Chapter 5: Current Conditions Inventories

CHAPTER HIGHLIGHTS

- The Auto Network
- The Bicycle Network
- The Bus Network
- The Truck Network
- The Walk Network
- The Airport and Rail Systems

Introduction

Inventories of current conditions by mode are vital to define the extent of the respective infrastructure by Functional Class, along with the notable constraints and barriers faced by each network. This data is the basis for defining and evaluating potential network improvement projects.

The inventories by mode have been gathered from available data in Geographic Information System (GIS) layers provided primarily by KTMPO. Layers were verified through a review of online data, aerial photos, and limited on-site field work. For almost every layer, the verification effort showed that the GIS layers were generally complete and accurate, and only minor editing was required. The only GIS layer which was discovered to need more extensive updates is the sidewalk inventory. For this layer, several specific areas where an update of the inventory is needed were noted, as shown in the Walk Network section.

In addition to the five modal networks, the airport and railroad system are also inventoried to document their points of interaction with the networks. For the airport system, this refers to the individual streets providing access to the terminals. For the railroad system, a layer of rail routes was developed, but the primary interaction with the networks is the layer of railroad crossings.

Because of the scale of the region, detailed illustrations of each modal network for each KTMPO member jurisdiction would require a document of excessive length, so the inventories are primarily documented through GIS layers to support further work for this Plan. The GIS layers which were used in the inventories are shown in **Table 5-1**. Sources of the layers and the methods used to verify their coverage and accuracy are also listed.

Table 5-1: GIS Layers for the Modal Inventories

GIS Layers, Sources, and Verification Methods		
Modal Network	**GIS Layer**	**Notes on GIS Layer**
Auto	2017 Network	Updated from the 2010 network based on TIPs and verified through aerial photos.
Bicycle	Bike Ped Paths and Trails	Layer provided by KTMPO and verified.
	Bike Ped Bridges	Layer developed through review of aerial photos.
Bus	The HOP Fixed Routes	Layer provided by KTMPO and verified.
	The HOP Bus Stops	Layer provided by KTMPO and verified. Added data for shelters.
Truck	Truck Priority Routes	Developed layer from Federal and State data.
	Load Restricted Routes	Developed layer from Federal and State data.
	Load Restricted Bridges	Developed layer from Federal and State data.
	HAZMAT Routes	Developed layer from Federal and State data.
	Truck Prohibited Routes	Developed layer from field review.
Walk	Bike Ped Paths and Trails	Layer provided by KTMPO and verified.
	Sidewalks	Layer provided by KTMPO and verified.
	Sidewalk Inventory Needed Areas	Layer developed from review of aerial photos.
Airport	Airports	Layer developed from review of aerial photos.
Railroad	Railroads	Developed layer from GIS layer and updated based on aerial photos.
	Railroad Crossings	Layer developed through review of aerial photos.

To provide a compromise between the high-level regional view and a detailed view of networks at local scales, each modal network is provided with three Figures: an overall view showing the entire region, a western area view showing cities from Kempner to Salado, and an overlapping eastern area showing cities from Harker Heights to Troy and Rogers.

The **auto network** is the base layer for the Thoroughfare Plan, with Functional Classes for ***Controlled Access***, ***Major Arterial***, ***Minor Arterial***, and ***Collector.***

For the use of the regional travel demand model, the ***Controlled Access Functional Class*** is divided into three components: ***Interstate Highway***, ***Freeway***, and ***Expressway***.

The model standards from TxDOT defines ***Interstate Highways*** as fully controlled access facilities with no at-grade intersections and an Interstate designation. These facilities typically have grassy medians or raised concrete dividers, and frontage roads. Examples of Interstate Highways in the region include IH-35 and IH-14.

Freeways have similar standards, but are not designated as Interstates. Like Interstates, their primary function is to provide mobility for regional and through trips. The Copperas Cove bypass is an example of the Freeway Functional Classification in the region.

Expressways generally are multi-lane arterials with a mix of grade-separated and signal-controlled at-grade intersections. There is no exact specification on signal spacing, but signals are typically spaced no closer than at four-mile intervals. Examples of Expressways in the region include SH 195, the southwest portion of Loop 363, and US 190 / SH 36 between Temple and Rogers.

These Functional Classes for ***Controlled Access*** facilities are supported by the addition of ***Frontage Roads*** and ***Ramps*** to allow detailed network coding.

Figure 5-1 shows the 2017 regional inventory of the Thoroughfare Network by Functional Class. The following **Figure 5-2** and **Figure 5-3** are insets for the western and eastern areas to show the data in greater detail.

