in the crosswalk in a position that is more visible to the motorist.

Rectangular Rapid Flash Beacon - The rapid flash beacon device consists of a pair of rectangular, yellow LED beacons that employ a stutter-flash pattern similar to that used on emergency vehicles. The beacons are often mounted below a standard pedestrian crossing warning sign and above the arrow plaque. The beacons are pedestrian activated (push button or passive detection) and placed on both sides of the street. Advanced pedestrian warning signs can also be used with the rapid flash beacon. If traffic volumes are too high or there are too many lanes (generally more than 4 travel lanes) a HAWK (High Intensity Activated Crosswalk) or full signal may be warranted.

Mid-Block Signal - Traffic signals may be necessary at mid-block pedestrian crossing locations where there are high volumes of crossing pedestrians and insufficient gaps in motor vehicle traffic for crossing. If a mid-block signal system is used with a median, it is important

Z-Crossing in Median with Pedestrian Activated Runway Lights and Flashers, Stone Oak Parkway at Stone Oak Park, San Antonio, TX

The Mission Reach Riverwalk Features Shade, Benches, Lighting and other Amenities for Pedestrians, San Antonio, TX

to place pedestrian push buttons in the median; there will be times when some pedestrians start too late or when older pedestrians lack time to cross in one phase.

Other Pedestrian Accommodations

Median - Medians are raised barriers in the center portion of the roadway used to manage vehicle access to adjacent land uses and associated parking in order to reduce potential conflicts associated with turning vehicles. Medians can also provide a refuge for pedestrians at crossing locations (see "Crossing Island" counter measure). They can provide space for trees and other landscaping that, in turn, can help change the character of a street and reduce vehicle speeds. Signalized intersections with medians should be designed to allow pedestrians to cross the entire roadway during a single signal cycle.

Outdoor Comfort - Designing for outdoor comfort for people walking, includes providing protection from the elements such as sun and rain as well as seating options for people to enjoy the outdoor space. Accommodations that protect people walking from the elements may include awnings, covered walkways or arcades. Other accommodations for outdoor comfort may also address safety concerns of person walking such as lighting, buffering from moving vehicles, and protection from noise and air pollution. Trees and landscaping can provide shading and a protective buffer while also providing a more aesthetically pleasing environment. This list of outdoor comfort accommodations is incomplete as there are endless ways in which outdoor comfort can be addressed to ensure a pleasant environment that encourages people to walk.

Pedestrian Street Lighting - Good quality and placement of street lighting can enhance an environment as well as increase comfort and safety. Pedestrians often assume that motorists can see them at night. Without sufficient overhead lighting, motorists may not be able to see pedestrians in time to stop. In commercial areas with night time pedestrian activity, streetlights and building lights can enhance the aesthetics of the area and the visibility of pedestrians. In commercial areas or in downtown areas, specialty pedestrian-level lighting may be placed over the sidewalks to provide added pedestrian comfort, security, and safety.

Reduced Curb Radius - Curb radius is the actual radius prescribed by the curb line at an intersection. Reconstructing the curb radius to create a sharper turn reduces turning speeds, shortens the crossing distance for pedestrians, and also improves sight distance between pedestrians and motorists. Other benefits of smaller curb radii include the ability to increase the size of pedestrian waiting areas, greater flexibility in the placement of curb ramps, and improved signal timing by reducing pedestrian crossing distances.

Right Turn Slip Lane with Directional Island - Installing directional islands (also known as pork chops) in right-turn slip lanes can shorten crossing distances, reduce pedestrian exposure, and can improve overall signal timing of an intersection. The island enables pedestrians and drivers to negotiate one conflict point separately from others. Drivers approach the pedestrian crossing at a nearly 90-degree angle. The crosswalk is placed one car length back from the intersecting roadway so the driver can move forward and wait for a gap in oncoming traffic once the pedestrian conflict has been resolved. This design puts the crosswalk in an area where the driver is still looking ahead.

Sidewalk Buffer - Buffers between pedestrians and motor vehicle traffic create greater levels of comfort, security, and safety to pedestrians. A buffer zone of 4' to 6' is desirable and should be provided to separate pedestrians from the street. The buffer zone will vary according to the street type; in downtown or commercial districts, a street furniture zone (street signs, trees, newspaper boxes, trash receptacles, etc.) is usually appropriate. In more suburban or rural areas, a landscape strip is generally most suitable.

Separation of Sidewalks From Parking - Buffers along property lines to separate parking areas from the sidewalk provide added safety and comfort for pedestrians walking along the road. A variety of treatments may be used depending on available space and cost factors. Low cost treatments include painting a solid white line that demarcates the sidewalk from the parking area. Installing an extruded curb or pre-cast wheel stops

Sidewalk with buffer zone

Sidewalk with Landscaped Buffer Separating Parking on Pearl Parkway at the Pearl, San Antonio, TX

along the edge of the sidewalk is a more effective, if higher cost, treatment. A railing, bollards, or landscaped buffer are effective treatments that can also enhance aesthetics. In some cases, reorienting parking to be parallel to the sidewalk rather than perpendicular may provide additional room to implement some of these treatments; however, this may reduce off-street parking supply. In this case, on-street parking should be considered in situations where additional parking is needed to meet demand.

Right Turn on Red Restriction - A permissible right-turn-on-red (RTOR) can have detrimental effects on pedestrians. Motorists are often so intent on looking for motor vehicle traffic approaching on their left that they may not be alert to pedestrians approaching on their right. In addition, motorists may pull up into the crosswalk to wait for a gap in traffic, blocking pedestrian crossing movements. Prohibiting RTOR should be considered where and/or when there are high pedestrian volumes or where there are sight line obstructions. To restrict RTOR a NO TURN ON RED sign must be installed.

Trees and Landscaping - Street trees give people walking shade and comfort. Landscaping provides a buffer people walking from the moving vehicles on a street. Trees and landscaping also soften the hard surfaces of pavement and building to provide a connection to nature. Landscaping can be provided in the form of Low Impact Development (LID) such that the landscape not only provides protection from moving vehicles and an aesthetically pleasing environment but also address water quality issues by capturing storm water run-off from polluting waterways.

Shady Neighborhood Street and Sidewalks, King William, San Antonio, TX

Transit Stop / Landing Pad - It is necessary for passengers to access the sidewalk directly from the bus doors. It is desirable to provide a continuous 8' wide area to have a dedicated pad attached to the sidewalk or a continuous sidewalk to match the length of a bus or at least the distance between the front and rear bus doors. A larger pad area should be considered in areas with higher pedestrian volumes on the sidewalk and high transit use. Curb extensions can provide additional space for passengers to board and alight without interfering with sidewalk flow.

5 Year Action Plan

Take a Vision Zero and Complete Streets Approach

Walking should be considered equally important as other transportation modes. The primary goal of a transportation system is to safely and efficiently move people and goods. Walking should not be an afterthought in roadway design. The ultimate goal is that people of all ages and abilities will be able to safely, conveniently, and easily use our infrastructure to get to their destination.

- Continue to work with transportation partners to get out the traffic safety message, provide informational materials, and seek media coverage to reemphasize the message of safety for all
- Continue to educate and inform the public on pedestrian safety and infrastructure
- Update design guidelines that implement a complete streets approach
- Provide continued education courses planners and engineers on the latest Vision Zero traffic safety approaches
- Coordination with our local law enforcement agencies such as SAPD, Bexar County Sheriffs, Park Police and local school district police will be increased to find opportunities to increase enforcement in all areas of the city.

Fix Barriers

The City of San Antonio is dedicated to ensuring that there are transportation choices for people of all ages and abilities. Transportation facilities should be accessible and provide safe, convenient, and interconnected transportation networks.

- Include or reach out to representatives who can help ensure that the needs of all users are addressed, such as older adults, bicyclists, and people with disabilities, transit users, children, and low-income residents
- Create a transit friendly environment for safe pedestrian access to transit routes and provide transit rider amenities at key stops in the city that benefit pedestrian safety and allow for more sufficient transit operations, such as bus bulb-outs and boarding islands.
- Install more crosswalks to communicate to drivers that pedestrians should be expected
- Routinely check that projects meet the needs of all road users and ensure that transportation engineers plan and design for the needs of people of different ages and abilities
- Provide ADA-compliant infrastructure such as curb ramps, unobstructed sidewalks and crossings, and accessible pedestrian signals for persons with disabilities wherever a pedestrian way is newly built or altered
- Implement smaller curb radii and more curb extensions where appropriate to slow traffic and shorten the crossing distance at intersections that meets emergency vehicle standards
- To reduce speeding and enhance pedestrian safety, install more traffic calming measures such as raised crossings, speed tables, traffic circles and chicanes throughout the City.
- Repair existing sidewalks in order to provide a safer, more comfortable pedestrian environment.
- Minimize and consolidate driveways where possible or through future redevelopment to create a safer and more comfortable environment by eliminating conflict points between people driving and people walking and biking

Gather Data

A pedestrian data collection program will be initiated and expanded to better understand walking activity levels, crash locations and circumstances, and existing and proposed infrastructure. This data will enable more informed decision-making such as targeting improvements where the need is the greatest.

» Expand the traffic counts to include the number of people walking
» Continue to monitor the inventory of pedestrian facilities
» Continue to monitor walking trip generators and destinations to coordinate future walking amenities
» Continue to monitor crash and injury data

Design Right

Go beyond minimum design standards to make streets safe and convenient for all road users. Plan projects for the long-term to anticipate likely future demand for bicycling and walking facilities and not preclude the provision of future improvements.

» Provide enhanced pedestrian safety measures which include providing safe, comfortable, and convenient pedestrian crossings that make it not only possible, but practical to walk across streets which may include pedestrian refuge islands
» Offer connected and seamless transportation networks for people walking which includes installing new sidewalks, and rebuilding major thoroughfares and arterials with a minimum six foot buffer and a minimum six to eight foot sidewalk on main arterial roadways is recommended. Buffers between the roadway and sidewalk can create a safer and more comfortable environment for pedestrians. Six foot buffers and six to eight foot sidewalks are the recommended standard along main arterial roadways for higher density residential areas. Minimum ten foot sidewalks is recommended in downtown and in locations designated for transit oriented development
» Install lighting to improve visibility of those on foot and those using personal mobility devices within the public right-of-way
» Add bulbouts. Bulbouts are extensions of the sidewalk at intersections that make pedestrians more visible to drivers and reduce the roadway crossing distance for them.
» Provide accessible curb ramps, accessible pedestrian signals, and other tools that facilitate greater mobility for people with disabilities have safe access to sidewalks, crosswalks and passage through center islands in streets
» Install more pedestrian countdown and pedestrian priority or lead pedestrian signals throughout the City
» Implement distinctive, unified streetscape design that integrates street trees throughout the City to define the streetscape rhythm. The design should also integrate site furnishings and pedestrian-oriented lighting to create a unified system that can be seen throughout the City

Crosswalk with Pedestrian Railings/Barriers at VIA Transit Center in South Texas Medical Center, San Antonio, TX

» Apply lane and road diets to reduce the crossing distance. Lane diets and road diets can reduce motorist speeds which also reduces the injury severity of crashes.

» Install signal, High-Intensity Activated Crosswalk (HAWK), or Rapid Flash Beacon. Signals, HAWKs, and beacons use bright lights to communicate to drivers that pedestrians wish to cross the street and have a high driver compliance rate.

Improve Walking Safety Laws and Regulations

Take steps to protect all road users. Ideal local ordinances clarifies and promotes safe road uses, allow for shared or designated and proper road use by all, clearly outlines consequences for harmful traffic violations, and promotes cooperation and commitment to follow the rules. Codes should consider how development relates to the context of the surrounding community. Strengthening codes, ordinances, and practices can help to protect non-motorized users.

» Consider adopting or improving laws related to failure to yield and distracted driving

» Adopt pedestrian and transit supportive development codes and standards

» Reduce posted speed limit. Higher vehicular speeds make roadways more difficult to cross, and pedestrians feel less comfortable walking along them.

» Introduce lower speed limits in designated neighborhoods

» Develop or engage a multidisciplinary coalition or task force to review and identify gaps, loopholes, or deficiencies in local ordinances, codes, and practices

WHAT CAN WE DO?

WHAT CAN WE DO? - BICYCLE

Bicycle Element

Introduction

Since the City's Bicycle Master Plan was approved in 2011, much progress has been made to expand the bicycle network and increase bicycle ridership across the region. However, with the anticipated growth of an additional 1.1 million people to the city, there is no question that more has to be done and it has to be done now. The 2011 Bike Master Plan set in motion ambitious goals to build a bicycle network spanning 1,768 miles of facilities, the distance from San Antonio to St. Louis. This update builds upon the goals outlined in the 2011 Bike Master Plan but takes things a step further. While we have been making progress and closing the gaps in the network, the City recognizes that significant advancement needs to be made if we are to compete with other world-class cities in terms of our bicycle network. For that reason, this update focuses on the bicycle network as one component of a much larger, more complex transportation system and promotes aggressively pursuing key opportunities to meet the needs of a growing populace.

Fiesta Wildflower Ride

Expanding & taking advantage of the resources the City has already laid forth means getting creative and thinking big. The City will continue to leverage the existing resources and funding available, as well as cultivating the partnerships that have proven successful in implementing bicycle infrastructure. We have identified a series of key projects to be implemented in the short-term that will inspire and encourage more

people to try bicycling. In the long-term, there are several key connections that should be prioritized through the City's Infrastructure Management Program and future Bond packages. Bicycle programs will continue to emphasize safety, as well as connectivity and the many benefits of biking. Most notably, an increase in bicycle amenities and an enhancement of the bicycle counting program will continue to grow ridership and provide the needed justification for increased and sustained funding and investments to the bicycle network.

None of this will be possible without the involvement and commitment by the community, political figures, government leadership, and stakeholders across the region. Building the best bicycle network is a team effort, an effort that will benefit the entire community and region for generations to come. Building smart today means a happier tomorrow for all.

History

The first bicycle club in San Antonio was formed in 1891 and was called the Alamo Wheelmen. Bicycling was popular in the late 1800s and through the turn of the century, but declined in the 1930s with the rise of automobiles. Bicycling experienced a resurgence in the 1970s and the original bicycle club was revived as the San Antonio Wheelmen. Today there are numerous bicycle clubs in San Antonio that cater to different types and levels of cyclists.

Bicycle Planning and Implementation

In 1975, the City drafted a Bicycle Master Plan that included recommendations for facilities along creekways. Although this plan was not formally adopted, many of the recommended facilities have been implemented through the Greenway Trails Network Program.

In 1994, the Metropolitan Planning Organization (MPO) included a bicycle component within its Long-Range Plan. In 2001, the MPO conducted a Bicycle Suitability Study which resulted in a Bike Route Usability Map in 2003. The bicycle component of the MPO Long-Range Plan gets updated every five years with the update to overall Plan. With the expansion of the MPO in 2014, the organization began creating a regional Bicycle and Pedestrian map in 2015 to include cities and counties outside of Bexar County.

The first City-initiated Plan since 1975 was the 2011 Bike Plan that laid out a potential network of bicycle facilities to be built by the public and private sector as new roads were built and existing roads were upgraded in the City and its Extraterritorial Jurisdiction (ETJ). In 2000, San Antonio had 34 miles of bicycle facilities. This number increased to 66 miles in 2004, and 136 miles in 2009.

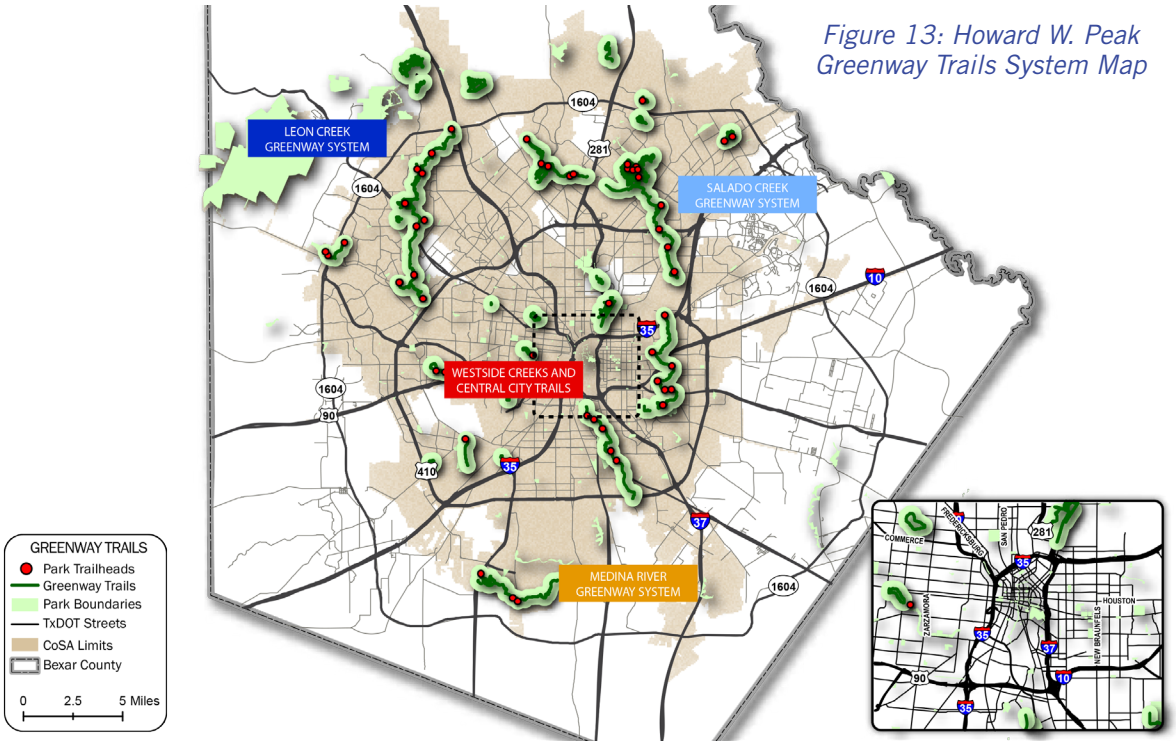


Figure 13: Howard W. Peak Greenway Trails System Map

Existing Conditions

On-Street Network

As of 2015, there are 286 miles of bicycle facilities in San Antonio. This represents an increase of 150 miles between 2010 and 2015. The majority of these facilities (63%) are bike lanes.

There are an additional 326 miles of bike facilities maintained by TxDOT, other incorporated cities, and unincorporated Bexar County for a total of 612 miles of bike facilities within Bexar County. The majority of these facilities (87%) are wide shoulders.

Off-Street Network

The Howard W. Peak Greenway Trails System (Figure 13) is an important component of the Bicycle Network. The system currently has 47 miles of trails that follow the Leon Creek, Salado Creek, Medina River, San Antonio River, and a series of smaller creeks on the Westside and Central City (Alazan, Apache, Martinez, San Pedro, and Olmos). Some of which are designed, constructed and managed by the San Antonio River Authority (SARA). A bicycle ridership counting program that began in 2012 by the Office of Sustainability reported over 100,000 cyclists in 2014 at a counter located at the San Antonio Mission Reach trail along the San Antonio River at the junction of Theo and Malone Streets. The count was almost at 75,000 when the counting program began in 2012. In addition to the Greenway Trails, several parks in San Antonio have mountain bike trails (e.g. McAllister Park, O.P. Schnabel Park, and Government Canyon State Park) that provide additional recreational options.

Ridership

A 2010 Bicycle Travel Patterns study reported that in 2010 approximately 350,000 households in the San Antonio and Bexar County region owned at least one bicycle and that there are approximately 325,000 people in San Antonio and Bexar County who ride their bicycle at least once per month. At that time, approximately 93% of respondents said that they rode for recreational purposes, 17% for errands, 7% to commute to work, and 4% to commute to school.

Off road facilties appeal to less experienced riders.

San Antonio River Walk Mission Reach Trail

A new survey was released in Winter 2015, asking about bicycle behavior, network preferences and priorities, and sentiments relating to bicycling in San Antonio. The City's Bicycle Survey found that 72% of respondents rode a bicycle weekly and 50% of respondents picked up bicycling within the last 10 years, lending quantitative support that bicycling has grown noticeably in San Antonio over the last decade. Coupled with an increase in available facilities, 35% ride to work and 13% ride to school at least monthly. Nearly half of respondents (44%) said they opt to run errands or do other shopping by bicycle at least once a month. Recreational riding still reigns supreme, with 84% riding for recreation at least monthly and 65% said they participate in social or group rides regularly. Most notably, 10% of respondents use bicycling as their primary mode of transportation.

It is also important to note throughout the bicycle count program analayis that the City of San Antonio's 2011 Bike Master Plan has extablished a goal of increasing the bicycle commute mode share to 0.5% in 2015, 1.0% in 2020, and 2.0% in 2025. Although several daily bicycle trips are not always intended specifically for work commutes, the American Community Survey (ACS) provides an additional important tool for tracking how travel patterns change across time and place within the San Antonio region. According to ACS 3-year estimates, the percentage of workers in San Antonio commuting by bike has increased from 0.1% in 2010 to 0.3% in 2013. The bicycle counting report provides us quantitative evidence through data collection of bicycling volumes that : (1) Off-street ridership typically is higher than on-street ridership, (2) Longer trail segments such as Leon Creek Greenway have a higher share of bicyclists vs. segments such as the Museum Reach which has substantially more pedestrian traffic (a likely function of land use), (3) on-street facilities have a higher share of weekly ridership vs. off-street facilities having a higher share of weekend ridership (utility vs. recreation), and most improtantly (4) our local data AND census data over time are showing that bicycling overall is increasing in San Antonio.

Interchanges can be challenging for bicyclists

Safety has repeatedly been highlighted as an area of concern for bicyclists and a major reason why people don't ride their bicycles more than they currently do. When asked how unsafe respondents felt, 63% said they felt unsafe or very unsafe when biking for daily needs. Over half of respondents (57%) said they rode on sidewalks at some point, overwhelmingly citing safety as the reason, even when knowing it is illegal to do so within the city limits. The survey also asked about education concerns for both drivers and bicyclists. Unsafe passing, distracted driving, and respect for bicyclists topped the list for drivers, while visibility, respecting traffic laws, and riding predictably topped the list for bicyclists.

Availability and types of facilities greatly influence a person's decision to ride a bike, whether recreationally or for utilitarian purposes. When asked about on- and off-street facilities, 43% preferred to ride on trails and other off-street facilities, while 20% preferred riding on the street; 37% said they have no preference and that both types of facilities are fine. With regards to on-street facilities, 60% of respondents preferred protected bike lanes, 31% preferred to use bike lanes, and 9% did not have a preference or preferred to forgo bicycle-specific facilities. The survey also showed that people would be more likely to ride a bike if: 1) bike lanes were physically separated from traffic; 2) there were more connected facilities; 3) bike facilities were better maintained; 4) increased enforcement of traffic laws & ordinances and; 5) more bike amenities are available.

Just as vehicles rely on parking and signage to move about the road network, so do bicycles. The availability of network amenities also influenced a person's decision to ride, especially for utilitarian reasons. People are more likely to ride their bike if ample and secure parking is available at their destination. Other amenities such as network maps, public work stands for maintenance, showers, and wayfinding enhance the bicycle network and encourage more people to consider replacing a car trip with a bicycle.

What we've seen as a result is that bicycling is continuing to grow in San Antonio, people are still concerned about safety, and people demand more bicycle facilities and amenities.

Bicycling and the Built Environment

Typically, most bicycle trips will not be further than three (3) to five (5) miles in length. Many recreational bicycle trips will be much further and are typically at least 15 miles, and often up to 50 miles.

Bicyclists represent all ages & all abilities

Enjoying the Fiesta Wildflower Ride

Shorter trips are typically more destination focused: getting to work, school, the store, or a friend's house. An increase in bicycling as a mode choice means that the need to have destinations within a three mile range will become increasingly important.

The opening of San Antonio B-Cycle in 2011 gave the city a first glimpse of the importance of bike share and its contribution to encouraging shorter trips by bicycle. Situated primarily in the Central Business District, B-Cycle currently boasts 58 stations and 500 bikes, providing locals and tourists alike

the ability to enjoy Downtown San Antonio and the Mission Reach River Trail, whether for recreational or utilitarian purposes. Since its inception, B-Cycle has traveled 1,075,010 miles across 237,525 total trips by 57,222 users (an average 4.5mi per trip).

Bicycling also encourages and supports transit. With nearly 10% of San Antonians relying on transit as their primary mode of transportation, bicycling offers choices to those seeking to access the transit network and addresses the "last-mile" problem of a multimodal transportation system. By providing facilities at destinations and integrating bicycling with transit, the symbiotic relationship between these two modes is strengthened and encourages more multimodal trips.

The Basics of Bicycling

1. How Roads and Bike Facilities Get Built

With the exception of state roads, brand new roads typically get built by the private sector as development occurs. This is the ideal time to acquire adequate right-of-way to ensure that the roadway provides safe facilities for bicycling as well as other modes of travel. Right-of-way is land dedicated for public purposes, including the transportation system. Once roads are built, dedicated, and accepted by a public entity, that entity is responsible for maintaining that road. Upgrades to roads can happen in one of two ways. The first is that private development will occur in the vicinity, and a Traffic Impact Analysis (TIA) will indicate developer responsibility for road improvements. The second form of upgrades is through publicly funded projects to enhance the overall transportation system.

Currently, the City's Unified Development Code (UDC) requires bicycle facilities on any roadways designated as collectors or above. Developers work with Development Services and TCI's Transportation Engineering team to determine the most appropriate facility for the development project.