Figure 5-1: 2017 Regional Inventory of the Auto Network

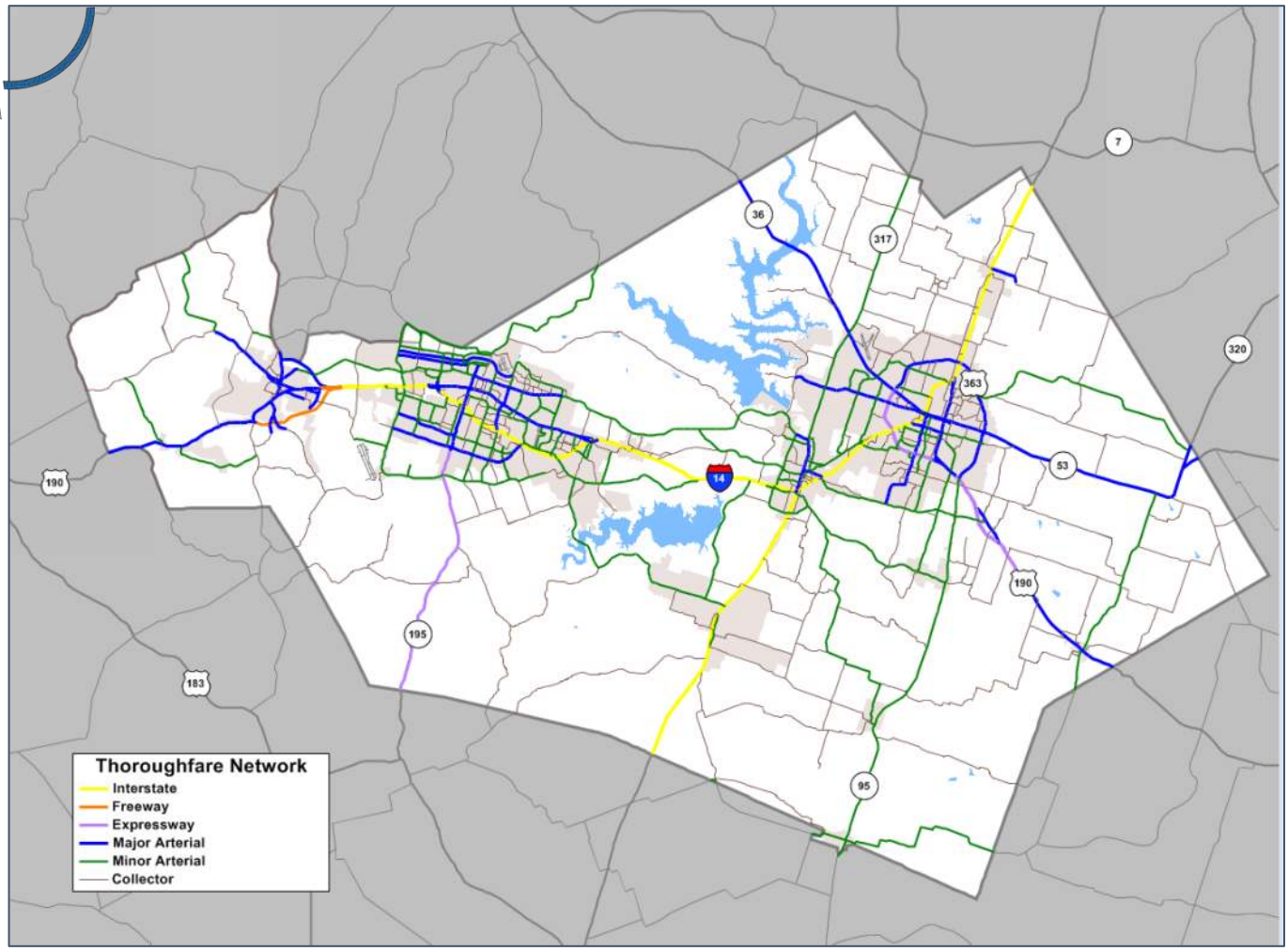


Figure 5-2: 2017 Regional Inventory of the Auto Network in the Western Area

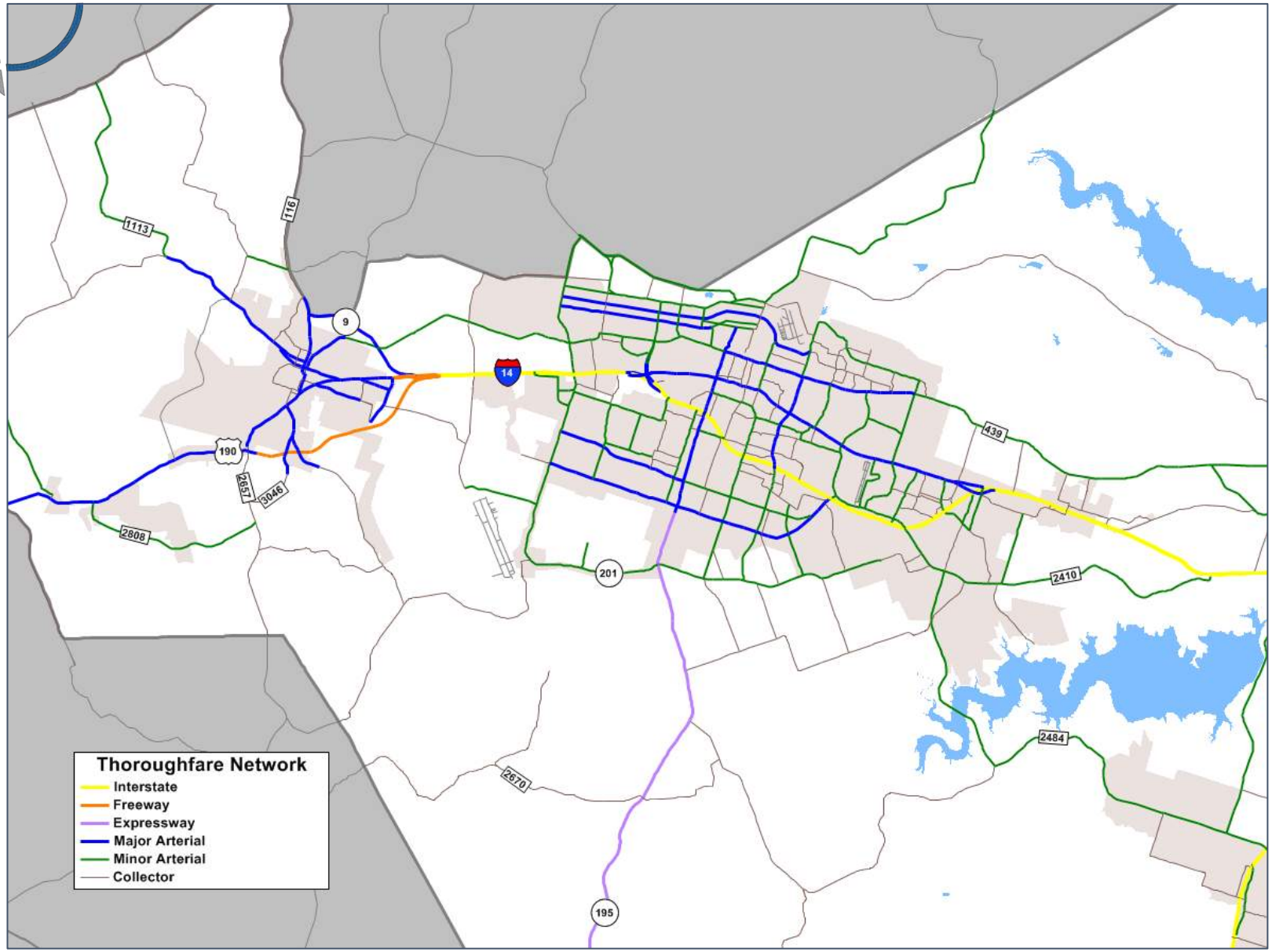
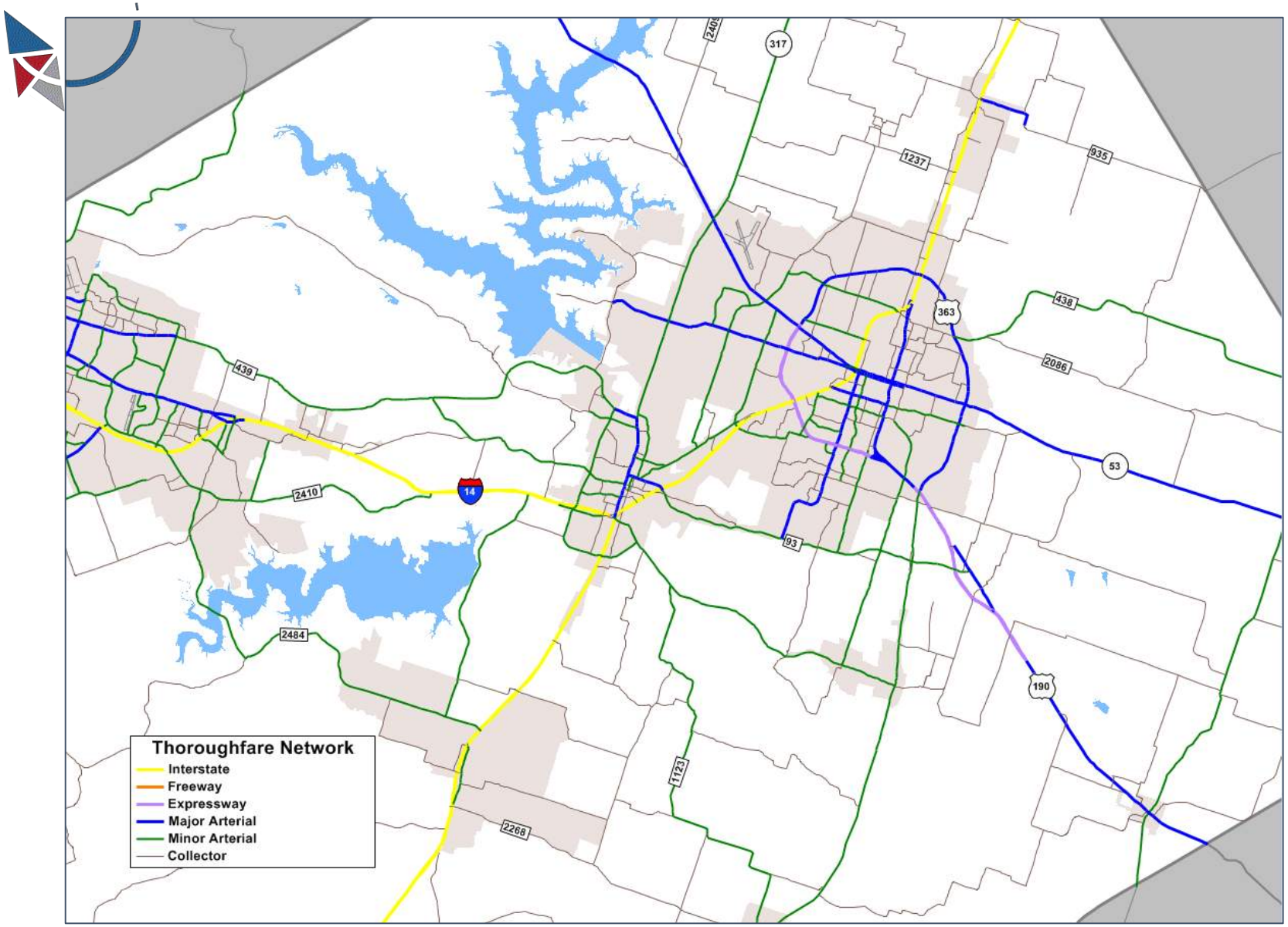


Figure 5-3: 2017 Regional Inventory of the Auto Network in the Eastern Area



As bicycles are legally defined as vehicles, the **bicycle network** includes all streets where they are not specifically prohibited, regardless of the designation of formal bicycle facilities. Bicycles are prohibited only from high speed, limited access facilities such as Interstate Highways.

Not all the Functional Classes which were defined for the bicycle network are present in the 2017 inventory. Those which are present include the ***Conventional Bike Lane***, the ***Shared Roadway***, and the ***Off-Street Multi-Use Trail***.

The 2017 inventory of bicycle facilities is shown in **Figure 5-4**, with insets of the western and eastern areas shown in **Figure 5-5** and **Figure 5-6**.

Figure 5-4: 2017 Regional Inventory of the Bicycle Network

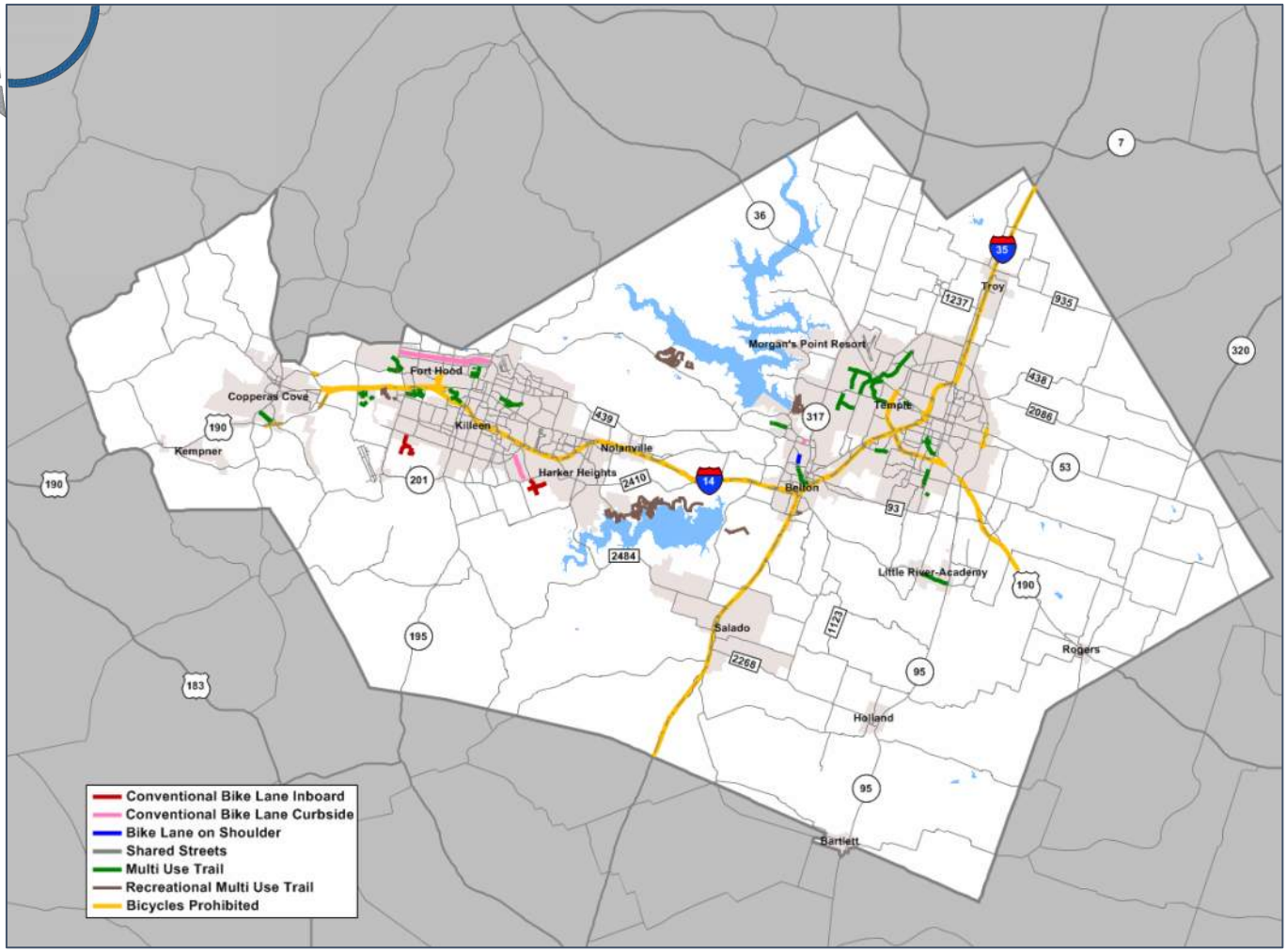


Figure 5-5: 2017 Regional Inventory of the Bicycle Network in the Western Area

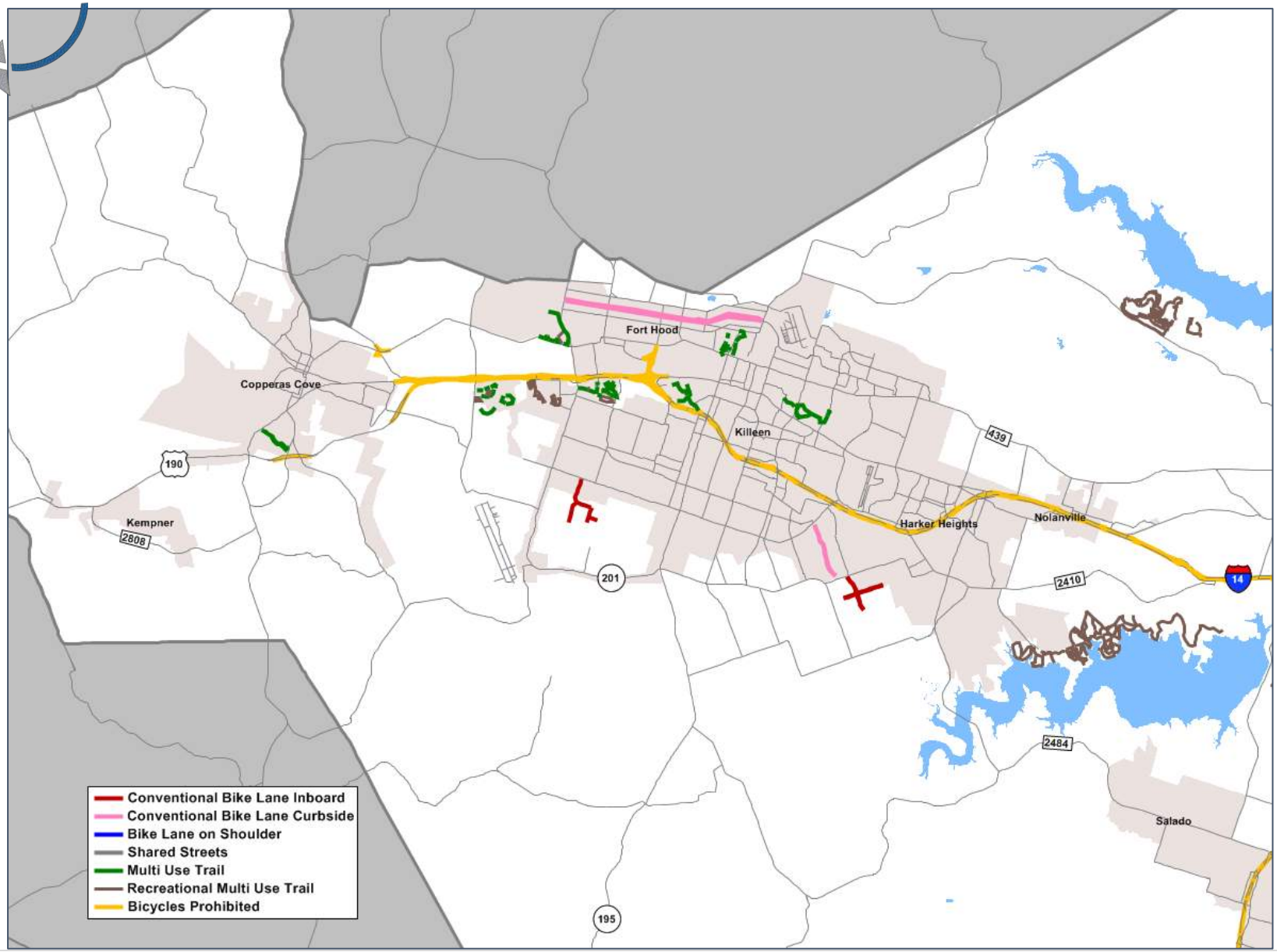
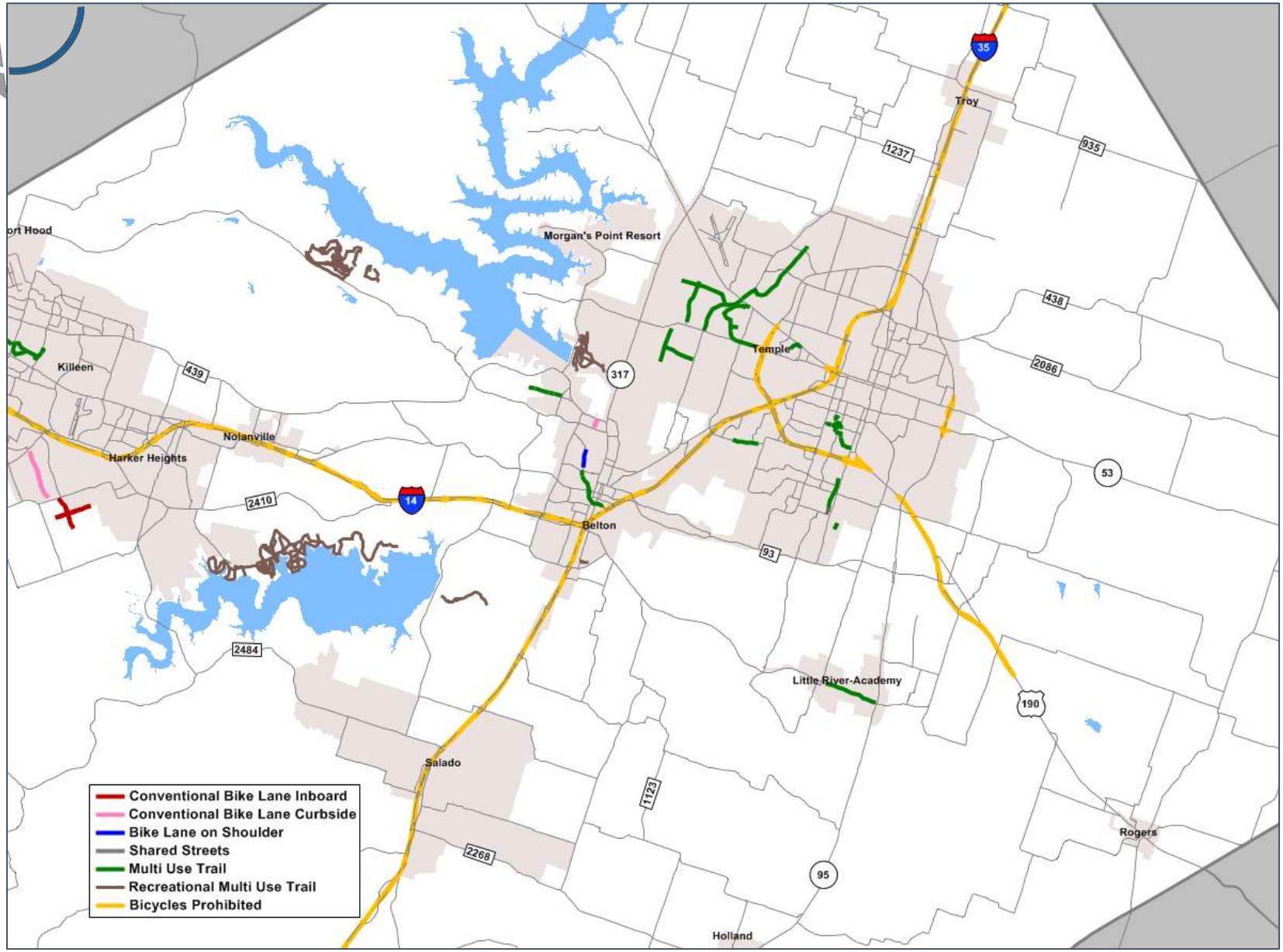


Figure 5-6: 2017 Regional Inventory of the Bicycle Network in the Eastern Area



For the **bus network**, Functional Classes were defined to establish a hierarchy of passenger amenities at bus stops. Four Functional Classes were defined as ***Station***, ***Shelter***, ***Bench***, and ***Basic Bus Stop***. All Functional Classes are present in the 2017 inventory of the region.

The HOP's bus system has a greater proportion of stops with shelters when compared to other transit systems. Overall, 43% of all stops have shelters. The system has a total of 359 active stops serving its 10 fixed routes. Of these, 154 stops have shelters, 1 has a bench only, and 204 are basic stops.

Figure 5-7 shows the 2017 regional inventory of the Bus Network by Functional Class. The following **Figure 5-8** and **Figure 5-9** are insets for the western and eastern areas to show the data in greater detail.