2. Types of Bicycle Facilties

There are many different types of bicycle facilities. In general, a bicycle facility is built to provide a designated space for people bicycling within the roadway. This visible designation (through pavement markings, signage, and/or physical barriers) provides guidance to people bicycling on where to ride and guidance to people driving and walking as to the potential presence of people bicycling in the roadway.

Much of the current roadway system was designed primarily for vehicles. As multimodal transportation options become more desirable, many of our roadways are being retrofitted to better and more safely accommodate all roadway users and modes of travel.

Having many different types of bicycle facilities is important to ensure a bicycle network that best meets the needs of different types of people that bike; to have options on different types of roadways; and to have options in different environments or "contexts" (such as rural

versus urban or greenfield/raw land versus infill development). The decision as to what type of facility gets implemented is based on all these factors.

While off-road bicycle facilities are often a great choice, it is also important to have on-road facilities. The reason is that people who bike are often trying to get to the same destinations as people who drive cars (work, school, stores, etc.). Utilizing the existing road network, including arterial roadways, is often the most efficient route to travel. Below are many different options for bicycle facilities

Wide Shoulders
Wide shoulders are often found in rural areas and on state and county roads. These are usually not designated as bicycle specific areas, but they do provide a space where vehicles are not supposed to travel.

Bike Route
Bike routes do not have pavement markings, but utilize signs to indicate that an area is part of a bike route. They are often found on roads with low speeds and low traffic volumes because the bicycle will be sharing the road with vehicles.

Bike Boulevard
Bike boulevards are located on local and collector street that are enhanced to favor bicycle movement and provide traffic calming through signage, pavement markings, landscaping, and other physical barriers.

Sharrow
Sharrows are pavement markings used on a lane in a roadway that has extra lane space (e.g. at least 14 feet in width), but are not wide enough to accommodate a dedicated striped bike lane (minimum 15 feet preferred.). Sharrows provide awareness to bicyclists and drivers that they will need to share the travel lane.

Multi-Use Path
A multi-use path is an off-road facility that provides shared space for people bicycling and walking and runs parallel to the roadway. Multi-use paths work best with at least 10 feet in space and with a buffer between those using the path and vehicles traveling in the roadway.

Bike Lane
A bike lane is an on-road facility that has pavement markings and signage to indicate exclusive space for people bicycling. The use of green paint to help mark bike lanes provides greater visibility to the facility, particularly in potential conflict zone areas. A bike lane may be accompanied by a painted buffer to provide additional space between the bicyclist and motorist.

Protected Bike Lane
A protected bike lane has all the same features as a bike lane, but also includes a separation in the form of a painted buffer or physical barrier between the bicycle lane and the vehicular travel lane. Separations can include paint or a physical object, such as a curb, bollard, or pylon to delineate the bike lane from the vehicular travel lane. Bike lanes can also be protected by employing parking spaces to the left of the bike lane. This is what's known as "parking protected bike lane".

Cycle Track
A cycle track is a type of protected bike lane that is outside of the travel lane and adjacent to the pavement. This separated facility often makes use of curbs and landscape buffers to separate it from vehicular traffic.

3. Types of Bicyclists

Just as there are different types of bicycle facilities, there are different types of bicyclists. At its most basic, bicyclists can be divided between utilitarian/functional riders and recreational riders. Within the recreation category, there are still more divisions, based on the mileage, frequency, and where bicyclists are willing and comfortable riding. The League of American Bicyclists has coined the term "ABC Cyclists" to denote the level of riding comfort with regards to the type of facility preferred or required by each group.

Wide shoulders, bike routes, and sharrows are generally used by more advanced bicycle riders. The reason is that these facilities are not dedicated specifically to people bicycling. Wide shoulders, while not specifically in the vehicular travel lane, are typically on high speed roads. Bike routes and sharrows may be on lower speed roads, but they do require people biking and people driving vehicles to share the travel lane.

The City has made many strides to place bike lanes throughout the roadway system. These facilities provide dedicated space for people who bike. However, on roads with high speed and/or high volumes of vehicular traffic, these roads may only feel safe to advanced bicycle riders. To help make these roads feel safe to more levels of people bicycling, the City is moving toward installing protected bike lanes.

For younger riders and less experienced riders, bike boulevards through neighborhoods and off-road multi-use paths or cycle tracks may provide the highest level of safety and comfort.

4. Multimodal Use of the Road and Roadway Design

There are many guides on how to build better bicycle facilities. The American Association of State Highway and Transportation Officials (AASHTO) provides the classic foundation for building transportation facilities. More recently, the National Association of City Transportation Officials (NACTO) created a supplemental guide that more specifically addresses multimodal road design.

Roadway design can be defined by three realms: The Pedestrian Realm, the Mode Transition Realm, and the Travelway Realm. The Pedestrian and Mode Transition Realm may include sidewalks, driveways, transit benches/shelters, transit landing pads, lighting, landscaping, curbs, parking, and bicycle facilities. The Travelway Realm may contain vehicular lanes, transit lanes, bicycle lanes, parking, and medians. All facilities may include pavement markings and signage. All facilities must be engineered for stormwater drainage flows and properly graded slopes.

Intersections provide a unique opportunity and represent the highest potential conflict point between people driving, biking, riding transit, or walking. Intersection design (e.g. roundabouts) and traffic signals help control the flow of traffic for all modes. Crosswalks and bike boxes help provide additional safety features. The second highest point of conflict is driveways.

For new roadways, particularly in new developments, design should reflect the highest level of safety for all modes – and all modes should be anticipated to use the facility. For existing roadways, particularly in built environments, roadway design is often restricted by limited right-of-way. Right-of-way is the dedicated space for the transportation system and other utilities (e.g. underground electric and cable). When right-of-way is limited, and additional land is not available, prioritizing all modes equally is not always feasible.

Facilities for people walking are always needed. All trips, whether by bike, transit, or vehicle begin and end with us as a pedestrian. When right-of-way is limited, the size of the pedestrian facility may be the minimum, versus wider for comfort and safety. Vehicular accommodations need to take into account the projected volumes of traffic on the roadway. Bike facilities should be on every collector and arterial. When this is not feasible, it is vital that alternative routes be identified and facilities built to ensure the bicycle network allows for safe passage to the same destinations as vehicles. People biking should only share facilities with people walking when that facility is built and designated as a multi-use path. Transit facilities may use vehicular lanes, but in certain corridors, it may be desirable to have dedicated transit lanes where cars are not permitted.

Of the 286 miles of bike facilities in the City (150 miles since 2010), most of the new facilities were in locations where right-of-way was not in direct competition with other modes for space in the road. To meet the travel needs of future generations, creative solutions will be needed to provide safe and reliable mobility options by both the private and public sectors. Supplemental guides from NACTO will be of greatest assistance to the City, when addressing the unique challenges that we face as we look to tomorrow and the incredible growth this region will witness.

VISION ZERO
SAN ANTONIO
Drive safe. Bike safe. Walk safe.

What Next?

Vision Zero

San Antonio adopted the Vision Zero goal in September 2015. Vision Zero is a philosophy of road safety with the goal of eliminating traffic fatalities and serious injuries. The effectiveness of Vision Zero comes from a "safety first" collaboration among community stakeholders such as political leaders, roadway designers, police, schools, transit operations, public officials, community advocates and the general public.

Recent efforts have emphasized the City's commitment to the community through strengthened programs and implementation toward Vision Zero. The key to success in achieving Vision Zero is a combined approach using the five essential elements for a safe transportation system: Education, Encouragement, Engineering, Enforcement and Evaluation.

Planning for Another Million

In addition to the fact that we see people biking more and more on San Antonio Streets and Greenway Trails today, as we look to the future we may see more of a shift to bicycling for necessity purposes as a percentage of the overall bicycling public. There are many reasons for this shift that include increasing congestion for automobile travel; increased desire for an active lifestyle to improve health outcomes; and changing demographic preferences for travel options. To accommodate this shift toward a desire for bicycling as viable option in everyday living, it's becoming increasingly important to ensure that public roadways allow for safe travel by bicycle as well as vehicular traffic.

San Antonio is a unique case study in bicycle planning in that the central business district is not the primary destination of those who travel throughout the city. Instead of a tradition central hub system, San Antonio has thirteen different activity centers throughout the city. As a result, bicycle network planning is two-fold: macro (city-wide) and micro (activity centers). This two-fold approach looks at the network holistically, focusing not only on bridging the gaps within the overall system but also on connecting neighborhoods to activity centers, as a way to increase bicycle ridership.

Importance of Public Outreach

In addition to the technical expertise of engineers and planners, the public will need to be engaged in this dialogue of trade-offs, challenges, and opportunities to meet current and long-term needs. While SA Tomorrow outreach has been successful, the bicycle survey and bicycle maps placed in area bike shops proved that the community is concerned with bicycling and wants to remain involved in the planning process. Moving forward, these groups will be key partners to collaborate with when choosing and designing new bicycle projects. In strengthening these community relationships, the bicycle network will reflect the needs and desires of those that use it. By getting people involved in the planning process, from start to finish, we ensure a network that not only functions as it needs to, but encourages and inspires more people to use the network in a way they never thought possible. The active involvement of community members who use the transportation system will also garner more attention from both elected officials and City staff.

Moving Forward - Elements of the Plan

The following four elements collectively support and work toward achieving the 2011 Bicycle Master Plan's overarching goals and Vision Zero:

1. Bicycle Facilities Network;
2. Network Support Facilities;
3. Program Recommendations; and
4. Implementation.

The specific goals and objectives of these elements support the overall vision and goals of Bike Plan 2016 of increasing bicycle ridership, improving the bicycle network, and maintaining safety among all bicyclists.

1. Bicycle Facilities Network

This element focuses on enhancing and maintaining a comprehensive bicycle system that serves all residents and visitors of the San Antonio-Bexar County region, regardless of age or ability. The bicycle network focuses on providing bicycle mobility within neighborhoods and destination areas and connectivity between destinations.

GOAL: Continue the development of a comprehensive network of on- and off-street bicycle facilities.

Objectives

1. Address key barriers in the bicycle network
2. Identify gaps in the bicycle network and prioritize key connections.
3. Improve bicycle facility maintenance practices.
4. Address and resolve the issues with parking in bicycle lanes
5. Connect the on-street network with off-street trails and paths to create a comprehensive bicycle network.
6. Prioritize protected bike facilities by quadrupling the lane miles of separated bicycle facilities.

2. Network Support Facilities

A comprehensive bicycle network is made up of more than just bicycle facilities on which to ride. The network also includes end-of-trip facilities such as bicycle parking and shower/changing facilities. Without the necessary end-of-trip facilities, bicycling will not be a feasible mode of transportation, no matter how many miles of facilities exist. Furthermore, facilitating the transition between on- and off-street networks and complementing bicycle trips with mass transit are other elements that help make bicycling more feasible and the bicycle network more usable.

GOAL: Develop a system of integrated support facilities that improve the usability of the bicycle network.

Objectives:

1. Provide a comprehensive wayfinding system to facilitate network navigation by bicyclists
2. Provide end-trip facilities that support bicycling
3. Prioritize the growth and expansion of San Antonio B-Cycle Bike Share
4. Improve intersections for safe accommodation for bicyclists
5. Integrate bicycling with the mass transit network

3. Bicycle Programs

A safe and well-connected bicycle network alone cannot significantly increase bicycling. Bicycle facilities don't make people better cyclists or make motorists understand how to drive around bicyclists. Education and encouragement are crucial elements to increasing bicycling while maintaining a safe environment to do so. We must equip all road users with the knowledge and skills of sharing the road if we are to expect bicyclists and motor vehicles to do so. Bicyclists, both inexperienced and experienced, and motorists alike must be educated of the rights, rules, and responsibilities of bicyclists in order to safely operate their bicycles. Promoting expansion of bicycle education in schools is encouraged.

Youth who learn to ride safely are more likely to embrace cycling as they mature. Like education, encouragement and promotion of bicycling are important elements of getting San Antonians on bicycles. Promotion is another form of education that informs of the benefits of bicycling. While similar to education, promotion focuses on attracting people to riding. Promotional programs should not only be for the general public, but also target certain populations and audiences of San Antonio, such as recreational cyclists, youth, or new bicyclists to give a few examples. Consistent enforcement of the rules for bicyclists and motorists as they pertain to bicyclists is a critical component of creating a safe and bicycle-friendly environment. This element focuses on enforcement efforts of

those laws in a consistent fashion, and ensuring that law enforcement officers are properly trained in bicycle laws. This component will overlap significantly with the education component and efforts to educate bicyclists and motorists of those laws.

GOAL: Provide educational, encouragement, and enforcement programs that support bicycling in San Antonio.

Objectives:

1. EDUCATE all road users of all ages and abilities of their rules, rights, and responsibilities.
2. ENCOURAGE bicycling as a form of transportation and exercise.
3. Consistently ENFORCE bicycle and motorist laws of the road.

4. Implementation

Funding and staffing are the key elements of implementation. This includes not only identifying and prioritizing dedicated funding and appointing staff persons; it also includes ongoing cooperation within and among City departments, other public agencies, and bicycle stakeholders to leverage resources that will strengthen implementation efforts. Furthermore, monitoring progress of implementation will help San Antonio periodically assess progress, identify new opportunities, and re-evaluate priorities and goals.

GOAL: Dedicate funding, political commitment, and partnerships to implement the facilities and programs in this plan.

Objectives:

1. Increase funding in appropriate areas of the City to implement the goals and objectives of Bike Plan 2011.
2. Institutionalize bicycle planning through new or revised policies, code amendments, operating procedures, and citizen advisory committees.
3. Engage and coordinate with other departments, agencies, and organizations to leverage resources and strengthen implementation efforts.
4. Periodically monitor implementation progress and update the bicycle master plan on a regular basis.

Educating drivers and bicyclists will improve safety

Bike Facilities Network

Objectives

1. Address key barriers in the bicycle network

In order to meet the needs of the bicycling community, we must continue to identify infrastructural barriers that prevent people from either choosing to ride or make it difficult to complete their trips by bicycle. Barriers include highway intersections (underpasses), train tracks, bridges, and floodplains. In identifying these challenges and taking into consideration the surrounding land use and existing bike facilities, we can design and implement facilities that address the specific challenges bicyclists face when traveling the network.

2. Identify gaps in the bicycle network and prioritize key connections.

Looking at a map, it is easy to see where bike facilities start, end, and where they don't connect. However, getting your feet on the ground paints a different picture of how we can close the gaps in the network. The bicycle network doesn't exist solely from 30,000 feet. Rather, a comprehensive network exists because neighborhood connections are identified and prioritized. A strong and functional network relies on connecting people to where they want to go. In order to build a network that does not discriminate against any of its users, we have to simultaneously look at the network from high above, as well as at the neighborhood level.

3. Improve bicycle facility maintenance practices.

A bicycle network will only be used if it feels safe to use. One barrier to ridership is the notion of maintenance. While debris in the road may not deter or interrupt vehicle travel, debris in the bike lane can have significant implications to those riding a bike. Ensuring regular maintenance of facilities, in terms of debris and pavement marking conditions, is important to keeping the network useful.

Currently, pavement markings are enhanced through the City's Infrastructure Management Program, though the schedule is limited and unpredictable. Street sweeping occurs every 6 months on residential streets and every 3 months on arterials and collectors. However, this is not consistent enough to keep bike facilities safe and fully functioning. Using funds to purchase and operate bike lane-specific street sweepers will address the challenges of debris.

4. Address and resolve the issues with parking in bicycle lanes

Perhaps one of the greatest barriers to a functional bike network is the conflict between bicycles and parking. Just as debris in bike facilities poses a threat to the safety of bicyclists, so do vehicles parked in the bicycle lane. While existing city ordinances address this issue in a balanced manner, enforcement is still lacking, making this a continued safety concern. Approaches thus far have included signage restrictions with bicycle infrastructure projects

and city ordinances. However, there are still several different approaches to be considered when addressing this issue. These include priced parking structures and permit programs in local neighborhoods and business districts that experience high levels of on-street, curbside parking. This will be a continued conversation with all stakeholders, as approaches thus far have not made significant progress in addressing the challenges for both parties.

5. Connect the on-street network with off-street trails and paths to create a comprehensive bicycle network.

The Greenway Trail system has been so wildly successful that connecting on-street facilities to off-street trails ensures public support for street projects. It also encourages more commutes by bicycle when people are able to use a variety of facilities that meet their comfort levels and needs.

6. Prioritize protected bike facilities.

As the network grows, we will need to accommodate all bicyclists, regardless of age and ability. Protected bike facilities have proven to increase ridership, while also improving safety for all users on the roadway. San Antonio is fortunate to have protected bike facilities that connect important and popular destinations. These facilities include the Avenue B protected lane (running parallel to Broadway from Newell Street to Mulberry Avenue), the Arsenal contraflow bike lane (S. Flores to Washington St), and the South Flores St. cycle track (Cesar Chavez to El Paso). While each of these facilities exhibit different designs, they have all seen an increase in use by a variety of bicyclists. These facilities reinforce the need for more protected bike lanes throughout San Antonio.

Network Support Facilities

Objectives

1. Provide a consistent and comprehensive wayfinding system with community input to facilitate network navigation by bicyclists

Wayfinding systems provide guidance of the network for users, while also providing visibility for those who may not be traveling by bike. Wayfinding supports travel to destinations and makes navigation easier, especially if someone is not familiar with the network. This system not only includes points of interest, but also educates users on the types of facilities they are using. Wayfinding also provides an opportunity to promote bike share programs by indicating the location of stations. It is important that wayfinding is developed with community input to identify important historic and cultural landmarks within their community.

Amenities like bike parking support bicycling

Bike Parking Area Along S. Alamo St.

2. Provide end-trip facilities that support bicycling

A bicycle network is not complete without amenities that make choosing bicycling easier. In order to enhance the network, amenities need to be available and secure at key destinations. Work with the community to identify potential locations within public facilities or private developments. Amenities to support bicycling include bike parking, bike stations, showers, and public work stands to address bike maintenance issues. These amenities make it more likely for people to consider a bike for errands, their commute, or riding to meet friends at a local restaurant.

3. Prioritize the growth and expansion of San Antonio B-Cycle Bike Share

San Antonio B-Cycle has experienced great success since its inception in 2011, but it has significant potential to impact the transportation network. Bike share addresses the last-mile problem with regards to transit use. In the context of San Antonio, it can enhance the tourism industry and contribute to smoother mobility within and around the downtown area, as well as other large commercial activity areas, such as Southtown and the Pearl.

4. Improve intersections for safe accommodation for bicyclists

Not all travel is direct and we will inevitably come into contact with people moving in different directions from us. To keep the system smoothly operating for everyone, we have to address all aspects of the network. Intersection improvements allow us to implement features that make traveling by bicycle more safe and smoother. Improvements can include bicycle boxes, which assist in traveling through an intersection safely and enhance the visibility of bicyclists. Bicycle traffic signals also increase safety by giving bicyclists the opportunity to clear an intersection before vehicles, making travel safer. As bicycling grows in the region, there will be increased opportunities to prioritize and implement protected intersections at high-volume areas.

5. Integrate bicycling with the mass transit network

By providing bicycle parking at transit stations and bicycle racks on buses, we're able to encourage multi-modal travel and increased transit use. For those that rely on transit as a primary mode of transportation, bicycling allows them to access the transit network easier and faster than walking. Safe & secure bike parking is necessary at transit stations, in the event that bicycle racks are at full capacity. Even if someone doesn't rely on transit and instead makes the choice to use public transit, bicycling solves the last-mile challenge of a transit commute.

6. Emphasize deployment and monitoring of bicycle counters.

In order to grow the network, performance measures need to be established and tracked. Quantitative data lends support to continued funding and future investments in the system. While our bicycle counting program is small right now, it has proven useful in highlighting the popularity of the bicycle facilities that have been implemented so far. As the network continues to grow, this program will be useful in indicating where we should put future facilities, as well as prioritizing funding for projects.

Bicycle Programs

Objectives

1. EDUCATE all road users of all ages and abilities of their rules, rights, and responsibilities.

Education of facilities, rights, and responsibilities is crucial to ensuring the safe travel by all users across the network. Vision Zero, the concept that all traffic injuries and fatalities are preventable, is being implemented by the City and employs the 5 E's – Engineering, Enforcement, Education, Encouragement, and Evaluation. One of the most important E's is Education and has so far been the biggest focus in implementing Vision Zero and eliminating traffic fatalities on the City's roadways. Through outreach programs and participating in local events, Vision Zero is able to remind people that everyone in our community matters and it is up to each of us to do our part to ensure the safety of others.

2. ENCOURAGE bicycling as a form of transportation and exercise.

Bicycling offers a multitude of benefits, be it economic, environmental, or personal health. Continued partnerships with San Antonio Metropolitan Health Department (MetroHealth), San Antonio Housing Authority (SAHA), and many other agencies and organizations will be key in encouraging bicycling as a way to improve quality of life for all San Antonians.

3. Consistently ENFORCE bicycle and motorist laws of the road.

In relation to Vision Zero, enforcement will still play an important role in ensuring the usability of the bicycle network, but will follow education and encouragement in strategy priority. Continued partnerships with local law enforcement will assist in keeping users safe and respecting all users of the road, regardless of chosen mode.

Implementation Strategies

Objectives

1. Increase funding in appropriate areas of the City to implement the goals and objectives of Bike Plan 2011.

Funding is always a challenge, but no matter how well we leverage our existing resources, increased funding will allow us to address the greatest needs and challenges. Steady increases in funding will allow consistent implementation of facilities and amenities.

2. Institutionalize bicycle planning through new or revised policies, code amendments, operating procedures, and citizen advisory committees.

Because bicycling has grown in San Antonio over the last five years, it has allowed for much progress to be made in terms of solidifying bicycling as a legitimate mode of transportation and recreation. Since 2010, the City has passed several ordinances that address safety and the inclusion of bicycle facilities in all major capital

projects. The Safe Passing Ordinance has drawn attention to the existence and vulnerability of bicyclists on the roadway, while the Complete Streets Ordinance has led to increased opportunities for facility implementation. The Unified Development Code was recently amended to strengthen the requirement of bicycle facilities in development projects by the private sector.

From a community standpoint, bicycling visibility has increased through the Bicycle Mobility Advisory Committee (BMAC) at the AAMPO. The rise in bicycling has also given rise to a considerable number of advocacy and social groups throughout the regions. Many of these groups focus on providing education on safety, bicycle mechanics, and social aspects of the bicycling community. Through events and group rides, these groups reinforce the social fabric of the bicycling community and the importance to support this particular community in meeting its many needs.

3. departments, agencies, and organizations to leverage resources and strengthen implementation efforts.

Taking advantage of the resources we have means collaborating with a variety of internal departments, as well as external agencies. Previous partnerships have proven successful in implementing infrastructure and amenities and future collaborations will allow us to continue the growth and expansion of the network. Key partners include the City's Office of Sustainability, Development Services Department, and Parks & Recreation. Outside of the city, we've formed strong partnerships with the San Antonio River Authority (SARA), the Alamo Area Metropolitan Planning Organization (AAMPO) and the Texas Department of Transportation (TxDOT).

However, there is always room to improve and seek coordination with the other municipalities in the region. These municipalities include Alamo Heights, Terrell Hills, Olmos Park, Leon Valley, Castle Hills, Balcones Heights, Shavano Park, Kirby, Hollywood Park, and Hill Country Village. Whether it is bicycle infrastructure or other modes, collaborations with neighboring cities will be crucial to ensuring a connected and complete transportation network.

4. Periodically monitor implementation progress and update the bicycle master plan on a regular basis.

Are we moving in the right direction? Are we meeting our goals? If not, what should we be doing instead? These are all important questions that rely on qualitative and quantitative data to determine if we are making the use of our resources and meeting the needs of the community. What may work today, may not work 5 years from now. It's important to constantly ask what we could be doing better.

5-Year Action Agenda

There are several opportunities in the short-term to address the above objectives. Many of them prioritize expanding the bicycle network, though each opportunity lends itself to implementing network facilities and supporting the continued growth of the region. These opportunities include the Infrastructure Management Program (IMP), Bond packages, the Advanced Transportation District (ATD), and continued partnerships with departments within the City and agencies outside of the City's purview.

Through the City's Infrastructure Management Program (IMP), several infrastructure maintenance issues are addressed. Aside from sidewalks and street rehabilitation, the IMP is the most consistent outlet for implementing bicycle facilities. Thanks to annual funds from the General Fund and the Advanced Transportation District (ATD), the city has allocated funds annually, specifically to building bicycle infrastructure. Bicycle IMP projects include several multi-use paths, shared routes, bike lanes, and protected bike lanes. Project lists are submitted in 5-year windows, so as one year is completed, another year's worth of projects are being identified and selected. This annual review of projects allows us to assess projects that will best meet the most immediate needs of the bike network.

Due to limited funds and restrictions on the use of these funds, the City leverages other IMP outlets to install bike facilities. Street rehabilitation ensures a clean, blank slate for us to restripe the roadway to include bicycle lanes. Pavement marking rehabilitation gives us an opportunity to re-enhance older bike lane markings, as well as restripe for new lanes. However, the ability to leverage this outlet is largely dependent on the existing conditions of the road pavement. Intersection improvements give us an opportunity to introduce bike boxes, bicycle traffic signaling, and other amenities that ensure bicyclist safety, visibility, and mobility at intersections.