Figure 5-7: 2017 Regional Inventory of the Bus Network

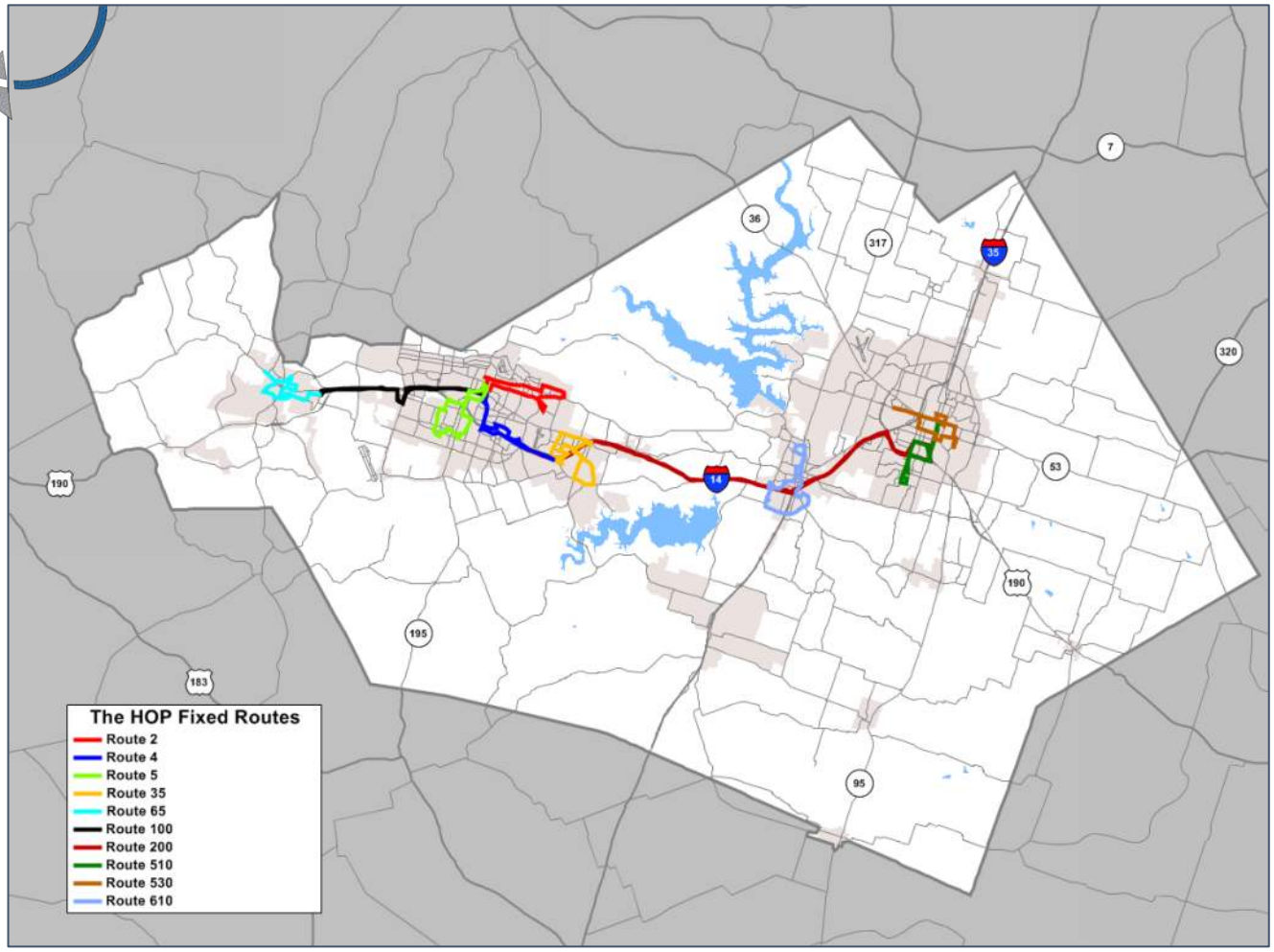


Figure 5-8: 2017 Regional Inventory of the Bus Network in the Western Area

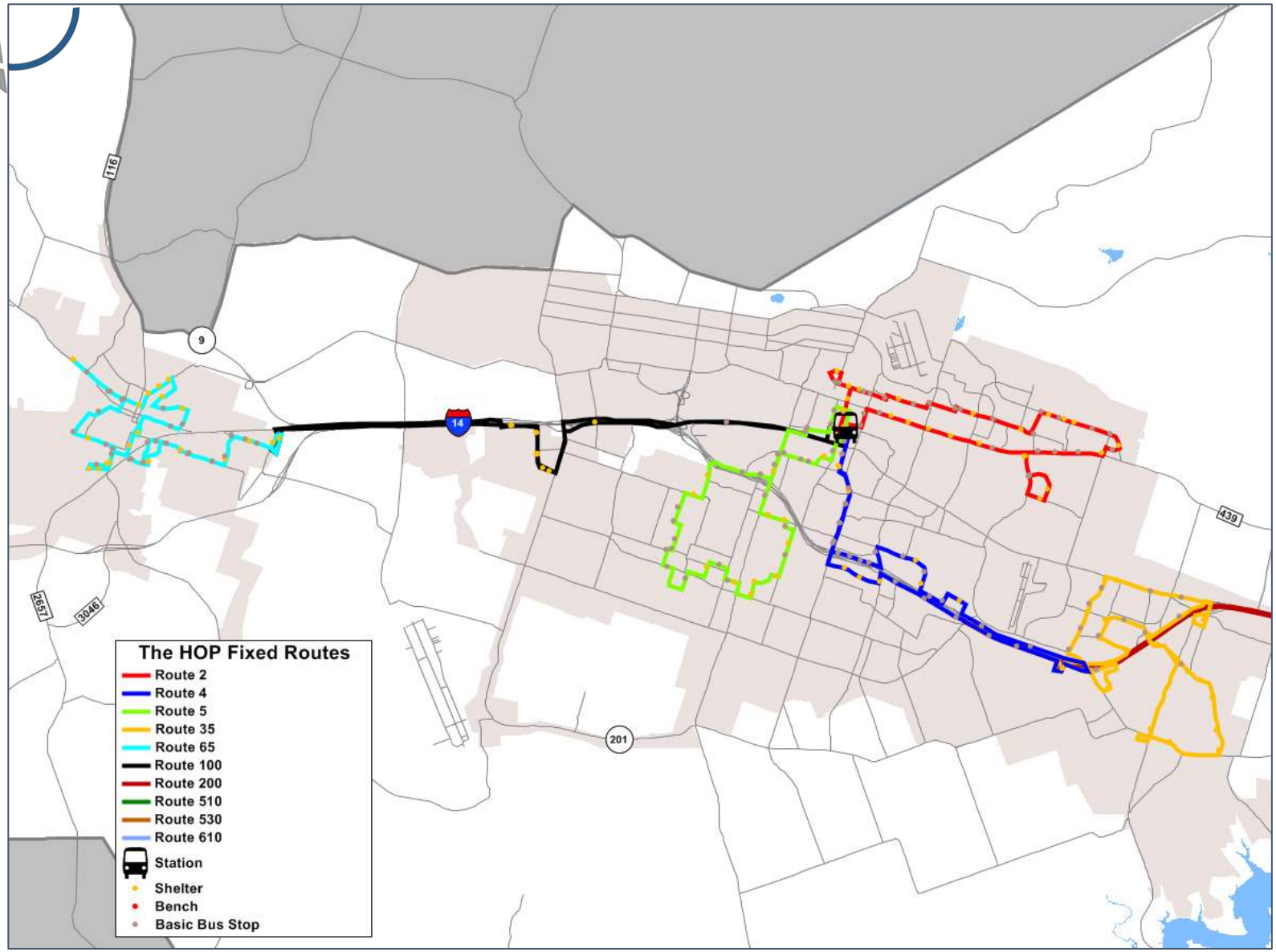
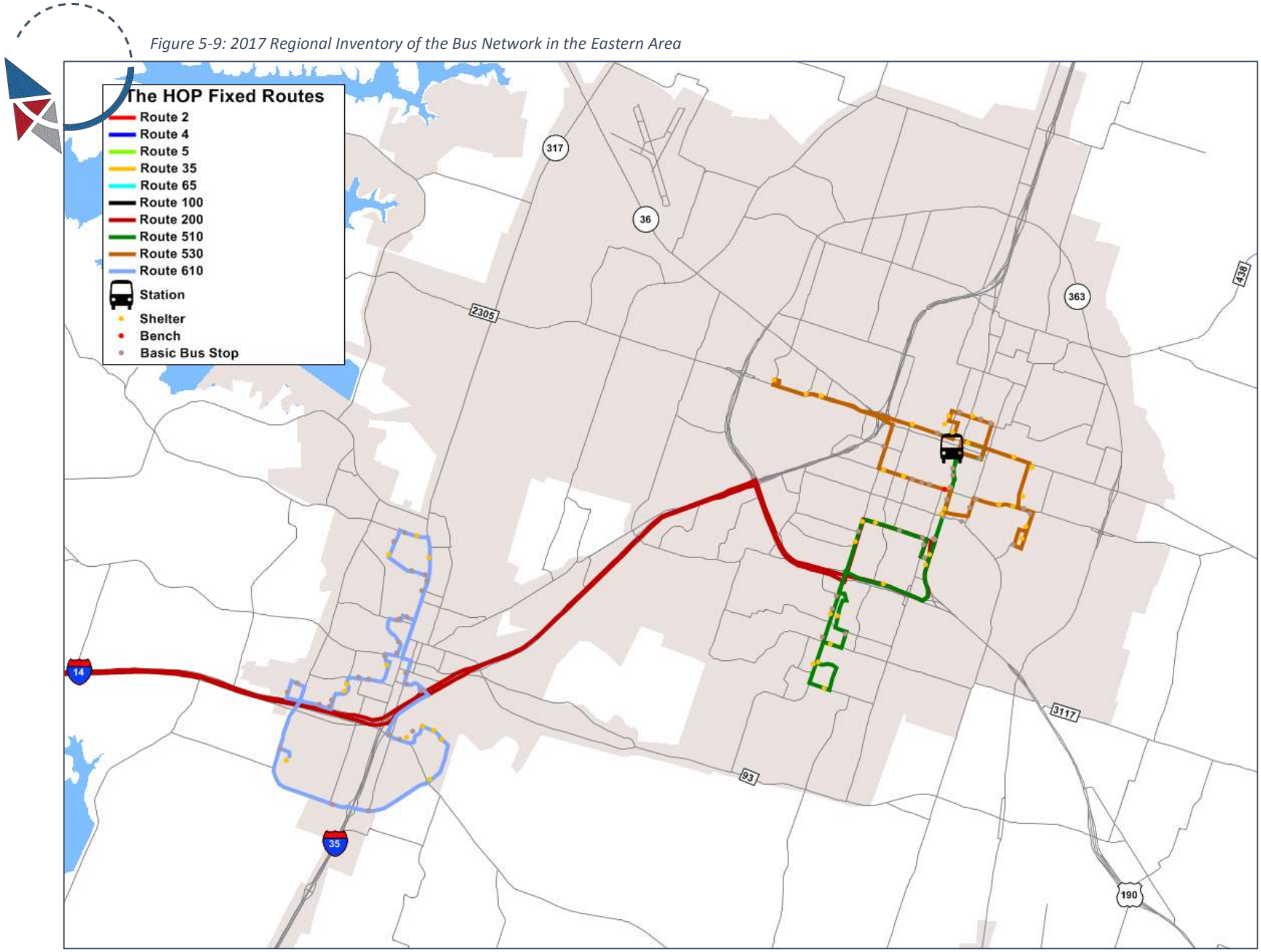


Figure 5-9: 2017 Regional Inventory of the Bus Network in the Eastern Area



Functional Classes for the **truck network** were defined to establish a hierarchy of streets based on the desirability of truck traffic. Four Functional Classes were defined as ***Priority***, ***Restricted***, ***Hazardous Materials***, and ***Prohibited***. All Functional Classes are present in the 2017 inventory of the region.

The ***Truck Priority Functional Class*** as shown for the region in **Figure 5-10**, with insets for the western and eastern areas in **Figure 5-11** and **Figure 5-12**, is a composite of several designated networks for trucks. Component networks include the National Highway System (NHS), the Eisenhower Interstate Highway System, other NHS routes and connectors, NHS intermodal connectors, and the Strategic Highway Network (STRAHNET). Truck priority networks introduced through the FAST Act include the National Highway Freight Network (NHFN) with its component Primary Highway Freight System (PHFS), other Interstate portions, Critical Rural Freight Corridors (CRFC) and Critical Urban Freight Corridors (CUFC). At the State planning level, Texas has defined a Texas Highway Freight Network complementing the Federal designations. There is considerable overlap among the designations, with critical regional routes such as IH-35 being listed in several different truck priority networks.

Truck Restricted Functional Class roads are based on the TxDOT listing of load-restricted roads, found online at http://www.txdot.gov/apps/gis/loadzone. Roads are restricted by gross vehicle weight or by the number of axles, or both. Bridges with load restrictions are listed by TxDOT at http://apps.dot.state.tx.us/apps/gis/lrbm. The data show thirty-five routes in Bell County and four routes in Coryell County with designated load restrictions. Thirteen bridges in Bell County are also designated with load restrictions. These published truck restrictions are supplemented by local ordinances which define general restrictions without specifically designating truck routes.

There are additional areas where trucks have not been officially prohibited, but where infrastructure or conditions do not support their safe or efficient operation. The geometric constraints at certain railroad crossings illustrate the issue. While the majority of railroad crossings in the KTMPO region are either at-grade or are grade separated with generous vertical and horizontal clearances, trucks have special needs and railroad crossings may present issues. Four locations are inventoried with geometric restrictions: two at-grade railroad crossings with high crowns, and two railroad underpasses with constrained clearances. The February 26, 2018 crash of a train and an 18-wheeler at an at-grade crossing on Teague Dr. in Moody (outside the KTMPO region) illustrates the issue.

Photo: Temple Daily Telegram

The crown of the road is such that the jacks on truck trailers can get caught, so the truck is unable to move forwards or backwards off the tracks. The crossing is well known locally and local officials say that trucks are prohibited from that crossing, but there are no signs prohibiting trucks and the crossing is not on the TxDOT list of restricted routes. This shows that the available routing data may not be sufficient in all cases, and very specific local knowledge of truck restrictions, constraints, and barriers is needed.

Local jurisdictions may also designate certain routes for their ***Hazardous Materials Functional Class*** roads, and enter them into the National Hazardous Materials Route Registry, which is maintained by the Federal Motor Carrier Safety Administration (FMCSA) and posted online at https://www.fmcsa.dot.gov/regulations/hazardous-materials/national-hazardous-materials-route-registry-state. In the KTMPO region, only Loop 363 in Temple and the portion of IH-35 inside the Loop are designated in the national registry.

Only one example of a route or bridge absolutely ***Prohibited*** to trucks was found in the KTMPO region: the bridge on W. Central Ave in Belton, which is not only load restricted, but also is narrow, one-lane, one-way, with concrete guardrails which constrict the horizontal clearance.