The City identifies and initiates a Bond package on five-year cycles. Focusing on major capital improvement projects, these projects range from improving community facilities to addressing storm water drainage needs. The Bond is most known for the inclusion of roadway projects and those that increase capacity. In moving towards a multimodal transportation system, all Bond projects must consider bicycle and pedestrian facilities, per the City's Complete Streets ordinance (passed in 2011). Balancing both the needs of today with the needs of the community in 2040, we seek the best possible bicycle facility for that particular roadway and surrounding area. These high dollar projects give us the best opportunity to implement "gold star" projects that will show the community what a street can look like and the positive impacts bicycle facilities can bring to a neighborhood.

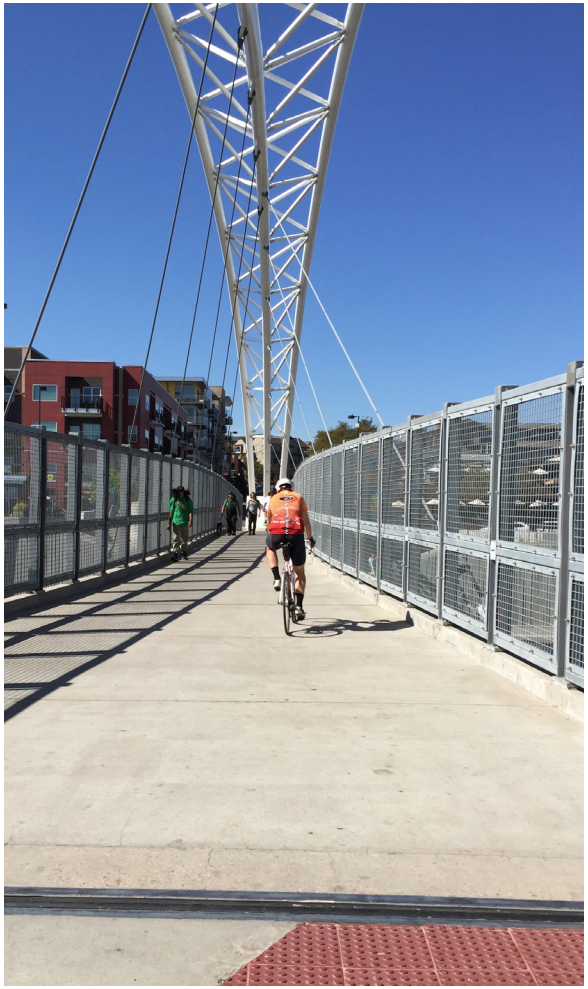
Because of the various needs of the bicycle network, every Bond program is an opportunity to address these needs.

Advanced riders are comfortable in traffic

Through the Bond, we are able to include bicycle facilities in street projects and network amenities in facility projects, such as ensuring bicycle parking at libraries, parks, and community centers. As the momentum for bicycle facilities continues to grow, the Bond will still be the strongest outlet to implement amenities such as bike stations and showers and other amenities that encourage bicycling for utilitarian reasons.

The Advanced Transportation District allocates funding for bicycle infrastructure projects and bicycle programming. Aside from infrastructure, we have the opportunity to dedicate funding to enhance the bicycle counting program, through our programming funds. This program is still in its early phases but has already proven to be successful in demonstrating the positive impacts of bicycling infrastructure. Count programs will provide quantitative data to support performance measures of facility use. By tracking performance progress, there is a stronger argument for increased funding for bicycle infrastructure projects. Another opportunity for network enhancement includes allocating funds to expand the bicycle parking and corral program, a program that has been in place since 2013 and works with local businesses to provide bicycle parking for customers and visitors.

Continued partnerships with other City departments and external agencies are key to enhancing the bicycle network. Departments such as Parks & Recreations and Development Services give us the opportunity to implement facilities through other funding outlets, both public and private. These partnerships also cultivate a sense of teamwork in ensuring a comprehensive bike network to include connections to greenway trail and creeks



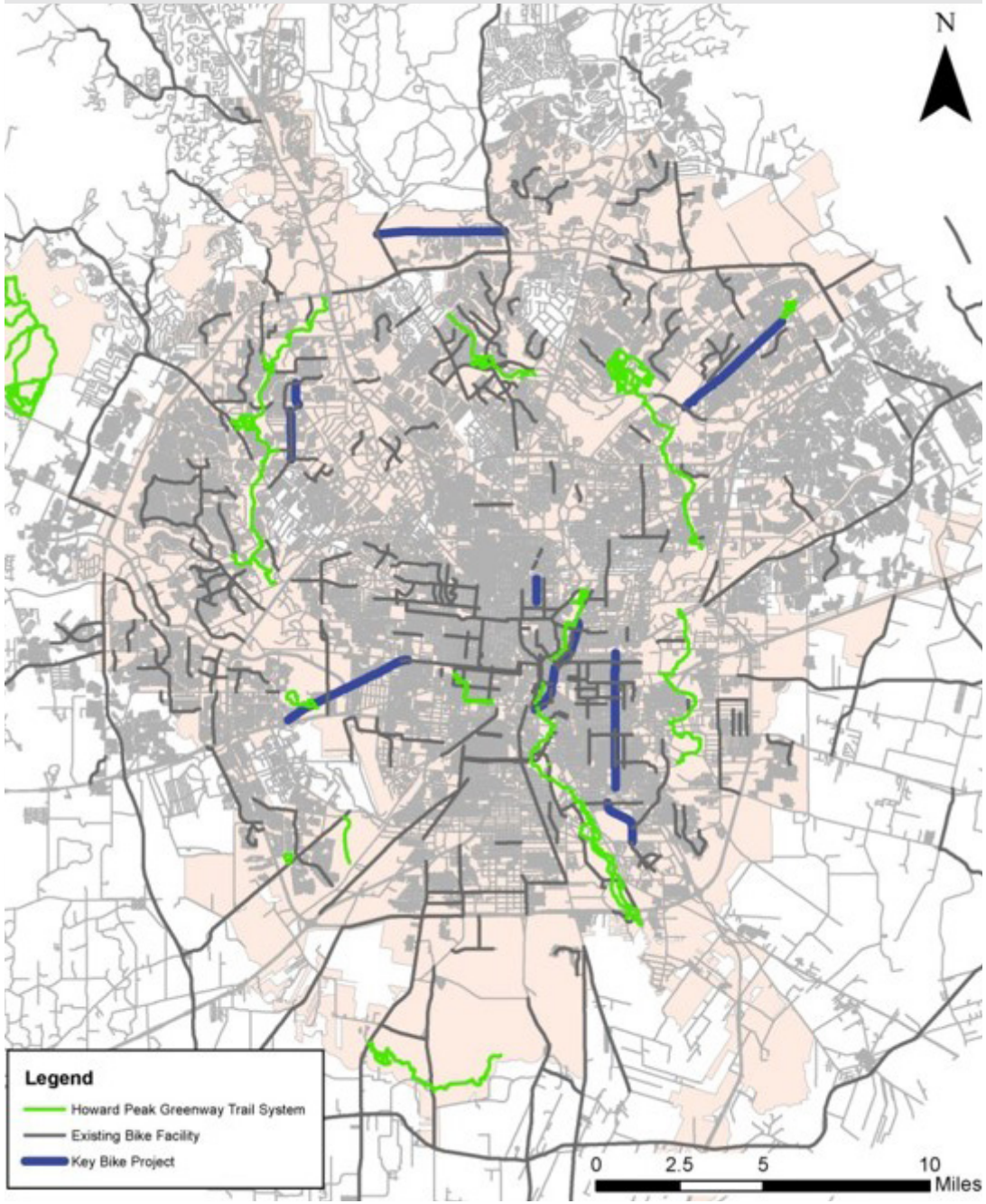
projects. These projects have positively contributed to an increased interest in bicycling throughout the city.

Safety is always a priority, one that remains strong through the implementation and commitment to Vision Zero. Continued education and outreach to the community will be crucial in encouraging people to ride, as well as a means to institutionalizing bicycling as a legitimate mode of transportation. Because bicycling is for all ages and abilities, so too is the community engagement and outreach to people of all ages and walks of life.

As bicycling has increased, it has become apparent that support facilities must also be prioritized. If there's not a place to safely park your bike or make basic repairs when out riding, people are less likely to ride. Emphasis on implementing bicycle amenities will encourage more people to ride and will lend more visibility to the fact that more people are choosing to bicycle every day.

Through these various outlets and taking into consideration the limitations faced, we've identified a number of key projects to implement in the short-term (see Figure 14). These projects that will not only address the various needs of the bicycle community but will also close several gaps in the bike network. These projects will give us the opportunity to show the community how a street can be reimagined and redesigned into a road for all modes. These projects have been identified through Bond consideration, Bike IMP, and SA Tomorrow. While some funding is guaranteed, other projects may require additional funding through outside parties, such as state and federal agencies.

Figure 14: 5 Year Action Plan Bike Projects



Key Projects

- Abe Lincoln: Eckhert – Horn Boulevard/Spring Time Street
- Alamo Street: Alamo Plaza – Blue Star Arts Complex
- Alamo Street: Houston Street – Cunningham/ Broadway
- Babcock: Spring Time – Horn Boulevard
- East-West Bike Trail
- Enrique Barrera Parkway: US Hwy 90 – Commerce Street
- Gevers Street: Sherman Street – Southcross Boulevard
- Howard Street: Mulberry Avenue to Hildebrand Avenue
- New Braunfels Avenue: Hot Wells – SW Military Drive
- Nacogdoches: Wurzbach Parkway – Judson Road

B-Cycle Station

The City has also identified several targets that address several aspects of the bicycle network that should be achieved. These are outlined below but are subject to being altered based on success of other programs and available funding at any given time. No timelines for completion have been established at the current time.

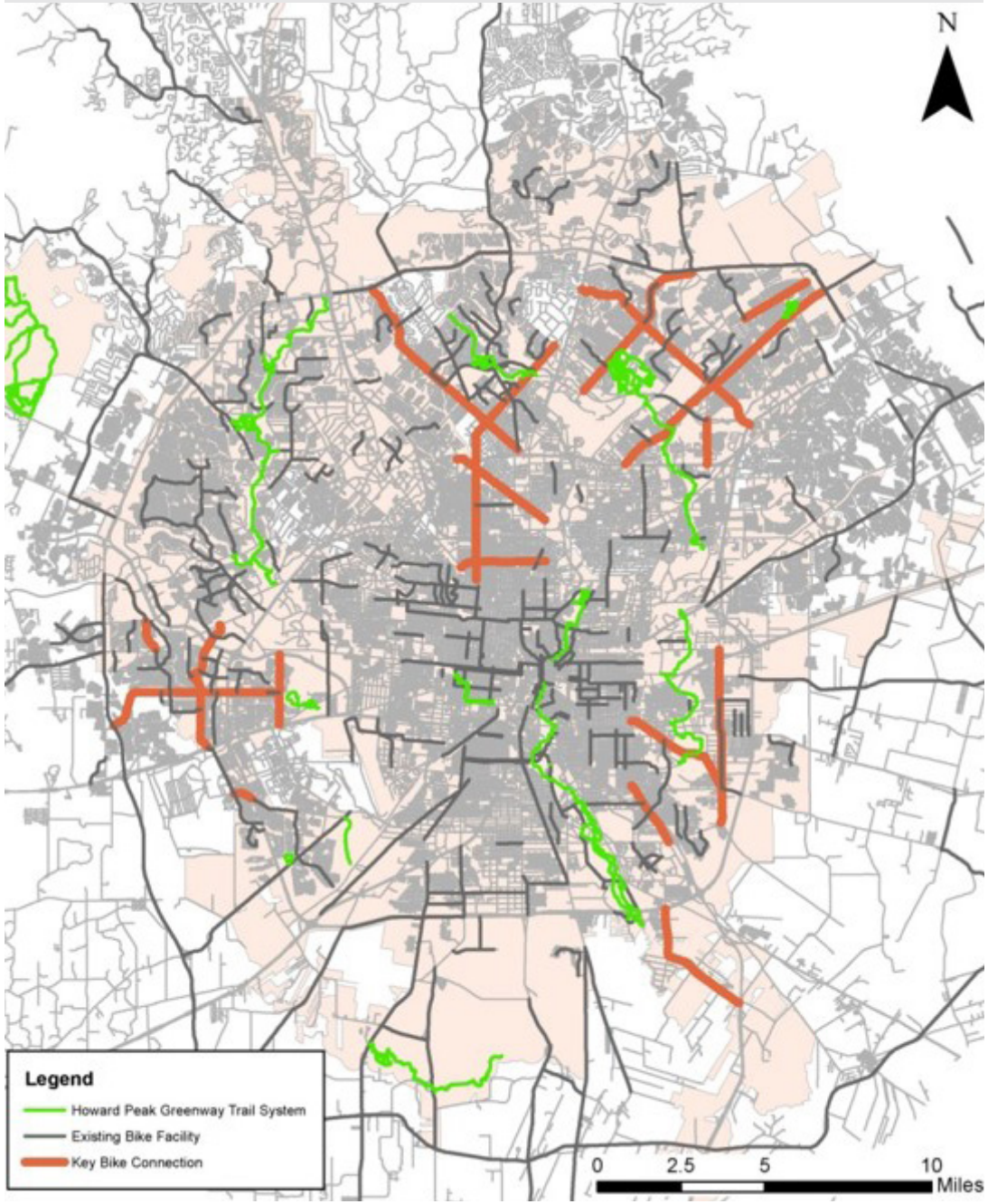
Targets

- Transform the B-Cycle bike-share system into a substantive transportation option with 100 stations and 1,000 bicycles.
- Allocate 2% of the TCI capital budget each year as a core program for pedestrian and bicycle improvements.
- Quadruple the lane miles of separated and protected bicycle facilities.
- Formally adopt bike boxes for bicyclist safety at top 30 critical intersections that have bicycle lanes.
- Repurpose on-street parking spaces for bicycle parking in at least 25 key locations.
- Exploring utility easements for additional off-road mountain biking trails
- Identify public-private partnerships and opportunities for protected facilities & facility amenities

25-Year Long-Range Agenda

In the long-term, bicycle planning will continue to evolve as infrastructure and amenities are implemented and bicycling grows. Below and in Figure 15, are identified key connections that, when implemented, will provide mobility and accessibility across the region. These connections are not intended to be projects implemented at once, but in a piece meal manner as funding becomes available. Through the continuation of the City's Bond packages and the enforcement of the Complete Streets ordinance, these connections will encourage more bicycling as well as increased transit ridership.

Figure 15: Key Bike Connections - 25 Year Goal



Key Connections

- Ellison Dr.: Military Dr – Potranco
- Ingram Rd: Potranco – Hunt Ln.
- Jackson Keller: Vance Jackson – McCullough Ave.
- Lockhill Selma: Blanco Rd. – N Loop 1604
- Roland Ave.: WW White – J Street
- WW White: Gembler – SE Military Dr.
- Goliad Rd: Southcross – SE Military Dr.
- Medina Base Rd.: Loop 410 – Ray Ellison
- Nacogdoches: Loop 410 – Loop 1604
- Perrin Beitel: Loop 410 – Wurzbach Pkwy
- Thousand Oaks: SH281 – IH35
- Jones Maltsberger: Wurzbach Pkwy – Loop 1604
- Stahl Rd: O'Connor – Green Mountain Rd.
- West Ave.: Fredericksburg Rd – Bitters Rd.
- Hunt Ln: Ingram Rd – Hwy 90
- Marbach: Loop 1604 – Pinn Rd.
- Pinn Rd: SH151 – Hwy 90
- Southton Rd: Loop 410 – IH37
- Fresno St: Fredericksburg Rd – McCullough Ave.

WHAT CAN WE DO?

WHAT CAN WE DO? - TRANSIT

Public transportation provides not only an alternative to the private automobile, but a critical transportation service to the region. Transit is essential to attracting jobs to the region as it is to providing the transit dependent population with access to employment, medical or education services. In the future, as the region grows by another one million residents and congestion increases, these services will become even more critical to maintaining an effective transportation system.

Transit Element – In Coordination with VIA's Vision 2040 Plan

VIA Metropolitan Transit Authority

VIA Metropolitan Transit Authority (VIA) has provided public transportation in the San Antonio area since March 1978. VIA currently operates 90 transit routes, with 7,080 bus stops and serves approximately 140,000 riders per day and over 44 million riders annually. VIA's services include frequent, metro, express, skip, VIVA, VIATrans, and Vanpool. VIA's first bus rapid transit (BRT) line, VIA Primo, which began operation in December 2012, circulates through downtown, then continues northwest along Fredericksburg Road to the South Texas Medical Center, with extended service to UTSA and Leon Valley. VIA Primo, operating in mixed traffic, carries over 6,000 riders per day, and has increased use by 15% since it began operation. VIA also currently operates eight park & rides, ranging from 30 to 500 parking spaces, and five transit centers, primarily serving to facilitate transfers between transit lines. Almost 20% of VIA's daily boardings occur in the downtown area, 60% of which are originating from or destined for that employment center. VIA is implementing two transit centers at the west and east ends of downtown to provide an improved rider experience for the remaining 40% of downtown boardings served in that area. Centro Plaza (formerly Westside Multimodal Transit Center) serves about 64 buses per hour in the peak, and Robert Thompson Transit Center is currently in project development, expected to open in the 2017-2018 timeframe.

VIATrans service provides paratransit service for residents with disabilities who are unable to use the fixed-route system. This service provides approximately 1 million rides annually, using a fleet of 230 paratransit vans. VIA also offers a rideshare program called Vanpool, which allows six or more passengers the ability to commute up to 100 miles to their place of employment with trips either originating or destined for Bexar County. VIA recently initiated a new service, "The E" line which is a free downtown circulator that begins operating between the hours of 6 PM and midnight, Tuesday through Saturday, on March 28, 2015. The E service is a joint effort between CENTRO, VIA and the City of San Antonio to provide access to entertainment venues, dining and cultural sites within downtown.

VIA's bus fleet includes 450 buses, of which 30 are diesel/electric hybrids, 16 are 60 foot articulated buses fueled with compressed natural gas, and 3 are fully electric. VIA buses operate 7 days a week, from 4:00 AM to 1:00 AM.

The highest boarding and alighting locations are heavily concentrated near downtown due to the level of bus service and concentration of access to employment and other destinations found downtown. While this information, along with that found in Tables 1 and 2 can help VIA plan improvements to respond to existing needs, transit services can be considered to offer more diverse choices to meet other major travel demands throughout the region. This has been studied in more detail in the VIA's Vision 2040 Long Range Plan update.

Travel Options if No Transit Service

In the table to the right, you can see that the vast majority of residents that use VIA services walk to the bus, reinforcing the need to ensure that pedestrian improvements are prioritized in areas where there is high demand for public transit. San Antonio benefits from transit in a variety of ways from economic development to tourism in addition to providing a viable and effective travel choice for local residents.

While other means of access and egress like getting a ride, driving, or cycling are used less often, this may show an opportunity to improve bike infrastructure to better

HOW DO PEOPLE GET TO THE BUS

2014 O&D Survey	
Mode	Percentage
Walked up	94%
Got a ride	4%
Drove	1%
Rode a bike	1%

Table 1, Source: VIA

"How would you make this trip if the bus was not availabile?"

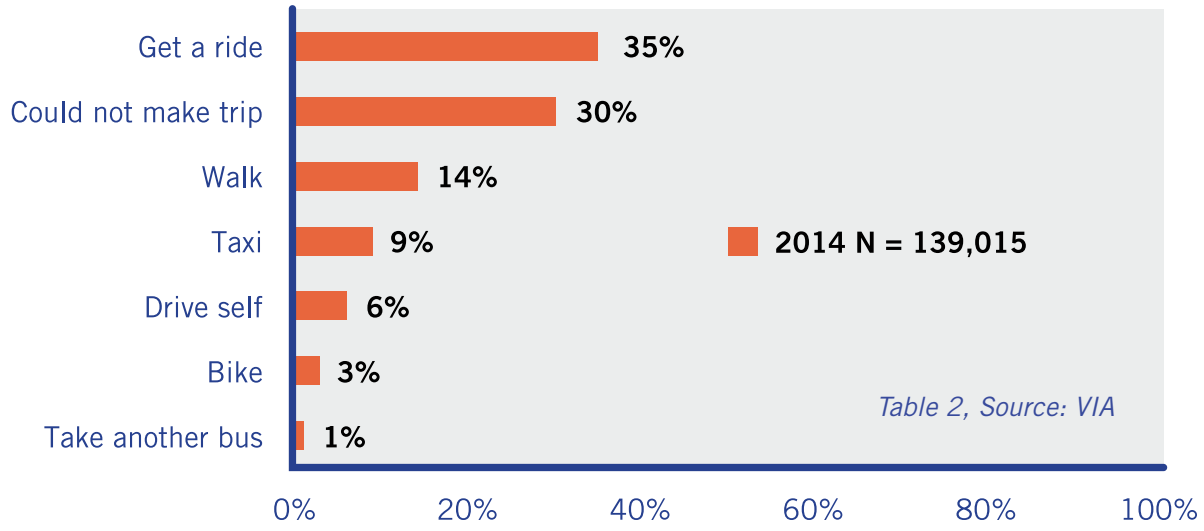


Table 2, Source: VIA

access areas where there is high transit demand, or to improve express services that cater more to the park & ride market providing access to other major employment centers outside downtown, South Texas Medical Center and the greater airport area. The bar chart on the prior page shows that many residents that rely on VIA would not have many other choices if their current service was not available to them.

VIA's capital improvement program includes current improvements in addition to Centro Plaza and Robert Thompson mentioned earlier include a transit center to be located at Brooks City Base, a comprehensive shelter program that includes the installation of 1,000 user-friendly shelters at bus stop locations across the service area with a goal to increase sheltered boarding from 50% to 95%, larger-scale improvements at existing transfer locations at Naco Pass and Five Points, Park & Ride facilities at the southwest corner of US 281 and

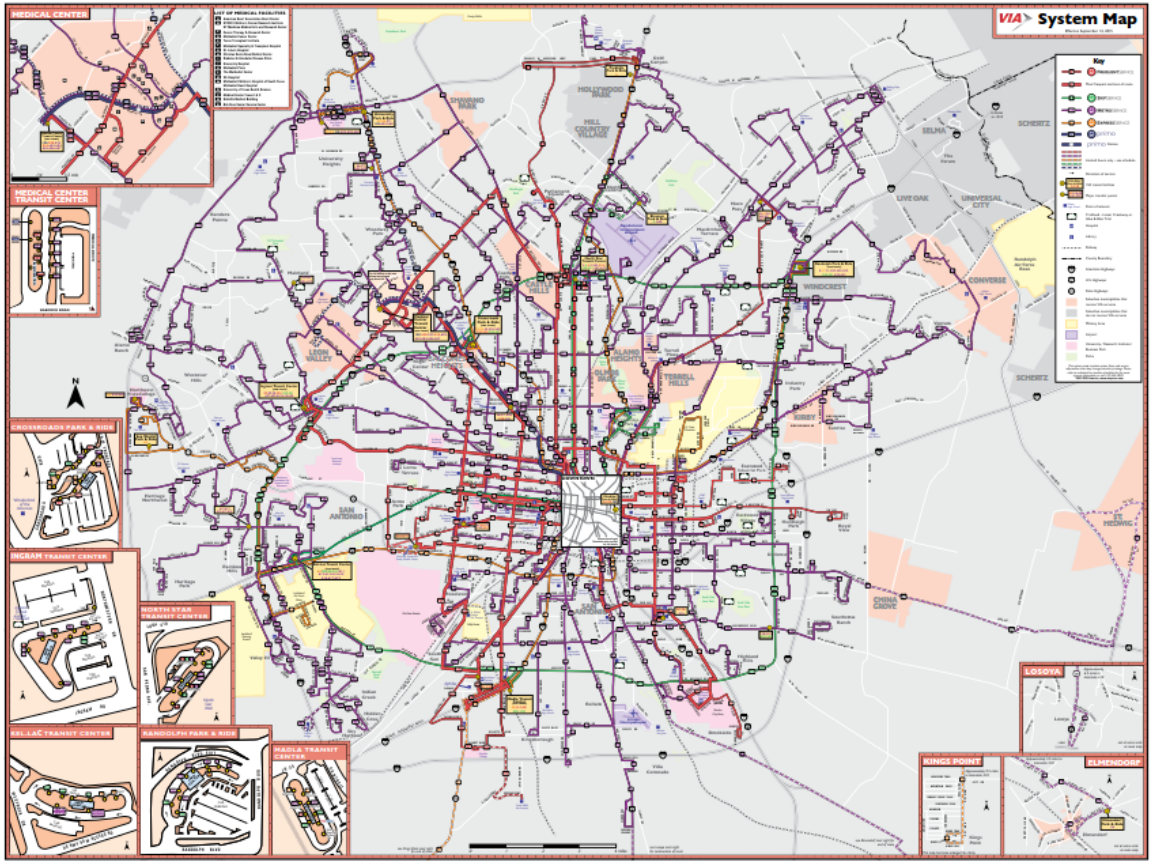


Figure 16: VIA's System Map

Stone Oak Parkway, near Rolling Oaks Mall, near the Bexar County line along I-10W, corridor mobility improvements in the I-35, I-10, and Highway 151 corridors, and new Primo services on Southwest Military Drive, Zarzamora, San Pedro, and West Commerce. Additional investments in the near-term include renovations at several existing passenger facilities and the replacement of the entire VIA bus fleet over the next five to seven years. Vision 2040 will help VIA identify opportunities for additional capital improvements that will need to be closely coordinated with the City of San Antonio and TxDOT.

Transit Element Context – VIA 2040

The transit element of the SA Tomorrow will need to address capacity, mobility and access. Many of the current key roadway configurations in the city offer limited opportunity to expand capacity because of their narrow rights-of-way within established neighborhoods. At the same time, there is an increasing need to move more people as the population of the region grows. Part of that expanding population includes more seniors, transit dependent riders, those who do not own a car, and those who prefer not to drive who will increasingly depend on transportation other than a personal vehicle. Furthermore, the destination of many residents is no longer exclusively to Downtown San Antonio, but to a growing number of regional activity centers throughout the region that demand improved transportation services as they evolve from minor collections of businesses into fully developed identifiable suburban and exurban communities.

Transit in the future will be as much about connecting the many outlying activity centers to the population base in the region and to each other as it will be about connections to downtown. This requires a broad approach to designing the transit element that relies less on radial connections into downtown and offers more direct links among the many centers in the region. The VIA visioning process is evaluating this shift in direction as they develop their long term plan. While the City's SA Tomorrow can help shape the VIA Plan as well as influence how transportation decisions are made going forward, it starts with the VIA Vision 2040 as the foundation for future transit service development.

With limited ability to widen streets in many parts of the city because of the extent of the potential impacts on adjacent properties and neighborhoods, there is a need to use the available capacity more efficiently. Such an approach is advisable under any circumstances, but essential where there are limits to modifying the roadway cross-section. More efficient use of the roadways could include enhancing the roadway environment through technology along with strategic physical corrections to improve performance in narrow corridors (e.g., widening intersections, access management, adding intelligent transportation systems (ITS) improvements, etc.). It can

also be achieved by adopting transit-supportive policies and standards that include provisions for converting general purpose travel lanes in some corridors with high capacity transit-only lanes, increased transit commuter capacity and increased transit reliability that can help carry more people in fewer vehicles. Widening intersections, ITS, etc. will marginally help move more cars along crowded roadways. A renewed emphasis on transit offers a longer term prospect of realigning how people think about and use transportation that can lead to a much more equitable and sustainable emphasis on moving people rather than vehicles.

Among the corridors evaluated in SA Tomorrow, there are some that lend themselves well to an automobile focus and others that will support a heavier emphasis on transit by virtue of the character of the land uses they serve. In all cases, because of the implications of some of the physical improvements needed, the changes will require a firm commitment to a chosen course of action. In the case of a transit-supportive plan, there will be many associated decisions about prioritizing and incentivizing land uses to encourage increased density in locations where people begin and end their trips and allocating funding that will be needed to make the plan work. These decisions will be as much about the way land use and transportation work together as they will be about the physical infrastructure required to deploy the services contemplated. With the proper City policies in place and close coordination with VIA, the transit program can contribute significantly to accommodating the demand of the anticipated growth in the region, while doing so more sustainably.

Transit Element Concept

The transit program can be adapted to any circumstance. VIA has a successful system and provides extensive service on 90 routes throughout the region. As VIA seeks to refine its network and assess opportunities for more robust service in corridors that carry high demand, the City will be asked to support decisions about aspects of the plan that require local agency action. The range of choices for transit service can vary from adding new services to increasing service frequency where it is warranted to create a transit-intensive network that can operate in parallel with other transportation modes and provide a comprehensive alternative to other travel choices.

Current VIA plans call for adding Primo routes, similar to the service operated now on Fredericksburg Road, on Zarzamora Street and SW Military Drive in 2018. These will operate largely as limited stop services augmented by a more extensive deployment of transit signal priority treatments to expedite transit operations where possible. Beyond that, based on the VIA Vision 2040 Long Range Plan that is currently being developed, there will be more high capacity corridors introduced over time. Some of those include not

only basic Primo services, but Primo Plus service which includes dedicated transit lanes suitable for bus rapid transit (BRT) and light rail transit (LRT). While these measures can provide an improved level of service in those corridors, to a significant extent the VIA Plan is dependent on the configuration of the roadways it uses and by what the City is willing and able to implement in support of transit.

SA Tomorrow takes a very long range view of the transportation system, but also identifies opportunities for short term improvements to critical corridors that will help all users regardless of mode. The transit element in SA Tomorrow provides a long range menu of future-oriented concepts that are designed to stimulate thinking about how to handle transportation issues as comprehensively as possible in the future. Some of the options require a major investment and others have associated effects on their locations, but benefits outweigh challenges when taking a broad view of the long term plan.

More traditional concepts in the corridors also vary from BRT to LRT complemented by pedestrian and bicycle network improvements to facilitate the use of alternative modes. Many of these options require use of parallel or perpendicular links in the network because of limitations in the primary corridor, but are designed to provide an improved level of access while continuing to accommodate all travel.

Premium Transit

Most are VIA routes are local buses that travel their designated route from stop to stop as riders request service. VIA also operates six express bus routes from outlying areas into the downtown. More recently, VIA has introduced the VIA Primo service which is a premium travel mode that uses modern rubber-tired, high capacity vehicles; improved fare collection systems, and traffic management devices to move riders more efficiently. Boarding takes place at "stations" rather than bus stops. The purpose of this premium transit service is to get riders to their destinations faster and more reliably. The emphasis on premium transit service is designed to address capacity limitations in the system and the ability to more effectively serve as an alternative to the private vehicle. This latter point, the ability of the new or improved transit service to entice riders who would otherwise drive as well as transit-dependent riders, is a critical part of coordinating transit long range planning within SA Tomorrow. This is where the public transit can have the greatest influence on how effectively the transportation system functions and can help mitigate long term transportation challenges.

Much of the transit program in the SA Tomorrow focuses on where high capacity transit options make the most sense. Working with VIA, the SA Tomorrow transit element makes recommendations for how San Antonio can help move travelers' perceptions of their travel needs beyond relying exclusively on a car to make a trip.

The more efficient the transit system and the more convenient and comfortable the service, the more likely people will be to opt for public transportation.

VIA recognizes the local bus network is the backbone of the public transportation program and must be the foundation of the overall system. However, VIA Vision 2040, currently under development, shows a growing orientation toward introducing services that are likely to generate higher ridership in critical corridors. Over the next 25 years, the existing 18 miles of premium transit services could grow to over 200 miles. That includes not only service into the downtown, but also services that will move riders more directly between outlying activity centers such as the Medical Center and UTSA or Fort Sam Houston and Brooks City Base.

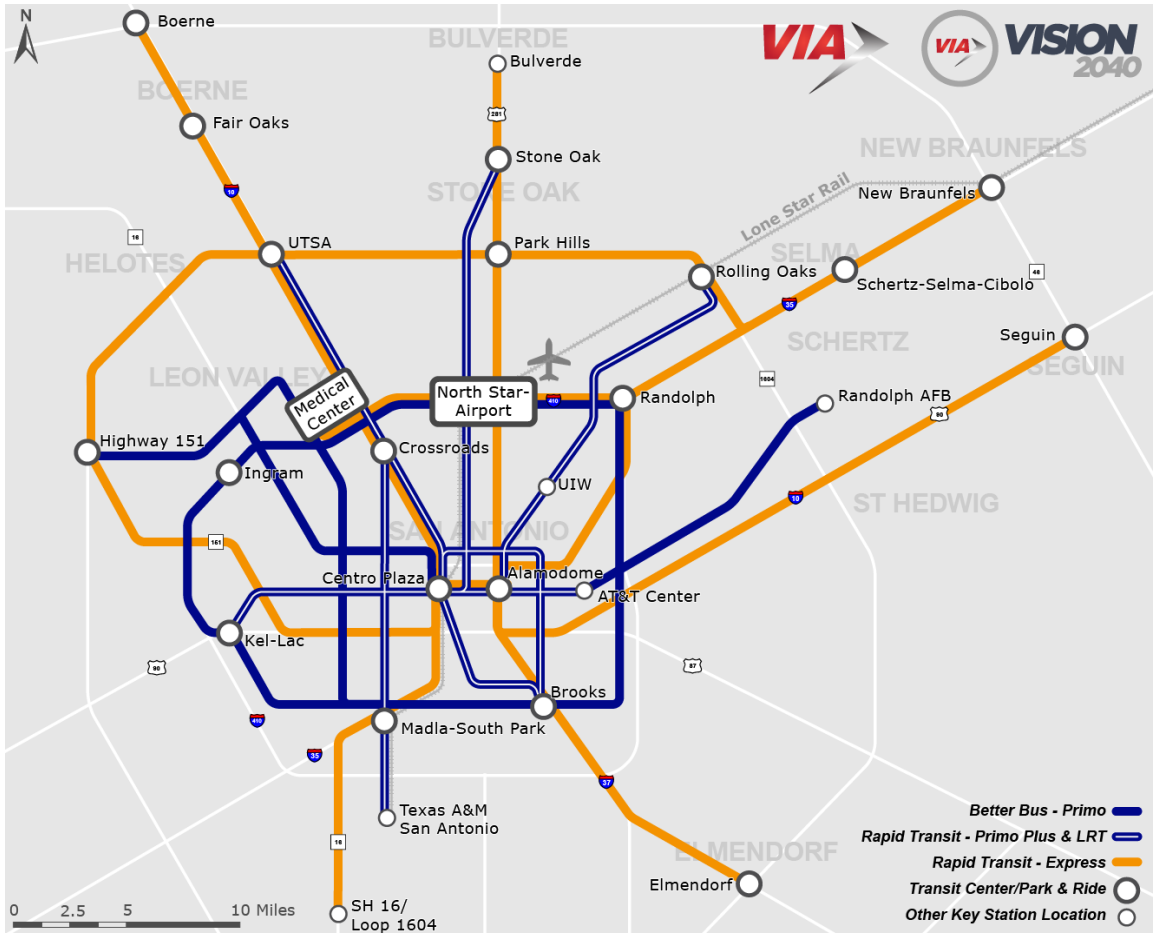
These new connections provide more efficient travel for all users in the corridors they serve, but a primary intent is to draw riders to transit in the interest of reducing cars on streets and managing congestion.

Within the timeline of the Vision 2040, forecasts of ridership suggest that some of the premium services could be BRT in dedicated lanes or LRT. Because at truly higher capacity levels of these modal options (i.e., dedicated BRT and LRT) require substantial advance planning, identification of routes and operating plans must occur far in advance of the actual deployment of the service. By identifying the key decisions and a timeline for their consideration, the SA Tomorrow can support the VIA Long Range Plan by offering a foundation upon which to build a comprehensive implementation strategy that makes transit a competitive element in the regional transportation plan.

The SA Tomorrow transit element is intended to complement the VIA plan and help the community see the role of transit more broadly within the overall transportation system. If transit can offer competitive travel times by making some key infrastructure changes, it can begin to move travelers away from cars and into buses or trains. This can ultimately help manage system congestion and improve roadway safety. The SA Tomorrow identifies changes required to accomplish such a goal by taking a very long view of how the city's street network can be reinvented for a wider multimodal appeal. This includes committing to transit-supportive land use plans within high capacity corridors as well as transit-supportive infrastructure design requirements.

Transit Modes

The success of how San Antonio accommodates the travel needs of both existing residents and those anticipated to move to the region over the next 25 years will depend on how comprehensively the City and the surrounding communities can adopt a multimodal approach to transportation. There is and will



continue to be a heavy emphasis on the single occupant vehicle (SOV), but a critical broadening of the acceptance of other modes of transportation needs to complement the car given the forecast of increasingly higher levels of congestion over time. Adding modes will help manage congestion levels and, more importantly, will give people a choice in how they move about the region.

A multimodal commitment goes beyond the transportation system in that it also needs a complementary land use plan that is built to support and encourage alternative mode use. Within the SA Tomorrow, there are references to key land use decisions that will not only help build projects that will support transit and active transportation, but that will also help create places and activity centers around which community life will revolve and flourish. Well-structured, complete places have the added benefit of reducing the amount of travel needed to manage daily demands by locating many activities

in close proximity to each other. Given the large projected increase in population, such activity centers and any possible reduction in trip-making they contribute, will be critical to the City's ultimate success.

Among the many modes discussed in SA Tomorrow and to be considered going forward are:

Bus - The backbone of the transit system in San Antonio is a robust local bus network. It will continue to be the primary mode of public transportation, but its intent and network configuration could change over time to accommodate rapid transit modes such as (BRT, LRT and streetcar) for which they can provide effective feeder services. There is also an express bus network that connects outlying areas into major employment centers that will continue to serve this function and eventually take advantage of traffic management improvements to the highway network. The recently implemented VIVA circulator serving the downtown area will establish a localized ridership market that could later be considered for conversion to a fixed rail streetcar service. This should also help focus development or redevelopment activity in the area. The ViaTrans paratransit service will continue to operate as it does today, though strategically adding flexibility to parts of the bus network could accommodate some of the special demands of many paratransit users and afford this market a more efficient service option with wider coverage. Daily transit ridership in San Antonio is over 140,000 and is expected to carry substantially more in the future as more people come to the area and require alternative mode options. In consideration of growing demand going forward, VIA's Vision 2040 contemplates new routes and substantial increases in peak hour frequency on key routes throughout the system.

VIA Primo Station along Fredericksburg Road

VIA Primo Bus at stop on Fredericksburg Road

Bus rapid transit (BRT) - Serving a regional travel market, VIA BRT in San Antonio is represented by Primo (mixed flow BRT) and proposed Primo Plus (dedicated BRT or LRT) services. These services offer a very attractive option on the most heavily travelled bus routes. The quality of the vehicles and the features and flexibility they afford the user are designed to entice riders to consider the benefits of taking the bus for many trips. Primo service has already deployed a successful service on Fredericksburg Road as a mixed use BRT and will introduced similar services on Zarzamora Street and Military Drive starting in 2018.

BRT can be an effective travel option for the future San Antonio transportation network. It offers greater capacity to serve commuters as well as rapid, frequent and reliable service. The service are most effective when combined with priority operation capacity in a dedicated guideway. That, at times, may come at the expense of single occupant vehicle (SOV) capacity. in some corridors. Despite the ability of BRT to operate along roadways as a rubber tired bus, implementing this type of service requires potentially significant infrastructure improvements to existing roadways and sidewalks that can carry high costs in some corridors. SA Tomorrow recommends aggressive reliance on dedicated BRT with strategically planned dedicated transit lanes. Among the corridors recommended for BRT is Zarzamora Street, for example. (A Primo route is planned by VIA on Zarzamora to begin service by 2018.) Over time, given the limitations of the narrowest portions of the corridor and the expected growth in demand, a center-running dedicated BRT route in exchange for some of the single occupant vehicle capacity would afford more person-carrying capacity than the current configuration. The individual corridor descriptions contemplate how these are proposed to become part of the plan.

Light rail – Light rail is a high capacity mode of transit service that operates passenger rail cars in short, usually two or three-car trains, on fixed rails in right-of-way that is most often physically separated from other traffic. Light rail vehicles in the U.S. are typically electrically driven with power being drawn from an overhead catenary delivery system. Where LRT uses street rights-of-way, in most cases, it benefits from traffic signal priority treatments at intersections to permit efficient operation and allow closer adherence to schedules. Light rail vehicles can travel at over 50 mph in open isolated areas, but are required to abide by posted speeds on streets they occupy.

Streetcar - Streetcar systems are typically designed to serve a connection of nearby destinations, usually in a downtown, to expedite short distance travel among them. Streetcars travel more slowly, stop more frequently, usually carry smaller passenger loads and are less capital intensive than light rail systems. They are very effective at moving people within the localized environment in which they operate. Streetcars also help strengthen the connection between transportation and land use because they activate their routes and can pick up and drop off riders in front of their origins and destinations. While streetcars are compatible with LRT infrastructure, they seldom share tracks because of their distinct operational differences. Streetcars can travel in a dedicated guideway or share streets with other traffic. San Antonio has been developing a streetcar for downtown applications that has been paused pending further evaluation of funding and routing.

Dedicated right-of-way network – In VIA's Vision 2040, VIA has identified a future network of dedicated right-of-way corridors for the deployment of high capacity services. While there is no specific designation for the technology associated with each corridor (Primo Plus BRT or light rail), they include major roadways such as San Pedro Avenue, Fredericksburg Road, Barrera Parkway/ Houston Street, Zarzamora Road, New Braunfels Avenue, South Presa Street, among others. These corridors would require a reconfiguration of their cross-sections to accommodate the dedicated service they would carry. This would impact car travel in those corridors, but as noted, would expand the overall person-carrying capacity of the corridor.

Lone Star Commuter Rail – Lone Star Rail is evaluating the initiation of commuter rail service between San Antonio and the Metroplex using existing Union Pacific Railroad tracks. The proposed route connects the cities of New Braunfels, Austin and others to the northeast with downtown San Antonio. The route also runs adjacent to San Antonio International Airport (SAT). While this is a separate undertaking not under the purview of VIA or the City, it has the ability to offer additional mobility within the region.

Depending on the final configuration, a portion of the Lone Star Rail line could also afford access to light rail services into the downtown from SAT.

Dedicated guideway transit options, as contemplated in the Primo Plus program envisioned by VIA, will raise the level of service quality. The expansion of high capacity, high quality modes that can provide competitive travel times and high convenience and safety is an important element of a long range plan that will help balance travel demand among modes. Though in some cases, roadways may need to be widened, adding a high capacity transit service can often be accomplished without widening roadway cross-sections. Overall high capacity or rapid transit services are forecast to carry 190,000 daily riders in 2040 under the VIA Vision 2040 plan when combined with the necessary transit-oriented development (TOD).

The City of San Antonio has been participating in an organization supporting high-speed rail. The Texas High-Speed Rail and Transportation Corporation is a not-for-profit Texas corporation dedicated to bringing specific regions of the state together in a grassroots, collective effort to improve transportation and create a network of high-speed rail service in Texas that can connect to states and countries beyond.

Since its inception in 2002, the corporation's goal and approach has been to connect cities and counties by high-speed rail in the main Texas "triangle" of dense population, including the Dallas-Fort Worth, Houston and San Antonio-Austin areas and points within, including College Station and Fort Hood. The corporation's members represent millions of Texans. The goal is to coordinate High Speed Rail within the triangle and to Monterrey, Mexico.

Mike Frisbie, Director, Transportation & Capital Improvements, City of San Antonio, currently serves as Vice Chairman of the organization. Our members share an intense interest in the future of transportation, are supported by a Legislative and Congressional caucus, and proactively pursue Texas' best interests.

Regional Activity Centers – opportunities to provide connections to other modes, create walkable communities.

In coordination with the update of the Comprehensive Plan and in keeping with VIA's Vision 2040, the SA Tomorrow transit element places emphasis on regional activity centers around the region to define how demand for travel in the region will evolve over the next 25 years. In addition to the downtown, the Comprehensive Plan identifies regional activity centers as a primary focus of growth and an opportunity to manage how the region changes over time. From a transit perspective, the regional

activity center concept provides a basis for reconfiguring transit services to offer connections that have not historically been available. The travel attraction to the downtown will continue to be strong, but employment centers in particular are adapting to a more distributed pattern of growth and demanding more flexible travel options.

Historic travel patterns were city center oriented and service designs reflected that radial pattern. The issue now is that the radial transit network design required most transfers to take place in the downtown even if travel was between activities on the outskirts of the urban area. That inconvenient and time-consuming system design is being updated to serve changing demands more efficiently. VIA proposes direct links among many of the identified activity centers which can also provide more direct access to the downtown and other locations at transfer points within the activity centers.

The other consideration related to the activity center design concept is that, while activity centers may have evolved from an auto-centric development pattern, they are also a potential for creative land use planning that can help tie the region together. Introducing TOD development with walkable environments and ready access to local services can help reduce demand for long distance congestion-inducing travel. Some of this may be accomplished through overlay district zoning that will define TOD and sustainability requirements and could be implemented at least partly through value capture financing and P3s within the activity centers. These could help encourage transit ridership and could reduce the demand for highway capacity on major routes between activity centers.

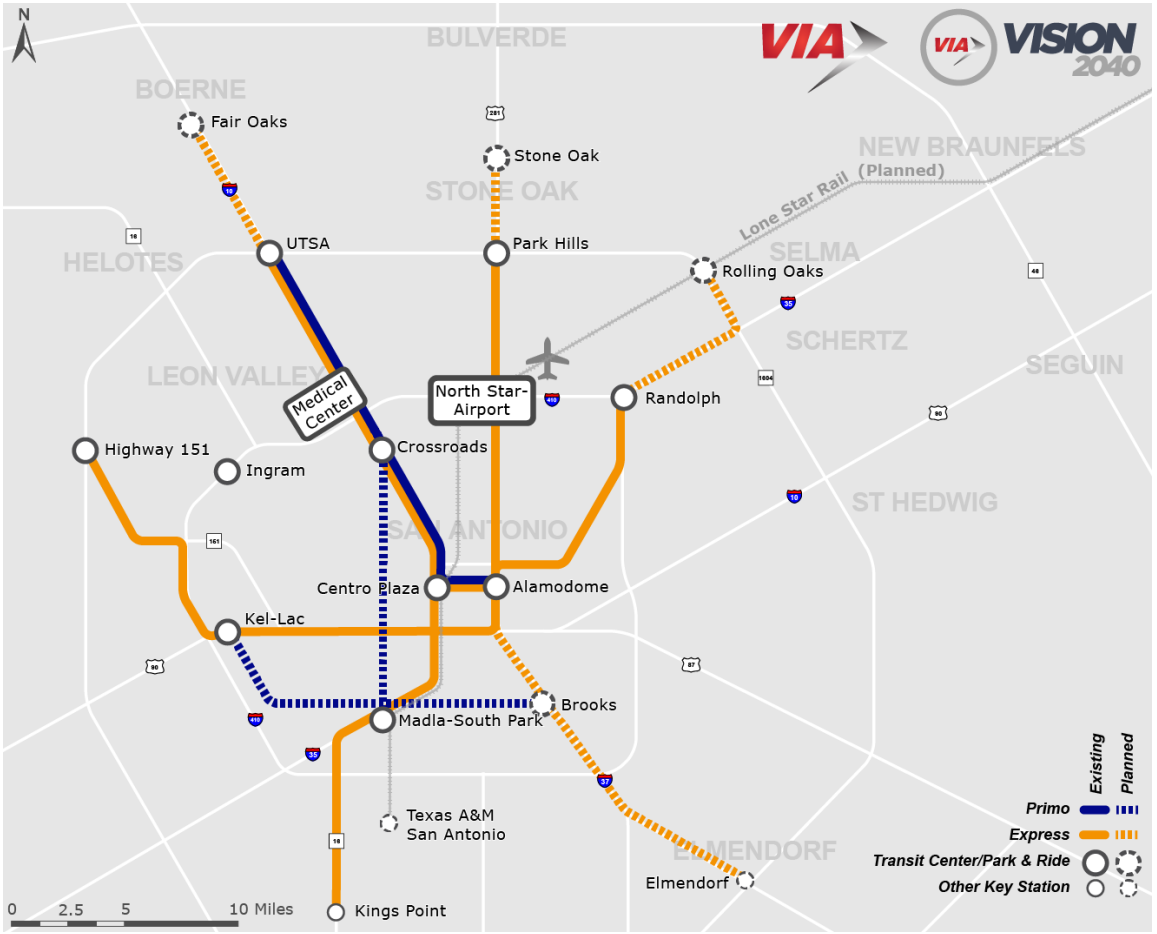
VIA's Centro Plaza Multimodal Transit Center

SA Tomorrow identifies concepts for long term transit development that take advantage of the corridors that link the activity centers. The activity center concept allows for a renewed interpretation of travel by any mode but an opportunity to encourage transit ridership through complementary land use and transportation system design.

Transit Centers/Multimodal Centers

VIA operates six transit centers and eight park and rides throughout the region. Many more are envisioned as the VIA Vision 2040 comes together. Transit centers are a critical element of the overall transit system in that they provide an anchor for the system. In addition to access to users arriving from many modes (car, bike, walking, other transit users), transit centers define major transfer points and offer economic opportunities in support of the activity centers in which they are located. In San Antonio, placement of transit centers in the future will need to reflect the distributed growth pattern of multiple activity centers around the region to maximize their performance potential.

Transit centers are the connection points in the system. If closely coordinated to anticipated growth, transit centers will not only provide good transit service, they will provide a focal point around which land use and transportation needs can be



managed as the communities develop. As noted in the above discussion, creating a unifying context that requires less reliance on a personal automobile and the ability to reach work/live/play destinations effectively in the absence of such a vehicle. The transit center will define the transportation epicenter of the place. By coordinating the Comprehensive Plan, the VIA Vision 2040 transit center locations, both local and regional access will be enhanced for users.

Downtown transit center - Because of the importance of the transit centers in the structuring of the transportation system, there is one location that deserves special consideration: downtown. The Centro Plaza transit center brings many transportation choices together, including a future commuter rail option, in an attractive new facility. It lies at the west edge of the downtown and beyond a typical walking distance (about ¼ to ½ mile) of most downtown activities or destinations. At present, travel in the downtown area requires the use of the E, a downtown circulator, or various bus routes that carry passengers along downtown streets to their destinations. Boarding and alighting as well as all transfers between routes happen on the street, which congests both streets and sidewalks in the downtown and creates other associated challenges. The lack of a specific central transit center, such as successfully built in other major cities such as Charlotte, NC; Phoenix, AZ and many other cities, also limits the economic contribution the transit system can make because it is less likely to attract supporting small businesses unless centrally located near the government center and the established urban core where the community comes together for various purposes. In the future, particularly if light rail or streetcar options are part of the plan, a well-placed central station near City Hall, the Riverwalk or other tourist or business centers will help redefine the downtown and provide a recognizable identity to the transit system.