Figure 5-10: 2017 Regional Inventory of the Truck Network

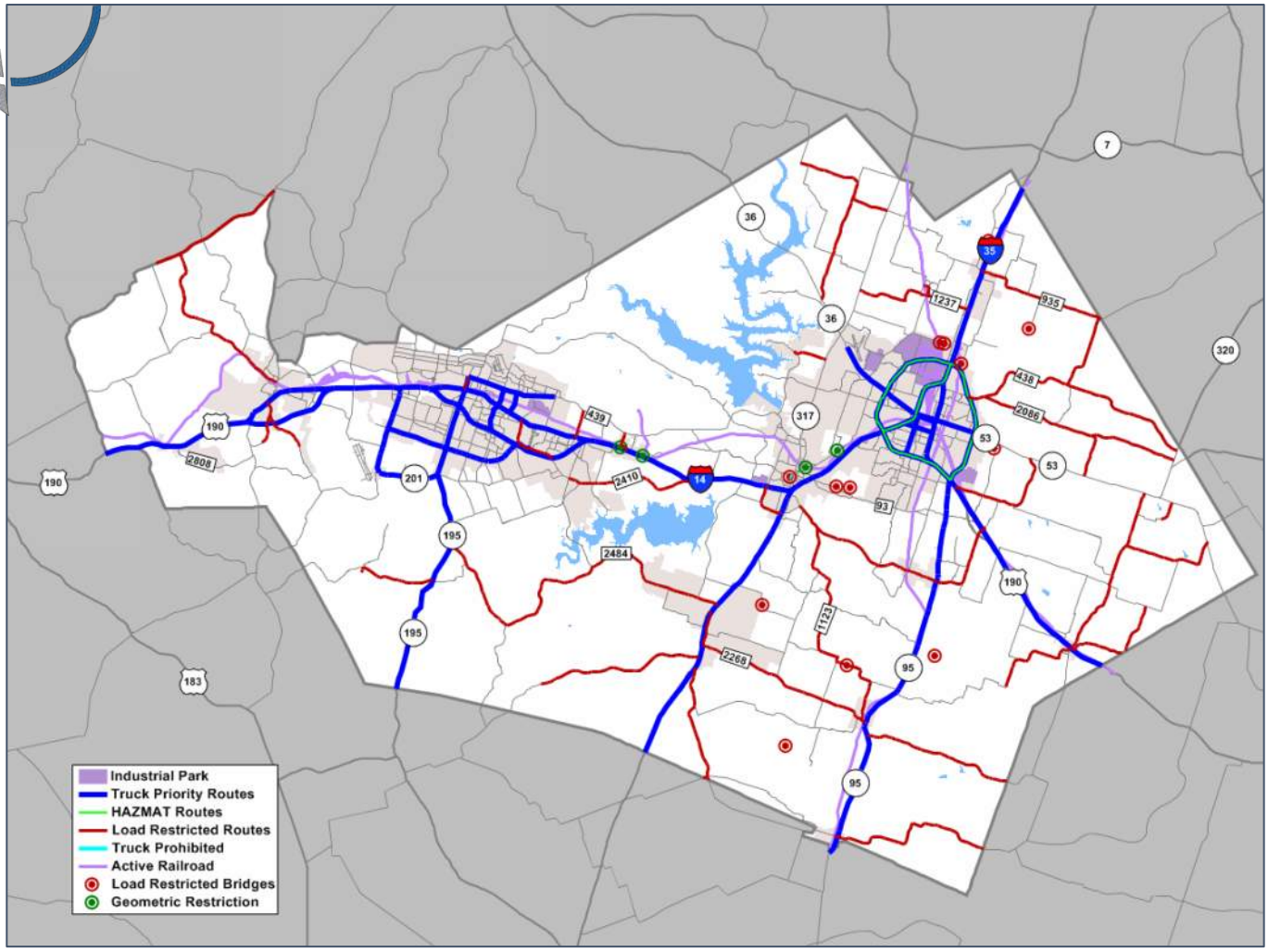


Figure 5-11: 2017 Regional Inventory of the Truck Network in the Western Area

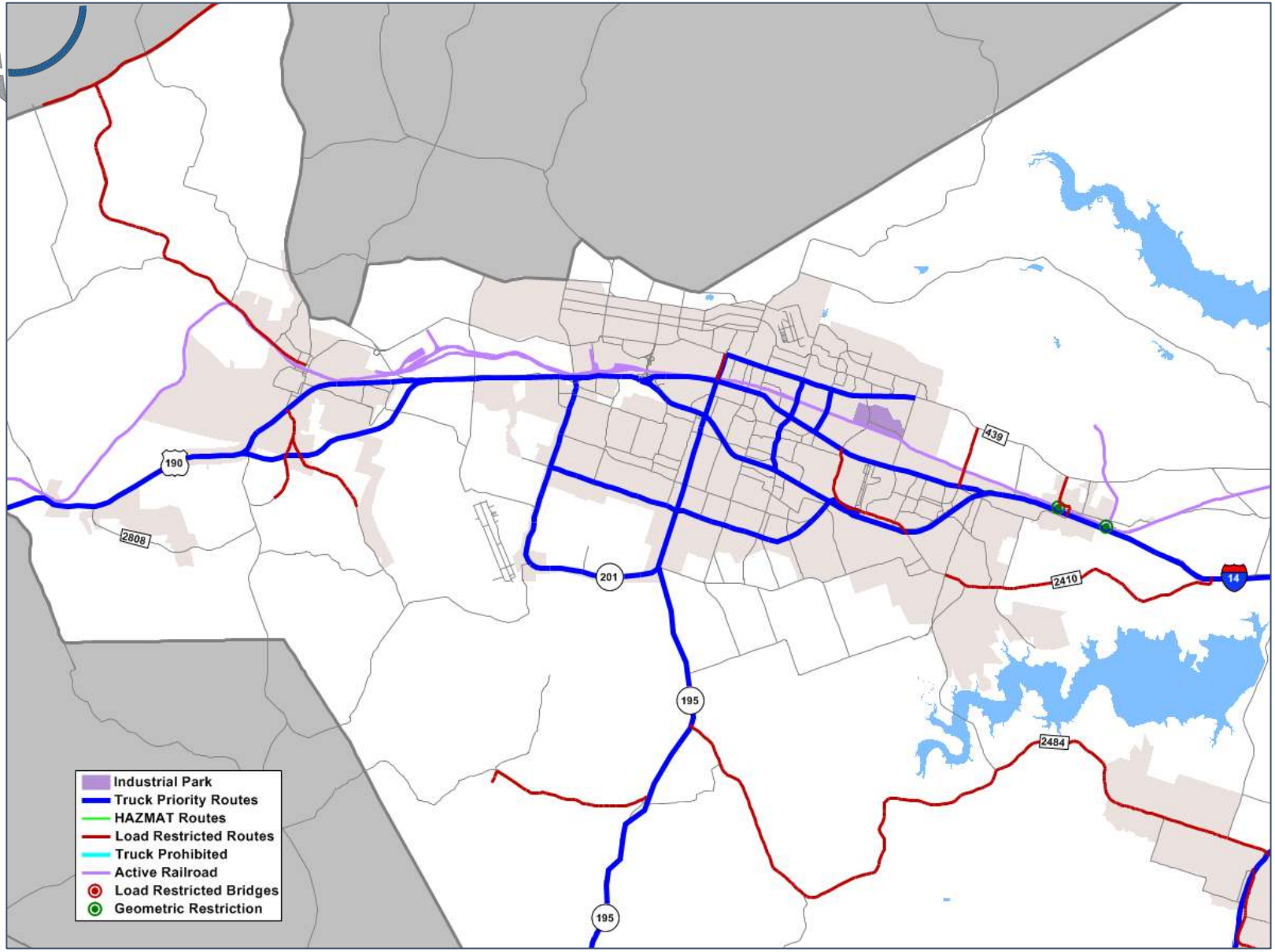
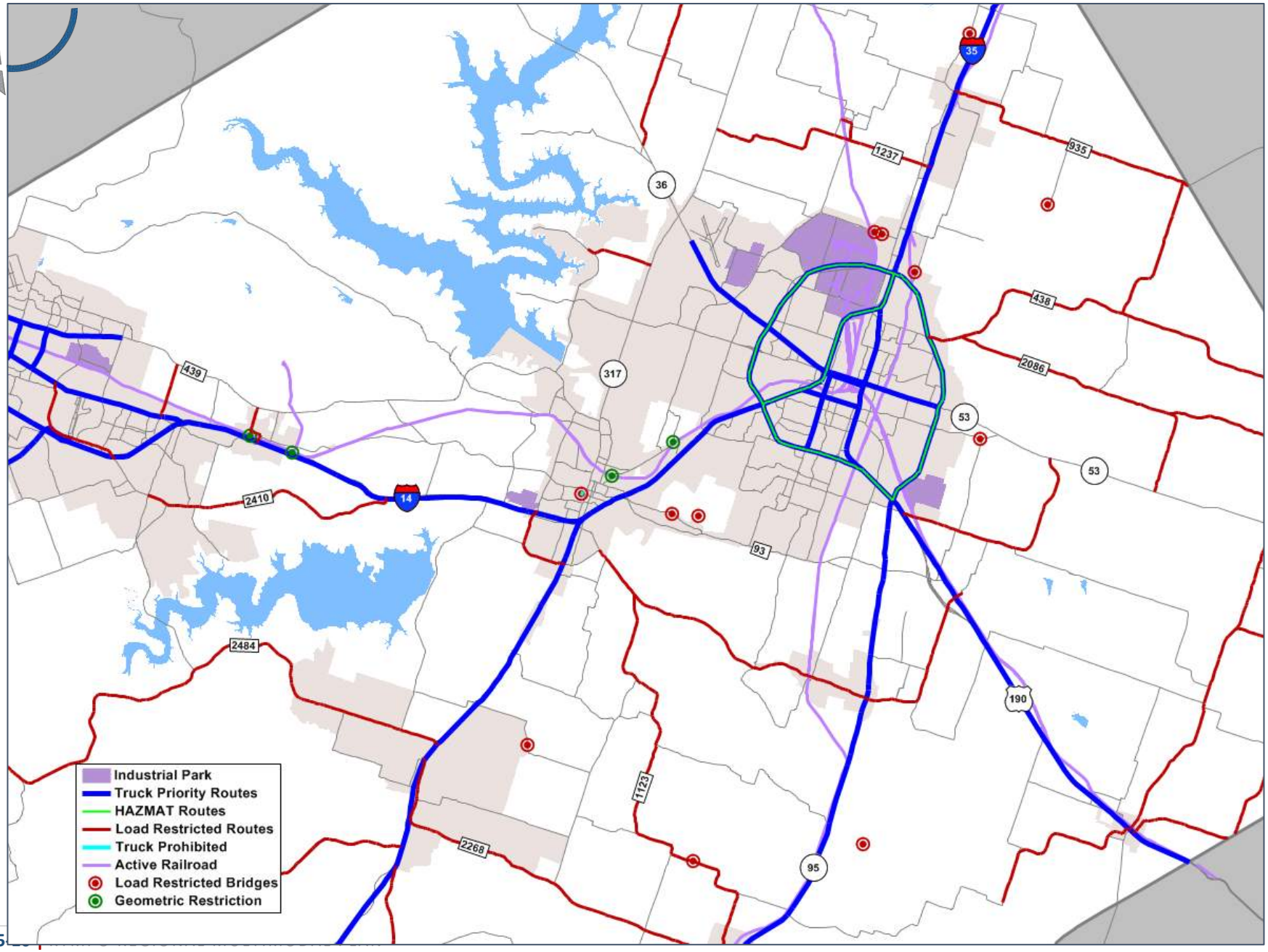


Figure 5-12: 2017 Regional Inventory of the Truck Network in the Eastern Area



The **walk network** has been defined with four Functional Classes. ***Sidewalks*** and ***Multi-Use Trails*** are included in the inventories, and are tracked by KTMPO with current infrastructure and projects. Inventories of these two Functional Classes are shown in **Figure 5-15**, with insets for the western area in **Figure 5-16** and for the eastern area in **Figure 5-17**.