Corridors

A main focus of the corridor assessment completed as part of the SA Tomorrow was to identify opportunities to broaden the use of select corridors beyond a singular focus on the automobile in a way that can accommodate more trips even if not more vehicles. Along with a transit supportive land use policy, the introduction of a multimodal context into the roadway environment, in many cases, requires some physical adjustments and, more importantly, requires a shift in the mindset of the users. Part of the objective is to show how a broader interpretation of the purpose of the roadway space can assist in addressing future needs. Growth in the region over the next 25 or more years suggests the existing automobile emphasis, by itself, will be insufficient to handle expanding travel needs. Hence, there will need to be a broader vision of how travel is managed and served in San Antonio.

That vision starts with how best to link transportation to local land uses so they function in a complementary fashion and provide opportunity for new or redeveloping land uses to take full advantage of a more comprehensive set of travel choices. The vision also includes a commitment to a multimodal approach to the long term transportation system that can address the needs of growth as well as the needs of a changing population. A large part of that approach will rely upon public transportation. In addition to strengthening the transportation-land use link, there is also a need to prepare the corridors to adopt technology enhancements to improve system management opportunities and to position the transportation system to adopt new autonomous/connected vehicle technologies at the appropriate time. Good ITS and signal coordination within the corridors will help traffic flow as well as transit operations. Transit signal priority and some localized improvements can substantially contribute to improved transit service quality in all the corridors. Connected/autonomous vehicles may offer an even more robust ability to deliver transit services.

The individual corridor concepts, viewed from a transit perspective, include:

New Braunfels Avenue – Narrow rights-of-way demand either a road diet approach (narrowing rather than widening the road or lanes for improved performance) or a major shift toward a transit intensive emphasis that relies more on transit than other modes of travel in how the corridor will be used. Near term recommendations include incorporating a mixed flow high capacity bus service that addresses high ridership forecasts for the corridor by VIA. New Braunfels connects major destinations and Route 20 already carries high patronage. In the longer term plans recommend more emphasis on public transportation and the supporting bike and pedestrian modes to encourage more people to travel in fewer vehicles among the major centers along or at the ends of the corridor. The roadway narrow right-of-way could take on a number of configurations including transit-only or transit with a single general purpose lane in each direction, along with enhanced bike/ped modes. The sensitive character of portions of the corridor limits how and where property can be acquired to widen rights-of-way if other uses are contemplated. In cases that preserve SOV travel on the roadway, bicycle travel would need to be moved to a parallel roadway such as Gevers St to the east of New Braunfels.

Zarzamora Street – Like New Braunfels, portions of Zarzamora Street are constrained by very narrow rights-of-way. Despite the street limitations, Route 520 bus service is one of the most productive in the city, but it has limited ability to expand service to the levels needed in the future based on travel forecasts. VIA has a plan to deploy a Primo route in this corridor starting in 2018. It is proposed as a mixed flow operation with transit

signal priority and limited stop service supported by improved stations and facilities. Over the long run, the Primo service could evolve into a dedicated BRT corridor with improved and continuous sidewalks to streamline pedestrian movement and access to transit. This would address high ridership forecasts and help manage growing demand for travel in the corridor and the region. This configuration could require the reduction of travel lanes for other vehicles and could necessitate restrictions at intersections. Right-of-way in the northerly segment is limited, but the uses along the roadway are largely commercial and potentially more malleable than on corridors with residential frontage. South of US 90, the roadway widens and can better accommodate dedicated transit needs as well general purpose traffic in addition to improving pedestrian facilities.

Perrin-Beitel Road – The corridor is largely commercial within the segment under consideration. It has a reasonably wide right-of-way that can accommodate a variety of cross-sections. The road carries a lot of traffic during a good portion of the day, but will not be able to grow substantially to handle much higher demand. VIA operates 20 minute headways on Route 14 and carries high ridership. Because of the ridership levels today and those forecast, VIA proposes Perrin-Beitel as a future high capacity corridor in their Vision 2040. Though not identified as such in the Vision 2040, because of the character of the corridor, Perrin-Beitel is an opportunity to introduce center-running BRT while strengthening transit support elements such as bikeways and pedestrian facilities along the corridor and connecting the corridor to the surrounding neighborhoods. The ultimate success of such a long term plan will hinge largely on a commitment to redevelop the corridor away from its heavily car-oriented personality and to manage access to encourage convenient and easy transit use.

Wetmore Road – This corridor links Loop 410 and Loop 1604. It runs adjacent to the San Antonio International Airport (SAT) and through a number of sparsely populated segments northeast of SAT prior to reaching regional centers on Bulverde Road near Loop 1604. There is currently no transit service on Wetmore and none is proposed in near term future plans. The industrial character of the road and its location adjacent to both SAT and UPRR creates challenges as well as opportunities. The advent of Lone Star Rail commuter service could benefit passenger services traveling to or from airport activities within the southerly portion of the corridor. However, there are limited pedestrian facilities to support such service at this point and redevelopment would most likely remain reasonably consistent with current uses because of its placement near the airport. Both conditions raise questions about the

Fredericksburg Road

viability of a major passenger focus in the corridor.

Enrique Barrera Parkway – This corridor is relatively undeveloped, has underused rights-of-way and provides a direct link into the San Antonio downtown from Lackland AFB and the Kel-Lac transit center. East of the corridor, along Commerce and Buena Vista Streets, existing Routes 75 and 76 carry high ridership and are forecast to continue to do so. As a result, Barrera Parkway is identified as a potential high capacity corridor by VIA. An extension to the park-and-ride and even to Lackland AFB, along with supporting land uses, would allow future residents and businesses to evolve within the envelope of a high capacity service and become accustomed to use transit as their primary travel option.. The short term improvements revolve around traffic management improvements to realign offset intersections and strengthen access management. Both will benefit transit by eliminating conflict locations and improving traffic flow. The longer term proposed transit improvements include a dedicated BRT/LRT route as well as connecting and improving the pedestrian and bicycle facilities. The available right-of-way will accommodate these features without substantially impacting the existing travelway.

Fredericksburg Road – This is a major corridor in the region that connects multiple activity centers. The first VIA Primo route operates in this corridor. Ridership is high and projected to grow much higher given the high density of residents and jobs in the corridor and the connections between Downtown and the Medical Center campus and UTSA which are among the key regional activity centers in the long term plan for the region. VIA is considering Fredericksburg Road as a potential future dedicated guideway BRT or LRT route to carry long term ridership

forecasts. Much of the corridor boasts a wide right-of-way that can accommodate a dedicated guideway facility with some impact to general purpose lanes, but there may be room to adapt such a change given the many underutilized commercial centers along the route. In the narrow section of the corridor, closer to downtown, VIA is considering shifting the guideway alignment to the UPRR Kerrville freight rail line right-of-way to enter the CBD. Complemented with a strong transit-supportive land use plan that takes advantage of underused property and ready access to nearby communities, Fredericksburg Road could accommodate substantial growth in the corridor and provide the basis for a very successful residential and business corridor.

Applewhite Road – There is currently no transit service on Applewhite Road, but there is a major employer that could benefit from a good transit connection to the rest of the region for employee access. Until plans for the area become better

VIA's North Star Transit Center on San Pedro Avenue at Loop 410

defined, it is not likely transit will be a major factor. However, the opportunity to establish a transit toehold in a very undeveloped area of the city, building upon the connection to the Toyota plant is appealing from a long term perspective. In the short term, this corridor will benefit more from adopting a transit-supportive land use plan than from the transit service itself. In the long term, the short term decisions could set the stage for a community that grows up with a multimodal mindset.

San Pedro Avenue – This is a heavily used roadway that links the San Antonio Airport area with downtown. It is also a heavily used transit corridor where Routes 3 and 4 reflect the demand for service between the airport activity area and the downtown. The San Pedro corridor travels from a highly suburban commercial district with a very wide right-of-way to a very urban environment in a constrained right-of-way. The corridor connects the airport area with downtown and is identified by VIA as a high capacity corridor. Travel forecasts support that designation. In the wider portions of the corridor, the incorporation of a dedicated transit facility for BRT or LRT as a center-running mode will provide a strong connection between transit and local land uses and open opportunities for more economic development. It is relatively easy to accommodate physically, though it will mean adjustments to the configuration of the right-of-way with some effect on the number of lanes and the arrangement of access locations. To the south, where the corridor runs adjacent to older, historic neighborhoods and educational settings, the narrow right-of-way requires a different accommodation of the transit element. BRT can run in mixed flow conditions in the narrower sections, most likely in the curb lane. There is also the potential to take advantage of the UPRR freight rail corridor that travels from near San Pedro and Hildebrand into the downtown. This option would need to be coordinated with a future Lone Star Rail commuter service proposed on the same tracks.

In the longer run, a vision of San Pedro as a "transit first" corridor is worthy of serious consideration. Increasing transit ridership and growing automobile congestion in the corridor will precipitate bolder choices that will require modifying current practice. As the community grows more comfortable with an expanding and increasingly effective transit system, a transit first or "transit only" treatment may become a realistic and necessary option to meet travel needs.

Culebra Road – Provides a major east-west connection between downtown and the growing communities to the west. VIA Route 82 travels Culebra from downtown to the vicinity of Loop 410 at 30 minute headways. Because much of the growth is forecast to occur in the northwest portion of the region, improved transit services will be essential to provide existing and future residents and employees with a viable alternative to driving. In light of

that forecast, VIA's Vision 2040 Plan contemplates frequency to be improved to between 15 and 30 minutes in the future. In addition, Culebra also represents the easterly portion of a proposed VIA Primo route that extends from the downtown to the northwest along Bandera Road.

Babcock Road – Also in the northwest of the City, Babcock Road connects Fredericksburg Road with the southerly side of the Medical Center campus. VIA Route 522 currently serves Babcock Road with 30 minute headways. VIA Vision 2040 proposes to reduce headways to as low as 15 minutes and has also identified the combination of General McMullen Dr and Babcock Road as a potential future Primo route given high forecast ridership figures.

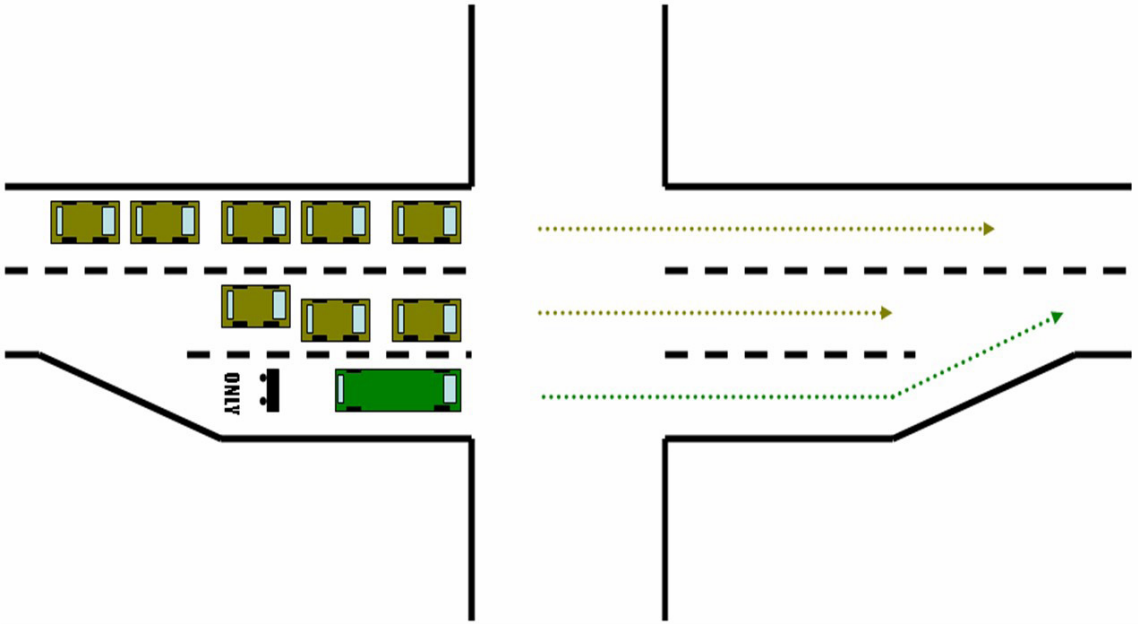
SW Military Drive – This is a very suburban, largely commercial corridor that is the primary east-west arterial connection south of downtown. Transit usage is high on Routes 550 and 551 which are part of a major route element that encircles the city. VIA proposes to begin Primo service on SW Military Drive as a mixed flow BRT in 2018. The environment of the corridor is suburban with a predominance of strip and subregional big box commercial establishments fronted by large parking lots. Residential enclaves are located immediately behind the commercial uses and could become a basis for higher capacity services if improved connectivity to the corridor can be established. The corridor is very wide and could incorporate the requirements for a fully dedicated BRT operation that will become critical as the area grows and needs to accommodate more residents. In the event of redevelopment, consideration should be given to enhancing the attractiveness of transit, including a dedicated median-running BRT and associated amenities, by strengthening the connections between the residential uses and the corridor transit operation. That means stronger bicycle and pedestrian linkages and coordination with property owners to evaluate better use of underutilized space such as parking areas adjacent to the roadway.

E Houston Street – VIA Route 24 transit service on E Houston Street links downtown San Antonio with the AT&T Center and beyond at 15 to 20 minute intervals. High anticipated demand shows a potential dedicated guideway Primo or LRT service in the 2040 Vision. The corridor's proximity to downtown and the connection to major activities near the AT&T Center suggests ridership will remain high or grow in the future.

Innovative Ideas & Technologies

Transit signal priority – Transit Signal Priority (TSP) is a general term for a set of operational improvements that use technology to reduce stopped time at traffic signals for transit vehicles by holding green lights longer or shortening red lights. TSP may be implemented at individual intersections or across corridors or entire street systems and has become a widespread technique to improve the reliability of transit services in many communities. In effect, TSP accommodates transit needs rather than

preempt the needs of the rest of the users of the transportation system. TSP can reduce trip times by as much as 25% when properly installed and managed. In San Antonio, TSP is advisable for every corridor with transit service and is essential on those offering high capacity services. Fredericksburg Road and Medical Drive currently have TSP for VIA's Primo Service. VIA has plans to implement TSP with the city's assistance, on Military Drive and Zarzamora.



Queue-jumping signals/lanes - A queue jump is a type of roadway geometry used to provide preference to buses at intersections, often found in bus rapid transit systems. It consists of an additional travel lane on the approach to a signalized intersection. This lane is often restricted to transit vehicles only. A queue jump lane is usually accompanied by a signal which provides a phase specifically for vehicles within the queue jump. Vehicles in the queue jump lane get a "head-start" over other queued vehicles and can therefore merge into the regular travel lanes immediately beyond the signal. The intent of the lane is to allow the higher-capacity vehicles to cut to the front of the queue, reducing the delay caused by the signal and improving the operational efficiency of the transit system.

This technique would also apply throughout the San Antonio system, but has highest benefits as well as greatest challenges in the narrow rights-of-way of corridors such as Zarzamora or New Braunfels where widening of an intersection will have a potentially major impact on local properties. In many cases, it may still be worth investigating the opportunities to improve bus flows if enough benefit can be derived from the improvement.

Vehicle location systems/Automated traveler information system - Automatic vehicle location (AVL) describes the use of computers and global positioning

systems (GPS) in dispatching and tracking transit vehicles. AVL is accompanied by added costs of operating and maintaining additional computer equipment, but transit agencies benefit from improvements to customer service through real-time information. Operating costs, however, are not generally reduced by these improvements. Because AVL is becoming so common, it is increasingly becoming expected as standard for fixed-route systems, often as a downloadable application on a smart phone. AVL is very common on BRT systems. This is typically a technique that can be applied uniformly throughout a transit system operation to help inform riders and keep track of vehicle operations.

Dedicated transit right-of-way (ROW) – The ability to operate buses or trains in dedicated rights-of-way offers more flexibility in managing transit service performance. Schedules can be better adhered to, safety is enhanced for both passengers and other users of the transportation system, and there is a clear demarcation of the purpose of the right-of-way where modes would otherwise share it. In San Antonio, the SMMTP has proposed dedicated BRT or LRT corridors on a number of key corridors including, Fredericksburg Road, Military Rd, Zarzamora, Enrique Barrera Parkway, San Pedro and potentially others. The VIA Vision 2040 Long Range Plan identifies the need for dedicated transit lanes of rapid transit as shown in Figure ___. The intent is to offer the best possible access to bus and rail services in the primary corridors of the city. Transit-only streets have been used very successfully in Portland, Oregon, Denver, Colorado and Minneapolis, Minnesota among many others around the world. Transit streets or transit malls attract activity. In the case of the Denver 16th Street Mall, many tourist-oriented and local businesses benefit from the easy transit accessibility the mall affords.

The use of dedicated rights-of-way is a departure from a primarily car-oriented roadway environment. It favors of the idea of moving people over vehicles. In some corridors such as Zarzamora Street, the narrowest right-of-way will involve reducing auto travel lanes from four to two to accommodate a dedicated BRT guideway in the middle of the street. In others, such as Enrique Barrera Parkway, there is sufficient right-of-way that can be used to provide the necessary transit space within the street.

Transit/pedestrian-only corridors – Among the most far-reaching system design concepts considered that builds on the concept of dedicated guideways, is the idea of transit/pedestrian-only corridors that could vastly improve transit and alternative mode operations. This entails the elimination of cars from certain corridors or portions of corridors that carry high transit ridership that cannot effectively accommodate sufficient dedicated space for all modal demands. In these cases, the plan is to offer priority consideration to transit services and the active transportation modes (i.e., pedestrian and bicycle) that best

support them. Because some of the rights-of-way are so narrow, elimination of cars would allow for the introduction of dedicated busways and supporting well-defined pedestrian and bicycle networks.

At the more ambitious end of the transit/pedestrian-only spectrum is a transit-only network that would allocate key corridors to dedicated high capacity transit service and remove other automotive travel from the selected facilities (subject to appropriate exceptions) to create a network of transit/ped/bike-only corridors. The intent is to introduce a transit-based network that encircles downtown, provides cross-town connections and link key external activity centers in a way that would comprehensively complement automobile travel in the metropolitan area. This system design requires extensive adaptation of the current transportation network and critical decisions about the adjacent areas to support land uses that will guide and accommodate some of the anticipated regional growth inside the urban area, strengthen ridership and help reduce vehicle usage and manage vehicle congestion.

Figure 17: VIA + Uber Fiesta 2016 Promotion
Source: VIA Transit

Autonomous/Connected (AV/CV) transit vehicles - This is a rapidly evolving segment that will very likely define how we think of all transportation in the near future and transit will be affected in a major way. As autonomous vehicle/connected vehicle (AV/CV) technology evolves, everything from service coverage to vehicle technologies to labor requirements stands to change for VIA. VIA's leadership will need to completely re-think their services and fee structure in order to stay relevant and competitive in the new transportation environment. VIA might consider:

» Leveraging private mobility companies (e.g., Uber, Lyft, etc.) to provide first/last mile solutions in support of an emphasis on longer-distance transit services such as Primo and Primo Plus. This concept could also be applied to paratransit services. More recently (April 2016) VIA partnered with Uber during Fiesta (a local annual San Antonio celebration with numerous events) to provide riders with a complete trip to and from major Fiesta events scheduled over the weekend (See Figure 17). VIA riders traveling to and from 3 Fiesta park and ride locations were able to

use Uber for the first and last leg of the trip. Uber transported people to and from the park and ride locations connecting with VIA buses completing the trip.

» Transitioning the transit fleet to take advantage of driverless technology. The most readily adaptable element could be BRT and other services operating in protected guideways. Such services already exist in places.

VIA will also need to re-evaluate its fleet management plan in order to incorporate driverless and connected vehicles in its fleet. This will have significant implications for labor requirements (and union agreements), maintenance facilities, maintenance workers, safety and security of passengers, etc.

In the near-term, connected vehicle systems could begin to replicate or replace existing transit technology, such as Automated Vehicle Locator (AVL) and Transit Signal Priority (TSP) systems. As more vehicles and traffic signals are equipped with connected vehicle technologies, the Dedicated Short Range Communications (DSRC) radio technology could ultimately replace stand-alone AVL and TSP systems, reducing VIA's deployment, operations and maintenance costs. This potential should be considered as part of any evaluation of further AVL or TSP system investments.

Car share programs - Car sharing is becoming increasingly popular with its promise of personal convenience and social improvement. Car sharing is a model of car rental where people rent cars for short periods of time, often by the hour. They are attractive to customers who make only occasional use of a vehicle, as well as those who would like occasional access to a vehicle of a different type from what they use day-to-day. The organization renting the cars may be a commercial business or the users may be organized as a company, public agency, cooperative, or ad hoc grouping. A popular commercial car share company is Zipcar which has locations in San Antonio. The principle of car sharing is that individuals gain the benefits of private cars without the costs and responsibilities of ownership. Instead a household accesses a fleet of vehicles on an as-needed basis. Car sharing may be thought of as organized short-term car rental.

While not a good alternative for daily commuting, car sharing can also help reduce congestion and pollution. Replacing private automobiles with shared ones directly reduces demand for parking. Since only a certain number of cars can be in use at any one time may reduce traffic congestion at peak times and strong metering of costs provides a cost incentive to drive less. Car sharing can provide numerous transportation, land use, environmental, and social benefits. Neighborhood car sharing is often promoted as an alternative to owning a car where public transit, walking, and cycling can be used most of the time and a car is only necessary for out-of-town trips, moving large items, or special occasions.

Community based alternatives

- Volunteer ride share
- Entrepreneurial businesses

Recommendations for Policy Changes

- Transit supportive development incentives – Density bonuses, parking reductions, fee adjustments, etc., should be considered as a means to entice development into "opportunity areas" and create transit-friendly conditions in support of transit services
- Provide amenities at transit centers/stations – Transit centers must be able to provide basic services in a comfortable and safe environment to help attract ridership
- Access management – Creating a coordinated plan for car travel in commercial environments that encourages sharing of driveways and reduction of unnecessary access points to help move traffic and make transit and active transportation options safer and more convenient by eliminating obstructions and conflict points.
- Prioritizing sidewalks, curb ramps and crosswalks within a distance from a transit stop that connect to the local community
- Developing street design criteria that eliminate obstructions to multimodal transportation options and streamline automobile travel will help improve safety and reduce congestion
- Additional street lighting near transit routes and stations – The environment around transit is a major determinant of its success. Safety is essential to encourage ridership.
- Transit supportive development policies
  - Establish overlay districts that foster transit supportive practices in regional activity centers and along designated major transit corridors (e.g., Primo Plus corridors)
  - Incentivize denser uses and developments closer to high capacity transit facilities
  - Encourage active ground floor uses surrounding station areas to promote security
  - Establish building setbacks that encourage a walkable environment
- Develop a development program and guidelines to:
  - Define project areas
  - Identify long-term circulation easements within the project area
  - Participate in the upsizing of infrastructure improvements to anticipate future redevelopment needs
  - Allow short-term uses as a land bank strategy for essential parcels
  - Consider purchase of key parcels for lease backs to generate additional revenue to pay for O&M
- Emphasize the need to move people over vehicles as the region grows and congestion increases by prioritizing transit and active transportation enhancements over SOV improvements
- Establish a traffic and bus priority plan to ensure direct and protected access for transit (e.g., emergency vehicles) during special events
- Prioritizing transit signal priority (TSP) and ITS improvements on corridors with premium and high frequency transit service where service reliability is consistently challenged by

localized congestion

- » Pioneering comprehensive connected vehicle technology at intersections to prevent vehicle, pedestrian and bicycle conflicts and eliminate crashes in support of Vision Zero
- » Invest in regional multimodal trip planning applications to better inform citizens of transportation choices
- » Maintain flexibility to accommodate future driverless buses
- » Develop a sidewalk inspection and repair program that makes it easier and less expensive for property owners to comply with codes that require them to keep their sidewalks free of defects.

Prioritization of Implementation

The most common practice in western cities is to focus priorities on the roadway system expressly around expediting travel by car. While many of the proposed improvements in the SA Tomorrow also rely upon the roadway network for their success, how priorities are established going forward can be an effective way to foster a multimodal mindset within the community. The emphasis needs to be on what is most effective over the long run rather than what is accepted practice. Priority for implementation will be addressed on a case by case basis, but there are some basic considerations that can help establish a foundation for transit and active transportation modes to compete more effectively with the single occupancy vehicle (SOV). The main element in priority setting in a multimodal environment is to recognize the advantages of a wider range of travel options and treat them based on the objectives of the project and, ultimately, the system as a whole. In the interest of assessing priorities from a multimodal perspective, some of the following are worthy aspects of a more comprehensive transportation plan approach:

High transit demand corridors – Where transit ridership is already high or projected to be high, it is essential to invest in the success of the service to maintain ridership and improve its competitiveness with the SOV. High demand transit should be a significant factor in determining transportation investment priorities. These will often be compatible with automobile priorities. The difference is the priorities are defined by the transit element rather than the SOV.

Transit Stops/Centers/Rail Stations – As part of a multimodal commitment, establishing a safe, convenient and attractive user environment at contact points with the system is essential to multimodal success. The stations are often an economic development opportunity with the prospects for jobs and commercial activity if a transit supportive land use community can be built into the broader concept of station areas serving transit.

Regional Activity Centers – The San Antonio region growth will be shaped by a series of regional activity centers (as further noted in the Comprehensive Plan) in addition to strengthening the

downtown. This provides an opportunity to organize transportation investment around strengthening travel within and between the centers. Connecting regional activity centers is also an effective way to use a transit system in that it can help define a clearly established travel network within the region. This commitment to an regional activity center-based urban form will be most successful with strong multimodal linkages and in many case a high capacity transit connection. Shaping a land use plan that supports a successful transit system should be a significant priority consideration in how the system evolves into the future.

WHAT CAN WE DO?