The review of the inventories found several areas where the sidewalk inventory needs to be updated. The areas needing inventory updates are noted in the Figures with key "Sidewalk Inventory Needed". The areas needing inventory updates include both new developments and older residential areas in Copperas Cove, south of Killeen and Harker Heights, north of Belton, Temple, and Troy.

The exact distinction between on-street multi-use trails and sidewalks should be defined to add more precision to the network inventory. In general, the width of the facility is the most important distinction, with multi-use trails serving both bicycles and pedestrians requiring a width of at least five feet. Neither the current bicycle path and trails inventory nor the sidewalk inventory include width as an attribute, so adding this level of precision will require additional field work to update the inventories.

Compliance of the walk network with the requirements of the Americans with Disabilities Act (ADA) is also an important attribute which will add precision to the inventories. Extensive efforts to make the walk network ADA compliant are evident throughout the region, particularly with curb cuts, ramps, and texturing. However, the nuances of ADA compliance are complicated. **Figure 5-13** shows a bus stop which is set back from the curb to allow room for buses to drop their wheelchair ramps, while still allowing room for wheelchairs to maneuver to get into position. However, while this setup is compliant for access to the bus for wheelchair users, the shelter blocks the path of the sidewalk and may not be compliant for sight-impaired users. These types of nuances and the potentially conflicting needs of multiple users mean that an inventory of ADA compliance would be complex, and would require extensive knowledge of requirements as well as extensive field work.

Figure 5-13: Sidewalk ADA Compliance at a Bus Stop

The ***Multi-Use Trails*** are shared with the **bicycle network**, and are shown here as well. Two Facility Types of Multi-Use Trails are distinguished: on-street and recreational. As shown in the Figures, the recreational multi-use trails are typically located in parks or recreational areas and form closed loops rather than forming connections to the network.

The ***Desire Line*** and the ***Crosswalk*** Functional Classes have been newly defined for the walk network in this Plan, and therefore are not included in the KTMPO inventories. **Figure 5-14** shows the walk network along S. 31st Street in Temple to illustrate the issues. Several residential and commercial areas are shown which have no walk network coverage, and some sidewalks are shown to have linear gaps. Desire line paths are shown on both sides of S 31st Street: on the east side along the gap in the line of sidewalks, and on the west side where there are no sidewalks. An inventory for sidewalks, desire lines, and crosswalks will require extensive field work. A review of aerial photos could contribute to the inventories but would not be sufficient to fully describe the networks.

Figure 5-14: Sample of Sidewalks and Desire Lines

In general, the regional view in **Figure 5-15** shows how the walk network inventory varies by area. Killeen and Harker Heights show an extensive sidewalk network in their newly-developed residential areas both north and south of IH-14. In contrast, the eastern area has a much less dense sidewalk network, even in its areas of recent residential development along SH 317 north of Belton and around S 5th Street south of Temple.