WHAT CAN WE DO? - RAIL

Passenger Rail

Texas Passenger Rail Studies and Projects

Passenger rail in Texas is typically developed at the municipal level through local support. Dallas and Houston have both successfully implemented LRT (Light Rail) systems to serve their citizens. Development beyond the municipal level requires cooperation of the regions cities, counties, MPO's and other stakeholders. The Lone Star Rail District is an example of this regional cooperation.

At the state and regional level, several rail investigations are underway in Texas including the passenger rail corridors shown in Figure 18. These studies include federal, state, regional, and private funding sources. If supported and developed, these corridors will serve Texas and the adjacent states and international ports (Mexico, Gulf seaports).

Figure 18: Texas Passenger Rail Studies

Discussions have explored the concept of a High Speed Rail (HSR) passenger network connecting San Antonio with the DFW Metroplex and Houston. Such a network, if supported by regional agencies, can form the statewide infrastructure for safe, reliable mobility choices; driving economies, and sustained development.

San Antonio sits at a crossroads of two long distance passenger rail lines operated by Amtrak (see Amtrak below) and a freight crossroads connecting Mexico with the United States by rail. Monterrey, Mexico has been discussed as a future high speed rail (HSR) passenger terminal for travel into Texas (currently there are many long haul buses from Mexico traveling to, and through, San Antonio). The IH-10 East corridor from San Antonio to Houston is a likely candidate for HSR development and would likely connect with the planned Texas Central Railway HSR between Houston and Dallas.

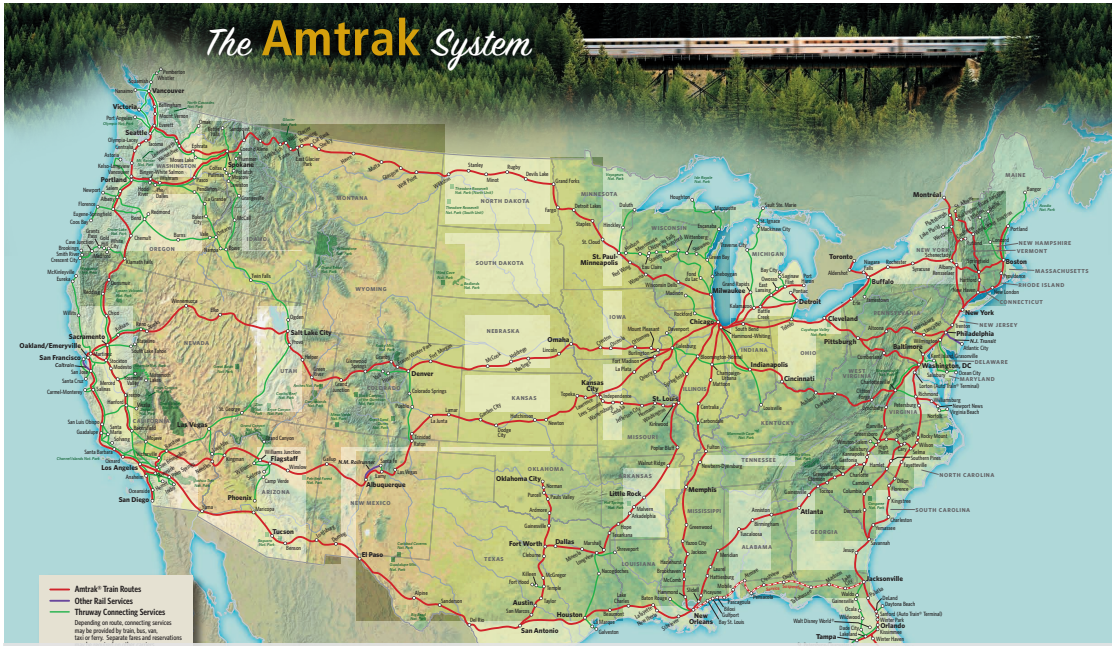


Figure 19: Amtrak System Map
https://www.amtrak.com/ccurl/631/638/SystemMapMar2015.pdf

Amtrak Passenger Rail Service

Amtrak operates a nationwide rail network, serving more than 500 destinations in 46 states, the District of Columbia and three Canadian provinces (see Figure 19). Service is provided on more than 21,300 miles of routes. During FY 2015 (October 2014 - September 2015), Amtrak recorded more than 30.8 million passengers, *representing the fifth straight year in which ridership has exceeded 30 million*. On an average day, more than 84,600 passengers ride more than 300 Amtrak trains.

Two Amtrak lines currently run through San Antonio. Both operate on existing freight rail lines as long distance service (neither line provides local service). The Sunset Limited runs from New Orleans to Los Angeles, and the Texas Eagle runs from Chicago to San Antonio. Both lines arrive and depart at Sunset Station on the east side of downtown San Antonio.

The Sunset Limited currently has westbound departures every Tuesday, Thursday, and Sunday at 2:45 AM and eastbound departures every Tuesday, Friday, and Sunday at 6:25 AM. Other stops in Texas include Beaumont, Houston, Del Rio, Sanderson, Alpine, and El Paso.

San Antonio is the southern terminus of the Texas Eagle and serves as the transfer point to the Sunset Limited. The Texas Eagle departs daily (northbound) at 7 AM and the southbound train arrives daily at 9:55 PM. There are 13 stops in Texas including San Marcos, Austin, Fort Worth, Dallas, and Texarkana. Scheduled travel time on the Texas Eagle from San Antonio to Chicago is approximately 31 hours.

In northern Texas, Amtrak also operates the Heartland Flyer providing service between Fort Worth and Oklahoma City.

"Amtrak's growth over the past ten years, especially on intercity corridors between 100 - 500 miles, hints at the tremendous opportunity of developing a robust, nationwide passenger rail system focused on city pairs."

Source: (Amtrak National Facts: https://www.amtrak.com/servlet/ContentServer?c=Page&pagename=am%2FLayout&cid=1246041980246)

Proposed Lone Star Rail (LSTAR) Commuter Service

In 1997 the Texas State Legislature enacted legislation which allowed local jurisdictions in the Austin-San Antonio Corridor to create an intercity rail district (Rail District) to manage and operate a proposed passenger rail system. In 2003, State legislation approved granting the Rail District the Exclusive Development Agreement authority for the region. In 2009, the Rail District was re-branded officially as Lone Star Rail District (LSRD).

One of LSRD's tasks is to evaluate the existing transportation corridors in the region for developing a passenger rail service (see Figure 20). This evaluation has progressed and is currently being conducted through the NEPA EIS process with multiple alternatives under scrutiny at this time. Passenger service will add capacity to the regional transportation system without the disruption and expense of highway expansion.

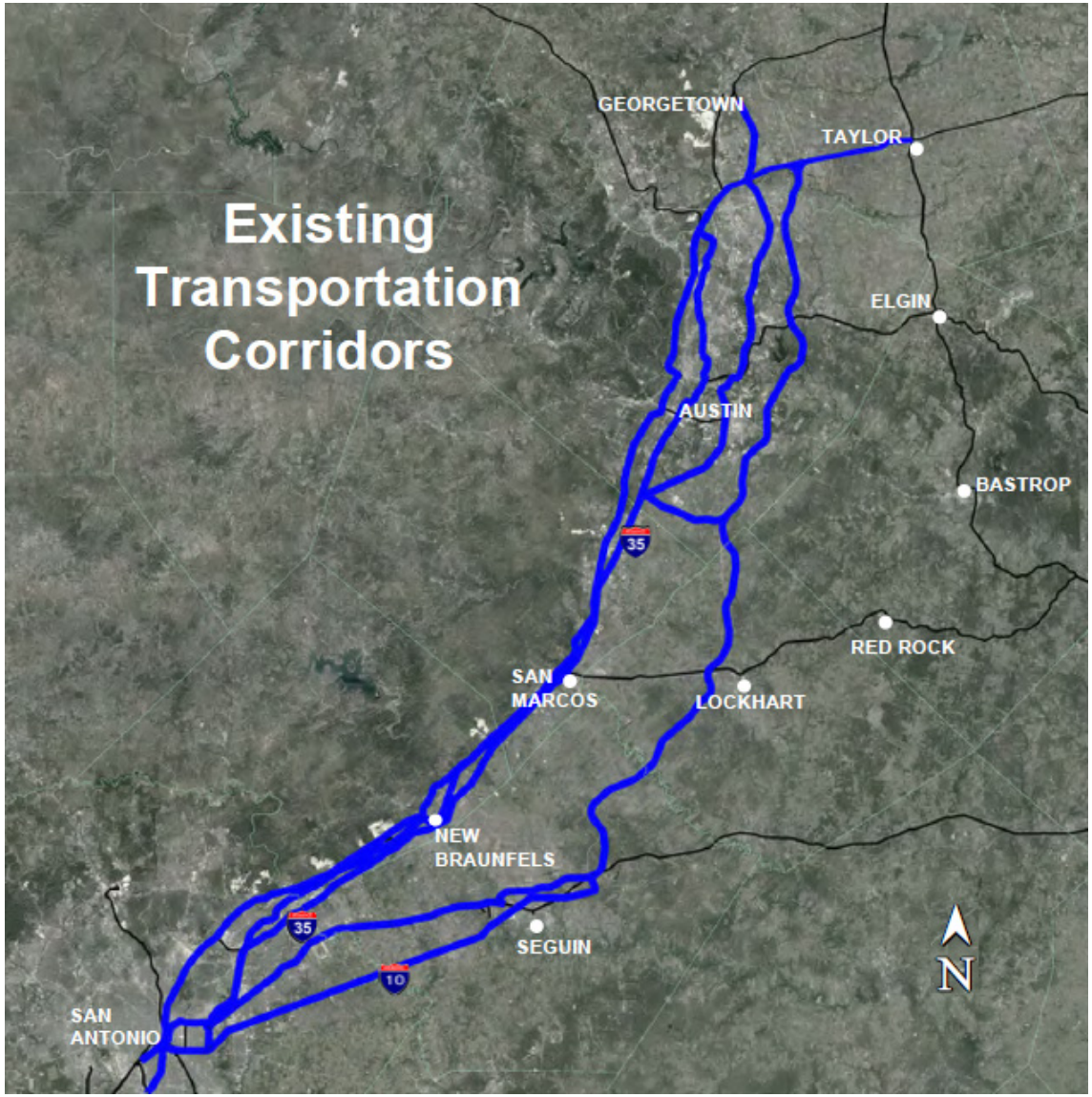


Figure 20: Existing Transportation Corridors between San Antonio and Austin
Source: Lone Star Rail District Board Meeting, March 4, 2016

At peak hours, passenger rail service can carry the equivalent of two to four additional lanes in each direction on I-35. Users will see savings in terms of avoided congestion delays and fuel savings, while enjoying quality travel time to read, work, or enjoy the trip. Passenger rail service is a true economic engine for a region; providing quality mobility choices, economic development, increased tax base, jobs and increased quality of life and environment. At full proposed operation, the LSTAR service plans to offer up to 32 trains per day, seven days a week.

The current EIS alternatives analysis assesses the existing transportation corridors. As seen on Figure 21; the corridors include (but are not limited to) I-35, State Highway 130, the UPRR existing freight line, and other corridors/combinations. In addition to the 'geographic' corridors, the NEPA EIS process also assesses the different technologies for passenger rail (diesel,

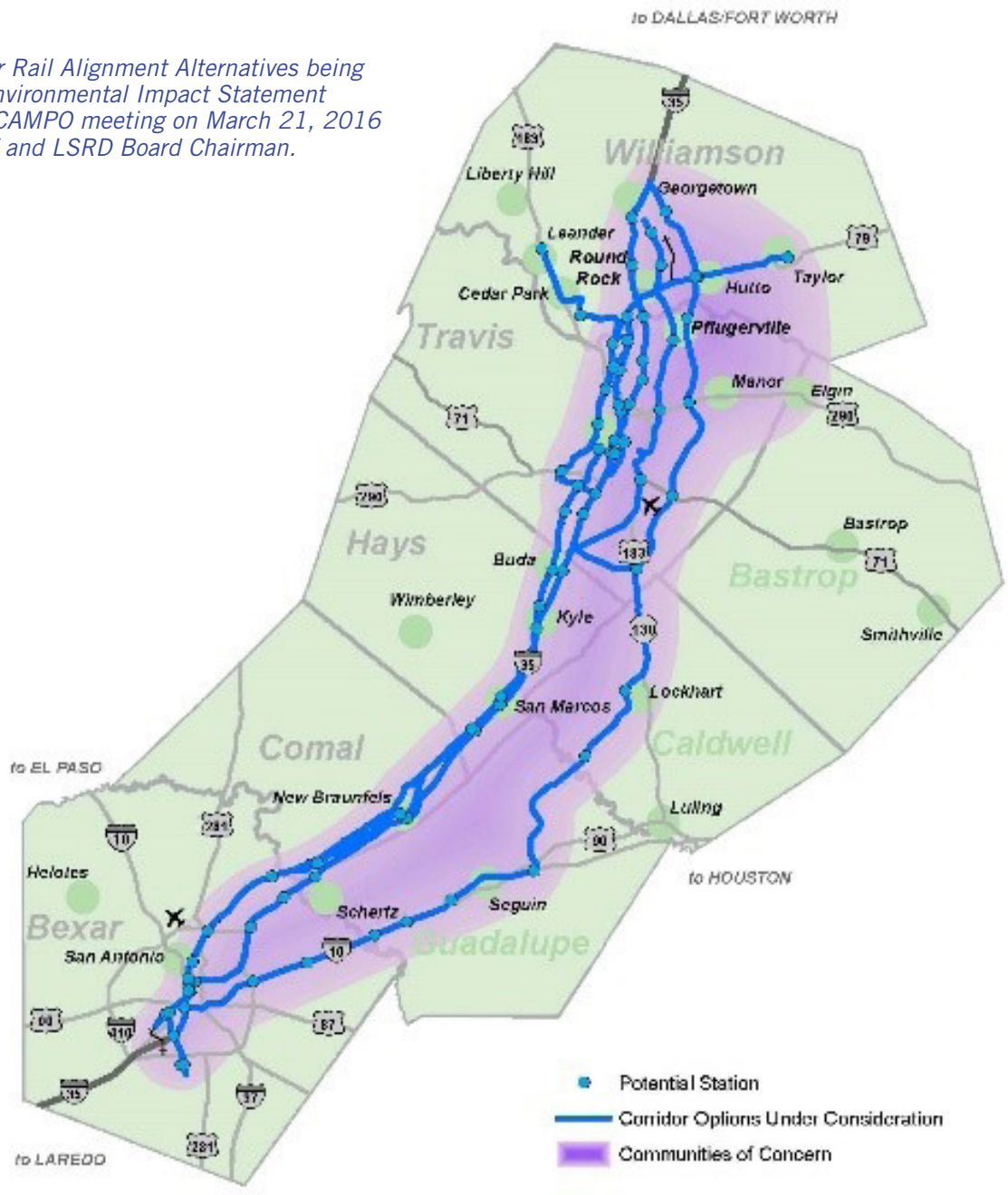
electric, higher speed), construction (at-grade, grade separated, elevated, tunnel), ridership projections, and stations. The anticipated completion date of the studies and receipt of federal approval is 2017, after which final design and construction is proposed to begin.

a. One alternative utilizing the existing UPRR tracks for commingled passenger and freight traffic with modified freight usage, has been extensively publicized with strong public support. In this alternative, the Lone Star Rail District (LSRD) is evaluating a 118 mile intercity passenger rail service from north of Austin to San Antonio operating on the existing UPRR line as shown in Figure 3. Up to 24 possible stations are considered including San Antonio, San Marcos, New Braunfels and Austin. If supported by UPRR, the proposed passenger rail service would operate commingled with UPRR freight traffic. Potentially, some through-freight traffic could be shifted to an East Freight Rail Line comprised of existing and new rail lines to the east with estimates of up to 30 freight trains per day shifted to the east freight line. This plan requires over 80 miles of new freight rail line to be constructed between Seguin and Taylor, modifications to the existing freight line for passenger service, and support by all stakeholders. A variation in this new freight line may be to upgrade the existing line that runs between San Marcos and Taylor to the east bypassing the communities it currently bisects for "through" freight. This alternative would probably use current technology diesel-electric locomotives with top speeds of 79 miles per hour. LSRD is currently conducting environmental, economic and engineering studies associated with the 80 miles of new freight rail line.

b. A second alternative is a modification of the Commingled use of the UPRR line alternative above. This alternative could focus on the acquisition of available ROW adjacent to the existing UPRR line, and construction of a separate passenger rail system – spatially running 'parallel' to the UPRR line. This alternative would not require providing an eastern through-freight line (i.e. freight rail operations will remain on the current UPRR tracks). This alternative would however, allow for other train-set technologies including elevated, electric, or higher speed. Stations may be located within the general footprint of those discussed in the commingled use alternative.

c. An Interstate 35 alternative may involve construction of the rail line in the middle of, and/or adjacent to, Interstate 35. This alternative will not require a through-freight line to the east (i.e. freight rail operations will remain on the current UPRR tracks). This alternative will probably require some/all stations to be adjacent to the interstate highway; requiring local transit connections from the station to municipal business or education districts. This alternative may allow for diesel-electric, electric, elevated, and higher speed (100+ MPH) rail service.

Figure 21: Lone Star Rail Alignment Alternatives being studied in the Environmental Impact Statement
Source: presented at CAMPO meeting on March 21, 2016 by LSRD staff and LSRD Board Chairman.



d. A Highway 130 alternative may offer greater 'greenfield' development, and also allows different train-set technologies (diesel-electric, elevated, electric, higher speed). However, proximity of the 130 alternative presents connection challenges with the municipalities along I-35 (Austin, San Marcos, New Braunfels, etc). Transit connections to those western communities will be important, requiring multi-modal stations and a robust regional transit infrastructure. This alternative probably provides the least immediate relief to the I-35 congestion.

In addition to providing relief to I-35 drivers, LSRD has the potential of connecting over 300,000 higher education students (Universities and Colleges along its proposed route) with homes, employment, training, and internship locales. If used by daily commuters, LSRD can provide reliable and affordable access between affordable housing and job markets in San Antonio and Austin.

Dallas Houston High Speed Rail Project

Texas Central Partners, LLC (TCP) is a private, Texas-based company developing the proposed 240-mile high-speed passenger railway and associated facilities between Houston and Dallas. TCP and its affiliated entities are responsible for the system's design, finance, construction, operation and maintenance. Texas Central High-Speed Railway (TCR) is a separate affiliated company leading the feasibility effort and the environmental analyses necessary to complete the environmental impact statement (EIS). The Federal Railroad Administration (FRA) is preparing the EIS and serves as the lead federal agency for the project [1].

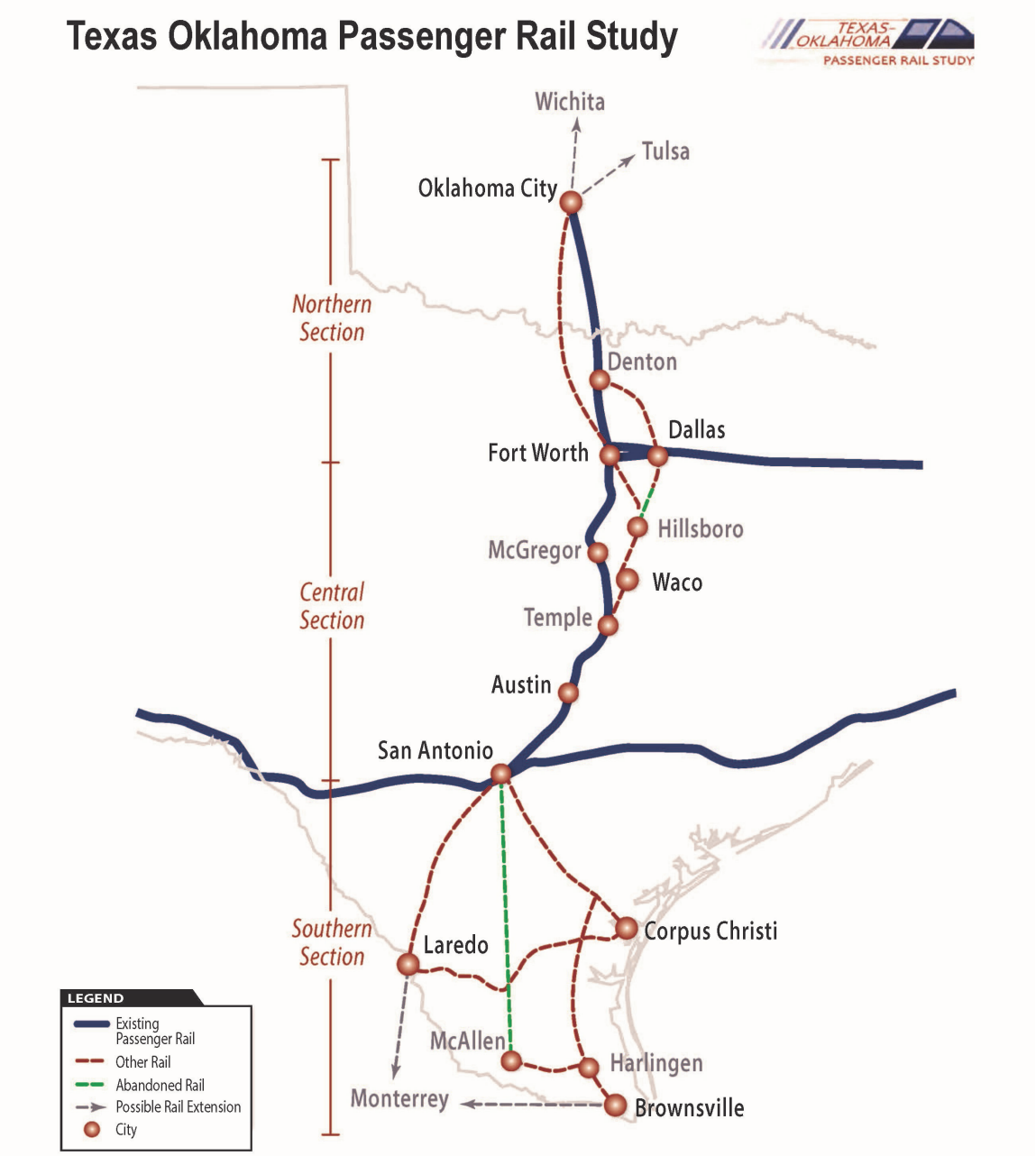
The FRA published a Notice of Intent to prepare an Environmental Impact Statement (EIS) on June 25, 2014. Twelve public scoping meetings were held in October - December. The scoping period ended on January 9, 2015. The EIS will analyze alternative HSR route alignments.

The TCR's proposed high speed line will not share track or infrastructure with existing trains or rail lines and may be located alongside a utility corridor. The EIS will also analyze potential impacts associated with stations and maintenance facilities.

Service will be electrified high speed (up to 205 MPH) and track construction is proposed to be elevated, grade separated between Houston and Dallas. The Dallas station has been conceptualized south of, in close proximity to Dallas Union Station (http://www.texascentral.com/project/). The Houston station is currently being planned along the 610 Loop between 290 and I-10 (west side of Houston; better proximity to San Antonio). TCP successfully completed two rounds of Texas focused fund raising, and the project met a major milestone by attracting a world-class design build firm, Dallas to Houston Constructors (DHC), to conduct engineering and pre-construction work. DHC is a joint venture between Archer Western Contractors and Ferrovial Agroman US Corp. Texas Central values the work being done by DHC at $130 million, signaling another significant boost for the project. DHC has no equity or ownership stake in the project and will not be involved in land acquisition.

There are currently no formal plans for a connection to San Antonio. However, this project, in conjunction with the Dallas-Fort Worth Core Express Project, Lone Star Rail Project and the Texas-Oklahoma Passenger Rail Study will provide Texas with an opportunity to address future growth and congestion on highways and in airports through development of an interconnected and multimodal transportation system.

Figure 22: Texas Oklahoma Passenger Rail - Three Sections
Source: http://www.txdot.gov/inside-txdot/projects/studies/statewide/texax-oklahoma-rail.html



Texas-Oklahoma Passenger Rail Project

The Texas-Oklahoma Passenger Rail Study is a TxDOT project to explore how passenger rail service could provide a transportation alternative to the IH 35 corridor between Oklahoma City and South Texas shown in Figure 22. The 850-mile corridor has been split into three sections [2]:

- Northern: Oklahoma City to Dallas/Fort Worth
- Central: Dallas/Fort Worth to San Antonio
- Southern: San Antonio to Rio Grande Valley/ Corpus Christi/Laredo

TxDOT is preparing a service-level environmental impact statement (Tier One EIS) per NEPA on this federally- funded project to determine the feasibility of the passenger rail service within the corridor. The analysis is based on conceptual passenger rail alternatives to identify a group of feasible improvements for different sections of the corridor.

[1] *http://www.texascentral.com/*
[2] *http://www.txdot.gov/inside-txdot/projects/studies/statewide/texas-oklahoma-rail.html*

The study will answer "big picture" questions:

» Is improved passenger rail a good idea?
» What kind of passenger rail service is feasible?
» What are the costs, impacts, and benefits of passenger rail service?
» What cities would be served by passenger rail?

The study will not determine:

» Where would new railroad track be constructed?
» What would the impacts be to specific properties?
» When would new service be available?
» Exactly where would stations be located?

Figure xx shows the different types of passenger rail service being considered. The operating speed options influence ridership, the number and locations of stations and the cost of construction, operations and maintenance.