Figure 5-15: 2017 Regional Inventory of the Walk Network

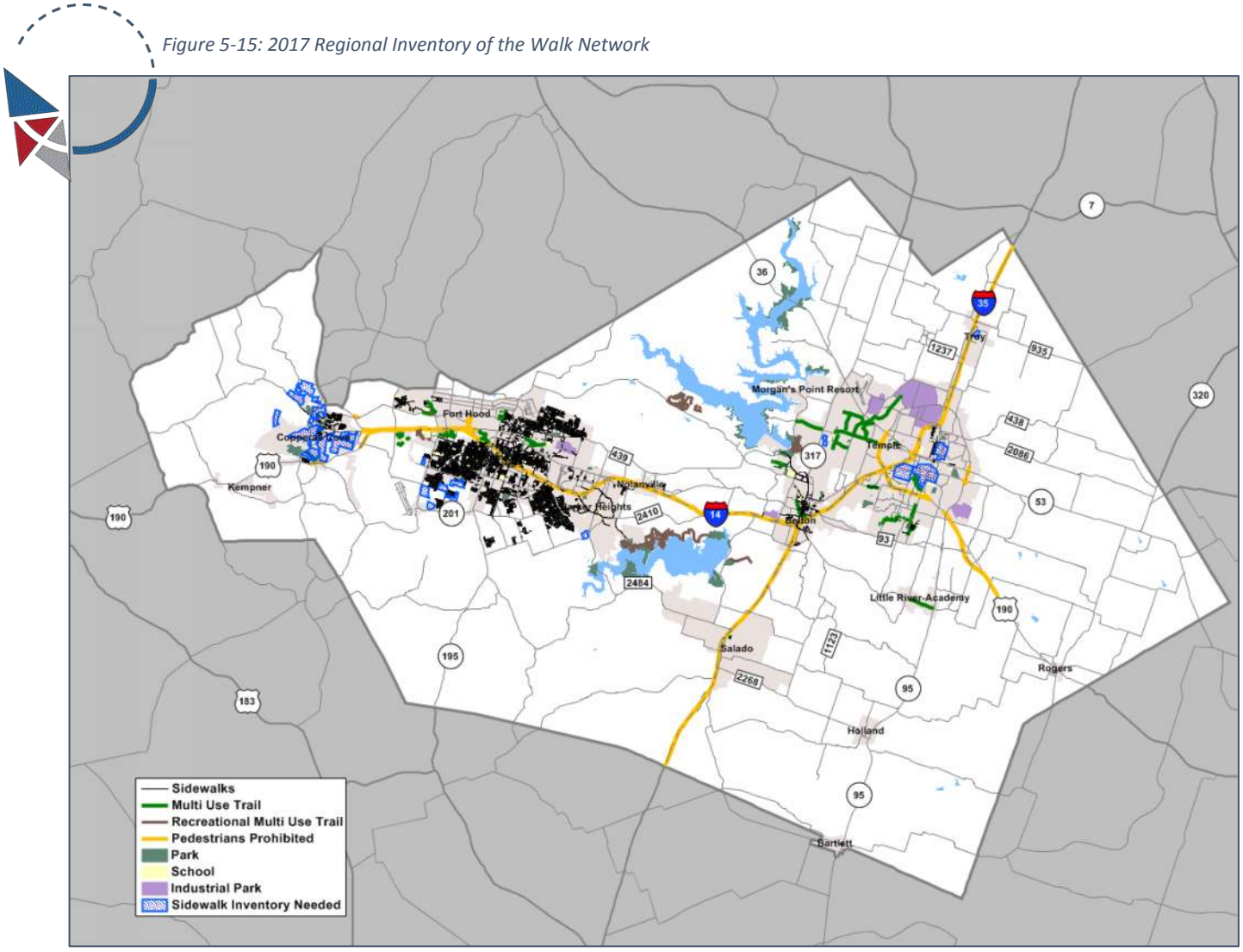


Figure 5-16: 2017 Regional Inventory of the Walk Network in the Western Area

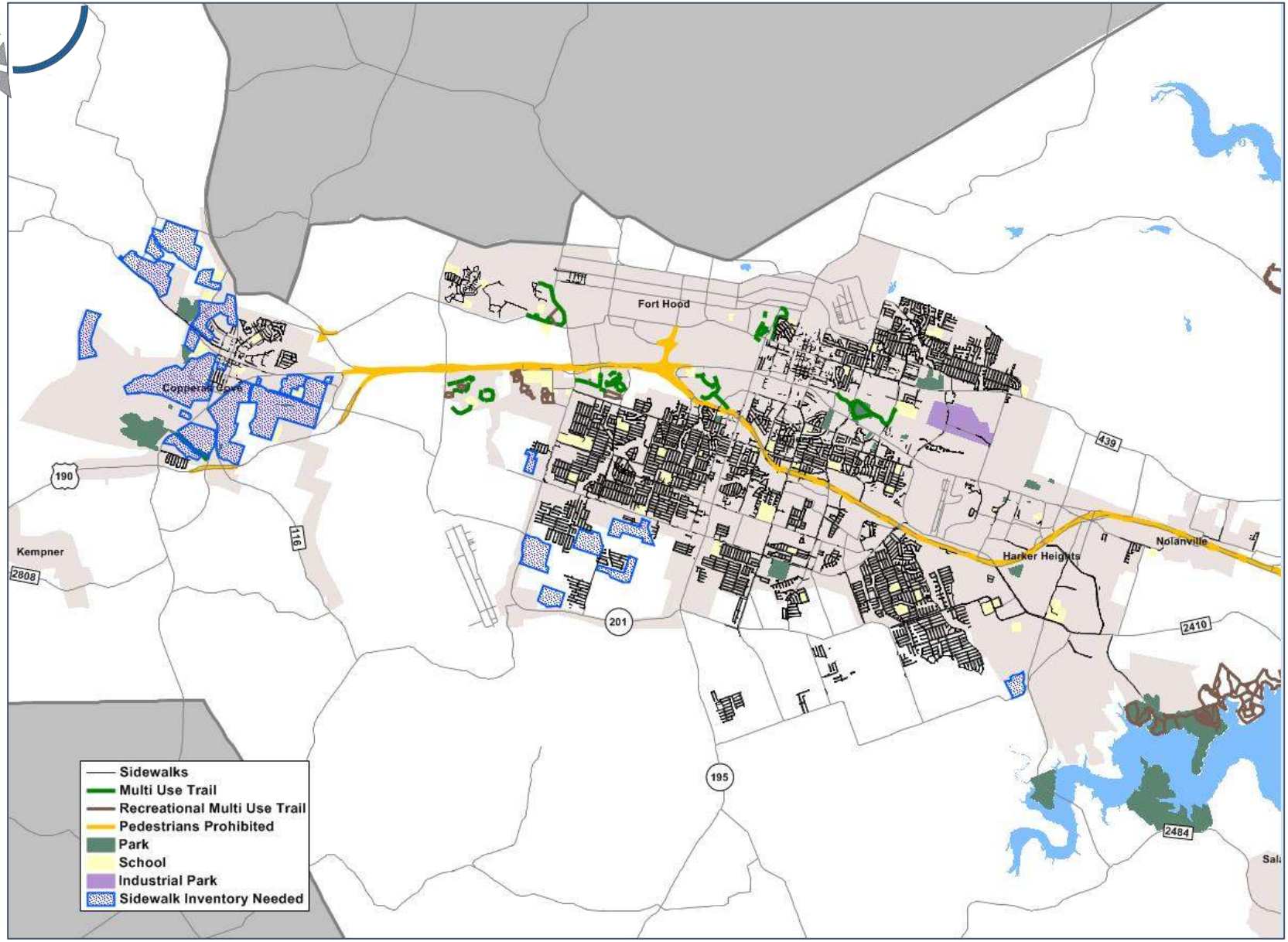
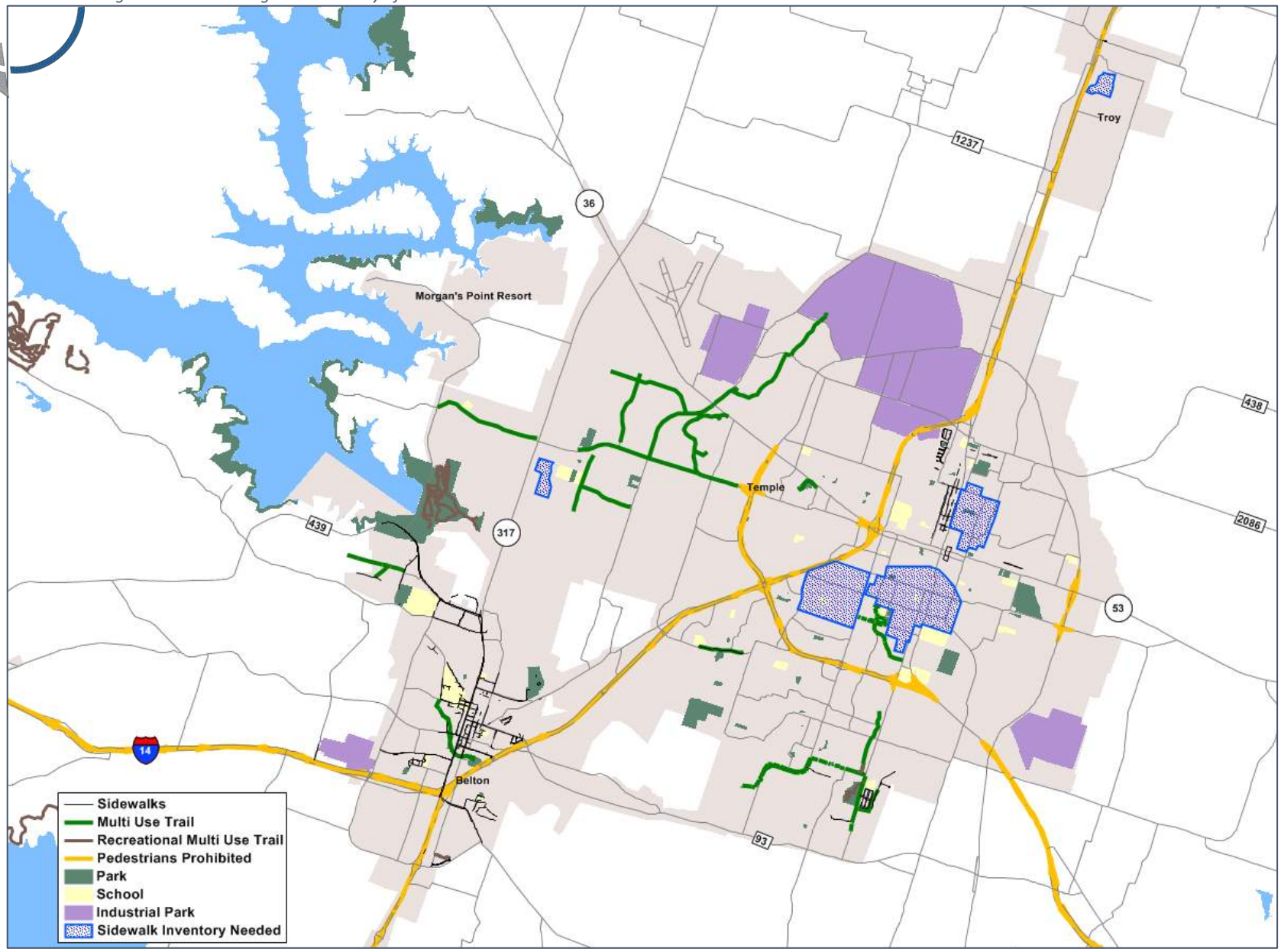


Figure 5-17: 2017 Regional Inventory of the Walk Network in the Eastern Area



The **Airport System** and the **Rail System** are not treated as networks in this Plan, but as points that are accessed by the other networks. For airports, those points are the single roads that serve the airport entrances. The interaction of railroads with the other networks is primarily found at railroad crossings. Railroad crossings can be either at-grade or grade separated with an overpass or underpass.

The airport and railroad system inventories are shown in **Figure 5-19**, with insets for the western area in **Figure 5-20** and for the eastern area in **Figure 5-21**.

There are four major airports in the region. The Killeen-Fort Hood Regional Airport is a shared field with the Robert Gray Army Airfield. Access to the civilian side of the airport is provided by Chet Edwards Loop. It is classed as a primary commercial service airport, and is served by American Eagle and United Airlines. Service by Delta Airlines was terminated in January 2018. The Hood Army Airfield is not open to civilian air traffic, but is noted for completeness of the inventory. Skylark Field is the former Killeen Municipal Airport; commercial operations were moved to the Killeen-Fort Hood Regional Airport in 2004. Airport Drive provides access to the terminal. It is not served by scheduled passenger air service, but is open for general aviation. The Draughon-Miller Central Texas Regional Airport is also a general aviation facility. One street provides access to the airport's administrative buildings, and three other streets provide access to individual areas of hangers.

At-grade railroad crossings impact the network with the quality of the crossing. All of the 140 at-grade crossings in the KTMPO region have a smooth crossing, typically with pre-cast concrete pads between the rails. The only issues found with at-grade crossings were at two locations in Nolanville: N 5th Street and Levy Crossing Road, where a high crown with a steep grade on both sides of the tracks may cause issues with longer vehicles bottoming out.

There are twenty-seven grade separated railroad crossings in the region. All except two provide generous horizontal and vertical clearance for crossing traffic. The two exceptions, on Waco Road and on Charter Oak Drive (which are actually the same road) in Belton, have low horizontal and vertical clearance that may constrain larger trucks. They are also both located on curves and in dips, which can restrict visibility and speed. The crossing on Charter Oaks Drive is shown in **Figure 5-18**. Neither the two at-grade crossings with high crowns nor the two grade-separated crossings with constrained geometries are posted as truck restricted, but larger trucks may have difficulty with the routes.

Figure 5-18: Railroad Overpass on Charter Oaks Drive

This shows that the available routing data may not be sufficient in all cases, and very specific local knowledge of truck restrictions, constraints, and barriers is needed.

Figure 5-19: 2017 Regional Inventory of the Airport and Rail Systems

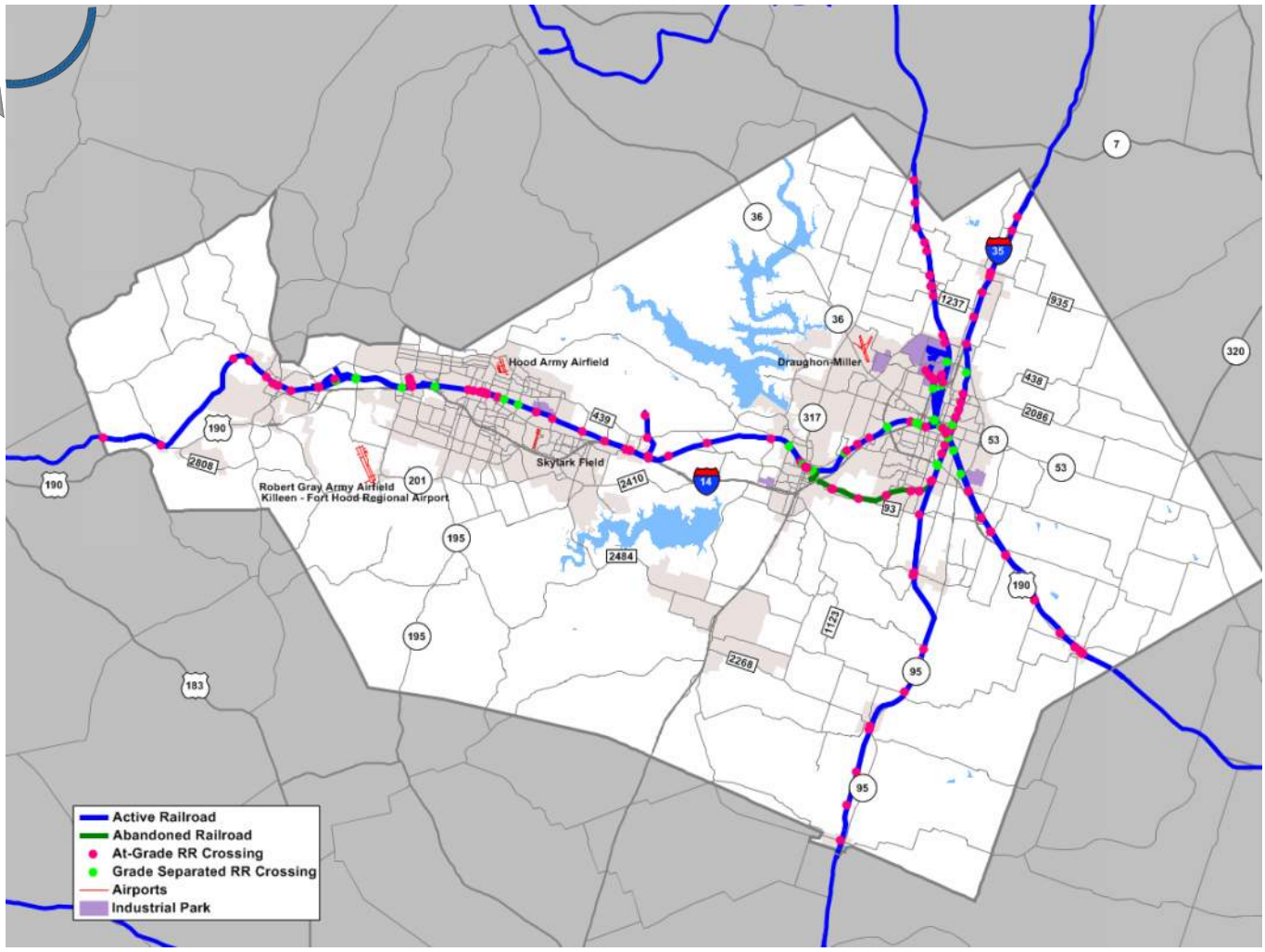


Figure 5-20: 2017 Regional Inventory of the Airport and Rail Systems in the Western Area