Texas Oklahoma Passenger Rail Service Types

	Speed (miles per hour)	Stops/ frequency
Conventional rail (mostly uses existing tracks) 	Maximum: 70-90 mph Average: 45-60 mph	Stops 15 to 60 miles apart 3-6 trains/day each direction (no more than 12)
Higher speed rail (some dedicated tracks) 	Maximum: 110-125 mph Average: 70-85 mph	Stops 30 to 90 miles apart 4-8 trains/day each direction (as many as 12)
High speed rail (fully dedicated tracks) 	Maximum: 165-220 mph Average: 100-140 mph	Stops 50 to 100+ miles apart 12-24 trains/day each direction

Common Attributes: *Single or double deck trains, stations with parking, operation on existing or dedicated tracks*

Source: TOPRS Public Meetings Presentation, Winter 2014 http://www.txdot.gov/inside-txdot/projects/studies/statewide/texas-oklahoma-rail.html

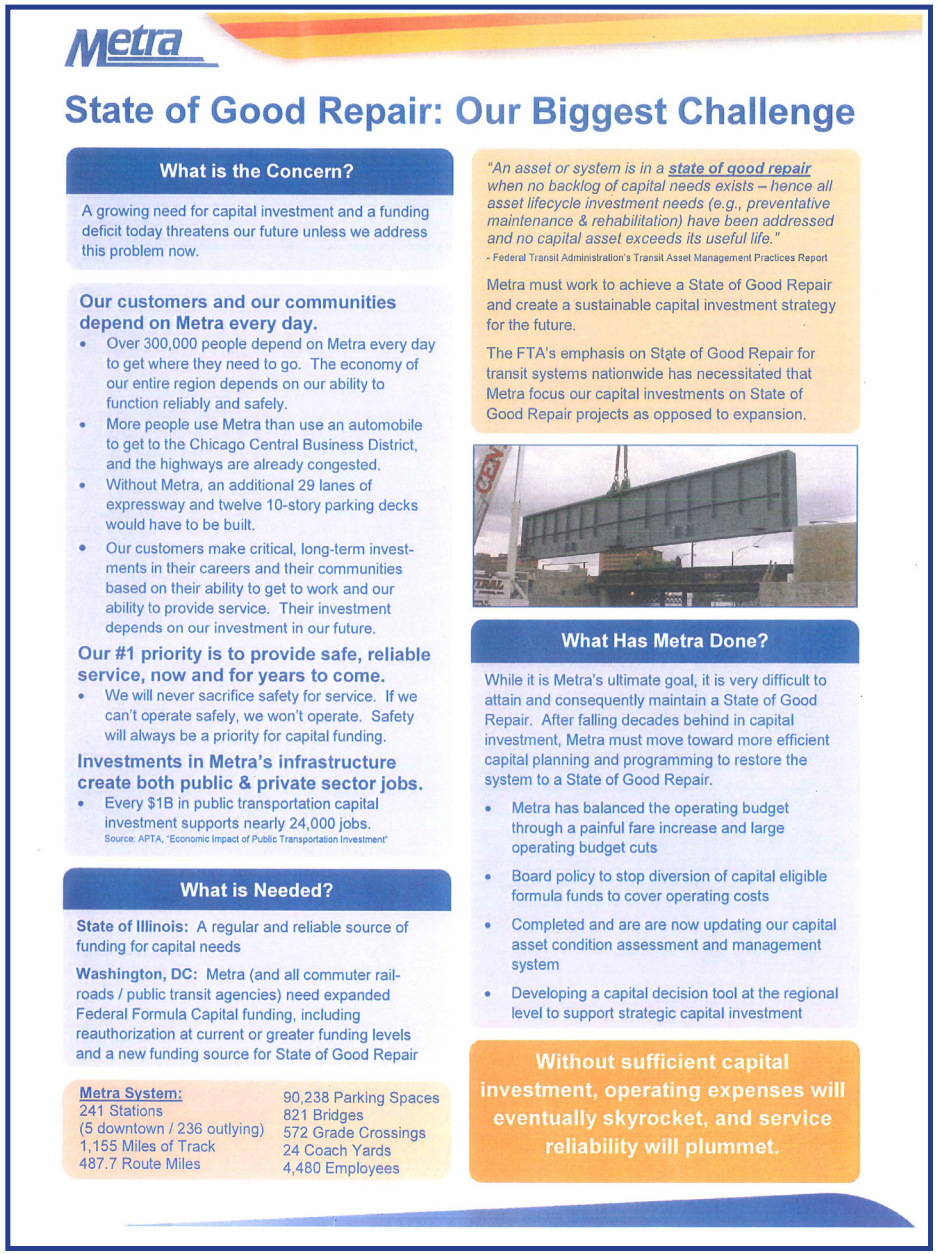
The alternatives were presented at a series of public meetings along the corridor in January and February of 2014. The Draft Environmental Impact Statement (DEIS) target publication is Summer 2016.

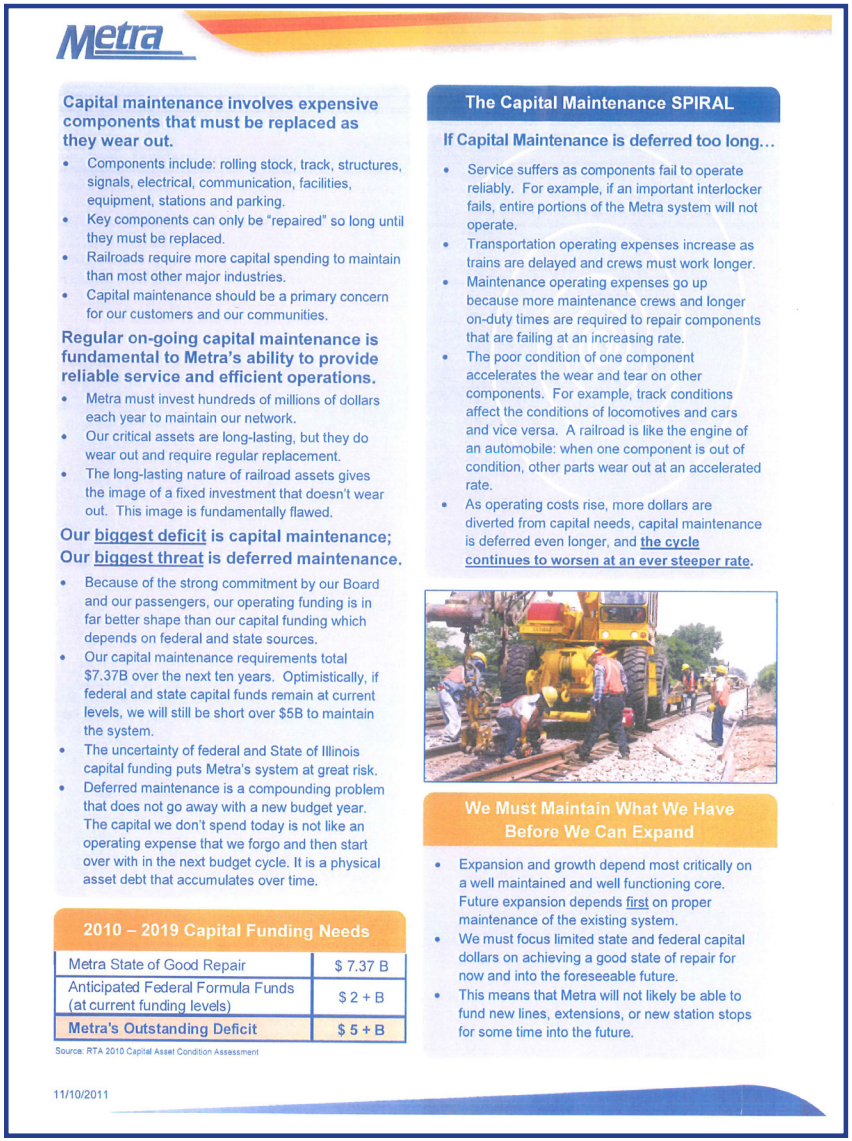
San Antonio's Future Role in Passenger Rail

The City of San Antonio has been participating in an organization supporting high-speed rail. The Texas High-Speed Rail and Transportation Corporation is a not-for-profit Texas corporation dedicated to bringing specific regions of the state together in a grassroots, collective effort to improve transportation and create a network of high-speed rail service in Texas that can connect to states and countries beyond.

Since its inception in 2002, the corporation's goal and approach has been to connect cities and counties by high-speed rail in the main Texas "triangle" of dense population, including the Dallas-Fort Worth, Houston and San Antonio-Austin areas and points within, including College Station and Fort Hood. The corporation's members represent millions of Texans. The goal is to coordinate High Speed Rail within the triangle and to Monterrey, Mexico.

Mike Frisbie, Director, Transportation & Capital Improvements, City of San Antonio, currently serves as Vice Chairman of the organization. Our members share an intense interest in the future of transportation, are supported by a Legislative and Congressional caucus, and proactively pursue Texas' best interests.





Metra

Capital maintenance involves expensive components that must be replaced as they wear out.

- Components include: rolling stock, track, structures, signals, electrical, communication, facilities, equipment, stations and parking.
- Key components can only be "repaired" so long until they must be replaced.
- Railroads require more capital spending to maintain than most other major industries.
- Capital maintenance should be a primary concern for our customers and our communities.

Regular on-going capital maintenance is fundamental to Metra's ability to provide reliable service and efficient operations.

- Metra must invest hundreds of millions of dollars each year to maintain our network.
- Our critical assets are long-lasting, but they do wear out and require regular replacement.
- The long-lasting nature of railroad assets gives the image of a fixed investment that doesn't wear out. This image is fundamentally flawed.

Our biggest deficit is capital maintenance; Our biggest threat is deferred maintenance.

- Because of the strong commitment by our Board and our passengers, our operating funding is in far better shape than our capital funding which depends on federal and state sources.
- Our capital maintenance requirements total $7.37B over the next ten years. Optimistically, if federal and state capital funds remain at current levels, we will still be short over $5B to maintain the system.
- The uncertainty of federal and State of Illinois capital funding puts Metra's system at great risk.
- Deferred maintenance is a compounding problem that does not go away with a new budget year. The capital we don't spend today is not like an operating expense that we forgo and then start over with in the next budget cycle. It is a physical asset debt that accumulates over time.

2010 – 2019 Capital Funding Needs

Metra State of Good Repair	$ 7.37 B
Anticipated Federal Formula Funds (at current funding levels)	$ 2 + B
Metra's Outstanding Deficit	$ 5 + B

Source: RTA 2010 Capital Asset Condition Assessment

The Capital Maintenance SPIRAL

If Capital Maintenance is deferred too long…

- Service suffers as components fail to operate reliably. For example, if an important interlocker fails, entire portions of the Metra system will not operate.
- Transportation operating expenses increase as trains are delayed and crews must work longer.
- Maintenance operating expenses go up because more maintenance crews and longer on-duty times are required to repair components that are failing at an increasing rate.
- The poor condition of one component accelerates the wear and tear on other components. For example, track conditions affect the conditions of locomotives and cars and vice versa. A railroad is like the engine of an automobile: when one component is out of condition, other parts wear out at an accelerated rate.
- As operating costs rise, more dollars are diverted from capital needs, capital maintenance is deferred even longer, and the cycle continues to worsen at an ever steeper rate.

We Must Maintain What We Have Before We Can Expand

- Expansion and growth depend most critically on a well maintained and well functioning core. Future expansion depends first on proper maintenance of the existing system.
- We must focus limited state and federal capital dollars on achieving a good state of repair for now and into the foreseeable future.
- This means that Metra will not likely be able to fund new lines, extensions, or new station stops for some time into the future.

11/10/2011

San Antonio can be a critical, and vibrant driver, and anchor, in the development of a robust rail system. Passenger Rail service is essentially immune to overcrowding and congestion; simply adding a car, or increasing service provides huge capacity increases at minimal costs and efforts. San Antonio will continue to improve railroad crossing and rail passenger safety consistent with Vision Zero.

Passenger Rail is a congestion proof Economic Engine moving people and commerce. The vibrant cities of the future will develop expanding cores of highly trained professionals that contribute higher percentages of per capita to a region. These professionals demand quality of life; translating into better mobility choices (many 17 to 25 year olds today choose to NOT have driver licenses) to access housing, education, and work choices.

San Antonio should immediately implement the following:

» Get involved with LSRD for most immediate regional benefit. Put $ in the game. Corridor selection, station selection and direct access to Austin CBD, I-35 Corridor, and SA CBD is at stake. Regional rail provides immense long term Economic stability by providing reliable access and flow of business into San Antonio. See METRA flyer on passenger, highway, parking, etc. benefits.

» Support VIA initiatives to develop municipal rail in SA and within a Regional and Statewide System. VIA is an extremely important municipal anchor to the regional infrastructure. A good example is the relationship

between Chicago Metra (regional passenger rail), Chicago Transit Authority (municipal rail/bus transit), and PACE (urban bus transit). Together, these systems move commerce (people) into, around, and out of the Business Districts – allowing more businesses to flourish in downtown with minimal expansion problems (no additional parking garages, roads, or highway congestion needed). Personnel arrive less stressed, on time, and more productive.

- Metra alone transports over **300,000 daily commuters** into downtown Chicago to work, play, and spend money.

» Become an active supporter with the TxDOT Rail Division to help shape the future of passenger and freight rail transportation.

- This is important from a freight perspective as more NAFTA trade comes across the border from Mexico, into the USA, and through San Antonio by truck. Eventually the opening of the Panama Canal to larger cargo ships headed for Texas ports, will impact the state in a positive (if prepared) or negative (if ignored) manner. Freight rail with intermodal centers are some of the most efficient means of transport.
- This is important from a passenger rail perspective as TxDOT can assist and help develop a State passenger rail network – if local, regional, and state support is cultivated.

» Communicate with and establish relationship with the Texas Central Railway executives. HSR is a preferred mobility choice in most countries, and the USA will soon catch up.

- Can TCR expand their HSR from Houston or Dallas to San Antonio?
- What lessons can be shared for future development?

» Engage with the Class 1 freight railroads that transport into and through San Antonio. Topics to address include: how to minimize impact of long freight trains on citizens; how can freight be routed around San Antonio to intermodal facilities; can existing ROW inside the city be commingled with passenger rail?

» Actively encourage, and CULTIVATE, investments in passenger rail infrastructure. Look to foreign investors as well as domestic (TCR raised much investment from Texans). Many European and Asian passenger rail firms look to the USA as the next investment horizon – especially as more of their own countries become well served by passenger rail (heavy rail, electric, HSR, LRT). San Antonio can reap the benefits of known systems, implementations, and operations. Texas is viewed by many foreign firms as the one of the best regions for intercity passenger rail.

WHAT CAN WE DO?

WHAT CAN WE DO? - FREIGHT

Freight: Moving Goods Effectively & Efficiently

The Texas Freight Mobility Plan (Freight Plan) is TxDOT's first comprehensive multimodal transportation plan focusing on Texas' freight transportation needs. The Freight Plan identifies Texas' freight transportation challenges, outlines statewide goals and objectives to improve the movement of goods, and offers investment strategies and policies needed to address Texas' freight transport needs. Among the freight challenges that the Freight Plan has identified are deficiencies (with examples in parentheses) in:

- System Capacity (highway congestion and rail bottlenecks);
- System Operations (lack of designated statewide freight network, lack of alternate routes to interstate highways, aging port infrastructure);
- Safety (inadequate truck parking, at-grade rail crossings);
- Connectivity (lack of modal interconnectivity, need for improved rural-urban connectivity);
- Institutional Coordination (need for increased and improved interstate, public-private, and intergovernmental coordination);
- Border Crossings (increasing congestion at border crossings, need for deployment of cross-border technology applications);
- Public Awareness (lack of awareness and understanding of importance of freight movement);
- Funding (inadequate and inflexible funding of infrastructure and innovation).

A key recommendation of the Freight Plan is the designation of a Texas Freight Network. The Freight Plan's proposed Primary Freight Network includes the IH 10, IH 35 and IH 37 corridors through San Antonio, while facilities such as US 90 and US 281 are mapped as proposed Secondary Freight Network/Emerging Freight Corridors through the area. San Antonio International Airport is included as a Top Cargo Airport.

The Freight Plan's prognosis for the future is that congestion and truck tonnage will increase significantly on Texas' interstate highways, especially "Texas Triangle" and border gateway corridors, such as IH 35 and IH 10, resulting in increasing daily truck trips and VMT and, consequently, deteriorating levels of service impeding the movement of freight and people throughout Texas.

The Freight Plan makes 21 policy recommendations to address the freight transportation challenges identified, many of which pertain to the designation of and investment in the proposed Texas Freight Network. The Freight Plan also includes six program recommendations that outline multimodal freight improvement program strategies. These include:

- Continue to develop and administer a comprehensive and multimodal TxDOT Freight Planning Program;
- Develop a freight movement public education and public awareness program;
- Develop and implement a statewide freight technology-based safety and operations program;
- Establish a Texas Border Freight Transportation and Trade Management Program;
- Develop a Texas Highway Freight Network Safety Program; and
- Develop and administer comprehensive Rail Freight, Maritime Freight and Air Cargo Development and Improvement Programs.

Freight Transported on Rail Line near Airport and Parallel with Wetmore Road, San Antonio, TX

In addition, the Freight Plan includes a multimodal set of recommendations for over 1,200 projects to address the freight transportation challenges and needs identified in the Plan. These include 878 highway projects currently under development or planned, totaling approximately $36.6 billion, and 34 rail projects, estimated at approximately $545 million. The total estimated cost of these projects is over $49 billion; however, not all of these projects are fully funded, so the total cost to implement them may be much higher.

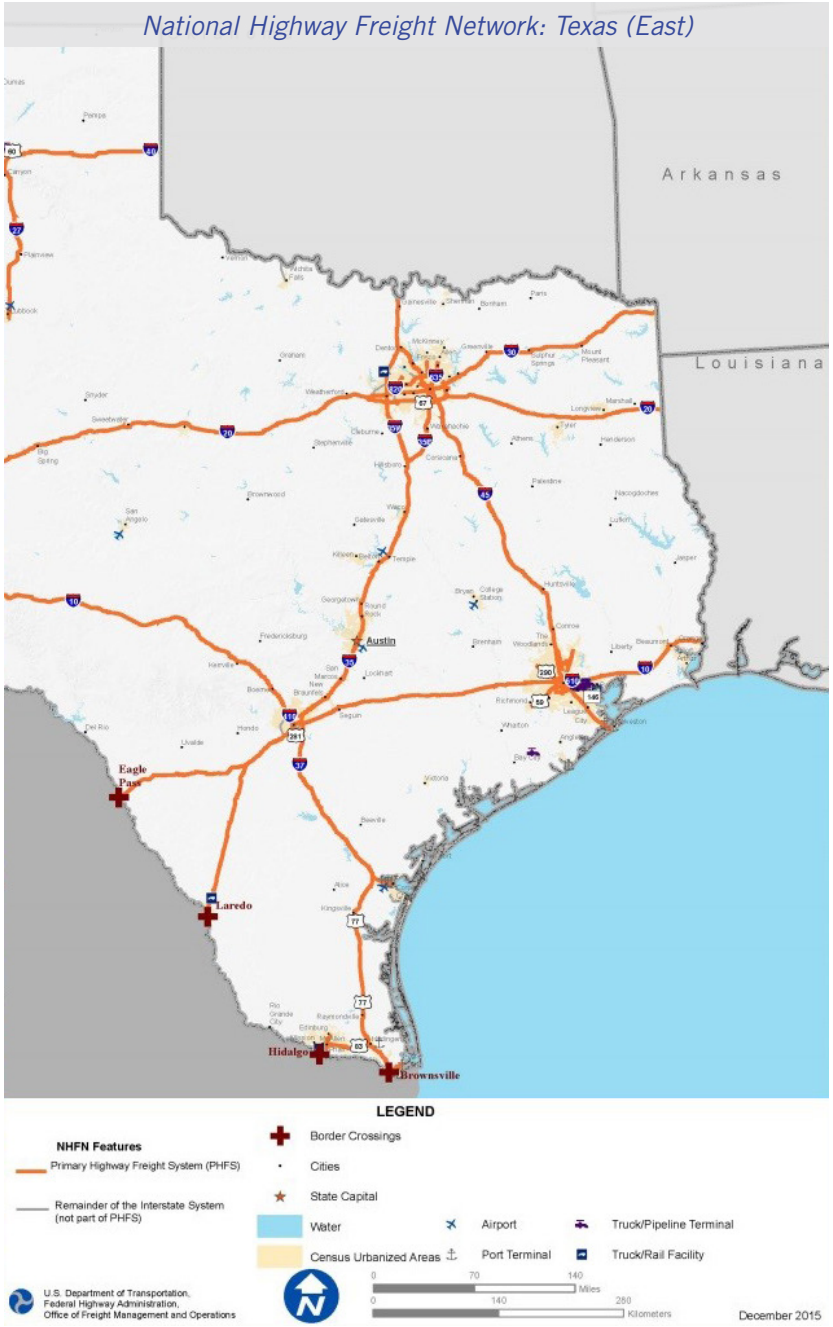
Relevant Policy Recommendations

A number of the Freight Plan's policy recommendations merit discussion as being particularly relevant to San Antonio's urban highways and railroads. A very important one is the recommendation for Freight Network Designation and Investment. Beyond the initial designation of the Freight Network, the policy is intended to direct and prioritize federal, state and local investment in freight facilities on the network, which, as noted above, includes major interstate

and US highways in San Antonio, as well as the Union Pacific Railroad.

An important and new aspect of this derives from the FAST Act. Texas receives approximately $110 million per year in formula freight funds which can be expended on a network in Texas with three components: a Primary Highway Freight System (PHFS) consisting of 3,700 miles of chiefly interstate highways in the state, including I-35 and I-10, and I-37; 746 miles of critical rural freight corridors to be designated by TxDOT; and 373 miles of critical urban freight corridors to be designated mainly by major MPOs (including the Alamo Area MPO), but with the statewide total adjudicated by TxDOT. A map of the PHFS in East Texas appears below; definition of the critical rural and urban corridors to be added to it obviously will become a central concern of TxDOT's freight network designation effort, and development of its investment plan. The key point is that the City of San Antonio should take an active role in the selection of Critical Urban Freight Corridors by the Alamo Area MPO for submission to TxDOT, because those routes will become eligible for a large new source of funds.

National Highway Freight Network: Texas (East)



In tandem with that policy is a recommendation for Highway Freight Network Design Guidelines and Implementation. Among this recommendation's objectives are the following:

- Evaluate TxDOT geometric design standards with respect to commercial vehicle movement on the Freight Network (e.g., turning radii, number of turning lanes, ramp configurations, capacity, frontage road connectivity and clearance or width for oversize loads);
- Increase TxDOT's current vertical clearance standard from 16.5 feet to 18.5 feet on the Highway Freight Network;
- Harmonize truck-related requirements and provide guidance to local jurisdictions, including consistent designated routes and/or restrictions for trucks carrying oversize/overweight loads and hazardous materials; and
- Assess opportunities to provide greater separation between truck and passenger vehicles on interstate segments of the Highway Freight Network.

The recommended policy for Safety, Security and Resiliency of the Freight Transportation System includes among its objectives to:

- Prioritize funding for the elimination of freight movement safety "hot spots" (locations with high truck-related crashes) and identify potential crash remediation strategies.
- Improve safety along the Freight Network, especially for the movement of hazardous materials and oversize/overweight loads, through clear route designation and signage, increased educational and training programs and accurate/timely communication with freight system operators.
- Build safety, security and resiliency factors into transportation infrastructure designs and investment decisions and ensure all Primary Texas Highway Freight Network corridors have alternate routes in the event of disasters.

The policy recommendation for Freight-Based Technology Solutions and Innovation may potentially realize significant benefits for the urban freight network. This policy's objectives are to:

- Develop and expand partnerships with public- and private-sector stakeholders to implement proven freight-based technology solutions and foster emerging transportation technologies.
- Expand the development of sophisticated real-time information systems and increase the dissemination of dynamic travel information to improve freight movement mobility and reliability.
- Provide a seamless statewide traffic management system by integrating existing traffic management centers to provide comprehensive traveler information, such as weather-related information, construction, incident management, emergency management coordination and identification of alternative routes. Another facet should be parking reservation systems accessible by truck drivers and fleet dispatchers from smartphones. This is significant for long haul truckers needing to plan mandated rest stops efficiently, and for local drivers making

Grade Crossing on South Brazos Street, South of Laredo Street, San Antonio, TX

deliveries in the more challenging locations of the city. These systems have safety and productivity benefits, which in turn positively influence the cost of freight transportation.

» The major change in technology that needs to be planned for at every level is Connected and Automated/Autonomous Vehicles (CAV), because components of the technology already are in use and some of the more dramatic applications are in continuing testing. It is not unrealistic to anticipate truck platoons (multiple trucks traveling closely together, wind drafting and potentially using a single driver) operating in the Texas Triangle and for long-haul border traffic. Quite apart from platooning - which is only one form of CAV, although one with major implications for rail competition - the technology has large safety benefits because vehicles sense one another and the roadway. This allows human error to be overcome and reaction times to become faster. In a metropolitan region where community concerns about truck activity are based on safety, a new generation of interactive trucks and infrastructure can improve safety performance and reduce community opposition to freight routes and economic development.