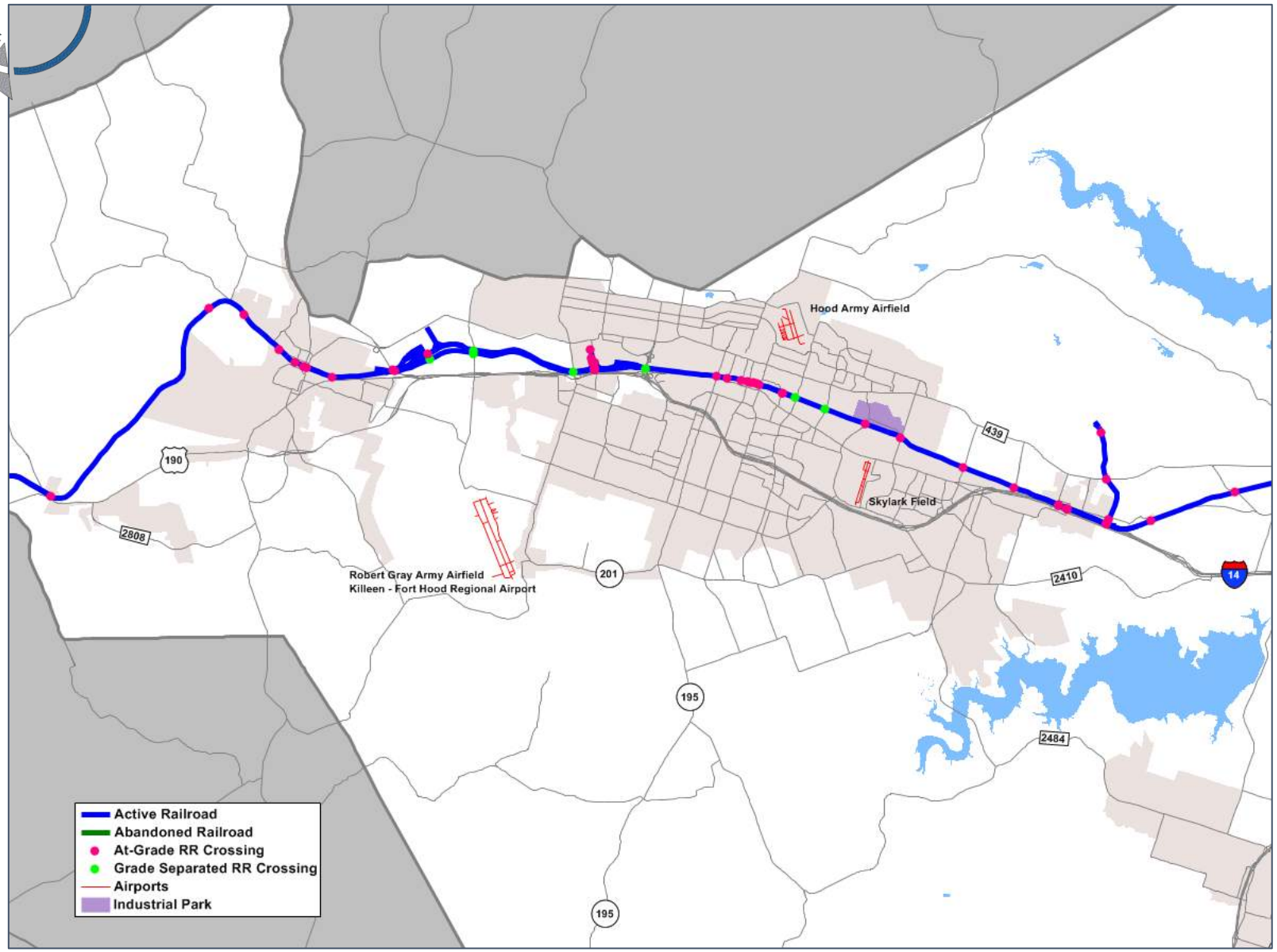
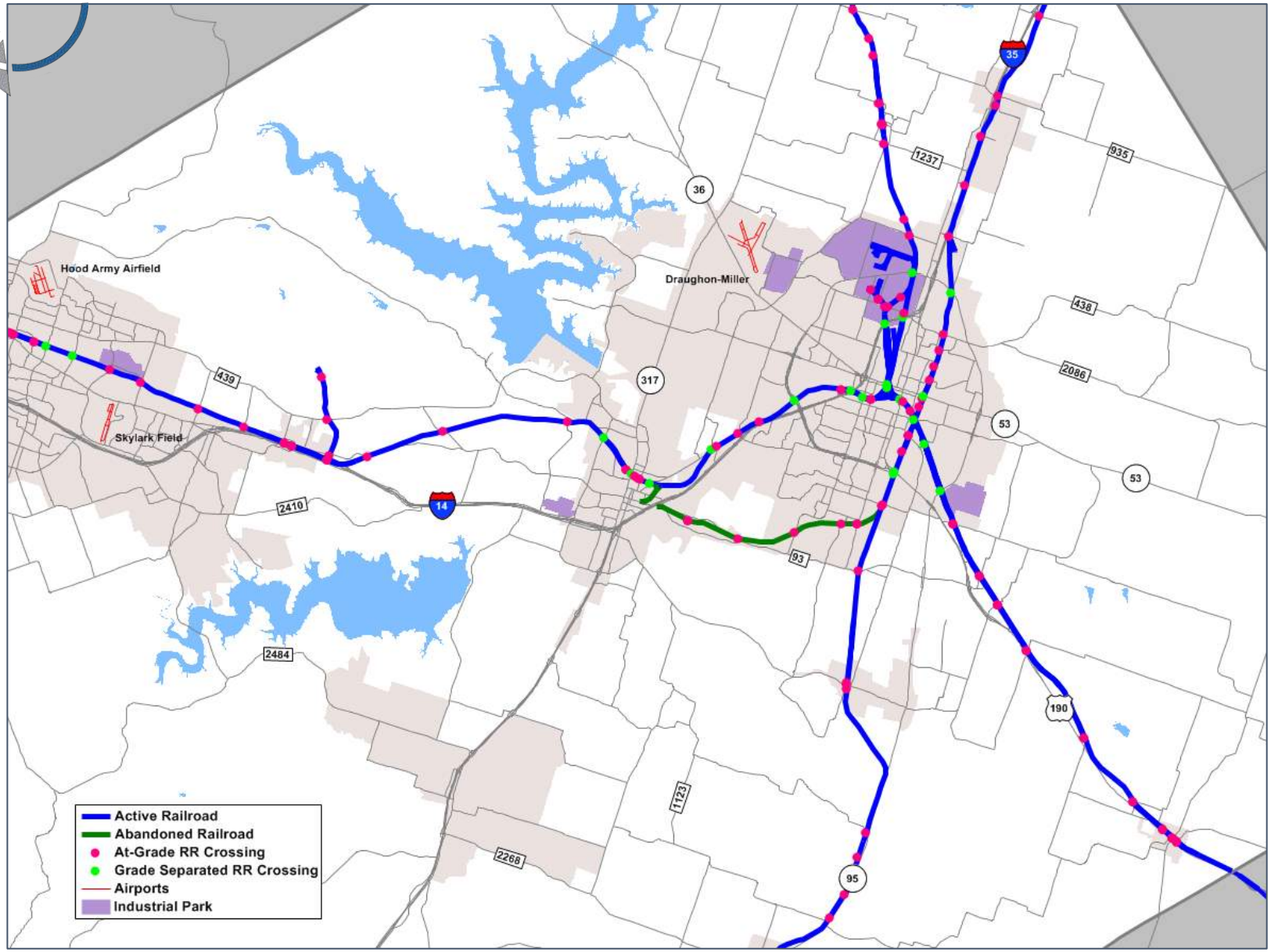


Figure 5-21: 2017 Regional Inventory of the Airport and Rail Systems in the Eastern Area



Summary

Inventories of current conditions by mode are vital to define the extent of the respective infrastructure by Functional Class, along with the notable constraints and barriers faced by each network. This data is vital to both define and to evaluate potential network improvement projects.

Inventories were developed as GIS layers and verified for each of the five modal networks and the airport and railroad systems. The inventories are primarily documented through GIS layers rather than paper maps to support further work for this Plan because of their necessary level of detail, which is cumbersome to show in printed maps. The inventories were primarily based on available data gathered from the KTMPO and other sources and extensive field work was not intended. The verification effort showed that the GIS layers were generally complete and accurate, and only minor editing was required. The only GIS layer which was discovered to need more extensive updates is the sidewalk inventory, which showed several areas where updates to the inventory are needed. Additionally, the inventories, coupled with the definitions of Functional Classes and Facility Types by mode which were developed for this Plan in Chapter 4, show the need for additional data attributes to add precision to the inventories for several of the modal networks.

The **auto network** is the base layer for the Thoroughfare Plan, with Functional Classes for the Plan generally following the defined Functional Classes for the regional travel demand model. Important differences are that the model breaks the Controlled Access Functional Class down to Interstate, Freeway, and Expressway, and includes frontage roads and ramps for detailed coded sections. Additionally, the model Principal Arterial Functional Class is re-named as Major Arterial for the Plan. The auto network was reviewed and updated for all street projects up to the year 2017.

For the **bicycle network**, the Facility Types defined in Chapter 4 can be added to the inventories to distinguish the Conventional Bike Lane Functional Class as either the Inboard or the Curbside Facility Type. The Multi-Use Trail Functional Class, which is shared with the Walk Network, needs additional data to define its Facility Types as Hard Paved or Soft Paved. In addition, the exact and consistent definitions and the distinctions between a Multi-Use Trail and a sidewalk need to be established, and data collected accordingly to supplement the inventories. In general, the width of the facility is the most important distinction, with multi-use trails serving both bicycles and pedestrians requiring a width of at least five feet. Neither the current bicycle path and trails inventory nor the sidewalk inventory include width as an attribute, so adding this level of precision will require additional field work to update the inventories.

The **bus network** includes a Facility Type for ADA Access to define pedestrian access to bus stops. Defining this Facility Type would require extensive field work to supplement the bus stop inventory with this attribute. The bus network includes The HOP's ten fixed routes and three stations where these routes connect with intercity bus and AMTRAK passenger rail.

All Functional Classes in the **truck network** have been adequately defined and inventoried, but there are additional areas where trucks have not been officially prohibited, but where infrastructure or conditions do

not support their safe or efficient operation. This shows that the available routing data may not be sufficient in all cases, and very specific local knowledge of truck restrictions, constraints, and barriers can be added as attributes in the truck network inventory.

For the **walk network**, several areas needing an update to the sidewalk inventory were defined in a GIS layer. In addition, the exact distinction between the Multi-Use Trail and the Sidewalk Functional Classes needs to be established, and the inventories updated accordingly. Additional attributes to establish the Conventional, Landscaped, and Urbanized Sidewalk Facility Types would add precision to the inventory.

Finally, Desire Lines and Crosswalks are new Functional Classes for the walk network, and inventories should be established for them.

The updated inventories and attributes are based on the need to support the definition and evaluation of network improvement projects. The full level of precision specified by the new Functional Classes and Facility Types for each modal network may or may not be immediately necessary, based on the network projects that are under consideration in order to build a fully **integrated regional multimodal transportation system**. In general, the updates would require extensive field work to complete. A review of aerial photos could contribute to the inventories, but would not be sufficient to fully describe the networks and their attributes.