There is also a specific policy recommendation for Rail Freight Transportation, which includes among its objectives the following:

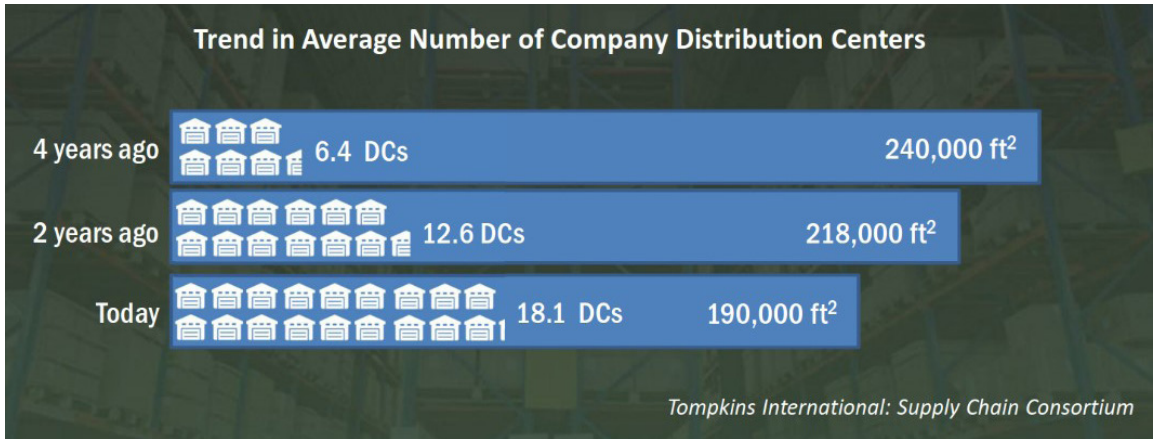
» Support partnerships for public-private funding and financing opportunities that expand rail capacity and connectivity.
» Support strategies that reduce the number of at-grade highway/rail crossings, improve the efficient movement of freight and increase the quality of life through reduced congestion and improved safety.
» Foster rail freight as a practical modal alternative that could potentially relieve freight congestion on Texas highways.

The recommended Institutional Coordination and Collaboration policy has a local and regional nexus. Its relevant objectives include to:

Advance the development of a "one-stop shop" permitting and compliance agency in Texas, empowered to coordinate permitting reviews within the state and with other permitting agencies at the local, regional, state and federal levels.

Improve communication between public agencies to streamline project delivery and build consistency among various jurisdictions in regulations, permitting, planning and preservation of the freight network.

Enhance coordination with MPOs and local governments to identify freight infrastructure needs of statewide significance.



Home Delivery: Fitting with the policy of state and local coordination is the growth in internet home delivery as a substitute for conventional retail, because it affects both state and local land use and transportation patterns. Retail distribution is one of the main markets for freight transportation and is the channel by which freight provides service to the population. The location of retail distribution centers dictates where freight will flow to and from, and what regions it serves. A pronounced trend in recent supply chain design has been an emphasis on faster time to market, which requires more distribution centers placed closer to end users. The accompanying graphic from the Tompkins International Supply Chain Consortium shows that major American companies have tripled the number of distribution centers they use just in the last four years. A major driver of this trend is home delivery.

The battle front in the competition between store-based and web-based retail is convenience. The web can offer a vastly larger array of products but not the utility of possessing the product immediately. To combat this, web merchants have been offering faster delivery times and lower shipping charges. In San Antonio, the market leader Amazon began offering 2-hour delivery for certain products and zip codes in the fall of 2015,[1] with free shipping for its Prime members (membership costs $99/

[1] *http://www.sacurrent.com/Blogs/archives/2015/10/22/amazon-prime-now-brings-1-hour-delivery-to-san-antonio*

year). 1-hour delivery is available for $7.99. The effect of this on consumers is to make it easy and cheap to change buying behavior, to the point that package delivery companies report that products on the home delivery channel now include every day and bulky household items like paper products and pet food. The effect on the transportation system is two-fold: distribution centers have to be close enough delivery points to make the 2-hours delivery deadline despite traffic conditions, and trucks large enough to supply routine household items will appear in residential neighborhoods. How Texas plans for this and the common needs of metropolitan regions in preparing for it are clear areas for coordination.

Many, if not most, of the remaining policy recommendations in the Freight Plan may also have relevance to freight transportation planning in the San Antonio area. The preceding selection of recommendations from the Plan presents those that presented some issues of particular relevance.

Program Recommendations

Some elements of the Freight Plan's program recommendations that may be especially applicable to regional freight planning in the San Antonio area are listed below. These elements recommend that TxDOT/the State should:

» Continue to develop and administer a comprehensive and multimodal TxDOT Freight Planning Program, focused both on developing strategies, policies and methodologies to improve the freight transportation system and on better ways to link transportation investments to the state's economic development goals.

» Develop and implement a statewide Freight Technology-Based Solutions Program focused on enhancing freight transportation system safety, management, operations and asset management.

» Develop a Texas Highway Freight Network Safety Program focused on improving safety by minimizing conflicts between trucks and passenger vehicles on the network.

» Develop a Design, Construction and Safety Standards Program focused on reviewing and modifying standards to address safety and mobility needs for truck movements, increasing connectivity and increasing Texas Highway Freight Network efficiency and operations.

» Develop a Bridge Reconstruction and Replacement Program to address deficient bridges, increase vertical clearance to 18.5 feet to accommodate oversize/overweight vehicles and military transportation needs and facilitate efficient movement of people and goods.

» Develop an Interchange Reconstruction and Upgrade Program for all interstate highways to address obsolete designs and left exits to improve safety and mobility.

» Develop a Statewide Construction Management and Coordination Program to proactively minimize traffic impacts and improve safety and mobility for motorist and trucks.

» Develop, in cooperation with the freight industry, a comprehensive Rail Freight Development and Improvement Program to expand rail freight capacity and improve rail freight mobility.

Project Recommendations

As noted above previously, over 1,200 projects were recommended in the Freight Plan for the Texas Freight Network, which are currently under development or planned at an estimated cost of $36.6 billion, but not all of which are fully funded. In addition to these recommended projects, 786 segments of the Highway Freight Network were identified with freight needs, but which do not yet have a planned project. These needs have an estimated cost of approximately $25.9 billion. Urban areas account for 63 percent of total projects and 79 percent of total estimated project cost. Freight Plan goals upon which the identification of project recommendations and highway freight needs were based include:

- Mobility/Connectivity
- Alternate Routes
- Commercial Motor Vehicle (CMV) Bottlenecks
- At-Grade Rail Crossings
- Truck Rollovers/CMV Hot Spots
- Asset Management
- Technology and Operational Improvements

Truck Traffic on IH 35 at Thousand Oaks, San Antonio, TX

The Freight Plan maps the needs represented by the first six bullet points for the state of Texas, with needs included under Asset Management as being focused on bridge deficiencies. The maps show that the San Antonio area has needs in all six areas categories.

The Freight Plan's rail recommendations provide for improving mobility and increasing capacity by double-tracking existing rail lines and adding new rail lines. Additionally, several rail grade separation projects are identified to reduce the number of incidents, alleviate bottlenecks and allow trains to operate more efficiently. The Freight Plan estimates over $1.7 billion for 65 highway/rail grade separations projects from TxDOT's UTP. These projects are eligible for funding through TxDOT's railroad grade separation program. Highway-rail grade separation projects were selected, prioritized and targeted for:

» New grade separation structures; and
» Upgrading deficient railroad underpasses.

Grade Crossing on Fredericksburg Road, South of Myrtle Street, San Antonio, TX

Union Pacific Rail Road (UPRR) identified the following grade crossing locations in San Antonio that could benefit from grade separation. The locations were identified by UPRR as part of the Partner Agency Group efforts for the Multimodal Transportation Plan. UPRR based the selection on citizen complaints and safety statistics.

- Houston Street crossing next to Freeman Coliseum & AT&T Center
- Jones Maltsberger crossing at Quarry Market & US Highway 281
- Frio City Road & Zarzamora crossing
- Rittiman Road or Walzem Road along Gibbs Sprawl Road at the railroad crossing east of Kirby
- Rittiman Road & I-35 crossing
- Thousand Oaks along Wetmore Road at the railroad crossing
- Support the designation of SH 130 as an alternate route for freight traffic not destined to San Antonio

Opportunities to seek available state and/or federal funding for grade separating crossings should continue to be pursued. However, freight carriers should partner with the City and/or TXDOT to help underwrite grade separation improvements for crossings that impede freight movement and contribute to safety issues. A partnership to improve these crossings would benefit both agencies and an agreement sharing the cost with the City and/or TXDOT to grade separate could speed up implementation greatly.

WHAT CAN WE DO?

WHAT CAN WE DO? - AIRPORTS

Airport System

The airport system is comprised of two airports, the San Antonio International Airport (SAT) and the Stinson Municipal Airport (SMA), both operated by the City of San Antonio. The San Antonio International Airport is located eight miles north of downtown, near North Loop 410 and US Highway 281. The airport has two terminals, A and B, which serve over eight million visitors each year. Terminal A was recently renovated and the new Terminal B was finished in 2010. Twelve airlines provide service to passengers at the airport. There are currently 31 non-stop destinations across the US and in Mexico originating from SAT. Stinson Airport is the General Aviation reliever airport.

In 2009, the City initiated the San Antonio International Airport Vision 2050 Master Plan (Vision 2050 Plan). The Master Plan calls for a proposed Terminal C to be constructed to meet demand in 2030. A consolidated car rental facility (CONRAC) is to begin construction in 2015. The CONRAC will be located with the hourly parking garage. An intermodal center is also proposed in the Master Plan. The new Intermodal Center will encourage transit ridership by providing access to several modes of transportation, such as bus and regional rail, all contained in one facility.

Stinson Airport is the second oldest General Aviation Airport under continuous operation in the county. General Aviation Airports are open to public use but do not have scheduled service or have less than 2,500 annual passenger boardings. Stinson Airport is located 6 miles south of San Antonio's downtown Central Business District on Mission Road, south of SE Military Drive and north of Loop 410. Stinson serves as the general aviation reliever airport to San Antonio International. Reliever Airports are public or private-owned airports designated by the Federal Aviation Administration (FAA) to relieve congestion at the commercial

SAN ANTONIO'S INTERNATIONAL AIRPORT IS FOCUSED ON SUSTAINABILITY!

MISSION STATEMENT: The Vision 2050 project provides a plan for sustainable development of the San Antonio International Airport, enhancing customer service, reflecting the unique identity of San Antonio, accommodating future growth in an environmentally and fiscally sound manner, integrating into the regional transportation system, and supporting regional economic development.

Source: San Antonio International Airport Vision 2050 Plan

service airport. Reliever airports also provide aviation access to the community.

Mission Road provides the main access to the Airport and is a two lane, two-way, road with no curb, gutter or sidewalks. Access to Mission Road is provided from Southeast Military Highway, which is a major east-west thoroughfare. Roosevelt Avenue is a major north-south thoroughfare that provides access to the west airfield and tenant areas. On a regional scale, Interstate 37 provides access to Southeast Military Drive from downtown San Antonio and northern areas, as well as from the south. Additionally, Interstate 35 provides access to Southeast Military Highway from the western portions of San Antonio.

Future Airport Access

At only 15 minutes from downtown, current access to and from SAT is very convenient for residents and visitors alike, especially during non-peak conditions. As we see one million more people in San Antonio and the subsequent congestion it creates, our travel times to and from the airport will increase along with other trips. Loop 410 and US Highway 281 provide direct access to the airport. Both highways are anticipated to experience significant congestion by year 2040. Neither highway has significant available ROW for widening, which means access to and from the airport during congested periods will be affected. Flow and efficiency can be improved by implementing Intelligent Transportation Systems (ITS) components to time signals and install adaptive traffic control on adjacent roadways that are used for part of the trip to the airport or are used as a detour. Reliability, or the ability to rely on a consistent travel time, is very important to travelers catching planes and family and friends picking up passengers. Reliability can be greatly improved by implementing an incident management system to alert drivers of crashes or other incidents in advance, giving them an opportunity to change their route. In addition, crashes and incidents can be cleared quickly to reduce the residual delay.

Opportunities to improve access must focus on ways to move more people without widening the highways. Effective options include dedicated lanes, such as HOV lanes, HOT lanes, transit only lanes. Either of these would be highly effective for airport travelers since pick-up/drop-off operations usually include a driver and one or more passengers.

Even better than dedicated lanes, a light rail system would be very attractive to airport users, employees and travelers, since those using it would not require parking and would avoid delays due to highway incidents. Most attractive would be the reliability or the ability to predict the time it takes to get to and from the airport. Lone Star Rail is proposing service

Figure 23: The Preferred Development Plan for SAT

Preferred Development Plan

1. Construct a consolidated rental car facility (CONRAC) and expand parking garage
2. Relocate employee lot south of Loop 410
3. Relocate employee lot south of Loop 410
4. Reserve land for development of an intermodal facility. The intermodal center will encourage transit ridership by providing access to several currently available and future modes of transportation in one consolidated facility, including bus and regional rail service.

that would travel on an existing rail line adjacent to the airport. A station is being proposed near Loop 410. If the service is implemented, the connection to the airport could provide a huge benefit to the airport economy while spurring redevelopment of the surrounding area. The Vision 2050 Plan calls for relocating the employee parking lot south of Loop 410 and providing 1,900 parking spaces. Light Rail or Lone Star Rail to/from the airport with a station located near the employee lot would prove very attractive to employees and passengers alike if a connection to the Airport Terminals is planned. Rail service would remove these trips from San Antonio highways, especially the overburdened US Highway 281 and Loop 410.

Figure 23 shows the Preferred Development Plan for SAT. The plan includes an intermodal facility south of Loop 410 and adjacent to the rail line being proposed for use by Lone Star Rail. The intermodal facility will provide a

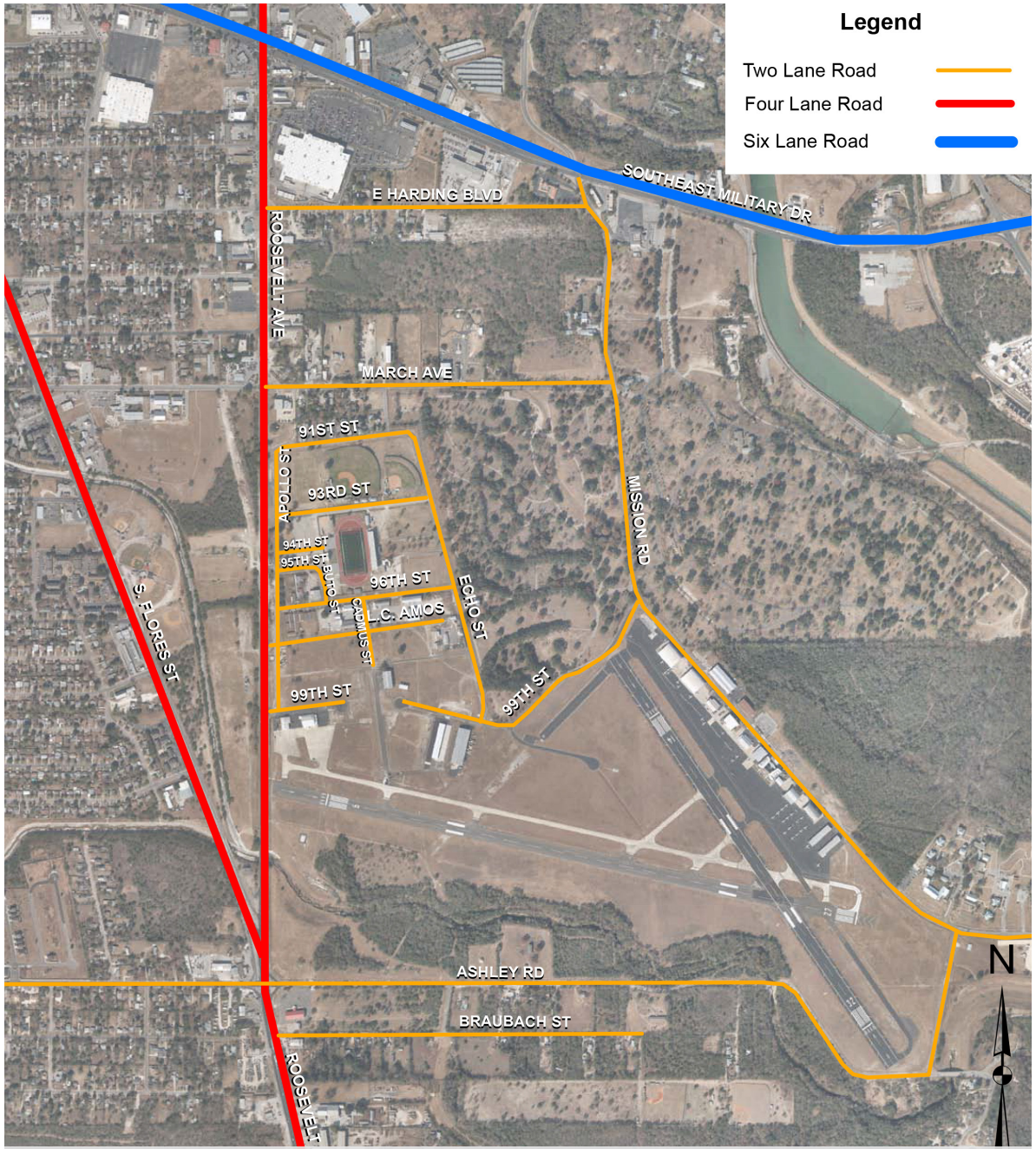
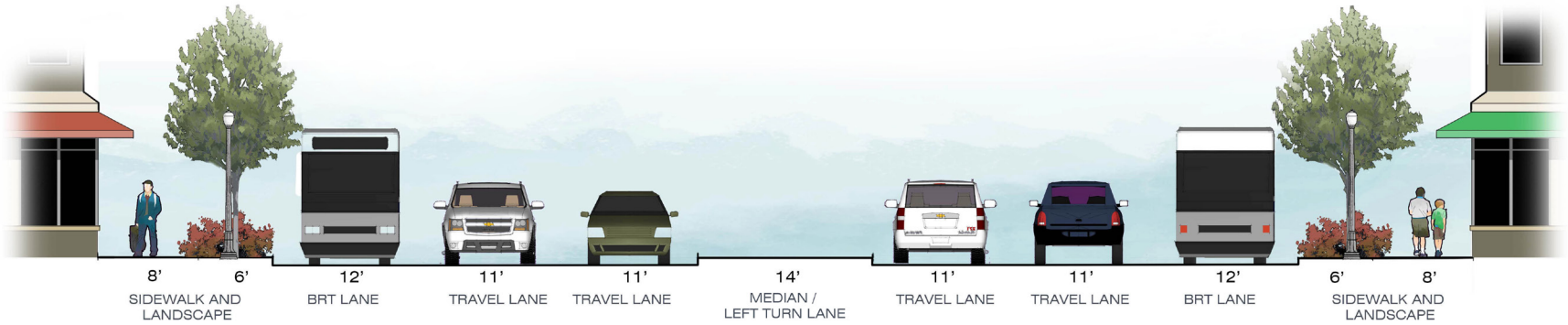


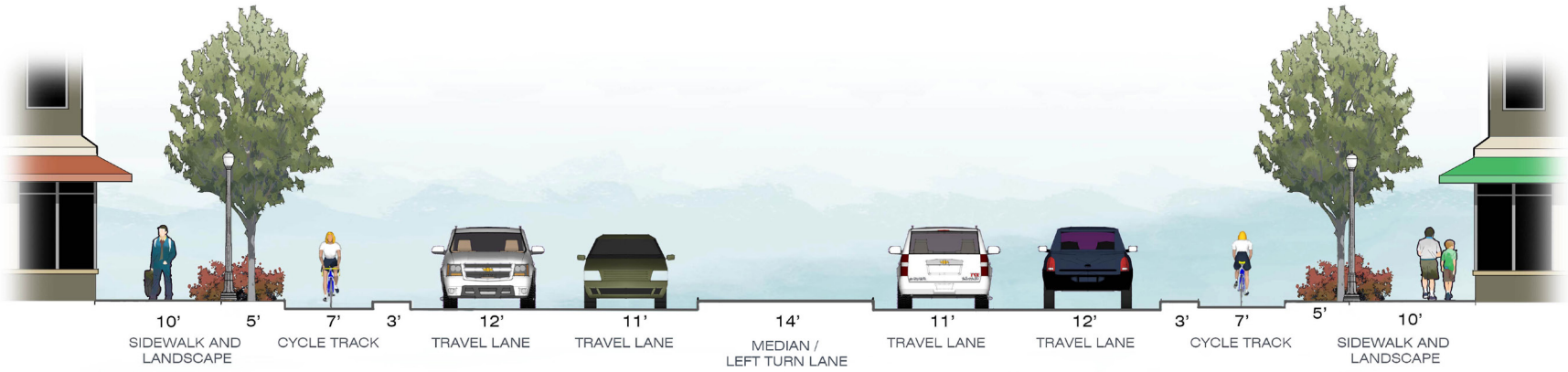
Figure 24: Stinson Municipal Airport (SMA) Local Road Network

Source: City of San Antonio, 2012
Prepared by: Kimley-Horn and Associates, Inc., March 2012

Scale: 1" = .25 Miles



SECTION : SOUTHWEST MILITARY : QUINTANA - IH 37 (OPTION 1)



SECTION : SOUTHWEST MILITARY : QUINTANA - IH 37 (OPTION 2)

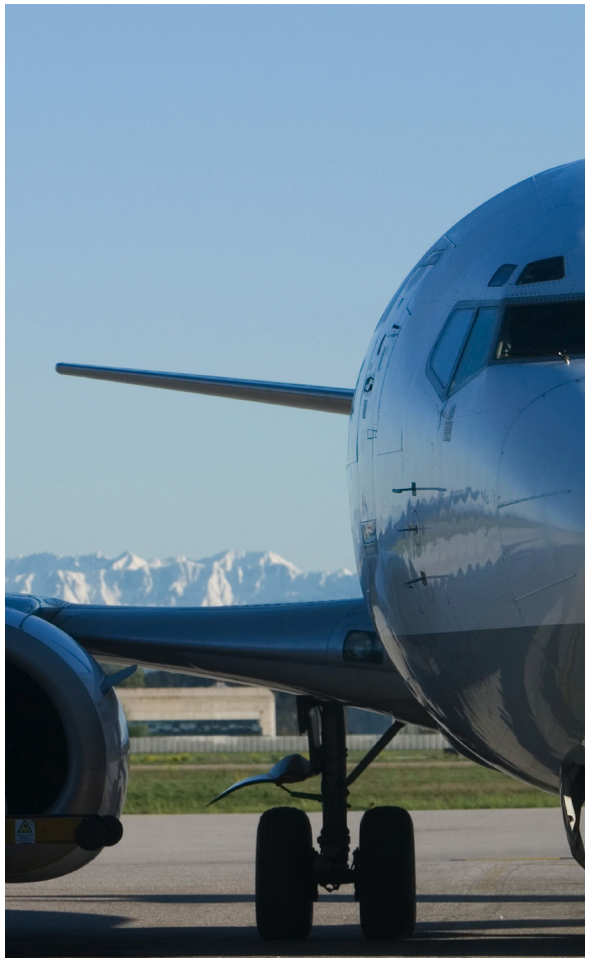
"place" where modes connect allowing users to transfer from one mode to another and continue their trip.

Stinson Municipal Airport (SMA) also has a Master Plan that was updated in 2013. Figure 24 shows the current roadway network that provides access to and from SMA.

The Master Plan calls for access improvements consisting of construction of a new roadway connecting Roosevelt Avenue and Mission Road north of the airport. The Master Plan also proposes to close the L.C. Amos Jr. (formerly 97th Street) intersection at Roosevelt Avenue.

The UNESCO World Heritage designation of 4 of the 5 Missions in San Antonio will bring interest and increased visitors to the area. The SMA is located near the Mission Espada site and the San Antonio River Mission Reach Trail which connects all 4 of the missions. VIA is proposing to implement new service in June 2016 called "VIVA Missions" connecting the Alamo (the 5th and most famous Mission), San Jose, Concepcion, Espada, and San Juan Capistrano Missions.

The Multimodal Transportation Plan identifies potential long term options for SW Military, an east-west arterial intersecting Roosevelt Avenue and Mission Road, located just north of SMA. The long-term options consider a barrier separated bicycle facility or cycle track that connects with the San Antonio River Mission Reach trail and a dedicated Bus Rapid Transit lane to promote transit use along the corridor. Both options are compatible with the Stinson Municipal Airport Master Plan and help support transportation choices for airport users and visitors to the area. The long-term options are described in greater detail later in the "What Can We Do" section of this report.



Conclusion

Both airports are anticipated to have increased access demands as the population in the area increases by 1 million. However, the activity will be at a much larger scale at SAT based on its role as the Commercial Service Airport. Opportunities for intermodal connections to serve passengers and visitors should continue to be improved and expanded. Light Rail service for SAT with connections to transit, bicycle and pedestrian facilities is needed for a sustainable transportation system serving the airport. Placemaking opportunities should also be considered as the intermodal facility is planned and designed. The Stinson Airport is currently under-design for a new control tower. With the increase of more national and international companies locating in San Antonio, Stinson offers the extra capacity needed to provide private plane services. It also offers an opportunity for re-development of the area connecting historical sites with new transportation oriented potential. VIA's "VIVA Missions" bus service that connects the Missions, Mission Reach Trail and Downtown can connect with SMA with transfers available to other areas of the City.

SA Tomorrow emphasizes the critical need to protect, preserve and ensure safe existence of the Runway Protection Zone (RPZ), along Wetmore Road and wherever it exists, and limitation of places of public/private assembly.

The RPZ exists for safety reasons. The Federal Aviation Administration (FAA) imposes, inspects and governs this and countless other aviation related safety requirements. We urge advance and close communication, coordination and collaboration with the FAA, through the Aviation Department, for projects affecting Wetmore Road and RPZ areas.